

Adani Transmission Limited

June 2021

Quality information

Prepared by

Checked by

Souvik Basu

Project Consultant

Verified by

Aziz Haban

Sourik Base

Avijit Sarkar Associate Director

Approved by

Chetan Zaveri Executive Director

Aziz Hasan Project Consultant (Environment Specialist)

Dr. Prajakta Shivaji Pathare Consultant - Ecology and Biodiversity Specialist

W. Lanas

Wanda Lamare Consultant - Social Specialist

Dr. Sudin Pal Consultant -Ecology Specialist

Maitreyee Sevekari Consultant - Social Specialist

Albamozikan

Amruta Dhamorikar Consultant -Biodiversity Specialist

Revision History

Revision	Revision date	Details	Authorized	Name	Position
00	08.06.2021	Final ESIA Report	Yes	Chetan Zaveri	Executive Director

Distribution List

# Hard Copies	PDF Required	Association / Company Name
-	Yes	Adani Transmission Limited

Prepared for:

Adani Transmission Limited

Adani Corporate House Shantigram, S G Highway Ahmedabad 382421 Gujarat, India

Prepared by:

AECOM India Private Limited

9/F, Infinity Tower – 'C', DLF Cyber City, DLF Phase II Gurgaon, Haryana, India 122002.

CIN: U74210HR2008FTC038183

+91 124 4830100 Tel +91 124 4830108 Fax

aecom.com

© 2020 AECOM India Private Limited. All Rights Reserved.

This document has been prepared by AECOM India Private Limited ("AECOM") for sole use of our client (the "Client") in accordance with generally accepted consultancy principles, the budget for fees and the terms of reference agreed between AECOM and the Client. Any information provided by third parties and referred to herein has not been checked or verified by AECOM, unless otherwise expressly stated in the document. No third party may rely upon this document without the prior and express written agreement of AECOM.

Table of Contents

Execu	tive Summery	1
1.	Introduction	5
1.1	Background	5
1.2	Objective of the Project	5
1.3	Scope of the Project	6
1.4	Project Proponent	6
1.5	Limitation of the Report	6
1.6	Report Structure	7
2.	Description of the Project	8
2.1	Need of The Project	8
22	Regional Setting	9
2.3	Accessibility	11
24	Segment Analysis of the Alignment	12
2.1	Analysis of Alternative Transmission Line Alignment	13
2.0	Pronosed Components of the Project	16
2.0	Proposed Components of Transmission Lines	16
2.1	Proposed Components of Transmission Lines	10
2.0	Project Component of Substation	. 19
2.9		. 19
2.9.1		. 19
2.9.2	Construction Phase	. 20
2.9.3	Operation and Maintenance	.21
2.9.4	Details of ROW	. 21
2.9.5	Details of Tree Enumeration and Cuttings	. 21
2.10	Project Duration and Schedule	.21
2.11	Quantification of greenhouse gas	.24
2.11.1	Emission Sources for the proposed project	. 24
2.11.2	Construction of the sub station	. 24
2.12	Calculation of the GHG emission from different source for the proposed project	.24
2.12.1	Methodology for assessing the GHG emission from construction equipment	. 24
2.12.2	Land clearing due to erection of tower	. 25
2.13	Raw Materials Requirement	.27
2.13.1	Raw material	. 27
2.13.2	Land Requirement	. 27
2.13.3	Manpower Requirement during Construction	. 27
2.13.4	Equipment and machinery used in Construction	. 28
2.13.5	Power requirement during Construction	. 28
2.13.6	Water requirement during Construction	. 28
2.14	Pollution Sources & Characteristics during Construction	.28
2.15	Waste Management during Construction	.28
2.16	Waste Management during Operations	.29
2.17	Present Status of the Project	.29
3.	Policy Legal and Administrative Framework	.30
3.1	National and State Laws	30
3.2	Clearance and Permission Required	.36
3.3	Codes and Guidance	38
3.4	Founter Principles	38
3. 1	IFC Performance Standards	.00 ⊿ว
3.6		. <u>-</u> -
J.U 1	Description of Environment	.44 /F
н. 11		.40 AE
+ .1		.40

4.2	Physical Environment	.46
4.2.1	Topography	. 46
4.2.2	Regional Profile	. 47
4.2.3	Ambient Air Quality	. 47
4.2.4	Ambient Noise Quality	. 47
4.2.5	Physiography	. 47
4.2.6	Soil	. 48
4.2.7	Geology and Hydrogeology	. 48
4.2.8	Drainage	. 49
4.2.9	Ground water	. 50
4.2.10	Land Use- Land Cover	. 50
4.2.11	Natural Disaster	. 51
4.2.12	Climate Vulnerability	. 53
4.3	Ecological Environment	.53
4.3.1	Delineation of the Study Area	. 53
4.3.2	Overview of the Study Area	. 53
4.3.3	Methodology	. 54
4.3.4	Forest Areas Involved	. 54
4.3.5	Primary Data	. 54
4.3.6	Secondary Data	. 56
4.3.7	Species Profile of the Study Area	. 56
4.3.8	Habitat Profile of the Study Area	. 68
4.3.9	Critical Habitat Screening	. 73
4.3.10	Designated Areas	75
4.3.11	Internationally Recognized Areas	77
4.3.12	Ecosystem Services	77
4.4	Socio Economic Environment	.80
4.4.1	Area of Influence	. 80
4.4.2	Settlement Within Area of Influence	. 80
4.4.3	Methodology for Socio Economic Assessment	. 81
4.4.4	Administrative Set Up of AOI	. 81
4.4.5	Socio Economic Profile of AOI	. 83
4.5	Cultural and Heritage Site	89
4.6	Details of Community Consultation	89
5.	Anticipated Impacts and Mitigation Measures	.90
5.1	Impact Assessment Methodology	90
5.2	Impact Criteria and Ranking	91
5.3	Impact Significance	91
5.4	Residual Impacts	92
5.5	Impact Assessment (Detailed Design Construction and Operation)	95
5.5.1	Potential Impact on Land Use	. 95
5.5.2	Potential Impact on Topography and Drainage	. 96
5.5.3	Potential Impact on Soil Quality	. 97
5.5.4	Potential Impact on Air Quality	100
5.5.5	Potential Impact Due from Noise and Vibration During Construction	102
5.5.6	Potential Impact on Surface Water Quality	103
5.5.7	Potential Impact on Groundwater Resource and Quality	105
5.5.8	Potential Impact on Ecology	106
5.5.9	Socio Economic Impact	.111
5.5.10	Potential impact on Community Health and Safety	112
5.5.11	Potential Impact on Occupational Health and Safety	113
5.5.12	Potential Impact on Aesthetics	115

6.	Environmental and Social Management Plan			
6.1	Introduction			
6.2	Environmental and Social Management Plan			
6.3	Environmental and Social Monitoring Plan			
6.4	Organizational Structure			
6.5	Inspectional Monitoring and Reporting			
6.5.1	Roles and Responsibility			
6.5.2	Reporting and Documentation			
6.5.3	External Reporting and Communication			
6.5.4	Internal Reporting and Communication			
6.5.5	Documentation			
6.6	ESMP Review and Amendments			
6.7	Occupational Health Management	128		
6.8	Disaster Management			
7.	Stakeholder Assessment and Discloser	130		
7.1	Stakeholder Assessment	130		
7.1.1	Stakeholder Identification			
7.1.2	Stakeholder Analysis			
7.1.3	Stakeholder Consultation			
7.2	Present Status of Stakeholder Engagement by Project	137		
7.3	Information Disclosure	137		
7.3.1	Reporting and Monitoring			
8.	Grievance Redressal Mechanism	139		
8.1	Grievance Mechanism Principal	139		
8.2	Approach to Grievance Redressal	139		
8.3	Project Level Grievance Mechanism	140		
8.3.1	Field Level GRM	140		
8.3.2	Project Level GRM			
8.3.3	Corporate Level GRM.			
8.4	Beyond Project Grievance Mechanism	140		
8.4.1	Country/State Legal System:	141		
8.5	Resource required for Grievance Redressal Mechanism Implementation	142		
8.5.1	Manpower	142		
8.6	Discloser of The Grievance Redressal Mechanism	142		
9.	Conclusion and Recommendation	144		
Apper	ndix A Stakeholder Consultations	145		
Apper	ndix B Mammals of the Study Area	148		
Apper	ndix C Resident Birds of the Study Area	151		
Apper	ndix D Migratory Birds of the Study Area	156		
Apper	Appendix E Reptiles of the Study Area159			
Apper	Appendix F Amphibians of the Study Area161			
Apper	ndix G Fishes of the Study Area	162		
Apper	ndix H Map of Existing Transmission Corridor			

Figures

Figure 2-1. Location map of the transmission line	. 10
Figure 2-2.Physical features map of the project area	. 11
Figure 2-3. Accessibility Map of the project area	. 12
Figure 2-4. Route map of the transmission line	. 15
Figure 2-5. Alignment of the route on Toposheet	. 15

Figure 2-7. GHG Emission source comparison26Figure 4-1. Environmental settings of the Project area45Figure 4-2. Elevation map of the project site46Figure 4-3. Hydrogeology of the Mumbai49Figure 4-4. Land use of the project site (1)50Figure 4-5. Land use of the project site (2)51Figure 4-6. Seismicity map of India52Figure 4-7. Map showing the Study Area along with the biodiversity sampling locations56Figure 4-8. The Central Asian Flyway75Figure 4-9. Locations of the Designated Areas in closest proximity to the Study Area76Figure 6-1. Corporate level Organization structure125	Figure 2-6.	Execution Plan for KVTPL Project	23
Figure 4-1. Environmental settings of the Project area 45 Figure 4-2. Elevation map of the project site 46 Figure 4-3. Hydrogeology of the Mumbai 49 Figure 4-4. Land use of the project site (1) 50 Figure 4-5. Land use of the project site (2) 51 Figure 4-6. Seismicity map of India 52 Figure 4-7. Map showing the Study Area along with the biodiversity sampling locations 56 Figure 4-8. The Central Asian Flyway 75 Figure 4-9. Locations of the Designated Areas in closest proximity to the Study Area 76 Figure 6-1. Corporate level Organization structure 125	Figure 2-7.	GHG Emission source comparison	
Figure 4-2. Elevation map of the project site 46 Figure 4-3. Hydrogeology of the Mumbai 49 Figure 4-4. Land use of the project site (1) 50 Figure 4-5. Land use of the project site (2) 51 Figure 4-6. Seismicity map of India 52 Figure 4-7. Map showing the Study Area along with the biodiversity sampling locations 56 Figure 4-8. The Central Asian Flyway 75 Figure 4-9. Locations of the Designated Areas in closest proximity to the Study Area 76 Figure 6-1. Corporate level Organization structure 125	Figure 4-1.	Environmental settings of the Project area	45
Figure 4-3. Hydrogeology of the Mumbai 49 Figure 4-3. Land use of the project site (1) 50 Figure 4-5. Land use of the project site (2) 51 Figure 4-6. Seismicity map of India 52 Figure 4-7. Map showing the Study Area along with the biodiversity sampling locations 56 Figure 4-8. The Central Asian Flyway 75 Figure 4-9. Locations of the Designated Areas in closest proximity to the Study Area. 76 Figure 6-1. Corporate level Organization structure 125	Figure 4-2.	Elevation map of the project site	46
Figure 4-4. Land use of the project site (1) 50 Figure 4-5. Land use of the project site (2) 51 Figure 4-6. Seismicity map of India 52 Figure 4-7. Map showing the Study Area along with the biodiversity sampling locations 56 Figure 4-8. The Central Asian Flyway 75 Figure 4-9. Locations of the Designated Areas in closest proximity to the Study Area 76 Figure 6-1. Corporate level Organization structure 125	Figure 4-3.	Hydrogeology of the Mumbai	49
Figure 4-5. Land use of the project site (2) 51 Figure 4-6. Seismicity map of India 52 Figure 4-7. Map showing the Study Area along with the biodiversity sampling locations 56 Figure 4-8. The Central Asian Flyway 75 Figure 4-9. Locations of the Designated Areas in closest proximity to the Study Area 76 Figure 6-1. Corporate level Organization structure 125	Figure 4-4.	Land use of the project site (1)	50
Figure 4-6. Seismicity map of India 52 Figure 4-7. Map showing the Study Area along with the biodiversity sampling locations 56 Figure 4-8. The Central Asian Flyway 75 Figure 4-9. Locations of the Designated Areas in closest proximity to the Study Area 76 Figure 6-1. Corporate level Organization structure 125	Figure 4-5.	Land use of the project site (2)	51
Figure 4-7. Map showing the Study Area along with the biodiversity sampling locations 56 Figure 4-8. The Central Asian Flyway 75 Figure 4-9. Locations of the Designated Areas in closest proximity to the Study Area 76 Figure 6-1. Corporate level Organization structure 125	Figure 4-6.	Seismicity map of India	
Figure 4-8. The Central Asian Flyway 75 Figure 4-9. Locations of the Designated Areas in closest proximity to the Study Area 76 Figure 6-1. Corporate level Organization structure 125	Figure 4-7.	Map showing the Study Area along with the biodiversity sampling locations	
Figure 4-9. Locations of the Designated Areas in closest proximity to the Study Area	Figure 4-8.	The Central Asian Flyway	75
Figure 6-1. Corporate level Organization structure	Figure 4-9.	Locations of the Designated Areas in closest proximity to the Study Area	76
	Figure 6-1.	Corporate level Organization structure	125
Figure 6-2. Project level Organization structure	Figure 6-2.	Project level Organization structure	126

Tables

Table 1-1 :KVTPL Project Details	5
Table 1-2 :Structure of the Report	7
Table 2-1 :Project Snapshot	8
Table 2-2 :Long Term Transmission Customers of the KVTPL	8
Table 2-3 :Infrastructural Details of the KVTPL along the Routes	9
Table 2-4 : Details of the highway and railway	12
Table 2-5 : Project Details	16
Table 2-6 : Project Components in the 400 KV Pooling Substation	19
Table 2-7 : Raw Material Requirement for KVTPL Transmission line	27
Table 2-8 :Reference Noise levels of various equipment to be used in the construction activity	28
Table 3-1 :Applicable Environmental Legislations and Specific Requirements for the Project	30
Table 3-2 :Permission and Clearance required in the Project	36
Table 3-3: Application of Equator Principles	38
Table 3-4: Application of IFC Performance Standards to the Project	43
Table 4-1 -Details of Sampling Sites	55
Table 4-2. Details of the Floristic Species	57
Table 4-3 – Spices list for Invasive Alien	68
Table 4-4: Details about critically endangered species	73
Table 4-5: Settlement within the AOI	80
Table 4-6: List of stakeholders Consulted	81
Table 4-7 Demography of Maharashtra State	81
Table 4-8: Profile of Municipal Corporations	83
Table 4-9 -Demography of concerned districts	83
Table 4-10 -Demography of the Study Area	84
Table 4-11 – Data for household and population	85
Table 4-12: Proportion of Working Population in the Study Area	87
Table 4-13Gender Disaggregated Profile of Study Area	88
Table 5-1. Impact Prediction Criteria	91
Table 5-2. Criteria Based Significance of Impacts	92
Table 5-3. Anticipated Impact of Important Environmental Components – Natural and Socio-economic	
Environment	93
Table 6-1 : Environmental and Social Management Plan	117
Table 6-2 : Environmental and Social Monitoring Plan and Responsibility	122
Table 6-3 :General Measures for Workers' Health	128
Table 6-4 :General Measures for Workers' Safety	129
Table 7-1 : Stakeholder Group Categorisation	130
Table 7-2 :Stakeholder Impact Matrix	131
Table 7-3 :Stakeholder Mapping and Analysis	132
Table 7-4 :Summary of Stakeholder Analysis	136
Table 7-5 Information Disclosure Plan	138

Executive Summery

Introduction

Adani Transmission Limited hereinafter referred as "ATL", headquartered in Ahmedabad, Gujarat is the largest private sector power transmission company in northern, western and central India. ATL owns and operates various High voltage AC transmission lines and substations of 132kV, 220kV, 400kV, 765kV voltage level and High Voltage DC transmission lines and substations of +/- 500kV voltage level. Today, ATL has portfolio of more than 14,000 ckt km of transmission lines and around 27,000 MVA of power transformation capacity. This report intends to assess Environmental and Social Impact Assessment (ESIA) of the proposed transmission line.

The Government of Maharashtra has set a goal for strengthening of Mumbai transmission system aiming additional power to be brought into Mumbai and would thus help in meeting the future demand of the city. ATL has won the project named Kharghar Vikhroli Transmission Line and has established the Special Purpose Vehicle (SPV) named "Kharghar Vikhroli Transmission Private Limited" (KVTPL) to execute the project which of approximately 34 km of 400 kV and 220 kV transmission lines along with 1500 MVA 400kV GIS Substation at Vikhroli in Mumbai on build, own, operate and maintain basis Competitive Bid.

Based on the initial screening and the preliminary assessment it can been said with a degree of certainty that the transmission line does not pass through any protected area or any area of ecological importance. Further most of the impacts of the project during construction are site specific, reversible with mitigation measures, short time and co-terminus with the construction activities. The ESIA has assessed overall acceptability of environmental and social impacts likely to arise as a result of construction and operation of transmission line for KVTPL project. With the available information and presented in this report, the proposed project passes through ecological and socially sensitive areas. However, the proponent has agreed to include additional mitigation measures. The Critical habitat assessment is under process and based on the assessment the category of the project will be specified.

Route of Transmission line

The proposed transmission project includes 400 kV Kharghar-Vikhroli D/C & M/C line with bays at Kharghar & Vikhroli (with conductor capacity of 2,000 MW per circuit) along with 400 kV Bus extension at 400 kV Kharghar end, LILO on 400 Talegaon-Kalwa line at 400 kV Vikhroli GIS S/S with bays, LILO of existing 220 kV Trombay – Salsette I & II and 220 kV Trombay – Salsette III & IV at 400/220 kV Vikhroli S/S. The project is also included the installation of 1x 125 MVAR 400 kv BUS reactor, along with 400/220 KV GIS substation with 3 x 500 MVA, 400/220 kV ICTS. There is also a line diversion of existing 110 KV Dharavi Salsette via Vikhroli lines considering future 220 KV upgradation.

Need & Objective

The objective of the ESIA is

- To document various environmental and social impacts related to field activities that are being undertaken by ATL for laying of transmission line and
- To highlight the environmental and social management strategies, systems and procedures being employed along the transmission line route and to meet the environmental and social requirements of the funding institutions.

Project Description

The length of the KVTPL transmission line is 36.953 KM in total which includes the 400 kV Kharghar-Vikhroli D/C & M/C line with bays at Kharghar & Vikhroli as well as the LILO on 400 kV Talegaon Kalwa line. This line passes from the Kharghar in Navi Mumbai Region to Vikhroli in Mumbai Region and from Vikhroli to Airoli. The transmission line passes through three districts namely, the Mumbai Suburban Area, Thane, and Raigarh Districts. The transmission line fall under the jurisdiction of three different Municipal Corporations namely, The Navi Mumbai Municipal Corporation, Brihan Mumbai Municipal Corporation and the Panel Municipal Corporation.

The land on which the project is to be constructed is public land, forest land or land belonging to bigger private entities. No private residential land has been used for the project. It shall also be noted that the transmission line route does not have any R & R issues.

400 KV Kharghar – Vikhroli TL: This line passes from the Kharghar in Navi Mumbai Region to Vikhroli in Mumbai Region. The entire route is going to follow the existing transmission line route. So, the approach roads use for maintaining of the exiting towers, will be used for approaching the proposed towers.

LILO on 400 kV Talegaon-Kalwa line at 400 kV Vikhroli GIS S/S with bays: This route starts near Airoli, crosses Thane Creek and passes through Core zone of Thane Creek Flamingo Sanctuary, mangroves, salt pans, MCGM Dumping Ground near Kanjurmarg, Godrej property and ends at Vikhroli GIS S/S. Width of the approach access to the proposed tower locations are to be 4 m. Hence, a 4 m wide shortest possible belt connecting the tower base to the existing approach access was also considered while calculating mangrove tree cover damage. There are existing bunds (walkways made for Salt pans) at most of the locations which will be used for approaching the proposed towers.

The Right of Way of the transmission line has been defined as per as per IS 5613. In case of 400 KV lines 46 m is considered as the ROW while in case of 220 KV line the ROW is stipulated to be 35 m. This is also the horizontal clearance required for transmission lien of these capacity. The minimum ground clearance for 400 kV transmission lines shall be 8.84 m and for 220kV D/C transmission lines shall be 7.01m, so that maximum electric field does not exceed 10kV/m within the ROW and does not exceed 5kV/m at the edge of the ROW as per international guidelines.

During the O&M stage of the project ground patrolling would be carried out. The patrolling would monitor the growth of tress in violation of the minimum safety clearance., development of any house or settlement within the RoW. Roads and bridges constructed within the ROW would also reduce the minimum safety clearance so these would also be monitored.

The foundation construction team would have around 15-20 labours while the tower erection teams which would follow would have 20-25- people. Finally, the stringing team would also have around 30-40 people involved in the job. During the foundation and tower construction approximately 2-3 teams would be working in parallel. Thus approximately 100-120 labours would be working at any time in the project.

Pollution and control measures

The pollution expected from construction activities includes fugitive dust emission due to excavation and project related vehicular movement and waste debris from casting of foundations. There is potential for disturbance to habitations in proximity of the towers due to construction activities.

Implementation of suggested measures will enable suppression of dust generation, disposal of waste debris and other adverse impacts.

Description of Environment

The baseline studies have profiled the environmental and social conditions along the transmissions line, covering in general a buffer distance of 500m of both side of the alignment where any significant environmental sensitive is identified. The studies were designed to collect information from secondary sources and to obtain primary information through site visits and consultation switch local communities and other related stockholders. Overall the i reflective of the environmental and social landscape of the districts through which the alignment would pass.

The transmission line is in north-east suburb of Mumbai in the state of Maharashtra. Geographically, the Study Area comprises a part of the Thane Creek, an inlet in western shoreline of the State of Maharashtra. The proposed project comprises of construction of 12 km transmission line between MSETCL's existing 400 kV Receiving station at Kharghar and Tata Power's 400 kV Receiving station at Vikhroli for meeting additional load requirement of power to Mumbai metropolitan area. This line emanates from MSETCL's Kharghar Receiving Station, passes through hilly area and reaches Devisaddle. From Devisaddle, the transmission line runs on existing Right of Way of two 110kV Transmission lines of Tata Power and reaches Vashi via Palm beach road.

The topography of the Study Area is generally flat, with an overall gentle slope draining into the creek. The land is drained mainly by small tributaries into a large creek. The eastern part of the Study Area lies near the Kharghar Hill Range, which is a contiguous range of hills nestled between the city. Most of these hills are covered with natural vegetation, while a few patches along hill slopes are degraded. The natural terrestrial habitats of the Study Area mainly comprise tracts of natural forests, grasslands and mangroves. The natural aquatic habitats of the Study Area comprise the creek, seasonal or perennial streams and lakes. The modified habitats in the Study Area comprise habitations, gardens, saltpans, substations, bunds, culverts and roads. The land-use in the Study Area is dominated by habitation, mangrove forests and wetlands.

A part of the Study Area overlaps with Thane Creek Flamingo Sanctuary, a legally protected area and a key biodiversity area. Approximately 2.2 km stretch of the project alignment passes through the southern, western and

northern part of the core boundary of the sanctuary, while 16.5 km of the project alignment passes through its proposed Eco-sensitive Zone, towards the west of the sanctuary.

The climate of Mumbai city area is a tropical wet and dry climate type with moderate temperatures with high level of humidity. Its coastal and tropical location ensure moderate temperature throughout the year, average of 27.2 °C and annual average precipitation of 242.2 cm (95.35 inches). According to the CGWB report of Greater Mumbai the average ambient temperature of this area is on average about 32.2°C in summer and 16.3°C in winter. Rainfall Mumbai experiences heavy rainfall during the monsoon time as it is in the windward side of Western Ghat. Between June and September, the south west monsoon rains splurge the city July and August are the wettest months all over the region. Towards the later part of the season, there are breaks in between, when the oppressive hot weather is associated with high humidity along the coast. The average rainfall in the region is nearly 2000 mm.

In the Environmental Status Report of Navi Mumbai Municipal Corporation-2018-19 reported the Air Quality Index (AQI) of the area following the calculation suggested by CPCB in consultation with IIT (Indian Institute of Technology) Kanpur. It is reported that as per the air quality monitoring data of 2018-19 the Navi Mumbai is clean for NOx, SO2 and Ozone pollutants as most of the observations are either in Good or Satisfactory category. In terms of Carbon Monoxide (CO), 23% of total observations were recorded under Moderate category.

According to CGWB report, the broad physiographic feature of the greater Mumbai area is broad and flat terrain flanked by north – south trending hill ranges. The eastern and western part of the area having hilly ranges. The maximum elevation of the area is 450 m above mean sea level.Malbar, Colaba, Worli and Pali hills are the isolated small ridges trending north – south in the western part of the district. The Powai – Kanheri hills form the largest hilly terrain in the central part of the Salsette island and are the feeder zone for the three lakes viz., Powai, Vihar and Tulsi. There are a number of creeks, dissecting the area. Thane is the longest creek. Other major creeks are Manori, Malad and Mahim which protrudes in the mainland and give rise to mud flangs and swamps. Two types of soils have been observed in the district viz., medium to deep black and reddish soil.

The pre-monsoon average depth to water levels recorded by National Hydrograph Network Stations (NHNS) of CGWB during May 2011 ranges between 2.67 m bgl and 4.25 m bgl. The depth to water levels during post-monsoon recorded in November 2011 in major part of the district ranges between 2 and 5 m bgl.

Due to ingress of sea water, the ground water quality of deeper aquifer is brackish to slightly saline in some localities such as Colaba, Dharavi, and Khar.

Flora

Two hundred and thirty-six (236) higher floristic species were recorded in the Study Area as part of the biodiversity sampling. These include one hundred and twenty-seven (127) woody species, which contribute to the perennial groundcover of the Study Area, as well as, one hundred and nine (109) non-woody species, which predominantly contribute to the seasonal ground-cover of the Study Area.

Birds

At least three hundred and three (303) species of birds have reported ranges that include the Study Area. These include one hundred and seventy-seven (177) species which are resident with respect to the Study Area and one hundred and twenty-six (126) species, which are migratory with respect to the Study Area. With respect to the IUCN Red List, two (02) bird species of the Study Area are designated as Critically Endangered, two (02) as Endangered, four (04) as Vulnerable and twelve (12) are listed as Near Threatened. With respect to the WPA Schedules, six (06) bird species of the Study Area are listed under Schedule I. Fourty-four (44) species of birds, consisting of thiry-one (31) resident species and thirteen (13) migratory species, were recorded as part of the primary data.

Socio Economic Condition

The length of the KVTPL transmission line is 74KM in total which includes the 400 kV Kharghar-Vikhroli D/C & M/C line with bays at Kharghar & Vikhroli as well as the LILO on 400 kV Talegaon Kalwa line. This line passes from the Kharghar in Navi Mumbai Region to Vikhroli in Mumbai Region and from Vikhroli to Airoli. These areas fall under the jurisdiction of 3 different Municipal Corporations namely, The Navi Mumbai Municipal Corporation, Brihan Mumbai Municipal Corporation and the Panel Municipal Corporation.

The land on which the project is to be constructed is public land, forest land or land belonging to bigger private entities. No private residential land has been used for the project.

Consultations carried out in the influence area of the transmission line have been limited in number. It could be ascertained from the primary survey and observations that most of the people in the study area depend on

occupations other than agriculture and industries. This includes work in the service sector, construction, small business and shops, etc. The modes of transportation used by people include public transport like local trains, buses, etc. as well as auto rickshaws and other private modes like cars, two-wheelers, etc. Amenities like drinking water, sanitation, etc. are provided in the influence area by the municipal corporations of Mumbai, Navi Mumbai and Panvel. Many primary and secondary schools, colleges, other educational institutions, both private and government-run, are present in the influence area. Private hospitals, clinics, dispensaries, etc. and other health-related facilities are present in the influence area of the transmission line. Places of religious and cultural importance like temples, cinema halls, theatres, etc were also visible in the influence area.

It was noted through the primary survey and observations that the land on which the transmission tower is to be erected is public land, hence, compensation for the use of this land was not given to any private entities. Ownership of the said land is still with public and would be open for public use

Impact Assessment and Mitigation Measures

Potential impacts of proposed transmission line during:

Construction phase for casting of foundation, tower erection and stringing activities will be mainly disturbance to fauna and flora, traffic hazards, noise, safety issues.

Impact during the operational phase is limited to effect of electromagnetic field at disturbances from noise for corona effect.

Environmental and Social Management Plan

The ESMP provides a delivery mechanism to address potential adverse impacts, to instruct contractors and to introduce standards of good practice to be adopts for project activities taken up during construction and operation phases of the project. Inspection and monitoring of the environmental and social components phase activities will increase the effectiveness of suggested mitigations.

Through the process of inspection, audit and monitoring KVTPL will ensure that all the contractors comply with the requirements of conditions of any required clearance, and other permits including suggested action plans.

The inspection and audits will be done by trained team ATL's Environment, Health and Safety (EHS) department as well subject to be reviewed and conducted by external agencies/experts. The entire process of inspections and audits are being documented. The inspection and audit findings are to be implemented by the contractors in their respective areas.

Conclusion

The project is likely to generate some environmental and social impacts both during construction and operation. During construction phase the environmental impacts expected from the project include disturbance to fauna and flora, construction waste of disposal, increase of noise level and social impacts mainly from engagement of land and loss of crop. During operation phase the impacts include disturbance to vegetation, noise generation and social impacts of restricted activities within corridor.

Environmental and social management plan describes implementation mechanism for recommended mitigation measures during construction and operation phase to verify overall project performance.

1. Introduction

1.1 Background

Adani Transmission Limited hereinafter referred as "ATL", headquartered in Ahmedabad, Gujarat is the largest private sector power transmission company in northern, western and central India. ATL owns and operates various High voltage AC transmission lines and substations of 132kV, 220kV, 400kV, 765kV voltage level and High Voltage DC transmission lines and substations of +/- 500kV voltage level. Today, ATL has portfolio of more than 14,000 ckt km of transmission lines and around 27,000 MVA of power transformation capacity.

ATL primarily aims at addressing the vast potential in India's transmission sector and has set an ambitious target to set up 20,000 circuit km of transmission lines by 2022. ATL has invested in the latest technologies resulting in the highest network availability of over 99.76% in the country, which corresponds to the best global standards.

The Government of Maharashtra has set a goal for strengthening of Mumbai transmission system aiming additional power to be brought into Mumbai and would thus help in meeting the future demand of the city. ATL has won the project named Kharghar Vikhroli Transmission Line and has established the Special Purpose Vehicle (SPV) named "Kharghar Vikhroli Transmission Private Limited" (KVTPL) to execute the project which of approximately 34 km of 400 kV and 220 kV transmission lines along with 1500 MVA 400kV GIS Substation at Vikhroli in Mumbai on build, own, operate and maintain basis Competitive Bid. This project is critical to the city of Mumbai as the existing capacity of transmission corridor is not sufficient to carry further power into the city. The scheduled completion target date of this project 31st August 2022 and the concession/TSA terms is 35 years. The name of the transmission elements under this KVTPL project are presented in Table 1-1

Table 1-1 :KVTPL Project Details

SI No.	Name of the Transmission Element	Location
1.	400 kV Kharghar-Vikhroli D/C & M/C line with bays at Kharghar & Vikhroli (with conductor capacity of 2,000 MW per circuit) along with 400 kV Bus extension at 400 kV Kharghar end	Maharashtra
2.	LILO on 400 kV Talegaon-Kalwa line at 400 kV Vikhroli GIS S/S with bays	Maharashtra
3.	LILO of existing 220 kV Trombay – Salsette I & II and 220 kV Trombay – Salsette III & IV at 400/220 kV Vikhroli S/S	Maharashtra
4.	Installation of 1 x 125 MVAR 400 kV Bus Reactor	Maharashtra
5.	400/220 kV GIS Substation with 3 x 500 MVA, 400/220 kV ICTs	Maharashtra
6.	Diversion of existing 110 kV Dharavi-Salsette via Vikhroli lines considering future	Maharashtra

 Diversion of existing 110 kV Dharavi-Salsette via Vikhroli lines considering future Maharashtra 220 kV upgradation

1.2 Objective of the Project

ATL is currently exploring for fund from International Lenders, and this Environment and Social Impact Assessment (ESIA) report is prepared to meet the requirement in terms of providing the Lenders, an assessment of the project against International Standards. In this context, the project requires evaluating the environmental and social risks associated with the project and to implement mitigation measures to avoid adverse impacts for the remainder of the project's lifecycle.

This report discusses the environmental and social baseline within which the proposed transmission line project is commissioned and assesses the potential adverse and beneficial impacts that the project could have, along with suitable mitigation measures and an Environmental and Social Management Plan (ESMP) for the project. The following sections provide an understanding of the scope of work and the applicable reference framework for the ESIA.

1.3 Scope of the Project

The scope of work for ESIA included the following:

- I. Identification of applicable local and national environmental and social regulations and relevant International E&S standards and Equator Principle 4 for transmission power projects.
- II. Categorization of the projects based on IFC Performance Standards.
- III. Summary of the approach adopted by KVTPL for design of the transmission line and assessment of alternatives available for the project together with an overview of outcome of the key decisions already taken up by the company for the transmission line route.
- IV. Description of the environmental and social baseline of the project in terms of the key sensitivities and potential constraints on the construction and operation and maintenance of the transmission line.
- V. Identification of the potential adverse environmental and social impacts during erection and operation of the transmission line and mitigation measures to be adopted by KVTPL

1.4 Project Proponent

The Adani Group's journey in the transmission sector started in 2006, well before Adani Transmission Limited (ATL) was formally established. This was necessitated by need to evacuate power from Adani's Mundra Thermal Power Plant. The dedicated lines, commissioned for evacuation of power spanned more than 3800 ckt kms connecting Mundra – Dehgam, Mundra – Mohindergarh and Tirora – Warora.

Another line spanning more than 1200 ckt kms was commissioned in 2014 for evacuation of power from Adani's Tiroda power plant. Subsequently, in 2015, looking at the enormous business potential in transmission sector, Adani Transmission Limited (ATL) was carved out of Adani Enterprises Limited (AEL) for a focused pursuit of opportunities in transmission sector. ATL has also tapped various inorganic avenues for growth and acquired GMR's transmission assets in Rajasthan (2016), Reliance Infrastructure's transmission assets in Maharashtra, Madhya Pradesh and Maharashtra (2017) and KEC's Bikaner Sikar transmission asset in Rajasthan (2019)

In 2018, ATL forayed into the distribution space with the acquisition of Reliance Infrastructure's Power Generation, Transmission & Distribution Business in Mumbai. Today, Adani Electricity Mumbai Limited (AEML) caters to electricity needs of over 3 million customers in Mumbai suburbs and Mira-Bhayender Municipal Corporation in Thane district with a distribution network spanning over 400 sq. kms.

Today, ATL is the largest private transmission company and operates more than 11,000 ckt km of transmission lines and around 18,000 MVA of power transformation capacity. ATL has further set an ambitious target to set up 20,000 circuit km of transmission lines by 2022 by leveraging both organic and inorganic growth opportunities.

1.5 Limitation of the Report

This ESIA report is based on scientific principles and professional judgment applied to facts with resultant subjective interpretations. Professional judgments expressed herein are based on the analysis of available data and information. The ESIA report was prepared with the following limitations;

- The assessment of the environment and social risks is limited to project information available at this stage of the project, discussion with stakeholders, secondary data collected, consultation with local community and observations made during site survey. Professional judgment and interpretation of facts has been applied for presenting inference from the collected information;
- 2. The consultations undertaken as part of the ESIA were limited to the stakeholders, who were available for consultation during the site visit, which included landowners, local community, and Project site Team;
- 3. Consultation with the local community was limited to those villages only where the project has already obtained the land as recommended by ATL as it apprehends that locations where land uptake is in process consultations may cause some hindrances.
- 4. As rapid site assessment was undertaken for a short duration, report does not address seasonal variability of the data.
- 5. Due to the prevailing pandemic situation in India i.e. COVID-19, limited consultation with local communities has been conducted with all safety provision.

1.6 Report Structure

The structure of the ESIA report is given below in Table 1.2

Table 1-2 :Structure of the Report

Chapter	Particulars	Description
Chapter 1	Introduction	Introduction to the Project
Chapter 2	Project Description	Technical description of the Project & related infrastructure and activities
Chapter 3	Policy Legal and Administrative framework	Discussion of the applicable environmental and social regulatory framework and its relevance for the Project.
Chapter 4	Description of Environment	An outline of the Environmental, Ecological and Social Baseline status within the study area of the Project.
Chapter 5	Anticipated impacts and mitigation measures	This section includes details of identified environmental, ecological and social impacts and associated risks due to project activities, assessment of the significance of impacts, and presents mitigation measures for minimizing and /or offsetting potential impacts identified.
Chapter 6	Environmental and Social Management plan (ESMP)	Outline of the Environmental and Social Management Plan (ESMP) considering identified impacts, proposed mitigation measures, and monitoring requirement
Chapter 7	Stockholder Assessment and Discloser	An outline of the engagement with the stakeholder groups undertaken as part of the assessment process and the key issues identified from the same
Chapter 8	Grievance Redressal /mechanism	Discuss about the Grievance redressal process of the employee and local community
Chapter 9	Conclusion and Recommendation	Short description of the project background

2. Description of the Project

KVTPL has been selected as a successful bidder by Bid Process Coordinator, Maharashtra State Electricity Transmission Company Limited appointed by The Government of Maharashtra, as Transmission Service Provider (TSP) to establish Transmission System for 400 kV Vikhroli receiving station and associated incoming transmission lines for strengthening of Mumbai transmission system through tariff based competitive bidding process. As a TSP, now ATL has to established the SPV named KVTPL to execute the Transmission System for 400 kV Vikhroli receiving station and associated incoming transmission lines for strengthening of Mumbai transmission system (Refer Table 2-1 for Project Snapshot) on build, own, operate and maintain basis, and to provide transmission service on a long term basis to the Long Term Transmission Customers, as listed out in Table 2-2.

Table 2-1 : Project Snapshot

Name of Project	:	Transmission System for 400 kV Vikhroli receiving station and associated incoming transmission lines for strengthening of Mumbai Transmission System
Project Location	:	Maharashtra
Regulator	:	Maharashtra Electricity Regulatory Commission
Circuit Length	:	85.34 kms approx.
Substation Capacity	:	1500 MVA
Business Model	:	Build Own Operate Maintain
Scheduled COD	:	August 2022
Concession / TSA Term	:	35 years
Project Mode	:	Tariff Based Competitive Bid
Project Type	:	Intra State
Beneficiary State / Transmission Customers	:	Maharashtra

Table 2-2: Long Term Transmission Customers of the KVTPL

	Long Term Transmission Customers	Allocated Capacity
1.	Maharashtra State Electricity Distribution Company Limited	(83.80%)
2.	Tata Power Company -Distribution	(Allocated Capacity: 3.74%)
3.	Adani Electricity Mumbai Limited- Distribution	(Allocated Capacity: 6.90%)
4.	Brihanmumbai Electric Supply and Transport (Undertaking)	(Allocated Capacity: 3.89%)
5.	Mindspace Business Park Private Limited	(Allocated Capacity: 0.06%)
6.	Gigaplex Estate Private Limited	(Allocated Capacity: 0.05%)
7.	Nidar Utilities Panvel Limited Liability Partnership	(Allocated Capacity: 0.07%)
8.	Central/India Railway	(Allocated Capacity: 1.49%)

2.1 Need of The Project

Globally, electricity infrastructure plays a vital role for the overall development of the economy of the country. Mumbai is the capital of the second largest state in India in terms of population and geographical area. Being one of the leading metropolises of India, Mumbai has increased its electricity demand a few folds in the last few decades. Now, The Government of Maharashtra initiated to carry further power into the city installing a new transmission line to enable additional power to the city to meet the city's future power demand. This project is critically important for the further development of the city of Mumbai, as the existing capacity of the transmission corridor is not enough to carry additional power.

2.2 Regional Setting

The length of the KVTPL transmission line is 36.953KM + 2.35 KM (Connecting line from Tower no. 63 to Vikhroli substation) in total which includes the 400 kV Kharghar-Vikhroli D/C & M/C line with bays at Kharghar & Vikhroli as well as the LILO on 400 kV Talegaon Kalwa line. This line passes from the Kharghar in Navi Mumbai Region to Vikhroli in Mumbai Region and from Vikhroli to Airoli. The transmission line passes through three districts namely, the Mumbai Suburban Area, Thane, and Raigarh Districts. The transmission line falls under the jurisdiction of three different Municipal Corporations namely, The Navi Mumbai Municipal Corporation, Brihan Mumbai Municipal Corporation.

The proposed 400 KV transmission line passes through the public land between the Kharghar substation and the Vikhroli Substation. Beyond tower footing no. 26N2, it is proposed to use the RoW of 2 existing 220 KV transmission Line till tower footing no 46, till shoreline of the creek. Thereafter in the Thane Creek Area, the RoW of the 440 KV line would be used. Thus, the land on which the project is to be constructed is public land, forest land, or land belonging to bigger private entities.

The client has conducted the route alignments through satellite images available in google map and a physical walk-over survey. Infrastructural Details along the Routes as provided by the client are presented in the below Table: 2-3.

Table 2-3 : Infrastructural	Details of the	KVTPL along	the Routes
-----------------------------	-----------------------	--------------------	------------

Particulars	400 KV Kharghar – Vikhroli TL	LILO on 400 kV Talegaon-Kalwa line at 400 kV Vikhroli GIS S/S with bays	LILO of existing 220 kV Trombay – Salsette I & II and 220 kV Trombay –Salsette III & IV at 400/220 kV Vikhroli S/S	Diversionofexisting110kVDharavi-SalsetteviaVikhrolilinesconsideringfuture220KVupgradation
Voltage Level in kV	400 KV	400 KV	220 KV	220 KV
Circuit	D/C &M/C	D/C	D/C	D/C
Conductor Configuration	Twin HTLS	Moose	Zebra	Zebra
B-Line Length in Km.	15.38 Km	9.271 Km	2	1
Route Length in Km.	21.725 + 2.35 Km	12.228 Km	2	1
Circuit Km.	54.85 Km	24.454 Km	4	2
Plain Terrain	79%	90%	100%	100%
Undulation/ Hilly	21%	10%	0%	0%
Angle Points	58	30	3	2
Wind Zone	3	3	3	3
NH / Ex Crossings	3	1	0	0
SH Crossings	0	0	0	0
Railway Crossings	2	2	0	0
Non Electrified	0	0	0	0
River / Creek Crossings	1	0	0	0
Airport	0	0	0	0
Canal	0	0	0	0
Wildlife (Km.)	0	0.50		
Wildlife (Ha.)	0	2.33		
PF/RF (km.)	12.50	12.99		
PF/RF (Ha.)	57.51	59.754		
Total Forest in Km.	12.50	13.49		
Total Forest in Ha	57.51	62.08	0	0

Source: Detail Project Report of KVTPL, March 2020 (as provided by client)







2.3 Accessibility

400 KV Kharghar – Vikhroli TL: This line passes from the Kharghar in Navi Mumbai Region to Vikhroli in Mumbai Region. The entire route is going to follow the existing transmission line route. (See *Annexure H* for existing transmission line corridor) So, the existing approach roads would be used for maintaining the exiting towers, will be used for approaching the proposed towers.

LILO on 400 kV Talegaon-Kalwa line at 400 kV Vikhroli GIS S/S with bays: This route starts near Airoli, crosses Thane Creek and passes through Core zone of Thane Creek Flamingo Sanctuary, mangroves, salt pans, MCGM Dumping Ground near Kanjurmarg, Godrej property and ends at Vikhroli GIS S/S. The width of the approach access to the proposed tower locations is to be 4 m. Hence, a 4 m wide shortest possible belt connecting the tower base to the existing approach access was also considered while calculating mangrove tree cover damage. There are existing bunds (walkways made for Salt pans) at most of the locations which will be used for approaching the proposed towers.



2.4 Segment Analysis of the Alignment

The details of the locations where the proposed transmission line crosses the highways and railways are presented in Table 2.4

Table 2-4 : Details of the highway and railway

SL no	Line	Highway/Railway	Approx. segment. (from -to)
1.	400 KV Kharghar – Vikhroli TL	Crossing of Sion Panvel Expy, and Uran Road	26N1 – 26N2
2.		Railway	31 - 32
3.		Rajiv Gandhi Bridge, Nerul on Ahilya Gokul Patil Rd	33 – 33A
4.		Municipal Road Akhandanand Saraswati Marg	34 -35
5.		Palm Beach Rd	36 -37
6.		Railway	41 – 42
7.		Sion PanvelExpy	44A - 45
8.		Eastern Express Hwy	70 - Gantry
9.	LILO on 400 kV Talegaon-Kalwa	Eastern Express Hwy	LOC 37 - Gantry
10.	line at 400 kV Vikhroli GIS S/S with bays	Approach road to Existing Waste Management Unit	AP 11/ LOC22 – LOC 21
11.		Mulund - Airoli Rd	LOC 9 – LOC 8

2.5 Analysis of Alternative Transmission Line Alignment

400kV Kharghar-Vikhroli Transmission Line:

Alternative-1: This line starts from MSETCL's Kharghar Receiving Station and reaches Devisaddle. From Devisaddle, the transmission line runs on the existing Right of Way of two 110kV Transmission lines of Tata Power and reaches Vashi via Palm beach road. Then it crosses Vashi creek via Mankhurd and finally ends at the proposed Vikhroli Receiving station on the new Right of way. From Mankhurd to Vikhroli the line runs through sparse mangroves.

Alternative-2: Keeping in view of geographical restrictions and development in the Navi Mumbai area, there is no other alternative that are possible. In CRZ area this line runs on the existing RoW of two 100kV Transmission lines of Tata Power¹.

Alternative-1 was recommended due to less damage to mangroves and development in Navi Mumbai area. This line was initially planned to be implemented by Tata Power Company Limited (TPCL). Accordingly, TPCL had obtained various statutory approvals for the said project. Now, all the statutory approvals granted to this project are transferred to KVTPL.

