Environmental and Social Impact Assessment (ESIA) for 14.9 MW Waste to Energy Plant at Rajkot, Gujarat

Project SPV: Goodwatts WTE Rajkot Private Limited

Project Location: Rajkot, Gujarat

Final Report

May 2024

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Name	Description
ACEL	Abellon Clean Energy Limited
WTE	Waste to Energy
Amsl	Above mean sea level
GETCO	Gujarat Energy Transmission Corporation Limited
GWRPL	Goodwatts WTE Rajkot Private Limited
RMC	Rajkot Municipal Corporation
AoI	Area of Influence
APCD	Air Pollution Control devices
BMTPC	Building Materials and Technology Promotion Council of India
CEA	Central Electricity Authority
CGWA	Central Groundwater Authority
CPCB	Central Pollution Control Board
CGWB	Central Ground Water Brochure
CMS	Convention of Migratory Species
CO2	Carbon dioxide
CPCB	Central Pollution Control Board
CSR	Corporate Social Responsibility
CTE	Consent to Establish
CTO	Consent to Operate
DG	Diesel Generator
ESP	Electrostatic Precipitator
EHS	Environment, Health and Safety
ESMP	Environmental and Social Management Plan
GSI	Geological Survey of India
GLC	Ground Level Concentration
GSS	Grid Substation
HWA	Hazardous Waste Authorization
ESIA	Environmental & Social Impact Assessment
IFC	International Finance Corporation
ILO	International Labour Organization
IMD	India Meteorological Department
kV	Kilowatt
m3/day	Kilo Litres Per Day
kWh	Kilowatt per hour
Mbgl	Meters below ground level
MNRE	Ministry of New and Renewable Energy

Name	Description
MoEFCC	Ministry of Environment, Forest and Climate Change
MW	Mega Watt
NAAQ	National Ambient Air Quality
NOC	No Objection Certificate
O&M	Operation and Maintenance
OBC	Other Backward Caste
PPE	Personal Protective Equipment
PPM	Parts per million
PM	Particulate Matter
PPM	Project-affected People's Mechanism
PS	Performance Standards
PUC	Pollution under Control
PPA	Power Purchase Agreement
STP	Sewage Treatment Plant
RDF	Refuse Derived Fuel
SC/ST	Schedule Caste/Schedule Tribe
SPV	Special Purpose Vehicle
TPH	Tons Per Hours
TPD	Tons Per Day
TL	Transmission Line

1 Introduction

Abellon Clean Energy Limited (hereinafter referred to as "Client" or "ACEL" or "Company") has engaged a service provider (hereafter referred to as 'E&S Advisor') to undertake Environment and Social Impact Assessment of its 14.9 MW under-construction waste to energy plant located in Nanekarwadi in Rajkot tehsil and district in the state of Gujarat, India (hereinafter referred to as "Project").

Abellon Clean Energy Limited (ACEL) is a Waste to Energy (WTE) developer based out of Gujarat in India, who is developing 4 Nos of WTE plants of cumulative capacity 52.20 MW as of 2023. The company is headquartered in Ahmedabad, Gujarat and has forayed in renewable energy space (WTE, Bio-Mass and Solar Energy) since 2008[1]. The Company is seeking financial assistance from International Finance Corporation (hereinafter referred to as "IFC") to fund the capital expenditure of the project and therefore, ACEL has engaged E&S advisors to undertake ESIA for the Project.

This ESIA report identifies and analyses environmental and social risks impacts associated with the construction and operation phase of the project including a review of any legacy risks and impacts related to the project and determines the measures needed to prevent, minimize, mitigate and compensate adverse impacts in compliance with the Applicable Reference Framework ***(refer Section 1.2).***

1.1.1 Objective

The primary objective of the ESIA is to -

- To establish the environmental and social baseline of the area of influence of the project (10 km radius) and associated facilities.
- Conduct consultations with the project stakeholders to ensure that all key stakeholders are aware of the objectives, impacts and mitigation measures adopted by the project.
- Undertake an analysis of alternatives.
- Assess the environmental and social impacts.
- Suggest mitigation measures for consideration in the project for implementation so as to minimize the identified impacts.
- Prepare Environmental and Social Management Plan (ESMP) for implementation & monitoring of the mitigation measures.
- Categorize the Project as per IFC Categorization, based on outcome of the ESIA study.

1.2 Applicable Reference Framework

Applicable reference framework for this assignment includes the following:

- Applicable local, national, and international environmental and social legislations including Solid Waste Management Rules, 2016
- Applicable technical guidelines on waste to energy including revised guidelines of waste-to-energy Programme, Ministry of New and Renewable Energy (MNRE), Government of India
- Applicable guidelines/legislations on waste pickers and recycling
- IFC Performance Standards (PS) on Social and Environmental Sustainability (2012)
- World Bank Group (WBG) General EHS Guidelines, 2007
- WBG EHS Guidelines for Waste Management Facilities, 2007
- WBG EHS Guidelines Water and Sanitation, 2007
- WBG EHS Guidelines for Power Transmission & Distribution, 2007
- The International Labour Organization (ILO) conventions covering core labour standards and the basic terms and conditions of employment – Declaration of Fundamental Principles and Rights to Work,1998
- IFC/ERBD Guidance on Worker Accommodation, 2009
- UN Voluntary Principles on Security and Human Rights, 2000
- Addressing Gender-Based Violence and Harassment - Emerging Good Practice for the Private Sector, 2020

[1] https://abelloncleanenergy.com/ (Accessed on June 07, 2023)

1.3 Scope of Work

The scope of work for the ESIA includes:

- Review of Project Information – Review of all the relevant (E&S) documents / information to assess impacts on various environmental and social components.
- Review of legal framework – Review of the compliance of the project with the reference framework as a part of this assignment.
- Scoping Study –Review of available primary and secondary data to focus on key issues/impacts and define the project's area of influence (AoI)
- Site Visit – Undertake site visit to the under-construction waste to energy plant to understand site settings, environmental and social baseline and identify potential project specific impacts. This also involved:
    - Identification of sensitive receptors in the study area
    - Stakeholder consultation comprising of local community, project site team, rag pickers, etc.
- Analysis of Alternatives – This includes covering site suitability as per IFC PSs, WBG EHS Guidelines, Site Selection Guidelines specified in the Solid Waste Management Rules /CPHEOO Guidelines and other applicable regulations based on the nature/type of wastes to be used as feedstock.
- Establishment of Baseline - Establish the baseline of the project area of influence (AoI) through review of data on environmental and social components collected from authenticated agencies/authorities and published secondary sources. Primary environmental, ecological and social assessments at project location and its AoI was also undertaken to supplement secondary information.
- Land use mapping was conducted to identify sensitive receptors within the study area, including the land-use pattern along the route of the transmission line and water pipeline, based on a desk-based GIS review. Additionally, the land use mapping was utilized to assess historical and legacy issues related to land ownership and livelihood dependence on the allotted land for the power plant.
- Stakeholder Consultation and Analysis - Identify relevant stakeholders for the project, undertake consultation and information dissemination session with project affected persons and other relevant stakeholders as well as with local community in general to inform stakeholders about the objectives and potential impacts of proposed project and seek their inputs, concerns and expectations.
- Impact Assessment and Mitigation Measures - Based on the project details and baseline information related to site locations, assessment of impacts for operation phase of the Project. Develop management plans with measures to avoid, minimize, mitigate, compensate/ offset for the identified impacts associated with various Project activities.
- Environmental and Social Management Plan - Formulation of an environment and social management plan to minimize any impact on environment and social parameters and mechanism for continuous consultation and involvement of the community throughout the project life.

1.4 Approach & Methodology

The ESIA comprised an E&S scoping which includes site visit and identification of key risks and impacts associated with the under-construction project that were analyzed during the ESIA study. The key tasks undertaken as part of the ESIA has been presented in subsequent sections.

1.4.1 Project Kick Off

E&S Advisors organized a kick-off discussion with the Client to obtain an overview of the status of the project, and their expectations. Kick off meeting also included discussion on timelines for the site assessment and the deliverables. After project kick off, indicative list of details/ documents required to be reviewed were shared.

1.4.2 Documentation Review

E&S Advisors reviewed a list of project-related documents to understand any sensitive environmental or social receptors and to compile existing information on baseline conditions. Documents reviewed as part of this assignment included Project location in Kmz, project layout, permits and license, technical specifications, policies and other documents etc. made available in the data room by the client. A comprehensive list of information reviewed as part of this assignment has been attached as **Appendix 1.**

Based on a review of the documents, E&S Advisors prepared the legal, and administrative framework within which the site visits were carried out, including state and central regulations, obligations of implementing relevant international social and environmental treaties, agreements, and conventions and IFC PS. E&S Advisors has compiled desk based information on the environmental and social baseline of the Project areas which are supported by primary data collection thereafter.

1.4.3 Detailed Site Visit & Baseline Data Collection

Team comprising of EHS, social and ecological experts conducted site visit to the Project location between 16th to 18th May (for Ecology and Biodiversity), followed by 21st June & 27th June to understand key ecological, environmental and social sensitivities within the Project footprint and area of influence.

The focus of this visit was to better understand the site settings, sensitivities with respect to the Project and associated facilities. Visual observation of the on-going construction activities and consultation with key stakeholder groups was also undertaken during site visit. Details of activities undertaken during site visit is as presented in Table below.

Table 1-1 Site Assessment Activities

Date(s)	Location	Activities
16th May 2023	5 km buffer of Project Site	• Ecology and Biodiversity Survey; • Consultations with the locals.
17th May 2023	10 km buffer of Project Site	• Ecology and Biodiversity Survey; • Consultations with the locals on ecology and biodiversity aspects.
18th June 2023	Under Construction Project Site and its vicinities	• Discussion with client representative about the project infrastructures and project activities; • Ecology and Biodiversity Survey of the surrounding area; • Consultations with the locals.
21st June 2023	• Project Site • Along the proposed ROW for transmission line and pipeline • Existing Dumping ground for Rajkot Municipal Corporation	• Discussion with project team on status of the Project and WTE plant process flow. • Site reconnaissance of the WTE plant to identify environmental and social sensitivities and risks. • Site reconnaissance of the underground and overhead transmission line route and water pipeline route connected from the nearby Gujarat Energy Transmission Corporation Limited (GETCO) Substation and sewage treatment plant, respectively. • Understanding of the process for waste receiving and handling, waste characterization, segregation, segregated storage, material recovery and conveyance to planned treatment facilities (internal transfer of waste) (to WTE/ to landfill). • Consultation with technical team, site representatives to understand the project process and layout. • Visit to the existing landfill.
27th June 2023	• Project Site • Along the proposed ROW for transmission line and pipeline • Exiting Dumping ground for Rajkot Municipal Corporation • Villages/habitations around the Project area	• Discussion with the project teams regarding HR policy, labor and progress of construction and contractor. • Plant inspection to understand the EHS implementation and labor issues. • Consultation with labor to understand the labor welfare practices followed at project level. • Consultations with rack pickers to understand the potential issues with respect to their income and livelihood. • Transit walk /route survey along the TL and water pipeline route to understand the potential issues related to R&R and displacement if any.

Date(s)	Location	Activities
		• Consultations with Sarpanch to understand their potential concerns and expectations from the Project.

1.4.3.1 Primary Environmental Baseline

The primary baseline data collection has been undertaken for a period of 4 weeks, through engagement of a third-party government accredited monitoring laboratory/ agency for following parameters as per WB sectoral EHS guidelines.

- Ambient Air Quality
- Ground water quality (drinking purpose). A separate study has been undertaken for the Phase 2 site contamination/historical pollution assessment;
- Traffic monitoring for the access road
- Surface water quality sampling and analysis; and
- Monitoring of Noise levels of the study area

The attributes, parameters, frequency, number of samples and locations for monitoring has been detailed in ***Section 5.2***.

1.4.3.2 Ecology & Biodiversity Survey

The ecological baseline (flora and fauna) survey was conducted to understand the ecological sensitivity of the study area, between 16th – 18th May 2023. The main objective of this exercise was to identify the potential impacts on the species and habitats (present in the vicinity) due to the project-related activities, so as to identify suitable impact mitigation and management strategy.

A field survey was conducted to determine the existing ecological conditions (habitats, flora and fauna) within the study area. This baseline facilitates an adequate assessment of the project's impacts upon ecology as well as it helps the development of appropriate mitigation measures. Habitats, which may support good biodiversity i.e., forest patches, scrubs, water bodies, etc. will be focused during the survey. During the survey, different habitats (natural and modified) available within the study area were explored to assess the floral and faunal (specifically reptiles, birds, and mammals) diversity.

The detailed methodology and outcomes of the survey have been explained under section ***Ecological Baseline***.

1.4.3.3 Primary Social Baseline Assessment

The primary data collected for Project was based on key informant interview schedule, focused group discussion & stakeholder consultations, transect walk and visual observations at site. During the site visit most of the primary data collected for the proposed project was qualitative in nature such as sources of income of the rack pickers, type of waste and market value of the waste, trade cycle, gender & caste profile of the people involved in waste collection, potential community concerns related to the project. Details of social baseline is given in ***Section 5.4.***

1.4.4 Secondary Baseline Data Collection

Secondary baseline data collection involved identifying and collecting available published material and documents. Information's on various environmental aspects like soil, geology, hydrogeology, hydrology, drainage pattern, ecology, meteorology, etc. Type of secondary data and their different sources is as given in table below:

Table 1-2 Sources of Secondary Data Collection

S. No	Attribute	Source
1	Long term meteorological data	• India Meteorological Department (IMD) • District Statistical Handbook

S. No	Attribute	Source
2	Soil, Geology, Hydrogeology and hydrology	• District Resource Map • Geological Survey of India • Central Ground Water Board
3	Land use	• Satellite Imagery • ARC GIS Mapping
4	Natural Hazards	• Building Material and Technology Promotion Council of India (BMTPC) • India Meteorological Department (IMD)
5	Flora & Fauna	• https://www.iucnredlist.org/ • https://ebird.org/ • https://www.inaturalist.org/ • https://indiabiodiversity.org/
6	Socio-Economic Details	• Census of India • District Statistical Handbook • Ward details from Rajkot Municipal Corporation

1.4.5 Analysis of Alternatives

E&S Advisors undertook a comparison of reasonable alternatives in terms of their technical as well as a social, environmental and health and safety positive and negative impacts related to use of resources (i.e., water source options and impacts), provisional transmission line route/corridor, etc. Rationale towards considering the project design has been provided with respect to Project site, technology, contextual E&S risks, no project alternatives.

1.4.6 Stakeholder Consultation

Consultation with various stakeholders identified for the Project including project team, labors and ragpickers & sarpanch was undertaken as a part of this assessment. Details of stakeholder engagement and consultation are presented in Section 6 of the report.

1.4.7 Impact Assessment and Mitigation Measures

Based on the project details and baseline information, an assessment of the E&S impacts was done which included the following:

- Predicting and assessing the project's likely positive and negative impacts and assigning significance to each type of impact.
- Identifying mitigation measures and any residual negative impacts that cannot be mitigated.
- Identifying and estimating the extent and quality of available data, key data gaps and uncertainties associated with predictions, and specifying topics that do not require further attention.

1.4.8 Environmental and Social Management Plan

Environmental and Social Management Plan (ESMP) to minimize E&S impacts associated with various Project activities has been developed. Also detailed Project specific Management Plans has been prepared in discussion with the Client.

1.5 Limitations

This report has been developed based on the Project level information provided by GWRPL and professional judgment to certain facts with resultant subjective interpretation. If information to the contrary is discovered, the findings in this ESIA may need to be modified accordingly. This ESIA report has following limitations:

- The secondary data utilized for the purpose of baseline assessment is limited to that available in the public domain or made available during the consultations with the GWRPL site representative.

- The project report is not intended to meet any national, state, or local statutory requirements and for any regulatory submission (as part of any permitting process or otherwise).
- This is a non-assurance work with no audit/loan staffing services to be provided and there are no other client-side / other-side parties involved in this engagement.
- Ecological survey was conducted in non-migratory season during the daylight hours and thus the avifaunal and faunal activities recorded were restricted to diurnal hours only.
- Compensation to the impacted land owners (12 for overhead and 1 for underground transmission line) has been disbursed. To ensure conformity with the stipulations outlined in the Gujarat Circular No. JET-11-2015-GOI-199-K, dated 14.08.2017 and 31.12.2021, as well as adherence to prevailing market rates, both the service provider and the Project have formally requested information from GETCO. However, GETCO has not disclosed the specific amount of compensation paid to the landowners. GETCO has not shared any information related to compensation despite Abellon's follow-up efforts.
- During the site visit the weather conditions was unfavorable because it was raining heavily therefore most of the community based stakeholder was unavailable for consultations.

1.6 Structure of the Report

Chapter 1	Introduction (This Section)
Chapter 2	Project Description
Chapter 3	Applicable Legislative Regulatory & Administrative Regime
Chapter 4	Analysis of Alternatives
Chapter 5	Environment & Social Baseline Conditions
Chapter 6	Stakeholder Identification & Engagement
Chapter 7	Impact Assessment & Mitigation Measures
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Appendix 1	Documents Reviewed
Appendix 2	Photolog
Appendix 3	Design Specification for Flue Gas Cleaning
Appendix 4	Emergency Preparedness and Response Plan
Appendix 5	Contractor Management Plan
Appendix 6	Pollution Prevention and Management Plan
Appendix 7	Traffic Management Plan
Appendix 8	Resource Efficiency and Conservation Management
Appendix 9	Biodiversity Management Plan
Appendix 10	Security Risk and management plan
Appendix 11	Stakeholder Engagement Plan
Appendix 12	Labour Management and Working Condition including Labour Camps
Appendix 13	Environment and Social Monitoring Plan
Appendix 14	Occupational Health & Safety
Appendix 15	Detailed AEROMOD Results
Appendix 16	Community Health & Safety
Appendix 17	Detailed Environmental Monitoring results

2 Project Description

This section provides an overview of under construction project, in terms of location, associated facilities, site settings, resource requirement, land details and status of the project.

2.1 Project Overview

The Government of Gujarat notified Gujarat Waste to Energy Policy, 2016 to facilitate and promote utilization of Municipal Solid Waste (MSW) for generation of electricity in a sustainable manner and also contribute to Swachh Bharat Abhiyan. In line with the Gujarat Waste to Energy (WTE) Policy, 2016, Rajkot Municipal Corporation (RMC) issued Request for Proposal (RFP) on 18.10.2017 inviting bidders for design, construction, operation, and maintenance of processing plant based on waste to energy to manage 500 TPD of fresh waste and 100 TPD of legacy waste in the city of Rajkot. The competitive bidders submitted their respective proposals in response to the RFP for development of the 14.9 MW waste to energy plant at a tariff of INR 7.01 per unit of electricity. Post evaluation of the Proposals, RMC declared Abellon Clean Energy Limited (ACEL) as the successful bidder for setting up the WTE plant as per provision of the Gujarat WTE policy, 2016 and SWM Rules 2016 and issued letter of award (LoA) dated 15.03.2018. ACEL established a special purpose vehicle (SPV) i.e., Goodwatts WTE Rajkot Private Limited and incorporated the SPV under Companies Act 2013 and further requested RMC to accept the SPV as the concessionaire for the project which shall perform the obligations under the LoA and Concession Agreement (CA).

The concession agreement was executed between RMC and Goodwatts WTE Rajkot Private Limited on 31.08.2018 for conversion of 600 TPD municipal solid waste to energy at Nakaravadi in Rajkot tehsil and district in the state of Gujarat, India. The 14.9 MW WTE plant is currently in construction phase and has been established on a land admeasuring 15 acres. The project has been developed with a waste processing capacity of 600 TPD, out of which 500 TPD of fresh municipal solid waste generated will be transported from various transfer station[2] in Rajkot city in line with the concession agreement and remaining 100 TPD of legacy waste will be utilised through biomining activity being carried out at Rajkot Municipal Solid Waste (MSW) landfill.

The Project will be operational in two (2) phases, where Phase 1 (7.5 MW) will be commissioned in March 2025 and Phase II (7.4 MW) will be commissioned in June 2025. As reported, 600 TPD of waste will be utilized for operation of phase 1 of the project i.e. 7.5MW and a total of 1000TPD of waste is required for operation of 14.9 MW of the project. The total MSW produced by the Rajkot city and rural area is 725 to 730 tons per day (TPD). The Municipal Solid Waste (MSW) feed requirement for the project during full capacity operation is projected to be 1000 TPD (Tons Per Day). Consequently, approximately 730 TPD of waste will be managed through daily collection of fresh waste, while the remaining 270 TPD will be sourced from legacy waste extracted from the RMC landfill. It's important to note that as the waste generation in the city increases, the reliance on legacy waste will gradually diminish. Priority will be given to handling freshly generated waste.

The salient features of the under construction waste to energy project has been presented in **Table 2-1** and project process flow has been presented as **Figure 2-1.**

Table 2-1 Salient Features of the under-construction project

Sr. No.	Components	Description
1	SPV Name	Goodwatts WTE Rajkot Private Limited
2	Project Capacity	14.9MW
3	Project Coordinates	22°22'29.74"N; 70°51'42.97"E
4	Project Location	Nakrawadi village, Rajkot tehsil and district, Gujarat, India
5	Project Current Status	Under construction with 70% construction work completed
6	Commercial Operation Date	The Project will be operational in two (2) phases, where Phase 1 (7.5 MW) will be commissioned in March 2025 and Phase II (7.4 MW) will be commissioned in June 2025.

[2] There are two transfer stations in Rajkot from where the waste gets transferred to the existing dumping site i.e. KSD Garbage Station and Raiya Garbage Station

<table>
<tr><th colspan="2">Sr. No. Components</th><th>Description</th></tr>
<tr><td>7</td><td>Total Municipal Waste used per day (Proposed)</td><td>500 TPD Fresh MSW plus 100 TPD legacy waste as per the existing Concessionaire Agreement for 14.9MW, however as per GRWPL, the project will use up to 1000 TPD during full capacity operation of the project, i.e. 14.9MW.</td></tr>
<tr><td>8</td><td>Biomining activities</td><td>Biomining operations at the Rajkot Municipal Solid Waste (MSW) landfill site are conducted by a third-party contractor namely Jay Vachharaj Roadways & Earth Movers (JVREM), duly appointed by the Rajkot Municipal Corporation (RMC). As per the information provided by the project representative, The project currently plans to procure biomining waste from the contractor appointed by RMC or nearby municipalities/ULBs as the case may be. As the city of Rajkot continue to witness high growth trajectory leading to generation of higher amount of fresh water , the reliance on legacy waste will gradually diminish.
Project may also procure RDF from other contractors appointed by RMC or nearby municipalities as the case may be at the time of start of operations.
It is important to note that the contractors will be operating autonomously and will be responsible for the excavation and extraction of legacy waste from the landfill site. The biomining activities encompass various processes, including the extraction of legacy waste, segregation and recovery of recyclable materials, organic waste separation, and handling of other waste components, all of which are further subjected to specific processing and disposal procedures.</td></tr>
<tr><td>9</td><td>Existing Transfer Stations (Managed by RMC)</td><td>Rajkot has two operational transfer stations i.e., KSD garbage transfer station and Raiyadhar garbage station with a capacity of 350 TPD each, out of which 20 TPD waste is sent to the material recovery facility (MRF) located within both the transfer stations.
Currently, the wastes generated at the households are transported to the transfer stations through tippers where MSW is further transferred to heavy duty trucks which transport the MSW to the Rajkot MSW landfill facility. Post the commencement of operations for the project, the MSW from the transfer station will be transported to the project site as fuel for the boilers.
RMC has one under construction and one proposed transfer stations in addition to the above-mentioned operational transfer stations.</td></tr>
<tr><td>10</td><td>Proposed Boiler no. and capacity</td><td>2 Steam Boilers of 40 tons per hour (TPH) capacity each.</td></tr>
<tr><td>11</td><td>Proposed Boiler Stack Height</td><td>50 m (compliant to CPCB guidelines (national requirements) as well as requirements of IFC EHS guidelines)

For details refer section 2.7.1.1</td></tr>
<tr><td>12</td><td>Proposed Ash generated from the power plant</td><td>70 TPD (Per Boiler)</td></tr>
<tr><td>13</td><td>Proposed Transmission Line</td><td>66 kV transmission line of 11.8 km length (2.9 km underground + 8.9 km overhead) having towers connecting plant to the Gauridad Substation situated at a aerial distance of 6.5 km from the WTE plant towards north west direction</td></tr>
<tr><td>14</td><td>Land Requirement for the Project</td><td>The total land requirement for the project is provided below:
<table>
<tr><th>Project Component</th><th>Total Land (acres)</th></tr>
<tr><td>Waste to Energy Plant</td><td>15</td></tr>
<tr><td>RoW of Transmission Line – Overhead</td><td>37.748 (8.9 km length)</td></tr>
<tr><td>Underground transmission Line</td><td>0.708 (2.9 km length)</td></tr>
<tr><td>Underground water pipeline</td><td>2.9734</td></tr>
<tr><td>Total</td><td>55.7214</td></tr>
</table></td></tr>
<tr><td>15</td><td>Water Requirement and Source</td><td><u>Construction Phase</u></td></tr>
</table>

Sr. No.	Components	Description
		Water requirement during construction phase is being met through groundwater abstracted from borewell (1 in no.) located within the project premises. GWRPL has obtained permission from Central Groundwater Authority (CGWA) for abstraction of 7.5 kilo litres per day[3] (7.5 m^3/day)) of groundwater. <u>Operation Phase</u> During operation phase (considering both the phases), the project will require 1478 m^3/day water for industrial purpose and 7.5 m^3/day water for domestic purpose. Bottled water for drinking purposes will be procured from third party. Groundwater can only be used for flushing purpose as it is contaminated as per Phase II groundwater quality results (refer ***Section 5.3.6.5***). Recommendation on use of groundwater for domestic purpose are given in ***Section 7.4.2.4***. The project has been allocated 2 million litres per day (MLD[4]) i.e. 2000 m^3/day secondary treated water from 70 MLD i.e. 70,000 m^3/day Gauridad sewage treatment plant (STP) located at 12 km (aerial distance) from the WTE plant towards north west direction operated by RMC for industrial requirement.
16	Treated Water Pipeline	The project will install 12.2 km underground pipeline of diameter 9 inches connecting the project to the RMC STP.
17	Presence of Indigenous People (ownership of procured land or usage on procured land)	The land for the proposed project was owned by RMC and the same was given on 25 years lease to the project. As per the available the land does not belong to any indigenous community (Schedule tribe) and there are no land ownership claims.
18	National Park, Protected Area, or ecologically sensitive sites	No protected area is present within the buffer of 10 km from the Project site. Rampara Wildlife Sanctuary is the nearest Protected Area (PA) and situated about 18 km away from the project location in North-Northeast direction[5].
19	River / water bodies	Six water bodies are present within the buffer of 5 km from the Project location. The nearest River Lalpari is flowing ~ 5.5 km away from the project location in Southwest direction.
20	Natural Hazard in the Project area	The Project level details with respect to natural hazards as per Building Materials and Technology Promotion Council (BMTPC) Vulnerability Atlas of India, Third Edition[6] and District Disaster Management Plan for Rajkot, 2022 have been presented below o **Earthquake**: The Project is located in an area categorized between Zone III-Zone IV i.e., moderate to high to damage risk zones (MSK VII and MSK VIII) o **Wind**: The Project is located in an area categorized as Very High Damage Risk Zone with wind speed of 50 m/s o **Flood**: The Project is located in an area not vulnerable to floods. However, as per information available on public domain, there had been instance of flood in Rajkot city in 2021 and 2022 due to heavy rainfall[7],[8]. However, as reported site was not impacted during these floods. o **Drought**: According to District Disaster Management Plan for Rajkot, 2022, probability of drought for Rajkot is low, but may occur in the month of July to October once in two years. Design basis reports have been developed for civil/structural design where geotechnical investigation was undertaken along with structural analysis. Earthquake load and high wind load have been factored in the design load for industrial building.
21	Project' Area of Influence considered as part of the ESIA	o **Ecological Parameters:** Based on identified sensitivity during desk-based review and previous experiences, the study area for ecological assessment was demarcated as, o ***Core Area:*** Boundary of the project, and o ***Buffer Area:*** 10 km radius from the project boundary.

[3] 1KLD= 1 m^3/day

[4] 1MLD=1000 m^3/day

[5] Rahmani, A.R., Islam, M.Z. and Kasambe, R.M. (2016) Important Bird and Biodiversity Areas in India: Priority Sites for Conservation (Revised and updated). Bombay Natural History Society, Indian Bird Conservation Network, Royal Society for the Protection of Birds and BirdLife International (U.K.). Pp. 1992 + xii

[6] https://vai.bmtpc.org/

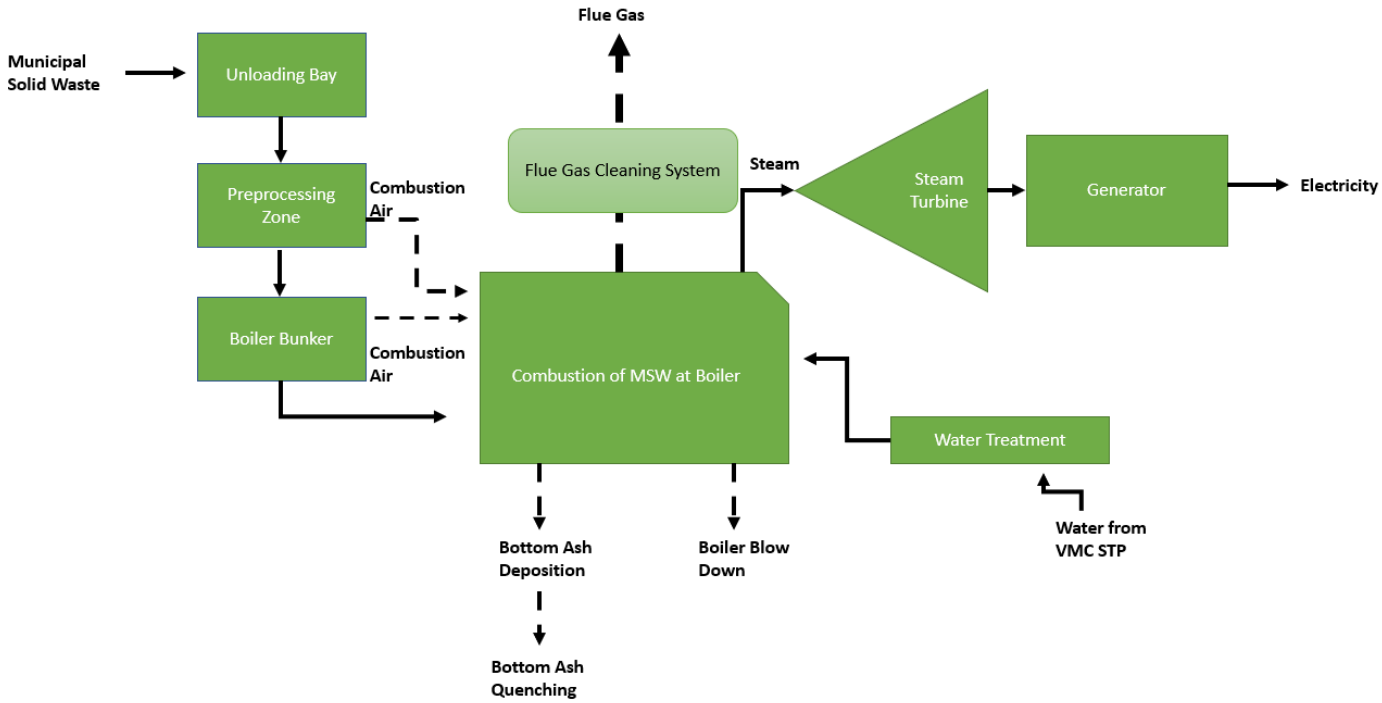
[7] https://theprint.in/india/gujarat-flood-like-situation-in-rajkot-after-heavy-rainfall/1035648/

[8] https://timesofindia.indiatimes.com/city/rajkot/rajkot-city-grapples-with-heavy-floods/articleshow/86189860.cms

Sr. No.	Components	Description
		○ **Environmental Parameters:** The area of up to 10 km radius from the Project boundary has been demarcated as study area or Area of Influence for the Project by considering the extent of project impact in terms of air quality, noise, water resources, human settlement, location of the access roads besides considering the actual land area which will be used for the facilities. For the purpose of environmental baseline assessment, ○ *core (0 – 2km from project site) and* ○ *buffer zones (beyond 2km – 10km of project site).* ○ **Social and Cultural:** The study area for the social assessment comprises of the area identified for the Project as well as villages which might be impacted directly or indirectly by the Project. The key terms used for sub-categorization of the study area are: ○ **Core zone -** The core zone is defined as the radius extending from the Project footprint area which would have majority of the impacts (during mobilization, construction, operation and decommissioning phase). The core zone area for the study is project footprint area i.e. WtE Plant, Water Pipeline and Transmission Line and adjacent area within 500 m radius. ○ **Buffer Zone -** An AoI of 10 km radius from the location of WTE Plant, transmission line and the water pipeline is considered for socioeconomic consultations to determine perceived impacts due to the Project including employment opportunities, loss of livelihood and increased vehicular activity in remote areas. **Study area:** Project footprint = Core zone (500 meters) + buffer zone (10 km). ***Figure 5-26*** provide the illustration of the study area.

Source: GWRPL & Site visits undertaken

Figure 2-1 Process Flow



Source: GWRPL Project Parameter Booklet, Abellon

2.1.1 Proposed Use of Industrial Waste

Type of industrial waste identified to be handled in the plant is as below.

S.No	Type of Industry	Waste Name
1	Paper	Pulp & Paper Waste
2	Textiles	Silk Waste/ Fiber Waste
3	Automobiles	Oily Rags, Cotton rags
4	Pharmaceuticals	Date expired goods
5		Off specifications goods
6		Spent Carbon
7		Process Wastes and residues
8	Heavy Engineering	Used Oil
9		Waste residues containing Oil

Source: GWRPL

Industrial waste from only the above type of industries will be handled after proper screening. Screening of the waste will be undertaken prior to approval for use /incineration of the waste within the Plant. Screening of waste will include the following:

- Check & confirm the industry type
- Obtain waste categorization report from the industry
- Conduct test to identify and confirm hazardous content in the waste
- Assess suitability of incineration of the waste within the Plant including disposal mechanism of the hazardous ash
- Identify need for any additional Air Pollution Control Device due to incineration of any such waste, also identify need for any additional waste handling and storage requirement.
- All the applicable permits required for incineration of the identified waste including amendment in the existing legal permits, if required, will be obtained. All the conditions in the legal permits will be complied with

Ash generated from the plant will be examined for hazardous content. If found hazardous, to be disposed of as per the provisions of Hazardous and Other Wastes (Management and Transboundary Movement) Rules, 2016, as amended.

2.2 Project Location & Site Setting

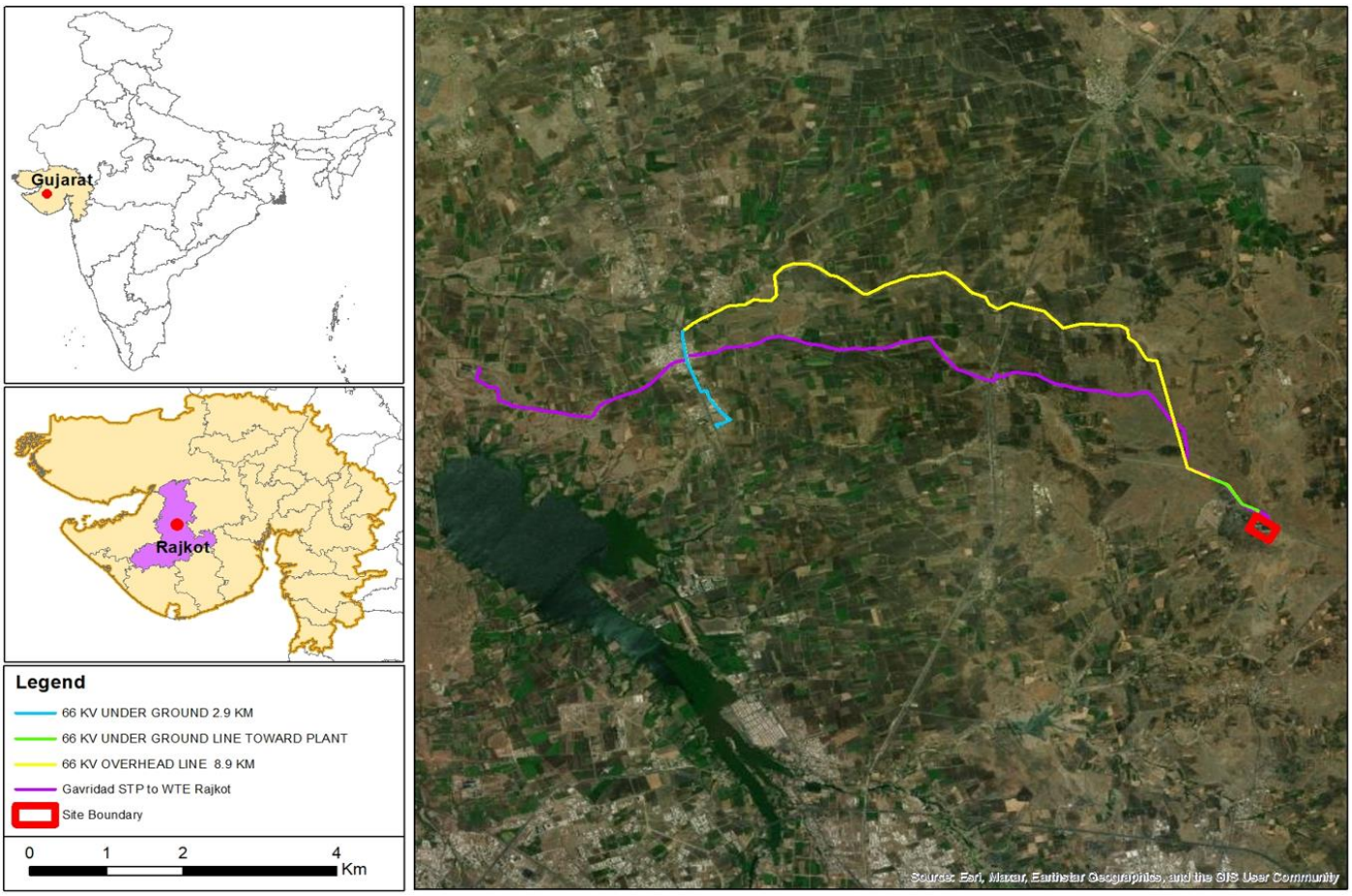
The 14.90 MW under construction waste to energy plant is located at Nakrawadi village in Rajkot tehsil and district, Gujarat. The project is situated on the outskirts of Rajkot city and is surrounded by waste land, patches of agriculture, fallow land and settlements in a 500-meter radius of the project boundary. The RMC municipal solid waste landfill is located adjacent to the project site towards west direction. The project has obtained the land for the WTE plant on a lease for a period of 25 years from Rajkot Municipal Corporation. Further, the allocated land for the WTE plant is under the ownership of Rajkot Municipal Corporation.

The project is accessible through Kuvada village road which connects to Rajkot Ahmedabad Highway at an aerial distance of ~ 4km. Nearest airport to the WTE plant is Rajkot airport located at ~ 11 km from the WTE plant towards south direction and nearest commercial railway station is Rajkot railway station located at ~ 9 km towards south direction.

Rampara Wildlife Sanctuary is the nearest Protected Area (PA) and situated about 18 km away from the project location in North-Northeast direction. The Aji dam is located 7.5 km away from site towards west direction. The Aji river flows approximately at 11 km from the site towards in the west direction.

The 70 MLD RMC STP is located at ~ 9.84 km (aerial distance) from the WTE plant towards north west direction. Additionally, GETCO 66kV substation is located at ~ 6.65 km (aerial distance) from the WTE plant towards north west direction. Rajkot city is located approximately at 7 km (aerial distance) towards south direction and the nearest settlement to the project site is Pipaliya village which is located at 1.7 km (aerial distance) towards north east direction. There are no hospitals and schools in the near vicinity to the project location.

Figure 2-2 Project Location Map



Source: Google Earth Imagery

2.3 Project Planning & Strategy

2.3.1 Waste Quantity

At present, Rajkot city is approximately producing 725 TPD of fresh municipal waste. As reported by the official of RMC, the waste generation of the city is increasing at a rate of 25% per year. Thus, the waste generation in 2024 will be approx. 900 TPD and 1,130 TPD in 2025[9].

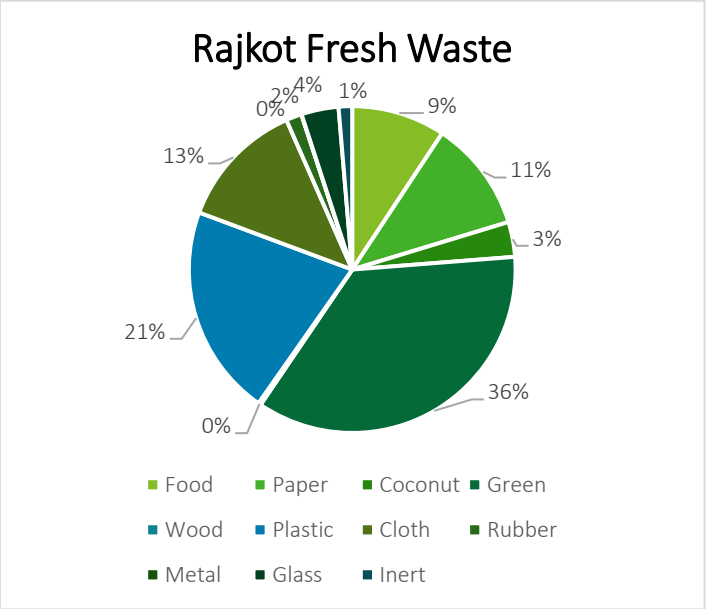
2.3.2 Waste Characteristics

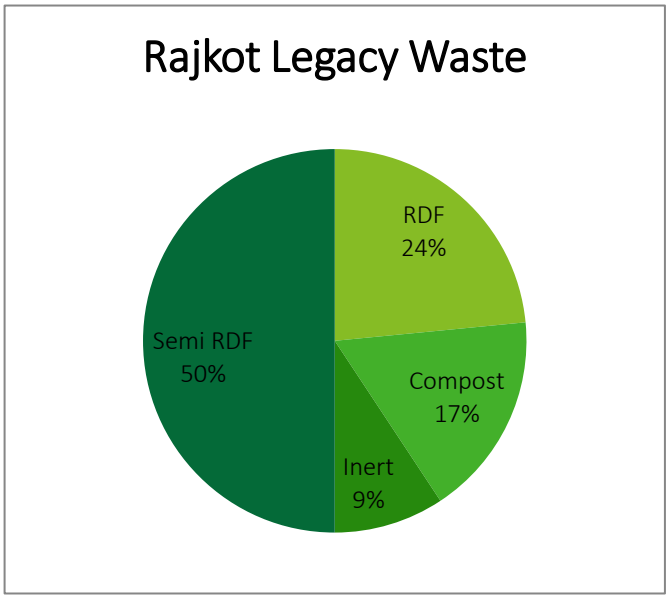
To understand the waste categorization of the area, the samples of waste were collected from 2 garbage stations (KSD Station and Raiya Garbage station) each of capacity 350 TPD and from the legacy waste present at the Rajkot waste dumping area. Total 198 tests were performed on the samples collected between 3rd to 8th September 2022. This included qualitative tests like bulk density, moisture, ash, GCV along with quantitative sieve analysis for 8 inch, 4-8 inch, 2-4 inch and below 2 inch size. Waste characterization for the fresh waste (sampled from the two garbage stations) and legacy waste[10] (sampled from Rajkot Waste dumping area) for Rajkot has been presented in ***Figure 2-3***. The Municipal Solid waste collected from these 2 locations majorly comprised of Food (9%), Plastic (21%) and green waste i.e., landscaping waste (36%). Other materials like Paper (11%), Coconut (3%), Rubber (2%) and Glass (4%) also contributes to the collection.

[9] The estimation of waste generation is based on the information provided by the official of Rajkot Municipal Corporation. However, it is important to note that this information may subject to changes due to several factors such as population and urbanization, economic development and consumption patterns, lifestyle and culture, Industrial and commercial activities, etc.

[10] Legacy waste refers to accumulated waste that has not been properly managed or treated over a long period of time

Figure 2-3 Waste characterization for Fresh waste as well as legacy waste for Rajkot





Source: GWRPL, Abellon

Waste categorization was also undertaken separately by Abellon for the two-transfer station to assess the moisture content ash %, Gross Calorific Value (GCV), Heating value etc, details have been presented in ***Table 2-2***. The waste samples collected from KSD Garbage station were recorded to have 50% moisture, whereas waste collected from Raiya Garbage station had 44% moisture. The percentage of dry ash was recorded more in Raiya Garbage Station (21%) in comparison to KSD Garbage Station (20%). This resulted in higher GCV value of dry waste at KSD Garbage Station (4689 kcal/kg). The Low heating value (LHV) value of wet waste is 2079kcal/kg and 2120 kcal/kg for KSD and Raiya Garbage Station respectively.

Table 2-2 Transfer Station specific waste characterization

	Weighted Average values					Derived Composition		
Rajkot Transfer Station	Moisture (%)	Ash_{dry} (%)	GCV_{dry} (kcal/kg)	GCV_{wet} (kcal/kg)	LHV_{wet} (kcal/kg)	Organic matter (%)	Moisture (%)	Ash + Inert (%)
KSD Garbage Station	50%	20%	4689	2486	2079	41%	50%	10%
Raiya Garbage Station	44%	21%	4430	2500	2120	42%	44%	14%%
Average	47%	20%	4560	2493	2099	41%	47%	12%

Source: GWRPL Project Parameter Booklet, Abellon

2.4 Waste Collection and Transportation

2.4.1 Door to door waste collection

For Phase 1, i.e., WTE plant of capacity 7.5MW, 83.33% of the total waste (500 TPD of the total 600 TPD) for the Project is proposed to be from the door-to-door collected waste or the fresh waste. For project operational in full capacity i.e. 14.9 MW (Phase 1 & Phase 2), 73% of the total waste (730TPD of the total requirement of 1000TPD) is proposed to be from the door-to-door collected waste or the fresh waste. The process adopted by Rajkot Municipal Corporation (RMC) for door to door waste collection involves following steps:

1. **Segregation:** Waste generated by households is segregated into different categories like biodegradable (organic) waste, recyclable waste, and non-recyclable waste. This step is not universally followed by all households; however, some households has adopted the practice of segregation of waste at the household level.

2. **Collection Schedule:** RMC has set a collection schedule for each area or locality of the Rajkot city. The schedule specifies the time for waste collection from the area/ locality.
3. **Collection Staff:** Waste collection staff, often known as waste collectors or sanitation worker, are responsible for going from house to house to collect waste. They may be employed by the municipality or contracted through private companies.
4. **Collection Process:** Waste collectors go to each household during the designated collection hours and collect the waste. They use trolleys, bins, or sacks to collect and transport the waste from individual houses to the collection vehicle.
5. **Collection Vehicles:** Dedicated waste collection vehicles, such as compartmentalized mini trucks, are deployed to collect segregated dry and wet waste from door to door.
6. **Collection Centers:** The door-to-door collected waste through mini-trucks is dumped at collection centers from where the collected waste will be loaded in compactors or big trucks to transport it to the Waste to Energy project site.

During the door-to-door collection process, the collection staffs collect the recyclable waste from the household produced waste. After the collection, the recyclable waste is then sold by the collection staff at the Material Recovery Facility (MRF) owned by the Rajkot Municipal Corporation (RMC). The MRF serves as a centralized facility where recyclable materials are sorted, processed, and prepared for further recycling or sale to recycling industries.

Currently, the collected waste is loaded in compactors or big trucks to transport from collection centres to the landfill. After the dumping of freshly collected waste at the landfill, ragpickers further collect recyclable waste from the dumped waste. The process of collection of recyclable waste by ragpickers from freshly dumped waste at the landfill is an informal process.

2.4.2 Legacy waste[11] bio-mining and transportation

The total waste requirement for the project to run at its full capacity is 1000 TPD and at present the Rajkot city is producing ~730 TPD. As reported by the official of RMC, the waste generation of the city is increasing at a rate of 25% per year. Thus, the waste generation in 2024 will be approx. 900 TPD and 1,130 TPD in 2025. Therefore, to fulfil the requirement of waste for the project, the Project need to acquire waste from the legacy waste mining at the Rajkot's landfill until 2025.

100 TPD (Phase 1) and 170 TPD (Phase 2) of legacy waste will be collected, processed, and transported from the Rajkot Landfill. Process to be adopted by the Project for collection, processing and transportation includes:

1. **Identification and Assessment:** Abellon (at the group level) in collaboration with Rajkot Municipal Corporation (RMC) has identified Rajkot city's waste landfill site where legacy waste is already been accumulated and can be used as a site to mine the legacy waste.
2. **Collection and Segregation:** Biomining operations at the Rajkot Municipal Solid Waste (MSW) landfill site are overseen by a third-party contractor named M/s Jay Vachharaj Roadways & Earth Movers (JVREM), who has been duly appointed by the Rajkot Municipal Corporation. The bio mined waste is segregated into different categories, such as organic waste, recyclables, and non-recyclables. This segregation helps in optimizing the waste-to-energy conversion process and maximizing resource recovery
3. **Temporary storage:** Segregated legacy waste will be temporarily stored at designated facilities inside the legacy waste site.
4. **Transportation:** The segregated waste will then be transported from the legacy waste site to the Project. This transportation will typically be done using specialized waste transport vehicles, such as trucks or trailers provided by JVREM.

JVREM has a direct contract with Rajkot Municipal Corporation to undertake the bio-mining of 3.0 Lacs MT/year of Legacy Waste, who operates autonomously (without any involvement of the Abellon Group or the GWRPL), duly appointed by the Rajkot Municipal Corporation (RMC) without any involvement of the Abellon Group or the GWRPL. The contractor is responsible for the excavation and extraction of the legacy waste from the landfill site.