As ATL won and take over the project from TPCL including the transfer of all the project statutory approvals obtained for the Project (400 KV Vikhroli receiving station) by TPCL and won the associated transmission lines (LILO on 400 kV Talegaon-Kalwa line at 400 kV Vikhroli GIS S/S and LILO of existing 220 kV Trombay – Salsette I & II and 220 kV Trombay – Salsette III & IV at 400/220 kV Vikhroli S/S).

Analysis of alternative transmission line for the LILO on 400 kV Talegaon-Kalwa line at 400 kV Vikhroli GIS S/S and LILO of existing 220 kV Trombay – Salsette I & II and 220 kV Trombay – Salsette III & IV at 400/220 kV Vikhroli S/S line is presented below:

Sr.		Alternative-1 (Final		
No	Description	route)	Alternative-2	Alternative-3
1	Route	This route starts at tower	This route also starts at	This route also starts at tower
	description	number 197/A of	tower number 197/A of	number 197/A of Talegaon
		Talegaon Kalwa line at	Talegaon Kalwa line at	Kalwa line at Airoli and runs
		Airoli, passes from the	Airoli, crosses Thane	parallel to Thane Creek
		outer zone of Thane creek	Creek and passes	longitudinally and passes
		flamingo Sanctuary	through about 4000m in	through dense mangrove
		covering about 404m in	length (about 18.40 Ha.)	vegetation & mud flats of
		length between proposed	of the Core zone of Thane	about 3500 m which is the
		Loc No. 3 & 5. This route	Creek Flamingo	main habitat (roosting &
		involves 1.86 Ha. of	Sanctuary. The line	feeding area) of flamingos.
		Thane Creek Flamingo	passes through dense	The line runs parallel to
		Sanctuary which is a bare	mangroves, salt pans,	Thane Creek up to existing
		minimum. Further, the	MCGM Dumping Ground	transmission lines near Sion
		transmission line passes	near Kanjurmarg, Godrej	Panvel expressway. There
		through Saltpans and	property and terminates	after line crosses Thane
		mangrove area near	at 400 kV Vikhroli Sub	creek laterally and the core
		MCGM Dumping Ground	Station. There after line	zone of Flamingo Sanctuary
		near Kanjurmarg and	extends from the Vikhroli	of about 600m length (2.76
		Godrej property and	substation to MCGM STP	Ha.) and runs parallel to
		terminate at 400 kV	at Ghatkopar and joins	existing transmission lines
		Vikhroli Sub Station.	tower number 63 from the	and joins tower number 63 of
		Another LILO	400 kV Kharghar Vikhroli	400 kV Kharghar Vikhroli
		transmission line will be	line.	transmission line. There after
		extended from the Vikhroli		lines terminate at Vikhroli
		substation and join at		sub-station on multi-circuit
		Location/Tower no 63 of		tower.
		400 kV Kharghar Vikhroli		
		line.		

¹ Source: Project Note and Justification, CRZ Clearance, KVTPL. Submitted to MoEF&CC by Tata Power Limited

Sr. No	Description	Alternative-1 (Final	Alternative-2	Alternative-3
		(Loop-In-Loop-Out (LILO) of 400 kV Talegaon- Kalva transmission line (Start from Location/tower no. 197A and terminates at Vikhroli substation approximately 12.0 km) and the line will be extended from Vikhroli substation and join at Location/Tower no 63 of 400 kV Kharghar Vikhroli line approximately 2.35 km)		
2	Total length (in Km.)	14.35	13.20	18.40
3. a)	Forest area for transmission corridor (Ha.)	62.8870	56.1200	59.1000
3. b)	Approx. forest area for approach the road outside corridor (Ha.)	8.9416	13.5000	11.4000
3. (a+ b)	Total forest area involved (Ha.)	71.8286	69.6200	70.5000
4. a)	Length inside Thane Creek Flamingo Sanctuary (meter)	404	4000	600
4. b)	Thane Creek Flamingo Sanctuary area (Ha.)	1.8600	18.4000	2.7600
5	Mud flats, bird roosting & feeding areas	Negligible	Moderate	Very high
6	Accessibility	Accessible	Less accessible	Less accessible
7	Recommendati on and reason for selecting Alternative-1 as final route	Alternative-1 has been se on environmental, forest	lected as it is more access and wildlife aspect in com	sible and has minimal impact parison to Alternative-2 & 3.







2.6 **Proposed Components of the Project**

The name of the transmission elements under this KVTPL project are presented in Table 2-5. It would be pertinent to mention that a part of RoW for the proposed transmission Line is presently being used by the 2x 200 KV Transmission Line. These lines are owned by Tata Power Company Limited. As part of the agreement between TATA and ATL the existing towers of these two lines would be decommissioned and the new tower would be shared by these three lines., i.e. two 220 KV line and the new 440 KV line by KVTPL. All the existing towers between the Tower footing numbers 26N2 to 46 of the proposed projects will be decommissioned.

Table 2-5 : Project Details

SI No.	Name of the Transmission Element		
1.	400 kV Kharghar-Vikhroli D/C & M/C line with bays at Kharghar & Vikhroli (with conductor capacity of 2,000 MW per circuit) along with 400 kV Bus extension at 400 kV Kharghar end		
2.	LILO on 400 kV Talegaon-Kalwa line at 400 kV Vikhroli GIS S/S with bays		
3.	LILO of existing 220 kV Trombay – Salsette I & II and 220 kV Trombay – Salsette III & IV at 400/220 kV Vikhroli S/S		
4.	Installation of 1 x 125 MVAR 400 kV Bus Reactor		
5.	400/220 kV GIS Substation with 3 x 500 MVA, 400/220 kV ICTs		
6.	Diversion of existing 110 kV Dharavi-Salsette via Vikhroli lines considering future 220 kV up- gradation. Since the RoW of the exiting 2X 220 KV line would be used for the construction the project in addition to the construction activities would also involve decommissioning works. The decommissioning works would include the temporary shutdown of the use of these two lines, dismantling of the towers. This would allow space for the construction of the towers. The two no of 220 KV line would be restrung on the new towers and the lines would again be made operational.		

2.7 Proposed Components of Transmission Lines

The KVTPL Transmission line will be laid overhead using lattice structures fabricated with MS/HS angles and galvanized. The technical specification of the transmission line, which would be used for this project is presented in this section.

- The Tower shall be fully galvanized using mild steel or/and high tensile steel section. Bolts and nuts with a spring washer are to be used for the connection.
- IS Steel section of tested quality in conformity with IS 2062:2011, grade E 250 (Designated Yield Strength 250Mpa) and/or grade E 350 (Designated Yield Strength 350 IVIPa) are to be used in towers, extensions. Gantry structures and stub setting templates. However, the use of steel grade having a designated yield strength of more than 350 MPa is not permitted.
- Towers shall be designed as per |S-802:2015 considering wind zone as per IS-875. However, the drag coefficient of the tower shall be as follows: -

As per Clause 12.1.2.1 b) 2) of IS 802:2015, Under security condition for tension and dead-end towers, the transverse loads due to line deviation shall be the component of 100 percent mechanical tension of conductor and ground wire/ OPGW corresponding to 100% of design wind pressure at everyday temperature or 36% design wind pressure at minimum temperature after accounting for drag coefficient and gust response factor.

As per CEA's technical standards for construction of lines Regulation 2010, Transmission Service Provider (TSP) may adopt any additional loading/ design criteria for ensuring the reliability of the line, if so desired and/ or deemed necessary.

A) For power line crossing of 400 kV **or** above voltage level, large-angle & dead-end towers (i.e. D/DD/QD) shall be used on either side of power line crossing (i.e. D/DD/QD - D/DD/QD arrangement).

B) For power line crossing of 132 kV and 220 kV voltage level, angle towers (B/C/D/DB/DC/DD/Q B /QC/QD) shall be used on either side of power line crossing depending upon the merit of the prevailing site condition and line deviation requirement.

C) For power line crossing of 66 kV and below voltage level, suspension/tension towers shall be provided on either side of power line crossing depending upon the merit of the prevailing site condition and line deviation requirement.

The conductor configuration shall be as follows: -

Transmission line	ACSR Conductor Specified	Equivalent AAAC conductor based on 53.5% conductivity of Al Alloy	Sub conductor Spacing
400kV D/C (Twin) transmission lines	Moose: Stranding 54/3.53 mm-Al + 7/3.53 mm-steel,	Standing details: 61/3.66 mm	457 mm
	528.5 sq. mm, Aluminum area, 31.77 mm diameter	32.94 mm diameter; Total Section Area 6402mm	

Note 1) The transmission lines shall have to be designed for a maximum operating conductor temperature of 85 degree C for both ACSR and 95 degrees C for AAAC.

2) In the case of H TLS conductor 0.5 ACSR Moose weight equivalent H TLS carbon core conductor having current-carrying capacity double of that of 0.5ACSR Moose conductor may be provided in Twin conductor configuration as per the project requirement.

Transmission line	ACSR Conductor Specified
220kV D/C Transmission Line	Zebra: Stranding 54/3.18mm-Al + 7/3.18 mm-Steel, 428 sq. mm, Aluminium area, 28.62 mm diameter

- The required phase to phase spacing and horizontal spacing for the 400 kV line shall be governed by the tower design as well as minimum live metal clearances for respective voltage levels under different insulator swing angles.
- The minimum live metal clearances for 400 kV lines may be considered as follows:

Under swing conditions

Wind pressure Condition	Min. electrical clearance
a) (22 ⁰) swing of I String & (31 ⁰) swing of jumper	3050mm
b) (440) swing of I String e (620) swing of jumper	1860mm

However, the phase to phase spacing for 400 kV D/C shall not be less than 8 m.

- The required phase to phase spacing and horizontal spacing for the 400 kV line shall be governed by the tower design as well as minimum live metal clearances for respective voltage levels under different insulator swing angles.
- The minimum live metal clearances for 400 kV lines may be considered as follows:

Under swing conditions

Wind pressure Condition	Min. electrical clearance
a) (22 0) swing of I String & (31 0) swing of jumper	3050 mm
b) (440) swing of I String e (620) swing of jumper	1860 mm

However, the phase to phase spacing for 400 kV D/C shall not be less than 8 m.

• The minimum ground clearance for 400 kV transmission lines shall be 8.840 m.

- The minimum mid-span separation between earth-wire and conductor shall be 9.0 m for 400 kV D/C transmission lines. Shielding angle shall not exceed 10 degrees for 400 kV D/C transmission lines.
- Transposition is to be done for all transmission lines whose length is greater than 100 km. Transposition should be carried out 1/3 and 2/3 of line length tower positions.

- Each tower shall be earthed such that tower footing resistance does not exceed 10 ohms. Pipe type or Counterpoise type earthing shall be provided as per relevant IS. Additional earthing shall be provided at every 7 to 8 km distance at the tension tower for direct earthing of both shield wires.
- Following are the salient parameters

Sr. No	Particulars		Sir Sus for Sus	ngle spension Strin spension Tower	Double g Tension String angle	Sing Susp for Pilo tower An	le bension t String for gle Tower
1	Length of Standard Dis	c per string	333	35	4080	3335	
2	Number of insulator of of the insulator string	each limb	23		24	23	
3	E & M Strength of each	ı disc (KN)	120)	160	120	
4	Mechanical strength of (KN), Hardware only	the string	120)	320	120	
5	Size and designation o Shank in mm	f Pinball	20		20	20	
6	Min. Creepage distance	e of each	736	60(Normal)	7680(N)	7360	(Normal)
	limb of insulator string	(mm)	989	90(Antifog)	10320(AF) 9890	(Antifog)
7	Weight of Insulator Stri with Hardware (Kg)	ng along					
	a) Disc Insu.(N)		173	3	498	173	
	b) Disc Insu (A/F)		230)	670	230	
Sr. No.	Particulars	Single Suspensi String fo Suspensi Tower	on or on	Double Suspension string for Suspension tower	Single Tension String for angle	Double Tension String for angle tower	Single Suspension Pilot String for Angle Tower
1	Number of insulators of each limb of the insulator string				IX15	2X15	
2	E and M Strength of each disc (KN)	70		70	120	120	70
3	Disc dimension in mm	280 X145		280 X145	280 X145	280 X145	280 X145
4	Size and designation of Pinball Shank in mm	16		16	20	20	16
5	Min. Creepage distance of each insulator disc (mm)	430 (AF)		430 (A F)	430	430	430 (AF)

• The required phase to phase spacing and horizontal spacing for 220 kV line shall be governed by the tower design as well as minimum live metal clearances for respective voltage levels under different insulator swing angles.

The minimum live metal clearances for 220 kV lines may be considered as follows:

Under swing conditions	
Wind pressure Condition	Min. electrical clearance
a) (15 0) swing of I String & (10 0) swing of jumper	2130mm
b) (45 ^{0}) swing of I String & (20 0) swing of jumper	1675mm

However, the phase to phase spacing for 220 kV D/C shall not be less than 5 m

• The minimum ground clearance for 220 kV transmission lines shall be 7.01m.

- The minimum mid-span separation between earth wire and conductor shall be 8500 m for 220 kV D/C transmission lines. Shielding angle shall not exceed 300 degrees for 220 kV D/C transmission lines.
- Transposition is to be done for all transmission lines whose length is greater than 100 km. Transposition should be carried out 1/3 and 2/3 of line length tower positions.
- Each tower shall be earthed such that tower footing resistance does not exceed 10 ohms. Pipe type or Counterpoise type earthing shall be provided as per relevant IS. Additional earthing shall be provided on every 7 to 8 km distance at the tension tower for direct earthing of both shield wires.

2.8 Project Component of Substation

The project components of the 400 KV and 200 KV Sub- station are presented in the Table 2-6

SI. No	Component	Description	Remarks
Α.	Core Infrastructure		
1.	Transformer	3 nos (500 MVA Each) Transformer.	
2a.	Bays (incoming)	6 nos of 400 KV bays	-
2b.	Bays (outgoing)	8 nos of 220 KV bays	-
3	Transformer Oil	Would be as per the Regulation of Polychlorinated Biphenyls Order, 2016	
4.	Circuit Breakers	The circuit breakers and accessories shall conform to IEC: 62271-100, IEC: 62271-1 and shall be of SF6 Type	
В.	Associated Infrastructure		
4	Control Room	One number with a control panel	It would have station level control (SAS) along with its peripheral and recording equipment, AC & DC distribution boards, DC batteries & associated battery chargers, Fire Protection panels, Telecommunication panels & other panels as per requirements. Air conditioning requirement
5	Toilet Facility	02 nos of Toilet	The toilet units would be provided septic tank and soak pits for discharge of wastewater.
6	Pump House	01 nos of pump	This water would be used for supply to substations to meet drinking water and sanitary requirement.
7.	Fire Fighting	Fire-fighting system in general conforms to fire insurance regulations of India	AC motor & diesel engine driven pumps housed in a fire fighting pump house building along with water storage tank of adequate capacity. Automatic heat actuated emulsifying system is proposed for transformers & reactors.

Table 2-6: Project Components in the 400 KV Pooling Substation

Source: Detailed Project Report, KVTPL, March 2020

2.9 Description of Project Phases

2.9.1 Detailed Design

During the stage the route planning for the transmission line takes place. At the planning stage, three alternatives are identified avoiding the major settlements, forests, coastal regulation zone and, other technical considerations. An analysis is carried out to identify the best alternative.

The typical activities which would be carried out during the project conceptualization phases include:

- Walkover surveys of the three alignments: These have already been carried out and the finding has been used in the analysis of alternative section;
- A detailed survey of the final alignment. The inputs from this study have also been used in the ESIA report e.g. number of trees to be felled. number of structures etc;
- Soil investigation of the tower locations at regular interval to ascertain the type of foundation;

2.9.2 Construction Phase

The construction of the transmission line route includes carrying out check surveys, site clearing and, access road establishment through to foundation construction and structure installation to energizing. This phase is expected to take 21 months to complete. The Construction is projected to be over by August 2022.

In additions, the contractor would carry out i) Check Surveys, ii) Site Clearance and vegetation removal (including felling trees if required) iii) Excavation for tower foundation, construction of the concrete bases for the transmission line towers, iv) transportation in of the tower components and other raw materials; v) assembly and erection of the towers; vi) stringing of the transmission line, and vii) site rehabilitation.

2.9.2.1 Check Surveys

Check surveys are carried out by the contractor at the initiation for fixing the tower locations. All construction activities would be carried out within the Right of Way for the safe operation of the transmission lines as per IS 5613. Check survey has been completed for both the line.

2.9.2.2 Clearing of Sites

At the tower site, all vegetation in the footprint of the tower base and the working area of approximately 2.5 m on each side of the base (15 m x 15 m) would be cleared of vegetation

2.9.2.3 Excavations

Excavators would be used to excavate the foundation for tower footing. Foundation sizes would be as described above depends on the soil conditions and tower type. Excavated soil will be dumped around the excavation and excess dump rock will be uplifted and removed as required. Each excavation will be inspected and tested to confirm its suitability. The foundations would be filled with concrete.

The formwork, reinforcing bars, embedded of the tower, and any earthing elements would be placed in the pits. A 50 mm thick pre-stressed concrete cement pad is laid at the base of the foundation. Concrete will be sourced from a 'ready-mix' truck that will access the site or concrete will be mixed on-site using a portable concrete mixer. Approximately, 16 - 40 m3 of concrete is required per tower. The casting of the foundation would take approximately 15- 30 days and would involve 15- 20 labours depending on the terrain and soil conditions. Once the excavations have been filled, the concrete requires 14 days for curing. The excavated soil would be backfilled and compacted as per good engineering practices.

In the Thane Creek area winch machine operated on diesel will be used for pilling. Every tower will have four legs thus, four piles will be there for each tower.

2.9.2.4 Erection of Tower

The material for the construction of the tower would be brought by track trailer or manually depending on the accessibility and site condition and delivered directly from the storage yard/lay down area to the tower construction site. Transposition is to be done for all transmission lines whose length is greater than 100 km. Transposition should be carried out at 1/3 and 2/3 of line length tower positions. The tower construction would start after the setting of the concrete is complete. It is estimated that in KVTPL numbers of towers (76 towers in 400 kV line and 38 towers in 200 kV LILO line) would be constructed. The prefabricated component of the lattice structure would be first assembled on the ground. The erection of the tower is done manually. The components are also hoisted manually by using a pulley system.

2.9.2.5 Stringing of Conductors

The stringing of the conductors will be done by tension method using a winching machine. The tension methods are generally used for stringing as this method keeps the conductor surface safe during the stringing process. As part of the stringing process using the tension method, the conductor is kept under tension during the stringing process. This helps it to keep the conductor clear of the ground. For pulling the conductor a pulling line is installed on travellers affixed temporarily to the arms of the tower. A pulling line is pulled which is then used to pull the conductor from the reel stands using specially designed tensioners and pullers. Two types of pulling machines are

used in the construction of transmission lines being strung under tension. These are defined as bull wheel and drum/reel-type. Pullers would be equipped with load-indicating and load-limiting devices. Tensioners would be equipped with tension indicating devices. The capacities of the puller and tensioner would be based on the conductor, span length, terrain and, clearances required above obstructions. Sag tensions can never exceed during stringing. The capacity for both puller and tensioner is calculated as per IEE 524. Positive braking systems will be required for pullers and tensioners to maintain conductor tension when pulling is stopped.

2.9.3 Operation and Maintenance

During the O&M stage of the project, ground patrolling would be carried out. The patrolling would monitor the growth of tress in violation of the minimum safety clearance., development of any house or settlement within the RoW. Roads and bridges constructed within the ROW would also reduce the minimum safety clearance so these would also be monitored.

Further to ensure safety to adjoining properties; development of oil and gas pipelines, development of industry and plants, like cement, chemicals, dumping yard, etc. would be monitored appropriated measures taken to prevent such activities would reduce the efficiency of the transmission lines. For this monitoring exercise ground patrolling would be organised preferably on a monthly basis.

2.9.4 Details of ROW

The Right of Way of the transmission line has been defined as per as per IS 5613. In case of 400 KV line 46 m is considered as the ROW while in the case of 220 KV line the ROW is stipulated to be 35 m. This is also the horizontal clearance required for the transmission line of these capacities. The minimum ground clearance for 400 kV transmission lines shall be 8.84 m and for 220kV D/C transmission lines shall be 7.01m, so that the maximum electric field does not exceed 10kV/m within the ROW and does not exceed 5kV/m at the edge of the ROW as per international guidelines.

Approval under Section 164 of the Electricity Act 2003 has been received for the KV line. For the proposed LILO line, this approval is under process and it is expected to get approval by March 2021.

2.9.5 Details of Tree Enumeration and Cuttings

The natural terrestrial habitats of the Study Area mainly comprise tracts of natural forests, grasslands, and mangroves. The eastern part of the Study Area lies near the Kharghar Hill Range, which is a contiguous range of hills nestled between the city. Most of these hills are covered with natural vegetation, while a few patches along hill slopes are degraded. The final numbers of trees would be assessed during the start of the construction and will take prior permission from Forest Department.

To compensate for the loss of a total of 1367 mature mangroves (852 due to approach path and 515 due to tower foundation) plantation of multi-species mangroves would be undertaken by the project team (*Source: CRZ Clearance for 400 KV multi-circuit transmission line; Reference no. TP/KVL/2018-19/414, Dated 17th December 2018*). Regarding compensation toward mangrove in forest land are included under the NPV (Net Present Value) determined by the forest department, under the provision of FC Act. Since the project has already been granted final forest clearance hence, NPV and extraction cost for mangrove has already been paid by KVTPL as part of Stage 1 forest approval compliance.

2.10 Project Duration and Schedule

The project implementation has been planned for a period of 21 months, this would include the Detailed design Phase as well as Construction (Detailed Surveys, material supply, foundation, erection of the tower, stringing, testing, and commissioning). The date of commissioning is August 2022.



neme Name : Tra	anamission system for 400 KV Vikhroli receiving st	tion and associ	ted incoming	ranamiaaior	lines for street	gthening o	f Mumba	i Transmise	ion Syster																																				
oject Executio	on Plan/L1 Schedule (SCoD : 12-March-202	Anticipated	COD : 31-A	g-2022)																																									
400 kV Kharghar	Wikhroli D/C & M/C line with bays at Kharghar & Vikhr	il (with conductor	capacity of 2,0	IOMIV per ci	uit) along with 4	00 kV Bus	extension	at 400 kV K	hanghar en	d (SCOD : *	2.03.2022)																																		
ILO on 400 kV	Talegaon-Kalwa line at 400 kV Vikhroli GIS S/S with be	75 (SCOD : 12.	3.2022)																																										
(2) (LR O of webpy 220 KV Trombay - Solute1a II and 222 KV Trombay - Solute1a II																																													
stallation of 1 x	125 MVAR 400 KV Bus Reactor (SCOD : 12.03.2022																																												
00/220 kV GIS	Substation with 3 x 500 MVA, 400/220 kV ICTs (I) Co	st. of 400 kV Gi	8 & 220 kV GIS	Buildings at 1	khroli S/s (II) 2	t0 kV spare	Bays - 0	2 Nois (SC/	JD : 12.03	2022)																																			
Iversion of exist	ing 110 kV Dharavi-Salsette via Vikhroli lines consideri	g future 220 kV i	pgradation (SC	OD : 12.03.2	(22)																																								
		-	10000000				2019						1	1		2833					No. 11	00.18	100.71		Mar.T			Macht	202	1	And N .	Bec. 11	04121	No. 11	045.21	Inc.W	100.71			202	a Mar 22			11.97	too M
~	Accery	Start Date	End Date	No. of Day	Sec-19 MD	Oct-19 M1	Nos	-19 De	6-19 MD	Jan-20 Mil	Fe0-20 MG	Mbr-20 NG	Apr-20 W7	May-20	9 Jun-3 M9	D Jul-		1 N	112	M13	MISE	MIS	MISE	Feb-21 M17	MIR	10	r-21 F19	M20	Jun-21 M21	Jul-21 M22	M23	M24	M25	M26	M27	M28	8629		10	1631	M32	MD	13	MD4	MDS
-	Equipment Erection	ton 28 Feb 21	10 Aug 22	628	-		-			-+			-	-							-								-				_									Ŧ			
	Testing & Commiss	ring 10 Aug 22	31-Aug-22	21					-							1.000							-				-															-			
-		-			-		-		-				10		1	_								-	-		-								-	-	1	-	-			-			
	Monsoon/ Rainy 3	leason																																											
Note : 1. Lol rece 2. SPV wa	elved on 12.12.2019, As per timelines mentione is acquired on 26.06.20, As per timelines mention V takeover, KVTPL is yet to receive posession V takeover, KVTPL is yet to obtain NOC from T	in RFP, there ned in RFP, the of land for resp ata Power Con	s a delay of 9 re is a delay of ective substati pany Limited	8 days in is f 287 days ion. In this r TPCL) for	uance of Lol, 1 SPV takeow gards, Notice ansfer of exis	which is br or which is of Force I ting appro	eyond the beyond Majeure vals/clea	s control of the control under Artic arances, in	ATL. of ATL. ie 11 of 1 this rega	he TSA har rds, Notice	been subr	nitted. Iajeure uni	ter Article 1	1 of the TS	SA has bee	n submitted																													
4. Post SF		everely affect	d due to Glob	al Pandemi	of COVID 19	Our proje	ect impler	mentation r	activity is	also affectr	d due to C	OVID 19,	for which F	M Notice h	ave been is	sued to all	concerned,	as per provi	sions of T	SA. KVTPL	is not cert	ain about p	eriod for wh	ich, our pr	oject implen	mentation a	activities v	will continue	e to be impo	acted. The I	1 schedule i	submitted h	rewith will h	ave to be	evised, one	impact of (OVID is o	ver.							
4. Post SF 5. Mumbal	I City, where the project is to be implemented, is																																												
 Post SF Post SF Mumbal 10 acces 	r City, where the project is to be implemented, is	ere Coordinat	r (BPC) in of	tain Anerrow	I Inder Section	en 68 of th	e Electri	the Act 20	13 Hours	mr BDC h	an and area	ided some	nual under	Section 68	of the Elect	tricity Act 2	003 There	ITN/A MAR	has proce	reded to ob	Main annen	und LUe BR #	from speces	rinte Gouse	emment Auti	boritian Er	orea Main	euro Notice	a nasking at	dension of	me for this I	ne hearin	und in term	e of the T	A*										

2.11 Quantification of greenhouse gas

Quantification of greenhouse gas was estimated for the 400 KV Kharghar- Vikhroli transmission line and 220 KV LILO transmission line was carried out based on the methodology provided in Guidance Note: Greenhouse Gas Accounting for Energy Investment Operations, Transmission and Distribution Projects

Power Generation Projects, and Some Demand-Side, Energy-Efficiency Activities, Version 1.0. The World Bank For determining the Green House gasses it important to determine the project boundaries. For this purpose, the existing RoW has been considered as a source of direct emission. For indirect emission, the lead distance for transport of material and equipment has been considered as a project boundary area.

2.11.1 Emission Sources for the proposed project

For the proposed activity of the establishment of the transmission line, screening of the activity was done, in line with the goal to achieve the prominent activities, which could be the major contributor to the greenhouse gas emission. After the detailed analysis some activities have been highlighted, as followed:

- Construction of the substation.
- Technical loss of energy in the transmission line.
- Land clearing due to erection of the tower.
- Vehicular emission due to transportation of equipment to the tower site.
- Emission due to SF₆.

2.11.2 Construction of the sub station

During the construction activity of the substation, several construction equipments would be engaged. It has been assumed that excavator, Dump truck, Crawler, Crane, Payloader, and Rig would be present in a single number and two transit concrete mixers would be present in the site.

2.12 Calculation of the GHG emission from different source for the proposed project

Estimation of GHG from different sources was done for the proposed project. Before jump into the calculation a screening was done to identify the most dominant GHG source for the proposed project and it has been understood that during the construction period construction equipment and the transportation of raw materials would be the direct source of emission, whereas the raw materials like cement and steel would be the indirect source of emission.

In the operational period, technical loss from the transmission line would be the only source of emission, and it would be a permanent source of emission for the whole life of the project. In the case of substation, SF6 would be used in some equipment. During the refilling and maintenance work, some SF6 might be released into the atmosphere and posed as a source of GHG emissions.

2.12.1 Methodology for assessing the GHG emission from construction equipment

The emission from the construction equipment would be considered as a stationary combustion source. The greenhouse gases CO_2 , CH_4 , and N_2O are emitted during the combustion of fuels. CO_2 accounts for the majority of the GHG emissions from stationary combustion sources. CH_4 and N_2O emissions together represent less than one percent of the total CO_2 equivalent emissions from the same sources. In the proposed project emission from DG sets, some construction equipment, and emission from heat recovery system could be considered as stationary combustion sources, and as per EPA, the amount of greenhouse gas could be calculated by this equation below: Emissions = Fuel x HHV x EF2

Where:

Emissions = Mass of CO₂, CH₄, or N₂O emitted

Fuel = Mass or volume of fuel combusted

HHV = Fuel heat content (higher heating value), in units of energy per mass or volume of fuel

 $EF_2 = CO_2$, CH_4 , or N_2O emission factor per energy unit.

Emission factor and heat content is collected from the "Greenhouse gas inventories, 2018" by EPA. To represent the CH₄ and N₂O emission in terms of the equivalent amount of CO₂, the emission from CH₄ and N₂O, would be multiplied by the global warming potential of CH₄ and N₂O.

It has been assumed that the total construction period would be for 6 months, and by using this equation total greenhouse gas emission for the total period would be 1133 tonnes.

For the construction purpose, a total of 12972 tons of cement would be required to prepare M20 and M10 grade concrete. Approximately, 900 kg of CO_2 is emitted to prepare 1 tonne of cement, by calculating the above factor with the total quantity of cement, it has been estimated that 12895 tonnes of CO_2 would be emitted in the atmosphere. But this would consider as, indirect emission of GHG for the proposed project, as project proponent was not directly involved in the cement preparation procedure.

It has been assumed that each transmission tower would consist of almost 12 tonnes of steel, in both lines total 114 towers are scheduled to be set up. So, it can be assumed that approximately 1368 tonnes of steel are required for the project.

According to a report of the World Steel Association, to make one ton of steel almost 1.9 tonnes of CO_2 emitted in the atmosphere. So, by calculating the total amount of steel with the said factor, it can be predicted that total 2599.2 tonnes of CO_2 have been emitted in the atmosphere, which is indirectly associated with the project.

For the substation, it can be assumed that total of 6000 tonnes of steel would be involved, as most of the equipment in the substation are made of galvanized steel. So, as an indirect emission, total of 11400 tonnes of CO_2 has been emitted for the proposed substation.

Technical Loss in transmission line

According to the information from the project proponent, Kharghar - Vikhroli line was equipped with a power flow of 1340 MWh and incurred a loss of 4.5 MWh. Whereas LILO of Trombay - Salsette line having a power flow of 740 MWh, with an estimated loss of 3.7 MWh.

Methodology

According to the user guide of the CO_2 database for the Indian power sector, published by the Central Electricity Authority, the weighted average of the grid emission is 0.82 tonnes of CO_2 per megawatt per hour. Using the grid emission factor total emitted co_2 for the Kharghar - Vikhroli line was estimated as 32324.40 tonnes and total emitted CO_2 for the LILO of Trombay - Salsette line was estimated as 26577.84 tonnes of CO_2 . Accounting for both the emission, the total GHG emission would be 58902.24 tonnes of CO_2 from technical loss annually from the transmission lines.

2.12.2 Land clearing due to erection of the tower

New construction of long-distance lines, or even of distribution lines and substations, may affect carbon stored in biomass and soil. Depending on the circumstances, land clearing could account for the largest fraction of total gross emissions within the project boundaries. An obvious example would be clearing a forest for a long-distance transmission line, which would result in a one-time release of the carbon stored in the vegetation. According to the study of the urban forest network, 1 acre of forest can sequester 2.5 tonnes of carbon annually, so inversely, if 1 acre of forest land would clear it could release 2.5 tonnes of CO_2 in the atmosphere. But considering the forest type in the region, which is mainly shrubs and medium trees, it can be concluded that these forests are not capable of sequestrate that much of CO_2 from the atmosphere. So, this scope could be ruled out from the GHG emission.

Vehicular emission due to transportation of equipment to the tower site

Vehicular emission would be considered as a mobile source for the proposed project. According to the information from the project proponent, only one truck would be needed for the erection of one tower. So, it has been predicted that daily 2 trucks would be needed, to transfer the tower erection equipment at two different sites. Considering the tower numbers for both lines, it can be predicted this activity will continue for at least one year.

Considering the time frame, total distance, and vehicle type (heavy-duty truck), the total predicted CO_2 emission would be 68.91 tonnes annually.

Emission due to SF₆

 SF_{6} is used in insulation and current interruption applications in T&D systems.8 SF_{6} is used in gas-insulated switchgear and substations, gas circuit breakers, and (less frequently) in high-voltage, gas-insulated lines. SF_{6} may escape fugitive emissions during the manufacturing, installation, use, maintenance, and disposal of this equipment. Sealed distribution equipment may not emit any SF_{6} during use, but transmission equipment often requires periodic refilling and hence has higher fugitive emissions during use. The amount of SF_{6} emitted during operation and decommissioning is related to the number and type of equipment used, as well as the maintenance and recycling procedures SF_{6} is used in insulation and current interruption applications in T&D systems.8 SF_{6} is used in gas-

insulated switch-gear and substations, gas circuit breakers, and (less frequently) in high-voltage, gas-insulated lines. SF_6 may escape as fugitive emissions during the manufacturing, installation, use, maintenance, and disposal of this equipment. Sealed distribution equipment may not emit any SF_6 during use, but transmission equipment often requires periodic refilling and hence has higher fugitive emissions during use. The amount of SF_6 emitted during operation and decommissioning is related to the number and type of equipment used, as well as the maintenance and recycling procedures.

Methodology

Emissions from Operation and refilling = $C \times (x/100) \times T$ where:

C = refrigerant capacity of the piece of equipment

x = annual leak rate in percent of capacity

T = time in years used during the reporting period (e.g., 0.5 if used only during half of the reporting period and then disposed).

According to the study of Mr. Shigeru Maruyama, it has been predicted that 0.1 percent of the total SF6 volume would be leaked during refueling or operation. Total 1004.8 kg of SF_6 would be used in the substation, and approximately 1.0048 kg of SF_6 would be leaked during the process.

Considering all the factors it can be calculated that approximately 22.91 tonnes of CO_2 equivalent would be releases annually.

Conclusion

By considering all the probable emissions it could be predicted that most of the emissions would be end in a definite time frame, except the technical loss and SFF6 emission. So, at the initial period of the project, the CO_2 emission would be high, but at later stage, the emission of GHG would be minimum. Though in the later stage the SF_6 emission could be avoided by the installation of SF_6 recovering unit. Comparison of CO_2 emission sources are presented in a graphical manner in figure

Emission sources	CO ₂ (tonne)
Technical loss	58902.24
Construction emission	28027
SF ₆ emission	22.91
Vehicular emission	68.91



2.13 Raw Materials Requirement

2.13.1 Raw material

The raw material required for the construction of the transmission line and substation has been estimated These are presented in Table 2-7.

Table 2-7 : Raw Material Requirement for KVTPL Transmission line

Material	Quantity
Cement (kg)	4,712412
Sand (m ³)	5093
Aggregate (m ³)	10,187
Water (Concrete Only) (KL)	2842

2.13.2Land Requirement

Land Requirement for Transmission Line

The land on which the project is to be constructed is public land, forest land, or land belonging to bigger private entities. As reported by the KVTPL project team, the land of the existing substation in Kharghar and Vikhroli already procured² by the KVTPL No private residential land has been used for the project. It shall also be noted that the transmission line route does not have any R & R issues. The average land requirement for tower footing would be 225 sqmt.

In the case of 400 kV transmission line of this project, the total number of towers would be 76. Thus, the land requirement for tower footing, in this case, would be 17100 sqmt (4.225 acre) and it belongs to the public/forest or CRZ department. The width of the right of way for the 400 kV line is 46 meters (23 meters on each side and one-line distance are 10.86 km (total length of the transmission line would be 21.725 km). Thus, the total land requirement for ROW is 499560 sqmt (123.44 acres). CRZ clearance already obtained for the project.

In the case of 220 kV transmission line of this project, the total number of towers would be 38. Thus, the land requirement for tower footing, in this case, would be 8550 sqmt (2.112 acre) and it belongs to the public/forest or CRZ department. The width of the right of way for 220 kV line is 35 meters (17.5 meters on each side and one-line distance are 6.114 km) and the total length of the transmission line would be 12.228km. Thus, the total land requirement for ROW is 213990 sqmt (52.87 acres). Forest and CRZ clearance already obtained for the project.

Land Requirement for Substation

As indicated the Kharghar and Vikroli are existing substations. As part of the project, the vacant land adjoining these substations would be used for the construction of substation a bay for this project. Reportedly, the land of the existing substation in Kharghar and Vikhroli was already procured by the KVTPL.

Land Requirement for Stockyard/Laydown and Labour Camp

The project will require a stockyard area for construction materials during the construction period. For this, the contractor will arrange the land on lease for the construction period only.

2.13.3 Manpower Requirement during Construction

The construction activity would be carried out by primarily three teams i) foundation ii) Tower erection iii) stringing. The foundation construction team would have around 15-20 labours while the tower erection teams which would follow would have 10-15 people. Finally, the stringing team would also have around 20-25 people involved in the job. During the foundation and tower construction, approximately 2-3 teams would be working in parallel. Thus approximately 100-120 labours would be working at any time in the project. However, these numbers can increase, and 150 people may be employed at a maximum at any point of time in the project. The development of the

² It may be mentioned that Tata Power Company Limited was initially selected by the Government of India as the promoter of KVTPL. However, subsequently this line was taken over by ATL. As reported by ATL the land for the Kharghar and Vikroli was procured by Tata Power Company Limited and was as part of the transfer would be handed over to ATL on as –is basis. No document however, has been provided to this regard.

substation and bays would be carried out by a separate team specialized in these activities. This team would comprise 30-50 people.

Most of the labour required for the foundation, especially unskilled labour would be sourced from the local area. It has been indicated by KVTPL that for tower erection, stringing, operation of equipment and machinery no migrant labour from other areas. Thus, it has been informed by KVTPL that there is no requirement for the construction camp. During the operation phase, approximately 15 people would be required and working in 3 shifts.

2.13.4 Equipment and machinery used in Construction

The construction of the transmission line and the substation would require the following machinery i.e. front-end loader, backhoe, concrete mixer, crane, poker vibrator. This equipment would be mainly located at the site of the construction activity. A temporary staging shall be in the Construction Camp. The maintenance and repairs of the equipment would also be carried out at the camp. The operating noise levels of the equipment is presented in

Equipment	Noise Level	Equipment	Noise Levels
Front End Loader	85-91	Crane	90-96
Backhoe	79-89	Concrete Mixer	<85
Poker Vibrator	87-98	Electric Drill	102

Table 2-8 :Reference Noise levels of various equipment to be used in the construction activity

2.13.5 Power requirement during Construction

Power required at the construction activities would be drawn from the grid where it is available, else diesel generator DG sets would be used to supply the power. 2 nos. of 100 KVA DG set would be used for the supply of power. 1(One) DG would be in running condition and another one (1) on standby. In addition, one 50 KVA DG set would be used for domestic purposes. All the DG sets would conform to the Central Pollution Control Board (CPCB) standards for DG sets.

2.13.6 Water requirement during Construction

Water would be required for both construction activities and domestic purposes during the construction period. The operations period of the project would also have water requirements, but the quantities required would be much lesser in quantities. The water requirement for construction depends on the climatic conditions, type of equipment, type of material available, mix design, type of construction. Considering the above factors and the total duration of the execution of the project it is estimated that the average water requirement for domestic consumption and construction would be approximately 19.5 KLD and 2842 KLD respectively. However, there would be variations in the daily water requirement depending on the construction activities. During the operation phase considering the activities which have been considered the quantity of water required would be negligible.

2.14 Pollution Sources & Characteristics during Construction

Operation of Heavy Vehicle and Machinery: The operations of construction vehicles, diesel generators, and machineries engaged in the construction would contribute to Suspended Particulate Matter (SPM), Sulphur and Nitrogen dioxides (SO₂ and NO_x), Carbon monoxide (CO), and other hydrocarbons (HC). In addition, fugitive emissions are envisaged from plying of vehicles, storage, handling and transportation of materials during the construction phase. Dust will be mainly emitted during material transport, loading-unloading activities. Also, during the construction phase, the noise will be generated from operating heavy machineries, vehicular movement, etc. All the generator sets will be equipped with exhaust mufflers and acoustic enclosures and subjected to periodic preventive maintenance to reduce noise and shall conform to the CPCB requirement for generators.

2.15 Waste Management during Construction

Generation of waste from construction activities: Due to the construction of the transmission line and substation approximately 47,124 Kg of construction waste would be generated. This would be primarily from concreting

activities and can easily be used as a backfill material. This construction and demolition waste can be used for raising the sites for substation and strengthening of the approach road.

Discharges from Campsite and Construction areas: Sewage effluent will be generated during the construction. The campsite would be provided with a septic tank and soak pit / bio-toilets to treat the sewage. Since the camp would primarily cater to the requirement of the skilled and semi-skilled labour. As per KVTPL official labours for this project would be sourced locally, no migrant labour would be involved in the construction phase thus there would be no requirement for a construction camp. It is estimated that on average 15.0 kg of municipal solid waste (MSW) would be generated per day during the construction phase. This would comprise food waste and recyclables viz. packaging material. The MSW would have to be handled by the Contractor so that the adjoining areas are not contaminated.

Hazardous Waste: The used oil and lubricant, oil-soaked rags, empty drums from transformer oils would be considered as Hazardous Waste. In addition, paints, solvents, and oil used would also be considered hazardous waste. These would be disposed of by the Contractor as per the provisions of the Hazardous and Other Waste (Management and Transboundary) Movement Rules 2016.

2.16 Waste Management during Operations

E-waste: During operations, e-waste would be the main type of waste that would be generated. The e-waste is likely to be generated primarily from the maintenance of the substation equipment. These must be disposed of as per the e-Waste Management Rules 2016.

Hazardous Waste: The waste transformer oil (which would be generated after 5 years of the commissioning) would qualify as Hazardous waste would have to be disposed of as a Hazardous and Other Wastes (Management and Transboundary Movement) Rules 2016.

Battery Waste: The substation would have a DC battery which would be required to supply power to some of the equipment in case of emergency. The battery waste would be disposed of as per the Battery (Management and Handling) Rules 2001.

2.17 **Present Status of the Project**

Assessment of the various system like load flow, stability, short circuit, etc. has been already completed. Presently, all clearance related to Forest, CRZ, NGT, Bombay High Courte Order which were granted in the name of Tata Power Company Limited are now transferred to the name KVTPL. For the erection of the tower in both lines' primary survey is ongoing for the finalization of the tower footing locations.
3. Policy Legal and Administrative Framework

This section highlights the relevant environmental and social policies and regulations, IFC, and World Bank Group guidelines applicable for transmission projects especially transmission projects in Maharashtra state. The regulatory framework is based on a) applicable national and state-level environmental and social regulations for the project; b) International Standards and Conventions; and c) Applicable Environmental and Social Guidelines. The institutional framework for the implementation of the regulatory framework has also been taken into consideration.

3.1 National and State Laws

Constitution of India under Article 21 assures that "The State shall endeavour to protect and improve the environment and to safeguard the forests and wildlife of the country." Similarly, Article 51 (A) also make say that "It shall be the duty of every citizen of India to protect and improve the natural environment including forests, lakes, rivers, and wildlife and to have compassion for living creatures." Considering the direction from the constitution, the Government of India has laid out various policy guidelines, acts, and regulations pertaining to the protection of the environment. Consequently, the individual states have also framed rules to further the cause of environmental protection.