Most of the Urban Local Bodies (ULBs) are currently in the process of awarding contracts to facilitate the bio-mining of legacy waste, in compliance with the directives issued by the National Green Tribunal (NGT) for the quick clearance of legacy waste present at the waste dumping grounds and these biomining contracts are being issued directly by the ULBs and the contractors

[11] Legacy waste refers to accumulated waste that has not been properly managed or treated over a long period of time

operates autonomously (without any involvement of the Abellon Group or the GWRPL), duly appointed by the Rajkot Municipal Corporation (RMC) .

GWRPL is evaluating and engaging with these bio-mining contracting parties for good quality and commercially attractive terms. GWRPL will not engage any exclusive, binding or long-term contractual arrangements with any of the participating parties for supply of RDF or legacy waste. GWRPL will have a formalized non-binding agreement. The salient terms of which are as follows:

- The contractor at their own expense, to deliver the requisite agreed RDF quantity to the location specified GWRPL.
- Given that the contractor is focused on the scientific disposal of RDF, which constitutes part of their responsibilities to the ULBs and for which they are entitled to tipping fees from the ULBs, the disposal of RDF by GWRPL serves as the consideration for the contractor.
- The supply arrangement is non-exclusive, affording the contractor the freedom to supply to other entities. Similarly, GWRPL is under no obligation to exclusively procure RDF from these contractors. Abellon retain the flexibility to source RDF from other suppliers if such sourcing aligns with GWRPL commercial and operational requirements with qualitative considerations.
- The agreement's term is one year, subject to automatic renewal on an annual basis unless terminated by mutual agreement of the parties.

In addition, Abellon is also in advance discussions to source RDF from the below mentioned locations (in future) for their facilities.

Future sources of Legacy Waste in the state of Gujarat:

Name of the city	In Lakhs MT
Ahmedabad	70.00 MT
Baroda	10.00 MT
Surat	25.00 MT
Rajkot	15.00 MT
Jamnagar	1.00 MT
Bhavnagar	5.00 MT
Junagadh	0.6 MT
Gandhinagar	1.00 MT
100 ULB(1)	25.00 MT
Total Legacy Waste	**152.60 MT**

Further, the state of Gujarat is also in the process to enter into agreements with third party contractors for legacy waste Bio Mining at the below mentioned sites with the Quantity mentioned which will further add to the supply chain of RDF within the close vicinity of GWRPL:

- Vadodara: 5,00,000 MT
- Surendra Nagar: 2,00,000 MT
- Rajkot : 6,50,000 MT

As per information provided by the project representative, the project will procure biomining waste from contractors, who will form an integral part of the Project's supply chain but not as an associated facility. Further, the following information is considered while stating that the biomining activity is not associated facility for the Project:

- The initiation and continuation of bio-mining operations are not contingent upon the existence of implementation of the Project. Bio-mining is an independent activity undertaken by a third-party contractor and is not initiated or driven by the Project. It is an ongoing process aimed at addressing the legacy waste at the landfill site irrespective of the Project's presence.
- The bio-mining contract between the appointed contractor and Municipality of Urban Local body, does not obligate the contractor to supply of bio-mine waste exclusively to the Project. The contractor retains the independence to sell the waste or other derived materials to entities other than the Project. There is no contractual binding that mandates the exclusive

supply of the bio-mine waste to the Project, however they are liable to dispose RDF as per prescribed Rules and Regulations i.e. supplying them to Waste to Energy, Cement units.

- The bio-mining contract is distinct from the Project concession and contract. Bio-mining operations, including the contractual agreements with the biomining contractor, may have commenced prior to, concurrently with, or subsequent to the project concession and contract. These are separate and independent contractual relationships.
- The project concession agreement does not obligate the Project to take a specific portion of waste from the bio-mining activity. The Project operates independently and has the discretion to determine its waste sourcing strategy, including whether or not to procure waste from the bio-mining activity. There is no contractual binding that mandates the project to take a specific amount of waste from bio-mining.
- The Project is free to exercise its discretion in deciding whether to procure bio-mined waste. There is no contractual obligation that compels the Project to accept or utilize waste derived from the bio-mining process. The Project retains the flexibility to make waste procurement decisions based on its operational requirements and objectives.

2.5 Waste Handling and Treatment Process

For Phase 1, GWRPL will receive 500 TPD MSW directly from Rajkot Transfer stations (collected from households) which are proposed to be transported through trucks and tippers owned by RMC at the WTE plant on daily basis. Nearly 50 trucks and tippers are anticipated to arrive at the plant with MSW. The remaining 100 TPD waste will be sourced from Rajkot MSW landfill where biomining activity will be carried out by third party contractors. The Rajkot Landfill is present adjacent to the project site.

Project when 100% operational will receive 730 TPD MSW directly from Rajkot Transfer stations (collected from households), i.e. additional 230TPD which will be transported through trucks and tippers owned by RMC on daily basis. Nearly 20 additional trucks and tippers (i.e. total 70) are anticipated to arrive at the Plant with MSW. The additional 170 TPD waste will be sourced from Rajkot MSW landfill where biomining activity will be carried out by a third party contractors.

Each truck carrying the municipal solid waste (MSW) will be visually inspected before going to a weighbridge. MSW vehicle containing high percentage of unwanted materials, will not be accepted in the plant and returned post communication with the municipality. After visual inspection and weighment, the municipal solid waste will be unloaded at the unloading bay in the pre-processing bunker of capacity 590Ton from where it will be fed into the pre-processing zone. At the pre-processing zone, splitters, shredders, star screen and metal removing equipment are proposed to be installed to:

- Removal unwanted particles size from MSW and size reduction of RDF & Remove big size stones as much as possible
- Remove metal (mostly Fe) to the extent possible
- Remove content like glass bottles, big tin and other large size cubes to the extent possible

Processing of all incoming waste will be undertaken as fast as possible to minimize waiting time of vehicles bringing material to Plant.

The rejected waste/ inert waste generated at the preprocessing unit will be transferred back into RMC trucks which will dispose the inert waste at Rajkot MSW landfill. Large pieces of glass (empty bottles) and metal will be collected and stored within the plant and further will be disposed of through local scrap vendors.

Post preprocessing of waste, it will then be transferred at the boiler bunker proposed to be constructed to store prepared fuel for boiler. Bunker of capacity (~1500 Ton) will be built to accommodate approximately waste requirement of 2+ days of prepared RDF to ensure round the clock availability of the fuel for the two boilers.

Boiler is proposed to be fed with RDF (also termed as “fuel”) with the help of fuel feeding system. The WTE plant at GWRPL is equipped with two boilers of capacity of 40 TPH (Tons per Hour) each with steam pressure and temperature of 42 kg/cm^2(g) and 410+-10^{0}C and a stack height of 50 meters and stack diameter of 2.1 m. Fuel is proposed to enter the boiler at an elevated height of 5.5 m above travelling grate which will help in partial combustion of about 40% in suspension and remaining combustion will take place on grate[12]. As proposed, the incineration process will take place in Boiler itself. Combustion of Fuel or RDF is proposed to be undertaken at a temperature more than 900°C. A special radiation zone without heat recovery is provided in the boiler after the last injection point of secondary air into furnace. As the air goes higher, the temperature of the boiler will decreases, however it will still remain at 850 ^{o}C at least for about two seconds. This higher temperature will help in achieving complete combustion

[12] The primary air required for combustion is proposed to be drew from boiler bunker area and preprocessing zone.

and ensure destruction of harmful emission before flue gas enters heat recovery area. A rapid cooling zone (400°C to 200°C) is provided for the flue gas post combustion to avoid formation of carcinogenic compounds.

A comprehensive flue gas cleaning system is proposed to be installed after boiler exhaust to control emissions. The flue gas cleaning system will include Dry ESP, Activated Carbon Injection System and Bag Filters to control emission in the atmosphere as per EU Norms 2010.

2.6 Project Components

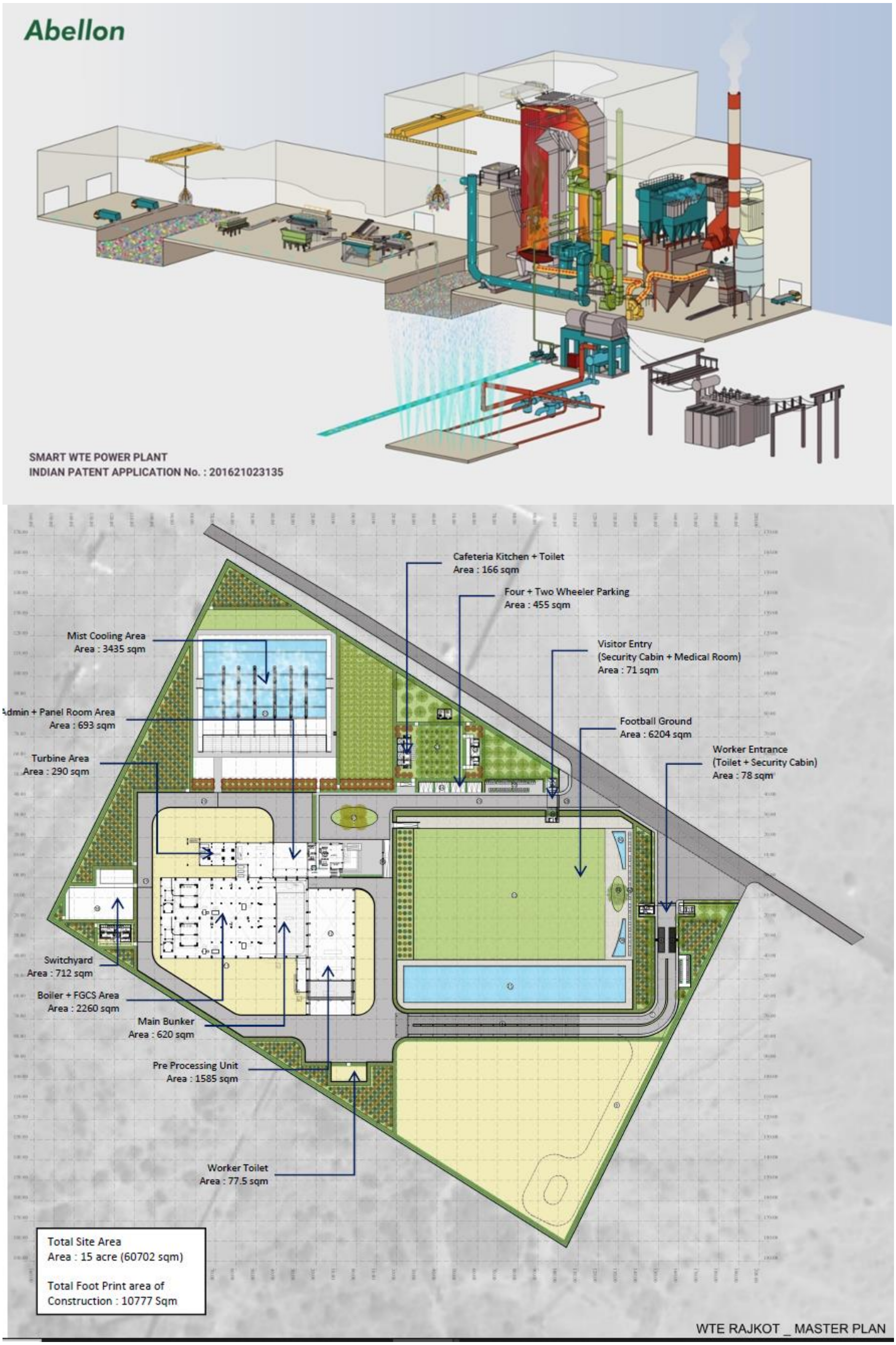
Project site overview with Layout plan and area details (refer ***Table 2-3***) of the Project are presented below in ***Figure 2-4***.

Table 2-3 Area Details

Component	Area in Sqm
Mist Cooling Area	3435
Admin cum Panel Room area	693
Turbine Area	290
Switchyard	712
Boiler and FGCS Area	2260
Main Bunker	620
Pre-Processing Unit	1584
Workers Toilet	77.5
Worker Entrance (Including toilets and security Cabin)	78
Football Ground	6204
Visitor Entry including security cabin and medical room	71
Vehicle Parking area (Four and Two Wheeler)	455
Cafeteria Kitchen and Toilets	166
Total Area	60702 sqm

Source: GWRPL Project Parameter Booklet, Abellon

Figure 2-4 Project Site Overview & Layout



Source: GWRPL, Abellon

2.6.1 Weighbridge

A Weighbridge will be setup at the truck/vehicle entrance of the project and will be used to weigh trucks loaded with waste as well as empty trucks.

2.6.2 Pre-processing

Pre-processing is a PLC based control system with operating station in which operator controls and monitors the operation of splitters, shredders, star screens and belt conveyors. The entire system has auto start/stop for all the equipment and can be operated by the operator sitting in the operation station with a processing capacity of 60TPH. Only 4-5 personnel are required to be present within the area to overlook the overall processing.

Pre-processing will include:

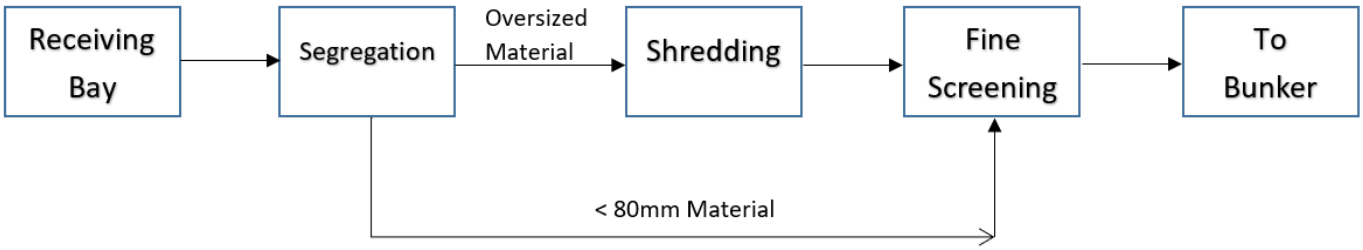
Waste segregation: Waste from the receiving area will be fed into splitter machine through grabbers. The splitter will segregate the in-feed material in 3 streams:

- 3D cubical heavy parts (size >80mm, rejected)
- 2D long material (size >80 mm)
- Fine/ under size material (size < 80 mm)

Waste shredding: The oversized material from the splitter will be passed through a single shaft shredder.

Waste screening: The fine material of size < 80 mm from both splitter and shredder will then be passed through star screen unit for the segregation of the material. The screened material will mostly be inert and of the size of <20 mm and is considered as reject. Process flow diagram for pre-processing is as presented *Figure 2-5* below.

Figure 2-5 Process Flow Diagram for Pre-Processing



Rajkot WTE plant is proposed to be equipped with two (2) boilers; hence the Plant will have two separate pre-processing areas and equipment for the boilers.

2.6.3 Fuel Feeding System

The fuel feeding system consists of feeders for both primary fuel (RDF) and auxiliary fuel (biomass). The Project will have two separate boilers with common steam turbine.

Fuel feeding system will consist of the following components:

- Boiler bunker along with storage of auxiliary fuel: The boiler bunker will have a partition to store auxiliary fuel (Biomass Pellets/briquettes, saw dust, wood chips). Separate unloading access point will be provided to the auxiliary fuel area of capacity 350 ton. The auxiliary fuel (Biomass pellets) will be used to ignite boiler and achieve target furnace temperature. Fuel will be fed in the boiler only after achieving the target temperature.
- Orange Peel Grab Crane: orange peel grab will be provided to lift the required quantity of boiler fuel from bunker and deliver the same on fuel pushing mechanism and to tumble stored Boiler Fuel (RDF) in bunker to achieve better homogeneity.
- Fuel Pushing Mechanism (FPM) & Fuel feeding chute system: 2 fuel pushing mechanism per boiler will be available to supply fuel to the boiler. Each FPM will be connected to hydraulic push with a vibro feeder to increase the better waste

flowability. Four Fuel feeding chutes will be provided per boiler. Inlet for each feeding chute will be inside boiler area. The portion present within the boiler will be made of stainless steel material, and will be water jacketed.

2.6.4 Boiler

Boiler of output 40 TPH has been installed to convert water to steam. Technical specification of boiler is as presented in Table below.

Table 2-4 Boiler Specification

Design Parameters	Unit	Value
No. of Boiler	2	Two
Boiler output – Maximum Continuous Rating	TPH	40
Boiler type		Single-drum, Water tube natural circulation, Top supported
Installation		Indoor, Field erected
Steam Pressure at Super heater outlet	Kg/cm2(g)	42
Steam temperature at Super heater outlet	°C	410±10
Feed water temperature inlet to economizer	°C	130
Feed water temperature inlet of Deaerator	°C	35
Fuel Feeding Capacity	TPH	Required 16 (can feed up to 20)
Fuel Required quantity	Kg/Hr	16.168
Type of firing		Travelling Grate (Air cooled) with Pneumatic Spreader
RDF Fluff		Top size not to exceed 100 mm in length for a Micro Cross Section of 2.0 mm2

Source: GWRPL Project Parameter Booklet, Abellon

2.6.5 Power Generation & Evacuation

Boiler will generate superheated steam which will expand in steam turbine which in turns rotates alternator and generated electricity will be evacuated through 66KV transmission line at GETCO substation. Steam turbine is proposed to be equipped with condenser with cooling water circulation. Process of generation of electricity from turbo-generator is as described below.

2.6.5.1 Steam Turbine

Turbo-generators convert the thermal energy of steam into mechanical work (Turbine) & then convert the mechanical energy to the electricity (Alternator). Depending upon the size of the machine and operating parameters, the alternator can be either directly coupled with the turbine or mechanically connected through a gear box in between; latter is mostly in case of smaller capacity machines such as the ones for WTE projects. This coupling is connected through reduction gearbox and is of pinbush/shear pinbush type.

High pressure steam is admitted into the turbine and then expanded in fixed and moving nozzles depending upon the turbine configuration. During the process of expansion, the nozzles/blades thermal energy is converted into mechanical work. Low pressure steam at the end of the expansion can be either extracted for processes and/or preheating of feed water for improving the overall thermodynamic efficiency of the plant or condensed directly at lowest possible pressure (related to the absolute atmospheric pressure) for generating maximum power from the available steam. Steam is required in the WTE plant for the HP-heater as well as feed water de-aerator& SCAPH. This steam can be extracted from the turbine under different modes.

Table 2-5 Turbine Technical Specification

Description	Value
Type	Multistage, impulse/reaction, nozzle governed bleed cum condensing

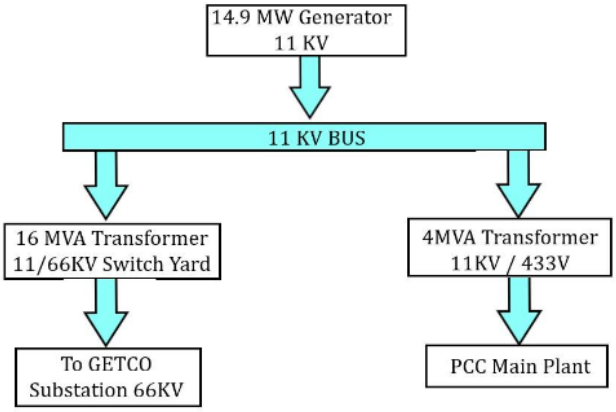
Description	Value
Casing split	Horizontal
Rotor type	Solidly forged & machined rotor with integral disks
No of Stage	16
Shaft seal	Labyrinth
No. of governing valves	Three(Inlet)
Bearing support	Double pedestal
Rated power	15,000 KW
Power Generation Capacity (MW)	14.9
Generation Voltage (kV)	11
Frequency (Hz)	50±5%

Source: GWRPL Project Parameter Booklet, Abellon

2.6.5.2 Power Evacuation

GWRPL will setup a switchyard within the project premises, where the Power Transformer (16 MVA, 66/11 KV) will be used to step up voltage from 11 KV to 66 KV. 66 KV power from the switchyard will be further evacuated to Gauridad 66 KV Substation through transmission line. Refer ***Section 2.6.5.3*** for details on transmission line.

Figure 2-6 Power Flow Diagram



Source: GWRPL Project Parameter Booklet, Abellon

Project will also use the 16.3% of the generated power within the premises for various project components. The Auxiliary power transformer will step down the voltage from 11KV to 433 Volt and further distributes power through the panels to be used in various locations within the WtE Plant.

Project is also going to setup a solar power plant of capacity of 175KW near the truck entrance area, generating the effect of solar tunnel. The power generated from the panels will be used with the project premises. Location and capacity of the solar tunnel has been presented in ***Figure 2-7*** below.

Figure 2-7 Solar Tunnel Location & Capacity

Source: GWRPL, Abellon

2.6.5.3 Transmission Line

The total length of the 66 kV transmission line is 11.8 kilometres out of which 8.9 km is overhead and 2.9 km is underground. The details of the transmission line are provided below:

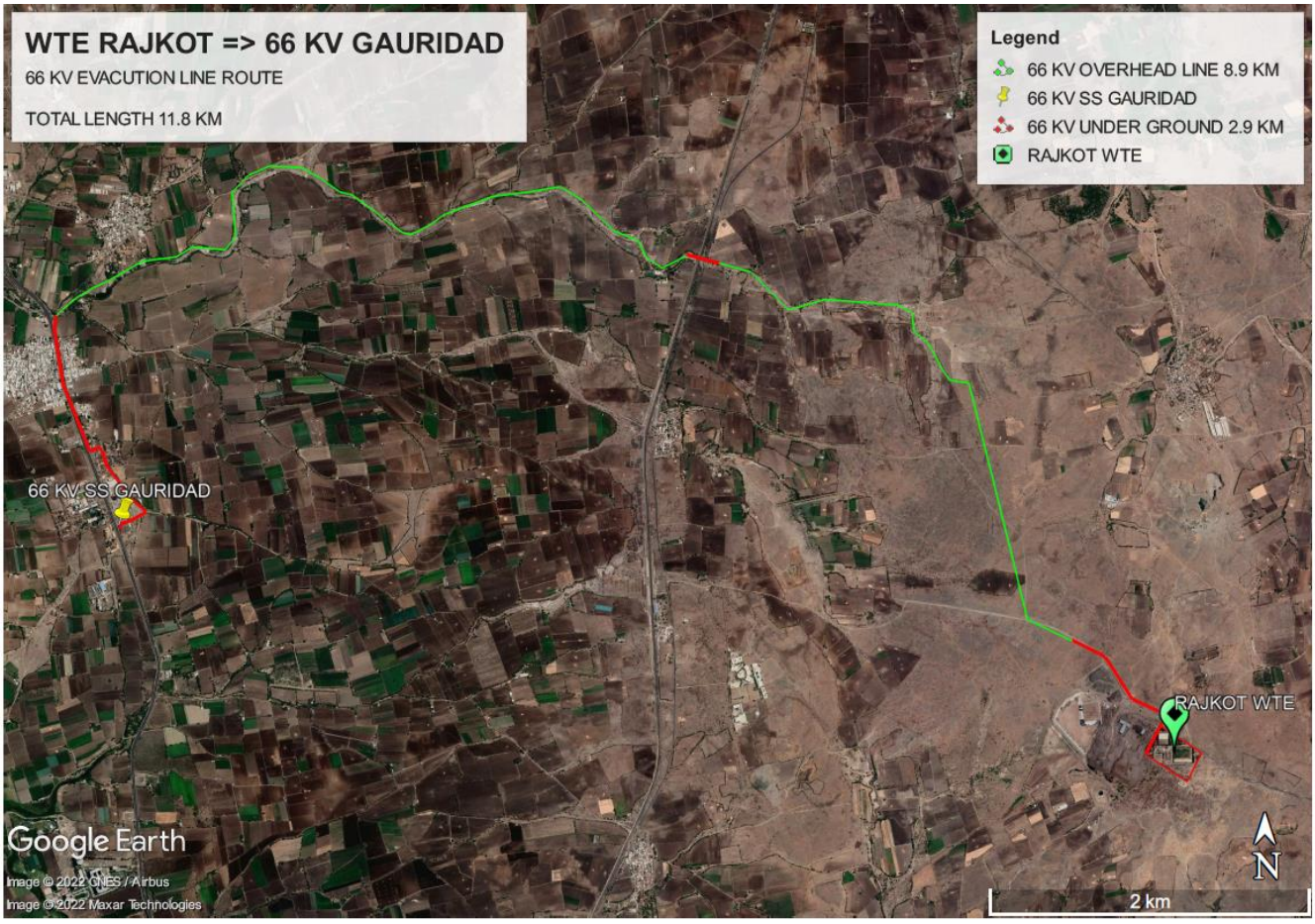
Table 2-6 Details of the overhead and underground transmission line

Type of transmission line	Details
Overhead Transmission Line	• Total length: 8.648 KM • Total of 48 towers (46 Towers +2 H frame DP) with 66 KV D/C tower with ACSR Dog conductor. • The Overhead Transmission line will be crossing the IOCL pipe line and a 400 KV D/C transmission line
Underground Transmission Line	• Total Length of 2.938 km • Underground line length from GWRPL substation to Tower no 1 is 1.735 Km. • Underground line length across the railway line is 0.19 Km.

Type of transmission line	Details
	• Underground line length from Tower no 48 to Gauridad Substation is 1.065 Km

The transmission line is not associated facilities[13] as per the IFC PS, 2012, because it is part of the project and funded by the Project. It is not a separate facility that relies on the project or provide essential goods or services to the project. Therefore, Transmission line do not fall under the scope of the definition of associated facilities.

Figure 2-8 Transmission Line Route



Source: Project Parameter Booklet, GWRPL

2.6.6 Mist Cooling Water System

Cooling system is required for cooling of hot condensate, coming from turbine, oil cooler of turbine, air cooler of generator, feed pump gland cooling and steam samplers. To cool about 60 TPH of condensate and to meet total cooling requirement, circulation of about 4200 m^3 of water with inlet temperature of about 40^0 C will be done in condenser unit.

Mist cooling system (MCS) ensures an approach of reduction in 3˚C to WBT (wet bulb temperature) with a temperature drop of 8˚C. i.e., from 40˚C to 32˚C.

[13] As per the International Finance Corporation's (IFC) performance standard (PS), associated facilities are defined as facilities that are not funded as part of the project and that would not have been constructed or expanded if the project did not exist and without which the project would not be viable.

2.7 Air Pollution Control Devices

Air pollution control devices proposed to be installed are as presented in subsequent sections.

2.7.1.1 Stack Height

The flue gas will be released through stack at a height of 50 m in compliance to CPCB guidelines (national requirements) as well as requirements of IFC EHS guidelines. However stack height as mentioned in consent to establish obtained from GPCB dated is 60 m. Project is advised to discuss the same with GPCB and make necessary updates in the CTE.

As per the Environment (Protection) Amendment Rules, 2023, published on 16th May 2023[14], for boilers, minimum stack height (in meter) shall be as per the formula,

- $H=14Q^{0.3}$ (where Q is SO2 emission rate in kg/hr); or
- $H=74Q^{0.27}$ (where Q is PM emission rate in tonne/hr), whichever is more.

However, in no case the stack height shall be less than 11 m for boilers of < 2 ton/hour steam generation capacity and 30 m for boilers of higher steam generation capacity.

GWRPL will be setting up two boilers with 40TPH steam generation capacity and will be using waste as primary fuel for the boiler, Stack height as calculated as per the above-mentioned formula should be 48.75m. GWRPL is developing a stack height of 50m for each boiler.

Table 2-7 Stack height calculation as per The Environment Protection Rule-1986

Particulars	Units	Value	Remark / Formula
Fuel Feeding Rate (F)	Kg/hr	16000	--
Sulphur Content in Fuel (S)	%	0.20	--
Emission Rate of SO_2 (Q)	Kg/hr	64	Q = (F*S%*2)/ 100
Stack Height (H)	metre	48.75	H = 14*(Q^0.3)

Stack Design for both the boilers

- Top Part of Stack The Height of the Top Part of the Chimney will be 14.50 meters
- Bottom Part of Chimney: The Height of the Bottom Part of the Chimney is proposed to be 22.70 meters

The Bottom part of chimney will start at elevation of 12.80 meters. So, total height of the chimney will be 50 meters from the Ground Level at the plant.

As per the IFC EHS[15] guidelines the stack height should be as per the following formula:

Hg= H+1.5L,

H is the height of the nearby structures above the base of the stack (stack is set on ground level)

Where L is the lesser dimension, height (h) or width (w) of nearby structure, wherein nearby structures are structures within or touching a radius of 5L, but less than 800 m (in this case, during construction phase (scenario-1) nearest residential structure[16] is present at a distance of ~530m from GWRPL plant in north east direction, however post completion of construction of the project (scenario-2) nearest structure present will be the admin building present adjacent to the stack with a height of 14 m and width of 23 m approx.)

Scenario 1: Hg is calculated as ~19.2 m (considering H= 5.5m, L= 9.15m)

Scenario 2: Hg is calculated to be ~35 m (considering H= 14m, L= 14m).

Since the stack height will be 50 m which is higher than the minimum stack height requirement for the project, therefore the stack height of the boilers is compliant to IFC EHS guidelines as well.

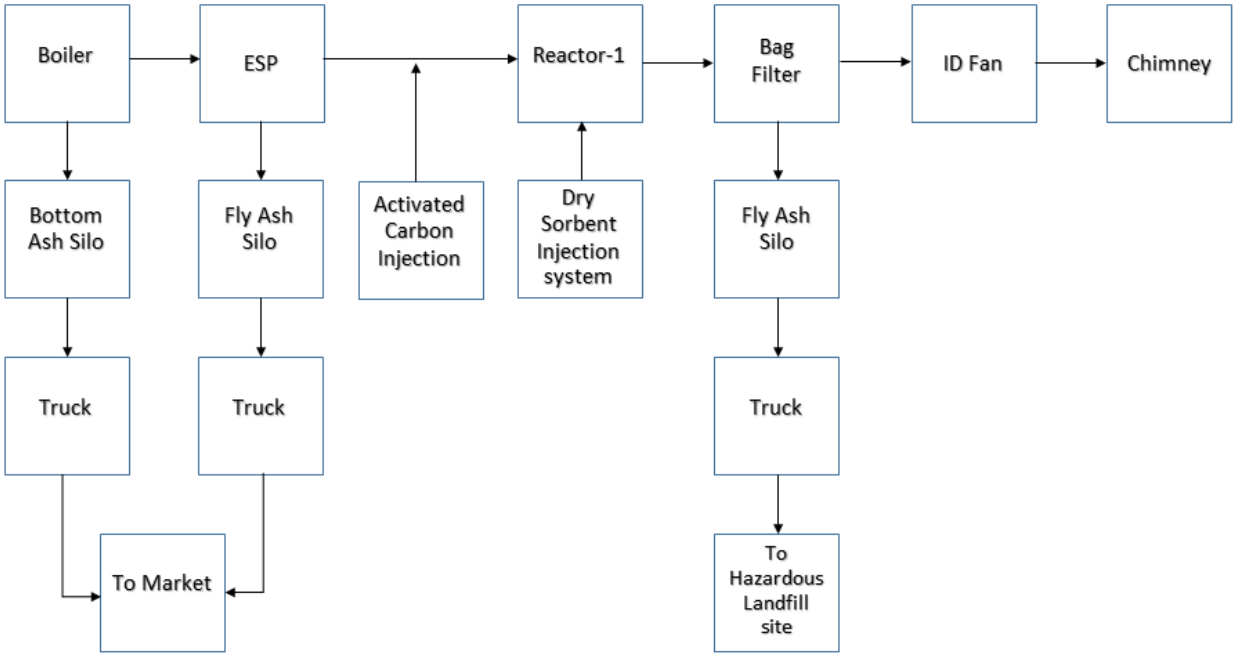
[14] https://cpcb.nic.in/displaypdf.php?id=SW5kdXN0cnktU3BlY2lmaWMtU3RhbmRhcmRzL0VmZmx1ZW50LzQ1OS0xLnBkZg==
[15] Air Emissions and Ambient Air Quality (Environmental, Health & Safety Guidelines: General EHS Guidelines: Environmental))
[16] This is a standalone residential structure in the midst of the agricultural fields

2.7.1.2 Flue Gas Cleaning Mechanism

GWRPL's flue gas cleaning system has been designed to control emission of dioxin, furan and heavy metals i.e., Sc (Scandium), As (Arsenic), Pb (Lead), Co (Cobalt), Cr (Chromium), Cu (Copper), Mn (Manganese), Ni (Nickel) and V (Vanadium), acidic gases like HCl (Hydro-Chloric Acid), SOx (Sulfur Oxides), NOx (Nitrogen Oxides) and suspended particulate matter (SPM).

The dust extraction system will be equipped with bag filters and Electrostatic Precipitator (ESP). The bag filters will enhance the acid removal process by forming cake and also minimize SPM emission. Air will be purged on the Deferential Pressure (DP) basis within the bag house system. The bag house system will be designed in a way that whenever there is increase in differential pressure to certain limit, the air is purged automatically. The ESP helps in controlling emission of particle size of less than 100 micron and enhance efficiency of hydrated lime and activated carbon powder used in Dry Sorbent Injection System (DSIS)[17]. As per documents shared by GWRPL, there will be two units of flue gas cleaning trains (one train per boiler) within the dust extraction system where one train of flue gas cleaning system will comprise of an ESP, Injection of Activated Carbon, reaction tower, DSIS and bag filter. ***Figure 2-9*** below for details.

Figure 2-9 Flue Gas Circuit



Technical details and design parameters for ESP, Activated Carbon Injection, Acid Control Reactor Tower, Dry Sorbent Injection (DSI) system, Filter bag house have been added as ***Appendix 3***

2.7.1.3 Dioxin and Furan Control Mechanism

Dioxins and furans are typically formed in a temperature zone of 200-400°C and are minimized/destroyed in a temperature zone of 800-900°C. Therefore, the boiler system will be designed to help in achieving complete combustion and ensuring destruction of harmful emissions before flue gas enters heat recovery area. Factors promoting formation of Dioxins and Furan are presence of Chlorine in vapor phase, presence of oxygen, resident time of flue gas between 400^{0}C to 200^{0}C, presence of pre-cursors for Dioxin and Furan, presence of large surface area of Fly ash, presence of metallic catalyst like copper (Cu) and lack of online cleaning mechanism for minimizing fouling on heat transfer area.

GWRPL aims to ensure that the formation of dioxins and furans does not takes place. In that approach, suspension firing will be undertaken for at least 50% of the waste and rest combustion will take place on travelling grate where average temperature is around 1000^{0}C.

[17] Dry Sorbent Injection Systems involve the injection of a dry sorbent into the flue gas ductwork following the boiler to reduce concentrations of acid gases like Sox and HCl. These acid gases react directly with the dry sorbent, which are collected in a downstream particulate control device.

2.7.1.4 Ash Conveying System

Each boiler of capacity 40 TPH will have Suspended Firing Combustion System, therefore, about 20% of total ash generated during incineration process will be "Fly Ash". The estimated fly ash quantity generated at the WTE plant will be about 70 TPD (Per Boiler) which will be collected at different points i.e.,8 collection points for Bank Zone ash[18], 4 collection points for ESP ash and 2 collection points for bag filter.

The bottom ash received from the boiler will be disposed in the water submerged belt conveyor to reduce high temperature of bottom ash and also avoid unwanted air ingression in the boilers. The bottom ash temperature at the boiler will be about 350 ^{0}C which will be reduced to 100 ^{0}C at the submerged water belt conveyor. The bottom ash will be transported to the sludge drying area for natural drying prior to its disposal to the RMC landfill via RMC trucks[19]. The fly ash generated will be stored in silos before it is sent to cement plant or as per conditions stipulated in the Consent To Operate to be obtained prior to operation phase.

Table 2-8 Technical Specification of Ash Conveying System

Bank zone Ash conveying system	ESP Ash conveying system	Bag Filter Ash/Residue Conveying system
• Conveying capacity: 600 kg/hr. • Conveying distance: 25 ± 5% Meter • Storage silo capacity: 22.5 Cubic Meter • No. of Silos: 1 per boiler (2 total)	• Conveying capacity: 800 kg/hr. • Conveying distance: 40 ± 5% Meter • Storage silo capacity: 22.5 Cubic Meter • No. of Silos: 1 per boiler (2 total)	• Conveying capacity: 600 kg/hr. • Conveying distance: 25 ± 5% Meter • Storage silo capacity: 22.5 m3 • No. of Silos: 1 per bag house (2 total)
Source: ESP discharge Hopper 1 & 2	*Source: Bank Zone Ash, Vertical Economizer zone, PAPH-II, ESP inlet duct*	*Source: Bag Filter Discharge*

Figure 2-10 Ash Sources

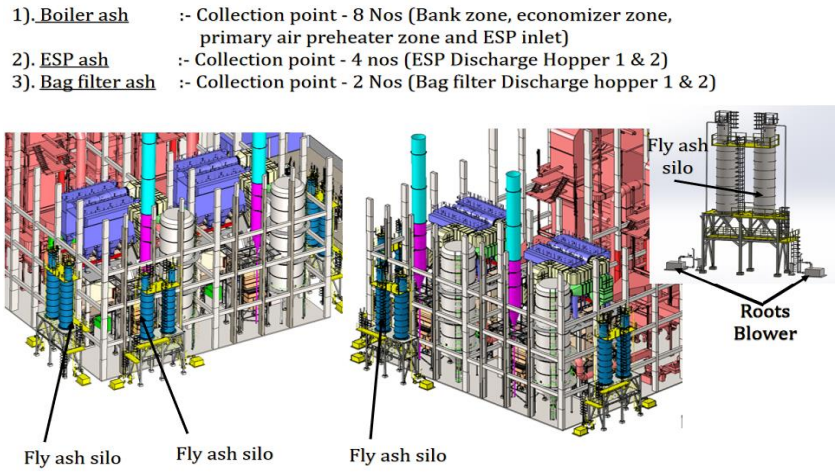


Table 2-9 Ash Balance- Per Boiler

Ash Type	Ash Quantity (TPD)	% Ash composition	Proposed Disposal Mechanism	Potential Ash Use[20]
Total Ash	70	20% of the total fuel	--	
Bottom Ash	56	80% of Total Ash, contains 0.25% ferrous material and 0.012% Nonferrous material	Submerged belt conveyer post which disposed in sludge drying bed area for natural drying	Most of It can be used as void material for construction purpose subject to proper screening and drying process.

[18] Bank zone is an area between boiler super heater and economizer area. It is horizontally laid immediately after end of furnace. There are three fly ash collector pipeline which are connected in bank zone area at three different location. This provision is required to drain any fly ash deposition in this area. With help of common RAV (rotary airlock valve) they are connected to fly ash silo located adjoining boiler house. Fly ash generated from bank zone and ESP area collected in same silo and from there same is transferred out of the campus in closed transport vehicle.

[19] As reported by GWRPL, the inert waste and ash disposal does not fall within the purview of GWRPL and the same will be disposed by RMC at designated landfill through RMC owned trucks

[20] Please note, the ash uses are potential uses and the ash is not currently used.

Ash Type	Ash Quantity (TPD)	% Ash composition	Proposed Disposal Mechanism	Potential Ash Use[20]
			Metal Scrap recovery	There are other ingredients like metal pieces, glass material, some portion of unburnt needs scientific separation and its disposal.
Bank Zone Ash	2.80	4% of Total Ash	Sent to market as replacement @1000INR/Ton	It can be utilized in place of river sand in construction due to its larger course size.
ESP Fly Ash	7.70	11% of Total Ash	Can be sent for Pavor Production	it can be utilized to produce concrete pavers, aerated concrete blocks, etc.
Bag Filter cake ash	3.50	5% of Total Ash	Hazardous Landfill site	Most of It can be used as void material for construction purpose subject to proper screening and drying process
Bag Filter Residue due to hydrated lime reacted with HCL and activated carbon injection	7.30	--	Hazardous Landfill site	--
Metal Scrap Recovery	0.14	@0.25% of the bottom ash	--	--

Source: Project Parameter Booklet, GWRPL

2.7.1.5 Continuous Emission Monitoring System (CEMS)

CEMS will include a PLC-based control system with an operating station that communicates with DCS for centralized monitoring, data archiving, and report generation. Data from this system will be directly communicated with the government body (CPCB). Flue gas emission data for SOx, NOx, CO, CO2, O2, HCl, and SPM will be measured.

2.7.1.6 Odor Control Mechanism

Primary air required for combustion will be sucked from boiler bunker area and pre-processor area. This will result into negative draft inside boiler bunker. Thus, there will be a control on spread of pathogens and odour in surrounding region. In addition, Project will also install fragrance sprinkler as well as fogging system in the pre-processing area for odor management.

Fresh waste will be stored for a maximum of 8-10 hours which will leave limited time for disintegration and odour. Further, it will be mixed with biomining which will largely stabilize the waste resulting into low disintegration/ decay and hence low odour.

2.8 Water Requirement & Treatment Systems

2.8.1.1 Water Requirement

GWRPL will lay two underground pipeline of 9 inches diameter (1.5 m below natural ground level), 12.033 km length each connecting the Gauridad Sewage Treatment Plant (STP) Rajkot to the project site. Project will undertake secondary treatment of the water received from the water pipeline prior to its use within the WTE plant. The underground water pipeline is not considered as associated facilities[21] as per the IFC PS, 2012, because it is part of the project and funded by the Project. It is not a not separate facility that relies on the project or provide essential goods or services to the project. Therefore, underground water pipeline do not fall under the scope of the definition of associated facilities.

[21] As per the International Finance Corporation's (IFC) performance standard (PS), associated facilities are defined as facilities that are not funded as part of the project and that would not have been constructed or expanded if the project did not exist and without which the project would not be viable.

According to the water utilization plan, approximately 1478 m^3/day water is required for project operations, the water requirement will be sourced from the STP[22]. According to the water balance diagram ***(refer Figure 2-11***) the daily water requirement for industrial purpose within the WTE plant is 1478 m3/day, for which pre-treatment is required for 2343 m3/day at the STP. The project will undertake treatment of 2343m3/day water at the STP and return 865 m3/day rejected water back to the STP for further treatment. The project has received permission for receiving 2 MLD secondary treated water from the RMC STP. Refer ***section 2.8.1.2.1*** for details on Pre-Treatment of treated STP water.

Approximately, 66 m^3/day of water is used for boiler feed and 1358 m3/day is used as mist make up water. As reported, rejected water after secondary treatment within the WTE plant will be utilized for bottom ash quenching. Any excess water will be diluted within campus with the help of makeup water (treated wastewater from nearby STP) to bring down TDS level to less than or equal to 2100 PPM, which will further be used for gardening on premise23.

For domestic purpose, initially GWRPL was exploring water procurement opportunity via Narmada river as well as ground water for approximately 7.5 m3/day water. However, the project has obtained permission to developed 1 borewell within the project premises via application no 21-4/6510/GJ/IND/2020 valid up to 1st Nov 2023 for abstraction of 7.5m3/day of fresh water. As per the categorization, Rajkot falls in an area categorized as safe in terms of availability of ground water. Groundwater can only be used for flushing purpose as it is contaminated as per Phase II groundwater quality results (refer 5.3.6.5).

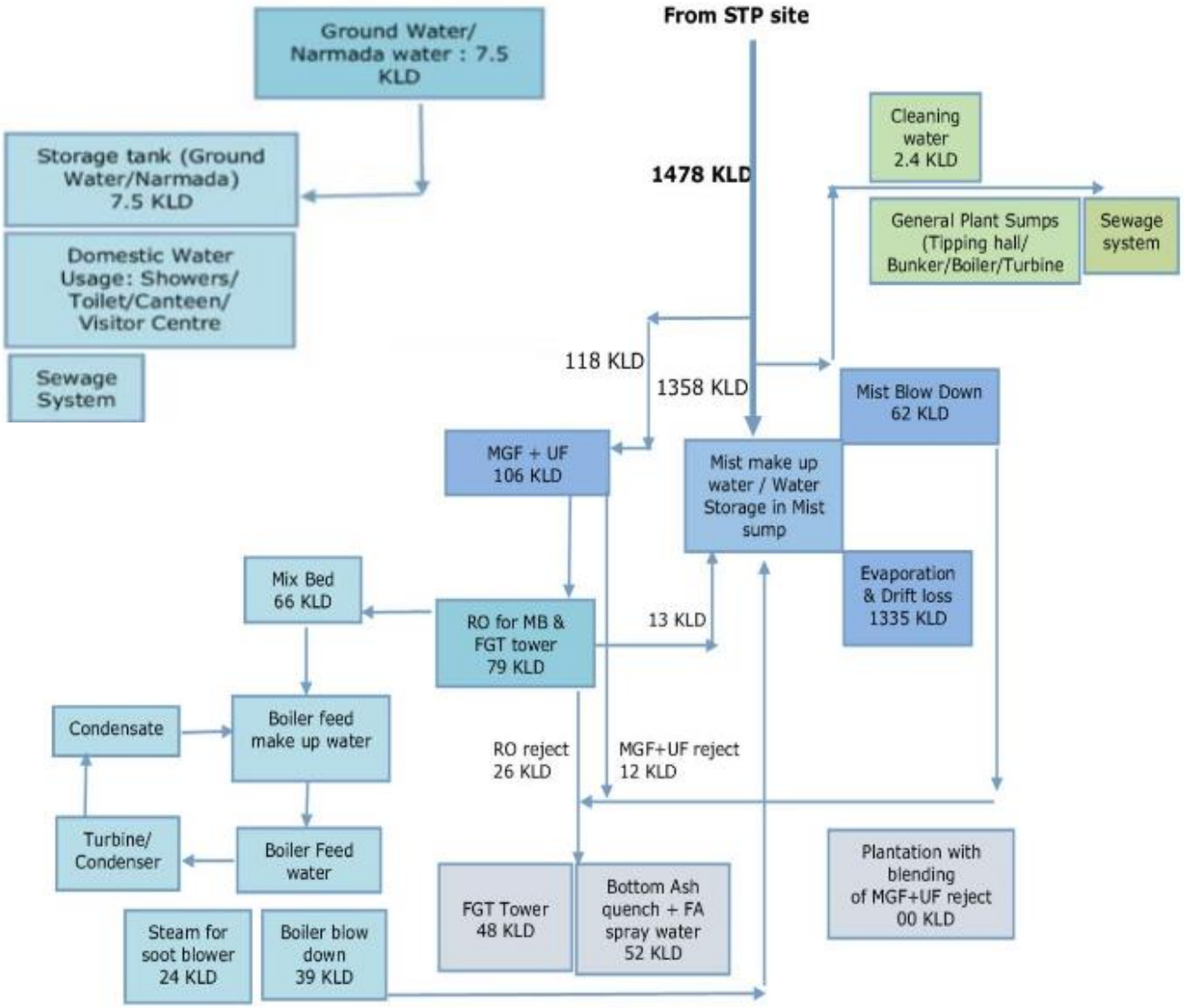
Bottled water from a third party vendor will be sourced for drinking purposes. Wastewater generated from toilets, showers, canteen within the plant premises (domestic stream) is proposed to be drained to sewage system. Also the water quantity generated from cleaning of office area, tipping hall, bunker area, boiler area and Turbine hall will be drained to Sewage System.

Water balance diagram for Pre-treated STP water and Ground water has been presented in ***Figure 2-11***.

[22] For obtaining water 1478m3/day of treated water, 2343m3/day needs to be treated at STP and the reject water of 865 m3/day will be returned to the STP itself. Currently, the project has received permission for receiving 2 MLD water from the RMC STP, the excess 343 m3/day water the project will apply for revision of the permission to receive 2.5 MLD treated water from the STP

[23] Water for gardening will meet the GPCB requirement and the TDS of the water is less than or equal to 2100 PPM

Figure 2-11 Water Balance for Pre-Treated STP water and Ground Water



Source: Project Parameter Booklet, GWRPL

GWRPL will also store 2952 m^3 of water within the project premises, of which 2220 m^3 will be stored in the water body being developed and 732 m^3 of water will be stored in Mist cooling sump. This water storage body will be utilized for campus rain water harvesting, storage of pre-treated water from STP and Fire Reservoir.

2.8.1.2 Water Treatment Process

2.8.1.2.1 Pre-water treatment systems at the existing Gauridad STP

GWRPL will setup a treatment plant ("Pre-Treatment" at STP) within the vicinity of the Gauridad 70MLD STP area and further treat the treated STP water within the premises.

To meet the water requirement for WTE plant operations, GWRPL has obtained permission vide letter dated 9th November 2022 from the Rajkot Municipal Corporation, Solid Waste Management Branch, WOW cell for lease of land within the existing STP Premises, laying of pipeline network for WTE plant and pumping house and for further treatment of water (Pre-Treatment) at Gauridad STP for sourcing 2 MLD secondary treated water from the 70 MLD Sewage Treatment Plant (STP) located at 12 km (aerial distance) from site towards north west direction.

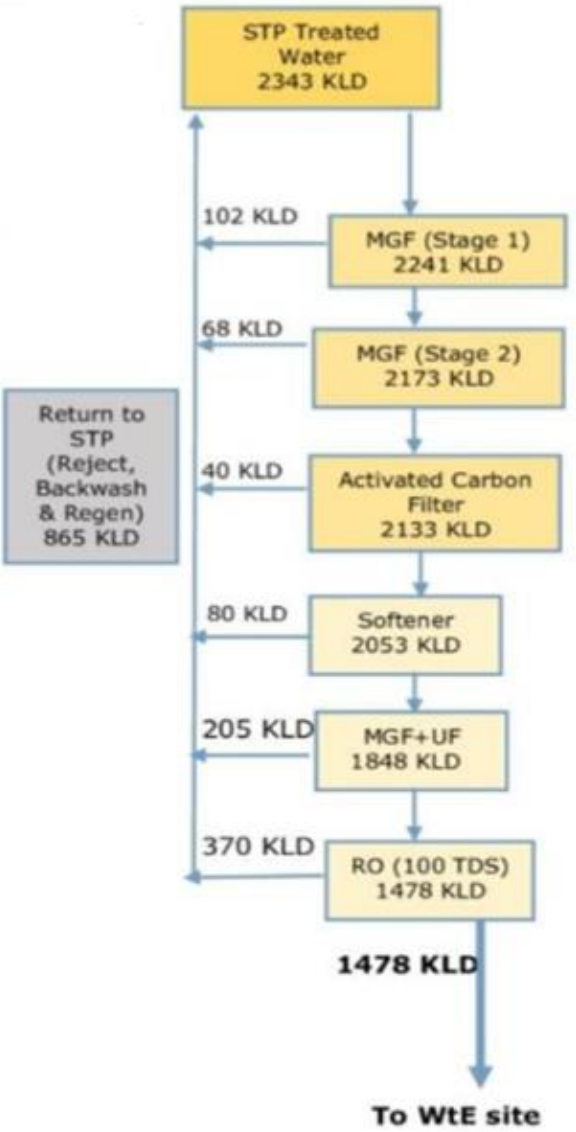
As understood, treated STP water from the existing 70MLD plant at Gauridad is currently discharged in open fields and drains in the vicinity through river basin. The project will source water from Gauridad STP as primary source of water requirement for the project operations.

GWRPL will setup a treatment plant ("Pre-Treatment" at STP) within the vicinity of the Gauridad 70MLD STP area and further treat the treated STP water within the premises. The Pre-treatment will comprise three stage process,

- Stage 1: Removal of TSS, color and odor via Multi Grade Filter & Activated Carbon Filter (ACF)
- Stage 2: Water softening.
- Stage 3: Reduction of TDS and sediments/suspended particulate via Multi-grade filter (MGF), Ultra- Filtration (UF), and Reverse Osmosis (RO)

Flow diagram of the Pre-treatment process has been presented as ***Figure 2-12***. The project will treat 2343 m3/day of treated STP water and all reject water (865 m3/day) in the form of backwash/regeneration/reject from MGF, ACF, Softener & RO etc. will sent back to STP Inlet for further treatment at the STP plant itself. This treated water i.e. 1478 m3/day will be transported via underground water pipeline of ~12 km length to the WTE plant. GWRPL will undertake the Pre-Treatment process at the STP as the treated water from the Gauridad STP does not meet the quality requirement.

Figure 2-12 Pre-Treatment Process at STP



Source: Project Parameter Booklet, GWRPL

Details of the inlet parameters and outlet parameters of the water for the per-treatment process has been presented in ***Table 2-10.***

Table 2-10 Inlet and Outlet water quality for the Pre-Treatment Process

Parameters	Inlet water quality	Outlet water quality
Appearance	Turbid	Clear
pH	7-8	8.8-10.2
Total dissolved solid (ppm)	500-1200	100
Total suspended solid (ppm)	≤ 70	<5
Alkalinity (mg/L)	≤ 370	Nil
Sulphate as SO4 (ppm)	≤ 52	Nil
Chloride as Cl (ppm)	≤ 250	<8
Sodium (ppm)	≤ 182	Nil
Potassium (ppm)	≤ 25	Nil
Calcium (ppm)	≤ 75	Nil
Total Hardness (ppm)	≤ 500	<5
Silica (ppm)	≤ 32	Nil
Conductivity (µS/cm)	≤ 1.83	<30 – 40
Biological Oxygen Demand (mg/l)	≤ 30	Nil
Chemical Oxygen Demand (mg/l)	≤ 100	Nil
Dissolved Oxygen Demand (mg/l)	≤ 3.5	Nil
Oil & Grease (mg/l)	≤ 0.5	Nil

Source: Project Parameter Booklet, GWRPL

The sewage treatment plant, which has been established by RMC, is not considered an integral component of the associated facility for the Project. Nevertheless, it is crucial to acknowledge that the project is reliant on the provision of water from the STP. It is worth noting that the STP's financing and operational status differ significantly from that of the main Project. It is essential to emphasize that the sewage treatment plant (STP) was constructed independently and is not funded as part of the current Project. The STP's existence predates the inception of the project, and it remain operational irrespective of whether the Project is not executed or not. This underscores that the STP is a pre-existing municipal infrastructure facility to treat the Rajkot city sewage water and is not specifically tailored to the needs or financing of the Project.

2.8.1.2.2 Secondary Water Treatment

The Pre-treated water will be further treated prior to use in the boiler. The secondary water treatment system comprise of the following: Boiler Feed Water Treatment Plant will comprise of De-mineralization Plant, Reverse Osmosis and Mix Bed.

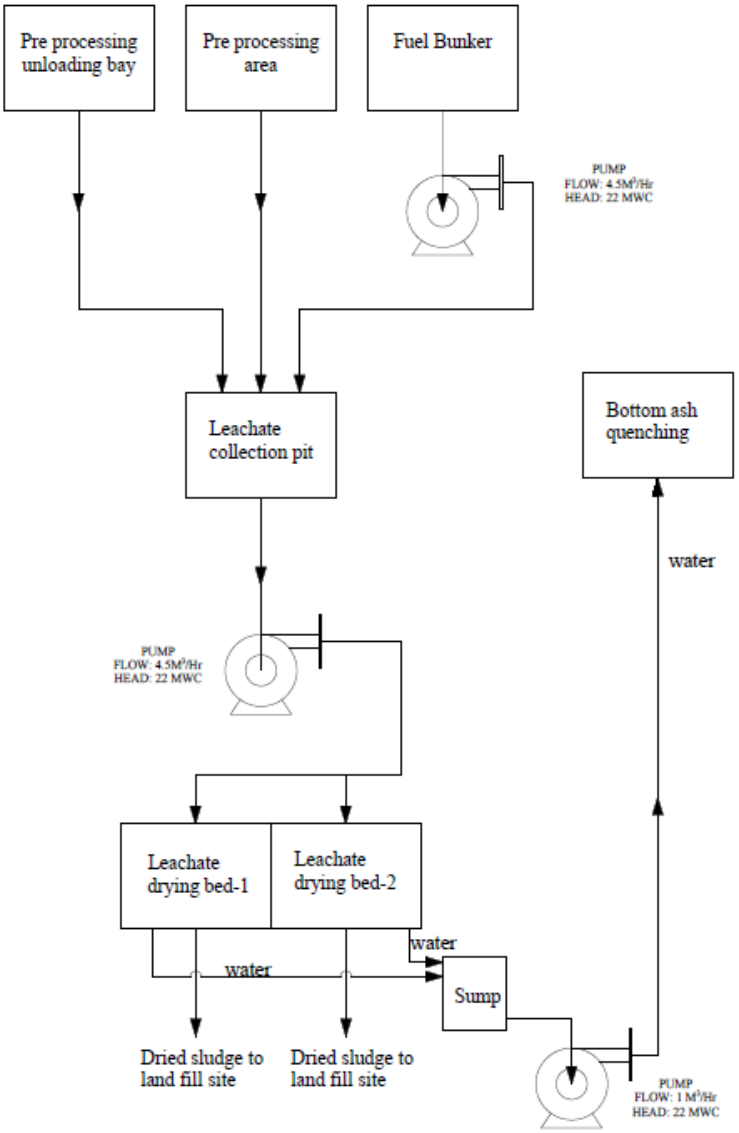
Water used in Mist Cooling will be further treated via MGF & Water Softener and further used within the mist cooling system.

Domestic sewage at site will be managed using soak pit-septic tank system. The septic tanks will be cleaned as required.

2.8.1.3 Leachate Management

Leachate will be collected from pre-processing unit and main bunker. This leachate will be pumped to sludge drying beds and in SMBC. Dried leachate sludge is proposed to be disposed at nearest sanitary landfill. Also, Project plans to use leachate for bottom ash quenching or alternatively inject it into the boiler. Proposed leachate management plan is as presented in Figure below.

Figure 2-13 Leachate Management Plan

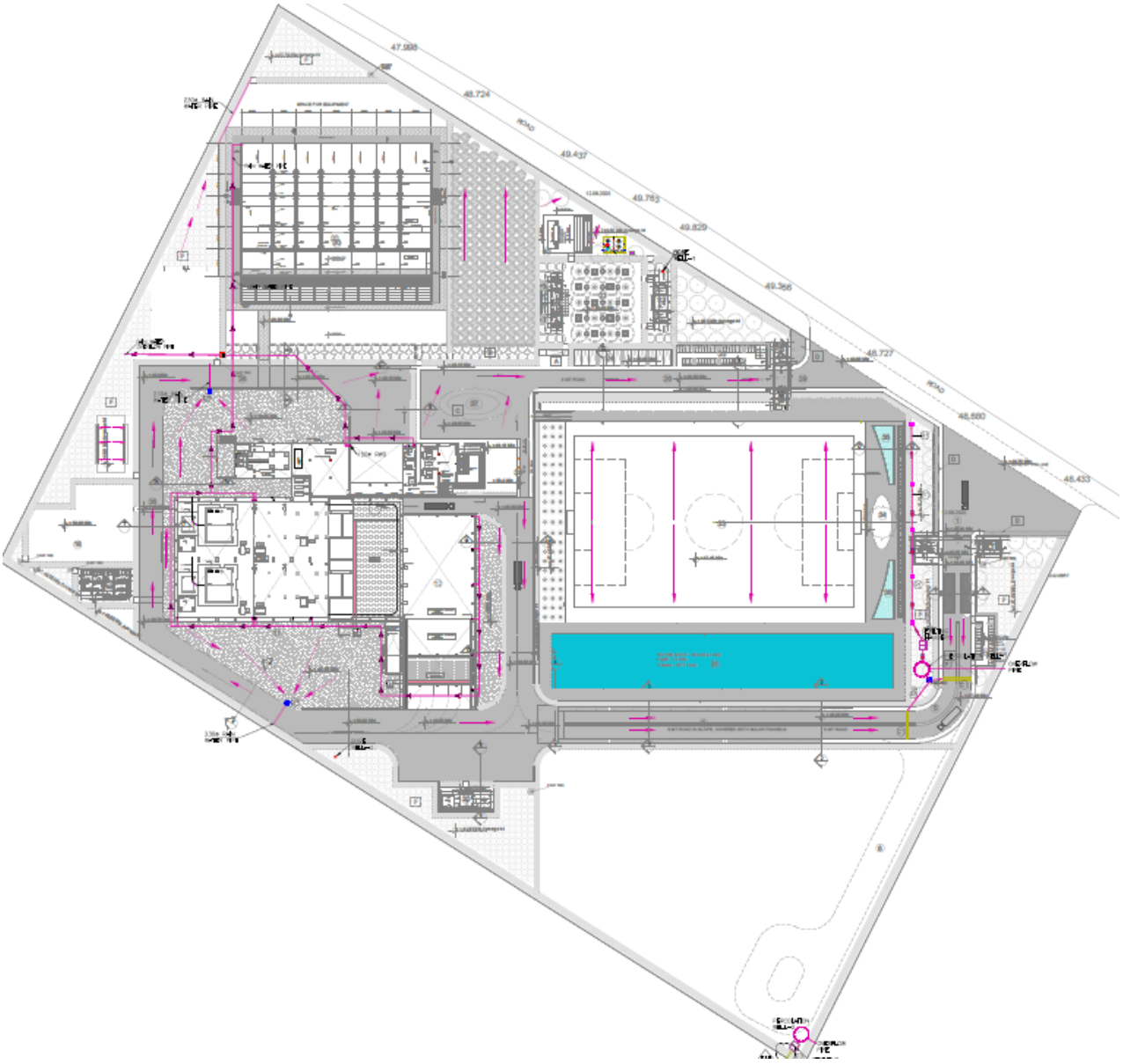


Source: Project Parameter Booklet, GWRPL

2.8.1.4 Storm Water Control & Management

Based on the master planning and contours, Plant area has been segregated in such a way to prevent crisscross movement of storm water drainage between operations area, ash handling area and landscape area. Slope of the site is predominantly towards southwest. Water collected in the catch pits installed within the Project site will be collected through rain water pipe and will be discharged into the percolation wells. Total 2 no. of percolation wells are proposed within the Project (towards south and east) for recharging 22000 m^3/annum of ground water. Layout plan showing location of the catch pits and percolation wells is presented in ***Figure 2-14*** below.

Figure 2-14 Stormwater Management Plan



Source: Project Parameter Booklet, GWRPL

2.9 Fire Fighting Requirement

Proposed firefighting system will consist of fire hydrant comprising of Jockey Pump and main pump. Jockey Pump and main pump will be installed in MCS (mist cooling sump). Another jockey pump and one transfer pump (water body to MCS) are proposed to be installed in water body. Therefore, in case of water requirement, GWRPL intends to use water available in the water storage body in campus in-case of fire. Fire Hydrant System will be connected with mist cooling water pumps which ensure pressurized line during plant operations.

As per latest notification of Urban Development and Urban Housing Department Sachivalaya, Gandhinagar dated 8th July 2021, separate Fire NOC for construction phase is not required and will be a part of Building Approval Plan.

Fire and life safety arrangement will be as per the requirements of the Gujarat Fire Prevention and Life Safety Act and Fire NOC will be obtained prior to start of operations.

Fire Detection System proposed at Control Panel includes:

- Conventional Fire Alarm Control Panel

- Multi Sensor (Smoke and Heat combination) Detector
- Manual Pull Station
- Conventional Sounder cum strobe with 24V DC, Audible Sound 75 dB @ 1 metre range (16 V DC) – to be used Fire, Burglar & Emergency Alarm System.

Details of fire extinguishers proposed is as presented below.

Table 2-11 Details of proposed fire extinguishers

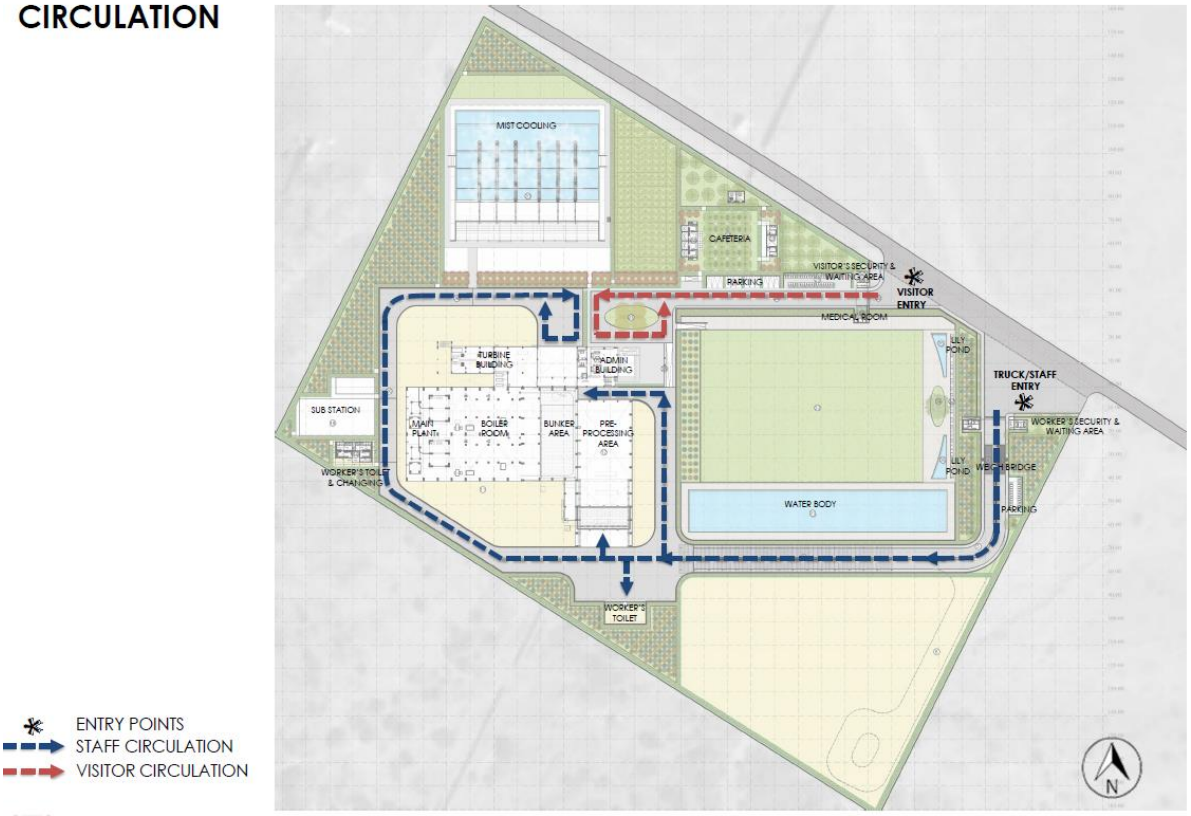
S. No	Detail	Qty	UOM
1	ABC 6 Kg Fire Extinguisher Mono Ammonium Phosphate Powder 50, Stored Pressure Type, Pressure Gauge, Controllable discharge mechanism Class A Rating 3A & Class B rating 21B as per IS 15683	11	Nos
2	CO2 type Fire Extinguisher of capacity 4.5 kg filled with Co2 Gas as per IS 15222 with control discharge mechanism, fitted with Hose & Horn applicable on Class B fire rating 21B confirms to IS 15683 bearing ISI mark. Co2 cylinder as per IS 7285	20	Nos
3	CO2 type Fire Extinguisher with trolley of capacity 22.5 kg filled with Co2 Gas as per IS 15222 with control discharge mechanism, fitted with Hose & Horn applicable on Class B fire rating 21B confirms to IS 15683 bearing ISI mark. Co2 cylinder as per IS 7285	1	No.
4	Nitrogen Injection Fire Protection System for 4MVA Auxiliary Transformer 11KV/433V	1	No.
5	Nitrogen Injection Fire Protection System for 16MVA Auxiliary Transformer 66/11KV	1	No.

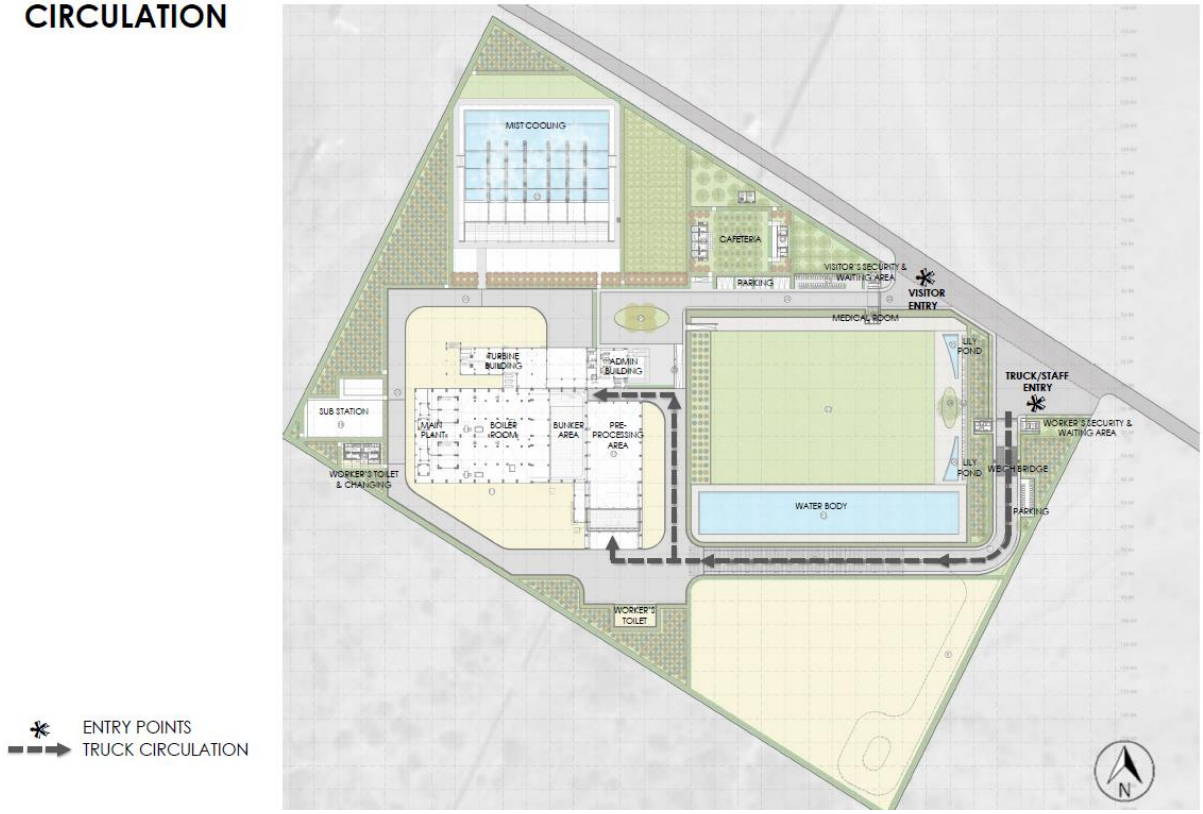
Source: GWRPL

2.10 Traffic Management

To manage the traffic movement within the project site during operational phase, the project plans to separate the entry and exit for staff, vehicle and visitor movement. Circulation within the Plant has been presented in ***Figure 2-15*** below:

Figure 2-15 Manpower, Material and visitor movement





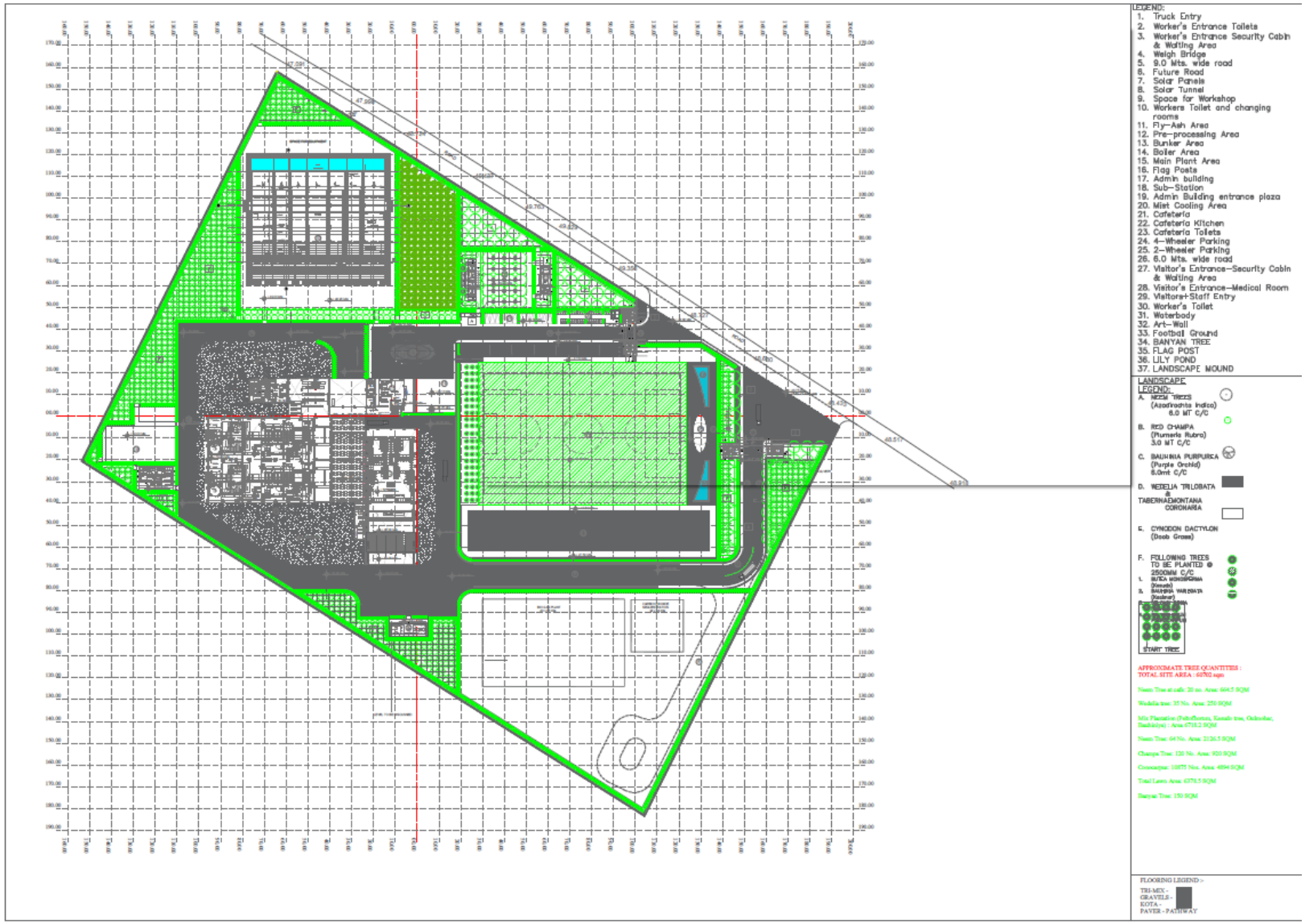
2.11 Greenbelt & Landscape

Trees proposed to be planted within the Plant includes Neem, Rad Champa, *Bauhinia Purpurea*, *Wedelia Trilobta*, *Tabernaemontana Coronaria*, *Cynodon Dactylon*, etc. No. of trees proposed to be planted and area proposed for greenbelt and landscape are as presented in table below.

Table 2-12 Indicative no. of trees proposed to be planted

Sr. No.	Tree	Number	Area
1.	Neem	20	664.5 sqm
2.	Wedelia	35	250 sqm
3.	Mix plantation (Peltofhorum, Kesudo, Gulmohar, Bauhiniya)		6718.2 sqm
4.	Neem	64	2126.5
5.	Champa	120	920 sqm
6.	Conocarpus	10875	4894 sqm
7.	Total Lawn Area		6378.5
8.	Banyan		150

Figure 2-16 Layout showing Landscape and Greenbelt Area



2.12 Land Requirement and Procurement

The project has obtained a lease for 15 acres of land from the Rajkot Municipal Corporation (RMC) for a period of 25 years. Prior to the project, as per the lease agreement the allotted land was categorized as barren or unused land. The land allotted land (15 acres) falls under one (1) survey number – 222/p.

The possession of the land has been allotted in the name of Goodwatts WTE Rajkot Private Limited vide possession receipt number R.M.C/C.Z./S.W.M./No.3472 dated 06.03.2019.

Leasing land from RMC allows the project to utilize the allocated area for the designated purposes outlined in the agreement. The lease agreement defines the terms and conditions under which the land is leased, including the duration of the lease, payment obligations, permitted land use, and any other specific provisions related to the agreement.

Component wise land requirement for the project is provided below:

Table 2-13 Total Land Requirement for the Project

<table>
<tr><th>Project Component</th><th>Total Leased out Land Size (in acres)</th><th>Easement Rights (in acres)</th><th>Total land requirement (acres)</th><th>Land Category</th><th>Remarks</th></tr>
<tr><td>Waste to energy (WTE) plant</td><td>15</td><td>0</td><td>15</td><td>Government leased out land</td><td>The project has obtained the land on a lease for a period of 25 years from Rajkot Municipal Corporation</td></tr>
<tr><td>RoW of Transmission Line</td><td>0</td><td>Overhead Transmission Line – 37.04

Underground Transmission Line – 0.708</td><td>37.748</td><td>Land use category of impacted land is provided below:
<table>
<tr><th>Land Use</th><th>Area (acres)</th></tr>
<tr><td colspan="2">Overhead Transmission Line</td></tr>
<tr><td>Agricultural Land</td><td>1.2</td></tr>
<tr><td>Open Scrub Land</td><td>15.62</td></tr>
<tr><td>Nalla Land</td><td>20.22</td></tr>
<tr><td>Sub-Total</td><td>37.04</td></tr>
<tr><td colspan="2">Underground Transmission Line</td></tr>
<tr><td>Agricultural Land</td><td>0.017</td></tr>
<tr><td>Open Scrub Land</td><td>0.23</td></tr>
<tr><td>Road Land</td><td>0.41</td></tr>
<tr><td>Railway Land</td><td>0.01</td></tr>
<tr><td>Substation Land</td><td>0.009</td></tr>
<tr><td>WTE Plant Land</td><td>0.032</td></tr>
<tr><td>Sub-total</td><td>0.708</td></tr>
<tr><td>Grand Total</td><td>37.748</td></tr>
</table></td><td>Total number of private landowners impacted by transmission line is 13 (12 by overhead transmission line and 1 by underground transmission line).</td></tr>
<tr><td>Underground water pipeline</td><td>0</td><td>2.9734</td><td>2.9734</td><td>
<table>
<tr><th>Land Use</th><th>Area (Acre)</th></tr>
<tr><td>STP Land</td><td>0.0037</td></tr>
<tr><td>Open Scrub Land</td><td>0.108</td></tr>
<tr><td>Road Land</td><td>2.86</td></tr>
<tr><td>WTE Plant Land</td><td>0.0017</td></tr>
<tr><td>Total</td><td>2.9734</td></tr>
</table></td><td>The total number impacted by water pipeline is 3</td></tr>
<tr><td>Total</td><td>15</td><td>40.7214</td><td>55.7214</td><td></td><td></td></tr>
</table>

2.12.1 External Transmission Line

The total length of the 66 kV transmission line is 11.586 kilometres out of which 8.648 km is overhead and 2.938 km is underground. The total land requirement for the transmission line is presented in Table 2-14 below:

Table 2-14 Land requirement for overhead and underground transmission line

Transmission Line type	Width of Right of Way (in meters)[24]/area per tower	Total Length (km)/Number	Total Land (acres)
Overhead	18 meters RoW	8.648 km	37.04
Underground transmission line	1 meter	2.938 km	0.708
Total			**37.748**

2.12.2 Payment of crop compensation and damages for RoW of overhead and underground transmission line

During the site visit it was observed that most of the laying of transmission line and tower erection was completed and as informed the project through the Gujarat Electricity Transmission Corporation's (GETCO) appointed authorised contractor (for more detail refer to section 2.12.3) has paid the compensation to the 13 (12 from overhead and 1 from underground) impacted landowners due to installation of overhead transmission line as per the Government of Gujarat Circular No. JET-11-2015-GOI-199-K date 14.08.2017 AND 31.12.2021, negotiation with impacted landowners, and the "Guideline for payment of compensation towards damages in regard to Right of Way for Transmission Line" issued by the Ministry of Power.

The details of the compensation as per the guideline, are presented below:

- Compensation @ 85% of land value as determined by District Collector, or any other authority based on Circle rate/Guideline value/Stamp Act rates for tower base area (between four legs) impacted severely due to installation of tower/pylon structure.
- Compensation towards diminution of land value in the width of Right of Way (RoW) corridor due to laying of transmission line and imposing certain restriction would be decided by the States as per categorization/type of land in different place of States, subject to a maximum of 15% of land value as determined based on Circle rate/guideline value/stamp rates.

2.12.3 Determination of rate of payment for overhead transmission line

Reportedly to determine the optimum land rates for the land the project has adopted a specific approach to determine the rate for obtaining the easement right. The baseline rate was initially taken from the district collector's issued land rates of 2011 (circle rate – the latest circle rate issued by the Rajkot district collector[25]) , which was INR 323 per square meter[26]. And in order to match the current market rate, the project has escalated the base rate by 10% and compounded annually. The easement right of the transmission line has been obtained in the year 2022-23.

As a result, minimum rate at which the payment has been made is INR 927.32[27] per square meter. Further, as reported by the local community, the calculated rate by the project is more than the market rate which is INR 35 lakhs to 40 lakhs per acre (INR 80.35 to ~92/square meter).

Further, analysis of secondary data on market rate has been done, based on the secondary data, the market rate of agricultural land in the Rajkot city is in the range of INR 20 lakhs – 45 lakhs[28] (INR 494.2 – 1,112/square meter).

As informed the final compensation was determined through voluntary negotiations, and the baseline rate used in these negotiations was INR 927.32 per square meter (which is at par with the prevalent market rate). The voluntary negotiated rate has

[24] The width of RoW has been taken from Ministry of Power's disclosed "Guidelines for Payment of compensation towards damages in regard to Right of Way for Transmission Line".
[25] https://garvi.gujarat.gov.in/PDF/Corp/RAJKOTCORP.pdf (Accessed on January 16, 2024)
[26] https://garvibeta.gujarat.gov.in/PDF/Corp/RAJKOTCORP.pdf (Accessed on June 12, 2023)
[27] As per the calculation per acre rate is 927.32 * 4046.856 (sq. m. in 1 acre) = INR 3,752,730.5
[28] https://www.realestateindia.com/rajkot-property/farm-land-for-sale.htm (Accessed on January 20, 2024)

taken into account various factors, such as the market value of the particular land, distance from the road, agricultural activities, and other relevant consideration. The following table provide at minimum rate (baseline) of compensation for RoW and TL's tower:

Table 2-15 Minimum rate (baseline) of compensation

Transmission line aspects	Compensation mandate as per the Guideline issued by Ministry of Power	Compensation rate (per square meter)
Transmission Line's tower	85% of land value	INR 788.22
Transmission line's RoW	15% of land value	INR 139.1

Note: Furthermore, based on the minimum baseline compensation rate, the authorized contractor has engaged in voluntary negotiations with the impacted landowners to determine the final compensation rate.

Note on process of installing of transmission line and compensation payment term:

As reported by the Project, as a process, the Project initiated the process of installing the transmission line by submitting the written application to the Gujarat Energy Transmission Company Limited (GETCO)[29] with information such as WTE plant location, capacity of the transmission and the connecting substation. After receiving the application, GETCO initiate the route survey for the transmission line through its authorised contractors[30]. Further, after finalisation of the survey route, GETCO provide the survey route to the project and provide go ahead for installing the transmission line. However, before installing the transmission line, the Project shall submit an advance amount to GETCO, the advance amount is finalised basis of the total length and capacity of the transmission line.

Upon finalizing the survey route, GETCO communicates the approved route to the project and grants authorization for the installation of the transmission line. Prior to the commencement of installation, the Project is required to submit an advance amount to GETCO. The determination of this advance amount is based on factors such as the total length and capacity of the transmission line.

Further, after finalisation of the route from GETCO, Project hires the installation contractor from GETCO approved contractor list[31]. After finalisation of contractor, the project along with the appointed contractor undertake resurvey of the approved route. And if there is any change in the finalised survey route, the Project inform GETCO and take approval on the change route.

Once the route of the transmission line is finalised, the appointed contractor initiates the installation of transmission line. During, the installation of the transmission line, if there is any impact on the private landowners due to the installation, the contractor pays the compensation amount to the impact landowners based on the Government of Gujarat Circular No. JET-11-2015-GOI-199-

[29] Gujarat Energy Transmission Corporation Limited (GETCO) is an electrical power transmission company based in the state of Gujarat, India. Established in May 1999, GETCO operates as a wholly owned subsidiary of the erstwhile Gujarat Electricity Board (GEB) and is the nodal agency in the state of Gujarat for energy transmission (Gujarat Energy Transmission Corporation Limited (getcogujarat.com) – accessed on March 8, 2024)

[30] The process for authorizing contractors by Gujarat Energy Transmission Corporation Limited (GETCO) involves several steps to ensure compliance, quality, and safety. Here's an overview of the process:

- Contractors interested in working with GETCO must apply for registration. The application form can be downloaded from the GETCO website.
- The registration process includes verification of credentials, financial stability, and relevant experience.
- Contractors must meet specific qualifications related to technical expertise, financial capacity, and safety standards.
- GETCO assesses the contractor's capabilities to handle transmission line installation projects.
- Contractors submit necessary documents, including their company profile, financial statements, and past project experience.
- GETCO reviews these documents to evaluate the contractor's suitability.
- GETCO assesses the contractor's technical capabilities, such as equipment availability, skilled workforce, and adherence to safety norms.
- The contractor's track record in executing similar projects is also considered.
- GETCO evaluates the contractor's financial stability, ensuring they have the necessary resources to complete the project.
- Financial solvency and liquidity are critical factors.
- Contractors must demonstrate compliance with safety regulations and quality standards.
- GETCO verifies safety protocols, certifications, and adherence to industry best practices.
- GETCO conducts site visits to assess the contractor's infrastructure, equipment, and operational practices.
- The site inspection ensures alignment with project requirements.
- Once approved, GETCO enters into a contract with the authorized contractor.
- The agreement outlines project scope, timelines, deliverables, payment terms, and safety protocols.
- The authorized contractor begins the transmission line installation as per the agreed-upon terms.
- GETCO monitors progress, quality, and safety throughout the project. (GETCO_STU_Report_2021-22.pdf (getcogujarat.com), and Gujarat Energy Transmission Corporation Limited (getcogujarat.com) – accessed on March 8, 2024)

[31] GETCO List of Registered Electrical Contractor as on 28.02.2022.pdf (getcogujarat.com) (Accessed on March 8, 2024)

K date 14.08.2017 AND 31.12.2021, and voluntary negotiation with the landowner. However, the information of the total amount of compensation paid is only shared with GETCO and not with the project.

2.12.4 Payment of compensation to impacted Landowners due to Overhead Transmission Line

As per the project report, the designated contractor has duly disbursed compensation to 12 affected landowners, adhering to the stipulated guidelines set forth in the Government of Gujarat Circular No. JET-11-2015-GOI-199-K, dated 14.08.2017 AND 31.12.2021. The compensation disbursal was conducted through a structured approach, encompassing three (3) instalments. A comprehensive breakdown of the instalment details is provided in the table below:

Table 2-16 Stages of percentage of total payment of compensating for construction of overhead transmission line

Stages/installation	Activities	Percentage of total compensation
1st Stage/installation	Building the foundation of tower	33.33 per cent of the total compensation
2nd Stage/installation	Raising the tower	33.33 per cent of the total compensation
3rd Stage/installation	Stringing of transmission line	33.33 per cent of the total compensation

Compensation to the impacted land owners has been disbursed. To ensure conformity with the stipulations outlined in the Gujarat Circular No. JET-11-2015-GOI-199-K, dated 14.08.2017 and 31.12.2021, as well as adherence to prevailing market rates, both the service provider and the Project have formally requested information from GETCO. However, GETCO has not disclosed the specific amount of compensation paid to the landowners.

In addition, GETCO has conveyed that the compensation was determined through negotiations with the impacted landowners, a confirmation reiterated by the installation contractor. Furthermore, GETCO has reported that there have been no grievances raised by the landowners concerning the compensation payment process.

2.12.5 Underground Transmission Line

The installation of the underground transmission line has impacted one (1) private landowner. Similar to the process for overhead transmission lines, the installation of the underground line involves same steps. First, GETCO (Gujarat Energy Transmission Corporation Limited) conducts a survey and shares the survey route with the Project. The Project then appoints an authorized contractor who performs a resurvey of the approved route. Any changes to the route after resurvey are communicated to GETCO. The appointed contractor is responsible for installing the underground transmission line. Compensation for the impacted landowner is determined by GETCO, taking into account the base minimum land price (refer to **Table 2-15** for more details) and voluntary negotiations with the landowner. However, specific details regarding the compensation paid to the impacted landowner are not disclosed by GETCO to the Project.

Details of different section of underground transmission line and the type of land it is passing are provided below:

Table 2-17 Details of nature of land falling under different sections of underground transmission line

Length of different section of underground transmission line	Nature of land
1.138 Km	The section is passing through the Rajkot's landfill area
0.1 km	The section is crossing the railway line and passing through the railway owned land. The project has obtained the permission for crossing the underground transmission line from the Railway. As per the site visit no informal users were observed on the railway owned land impacted by the transmission line. The same can be observed in the following figures:

Length of different section of underground transmission line	Nature of land
	
0.3 km	0.3 km is crossing the main market Gavridad village and is impacted one (1) landowner.
1.4 km	Passing through the state highway's RoW.

2.12.6 Water Pipeline

The project will lay down 12.033 km of underground water pipeline from the project location to the Gauridad STP Rajkot. The total land requirement for the underground water pipeline is provided below:

Table 2-18 Total land requirement for underground water pipeline

Total Length of water pipeline	Width of RoW for underground water pipeline	Total Land (acres)
12.033 km	1 meter	2.9734

Reportedly the water pipeline, majorly passes through government land or the right-of-way (RoW) of state highways. However, the installation of water pipeline has impacted three (3) landowners. Therefore, there is no expected impact on any private land. And for laying of water pipeline the project has already obtained the separate approval from Rajkot Municipal Corporation for laying down of water pipeline in RoW of the municipality owned road. The compensation for the impacted landowners is paid in the same line with the compensation paid to the impacted landowners by transmission line.

2.13 Manpower Requirement

The project has appointed one (1) contractor (manpower supplier) for providing contractual construction workers and one (1) private security agency for providing security personnel at the under-construction waste to energy (WTE) project at Rajkot. In addition to the contractual workers, GWRPL also has deployed its on-roll employee at the waste to energy power plant.

Details of on-roll employees and contractual workers are provided below:

Table 2-19 Manpower Requirements (Manpower strength on day of visits)

Sr. No.	Employer name	Nature of work	Total number of employees/contract workers		
			Male	Female	Total
On-roll employees					
1.	Abellon Staff	Project Execution & Management	5	0	5
Contractual workers during construction phase					
2.	Subcontracted construction Workers	Construction work	65	10	75

Sr. No.	Employer name	Nature of work	Total number of employees/contract workers		
			Male	Female	Total
3.	Security Allied Services	Security Services	5	0	5
Proposed contractual workers during operation phase					
4.	On Roll Staff	110 (Estimated for three (3) shifts 100 Males & 10 Females)			
5.	Contractual worker (contractor yet to be finalised)	Operational work	~117 (Estimated for three shifts)		
6.	Security Allied Services	Security Services	10	1	11

3 Analysis of Alternatives

As per the applicable standards, an analysis of probable alternatives for the chosen technology and location of Project site along with other similar factors that contribute to the Project as a whole has been carried out. This step will ensure all reasonable alternatives or options are taken into account, including the effect of a no project scenario, and that these are examined with an eye towards minimizing impacts to the environment and allowing decision makers to choose the best alternatives to protect and enhance environmental quality.

The following scenarios have been taken into consideration:

- No Project scenario
- Alternative Options for the Management of Waste
- Alternate Source for Power Generation
- Alternate Incineration Technologies
- Suitability for Project Site and associated facilities

3.1 No Project Scenario

The no project option takes the following into consideration:

- Access to energy and increasing energy demand at state level.
- Continuation of current practices of dumping of waste in landfill as a method to manage waste in Rajkot.

Access to energy is a fundamental enabler for economic development and prosperity of any region. A survey conducted by the World Energy Council states that as the population increases and as the growing rate of electrification places huge requirements on energy supplies, the total primary energy demand of India is expected to increase by almost 150% by 2035.

As per the Central Electricity Authority (CEA), Gujarat's energy demands up to February 2023 was 139,245 MU with 44 MU supply deficit. The deficit in the entire western region of India was 588 MU. As of July 2023, Gujarat's power demand rose to 16,733 MW.

Table 3-1 Energy Demand Gap – February 2023

State/Region	Requirement (MU)	Availability (MU)	Deficit (MU)	Deficit (%)
Gujarat	139,245	139,201	-44	-0.0
Western Region (India)	474,458	473,870	-588	-0.1

Source: Central Electricity Authority

In order to meet the energy demand, renewable/non-conventional sources of power will be required to supplement the conventional sources. The Project, being renewable source of power generation, will contribute towards bridging the gap between demand and supply. The Project presents an opportunity to utilize the potential for Waste-to-Energy power generation. A "No Project Scenario" will not address the issue of power demand and would be a constraint on economic growth in the future.

In view of the current status of the waste issue in Rajkot, it is evident that the waste management practices need urgent attention. As per Census 2011, Rajkot City has population base 13,46,192. The municipal solid waste management in Rajkot city limits is the responsibility of Rajkot Municipal Corporation (RMC). There is one existing landfill site of about 100+ acres near village Nakarwadi where entire waste collected from the city is currently being dumped in unscientific manner since last 20 or more years. At present, Rajkot city generates approx. 700 TPD of fresh waste and it is anticipated that the current accumulated quantity of MSW in the landfill could be in the range of 20-25 Lakhs Ton. Since the Rajkot landfill is an unscientific open landfill, the organic waste matter is subjected to biodegradation resulting into Green House Gas (GHG) emissions in the form of methane, which is a matter of environmental concern. Continuation of such practice will result in increase in GHG emissions. Other adverse impacts of open dumping of waste are:

- Issue of odor in surrounding areas
- Spread of pathogens, and unhealthy microbes with potential health concerns in nearby areas
- Potential for contamination of soil and groundwater due to absence of scientific lining
- Fire hazards resulting in gaseous emissions and safety of worker, ragpickers and nearby community

- Diversion of new land parcels for landfill in long term once city's waste generation increases.

Since the Project not only produces energy, but also provides an environment friendly manner for waste utilization, a no project scenario would not be a preferable option.

3.2 Alternative Options for the Management of Waste

Waste to energy plants hold significant potential for India's sustainable development goals. With the rapidly growing population and increasing urbanization, waste management has become a pressing challenge. Waste to energy plants thus offer a viable solution by converting municipal solid waste into energy. This not only mitigates the burden on waste landfills, but also provides a source of renewable and clean energy.

In order to address the challenges of municipal solid waste management and treatment, there are three primary methods under consideration: sanitary landfill, composting and power generation.

Table 3-2 Advantages and Disadvantages of waste treatment facilities

Type of waste treatment	Advantages	Disadvantages
Sanitary landfill	• Simple in terms of implementation and management • Partial Recycling Potential	• Requirement of larger land area • Very low reduction of waste volume • Uncapped landfills have potential for GHG emissions • Potential for soil and groundwater contamination in case of lack of proper scientific lining due to leachate generation • Potential for spread of airborne microbial load as well as pest infestation • Not aesthetic • Odor and fire issues
Composting	• Partial possibilities of diversion of waste from the landfill • Uncontrolled methane gas or leachate generation	• Low reduction of waste volume • Odor issues • Lesser market viability • Birds and pest related issues • Time consuming process to treat waste and generate end product • Dependent on weather and temperature conditions • Health risks due to waste handling • Potential for soil and groundwater contamination due to leachate generation • Not Aesthetic • Requirement of larger land area
Waste to energy	• Fast and compact and human friendly process when designed with a higher degree of Automation. • Adequate pre-processing infrastructure will may create opportunities for multiple value chains like Biogas, Plastic Recycling, Metal Recycling, Glass Recycling, etc. • Diversion of fresh waste from the landfill • Methane avoidance with WTE project. • Higher reduction of waste volume • Lowest possibility of methane gas or leachate generation • Power generation and utilization • Lower health risks due to waste handling	• Larger capital investment • Technology dependent • Ash generation and disposal • Potential for dioxin and furan emissions

The waste to energy plant being constructed by Abellon in Rajkot would thus help process 1000 TPD of MSW thereby reducing the quantity of municipal solid waste that would otherwise have collected at the landfill in Rajkot. It will also help meet a portion of the energy requirements for the region via clean energy generated through the plant.

The Government of Gujarat has also accorded a high priority to setting up power projects based on non-conventional energy sources in the State. With a view to promote generation of power from these sources, Gujarat Energy Development Agency (Government of Gujarat) issued a "Waste to Energy Policy" in 2016, amended in 2018, 2021 and 2022. The Gujarat Waste to Energy Policy, 2022 aims to promote Municipal Solid Waste (MSW) utilization as a renewable resource for generation of electricity. The Gujarat Waste to Energy Policy, 2022 emphasizes waste segregation, thus helping operations of an MSW WTE plant. The usage of modern and efficient technology in the WTE plant, coupled with effective waste management practices would help ensure maximum energy recovery while minimizing environmental impacts. Under this policy, any individual company or corporate or association or body of individuals, Urban Local Bodies/ Urban Development Authorities will be eligible for setting up Power Plants utilizing Municipal Solid Waste either for the purpose of captive use or for sale to Obligated Entities. The Rajkot WTE project is also being set up in line with this policy requirement.

3.3 Alternate Source for Power Generation

As per the estimations of World Nuclear Association the grams of carbon-equivalent (including CO2, CH4, N2O, etc.) per kilowatt-hour of electricity (gCO2eq/kWh) for MSW to energy project are low and scores better when compared with other forms of conventional sources of energy. The International Energy Agency (IEA) also estimates municipal solid waste-based energy generation to be lower in life cycle carbon emissions. Table below highlights GHG emissions that each technology possesses.

Table 3-3 GHG Emissions power generation sources

Technology	Average tonnes (CO2e/GWh)
Lignite	1054
Coal	888
Oil	733
Natural Gas	499
MSW[32]	367
Solar PV	85
Biomass	45
Nuclear	29
Hydroelectric	26
Wind	26

Source: World Nuclear Association (WNA), 2011[33]

Carbon capture for a waste to energy plant is simpler than for a coal-fired power station. Issues such as presence of sulphur and generation of particulates is lesser in case of MSW as compared to coal. WTE plant is considered as a better option when compared to other conventional sources of power generation.

3.4 Alternate Technologies for Waste Incineration

3.4.1 Grate technology

Grate incinerators are widely applied for the incineration of mixed municipal wastes and can be used for untreated, non-homogenous, and low calorific municipal waste. An overhead crane feeds waste into the hopper, where it is transported via the chute to the grate in the furnace. On the grate, the waste is dried and then burned at high temperature with supply of air. The ash, including non-combustible fractions of waste, leaves the grate as slag or bottom ash through the ash chute. Different grate

[32] https://www.ieabioenergy.com/wp-content/uploads/2013/10/40_IEAPositionPaperMSW.pdf
[33] https://www.world-nuclear.org/uploadedfiles/org/wna/publications/working_group_reports/comparison_of_lifecycle.pdf

systems can be distinguished by the way the waste is conveyed through the different zones in the combustion chamber. The type of grate system determines the efficacy of primary air feeding, conveying velocity and raking, as well as mixing of the waste.

Grate incinerators are of two types:

- Reciprocating Grate: Waste enters from one end and ash is discharged at other end. Generally there are three zones in series. These are drying, combustion, and burnt out zone.
- Travelling Grate: Prepared RDF from fresh MSW is fed into furnace in suspended mode. Partial Combustion takes place during suspension and balance combustion take place on top of travelling grate. Travelling grate moves from rear end to front end and therefore RDF feeding and bottom ash discharge are in the front side of the boiler.

Advantages of grate incinerators	• This technology is most widely tested and meets the standards of technical performance. • It accommodates large variations in waste composition and calorific value. • One can achieve complete combustion with better control on harmful emissions.
Disadvantage of grate incinerators	• Capital and maintenance costs are high

3.4.2 Gasification

Gasification is a partial combustion of organic or fossil based carbonaceous material, plastics, etc. into carbon monoxide, hydrogen, carbon dioxide, and methane. This is achieved at high temperature (650°C and above), with a controlled amount of air, oxygen, or steam. The process is largely exothermic, but some heat may be required to initialize and sustain the gasification process. The main product is syngas, which contains carbon monoxide, hydrogen, and methane and solid residue of non-combustible material (ash).

MSW should be pre-processed before it can be used as feedstock for the gasification process. The pre-processing comprises of manual and mechanical sorting, grinding, blending with other material, drying, and pelletization.