The Environment (Protection) Act, 1986 provides umbrella legislation for the protection of the environment. As per this Act, the responsibility to administer the legislation has been jointly entrusted to the Central Ministry of Environment Forests and Climate Change (MoEF&CC) and the Central Pollution Control Board (CPCB) / State Pollution Control Board (SPCB)

The implementation of the subprojects will be governed by the Government of India and the State of Maharashtra and other applicable environmental acts, rules, regulations, and standards. These regulations impose restrictions on the activities to minimize or mitigate likely impacts on the environment. It is the responsibility of the project executing and implementing agencies to ensure subprojects are consistent with the legal framework, whether applicable international, national, state or municipal, or local. Key standards include those related to air quality, and protected areas are included. Compliance is required in all stages of the project including design, construction, and operation, and maintenance of Transmission lines. The specific regulatory compliance requirements of for the KVTPL Project are shown in **Table 3.1**

SI. No.	Acts/Rule/Pc	blicy	Description	Applicability Required	&	Action	Responsibility
Envii	nvironment-related regulations						
1.	National Policy, 2006.	Environment	NEP is a comprehensive guiding document in India for all environmental conservation programs and legislation by central, state, and local governments. The dominant theme of this policy is to promote the betterment of livelihoods without compromising or degrading the environmental resources. The policy also advocates collaboration methods of different stakeholders to harness potential resources and strengthen environmental management.	The KVTPL P adhere to the NE "enhancing and of environment and abatement of	roject EP prir conse al re of pollu	should nciple of ervation sources tion".	Project Company
2.	Environment Act, 19 Environmenta	(Protection) 86 and al Standards.	The Environment (Protection) Act is an umbrella legislation seeking to supplement the existing laws on the control of pollution (the Water Act and the Air Act) by enacting general legislation for environmental	The Transmissic all activities und should adher regulations an under the (Protection) Ac Environmental S	on proj der the e to d sta Envir t, 198 tandar	ect and e same o the andards onment 36 and ds.	Project Company and the contractors/subcontractors and other supply chain contractor should adhere to the rules and standards specified under the

Table 3-1: Applicable Environmental Legislations and Specific Requirements for the Project

SI. No.	Acts/Rule/Policy	Description	Applicability & Action Required	Responsibility
		protection and to fill the gaps in the regulation of major environmental. hazards.		Environment Protection acts
3	EIA Notification of 2006 and the later amendments	The EIA Notification set out the requirement for environmental assessment in India. This states that Environmental Clearance is required for certain defined activities/projects, and this must be obtained before any construction work or land preparation (except land acquisition) may commence. The Schedule I of the notification defines the threshold of activities that require to undertake an environmental assessment and obtain environmental clearance from statutory bodies.	The transmission projects are not included in Schedule I of the EIA notification. Thus, there is no requirement for the Project Company to undertake environmental clearance.	Not applicable
4.	Water (Prevention and Control of Pollution) Act of 1974, Rules of 1975, and amendments	Control of water pollution is achieved through administering conditions imposed in consent issued under the provision of the Water (Prevention and Control of Pollution) Act of 1974. These conditions regulate the quality and quantity of effluent, the location of discharge, and the frequency of monitoring of effluents. Any component of the Project that has the potential to generate sewage or trade effluent will come under the purview of this Act, its rules, and amendments. Such projects must obtain Consent to Establish (CTE) under Section 25 of the Act from Maharashtra Pollution Control Board (MPCB) before starting implementation and Consent to Operate (CTO) before commissioning. The Water Act also requires the occupier of such subprojects to take measures for abating the possible pollution of receiving water bodies.	The transmission line project does not require any permission under the Water Act 1974. However, the Contractor has to obtain a Consent to Operate (CTO) under the said Act. The Consent has to be regularly renewed during the tenure of the project.	Contractor
5.	Air (Prevention and Control of Pollution) Act of 1981, Rules of 1982, and amendments.	The subprojects having the potential to emit air pollutants into the atmosphere must obtain CTE under Section 21 of the Air (Prevention and Control of Pollution) Act of 1981 from MPCB before starting implementation and CTO before commissioning the project. The occupier of the project/facility has the responsibility to adopt necessary air pollution control measures for abating air pollution.	For the subproject, the CTE and CTO from MPCB are required for (i) diesel generators; and (ii) cement concrete batching plants, stone crushers, etc. if installed for construction.	Contractor
6.	The Motor Vehicles Act, 1988 (59 Of 1988) (14 Oct. 1988)	The equipment and vehicles used in the sub-projects will emit air pollutants. Enforcement of air pollution norms and other applicable rules as per the motor vehicle act	Rule no 115. Emission of smoke, vapor, etc. from motor vehicles and Rule 115 (A) sub- rule (8) also provides standards for construction equipment	Contractor

SI. No.	Acts/Rule/Policy	Description	Applicability & Action Required	Responsibility
7.	Noise Pollution (Regulation and Control) Rules, 2002 amended up to 2010.	This provides for standards for noise for day and night for various land uses and specifies special standards in and around sensitive receptors of noise such as schools and hospitals. Contractors will need to ensure compliance to the applicable standards and install and operate all required noise control devices as may be required for all plants and work processes.	The project during the construction and operation has to adhere to the noise limits for various land use	Project Company and Contractor
8.	National Institute of Occupational Safety and Health (NIOSH) Publication No. 98-126	NIOSH has laid down criteria for a recommended standard: occupational noise exposure. The standard is a combination of noise exposure levels and duration that no worker exposure shall equal or exceed.	Internationally recognized environmental standards have to be adhered to during the construction and operation of the railway electrification project	Project Company and Contractor
9.	Solid Wastes Management Rules, 2016	Rules to manage municipal solid waste generated; provides rules for segregation, storage, collection, processing, and disposal.	During the construction municipal waste generated has to be managed according to the rules	Contractor
10.	E-Waste (Management) Rules, 2016	Bulk consumers of electrical and electronic equipment will ensure that e-waste generated is channelized through the collection center or dealer of the authorized producer or dismantler or recycler or the designated take-back service provider of the producer to authorized dismantler or recycler.	The project would qualify as a bulk consumer and that the e- waste generated from the project has to comply with the provisions of the rules and disposed of through the prescribed channels only	Project Company
11	Construction and Demolition Waste Management Rules, 2016	Rules to manage construction and to waste resulting from construction, remodeling, repair, and demolition of any civil structure. Rules define C and D waste as waste comprising of building materials, debris resulting from construction, remodeling, repair, and demolition of any civil structure.	All debris generated during the construction would be handled in accordance to the provisions of the Construction and Demolition Waste Management Rules, 2016	Contractor
12.	Hazardous and Other Wastes (Management and Transboundary Movement) Rules, 2016	According to the Rules, hazardous wastes are wastes having constituents specified in Schedule II of the Rules if their concentration is equal to or more than the limit indicated in the said schedule.	The hazardous waste generated from the construction e.g. waste oils, lubricants, and rags would have to comply with the provisions of the rules with regards to storage and disposal. The rules also make it mandatory for maintaining records and reporting the same to the MPCB.	Contractor
13.	Battery (Management & Handling) Rules 2001	It is the responsibility of the bulk consumer to ensure that the used batteries are deposited with the dealer, manufacturer, or registered recycler for handling and disposal. A half-yearly return (Form-1) is to be filed as per the rule to MPCB.	The batteries need to be disposed of as per the provision of the notification	Project Company
14.	Ozone Depleting Substances (Regulation and Control) Rules, 2000	The project would reduce the use of ozone-depleting substances	KVTPL shall follow the provisions of the notification and shall phase out all equipment, which uses these	Project Company

SI. No.	Acts/Rule/Policy	Description	Applicability & Action Required	Responsibility
			substances. In case of substation no equipment would be procured which contain CFC's.	
15	Forest (Conservation) Act, 1980 and Forest Conservation Rules, 2003 as amended	As per Rule 6, every user agency, who wants to use any forest land for non-forest purposes, shall seek approval of the Central Government.	The project proponent has already obtained Forest Clearance from the competent Authority for 400KVA Kharghar- Vikhroli line. Project Company applied for Forest stage clearance for Loop-In-Loop-Out of 400 kV Talegaon- Kalwa transmission line and extension of Vikhroli substation to Tower no 63 of 400 kV Kharghar Vikhroli line. Construction of transmission lines and towers in a radius of 10km from Sanjay Gandhi National Park. To fulfill the specific condition mentioned in the Forest Clearance, as the project alignment is crossing through the eco-sensitive zone of Sanjay Gandhi National Park, the project proponent require to obtain permission from National Green Tribunal.	Tata Power Company has obtained an order dated 22 January 2016 from the National Green Tribunal for construction of the project. The user agency shall abide by all the condition of forest clearance accorded by MoEF&CC
16	Wildlife (Protection) Act, 1972 Wildlife (protection) rules	The Act envisages the requirement of Clearance from the National Board of Wildlife (NBWL) if any project activity is located within the Boundary of Wildlife Sanctuary and its Ecosensitive Zone. The proposed transmission line is passing through the Thane Creek flamingo sanctuary and its Ecosensitive Zone.	Applicable. The KVPTL has already submitted the Wildlife clearance application to the regulatory authority.	Project company.
17.	The Maharashtra Felling of Trees (Regulation) (Amendment) Act, 1988 (No. 26 of 1989), 5 August 1989	Permission is required for the felling of trees under the Act.	In the case of felling of the tree, permission for felling must be obtained.	Contractor
18.	The Ancient Monument and Archaeological Sites and Remains (Amendment and Validation) Act 2010	The Rules designate areas within a radius of 100 m and 200 m from the "protected property/ monument/ area" as "prohibited area" and "regulated area" respectively.	The Ancient Monument and Archaeological Sites and Remains (Amendment and Validation) Act 2010	Contractor
19.	Ministry of Environment, Forests and Climate Change (MOEF&CC) and Maharashtra Coastal Zone Management Authority (MCZMA), Order dated 6 th July 2018	Construction of transmission line in CRZ. The project proponent requires to obtain CRZ clearance for the project.	The project Company needs to be obtained CRZ clearance from MCZMA and MoEF&CC if RoW of the line passes through the CRZ area. The project company needs to obtain all statutory clearance and judiciary process related to CRZ for Loop-In-Loop-Out of 400 kV Talegaon- Kalwa transmission line and extension of Vikhroli substation to Tower no 63 of 400 kV Kharghar Vikhroli line	Project Company CRZ Clearance was originally obtained by Tata Power Company vide letter from MOEF&CC dated 30 September 2015 and amended on 6 November 2016. The clearance was then transferred to Kharghar Vikhroli Transmission Private Limited vide letter issued by MOEF&CC dated 1 September 2020.
20	The National Green Tribunal (NGT) Act, 2010	NGT provides effective and expeditious disposal of cases relating to environmental protection and conservation of forests and other natural resources including	Stakeholders / affected persons may approach NGT to resolve project induced environmental issues	Project company

SI. No.	Acts/Rule/Policy	Description	Applicability & Action Required	Responsibility		
		enforcement of any legal right relating to the environment and giving relief and compensation for damages to persons and property and for matters connected therewith. NGT has jurisdiction over matters related to Water Act, 1974; Water Cess Act, 1977; Forest (Conservation) Act, 1980; Air Act, 1981; Environment (Protection) Act, 1986; Public Liability Insurance Act, 1991; and Biodiversity Act, 2002. Consequently, no other court will have jurisdiction over the matters related to the environment falling under the above-referred Acts. Being a dedicated tribunal for environmental matters with the necessary expertise to handle environmental disputes.				
21.	Bombay High Court	Development of project in the area affected by mangroves.	The project proponent requires to obtain permission from the Bombay High Court for the development of the project in the mangrove affected area.	Project Company A petition seeking permissions from the Bombay High Court was filed by KVTPL on 8 July 2020. The hearings are in progress.		
Elect	tricity Related Rules and Re	gulations				
22.	Electricity Act 2003	Under the provisions of Section 68(1): -prior approval of the Govt. of Maharashtra (GoM) is a mandatory requirement to undertake any new transmission project to plan and coordinate activities to commission a new Transmission project.	The permission under Section 68(1) has already been obtained	Project Company		
23.	Electricity Act 2003	Under Section 164: - (Government of Maharashtra) GoM, may by order in writing, authorize ATL for the placing of the electric line for the transmission of electricity to confer upon licensee (i.e. KVTPL) in the business of supplying electricity under this Act subject to such conditions and restrictions, if any, as GoM may think fit to impose and to the provisions of the Indian Telegraph Act, 1885, any of the power which the Telegraph authority possesses.		Project Company		
Labo	Labour Related regulations					
24.	The Child Labour (Prohibition and Regulation) Amendment Act, 2016 The Child Labour (Prohibition and Regulation) Act, 1986	No child below 14 years of age will be employed or permitted to work in any of the occupations outlined in the Act's Part A of the Schedule or any workshop wherein any of the processes outlined in Part B of the Schedule. A child can help his family or family enterprise, which is other than any hazardous occupations or processes outlined in the Schedule, after	No children between the age of 14 to 18 years will be engaged in hazardous working conditions.	Project Company and Contractor		

SI. No.	Acts/Rule/Policy	Description	Applicability & Action Required	Responsibility
		his school hours or during vacations		
25.	Contract Labour (Regulation and Abolition) Act, 1970	The Act provides for certain welfare measures to be provided by the Contractor to contract labour and in case the Contractor fails to provide, the same is required to be provided by the Principal Employer by Law. The principal employer is required to take a Certificate of Registration and the Contractor is required to take a License from the designated Officer. The Act applies to the establishments or Contractor of the principal employer if they employ 20 or more contract labour.	Applicable to all construction works under Railway Electrification	Project Company and Contractor
26.	The Building and Other Construction Workers (Regulation of Employment and Conditions of Service) Act, 1996 and the Cess Act of 1996.	All the establishments that carry on any building or other construction work and employ 10 or more workers are covered under this Act. All such establishments are required to pay Cess at a rate not exceeding 2% of the cost of construction as may be notified by the Government. The employer of the establishment is required to provide safety measures at the building or construction work and other welfare measures, such as canteens, first-aid facilities, ambulance, housing accommodation for workers near the workplace, etc. The employer to whom the Act applies has to obtain a registration certificate from the Registering Officer appointed by the Government - Cess should be paid at a notified rate.	Applicable to any building or other construction work employing 10 or more workers. provide safety measures at the construction work and other welfare measures, such as canteens, first-aid facilities, ambulance, housing accommodation for workers near the workplace, etc.,	Project Company and Contractor
27.	The Inter-State Migrant Workmen (Regulation of Employment and Conditions of Service) Act, 1979	The Act applies to an establishment that employs 5 or more inter-state migrant workmen through an intermediary (who has recruited workmen in one state for employment in the establishment situated in another state). The inter-state migrant workmen, in an establishment to which this Act becomes applicable, are required to be provided certain facilities such as housing, medical aid, traveling expenses from home up to the establishment and back, etc.,	All the workers who would be engaged during the construction phase of the project would be sourced locally. No migrant labour would be involved in the project. Hence this rule would not be applicable for this project.	Not applicable.
28.	Minimum Wages Act, 1948.	The employer is supposed to pay not less than the Minimum Wages fixed by the appropriate Government as per provisions of the Act if the employee is scheduled. Construction of Buildings, Roads, railways, and	All construction workers should be paid not less than the prescribed minimum wage.	Project Company and Contractor

SI. No.	Acts/Rule/Policy	Description	Applicability & Action Required	Responsibility
		Runways are scheduled employment.		
29.	Workmen Compensation Act, 1923.	The Act provides for compensation in case of injury by accident arising out of and during employment.	Compensation for workers in case of injury by accident.	Project Company and Contractor
30.	Equal Remuneration Act, 1979.	The Act provides for payment of equal wages for work of equal nature to Male and Female workers and not for making discrimination against Female employees in matters of transfers, training, and promotions, etc.	Equal wages for work of equal nature to male and female workers.	Project Company and Contractor
31.	The Public Liability Insurance Act, 1991 and	These provide for public liability insurance for providing immediate relief to the persons affected by accident occurring while handling hazardous substances and for matters connected therewith or incidental thereto. Hazardous substance means any substance or preparation which is defined as a hazardous substance under the Environment (Protection) Act 1986, and exceeding such quantity as may be specified by notification by the Central Government	The Contractor needs to obtain insurance under this act to compensate any liability arising out of environmental degradation caused wilfully or unwilfully by him.	Project Company and Contractor

3.2 Clearance and Permission Required

Clearances/permissions to be obtained prior to the start of construction are presented in. This list indicative and the ATL/ Contractor should ascertain the requirements of any additional permission required and obtain the same prior to start of the construction.

Table 3-2: Permission and Clearance required in the Project

SI. No	Construction Activity	Regulatory Agency	Implementation	Supervision	Remarks
1.	Permission for Activities in ESZ	Wildlife Division, Forest Department, Government of Maharashtra	PIU	PMU	Permission of ESZ to be obtained before the start of construction
2	Permission from Forest Department regarding Diversion of Forest land for Non-forestry purpose. The project proponent has obtained forest clearance from competent authority vide letter no F. No.6- MHA-02/2015- BHO/4571 dated 8.11.2018.	Forest Department, Govt. Of Maharashtra	PIU	PIU	KV Line - Available, LILO Line - In process & Stage - I Expected by Sep'21
3	ROW permission for construction, operation, and maintenance for transmission lines within Thane Creek Flamingo Sanctuary. KVTPL	Revenue and Forests Department, Government of Maharashtra	PIU	PMU	CRZ Clearance has already been obtained by TATA power company Ltd through notification no WLP/0315/CR- 76/F1 dated 10.05.2018 RR for the section in the CRZ under the

SI. No	Construction Activity	Regulatory Agency	Implementation	Supervision	Remarks
					Vikroli- Tower No 63 corridor. This needs to be Transferred to KVTPL.) LILO Line - In process & Expected by Aug'21
4	Construction of transmission line in CRZ. The project proponent has obtained CRZ clearance through letter No F. NO.11- 17/2014-IA-III. Dated 30.09.2015.	Ministry of Environment, Forests and Climate Change (MOEF&CC) and Maharashtra Coastal Zone Management Authority (MCZMA).	PIU	PMU	CRZ Clearance has already been obtained by TATA power company Ltd through notification no WLP/0315/CR- 76/F1 dated 10.05.2018 RR for the section in the CRZ under the Vikroli- Tower No 63 corridor. This needs to be Transferred to KVTPL.) LILO Line - In process & Expected by Aug'21
5	HC Permission for Working in Mangroves	High Court of Maharashtra	PIU	PMU	KV Line - Available, LILO Line - Will be Applied after CRZ and Forest Clearance
6	Tree Cutting/pruning – of Trees (if required ³)	State Forest Department	PIU	PIU and PMU	The requirement will be established once the final designs are prepared during the construction
7	Establishment of batching plant	Consent to establish and consent to operate under Air Act, 1981 from MPCB	Contractor	PIU	Permission of ESZ to be obtained before the start of construction
8	Procurement of construction material (sand, aggregate)	Permission from District Collector/ State Department of Mining, under Maharashtra Minor Minerals and Concession Rules	Contractor	PIU	Permission of ESZ to be obtained before the start of construction
9	Temporary traffic diversion measures	District traffic police	Contractor	PIU	Permission to be obtained before the start of construction
10	NOC from MMB	Maharashtra Maritime Board	PIU	PMU	Permission of ESZ to be obtained before the start of construction
11	Aviation Clearance	Aviation Department	PIU	PMU	KV Line - Available, LILO Line - In process & Expected by May'21

³As described above in SI. No. 6, there may be requirement for felling of certain trees , However, the requirement will be established ones the final designs are prepared during the construction.

SI. No	Construction Activity	Regulatory Agency	Implementation	Supervision	Remarks
12	Salt Pan Clearance	The Salt Commissioners Organization, Ministry of Commerce & Industry	PIU	PMU	KV Line – Not Applicable,
					LILO Line - In process & Expected by Apr'21
13	Power Line Crossing	Central Electricity Authority	PIU	PMU	KV Line - in process-May'21, LILO Line - In process & Expected by May'21
14	Railway Crossing	The Ministry of Railways	PIU	PMU	V Line - in process- May'21, LILO Line - In process & Expected by May'21
15	NH Crossing	National Highway Authority of India	PIU	PMU	KV Line - in process-May'21, LILO Line - In process & Expected by May'21
16	NOC - PTCC	Power and Telecommunication Coordination Committee	PIU	PMU	KV Line - in process-Oct'21, LILO Line - In process & Expected by Oct'21

3.3 Codes and Guidance

The transmission line for the codes which would be relevant from an environmental and social perspective include:

- IS 5613. Code of Practice for Design, Installation, and Maintenance of Overhead Power Lines
- IS-875. Code of Practice for Design of Loads (other than Earthquake) for Buildings and Structure

3.4 Equator Principles

The EPs, based on the IFC Performance Standards on social and environmental sustainability and the World Bank Group Environmental, Health, and Safety Guidelines (EHS Guidelines), are intended to serve as a common baseline and framework for the implementation by Lending Agency/IFC. The applicability of EP to the project has been outlined in **Table 3.3**.

Table 3-3: Application of Equator Principles

Equator Principles	Requirements	Project Information/ Application	
Principle 1: Review and Categorization	As the project is seeking financing from Lending Agency/IFC, the project has to be categorized based on the magnitude of its potential impacts and risks in accordance with the environmental and social screening criteria of IFC.	It is expected that most of the impacts are routine for construction activities. It is expected most of the impacts are co- terminus with construction. However, as indicated earlier the project passes through a part of the Thane Creek Flamingo Sanctuary. However, the project company agreed to apply additional mitigation measures thus the proposed transmission project is identified as a Category "B" project. The rationale is presented in Section 3.6 of this report	
Principle 2: Social and Environmental Assessment	For each project assessed as being either Category A or Category B, the Lending Agency/IFC will require the borrower need to conduct an Environmental and Social Assessment process to address, to the Lending Agency/IFC's satisfaction, the relevant environmental and social risks and impacts of the proposed Project. The assessment	The social and environmental assessment has been carried out including a risk assessment.	

should also propose measures to minimize, mitigate, and offset

Equator Principles	Requirements	Project Information/ Application
	adverse impacts in a manner relevant and appropriate to the nature and scale of the proposed Project.	
Principle 3: Applicable Social and Environmental Standards	The principle requires the Environment and Social Assessment to refer to the applicable IFC performance standards and then applicable industry-specific EHS guidelines including the project's overall compliance with or justified deviation from, the respective Performance Standards and EHS Guidelines. The assessment process also needs to address compliance with relevant host country laws, regulations, and permits that pertain to social and environmental matters.	The industry-specific EHS guidelines also mention and relevant host country laws, regulations, and permits are mentioned in this chapter.
Principle 4: Action Plan and Management System	For all Category A and B projects, an Action Plan (AP) needs to be prepared which addresses relevant findings and draws on the conclusions of the Assessment. The AP will describe and prioritize actions needed to implement mitigation measures, corrective actions and monitoring measures necessary to manage the impacts and risks identified in the Assessment. In this regard, the borrower /proponent needs to maintain or establish a Social and Environmental Management System that addresses the management of these impacts, risks and corrective actions required to comply with applicable host country social and environmental laws and regulations, and requirements of the applicable Performance Standards and EHS Guidelines, as defined in the AP.	In accordance with the provision of this Principle, an Environmental and Social Management Plan has been drawn up as part of the ESIA study for the proposed project specifying appropriate plans and procedures which requires to be implemented during various phases in order to prevent, control and mitigate any potential environmental and social risks. For further details please refer to Chapter 6 of this document.
Principle 5: Consultation and Disclosure	According to this Principle, for all Category A and (as appropriate), Category B projects, the Government, borrower, or third-party expert to consult with project-affected communities in a structured and culturally appropriate manner. For projects with significant adverse impacts on affected communities, the process will ensure their free, prior and informed consultation and facilitate their informed participation as a means to judge, vide IFC norms, whether a project has adequately addressed the concerns of the affected communities.	In congruence with the requirement of this Principle, the proponent, has undertaken social consultation with the affected persons and nearby village's representatives to establish the socio- economic condition of the area, at the same time trying to understand any community concern that might be associated with the proposed project, particularly related to loss of land, livelihood, resource requirement, etc during the ESIA Preparation. For further details please refer to Section Chapter 8 of this document.
Principle 6: Grievance Mechanism	For all Category A and (as appropriate), Category B projects, it needs to be ensured by the proponent that consultation, disclosure and community engagement continues throughout construction and operation of the project and community concerns/grievances addressed through establishing a 'Grievance Redressal Mechanism'. In this regard, the proponent of the proposed solar PV project needs to develop and implement a 'Grievance Redressal Mechanism (GRM)' to receive and facilitate resolution of any concern and grievance that may be raised by land loser groups and/or nearby village communities during both construction and operational phase of the project. As part of this Principle, it is also imperative that the proponent maintains regular dialogue with communities through the implementation of focused CSR programmes/ initiatives.	The EHS team of KVTPL will take care of grievances raised verbally or in a written manner. The details are given in chapter- 8
Principle 7: Independent Review	For all Category A projects and, as appropriate for Category B projects, an independent social or environmental expert not directly associated with the proponent will review the assessment, action plan and consultation process documentation in order to assist Lending Agency/IFC 's due diligence and assess Equator Principle Compliance.	As part of the loan approval for the project, KVTPL will appoint an independent social or environmental expert/organization for review of the ESIA/ESMP report and its implementation.
Principle 8: Covenants	For Category A and B projects, the proponent will covenants in financing documentation: a) to comply with all relevant host country social and environmental laws, regulations and permits in all material respects; b) to comply with the action plans (where applicable) during the construction and operation of the project in all material respects; c) to provide periodic reports in a format agreed with Lending Agency/IFC (with the frequency of these reports proportionate to the severity of impacts, or as required by law, but not less than annually), prepared by in-house staff or third-party experts, that) document compliance with the action plans (where applicable), and ii) provide a representation of compliance with relevant local, State and host country social and environmental laws, regulations and permits (where applicable) d) to decommission the facilities, where applicable and appropriate, in accordance with an agreed decommissioning plan.	E&S Covenants shall be embedded within the contracts drawn between KVTPL and the contractors hired for construction activities and technology providers and waste handlers. Periodic reporting to the project developers will have to be carried out by the contractors.

Equator Principles	Requirements	Project Information/ Application
Principle 9: Independent Monitoring and Reporting	To ensure ongoing monitoring and reporting over the life of the loan, Lending Agency/IFC will, for all Category A projects and, as appropriate for Category B projects, require the appointment of an independent environmental and/or social expert, or require that the proponent retain qualified and experienced external experts to verify its monitoring information which would be shared with Lending	As the project categorization is still to be updated at a later stage, hence the reporting mechanism will be decided as deem fit between lending Agency/IFC and KVTPL/ATL.

Equator Principle IV

Agency/IFC

The Equator Principle IV has emphasized addressing potential and adverse impacts on Human Rights and requires the Project to comply with relevant host country laws, regulations and permits that pertain to environmental and social issues. For addressing compliance (in addition to national social applicable laws) the project has in place an existing mechanism for policies adaptation for workers and affected communities. Table 3-4 provides an overview of the policies adaptation by the project.

Table 3-4: Labour and Human Rights Policies Requirements

Requirements	Aspects of Human Rights Issue	Adani Compliance to Requirements
EP IV requires conducting risks and impacts on workers which include employees and contractors. As per UNGP the project should consider avoiding causing or contributing to adverse human rights impacts through their activities, and address such impacts when they occur; (b) Seek to prevent	Child Labor: As per ILO standards prohibit the engagement of children under 18 years in hazardous work. Moreover, it also prohibits the engagement of Children for those under 15, with limited exceptions for developing countries.	The Business Responsibility Policies has strictly prohibited the engagement of Child Labour in the operation. Principle 3 of the Business Responsibility Policy (BRP) prohibits the use of child labour, forced labour, or any form of involuntary labor, paid or unpaid in the business activities for Adani Transmission. The company existing human rights principle is committed to upholding of fundamental human rights and compliance with applicable laws including internationally recognized human rights, as set out in the International Bill of Human Rights and the International Labour Organization's Declaration on Fundamental Principles and Rights at Work. This policy applies to all direct employees, consultants (including fixed-term appointees), associates, trainees, suppliers, vendors, etc. For ensuring contractors/vendors compliance to Human rights violations, General conditions of Contract is in place whereby contractors shall bound to comply with the labour and human rights requirements. The GCC forms parts of the contractor identification, screening and onboarding process.
adverse human rights impacts that are directly linked to their operations, products or services by their business.	Collective Bargaining and Freedom of Association Non-Discrimination and Forced Labour	As per Principle 2 and 3 of Adani's Business Responsibility Policies (BRP)is committed and respects the employees' right to freedom of association, participation and collective bargaining. Employees at all levels shall have freedom of association and be free to participate in collective bargaining. The company's Business Responsibility Policies is also committed to provision non-discrimination and equal opportunity to all employees irrespective of their caste, creed, gender, race, religion, and language. The discrimination policy is applicable for Employees, agency staff, vendors, customers and suppliers (<i>Principle 4 of Business Responsibility Policies</i>).
	Working Conditions and Occupational Health and Safety	Section 25.1 of the GCC mandates Contractor and Sub- Contractors to abide by all applicable laws including environmental laws and laws pertaining to health and safety. The Contractor shall take all necessary care that the Services are performed with the minimum possible impact on the

Requirements	Aspects of Human Rights Issue	Adani Compliance to Requirements
		environment and local community in respect of land and occupants affected by or adjacent to the Site.
		Section 25.2 of the BRP The Contractor shall comply with the specific rules and regulations (including safety regulations) and the same shall abide for Sub-Contractors, laborer's and personnel to comply with the said rules and regulations. Such rules and regulations shall include rules in respect of security, the safety of the Services and people at the Site, gate control, sanitation, medical care and fire prevention.
		The Contractor shall also strictly comply with standard safety norms, rules and regulations prevalent in the industry while performing its obligations.
		At the company level, committed to providing a workplace environment that is safe, hygienic and which upholds the dignity of the employee. Moreover, schemes and policies to address health, superannuation issues and welfare needs of employees and their families will be put in place to promote the well-being of employees.
	Wages	The Contractor shall be liable and responsible for all payments to its personnel, including salaries, wages, taxes, allowances and other benefits in accordance with the existing laws.
	Women Rights	The company besides the discrimination policy has put in place stringent policies (Prevention of Sexual Harassment at the Workplace- POSH) to ensure that the employees especially female employees do not suffer harassment and create an environment where they feel safe and secure in discharging their responsibilities. This policy is applicable for employees, contractor workers, etc.
	Social Security	Section 20 subsection 20.1 of the General condition of Contract (GCC) mandates that Contractor shall, at its own cost, arrange, secure and maintain, all insurance policies workmen's compensation, employees' state insurance, public liability insurance and insurance for all its employees.
		Besides insurance, adequate training will be provided to employees to meet the challenges of a dynamic business environment and will also provide adequate grievance handling mechanisms.
EP IV requires conducting actual or potential adverse impacts to the communities.	Potential Human rights/risks issues such as the right to health, right to participate in the cultural life of the community, right to natural resources.	The project has in place policies for ensuring a balance between economic social and environmental performance. As per the BRP, the company is committed to respecting the rights of people in communities impacted by the business operations. Any potential adverse impact on human rights will be identified and take appropriate steps to avoid, minimize and/or mitigate them. The company will also undertake several initiatives to engage with and ensure sustainable development of the marginalized groups in the local communities around its sites of operations.
		Principle 6 of BRP of the Company is committed to addressing global environmental issues such as climate change and global warming through energy conservation, efficient natural resource utilization, and the adoption of cleaner energy.
		The company has put in place a CSR plan for the affected communities for ensuring inclusive growth and equitable development by establishing competitive and sustainable value chains capable of generating sustainable livelihoods, especially among the poor in rural India. Inclusive development includes education, health care, natural resources management and rural infrastructure

Environmental and social Impact Assessment Report for
Kharghar Vikhroli Transmission Private Limited (KVTPL), Maharashtr

Requirements	Aspects of Human Rights Issue	Adani Compliance to Requirements
Consultation must be undertaken with indigenous peoples potentially impacted by projects affecting lands or resources subject to traditional or customary use, requiring relocation or resettlement, or impacting cultural heritage. This includes evaluating whether the free, prior and informed consent (FPIC) of indigenous peoples has been obtained for projects with specific impacts on indigenous peoples.	Indigenous Peoples are afforded unique group rights under international law that permits them to give or withhold their consent to projects that may impact them under certain scenarios	The project does not fall under the schedule and the transmission line does not involve any SC/ST land and no displacement of people (including indigenous people). The land has been leased from willing owners; hence this requirement is not applicable. In the case of the substation, no tribal land has been involved. Hence, this is not applicable to the proposed land for the substation.
EP IV requires, establishing effective grievance mechanisms which are designed for use by Affected Communities and Workers, as appropriate, to receive and facilitate the resolution of concerns and grievances about the Project's environmental and social performance.	All people have the right to remedy when their rights have been violated and identify that they have caused or contributed to adverse Human Rights impacts.	The company has in place the website which acts as a special window called 'Help-desk' which may be accessed by stakeholders of the Company for redressal of their grievances. For KVTPL project-specific Grievance Redress Mechanism has been developed for the projects for stakeholders -workers and communities. The company has also agreed to initiate steps to advertise the presence of these to the local population.

3.5 IFC Performance Standards

IFC Performance Standards (revised applicable from January 2012) define clients' roles and responsibilities for managing their projects and the requirements for receiving and retaining financing from EPFI's. The applicability of IFC Performance Standards to the project is outlined in.

Table 3-4: Application of IFC Performance Standards to the Project

IFC Performance Standards	Requirements	Project Information/ Application
Performance Standard 1: Social & Environmental Assessment and Management System	The project should have a social and environmental management system that incorporates the following: (i) policy; (ii) identification of risks and impacts; (iii) management programs; (iv) organizational capacity and competency; (v) emergency preparedness and response; (vi) stakeholder engagement; and (vii) monitoring and review.	This Performance Standard is applicable to the Project. Even though ATL has an ESMS the same has not been rolled out to KVTPL
Performance Standard 2: Labor and Working conditions	KVTPL/ATL requires to follow requirements on (i) working conditions and management of worker relationship (human resource Conditions policy, working conditions, terms of employment, workers organizations, non-discrimination equal opportunity, retrenchment, grievance mechanism); (ii) protecting workforce (not engaging child labour and forced labour); (iii) occupational health and safety; (iv) workers engaged by third parties; and (v) adverse impacts related to supply chain.	This Performance Standard is applicable to the Project and addressed in Table 3-1as well as the Environment Management Plan in Chapter 6.
Performance Standard 3: Pollution Prevention and Abatement	KVTPL/ATL requires to consider (i) sustainable resource utilization (water consumption); (ii) pollution prevention (wastes, hazardous materials management, pesticide use and management)	This Performance Standard is applicable to the Project and the relevant activities are presented in Environment Management Plan Chapter 6
Performance Standard 4: Community Health, Safety and Security	KVTPL/ATL requires to follow requirements on i) infrastructure and equipment design and safety; (ii) hazardous materials management and safety; (iii) ecosystem services; (iv) community exposure to disease; (v) emergency preparedness and response; and (vi) security personnel.	This Performance Standard is applicable to the Project and is addressed in the management plan. Details are given in Chapter 6.
Performance Standard 5: Land Acquisition and Involuntary Resettlement	Specifies requirements on (i) project design to avoid or minimize physical and/or economic displacement; (ii) compensation and benefits for displaced persons; (iii) community engagement; (iv) grievance mechanism; (v) resettlement and livelihood restoration planning and implementation; (vi) physical and economic displacement; (vii) private sector responsibilities under government-managed resettlement	The project involves the right of way of land for the transmission line, but for the substation, land has been procured from Tata Power Company Limited. However, as indicated earlier no documentation was made available for further analysis. Thus, this policy would be triggered.
Performance Standard 6: Biodiversity Conservation and Sustainable Natural Resource Management	Specifies requirements on (i) protection and conservation of biodiversity (modified, natural, critical habitat, legally protected and internationally recognized areas, invasive alien species); (ii) management of ecosystem services; (iii) sustainable management of natural resources; and (iv) supply chain	This performance standard is applicable to the proposed project. A part of the Study Area is passing through the boundary and Eco- sensitive Zone of Thane Creek Flamingo Sanctuary, a legally protected area and a key biodiversity area. Approximately 2.2 km stretch of the project alignment passes through the southern, western and northern part of the core boundary of the sanctuary, while 16.5 km of the project alignment passes through its proposed Eco-sensitive Zone, towards the west of the sanctuary. The natural terrestrial habitats of the Study Area mainly comprise tracts of natural forests, grasslands and mangroves. Thus, there are chances of impact on biodiversity. This overlap of the Study Area with the legally protected and internationally recognized area triggers the Critical Habitat criterion. This is further discussed in Chapter 5.
Performance Standard 7: Indigenous Peoples	Specifies requirements on (i) avoidance of adverse impacts; (ii) participation and consent; (iii) circumstances requiring free, prior, and informed consent; (iv) mitigation and development benefits; and (v) private sector responsibilities where the	The transmission line does not involve any SC/ST land and no displacement of people (including indigenous people).

IFC Performance Standards	Requirements	Project Information/ Application
	government is responsible for managing indigenous people's issues	
Performance Standard 8: Cultural Heritage	Specifies requirements on (i) protection of cultural heritage in project design and execution (chance find procedures, consultation, community access, removal of replicable cultural heritage, removal of non- replicable cultural heritage, critical cultural heritage); and (ii) project's use of cultural heritage	As such the project does not impact any cultural property or structure of archaeological importance.

3.6 **Project Classification**

Initial reconnaissance of the KVTPL alignment indicates that the transmission lines pass through the natural habitat or sensitive environmental areas. The natural terrestrial habitats of the Study Area mainly comprise tracts of protected natural forests, grasslands, and mangroves. Given the sensitivities associated with the transmission line through the protected area and consider the agreement of the project company to undertake additional mitigation measures the project. However, the Critical habitat assessment is under process and based on the assessment the category of the project will be specified.

4. Description of Environment

This section establishes the baseline environmental and socio-economic status of the study area to provide a context within which the impacts of the Project are to be assessed.

Establishing a baseline helps in understanding the prevailing environmental and socio-economic status of the study area. It provides the background environmental and social conditions for the prediction of the future environmental characteristics of the area based on the operation of the new/ expansion activity of the project during its life cycle. It also helps in environmental and social management planning and strategy to minimize any potential impact due to the Project activities on the surrounding environment.

4.1 Study Area

The transmission line is in the northeast suburb of Mumbai in the state of Maharashtra. Geographically, the Study Area comprises a part of Thane Creek, an inlet in the western shoreline of the State of Maharashtra. The proposed project comprises of construction of 12 km transmission line between MSETCL's existing 400 kV Receiving station at Kharghar and Tata Power's 400 kV Receiving station at Vikhroli for meeting additional load requirements of power to the Mumbai metropolitan area. This line emanates from MSETCL's Kharghar Receiving Station, passes through a hilly area, and reaches Devisaddle. From Devisaddle, the transmission line runs on the existing Right of Way of two 110kV Transmission lines of Tata Power and reaches Vashi via Palm beach road.





4.2 Physical Environment

4.2.1 Topography

The topography of the Study Area is generally flat, with an overall gentle slope draining into the creek. The land is drained mainly by small tributaries into a large creek. The eastern part of the Study Area lies near the Kharghar Hill Range, which is a contiguous range of hills nestled between the city. Most of these hills are covered with natural vegetation, while a few patches along hill slopes are degraded. The natural terrestrial habitats of the Study Area mainly comprise tracts of natural forests, grasslands and mangroves. The natural aquatic habitats of the Study Area mainly comprise the creek, seasonal or perennial streams and lakes. The modified habitats in the Study Area comprise habitations, gardens, saltpans, substations, bunds, culverts and roads. The land-use in the Study Area is dominated by habitation, mangrove forests and wetlands.

A part of the Study Area overlaps with Thane Creek Flamingo Sanctuary, a legally protected area and a key biodiversity area. Approximately 2.2 km stretch of the project alignment passes through the southern, western and northern part of the core boundary of the sanctuary, while 16.5 km of the project alignment passes through its proposed Eco-sensitive Zone, towards the west of the sanctuary.



4.2.2 Regional Profile

4.2.2.1 Climate

The climate of Mumbai city area is a tropical wet and dry climate type with moderate temperatures with high levels of humidity. Its coastal and tropical location ensures moderate temperature throughout the year, an average of 27.2 °C and annual average precipitation of 242.2 cm (95.35 inches). According to the CGWB report of Greater Mumbai, the average ambient temperature of this area is on average about 32.2°C in summer and 16.3°C in winter.

4.2.2.2 Rainfall

Rainfall Mumbai experiences heavy rainfall during the monsoon time as it is in the windward side of Western Ghats. Between June and September, the southwest monsoon rains splurge the city July and August are the wettest months all over the region. There is hardly a day without rain, in these two months. Towards the latter part of the season, there are breaks in between, when the oppressively hot weather is associated with high humidity along the coast. The average rainfall in the region is nearly 2000 mm.

4.2.2.3 Humidity

The Relative Humidity (RH) ranges between 61% to 87% in the monsoon period. Between November to January i.e. in the winter months, the relative humidity varies from 57% to 72%. The Relative Humidity generally is higher than 60% throughout the year. The humidity during December varied from minimum 55% to maximum 80% while in January it was a minimum 57% to a maximum 82% and in February the variation in humidity was observed from a minimum 55% to a maximum 81%.

4.2.3 Ambient Air Quality

Nearest Continuous Ambient Air Quality Monitoring Stations of the project area is in Airoli of Navi Mumbai Municipal Corporation. The air pollutant details recorded in the year 2018-2019 at the Airoli station is tabulated below:

Pollutant	Average (μg/m³)
RSPM	22.06
PM ₁₀	90.67
NO ₂	22.64
SO ₂	33.30

Source: Environmental Status Report of Navi Mumbai Municipal Corporation-2018-19

In the Environmental Status Report of Navi Mumbai Municipal Corporation-2018, -19 reported the Air Quality Index (AQI) of the area following the calculation suggested by CPCB in consultation with IIT (Indian Institute of Technology) Kanpur. It is reported that as per the air quality monitoring data of 2018-19 the Navi Mumbai is clean for NOx, SO₂ and Ozone pollutants as most of the observations are either in the Good or Satisfactory category. In terms of Carbon Monoxide (CO), 23% of total observations were recorded under Moderate category.

4.2.4 Ambient Noise Quality

Environmental Status Report of Navi Mumbai Municipal Corporation-2018-19 reported that all locations under commercial zones were recorded within the permissible limit (65 dB) as per The Noise Pollution (Regulation and Control) Rules, 2000. Whereas, all locations within the residential zones violated the day (55dB) time standards. The traffic zones recorded noise levels in the range of 61-67 dB.

4.2.5 Physiography

According to CGWB report, the broad physiographic feature of the greater Mumbai area is broad and flat terrain flanked by north-south trending hill ranges. The eastern and western part of the area having hilly ranges. The maximum elevation of the area is 450 m above mean sea level. Malbar, Colaba, Worli and Pali hills are the isolated small ridges trending north-south in the western part of the district. The Powai – Kanheri hills form the largest hilly terrain in the central part of the Salsette island and are the feeder zone for the three lakes viz., Powai, Vihar and Tulsi. There are several creeks, dissecting the area. Thane is the longest creek. Other major creeks are Manori, Malad and Mahim which protrudes in the mainland and give rise to mud flanges and swamps.

4.2.6 Soil

Two types of soils have been observed in the district viz., medium to deep black and reddish soil. Soil cover in the city region is predominantly sandy due to its proximity to the sea. In the suburbs, the soil cover is largely alluvial and loamy.

4.2.7 Geology and Hydrogeology

Geology & Hydro-Geology Geology of Mumbai is part of the geology of the Deccan traps that formed by the eruptions to rapidly cover a large part of the Indian Peninsula (at present extends over 500,000 sq. kms.) the volcanic eruptions around the Mumbai area occurred in shallow lagoon conditions and thus most of the lava flows. Due to sub-aqueous eruptions of the lava, the basalt was converted to spilite, as a result of the metasomatic changes. Some of the lava flows developed pillow structure and some became brecciated to form volcanic breccia. Such sub-aqueous volcanic breccia may be described as Hyaloclastic. There were intermediate and acid rocks formed as trachyte intrusive and rhyolie flows. Two types of soils have been observed in the district viz., medium to deep black and reddish colored soil.



Source: CGWB

4.2.8 Drainage

CGWB reported that the area is drained by Mahim, Mithi, Dahisar, and Polsar rivers. These small rivers near the coast, form small rivulets which intermingle with each other resulting in swamps and mudflats in the low-lying areas.

4.2.9 Groundwater

The pre-monsoon average depth to water levels recorded by National Hydrograph Network Stations (NHNS) of CGWB during May 2011 ranges between 2.67 m bgl and 4.25 m bgl. The depth to water levels during post-monsoon recorded in November 2011 in major part of the district ranges between 2 and 5 m bgl.

Due to the ingress of seawater, the groundwater quality of the deeper aquifer is brackish to slightly saline in some localities such as Colaba, Dharavi, and Khar.

4.2.10 Land Use- Land Cover

The land use and land cover has been monitored within a radius of 500 m from the alignment of both lines. Tower footings no 40,41,53-62A, LOC22-32, LOC15-16, LOC-9, LOC2-5 fall within the mangroves area.

Major built-up area has been observed within the 500 m of the transmission line. Tower footings number 44 A,45, 26N2, 27D2, 29,31,32,34 falls within the built-up area.

Tower footings no 47,48,49,50,51 falls within the Thane creek.

Tower footings number 1A, 2A, 3A, 4N, 5A, 6N, 7N, 8A, 9N,11, 12 N, 13 A,15 A,16 A,17 –20A, 21, 22, 23N1, 23N2, 24N, 25D1, 25D2, 26N1 falls within the hill area in the substation facility the land use pattern was observed vacant land.





4.2.11 Natural Disaster

4.2.11.1 Earthquake

The whole state of Maharashtra falls in the Zone III and Zone IV category in terms of earthquake vulnerability. Zone III represents the moderate earthquake-prone area, and Zone IV represents a highly vulnerable area.



Source:www.mapsofindia.com, June 2014

4.2.11.2 Floods

Mumbai and Thane both districts are prone to flood every year due to heavy rainfall, in the monsoon. Sometimes heavy low pressure also affects the region and caused heavy rainfall followed by flood situations in both the district.

4.2.11.3 Cyclone

According to the BMTPC cyclone zonation map of India Thane and Mumbai district falls within the moderate damage risk zone

4.2.12Climate Vulnerability

The State Action Plan for Climate Change adopted by the Government of Maharashtra shows the following Climate Change Projections

- The historical data (past 30 years) analysis indicates an increase of mean maximum temperature over Maharashtra by 1.15°C. The global as well as regional modelling results show a rise in the range of 1.5 to 2.5°C for 2030.
- Historical data for the 40 years (1969-2008) over Maharashtra shows an increase in rainfall overall stations but the spatial distribution will remain the same.
- Cyclones over Indian coastlines are projected to increase in intensity in the future.
- Sea level rise is the major concern of the state.

4.3 Ecological Environment

This section of the report summarizes the biodiversity baseline study carried out towards the ESIA for 400 kV Kharghar-Vikhroli D/C & M/C line with bays at Kharghar & Vikhroli as well as the LILO on 400 kV Talegaon Kalwa line along with 1500 MVA 400kV GIS Substation at Vikhroli, Mumbai. It delineates the study area covered by the assessment, describes the methodology used for the assessment and establishes an existing biodiversity baseline covering the species, habitats, and ecosystem services of the study area, any invasive alien species present in the study area and the designated areas in closest proximity to the study area. This biodiversity baseline forms the basis for predicting the potential impacts of the project on the biodiversity of the study area and suggesting mitigation measures to manage the predicted impacts.

4.3.1 Delineation of the Study Area

This sub-section delineates the study area covered by the biodiversity assessment. It also briefly describes the geographical and ecological status of the delineated study area.

The overall area covered by the assessment includes the following constituent areas:

- a) The footprint of the project hereafter referred to as the 'Project Alignment';
- b) The area extending 100 m outward from the Project Alignment (estimated to contain the potential receptors of any project-related ecological impacts), hereafter referred to as the 'Area of Influence' or 'AOI'; and
- c) The footprint of the associated facilities such as existing substations, approach roads, etc.

The 'Project Alignment', the 'AOI' and the associated facilities are hereafter collectively referred to as the 'Study Area'.