Gasification technology is selected on the basis of available fuel quality, capacity range and gas quality conditions. The main reactors used for gasification of MSW are fixed beds and fluidized beds.

- Fixed Bed: typically have a grate to support the feed material and maintain a stationary reaction zone. They are relatively easy to design and operate, and are therefore useful for small and medium scale power and thermal energy uses.
- Fluidized Bed: In this, a stream of gas (typically air or steam) is passed upward through a bed of solid fuel and material (such as coarse sand or limestone). The gas acts as the fluidizing medium and also provides the oxidant for combustion and tar cracking. Waste is introduced either on top of the bed through a feed chute or into the bed through an auger. The sand with the pre-treated waste and/or fuel is kept suspended on pumped air currents and takes on a fluid-like character. The bed is thereby violently mixed and agitated keeping small inert particles and air in a fluid-like state. This allows all of the mass of waste, fuel and sand to be fully circulated through the furnace. Fluidized beds have the advantage of extremely good mixing and high heat transfer, resulting in very uniform bed conditions and efficient reactions.

However, during gasification, tars, heavy metals, halogens, and alkaline compounds are released within the product gas and can cause environmental and operational problems. Further, it requires specific feedstock quality, that is, high calorific value waste, which has a direct impact on the efficiency and commercial viability of the product. To achieve this pre-processing including source segregation and on-site sorting is essential which makes it not viable.

3.4.3 Pyrolysis

Pyrolysis involves an irreversible chemical change brought about by the action of heat in an atmosphere devoid of oxygen. Pyrolysis is an endothermic reaction and heat must be applied to waste to distil volatile components. The converting of plastic to fuels through pyrolysis is possible, but it is yet to be proven to be a commercially viable venture.

Pyrolysis is carried out at 500°C – 1,000°C and produces a mixture of combustible gases such as hydrogen, carbon monoxide, methane, carbon dioxide, and some hydrocarbons. Liquid consisting of tar, pitch, light oil, and low boiling organic chemicals like

acetic acid, acetone, methanol, etc. and char consisting of elemental carbon along with the inert material in the waste feed are also end products of the process.

It is required that feedstock for pyrolysis should have high calorific value with very limited moisture content and should be homogenous in nature. For mixed MSW, pre-processing is necessary to bring homogeneity to increase efficiency. As a result of combustion of organic matter in an oxygen-deficient environment, various products such as char (ash), pyrolysis oil, and syngas are produced. Syngas can be further refined to remove particulates, hydrocarbons, and soluble matter, and is then combusted to generate electricity. One key issue for use of syngas in energy recovery is tarring. The deposition of tars can cause blockages and other operational challenges and has been associated with plant failures and inefficiencies at some pilot and commercial scale facilities.

Given the requirements of achieving specified size and consistency of MSW before it can be used as feed, pyrolysis and gasification processes are not viable options under the project. Therefore the grate incineration technology has been selected by Abellon.

3.5 Suitability for Project Site and associated facilities

The Project is proposed to be set up adjacent to the existing landfill in Rajkot city. The location of the Project site was finalized by RMC, on land already owned by RMC and is provided on lease to Abellon for development of WTE plant. The waste will be collected on daily basis by RMC from door to door and supplied to the WTE plant. Since the project site is located adjacent to the unscientific landfill, the RMC trucks will follow the same transportation route once the plant is operational. This will ensure that no new route plan has to be prepared or implemented by RMC, thus minimizing any additional community disturbance issues.

The proposed project land was thus finalized due to the following factors:

- Proximity to Landfill site
- Minimal economic displacement due to existing land use
- No reported legacy issues related to waste dumping & contamination
- No physical structures or houses on the land
- Good connectivity to village roads and state highways.

Therefore, considering the above no other alternate locations for this project have been considered.

The project has proposed 66 kV transmission line of length 11.8 km (2.9 km underground and 8.9 km overhead) having 48 towers connecting to GETCO Gauridad Substation. The project will also lay down two 12.2 km of underground water pipeline from the project location to the Gauridad Sewage Treatment Plant (STP) Rajkot.

The TL and pipeline routes identified follows all the below-mentioned points.

- TL route minimise passing through human settlement.
- TL route does not affect/ minimum affect any archaeological/ cultural monument.
- TL route avoids forest area.
- TL route avoids passing through any protected area such as National Park/ Wildlife Sanctuary.
- TL routes avoid disturbance to public utility services such as school, playground, bus depots etc.
- Undergrounding of TL has been proposed at areas where there is railway crossing.
- Both underground TL and underground treated water pipeline are proposed on government land and ROW of state highways to minimize construction related disturbances to community.

Furthermore, as reported, the project has determined the identified route as the optimal path for the transmission line and pipeline, taking into account environmental and social sensitivities. This conclusion is drawn by mitigating the aforementioned sensitivities related to impacts on human settlements, cultural monuments, forest areas, national parks/wildlife sanctuaries, and public utilities.

4 Applicable Legislative, Regulatory and Administrative Regime

The following reference framework is applicable to the project:

- Applicable local, national and international environmental and social legislations including Solid Waste Management Rules, 2016
- Applicable technical guidelines on waste to energy including revised guidelines of waste-to-energy Programme, Ministry of New and Renewable Energy (MNRE), Government of India
- Applicable guidelines/legislations on waste pickers and recycling
- IFC Performance Standards on Social and Environmental Sustainability (2012).
- IFC/World Bank Group EHS General and relevant Sector Specific Guidelines as applicable
- WB General EHS Guidelines, 2007
- WBG EHS Guidelines for Waste Management Facilities, 2007
- WBG EHS Guidelines Water and Sanitation, 2007
- IFC/WBG EHS Guidelines for Power Transmission & Distribution, 2007
- The International Labour Organization (ILO) conventions covering core labour standards and the basic terms and conditions of employment – Declaration of Fundamental Principles and Rights to Work, 1998
- IFC/ERBD Guidance on Worker Accommodation, 2009
- UN Voluntary Principles on Security and Human Rights, 2000
- Addressing Gender-Based Violence and Harassment - Emerging Good Practice for the Private Sector, 2020

4.1 Permitting Status of the Project

As per the EIA Notification (2006) and its amendments, dated 14.07.2022 , the thermal Power plant up to 25MW, based on non-hazardous municipal waste and using auxiliary fuel such as coal / lignite / petroleum products up to 15% are exempted from prior environmental clearance. Additionally, Thermal Power plants using waste heat boiler without any auxiliary fuel are exempted from prior environmental clearance. Since the capacity of the project is 14.9 MW and MSW will be used as fuel for the boiler, therefore, environmental clearance is not applicable to the project.

As per latest notification from the CPCB, dated 07/03/2016 (Ref No: B-29012/ ESS (CPA)/2015-2016[34], "Waste to Energy Power Generation Project " have been classified as "Red category" and therefore "there shall be necessity in obtaining 'Consent to Establish & Operate" for Red category of industries". The project has received Consent to Establish (CTE) under Air Act 1981 and Water Act 1974 dated 12.09.2019 valid till 10.06.2026. According to the conditions of the CTE, the project is entitled to use 500 TPD MSW and 350 TPD Refuse Derived Fuel (RDF) as fuel for the WTE plant. However, based on discussion with GWRPL, it is understood that approximately 1000 TPD MSW will be required for the operation of the WTE plant.

The project will generate, store and handle hazardous wastes such as used oil from operating equipment and DG sets, fly ash from Bag House during operational phase which shall require hazardous waste authorization under Hazardous and other Wastes (Management and Transboundary Movement) Rules, s2016. According to Clause 2(ii) of the Hazardous and other Wastes (Management and Transboundary Movement) Amendment rules,2019, industrial sectors /projects which are not required to obtain Consent to Establish (CTE) or Consent to Operate (CTO) from the State Pollution Control Board or Pollution Control Committee under The Water (Prevention and control of pollution) Act,1974 (25 of 1974) and Air (Prevention and control of pollution) Act 1981 (21 of 1981) shall also be exempted from obtaining Hazardous Waste Authorization from SPCB. Since the project requires CTE and CTO, hence, the project does not fall within the aforesaid exemption and is required to obtain hazardous waste Authorization..

4.2 National Administrative Requirements

In India, the national level laws are formulated by Ministry of Environment Forests and Climate Change (MoEFCC) and state governments are required to consider these regulations as base level for implementation. The State Pollution Control Boards (SPCBs) are responsible for securing compliance under the Environmental Protection Act, 1986, the umbrella legislation regulating environmental issues in the country. A brief description of the relevant enforcement agencies both at central level and state level with respect to the institutional framework is described in *Table 4-1* below.

[34] https://cpcb.nic.in/openpdffile.php?id=TGF0ZXN0RmlsZS9MYXRlc3RfMTE4X0ZpbmFsX0RpcmVjdGlvbnMucGRm

Table 4-1 Relevant Enforcement Agencies

Sr. No.	Agency	Function
Central Level		
1	Ministry of Environment Forests and Climate Change (MoEFCC)	The Ministry of Environment and Forests (MoEFCC), Government of India is responsible for the environment management at Union of India level. The specific functions of MoEFCC are as follows: • Environmental policy planning; • Effective implementation of legislation; • Issuing guidelines under EP Act for environment protection; • Monitoring and control of pollution through Central Pollution Control Board and State Pollution Control Boards; • Environmental clearance for industrial and development projects covered under EIA Notification; • Monitoring of compliance conditions stipulated in Environmental clearance through its regional offices; • Promotion of environmental education, training and awareness; • Forest conservation, development, and wildlife protection; and • Protection of Coastal areas. MoEFCC is responsible for the implementation and enforcement of the Environment Protection Act, 1986, and Rules issued under the Act, including the EIA notification. Under sections 3 and 5 of the EP Act, 1986, it retains enormous powers to issue directions in the interests of environment protection.
2	Ministry of New and Renewable Energy (MNRE)	The Ministry of New and Renewable Energy (MNRE) is the nodal Ministry of the Government of India for all matters relating to new and renewable energy. The broad aim of the Ministry is to develop and deploy new and renewable energy for supplementing the energy requirements of the country. The Ministry facilitate research, design, development, manufacture, and deployment of new and renewable energy systems/devices for transportation, portable and stationary applications in rural, urban, industrial, and commercial sectors.
3	Central Pollution Control Board	The Central Pollution Control Board (CPCB) has been constituted for the control of water, air and noise pollution, land degradation and hazardous material and waste management. The specific functions of CPCB are as follows: • Prevent pollution of streams and wells. • Advise the Central Government on matters concerning prevention, control and abatement of water and air pollution. • Co-ordinate the activities of SPCB's and provide them with technical and research assistance. • Establish and keep under review quality standards for surface and groundwater and for air quality. • Planning and execution of national programme for the prevention, control and abatement of pollution through the Water and Air Acts. Guidelines on the provision of the buffer zone around waste processing and disposal facilities, April 2017; amended in March 2019- Recommends developing buffer zone around waste processing and disposal facilities; development of Green Belt (including species of trees to be planted); responsibilities of various stakeholders
4	Central Ground Water Authority	The Central Ground Water Authority (CGWA) was constituted in 1997 to regulate, control and manage groundwater development in the country, under the EP Act 1986. One of the main functions of CGWA is to regulate indiscriminate boring and withdrawal of groundwater and to issue necessary regulatory directions with a view to preserve and protect the groundwater. CGWA has declared certain areas of India as "notified areas" from the point of over-development of resource, or from groundwater quality point of view, or for registration of groundwater abstraction structures. In these so "notified areas" further extraction is regulated in order to prevent the depletion of groundwater levels and deterioration of its quality.
5	Petroleum and Explosives Safety Organization (PESO)	The PESO is under, Ministry of Commerce and Industry, Department of Industrial Policy & Promotion, Government of India. The Chief Controller of explosives is responsible to deal with provisions of:

Sr. No.	Agency	Function
		• The Explosive Act 1884 and Rules, 1983; • The Petroleum Act 1934 and the Rules 2002; • The Static and Mobile pressure vessels {Unfired} Rules, 1981 and amendment 2000, 2004; • Gas Cylinder Rules, 2004; and • Manufacture, Storage and Import of Hazardous Chemical Rules, 1989 and amendment, 2000
State Level		
6	Gujarat Energy Development Agency (GEDA)	Different states have created Energy Development Agency as the designated agency to co-ordinate, regulate and enforce the provisions of the Energy Conservation Act and implement schemes under the said Act within the State. The objective is to undertake development of renewable energy and facilitate energy conservation, as a state nodal agency under the umbrella of the MNRE. The objective of GEDA are • Undertake or sponsor, techno-economic/socio-economic feasibility studies/cost-benefit analysis. • Formulate and implement a broad-based programme for conservation of energy at all stages, including extraction, conversion, distribution and consumption in all sectors of the economy. • Study the environmental effects of all energy-related processes. • Establish an Energy Resources Centre that will collect and collate energy and inter-related information. • Develop and support Documentation Services in area of energy in general and renewable energy in particular. • Develop Communication and Education projects for wide spread dissemination of energy and environmental issues
7	The Forests & Environment Department, Gujarat	The Forests & Environment Department in the Government of Gujarat has environment wing and forest wing. The environment wing of the Department is the apex body in the Gujarat State for implementation of all the environment related matters including Environment (Protection) Act, 1986, which is an umbrella Act on environment in the country. The main mandate of the Department is to achieve the sustainable development in the State and introducing the sound environmental management practices. The Department has four executing agencies viz Gujarat Pollution Control Board, Gujarat Ecology Commission, Gujarat Institute of Desert Ecology and Gujarat Environmental Management Institute, for discharging its functions.
8	Gujarat Pollution Control Board	The Government of Gujarat constituted the GPCB (Gujarat Pollution Control Board) on 15.10.1974 as per provisions under the Water (Prevention and Control of Pollution) Act, 1974 with a view to protect the environment, prevent and control the pollution of water in the State of Gujarat, that occupies a prominent niche in progressive and industrial development of the country. The Board has been entrusted with the Central Acts and relevant Rules for pollution control as notified thereof from time to time. The function of the Board is to enforce provisions of the following Acts, Rules and Directives issued by the Authorities from time to time. • The Water (Prevention and Control of Pollution) Act, 1974 • The Water (Prevention and Control of Pollution) Cess Act, 1977 • The Air (Prevention and Control of Pollution) Act, 1981 • The Environment Protection Act,1986, various relevant Rules notified thereof • The Hazardous and other Waste (Management and Trans boundary Movement) Rules,2016.
9	Labour Department, Government of Gujarat	The Department of Labour is responsible for formulation, implementation, and enforcement of the labour laws in the state of Gujarat. Decent Working Conditions and Improved Quality of Life of Workers, Ensuring India without Child Labour and Enhancing Employability on a Sustainable Basis. Formulating and Implementing Policies / Programmes / Schemes / Projects for Providing Social Security and Welfare, Regulating Conditions of Work, Occupational Health and Safety of Workers, Eliminating Child Labour, Promoting Harmonious Industrial Relations, Ensuring Enforcement of Labour Laws and Promoting Employment Services. • The most important functions of the Commissionerate of Labour include maintaining peaceful atmosphere in the labour sector; ensure co-operation and healthy relation between employers and the employees, systematic implementation of labour legislation, enhancing welfare of workers through better policies and programmes.

Sr. No.	Agency	Function
10	Private Security Agency, Gujarat	It is a state government body, with the aim to establish providing licenses to the private security agencies under the Private Security Agencies (Regulations) Act, 2015. To provide: • Better services to the PSARA Controlling Authorities, private security agencies as well as to the citizen • Quick implementation of government policies from time to time. • Improved/transparent image of Government & Department • Instant access to information related to private security agencies To improve the quality of service delivery to the citizen and the quality of the work environment of the PSARA licensing authorities.
11	Directorate Industrial Safety and Health Department (DISH) and Labour Department	The Directorate Industrial Safety and Health Department enforces the provisions of Factories Act 1948 and State Factories Rules and the rules made there under to ensure the safety health and welfare of the workers. It also plays a significant role in regularizing working hours, working conditions, and reducing the accident and dangerous occurrences in the factories, redressal of the grievances of the workers in respect of Safety Health and Welfare through a set of policies and programs developed by both the Central and State Government. Some of the functions of DISH are • Eliminating inequality and discrimination in the work place; • Enhancing occupational health and safety awareness and compliance in the workplace; • Workforce and community participation, to employers, employees, workplaces, communities, businesses and unions; and • Providing policy advice and analysis to government on labour and employment related matters. The main activities Directorate Industrial Safety and Health Department are: • To create awareness for Health & Safety amongst workers and factory management through seminars and other programs. • To update with the latest trend department arrange the Safety Conference every year. • To encourage and appreciate the workers contribution in the industry by Shram Awards • To facilitate implementation of various welfares schemes for Construction workers. • To conduct required Health & Hygiene Survey in various industrial sectors.
12	State Forest Department	The Forests & Environment Department forms the policy for the conservation of the forest, protection of the Wildlife and the Environment in the State of Gujarat. The main objectives of the policy states that: • Protection, Conservation and development of forests and wildlife, the adoption of measures of soil conservation, moisture conservation and increasing soil fertility. • The utilization of the forest so as to obtain the maximum yield consistent with their permanent maintenance and the supply of the needs of the people, agriculture, industry and defence. • To conduct research into silviculture, utilization and other problems affecting the regeneration and development of the forests. • To achieve the goals of National Forest policy 1988 and to cover the maximum area under forests. • To create awareness among the people about the forests and environment. • To increase the active participation of the local people in protection and conservation of forest with special emphasis on tribal, poor and women.

4.3 Gujarat Waste to Energy Policy – 2022

The objectives of the "Gujarat Waste to Energy Policy – 2022" are as enlisted below:

- Help improve efficiency and effectiveness of collection and disposal of MSW, thereby contributing to 'Swachh Bharat Mission'
- Facilitate and promote disposal of MSW in more environment friendly manner
- Facilitate and promote utilization of MSW as renewable resource for generation of electricity
- Reduce the requirement of lands for disposal of MSW, thereby saving precious public resource for alternative public purpose
- Promote investment, employment generation & skill enhancement in Renewable Energy Sector

- Lay down rational framework for smooth implementation of policy

Gujarat Energy Development Agency (GEDA) shall be the state Government Nodal Agency for facilitation and implementation of the Gujarat WTE Policy 2022. The Nodal Agency will facilitate and assist the project developers to undertake the following activities in achieving the objectives of the Policy.

1. Registration of projects
2. Respond to queries and problems of Project Developers
3. Accreditation and recommending WTE Projects for registering with Central Agency under REC Mechanism
4. Certifying commissioning of Projects

4.4 Applicable National Environmental and Social Acts and Rules

Table 4-2 below summarizes the key regulations that are relevant to the project across its lifecycle. This table should be used to update/develop a comprehensive legal register for the project that can be regularly monitored for compliance as well as updated to reflect changes/non-applicability of regulations, policies, and standards.

Table 4-2 Applicability of key E&S regulations in the different phases of Project lifecycle

Sr. No.	Applicable Regulation/Permit	Construction	Operation	Responsible Authority	Applicability to the Project/ Status
	Environment Protection				
1	EIA Notification (2006) and its amendments	×	×	MoEFCC	According to EIA Notification 2006 and amendment dated 25.06.2014, the Thermal Power plant up to 15MW, based on non-hazardous municipal waste and using auxiliary fuel such as coal / lignite / petroleum products up to 15% are exempted from prior environmental clearance. Additionally, Thermal Power plants using waste heat boiler without any auxiliary fuel are exempted from prior environmental clearance. Since the capacity of the project is 14.9 MW and MSW will be used as fuel for the boiler, therefore, environmental clearance is not applicable to the project
2	Environment Protection Act, 1986 and as amended. The Air (Prevention and Control of Pollution) Act, 1981. The Water (Prevention and Control of Pollution) Act, 1974	✓	✓	GPCB CPCB	As per latest notification from the CPCB, dated 07/03/2016 (Ref No: B-29012/ ESS (CPA)/2015-2016[35] and GPCB[36] "Waste to Energy Power Generation Project " have been classified as "Red category" and therefore "there shall be necessity in obtaining 'Consent to Establish & Operate" for Red category of industries". The project has received Consent to Establish (CTE) under Air Act 1981 and Water Act 1974 dated 09.07.2019 valid till 10.06.2026. According to the conditions of the CTE, the project is entitled to use 500 TPD MSW and 350 TPD Refuse Derived Fuel (RDF) as fuel for the WTE plant. However, based on discussion with GWRPL, it is understood that approximately 1000 TPD MSW will be required for the operation of the WTE plant which is not aligned to the condition of the CTE. Stack height as mentioned in CTE is 60 m. Project is planning to install stack of height 50m, which is not in compliance with stack height as per CTE obtained from GPCB. The Project should update the existing CTE and ensure future CTO include procurement of 1000 TPD MSW for operation of the project instead of 850 TPD mentioned in the CTE. Project to also discuss on the stack height with GPCB.
3	The Noise (Regulation & Control) Rules, 2000 and as amended up to 2010 Ambient Noise Standards	✓	✓	GPCB CPCB	As per the Act, ambient noise levels are to be maintained as stipulated in the rules for different categories of areas such as residential, commercial, and industrial and silence zones. Considering the location of the Project, the construction and operation activities of the Project and its contractors will need to abide by the limits prescribed for industrial area. As per the Noise Pollution (Regulation and Control) Rules 2010, every operating facility is required to take all possible steps to meet the ambient noise level standards prescribed in the Rules. The rules prescribe maximum permissible values of day and night-time noise levels for zones A, B, C and D representing industrial, commercial, residential and silence zone respectively. The same categorization and area code are being followed by EHS guidelines of IFC and MoEFCC vide gazette notification dated 14th February 2000 Area Code / Category of Area / Day Time limits in d B(A)Leq / Night-time limits in d B(A)Leq A / Industrial Area / 75 / 70 B / Commercial Area / 65 / 55 C / Residential Area / 55 / 45 D / Silence Zone** / 50 / 40 **Silence zone is defined as area up to 100 m around premises of hospitals, educational institutions and courts. Use of vehicle horns, loudspeakers and bursting of crackers are banned in these zones.
4	Guidelines on usage of RDF in various industries (waste management sector included) by Ministry of Housing and Urban Affairs, 2018	×	✓	GPCB	Criteria for waste to energy process (i) Non-recyclable waste having calorific value of 1500 Kcal/kg or more shall not be disposed off on landfills and shall only be utilized for generating energy either or through refuse derived fuel or by giving away as feed stock for preparing refuse derived fuel. (ii) High calorific wastes shall be used for coprocessing in cement or thermal power plants. GWRPL will comply with the above requirements during operation phase of the project

[35] https://cpcb.nic.in/openpdffile.php?id=TGF0ZXN0RmlsZS9MYXRlc3RfMTE4X0ZpbmFsX0RpcmVjdGlvbnMucGRm
[36] https://gpcb.gujarat.gov.in/uploads/Final_Categorization.pdf

Sr. No.	Applicable Regulation/Permit	Construction	Operation	Responsible Authority	Applicability to the Project/ Status
5	Solid Waste Management Rules 2016 as amended	×	✓	GPCB/ local municipal body	The Solid Waste Management Rules applies to solid or semi-solid domestic waste, sanitary waste, commercial waste, institutional waste, catering and market waste and other non-residential wastes, street sweepings, silt removed or collected from the surface drains, horticulture waste, agriculture and dairy waste, treated bio-medical waste excluding industrial waste, bio-medical waste and e-waste, battery waste, radio-active waste generated in the area under the local authorities. It provides specifications for generators, manufacturers, industrial units, local authorities and other entities regarding the various treatment methods and disposal mechanisms to be utilised. *Clause 19 of Solid Waste Management* Criteria for Duties regarding setting-up solid waste processing and treatment facility: • The operator of the facility shall design and set up the facility as per the technical guidelines issued by the Central Pollution Control Board in this regard from time to time and the manual on solid waste management prepared by the Ministry of Urban Development. • The operator of the facility shall obtain necessary approvals from the State Pollution Control Board or Pollution Control Committee. • The operator of the facility shall be responsible for the safe and environmentally sound operations of the solid waste processing and or treatment facilities as per the guidelines issued by the Central Pollution Control Board from time to time and the Manual on Municipal Solid Waste Management published by the Ministry of Urban Development and updated from time to time. • The operator of the solid waste processing and treatment facility shall submit annual report in Form III each year by 30th April to the State Pollution Control Board or Pollution Committee and concerned local body. *Clause 21: Criteria for Waste to Energy Process* • Non-recyclable waste having calorific value of 1500 K/cal/kg or more shall not be disposed of on landfills and shall only be utilised for generating energy either or through refuse derived fuel or by giving away as feed stock for preparing refuse derived fuel. • High calorific wastes shall be used for co-processing in cement or thermal power plants. • The local body or an operator of facility or an agency designated by them proposing to set up waste to energy plant of more than five tonnes per day processing capacity shall submit an application in Form-I to the State Pollution Control Board or Pollution Control Committee, as the case may be, for authorisation. All types of waste received at the facility will be pre-processed and processed and will be managed by GWRPL in accordance with the relevant provision of this Rule
6	Indian Boilers Act-1923	×	✓	Chief Inspector of Boilers	The Indian Boilers Act-1923 was enacted with the objective to provide mainly for the safety of life and Property of persons from the danger of explosions of steam boilers and for achieving uniformity in registration and inspection during operation and maintenance of boilers in India. As the WTE project will require boilers for producing energy, this act is applicable. According to the Indian Boilers Act, 1923, every boiler owner who purchases a new boiler • submit an application to the Chief Inspector of Boilers along with the inspection fees as per regulation 385 of IBR-1950 and the certificates of the manufacture in form of II, III & IV issued by the Chief Inspector of Boilers of the state, for the registration of the boiler. • The Boiler is inspected and its M.B along with (Memorandum of Inspection Book) is prepared. All calculations for the pressure parts of the boiler are made as per IBR-1950 and a P.O. (Provisional Order) is issued for a maximum period of six months to operate the boiler at the maximum working pressure as calculated. • The boiler is offered for the STEAM TEST by the boiler owner within the validity of PO and if found satisfactory, a certificate for a period of 12 months is issued. GWRPL will comply with the above requirements during operation phase of the project
7	Fly Ash Utilization Notification, 2022	×	✓	GPCB CPCB	The project will generate 140TPD of fly ash from the waste combustion and the fly ash will be managed as per the Fly ash utilization notification 2022
8	Construction and Demolition Waste Management Rules 2016	✓	×	Local authority	Construction waste generated at site will be handled as per the provisions of Construction and Demolition Waste Management Rules, 2016.
9	Manufacture, Storage and Import of Hazardous Chemicals (MSIHC) Rules, 1989 and as amended	✓	✓	GPCB	Rules will be applicable during construction and operation phases if chemicals stored at site satisfy the criteria laid down in the Rules
10	The Batteries (Management and Handling) Rules 2022	✓	✓	GPCB	Batteries waste, if any generated in construction and operation phase to be disposed of as per Batteries (Management and Handling) Rules 2022.

Sr. No.	Applicable Regulation/Permit	Construction	Operation	Responsible Authority	Applicability to the Project/ Status
11	E-waste (Management) Rules, 2016	✓	✓	GPCB	E waste generated on site to be collected, stored, and disposed of as per E waste Management Rules.
12	Hazardous and Other Wastes (Management and Transboundary Movement) Rules, 2016 as amended till date	✓	✓	GPCB CPCB	Hazardous waste estimated to be generated from the plant includes organic residue, salts, spent solvents, used oil from operating equipment and DG sets, fly ash from ESP, waste effluent, empty drums, etc., therefore the WtE plant attracts the provisions for obtaining a hazardous waste authorization as per Hazardous and other Wastes (Management and Transboundary movement) Rules, 2016 and its amendments thereof. Handling of hazardous waste including collection, storage, transportation, and disposal/ recycling as well as documentation needs to be maintained as per the requirements of Hazardous and Other Wastes (Management and Transboundary Movement) Rules, 2016. Hazardous waste Authorization for the project shall be obtained prior to operation phase.
13	Plastic Waste Management Rules 2016	✓	✓	GPCB CPCB	The WtE plant must comply with the Plastic Waste Management Rules. As per the rules, if the project generates plastic waste, then the same must either be sent to nearby cement kiln for co-processing or disposed of through authorised recyclers. The project also has to make sure that the plastic used in the project is greater than 50 microns.
14	Bio-Medical Waste Management Rules, 2016 as amended 10.05.2019	✓	✓	GPCB CPCB	Bio-medical waste generated at site will attract provisions of Bio-Medical Waste Management Rules, 2016. Biomedical waste generated to be disposed of through authorized agency.
15	Ground water extraction permission will be required if the project plans to abstract groundwater for fulfilling water demand.	✓	✓	GPCB CPCB	As per the information provided by Aquifer Mapping and Ground Water Management Plan for Rajkot, 2020, the Rajkot block where the under construction Project fall is categorised as ***Safe*** in terms of ground water extraction.All industries/mining/ infrastructure projects drawing ground water in safe, semi-critical and critical assessment units will have to pay ground water abstraction charges based on quantum of ground water extraction and category of assessment unit as per details given in this guideline. GWRPL has obtained No Objection Certificate (NOC) from CGWA on 02.11.2020 valid up to 01.11.2023. As per the NOC, the project can abstract 7.5 m3/day water from one existing borewell within the project premises. Based on review of waterlog, it was observed that project is abstracting 7.5 m3/day water from the borewell which is in compliance to the NOC obtained. However as per the conditions of the NOC, Proponents shall install roof top rainwater harvesting in the premise as per the existing building bye laws in the premise. Based on discussion with GWRPL, no rainwater harvesting system is planned for the project. Additionally, as per the conditions, the firm shall report compliance of the NOC conditions online on the website (www.cgwa-noc.gov.in) within one year from the date of issue of this NOC
	Social				
16	The Indian Telegraph Act, 1885	×	×	Department of Telegraphic – Communication, Government of Gujarat	**Section 10** Power for telegraph authority to place and maintain telegraph lines and posts. The telegraph authority may, from time to time, place and maintain a telegraph line under, over, along, or across, and posts in or upon, any immovable property subject to the following conditions: • The telegraph authority shall not exercise the power conferred by this section except for the purpose of a telegraph established or maintained by the Central government of India. • The central government shall not acquire any right other than that for use of the property for placing telegraph lines passing either under, over, along or across the property. • The central authority shall not exercise its powers with respect to any property which is under the control or management of any local authority, without permission of that authority. • given the powers under this section, the telegraph authority shall minimize/avoid damage to the property to the extent possible and shall pay full compensation to all persons interested in any damage sustained by them due to the powers exercised by the telegraph property with respect to the land.
17	The Electricity Act, 2003	✓	✓	Gujarat Energy Transmission Corporation Limited	**Section 67** Section 67 of the Electricity Act 2003 (along with Section 68 discussed below) deal with the powers of the central/state authority on the use of land for Right of Way (RoW), erection of transmission towers/electric poles. However, the provisions of Electricity Act under Section 67 apply on the licensee (as appointed by the government) who has not been granted the powers of the Telegraph Authority under the Telegraph Act, 1885. The licensee, subject to the terms and conditions of the license, as awarded by the government, may carry out work to lay down supply lines, that includes: • To open/break the soil and pavement of any street, railway. • To open/break any sewer, drain or tunnel in or under any street, railway. • To lay down and place electric lines, electrical plant, and other works • To repair existing electrical supply lines In order to carry out works, as incidental to, and required for the laying of electrical supply lines, the appropriate government (central/state), may specify the conditions and grant the necessary permissions, particularly on matters relating to –

Sr. No.	Applicable Regulation/Permit	Construction	Operation	Responsible Authority	Applicability to the Project/ Status
					• Consent of the local authority, owner, or occupier of the land parcel on which work is to be carried out, as required. • The duration of the contract of the licensee, and the nature of work • Determining the compensation amount, procedure of deposit of compensation amount payable by the licensee and payment process to the persons affected by the work to be carried out. • The rights of the owner/occupier of the land parcels that is being utilized for the works to be carried out by the licensee. • The procedure for fencing, guarding, and other safety measures relating to work on streets, railways and for alteration of the position of pipes, electric lines, telegraph lines. • The manner of restoration of property affected by such works and maintenance of the same. • Matters relating to disputes on compensation amount shall be determined by an "appropriate commission". the execution of works, involving erection of towers and connection of overhead lines, are done, only after a detailed field study, by identifying a feasible route of the proposed transmission line and by selecting a suitable corridors, by avoiding densely populated residential areas, span length, the angle of deviation, the extent of damage, likely to be caused, while erecting towers, maintenance cost of electric lines and towers and more particularly, the public interest in providing electricity to a large section of people and industrial establishments, **Section 68** The section provides for process of approval from the appropriate government for stringing of overhead lines, and/or maintenance of existing overhead lines. While section 67 contains provisions granted to the licensee by the government regarding erection of towers, this section deals with structures under the transmission line (TL) RoW • Any tree, or any structure standing near overhead line, or has been placed near an overhead line after the approval of the RoW, and erection of towers, can be removed or dealt with as accordingly by the licensee, after obtaining necessary approvals from appropriate government. • In case of any tree, structure in existence prior to the approval of the RoW and subsequent construction activities in the RoW, compensation shall be awarded to such persons with ownership of the trees/structures by the licensee. (Tree includes shrub, jungle, hedge). Section 68 of the Act contemplates that the appropriate government may, by rules made in this behalf, delegate the powers for carrying out over headline tower works and such power cannot be delegated by anyone else especially without prior permission from the appropriate government. Section 68 (2) (c) of the Indian Electricity Act prescribe the period of notice to be given prior to carrying out the works. **Section 164** This section grants the equivalent powers as vested to the telegraph authority through the Telegraph Act of 1885 to the private licensee (electricity generation and Distribution Company) for placing/erecting TL towers, and procurement of easement rights for RoW (Ministry of Power, Procedure for Obtaining Authorization U/s 164 of the Electricity Act, 2003, 2016). The appropriate government may elevate the status of a private company to the status of a public body and confer the powers as prescribed in the Telegraph Act upon the licensee, upon the submission of request from the company. In the submission of request, the licensee will furnish the following details: • Newspaper publication of the scheme (dissemination of information in public domain) • Authenticated maps showing the details of the selected route alignment, along with justification.
18	Guidelines on Payment of Compensation for the Right of Way (RoW) for Transmission Lines, Ministry of Power, October 2015	✓	x	Gujarat Energy Transmission Corporation Limited	In order to address the inadequacy of rules and statutes contained in Section 16 of the Telegraph Act and Section 68 of the Electricity Act regarding payment of compensation for loss of trees/structures, the Ministry of Power formulated guidelines for determining the compensation towards "damages" as stipulated in the Electricity Act, 2003 along with Indian Telegraph Act, 1885. These guidelines take into account losses that were not described in the two Acts. The guidelines are applicable for construction activities related to electricity lines of 66 kV and above (Ministry of Power, Guidelines for payment of compensation towards RoW damages, 2015). These are: • For tower base area impacted by erection activities, compensation at 85% of land value based on Circle rate/Stamp Act rates for tower base area. • For deterioration in value of land caused due to stringing of overhead lines and demarcation of the RoW corridor, compensation will be decided by the States as per the land category s.t a maximum of 15% of the land value based on Circle rate
	Labour				
19	Contract Labour (Regulation & Abolition) Central Act 1970 and Contract Labour (Regulation And Abolition) Rules, 1972 Gujarat	✓	✓	Labour Department	The Act applies to: • To every establishment in which twenty or more workmen are employed or were employed on any day of the preceding twelve months as contract labour • To every contractor who employees or who employed on any day of the preceding twelve months twenty or more workmen The Act details out conditions of licensing of contractors[37] and ensure basic welfare measures to be made available to the contract workers by the employer, which includes: • Canteens • Restrooms

[37] No contractor to whom this Act applies, shall undertake or execute any work through contract labour except under and in accordance with a license issued in that behalf by the licensing officer

Sr. No.	Applicable Regulation/Permit	Construction	Operation	Responsible Authority	Applicability to the Project/ Status
					• First aid facilities • Liability of principal employer • Responsibility for payment of wages • Penalties and procedure Registers and other records to be maintained[38] **Applicability** **Applicable** **Applicable on M&N Infra Construction Private Limited** M&M Infra construction Private Limited has obtained the contractual labour license with license number CLRA/License/CLRA/RJT/2022/CLL/32 **Not Applicable on Golden Crown Security Allied Services** The number of security personnel employed (which is 5) by the agency are below the mandatory applicability limit of 20 workers as per the Act. Therefore, as per the section 4 of the Act, the contractor labour license is not applicable on the agency
20	The Gujarat Factory Rule, 1963	×	✓	Chief Inspector of Factories	According to the act, an application for obtaining permission for the site on which the factory is to be situated and for the construction or extension of a factory shall be made to the Chief Inspector of Factories, Application for such permission shall be made in Form No. 1 which shall be accompanied by the following documents • a flow chart of the manufacturing process supplemented by a brief description of the process in Its various stages. • plans in duplicate drawn to scale showing: - o the site of the factory and Immediate surroundings including adjacent buildings and other structures, roads, drains, etc. o the plan elevation and necessary cross-sections of the various buildings, indicating all relevant details relating to natural lighting, ventilation and means of escape in case of fire. The plans shall also clearly indicate the position of the plant and machinery, aisles and passageways; and • such other particulars as the Chief Inspector may require, If the Chief Inspector is satisfied that the plans are in consonance with the requirements of the Act he shall, subject to such conditions as he may specify, approve them by signing and returning to the applicant one copy of each plan or tie may call for such approval to be given. **Applicability** **Not Applicable** The project is still in the construction phase, thus, the Act is not applicable.
21	Minimum Wages Act 1948	✓	✓	Labour Department	The act ensures minimum wages for each category of workers. Per the provision of the Act, the employer shall pay to every employee engaged in a schedule employment under them, wages at a rate not less than the minimum wages fixed by such notification of by the state government for that class of employees in that employment without any deductions except as may be authorised within such time and subject to such conditions as may be prescribed. Further, the Act also detailed out provisions on key aspects, such as: • fix the working hours for a normal working day • overtime payment • wages of worker who works for less than normal working days • Minimum time rate wages for piecework • Maintenance of registers and records • Penalties on offences to the Act • General provision for punishment of offences • Payment of undisbursed amounts due to employees **Overtime Payment** The employer shall pay to every employee engaged in a scheduled employment under him wages at a rate not less than the minimum rate of wages fixed by the appropriate Government Authority for that class of employees in that employment without any deductions except as may be authorized within such time and subject to such conditions as may be prescribed. **Applicability** **Applicable** **Applicable**

[38] Every principal employer and every contractor shall maintain such registers and records giving such particulars of contract labour employed, the nature of work performed by the contract labour, the rates of wages paid to the contract labour and such other particulars in such form as may be prescribed

<table>
<tr><th>Sr. No.</th><th>Applicable Regulation/Permit</th><th>Construction</th><th>Operation</th><th>Responsible Authority</th><th>Applicability to the Project/ Status</th></tr>
<tr><td></td><td></td><td></td><td></td><td></td><td>It has been confirmed through consultation and a review of the wage register that all workers and security personnel at the project are receiving wages equivalent to the minimum wages prescribed by the Gujarat state notification[39], it indicates the compliance with the provisions of the Minimum Wages Act, 1948.

The review of sample of wages received by the workers are provided below:
<table>
<tr><th>Workers</th><th>Employment</th><th>Wages Received</th><th>Class of employee</th><th>Wages as per notification</th></tr>
<tr><td>Workers 1</td><td>Construction workers</td><td>700/day</td><td>Skilled</td><td>474</td></tr>
<tr><td>Workers 2</td><td>Helper in construction activities</td><td>500-600/day</td><td>Semi-skilled and unskilled</td><td>462</td></tr>
<tr><td>Workers 3</td><td>Security personnel</td><td>15,000/month and 577/day</td><td>Skilled</td><td>474</td></tr>
</table></td></tr>
<tr><td>22</td><td>Equal Remuneration Act 1976</td><td>✓</td><td>✓</td><td>Labour Department</td><td>Puts in place rules and regulations governing the remuneration payable to workers and employees.
Applicability
Applicable
As per the review of wage register and consultation with workers it was observed that the workers working at same level is receiving equal remuneration irrespective of their gender</td></tr>
<tr><td>23</td><td>The Payment of Wages Act, 1936, amended in 2005 and 2017</td><td>✓</td><td>✓</td><td>Labour Department</td><td>• This Act was passed with the aim of regulating the payment of wages but excluding bonus/pension/PF/gratuity etc. to persons employed in any factory, either directly or indirectly through a sub-contractor.
• The Act holds the employer solely responsible for the payment of wages to the employees.
• The Act also specifies the need for a timeline for the wage payment, and the provisions for fines and deductions amongst other details pertaining to wages
No wage period shall exceed one month.

Applicability
Applicable
Based on the consultation with workers and review of wage register, it is understood that all workers receive their wages within seven (7) days of the end of the wage period. In the case of the project, wage period is the last day of a month, and the workers receive their wages on or before the seventh day of the next month</td></tr>
<tr><td>24</td><td>Maternity Benefit Act, 1961 & The Maternity Benefit (Amendment) Act, 2017</td><td>✓</td><td>✓</td><td>Labour Department</td><td>• Every woman shall be entitled to, and her employer shall be liable for, the payment of maternity benefit at the rate of the average daily wage for the period of her actual absence the period immediately preceding the day of her delivery, the actual day of her delivery and any period immediately following that day.
• Increases the duration of the maternity leave from 12 to 26 weeks which can be availed prior to 8 weeks from the date of expected delivery (earlier it was 6 weeks prior).
• From third child onwards, maternity leave to be for 12 weeks which can be availed 6 weeks prior.
Employer to permit a woman to work from home, if the nature of work permits her to do so and the same can be availed after the completion of her maternity leave for a duration mutually decided. Woman to be informed at the time of appointment, of the maternity benefits available, either in writing or electronically.

Applicability
Applicable
As reported, the project is providing benefits to female workers as per the Act.</td></tr>
<tr><td>25</td><td>The Sexual Harassment of Women at Workplace (Prevention, Prohibition and Redressal) Act, 2013</td><td>✓</td><td>✓</td><td>Labour Department</td><td>• No woman shall be subjected to sexual harassment at any workplace
• The following circumstances, among other circumstances, if it occurs or is present in relation to or connected with any act or behaviour of sexual harassment may amount to sexual harassment:-</td></tr>
</table>

[39] https://col.gujarat.gov.in/Portal/News/998_3_minimum_wages_46_Schedule_Employment_27.03.2023.pdf (Accessed on May 27, 2023)

Sr. No.	Applicable Regulation/Permit	Construction	Operation	Responsible Authority	Applicability to the Project/ Status
					• Implied or explicit promise of preferential treatment in her employment: or • Implied or explicit threat of detrimental treatment in her employment; or • Implied or explicit threat about her present or future employment status: or • Interference with her work or creating an intimidating or offensive or hostile work environment for her; or Humiliating treatment likely to affect her health or safety. **Applicability** **Applicable** Based on consultation with female workers it is confirmed that there is no sexual harassment at the project level. Sexual harassment refers to unwelcome sexual advances, requests for sexual favours, or any other verbal, non-verbal, or physical conduct of a sexual nature that creates an intimidating, hostile, or offensive working environment.
26	The E.P.F. and Miscellaneous Provisions act, 1952	✓	✓	Labour Department	• This Act is applicable to every factory or establishment employing 20 or more persons. • This Act requires the employer to provide for provident fund as under the scheme to the general public The contribution which shall be paid by the employer to the Fund shall be ten percent. Of the basic wages, dearness allowance and retaining allowance, if any, for the time being payable to each of the employees whether employed by him directly or by or through a contractor, and the employee's contribution shall be equal to the contribution payable by the employer in respect of him and may, if any employee so desires, be an amount exceeding ten percent of his basic wages, dearness allowance and retaining allowance if any. **Applicability** **Applicable** The applicability and status of the registration of contractor and security personnel are provided below:

Contractor/Project SPV	ApplicabilityStatus	
M&M Infra Construction Private Limited	The Act is not applicable on the contractor	As per the Act, an employee whose salary applicable for PF is more than INR 15,000 per month and first time covered under the Act, is an Excluded employee. **Note:** All the workers employed by the contractor are earning more than INR 15,000 per month and have not been covered under the Act before employing at the Project.
Golden Crown Security Allied Services	The Act is applicable on the contractor	The security agency has obtained the PF registration vide establishment code GJAH1910947000. Further, based on the consultation with security personnel, they are receiving benefits as per the Act.

27	Payment of Bonus Act, 1965 and rules and subsequent amendment	✓	✓	Labour Department	Every employee shall be entitled to be paid by his employer in an accounting year, bonus, in accordance with the provisions of this Act, provided he has worked in the establishment for not less than thirty working days in that year. Further, every employer shall be bound to pay to every employee in respect of the accounting year commencing on any day in the year 1979 and in respect of every subsequent accounting year, a minimum bonus which shall be 8.33 per cent. of the salary or wage earned by the employee during the accounting year or one hundred rupees, whichever is higher, whether the employer has any allocable surplus in the accounting year. An employee shall be disqualified from receiving bonus under this Act, if he is dismissed from service for • fraud; or • riotous or violent behaviour while on the premises of the establishment; or theft, misappropriation, or sabotage of any property of the establishment
28	Payment of Gratuity Act, 1972	✓	✓	Labour Department	Gratuity shall be payable to an employee on the termination of his employment after he has rendered continuous service for not less than five years, • on employee's superannuation, or

Sr. No.	Applicable Regulation/Permit	Construction	Operation	Responsible Authority	Applicability to the Project/ Status
					• on his retirement or resignation, • on his death or disablement due to accident or disease Provided that the completion of continuous service of five years shall not be necessary where the termination of the employment of any employee is due to death or disablement. The gratuity amount will be calculated as follows: • Employees are entitled to get the salary of 15 days for every completed year as gratuity. • Only the basic pay and DA (if any) are considered while accounting for the salary. It means any bonus, special allowance and HRA are not taken for the gratuity calculation. **Note** Gratuity calculation: Gratuity = (Salary / 26) x 15 x Number of years in service Where; Salary is "Last drawn basic pay + DA" 26 is the average working days in a month (As per Gratuity rules – 26 days not 30 days calculated) 15 is the actual days considered for gratuity in a year
29	ESI Act, 1948 (Employees State Insurance Act, 1948)	x	✓	Labour Department	• It applies to all non-seasonal factories • To provide benefits in case of sickness, maternity, and employment injury' and to make provision for certain other matters in relation thereto. • all employees in factories or establishments to which this Act applies shall be insured in the manner provided by this Act. The contribution payable under this Act in respect of an employee shall comprise contribution payable by the employer (hereinafter referred to as the employer's contribution) and contribution payable by the employee (hereinafter referred to as the employee's contribution) and shall be paid to the Corporation. **Applicability** **Not Applicable – construction workers** Based on Hon'ble Supreme Court of India order dated 06.07.2018, ESIC is not applicable on the construction workers during the stay order. However, till date the stay order is applicable across India. Further, Employees State Insurance Corporation through its letter no. T.11/13/03/2015 Rev.II dated 26.09.2018 – also clarifies that no ESIC contribution may be collected from construction site workers. **Applicable – Security personnel** Golden Crown Security and Allied Services has obtained the ESIC registration, and the employee code of the agency is 37001136390001018
30	Workmen's Compensation Act, 1923	✓	✓	Labour Department	Payment of compensation amount as applicable at the time of the accident resulting in a temporary or a permanent disablement such that it reduces the earning potential of workman in any employment. Or contracts an occupational disease peculiar to that employment. **Applicable** The project has reported that they will pay the compensation amount as applicable at the time of the accident resulting in a temporary or a permanent disablement.
31	Child Labour (Prohibition and Regulation) Act, 1986 and subsequent amendments	✓	✓	Labour Department	The Act intends to: • Ban the employment of children, i.e., those who have not completed their fourteenth year, in specified occupations and processes • Lay down a procedure to decide modifications to the schedule of banned occupations or processes • Regulate the conditions of work of children in employments where they are not prohibited from working Lay down enhanced penalties for employment of children in violation of the provisions of this Act and other Acts which forbid the employment of children. **Applicability** **Applicable** During the site visit, it was observed that the project has not employed any child labour.
32	The Bonded Labour System (Abolition) Act 1976;	✓	✓	Labour Department	Abolition of Bonded Labour System: (i) The bonded labour system is abolished and every bonded labourer stands free and is discharged from any obligation to render any bonded labour; (ii) (a) No person is to make any advance of bonded labour, (b) No person is to compel any person to render any bonded labour or other form of forced labour. **Applicability** **Applicable**

Sr. No.	Applicable Regulation/Permit	Construction	Operation	Responsible Authority	Applicability to the Project/ Status
					Based on the consultation with workers and information reviewed, it is confirmed that there is no bonded labour at the project level. Bonded labour refers to a situation where a person is compelled to work in order to repay a debt, often through exploitative and coercive practices. It is a form of forced labour and is considered a violation of human rights.
33	The Protection of Civil Rights Act, 1955	✓	✓	Labour Department	A person shall be deemed to boycott another person who - (a) refuses to let to such other person or refuses to permit such other person, to use or occupy any house or land or refuses to deal with, work for hire for, or do business with, such other person or to render to him or receive from him any customary service, or refuses to do any of the said things on the terms on which such things would be commonly done in the ordinary course of business; or (b) abstains from such social, professional or business relations as he would ordinarily maintain with such other person. **Applicable** The project is in compliance with the requirement of the Act.
34	Inter-state Migrant Workmen Act 1979.	✓	✓	Labour Department	The Key provisions of the Act, include: • Responsibility of payment of wages: 1) A contractor shall be responsible for payment of wages to each inter-state migrant workman employed by him and such wages shall be paid before expiry of such period as may be prescribed; 2) Every principal employer shall nominate a representative duly authorised by him to be present at the time of disbursement of wages by the contractor and it shall be the duty of such representative to certify the amounts paid as wages in such manner and may be prescribed; 3) It shall be the duty of the contractor to ensure the disbursement of wages in the presence of the authorize representative of the principal employer; 4) In case the contractor fails to make payment within the prescribed period or make short payment, then the principal employer shall be liable to make payment of the wages in full or the unpaid balance due, as the case maybe, to the inter-State migrant workman employed by the contractor and recover the amount so paid from the contractor either by deduction from any amount payable to the contractor under any contract or as a debt payable by the contractor • The wage rate of an interstate migrant worker shall in no case be paid less than the wages fixed under the Minimum Wages Act, 1948, 2. Wages payable to an interstate migrant workman shall be paid in cash • There shall be paid by the contractor to every interstate migrant worker at the time of recruitment, a displacement allowance equal to fifty per cent of the monthly wages payable to him or seventy-five rupees whichever is higher The amount paid to a worker as displacement allowance shall not be refundable and shall be in addition to the wages or other amount payable to him. **Not-Applicable** The project's employed workers does not fall under the category of Inter-state migrant workmen[40].
35	The building and other Construction Workers Act, 1996	✓	X	Labour Department	Ensure safety measures at construction work site and other welfare measures such as canteens, first-aid facilities, ambulance, housing accommodation for Workers near the Workplace etc. **Overtime Payment** Wages for overtime work: 1) Where any building worker is required to work on any day more than the number of hours constituting a normal working day, he shall be entitled to wages at the rate of twice his ordinary rate of wages; 2) The ordinary rate of wages means the basic wages plus such allowances as the worker is for the time being entitled to but does not include any bonus. **Workers' Accommodation** (1) The employer shall provide, free of charges and within the work site or as near to it as may be possible, temporary living accommodation to all building workers employed by him for such period as the building or other construction work is in progress. (2) The temporary accommodation provided under sub-section (1) shall have separate cooking place, bathing, washing and lavatory facilities. (3) As soon as may be, after the building or other construction work is over, the employer shall, at his own cost, cause removal or demolition of the temporary structures erected by him for the purpose of providing living accommodation, cooking place or other facilities to the building workers as required under sub-section (1) and restore the ground in good level and clean condition. **Creches** (1) In every place wherein, more than fifty female building workers are ordinarily employed, there shall be provided and maintained a suitable room or rooms for the use of children under the age of six years of such female workers. (2) Such rooms shall— (a) provide adequate accommodation; (b) be adequately lighted and ventilated; (c) be maintained in a clean and sanitary condition; (d) be under the charge of women trained in the care of children and infants. **Applicability** **Applicable** GWRPL has obtained BOCW registration with registration number JDISH/RJT/BOCW/174/2022 dated 03.01.2023. The registration is valid till 31.12.2023.
36	The Industries Disputes (Amendment) Act, 2010	✓	✓	Labour Department	• Every industrial establishment employing twenty or more workmen shall have one or more Grievance Redressal Committee for the resolution of disputes arising out of individual grievances.

[40] Inter-state migrant workmen mean any person who is recruited by or through a contractor in one State under an agreement or other arrangement for employment in an establishment in another State, whether with or without the knowledge of the principal employer in relation to such establishment

Sr. No.	Applicable Regulation/Permit	Construction	Operation	Responsible Authority	Applicability to the Project/ Status
					• The Grievance Redressal Committee shall consist of equal number of members from the employer and the workmen. • The chairperson of the Grievance Redressal Committee shall be selected from the employer and from among the workmen alternatively on rotation basis every year. • The total number of members of the Grievance Redressal Committee shall not exceed more than six: Provided that there shall be, as far as practicable, one-woman member if the Grievance Redressal Committee has two members and in case the number of members are more than two, the number of women members may be increased proportionately. • Notwithstanding anything contained in this section, the setting up of Grievance Redressal Committee shall not affect the right of the workman to raise industrial dispute on the same matter under the provisions of this Act. • The Grievance Redressal Committee may complete its proceedings within forty-five days on receipt of a written application by or on behalf of the aggrieved party. • The workman who is aggrieved of the decision of the Grievance Redressal Committee may prefer an appeal to the employer against the decision of Grievance Redressal Committee and the employer shall, within one month from the date of receipt of such appeal, dispose off the same and send a copy of his decision to the workman concerned. Nothing contained in this section shall apply to the workmen for whom there is an established Grievance Redressal Mechanism in the establishment concerned. **Applicability** **Applicable** The project has established a grievance redressal mechanism depicting grievance redressal committee, and the process of redressing the grievances.
37	Trade Union Act, 1926	✓	✓	Labour Department	Any seven or more members of a Trade Union may, by subscribing their names to the rules of the Trade Union and by otherwise complying with the provisions of this Act with respect to registration, apply for registration of the Trade Union under this Act. The admission of ordinary members who shall be persons actually engaged or employed in an industry with which the Trade Union is connected, and the admission of the number of honorary or temporary members to form the executive of the Trade Union. **Applicability** **Applicable** The project has reported that they are not stopping any workers to join or form trade union.

38	Persons with Disabilities Act, 1995 and Persons with Disability Rules 1996	✓	✓	Labour Department	• Give effect to the proclamation on the full participation and equality (equal opportunities) of people with disabilities and protection of rights
					• The employer in every establishment shall furnish such information or return as may be prescribed in relation to vacancies appointed for person, with disability that have occurred or are about to occur in that establishment to such Special Employment Exchange as may be prescribed and the establishment shall thereupon comply with such requisition.
					• Every employer shall maintain such record in relation to the person. With disability employed in his establishment in such form and in such manner as may be prescribed by the appropriate Government
					• Every appropriate Government shall appoint in every establishment such percentage of vacancies not less than three per cent. for persons or class of persons with disability of which one per cent. Each shall be reserved for persons suffering from-
					  ○ Blindness or low vision;
					  ○ Bearing impairment;
					  ○ Loco motor disability or cerebral palsy, in the posts identified for each disability:
					Provided that the appropriate Government may, having regard to the type of work carried on in any department or establishment, by notification subject to such conditions, if any, as may be specified in such notification, exempt any establishment from the provisions of this section.
					
					Applicability
					Based on the consultation with workers it is confirmed that there is no discrimination at the project level. Discrimination refers to the unfair or unequal treatment of individuals or groups based on certain characteristics such as race, gender, religion, nationality, or disability. It is a violation of human rights and can create a hostile and unequal working environment.

39	Ancient Monuments and Archaeological Sites and Remains Act 1958	✓	×	Labour Department	This Act places restrictions on the destruction, alteration, defacement, or removal of monuments and on construction on or near the site of any protected monument. No person, including the owner or occupier of a protected area, shall construct any building within the protected area or carry on any mining, quarrying, excavating, blasting or any operation of a like nature in such area, or utilise such area or any part thereof in any other manner without the permission of the Central Government
40	Private Security Agencies (Regulation) Act, 2005	✓	✓	Managing Director, Gujarat Police Academy, General Administrative Department	An Act to provide for regulations of private security agencies and for matters connected therewith or incidental thereto. Per the provision of the Act – No person shall carry on or commence the business of private security agency , unless he/she holds a license issued under this Act. **Applicable** Golden Crown Security and Allied Services – the private security providing agency has obtained the PSARA license vide license number 19083828 and is valid till 19.08.2024.

Sr. No.	Applicable Regulation/Permit	Construction	Operation	Responsible Authority	Applicability to the Project/ Status
	Ecology				
41	Wildlife (Protection) Act, 1972	✓	✓	Wildlife Warden, State Forest Department	If any protected/ endangered flora or fauna (as listed in Schedules of Wildlife Protection Act, 1972) are found in the project area, the proponent should implement conservation measures for their protection.

4.5 Applicability of International Finance Corporation – Performance Standards, 2012

Table 4-3 provides the detail of the applicability of IFC PS, 2012 on the project.

Table 4-3 Applicability of IFC Performance Standards to the Project

Sr. No.	IFC Performance Standards	Applicability/ Compliance/Details
1	PS 1: Assessment and Management of Environmental and Social Risks and Impacts	Applicable This PS aims to assesses the existing social and environmental management systems of ACEL and to identify the gaps with respect to their functioning, existence and implementation of an environmental and social management plan (ESMP), a defined EHS Policy, organization chart with defined roles and responsibilities, risk identification and management procedures as well as processes like stakeholder engagement and grievance management. This ESIA is being conducted as part of the "identification of risks and impacts" requirement under the IFC PS 1. The management measures prescribed in this ESIA report will be implemented for mitigation of impacts identified.
2	PS 2: Labor and Working Conditions	Applicable This PS is guided by a number of international conventions and instruments on labour and workers' rights. It recognizes that the pursuit of economic growth through employment creation and income generation should be accompanied by protection of fundamental rights of workers. The PS covers following themes: human resource policy and management, workers' organization, non-discrimination and equal opportunity, retrenchment, protecting the workforce and occupational health and safety. This PS helps to assess the status of the employees and workers at the Project as well as any contractors. The construction and operation phase for the Project will include employment of labor for varying activities. These staff and workers shall be governed by the HR policy, minimum wage regulation etc. that fall within the purview of IFC PS 2.
3	Performance Standard 3 Resource Efficiency and Pollution Prevention	Applicable PS-3 covers the use of resources and materials as inputs and wastes that could affect human health. The objective of PS-3 is to avoid or minimize adverse impacts on human health and the environment by avoiding or minimizing pollution from project activities; to promote more sustainable use of resources, including energy and water, etc. Key themes covered under PS-3 are pollution prevention, resource conservation and energy efficiency, wastes, hazardous materials, emergency preparedness and response, greenhouse emissions, pesticide use and management. This PS will assess how the SPV intends to minimize pollution related impacts, what management plans and systems are in place, and what measures it plans to take to conserve and use resources more efficiently. The Project involves air emissions and pollution discharge during both construction and O&M phases. The following activities fall under the purview of the PS3: Use of groundwater and treated water from STP in project activities , impact on soil and water, wastewater discharge, use of MSW as fuel, air emissions, leachate collection & management, ash handling from the site, generation, and disposal of hazardous waste etc.
4	PS 4: Community Health, Safety & Security	Applicable PS-4 anticipate and avoid adverse impacts on the health and safety of the affected community during the project life from both routine and non-routine circumstances. It also requires to ensure that the safeguarding of personnel and property is carried out in accordance with relevant human rights principles and in a manner that avoids or minimizes risks to the affected Communities. Key areas of compliance screened under PS-4 includes: infrastructure/equipment safety, hazardous material safety, natural resource issues, exposure to disease, emergency preparedness and response, and security personnel requirements. The project may impact the health and safety of the communities adjacent to its boundary during construction phase. PS 4 is applicable to the project as the Project use access roads for transportation of construction materials to site which may have potential impact on the health and safety of the commuters and communities located along the access road. The same access roads will be used for transportation of MSW during operation phase at the project site.
5	Performance Standard 5	Not Applicable PS-5 requires project proponents to anticipate and avoid, or where avoidance is not possible, minimize adverse social and economic impacts from land acquisition or restrictions on land use. The key themes covered under this

Sr. No.	IFC Performance Standards	Applicability/ Compliance/Details
	Land acquisition and involuntary resettlement	are: compensation and benefits for displaced persons, consultation and grievance mechanism, resettlement planning and implementation, physical displacement, economic displacement. The PS-5 also prescribes private sector responsibility to supplement government actions and bridge the gap between governments assigned entitlements and procedures and the requirements of PS-5. The land for the proposed project has been provided by the RMC (Rajkot Municipal Corporation) on a 25-year lease to the project. Consequently, the proposed project does not have potential impacts related to involuntary resettlement. However, the project may result in potential economic displacement for approximately 200 ragpickers currently working at the RMC landfill site. This displacement arises due to the transfer of fresh waste from the landfill to the project site. It is important to note that this potential economic displacement is likely to be temporary, contingent upon the fresh waste exceeding the plant capacity and the subsequent resumption of dumping at the landfill site. According to estimates, the dumping of fresh waste is expected to recommence after the year 2025. To operate at its full capacity, the project requires a total waste input of 1000 TPD (tons per day). Currently, Rajkot city generates approximately 730 TPD of waste. As reported by RMC officials, the waste generation in the city is increasing at a rate of 25% per year. Therefore, waste generation is projected to reach approximately 900 TPD in 2024 and 1130 TPD in 2025. Consequently, until 2025, the project will need to acquire waste from the legacy waste mining at Rajkot's landfill. Furthermore, as confirmed by both the Project and RMC (Rajkot Municipal Corporation), a mitigation measure will be implemented to support the affected ragpickers. They will have the opportunity to salvage waste at designated collection centers or transfer stations. In cases where relocation to these centers is not feasible, alternative employment opportunities will be explored, including potential roles within the proposed project, based on the technical skills possessed by the ragpickers. This impact cannot be categorized as a PS 5 compliance issue. Abellon, being the project proponent, does not exercise control over the dumpsite and will not restrict access to the site for ragpickers. Consequently, a comprehensive Livelihood Restoration Plan is not warranted. Additionally, the potential impact on these ~200 ragpickers falls within the scope of PS 1 (Social Assessment and Management).
6	Performance Standard 6	**Applicable** The project is surrounded by the open scrub (natural habitat) and transmission line of the project is crossing over the agricultural land (modified habitat) and open scrub (natural habitat), which will contribute towards a risk of collision and/or electrocution. Thus, IFC PS-6 is applicable here.
7	Performance Standard 7 Indigenous People	**Not Applicable** there is no direct potential adverse impact on the Schedule Tribes (Indigenous People) therefore PS-7 is not getting triggered
8	Performance Standard 8 Cultural Heritage	**Not Applicable** As per the available data there are no archeologically protected monuments within the close vicinity of the project and project does not affect any intangible cultural heritage therefore PS-8 is not getting triggered.

4.6 Applicable National and International Standards

4.6.1 Ambient Air Quality Standards

4.6.1.1 National Ambient Air Quality Standards (NAAQS)

National Ambient Air Quality Standards (NAAQS), as notified under Environment (Protection) Rules 1986 and revised through Environment (Protection) Seventh Amendment Rules, 2009 has been presented in ***Table 4-4***.

Table 4-4 NAAQS Air Quality Standards

Pollutant	Time Weighted Avg.	Concentration in Ambient Air	
		Industrial, Residential, Rural & Other Areas	Ecologically Sensitive Areas (notified by Central Government)
Sulphur dioxide (SO_2) $\mu g/m^3$	Annual Average*	50	20
	24 Hours**	80	80
Oxides of Nitrogen (NO_x) $\mu g/m^3$	Annual Average*	40	30
	24 Hours**	80	80
Particulate Matter (PM 10) $\mu g/m^3$	Annual Average*	60	60
	24 Hours**	100	100
Particulate Matter (PM 2.5) $\mu g/m^3$	Annual Average*	40	40
	24 Hours**	60	60
Ozone (O_3) $\mu g/m^3$	8 Hours**	100	100
	1 Hour**	180	180
Lead (Pb) $\mu g/m^3$	Annual Average*	0.50	0.50
	24 Hours**	1.0	1.0
Carbon monoxide (CO) mg/m^3	8 Hours**	02	02
	1 Hour**	04	04
Ammonia (NH_3) $\mu g/m^3$	Annual*	100	100
	24 Hours**	400	400
Benzene (C_6H_6) $\mu g/m^3$	Annual*	05	05
Benzo(α)Pyrene- particulate phase ng/m^3	Annual*	01	01
Arsenic (As) ng/m^3	Annual*	06	06
Nickel (Ni) ng/m^3	Annual*	20	20
Cadmium ng/m^3	Annual*	5***	-
Mercury[41] mg/l	-	0.1	-

Note: *Annual arithmetic mean of minimum 104 measurements in a year at a particular site taken twice a week 24 hourly at uniform interval.

** 24 hourly/8 hourly/1 hourly monitored values, as applicable shall be complied with 98% of the time in a year. 2% of the time, it may exceed but not on two consecutive days of monitoring.

*** WHO air quality guideline for cadmium of 5 ng/m3 has been recommended in order to prevent any further increases in cadmium levels in agricultural soils

4.6.1.2 WBG EHS Ambient Air Quality Standards

According to the WBG EHS guidelines, the ambient quality standards are referred to the ambient air quality levels established and published through national legislative and regulatory processes, and ambient quality guidelines refer to ambient quality levels

[41] https://cpcb.nic.in/uploads/News_Letter_Mercury_2017.pdf

primarily developed through clinical, toxicological, and epidemiological evidence (such as those published by the World Health Organization). The ambient air quality as per WBG EHS guidelines has been presented in ***Table 4-5.***

Table 4-5 WBG EHS Ambient Air Quality Standards

Pollutant	Averaging Period	Guideline Value in µg/m^3
Sulphur Dioxide	24-hour	125 (Interim target-1)
		50 (Interim target-2)
		20 (guideline)
	10 minute	500 (guideline
Nitrogen Oxide	1 year	40 (guideline)
	1 hour	200 (guideline)
Particulate Matter 10	1 year	70 (Interim target-1)
		50 (Interim target-2)
		30 (Interim target-3)
		20 (guideline)
	24 hour	150 (Interim target-1)
		100 (Interim target-2)
		75 (Interim target-3)
		50 (guideline)
Particulate Matter 2.5	1 year	35 (Interim target-1)
		25 (Interim target-2)
		15 (Interim target-3)
		10 (guideline)
	24 hour	75 (Interim target-1)
		50 (Interim target-2)
		37.5 (Interim target-3)
		25 (guideline)
Ozone	8-hour daily Maximum	160 (Interim target-1)
		100 (guideline)

Interim target means Interim targets are provided in recognition of the need for a staged approach to achieving the recommended guidelines.

Therefore, as per ***Table 4-4*** and ***Table 4-5,*** since the 24 hours monitoring standards for WBG EHS ambient air quality is smaller as compared to NAAQS, the ambient air quality as per WBG EHS standards are more stringent as compared to NAAQS Standards.

4.6.2 Ambient Noise Quality Standards

4.6.2.1 Ambient Noise standards as per MOEFCC

Noise standards specified by the MoEFCC vide gazette notification dated 14th February, February 2000 based on the A weighted equivalent noise level (Leq) are as presented in ***Table 4-6.***

Table 4-6 Ambient Noise Standards as per MOEFCC

Area Code	Category of Area	Limits in dB(A) Leq	
		Day time*	Night Time
A	Industrial Area	75	70
B	Commercial Area	65	55
C	Residential Area	55	45
D	Silence Zone**	50	40

Note:*Day time is from 6 am to 10 pm, Night time is10.00 pm to 6.00 am;**Silence zone is an area comprising not less than 100 meters around premises of hospitals, educational institutions, courts, religious places or any other area which is declared as such by the competent authority. Use of vehicle horns, loud speakers and bursting of crackers are banned in these zones.

4.6.2.2 WBG EHS Ambient Noise Standards

As per the WBG EHS, General EHS Guidelines on noise management, noise impacts should not exceed the levels presented in ***Table 4-7*** or result in a maximum increase in background levels of 3 dB at the nearest receptor location off-site.

Table 4-7 WBG EHS Ambient Noise Standards

Receptor	One Hour Leq (dBA)	
	Daytime 07:00 - 22:00	Night time 22:00 -
Residential; Institutional; Educational	55	45
Industrial, commercial	70	70

Since the project is proposed to be set up in the Industrial Area, the noise limits of industrial area has been considered for the project. Based on ***Table 4-6*** and ***Table 4-7***, the ambient noise levels as per MoEFCC are different for industrial and commercial areas, however, WBG noise guidelines provide same ambient noise standards for commercial and industrial areas. Therefore, the ambient noise standards as per WBG is more stringent as compared to MOEFCC for industrial areas and the stringent standards are to be followed.

4.6.3 Incineration Standards (National & International)

As per MSW Rules 2016, the emission from incinerator / thermal technologies in solid waste treatment/ disposal facility shall meet the following standards and as per the WBG, the waste management facilities shall meet the EU Directive 2000/76/EC as mentioned in the guidelines. The same has been presented below:

Table 4-8 Air Emission Standards for MSW Incinerators as per SWM Rules 2016 and WBG Waste Management Facilities EHS guidelines

Sr. No.	Parameters	UOM	India SWM Rules 2016	MSW Incinerators, WBG EHS Guidelines[42] (EU Directive 2000/76/EC)
1	Total Dust/PM	mg/Nm^3	50	10 (24-hr average)
2	Hydrogen chloride(HCL)	mg/Nm^3	50	10
3	Sulphur dioxide (SO_2)	mg/Nm^3	200	50 (24-hr average)
4	Carbon monoxide (CO)	mg/Nm^3	50-100	50 – 150
5	Total Organic Carbon (TOC)	mg/Nm^3	20	--
6	Hydrogen fluoride (HF)	mg/Nm^3	4	1
7	Nitrogen oxide (NOx)	mg/Nm^3	400	200 – 400 (24-hr average)
8	Cadmium (Cd) + Thorium (Th) + Their compounds	mg/Nm^3	0.05	0.05 – 0.1 [0.5 – 8 hr average]
9	Mercury (Hg) and Its compound	mg/Nm^3	0.05	0.05 – 0.1 [0.5 – 8 hr average]
10	**Total Metals** Scandium (Sc) + Arsenic (As) + Lead (Pb) + Cobalt (Co) + Chromium (Cr) + Copper (Cu) + Manganese (Mn) + Nickel (Ni) + vanadium (V) + Their compounds	mg/Nm^3	0.5	0.5 – 1 [0.5 – 8 hr average]
11	Dioxins and furans	mg TEQ/Nm^3	0.1	0.1 ng TEQ/m3 [6 – 8 hr average]

Since the Incineration emission norms are more stringent as per WBG EHS waste management facilities, the stringent standards are to be followed.

4.7 Other Relevant International Guidelines and Standards

- **World Bank Group Environmental, Health and Safety (EHS Guidelines):** These General EHS Guidelines are designed to be used together with the relevant Industry Sector EHS Guidelines which provide guidance to users on EHS issues in specific industry sectors. The EHS Guidelines contain the performance levels and measures that are generally considered to be achievable in new facilities by existing technology at reasonable costs. Application of the EHS Guidelines to existing facilities may involve the establishment of site-specific targets, with an appropriate timetable for achieving them. The applicability of the EHS Guidelines should be tailored to the hazards and risks established for each project on the basis of the results of an environmental assessment in which site-specific variables, such as host country context, assimilative capacity of the environment, and other project factors, are considered.

- **IFC/World Bank EHS Guidelines for Electric Power Transmission and Distribution (2007):** The EHS Guidelines for Electric Power Transmission and Distribution include information relevant to power transmission between a generation facility and a substation located within an electricity grid, in addition to power distribution from a substation to consumers located in residential, commercial, and industrial areas. The guidelines covers the following aspects:
  - Industry specific environmental, occupational health and safety, community health and safety impacts and management
  - EHS Performance Indicators
  - General Description of Power Transmission and Distribution Industry

[42] https://www.ifc.org/content/dam/ifc/doc/2000/2007-waste-management-facilities-ehs-guidelines-en.pdf

- IFC/World Bank EHS Guidelines for Waste Management Facilities, 2007: The EHS Guidelines contain the performance levels and measures that are generally considered to be achievable in new facilities by existing technology at reasonable costs. Application of the EHS Guidelines to existing facilities may involve the establishment of site-specific targets, with an appropriate timetable for achieving them. The EHS Guidelines for Waste Management cover facilities or projects dedicated to the management of municipal solid waste and industrial waste, including waste collection and transport; waste receipt, unloading, processing, and storage; landfill disposal; physico-chemical and biological treatment; and incineration projects. Industry-specific waste management activities applicable, for example, to medical waste, municipal sewage, cement kilns, and others are covered in the relevant industry-sector EHS Guidelines, as is the minimization and reuse of waste at the source.

- World Bank Group EHS Guidelines on Air Emissions and Ambient Air Quality: This guideline applies to facilities or projects that generate emissions to air at any stage of the project life-cycle. It complements the industry-specific emissions guidance presented in the Industry Sector Environmental, Health, and Safety (EHS) Guidelines by providing information about common techniques for emissions management that may be applied to a range of industry sectors. Emissions of air pollutants can occur from a wide variety of activities during the construction, operation, and decommissioning phases of a project. Where possible, facilities and projects should avoid, minimize, and control adverse impacts to human health, safety, and the environment from emissions to air. Where this is not possible, the generation and release of emissions of any type should be managed through a combination of: Energy use efficiency, Process modification, Selection of fuels or other materials, the processing of which may result in less polluting emissions, Application of emissions control techniques.

- World Bank Group EHS Guidelines on Noise Management: This guideline addresses the impacts of noise beyond the property boundary of the facilities. Worker exposure to noise is covered in Section 2.0 on Occupational Health and Safety. Noise prevention and mitigation measures should be applied where predicted or measured noise impacts from a project facility or operations exceed the applicable noise level guideline at the most sensitive point of reception. The preferred method for controlling noise from stationary sources is to implement noise control measures at source. Methods for prevention and control of sources of noise emissions depend on the source and proximity of receptors.

5 Environmental and Social Baseline Conditions

This section describes the existing environmental and social sensitivities of the study area (as described below). The sensitivities include the relevant components of the physical, biological, and socio-economic environment. The purpose of describing the environmental and social sensitivities of the study area is to:

- To describe the environmental characteristics of the Project site and surrounding areas to identify key resources and receptors that will be affected by the Project;
- To determine if any nearby communities or structures will be affected by the Project establishment; and
- To understand the significance of the different habitats within the study area and its importance for sustaining species of conservation importance, in terms of providing habitat contiguity to the surrounding region and dependency of surrounding communities

5.1 Study Area

The area of up to 10 km radius from the Project boundary has been demarcated as study area (as presented in ***Figure 5-1***) for the Project by considering the extent of Project impact in terms of air quality, noise, water resources, human settlement, cultural heritage sites, land used for transmission line, land used for Right of Way (RoW) i.e. (i.e. 46 m on each side of the TL alignment), land utilized for water pipeline from Sewage Treatment Plant (STP), location of the access roads besides considering the actual land area which has been procured for the Project and its utilities footprints.

5.1.1 Project footprint area

The Project footprint is the area that may reasonably be expected to be physically touched by Project activities across all phases. The project footprint for the Project include land used for setting up the Waste to Energy Plant , transmission line infrastructure and water pipeline to be installed for the Project from STP. The footprint area also includes the RoW of the associated transmission line.

5.1.2 Project area of influence (AoI)

The effects of the Project and Project activities on a particular resource or receptor will have spatial (distance) and temporal (time) dimensions, the scale of which is dependent on a number of factors, including:

- Nature of the activity
- Specific resource or receptor
- Sensitivity of that resource or receptor
- Whether the impact is direct or indirect (e.g., secondary effect)

The Project's AoI refers to the Project footprint area as well as to a larger area in its immediate vicinity. This includes the footprint of the project components, as well as the immediate surroundings that will see increase movement of vehicles and personnel. Most of the impacts will occur within the project footprint area as identified above. However, certain impacts can be further reaching in terms of expected impacts.

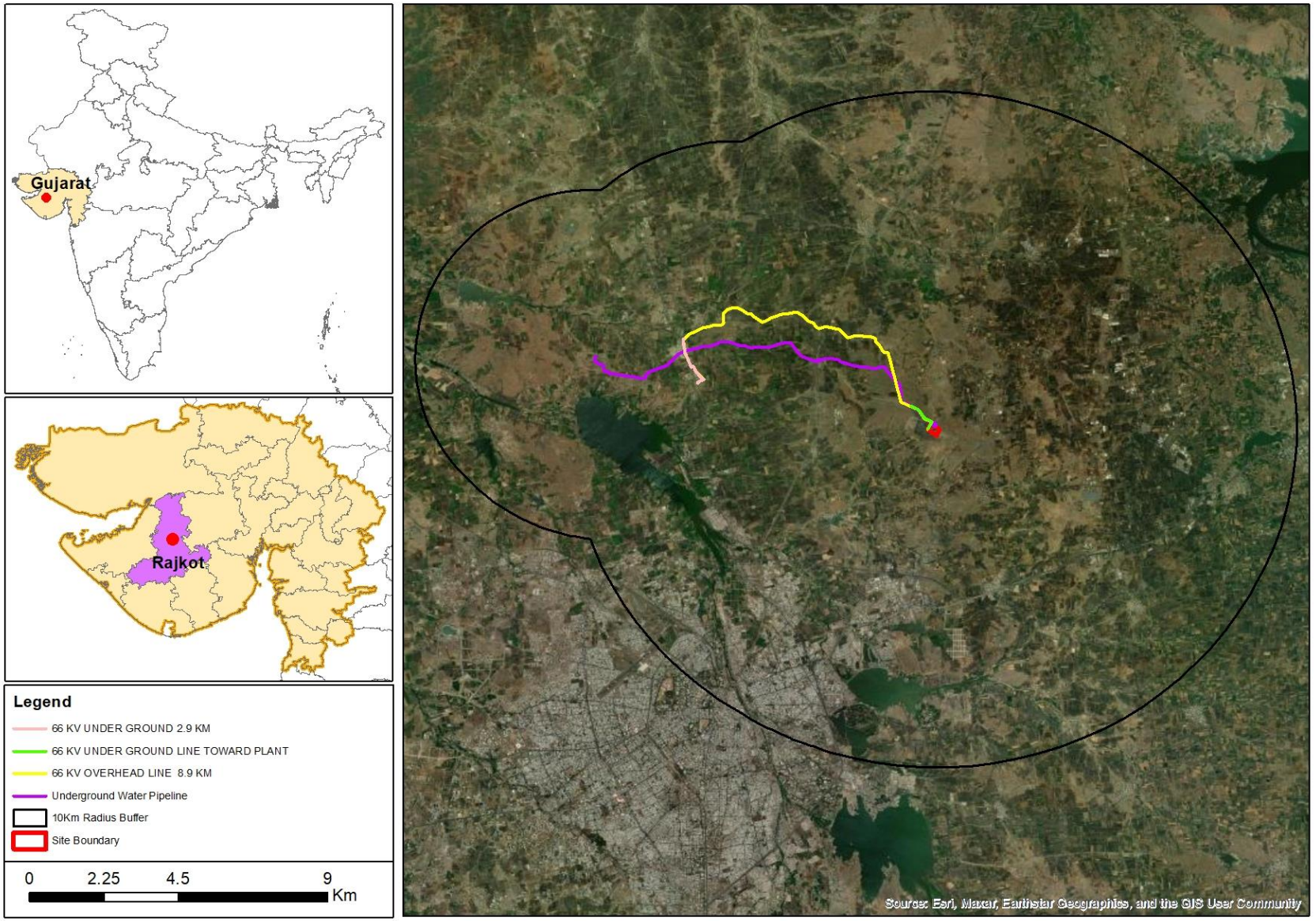
The AoI considered for the Project with respect to the environmental, social, and ecological resources was based on the following reach of impacts:

- Ecological Parameters: Based on identified sensitivity during desk-based review and previous experiences, the study area for ecological assessment was demarcated as,
  - *Core Area:* Boundary of the project, and
  - *Buffer Area:* 10 km radius from the project boundary.
- Environmental Parameters: The area of up to 10 km radius from the Project boundary has been demarcated as study area or Area of Influence for the Project by considering the extent of project impact in terms of air quality, noise, water resources, human settlement, location of the access roads besides considering the actual land area which will be used for the facilities. For the purpose of environmental baseline assessment,
  - *core (0 – 2km from project site) and*
  - *buffer zones (beyond 2km – 10km of project site).*

- Social and Cultural: The study area for the social assessment comprises of the area identified for the Project as well as villages which might be impacted directly or indirectly by the Project. The key terms used for sub-categorisation of the study area are:
  - Core area of WtE power Plant: The core zone is defined as the radius extending from the WtE power plant area which would have majority of the impacts (during mobilization, construction, operation, and decommissioning phase). The core zone area for the WtE power plant is 500 meters radius from the plant location.
  - Buffer area of WtE Power Plant: Buffer area of 10 km radius from WtE power plant's location is considered for socioeconomic baseline to determine perceived impacts due to the Project.
  - Core area of water Pipeline and transmission line: The core area for the water pipeline and transmission line is 500 meters radius from the footprint of water pipeline and transmission line.
  - WtE power plant's study area: WtE power plant's village + core area+ buffer area of 10 km radius from the WtE Power Plant.
  - Water Pipeline and transmission line's study area: water pipeline and transmission line footprint area and core area of water pipeline and transmission line.
    Note: The decision to designate the water pipeline and transmission line footprint area, along with the core area extending to a 500-meter radius, as the study area for socio-economic analysis was made based on several key considerations. Below are the primary reasons behind this selection:
    - Direct Impact Zone Identification: The core area within a 500-meter radius of the water pipeline and transmission line represents the immediate vicinity that is most likely to experience direct impacts from the construction and operation of these infrastructures.
    - Minimization of Buffer Area: Given the nature of the construction activities and operation of the pipeline and transmission line, it is anticipated that the impact will be most pronounced within the core area.

  Project's study area: WtE power plant's study area + Water pipeline and transmission line's study area.

Figure 5-1 Identified Study area for the Project



5.2 Primary Environmental Baseline Monitoring

Primary environmental baseline monitoring was conducted within 10 km radius of the study area by a National Accreditation Board for Testing and Calibration Laboratories (NABL) under the supervision of E&S Advisor to understand the baseline conditions of the study area. Monitoring locations considered has been presented in ***Table 5-1***. Map showing monitoring locations has been presented in ***Figure 5-2***. Sampling for Air, Noise, Surface water Ground Water, Soil were undertaken during the months of May-June 2023.

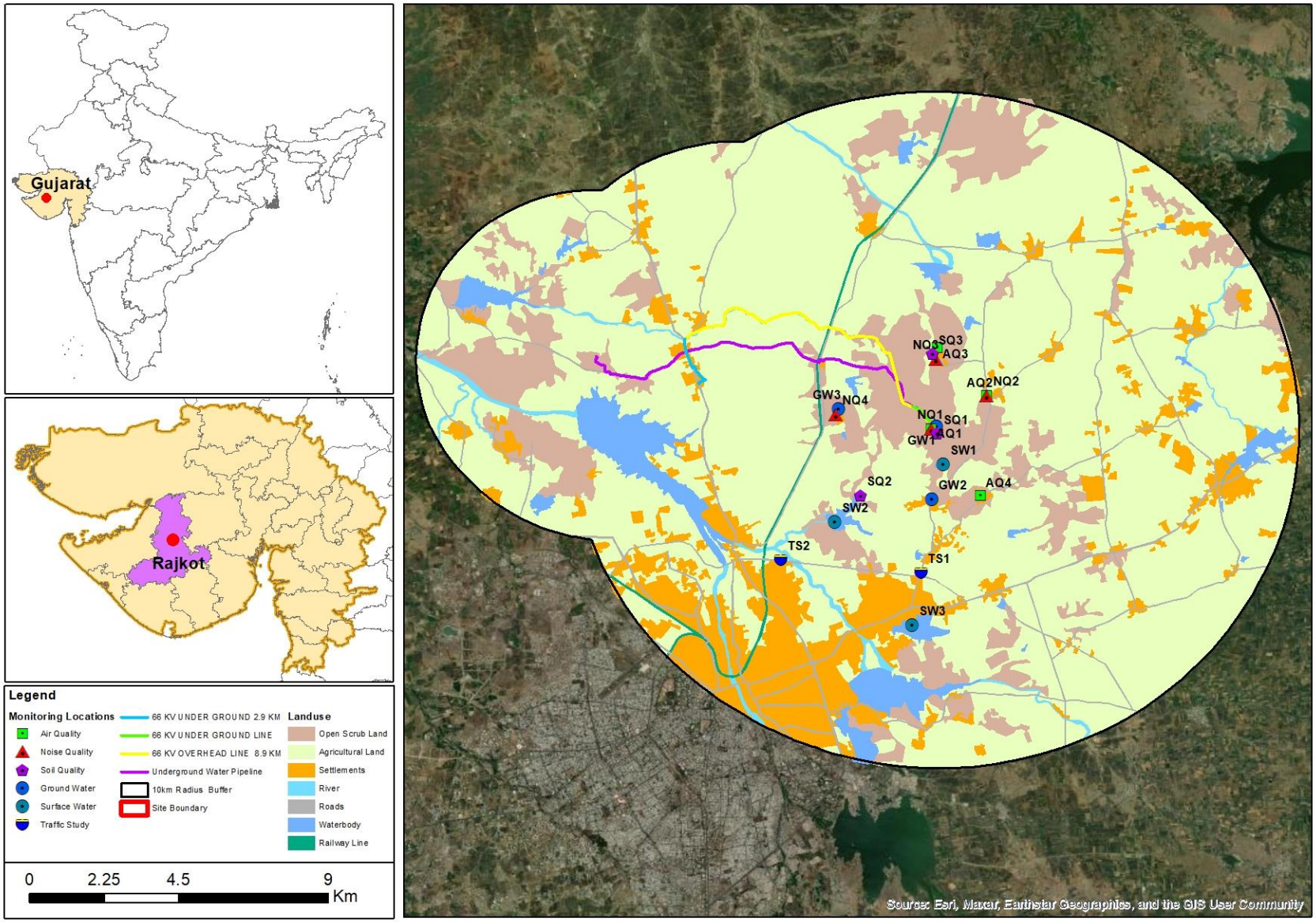
Table 5-1 Environment Monitoring Locations

Parameter	Location Code	Name of the Location	Coordinates	Distance and Direction from Project Site	Frequency / Remarks
Ground Water	GW1	Project Site	22°22'31.9''N 70°51'45.9''E	Project site	Physical, chemical and biological parameters as per IS 10500:2012 drinking water standards were assessed for the collected samples Once during the monitoring period in May 2023
	GW2	NEAR, Ranuja Mandir	22°21'21.2''N 70°51'41.4''E	2 km towards south direction	
	GW3	SRCOE College	22°22'49.1''N 70°50'10.7''E	2.6 km towards west direction	
Surface Water	SW1	NEAR Pragati Pride (Residential building)	22°21'54.9''N 70°51'52.4''E	890 m towards south direction	Once during the monitoring period in May 2023
	SW2	Lake Of Vidi Pir	22°20'58.6''N 70°50'06.9''E	3.8 km towards southwest direction	
	SW3	Anandpar lake	22°19'18.5''N 70°51'21.9''E	5.75 km towards south direction	
Soil	S1	Project Site	22°22'25.3"N 70°51'46.6"E	Project Site	Sample were assessed for parameters such as pH, Conductivity , Moisture Content, Texture, Particle Sizes, Sand Silt, Clay, Bulk Density, Chemical Characteristics, Organic Content, Chlorides as Cl, Sulphates as So4, Total Nitrogen as N, heavy metals, total petroleum hydrocarbons Once during the monitoring period in June 2023
	S2	NEAR, SRCOE College	22°21'25.1"N 70°50'32.0"E	2.7km towards southwest direction	
	S3	Near, Nagalpar Pri Govt School	22°23'43.0"N 70°51'42.0"E	2.1 km towards north direction	
Ambient Air	AAQ1	Project Site	22°22'30.1"N 70°51'40.8"E	Project Site	Twice a week for 4 weeks from the nearest residential receptors covering all directions within 3km radius of the project site from 18th May to 14th June as impacts from Project are anticipated to be up to 3 km from the Project site.
	AAQ2	Pipaliya Primary School Pipaliya (Sukal)	22°23'02.2"N 70°52'34.7"E	1.6 km towards northeast cross wind in the month of May and downwind in the month of June	
	AAQ3	Nagalpar Pri Govt School	22°23'49.4"N 70°51'46.4"E	2.3 Km towards north direction cross wind in the month of May and June	
	AAQ4	Dhamalpar	22°21'24.5"N 70°52'28.5"E	2.1 km towards southeast downwind in the month of May and crosswind in the month of June	
Ambient Noise	N1	Project Site	22°22'29.5"N 70°51'41.0"E	Project Site	Once for 24 hours from the nearest residential receptors covering all directions in the 3
	N2	Pipaliya Primary School Pipaliya (Sukal)	22°23'02.0"N 70°52'34.7"E	1.6 km towards northeast	

Parameter	Location Code	Name of the Location	Coordinates	Distance and Direction from Project Site	Frequency / Remarks
	N3	Nagalpar Pri Govt School	22°23'36.9"N 70°51'45.2"E	2 km towards north direction	km radius of the project site as per MoEFCC guidelines Leq Noise Levels in dB(A), day and night for 48 hour, once at the selected locations in June 2023.
	N4	SRCOE College	22°22'43.1"N 70°50'07.4"E	2.6 km towards west direction	
Traffic	T1	Near, Gram Panchayat , Sokhada	22°20'09.6"N 70°51'31.0"E	4.1 km towards north direction	Access Road used for the project site in June 2023
	T2	Near, Lalpari River	22°20'21.8"N 70°49'14.2"E	5.6 km towards southwest	
D&F	D&F 1 & 2	Project Site	22°22'30.9"N 70°51'46.7"E	Project Site	To assess the presence of D&F in the ambient air in June 2023

Source: Monitoring by NABL accredited laboratory, May & June 2023

Figure 5-2 Monitoring Location Map



Source: Developed by E&S Advisor

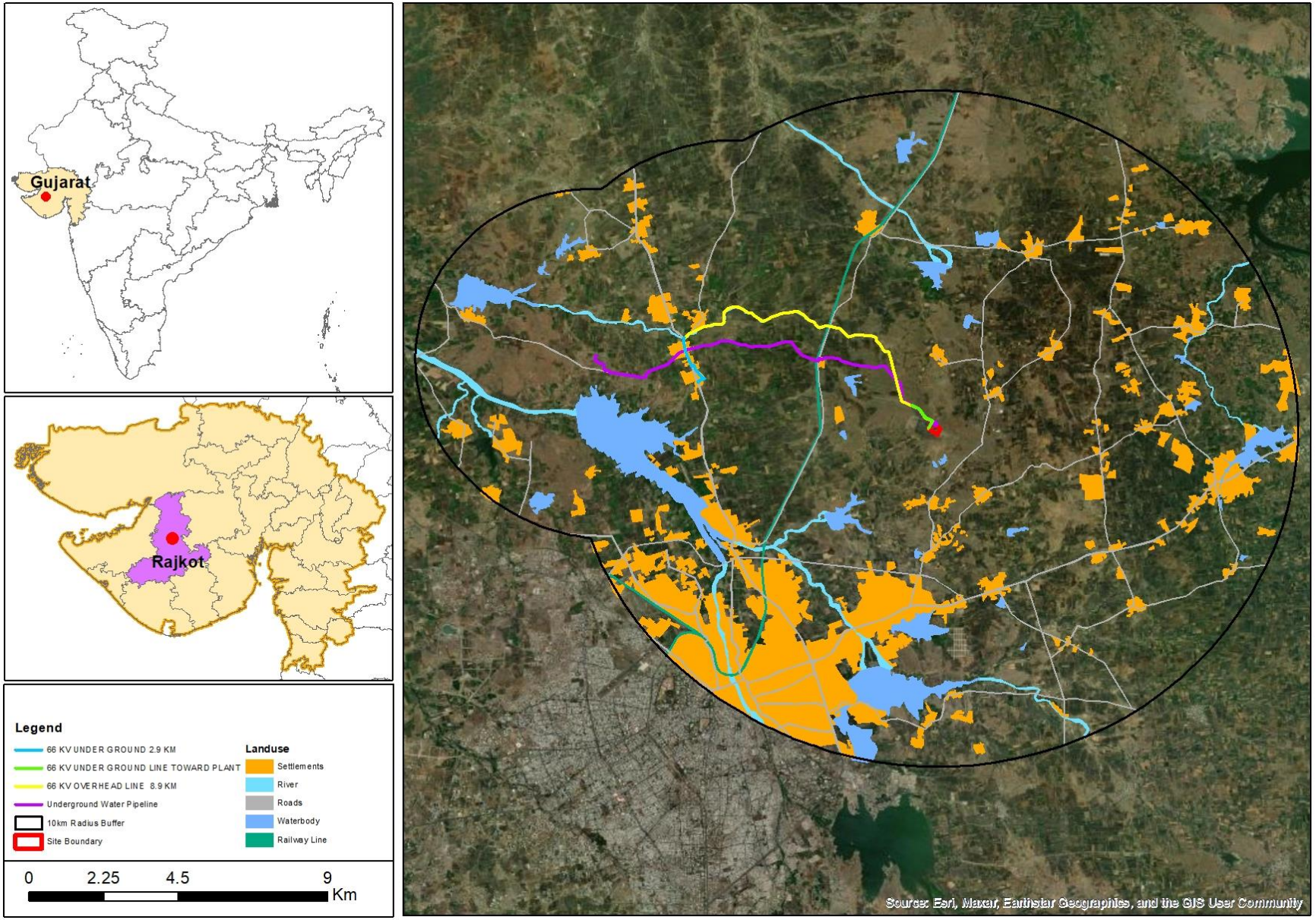
5.3 Physical Environmental Sensitivities

5.3.1 Physical Features

The physical features map of the study area is showcased in ***Figure 5-3***. The map displays the following features that are located within 10 km radius from the Project site:

- The location of the Project site and transmission line route (underground and above ground),
- Water pipeline route from Sewage Treatment Plant
- Settlements within 10 km radius of the Project
- Road network around the site
- Railway Track
- Water bodies located within 10 km radius

Figure 5-3 Physical Feature Map for study area



Source: Developed by E&S Advisor

5.3.2 Climatology & Meteorology

According to the Aquifer Mapping and Management of Ground Water Resources, Rajkot District, 2022, the district has semi-arid climate. Extreme temperatures, erratic rainfall and high evaporation are the characteristic features of this type of climate. General climate of the district is sub-tropical and is characterized by three well-defined seasons, i.e. summer - from April to June, monsoon - from July to September, and winter - from October to March.

Table 5-2 Meteorological Data for Rajkot District from IMD (1991-2020) (Rajkot IMD Station)

Month	Temperature				Relative Humidity (%)		Rainfall		Mean Wind speed (m/s)	Pre dominant direction from
	Mean Max	Mean Min	Highest	Lowest	Max	Min	Monthly (mm)	No of rainy days		
January	28.6	12.7	36.4	-0.6	61	29	0.7	0.1	7.5	NW
February	31.4	15.3	40.0	1.1	64	25	0.1	0.0	8.6	NW
March	36.0	19.5	43.9	6.1	66	19	0.1	0.0	10.6	NW
April	39.6	23.0	44.8	10.0	70	19	1.3	0.3	14.1	NW
May	41.0	25.7	47.9	16.1	74	28	3.8	0.3	18.6	NW
June	38.1	26.6	45.8	20.0	78	50	130	4.6	18.2	SW
July	33.0	25.4	40.6	19.4	87	71	293.3	10.3	16.7	SW
August	31.7	24.5	38.8	20.1	89	71	195.2	8.5	15.3	SW
September	33.4	23.9	42.8	16.7	87	60	125.1	5.4	12.2	NW
October	36.0	22.6	41.9	12.2	72	35	23.7	1.3	7.7	NW
November	33.6	18.6	38.4	7.2	57	30	2.7	0.2	6.3	NE
December	30.3	14.3	37.6	2.8	60	30	0.2	0.0	6.8	NE

Source: https://www.imdpune.gov.in/library/public/Climatological%20Tables%201991-2020.pdf

Temperature: According to the above table from Meteorological Data for *Rajkot* District from IMD (1991-2020), the mean maximum temperature recorded in the region is 41°C and the highest temperature recorded is 47.9 °C which is recorded in the month of May. The mean minimum temperature recorded is 12.7 °C and the lowest temperature is -0.6 °C which is recorded in the month of January.

Wind: According to National Renewable Energy Laboratory, the seasonal cycle leads to strong winds from March through August and relatively weak winds from November through March. Because Gujarat has a long coastline, sea breezes also influence the wind characteristics in this region. From the ***Table 5-2*** it is established that June month experiences the fastest wind i.e. 267.1 Spd. Kmpd. The wind speed decreases gradually in the month of October to about 87.3 Spd. Kmpd.

Rainfall: According to the above table from Meteorological Data for *Rajkot* District from IMD (1991-2020), the months of June, July, August and September constitute the monsoon season (refer ***Table 5-2***). This is the main rainy season for most part of India. Frequent rainfall, thunderstorms, heavy rains are characteristics features of these months of the year. According to IMD report, July month has received the maximum rainfall of 293.3mm in the last 30 years with at least 11 rain days. During this month the relative maximum and minimum average relative humidity over 3 decades has been recorded as 87% and 71% respectively.

5.3.3 Land Use

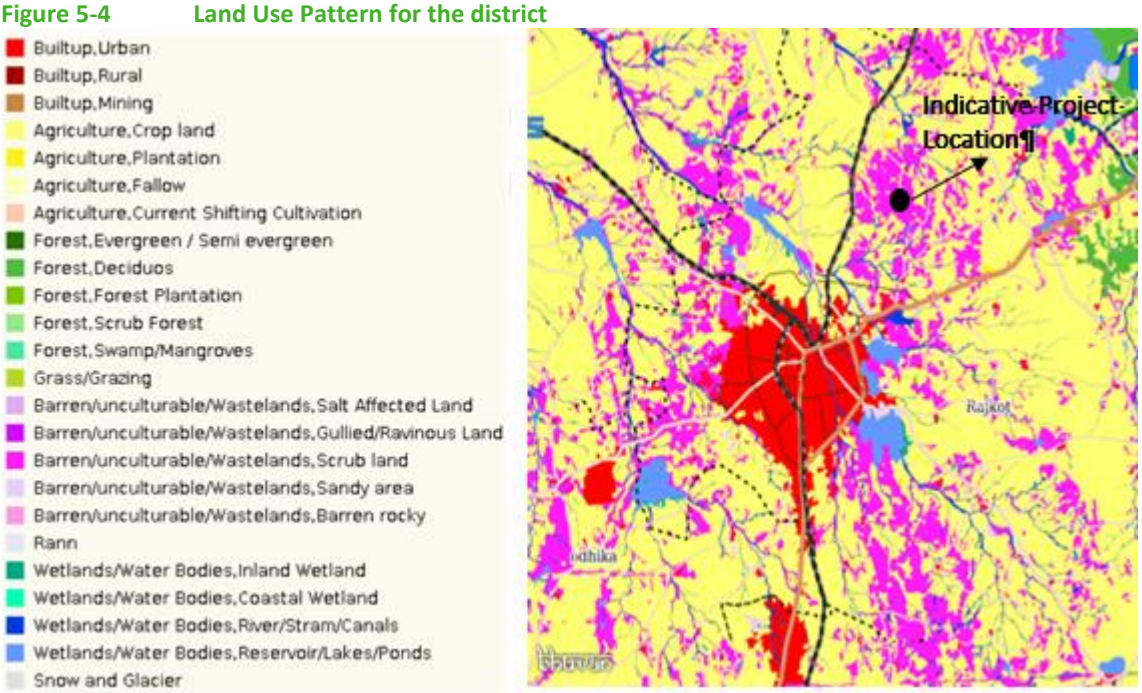
According to the Aquifer Mapping and Management of Ground Water Resources, Rajkot District, 2022, the majority of district is covered by agriculture and scrub land and spread over all parts of districts. The current land use of the Rajkot area majorly falls under Agricultural land category and barren land (project site lies in this region) according to the district land use report 2015-16. As given in below ***Figure 5-4***, the project lies in an area categorized as barren/unculturable/waste land.