4.3.2 Overview of the Study Area

Geographically, the Study Area comprises a part of Thane Creek, an inlet in the western shoreline of the State of Maharashtra.

The topography of the Study Area is generally flat, with an overall gentle slope draining into the creek. The land is drained mainly by small tributaries into a large creek. The eastern part of the Study Area lies near the Kharghar Hill

Range, which is a contiguous range of hills nestled between the city. Most of these hills are covered with natural vegetation, while a few patches along hill slopes are degraded. The natural terrestrial habitats of the Study Area mainly comprise tracts of natural forests, grasslands and mangroves. The natural aquatic habitats of the Study Area mainly comprise the creek, seasonal or perennial streams and lakes. The modified habitats in the Study Area comprise habitations, gardens, saltpans, substations, bunds, culverts and roads. The land-use in the Study Area is dominated by habitation, mangrove forests and wetlands.

A part of the Study Area overlaps with Thane Creek Flamingo Sanctuary, a legally protected area and a key biodiversity area. Approximately 2.2 km stretch of the project alignment passes through the southern, western and northern part of the core boundary of the sanctuary, while 16.5 km of the project alignment passes through its proposed Eco-sensitive Zone, towards the west of the sanctuary. This overlap of the Study Area with the legally protected and internationally recognized area triggers the Critical Habitat criterion and a detailed critical habitat assessment is required to be done.

4.3.3 Methodology

The ecological baseline of the study area has been generated based on primary data recorded through field studies conducted on 26th and 27th November 2020, supplemented with secondary data collated from suitably authenticated public domain sources, as also, informal consultations with local community. The information sources quoted in this report are listed after the corresponding sections throughout the report.

The primary and secondary data collection for species was limited to the higher flora, namely angiosperms, and the higher fauna, namely vertebrates.

Details of the methodology applied for obtaining the primary and secondary data are provided in the sections that follow.

4.3.4 Forest Areas Involved

It is reported that the project would involve 57.5092 ha of forest land. This includes 37.3704 ha Mangrove Forest,11.7116 ha. of Reserved forest 3.8456 ha. of protected forest and 4.5816 ha. of the private acquired forest. KVTPL has obtained clearance for the forest land. The clearance conditions indicate that 116 ha of land would be required for compensatory afforestation 10,000 nos of mangrove would be replanted. The total no of mangrove plants would be affected around 1184 nos.

4.3.5 Primary Data

The primary biodiversity data was collected through qualitative sampling at twenty-six (26) sites in the Study Area. The sampling sites were selected by identifying ecologically sensitive locations, governed by considerations of safety and accessibility. At each site, primary observations on species, habitats and ecosystem services were recorded.

The timings of the primary data collection covered the entire diurnal faunal activity period, from early morning till late evening, but excluded the nocturnal faunal activity period. Primary data on both, floristic and faunal species (except aquatic species), was recorded through the visual encounter method. The aquatic diversity data was not collected during the primary visits. Primary data records were based on direct sightings of species, as well as, indirect evidence, such as flowers, pods, calls, nests, burrows, droppings, scats, moults and tracks.

Table 4.1 that follows presents the details of the 26 sampling sites along with their location coordinates, elevation above the mean sea level (msl), reference to the nearest proposed tower or project feature and associated habitat type(s) and **Figure 4.7** presents a map showing the sampling locations along the transmission line alignment.

Sampling Site Code	Location Co-ordinates	Elevation (m)	Nearest Tower/ Project Feature	Habitat Type(s)
BD 1	19° 02' 32.70" N, 73° 03' 35.04" E	27	1A	Natural vegetation on hill slopes
BD 2	19° 02' 22.31" N, 73° 03' 27.53" E	24	3A	Natural vegetation on hill slopes
BD 3	19° 01' 51.10" N, 73° 03' 07.68" E	68	8A	Natural vegetation on hills
BD 4	19° 01' 46.19" N, 73° 03' 05.81" E	68	9N	Natural vegetation on hills
BD 5	19° 01' 34.83" N, 73° 03' 03.10" E	40	11	Natural vegetation on hills
BD 6	19° 01' 55.10" N, 73° 02' 41.48" E	15	17A	Vegetation along the stream
BD 7	19° 02' 09.40" N, 73° 02' 34.06" E	14	20A	Lake
BD 8	19° 01' 54.19" N, 73° 01' 54.13" E	81	26N1	Natural vegetation on hilltop
BD 9	19° 02' 00.61" N, 73° 01' 43.66" E	12	26N2	Degraded patch of natural vegetation
BD 10	19° 02' 23.96" N, 73° 01' 11.01" E	13	31	Garden
BD 11	19° 02' 40.69" N, 73° 00' 53.86" E	5	33A	Garden
BD 12	19° 02' 49.34" N, 73° 00' 43.18" E	4	35	Vegetation along roadside
BD 13	19° 03' 09.52" N, 73° 00' 18.37" E	4	38	Mangroves
BD 14	19° 03' 47.43" N, 72° 59' 41.35" E	6	42	Degraded patch of natural vegetation
BD 15	19° 03' 53.90" N, 72° 59' 28.50" E	4	43	Lake
BD 16	19° 04' 46.13" N, 72° 55' 44.55" E	5	64	Creek, Mangroves
BD 17	19° 05' 41.97" N, 72° 55' 33.71" E	5	Gantry	Open area
BD 18	19°09' 11.30" N, 72° 59' 18.32" E	3	1 (D/End)	Mangroves
BD 19	19° 09' 23.69" N, 72° 59' 14.69" E	4	AP-1/Loc-2	Mangroves, water channel
BD 20	19° 09' 40.86" N, 72° 58' 32.53" E	4	AP-3/Loc-5	Open area
BD 21	19° 08' 29.18" N, 72° 57' 42.97" E	4	Loc-13	Natural vegetation, water channel
BD 22	19° 08' 25.13" N, 72° 57' 32.84" E	4	Loc-14	Wetland, mangroves
BD 23	19° 07' 33.17" N, 72° 56' 30.82" E	5	Ap-11/ Loc-22	Wetland, mangroves
BD 24	19° 07' 22.74" N, 72° 56' 33.47" E	5	Loc-23	Mangroves, dumping ground
Bd 25	19° 07' 14.18" N, 72° 56' 36.00" E	4	AP-12/ Loc-24	Open scrub
BD 26	19° 06' 22.60" N, 72° 56' 26.17" E	4	AP-16/Loc-30	Natural vegetation

Table 4-1 -Details of Sampling Sites

Source: ESIA ecology team Primary Survey



4.3.6 Secondary Data

Study Area-specific secondary data was collected, as available, from project site personnel and members of the local community. Additional suitably authenticated secondary data was collated from sources in the public domain, including research journals, standard field guides, scientific reports by research institutions and forest department offices, and websites maintained by internationally recognized conservation organizations, such as International Union for Nature and Natural Resources (IUCN), Alliance for Zero Extinction, World Wide Fund for Nature (WWF-India), Birdlife International and Wetlands International, regarding sensitive ecological habitat (National Park, Wildlife Sanctuary, Protected Forest like Community Reserve, Conservation Reserve, Ecological Sensitive Area, Migratory Corridor, Critically Endangered, Endangered and range-restricted species, etc.), Forest types and forest cover, Wetlands, Important Bird Areas, etc

4.3.7 Species Profile of the Study Area

This sub-section describes the reported and recorded floristic and faunal species of the Study Area.

4.3.7.1 Floristic Species Profile

The floristic species profile of the Study Area may be understood on the collective basis of the species recorded during the fieldwork and the species considered to be typical to the forest types reported from the Study Area

Reported Forest Types

As per the Champion and Seth Revised Classification of the Forest Types of India, the natural vegetation of the Study Area mainly represents the following forest types:

Forest Type 3B/C2 [Southern Moist Mixed Deciduous Forest]

Floristic species typical to this forest type include –

- Tree species, such as Albizia spp., Alstonia scholaris, Anogeissus latifolia, Bauhinia spp., Bombax ceiba, Bombax insignis, Bridelia retusa, Cassia fistula, Dalbergia spp., Diospyros montana, Emblica officinalis, Erythrina spp., Ficus spp., Flacourtia indica, Gmelina arborea, Grewiati liaefolia, Haldina cordifolia, Ixora parviflora, Lagerstroemia parviflora, Lannea coromandelica, Madhuca indica, Mallotus philippinensis, Mangifera indica, Pterocarpus marsupium, Sterculia spp., Stereospermum tetragonum, Syzygium cumini, Tectona grandis, Terminalia spp., Wrightia spp., and Ziziphus mauritiana;
- Bamboo species, such as Bambusa bambos and Dendrocalamus strictus;
- Shrub species, such as *Callicarpa tomentosa, Carissa congesta, Catunaregam spinosa, Leea* spp. and *Woodfordia fruticosa*;
- Climber species, such as Vachellia spp., Calycopteris floribunda, Jasminum malabaricum, Moullava spicata, Ziziphus oenopolia and Ziziphus rugosa;
- Forb species, such as Barleria spp., Desmodium spp., Pogoste monparviflorus, Sida spp.; and
- Grass species, such as Apluda mutica, Heteropogon contortus, Ischaemum spp. and Themeda quadrivalvis.

Forest Type 4B/TS1 [Mangrove Scrub]

Floristic species typical to this forest type include -

- Tree species, such as Avicennia officinalis, Bruguiera gymnorrhiza, Excoecaria agallocha, Rhizophora apiculata, Rhizophora mucronata and Sonneratia apetala; and
- Shrub species, such as Acanthus ilicifolius and Clerodendrum inerme;
- Climber species, such as Caesalpinia crista and Derris trifoliata;
- Herb species, such as *Cyperus rotundus*.

Source: ESIA ecology team Primary Survey; H.G. Champion & S. K. Seth (2005). A Revised Survey of the Forest Types of India. Natraj Publishers, Dehradun.

Recorded Floristic Species

Two hundred and thirty-six (236) higher floristic species were recorded in the Study Area as part of the biodiversity sampling. These include one hundred and twenty-seven (127) woody species, which contribute to the perennial groundcover of the Study Area, as well as, one hundred and nine (109) non-woody species, which predominantly contribute to the seasonal groundcover of the Study Area.

Table 4.2 presents the details of these floristic species, including the scientific, common and local name of each species, its habit or morphological form, the botanical family to which it belongs, and status designated by the IUCN.

Table 4-2. Details of the Floristic Species

S. No.	Scientific Name	Common Name/ Local Name	Family	Habit	IUCN Status*
1	Abelmoschus manihot	Sweet Hibiscus/JungliBhendi	Malvaceae	Undershrub	-
2	Acacia auriculiformis	Earleaf Acacia	Fabaceae	Tree	LC
3	Acacia sp.	-	Fabaceae	Tree	-
4	Haldina cordifolia	Haldu/ Hedu	Rubiaceae	Tree	-
5	Albizia lebbeck	Siris tree/ Shirish	Fabaceae	Tree	-
6	Alstonia scholaris	Dita bark/ Satvin	Apocynaceae	Tree	LC
7	Annona squamosa	Custard apple/Sitaphal	Annonaceae	Tree	LC
8	Anogeissus latifolia	Axle Wood Tree/ Dhawada	Combretaceae	Tree	-
9	Artocarpus heterophyllus	Jackfruit/Phanas	Moraceae	Tree	-
10	Avicennia marina	Grey Mangrove/Tivar	Acanthaceae	Tree	LC
11	Avicennia officinalis	Indian Mangrove	Acanthaceae	Tree	LC
12	Azadirachta indica	Neem/ Kadunimb	Meliaceae	Tree	LC
13	Bauhinia purpurea	Purple Orchid Tree/ Rakta Kanchan	Fabaceae	Tree	LC
14	Bauhinia racemosa	Bidi Leaf Tree / Aapata		Tree	-
15	Bombax ceiba	Silk Cotton Tree/ Katesawar	Malvaceae	Tree	LC
16	Borassus flabellifer	African fan palm/ Taad	Arecaceae	Tree	-
17	Bougainvillea spectabilis	Great bougainvillea/ Boganvel	Nyctaginaceae	Tree	-
18	Bridelia retusa	Spinous Kino Tree/ Asana	Phyllanthaceae	Tree	LC
19	Butea monosperma	Flame of the Forest/ Palas	Fabaceae	Tree	-
20	Callicarpa tomentosa	Velvety Beauty Berry/ Aisar	Lamiaceae	Tree	LC
21	Calotropis gigantea	Crown Flower/ Rui	Apocynaceae	Shrub	-
22	Calotropis procera	Rubber Bush/ Mandar	Apocynaceae	Shrub	-
23	<i>Capparis</i> sp.	-	Capparaceae	Shrub	-
24	Carica papaya	Papaya/ Papai	Caricaceae	Tree	DD
25	Carissa congesta	Karonda/ Karwand	Apocynaceae	Shrub	-
26	Casuarina equisetifolia	Whistling Pine/Suru	Casuarinaceae	Tree	-
27	Chromolaena odorata	Siam Weed	Asteraceae	Shrub	-
28	Cocos nucifera	Coconut/ Naral	Arecaceae	Tree	-
29	Combretum latifolium	Large Leaved Climbing Bushwillow/ MothaPiluk	Combretaceae	Woody climber	-
30	Cordia myxa	Clammy Cherry/ Bargund	Boraginaceae	Tree	-
31	Cryptostegia grandiflora	Rubber vine/ Vilyati-Vakundi	Apocynaceae	Woody climber	-
32	Dalbergia sissoo	Indian rosewood/ Sisam	Fabaceae	Tree	-
33	<i>Dalbergia</i> sp.	-	Fabaceae	Tree	-
34	Delonix regia	Flame Tree/ Gulmohar	Fabaceae	Tree	-
35	Dendrocalamus sp.	•	Poaceae	Bamboo	-
36	Dendrophthoe falcata	Honey Suckle Mistletoe/ Bandgul	Loranthaceae	Shrub	-

S. No.	Scientific Name	Common Name/ Local Name	Family	Habit	IUCN Status*
37	Derris trifoliata	Common Derris/ Karanjvel	Fabaceae	Woody climber	-
38	Dolichandrone falcata	Medhshingi	Bignoniaceae	Tree	-
39	Duranta erecta	Sky flower	Verbenaceae	Shrub	LC
40	Ensete superbum	Rock Banana/ Rankel	Musaceae	Shrub	-
41	Erythrina suberosa	Corky Coral Tree/ Pangara	Fabaceae	Tree	-
42	Euphorbia neriifolia	Indian Spurge Tree/ Mingut	Euphorbiaceae	Shrub	-
43	Excoecaria agallocha	Milky mangrove/ Geva	Euphorbiaceae	Tree	LC
44	Ficus amplissima	-	Moraceae	Tree	-
45	Ficus benghalensis	Banyan tree/ Vad	Moraceae	Tree	-
46	Ficus hispida	Hairy Fig/ Dhed Umbar	Moraceae	Tree	LC
47	Ficus racemosa	Cluster fig/ Umbar	Moraceae	Tree	LC
48	Ficus religiosa	Peepal/ Pimpal	Moraceae	Tree	LC
49	Ficus rumphii	Golden Rumph's Fig/ Ashta, Payar	Moraceae	Tree	-
50	Flueggea virosa	Common Bushweed/ Kodarsi	Phyllanthaceae	Shrub	LC
51	Getonia floribunda	Paper Flower Climber/ Ukshi	Combretaceae	Shrub	-
52	Gliricidia sepium	Mexican lilac/ Undirmari	Fabaceae	Tree	LC
53	Gmelina arborea	Gamhar/ Shivan	Lamiaceae	Tree	LC
54	Grewia tiliifolia	Dhaman	Malvaceae	Shrub	-
55	Hibiscus rosa-sinensis	China Rose/ Jaswand	Malvaceae	Shrub	-
56	Holarrhena pubescens	Indrajao/ PandharaKuda	Apocynaceae	Shrub	LC
57	Holoptelea integrifolia	Indian Elm/ Waval	Ulmaceae	Tree	-
58	Ipomoea carnea	Bush Morning Glory/ Besharam	Convolvulaceae	Shrub	-
59	Ixora coccinea	Jungle geranium	Rubiaceae	Shrub	-
60	<i>Ixora</i> sp.	-	Rubiaceae	Tree	-
61	Jasminum sp.	-	Oleaceae	Woody climber	-
62	Kigelia africana	Sausage Tree	Bignoniaceae	Tree	LC
63	Lagerstroemia speciosa	Queen Crape Myrtle/ Taman	Lythraceae	Tree	-
64	Lannea coromandelica	Indian Ash Tree/ Moi	Anacardiaceae	Tree	-
65	Lantana camara	Lantana/ Ghaneri	Verbenaceae	Shrub	-
66	Lysiloma latisiliquum	Subabhul	Fabaceae	Tree	LC
67	Madhuca longifolia var. latifolia	Indian Butter Tree/ Moha	Sapotaceae	Tree	-
68	Mangifera indica	Mango/ Amba	Anacardiaceae	Tree	-
69	Manilkara zapota	Chikoo	Sapotaceae	Tree	-
70	Melia azedarach	Chinaberry tree/ BakanNimb	Meliaceae	Tree	-
71	Millingtonia hortensis	Indian Cork Tree/ Booch	Bignoniaceae	Tree	LC
72	Morinda citrifolia	Indian Mulberry/ Bartondi	Rutaceae	Tree	-
73	Morinda pubescens	Aseti	Rutaceae	Shrub	-
74	Moringa oleifera	Drumstick/ Shevga	Moringaceae	Tree	-

S. No.	Scientific Name	Common Name/ Local Name	Family	Habit	IUCN Status*
75	Muntingia calabura	Jamaica Cherry/ Panchara	Muntingiaceae	Tree	_
76	Murraya paniculata	Chinese box/ Kunti	Rutaceae	Tree	-
77	Neolamarckia cadamba	Kadamb	Rubiaceae	Tree	-
78	Nyctanthes arbor-tristis	Coral Jasmine/ Parijatak	Oleaceae	Tree	-
79	Oroxylum indicum	Indian Trumpet Flower/ Tetu	Bignoniaceae	Tree	-
80	Parkinsonia aculeata	Jerusalem thorn/ Vilaiti-kikkar	Fabaceae	Shrub	LC
81	Pavetta indica	Indian Pavetta/ Papat	Rubiaceae	Shrub	-
82	Peltophorum pterocarpum	Copperpod tree	Fabaceae	Tree	-
83	Phoenix sylvestris	Wild Date Palm/ Shindi	Arecaceae	Tree	-
84	Phyllanthus acidus	Star Gooseberry/ Awala	Phyllanthaceae	Tree	-
85	Pithecellobium dulce	Manilla Tamarind/ Vilayatichinch	Fabaceae	Tree	-
86	Pluchea lanceolata	Rasna	Asteraceae	Shrub	-
87	Pongamia pinnata	Indian Beech Tree/ Karanj	Fabaceae	Tree	LC
88	Prosopis juliflora	Algaroba	Fabaceae	Tree	-
89	Psidium guajava	Guava/ Peru	Myrtaceae	Tree	LC
90	Pterygota alata	Buddha Coconut	Malvaceae	Tree	-
91	Ricinus communis	Castor bean/ Erand	Euphorbiaceae	Shrub	-
92	Rivea hypocrateriformis	Midnapore Creeper/ Saanjvel	Convolvulaceae	Woody climber	-
93	Roystonea regia	Royal Palm	Arecaceae	Tree	-
94	Salvadora persica	Toothbrush Tree/ Pilu	Salvadoraceae	Shrub	LC
95	Samanea saman	Rain Tree	Fabaceae	Tree	LC
96	Sapindus laurifolius	Soapnut tree/ Reetha	Sapindaceae	Tree	-
97	Senegalia catechu	Black Cutch Tree/ Khair	Fabaceae	Tree	-
98	Senna alata	Candle Bush	Fabaceae	Undershrub	LC
99	Senna siamea	Siamese Senna/ Kassod	Fabaceae	Tree	LC
100	Senna tora	Chinese senna/ Takala	Fabaceae	Undershrub	-
101	Sesbania sesban	-	Fabaceae	Shrub	LC
102	Sida rhombifolia	Cuban jute	Malvaceae	Undershrub	-
103	Sonneratia apetala	Sonneratia Mangrove/ Chipi, Kandal	Lythraceae	Tree	LC
104	Sterculia urens	Gum Karaya/ Bhutya, Sardol	Malvaceae	Tree	
105	Syzygium cumini	Black Plum	Myrtaceae	Tree	LC
106	Tabebuia aurea	Caribbean Trumpet Tree	Bignoniaceae	Tree	-
107	Tabernaemontana divaricata	Crape jasmine/ Tagar	Apocynaceae	Tree	-
108	Tamarindus indica	Tamarind/ Chinch	Fabaceae	Tree	LC
109	Tecoma stans	Yellow trumpetbush/ GhantiPhul	Bignoniaceae	Tree	LC
110	Tectona grandis	Teak/ Sag	Lamiaceae	Tree	-
111	Terminalia arjuna	Arjun	Combretaceae	Tree	-

S. No.	Scientific Name	Common Name/ Local Name	Family	Habit	IUCN Status*
112	Terminalia bellirica	Belliric Myrobalan/ Behada	Combretaceae	Tree	-
113	Terminalia catappa	Indian Almond/ JangaliBadam	Combretaceae	Tree	LC
114	Terminalia chebula	Chebulic Myrobalan/ Hirda	Combretaceae	Tree	-
115	Terminalia tomentosa	Ain	Combretaceae	Tree	-
116	Thespesia populnea	Indian tulip tree/ Paras Pimpal	Malvaceae	Tree	-
117	Tinospora sinensis	Malabar Gulbel/ Gulvel	Menispermaceae	Woody climber	-
118	Trema orientalis	Indian Charcoal Tree/ Ghol	Cannabaceae	Tree	LC
119	Urena lobata	Caesarweed/ Ran tupkuda	Malvaceae	Undershrub	LC
120	Urena sinuata		Malvaceae	Undershrub	-
121	Vachellia leucophloea	White Bark Acacia, Hivar	Fabaceae	Tree	LC
122	Vachellia nilotica	Gum Arabic	Fabaceae	Tree	LC
123	Vitex negundo	Chaste Tree/ Nirgudi	Lamiaceae	Shrub	LC
124	Woodfordia fruticosa	Fire Flame Bush/ Dhayati	Lythraceae	Shrub	LC
125	Ziziphus jujuba	-	Rhamnaceae	Tree	LC
126	Ziziphus nummularia	Chanya-bor	Rhamnaceae	Shrub	-
127	Ziziphus rugosa	Wild Jujube/ Toran	Rhamnaceae	Shrub	-
Non-w	oody Species				
1	Acanthus ilicifolius	Sea Holly/ Marandi	Acanthaceae	Herb	LC
2	Achyranthes aspera	Prickly Chaff Flower/ Aghada	Amaranthaceae	Herb	-
3	Acmella paniculata	Panicled Spot Flower	Asteraceae	Herb	-
4	Alternanthera sessilis	Chubukkata	Amaranthaceae	Herb	-
5	Alternanthera ficoidea	Sanguinarea	Amaranthaceae	Herb	-
6	Amaranthus spinosus	Prickly Amaranth/ Katemath	Amaranthaceae	Herb	-
7	Ampelocissus sp.	-	Vitaceae	Climber	-
8	Apluda mutica	Mauritian Grass	Poaceae	Herb	-
9	<i>Argyreia</i> sp.	-	Convolvulaceae	Climber	-
10	Aristolochia sp.	-	Aristolochiaceae	Climber	-
11	Artemisia nilagirica	Indian Wormwood/ Dhordavana	Asteraceae	Herb	-
12	Barleria prionitis	Porcupine Flower/ PiwaliKoranti	Acanthaceae	Herb	-
13	Bidens bipinnata	Yellow Flowered Blackjack	Asteraceae	Herb	-
14	Bidens biternata	-	Asteraceae	Herb	-
15	Blumea lacera	Burando	Asteraceae	Herb	-
16	Blumea laciniata	-	Asteraceae	Herb	-
17	Blumea malcolmii	-	Asteraceae	Herb	-
18	Boerhavia diffusa	Red hogweed/ Punarnava	Nyctaginaceae	Herb	-
19	<i>Cayratia</i> sp.	-	Vitaceae	Climber	-
20	Celosia argentea	Silver Cockscomb/ Kurdu	Amaranthaceae	Herb	LC
21	Cheilocostus speciosus	Crepe Ginger/ Koshta	Costaceae	Herb	LC

S. No.	Scientific Name	Common Name/ Local Name	Family	Habit	IUCN Status*
22	Chloris barbata	Swollen Finger Grass	Poaceae	Herb	-
23	Chloris virgata	-	Poaceae	Herb	-
24	Chrysopogon fulvus	-	Poaceae	Herb	-
25	Cissus verticillata	Princess Vine	Vitaceae	Climber	-
26	Cleome rutidosperma	Fringed Spider Flower/ NiliTilwan	Cleomaceae	Herb	-
27	Clitoria ternatea	Gokarna	Fabaceae	Herb	-
28	Cocculus hirsutus	Broom Creeper/ Vasanvel	Menispermaceae	Climber	-
29	Coccinea grandis	Ivy Gourd/ Tondali	Cucurbitaceae	Climber	
30	Coix lacryma-jobi	Kasai	Poaceae	Herb	-
31	Corchorus sp.	-	Malvaceae	Herb	-
32	Crotalaria sp.	-	Fabaceae	Herb	-
33	<i>Cucumis</i> sp.	-	Cucurbitaceae	Climber	-
34	Cyathocline purpurea	Gangotra	Asteraceae	Herb	LC
35	Cynodon dactylon	Harali, Durva	Poaceae	Herb	-
36	Cyperus distans	Slender Sedge	Cyperaceae	Herb	LC
37	Cyperus rotundus	Common Nut Sedge/ Barik Motha	Cyperaceae	Herb	LC
38	<i>Cyperus</i> sp.	-	Cyperaceae	Herb	-
39	Cyperus squarrosus	Bearded Flatsedge	Cyperaceae	Herb	LC
40	Datura innoxia	-	Solanaceae	Herb	-
41	Dichanthium annulatum	Sheda Grass	Poaceae	Herb	-
42	Dicliptera paniculata	PanicledFoldwing	Acanthaceae	Herb	-
43	Digitaria ciliaris	Wild Crabgrass	Poaceae	Herb	-
44	Dimeria ornithopoda	-	Poaceae	Herb	LC
45	Dioscorea pentaphylla	Wild yam/ Shendvel	Dioscoreaceae	Climber	-
46	<i>Dioscorea</i> sp.	-	Dioscoreaceae	Climber	-
47	Echinochloa sp.	-	Poaceae	Herb	-
48	Eclipta prostrata	False Daisy/ Bringaraj	Asteraceae	Herb	LC
49	Eichhornia crassipes	Water Hyacinth/ Jalparni	Pontederiaceae	Herb	-
50	Eleusine indica	Indian Crowfoot Grass/ Ranchanni	Poaceae	Herb	LC
51	<i>Eragrostis</i> sp.	-	Poaceae	Herb	-
52	Eranthemum roseum	Dashmuli	Acanthaceae	Herb	-
53	Eulalia trispicata	Three-Spike Silvergrass	Poaceae	Herb	-
54	Euphorbia heterophylla	Wild Poinsettia	Euphorbiaceae	Herb	-
55	Euphorbia hirta	-	Euphorbiaceae	Herb	-
56	Euphorbia prostrata	Prostrate Sandmat	Euphorbiaceae	Herb	-
57	<i>Fimbristylis</i> sp.	-	Cyperaceae	Herb	-
58	Haplanthodes tentaculatus	Nilajakara	Acanthaceae	Herb	-

S. No.	Scientific Name	Common Name/ Local Name	Family	Habit	IUCN Status*
59	Haplanthodes verticillatus	Spiny Bottle Brush	Acanthaceae	Herb	-
60	<i>Hedyotis</i> sp.	-	Rubiaceae	Herb	-
61	Heliotropium indicum	Indian turnsole/ Bhurundi	Boraginaceae	Herb	-
62	Heteropogon contortus	Black Speargrass	Poaceae	Herb	-
63	Hibiscus vitifolius	Tropical rose mallow/ Vankapas	Malvaceae	Herb	-
64	Hygrophila auriculata	Marsh Barbel/ Talimkhana	Acanthaceae	Herb	LC
65	Hygrophila ringens	-	Acanthaceae	Herb	-
66	Hyptis suaveolens	American Mint/ DarpTulas	Lamiaceae	Herb	-
67	<i>Indigofera</i> sp.	-	Fabaceae	Herb	-
68	<i>Ipomoea</i> sp.	-	Convolvulaceae	Climber	-
69	Ipomoea triloba	Little Bell/ Ivalibhonvari	Convolvulaceae	Climber	LC
70	<i>Justicia</i> sp.	-	Acanthaceae	Herb	-
71	Lemna minor	Common duckweed	Araceae	Herb	LC
72	<i>Limnophila</i> sp.	-	Plantaginaceae	Herb	-
73	Ludwigia octovalvis	Willow Primrose/ Pan lavang	Onagraceae	Herb	LC
74	Malachra capitata	Brazil Jute/ Raanbhendi	Malvaceae	Herb	-
75	Mimosa pudica	Touch-me-not plant/ Lajalu	Fabaceae	Herb	LC
76	Mucuna pruriens	Velvet bean/ Khaj-kuiri	Fabaceae	Climber	-
77	Nymphaea pubescens	Water Lily/ Kumud	Nymphaeaceae	Herb	LC
78	Nymphoides indica	Water Snowflake/ Kumudini	Menyanthaceae	Herb	LC
79	Panicum sp.	-	Poaceae	Herb	-
80	Paspalum paspalodes	-	Poaceae	Herb	-
81	Pennisetum pedicellatum	Desho grass	Poaceae	Herb	LC
82	Persicaria glabra	Common marsh buckwheat/ Sheral	Polygonaceae	Herb	LC
83	Phyllanthus amarus	Black catnip/ Bhuiavali	Phyllanthaceae	Herb	-
84	Phyllanthus reticulatus	Black-Honey Shrub/ Panjuli	Phyllanthaceae	Herb	-
85	Physalis minima	Ground Cherry/ Ran-popti	Solanaceae	Herb	-
86	Portulaca oleracea	Purslane/ Ghol	Portulacaceae	Herb	-
87	<i>Rostellularia</i> sp.	-	Acanthaceae	Herb	-
88	Rungia repens	Ghati-pitpapada	Acanthaceae	Herb	-
89	Sacciolepis interrupta	-	Poaceae	Herb	
90	Setaria intermedia	-	Poaceae	Herb	-
91	Setaria pumila	Pigeon grass/ Barati	Poaceae	Herb	-
92	Sida acuta	Common Wireweed/ Chikna	Malvaceae	Herb	-
93	Sida acutifolia	-	Malvaceae	Herb	-
94	Spermacoce pusilla	Tiny False Buttonweed/ Tarakadal	Rubiaceae	Herb	-

S. No.	Scientific Name	Common Name/ Local Name	Family	Habit	IUCN Status*
95	Sphaeranthus indicus	East Indian Globe Thistle/ Gorakhmundi	Asteraceae	Herb	LC
96	Sphagneticola trilobata	Creeping daisy	Asteraceae	Herb	-
97	Sporobolus coromandelianus	-	Poaceae	Herb	-
98	Suaeda maritima	Annual Sea-Blite	Amaranthaceae	Herb	-
99	Synedrella nodiflora	Cinderella Weed	Asteraceae	Herb	-
100	Teramnus labialis	Blue Wiss	Fabaceae	Herb	-
101	Themeda quadrivalvis	-	Poaceae	Herb	-
102	Themeda triandra	Kangaroo Grass	Poaceae	Herb	-
103	Tribulus terrestris	Gokharu	Zygophyllaceae	Herb	-
104	Tridax procumbens	Dagadi Pala	Asteraceae	Herb	-
105	Triumfetta rhomboidea	Burr Bush/ Jhinjhardi	Malvaceae	Herb	-
106	Vernonia cinerea	Little ironweed/ Sasodi	Asteraceae	Herb	-
107	<i>Vigna</i> sp.	-	Fabaceae	Climber	-
108	Xanthium strumarium	Common Cocklebur/ Shankeshrvar	Asteraceae	Herb	-

109 Zingiber sp.

Zingiberaceae Herb

*Status assigned by the International Union for Conservation of Nature and Natural Resources, where -LC - Least Concern.

Sources: ESIA Ecology Team Primary Survey; The IUCN Red List of Threatened Species. Version 2021-1; The Plant Listhttp://www.theplantlist.org/






Source: ESIA Ecology Team Primary Survey

Floristic species recorded in the Study Area

4.3.7.2 Fauna

This section of the report presents the higher faunal species, namely vertebrates, comprising mammals, birds, reptiles, amphibians and fishes, having reported ranges that include the Study Area. The detailed species-tables are provided as annexures to this report. Each annexed table gives the scientific and common names of each species, the conservation status assigned to it by the International Union for Nature and Natural Resources (IUCN) and the Schedule of the Wildlife Protection Act, 1972 (WPA) under which it is listed. Names of the species recorded as part of the primary data appear in **bold** font in Annexure.

Mammals

At least eighty-nine (89) species of mammals have reported ranges that include the Study Area. With respect to the IUCN Red List, three (03) of these species are designated as Endangered, seven (07) as Vulnerable and five (05) as Near Threatened. With respect to the WPA Schedules, twenty-seven (27) of these species are listed under Schedule I. One (01) species of mammals was recorded as part of the primary data.

Appendix B lists the mammal species of the Study Area.

Sources: The IUCN Red List of Threatened Species. Version 2021-1; Indian Wildlife (Protection) Act, 1972

Birds

At least three hundred and three (303) species of birds have reported ranges that include the Study Area. These include one hundred and seventy-seven (177) species that are resident to the Study Area and one hundred and twenty-six (126) species, which are migratory to the Study Area. With respect to the IUCN Red List, two (02) bird species of the Study Area are designated as Critically Endangered, two (02) as Endangered, four (04) as Vulnerable and twelve (12) are listed as Near Threatened. With respect to the WPA Schedules, six (06) bird species of the Study Area are listed under Schedule I. Forty-four (44) species of birds, consisting of thirty-one (31) resident species and thirteen (13) migratory species, were recorded as part of the primary data.

Appendices C and D list the resident and migratory bird species respectively of the Study Area. The below figure represents some of the bird species recorded during the primary survey.

Sources: R. Grimmett, C. Inskipp & T. Inskipp (2011). Birds of the Indian Subcontinent. Oxford University Press, pp 1-528; The IUCN Red List of Threatened Species. Version 2021-1; Indian Wildlife (Protection) Act, 1972



Source: ESIA Ecology Team Primary Survey

Reptiles

At least sixty-eight (68) species of reptiles have reported ranges that include the Study Area. With respect to the IUCN Red List, one (01) of these is designated as Critically Endangered and four (04) are designated as Vulnerable. With respect to the WPA Schedules, five (05) of these species are listed under Schedule I. Two (02) species of reptiles were recorded as part of the primary data.

Appendix E lists the reptile species of the Study Area. Sources: The IUCN Red List of Threatened Species. Version 2021-1; Indian Wildlife (Protection) Act, 1972

Amphibians

At least fourteen (14) species of amphibians have reported ranges that include the Study Area. With respect to the IUCN Red List, none of these species are designated as globally threatened. With respect to the WPA Schedules, none of these species are listed under Schedule I. No species of amphibians were recorded as part of the primary data.

Sources: The IUCN Red List of Threatened Species. Version 2021-1; Indian Wildlife (Protection) Act, 1972 Appendix F lists the amphibian species of the Study Area

Fishes

At least fifteen (15) species of fishes have reported ranges that include the Study Area. With respect to the IUCN Red List, none of these species are designated as globally threatened. With respect to the WPA Schedules, none of these species are listed under Schedule I. No species of fishes were recorded as part of the primary data.

Sources: Quadros, Goldin. (2016). Conducting Baseline Studies for Thane Creek – Preliminary report, SACON; Quadros, G. and Athalye, R.P. (2012). Decline of fish diversity in the anthropogenically polluted Thane Creek along the Central West Coast of India. International Journal of Biological Sciences, Vol. 1(4), 17-21; The IUCN Red List of Threatened Species. Version 2021-1; Indian Wildlife (Protection) Act, 1972

Appendix G lists the fish species of the Study Area

Invasive Alien Species

At least five (05) species, comprising four (04) floristic species and one (01) faunal species recorded from the Study Area, are designated as invasive alien species with respect to the Study Area.

Table 4.3 lists the invasive alien species of the Study Area, along with the common name of each species, the conservation status assigned to it by the International Union for Nature and Natural Resources (IUCN) and its native range. The floristic and faunal species are listed in separate sections.

S. No.	Scientific Name	Common Name	IUCN Status*	Native Range
Floristi	c Species			
1	Alternanthera ficoidea	Sanguinarea	-	Tropical America
2	Chromolaena odorata	Siam Weed/ Raanmari	-	Tropical America
3	Lantana camara	Lantana/ Ghaneri	-	Tropical America
4	Lysiloma latisiliquum	Subabhul	LC	Tropical America
Faunal	Species			
5	Columba livia	Common pigeon	LC	Europe, North Africa

Table 4-3 – Spices list for Invasive Alien

*Status assigned by the International Union for Conservation of Nature and Natural Resources, where -LC - Least Concern.

Sources: C. Sudhakar Reddy, G. Bagyanarayana, K.N. Reddy & Vatsavaya S. Raju (2008) Invasive Alien Flora of India. Published by National Biological Information Infrastructure, US Geological Survey, USA. <u>https://en.wikipedia.org/wiki/Rockdove</u>; IUCN (2020). The IUCN Red List of Threatened Species. Version 2020-2

4.3.8 Habitat Profile of the Study Area

This section presents the habitat profile of the Study Area on the collective basis of the primary and secondary data obtained. The habitats present in the study area are classified into natural or modified habitats. Natural habitats are areas composed of viable assemblages of plant and/or animal species of largely native origin, and/or where human activity has not essentially modified the area's primary ecological functions and species composition. Modified habitats

are areas that contain a considerably large proportion of plant and/or animal species of non-native origin, and/or where human activity has substantially modified the area's primary ecological functions and species composition. Any habitats of the study area having recorded or reported presence of critical habitat trigger species are identified as potential critical habitats.

4.3.8.1 Natural Habitats

The natural habitats of the Study Area mainly comprise relic patches of deciduous forests along hills, scrublands, grasslands, marshlands, mangrove forests, lakes, streams and creeks. These habitats are likely to be supporting habitat-specialist species for their feeding, nesting, breeding and roosting requirements. Initial part of the alignment passes through Kharghar Hill Reserve forest, 2.2 km of the alignment also pass through the Thane Creek Flamingo Sanctuary.







4.3.8.2 Modified Habitats

The modified habitats of the Study Area comprise habitations, gardens, saltpans, substations, bunds, culverts and roads. Aerial envelope of the Study Area is mainly interrupted by power transmission lines, transmission towers and pylons. These habitats are likely to support generalist species, though they may intermittently provide habitat features to habitat-specialist species.





4.3.9 Critical Habitat Screening

Habitats, either natural or modified, that are critical for the survival of IUCN-designated Critically Endangered (CR) or Endangered (EN) species, migratory species, congregatory species and endemic or restricted-range species are considered as Critical Habitat (CH). This sub-section lists such species having recorded ranges that include the study area.

Critically Endangered or Endangered Species

These are species listed nationally / regionally as Critically Endangered (CR) or Endangered (EN) on the IUCN Red List of Threatened Species. CR species are deemed to face an extremely high risk of extinction in the wild, while EN species are deemed to face a very high risk of extinction in the wild.

Details about the Critically Endangered and Endangered Species are provided in Table 4.4

S. No.	Scientific Name	Common Name	IUCN Status*	WPA Schedule**
1	Manis crassicaudata	Indian Pangolin	EN	I
2	Sousa plumbea	Indian Ocean Humpback Dolphin	EN	I
3	Balaenoptera musculus	Blue Whale	EN	I
4	Neophron percnopterus	Egyptian Vulture	EN	IV
5	Gyps bengalensis	White-rumped Vulture	CR	I
6	Gyps indicus	Indian Vulture	CR	I
7	Aquila nipalensis	Steppe Eagle	EN	IV
8	Eretmochelys imbricata	Hawksbill Turtle	CR	1

Table 4-4: Details about critically endangered species

*Status assigned by the International Union for Conservation of Nature and Natural Resources, where – CR – Critically Endangered and EN- Endangered. **Schedules I to VI: Indian Wildlife (Protection) Act, 1972.

Sources: The IUCN Red List of Threatened Species. Version 2021-1; Schedules I to VI: Indian Wildlife (Protection) Act, 1972.

Three (03) species of vultures have reported ranges within the Study Area. The Study Area does not support natural habitats preferred by these species. However, a modified habitat, two dumping grounds, located within the Study Area are known to be preferred by scavenger species such as raptors, typically the vultures. Therefore, the vultures could be potential triggers for the Project Alignment to qualify as a Critical Habitat. However, owing to a significant lack of

data on vulture populations specific to the Study Area, a dedicated assessment is recommended to ascertain the CH status.

Endemic and/or Restricted Range Species

Endemic or Restricted Range species are species that occur only within a pre-specified limited area. The study area falls under a reported range of endemic species i.e. Phipson's Earth Snake (*Uropeltis phipsonii*) which are potential CH Criterion 2 triggers and a dedicated assessment is recommended to ascertain the CH status.

Migratory and/or Congregatory Species

Migratory Species are defined as species of which a significant proportion of members cyclically and predictably move from one geographical area to another, including within the same ecosystem. The Study Area is located within the Central Asian Flyway and also in proximity to the East Asia - East Africa Flyway. Thus, the Study Area is very likely to be situated in the annual cyclical flightpaths of the various winter, summer, passage migratory or nesting birds migrating either to or through the region in which it is situated. At least one hundred and twenty-six (126) such Migratory Species, all birds, have reported ranges that include the Study Area, which may serve as wintering/summering destination, staging site, or flightpaths for these species.

Congregatory species include species that gather in globally significant numbers at a particular site and at a particular time in their life cycle for feeding, breeding or mid-migration resting. The Study Area contains vast wetland habitats, which indicates the probable seasonal occurrence of migratory and/or congregatory waterfowl in the wetlands and the aerial envelope of the Study Area.

As per the census conducted by the Bombay Natural History Society (BNHS) in January 2019, 1,21,900 flamingos have been reported in Thane Creek. With large congregations of 1,07,700 Lesser Flamingos and 14,200 Greater Flamingos recorded in 2019 within the Study Area, both these species trigger the CH criterion 3. Thus, the Project Alignment qualifies as a Critical Habitat. A dedicated assessment to ascertain the status of the CH with respect to other migratory and congregator birds is highly recommended.⁴

Appendix D lists the migratory species of the Study Area. *Figure 4.8* depicts the Central Asian Flyway vis-à-vis the Indian subcontinent.

⁴ Source: BNHS Press Release (2019). BNHS study reveals 1,21,000 flamingos in Mumbai (https://bnhs.org/press-releases)



Figure 4-8. The Central Asian Flyway

Source: Birdlife International (2020). Birdlife Data Zone: Central Asia/South Asia. Downloaded from <u>http://datazone.birdlife.org/</u> on 05/12/2020

4.3.10Designated Areas

Designated areas include legally protected areas, such as National Parks, Wildlife Sanctuaries, Reserve Forests, Protected Forests, Community Forests and Conservation Areas notified by the Government of India, as well as, internationally recognized areas, such as Ramsar Wetlands, Important Bird Areas, Key Biodiversity Areas or UNESCO World Heritage Sites. Approximately 2.2 km alignment passes through the Thane Creek Flamingo Sanctuary.

Figure 4-9 represents the locations of the designated areas in closest proximity to the Study Area.



Figure 4-9. Locations of the Designated Areas in closest proximity to the Study Area.

Legally Protected Areas

Thane Creek Flamingo Sanctuary

This is the Legally Protected Area which forms a part of the Study Area. It is notified as a Wildlife Sanctuary as per the provisions of the Wildlife (Protection) Act of India, 1972 (WPA), and is categorized as Category IV as per IUCN's Protected Area Categories. Approximately 2.2 km stretch of the project alignment passes through the southern, western and northern part of the core boundary of the sanctuary, while 16.5 km of the project alignment passes through its proposed Eco-sensitive Zone, towards the west of the sanctuary. The primary purpose of according legal protection to the area is the conservation of the wetland habitat of migratory birds such as the flamingos.

Kharghar Hills Reserved Forest

The hilly area towards Kharghar end of the Study Area is a legally protected area, notified as Reserve Forests. The nearest point of the Reserve Forest is located approximately 500 m north of the nearest point on the project alignment, *viz.*,19A tower.

Sanjay Gandhi National Park

The Sanjay Gandhi National Park is in close proximity to the Study Area (2.5 km to the west). It is notified as a National Park as per the provisions of the Wildlife (Protection) Act of India, 1972 (WPA), and is categorized as Category II as per IUCN's Protected Area Categories. It is comprised of various habitats such as the dry deciduous forests in the Sahyadri range as well as mangrove forests and coastal habitats. It has two large lakes that support aquatic diversity. About 300 species of birds, 59 mammals, 52 reptiles, 13 amphibians and 30 species of fish. It also supports globally threatened species as well as migratory birds.

4.3.11 Internationally Recognized Areas

Thane Creek IBA (IBA Code IN172):

This is the Key Biodiversity Area and Important Bird Area and the alignment passes through the areas. Approximately 16.5 km of the project alignment passes through the western side of the KBA. Thane Creek is one of the largest creeks in Asia. It is a very important wintering ground for water birds. Over 205 birds have been reported from the creek.

Sanjay Gandhi National Park (Code IN168):

This Key Biodiversity Area and Important Bird Area is in close proximity to the project alignment (2.5 km to the west). It is notified as a National Park as per the provisions of the Wildlife (Protection) Act of India, 1972 (WPA), and is categorized as Category II as per IUCN's Protected Area Categories. It is comprised of various habitats such as the dry deciduous forests in the Sahyadri range as well as mangrove forests and coastal habitats. It has two large lakes that support aquatic diversity. About 300 species of birds, 59 mammals, 52 reptiles, 13 amphibians and 30 species of fish. It also supports globally threatened species as well as migratory birds.

As a part of the Study Area overlaps with the legally protected area as well as the internationally recognized KBA Thane Creek, it is a potential CH and thus a Critical Habitat Assessment will be required.