Table 5-3 Land Utilization Pattern

LU Category (Level 1)	LU Category (Level 2)	Area (in Hectares)
Agriculture	Crop land	8395.41
	Fallow	490.66
Barren/unculturable/ Wastelands	Plantation	3.01
	Gullied / Ravinous Land	7.32
	Rann	25.28
	Salt Affected Land	4.04
	Scrub Land	1286.50
Built-up	Mining	12.94
	Rural	194.53
	Urban	232.59
Forest	Deciduous	20.52
	Scrub Forest	89.50
	Swamp / Mangroves	2.21
Wet Lands / Water Bodies	Inland Wetland	0.13
	Coastal Wetland	18.25
	River/Stream/Canals	195.95
	Water bodies	223.43

Source: https://bhuvan-app1.nrsc.gov.in/2dresources/thematic/LULC503/MAP/GJ.pdf

Figure 5-4 Land Use Pattern for the district



Source: Bhuvan Indian Geo Platform of ISRO

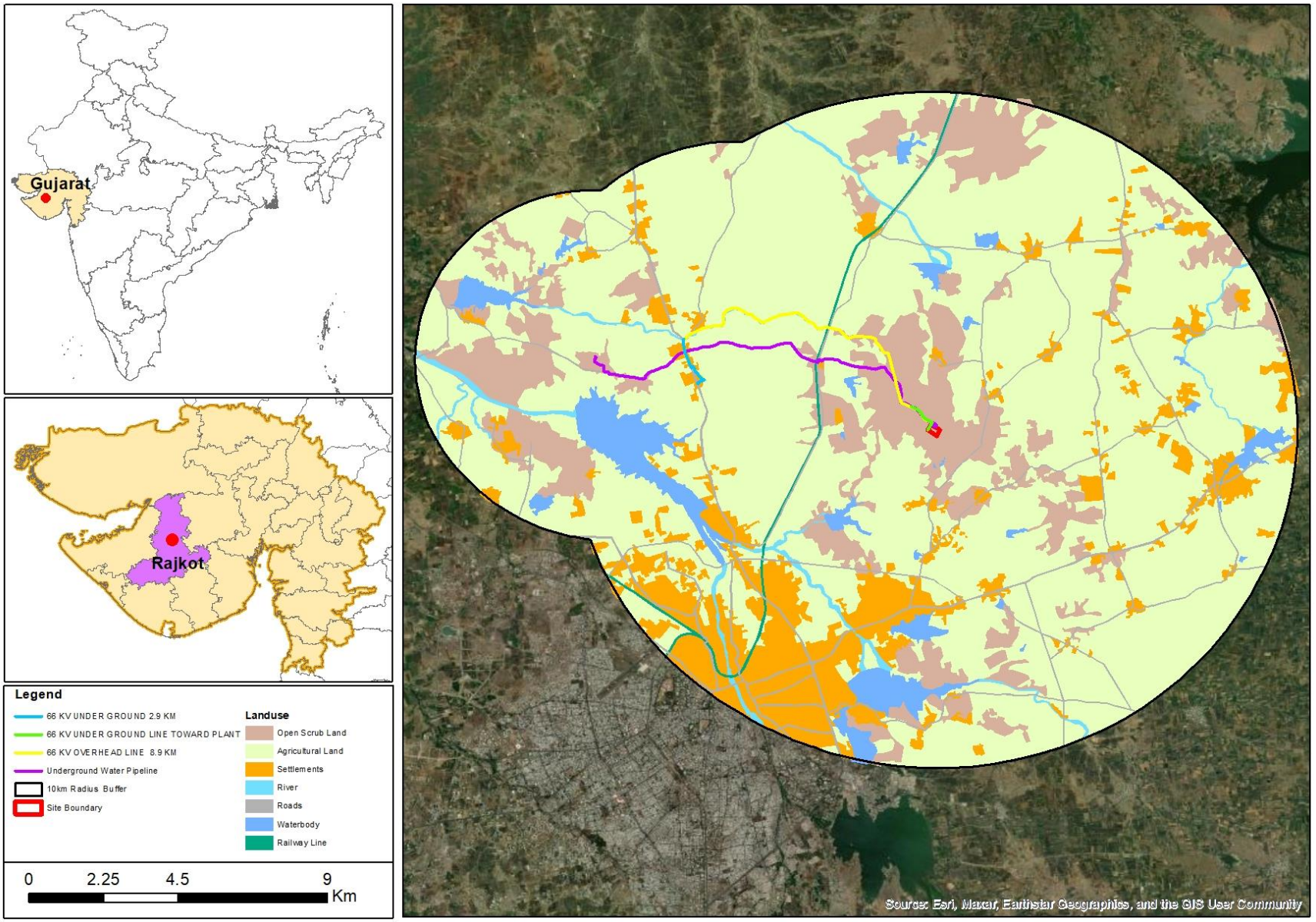
As observed during site visit, the site area and vicinity are categorized as barren land, unculturable waste land. Land use map showing the land use pattern of the Project study area has been presented in ***Figure 5-5.*** A snapshot of the land use pattern of the project study area has been presented in ***Table 5-4.***

Table 5-4 Land use Pattern of the Project Study Area

Sr. No.	Land use Category	Area (Sq Km)	%
1.	Agricultural Land	257.2992	69.87
2.	Settlements	37.3967	10.16
3.	River	3.7015	1.01
4.	Railway Line	1.2133	0.33
5.	Open Scrub Land	48.9999	13.31
6.	Waterbody	13.5806	3.69
7.	Roads	6.0404	1.64
Total Area (Sq Km)		368.2316	100

Source: ArcGIS Mapping

Figure 5-5 Land use Pattern of the Project Study Area



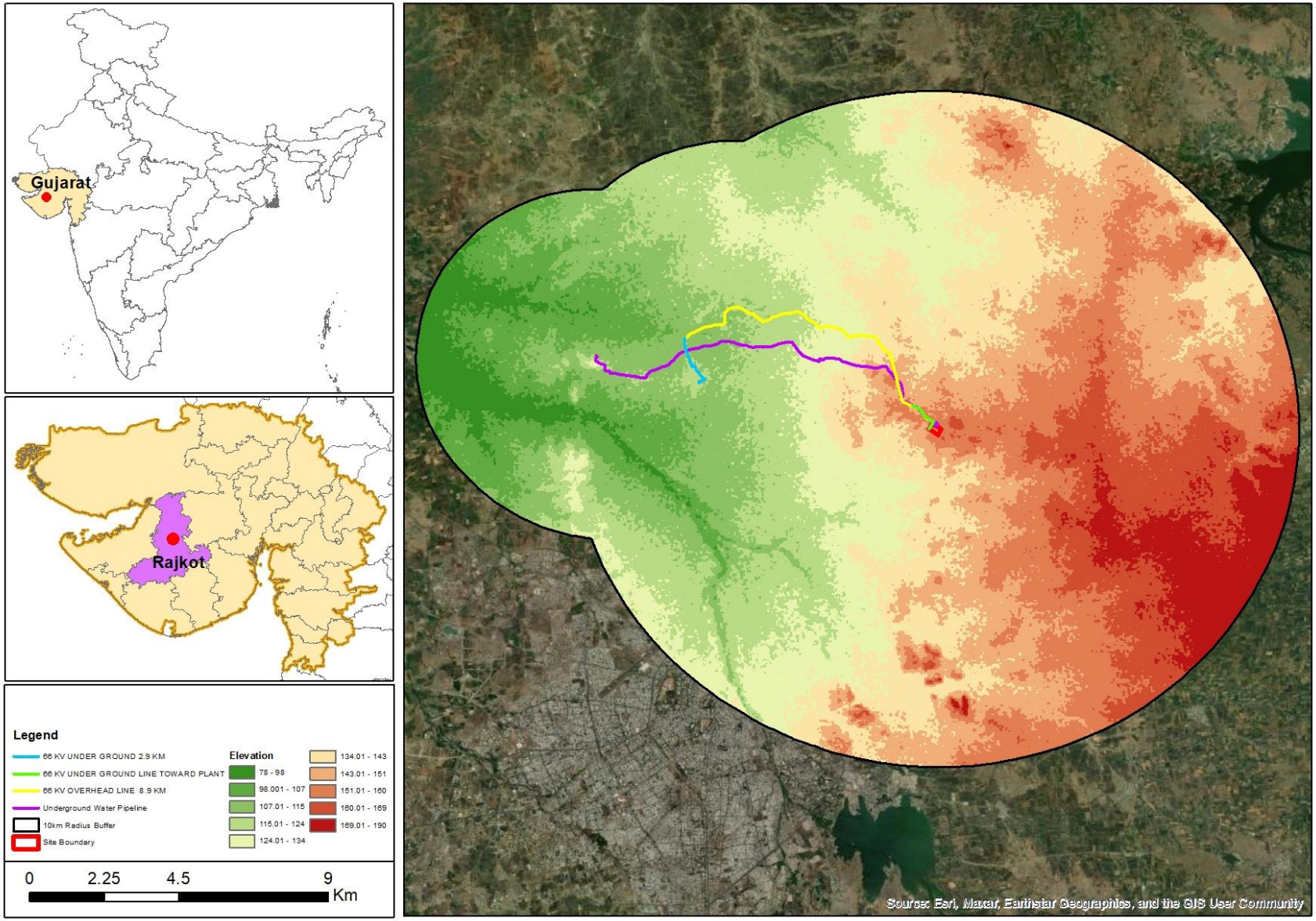
Source: Developed by E&S Advisor

5.3.4 Topography

According to the Aquifer Mapping and Management of Ground Water Resources, Rajkot District, 2022, the district is situated in the central part of Saurashtra peninsula. The northern part of the district (where the project location lies) bordering the Rann of Kachchh and the main underlying rock type is Deccan Trap basalt giving rise to rugged and rolling topography intersected by ridges formed by the dykes. Some of these ridges are as high as 300m amsl. The most prominent ridge is situated along the northern boundary of the Bhadar River and runs along the basaltic dyke locally known as Sardhar Dyke. The elevations range from almost sea level to more than 300 m AMSL. The highest point is 304 m located near Bhadala in the east-central part of the district.

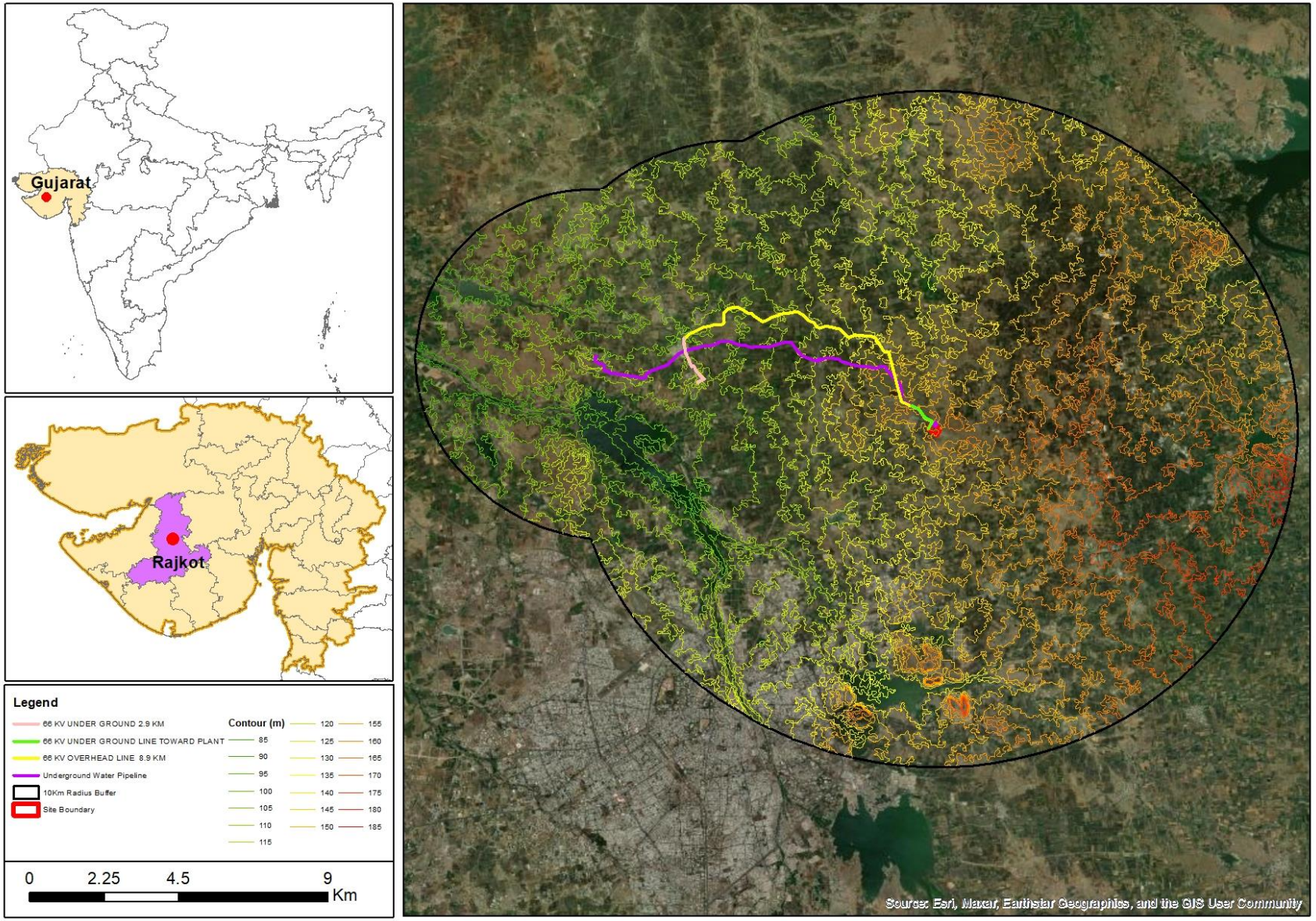
Based on satellite imagery dated 03.05.2022 and site visit, it was observed that the project is located at an elevation of 148 m to 160 m above mean sea level with almost flat surface. Analysis of digital elevation map presented in ***Figure 5-6*** for Project shows a trend in elevations ranging from 151m to 160m above mean sea level which is indicative of flat to undulating land in Project AoI. The below ***Figure 5-7***, shows the contour map which represents the elevation of the project area lies in 155m above mean sea level.

Figure 5-6 Digital Elevation Map of Study Area



Source: Developed by E&S Advisor

Figure 5-7 Contour Map of the Study area



Source: Developed by E&S Advisor

5.3.5 Geology and Geomorphology

Geology

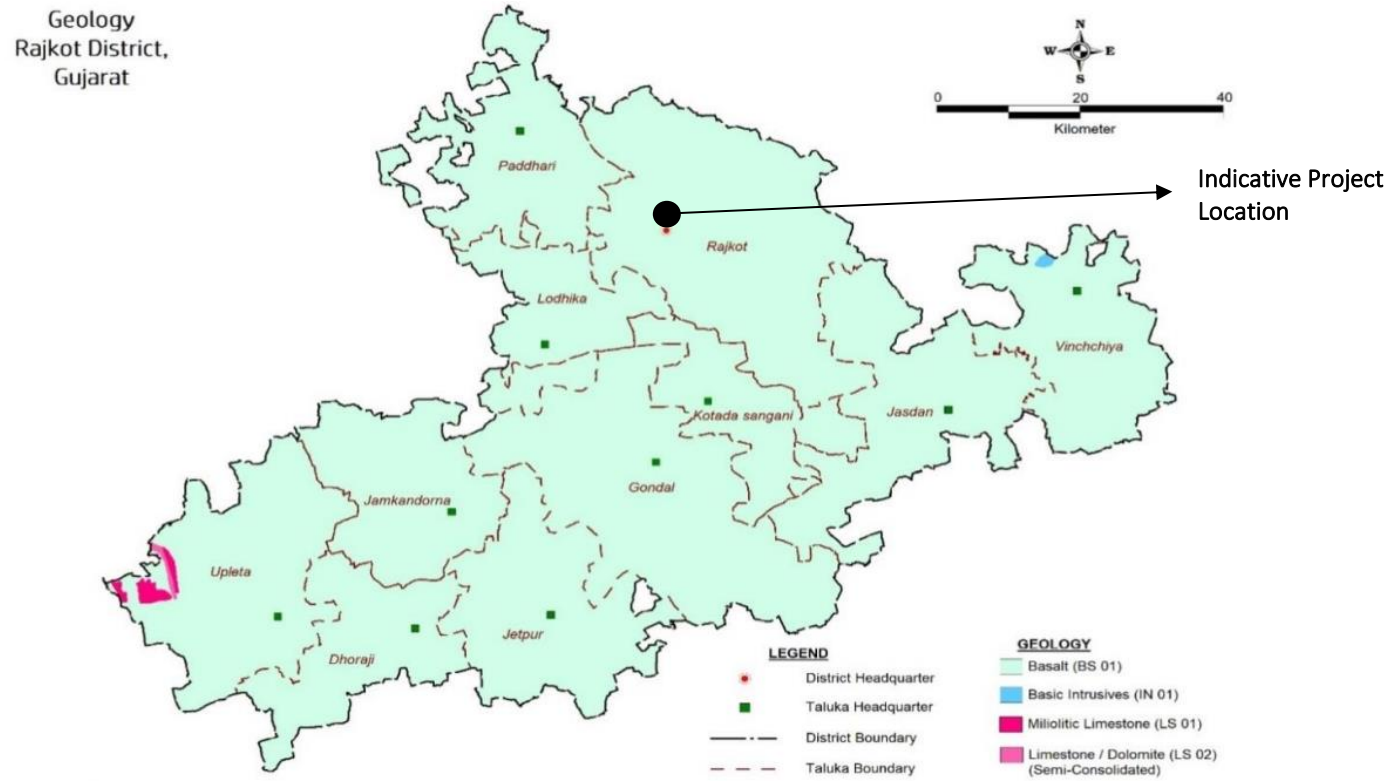
According to the Aquifer Mapping and Management of Ground Water Resources, Rajkot District, 2022, Deccan trap occupies a major part in Rajkot District and it covers most of the Saurashtra peninsula except along its fringes where Tertiary and Quaternary sediments and portion in North West where Mesozoic rock are exposed. The total thickness of Deccan Trap rocks, in Saurashtra ranges from 300 m to more than 900 m.

The below ***Figure 5-8*** shows that the project location lies in the Basalt (BS 01) type of geological formation. Most of the individual flows are 3 to 9 m thick, but some have thickness more than 25 m also. In North West part of exposure, older Jurassic sandstone is encountered at various depths of 200 to 450 mbgl. With average thickness of 300 m basaltic lava flows below ground level and except few volcanic plugs forming prominent hills & distinct high land and associated dykes swarms forming extensive & linear low laying ridges, mostly in southern part of Saurashtra, the Deccan Trap terrain exhibits overall relatively flat and low lying topography. The general geological succession of the rock formations occurring in the Rajkot district is given in below ***Table 5-5***

Table 5-5 Geological Succession of rock formation

Age	Formation	Lithology
Quaternary	Surface Soil/ Alluvium	Wind-blown sand and Black cotton soil
Lower Eocene to Upper Cretaceous	Deccan Trap	Plutonic Basalt stratified lava flows comprising amygdoloidal basalt, fine grained porphyritic basalt and basaltic/doleritic dykes.

Figure 5-8 Geological Map of Rajkot District



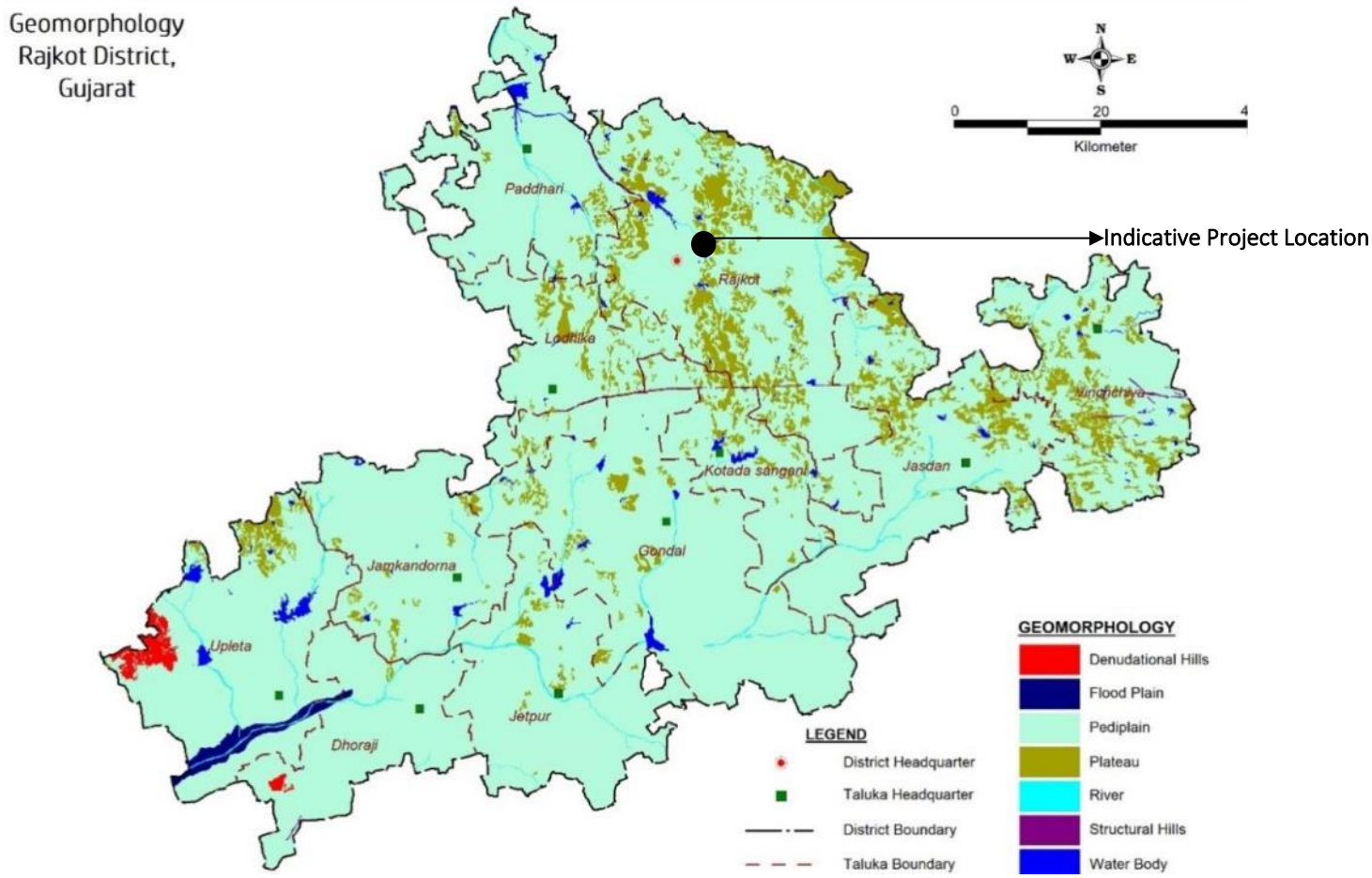
Source: NAQUIM Report -2022

Geomorphology

According to the Aquifer Mapping and Management of Ground Water Resources, Rajkot District, 2022, the district is situated in the central part of Saurashtra peninsula. The northern part of the district bordering the Rann of Kachchh, and the main underlying rock type is ***Deccan Trap basalt*** giving rise to rugged and rolling topography intersected by ridges formed by the dykes. The below ***Figure 5-9*** represents that the project location lies pediplain region which indicates an extensive plain formed by the coalescence of pediments.

In the central part of the district comprising Paddhari, Lodhika, Jasdan, Rajkot, Jam Kandorna and Kotada Sanghani talukas, the soils are of clayey loam to clay type. They are moderately deep to deep and vary in colour from very dark brown to very dark greyish brown and reddish brown. The EC of the soils is generally less than 1.0 mmhos/cm and cation exchange capacity is between 40 and 60 me/100 gm of soil.

Figure 5-9 Geomorphology Map of Rajkot District

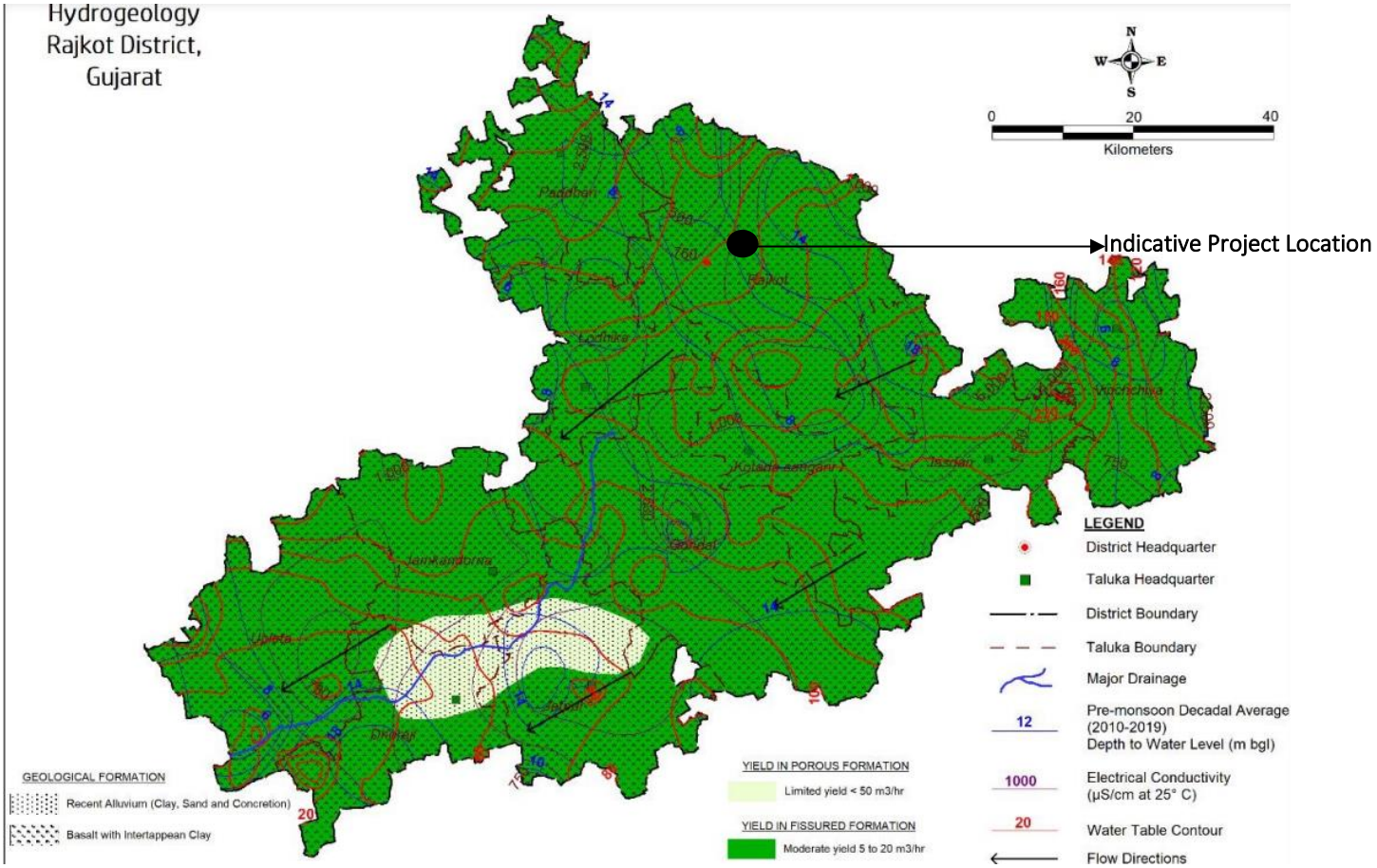


Source: NAQUIM Report -2022

5.3.6 Water Resources

According to the Aquifer Mapping and Management of Ground Water Resources, Rajkot District, 2022, Deccan trap occupies a major part of the district and forms the most important aquifer system. It generally forms a poor aquifer due to compactness and poor primary porosity. However, the upper weathered parts, which at places are up to 20 m thick, form good aquifer in the district. At deeper levels, the secondary porosity developed as a result of tectonic activities, in the form of joints, and fractures, shear zones, form repository of groundwater at many places. The dykes, particularly in the southern part of the district, play an important role in occurrence and movement of groundwater. At places, the dykes are highly weathered and themselves form potential aquifers. At other places where the dykes are more compact, they act as subsurface barrier for the groundwater flow and well-constructed upstream of these dykes have yield good yields. As per the below ***Figure 5-10***, the project location lies in the location of Basalt with Intertappean clay with a moderate yield of 5-20 m^3/hr.

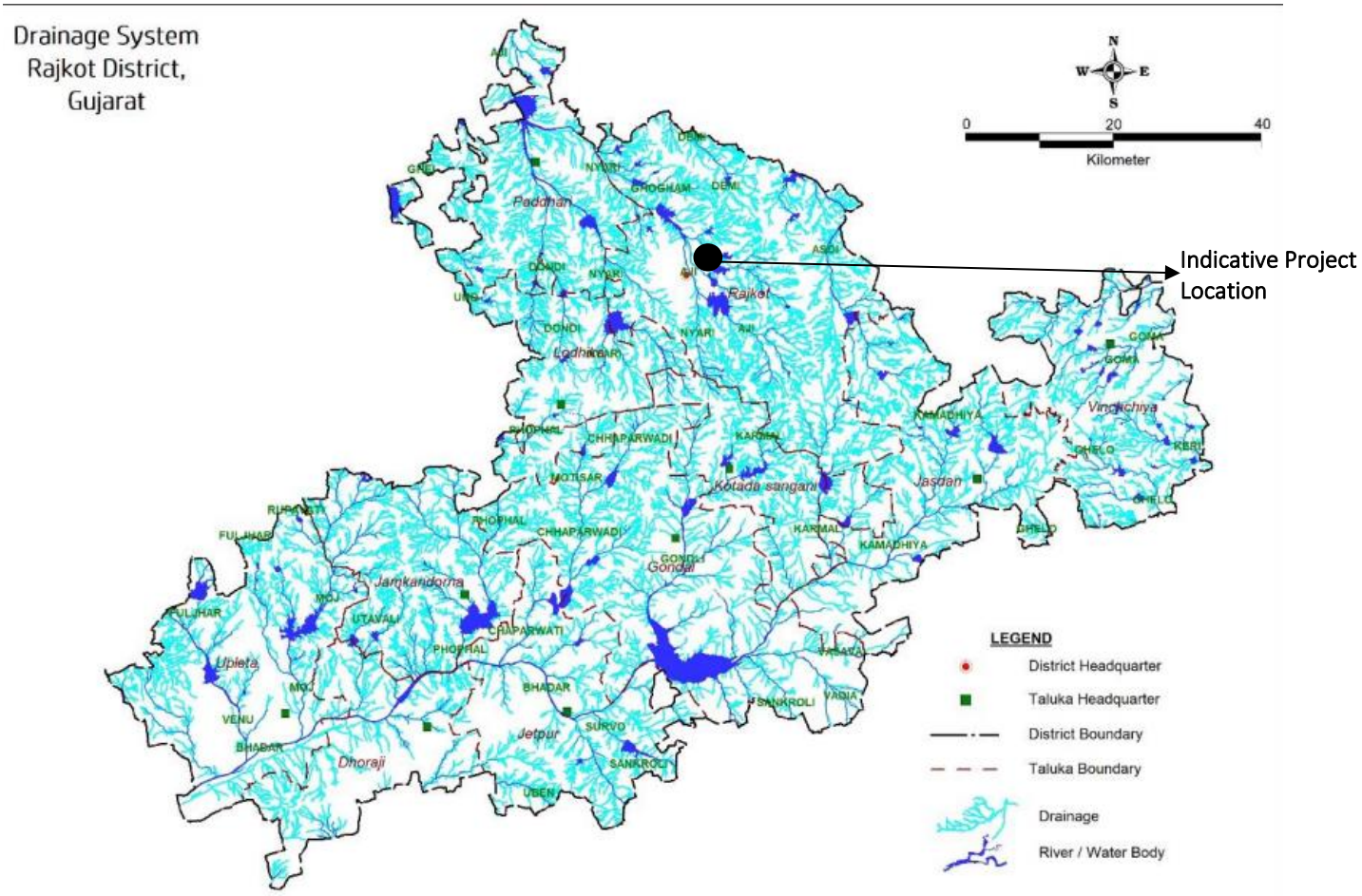
Figure 5-10 Hydrogeological Map of Rajkot District



Source: NAQUIM Report -2022

As per the below ***Figure 5-11***, there are multiple drainage channels flowing in the study area and nearby Aji dam is also located at an approximate aerial distance of 10 km towards south direction from the project site. The majority of the surface water in the district is created through canals from Aji and Bhadar dams. The water bodies present within 10km radius from the project site is Vidi Pir Lake, Aji-2 dam, Fofal dam, Lalpari Lake, Randadra lake, mining pond and some water ponds. The two major rivers Machhu and Aji, flow toward north of the Project site. In addition to these, there are 14 rivulets which have swift and short run to the sea.

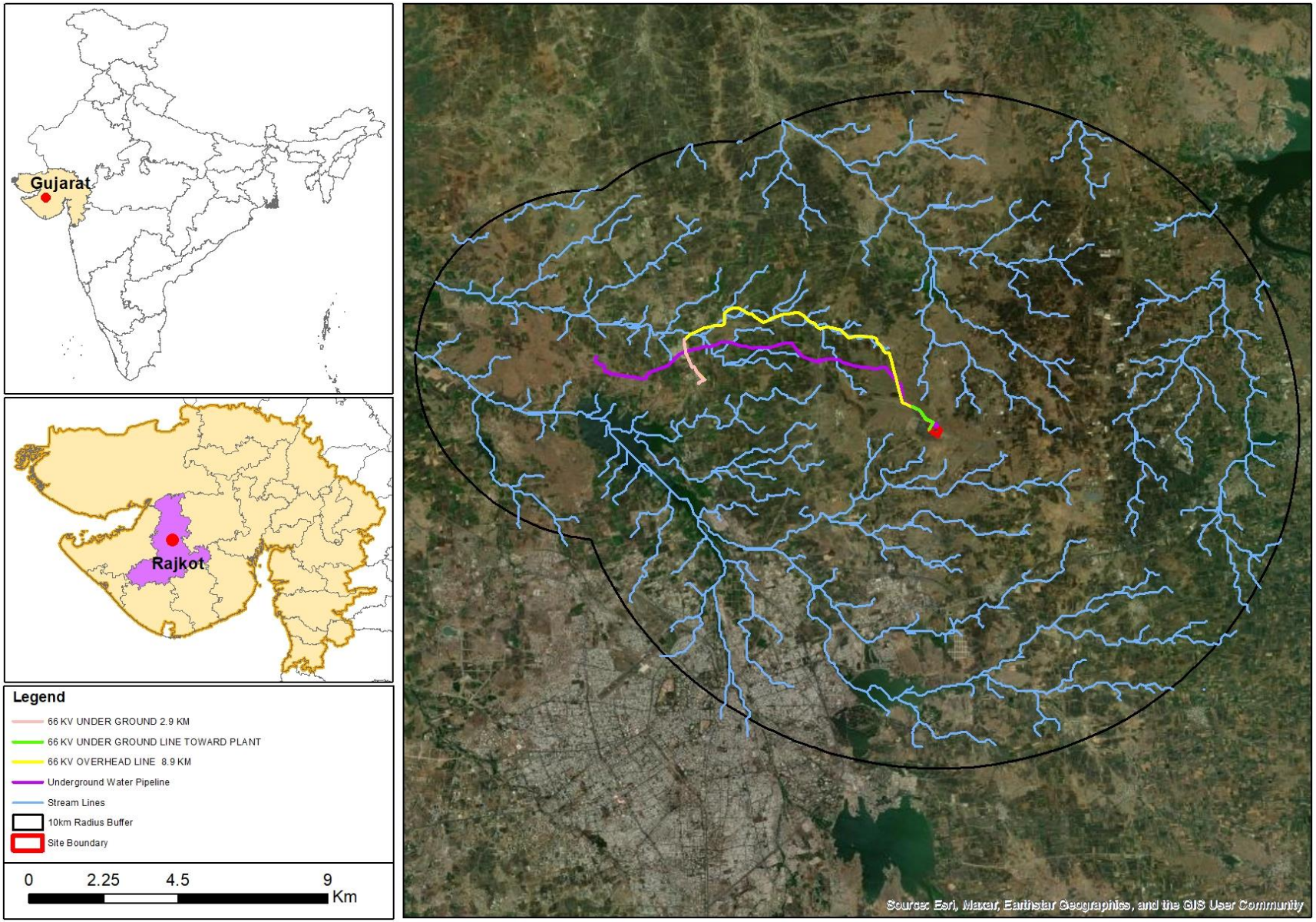
Figure 5-11 Drainage Map of Rajkot District



Source: NAQUIM Report -2022

The below ***Figure 5-12*** represents the drainage pattern of the proposed project area. Based on observations from drainage map below, there are no dendritic drainage channels passing through out the project area. But, however, there are some dendritic channels crossing over the pipelines of STP to WTE Rajkot.

Figure 5-12 Drainage Map of the Study Area



Source: Developed by E&S Advisor

5.3.6.1 Surface Water

According to the Aquifer Mapping and Management of Ground Water Resources, Rajkot District, 2022, Rajkot district has no perennial river. Narmada canal network is an important resource. It is primarily used as a supplement for drinking water supply. When water is available above household needs, it may be used for agriculture. However, as of now, its contribution to agriculture needs is nil.

Most of the surface water in the district is created through canals from Aji and Bhadar dams. Dhoraji has maximum command area under canal irrigation while Rajkot has the maximum number of sources of canal irrigation. Jasdan block has the majority of the community ponds in the district.

There are three major rivers in the district. The river Bhadar, which emerges from Jasdan taluka and flows across the southern part of the district is the biggest of all. Other two major rivers Machhu and Aji, flow toward north. In addition to these, there are 14 rivulets which have swift and short run to the sea. Water of the river is mainly used for agriculture and drinking purposes. Machhu River rises in the hills of Jasdan near village Khokhara in Chotila taluka of Surendranagar district. This is one of the North flowing rivers of Saurashtra in Gujarat state. It flows from district boundary of Surendranagar and Rajkot up to village Beti then flows towards North in Rajkot and finally meets in the little Ran of Kachchh near Malia. Bhadar River originates from, near Jasdan and meets in Arabian Sea.

Table 5-6 Surface Water Quality of Lake near the Project Site

Name of Monitoring Location	Distance from the Project Site	Temperature °C		Dissolved Oxygen (mg/L)		pH		Conductivity (µmhos/cm)		BOD (mg/L)		Nitrate N + Nitrite N (mg/L)		Fecal Coliform (MPN/100ml)		Total Coliform (MPN/100ml)	
Kuwadava Lake, Vill. Kuwadava, Dist. Rajkot.		Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max
	8.7 km towards west	26.0	30.0	5.9	6.9	7.3	8.4	452	3120	1.6	2.5	0.32	0.75	2	170	10	540

Source: https://cpcb.nic.in/wqm/2021/Water_pond_tanks_2021.pdf

5.3.6.2 Surface Water Quality Assessment

As part of the ESIA, surface water quality assessment was conducted by a National Accreditation Board for Testing and Calibration Laboratories (NABL) accredited lab in May 2023 to understand the surface water quality in the study area. One sample each of surface water was collected from Anandpar lake and Lake Of Vidi Pir within 5 km radius of the project under the supervision of E&S Advisors and the samples were analyzed against IS 2296 Inland surface Water class C standard. The location of primary surface water sample has been presented in ***Table 5-1*** and the results of the assessment has been presented in ***Table 5-7***. Map showing monitoring locations has been presented in ***Figure 5-2.*** Detailed monitoring results have been presented as ***Appendix 17***.

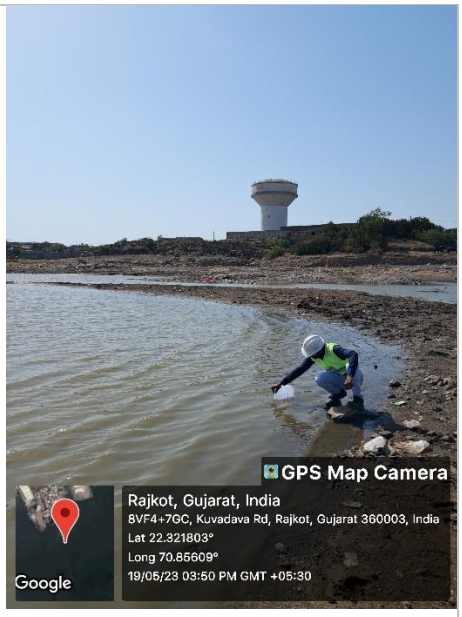
		
SW 1 Location	SW 2 Location	SW 3 Location

Table 5-7 Results of Surface Water Monitoring in Study Area

Sr. No.	Parameters	Unit	Surface Water Sample			Permissible Limit as per IS 2296 Inland surface Water class C	Test Method
			SW 1	SW 2	SW 3		
Physical Parameters							
1.	Colour	Hazen	<5.0	<5.0	<5.0	300	APHA (23rd Edition) 2120B : 2017
2.	pH at 25 deg C	None	7.91	7.50	7.86	6.5-8.5	APHA (23rd Edition) 4500 -H-B : 2017
3.	Turbidity	NTU	220	540	52	--	APHA (23rd Edition) 2130B : 2017
4.	Total Dissolved Solid (TDS)	mg/l	574	1076	688	1500 max	APHA (23rd Edition) 2540C : 2017
General Parameters							
5.	Calcium (Ca)	mg/l	53	147	53	--	APHA (23rd Edition) 3500 Ca B,2017_(O)
6.	Chloride (Cl)	mg/l	180	320	212	600	APHA (23rd Edition) 4500 -Cl B : 2017
7.	Copper (Cu)	mg/l	<0.02	<0.02	<0.02	--	APHA (23rd Edition) 4500 -Cl B : 2017
8.	Fluoride (F)	mg/l	0.53	0.23	0.22	1.5	APHA (23rd Edition) 4500 -FC/ D: 2017
9.	Iron (Fe)	mg/l	16	48	11	50	APHA (23rd Edition) 3500 Fe B : 2017
10.	Magnesium (Mg)	mg/l	11	111	37	--	APHA (23rd Edition) 3500 Mg B,2017_(O)
11.	Manganese (Mn)	mg/l	<0.02	<0.02	<0.02	--	APHA (23rd Edition) 3120 B : 2017

Sr. No.	Parameters	Unit	Surface Water Sample			Permissible Limit as per IS 2296 Inland surface Water class C	Test Method
			SW 1	SW 2	SW 3		
12.	Nitrate (NO_3)	mg/l	0.8	3.6	12	50	APHA (23rd Edition) 4500 - NO3 - E : 2017
13.	Phenolic Compounds (C_6H_5OH)	mg/l	<0.001	<0.001	<0.001	--	APHA (23rd Edition) 5530C : 2017
14.	Sulphate ($SO_{4)}$	mg/l	30	300	86	400	APHA (23rd Edition) 4500 - SO42- E : 2017
15.	Total Alkalinity	mg/l	200	172	175	--	APHA (23rd Edition) 2320B 2017_(O)
16.	Total Hardness	mg/l	176	832	284	--	APHA (23rd Edition) , 2340 C : 2017
Toxic Substances							
17.	Cadmium (Cd)	mg/l	<0.001	<0.001	<0.001	0.01	APHA (23rd Edition)3120B 2017_(O)
18.	Lead (Pb)	mg/l	<0.005	<0.004	<0.005	0.1	APHA (23rd Edition) 3120 B : 2017
19.	Mercury (Hg)	mg/l	<0.001	<0.001	<0.001	--	IS 3025 (Part 48): 1994
20.	Nickel (Ni)	mg/l	<0.02	<0.02	<0.02	--	APHA (23rd Edition) 3120 B : 2017
21.	Arsenic (As)	mg/l	<0.005	<0.005	<0.005	0.2	APHA (23rd Edition)3120B 2017 (ICP OES)_(O)
22.	Zinc (Zn)	mg/l	<0.02	<0.02	<0.02	15	APHA (23rd Edition) 3120 B : 2017
23.	Cobalt (Co)	mg/l	<0.05	<0.05	<0.05	---	APHA (23rd Edition)3120B 2017 (ICP OES)_(O)
24.	Total Suspended Solid (as TSS)	mg/l	420	1385	66	--	APHA (23rd Edition) 2540D : 2017
25.	Temperature	Deg C	25	25	25	---	APHA (23rd Edition), 2550B: APHA 23rd EDITION,2550 B_(O) 2017
26.	Conductivity	Us/cm	915	1816	1127	--	APHA (23rd Edition) 2510B: 2017
27.	Biochemical Oxygen Demand (BOD)	mg/l	56	38	14	3	APHA (23rd Edition) 5210B : 2017
28.	Chemical Oxygen Demand(COD)	mg/l	180	136	56	---	APHA (23rd Edition) 5220B : 2017
29.	Oil and Grease	mg/l	<5.0	<5.0	<5.0	0.1	APHA (23rd Edition) 5520B : 2017
30.	Salinity	None	0.54	1.10	0.67	---	APHA (23rd Edition)2520B, 2017_(O)
31.	Phosphate (PO_4)	mg/l	1.1	0.15	0.55	---	APHA (23rd Edition) 4500- P D, 2017_(O)
32.	DO	mg/l	5.5	5.1	5.7	4 minimum	APHA 23rd Ed. 2017-4500-OC/G_(O)

Sr. No.	Parameters	Unit	Surface Water Sample			Permissible Limit as per IS 2296 Inland surface Water class C	Test Method
			SW 1	SW 2	SW 3		
33.	Chromium (Cr)	mg/l	<0.01	<0.01	<0.01	0.05	APHA (23rd Edition)3120B 2017 (ICP OES)_(O
Bacteriological Parameters							
34.	Faecal coliform	/100ml	350	<1.8	700	--	APHA 23rd Edition 9221 B_(O)
35.	Total coliform bacteria	/100ml	2200	120	2800	5000	APHA 23rd Edition 9221 B_(O)

Source: Monitoring conducted by NABL accredited lab in May 2023

Represents value exceeding the permissible limit

5.3.6.2.1 Analysis of Surface Water Quality Monitoring

As per the results from above table, the parameters like Total Dissolved Solids (TDS) (1500 max), Chloride (600), Fluoride(1.5), Iron(50), Nitrate (50), Sulphate (400), Cadmium (0.01), Lead (0.1), Arsenic (0.2), Zinc (50) are found to be within the permissible limits as prescribed by IS 2296 Inland surface Water class C. But, however, the following parameters are found to be exceeding:

- **Biochemical Oxygen Demand (BOD):** The BOD level of surface water samples S1, S2 and S3 are exceeding the permissible limit of 3 mg/l. The environmental factors contributing to increasing BOD include surface runoff, floating debris, dead animals and plants, soil erosion, etc.
- **Oil and Grease:** Oil and Grease of the Samples S1, S2 and S3 are exceeding the permissible limits. The exceedance can be attributed to the human activities like hotel, restaurant, kitchen, food processing, and slaughtering industry.

Also, while comparing the surface water quality data via secondary sources (refer ***Table 5-6)*** and surface water Monitoring in Study Area from primary sources (refer ***Table 5-7)***, most of the parameters like Temperature, Dissolved Oxygen, pH, BOD, Nitrate N + Nitrite N, Fecal Coliform and Total Coliform are similar except the maximum value of conductivity of the lake is recorded on a higher side.

5.3.6.3 Groundwater Resources

According to the Aquifer Mapping and Management of Ground Water Resources, Rajkot District, 2022, the groundwater in Deccan trap occurs under phreatic to confined conditions. The groundwater is generally tapped through dug wells varying in depth from 10 to 50 m. At places, dug-cum bored wells are also constructing bores below the bottom of dug wells. The yield of dug wells and dug-cum-bored wells generally range from 20 to 100 m^3/day.

The ground water in major part of the district is suitable for domestic, irrigation and industrial purposes for both in phreatic and confined aquifers within 200 m depth. Deccan trap occupies a major part of the district and forms the most important aquifer system. The ground water is in general alkaline in nature with pH more than 7. The value of pH ranges between 7.25 & 8.7 in the district.

According to the below ***Table 5-8*** presented below, the stage of ground water development for the project taluka at year 2017, is 64.23 % and have been categorized as ***Safe***, based on the stages of ground water development and the long-term trend of pre and post monsoon ground water levels.

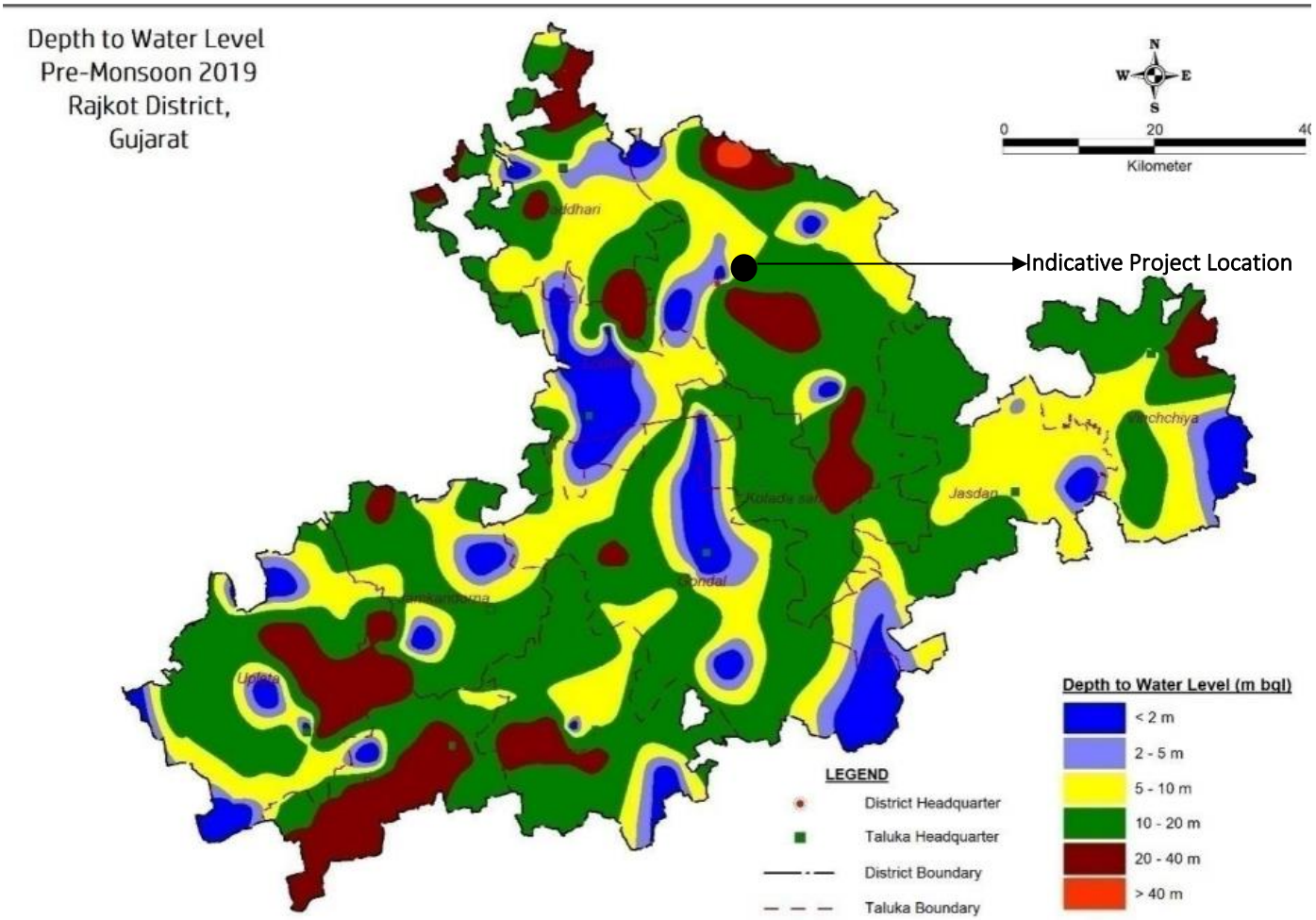
Table 5-8 Ground Water Resources, Availability, Utilization and Stage of Ground Water Development (2017) for Rajkot Tehsil

Assessment Unit Name	Total Ground Water Recharge (Ham)	Total Natural Discharges	Annual Extractable Ground Water Recharge (Ham)	Current Annual Ground Water Extraction (Ham) (Including Irrigation, Industrial and Domestic Use)	Net Ground Water Availability for future use	Stage of Ground Water Extraction (%)	Categorization

Rajkot	20372.46	1018.6 2	19353.8 4	12431.29	6832.46	64.23	Safe

In the Pre Monsoon, the major part of the district, the water level ranged in between 5 to 10 & 10 to 20 m bgl while some isolated patches of district showing shallow water of <2m and deep water level ranges 20 to 40 m. The below ***Figure 5-13*** shows that the depth to water level during pre-monsoon, whereas the project lies between 5-10 mbgl.

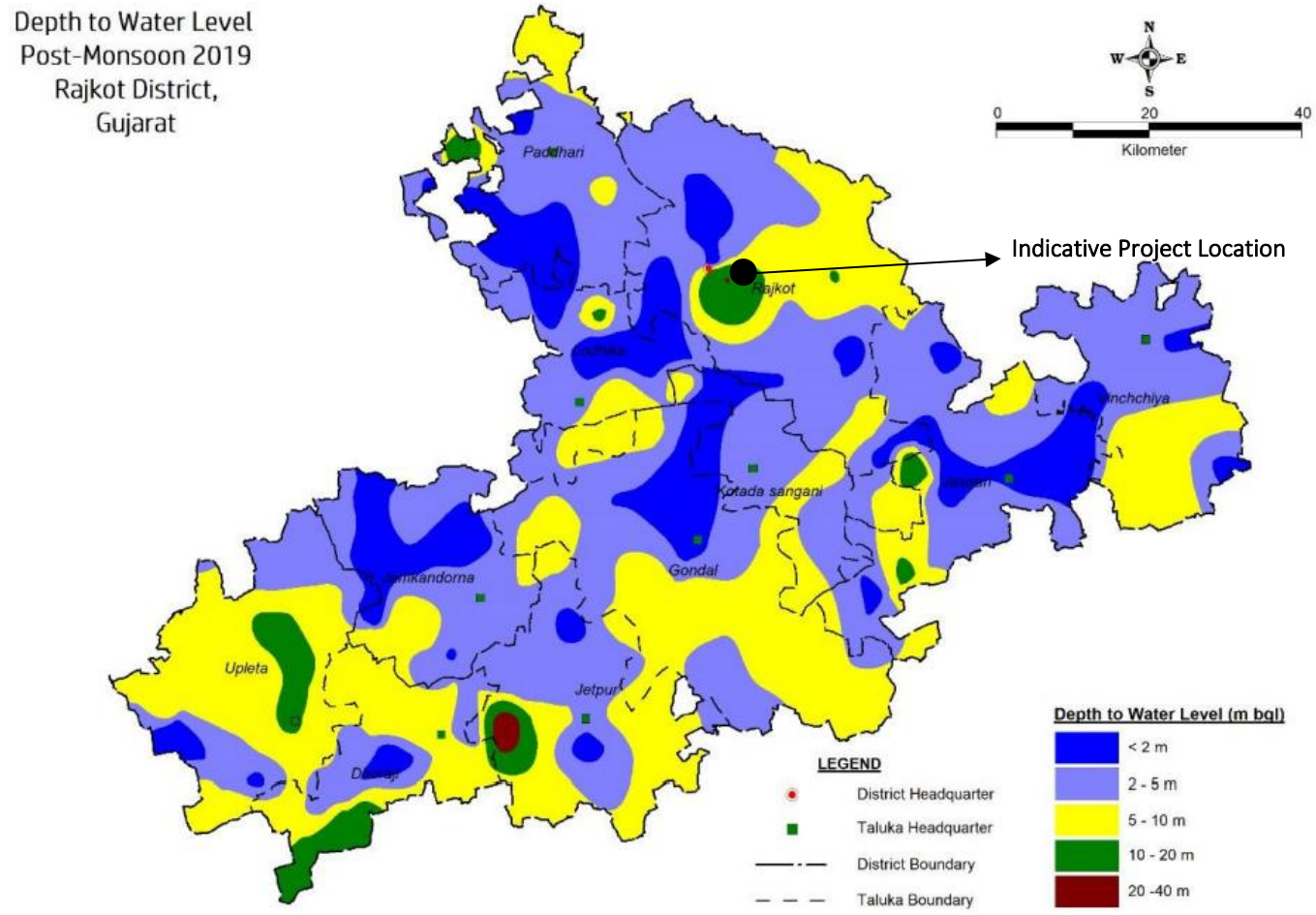
Figure 5-13 Depth to Water Level during Pre-monsoon, 2019



Source: NAQUIM Report -2022

In post monsoon, major part of the district, the water level ranged in between 2 to 05 & 5 to 10 m bgl while some isolated patches of district showing shallow water of <2m and deep water level ranges 20 to 40 m. The below Figure shows that the depth to water level during post-monsoon, whereas the project lies between 5-20 mbgl.

Figure 5-14 Depth to Water Level during Post Monsoon, 2019



Source: NAQUIM Report -2022

Based on the secondary data collected for the groundwater quality, based on the analysis, all the values are within the permissible limit of IS 10500:2012 drinking water standards except for ground water at Rajkot where total coliform bacteria were present indicating disease-causing organisms (water borne-pathogens) within the water.

Table 5-9 Groundwater Quality Data of borewells within the study area

Location	Distance	Temperature °C		pH		Conductivity (µmhos/cm)		BOD (mg/L)		Nitrate N (mg/L)		Faecal Coliform (MPN/100ml)		Total Coliform (MPN/100ml)		Total Dissolved Solids (mg/L)		Fluoride (mg/L)		Arsenic (mg/L)	
		Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max
Bore Well at STP Adhapar, Dist. Rajkot.	11 km towards southwest	28.0	28.0	7.2	7.2	1206	1206	1.4	1.4	1.10	1.10	-	-	-	-	1032	1032	0.2	0.2	0.004	0.004

	direction from project site																				
Borewell of Aji GIDC, Rajkot	11.2 km towards northwest	27.0	27.0	7.4	7.4	1526	1526	1.4	1.4	1.30	1.30	-	-	-	-	1088	1088	0.3	0.3	0.002	0.002
Ground Water at Rajkot	10.3 km towards northwest direction	28.0	28.0	7.3	7.3	786	786	1.5	1.5	1.10	1.10	2	2	2	2	620	620	0.2	0.2	0.004	0.004

Source: https://cpcb.nic.in/wqm/2021/NWMP_DATA_2021.pdf

5.3.6.4 Primary Groundwater Quality Assessment in Project Area

As part of the ESIA, groundwater quality assessment was conducted to understand the groundwater quality in the study area. Three samples of groundwater were collected within 5 km radius of the WtE plant and the samples were analyzed against IS 10500:2012 drinking water standards adopted by Bureau of Indian Standards (BIS). The location of primary groundwater sample has been presented in ***Table 5-1*** and the results of the assessment has been presented in ***Table 5-10.*** Map showing monitoring locations has been presented in ***Figure 5-2.*** Detailed monitoring results have been presented as ***Appendix 17***.

Figure 5-15 Groundwater monitoring conducted in Study Area

GW 1 Location	GW 2 Location	GW 3 Location

Table 5-10 Results of Primary Groundwater Quality

Sr. No.	Parameters	Unit	Ground Water Sample			Desirable Limit as per 10500:2012	Permissible Limit as per 10500:2012	Standard limits as per WHO guidelines (mg/L)	Test Methods
			GW 1	GW2	GW3				
	Physical Parameters								

Sr. No.	Parameters	Unit	Ground Water Sample			Desirable Limit as per 10500:2012	Permissible Limit as per 10500:2012	Standard limits as per WHO guidelines (mg/L)	Test Methods
			GW 1	GW2	GW3				
1.	Colour	Hazen	1.0	1.0	1.0	5	15	No visible colour	3025 (Part 4)-1983;
2.	Odor	None	AGREEABLE	1.0	AGREEABLE	Agreeable	Agreeable	--	Rffm:2002
3.	pH	None	7.64	7.37	8.02	6.5-8.5	No Relaxation	--	3025 (Part 5)-1983;
4.	Turbidity	NTU	1.0	1.4	9.6	1	5	--	Rffm:2002
5.	Total Dissolved Solid (TDS)	mg/l	980	975	258	500	2000	--	3025 (Part 11)-1983; Rffm:
	General Parameters								
6.	Aluminum (Al)	mg/l	0.01	0.01	0.01	0.03	0.2		IS 3025 (Part 2) : 2004
7.	Ammonia (N)	mg/l	0.1	0.1	0.1	0.5	No Relaxation	1.5	IS 3025 (Part 34): 1988
8.	Anionic Detergent	mg/l	0.05	0.05	0.05	0.2	1		IS 13428 (ANNEX _ K): 2005
9.	Barium (Ba)	mg/l	0.1	0.1	0.1	0.7	No Relaxation	0.7	IS 3025 (Part 2) : 2004
10.	Boron (B)	mg/l	0.25	0.25	0.25	0.5	1.0	0.5	IS 3025 (Part 40) : 1991
11.	Calcium (Ca)	mg/l	31.36	31.36	15.68	75	200	--	IS 3025 (Part 26) : 1986
12.	Chloramines (Cl2)	mg/l	0.1	0.1	0.1	4	No Relaxation	0.5-1.5	IS 3025 (Part 32) : 1988
13.	Chloride (Cl)	mg/l	460.46	480.05	97.97	250	1000	200-300	IS 3025 (Part 2) : 2004
14.	Copper (Cu)	mg/l	0.02	0.02	0.02	0.05	1.5	2.0	IS 3025 (Part 60) : 2008
15.	Fluoride (F)	mg/l	0.38	0.40	0.26	1	1.5	1.5	IS 3025 (Part 26) : 1986
16.	Free Residual Chlorine	mg/l	0.1	0.1	0.1	0.2	1	--	IS 3025 (Part 53) : 1988
17.	Iron (Fe)	mg/l	0.09	0.07	0.21	0.3	No Relaxation	--	IS 3025 (Part 46) : 1994
18.	Magnesium (Mg)	mg/l	9.41	14.11	9.41	30	100	--	IS 3025 (Part 2) : 2004
19.	Manganese (Mn)	mg/l	0.02	0.02	0.02	0.1	0.3	0.4	IS 3025 (Part 39) : 1991
20.	Mineral Oil	mg/l	0.5	0.5	0.5	0.5	No Relaxation	--	IS 3025 (Part 34) : 1988
21.	Nitrate (NO_3)	mg/l	1.12	1.09	0.89	45	No Relaxation	50	IS 3025 (Part 43) : 1992
22.	Phenolic Compounds (C_6H_5OH)	mg/l	0.001	0.001	0.001	0.001	0.002	--	IS 3025 (Part 2) : 2004
23.	Selenium (Se)	mg/l	0.005	0.005	0.005	0.01	No Relaxation	0.01	IS 3025 (Part 2) : 2004
24.	Silver (Ag)	mg/l	0.005	0.005	0.005	0.1	No Relaxation	--	IS 3025 (Part 24) : 1986
25.	Sulphate ($SO_{4)}$	mg/l	8.90	8.74	3.56	200	400	--	IS 3025 (Part 29) : 1986

Sr. No.	Parameters	Unit	Ground Water Sample			Desirable Limit as per 10500:2012	Permissible Limit as per 10500:2012	Standard limits as per WHO guidelines (mg/L)	Test Methods
			GW 1	GW2	GW3				
26.	Hydrogen Sulphide (H_2S)	mg/l	0.02	0.02	0.02	0.05	No Relaxation	--	IS 3025 (Part 23) : 1986
27.	Total Alkalinity	mg/l	81.60	81.60	61.2	200	600	--	IS 3025 (Part 21) : 2009
28.	Total Hardness	mg/l	117.60	137.20	78.40	200	600	--	IS 3025 (Part 2) : 2004
29.	Zinc (Zn)	mg/l	0.02	0.02	0.02	5	15	--	
					Toxic Substances				
30.	Cadmium (Cd)	mg/l	0.001	0.001	0.001	0.003	No Relaxation	0.003	IS 3025 (Part 2) : 2004
31.	Cyanide (CN)	mg/l	0.01	0.01	0.01	0.05	No Relaxation	0.07	IS 3025 (Part 27) : 1986
32.	Lead (Pb)	mg/l	0.005	0.005	0.005	0.01	No Relaxation	0.01	IS 3025 (Part 2) :2004
33.	Mercury (Hg)	mg/l	0.0002	0.0002	0.0002	0.001	No Relaxation	0.006	IS 3025 (Part 48) : 1994
34.	Molybdenum (Mo)	mg/l	0.05	0.05	0.05	0.07	No Relaxation	0.07	IS 3025 (Part 2) :2004
35.	Nickel (Ni)	mg/l	0.01	0.01	0.01	0.02	No Relaxation	0.07	IS 3025 (Part 2) :2004
36.	Polychlorinated Biphenyl (PCB)	mg/l	0.0005	0.0005	0.0005	0.0005	No Relaxation	--	USEPA 8082: 2007
37.	Polynuclear Aromatic Hydrocarbons (PAH)	mg/l	0.0001	0.0001	0.0001	0.0001	No Relaxation	--	APHA (23rd Edition) 6440C:2017
38.	Arsenic (As)	mg/l	0.05	0.005	0.005	0.01	0.05	0.01	IS 3025 (Part 2) :2004
39.	Total Chromium (Cr)	mg/l	0.01	0.01	0.01	0.05	No Relaxation	0.05	IS 3025 (Part 2) :2004
					Trihalomethanes				
40.	Bromoform	mg/l	0.01	0.01	0.01	0.1	No Relaxation	0.1	APHA (23rd Edition) 6232 B: 2017
41.	Dibromochloro methane	mg/l	0.01	0.01	0.01	0.1	No Relaxation	--	APHA (23rd Edition) 6232 B: 2017
42.	Bromodichloro methane	mg/l	0.01	0.01	0.01	0.06	No Relaxation	0.06	APHA (23rd Edition) 6232 B: 2017
43.	Chloroform	mg/l	0.01	0.01	0.01	0.2	No Relaxation	0.3	APHA (23rd Edition) 6232 B: 2017
					Pesticides Residues				
44.	Alachlor	µg/l	0.02	0.02	0.02	20	20	--	USEPA 525.2
45.	Atrazine	µg/l	0.02	0.02	0.02	2	2	0.002	USEPA 8141A: 2007
46.	Aldrin	µg/l	0.01	0.01	0.01	0.03	0.03	0.00003	AOAC (21st edition), 990.06: 2019
47.	Dieldrin	µg/l	0.01	0.01	0.01	0.03	0.03	0.00003	AOAC (21st edition), 990.06: 2019

Sr. No.	Parameters	Unit	Ground Water Sample			Desirable Limit as per 10500:2012	Permissible Limit as per 10500:2012	Standard limits as per WHO guidelines (mg/L)	Test Methods
			GW 1	GW2	GW3				
48.	Alpha-HCH	µg/l	0.01	0.01	0.01	0.01	0.01	--	AOAC (21st edition), 990.06: 2019
49.	Beta-HCH	µg/l	0.01	0.01	0.01	0.04	0.04	--	AOAC (21st edition), 990.06: 2019
50.	Butachlor	µg/l	0.02	0.02	0.02	125	125	--	USEPA 8141AOAC (21st edition), 990.06: 2019A: 2007
51.	Chlorpyrifos	µg/l	0.02	0.02	0.02	30	30	0.03	USEPA 8141 A
52.	Delta-HCH	µg/l	0.01	0.01	0.01	0.04	0.04	--	AOAC (21st edition), 990.06: 2019
53.	2,4-Dichlorophenoxyacetic acid	µg/l	0.01	0.01	0.01	30	30	0.03	USEPA 515: 1981
54.	o,p-DDT	µg/l	0.01	0.01	0.01	1	1	0.01	AOAC (21st edition), 990.06: 2019
55.	p,p-DDT	µg/l	0.01	0.01	0.01	1	1	0.01	AOAC (21st edition), 990.06: 2019
56.	o,p-DDE	µg/l	0.01	0.01	0.01	1	1	0.01	AOAC (21st edition), 990.06: 2019
57.	p,p-DDE	µg/l	0.01	0.01	0.01	1	1	0.01	AOAC (21st edition), 990.06: 2019
58.	o,p-DDD	µg/l	0.01	0.01	0.01	1	1	0.01	AOAC (21st edition), 990.06: 2019
59.	p,p-DDD	µg/l	0.01	0.01	0.01	1	1	0.01	AOAC (21st edition), 990.06: 2019
60.	Alpha - endosulfan	µg/l	0.01	0.01	0.01	0.4	0.4	--	AOAC (21st edition), 990.06: 2019
61.	Beta-Endosulfan	µg/l	0.01	0.01	0.01	0.4	0.4	--	AOAC (21st edition), 990.06: 2019
62.	Endosulfan sulfate	µg/l	0.01	0.01	0.01	0.4	0.4	--	AOAC (21st edition), 990.06: 2019
63.	Ethion	µg/l	0.02	0.02	0.02	3	3	--	US EPA 8141A: 2007
64.	Gama-HCH(Lindane)	µg/l	0.01	0.01	0.01	2	2	--	AOAC (21st edition), 990.06: 2019
65.	Isoproturon	µg/l	0.02	0.02	0.02	9	9	0.009	USEPA 532: 2000
66.	Malathion	µg/l	0.02	0.02	0.02	190	190	--	USEPA 8141A: 2007
67.	Methyl parathion	µg/l	0.02	0.02	0.02	0.3	0.3	--	USEPA 8141A: 2007
68.	Monostrophes	µg/l	0.02	0.02	0.02	1	1	--	USEPA 8141A: 2007
69.	Phorate	µg/l	0.02	0.02	0.02	2	2	--	USEPA 8141A: 2007
Bacteriological Parameters									
70.	Total coliform bacteria	/100ml	Not Detected	Not Detected	Not Detected	Not Detectable	Absent	--	IS 15185:2016

Sr. No.	Parameters	Unit	Ground Water Sample			Desirable Limit as per 10500:2012	Permissible Limit as per 10500:2012	Standard limits as per WHO guidelines (mg/L)	Test Methods
			GW 1	GW2	GW3				
71.	E.coli	/100ml	Not Detected	Not Detected	Not Detected	Not Detectable	Absent	--	IS 15185:2016

Source: NABL Accredited Lab

Represents value exceeding the desirable limit

Represents value exceeding the permissible limit

5.3.6.4.1 Analysis of Ground water Quality Results

Based on the results presented in ***Table 5-10,*** it is observed that most of the parameters (as per IS 10500:2012) for the groundwater sample are within the desirable and permissible limit as per IS 10500:2012 and WHO guidelines for drinking water except for the following.

- **Turbidity:** The turbidity of the water samples GW2 and GW3 was observed to be 1.4 NTU and 9.6 NTU which is found to be exceeding the desirable limit of 1 NTU and GW3 is also exceeding permissible limit of 5 NTU. The reason for high turbidity samples collected can be attributed to the legacy waste dumping site within 3km radius, ground water contamination due to leachate cannot be ruled out including contamination due to activities like industrial or agricultural run off or natural activities like weather or runoff caused by precipitation.
- **Total Dissolved Solid:** The TDS in the groundwater samples of GW1 and GW2 were observed to be exceeding the desirable of 500 mg/l however the samples was within permissible limit of 2000 mg/l. This may be attributed to the fact that the groundwater sample was collected from an area which is a mix of urban activities as well as agricultural activities, therefore run off may contaminate the water and mixing of soil contaminants with groundwater through leaching can lead to high TDS.
- **Chloride:** The concentration of chloride was observed to be 460.46 mg/l (GW1) and 480.05 (GW2) which exceeded the desirable limit of 250 mg/l, but it is within permissible limit of 1000 mg/l as well as the limits by WHO guidelines. Since, TDS in the groundwater sample was observed to be high, therefore, high concentration of chloride is bound to occur in the groundwater. Additionally, high chloride content can be attributed to the presence of naturally occurring minerals in the district.

As per Groundwater Quality Data of borewells from secondary sources (refer ***Table 5-9)*** and results of groundwater quality form primary sources (refer ***Table 5-10)***, the parameters are within the desirable limits for all except TDS level, where the samples are exceeding the desirable limit of 500mg/l. This has been attributed to the fact that the high TDS level may be due to the aquifer structure of the area. Also, the predominant ions in the region like Calcium, Magnesium, Chloride, Sulphate and Nitrate may affect the ground water quality.

5.3.6.5 ESA Phase II Groundwater Quality Results

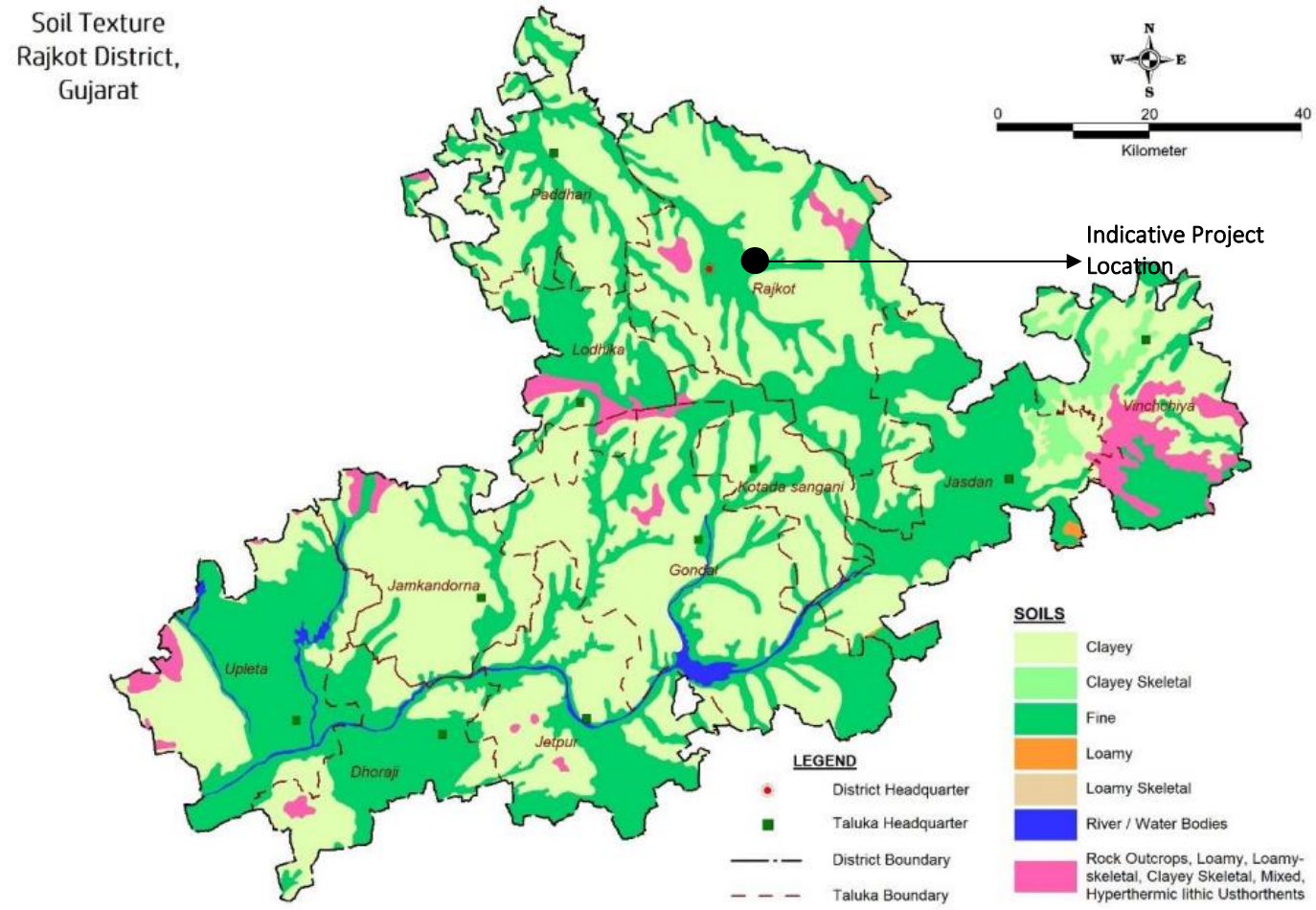
ESA Phase II assessment (undertaken separately) for ground water was undertaken for the facility for which groundwater samples across the Site were undertaken to assess the ground water quality as well as groundwater flow direction.

As per the Phase II report, as per the analytical results of groundwater samples, no exceedance of screening criteria was reported expect heavy metals (Arsenic, Barium and Nickel). The presence of heavy metal in groundwater samples exceeding LOR may be attributed to natural reason that's geogenic. Based on secondary literature heavy metals can be geologically present with in soil formation and geogenic concentrations in soil can leach in to shallow groundwater. Geology across the Site is Basalt/weathered Basalt from 1m to 30m depth, hence it is unlikely that groundwater will be contaminated based on current practices. It may be concluded, based on field visual observation and laboratory analytical results that groundwater at site is currently not impacted adversely due to past or current practices at site. However, it is recommend that the facility should conduct one more round of groundwater investigation for analyzing all 13 priority metals and VOCs/SVOCs.

5.3.7 Soil Type

According to the Aquifer Mapping and Management of Ground Water Resources, Rajkot District, 2022, the central part of the district comprising Paddhari, Lodhika, Jasdan, Rajkot, Jam Kandorna and Kotada Sanghani talukas, the soils are of clayey loam to clay type. They are moderately deep to deep and vary in colour from very dark brown to very dark greyish brown and reddish brown. The EC of the soils is generally less than 1.0 mmhos/cm and cation exchange capacity is between 40 and 60 me/100 gm of soil. As per the below ***Figure 5-16***, the nature of the soil in the project location is fine clayey loam type.

Figure 5-16 Soil Texture of the Rajkot District



5.3.7.1 Soil Quality Assessment

Soil characteristics within the study area, especially the physical quality and fertility of the soil have been characterized by analyzing soil samples collected from three (03) locations under the supervision of E&S Advisors through a NABL accredited Lab in May 2023. Soil sampling locations are shown in ***Table 5-1***. Soil analysis and results have been presented in ***Table 5-11.*** Map showing monitoring locations has been presented in ***Figure 5-2.*** Detailed monitoring results have been presented as ***Appendix 17***.

Figure 5-17 Soil test and monitoring conducted in Study Area

S 1 Location

S2 Location

S 3 Location

Table 5-11 Results of Soil Sampling in Study Area

Sr. No.	Parameter	Unit	S1	S2	S3	Test Method
1	Arsenic (as As)	mg/kg	<0.25	<0.25	<0.25	EPA 6010D_(O)
2	Bulk Density	g/cc	1.39	1.24	1.22	IS 2720(Part 29) 1975 RA 2015_(O)
3	Cadmium (as Cd)	mg/kg	<2.0	<2.0	<2.0	EPA 6010D_(O)
4	Chloride (as Cl)	mg/kg	50	130	110	TPM/MSK/P&E/1/10_(O)
5	Clay	%	7.0	18	6	TPM/MSK/P&E/1/36A_(O)
6	Conductivity at 25 deg C	Micro S/cm	186 (1:2)	786 (1:2)	391(1:2)	IS 14767:2000,RA 2016_(O)
7	Copper (as Cu)	mg/kg	41	29	58	EPA 6010 D (ICP-OES)
8	Heavy metals	mg/kg	17695	18161	28079	TPM/MSK/P&E/3/60_(O)
9	Lead (as Pb)	mg/kg	2.7	2.9	2.6	EPA 6010D_(O)
10	Mercury (as Hg)	mg/kg	<0.1	<0.1	<0.1	USEPA 245.5
11	Moisture	%	23	29	28	TPM/MSK/P&E/1/17_(O)
12	Nickel (as Ni)	mg/kg	19	28	30	EPA 6010 D (ICP-OES)
13	Organic Matter	%	0.41	2.2	2.9	IS 2720 (Part 22): 1972
14	Particle Size Distribution	%	Sand : 81% Silt: 12% Clay 7%	Sand:34% Silt:48% Clay:18%	Sand:43% Silt: 51% Clay: 6%	TPM/MSK/P&E/1/36A_(O)
15	Sand	%	81	34	43	TPM/MSK/P&E/1/36A_(O)
16	Silt	%	12	48	51	TPM/MSK/P&E/1/36A_(O)
17	Sulphate (as SO_4)	mg/kg	<15	<15	<15	IS 2720 (Part 27) 1977,RA 2015_(O)
18	Texture	None	Loamy sand	Loam	Silt Loam	TPM/MSK/P&E/1/36A, Issue date- April 02 Issue no-03: 2018
19	Total Chromium (as Cr)	mg/kg	26	56	78	EPA 6010D_(O)
20	Total Nitrogen (as N)	mg/kg	235	1271	1601	IS 14684 : 1999

Sr. No.	Parameter	Unit	S1	S2	S3	Test Method
21	Total Petroleum Hydrocarbon (as TPH)	mg/kg	<1.0	<1.0	<1.0	IS 3025 (Part 39)-1991 Rffm 2014_(O)
22	Zinc (as Zn)	mg/kg	29	25	40	EPA 6010 D (ICP-OES)
23	pH Value at 25 deg C	None	8.42 (1:2.5)	7.86 (1:2.5)	8.16 (1:2.5)	IS 2720 (Part 26) - 1987

Source: Monitoring conducted by NABL accredited lab in May 2023

Table 5-12 Soil Classification Standards

Sr. No.	Soil Test Parameters	Classification
1	pH	<4.5 Extremely acidic 4.51-5.00 Very strongly acidic 5.00-5.50 slightly acidic 5.51-6.0 moderately acidic 6.01-6.50 slightly acidic 6.51-7.30 Neutral 7.31-7.80 slightly alkaline 7.81-8.50 moderately alkaline 8.51-9.0 strongly alkaline 9.01 very strongly alkaline
2	Salinity Electrical Conductivity (mmhos/cm) (1 ppm = 640 mhos/cm)	Up to 1.00 Average 1.01-2.00 harmful to germination 2.01-3.00 harmful to crops (sensitive to salts)
3	Organic Carbon	Up to 0.2: very less 0.21-0.4: less 0.41-0.5 medium, 0.51-0.8: on an average sufficient 0.81-1.00: sufficient >1.0 more than sufficient
4	Nitrogen (kg/ha)	Up to 50 very less 51-100 less 101-150 good 151-300 Better >300 sufficient
5	Phosphorus (kg/ha)	Up to 15 very less 16-30 less 31-50 medium, 51-65 on an average sufficient 66-80 sufficient >80 more than sufficient
6	Potash (kg/ha)	0-120 very less 120-180 less 181-240 medium 241-300 average 301-360 better >360 more than sufficient

Source: Handbook of agriculture, Indian Council of Agricultural Research, New Delhi, India

5.3.7.1.1 Analysis of Soil Quality Monitoring

The analysis of the soil quality assessment has been provided below.

- ***pH*:** The pH value of the three soil samples were found to be 8.42 (S1), 7.86 (S2) and 8.16 (S3). As per the standard soil classification, S1, S2 and S3 are moderately alkaline.
- ***Texture:*** The texture of all the soil samples were found to be loam and loamy sand in nature with low concentrations of clay and silt having low water retention capacity and poor fertility.
- ***Electrical Conductivity (EC):*** EC is used to estimate the concentration of nutrients in soil. The electrical conductivity of S1, S2 and S3 was found to be 186 µs/cm, 786 µs/cm and 391 µs/cm respectively. This indicates low concentration of nutrients in the soil samples S1 and S3 whereas the value of S2 indicates the harmful nature for germination. The values within 1 ppm = 640 mhos/cm is an average value as per soil classification standards from Indian Council of Agricultural Research, whereas above 640 mhos/cm, the soil becomes harmful to germination. Hence, the samples S1 and S3 are within 640 mhos/cm and the sample S2 exceeds the average value.
- ***Metals:*** Iron, copper and zinc are important soil micronutrients considered essential for the normal growth of plants. Deficiencies of micronutrient drastically affect plant growth and metabolism. The concentration of copper in the soil samples were found to be 41 mg/kg, 29 mg/kg and 58 mg/kg. The level of zinc in the soil samples were found to be 29 mg/kg (S1), 25 mg/kg (S2) and 40 mg/kg (S3) .

5.3.8 Ambient Air Quality

5.3.8.1 Secondary Air Quality Data

Gujarat Pollution Control Board is monitoring ambient air quality at 62 strategic locations in the state of the Gujarat under the Ambient Air Quality Monitoring programme (AAQM) as well as National Air Quality Monitoring Programme (NAMP) including Rajkot. The ambient air quality samples are collected as per the standard norms for ambient air quality monitoring. The parameters determined during analysis include SO2, NOx, O-3, NH3, CO, PM10, PM2.5, LEAD, ARSENIC, NICKEL, BENZENE and BENZO-A-PYRENE. Of all the locations, three locations were observed to be present within 15 km radius of the project and the data pertaining to the locations for the year 2014-15 were reviewed and has been presented ***Table 5-13*** below:

Table 5-13 Average Yearly data of Air Quality Monitoring (2014-15)

Location	Distance from Project Site (km)	PM 10 µg/m3	PM 2.5 µg/m3	SO2 µg/m3	Nox µg/m3	O3 µg/m3	NH3 µg/m3	CO mg/m3	Pb µg/m3	As ng/m3	Ni ng/m3	Benzene µg/m3	Benzo-a-pyrene ng/m3
Nr. Sardara Corp. Amul Ind. Ltd. (SAMP)	11km	89	32	13.3	20.3	10.6	10.5	1.41	0.09	<1.0	1.6	1.5	<0.5
GPCB OFFICE (SAMP)	12 km	82	31	12.3	19	11	9.5	1.33	0.09	<1.0	1.3	1.3	<0.5
Fire Brigade Station (NAMP)	14 km	85	31	13.2	19.8	11.1	9.7	1.39	0.1	< 1.0	1.5	1.4	< 0.5
National Ambient Air Standards (Annual)	--	60	40	50	40	100	100	2	0.5	6	20	5	1

Source: https://gpcb.gujarat.gov.in/webcontroller/page/ambient-air-quality-monitoring-programmes

* All parameters are expressed in µg/m^3

As per the above results presented by Gujarat Pollution Control Board, the PM10 is exceeding the permissible standards of 60 $\mu g/m^3$. All other air parameters are within the prescribed permissible limits.

5.3.8.2 Ambient Air Quality Monitoring

Existing ambient air quality of the study area was monitored. at four (04) locations twice a week for four weeks Air quality samples were collected by NABL accredited lab by installation of air quality monitoring device. under the supervision of E&S Advisors. The monitoring parameters, including Respirable Particulate Matter (RPM) i.e. PM_{10} (particulate matter of particle size less than 10 micrometers) and $PM_{2.5}$ (particulate matter of particle size less than 2.5 micrometers), Sulphur Dioxide (SO_2), Oxides of Nitrogen (NO_X) and Carbon Monoxide (CO), Cadmium, Lead, Mercury (Hg), Nickel (Ni), Arsenic (Ar), Hydrogen Fluoride (HF), Hydrochloric Acid (HCL) and Dioxin and Furan . All the parameters were monitored on 24 hourly basis, while CO was monitored on 8 hourly basis- twice a week for four weeks in the study area, except dioxin and furan which were monitored twice within the plant premises.

The locations of the ambient air quality monitoring has been presented in ***Table 5-1*** and results of the air quality monitoring has been presented in ***Table 5-14 and*** Table 5-15. And the below Figure 5-19 shows the air quality monitoring analysis graphs. Map showing monitoring locations has been presented in ***Figure 5-2.*** Detailed monitoring results have been presented as ***Appendix 17***.

Figure 5-18 Ambient Air Quality Monitoring conducted in Study Area

AAQ 1 Location

AAQ 2 Location

	
AAQ 3 Location	AAQ 4 Location

Table 5-14 Results of Ambient Air Quality Monitoring

Monitoring Location	Date of Monitoring	Sample No	PM 10	PM 2.5	SO2	NOx	CO	Cadmium as Cd	Lead (Pb)	Mercury (Hg)	Nickel (as Ni)	Arsenic as	Hydrogen fluoride (HF)	Hydrochloric Acid (HCl)
AAQ-1	23.05.2023 to 24.05.2023	Sample 1	421.6	123.9	12.6	24.2	0.85	<0.01	0.12	<0.002	8.5	<1.0	<0.01	2.23
	25.05.2023 to 26.05.2023	Sample 2	335.3	105.1	9.6	32.3	0.65	<0.01	0.08	<0.002	6.9	<1.0	<0.01	2.52
	30.05.2023 to 31.05.2023	Sample 3	410.4	154.2	8.5	24.8	0.81	<0.01	0.1	<0.002	8.2	<1.0	<0.01	7.58
	01.06.2023 to 02.06.2023	Sample 4	361.8	141.3	11.5	23.6	0.74	<0.01	0.1	<0.002	7.5	<1.0	<0.01	2.03
	06.06.2023 to 07.06.2023	Sample 5	182.0	97.9	<6.0	21.2	0.68	<0.01	0.06	<0.002	5.9	<1.0	<0.01	2.07
	08.06.2023 to 09.06.2023	Sample 6	174.5	86.7	10.3	19.4	0.75	<0.01	<0.01	<0.002	<5.0	<1.0	<0.01	2.43
	13.06.2023 to 14.06.2023	Sample 7	125.8	78.8	<6.0	26.6	0.67	<0.01	<0.01	<0.002	<5.0	<1.0	<0.01	<0.01
	15.06.2023 to16.06.2023	Sample 8	267.6	139.6	9.7	31.5	0.63	<0.01	0.05	<0.002	5.8	<1.0	<0.01	<0.01
	Values for AAQ-1	**Min**	**125.8**	**78.8**	**8.5**	**19.4**	**0.6**	**0.0**	**0.1**	**0.0**	**5.8**	**0.0**	**0.0**	**2.0**
		Max	**421.6**	**154.2**	**12.6**	**32.3**	**0.9**	**0.0**	**0.1**	**0.0**	**8.5**	**0.0**	**0.0**	**7.6**
		Average	**284.9**	**115.9**	**10.4**	**25.5**	**0.7**	**0.0**	**0.1**	**0.0**	**7.1**	**0.0**	**0.0**	**3.1**
		98 Percentile	**420.1**	**152.4**	**12.5**	**32.2**	**0.8**	**0.0**	**0.1**	**0.0**	**8.5**	**0.0**	**0.0**	**7.1**
AAQ-2	22.05.2023 to 23.05.2023	Sample 1	96.6	51.8	<6.0	27.3	0.52	<0.01	<0.01	<0.002	<5.0	<1.0	<0.01	7.48
	26.05.2023 to 27.05.2023	Sample 2	156.4	92.5	<6.0	23.6	0.64	<0.01	0.04	<0.002	<5.0	<1.0	<0.01	1.76
	29.05.2023 to 30.05.2023	Sample 3	181.4	97.9	9.7	19.4	0.48	<0.01	0.07	<0.002	6.3	<1.0	<0.01	<0.01

Monitoring Location	Date of Monitoring	Sample No	PM 10	PM 2.5	SO2	NOx	CO	Cadmium as Cd	Lead (Pb)	Mercury (Hg)	Nickel (as Ni)	Arsenic as	Hydrogen fluoride (HF)	Hydrochloric Acid (HCl)
	02.06.2023 to 03.06.2023	Sample 4	233.5	87.9	8.5	32.7	0.59	<0.01	0.08	<0.002	6.8	<1.0	<0.01	<0.01
	05.06.2023 to 06.06.2023	Sample 5	87.8	49.6	<6.0	29.6	0.67	<0.01	<0.01	<0.002	<5.0	<1.0	<0.01	<0.01
	09.06.2023 to 10.06.2023	Sample 6	96.6	56.7	<6.0	16.3	0.75	<0.01	<0.01	<0.002	<5.0	<1.0	<0.01	2.48
	12.06.2023 to 13.06.2023	Sample 7	58.9	30.4	10.3	25.4	0.69	<0.01	<0.01	<0.002	<5.0	<1.0	<0.01	2.27
	16.06.2023 to17.06.2023	Sample 8	62.6	29.6	<6.0	19.4	0.45	<0.01	<0.01	<0.002	<5.0	<1.0	<0.01	<0.01
	Values for AAQ-2	**Min**	**58.90**	**29.59**	**8.46**	**16.33**	**0.45**	**0.0**	**0.04**	**0.0**	**6.30**	**0.0**	**0.0**	**1.76**
		Max	**233.50**	**97.94**	**10.28**	**32.66**	**0.75**	**0.0**	**0.08**	**0.0**	**6.80**	**0.0**	**0.0**	**7.48**
		Average	**121.72**	**62.05**	**9.47**	**24.21**	**0.60**	**0.0**	**0.06**	**0.0**	**6.55**	**0.0**	**0.0**	**3.50**
		98 Percentile	**226.21**	**97.18**	**10.26**	**32.24**	**0.74**	**0.0**	**0.08**	**0.0**	**6.79**	**0.0**	**0.0**	**7.18**
AAQ-3	22.05.2023 to 23.05.2023	Sample 1	154.6	84.7	<6.0	26.7	0.36	<0.01	0.05	<0.002	5.5	<1.0	<0.01	<0.01
	26.05.2023 to 27.05.2023	Sample 2	92.5	51.3	8.5	23.0	0.45	<0.01	<0.01	<0.002	<5.0	<1.0	<0.01	<0.01
	29.05.2023 to 30.05.2023	Sample 3	129.4	57.5	<6.0	19.4	0.58	<0.01	0.04	<0.002	<5.0	<1.0	<0.01	1.97
	02.06.2023 to 03.06.2023	Sample 4	69.6	35.4	9.7	26.6	0.47	<0.01	<0.01	<0.002	<5.0	<1.0	<0.01	<0.01
	05.06.2023 to 06.06.2023	Sample 5	48.3	24.6	10.3	24.2	0.72	<0.01	<0.01	<0.002	<5.0	<1.0	<0.01	<0.01
	09.06.2023 to 10.06.2023	Sample 6	65.5	33.8	<6.0	19.4	0.68	<0.01	<0.01	<0.002	<5.0	<1.0	<0.01	<0.01
	12.06.2023 to 13.06.2023	Sample 7	59.4	29.6	11.3	20.0	0.55	<0.01	<0.01	<0.002	<5.0	<1.0	<0.01	<0.01

Monitoring Location	Date of Monitoring	Sample No	PM 10	PM 2.5	SO2	NOx	CO	Cadmium as Cd	Lead (Pb)	Mercury (Hg)	Nickel (as Ni)	Arsenic as	Hydrogen fluoride (HF)	Hydrochloric Acid (HCl)
	16.06.2023 to17.06.2023	Sample 8	62.6	34.6	<6.0	21.8	0.49	<0.01	<0.01	<0.002	<5.0	<1.0	<0.01	<0.01
	Values for AAQ-3	**Min**	48.3	24.6	8.5	19.4	0.4	0.0	0.0	0.0	5.5	0.0	0.0	2.0
		Max	154.6	84.7	11.3	26.7	0.7	0.0	0.1	0.0	5.5	0.0	0.0	2.0
		Average	85.2	43.9	9.9	22.6	0.5	0.0	0.0	0.0	5.5	0.0	0.0	2.0
		98 Percentile	151.04	80.85	11.22	26.69	0.71	0.0	0.05	0.0	5.50	0.0	0.0	1.97
AAQ-4	23.05.2023 to 24.05.2023	Sample 1	68.5	34.6	<6.0	23.6	0.52	<0.01	<0.01	<0.002	<5.0	<1.0	<0.01	<0.01
	25.05.2023 to 26.05.2023	Sample 2	62.2	30.5	<6.0	19.9	0.48	<0.01	<0.01	<0.002	<5.0	<1.0	<0.01	<0.01
	30.05.2023 to 31.05.2023	Sample 3	44.7	16.7	8.5	31.5	0.32	<0.01	<0.01	<0.002	<5.0	<1.0	<0.01	<0.01
	01.06.2023 to 02.06.2023	Sample 4	83.0	48.4	9.1	22.4	0.56	<0.01	0.1	<0.002	7.9	<1.0	<0.01	<0.01
	06.06.2023 to 07.06.2023	Sample 5	57.8	31.3	<6.0	26.0	0.36	<0.01	<0.01	<0.002	<5.0	<1.0	<0.01	1.87
	08.06.2023 to 09.06.2023	Sample 6	85.5	51.7	<6.0	24.8	0.54	<0.01	<0.01	<0.002	<5.0	<1.0	<0.01	1.98
	13.06.2023 to 14.06.2023	Sample 7	75.5	38.3	10.3	20.6	0.69	<0.01	<0.01	<0.002	<5.0	<1.0	<0.01	<0.01
	15.06.2023 to16.06.2023	Sample 8	62.2	30.4	<6.0	19.4	0.51	<0.01	<0.01	<0.002	<5.0	<1.0	<0.01	<0.01
	Values for AAQ-4	**Min**	**44.7**	**16.7**	**8.5**	**19.4**	**0.3**	**0.0**	**0.1**	**0.0**	**7.9**	**0.0**	**0.0**	**1.9**
		Max	**85.5**	**51.7**	**10.3**	**31.5**	**0.7**	**0.0**	**0.1**	**0.0**	**7.9**	**0.0**	**0.0**	**2.0**
		Average	**67.4**	**35.2**	**9.3**	**23.5**	**0.5**	**0.0**	**0.1**	**0.0**	**7.9**	**0.0**	**0.0**	**1.9**
		98 Percentile	**85.15**	**51.21**	**10.23**	**30.69**	**0.67**	**0.0**	**0.10**	**0.0**	**7.90**	**0.0**	**0.0**	**1.98**

Monitoring Location	Date of Monitoring	Sample No	PM 10	PM 2.5	SO2	NOx	CO	Cadmium as Cd	Lead (Pb)	Mercury (Hg)	Nickel (as Ni)	Arsenic as	Hydrogen fluoride (HF)	Hydrochloric Acid (HCl)
	--	NAAQS, Standards (24 hours)	100	60	80	80	02 (8 hours)	--	1	--	20 (Annual)	6 (Annual)	--	--
	--	WBG EHS (24 hours)	150 (Interim target-1) 100 (Interim target-2) 75 (Interim target-3) 50 (WBG EHS guideline)	75 (Interim target-1) 50 (Interim target-2) 37.5 (Interim target-3) 25 (WBG EHS guideline)	125 (Interim target-1) 50 (Interim target-2) 20 (WBG EHS guideline)	1 year: 40 (WBG EHS guideline) 1 hour: 200 (WBG EHS guideline)	--	--	--	--	--	--	--	--

Table 5-15 Results of Dioxin and Furan in the study Area

Parameter	Units	Method	D&F1	D&F 2	SWM Rules, 2016 (Stack Monitoring)	WBG EHS guidelines for Waste Management facilities (Stack Monitoring)
Dioxin						
--	--	--	Ambient Temp:29°C Wind Direction: SW Date: 17.06.2023	Ambient Temp:29°C Wind Direction: SW Date: 18.06.2023	--	0.1
1 2 3 4 6 7 8-Heptachlorodibenzo-p-dioxin	ng.TEQ/N m³	Method TO-9A /QA.16.4.73	<0.00024	<0.00024	0.1	
1 2 3 4 7 8-Hexachlorodibenzo-p-dioxin	ng.TEQ/N m³	Method TO-9A /QA.16.4.73	<0.0024	<0.0024	0.1	
1 2 3 7 8 9-Hexachlorodibenzo-p-dioxin	ng.TEQ/N m³	Method TO-9A /QA.16.4.73	<0.0024	<0.0024	0.1	
1 2 3 7 8-Pentachlorodibenzo-p-dioxin	ng.TEQ/N m³	Method TO-9A /QA.16.4.73	<0.024	<0.024	0.1	

Parameter	Units	Method	D&F1	D&F 2	SWM Rules, 2016 (Stack Monitoring)	WBG EHS guidelines for Waste Management facilities (Stack Monitoring)
1 2 3 7 8-Pentachlorodibenzo-p-dioxin	**ng.TEQ/N m³**	Method TO-9A /QA.16.4.73	<0.005	<0.005	0.1	
1 2 3 6 7 8-Hexachlorodibenzo-p-dioxin	**ng.TEQ/N m³**	Method TO-9A /QA.16.4.73	<0.0024	<0.0024	0.1	
Octachlorodibenzo-p-dioxin	**ng.TEQ/N m³**		<0.000015	<0.000015	0.1	
Furan						
2 3 4 7 8-Pentachlorodibenzofuran	ng.TEQ/N m³	Method TO-9A /QA.16.4.73	<0.0072	<0.0072	0.1	0.1
1 2 3 4 6 7 8-Heptachlorodibenzofuran	ng.TEQ/N m³	Method TO-9A /QA.16.4.73	<0.00024	<0.00024	0.1	
1 2 3 4 7 8 9-Heptachlorodibenzofuran	ng.TEQ/N m³	Method TO-9A /QA.16.4.73	<0.00024	<0.00024	0.1	
1 2 3 4 7 8-Hexachlorodibenzofuran	ng.TEQ/N m³	Method TO-9A /QA.16.4.73	<0.0024	<0.0024	0.1	
1 2 3 6 7 8-Hexachlorodibenzofuran	ng.TEQ/N m³	Method TO-9A /QA.16.4.73	<0.0024	<0.0024	0.1	
1 2 3 7 8 9-Hexachlorodibenzofuran	ng.TEQ/N m³	Method TO-9A /QA.16.4.73	<0.0024	<0.0024	0.1	
1 2 3 7 8-Pentachlorodibenzofuran	ng.TEQ/N m³	Method TO-9A /QA.16.4.73	<0.00072	<0.00072	0.1	
2 3 4 6 7 8-Hexachlorodibenzofuran	ng.TEQ/N m³	Method TO-9A /QA.16.4.73	<0.0024	<0.0024	0.1	
2 3 7 8-Tetrachlorodibenzofuran	ng.TEQ/N m³	Method TO-9A /QA.16.4.73	<0.0005	<0.0005	0.1	
Octachlorodibenzofuran	ng.TEQ/N m³	Method TO-9A /QA.16.4.73	<0.000015	<0.000015	0.1	
Total Dioxins & Furans	ng.TEQ/N m³	Method TO-9A /QA.16.4.73	<0.01	<0.01	0.1	

Source: NABL Accredited Lab

5.3.8.2.1 Analysis of Ambient Air Quality Monitoring

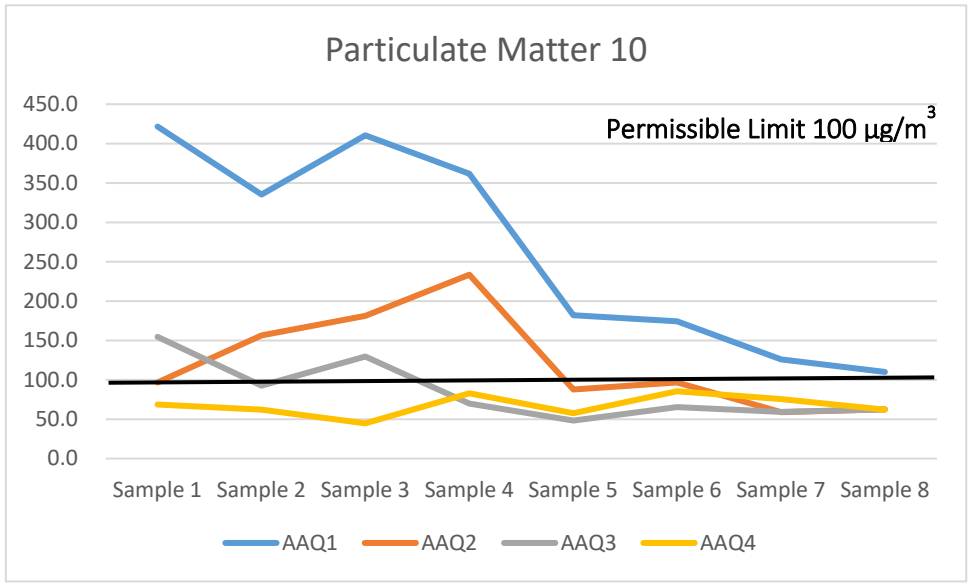
As per the above results, parameters such as Sulphur Dioxide (SO_2), Oxides of Nitrogen (NO_X) and Carbon Monoxide (CO), Cadmium, Lead, Mercury (Hg), Nickel (Ni), Arsenic (Ar), Hydrogen Fluoride (HF), Hydrochloric Acid (HCL) were found to be within NAAQS CPCB permissible limits as well as WBG EHS guidelines, whereas exceedance was observed for PM 10 and PM 2.5 values, where the 24 hours sample values were found to be exceeding the NAAQS as well as WBG Interim target-1 and 2.