4.3.12Ecosystem Services

Provisioning Services

The natural functioning of the ecosystems of the Study Area provides priority provisioning services such as water and food. A few freshwater lakes were recorded or reported to be providing domestic-use water. Many tidal inlets were recorded or reported to be supporting fishery.

Regulating Services

The natural functioning of the ecosystems of the Study Area leads to the following processes that provide both, direct and indirect benefits to the local communities.

Groundwater Recharge

The water-flows in the study area contribute to the recharge of wells, ponds and lakes of the area, which provide the freshwater needs of the local communities. The vegetation of the area helps to slow down the surface run-off, which in turn, increases the percolation of water into sub-surface layers, thereby promoting groundwater recharge.

Surface Water Purification

The microorganisms of the Study Area chemically recycle wastes, thereby purifying surface water. The vegetation of the Study Area physically filters out particulate matter from water flows, thereby purifying surface water.

Soil Erosion Control

The vegetation of the study area anchors soil particles and binds them together, lowering the rate of soil erosion by water and wind.

Pollination and Pest Control

The vegetation of the Study Area provides habitats to pollinator species, such as, pollen or nectar-feeding insects and birds, as well as, insectivorous species, including frogs, lizards, birds and bats. By harboring such species, the Study Area provides pollinator services and pest control services to plants in the area.

Supporting Services

The natural functioning of the ecosystems of the study area leads to the following processes that create or maintain basic natural resources, such as soil nutrients and photosynthetic production, that support human life-sustaining activities, such as food-gathering.

Nutrient Capture and Recycling

The food chains constituted by the organisms of the Study Area capture, transfer and recycle the macro and micronutrients in the soil, water and air, making them available in the nutrient-sinks of the local ecosystems. The biomass generated by the organisms of the Study Area, and transferred physically by water and wind, helps recharge the soil fertility in the surrounding area. The organisms of the Project site contribute to these nutrient captures and recycling services.

Primary Production

The photosynthetic organisms of the Study Area produce food that directly or indirectly supports the consumer organisms of the area, including the local human communities.

Cultural Services

The water bodies and hills in the Study Area provide cultural ecosystem services to the local communities. Waterbodies such as lakes and perennial streams in the Study Area are utilized by the local communities as places of performing religious activities such as the Chhath Puja festival. Kharghar hills in the Study Area are utilized for recreational activities such as cycling, walks and picnic.

Below photographs showing cultural ecosystem services recorded in the Study Area.



Picture- Cultural Ecosystem Services recorded in the Study Area

4.4 Socio Economic Environment

This section would give a demographic and socio-economic overview of the area of the project and the community settlements. The section focuses on the socio-economic profile of the community of affected persons including their social and religious backgrounds, literacy levels and occupations. It also includes a sub-section on physical and social infrastructure present in the area. The information is necessary for this section has been taken from primary observations, primary consultations, as well as secondary literature. The observations were done through visual surveys and walk-throughs along the project area. Primary consultations involved consultations with various stakeholders such as residents of settlements across the project area as well as workers who might get impacted due to the project.

4.4.1 Area of Influence

The length of the KVTPL transmission line is 36.953 KM in total which includes the 400 kV Kharghar-Vikhroli D/C & M/C line with bays at Kharghar & Vikhroli as well as the LILO on 400 kV Talegaon Kalwa line. This line passes from the Kharghar in Navi Mumbai Region to Vikhroli in Mumbai Region and from Vikhroli to Airoli. These areas fall under the jurisdiction of 3 different Municipal Corporations namely, The Navi Mumbai Municipal Corporation, Brihan Mumbai Municipal Corporation and the Panel Municipal Corporation.

The land on which the project is to be constructed is public land, forest land or land belonging to bigger private entities. No private residential land has been used for the project.

4.4.2 Settlement Within Area of Influence

A significant portion of the line passes through areas of Reserved Forest under the Government of Maharashtra while another large portion passes through areas of public ownership such as parks and roads. The line runs parallel to other transmission lines like the MSETCL, Tata power etc. in various portions to finally end at Vikhroli substation. The areas where the line passes close to settlements and city infrastructure is in the stretch from towers T17 – T19, T26 – T34, and T43 – T44.

During the site visit, it was observed that approximately 60 informal settlements between AP18 A and AP 19A would be affected. None of the houses will be resettled. It was also observed that between AP 26N2 and AP 33A approximately 30 number of the private multi-storied building are within the RoW of the transmission line. Detail analysis of the impacts is provided in section 5.5.9.

SI. No	Municipal Corporation	Villages along the Project Footprint
KVTPLLin	e	
1.	Navi Mumbai Municipal Corporation	Ward 88
2.	Navi Mumbai Municipal Corporation	Ward 87
3.	Navi Mumbai Municipal Corporation	Ward 84
4.	Navi Mumbai Municipal Corporation	Ward 78
5.	Navi Mumbai Municipal Corporation	Ward 65
6.	Navi Mumbai Municipal Corporation	Ward 15
7.	Navi Mumbai Municipal Corporation	Ward 14
8.	Greater Mumbai Municipal Corporation	Ward M/E (Chembur)
9.	Greater Mumbai Municipal Corporation	Ward N (Ghatkopar)
10.	Greater Mumbai Municipal Corporation	Ward S (Vikhroli)
11.	Greater Mumbai Municipal Corporation	Ward T (Mulund)
12.	Panvel Municipal Corporation	Kharghar (CT)
LILO		
13.	Greater Mumbai Municipal Corporation	Ward N (Ghatkopar)
14.	Greater Mumbai Municipal Corporation	Ward S (Vikhroli)
15.	Greater Mumbai Municipal Corporation	Ward T (Mulund)
16.	Navi Mumbai Municipal Corporation	Ward 15
17.	Navi Mumbai Municipal Corporation	Ward 14

Table 4-5: Settlement within the AOI

Source: Google Earth Pro

4.4.3 Methodology for Socio-Economic Assessment

The socio-economic baseline for this project has been developed based on the secondary literature review and primary sources which include inferences drawn from the consultation with different stakeholders including the local community.

4.4.3.1 Review of Secondary Information

Review and assessment of the available secondary data and information for the study area were undertaken to substantiate the findings from the stakeholder consultations. This also allows for a comparative assessment of the project area vis-à-vis the villages and block-level socio-economic baseline information. For secondary review, the following documents and literature have been reviewed:

- Village Directory Data (2011);
- Primary Census Abstract Data (2011);
- District Statistical Handbook-2011 for Kutch District

4.4.3.2 Primary data collection through stakeholder consultation

A key group of stakeholders who were consulted during the study process were affected communities, local communities, project officers, etc. The main objective of the consultation was to gain an understanding of the area, the demographic profile, the livelihood activities and a general understanding of the developmental needs of the community and their perceptions regarding the upcoming project in the project area. Details regarding the consultation with each group can be found in Section 7 of the Stakeholder Consultation Chapter.

Table 4-6: List of stakeholders Consulted

Stakeholder Group
Consultation with Local Community
Consultation with the affected community
Consultation with project officere

Consultation with project officers

4.4.4 Administrative Set-Up of AOI

4.4.4.1 State Profile: Maharashtra

Maharashtra, one of the largest states in the country was created on May 01, 2020, and is the second-most populous state in India. Located on the western coast, the area of the state is around 307,713 sq. km long coastline stretching 720 kilometers. Maharashtra is bordered by the Arabian Sea to the west, the Indian states of Karnataka and Goa to the south, Telangana to the southeast and Chhattisgarh to the east, Gujarat and Madhya Pradesh to the north, and the Indian union territory of Dadra and Nagar Haveli and Daman and Diu to the northwest. While Mumbai is the capital of Maharashtra, the state has 36 districts 355 talukas, 535 cities, 63,663 villages, 6 administrative divisions. One of the more prominent physical features of Maharashtra is the Deccan plateau, which is separated from the Konkan coastline by 'Ghats'.

Table 4-7 Demography of Maharashtra State

Attribute	2011	2001
Population	112,374,333	96,878,627
Male	58,243,056	50,400,596
Female	54,131,277	46,478,031
Population Growth	15.99%	22.57%
% of total population	9.28%	9.42%
Sex Ratio	929	922
Child Sex Ratio	894	913
Total Child Population (0 – 6 age)	13,326,51	13,671,126
Male Child population (0 – 6 age)	7,035,391	7,146,432
Female Child Population (0 – 6 age)	6,291,126	6,524,694

Attribute	2011	2001
Literacy	82.34 %	76.88 %
Male Literacy	88.38 %	85.97 %
Female Literacy	75.87 %	67.03 %

Source: https://www.census2011.co.in/census/state/maharashtra.html

The Maharashtra Census of 2011 shows that it has a total population of 11 crores which is approximately 9.28% of the total population of the country. Literacy rate in Maharashtra has seen an upward trend from 2001 (76.88%) to 88.38% in 2011. Female literacy has also seen a rise from the 2001 numbers from 67.03% to 75.87%. The sex ratio in the state is 929 which is lower than that of the country average which stands at 933 (946 rural and 900 urban) females per 1000 males as per census 2011 data.

4.4.4.2 District Profile:

The transmission line passes through three districts namely, the Mumbai Suburban Area, Thane, and Raigarh Districts. Mumbai Suburban District is in the Konkan Division of Maharashtra. Its headquarters is in Bandra. It consists of three administrative subdivisions: Kurla, Andheri, and Borivali. The district along with Mumbai City district and other suburban localities make up Greater Mumbai on Salsette Island. The district occupies an area of 446 km². Thane district is a district in the Indian state of Maharashtra in Konkan Division. At the 2011 Census it was the most populated district in the nation, with 11,060,148 inhabitants; however, in August 2014 the district was split into two with the creation of a new Palghar district, leaving the reduced Thane district with a 2011 Census population of 8,070,032. The headquarters of the district is the city of Thane. Other major cities in the district are Navi Mumbai, Kalyan-Dombivli, Mira-Bhayander, Bhiwandi, Ulhasnagar, etc. According to Table 4.5, Thane District has the highest population among the concerned districts and Mumbai Suburban is a close second. Thane is also the largest district among the three with 4214 sq km area. Raigad District (formerly Kolába district), is a district in the Konkan division of Maharashtra, India. The district is bounded by Mumbai Harbour to the northwest, Thane district to the north, Pune district to the east, Ratnagiri district to the south and the Arabian Sea to the west. It includes the large natural harbour of Pen-Mandwa, which is immediately south of Mumbai harbour, and forming a single landform with it. The northern part of the district is included in the planned metropolis of Navi Mumbai, consisting of Kharghar, Ulve node, New Panvel and Khanda Colony, Taloja, Kamothe and Kalamboli nodes as well as Uran City and its port, the JNPT.

4.4.4.3 Municipal Corporations Profile

The **Municipal Corporation of Greater Mumbai (MCGM)** formerly and commonly known as the Bombay Municipal Corporation (BMC) is the governing civic body of Mumbai, the capital city of Maharashtra. The MCGM is headed by an IAS officer who serves as Municipal Commissioner, wielding executive power. A quinquennial election is held to elect corporators, who are responsible for the basic civic infrastructure and enforcing duty. The Mayor, usually from the majority party, serves as head of the house. The MCGM's legislature, also known as the Corporation Council, consisted of 227 members. As per Census 2011, BMC covers an area of 480.24 sq km and has a population of 1,24,42,373. The metropolis is a major contributor to India's total international trade, government revenue and has become a leading center for education, scientific and technological research as well as progress. It is pertinent to note that the overall growth of Mumbai also contributed to the rapid development of the system of local self-government under British rule.

The **Navi Mumbai Municipal Corporation (NMMC)** is the municipal organization of Navi Mumbai, Maharashtra. NMMC came into existence on January 1, 1992.NMMC is considered as one of the most efficient Municipal Corporation in India. Till 2014, the NMMC headquarters is located at Killa Junction at CBD Belapur. The Navi Mumbai Municipal Corporation has an area of 162 Sq.km under its supervision. The population of the city as per the census 1991 was 3, 97, 000 which has increased to 7, 50,000 as indicated in the census figures in 2001. (A rise of 88.91%). The NMMC for administration has been divided into nodes. There are 8 nodes in the city, each of the nodes is divided into groups. These groups are blocks of one or more sectors in each of the nodes. Each group is further subdivided into bits which becomes the basis of the distribution of administration work as each bit has a supervisor who is required to ensure that all the facilities provided by the NMMC are in order.

Municipal Corporation of The City of Panvel is the governing body of the city of Panvel in Raigad district. Panvel Municipal Corporation is the first Municipal Corporation in Raigad district, 9th in the Mumbai Metropolitan Region and 27th in the state of Maharashtra. The Municipal Corporation includes 29 revenue villages of Panvel taluka including CIDCO colonies of Taloja, Kharghar, Kalamboli, Kamothe New Panvel covering an area of 110 km2. The Government of Maharashtra through its Urban Development Department's notification dated 14th October 2016 has added 11 more villages (namely: Bid, Adivali, Rohinjan, Dhansar, Pisarve, Turbhe, KarvaleBudruk, Nagzeri, TalojeMajkur, Ghot and Koynavele) of Panvel Taluka to the Panvel Municipal Corporation.

Attribute	Tehsils/Block							
	Greater Mumbai Municipal Corporation	Navi Mumbai Municipal Corporation	Panvel Municipal Corporation					
Population	9356962	1120547	180020					
Male Population	5031323	610060	92484					
Female Population	4325639	510487	87536					
Sex Ratio	853	837	946					
% of Schedule Tribes	1.11	1.68	2.38					
% of Schedule Caste	6.23	8.93	8.03					
% of Literacy Rate	80.96	89.62	93.89					
% of Female Literacy Rate	55.74	43.5	52.37%					
% of Male Literacy Rate	44.27	56.50	47.63%					

Source: Census Data, 2011

4.4.5 Socio Economic Profile of AOI

The transmission line passes through three (03) Municipal Corporation Regions, i.e. Brihan Mumbai Municipal Corporation (BMC), Navi Mumbai Municipal Corporation (NMMC), and the Panvel Municipal Corporation. The BMC is divided into various regions comprised of 24 Wards, the NMMC has 111 wards while the Panvel MC has 38 wards. Out of these, the line passes through 7 NMMC wards, 4 BMC wards and 1 Panvel MC wards.

4.4.5.1 Demography

The study area for the project lies in three municipal corporation areas of the districts mentioned above. The Navi Mumbai Municipal Corporation lies in the Thane district while the newly formed Panvel Municipal Corporation has incorporated some area in Kharghar in the Raigarh District. The Mumbai suburban area through which the line also passes is under the administration of the Greater Mumbai Municipal Corporation or the Brihan Mumbai Municipal Corporation.

These Corporation areas are further divided into different wards for elections and better administration. As the transmission line starts from Kharghar area in Navi Mumbai, it comes from wards M/E (Chembur) and N (Ghatkopar West) to end at S (Vikhroli). The LILO line starts in the S ward (Vikhroli) and passes through T ward (Mulund) to go into the Airoli region of Navi Mumbai to end there.

The electoral wards under Navi Mumbai Corporation (NMMC) are 111. The number of wards was increased in the year 2015 as before 2015 the number of wards under NMMC was 89. Since the 2011 census data for the wards in Navi Mumbai is only available for 89 wards, the wards 90-111 cannot be taken into consideration for this study. Hence for this study, the wards that the transmission line passes through wards 104, 103, 102 (Belapur), 92, 90, 88, 87, 84 (Nerul), 78, 65 (Vashi) and then crosses the Vashi Creek to go into Mumbai Suburban Area through Chembur. The LILO line goes into Navi Mumbai from Vikhroli through Airoli wards 14 and 15.

Kharghar is a part of the Panvel Municipal Corporation which is where the line starts at the substation. Kharghar as a part of the Navi Mumbai region has been marked as a separate Census town apart from the Panvel Municipal Corporation.

District	Total no. of Households	Total population	Total Area
Mumbai Suburban Area	2105604	9356962	446 km²
Thane District	2529165	11060148	4,214 km²
Raigarh District	611790	2634200	7,152 km²
Total	5,246,559	23,051,310	

Table 4-9 -Demography of concerned districts

Source: PCA 2011

Table 4-10 -Demography of the Study Area

Administrative Unit	Total no. of. Households	Total Population	Male Population	Female Population
Greater Mumbai Municipal Corporation	2105604	9356962	5031323	4325639
Ward M/E (Chembur)	12870	54375	28925	25450
Ward N (Ghatkopar)	26276	119700	64482	55218
Ward S (Vikhroli)	49589	216393	113954	102439
Ward T (Mulund)	26023	102918	52437	50481
Navi Mumbai Municipal Corporation	273626	1120547	610060	510487
Ward 88	4922	19584	10222	9362
Ward 87	5311	20734	10622	10112
Ward 84	2585	10800	5675	5125
Ward 78	5538	22398	12135	10263
Ward 65	6700	26634	13985	12649
Ward 15	1911	7590	3907	3683
Ward 14	2590	10834	5618	5216
Panvel Municipal Corporation	43107	180020	92484	87536
Kharghar (Census Town)	20737	80612	42001	38611

Source: PCA 2011

4.4.5.2 SC and ST community

While understanding the impact of a project on the community it is necessary to know the baseline condition of those on the lowest rungs of the socio-economic ladder. This gives an idea of the vulnerability of the community in the study area. The table below gives an overview of the vulnerable population living in the study area.

The table below shows that the Study area is characterized by Scheduled Caste representation of 8.68% percentage and ST representation of 1.54%. The study area has low SC and ST representation in comparison with that of the state and district levels. Consultations with the KVTPL team show that the line does not pass through any private lands and neither through lands of ST nor SC families.

4.4.5.3 Literacy Profile

As per the census data 2011, the wards in the AoI have a cumulative literacy rate of 82.6% which is significantly lower than the literacy rate of the NMMC and the Panvel MC which is 89.62% and 93.89% respectively. Of this, the male literacy (53.64%) stood higher than female literacy rate (46.36%). Among the study area, the ward T (Mulund) has the highest literacy rate (87%) much higher than the MCGM literacy rate whereas Ward 84 of NMMC has poor literacy rate (77.61%), much lower than the NMMC average of 89.62%. A look at the gender-wise literacy rate all the subunits have a lower literacy rate than their male counterparts in the respective subunits.

Table 4-11 – Data for household and population

Municipal Corporation	Wards/CTs	Total Households	Average	Total Population	Total Male Populatior	n	Total Fema Population	male Schedu on Caste ^c		Schedule Tribe %	Literacy Rate %	Male Literacy %	Female Literacy %
			HH Size		Number	%	Number	%					
MCGM	M/E	12870	4.7	54375	28925	51.1	25450	48.9	9.40	1.84%	80.45%	54.98%	45.02%
MCGM	Ν	26276	4.0	119700	64482	53.1	55218	46.9	10.37%	1.35%	80.45%	56.43%	43.57%
MCGM	S	49589	4.5	216393	113954	51.5	102439	48.5	10.80%	0.78%	82.20%	54.70%	45.30%
MCGM	Т	26023	4.6	102918	52437	52.0	50481	48.0	5.04%	2.51%	86.82%	51.68%	48.32%
NMMC	88	4922	4.4	19584	10222	48.8	9362	51.2	7.96%	1.18	83.60%	52.93%	47.07%
NMMC	87	5311	4.6	20734	10622	60.0	10112	40.0	7.73%	0.69	85.14%	51.67%	48.33%
NMMC	84	2585	4.4	10800	5675	52.1	5125	47.9	14.52%	2.22	77.61%	54.56%	45.44%
NMMC	78	5538	4.7	22398	12135	50.1	10263	49.9	8.84%	1.15	78.36%	56.44%	43.56%
NMMC	65	6700	5.2	26634	13985	50.2	12649	49.8	9.27%	1.87	81.61%	53.03%	46.97%
NMMC	15	1911	4.9	7590	3907	52.5	3683	47.5	4.40%	1.55	85.90%	51.83%	48.17%
NMMC	14	2590	4.8	10834	5618	49.2	5216	50.8	8.74%	1.40	86.51%	52.29%	47.71%
Panvel MC	Kharghar (CT)	20737	6.2	80612	42001	41.9	36	58.1	7.13%	1.90	82.59%	53.09%	46.91%
Grand Total		165052	4.75	692572	363963	51.04	290034	48.96	8.68	1.54	82.60	53.64	46.36

Source: Census Data 2011

4.4.5.4 Occupation and Livelihood

The study area is characterised by Worker Participation Ratio ⁵(WPR) of 39.31% of which male WPR 75.58% and female WPR is 32.68%. The female WPR is found to be much higher than the national female average WPR (23%). The survey conducted by the International Labour Organisation and Institute of Applied Manpower Research-Low Female Employment in a Period of High Growth reveal that the major factors cited for women pulling out of the workspace are reproductive roles, household and care responsibilities, cultural sanctions, and patriarchal hierarchies. Continuing in education and migration after marriage were also cited by females as reasons for withdrawal from the labour force. On the other side, the push factors for women joining the workforce are the availability of opportunities, household income, migration, and economic distress.

Of the total working population (39.31%) in the study 92.78% is comprised of the main working population (engaged in economic activity for more than 180 days in a year). Of the main working population, more than 75% of the population is engaged in occupational activities that do not pertain to cultivation, agriculture labour, or household industries. These are basically service-based activities as well as other labour work such as construction as is the norm in urban areas. It is evident from the Census 2011 data that the occupation of the people in the study area is not related to agriculture or industries.

⁵ Work Participation Ratio is defined as the percentage of total workers (main and marginal workers) to total population

Table 4-12: Proportion of Working Population in the Study Area

Municipal Corporation	Ward/CT	Total Population	Total WPR in %	% Male WPR	% Female WPR	Main Worker %	%Male Main Worker	%Female Main Worker	% Marginal Worker	%Male Marginal Worker	%Female Marginal Worker
MCGM	M/E	54375	41.21%	77.84%	28.46%	90.68%	79.49%	20.51%	9.32%	61.83%	38.17%
MCGM	N	119700	37.52%	82.09%	21.82%	95.69%	82.98%	17.02%	4.31%	62.33%	37.67%
MCGM	S	216393	38.83%	77.36%	29.26%	93.85%	78.47%	21.53%	6.15%	60.41%	39.59%
MCGM	Т	102918	40.71%	68.81%	45.33%	96.23%	69.60%	30.40%	3.77%	48.54%	51.46%
NMMC	88	19584	39.57%	73.51%	36.04%	90.67%	75.33%	24.67%	9.33%	55.74%	44.26%
NMMC	87	20734	39.65%	73.38%	36.27%	90.47%	75.86%	24.14%	9.53%	49.81%	50.19%
NMMC	84	10800	43.53%	68.64%	45.68%	95.85%	69.20%	30.80%	4.15%	55.90%	44.10%
NMMC	78	22398	39.00%	80.16%	24.75%	93.07%	81.27%	18.73%	6.93%	65.29%	34.71%
NMMC	65	26634	39.65%	75.08%	33.19%	92.57%	76.98%	23.02%	7.43%	51.34%	48.66%
NMMC	15	7590	37.46%	76.29%	31.07%	93.53%	78.15%	21.85%	6.47%	49.46%	50.54%
NMMC	14	10834	35.69%	78.02%	28.17%	92.63%	78.84%	21.16%	7.37%	67.72%	32.28%
Panvel MC	Kharghar (CT)	80612	38.89%	75.72%	32.07%	88.18%	78.96%	21.04%	11.82%	51.58%	48.42%
Grand Total		692572	39.31%	75.58%	32.68%	92.78%	77.10%	22.90%	7.22%	56.66%	43.34%

Source: PCA, 2011

4.4.5.5 Gender

While most of the wards have a higher literacy rate than the national literacy rate and the national female literacy rate, the female workforce participation does not exceed 30%, even when Mumbai and the surrounding region is one of the most developed urban regions in the country. The literacy rates and the workforce participation rates in all the wards are more or less in line with the rates of their respective municipal corporations.

Table 4-13Gender Disaggregated Profile of Study Area

Attributes	% Male	% Female
% Population	51.0	48.96
% Literacy rate	53.64	46.36
% Total WPR	75.58%	32.68%
% Main Worker	77.10%	22.90%
% Marginal Workers	56.66%	43.34%

Source: PCA, 2011

4.4.5.6 Social Infrastructure

Drinking-Water

As the study area lies in the Mumbai Metropolitan region, most of the population in the wards receives a regular supply of drinking water through government-supplied taps. There are provisions taps in public as well as a connection in the house. People also use bore wells and tube wells for water.

Banking Facilities

Commercial banks, public banks as well as cooperative banks are available in the study area for people's use and everyone has to access to them. The average distance to travel to any bank for the population in the study area is around 5 km.

Electricity

The study area receives a regular electricity supply for domestic and commercial use. Electricity supply is reported to be available throughout the day in all seasons.

Kharghar is a residential and commercial hub with an established social infrastructure while CBD Belapur was developed as the central business district (CBD) for Navi Mumbai. Navi Mumbai has witnessed strong commercial developments with many large corporate houses like Hindustan Uniliver, L&T and Reliance among others operating from here.

In Navi Mumbai, the transmission line passes alongside schools, hospitals and other buildings. At certain locations, the line has to cross over the Pune- Mumbai Expressway as well to go into Nerul. The line also passes over train stations like Nerul, and Vashi and some intermediate train routes. One of the transmission towers is going to be erected in the area of the Vashi Bus Depot.

The areas of Chembur and Vikhroli also have stable social infrastructure that has been providing social care to the residents for a long time. Hospitals, schools, universities are a major part of this social infrastructure. Various research institutes also fall under this area.

4.4.5.7 Common Property Resources

The transmission line passes through the Vashi Creek as well as the Thane Creek. Both of these creeks are classified under public control however, fishing activity is carried out in the Vashi Creek. There are existing transmission line passing through the Vashi Creek area, the KVTPL line will run parallel to these.

4.4.5.8 Sensitive Receptor along the Alignment within AOI

Potential Area of sensitivities along the alignments includes nearby settlements and houses located near the ROW corridor, agriculture fields.

- The alignment does not pass through any private land. However, locations of KVTPL towers T18 and T19 go close to a residential settlement area.
- The LILO line passes through salt pans at tower locations 5, 6, 7,8, 9 10,11,12, 13, 17, 18, 19, 20& 21 which could become sensitive for the workers.

4.5 Cultural and Heritage Site

The Navi Mumbai Municipal Corporation, under the mission of greening the city, has converted barren roads under existing transmission lines into public parks and jogging tracks. These not only add to the beauty of the place but also serve as a cultural spot for people living in the area. The transmission line passes through these parks wherein the towers would be erected. This would require cutting down the floristic trees and shrubs planted in the jogger's park of the ROW.

The Thane creek area has been converted into a wildlife sanctuary that hosts flamingos in huge numbers. This doesn't only attract wildlife enthusiasts but also other tourists to the creek. This place acts as a major cultural site along with a site of ecological importance. The transmission line would have to go through the creek as well.

4.6 Details of Community Consultation

Consultations carried out in the influence area of the transmission line have been limited in number. It could be ascertained from the primary survey and observations that most of the people in the study area depend on occupations other than agriculture and industries. This includes work in the service sector, construction, small business and shops, etc. The modes of transportation used by people include public transport like local trains, buses, etc. as well as auto-rickshaws and other private modes like cars, two-wheelers, etc. Amenities like drinking water, sanitation, etc. are provided in the influence area by the municipal corporations of Mumbai, Navi Mumbai and Panvel. Many primary and secondary schools, colleges, other educational institutions, both private and government-run, are present in the influence area. Private hospitals, clinics, dispensaries, etc. and other health-related facilities are present in the influence area of the transmission line. Places of religious and cultural importance like temples, cinema halls, theatres, etc were also visible in the influence area.

It was noted through the primary survey and observations that the land on which the transmission tower is to be erected is public land, hence, compensation for the use of this land was not given to any private entities. Ownership of the said land is still with the public and would be open for public use.

5. Anticipated Impacts and Mitigation Measures

This section identifies, predicts, evaluates and provides mitigation measures for the probable impacts on different environmental and social parameters due to the construction and operation of the proposed 400kV KVTPL transmission line. Survey and assessment of the existing baseline environmental and socio-economic scenario has been done through primary & secondary data collection, reviewing the process and as per the statutory requirements. The environmental impacts that the proposed project is likely to usher during construction and operation phases are identified and assessed in this section along with recommended mitigation measures. Superimposing impacts on the existing baseline scenario will enable the formulation of a suitable and site-specific Environmental Managemental Plan in the subsequent section of the report.

Identification of anticipated significant environmental impacts due to the activities during the preconstruction/detailed design, construction and post-construction as well as operation stages of the transmission line project was carried out using the checklist method during ESIA exercise. Such anticipated impacts without any mitigation measure had been characterized as being of varying intensities – minor, medium and major and were mostly adverse. Beneficial impacts were characterized as significant. During the ESIA study, the identification of significant environmental impacts due to the activities during various stages of the proposed transmission line was identified through a detailed matrix developed and presented in subsequent sections.

Identification of anticipated significant environmental impacts of the proposed project has been followed by the formulation of measures toward mitigating them. Enhancement measures for beneficial impacts have also been proposed. The mitigation measures, in addition to the regulatory requirements, have also taken into consideration the compliance requirements of environmental and social risk management standards/guidelines of Institutional Funding Agencies like IFC E&S Performance Standards and EHS Guidelines.

The alignment of the transmission line has been done in line with the statutory requirements under the Electricity Act and Central Electricity Authority, Ministry of Power and Ministry of Environment, Forest and Climate Change (MoEF), Gol guidelines. The alignment passes through an ecologically sensitive area such as forest, sanctuary and coastal zone. A part of the Study Area overlaps with Thane Creek Flamingo Sanctuary, a legally protected area and a key biodiversity area. Approximately 2.2 km stretch of the project alignment passes through the southern, western and northern part of the core boundary of the sanctuary, while 16.5 km of the project alignment passes through its proposed Eco-sensitive Zone, towards the west of the sanctuary.

As described earlier the emissions and discharges are only expected during the construction period. However, construction and demolition and hazardous waste would be generated during the election and string activities. In the case of operations emissions and discharges are negligible. Hazardous waste, E-waste and Battery waste would be generated through the entire lifecycle of the project.

5.1 Impact Assessment Methodology

Impact identification and assessment start with scoping and continues through the remainder of the process.

- Impact prediction: to determine what could potentially happen to resources/receptors because of the Project and its associated activities.
- **Impact evaluation:** to evaluate the significance of the predicted impacts by considering their magnitude and likelihood of occurrence, and the sensitivity, value and/or importance of the affected resource/receptor.
- **Mitigation and enhancement:** to identify appropriate and justified measures to mitigate negative impacts and enhance positive impacts.
- **Residual impact evaluation:** Evaluation of the significance and scale of the environmental impacts predicted to remain after the application of mitigation measures outlined in this ESIA study

5.2 Impact Criteria and Ranking

Once all project environmental aspects were comprehensively identified for the different activities of the project, the level of impact that may result from each of the activity-component interactions has been assessed based on subjective criteria.

For this, three key elements have been taken into consideration based on standard environmental assessment methodologies:

- Severity of Impact: Degree of damage that may be caused to the environmental components concerned;
- Extent of Impact: Geographical spread of impact around project location and corridors of activities; and
- Duration of Impact: Time for which impact lasts taking project lifecycle into account.

These elements have been ranked in three levels viz. 1 (low), 2 (moderate) and 3 (high) based on the following criteria provided in Table 5-1.

Table 5-1. Impact Prediction Criteria

Impact Elements	Criteria	Ranking
Intensity	 Impact resulting in long-term and/ or medium damage to the natural environment. Major impact on the community and occupational health (e.g. serious injury, loss of life) on account of accidental events and related operational activities. 	3
	 Impact resulting in short-term change and/or damage to the natural environment. Temporary loss of land, source of livelihood for affected communities Impact on terrestrial habitat, endangered species, drainage pattern and community resources. Moderate impact on occupation and community health & wellbeing (e.g. noise, light, odor, dust, injuries to individuals) 	2
	 Impact causing a temporary change in air shed, surface water quality, loss of some species etc. Limited impact on human health and well-being (e.g. occasional dust, odour, light, and traffic noise). 	1
Extent	Where the extent of the impact is beyond the AoI to cover impacts that affect nationally important environmental resources or affect an area that is nationally important/protected or have macro-economic consequences	3
	 Impacts extend beyond the area of influence to affect regionally important environmental resources or are experienced at a regional scale as determined by administrative boundaries. 	2
	 when impact due to the proposed Project-related activities is restricted within Area of Influence which has been determined as 5 km. 	1
Duration	 when impacts would occur during the development of the Project and cause a permanent change in the affected receptor or resource that endures substantially beyond the Project lifetime 	3
	 when impacts would continue for an extended period; this is based on the understanding that there will be the recovery of the effected environmental component to its best achievable pre-project state within 1 to 5 years 	2
	 when impact is likely to be restricted for a duration of less than 6 months; This is based on the understanding that there will be recovery of the effected environmental component to its best achievable pre-project state within 1 year; 	1

A positive or beneficial impact that may result from this project has not been ranked and has been depicted in the form of ++.

5.3 Impact Significance

The significance of impact has been determined based on a multiplicative factor of three-element rankings. Table 5.2 depicts impact significance in a scale of LOW-MEDIUM-HIGH and would be used for delineation of preventive actions, if any, and management plans for mitigation of impacts.

Impact significance has been determined considering measures that have been factored in the design and planning phase of the project. Legal issues have been taken into account, wherever appropriate in the criterion sets, to aid in KVTPL effort to comply with all relevant legislation and project HSE requirements. Additionally, the results of quantitative impact prediction exercise, wherever undertaken, have also been fed into the process.

Environmental and social Impact Assessment Report for Kharghar Vikhroli Transmission Private Limited (KVTPL), Maharashtra Table 5-2. Criteria Based Significance of Impacts

Severity of Impact (A)	Extent of Impact (B)	Duration of Impact (C)	Impact Signific	ance (A X B X C)
1	1	1	1	Negligible
1	1	2	2	
1	2	1	2	-
2	1	1	2	-
1	1	3	3	
1	3	1	3	Low
3	1	1	3	-
1	2	2	4	-
2	1	2	4	-
2	2	1	4	-
1	2	3	6	
1	3	2	6	
2	3	1	6	-
3	1	2	6	Medium
3	2	1	6	
2	1	3	6	
2	2	2	8	
3	1	3	9	
3	3	1	9	
1	3	3	9	
2	2	3	12	
2	3	2	12	High
3	2	2	12	- nign
2	3	3	18	
3	2	3	18	
3	3	2	18	
3	3	3	27	
Beneficial Impact -			++	Positive

The impacts on each of the environmental components and their significance during the different stages of the project are presented in Table 5.3 and discussed in detail in the following section. This is followed by a point-wise outline of mitigation measures recommended.

5.4 Residual Impacts

Residual impacts refer to those environmental and social impacts predicted to remain after the application of mitigation outlined in the ESIA. The predicted residual effects are considered for each Project phase (Construction, Operation, Decommissioning/post-decommissioning, and Unplanned Events).

Table 5-3. Antici	pated Imp	act of Impor	tant Environmenta	I Components	- Natural and Socie	o-economic E	Environment
	patea mip	act of impor		1 oomponents			

Environmental Aspect	Phys Enviro	ical nment		Phy	sico-Ch	emical E	invironr	nent		Ecolo Enviro	ogical onment				Human	Environm	nent			
Activity	Land Use	Topography & Drainage	Soil/ Sediment Quality	Air Quality	Noise & Vibration	Surface water resource	Surface water quality	Ground water resource	Ground water quality	Terrestrial Flora & Fauna	Aquatic Flora & Fauna	Aesthetic & Visual Impact	Job & economic opportunity	Social & Cultural Structures	Economy & Livelihoods	Infrastructure & Services	Resettlement	Cultural Resources	Community Health & Safety	Occupational health & safety
Pre- Construction Phase												L	E							
Obtaining of Right of Way Land by Company for transmission lines																				
Procurement of Land by Company for substation																				
Removal of Crops/ Trees																				
Procurement of Soil for filling of the sub-station land																				
Levelling and Compaction of the soil																				
Storage and Handling of Fuels (Unplanned Release)																				
Construction Phase																				
Building and operation of Construction camp and facilities																				
Strengthening and Widening of Access Road																				
Transport of Raw Material, Manpower																				
Development of Foundation for tower footing and substation																				
Erection of tower																				
Transport and installation of Equipment for Substation																				
Stringing of conductor																				

Environmental Aspect	Phys Enviro	sical nment		Physico-Chemical Environment						Ecole Enviro	ogical onment	Human Environment								
Activity	Land Use	Topography & Drainage	Soil/ Sediment Quality	Air Quality	Noise & Vibration	Surface water resource	Surface water quality	Ground water resource	Ground water quality	Terrestrial Flora & Fauna	Aquatic Flora & Fauna	Aesthetic & Visual Impact	Job & economic opportunity	Social & Cultural Structures	Economy & Livelihoods	Infrastructure & Services	Resettlement	Cultural Resources	Community Health & Safety	Occupational health & safety
Generation of Sewage and Discharge																				
Storage and Handling of Chemicals/Fuels (unplanned release)																				
Waste Handling and Storage																				
Testing and Commissioning																				
Operation Phase																				
Operation of Transmission Line																				
Operation of substation																				
Maintenance of Transmission Line																				
Maintenance of substation																				
Management of Non- Hazardous Waste (O&M)																				
Management of Hazardous Waste (O&M)																				

5.5 Impact Assessment (Detailed Design Construction and Operation)

5.5.1 Potential Impact on Land Use

Potential impact on land use during preconstruction and construction phase may arise due to below-mentioned activity

Construction Phase

- Obtaining Right of Way of land for transmission line
- Land lease for setting up a construction camp
- Strengthening and widening of the access road

Impact Due to Procurement of Land

The total land requirement for 400 kV and 220 KV transmission lines of this project are 6.56 acre. For the substation at Vikhroli end and Kharghar end existing sub-stations will be used and already procured.

The establishment of a transmission line will not be envisaged because a major part of the transmission line passes along the existing transmission line corridor. Also, in the mangrove area, suitable mangrove species will be planted.

Also, there is a no direct change of land use for the substation as the existing sub-stations will be used overall area involved in the project the impact on land use is considered negligible. The direct impact of the loss of agricultural land in case on substation and resultant livelihood impacts on landowners, the leaseholder has been dealt with separately in the socio-economic section

Intensity of Impact	1	Extent of Impact	1	Duration of Impact	3
Impact Significance = 3 i.e. Lo					

Mitigation Measures

The following measures will be implemented to mitigate the potential impact on land use.

- The land would be obtained limited to the tower footing and RoW required for the project as pe the norms stipulated in the IS Codes for different capacities of transmission lines. In case of substation land required would also take into consideration requirement for future expansions as per the guidelines.
- KVTPL would ensure all required clearance from the respective authority prior to taking possession of land for substation and transmission line;

Residual impact

With the implementation of the precautionary and the mitigation measures mentioned impacts on land use would be further reduced.

Impact Due to Land Lease for Setting Up Construction Camp

The land-use in the Study Area is dominated by habitation, mangrove forests and wetlands. So, there would be no option to set up the construction camp. Thus, there would be no permanent change in land use. Change in land use is assessed to be negligible.

Intensity of Impact	1	Extent of Impact	1	Duration of Impact	1
Impact Significance = 1 i.e. Ne	gligible				

Impact Due to Strengthening and Widening of Access Road

For the construction of the transmission line no movement of heavy vehicles is envisaged. Most of the equipment and material would be carried by tractor trolley or headloads, especially in Mangroves area and in a hilly area in Kharghar. Also, for the substation, transportation of the equipment e.g. transformer road need not to constructed as there is an exiting approach road for the substations. Thus, there is no impact due to strengthening and widening of the access road is assessed to be negligible.

Intensity of Impact	1	Extent of Impact	1	Duration of Impact	1
Impact Significance = 1 i.e. Neg	gligible				

Mitigation Measures

The following measures will be implemented to mitigate the potential impact on land use.

- Minimum required amount of land for strengthening and widening of access road would be taken during tower erection
- Forest/mangrove area land would be restored in the previous condition after the completed construction period.

Operation Phase

During the operation phase the following impacts are envisaged

• Long term change in land use due to the operational substation

The operation of the substation or transmission line is unlikely to have any impact on the land use.

5.5.2 Potential Impact on Topography and Drainage

Impact on land topography and drainage pattern would arise due to the below-mentioned activity

Construction Phase

• During tower erection

Impact Due to Filling of Land for Construction of proposed towers

In the case of sub-station, no filling or cutting is envisaged so the impact has been scoped out.

In the case of the transmission line, (5) nos of tower will be laid in Vashi Creek, flow of this drainage channel can have an impact on the flow of the creek. It is suggested to take all precautionary measures during the construction period and it	1	Extent of Impact	1	Duration of Impact	3
--	---	------------------	---	--------------------	---

will be done in low flow season. Intensity of Impact			
Impact Significance = 3 i.e. Lov	v		

Mitigation Measures

The following measures will be implemented to mitigate the potential impact on topography and drainage.

- Proper precaution will be taken during the pilling of tower foot in the Vashi Creek.
- Stormwater Drain outside sub-station boundary would be constructed to channelize the rainwater if required
- Regular cleaning of drains would be done to restrict the blockage in the drain, ensuring the free flow of water.
- In comparison to open cast foundation, Pile foundation needs to be done at creek locations. However, work has been awarded to the EPC agency and the actual cost for the same cannot be determined at this stage.
- Further, Route alignment has been finalised after a detailed survey and the minimum possible towers are being placed in Vashi creek.
- In order to protect the towers from erosion methods like epoxy coated steel, higher galvanization in towers is being adopted.
- The number to the tower will not be changed due to various alternatives.

Residual impact

With the implementation of the precautionary and the mitigation measures mentioned for the landfilling and to avoid or minimize impacts of landfilling would be negligible.

5.5.3 Potential Impact on Soil Quality

Construction Phase

The potential sources of impacts to soil and sediment quality due to the preconstruction and construction phase activities include:

- Storage and handling of Fuel
- Storage and handling of Fuel and Chemical
- Waste handling and Storage

Impact Due to Storage and Handling of Fuel and Chemical During Preconstruction and Construction Activity

Fuel (oil) used by the construction equipment would be stored within the substation site and the construction camp during the preconstruction period as well as construction activities to refuel the earth moving vehicle. Accidental release of fuel oil can contaminate the soil of that area and also can contaminate the groundwater. Soil contamination during the construction phase may result from leakage and spillage of oil, lubricants, fuel from heavy equipment or leakage from chemical/fuel storage Fuel, chemical or any other hazardous materials e.g. paints, solvents transformer oil are usually, as practice stored in the open. Leakage or spillage during handling can cause soil contamination. Maintenance of vehicle, equipment and machinery would cause accidental spillage Following measures would reduce the chances of accidental spillage of oil into an open area (soil) and associated impact is negligible.

Intensity of Impact	1	Extent of Impact	1	Duration of Impact	1
Impact Significance = 1 i.e. Neg	gligible				

Mitigation Measures

The following measures will be implemented to mitigate potential impact due to accidental spillage of fuel

- A drip tray would be used during the refueling
- Maintenance of earthmoving vehicle would be carried out in a designated place with concrete floor
- Oil, chemical Storage area would be covered and concrete floor and bund.
- Oil and the chemical container would be stored with secondary containment like dyke or embankment.
- Presence of adequate spill control kits & their appropriate use to contain and clean small spills and leaks
- The Contractor will prepare guidelines and procedures for immediate clean-up actions following any spillages of oils, fuels, or chemicals;
- A site-specific Emergency Response Plan will be prepared by the Contractor for soil clean-up and decontamination; and
- The construction contractor will implement a training program to familiarise staff with emergency procedures and practices related to contamination events.

Impact due to Construction of tower

The construction of the lattice structure tower for transmission lines would require the development of a foundation up to a depth of 2-4 m. At four legs of the tower, topsoil will be stripped, and foundations will be dug up to a depth of 2 - 4 m depending upon different technical considerations. If, the topsoil is not removed and reinstated properly impacts are envisaged on the soil quality due to the construction of the transmission tower. Further movement of the vehicle carrying men and material to the tower location over agricultural land can cause compaction. Moreover, in case of towers in the Thane Creek pile foundation would be used. Excavations are thus not envisaged., thus impact on soil is limited. Moreover, existing access roads and walkways would be used for the transportation of material to the tower footing area. However, in some tower footing, new approach road construction is envisaged. This can lead to compaction of the soil in Thane creek area.

The intensity of such impact is medium because the soil would regenerate over a period of time and is limited to a tower footing area. Thus, the impact is considered low. However, with these mitigations measure the intensity of the impact can further be reduced.

Intensity of Impact	2	Extent of Impact	1	Duration of Impact		
Impact Significance = 2 i.e. Low						

Mitigation Measures:

- Instead of constructing permanent roads and strengthening the pavement, it is suggested that flexible jute/coir matting be used for the construction of the road.
- Fuel storage and refueling areas, the area should be made impervious.
- Excess excavated material should not be dumped by the contractor on any adjoining vacant land or agricultural land. The excess excavated material to be stored at a specified location so that it can be reused wherever possible or used for strengthening of shoulders or other lower-order roads.
- Construction debris especially from concreting should be utilized in the backfilling wherever possible. All
 construction debris that cannot be reused should be disposed at pre-designated sites. No construction
 debris /muck (if any) shall be disposed of the mangroves area. The Contractor should identify a site for the
 temporary storage of the construction debris during the pre-construction in consultation with the local
 municipality. The PIU should be informed about the location.
- Vehicular movement over forest land and mangroves should be restricted.

Impact Due to Waste Handling and Storage

Soil may become contaminated due to improper handling and storage of waste. During the construction of the transmission line, MSW would be the bulk of the waste generated It is non-hazardous. Construction waste e.g. will comprise surplus or off-specification materials such as concrete, steel cuttings/filings, wooden planks, packaging

paper or plastic, wood, plastic pipes, metals, etc would also be generated. Large quantities of which would be recyclable or inert. However, some hazardous waste would be generated from both transmission lines e.g. Waste rags and cotton, in the case of substation empty transformer oil drums, waste lube from machinery, etc are hazardous waste. In addition, there are some possibilities of generation of e-waste from substation e.g., off-spec equipment or damaged equipment. These hazardous waste and e-waste and unless handled stored and disposed of properly can lead to contamination of soil.

Even though the intensity of such impact is high it is only limited to the construction camp and substation construction site. As the contractor is responsible for cleaning the site before decommissioning the duration is considered as low and the resultant impact is low. However, with these mitigations measure the intensity of the impact can further be reduced.

Intensity of Impact	3	Extent of Impact	1	Duration of Impact		
Impact Significance = 3 i.e. Low						

Mitigation Measures:

The measures in place to properly manage waste and thereby minimize any impacts to soil and sediment quality are:

- Design of processes to prevent/minimize quantities of wastes generated, and hazards associated with the waste generated;
- Batteries containing liquid shall be kept on impervious surfaces;
- Training labourers for waste segregation and disposal in designated areas and use of sanitation facilities;
- Segregation of hazardous and non-hazardous waste and provision of appropriate containers for the type of waste type (e.g., enclosed bins for putrescible materials to avoid attracting pests and vermin and to minimise odour nuisance);
- Proper storage of the construction materials and wastes to minimise the potential damage or contamination of the materials.
- Implementation of construction materials inventory management system to minimise over-supply of the construction materials, which may lead to disposal of the surplus materials at the end of the construction period.
- Storage of wastes in closed containers away from direct sunlight, wind and rain;
- Storage of waste systematically to allow inspection between containers to monitor leaks or spills;
- Contractor to carry out site clearance and restoration of the site to original condition after the completion of construction work; PIU to ensure that site is properly restored prior to issuing of construction completion certificate

Residual impact

With the implementation of the precautionary and the mitigation measures mentioned for the storage and handling of chemicals and to avoid /minimise impacts to soil/sediment the residual impact would be negligible.

Operational Phase

Potential impact on soil quality could arise due to:

- Accidental spillage of transformer oil from site and catch pit in substation;
- Surface runoff from spillage area into nearby agricultural land from substation.
- Maintenance of Equipment

The transformer oil would be stored at a designated area which will be paved. Thus, the contamination of soil can happen only due to accidental spillage of transformer oil. The surface runoff from the spillage site to nearby land may lead to contamination of soil.

During the operational phase, hazardous wastes generated from the substation would include small quantities of used oil, contaminated absorbent material, busted bulbs or tube lights, used parts, scrap and debris. The transformer oil is expected to be changed every 15 years and the waste oil is planned to be reused through authorized recyclers. E-waste (electrical parts, panels, etc. which will need replacement) and used batteries would also be collected and disposed of or recycled through authorized agencies. In addition, as all hazardous waste will be stored in covered areas which have a lined floor and with appropriate physical barriers for containment of spills, it is very unlikely to contaminate soil or underlying groundwater at site. Implementation of these embedded mechanisms, the impact on drainage and soils is expected to be Low.

Even though the intensity of the impacts arising out of the spillage are given the quantity of oil stored and the probability of the event occurring the significance is considered as Low.

The implementation of good housekeeping practices would minimise adverse impacts.

Intensity of Impact	3	Extent of Impact	1	Duration of Impact	1
Impact Significance = 3 i.e. Low					

Mitigation Measures:

The following mitigation measures are will be implemented:

- Ensure proper spill control and management at site;
- Monitor and detect any contamination on soil & groundwater;
- A designated waste storage area would be developed. This should have ab impervious flooring, bunded covered
- Good housekeeping to prevent spillage and runoff from the site.
- Obtain authorization for generation, storage and disposal for Hazardous Waste from the State Pollution Board and comply with the conditions mentioned in the authorization.
- Maintain record of the E-waste generated from the different facilities and provide an annual report to the Rajasthan State Pollution Board
- All transformers procured under the project should conform to the provisions of the Regulation of Polychlorinated Biphenyls Order 2016. CORE should ensure that the technical specification in the relevant bid documents of substation includes these provisions.

Residual Impact

Considering the implementation of the above-mentioned mitigation measures, the impact on soil quality is assessed to be negligible

5.5.4 Potential Impact on Air Quality

Impact on air quality may arise due to below mention activity

Construction Phase

- Transport of construction material including earth to proposed substation site
- Fugitive emission from earthwork in proposed substation and tower construction

Impact Due to Dust

During construction, the project is likely to generate dust (as particulates). There will be times during the construction phase especially during the construction of the foundation of towers and filling of soil at the substation to raise the height when elevated dust concentrations may occur. Higher amounts of dust will be generated at material handling and storage areas. A large percentage of such dust emissions from construction sites have been found to comprise particles that are coarse in size (>10 microns) and tend to settle down within 200 meters of the source of emissions. The smaller fractions (PM₁₀) can however be carried over longer distances in a dust cloud. In the case wind velocity is higher and depending on prevailing wind direction may be deposited in the adjoining settlements with a potential to cause soiling of residential premises, deposition on agricultural crops, etc. However, this will be a short-term impact lasting for a few months during the construction. Since the transmission lines avoid

settlement areas and the minimum RoW for 400 kV and 200 kV is 46 m and 35meter respectively, the intensity of impact is low.

Impact Due to Emissions

Heavy equipment such as DG sets excavators, cranes, and compactors would be used especially at the substation site. Emissions from these equipment and diesel generator sets used to generate power will cause impacts to ambient air quality. Transportation of construction material by tractor trolley and other transport vehicles will also contribute to exhaust emissions.

Since the number of vehicles plying would not be significantly higher due to dispersion impacts from vehicular emissions decrease rapidly with increasing distance from the source. As the foundation is done below the ground, and no building work/ cement work is done above the ground there will be no issue of dust and gas. Further, Work will be done impacting least to Air Quality. It is not expected to be significant at distances of more than 200 m from the source; they would not be significant. Moreover, these impacts would be limited to the construction period of approximately 21 months. Since these impacts would be restricted within the area of influence of the project the impact is of low significance.

The implementation of good construction practices would minimise adverse air quality impacts.

Intensity of Impact	2	Extent of Impact	2	Duration of Impact		
Impact Significance = 4 i.e. low						

Mitigation Measures:

To reduce dust impacts, the following measures would be put in place:

- Periodic water-spraying/sprinkling and sweeping of unpaved and paved roads to minimise dust and remove mud and debris. A sprinkling of water in dust-prone activities like transportation on the unmetalled road, digging works, material handling etc would be taken up.
- Covering of vehicles carrying dusty materials to prevent materials being blown from the vehicles while traveling;
- Ensuring any temporary site roads are no wider than necessary to minimise their surface area and thus the fugitive emission;
- Storing dusty materials away from site boundaries and inappropriate containment (e.g. sheeting, sacks, barrels etc.).
- If the residents and pedestrians complain about the dust and gas, the consultant of the supervision and contractors would reconsider the construction technique.
- Burning of wastes generated at the construction sites, work camps and any other project activity related site shall be strictly prohibited;
- All stockpile materials which are likely to generate airborne fugitive dust will be covered with canvas or plastic sheets during windy season.
- Storage of excavated materials in dumping/disposal areas designated for this purpose.

Exhaust emissions would be minimized as follows:

- Enforcing speed limits for vehicles to 20 km/hr on unmade surfaces to minimise dust entrainment and dispersion;
- Vehicles and machineries would be regularly maintained to conform to the emission standards stipulated under Environmental Protection Rules, 1986 and amendments thereafter.
- All fuels, oils and other chemicals would be stored in secure, sealed, labeled containers;
- Monitoring would be conducted for air quality parameters and in case the parameters are on borderline or exceed the environmental standards, stricter control measures will be adopted.
- Consideration would be made on using prefabricated materials where possible so that localised air pollution is minimised;
- Vehicles and equipment would be switched off when not in use;
- Avoiding fabrication work and shot/sandblasting work onsite.

Residual Impact

With the implementation of the precautionary and the mitigation measures mentioned for prevention/reduction of dust generation and exhaust emission, the residual impacts would below.

Operational Phase

Operational phase air quality impacts are not envisaged from the project.

5.5.5 Potential Impact Due from Noise and Vibration During Construction

This section identifies and evaluates the potential impacts of the project activities due to noise generation during construction phases, and formulates the measures to mitigate and manage the identified impact.

The main sources of noise at preconstruction and construction sites are as follows:

Construction Phase

- Movement of heavy earth moving vehicle during leveling and compaction of the earth at the proposed sub-station.
- Transportation of equipment.and construction materials
- Operation of Materials handling equipment, stationary equipment and other types of equipment etc.
- Traffic congestion due to stringing of the conductor.
- Operation of the Winching machine
- Piling of foundation for tower footing into Thane Creek Area

The construction activities such as transportation of raw materials for tower construction, operation of winching machine and construction machinery are likely to cause an increase in the ambient noise levels. The principal source of noise during the construction of transmission lines would be from the operation of winching machine during the stringing of transmission lines. The winching machine produces a noise level of more than 70 dB (A). This can cause disturbance to the settlement if located near (within 500 m) of the construction site. In the Thane Creek area, a winch-operated piling machine would be used for construction. This would produce noise in the range of 100 dB(A).

In all the areas except for the Thane Creek Area, the noise generated from the above-mentioned project activities is likely to be attenuated within 500m from the construction site. Since the line passes through the residential areas of Mumbai City and there are residential properties within/adjacent to the RoW so the impacts would be considerable.

Moreover, in the Thane Creek area winch operated piling would be carried out. The high noise levels would cause disturbance to the fauna in the area including migratory species. The construction activity will be a short-term activity. The scale of impact will be however high. The potential impact on noise quality due to above-mentioned construction activities is assessed to be Medium.

Intensity of Impact	3	Extent of Impact	1	Duration of Impact	2		
Impact Significance = 6 i.e. Me	Impact Significance = 6 i.e. Medium						

Operational Phase

The noise would be generated from the operation of transmission lines due to the corona effect, however, the same is not expected to cause any impact to the local community as it would mostly be head within the RoW. Similarly, in the case of substations noise would be generated from the operation of transformers, however, the same is not expected to cause any impact to the local community.

Mitigation Measures

During construction work, the management measures shall include in the first place, the use of state-of-the-art lownoise equipment wherever feasible. Material and equipment transportation vehicles shall ensure adoption of techniques for reducing noise generation including engineering control mechanisms such as installation of mufflers and speed reduction in the residential area, therefore the vehicle noise impact would be minimized. Other measures include:

- In the Thane Creek Area:
 - The piling would be limited to daytime only
 - \circ $\;$ No work of piling shall be carried out during the breeding or migratory season
 - The use of piling technology that produces less noise e.g. hydraulic Piling or vibratory piling may be explored.
- Noise generating equipment e.g. DG sets, winching machines should not be located near settlement to reduce the disturbance.
- Vehicle transporting construction material should avoid honking near settlements except for precautionary honking to alert the pedestrian/vehicles.
- Minimize the noise from construction equipment by using portable street barriers to minimize sound impact to surrounding sensitive receptors.
- Conduct noise monitoring/ inspection according to the Environmental Management Plan (EMP)
- As planned the work would be carried out during the daytime only. Only in case of emergency night work would be carried out.
- Noise limits for construction equipment to be procured such as front loaders concrete mixers, cranes (moveable), vibrators and saws will not exceed 75 dB (A), measured at one meter from the edge of the equipment in free field, as specified in the Environment (Protection) Rules, 1986.

Residual Impact

With the implementation of the precautionary and the mitigation measures mentioned for prevention/reduction in noise generation at source, impacts would further reduce.

5.5.6 Potential Impact on Surface Water Quality

Impact on surface water quality may arise due to below mention activity

Construction Phase

- Storage and handling of fuel
- Discharge of Sewage from Construction Camp
- Runoff corm construction site

Impact Due to runoff from construction site

The substation site would be raised using earth Thus, some amount of sand can be mixed with water and flow into the river, causing impacts like increased turbidity in the river water and change in sediment quality. However, return water would be channelized through a designated channel where a slit trap would be installed to trap the sand at the proposed site.

In case of the Thane Creek Area the vegetation clearance can cause run off from this area which can cause an increase in turbidity of the surface water in the water channels of the creek.

Since the impact would reversible but has the potential to impact the mangrove, along with the fact that it is a temporary activity, the impact on water quality like increased turbidity would not be significant.

Intensity of Impact	1	Extent of Impact	1	Duration of Impact	1			
Impact Significance = 1 i.e. Neg	Impact Significance = 1 i.e. Negligible							

Mitigation Measures

The following measures will be implemented to mitigate the potential impact due to sand filling.

- Return water would be discharged in the river through a designated channel.
- Silt trap would be installed before the commencement of sand filling/ clearance of vegetation in the mangrove area.

Impact Due to accidental leakage and spillage of Fuel and Chemical

Accidental release of fuel oil & chemical stored (transformer oil, paints and solvents) used at site can contaminate the surface water body. Fuel, chemical or any other hazardous materials would be stored at site and refueling of the earth moving vehicle and handling of chemical would be carried out by trained staff within a designated place. Hence chance of accidental spillage of oil would be very limited and a chance of contamination of river water due to mixing of surface run-off would be low considering the embedded prevention measures.

Intensity of Impact	1	Extent of Impact	1	Duration of Impact	2	
Impact Significance = 2 i.e. Lo	Impact Significance = 2 i.e. Low					

Mitigation Measures

The following measures will be implemented to mitigate potential impact due to accidental spillage of fuel

- Manual pumps would be used for the transfer of fuel during refueling
- A drip tray would be used during the refueling
- Maintenance of earthmoving vehicles would be carried out in a designated place with a concrete floor and bund.
- Oil, chemical Storage area would be covered and have an impervious or concrete floor and bund.
- Use of spill control kits to contain and clean small spills and leaks
- The Contractor will prepare guidelines and procedures for immediate clean-up actions following any spillages of oils, fuels or, chemicals;
- A site-specific Emergency Response Plan would be prepared by the Contractor for soil clean-up and decontamination; and
- The construction contractor will implement a training program to familiarise staff with emergency procedures and practices related to contamination events.

Impact due to construction of water intake station & unloading jetty has been delineated in the preceding section.

Impact Due to Discharge of Sewage

Sewage would be generated from the sub-station site and construction camp. However, it is proposed that sewage would be treated using a septic tank and soak pit at the construction campsite. Hence the impact significant is assessed to negligible.

Intensity of Impact	1	Extent of Impact	1	Duration of Impact	1			
Impact Significance = 1 i.e. Neg	Impact Significance = 1 i.e. Negligible							

Impact due to discharge of wastewater from construction activity

Wastewater from the construction activities e.g. discharge of piling activities, debris excavated, washing of concrete mixers, vehicles, etc are likely to pose a significant impact on the surface water quality if discharged without adequate treatment and mitigation measures. Further discharge of water would also increase the turbidity of the Thane Creek Area which can indirectly affect the ecological environment However, considering the construction activities to be of short duration and treatment of wastewater to be done before, the impact is assessed to be low and can be mitigated with following mitigation measures.

Intensity of Impact	3	Extent of Impact	1	Duration of Impact	1			
Impact Significance = 3 i.e. Lov	Impact Significance = 3 i.e. Low							

Mitigation Measures

- The effluent generated from the washing of equipment/miller wash would be stored and treated in a
 sedimentation tank, to be installed on a temporary basis, because chemicals may be used at the time of
 construction activity, washing the equipment. The effluent will be discharged following
 coagulation/flocculation and removal of supernatant (and their discharge in an environmentally sound
 manner) from the sedimentation tank to ensure that the turbidity of the water is not increased
- No debris from construction should be disposed of within the Thane Creek or in any intertidal zone
- Channelize all surface runoff from the construction site through the stormwater drainage system and provide adequate size double-chambered sedimentation tank;
- Oil leakage or spillage will be contained and cleaned up immediately. Waste oil would be collected and stored for recycling or disposal;
- Adequate sanitary facilities, i.e. bio-toilets toilets and showers, would be provided for the construction workforce;

Residual impact

With the implementation of the precautionary and the mitigation measures mentioned for the prevention of surface water contamination, the residual impacts would be negligible.

5.5.7 Potential Impact on Groundwater Resource and Quality

The potential sources of impact on Groundwater resources are as follows:

Construction Phase

- Extraction of water for Construction purpose;
- Extraction of water for domestic use by construction workers

Impact on Groundwater Resource

During construction, no groundwater would be used. So, no impact is envisaged on groundwater quality and quantity.

Considering both the availability of resources as week as the quality of water the scale of impact will be medium, the duration will be short term- only during the construction phase and extent of the impact will be localimmediate vicinity of the project site. The potential impact on groundwater resource quality is assessed to be low.

Intensity of Impact	1	Extent of Impact	1	Duration of Impact	1
---------------------	---	------------------	---	--------------------	---

Impact Significance = 1 i.e. Negligible

Mitigation Measures:

The Contractor needs to adopt the following measures to ensure that:

- Sourcing of construction and domestic do not result in stress and water competition with nearby communities:
- The Contractor shall make arrangement for drinking water which conforms to IS 10500; 2012 or bottled drinking water which conforms to IS 14543 (2004).
- In case the contractor uses groundwater for drinking purpose he shall install adequate treatment technologies for the purification and disinfection
- Permission from the Central Ground Water Board is required in case of abstraction of groundwater.
- Carry out the precautions especially related to fuel and lubricant presented in the above section to prevent any contamination of the groundwater.

5.5.8 Potential Impact on Ecology

The primary ecological concerns in transmission projects arise from the loss or degradation of near-natural habitats along with the attendant loss of provisioning services.

Construction Phase

The construction-related impacts of transmission lines and substation are expected from:

- Removal of Vegetation for transmission lines and substation
- Laying of approach roads
- Erection of transmission tower and bays
- Movement of Vehicles, machinery and people

Removal of vegetation

As a part of the project construction, the trees, shrubs and ground flora at the proposed tower locations will be cleared off for the construction of tower foundations and erection of towers. Tall trees along the transmission line route are to be cut for stringing of transmission wires.

 The removal of vegetation cover in the right of way (ROW) of the transmission corridor will result in indirect loss or fragmentation of hitherto contiguous habitats, especially in the reserved forest regions. The wildlife corridors connecting the various faunal populations in the region would be degraded due to habitat fragmentation. The loss of natural habitat will displace wild fauna currently using the Study Area, for feeding, roosting or nesting, to alternative sites supporting suitable habitat types, thereby increasing the pressures on such alternative sites in the short term and reduction in faunal populations in the long term. The clearing activities, in themselves, may result in death or injury to the ground organisms occupying the affected land areas. It has been enumerated that Approximately 2.2 km stretch of the project alignment passes through the southern, western and northern part of the core boundary of the sanctuary, while 16.5 km of the project alignment passes through its proposed Eco-sensitive Zone, towards the west of the sanctuary. KVTPL has obtained Forest Clearance as per the provisions of the FCA, 1980 However, removal of some mangroves will lead to a significant loss of a unique habitat, disruption of watercourses and wetlands and increase the risk of erosion and floods. Mangrove area, However, compensatory afforestation, mentioned in the Forest Clearance, which will minimize the extent of the impact. It is estimated 1367 nos of mangrove trees would be felled for the project which can lead to deterioration of the microhabitat of the avian species. However, to compensate for the loss of 1367 mangroves, about 15000 mangroves shall be planted at the cost of KVTPL. Since there would be considerable felling of mangrove the intensity of impact is considered to be high but compensatory afforestation will make the duration of impact medium Thus, in nature. once the regulatory permission takes care of the impacts and applied the suggested measure, the significance of the overall impact is medium.

Intensity of Impact	3	Extent of Impact	1	Duration of Impact	2		
Impact Significance = 6 i.e. Me	Impact Significance = 6 i.e. Medium						

Mitigation Measures

- Degradation and loss of habitats caused by the removal of natural vegetation could be minimized by removing only the most obstructive trees and shrubs and conserving the existing ground cover of the area as much as possible. There shall be no clearing of vegetation cover of lands that are not directly under construction footprints.
- Activities related to vegetation removal should be scheduled to avoid bird migration/ breeding season, i.e., winter.
- All the conditions mentioned in the Forest Clearance letter and direction of the Hon'ble Bombay High Court should strictly to be followed, as committed during the CRZ clearance process.
- The site clearance for tower erection and ancillary facilities shall be restricted only to the minimal area required for the respective purposes. The route alignment and width of the ROW should not be changed. For any changes required to be made in the layout plan, prior approval of the central government should be obtained.
- The adverse impacts of vegetation removal could be mitigated through implementing compensatory
 plantations. The species which are removed should be planted in their original proportions and should
 include species of shrubs, climbers, herbs, grasses, mangroves and bamboos that are currently forming
 the natural vegetation in the region. The cleared slopes could be seeded with propagates or seeds of
 quick-germinating species to help arrest soil erosion. After completion of the stringing work, natural
 regeneration of dwarf species will be allowed and maintained in consultation with the Forest Department.
- All such plantations should be done in accordance with the Compensatory afforestation scheme prepared by the State Forest Department and guidelines mentioned in CRZ and Forest clearances.
- To mitigate the impacts of the loss of bird nesting sites, alternate habitats for avifauna could be created and maintained. Such habitats can be made in the forest areas and human settlements adjoining the forest area through the installation of artificial nests made of eco-friendly material. All these activities to be carried out in association with the concerned forest office.
- To avoid adverse impacts of soil erosion and inducing unnatural sediment loads in the water channels, a temporary containment wall could be installed in Thane Creek Area.

Laying of approach roads

During the construction phase of the project, a few temporary approach roads will be prepared by temporary matting as suggested in CRZ clearance. The laying of mats of surfaces within the Study Area will temporarily hinder or obstruct the percolation of water into the ground. However, it will be only happened during the construction phase for about 15 - 20 days, thus the impact is low.

Intensity of Impact	1	Extent of Impact	1	Duration of Impact	1
Impact Significance = 1 i.e. Ne	gligible				

Mitigation Measures

- The impacts of road construction could be mitigated by limiting the number of roads to the least possible, keeping the width of the road as narrow as possible and maintaining any existing natural vegetation along the road alignments as far as possible.
- Wherever possible, temporary road mats or ground protection mats should be used.
- The construction material used for roads, maintenance and uninstallation of roads should be done as per the Forest Clearance guidelines.

Impacts due to erection of Transmission Tower

During the construction activities excavation at approximately 3m depth and min 4m X 4m to max 8m x 8m is done for the erection of the foundation. As a practice, the excavated soil is stored around the excavation as a sort of

bund. There are chances that mammalian species e.g. spotted deer, sambar, wild pigs etc., as well as domesticated livestock, can fall into these excavations and get hurt. Since these excavations would be for a short period of time e.g., 10-15 days the duration is low. However, several towers would be erected near each other exposing the animals passing through the area to greater risk. Thus, the extent is medium and collectively the impacts are of medium significance.

Intensity of Impact	2	Extent of Impact	2	Duration of Impact	2		
Impact Significance = 8 i.e. Me	Impact Significance = 8 i.e. Medium						

Movement of vehicles, machinery and people

During the construction phase, regular movement of vehicles, machinery and people will be there.

- The movement of vehicles and heavy machinery over the land surface not only exposes the natural environment to vehicular emissions and unnatural levels of noise, light and vibrations but also dislodges fine soil particles creating dust. The movement of heavy vehicles causes the compaction of the soil substrates. These effects lead to pollution of natural resources, injury or death of soil organisms,
- The presence of vehicles, machinery and construction workers causes visual and auditory disturbance to the wild fauna in the area.
- A few non-native plant species recorded in the Study Area are known to exhibit invasive behaviour. The
 movement of machinery and people during the construction phase are likely to increase the potential of the
 establishment of invasive species in the new areas. An increase in the spread of these species in natural
 habitats will lead to degradation of natural native vegetation and pose threat to habitat-specific faunal species,
 specifically in the protected areas.
- As per the present project plans, night-time works is not envisaged however in the case of night-time work special attention has to be paid to the movement of vehicles.
- The movement of vehicles will be only happened construction phase for about 15-20days. Thus, the impacts are thus considered low in nature

Intensity of Impact	2	Extent of Impact	2	Duration of Impact	1			
Impact Significance = 4 i.e. Lov	Impact Significance = 4 i.e. Low							

Mitigation Measures

- To reduce the impacts of soil compaction and rutting of soil the movement of vehicles should be strictly restricted to pre-designated routes.
- To control the impacts of increased emission, vehicle emissions should be checked and maintained within
 prescribed standards. For heavy machinery, there shall be strict adherence to all standard dust, noise and
 vibration mitigation measures.
- Project personnel needs to be educated to not spreading any plant seeds intentionally.
- Ensure proper barricading across the excavation with Plastic mesh and LED flashers especially in areas where there are a known movement of wildlife
- In case any wildlife is trapped in an excavation, contractors should be made aware not to harm the animal and intimate the Wildlife Division or Forest Department for its rescue.

Residual Impact

With the implementation of the precautionary and the mitigation measures mentioned the impact on ecology during the construction would reduce considerably

Operation and Maintenance Phase

The impact on the operation phase would be primarily from:

- Physical presence and operation of the transmission system and Bird collision from transmission lines
- Right-of-Way Maintenance

• Impacts from Illumination from substation

Physical presence and operation of transmission system

The physical presence of permanent structures, such as the transmission towers and their ancillary components, as well as, the transmission line system will persist throughout the operation phase of the project.

- The principal direct risk posed by the operational transmission line and its ancillary structures to avifauna is the potential for individuals to be injured or killed, either by collision with erected towers or by entanglement with power cables, leading to electrocution. Bird mortality due to collision with ground wire and conductors of transmission lines are common issues
- Amongst birds, raptors, which are relatively large-sized birds adapted for soaring and relatively less capable of maneuvering in flight, and migratory waterfowl, which tend to carry out migratory flights during the night when they are unlikely to spot and avoid transmission line, are the two groups of birds which are especially vulnerable to collision risk in the operation phase. A part of the ROW is overlapping with the Thane Creek Flamingo Sanctuary known for the presence of significant numbers of migratory waterfowl. Also, the study area is very likely to be situated in the annual cyclical flightpaths of the various winter, summer, passage migratory or nesting birds migrating either to or through the region in which it is situated. Moreover, in and around the project area globally significant concentration of migratory species i.e. Lesser Flamingo will be recorded from Thane Creek Flamingo Sanctuary area. However, in the case of 400 kV lines since the electrical separation is 8m respective it is more than the wingspan of large birds e.g. lbis, Egret, Black Kite, Open billed stork found in this region.
- The wingspan of these birds is between 1.5m-3m, which is less than the gap between two vertical wires (8m). Thus, the electrocution risk due to direct contact with conductors is low. Further, the KVPTL has agreed to install the bird reflector on the portion passing through the Thane Creek Sanctuary area. As noted during the ESIA studies, there are 5 existing transmission lines i.e. 220 KV Bhira- Dharavi, 110KV Khopoli – Mankhurd, 110 KV Khopoli – Chembur, 220 KV Trombay – Sonkhar, 220 KV Thrombay – Tifil which passes through the Study Area and which has formed a power transmission corridor. These existing transmission lines share common topography and aerial envelop of the Study Area considered for the proposed 440 KV transmission line. The physical presence of existing and proposed project infrastructures is likely to act as an obstacle and physically hinder of the aerial faunal species of the area. As per Thane Creek Flamingo Sanctuary Management Plan of Maharashtra Forest Department (2020)⁶, that there is a high possibility of birds getting hit by the transmission line and in the case of Flamingo, due to their large body size and heaviness, on spotting transmission lines they are unable to change its trajectory of flight quickly. Thus, to reduce the bird hits and mortality risk on Flamingo, the Maharashtra Forest Department suggested for installation of bird diverters on the transmission lines passing over the Thane Creek Flamingo Sanctuary. However, during the field survey no such collision/electrocution of birds has been noticed and reported from local consultation and also no such reports have been found in the public domain. Since the regulatory permission (Forest Clearance, Wildlife Clearance, CRZ Clearance) takes care of the impacts and KVTPL has agreed to implement the suggestive mitigation measures by Forest Department as embedded mitigation measures, the intensity of this impact is considered to be medium.
- The dumping ground located at Kanjurmarg that forms a part of the Study Area is recorded and reported for the presence of large numbers of raptors, though the major populations observed were of Black Kite (*Milvus migrans*), a least concerned species. However, they have a habit to frequently perch or nest on transmission towers. Thus, risk of electrocution, perching by some raptor species in the project area, thus cannot be eliminated and cause a high impact. However, in all three transmission lines will be passed through mostly the forest patch area, so, due to the presence of alternate perching areas i.e. forest land, the perching on the transmission line will be low.

Thus, the overall significance is considered medium.

Intensity of Impact	2	Extent of Impact	1	Duration of Impact	3			
Impact Significance = 6 i.e. Me	Impact Significance = 6 i.e. Medium							

Mitigation Measures

⁶ https://mangroves.maharashtra.gov.in/Site/SiteInfo/Pdf/MPTCFS_FEB21.pdf

- As indicated in the Baseline a Critical Habitat Assessment would be carried out by KVTPL once the project is approved by the lender. The species which are presented in IUCN species list would be assessed as part of the assessment.
- ٠ Monitoring of bird collision risk before/after establishing the transmission line: The population of migratory as well as resident birds should be monitored seasonally at the existing transmission line or once the line has been established. Any incidents or bird hits should be reported, and location-specific mitigation measures should be employed. Before establishing a transmission line, "bird-use" areas should be identified to guide the appropriate routing of the transmission line. In places of birds use or collision risks, if any, the transmission line should be rerouted in such a way that important habitats are avoided or install Bird Flight Diverters/bird flapper. Bird Flight Diverters/bird flapper should be installed Thane Creek area and in the area of Flamingo Sanctuary area and mangrove forest area. Also, monitoring of birds perching, especially raptors species, should be recorded after construction of transmission line and "high birds perching" area should be identified. To reduce the possible electrocution due to birds perching "Raptor Perch Deterrent Devices or Anti Perch Devices" like Pole Cap/ Cone, Bird Spider, Bird Spikes. Apart from that installing elevated perch with perch guard, perch guards on the post insulators to discourage perching on the insulators, insulate tension members on transmission tower arms, Suspend conductors below crossarm, installation of Swan Flight Diverter (SFD) on the phase conductor or wrap on a conductor will prevent physical contact with the bird's head and reduce or eliminate bird collisions
- The potential risk of collision and electrocution of faunal species could be reduced through designing the
 project layout to provide adequate spacing of 1.5 meters (60-inch) between energized components and
 grounded hardware will be maintained or, where spacing is not feasible, covering of energized parts and
 hardware should be done.
- Removing any carcasses from the site, thereby avoiding attracting scavenging raptors such as vultures, into the area.
- Instituting appropriate storm-water management measures, thereby avoiding the creation of potential migratory waterfowl habitats, such as pools or bogs, within the ROW.

Right-of-Way Maintenance

Regular maintenance of vegetation within the ROW is necessary to be done to avoid disruption to overhead power lines and towers and to evade the ignition of forest fires.

- Periodical removal or pruning of the vegetation, especially the trees and tall shrubs within the ROW, is likely to lead to complete loss or degradation of habitats of avifauna and also likely to limit the provisioning services being supplied by the concerned area.
- Regular maintenance related to the clearing of woody flora within the ROW is likely to limit the regeneration of such species, which may ultimately result in alterations in the natural succession process and an increased likelihood of the establishment of invasive species.

Intensity of Impact	2	Extent of Impact	1	Duration of Impact	2		
Impact Significance = 4 i.e. Low							

Mitigation Measures

- To mitigate the adverse impacts of ROW maintenance through clearings, it is recommended to implement an integrated vegetation management approach (IVM) in the operations. Felling/pollarding/ pruning of trees within ROW will be done with the permission of the local Forest Officer.
- The selective clearing of tall-growing tree species and encouragement of low-growing shrubs, herbs and grasses should be done. Vegetation maintenance should be kept limited to pruning and not to be removed completely.
- The use of machinery for vegetation maintenance should be strictly avoided and it should be done manually as far as possible.
- The use of herbicides to control fast-growing plant species within the ROW should be prohibited. Such species could be controlled through manual weeding.

5.5.9 Socio Economic Impact

Loss of Land

The land on which the project is to be constructed is public land, forest land or land belonging to bigger private entities. As indicated earlier in this report some private property is within the RoW of the transmission line. Since the line passes along Mumbai city, the Row at times is constricted. As observed during site assessment three structures. These structures were reported to be Temple and Public toilet & waiting area, located between 16A - 17A and 18A - 19A. Reportedly, none of the structures will be resettled. Measures such as design modification e.g. special tower design, tower extension and adequate electrical clearance will be maintained, etc have been used to reduce the impact zone of the transmission line.

As there is no need for resettlement. No private residential land thus be used for the project. Hence the impact significant is assessed to medium. Thus, the intensity and duration are high, resultant the impact is medium.

Intensity of Impact	2	Extent of Impact		Duration of Impact	3
Impact Significance = 6 i.e. Medium					

Mitigation Measures

- The transmission line is laid as per standards keeping all safety clearance from the ground and nearby objects and thus residential settlements and salt pans will not be affected.
- There is no involvement of residential area, displacement of people, involvement of the main habitat in any dense population. These ensure the respective health and safety.
- Adequate electrical Clearance will be maintained.

Residual Impact

With the implementation of the precautionary and the mitigation measures mentioned above impacts due to land, procurement would be low.

Influx of Labour

The project will require 300 workers for construction. The unskilled labourers were recruited. As the project area in metropolis major numbers of worker will migrant labour. A gang of 10-15 workers was clubbed in one unit for foundation and erection work. As the construction in one location is completed, they move toward the next location.

Some of the significant issues related to migrant labour would include:

- Conflict amongst workers, and between workers and local community, based on cultural, religious or behavioural practices.
- Discontent amongst the local community on the engagement of outsiders.
- Security issues to local women from the migrant workforce.
- The use of community facilities such as health centers, temples, transport facility, etc. by migrant labour may lead to discontent with the local community.
- In case contractors bring in unskilled migrant labour, there stands the risk of exploitation of a labourer. This can happen in the form of hiring underage labourers, low and unequal wage payments, forced labour and discrimination on basis of the basis of caste, religion, or ethnicity

Existing Measure

- The EPC contractors engaged for the project are responsible for ensuring adequate accommodation facilities
 for the labourers
- Thermal scanning for all worker prior to entering the premises for prevention of any infectious diseases
- Provision of safe drinking water and toilet facility for the workers

Mitigation Measure

 Adequate monitoring should be undertaken to ensure the contractor's compliance to the applicable rules and regulations and provisions of the contractual agreement and construction phase ESMP for the remaining duration of construction

- health screening of migrant workers,
- Strengthen security personnel around labour camps in order to maintain adequate law and order and avoid any possible tensions between the migrant workforce and local community.
- Each worker and employee shall be provided health and safety training as part of the induction process
- Create a labour management plan that will contain provisions to ensure non-discrimination and fair treatment for all workers. The labour influx management plan will also dictate the requirement of workers at different stages of the construction cycle, thereby helping in the management of employment issues.
- Access of local community and labourers to the grievance redressal mechanism for the project;

The impacts described above are primarily within the RoW or would only extend to the settlements near the transmission line, therefore localize in nature. Moreover, conflicts of the migrant labour with the community would be temporary. In addition, a planned labour camp for this project may further reduce the assessed potential impacts related to labour influx. Thus, socio-economic impact during the construction phase of the transmission lines is evaluated to be of low significance.

Intensity of Impact	2 Extent of Impact		1	Duration of Impact	1	
Impact Significance = 2 i.e. Low						

5.5.10 Potential impact on Community Health and Safety

The impacts envisaged during the construction phase on the health and safety of the community adjoining the worksite include:

Construction Phase

- Deterioration in environmental quality due to construction activities;
- Increased prevalence of disease arising from the influx of construction workers; and

Impacts due to deterioration of Environmental quality parameters

During the construction activities deterioration of the environmental conditions can be experienced by the local community in terms of increased dust, contamination of surface water or groundwater and high noise levels due to the operation of construction machinery.

Reduction of air quality may potentially lead to health impacts associated with respiratory problems eye irritation and general disturbance to daily activities. Similarly, discharges of wastewater from construction and discharge of domestic waste effluent from sanitary facilities for construction workers have the potential to cause contamination of surface water and groundwater resulting in gastro-intestinal problems of the community surrounding the construction sites.

Even though the intensity of the impact is medium the extent of the impact is low as there would be isolated houses adjoining the RoW. It may be noted as a design principle transmission lien avoids larger settlements. Further, since the impacts would be limited to the construction stage only the significance of the impacts are low.

Chances of increased prevalence of Disease

A total of 300 workers will be employed for the construction phase during the peak construction and commissioning. This influx of workers to the community may cause an increase in cases of communicable diseases or pandemics which may put pressure on existing health infrastructure. There is also the possibility of an increase in sexually transmitted diseases such as HIV/AIDS as a result of the expected influx of workers to the area. In addition, vector-borne diseases will be sensitive for settlements closer to campsites for the construction phase labour, particularly due to lack of hygienic conditions.

The impact on community health and safety during the construction phase is evaluated to be of minor significance due to the low density of population in the immediate vicinity of the corridor or campsite.

Intensity of Impact	2 Extent of Impact		1	Duration of Impact	1
Impact Significance = 2 i.e. low					

Mitigation Measures

To reduce Vector-Borne Diseases: The Contractor shall ensure that proper practices are in place to

- Avoid the spread of infections and diseases, the proliferation of mosquitoes, flies, rodents and other pests:
- No untreated wastewater is discharged from the construction camps.
- Treated discharge from the camp does not accumulate i.e. proper drainage is maintained for the water to flow.
- Solid Waste is not dumped into the adjoining areas but is handed over to the nearest municipal corporation for disposal

Operation Phase

During the operation of the transmission line and substation Electro Magnetic Field (EMF) created by the transmission line can cause inconvenience to the surrounding community. This has been reported during the consultation that the people feel inconvenienced due to this charge especially when working on the field underneath the conductors or passing under the conductors especially during the monsoon season.

There have been some concerns about the possibility of an increased risk of cancer from exposure to electromagnetic radiation from overhead transmission lines. However, a review by the World Health Organization (WHO) held as part of the International EMF Project (1996), concluded that "From the current scientific literature there is no convincing evidence that exposure to radiation field shortens the life span of humans or induces or promotes cancer".

Intensity of Impact	3	Extent of Impact	t of Impact 1 Duration of Impact		1		
Impact Significance = 3 i.e. low	Impact Significance = 3 i.e. low						

Mitigation Measures:

The proposed mitigation measures are as follows:

• Education of the community regarding the effects of the electromagnetic field is important

5.5.11 Potential Impact on Occupational Health and Safety

The impacts envisaged during the construction phase on the occupational health and safety of workers is the following:

Construction Phase

- Working at heights during the erection of transmission tower and stringing of the conductor, erection of gantry, etc;
- Electrocution during testing and commissioning

Impact Due to Fall from Height

The occupational risk related to the construction of transmission lines and substations is primarily due to falling from heights which might cause serious injuries. Transmission towers would be of different heights and the minimum height of the tower would be 44.35 m in the case of a 400 kV transmission line. A review of the incident database (OSHA's Integrated Management Information System (IMIS) database)⁷ indicates most of the incidents are due to falls from height while some incidents reported also include being struck by loads or falling objects during the erection of the tower. Similarly, there are risks of fall in the excavation created for tower footing.

Impacts of electrocution during the testing and charging

It has also been reported (OSHA's Integrated Management Information System (IMIS) database) that there have been fatalities due to electrocution. This occurs primarily during the testing and charging of the transmission lines if proper safety procedures are not followed.

⁷https://www.osha.gov/laws-regs/federalregister/2015-04-15-0

The duration and extent of the construction phase will be short but any possibility of the occurrence of any hazard will lead to adverse impacts that could range from loss of productive time and even fatalities. Hence the impact significance will be moderate.

Intensity of Impact	3	Extent of Impact		Duration of Impact	2	
Impact Significance = 6 i.e. Medium						

Mitigation Measures:

The measures would be in place to minimize the health and safety impacts to personnel from general construction activities include:

- Measures would be implemented to reduce the likelihood and consequence of the following hazards:
 - falling from height;
 - tripping over long-term obstacles or short-term obstructions;
 - contact with dangerous substances;
 - electric shock;
 - mistakes in operation;
 - variable weather conditions;
 - lifting excessive weights; and
 - traffic operations.
- Competent and adequately resourced sub-contractors would be used where construction activities are to be sub-contracted;
- All persons working on-site will be provided information about risks on Site and arrangements would be made for workers to discuss health and safety with the Contractor;
- All workers would be properly informed, consulted and trained on health and safety issues;
- Before starting work all the appropriate safety equipment and the first-aid kit would be assembled and checked as being in working order.
- All lifting equipment and cranes would be tested and inspected regularly. All hoistways would be guarded;
- All scaffolds will be erected and inspected, and the appropriate records maintained by the Contractor;
- Safety hoops or cages would be provided for ladders with a height in excess of two meters;
- The Contractor shall provide appropriate safety barriers with hazard warning signs attached around all exposed openings and excavations when the work is in progress.

Residual Impact

With the implementation of the precautionary and the mitigation measures mentioned above impacts would be negligible.

Operation Phase

During the operation phase and maintenance of the electrical equipment at the substation, the workers would also be exposed to the risk of electrocution unless the standard procedures related to electrical maintenance are followed. Since procedures are existing the impacts are low, but the inexperience and lack of knowledge and training can cause severe impacts. Thus, the impact of occupational health and safety is of medium significance.

Mitigation Measures:

The following precautions would be taken:

• Induction training has to be carried out for each of the new employees (temporary/ permanent/ contractual). They have to undergo refresher training once a year on OHS aspects

 All near misses have to be reported to the system. All injuries and fatalities have to be reported as per the Railway's systems and labour laws.

5.5.12Potential Impact on Aesthetics

The sources aesthetics and visual impacts can result from:

Construction Phase

- Erection of transmission tower
- Storage of Construction Material and Waste

Impact Due to Erection of Structure at substation and Transmission tower

Potential impacts to aesthetics and visual quality because of setting up transmission tower and substation may arise primarily due to disruption and degradation of views in the surrounding landscape. Visual impacts from transmission lines are highly variable and depend on several factors like location of the project, lines of sight, scenic vistas and most importantly the perception of individuals. With the study area, not being recognized as a place of natural scenic beauty or a tourist destination, these factors are unlikely to lead to any significant adverse visual and aesthetic impacts. Thus, visual impacts can be rated as low.

Intensity of Impact	2	Extent of Impact 1 Durat		Duration of Impact	2	
Impact Significance = 4 i.e. Low						

Impacts from Disposal of Waste

The disposal of construction waste and MSW from labour camp may lead to nuisance and visual impact of the nearby settlements if disposed of in a non-designated area.

In both the above cases the intensity of impacts is low due to the absence of any receptor near the transmission line. so the impact is considered negligible

Intensity of Impact	1	Extent of Impact		Duration of Impact	1
Impact Significance = 1 i.e. Negligible					

6. Environmental and Social Management Plan

6.1 Introduction

This section presents the Environmental and Social Management Plan (ESMP) for the proposed Project. The purpose of this ESMP is to specify the standards and controls required to manage and monitor environmental and social impacts during a different phase of the project life cycle, i.e. construction, operation phases. To achieve this, the ESMP identifies potential adverse impacts from the planned activities and outlines mitigation measures required to reduce the likely negative effects on the physical, natural and social environment. This is in accordance to IFC Performance Standards 1 that emphasizes the importance of managing social and environmental performance through the lifecycle of the Project.

6.2 Environmental and Social Management Plan

The environmental mitigation measures and plans are presented in form of a matrix according to the sequential flow of activities in the project life cycle. The matrix focuses on strategies to be adopted for the safeguard of the environment from possible impacts resulting from the project activities. The ESMP is provided in Table 6.1.

Table 6-1 : Environmental and Social Management Plan

SI. No.	Project phase/Activity	Potential impacts	Proposed mitigation plan	Responsibility
Planning and de	etailed design stage			
1	Planning/pre construct Transmission line through forest/ protected area / precious ecological area	Loss of precious ecological values/ damage to precious species	Careful selection of route alignment to avoid natural habitats (i. g. National Parks, Wildlife Sanctuary, Biosphere Reserves/ Biodiversity Hotspots)	Design Consultant
		Deforestation and loss of biodiversity edge effect	 Avoid transmission line/ tower in protected and reserve forest, by careful selection of alignment. If avoidance is not possible, minimise the land to be taken from forest Obtain Stage I and Stage II Clearance from the forest department. 	Design Consultant
		Tree felling permission	Permission for felling of trees to be obtained before tree felling	KVTPL
2	The line through identified migratory bird path and bird habitats and near water bodies	Risk to the bird population primarily due to collision	 Careful selection of a route to avoid such areas with known avian populations e.g. nesting grounds, foraging grounds, migration corridors, etc. Provide bird guards and markers [as per the specification provided in IS-5613 (Part-II)] in transmission line when passing through/near nesting grounds, foraging grounds, migration corridors, etc. 	Design Consultant
		Exposure to safety-related risks	 The transmission line will be designed as per IS 5613 (Par 2) to provide a setback from the dwelling area. 	Design Consultant
		Exposure to electromagnetic interference	 The transmission line would be designed considering international guidelines such as Commission on Non- lonizing Radiation Protection (ICNIRP), US National Council on Radiation, State Transmission Lines Standards and Guidelines in the USA, etc. 	Design Consultant
		Damage to private property	 Avoid settlement/hamlets within RoW Design modification and special towers, tower extension and adequate electrical Clearance will be maintained, etc have been used to reduce the impacts zone of the transmission line 	Design Consultant

		Impact on Cultural Heritage	 Careful selection of route alignment to avoid socially, culturally and archaeologically sensitive areas (i.e. sacred groves, graveyard, religious worship place, monuments, etc.); and Maintain a minimum distance of 100 m from archaeological monuments 	Design Consultant
Construction				
4.	Site preparation and construction work	Loss of topsoil	 Topsoil from the entire tower footing area (approx. 22 sq. m.) will be stripped (10 to 15 cm) before the commencement of construction work; Topsoil will be stored in a dedicated topsoil storage site, having adequate mitigation measures for preventing erosion due to runoff; Activities will be scheduled (as far as possible) to avoid extreme weather events, such as heavy rainfall; After construction work is over, topsoil will be reinstated at the construction site. 	Contractor
		Noise and vibrations	 All equipment/machineries to be regularly maintained to ensure efficient operation. DG sets with acoustic enclosure should be used. Construction work during the night-time (10 pm to 6 am) to be prohibited. In case of emergency work at night approval of Municipality is mandatory. 	Contractor
		Air Pollution	 Water sprinkling to be carried out twice a day during the dry season on the exposed surface area. Vehicles transporting loose construction/excavated materials shall be covered with tarpaulin sheets. Loose construction material/ excavated material shall be stored against any structure or would be kept covered with a tarpaulin sheet at the construction site. All vehicles utilized in the transportation of raw materials and personnel will have valid Pollution under Control Certificate (PUCC). 	

			 Regular maintenance of machines, equipment, and vehicles that will be used for construction activities of substation/tower construction. 	
5.		Water/Soil pollution	Soak pits/modular bio-toilets would be provided at all construction camp, laydown area and labor camp	Contractor
6.	Occupational Health and safety	Injury and sickness of workers	 Provide safety equipment's (PPEs) for construction workers; Prevent entry of unauthorized person at a construction site; Provide training on health and safety to all the workers. 	Contractor
7.	Line through areas having vegetation (trimming/cutting of trees/ vegetation clearance)	Loss of Vegetation	 Avoid felling of trees during stringing unless it becomes necessary. After completion of stringing, natural regeneration or dwarf tree/medicinal tree plantation would be allowed to heights as per the standards mentioned in IS: 5613 and Government of India Circular 7-25/2012-FC dated 5th May 2014. 	Contractor
8.	Line through Mangroves	Loss of Mangroves	 Use existing access roads wherever possible Compensation for as mentioned in CRZ clearance should be followed; 	KVTPL
9.	Community Health and Safety	Injury and sickness of local people	 Coordination with local communities for construction schedules etc; Barricading construction area; Placing reflective tapes on the boundary of the construction area; Undertaking regular health check-ups of the workforce and reporting any major illnesses at the earliest to Block health officer for disease control and surveillance; Creating mass and labour awareness on HIV and STDs; 	Contractor

10		Gender issue of the local community	 Awareness should be created among the migratory labour that they should not be entered in the adjoining area; Local resources should not be used by the labours. 	Contractors
11.	Health, Hygiene, Safety and Security of Workers in Labour Camp	Labour camp-related EHS and Hygiene Issues	 Facilities would be provided at the labour camp as per provisions of IFC Guidance Note on Worker's Accommodation 2009. Some of the relevant provisions to comply are as follows: Worker's accommodation; Provision of safe drinking water; Appropriate arrangement for cooking; Availability of medical facility (first aid); Security arrangement of the campsite; Arrangement to register and redress the grievance of workers. 	Contractor
12.	Community health and safety during operation	Injury/ mortality to public	 Barriers to prevent climbing on transmission towers Warning signs at transmission towers 	KVTPL
Operational Phase				
13.	Operation of transmission line	Collision of avifauna	Use of power line markers, which reduces bird collision by increasing the visibility of transmission line to birds.	KVTPL
14.	Uncontrolled growth of vegetation	Loss of vegetation	Periodic pruning of vegetation to maintain a minimum clearance of 4m between conductor and trees would (As per Government of India Circular 7-25/2012-FC dated 5th May 2014).	KVTPL
15.	Occupational health and safety of staff	Injury/ mortality to staff during O&M work	During the testing and charging of the electrical line, electricity insulating protective equipment like footwear (ISO 20345: 2004 Part-2), rubber gloves (IS 4770: 1991) would be provided to workers. In addition, provisions of the "Central Electricity Authority (Measures Relating to Safety and Electric Supply) Regulations 2010" would be adhered to. Induction training for the entire new employee and six- monthly refresher training for substation O&M staff would be organized.	KVTPL

Injury/ mortality from emergency situation

Preparation of fire emergency action plan and training KVTPL given to staff on implementing emergency action plan.

* Contractors are imposed with penalties in case of any default of norms during the supply & erection phase. During the construction phase, these activities are monitored by the KVTPL project team.

6.3 Environmental and Social Monitoring Plan

The monitoring indicators, the frequency for measurement and responsibility for monitoring for each of the migrations proposed in the management plan are described in Table 6.2. The monitoring of the EMP provisions would be carried out by the respective agencies at a frequency mentioned in the Environment Management Plan.

Table 6-2: Environmental and Social Monitoring Plan and Responsibility

SI No	il No Project Po phase/Activity		Parameter to be monitored/indicator	Monitoring frequency	Responsibility
Pre-construct	tion				
1.1		Exposure to safety-related risks	Setback distances to nearest dwelling units	Once during detailed design	KVTPL subdivision/Division/Circle
1.2		Exposure to electromagnetic inference	Electromagnetic field strength for proposed line design	Once during detailed design	KVTPL subdivision/Division/Circle
1.3		Damage to private property	Distance from nearest dwelling units	Once during detailed design	KVTPL subdivision/Division/Circle
1.4	Felling of trees on the land	Permission under the tree felling act	Number of trees felled against the permissible number of trees which can be felled	Once before the commencement of construction activity	KVTPL subdivision/Division/Circle
1.5	Design of residential quarter and office at the substation	Water/ soil pollution	Provision of a septic tank with soak pit in substation design	Once during detailed design	KVTPL subdivision/Division/Circle
1.6	Securing the land for transmission line/ tower	Loss of forest land	Stage I and Stage II clearance	Once before the commencement of construction activity	KVTPL subdivision/Division/Circle
Construction					
2.1	Site preparation and construction work for tower foundation and substation construction	Loss of topsoil	The practice adopted to store and reuse topsoil which is removed from the construction site	Every Week	KVTPL subdivision/Division/Circle
2.2		Noise and Vibrations	Maintenance logbook of vehicle/machinery, Number of equipment/vehicles undergoing regular maintenance	Every Week	KVTPL subdivision/Division/Circle
2.3		Air pollution	Water sprinkling dust- generating area	Every Week	KVTPL subdivision/Division/Circle
			Tarpaulin cover a vehicle carrying loose	Every Week	KVTPL subdivision/Division/Circle

SI No	Project phase/Activity	Potential impacts	Parameter to be monitored/indicator	Monitoring frequency	Responsibility
			construction/excavated material		
			Number of vehicles not having valid PUCC certificate	Every Month	KVTPL subdivision/Division/Circle
			Maintenance logbook of vehicle/machinery, number of equipment/vehicles undergoing regular maintenance.	Every Month	KVTPL subdivision/Division/Circle
		Water/soil pollution	Availability septic tanks and soak pits/modular bio-toilets	Every Month	KVTPL subdivision/Division/Circle
		Erosion and Sediment	Measures adopted to prevent erosion Availability of peripheral site drainage channel, sedimentation tank	Every Month	KVTPL subdivision/Division/Circle
		Depletion of water resource	Water conservation measures adopted at construction and labour camp	Every Month	KVTPL subdivision/Division/Circle
2.4	Community Health and Safety	Injury and sickness of local people	Number of accidents of local people (if any) of the construction site, number of grievances recorded Review of document	Every Month	KVTPL subdivision/Division/Circle
			related to regular health check-up of the workforce		
			• Review of document related to awareness camp organised periodically		
		Local women community	Physical observation of the labour camp before the commencement of construction and during construction period	Every Month	KVTPL subdivision/Division/Circle
2.5	Occupational Health and Safety	Injury and Sickness of workers	Awareness of workers, use of PPE by workers	Every 15 days	KVTPL subdivision/Division/Circle

SI No	Project phase/Activity	Potential impacts	Parameter to be monitored/indicator	Monitoring frequency	Responsibility
		Labour camp related EHS and Hygiene issues	Condition of labour camp, awareness of workers, compliant register	Every 15 days	KVTPL subdivision/Division/Circle
		Conflict with local community due to sharing of local recourse	No of registered grievances and redressal status	Every month	KVTPL subdivision/Division/Circle
3.Operatio	on and Maintenance				
3.1	Drainage of stormwater	Water /soil pollution	Available of the internal and peripheral site drainage channel, sedimentation tank and oil-water separator of the outfall of the peripheral site drainage channel	Every month	KVTPL subdivision/Division/Circle
3.2	Handling and disposal of waste	Water /soil pollution	Municipal disposal arrangement for GPS, Availability of composting pit Availability of authorization letter	Annually	KVTPL subdivision/Division/Circle
3.3	Occupational health and safety of staff	Injury/mortality to staff during operation and maintenance work	Accident incident register	Monthly	KVTPL subdivision/Division/Circle
			Document pertaining to training/awareness programs and mock drills/awareness level of staff engaged in O&M work of substation	Monthly	KVTPL subdivision/Division/Circle
		Injury/mortality from emergency situation	Accident-incident list	Monthly	KVTPL subdivision/Division/Circle
3.5	Community health and safety	Injury /mortality to public	Accident-incident list	Monthly	KVTPL subdivision/Division/Circle

6.4 Organizational Structure

6.4.1.1 Corporate Level E &S Management System

.



As per the document ESMS Manual, the ESMS applies to project life cycle and associated activities, which includes three sequential phases:

- Construction and development of renewable energy project and electric power transmission infrastructure;
- Renewable energy project operations; and
- Renewable energy project decommissioning, site restoration and closure.

The ESMS has established E&S requirements concerning a) policy level considerations and commitments, b) management programs/ procedures, c) risk and impact identification, d) organizational competency and capacity, e) emergency preparedness, f) monitoring and supervision of the implementation of management measures, and g) stakeholder engagement.

6.4.1.2 Project level Organization Structure

Project level organization structure given below.



6.5 Inspectional Monitoring and Reporting

Inspection and monitoring of the environmental impacts of the Project activities will increase the effectiveness of ESMP. Through the process of inspection and auditing, ATL will ensure that the conditions stipulated under various permits are followed. The inspections and audits will be done by off-role safety officers deployed by ATL (during the construction phase), ATL's EHS department and by external agencies/experts. The entire process of inspections and audits should be documented. The inspection and audit findings are to be implemented by the site head and safety office at site.

6.5.1 Roles and Responsibility

Environment, Health and Safety department shall be responsible for monitoring the implementation of the various actions which are to be executed by the agencies specified in the ESMS at the corporate level and ESMP.

In general, the EHS department shall perform the following activities:

- Preparation of required documents on environmental and social management;
- Ensuring availability of resources and appropriate institutional arrangements for the implementation of ESMP;
- Implementation of the health and safety measures;
- Collection of the statistics of health of workers;
- Providing support during routine medical check-ups of workers;
- Awareness and implementing safety programmes;
- Providing job specific induction training;
- Compliance of regulatory requirements;
- Carrying out environmental audits;
- Identify unsafe acts and conditions and suggest remedies;
- Develop safety culture and comply with company's EHS policy and standard requirements;
- Encourage and enforce the use of PPE's;
- Educate all employees for the use of PPE's and safe practices;
- Direct, coordinate and orient the safety activities;
- Promulgate the spread of policy, objectives, rules and/or regulations;
- Perform a thorough investigation of all accidents and review the recommendations to avoid any repetition;
- Monitoring the progress of implementation of ESMP; and

Environmental and social Impact Assessment Report for

Kharghar Vikhroli Transmission Private Limited (KVTPL), Maharashtra

• Reviewing and updating the ESMP as and when required for its effective implementation

6.5.2 Reporting and Documentation

ATL will develop and implement a programme of regular reporting through the stages of the project lifecycle. The personnel delegated EHS roles shall be required to fully comply with the monitoring programme in terms of timely submissions of reports as per the acceptable level of detail. Reporting will be done in form of an environmental checklist, incident record register, training records, and environmental and social performance reports (weekly, monthly, quarterly, half-yearly, yearly, etc.).

6.5.3 External Reporting and Communication

EHS head of ATL and Cluster Safety officer will be responsible for ensuring that communication with regulatory agencies and stakeholders is maintained as per the requirement. All complaints and inquiries are to be appropriately dealt with and records should be maintained in a Complaint/Enquiry Register by the delegated staff of EHS.

6.5.4 Internal Reporting and Communication

Documentation is an important step in the implementation of the ESMP. ATL has formal monitoring and review procedures in place. Key points of the monitoring and review procedure are as below.

The Monitoring and review procedure mandates ATL SOP No.1 Document and Record Control procedure to be followed at Site.

- The monitoring and review procedure also mandates the development of environmental and social monitoring plan to capture all the specific monitoring needs identified in the site-specific documents and final project ESIA/DPR.
- Non-conformances noted in monitoring activities will be resolved through the corrective and preventive action process as prescribed in SOP No. 3. Any EHS non-conformance identified at the Site should be brought in the immediate attention of the Site supervisor who will forward such information to the EHS Manager for evaluation.
- An annual regulatory compliance verification audit will also be conducted by the EHS manager for detailed verification of project compliance with the applicable regulation.
- After initiation of the construction phase, the project is required to conduct OHS hazards and risks assessment annually and results of the assessment to be shared at the Corporate level as part of performance data required by the management review process.
- > Internal audits are required to be conducted once in six months by the cluster level EHS coordinator.

6.5.5 Documentation

Documentation is an important step in the implementation of the ESMP, ATL will establish a documentation and record-keeping system in keeping with their ESMS, to ensure recording and updating of documents as discussed in the ESMP. Responsibilities have to be assigned to relevant personnel for ensuring that the ESMP documentation system is maintained, and that document control is ensured through access by and distribution to, identified personnel in form of the following:

- Master Environment Management System document;
- Legal Register;
- Operation control procedures;
- Work instructions;
- Incident reports;
- Emergency preparedness and response procedures;
- Training records;

- Monitoring reports;
- Auditing reports; and
- Complaints register and issues attended/closed.

6.6 **ESMP Review and Amendments**

The ESMP acts as an environment and social management tool which needs to be periodically reviewed to address changes in the organization, process, or regulatory requirements. Following a review, the Site in charge in coordination with personnel delegated EHS will be responsible for making the amendments in the ESMP and seeking approval from the Regional and Corporate heads. The amended ESMP will be communicated to all the staff on the project

6.7 Occupational Health Management

The construction phase includes site preparation, tower erection and sub-station construction, the access road to towers, construction area for sub-stations, etc. The health hazards associated with these activities are mainly due to dust and noise pollution. Excessive noise contributes to loss of hearing and triggers physiological and psychological body changes. Dust pollution can cause eye and respiratory irritation and, in some cases, allergic reactions. The inhalation of exhaust gases from vehicles and machinery is also harmful to health. Stress can be caused by working in shifts, high workload, poor living conditions of workers, etc.

Table 6-3 : General Measures for Workers' Health

Issues	Requirements				
Health and Hygiene	 Cleanliness Ventilation and temperature Dust and fumes Disposal of wastes and effluents Overcrowding Illumination Latrines and urinals Spittoons and dustbins 				
Dust and Fumes	 Any dust or fumes or other impurities likely to be injurious to the workers, effective measures shall be taken to prevent its accumulation and its inhalation by workers 				
Overcrowding	 No working room in any factory shall be overcrowded At least five hundred cubic feet of space shall be provided for every worker employed in a workroom 				
Latrines and urinals	 Sufficient latrines and urinals shall be provided Shall be maintained in clean and sanitary condition Shall be adequately lighted and ventilated 				
First aid	 Provided and maintained first aid facility One for every one-hundred and fifty workers Shall be kept with a responsible trained person who shall be available during the working hours In every facility where five hundred or more workers are employed, a dispensary shall be provided and maintained 				
Disposal of wastes effluents	 and • Provide with proper disposal system for solid waste and effluents In the case of a factory where no public sewerage system exists, prior approval of the arrangements should be made for the disposal of wastes and effluents 				

6.8 Disaster Management

The main risks are related to physical injuries due to fall from heights, objects falling on persons, risk of working in a confined environment, fire, electrocution and impact of electromagnetic waves. All the above risks can be life-

threatening and utmost care should be taken to reduce the risks. The section below gives the details of the mitigation measures to reduce the risks.

Table 6-4: General Measures for Workers' Safety

RISK OF WORKING AT HEIGHTS	 Construction workers should wear protective helmets, protective glasses, safety belts and protective shoes. 				
	Installation of fixtures on tower components to facilitate the use of fall protection systems.				
	The main guardrail at least 1 meter above the edge				
	 Implementation of a fall protection program that includes training in climbing techniques and use of fall protection measures; inspection, maintenance, and replacement of fall protection equipment; and rescue of fall-arrested workers, among others; Safety belts and harnesses should be of not less than 16mm two-in-one nylon or material of 				
	equivalent strength.				
	• When operating power tools at height, workers should use a second (back-up) safety strap.				
	• Signs and other obstructions should be removed from poles or structures prior to undertaking work.				
RISK OF FALLING OBJECTS	 Putting nets above the ground level in areas where work is in progress so as to avoid falling objects reaching the ground No loose material shall be left on the platform. Place the tools in the toolbox& other items in the basket. 				
	 Tethering Tools and equipment with connectors, connection points, and anchors Restriction to climb up on the rails of scaffold to overreach job location. Proper training to workers who are working heights 				
PRECAUTIONS IN CASE OF FIRE	 Shall be provided with means of escape in case of fire Effective measures shall be taken to ensure that all the workers are familiar with the means of escape Fire-fighting apparatus should be provided and maintained 				
WORKING IN CONFINED PLACES	Workers should not be exposed for more than 4 hoursEarmuffs and other PPEs should be provided				
ELECTRICAL HAZARDS DURING OPERATION	 Consider installation of hazard warning lights inside electrical equipment enclosures to warn of inadvertent energization; Use of voltage sensors prior to and during workers' entrance into enclosures containing electrical components; 				
	 Deactivation and proper grounding of live power equipment and distribution lines according to applicable legislation and guidelines whenever possible before work is performed on or proximal to them; 				
	 Provision of specialized electrical safety training to those workers working with or around exposed components of electric circuits. This training should include, but not be limited to, training in basic electrical theory, proper safe work procedures, hazard awareness and identification, proper use of PPE, proper lockout/tagout procedures, first aid including CPR, and proper rescue procedures. Provisions should be made for periodic retraining as necessary. 				

7. Stakeholder Assessment and Discloser

This section provides the stakeholder identification and analysis as well as a brief understanding of the engagement process for the project.

Stakeholder mapping and analysis is the process of identifying individuals or groups having a stake and influence over the entire cycle of the project. The identified stakeholder groups are then assessed according to their impacts on the project and the impact the project will have on them. This information is then used to assess the way the interests of the stakeholders or the project's impact on them should be addressed in the project development plan or its operation.

The identification of stakeholders and their inclusion in the decision-making process is thus crucial in the process of prioritizing, analysing and addressing issues; and in developing management systems and addressing the concerns/ expectations of various stakeholders.

The main objective of stakeholder analysis lies in the assessment and understanding of the socio-political environment surrounding the project. It allows for:

- Identification of the interests, concerns and societal risks surrounding the stakeholders, as well as conflicts
 of interests (if any);
- Identification of relations between stakeholders that may enable "coalitions" of project sponsorship, ownership and co-operation as well as the mechanisms which may influence other stakeholders;
- Key groups/ individuals to be identified who need to be informed about the project during the execution phase;
- Identifying stakeholders (those who might have an adverse impact on the project) and taking appropriate measures to mitigate their influence; and;
- Development of a framework for participatory planning and implementation of various project activities including interventions for community development.

7.1 Stakeholder Assessment

7.1.1 Stakeholder Identification

This section provides an analysis of the stakeholders identified for the project. This stakeholder identification is based on the present understanding of the project context, its footprint, the primary data collected during site visit in November 2020 and the understanding of transmission lines projects in India. This analysis of stakeholders identifies the individuals or groups that are likely to be impacted by the project activities and groups them based on the significance of the impact/influence.

A stakeholder is "a person, group, or organization that has a direct or indirect stake in a project/organization because it can affect or be affected by the Project/organization's actions, objectives, and policies". Stakeholders thus vary in terms of degrees of interest, influence and control they have over the project. Stakeholders who have a direct impact on or are directly impacted by the project are known as **Primary Stakeholders**, those who have an indirect impact or are indirectly impacted are known as **Secondary Stakeholders**. Keeping in mind the nature of the project and its setting, the stakeholders have been identified and listed in the table below.

Stakeholder Groups Primary Stakeholders		Primary Stakeholders	ders Secondary Stakeho	
Community	•	Project Affected Landowners of the Transmission Line (Tower and ROW)	•	Local Community Vulnerable Community

Table 7-1: Stakeholder Group Categorisation

Stakeholder Groups	Primary Stakeholders	Secondary Stakeholders		
Institutional	Project DevelopersMunicipal Corporation and Local administration			
Government Bodies	Regulatory AuthoritiesDistrict Administration			
Other Groups	EPC Contractor and Sub ContractorsContractual WorkersMigrant Labours	MediaLocal NGOs		

7.1.2 Stakeholder Analysis

Stakeholder Analysis is understood as the process of examining the relative influence that different individuals and groups have over a project as well as the influence of the project over them.

The significance of a stakeholder group is categorized considering the magnitude of impact (type, extent, duration, scale and frequency) or degree of influence (power and proximity) of a stakeholder group and urgency/likelihood of the impact/influence associated with the stakeholder group in the project context. The magnitude of stakeholder impact/influence is assessed taking the power/responsibility and proximity of the stakeholder group and the group is consequently categorized as negligible, small, medium or large. The urgency or likelihood of the impact on/influence by the stakeholder is assessed in a scale of low, medium and high. The overall significance of the stakeholder group is assessed as per the matrix provided below

Table 7-2: Stakeholder Impact Matrix

		Likelihood of influence on/by stakeholder			
		Low	Medium	High	
Ŧ	Negligible	Negligible	Negligible	Negligible	
de o ice/ ct	Small	Negligible	Minor	Moderate	
nitu luen npa	Medium	Minor	Moderate	Major	
Mag Inf	Large	Moderate	Major	Major	

Based on such an understanding, the stakeholders are categorized into High Influence/ Priority, Medium Influence/ Priority and Low Influence/ Priority. The stakeholders who are categorized as high influence implies a high degree of influence of the stakeholder/project on the project/stakeholders in terms of participation and decision making or high priority to engage with the stakeholder; Similarly, the stakeholders categorized as a medium influence are those who have a moderate influence over the project or even though they are to be impacted by the project, it is unlikely to be substantial and these stakeholders are thus neither high nor low in the project proponent's list for engagement. On the other hand, the stakeholders with low influences are those who have a minimal influence on the decision-making process or are to be minimally impacted by the project and are thus low in the project proponent's engagement list.

The intermediary categorisation of low to medium or medium to high primarily infer that their influence and importance could vary in that based on specific conditions and context or also based on the responses of the project towards the community.

The coverage of stakeholders as stated above includes any person, group, institution or organization that is likely to be impacted (directly or indirectly) or may have interest/influence over the project. Keeping this wide scope of inclusion in the stakeholder category and the long life of the project, it is difficult to identify all potential stakeholders and gauge their level of influence over the project at the outset of the project. Therefore, the project proponent is advised to consider this stakeholder mapping as a live document which should be revised in a timely manner to make it comprehensive for any given period of time. **Table 7.3** provides details on the stakeholder mapping and analysis.

Table 7-3 :Stakeholder Mapping and Analysis

Stakeholder Groups	Profile	Impact/Influence of the project on this Stakeholder Group	Impact/Influence of the Stakeholder Group on the project	Expectations, Opinions Key Concerns of Stakeholders	Overall Rating of Stakeholder Influence
Primary Stakeholders					
Project Affected Landowners of the transmission Line	This stakeholder group is comprised of approx. 1 large private landowner whose land is used for tower footing in certain areas. Since the contract for the transmission line has been transferred to ATL, the required documents for land will also be accordingly transferred.	The main influence of the project on the stakeholder group will be in the form of impact on the restriction of land use /depreciation of the land value will be impacted by the project and creation of economic opportunities.	The influence of the stakeholder group on the project will pertain to the willingness of the landowners to utilise the land for tower footprint.	The major concern of the stakeholder is adequate clearance for use of land which has already been transferred to the proponent.	Influence/Impact of Stakeholder: Medium Influence/Impact of the Project: Medium
Vulnerable Groups	This stakeholder group comprises the ST and SC population, women-headed households, elderly, physically handicapped, and economically poor households.	Based on the understanding of the project and its activities, the vulnerable groups are not likely to be impacted due to land use.	This group's influence on the project stems from the group being part of a larger community. However, the level of influence exerted is expected to be negligible since land from SC & ST families has not been acquired for the project.	Priority in economic benefits and development opportunities created by the project Access to project CSR activities Minimal disturbance to the community in regard to access issues, pollution and influx of migrant workers	Influence/Impact of Stakeholder: Small Influence/Impact of the Project: Small
Municipal Corporation and Local Administration	This stakeholder group is comprised of the lowest level of local governance. The Municipal Corporations are the lowest level of decision-making bodies for development activities in cities.	The project can play an important role in the development of the cities	This stakeholder group plays a crucial role in the smooth functioning of the projects. The Corporation also plays a critical role since the process of ROW procurement is still underway. They also have a significant role to play in the public opinion formation towards the project,	The project is expected to bring in positive impact to the overall electricity supply of the cities	Influence/Impact of Stakeholder: High Influence/Impact of the Project: Small
Regulatory Authority	This stakeholder group is comprised of the central, state	The influence of the project on the stakeholders pertains to the role the	The failure of the project to comply with the various rules and regulations	The key expectations and concerns of the regulatory	Influence/Impact of Stakeholder: High

Stakeholder Groups	Profile	Impact/Influence of the project on this Stakeholder Group	Impact/Influence of the Stakeholder Group on the project	Expectations, Opinions Key Concerns of Stakeholders	Overall Rating of Stakeholder Influence
	and district level regulatory authorities such as the Ministry of Forest, Pollution control board, Maharashtra Electricity Authority, etc These authorities influence the project in terms of establishing policy, granting permits and approvals for the project, monitoring and enforcing compliance with the applicable rules and regulations	project will play in the development of power evacuation networks in the area. The project should comply with the applicable regulatory framework comprising of the guidelines and policies of the state and central bodies	applicable may play a role in the timely implementation of the project. This stakeholder group is also critical for various permits/clearances required for the commissioning of the project	authorities from the project is ensuring the project compliance to all regulatory requirements, timely disclosure of information and provisioning of updates throughout the project life cycle	Influence/Impact of the Project: Small
District Administration	These stakeholder groups are comprised of government bodies at the district level which influences the decision- making authority throughout the decentralization process. These include the District Collector, forest Department, Block Development Officer, Tehsildars, Revenue Officer. These government bodies are responsible for providing approvals (section 164 of the electricity Act) for the project, deciding the compensation rate for the affected landowners, Similarly, the revenue and land registry would be responsible for documentation/ registration of land lease, mutation, updating and records	The project is expected to have a positive influence over the local administration by extending support through these authorities. The influence of the project on the stakeholders pertains to the role the project will play in the development of power evacuation networks in the area	This stakeholder group is critical for obtaining of the various permits/clearances required for the commissioning of the project and its smooth functioning thereafter. Delay in the issuance of the relevant permits can adversely impact the timely execution of the project. Similarly, unresolved matters relating to lands such as litigation, and encroachment might create complications, drag the firm into legal disputes thereby This group serves as important points of contact between the state- level authorities and the local community	The overall opinion of the local authorities is positive towards the project and secondly, that the project may bring development and create some local employment and other opportunities in the form of local contractors the local community	Influence/Impact of Stakeholder: High Influence/Impact of the Project: Small

Stakeholder Groups	Profile	Impact/Influence of the project on this Stakeholder Group	Impact/Influence of the Stakeholder Group on the project	Expectations, Opinions Key Concerns of Stakeholders	Overall Rating of Stakeholder Influence
EPC Contractors and Sub- Contractors	KVTPL is the project developer and has appointed contractors for project construction. KVTPL role is to provide the contractor the land for laying of tower foundation and tower erection. The land procurement was undertaken by the Land Department of Adani Group.	The influence of the project on the group pertains to the role of the project in business opportunities and the process of contract closure Employment opportunities for local unskilled and skilled labour.	This stakeholder group is critical for the smooth functioning and timely implementation of the project	The major concern of these stakeholders is, smooth functioning of the project without any litigation or community conflict; Timely payment of their agreed contract amount from developers;	Influence/Impact of Stakeholder: High Influence/Impact of the Project: High
Workforce-Migrant Labour/Contractual workers	This stakeholder group comprises of those workers who are to be engaged in the project on a contractual basis through the different phases of project life.	The primary concern of the stakeholder group pertaining to the project will be as following: - the role of the project in continued economic opportunity, work generation and a source of income	These stakeholder group's influence on the project pertains to their role in the smooth functioning of the project and the opinion formation towards the project	The main expectations from the project will be: - timely settlement of dues and payments in keeping with the legal requirements - continued work opportunities - safety at work	Influence/Impact of Stakeholder: High Influence/Impact of the Project: Medium
Workforce: Employees	This stakeholder group comprises the regular employees of KVTPL Team who are to be involved in the various stages of the project	The project is expected to ensure continued economic opportunities and work generation	The influence of these stakeholders pertains to the roles played by them in the overall smooth functioning of the project operations as well as the brand value. They will also serve an extremely important role in the maintenance and improvement of services and facilities	The expectations of this stakeholder group in regards to the project pertain to the following: - Job security, Safe working conditions, Provision of rewards and recognitions for good performances and safe behaviour - Proper work-life balance - Ethical and professional conduct - Employee engagement within & after working hours - Regular updating of rules and regulations Facilitation and maintenance of everyday convenience in regard to facilities such as	Influence/Impact of Stakeholder: High Influence/Impact of the Project: Medium

Stakeholder Groups	Profile	Impact/Influence of the project on this Stakeholder Group	Impact/Influence of the Stakeholder Group on the project	Expectations, Opinions Key Concerns of Stakeholders	Overall Rating of Stakeholder Influence
				transport, seating, food, accommodation, etc	
Secondary Stakeholders					
Local Community along the AOI	The local community is an important stakeholder as the transmission line is being erected on public land. The local community in the study area is comprised of 12wards in 3 Municipal Corporations along the 500-meter buffer along the TL corridor.	Consultation with the local community reveals that they do not have any issues with the erection of towers and the transmission line. They want development to happen.	The stakeholder group may have a significant role to play in the public opinion formation towards the project	As informed during the consultation, some local people in the study area wanted the TL to not pass through their settlement area, the reason being that they would have to be evacuated. They however do not mind if the alignment is changed in order for it to not pass over the settlement area.	Influence/Impact of Stakeholder: Medium Influence/Impact of the Project: Medium
NGOs/Local Media	Local NGOS based out in Maharashtra act as a social watchdog in matters relating to securing the livelihoods of the rural communities along with their socio-cultural facets Though the number of such NGOs active in the study could be ascertained. Media comprising of print and visual media	Engagement of local NGOs for any ongoing/upcoming CSR through partnership for local development.	The stakeholder group may have a significant role to play in the public opinion formation towards the project largely by whether the impacts of setting up of the development venture is being viewed/ perceived in a positive light by the local population with special reference to the vulnerable communities or not.	NGO They can also play a major role in community mobilization, building trust and even participate in implementing CSR initiatives.	Influence of Stakeholder: Medium Influence of the Project: Small

Summary of the overall stakeholder influence is presented in the Table 7.4

Table 7-4 : Summary of Stakeholder Analysis

Stakeholder Group	Relevant Stakeholders	Magnitude of Influence/Impact	Likelihood of Influence on/by Stakeholder	Overall Rating of stakeholder influence
Primary Stakeholder	Project Affected Person along the ROW and Tower Footing	Medium	Medium	Moderate
	Landowner for land procured for Substation	Medium	Medium	Moderate
	Regulatory Authorities	Small	High	Moderate
	District Administration	Small	High	Moderate
	EPC Contractor	Large	High	Major
	Contractual Labour/Migrant workers	Medium	High	Major
	Local Municipal Corporation	Small	High	Moderate
Secondary	Local Community	Small	Medium	Minor
Stakeholder	NGO/Media	Small	Medium	Minor

7.1.3 Stakeholder Consultation

As part of the ESIA process, the project team has undertaken consultation with the stakeholder of the project to understand the concern expectation for the projects. The main objective of the consultations was made to develop an understanding of the stakeholder group's key concerns and expectations from the project, the stakeholder group's perception of the project and to triangulate the secondary information available on the area. Table 7-5 provides a summary of the consultations undertaken with different stakeholders. Details regarding the consultation undertaken have been provided in **Appendix**.

Date	Stakeholders Details	Brief Outcome of the consultation
27 November 2020	Consultation with EHS officer KVTPL	• The project is transferred from Tata Power and hence the clearances applicable to the previous projects will be carried forward for the KVTPL line. The project will begin construction in December.
		 Clearances from CIDCO, Forest, CRZ, etc. have been transferred to ATL. Clearances from highways and railways (for overhead crossing) are pending.
		 For the LILO line, no forest/ railways/highways/CRZ clearances have been received as of yet. Clearances from salt commission are also awaited. Construction will not begin before all clearances are received.
		 The KVTPL alignment runs parallel to other transmission lines like the MSETCL line, Tata power line, etc. which already exist in the ROW.
		 The ROW does not go through any private lands. It goes through lands under forest/ CIDCO/Godrej or Tata control and public parks. Hence no land procurement has been required for either of the lines.
27 November 2020	Consultation with the affected community	 The CIDCO forest area is home to a slum area by the name of Jai Durga Mata Colony. The community of people has been staying in the area for more than 20 years.
		 The community has been told that the new transmission line will go overhead the slum area. This has led them to believe that they will be evacuated from their houses.

Date	Stakeholders Details	Brief Outcome of the consultation
		• The community is scared about the imminent displacement and hence are opposed to the line going overhead their area.
		• They want the tower to be constructed away from their area of residents so that people would not have to evacuate their residence.
27 November 2020	Consultation with salt pan workers	• The ROW passes through salt pans in the Mumbai region. Since there are already transmission lines passing in the area, the workers are not bothered by them
		• Current is felt during heavy winds and monsoons when they have to be under the transmission lines.
		• The issue that the workers have is that if the work stops due to the construction of the tower, they lose one day of wages.
27 November 2020	Consultation with the local community	The ROW passes through public parks, jogging tracks and trails in Navi Mumbai.
		• The joggers do not find an issue with a new line and the construction of new transmission towers.
		• Most of them do not notice the towers that are already existing.
		• If the towers will lead to an eventual development, then a few days of inconvenience is not a problem.
		• They do not think that the line will have a significant visual impact.

7.2 Present Status of Stakeholder Engagement by Project

As per consultation with the project team, the current status of engagement with stakeholders is limited to consultation with the local community residing along the ROW for disclosure of project, regulatory authorities for permits and approvals, contractors, vendors and suppliers for procurement and construction activities. No documentation is kept on the different engagement activities undertaken. A draft stakeholder engagement plan has been prepared for the project and is in the approval stage.

7.3 Information Disclosure

This section provides an understanding of the information disclosure and consultation plan for the project. This plan shall guide the engagement with the external stakeholders through the life of the project. The primary purpose of the disclosure process will be to make information accessible and available to all in a simple and easy-tounderstand manner. The disclosure of information should be in the local language. Following communication tools shall be designed for the effective dissemination of relevant information (**Table 7.5**) below.
Table 7-5 Information Disclosure Plan

Торіс	Documents to be Disclosed	How & Where	Frequency
Disclosure of the Proposed projects	Project related information	The project will develop an ESIA which will detail out the project impacts and proposed mitigation measure. The information will be shared with the community during consultation. Municipal office Lenders website Site Office of the KVTPL	At the time of preparing the ESIA
Disclosure of the draft ESIA	Draft ESIA	The project will prepare an ESIA and made available to affected persons in the local language; in the following offices: Project Website DC's Office Municipal Office	At the time of finalizing of the ESIA
 Grievance Redressal Environmental & Social Management Plan 	 SEP and GRM 	 Municipal office KVTPL Site Office Project Website Municipal office Office of the EPC contractor 	Prior to start of constructionPrior to start of construction.
 Regular Disclosure 	 Stakeholders meetings to provide them an update on the status of the project. 	 Municipal office 	 As per demand or request from specific stakeholders

7.3.1 Reporting and Monitoring

It is recommended that during the construction phase of the project, the performance of the SEP be reviewed on a bi-annual basis. For the purpose of the review, the Environmental and Social Specialists engaged for the Project, will prepare reports on public consultation issues, grievances and redressal, to be submitted to the project management, on a quarterly basis. During the operations phase, the reports will be submitted on a bi-annual basis. This report will include a summary of the issues raised by the stakeholders, the numbers of grievances, a summary of key actions taken to address the grievances, an analysis of trends, as well as plans for further engagement.

8. Grievance Redressal Mechanism

8.1 Grievance Mechanism Principal

The Grievance redressal process of the KVTPL project has been developed based on the ADANI Groups Grievance structure and has been customized to the requirement of the project. Some additional features have been added keeping in requirement the IFC Performance Standards. This system has been purely designed for external stakeholders (e.g. Aggrieved parties, project-affected people etc). Internal stakeholders e.g. employees, labour, the contractor would use the internal Grievance redressal mechanism of ATL. The Grievance Redressal Mechanism (GRM) is anchored on the five principles to guide in facilitating and resolving concerns and grievances:

- Transparency. The GRM encourages comments and feedback (negative and positive) to improve the project. The community must be aware of all complaints, grievances and problems reported; must be involved in their redress; and must be kept informed on progress made in resolving grievances. The public would be made aware of the grievance redress procedures. The campaign will ensure that the poor, women, indigenous peoples, the vulnerable and the disadvantaged groups are made aware of grievance redress procedures A Project Information Kit containing GRM overview and contact details in the form of brochures/leaflets and written in local dialects. A GRM hotline will be posted on the subproject site.
- **Socially Inclusive.** The whole community (and even those outside) is given the opportunity to raise concerns and the right to be accorded a response. The GRM provides an accessible, inclusive, gender-sensitive and culturally appropriate platform for receiving and facilitating the resolution of affected persons' grievances related to the project.
- Simple and Accessible. Procedures to file complaints and seek redress are kept simple and easy to understand by the affected people, most specially the nonliterate, and their communities. Affected persons will have the flexibility of conveying grievances/suggestions through verbal narration from walk-in affected person, by dropping grievance redress/suggestion forms in complaints/suggestion boxes inaccessible locations, through telephone hotlines, through WhatsApp, by e-mail, by post, or by writing in a complaint register in ULB office or PMU or PIU office.
- Anonymity and Security. To remain accessible, open and trusted, the GRM ensures that the identities of those complaining are kept confidential. This encourages people to openly participate and file a grievance. Careful documentation of the name of the complainant, date of receipt of the complaint, address/contact details of the person, location of the problem area and the grievance detail will be maintained by the project. The project will ensure a system for grievance tracking and monitoring of grievances lodged, response accorded, its resolution status and closure. The Project Manager along with the Environmental and or Social Management Officer will have the joint responsibility for timely grievance redressal on safeguards and gender issues and for registration of grievances, related disclosure, and communication with the aggrieved party. The affected persons will also be encouraged to seek a complaint registration number through the PIU.
- **Institutional Outreach.** Through the GRM, the project can strengthen channels of communication and mechanisms for grievance redress at the community/project area level.

8.2 Approach to Grievance Redressal

The Grievance redressal mechanism developed for Adani Transmission Limited (the parent organisation) would be extended to the project. A common GRM will be in place to redress the environmental and social safeguards concerns in the project and/or subproject-related grievances⁸ especially during the construction. However, some modification has been planned to consider the project location, socio-economic conditions.

The Grievance Process would include the surrounding community of the project is considered as important stakeholder by the Project. The possible grievances of the community envisaged, and which could be entertained/addressed through this project include:

• Community development, employment and other issues

⁸Grievance is defined as any comments/ suggestions, non-contentious questions/ clarifications regarding the project, issues/concerns that resulted to non-performance of obligations of any of the parties involved in project processes particularly safeguards implementation.

- Risks to community, health & safety (e.g. traffic, risk during construction of tower or stringing of conductor);
- Accidents (e.g. involving livestock, or other property including community property);
- Unethical Behaviour by ADANI personnel or its sub-contractors;
- Noise/dust/air emissions or any other impact on the environment caused by project or sub-contractors;
- Demand for development interventions in the community;
- Issues owing to behaviour of the security personnel and general attitude of the local community;
- Issues related to cultural conflicts or opportunity conflict owing to the presence of migrant workers in the community or in the nearby areas;
- Any attempts to conceal the above

8.3 **Project Level Grievance Mechanism**

A three-tier grievance mechanism is proposed for the project arrangement i.e. at Field level, Project level and Corporate level.

8.3.1 Field Level GRM

Field level arrangements will comprise of the contractor and their project implementation staff on the ground, and field-level staff from KVTPL/ATL. All minor issues and those that are immediate and urgent in the perception of the complainant will be resolved at the field level itself. The contractor and supervision personnel from KVTPL/ATL will try to successfully resolve them in consultation with the aggrieved person. In case of larger issues, they will seek the advice and assistance of the Project Management. The Contractor will be responsible for documentation and record-keeping. A summary of the grievance record will be submitted to the Project Management on monthly basis. The Project Manager at both the KVTPL/ATL and will both monitor and provide input support to the contractors in field-level grievance redress and its record-keeping.

8.3.2 Project Level GRM.

A Grievance Redress Cell will be established at Project Manager's Office constituting of the Project Manager of the respective project, Site in-charge, supported by the project manager /Project In charge of the Contractor. All such grievances that cannot be resolved at the field level and those that are directly registered with the GR cell will be addressed by this body. Proper documentation of grievances (including records of grievances redressed at the field level) will be maintained. The Grievance Redressal Cell will also be responsible for conducting periodic community meetings with affected communities to understand their concerns and help them through the process of grievance redressal, recording and registering grievances of nonliterate affected persons and explaining the process of GRM. In cases, where Site Level Management is unable to resolve the grievance within the stipulated time period, it shall consult Project Management for advice and implement suggested actions within the specified time. Grievance Redressal Cell will also be responsible for follow-up for each grievance, periodic information dissemination to complainants on the status of their grievance and recording their feedback (satisfaction/dissatisfaction and suggestions).

8.3.3 Corporate Level GRM.

This Corporate Level arrangement will be led by the Corporate Head with support from the Corporate EHS Manager and other departmental representatives (on invitation). All such grievances that cannot be resolved at the Project level Grievance Redress Cell, will be brought to the notice of this body, seeking its advice or referred for resolution at this level. This Corporate body will specifically, will provide regular monitoring and advisory support to Project in grievance redress functioning and its record-keeping. Project Level compilation of grievance redress records and documentation will be done by the Project Manager.

8.4 Beyond Project Grievance Mechanism

Grievances that cannot be redressed within/at the project level within the stipulated time period will be referred to the District Level Committee. The following will be the people would be part of the District Level Grievance Committee:

District Collector

- Additional District Collector
- Corporate Head
- Project Manager
- EHS Manager / E&S Officer.
- Tehsildar/ Local Land Revenue Official
- Representatives of local NGOs (Special Invitees)

8.4.1 Country/State Legal System:

An aggrieved person shall have access to the country's legal system at any stage and accessing the country's legal system can run parallel to accessing the GRM and is not dependent on the negative outcome of the GRM.

Steps for Developing Grievance Redressal Mechanism

The following process would be adopted for the setting up of the Grievance Redressal Mechanism:

8.4.1.1 Publicizing Grievance Management Procedures

For KVTPL Project would ensure suitable public disclosure of its grievance handling and redressal process to its external stakeholders such as the community or the local administration. As discussed earlier a Project Information Kit containing GRM overview and contact details in the form of brochures/leaflets and written in Marathi, Hindi and English will be prepared. An awareness campaign publicizing the GRM process and GRM Hotline would be carried out. Person from the company's grievance cell such as onsite personal for handling and managing grievances, CSR officers, or individuals working in analogous positions, shall be responsible for publicizing the procedure through appropriate methods

8.4.1.2 Receiving and Keeping Track of Grievances

This receipt and tracking of grievances primarily involve the following stages:

- Collecting and recording grievances as they come in and recording the following details (including contact details of the complainant, date the complaint was received, nature of the grievance;
- Registering them in a central place; and
- Tracking them throughout the processing cycle to reflect their status and important details e.g. agreed corrective actions and the date these were taken and the final outcome

8.4.1.3 Maintaining Record of Grievance

Tracking of grievances can be undertaken through a Grievance log maintained both at the Project and Corporate levels. This record maintenance would help track cases, respond to grievances in a timely manner, check the status of complaints and track progress, measure effectiveness, and report on results.

Relevant personnel from respective departments/sections of the project will track the resolution status, coordinate it with the division(s) responsible for corrective actions, and maintain a record of progress (for example- open, pending or closed).

The Project Manager of the sites will present to the Management both at the Project and Corporate Level an aggregated monthly report on the status of complaints; the frequency may vary once the construction stage is over. The Project Manager may also do a case-to-case grievance status reporting in case of critical grievances or grievances that may require the immediate attention of the management.

8.4.1.4 Reviewing and Investigating Grievances

The Project Manager responsible for grievance handling will organize the process to validate the complaint's legitimacy and arrange for investigation of details. To begin this process, the nature of the grievance shall be established to determine the measures needed for review and investigation. All grievances shall undergo some degree of review and investigation, depending on the type of grievance and clarity of circumstances:

8.4.1.5 Resolution of Grievance and Preparing a Response

The Rationale for Grievance resolution and closure is as follows:

• The requirements/need specified in the form of grievance by the aggrieved have been effectively addressed to the satisfaction of the complainant

Grievance to be duly addressed and closed by KVTPL.

8.4.1.6 Monitoring of Grievances

Grievance records will provide the background information for regular monitoring. Some of the monitoring indicators identified that can be a part of the monitoring mechanism may include:

- Tracking the number of grievances received and resolved (by gender, male/female, vulnerable categories);
- Analysing effectiveness and efficiency, using complaints to analyse systemic deficiencies.
- Patterns in the grievances the company receives, and their resolution.
- Communities preference of different channels to submit grievances;
- Any particular subgroup in the community who are aggrieved and raising complaints (for example, women, elderly, a particular locality);
- Trends observed in grievances e.g. particular groups/ particular kind of complaints relating to operations or accessibility or any specific issues;
- Average time taken for resolution of grievances falling under particular category;
- Matters significantly affecting company policy or requiring legal review;
- Issues of cultural appropriateness and transparency;
- Efficacy of the system to meet the company requirements and expectation of stakeholders

8.4.1.7 Reporting of Grievance

The number of grievances recorded and resolved, and the outcomes will be displayed/disclosed in the Project and Site offices, Municipality Office of the concerned notice boards and on the website of the company, as well as reported in the semi-annual environmental and social monitoring reports to be submitted to IFC.

8.5 Resource required for Grievance Redressal Mechanism Implementation

Manpower and Budget would be required for the successful implementation of the Grievance redressal ant both the project and Corporate Level.

8.5.1 Manpower

8.5.1.1 Corporate Level

The Corporate EHS Manager would be responsible for the day-to-day management of the Grievances. He would be responsible for coordinating with the Project level Project Manager at the Project to ensure that all the grievance is redressed in a timely manner. He would also be responsible for analysis of the trends in the grievances received and advising both the Corporate and Project level management of possible remedial measures.

8.5.1.2 Project Level

A grievance cell headed by the project head is to be formed during the initial inception phase of the project. The grievance coordinator will be responsible for the effective implementation of GRM and coordinating day-to-day functions. Periodic meetings and reviews of the Grievance cell are carried out by them. The grievance cell at the project level would keep a grievance log and be reporting back to the Project Head. He would also be responsible for supporting the Corporate EHS Manager in reporting to the Corporate Management and the Funding agency.

8.6 Discloser of The Grievance Redressal Mechanism

As part of the grievance redressal, the project prior to project commencement had issued notice for the proposed transmission line passing through the villages published in local & national newspaper and Gazette of India. This was carried out before authorization given for section 164 of the Electricity Act 2003, a window period of not less than 60 days from the date of such publication for the public/community to raise any objection/clarification on the proposed route. As reported, no objection received to the proposed route alignment of KVTPL project.

Presently, KVTPL has a well-developed Grievance redressal mechanism as a part of its ESMS system which has been implemented and applicable to all its subsidiaries and SPVs including the project site. The project KVTPL has a Grievance redressal mechanism overlook by the Project Head on site. The grievance mechanism has been shared with the local communities during obtaining consent stage. A grievance register as per format is available at site office for recording the grievances of local communities. Reportedly, since the project commencement, no grievance was formally submitted or recorded on the Standard grievance register.

9. Conclusion and Recommendation

The ESIA has assessed the overall acceptability of environmental and social impacts likely to arise as a result of the construction and operation of the transmission line for KVTPL project. With the available information and presented in this report, the proposed project passes through ecological and socially sensitive areas. However, the proponent has agreed to include additional mitigation measures. The Critical habitat assessment is under process and based on the assessment the category of the project will be specified.

The project is assessed to generate some environmental and social issues owing to land access and the spread of the transmission corridor. The community had raised concern on issues with regards to health and safety and potential exposure to electromagnetic fields during operation, especially during the rainy season.

Mitigation measures for potential impacts on Air, Water, land, soil, noise ecology and socioeconomics have been specified through proper

- Follow up of the best practice of compensation, public disclosure, grievance management and compensation.
- Planning and designing of the tower structure, site preparation and access route, compensation, etc.
- Application of standards for Health and safety for construction tower erection and stringing activities
- Clearances and permits (including forest clearance) required for each sub-activity

The ESMP provides a delivery mechanism to address potential adverse impacts, to instruct contractors and to introduce standards of good practice to be adopted for project activities taken up during construction and operation phases of the project. Inspection and monitoring of the environmental and social components phase activities will increase the effectiveness of suggested mitigations.

Appendix A Stakeholder Consultations

A	Pro	oject	Transmissionsystemfor400kVVikhrolireceivingstationandassociatedincomingtransmissionlinesforstrengthening			
	Titl	e:	theMumbaitransmissionsystem			
в	Sta	kehold	Consultations with local community			
	er T	Title:				
С	Bas	sic detai	i ls : Male			
	Loc	ation:	Kharghar Hills			
	Dat	e:	27 November 2020			
D	Att	ended E	By:			
	s		Name	Designation		
	r.					
	1.		Yogesh Mudaliyar			
	2.		Avinash Kumar			
	3.		Vivek			
	4.		Soumya Prasanna			
Е	Pur	pose of	Consultation			
		• P	rimary consultation of stakeholders to unders	stand possible impact of the project.		
F	Key Points Inferred:					
	The	They use the CIDCO trail in Kharghar hills for daily morning walks, jogging, etc.				
	Sor	me hear a buzzing sound from the existing transmission towers in the vicinity of the trail.				
	An	additional transmission line is beneficial for the people of Mumbai and hence he does not have any issues if there are				
	any	additior	al lines cropping up.			
	an a	additiona	al transmission line is beneficial for the people	e of Mumbai and hence he does not have any issues if there are		
	anv	addition	al lines cropping up			

that he has hardly noticed the lines around him and there are no issues with the existing lines.

A	Pro	oject	t Transmissionsystemfor400kVVikhrolireceivingstationandassociatedincomingtransmissionlinesforstrengthening		
	110	e.			
В	Sta	akehold	Consultation with the local community		
	er	Title:			
С	Ba	sic deta	ils:		
	Loc	cation:	Sardar Vallabhbhai Patel Udyan		
	Dat	te:	27 November 2020		
D	Att	ended E	3y:		
	s		Name	Designation	
	r.				
	1.		Dr. Kulkarni		
	2.		Sasikumar		
	3.		UttamraoPhanase		
Е	Pui	rpose of	Consultation		
		• P	rimary consultation of stakeholders for proje	ct to understand the impacts	
F	Key Points Inferred:				
	It is scientifically proven that there are no ill-effects of transmission lines to people. That it is important for people to				
	understand that. They are only there to help people. It might have an impact on the visual environment but not on health				
	which is completely fine. He says that there are already existing towers in the park.				
	Sor	metimes	a current is felt during the monsoon season	under the line but it doesn't cause any harm	
	Sin	ce they r	assunder a line in 2 seconds, it would not a	cause any impact on them	
		not hour	an opinion on the construction of new town	ro. He is not against or for it	
	Do	not have	e an opinion on the construction of new towe	rs. He is not against or for it.	

oiect					
0,000	I ransmissionsystemfor400kVVIknroilreceivingstationandassociatedincomingtransmissionlinesforstrengthening				
le:	theMumbaitransmissionsystem				
akehold	Consultation with affected community				
Title:					
sic detai	ils:				
cation:	Jai Durga Mata Colony				
te:	27 November 2020				
tended B	ly:				
	Name	Designation			
	Ganesh Tambe				
	Kisan Rathod				
	Namdev Rathod				
rpose of	Consultation				
Primary consultation of stakeholders for project to understand impact					
Key Points Inferred:					
They are aware of the project. They believe that if the alignment remains the same they will be asked to vacate their					
houses in which they have been living for many years. They hav all their taxes on time but are still made unsure of their					
co in the	area				
	area.	ainst development but they den't want the line to near through			
	le: kkehold Title: sic detail cation: te: ended B ended B pose of r pose of r	de: theMumbaitransmissionsystem akehold Consultation with affected community Title: Sic details: sic details: Jai Durga Mata Colony te: 27 November 2020 rended By: Name Ganesh Tambe Kisan Rathod rpose of Consultation Namdev Rathod rpose of Consultation Primary consultation of stakeholders for project y Points Inferred: Savare of the project. They believe that if the all uses in which they have been living for many years. The in the area. ay have no objection to the project as they are not age Savare at the project as they are not age			

their residential area. They have no objection to the line being farther away from their settlement area.

A	Pro Titl	Project Transmissionsystemfor400kVVikhrolireceivingstationandassociatedincomingtransmissionlinesforstrengthening Title: theMumbaitransmissionsystem			
в	Sta er 1	kehold Title:	Consultation with salt pan workers		
С	Bas	sic detai	ils: Male		
	Loc	ation:	Salt pans (T10)		
	Dat	e:	27 November 2020		
D	Att	ended B	By:		
	S	S Name Designation			
	1. 1.		Brijlal Patel	Salt pan worker	
Е	Pur	pose of	Consultation		
		• Pi	rimary consultation of stakeholders for project	ct to understand impacts	
F	 Finally consultation of statementers for project to understand impacts Key Points Inferred: Many lines pass through salt pans. There was one line that passed overhead the workers settlement. It used to make a buzzing sound continuously. He doesn't want the line to pass close to his house. IF the construction of the tower is going on his work will stop for atleast a week, as has happened before. That is a problem for him as he will not get paid for the week 				

Α	Project	Transmissionsystemfor400kVVikhrolireceivingstationandassociatedincomingtransmissionlinesforstrengthening
	Title:	theMumbaitransmissionsystem
в	Stakehold er Title:	Consultation with Project officers

С	Basic details: Male						
	Location:	KVTPL line					
Date: 26 November 2020							
D	Attended By:						
	s	Name	Designation				
	r.						
	1.						
	2.						
Е	Purpose of	Consultation					
	• P	rimary consultation of stakeholders for proje	ct				
F	Key Points	Inferred:					
	The project	is transferred from Tata Power and hence the	ne clearances applicable to the previous projects will be carried				
	forward for	the KVTPL line. The project will begin constr	ruction in December.				
	Clearances	from CIDCO, Forest, CRZ, etc. have been t	ransferred to ATL. Clearances from highways and railways (for				
	overhead crossing) are pending.						
	For the LILO line, no forest/ railways/highways/CRZ clearances have been received as of yet. Clearances from salt						
	commission are also awaited. Construction will not begin before all clearances are received.						
	The KVTPL alignment runs parallel to other transmission lines like the MSETCL line, Tata power line, etc. which already						
	exist in the	ROW.					
	The ROW of	loes not go through any private lands. It goe	s through lands under forest/ CIDCO/Godrej or Tata control and				
	public parks	s. Hence no land procurement has been requ	uired for either of the lines.				

Appendix B Mammals of the Study Area

SN	Scientific Name	Common Name	IUCN Status*	WPA Schedule**
1	Axis axis	Chital	LC	III
2	Bandicota bengalensis	Lesser Bandicoot Rat	LC	V
3	Bandicota indica	Greater Bandicoot Rat	LC	V
4	Boselaphus tragocamelus	Nilgai	LC	III
5	Canis aureus	Golden Jackal	LC	II
6	Cynopterus sphinx	Greater Shortnosed Fruit Bat	LC	V
7	Felis chaus	Jungle Cat	LC	II
8	Funambulus pennantii	Five-striped Palm Squirrel	LC	IV
9	Golunda ellioti	Indian Bush-rat	LC	V
10	Herpestes edwardsii	Indian Grey Mongoose	LC	II
11	Herpestes smithii	Ruddy Mongoose	LC	II
12	Hesperoptenus tickelli	Tickell's Bat	LC	-
13	Hipposideros fulvus	Fulvus Leaf-nosed Bat	LC	-
14	Hipposideros galeritus	Cantor's Leaf-nosed Bat	LC	-
15	Hipposideros speoris	Schneider's Roundleaf Bat	LC	-
16	Hyaena hyaena	Striped Hyaena	NT	111
17	Hystrix indica	Indian Crested Porcupine	LC	IV
18	Kerivoula picta	Painted Woolly Bat	NT	-
19	Lepus nigricollis	Indian Hare	LC	IV
20	Lutrogale perspicillata	Smooth-coated Otter	VU	11
21	Lyroderma lyra	Greater False Vampire	LC	-
22	Macaca radiata	Bonnet Macaque	VU	11
23	Manis crassicaudata	Indian Pangolin	EN	I
24	Megaderma spasma	Lesser False Vampire	LC	-
25	Mellivora capensis	Honey Badger	LC	-
26	Millardia meltada	Soft-furred Metad	LC	V
27	Moschiola indica	Indian Chevrotain	LC	I
28	Muntiacus vaginalis	Northern Red Muntjac	LC	111
29	Mus booduga	Common Indian Field Mouse	LC	V
30	Mus musculus	House Mouse	LC	V
31	Mus saxicola	Brown Spiny Mouse	LC	V
32	Mus terricolor	Jungle Cat	LC	V
33	Myotis horsfieldii	Horsfield's Myotis	LC	-
34	Paradoxurus hermaphroditus	Common Palm Civet	LC	II

SN	Scientific Name	Common Name	IUCN Status*	WPA Schedule**
35	Pipistrellus ceylonicus	Kelaart's Pipistrelle	LC	-
36	Pipistrellus coromandra	Indian Pipistrelle	LC	-
37	Pipistrellus tenuis	Least Pipistrelle	LC	-
38	Prionailurus bengalensis	Leopard Cat	LC	I
39	Prionailurus rubiginosus	Rusty-spotted Cat	NT	I
40	Pteropus giganteus	Indian Flying Fox	LC	V
41	Rattus rattus	House Rat	LC	V
42	Rhinolophus beddomei	Beddome's Horseshoe Bat	LC	-
43	Rhinolophus lepidus	Blyth's Horseshoe Bat	LC	-
44	Rhinolophus rouxii	Rufous Horseshoe Bat	LC	-
45	Rhinopoma hardwickii	Lesser Mouse-tailed Bat	LC	-
46	Rhinopoma microphyllum	Greater Mouse-tailed Bat	LC	-
47	Rousettus leschenaultii	Leschenault'sRousette	LC	V
48	Rusa unicolor	Sambar	VU	III
49	Saccolaimus saccolaimus	Bare-rumpedSheathtail-bat	LC	-
50	Scotophilus heathii	Greater Asiatic Yellow House Bat	LC	-
51	Scotophilus kuhlii	Lesser Asiatic Yellow House Bat	LC	-
52	Scotozous dormeri	Dormer's Bat	LC	-
53	Semnopithecus dussumieri	Southern Plains Gray Langur	LC	-
54	Suncus murinus	House Shrew	LC	-
55	Sus scrofa	Wild Boar	LC	Ш
56	Tadarida aegyptiaca	Egyptian Free-tailed Bat	LC	-
57	Taphozous longimanus	Long-winged Tomb Bat	LC	-
58	Taphozous melanopogon	Black-bearded Tomb Bat	LC	-
59	Taphozous nudiventris	Naked-rumped Tomb Bat	LC	-
60	Tatera indica	Indian Gerbil	LC	V
61	Tetracerus quadricornis	Four-horned Antelope	VU	I
62	Vandeleuria oleracea	Asiatic Long-tailed Climbing Mouse	LC	V
63	Viverricula indica	Small Indian Civet	LC	II
64	Vulpes vulpes	Red Fox	LC	П
65	Peponocephala electra	Melon-headed Whale	LC	I
66	Stenella coeruleoalba	Striped Dolphin	LC	I
67	Ziphius cavirostris	Cuvier's Beaked Whale	LC	I
68	Tursiops aduncus	Indo-Pacific Bottlenose Dolphin	NT	-
69	Lagenodelphis hosei	Fraser's Dolphin	LC	I
70	Grampus griseus	Risso's Dolphin	LC	I
71	Stenella attenuata	Pantropical Spotted Dolphin	LC	I
72	Globicephala macrorhvnchus	Short-finned Pilot Whale	LC	I

SN	Scientific Name	Common Name	IUCN Status*	WPA Schedule**
73	Stenella longirostris	Spinner Dolphin	LC	I
74	Kogia breviceps	Pygmy Sperm Whale	LC	I
75	Orcinus orca	Killer Whale	DD	I
76	Tursiops truncatus	Common Bottlenose Dolphin	LC	I
77	Dugong dugon	Dugong	VU	I
78	Balaenoptera acutorostrata	Common Minke Whale	LC	I
79	Pseudorca crassidens	False Killer Whale	NT	I
80	Physeter macrocephalus	Sperm Whale	VU	I
81	Delphinus capensis	Long-beaked Common Dolphin	DD	-
82	Mesoplodon densirostris	Blainville's Beaked Whale	LC	I
83	Feresa attenuata	Pygmy Killer Whale	LC	I
84	Neophocaena phocaenoides	Indo-Pacific Finless Porpoise	VU	I
85	Sousa plumbea	Indian Ocean Humpback Dolphin	EN	I
86	Indopacetus pacificus	Indo-pacific Beaked Whale	LC	-
87	Balaenoptera edeni	Bryde's Whale	LC	I
88	Kogia sima	Dwarf Sperm Whale	LC	I
89	Balaenoptera musculus	Blue Whale	EN	I

*Status assigned by the International Union for Conservation of Nature and Natural Resources, where -LC – Least Concern, EN – Endangered, VU – Vulnerable, NT – Near Threatened; **Status assigned by the Wildlife (Protection) Act, 1972, where I – V are the schedules

Appendix C Resident Birds of the Study Area

SN	Scientific Name	Common Name	IUCN Status*	WPA Schedule**
1	Francolinus pictus	Painted Francolin	LC	-
2	Francolinus pondicerianus	Grey Francolin	LC	-
3	Perdicula asiatica	Jungle Bush Quail	LC	IV
4	Perdicula argoondah	Rock Bush Quail	LC	IV
5	Galloperdix spadicea	Red Spurfowl	LC	IV
6	Gallus sonneratii	Grey Junglefowl	LC	II
7	Pavo cristatus	Indian Peafowl	LC	I
8	Dendrocygna javanica	Lesser Whistling-duck	LC	IV
9	Nettapus coromandelianus	Cotton Pygmy-goose	LC	IV
10	Anas poecilorhyncha	Indian Spot-billed Duck	LC	IV
11	Tachybaptus ruficollis	Little Grebe	LC	IV
12	Ciconia episcopus	Woolly-necked Stork	VU	IV
	Threskiornis			
13	melanocephalus	Black-headed Ibis	NT	IV
14	Ardeola grayii	Indian Pond Heron	LC	IV
15	Butorides striata	Striated Heron	LC	IV
16	Ardea purpurea	Purple Heron	LC	IV
17	Casmerodius albus	Great Egret	LC	IV
18	Ardea intermedia	Intermediate Egret	LC	IV
19	Falco tinnunculus	Common Kestrel	LC	IV
20	Falco jugger	Laggar Falcon	NT	IV
21	Falco peregrinus	Peregrine Falcon	LC	l
22	Elanus caeruleus	Black-winged Kite	LC	IV
23	Milvus migrans	Black Kite	LC	IV
24	Haliastur indus	Brahminy Kite	LC	IV
25	Haliaeetus leucogaster	White-bellied Sea Eagle	LC	1
26	Pernis ptilorhynchus	Oriental Honey-buzzard	LC	IV
27	Neophron percnopterus	Egyptian Vulture	EN	IV
28	Gyps bengalensis	White-rumped Vulture	CR	I
29	Gyps indicus	Indian Vulture	CR	I
30	Circaetus gallicus	Short-toed Snake Eagle	LC	IV
31	Spilornis cheela	Crested Serpent Eagle	LC	IV
32	Accipiter badius	Shikra	LC	IV
33	Accipiter virgatus	Besra	LC	IV
34	Butastur teesa	White-eyed Buzzard	LC	IV
35	Aquila rapax	Tawny Eagle	VU	IV
36	Aquila fasciata	Bonelli's Eagle	LC	IV
37	Nisaetus cirrhatus	Crested Hawk Eagle	LC	IV
38	Lewinia striata	Slaty-breasted Rail	LC	
39	Zapornia fusca	Ruddy-breasted Crake	LC	-
40	Amaurornis phoenicurus	White-breasted Waterhen	LC	IV
41	Turnix sylvaticus	Small Buttonquail	LC	IV

SN	Scientific Name	Common Name	IUCN Status*	WPA Schedule**
42	Turnix suscitator	Barred Buttonquail	LC	IV
43	Porphyrio porphyrio	Purple Swamphen	LC	IV
44	Gallinula chloropus	Common Moorhen	LC	IV
45	Fulica atra	Eurasian Coot	LC	IV
46	Hydrophasianus chirurgus	Pheasant-tailed Jacana	LC	IV
47	Metopidius indicus	Bronze-winged Jacana	LC	IV
48	Vanellus indicus	Red-wattled Lapwing	LC	-
49	Charadrius dubius	Little Ringed Plover	LC	IV
50	Rostratula benghalensis	Greater Painted-snipe	LC	IV
51	Glareola lactea	Small Pratincole	LC	-
52	Sterna aurantia	River Tern	NT	-
53	Columba livia	Common Pigeon	LC	-
54	Streptopelia decaocto	Eurasian Collared Dove	LC	IV
55	Streptopelia tranquebarica	Red Collared Dove	LC	IV
56	Stigmatopelia chinensis	Spotted Dove	LC	IV
57	Stigmatopelia senegalensis	Laughing Dove	LC	IV
58	Treron phoenicopterus	Yellow-footed Green Pigeon	LC	IV
59	Chalcophaps indica	Emerald Dove	LC	IV
60	Psittacula krameri	Rose-ringed Parakeet	LC	IV
61	Psittacula cyanocephala	Plum-headed Parakeet	LC	IV
62	Hierococcyx varius	Common Hawk Cuckoo	LC	IV
63	Eudynamys scolopaceus	Asian Koel	LC	-
64	Taccocua leschenaultii	Sirkeer Malkoha	LC	-
65	Centropus sinensis	Southern Coucal	LC	-
66	Tyto alba	Barn Owl	LC	IV
67	Otus bakkamoena	Indian Scops Owl	LC	IV
68	Glaucidium radiatum	Jungle Owlet	LC	-
69	Athene brama	Spotted Owlet	LC	-
70	Bubo bengalensis	Indian Eagle Owl	LC	IV
71	Ketupa zeylonensis	Brown Fish Owl	LC	IV
72	Strix ocellata	Mottled Wood Owl	LC	IV
73	Ninox scutulata	Brown Hawk Owl	LC	IV
74	Caprimulgus indicus	Jungle Nightjar	LC	IV
75	Caprimulgus asiaticus	Indian Nightjar	LC	IV
76	Caprimulgus affinis	Savanna Nightjar	LC	IV
77	Cypsiurus balasiensis	Asian Palm Swift	LC	-
78	Tachymarptis melba	Alpine Swift	LC	-
79	Hemiprocne coronata	Crested Treeswift	LC	-
80	Apus affinis	Little Swift	LC	-
81	Upupa epops	Coomon Hoopoe	LC	-
82	Coracias benghalensis	Indian Roller	LC	IV
83	Pelargopsis capensis	Stork-billed Kingfisher	LC	IV
84	Halcyon smyrnensis	White-throated Kingfisher	LC	IV
85	Alcedo atthis	Common Kingfisher	LC	IV
86	Ceryle rudis	Pied Kingfisher	LC	IV
87	Merops orientalis	Green Bee-eater	LC	-

SN	Scientific Name	Common Name	IUCN Status*	WPA Schedule**
88	Psilopogon zeylanicus	Brown-headed Barbet	LC	IV
89	Megalaima viridis	White-cheeked Barbet	LC	IV
90	Psilopogon haemacephala	Coppersmith Barbet	LC	IV
91	Hemicircus canente	Heart-spotted Woodpecker	LC	_
92	Micropternus brachyurus	Rufous Woodpecker	LC	-
		Brown-capped Pygmy		
93	Dendrocopos nanus	Woodpecker	LC	-
94	Dendrocopos mahrattensis	Yellow-crowned Woodpecker	LC	-
95	Dinopium benghalense	Lesser Goldenback	LC	-
96	Chrysocolaptes festivus	White-naped Woodpecker	LC	-
97	Tephrodornis pondicerianus	Common Woodshrike	LC	-
98	Artamus fuscus	Ashy Woodswallow	LC	-
99	Coracina macei	Large Cuckooshrike	LC	-
100	Aegithina tiphia	Common Iora	LC	IV
101	Pericrocotus cinnamomeus	Small Minivet	LC	IV
102	Pericrocotus flammeus	Orange Minivet	LC	IV
103	Lanius vittatus	Bay-backed Shrike	LC	-
104	Lanius schach	Long-tailed Shrike	LC	-
105	Lanius excubitor	Great Grey Shrike	LC	-
106	Dicrurus paradiseus	Greater Racket-tailed Drongo	LC	IV
107	Dicrurus macrocercus	Black Drongo	LC	IV
108	Dicrurus caerulescens	White-bellied Drongo	LC	IV
109	Oriolus kundoo	Indian Golden Oriole	LC	IV
110	Oriolus xanthornus	Black-hooded Oriole	LC	IV
111	Rhipidura aureola	White-browed Fantail	LC	IV
112	Terpsiphone paradisi	Asian Paradise-flycatcher	LC	IV
113	Hypothymis azurea	Black-naped Monarch	LC	IV
114	Dendrocitta vagabunda	Rufous Treepie	LC	IV
115	Corvus macrorhynchos	Indian Jungle Crow	LC	IV
116	Corvus splendens	House Crow	LC	V
117	Parus major	Great Tit	LC	-
118	Riparia paludicola	Plain Martin	LC	-
119	Ptyonoprogne concolor	Dusky Crag Martin	LC	_
120	Petrochelidon fluvicola	Streak-throated Swallow	LC	_
121	Hirundo smithii	Wire-tailed Swallow	LC	-
122	Cecropis daurica	Red-rumped Swallow	LC	-
123	Ammomanes phoenicura	Rufous-tailed Lark	LC	IV
124	Eremopterix ariseus	Ashy-crowned Sparrow Lark		IV
125	Galerida malabarica	Malabar Lark		IV
126	Alauda gulgula	Oriental Skylark		IV
120	Pvcnonotus leucotis	White-eared Bulbul		IV
127		Red whiskered Bulbul		
120	Pychonolus jocosus	Red-vented Bulbul		
129				
101	Prinia hodaconii	Grov broasted Brinic		IV
137	Fillia nougsonii			-
132	Fillia sylvalica			-
133	rinia socialis	Asny Prinia	LC	-

SN	Scientific Name	Common Name	IUCN Status*	WPA Schedule**
134	Prinia inornata	Plain Prinia	LC	-
135	Prinia buchanani	Rufous-fronted Prinia	LC	-
136	Cisticola juncidis	Zitting Cisticola	LC	-
137	Orthotomus sutorius	Common Tailorbird	LC	-
138	Pellorneum ruficeps	Puff-throated Babbler	LC	IV
139	Dumetia hyperythra	Tawny-bellied Babbler	LC	IV
140	Pomatorhinus horsfieldii	Indian Scimitar Babbler	LC	IV
141	Argya caudata	Common Babbler	LC	IV
142	Argya malcolmi	Large Grey Babbler	LC	IV
143	Turdoides striata	Jungle Babbler	LC	IV
144	Alcippe poioicephala	Brown-cheeked Fulvetta	LC	-
145	Chrysomma sinense	Yellow-eyed Babbler	LC	IV
146	Zosterops palpebrosus	Oriental White-eye	LC	-
147	Acridotheres fuscus	Jungle Myna	LC	IV
148	Acridotheres ginginianus	Bank Myna	LC	IV
149	Acridotheres tristis	Common Myna	LC	IV
150	Sturnia pagodarum	Brahminy Starling	LC	IV
151	Myophonus horsfieldii	Malabar Whistling Thrush	LC	IV
152	Geokichla citrina	Orange-headed Thrush	LC	IV
153	Copsychus saularis	Oriental Magpie Robin	LC	-
154	Kittacincla malabarica	White-rumpedShama	LC	-
155	Saxicoloides fulicatus	Indian Robin	LC	-
156	Saxicola caprata	Pied Bushchat	LC	-
157	Cyornis tickelliae	Tickell's Blue Flycatcher	LC	IV
158	Chloropsis jerdoni	Jerdon's Leafbird	LC	IV
159	Chloropsis aurifrons	Golden-fronted Leafbird	LC	IV
160	Dicaeum agile	Thick-billed Flowerpecker	LC	IV
161	Dicaeum erythrorhynchos	Pale-billed Flowerpecker	LC	IV
162	Leptocoma zeylonica	Purple-rumped Sunbird	LC	IV
163	Leptocoma minima	Crimson-backed Sunbird	LC	IV
164	Cinnyris asiaticus	Purple Sunbird	LC	IV
165	Cinnyris lotenius	Loten's Sunbird	LC	IV
166	Aethopyga vigorsii	Vigors's Sunbird	LC	IV
167	Passer domesticus	House Sparrow	LC	-
168	Gymnoris xanthocollis	Chestnut-shouldered Petronia	LC	-
169	Ploceus philippinus	Baya Weaver	LC	-
170	Euodice malabarica	Indian Silverbill	LC	-
171	Amandava amandava	Red Avadavat	LC	IV
172	Lonchura striata	White-rumped Munia	LC	IV
173	Lonchura punctulata	Scaly-breasted Munia	LC	IV
174	Lonchura malacca	Black-headed Munia	LC	IV
175	Motacilla maderaspatensis	White-browed Wagtail	LC	-
176	Anthus rufulus	Paddyfield Pipit	LC	IV
177	Emberiza lathami	Crested Bunting	LC	IV

*Status assigned by the International Union for Conservation of Nature and Natural Resources, where –LC – Least Concern, EN – Endangered, VU – Vulnerable, NT – Near Threatened; **Status assigned by the Wildlife (Protection) Act, 1972, where I – V are the schedules

Appendix D Migratory Birds of the Study Area

SN	Scientific Name	Common Name	IUCN Status*	WPA Schedule**	Migratory Status***
1	Coturnix coturnix	Common Quail	LC	IV	W
2	Coturnix coromandelica	Rain Quail	LC	IV	W
3	Tadorna ferruginea	Ruddy Shelduck	LC	IV	W
4	Anser indicus	Bar-headed Goose	LC	IV	W
5	Anas strepera	Gadwall	LC	IV	W
6	Anas penelope	Eurasian Wigeon	LC	IV	W
7	Anas platyrhyncos	Mallard	LC	IV	W
8	Anas clypeata	Northern Shoveler	LC	IV	W
9	Anas acuta	Northern Pintail	LC	IV	W
10	Anas querquedula	Garganey	LC	IV	W
11	Anas crecca	Common Teal	LC	IV	W
12	Netta rufina	Red-crested Pochard	LC	IV	W
13	Aythya ferina	Common Pochard	VU	IV	W
14	Aythya nyroca	Ferruginous Duck	NT	IV	W
15	Aythya fuligula	Tufted Duck	LC	IV	W
16	Podiceps cristatus	Great Crested Grebe	LC	IV	W
17	Mycteria leucocephala	Painted Stork	NT	IV	W
18	Anastomus oscitans	Asian Openbill	LC	IV	W
19	Ciconia nigra	Black Stork	LC	IV	W
20	Ciconia ciconia	White Stork	LC	IV	W
21	Phoenicopterus roseus	Greater Flamingo	LC	IV	W
22	Phoenicopterus minor	Lesser Flamingo	NT	IV	W
23	Plegadis falcinellus	Glossy Ibis	LC	IV	w
24	Platalea leucorodia	Eurasian Spoonbill	LC	IV	W
25	Dupetor flavicollis	Black Bittern	LC	IV	W
26	Ardea cinerea	Grey Heron	LC	IV	W
27	Bubulcus ibis	Cattle Egret	LC	IV	W
28	Egretta garzetta	Little Egret	LC	IV	W
29	Anhinga melanogaster	Darter	NT	IV	W
30	Phalacrocorax niger	Little Cormorant	LC	IV	W
31	Phalacrocorax fuscicollis	Indian Cormorant	LC	IV	W
32	Phalacrocorax carbo	Great Cormorant	LC	IV	W
33	Pandion haliaetus	Osprey	LC	I	W
34	Circus aeruginosus	Eurasian Marsh Harrier	LC	IV	W
35	Circus macrourus	Pallid Harrier	NT	IV	W
36	Aquila clanga	Greater Spotted Eagle	VU	IV	W
37	Aquila nipalensis	Steppe Eagle	EN	IV	W
38	Hieraaetus pennatus	Booted Eagle	LC	IV	W
39	Rallina eurizonoides	Slaty-legged Crake	LC	-	S
40	Porzana pusilla	Baillon's Crake	LC	-	W
41	Porzana porzana	Spotted Crake	LC	-	W

SN	Scientific Name	Common Name	IUCN Status*	WPA Schedule**	Migratory Status***
42	Turnix tanki	Yellow-leaged Buttonguail		-	W
43	Grus virao	Demoiselle Crane	LC	IV	W
44	Himantopus himantopus	Black-winged Stilt	LC	IV	W
45	Recurvirostra avosetta	Pied Avocet		IV	W
46	Haematopus ostralegus	Furasian Ovstercatcher	NT	IV	W
47	Pluvialis fulva	Pacific Golden Plover		IV	W
48	Pluvialis squatarola	Grev Plover			W
40	Charadrius alexandrinus	Kentish Plover			W
50	Charadrius leschenaultii	Greater Sand Plover			W
51	Charadrius reserienaulus	Lesser Sand Plover			\\/
52	Philomachus nugnay				\\/
52	Callinação stenura	Din tailed Spine			<u>vv</u>
53	Gallinago steriura	Common Snipe			<u>vv</u>
54	Gaiinago gaiinago	Common Shipe		N/	
55					
50	Limosa iapponica				VV
57	Numenius phaeopus	Whimbrei		IV	VV
58	Numenius arquata		NI		W
59	Tringa erythropus	Spotted Redshank	LC	IV	W
60	Tringa totanus	Common Redshank	LC	IV	W
61	Tringa stagnatilis	Marsh Sandpiper	LC	IV	W
62	Tringa nebularia	Common Greenshank	LC	IV	W
63	Tringa ochropus	Green Sandpiper	LC	IV	W
64	Tringa glareola	Wood Sandpiper	LC	IV	W
65	Xenus cinereus	Terek Sandpiper	LC	IV	W
66	Actitis hypoleucos	Common Sandpiper	LC	IV	W
67	Arenaria interpres	Ruddy Turnstone	LC	IV	W
68	Calidris tenuirostris	Great Knot	LC	IV	W
69	Calidris minuta	Little Stint	LC	IV	W
70	Calidris temminckii	Temminck's Stint	LC	IV	W
71	Calidris alba	Sanderling	LC	IV	W
72	Calidris ferruginea	Curlew Sandpiper	LC	IV	W
73	Calidris alpina	Dunlin	LC	IV	W
74	Larus cachinnans	Caspian Gull	LC	IV	W
75	Larus heuglini	Heuglin's Gull	LC	IV	W
76	Ichthyaetus ichthyaetus	Pallas's Gull	LC	IV	W
77	Chroicocephalus brunnicephalus	Black-headed Gull	LC	IV	W
78	Chroicocephalus ridibundus	Brown-headed Gull	LC	IV	w
79	Gelochelidon nilotica	Gull-billed Tern	LC	IV	W
80	Hydroprogne caspia	Caspian Tern		IV	W
81	Thalasseus bengalensis	Lesser Crested Tern	10	IV	W
82	Thalasseus sandvicensis	Sandwich Tern			W/
02 82	Thalasseus baraii	Creater Created Torn			<u>۷۷</u> \\/
03	Sterna birunda	Common Torn			<u>۷۷</u>
04	Sternula albifrana				<u>vv</u>
85					VV
86	Chlidonias hybrida	vvhiskered lern	LC	IV	VV

SN	Scientific Name	Common Name	IUCN Status*	WPA Schedule**	Migratory Status***
87	Streptopelia orientalis	Oriental Turtle Dove	LC	IV	W
88	Clamator jacobinus	Jacobin Cuckoo	LC	IV	S
89	Asio flammeus	Short-eared Owl	LC	IV	W
90	Merops persicus	Blue-cheeked Bee-eater	LC	IV	Р
91	Merops philippinus	Blue-tailed Bee-eater	LC	IV	Р
92	Jynx torquilla	Eurasian Wryneck	LC	IV	W
93	Pitta brachyura	Indian Pitta	LC	IV	Р
94	Lalage melanoptera	Black-headed Cuckooshrike	LC	IV	S
95	Lanius cristatus	Brown Shrike	LC	IV	W
96	Lanius isabellinus	Isabelline Shrike	LC	IV	W
97	Dicrurus leucophaeus	Ashy Drongo	LC	IV	W
98	Hirundo rustica	Barn Swallow	LC	IV	W
99	Calandrella brachydactyla	Greater Short-toed Lark	LC	IV	W
100	Acrocephalus stentoreus	Clamorous Reed Warbler	LC	IV	W
101	Acrocephalus agricola	Paddyfield Warbler	LC	IV	W
102	Acrocephalus dumetorum	Blyth's Reed Warbler	LC	IV	W
103	Phylloscopus griseolus	Sulphur-bellied Warbler	LC	IV	W
104	Phylloscopus trochiloides	Greenish Warbler	LC	IV	W
105	Phylloscopus tytleri	Tytler's Leaf Warbler	LC	IV	W
106	Sylvia curruca	Lesser Whitethroat	LC	IV	W
107	Sturnia malabarica	Chestnut-tailed Starling	LC	IV	W
108	Pastor roseus	Rosy Starling	LC	IV	W
109	Monticola solitarius	Blue Rock Thrush	LC	IV	W
110	Monticola cinclorhyncus	Blue-capped Rock Thrush	LC	IV	W
111	Luscinia svecica	Bluethroat	LC	IV	W
112	Phoenicurus ochruros	Black Redstart	LC	IV	W
113	Saxicola torquatus	Common Stonechat	LC	IV	W
114	Muscicapa dauurica	Asian Brown Flycatcher	LC	IV	W
115	Ficedula parva	Red-breasted Flycatcher	LC	IV	W
116	Ficedula superciliaris	Ultramarine Flycatcher	LC	IV	W
117	Eumyias thalassinus	Verditer Flycatcher	LC	IV	W
118	Motacilla flava	Yellow Wagtail	LC	IV	w
119	Motacilla citreola	Citrine Wagtail	LC	IV	W
120	Motacilla cinerea	Grey Wagtail	LC	IV	W
121	Motacilla alba	White Wagtail	LC	IV	W
122	Anthus trivialis	Tree Pipit	LC	IV	W
123	Anthus hodgsoni	Olive-backed Pipit	LC	IV	W
124	Carpodacus erythrinus	Common Rosefinch	LC	IV	W
125	Emberiza melanocephala	Black-headed Bunting	LC	IV	W
126	Emberiza bruniceps	Red-headed Bunting	LC	IV	W

*Status assigned by the International Union for Conservation of Nature and Natural Resources, where –LC – Least Concern, EN – Endangered, VU – Vulnerable, NT – Near Threatened; **Status assigned by the Wildlife (Protection) Act, 1972, where I – V are the schedules

Appendix E Reptiles of the Study Area

SN	Scientific Name	Common Name	IUCN Status*	WPA Schedule**
1	Acrochordus granulatus	Wart Snake	LC	IV
2	Ahaetulla nasuta	Green Vine Snake	NA	IV
3	Ahaetulla pulverulenta	Brown Vine Snake	LC	IV
4	Amphiesma stolatum	Striped Keelback	NA	IV
5	Argyrogena fasciolata	Banded Racer	NA	IV
6	Boiga beddomei	Beddome's Cat Snake	DD	IV
7	Boiga forsteni	Forsten's Cat Snake	LC	IV
8	Bungarus caeruleus	Common Indian Krait	NA	IV
9	Calliophis melanurus	Slender Coral Snake	NA	IV
10	Calotes rouxii	Sahyadri Forest Lizard	LC	-
11	Calotes versicolor	Indian Garden Lizard	NA	-
12	Chamaeleo zeylanicus	Indian Chamaeleon	LC	II
13	Coluber gracilis	Graceful Racer	DD	IV
14	Coronella brachyura	Indian Smooth Snake	LC	IV
15	Crocodylus palustris	Mugger	VU	I
16	Cyrtodactylus deccanensis	Deccan Ground Gecko	LC	-
17	Cyrtodactylus varadgirii	Giri'sGeckoella	NA	-
18	Daboia russelii	Russell's Viper	DD	IV
19	Dendrelaphis tristis	Common Bronzeback Tree Snake	NA	IV
20	Echis carinatus	Indian Saw-scaled Viper	NA	IV
21	Ervx conicus	Common Sand Boa	NA	IV
22	Eutropis allapallensis	Schmidt's Mabuya	LC	-
23	Eutropis carinata	Common Keeled Skink	LC	-
24	Fowlea piscator	Checkered Keelback	NA	IV
25	Grypotyphlops acutus	Beaked Worm Snake	LC	IV
26	Hemidactylus brookii	Brooke's House Gecko	LC	-
27	Hemidactylus flaviviridis	Yellow Green House Gecko	NA	-
28	Hemidactylus frenatus	Asian House Gecko	LC	-
29	Hemidactylus gracilis	Slender Gecko	LC	-
30	Hemidactylus maculatus	Spotted Rock Gecko	LC	-
31	Indotyphlops braminus	Brahminy Worm Snake	NA	IV
32	Lycodon aulicus	Common Wolf Snake	NA	IV
33	Lycodon striatus	White-banded Wolf Snake	NA	IV
34	Lycodon travancoricus	Travancore Wolf Snake	LC	IV
35	Lygosoma guentheri	Günther's Writhing Snake	LC	IV
36	Lygosoma lineata	Lined Supple Skink	LC	-
37	Melanochelys trijuga	Indian Black Turtle	LC	-
38	Monilesaurus rouxii	Roux's Forest Calotes	LC	-
39	Naja naja	Spectacled Cobra	NA	II
40	Oligodon arnensis	Banded Kukri Snake	NA	IV
41	Oligodon taeniolatus	Variegated Kukri Snake	LC	IV
42	Psammophis longifrons	Stout Sand Snake	LC	-
43	Pseudocerastes persicus	Persian Horned Viper	LC	IV

44	Ptyas mucosa	Oriental Rat Snake	NA	II
45	Rhabdophis plumbicolor	Green keelback	NA	IV
46	Sibynophis subpunctatus	Dumeril's Black-headed Snake	NA	IV
47	Sitana ponticeriana	Fan Throated Lizard	LC	-
48	Trimeresurus gramineus	Bamboo Pit Viper	LC	IV
49	Trimeresurus malabaricus	Malabar Pit Viper	LC	IV
50	Uropeltis macrolepis	Bombay Earth Snake	LC	IV
51	Uropeltis phipsonii	Phipson's Earth Snake	VU	IV
52	Varanus bengalensis	Bengal Monitor Lizard	LC	Ι
53	Eretmochelys imbricata	Hawksbill Turtle	CR	1
54	Hydrophis viperinus	Viperine Sea Snake	LC	IV
55	Hydrophis platurus	Yellow-bellied Sea Snake	LC	IV
56	Lepidochelys olivacea	Olive Ridley	VU	1
57	Caretta caretta	Loggerhead Turtle	VU	1
58	Hydrophis cantoris	Cantor's Narrow–headed Sea Snake	DD	IV
59	Hydrophis mamillaris	Bombay Sea Snake	DD	IV
60	Hydrophis lapemoides	Arabian Gulf Sea Snake	LC	IV
61	Hydrophis schistosus	Beaked Sea Snake	LC	IV
62	Hydrophis caerulescens	Dwarf Sea Snake	LC	IV
63	Hydrophis ornatus	Ornate Reef Sea Snake	LC	IV
64	Hydrophis spiralis	Yellow Sea Snake	LC	IV
65	Hydrophis stokesii	Stokes' Sea Snake	LC	IV
66	Hydrophis curtus	Spine-bellied Sea Snake	LC	IV
67	Hydrophis cyanocinctus	Annulated Sea Snake	LC	IV
68	Hydrophis gracilis	Graceful Small-headed Seasnake	LC	IV

*Status assigned by the International Union for Conservation of Nature and Natural Resources, where –LC – Least Concern, EN – Endangered, VU – Vulnerable, NT – Near Threatened; **Status assigned by the Wildlife (Protection) Act, 1972, where I – V are the schedules

Appendix F Amphibians of the Study Area

S. No.	Scientific Name	Common Name	IUCN Status*	WPA Schedule**
1	Duttaphrynus stomaticus	Indian Marbled Toad	LC	-
2	Microhyla ornata	Ant Frog	LC	_
3	Microhyla rubra	Guangdong Rice Frog	LC	_
4	Uperodon globulosus	Indian Globular Frog	LC	-
5	Euphlyctis hexadactylus	Indian Green Frog	LC	IV
6	Hoplobatrachus tigerinus	Indian Bullfrog	LC	IV
7	Polypedates maculatus	Indian Tree Frog	LC	-
8	Sphaerotheca breviceps	Indian Burrowing Frog	LC	-
9	Fejervarya limnocharis	Asian Grass Frog	LC	-
10	Duttaphrynus melanostictus	Asian Common Toad	LC	-
11	Euphlyctis cyanophlyctis	Indian Skittering Frog	LC	-
12	Hydrophylax malabaricus	Malabar Fungoid Frog	LC	-
13	Fejervarya syhadrensis	Bombay Wart Frog	LC	-
14	Uperodon variegatus	Eluru Dot Frog	LC	-

*Status assigned by the International Union for Conservation of Nature and Natural Resources, where –LC – Least Concern, EN – Endangered, VU – Vulnerable, NT – Near Threatened; **Status assigned by the Wildlife (Protection) Act, 1972, where I – V are the schedules

Appendix G Fishes of the Study Area

SN	Scientific Name	Common Name	IUCN Status*	WPA Schedule**
1	Aplocheilus lineatus	Striped panchax	LC	-
2	Therapon jarbua	Target Fish	-	_
3	Periopthalmus sp.	-	-	-
4	Boleopthalmus sp.	-	-	_
5	Trypauchen vagina	Burrowing Goby	LC	_
6	Tilapia mossambica	Mozambique Tilapia	LC	_
7	Lates calcarifer	Barramundi	LC	_
8	Megalops cyprinoides	Indopacific tarpon	DD	_
9	Mugil cephalus	-		_
10	Arius thalassinus	Giant Sea Catfish	LC	-
11	Mystus gulio	Long Whiskers Catfish	LC	-
12	Elops saurus	Northern Ladyfish	LC	-
13	Coilia dussumieri	-	LC	-
14	Trichiurus savala	-	-	-
15	Johnius sp.	-	-	-

*Status assigned by the International Union for Conservation of Nature and Natural Resources, where -LC – Least Concern, EN – Endangered, VU – Vulnerable, NT – Near Threatened; **Status assigned by the Wildlife (Protection) Act, 1972, where I – V are the schedules

Appendix H Map of Existing Transmission Corridor





AECOM India Private Limited 9/F, Infinity Tower – 'C', DLF Cyber City, DLF Phase II Gurgaon, Haryana, India 122002. CIN : U74210HR2008FTC038183