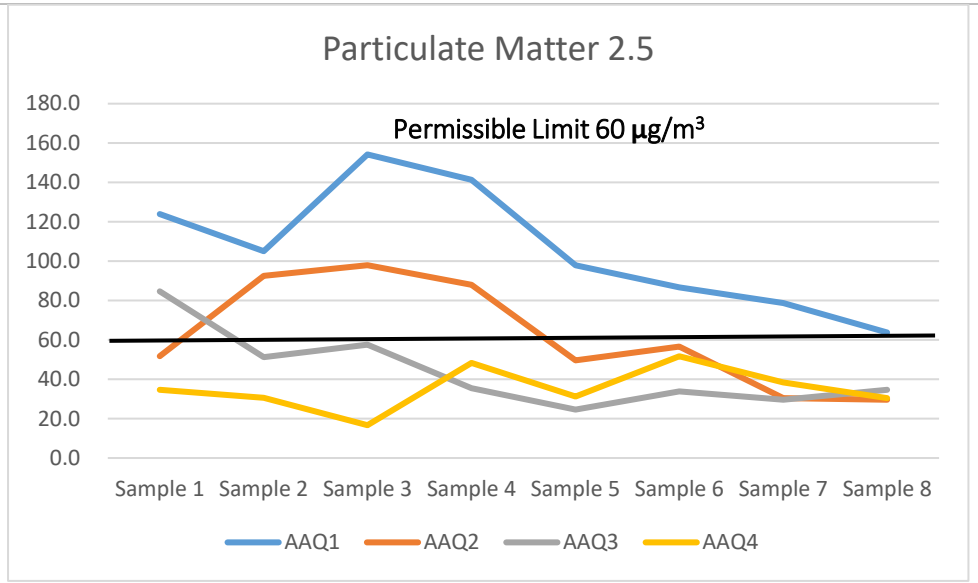
	PM10	PM 2.5
AAQ-1	All samples are exceeding the NAAQS as well as WBG Interim Target-1	All samples are exceeding the NAAQS as well as WBG EHS Interim Target-1
AAQ-2	3 samples are exceeding the NAAQS as well as WBG EHS Interim Target-1	3 samples are exceeding the NAAQS standards. All 8 samples are exceeding WBG EHS Guideline values, of which threes samples are exceeding Interim target-1, two samples are exceeding Interim target-2 and 1 sample is exceeding WBG EHS Interim Target-3.
AAQ-3	2 samples are exceeding the NAAQS standard, of which one sample is exceeding the WBG EHS Interim Target-2 and the second sample is exceeding Interim target-1 as well	1 sample is exceeding the NAAQS standard and 7 samples are exceeding the WBG EHS guideline values of which three samples are exceeding the WBG EHS Interim Target-3 and 2 as well. Only 1 sample is exceeding WBG EHS Interim Target-1.
AAQ-4	All samples well within the NAAQS standards however 4 samples are exceeding WBG EHS guidelines and three samples are exceeding the Interim target-3 and WBG EHS guideline values	All samples well within the NAAQS standards however 4 samples are exceeding WBG EHS guidelines and three samples are exceeding the Interim target-3 and WBG EHS guideline values

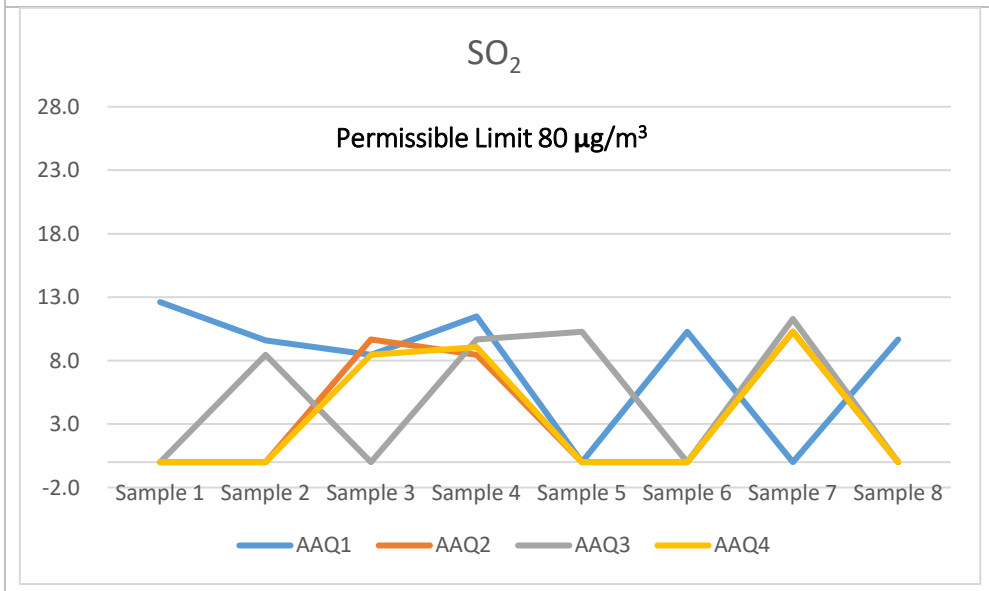
The exceedance in the values for PM10 and PM2.5 for AAQ-1 can be attributed to ongoing construction activities (landscape area development, transportation and installation of equipment, etc.), bio-mining activities being undertaken adjacent to the site, waste dumping, waste transportation, presence of dirt roads in the area and other activities along with the moderate wind speeds in that area during the monitoring period. Also, exceedance in the values of AAQ-2, AAQ-3 and AAQ-4 can be attributed to moderate wind speeds in the regions along with presence of scrub lands in the area along with presence of dirt roads in area used by all the vehicles leading to increase in the PM 10 and PM2.5 Values. Referring to the secondary air quality data (refer ***section 5.3.8.1***), the values for PM10 are also exceeding the NAAQS values. Presence of Dioxin and Furan is well within permissible limit.

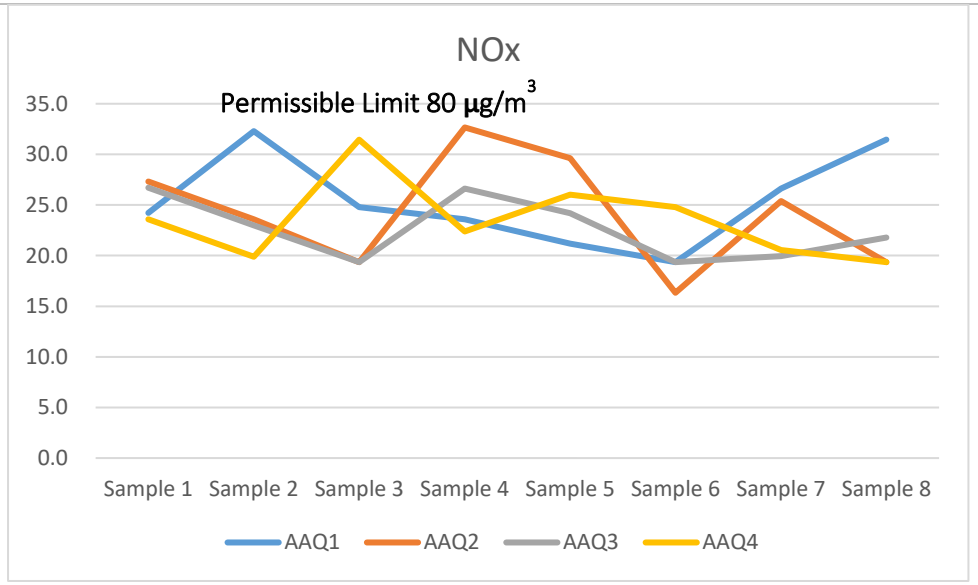
As understood, based on the site visit and the secondary data, there is exceedance in the PM 10 and PM 2.5 values for NAAQS as well as WBG EHS guidelines, Therefore, the airshed can be considered as degraded for 24 hour mean and annual mean PM10 and PM2.5 levels as per WBG EHS guidelines.

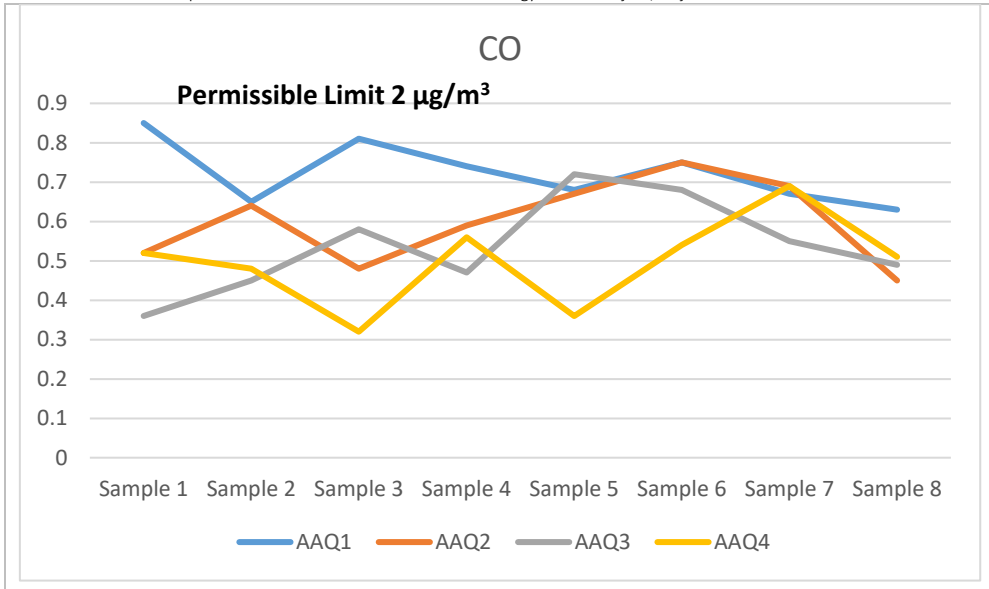
Figure 5-19 Air Quality Analysis Graph

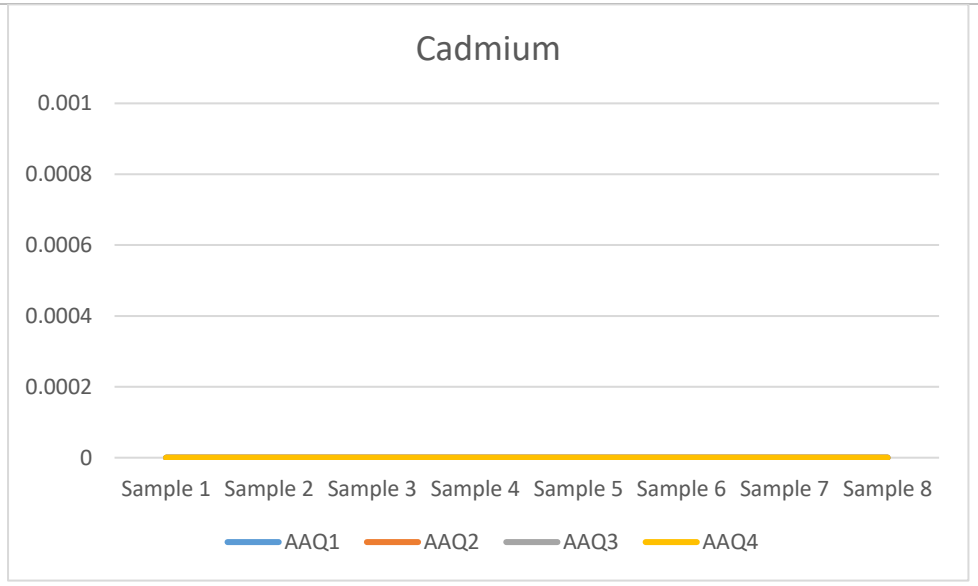


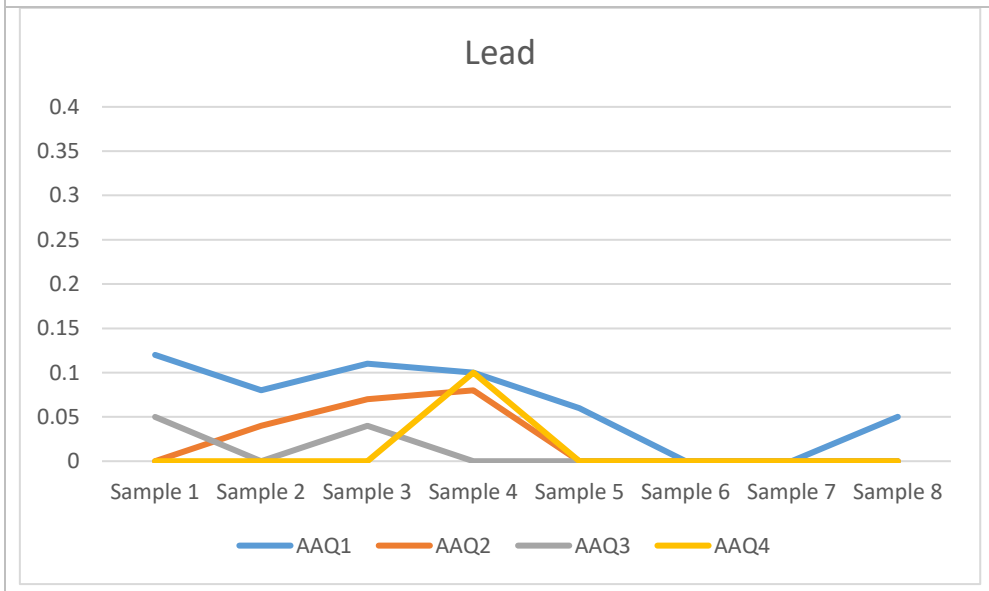


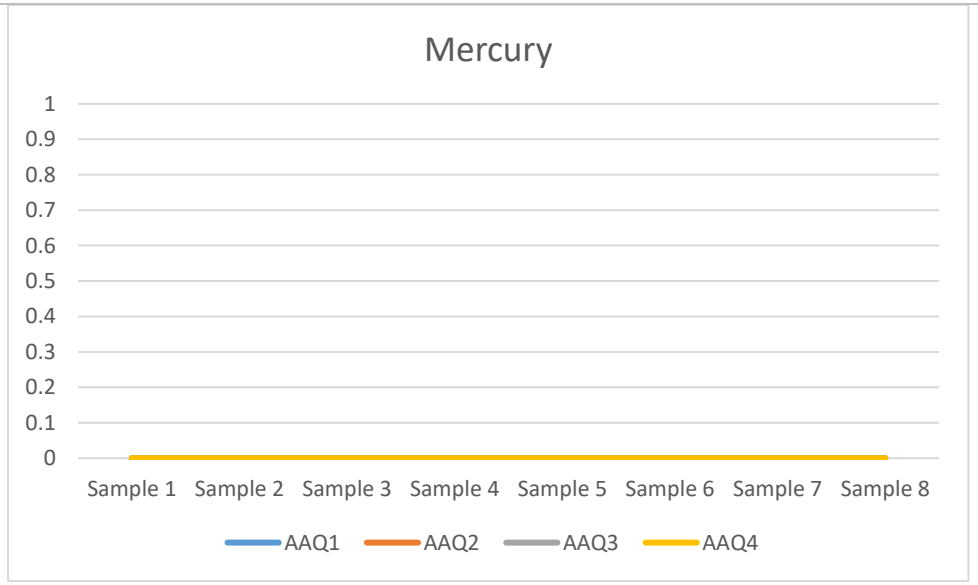


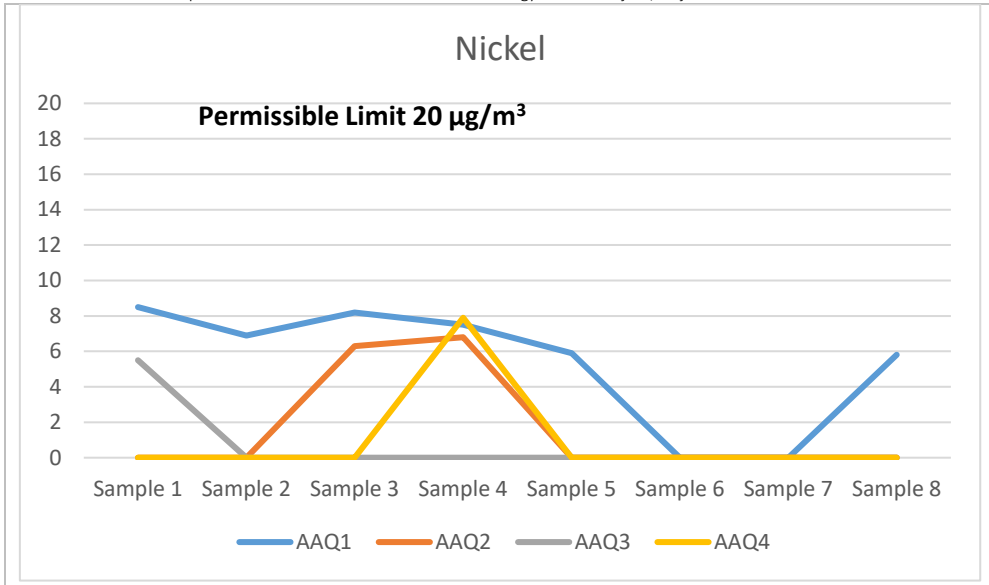


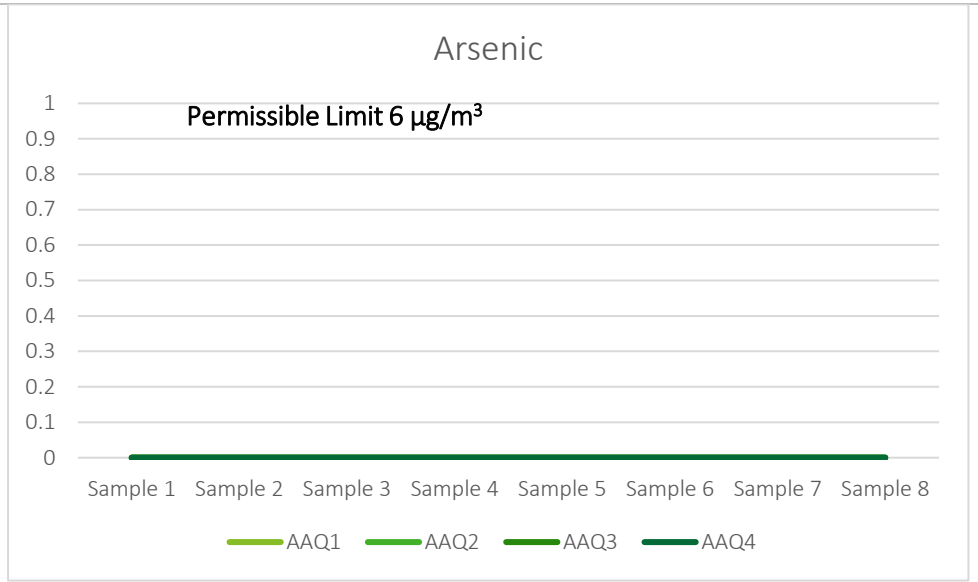


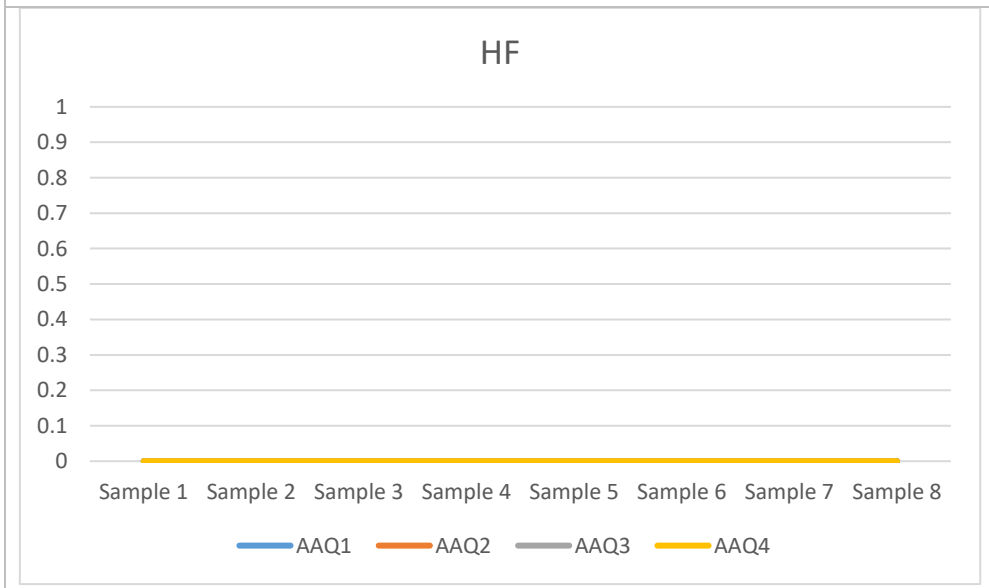


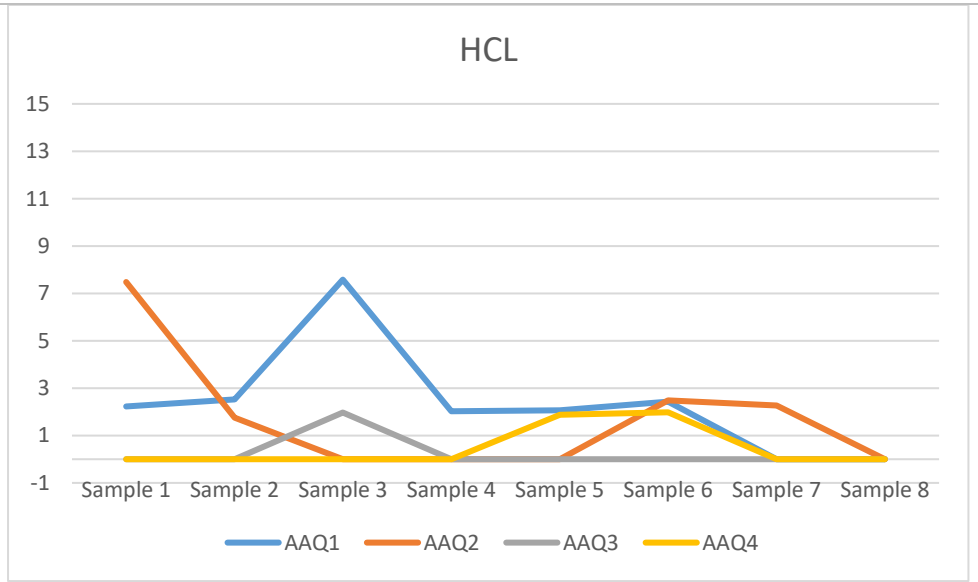












Source: NABL Accredited Lab

5.3.9 Noise Quality Assessment

Noise levels were recorded at four locations once during the study period with the aid of a digital noise level meter. Noise levels were recorded for 48 hours, and the noise quality has been reported as Leqday and Leqnight for each of the locations. Daytime is considered from 0600 to 2200 hours and night from 2200 to 0600 hours. The details of noise monitoring locations has been presented in ***Table 5-1*** and the results of the ambient noise monitoring has been presented in ***Table 5-16.*** Map showing monitoring locations has been presented in **Figure 5-2.** Detailed monitoring results have been presented as ***Appendix 17***.

Figure 5-20 Noise Level monitoring conducted in Study Area

			
N 1 Location	N 2 Location	N3 Location	N4 Location

Table 5-16 Ambient Noise Quality Monitoring in Study Area

S.No.	Sampling ID	Results Leq dB(A)	
		Leq Day	Leq Night
1.	N1 (Industrial Area)	68.15	45
2.	N2 (Residential Area)	53.3	38.15
3.	N3 (Residential Area)	59.8	52.15
4.	N4 (Residential Area)	47.85	43.85
Limit As per CPCB (Environment Protection Rules, 1986)			
Receptor		**Day Time 0600 to 2200 hours**	**Night Time 2200 to 0600 hours**
Industrial Area Leq dB(A)		75	70
Commercial Area Leq dB(A)		65	55
Residential Area Leq dB(A)		55	45
WBG General EHS Guidelines on noise management			
Receptor		**Daytime 07:00 - 22:00**	**Night time 22:00 - 07:00**
Residential; Institutional; Educational		55	45
Industrial, commercial		70	70

Source: Survey conducted by NABL accredited lab in June 2023

The proposed project sampling locations are located in industrial and residential areas respectively, therefore, as per the above results the Leq Day and Leq Night values of N1 which is located in an industrial area was found to be within limits as prescribed by CPCB as well as WBG EHS guidelines, whereas for sample N2 & N4 (both of the locations considered as residential area), N2 and N4 was found to be within the limit prescribed by CPCB. But the values of N3 for Leq day is 59.8 dB(A) and Leq night is 52.15 dB(A) found to be exceeding the limit of 55dB(A) and 45 dB(A) respectively. This can be attributed to the fact that since the monitoring location was near to a school, activities such as morning assembly or anthropogenic activities in the school may have led to increase in noise levels.

5.3.10 Traffic Survey

The primary traffic survey was conducted near the access roads for the Rajkot site. It is understood that the project is using and will continue to use during operation phase as well. Therefore, to understand the existing traffic (up and down) in these roads a primary traffic survey was conducted by a NABL accredited lab for 24 hours. The traffic survey locations have been presented in ***Table 5-1*** and ***Figure 5-21*** and the results of the survey has been presented in ***Table 5-17***. Detailed monitoring results have been presented as ***Appendix 17***.

Figure 5-21 Traffic Survey Monitoring conducted in Study Area

Traffic Survey at T1 Location (Up and Down)

Traffic Survey at T2 Location (Up and Down)

Table 5-17 Traffic Density Monitoring Results in Study Area

S.No.	Motorized Vehicles	Non-Motorized Vehicles	Total Vehicles

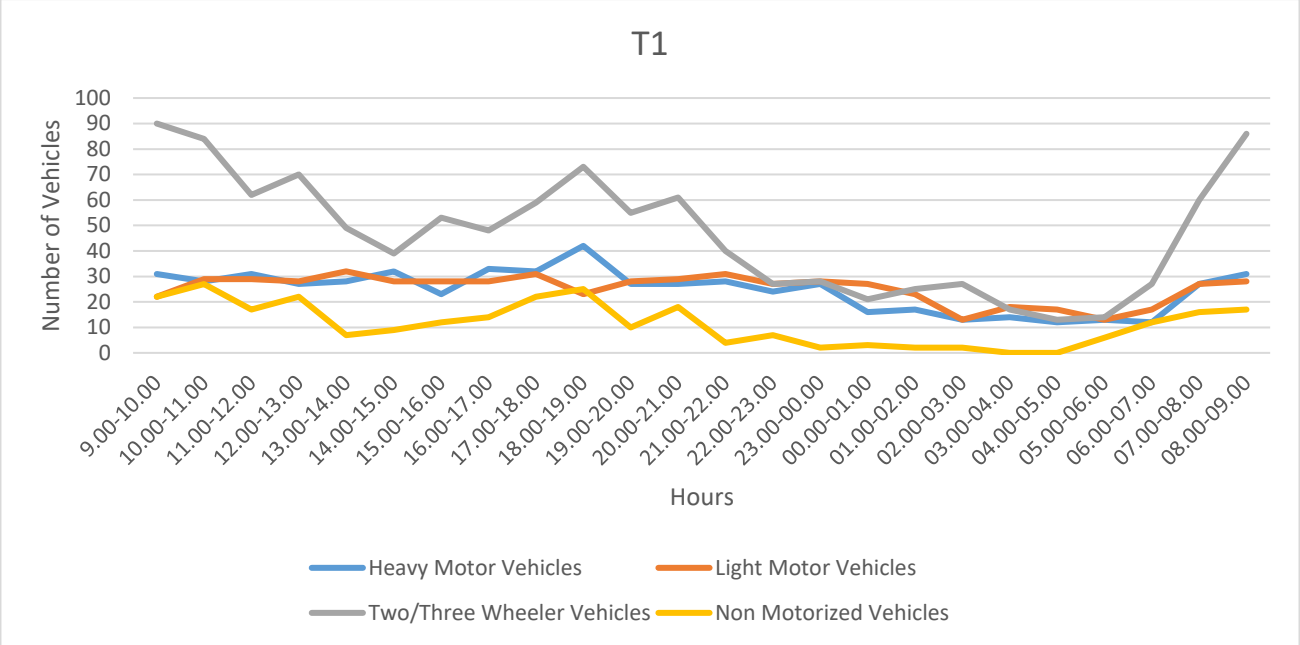
	Heavy Motor Vehicles (Truck, Bus, Dumper, Tanker, Trailer)	Light Motor Vehicles (Car, Jeep, Van, Metador, Tractor, Tempo)	Two/Three Wheelers (Scooter, M. Cycle, Auto, Moped)	Bicycle, Tricycle	
T1 (Up and Down)					
1.	595	604	1128	276	2603
T2 (Up and Down)					
3.	1954	1933	1776	700	6363

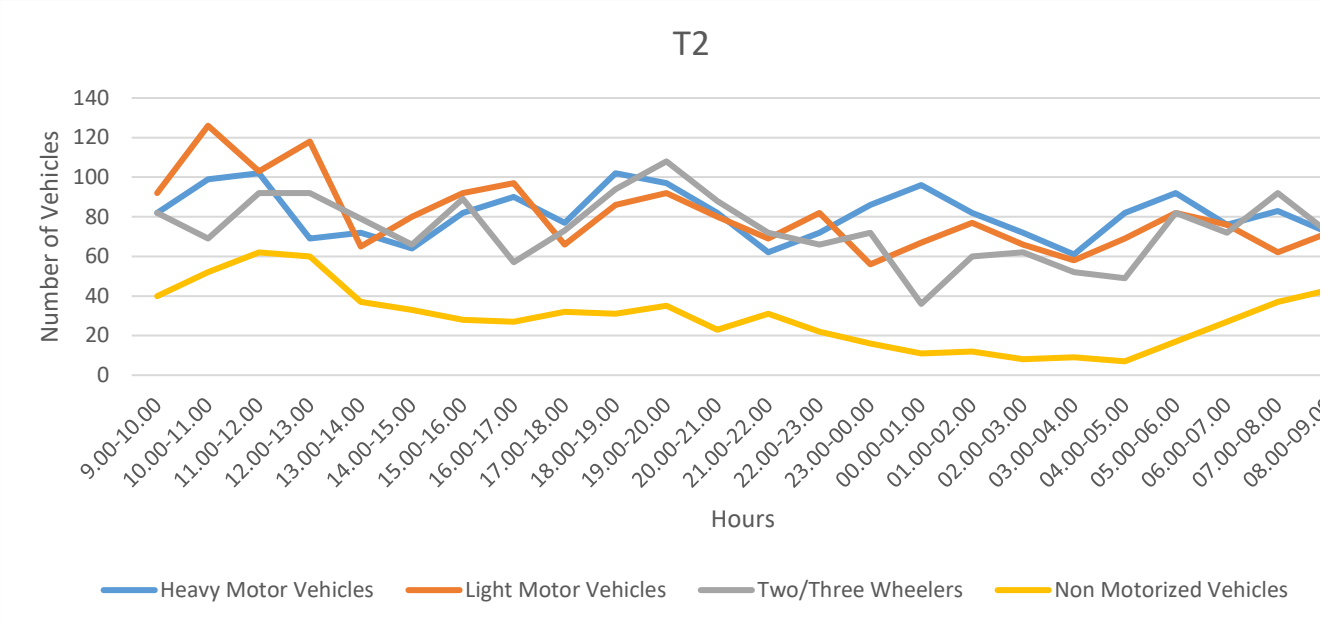
Source: Survey conducted by NABL accredited lab in June 2023

5.3.10.1 Analysis of Traffic Survey

Based on the traffic survey data presented in ***Table 5-17*** and hourly traffic scenario presented in ***Figure 5-22***, it is observed that T2 is busier than T1 with daily traffic accounting for 6363 vehicles. The hourly traffic scenario depicted that the majority of traffic in the T2 road is due to movement of Heavy Motor vehicles travelling up and down the roads followed by light motor vehicles comprising of car, jeep, van, matador, tempo and tractors. The movement of two/three-wheeler vehicles in T1 location paves for majority of the traffic T1 location. The movement of Heavy Motor vehicles contributed towards 30% of the total vehicles deployed whereas two/three-wheeler vehicles contributed to 27% of the total vehicles deployed on T2 location. Similarly, movement of light motor vehicles contributed towards 23%, whereas movement of Heavy Motor vehicles contributed towards 22% of the total vehicles deployed. Detailed traffic density data has been presented below.

Figure 5-22 Hourly Road Traffic Scenario





Source: Survey conducted by NABL accredited lab in June 2023

5.3.11 Natural Hazards

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Building Materials & Technology Promotion Council (BMTPC), Government of India, have published hazard maps of Gujarat. According to the BMTPC, floods, wind and earthquake are the main natural hazards that can cause damage to life and property in Rajkot district, where the Project site falls. Project level details with respect to natural hazards have been presented in below.

Wind/Cyclone: According to the Building Materials & Technology Promotion Council (BMTPC), Government of India, the Project site is located in an area that experiences very high wind velocities Vb= 50 m/s and the zone is classified as very high damage risk zone for cyclones. The below ***Figure 5-23*** presents the wind hazard map which indicates the project area lies in the very high damage risk zone. Most of the coastal areas of the state fall in the high wind velocity zone.

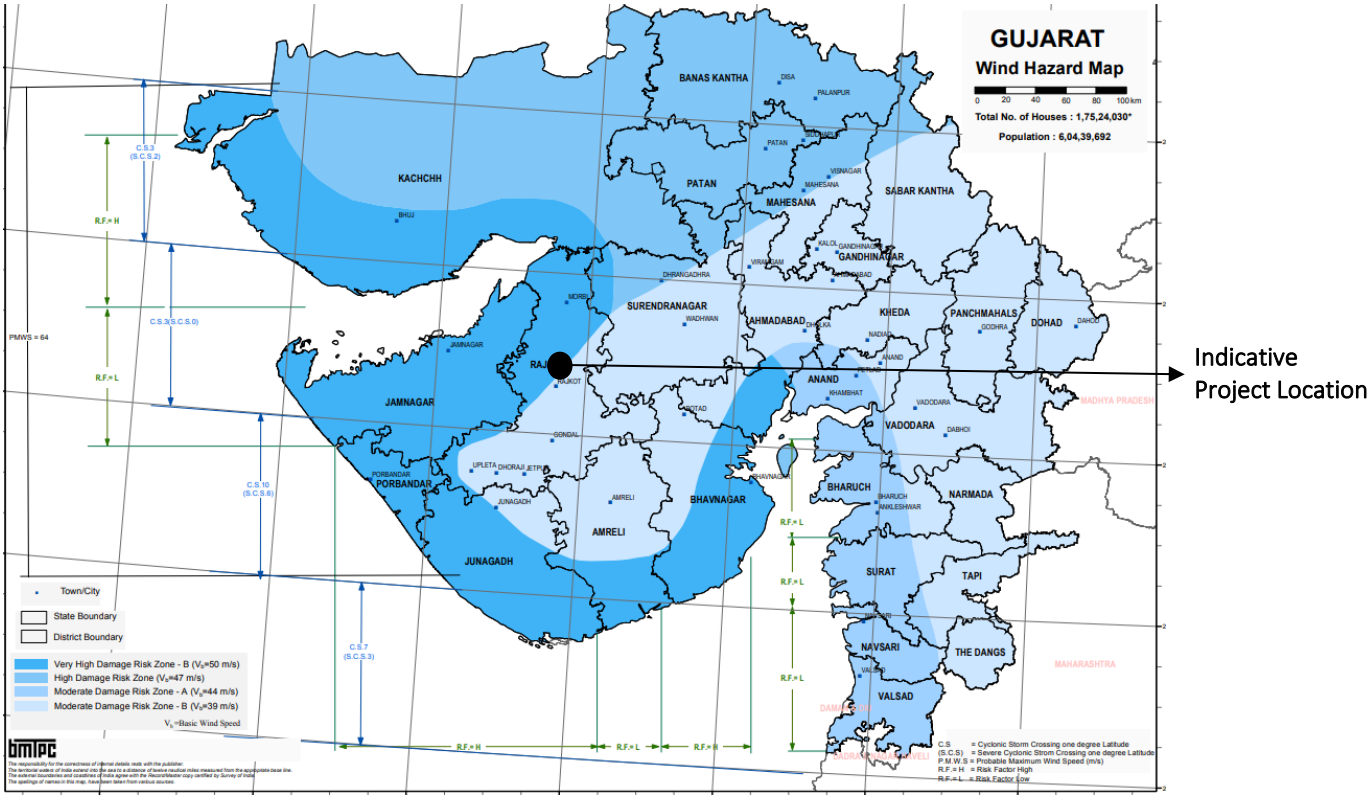
The state has faced 11 severe cyclonic storms. During the cyclone of 1998 there have been incidences of 8 metres height. A large proportion of the buildings in the state run the risk of Moderate to Very high risk from high velocity winds among which Rajkot is one of the region which fall in the high risk zone with cyclones partly or fully.

Floods: According to the Building Materials & Technology Promotion Council (BMTPC), Government of India, the Project site falls in an area which is not prone to flooding incidents. The below ***Figure 5-24*** presents the flood prone map showing the project area does not lie in the flood prone zone. According to the Floods Challenges and its Management Case Study of Gujarat Floods – 2017, the river Machhu originates from the hill ranges of Jasdan Sardar and Mandva in Rajkot district and flows mostly towards North in Rajkot district. Most of the Machhu drains are present in the Rajkot region. And hence the district is moderately prone to floods.

Earthquake: According to the Building Materials & Technology Promotion Council (BMTPC), Government of India, the Project is located in an area that is designated as Zone III that corresponds to MSK VII. This is classified as a moderate risk zone in terms of earthquake occurrence. The earthquake map in shown ***Figure 5-25.***

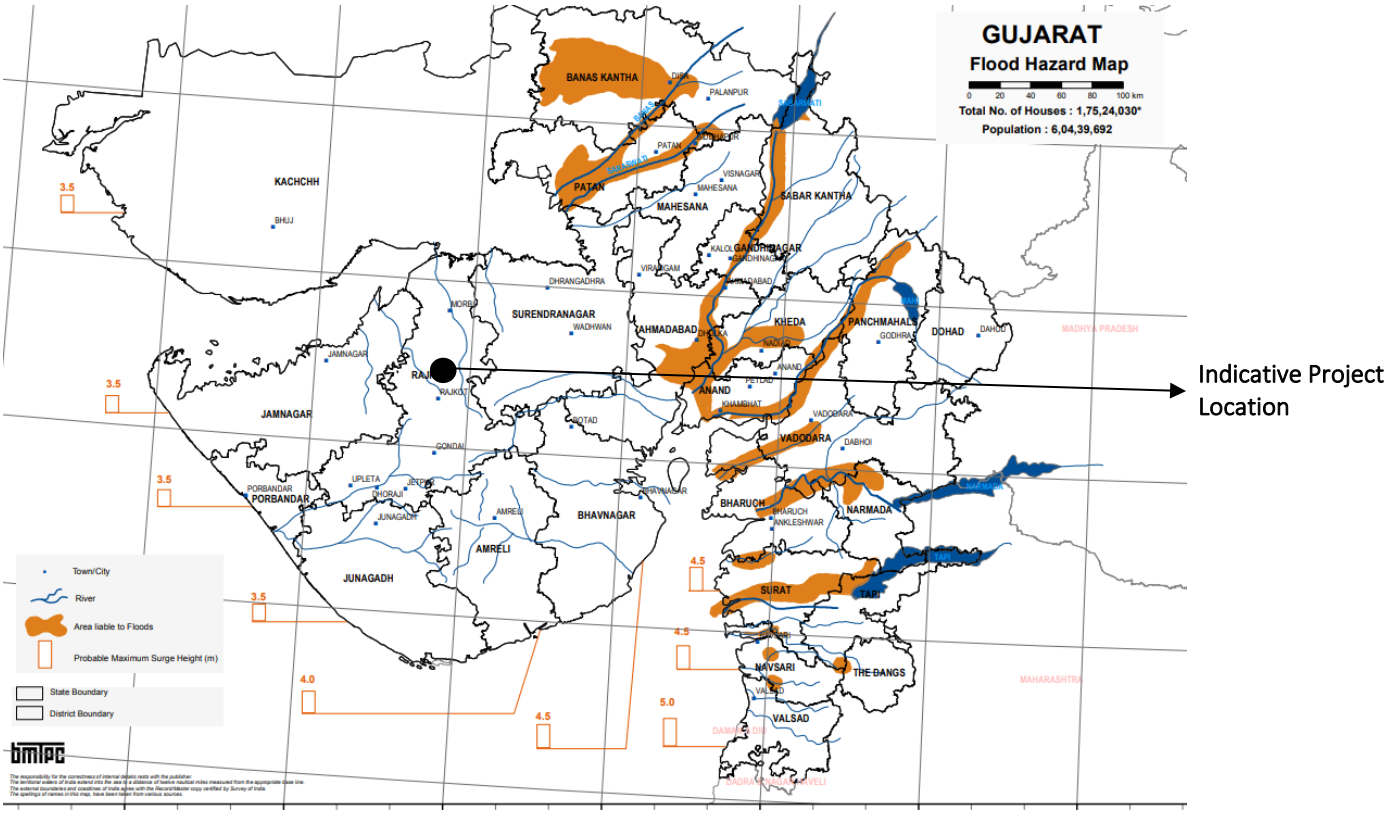
Tsunami: Gujarat is prone to Tsunami risk due to its longest coastline and probability of occurrence of near and offshore submarine earthquakes in the Arabian sea. Since, the Rajkot district is also present in the coastal region of the state, the district is Tsunami prone area.

Figure 5-23 Map showing Wind Hazard of the Gujarat State



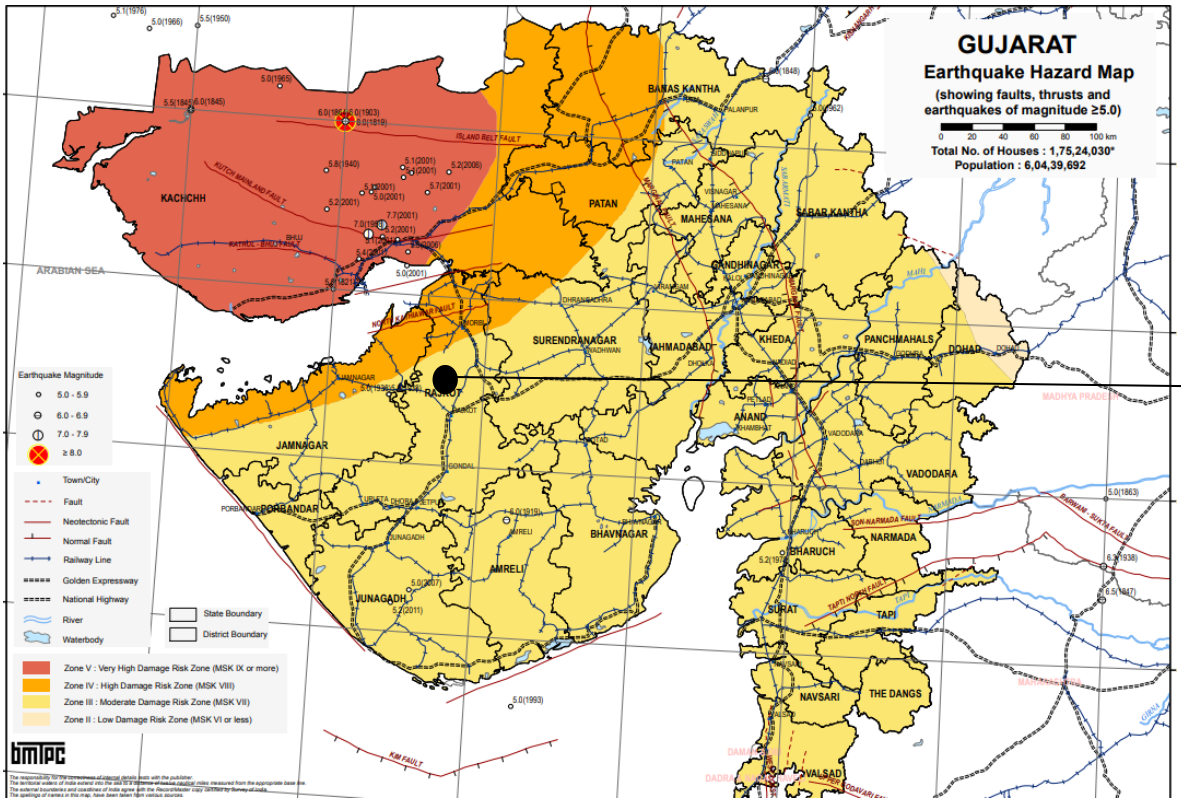
Source: The Building Materials & Technology Promotion Council (BMTPC)

Figure 5-24 Map showing Flood Prone Areas



Source: The Building Materials & Technology Promotion Council (BMTPC)

Figure 5-25 Map showing Earthquake Hazard of the Gujarat State



Source: The Building Materials & Technology Promotion Council (BMTPC)

5.4 Socio-Economic Sensitivity

5.4.1 Approach

the project, a participatory approach has been adopted. Through this approach an attempt was made to integrate the local understanding and perspective into the impact assessment process and identification of the mitigation measures. The purpose of such an approach was to allow for:

- The triangulation of the information available from secondary sources through the information made available by the local community, both qualitative and quantitative
- Formulation of the socio-economic baseline on the basis of a combination of primary and secondary qualitative and quantitative data
- An understanding to be developed of the local community's perception of the project and its activities and the possible impacts from the same and the desirable mitigation measures.

5.4.2 Study Area

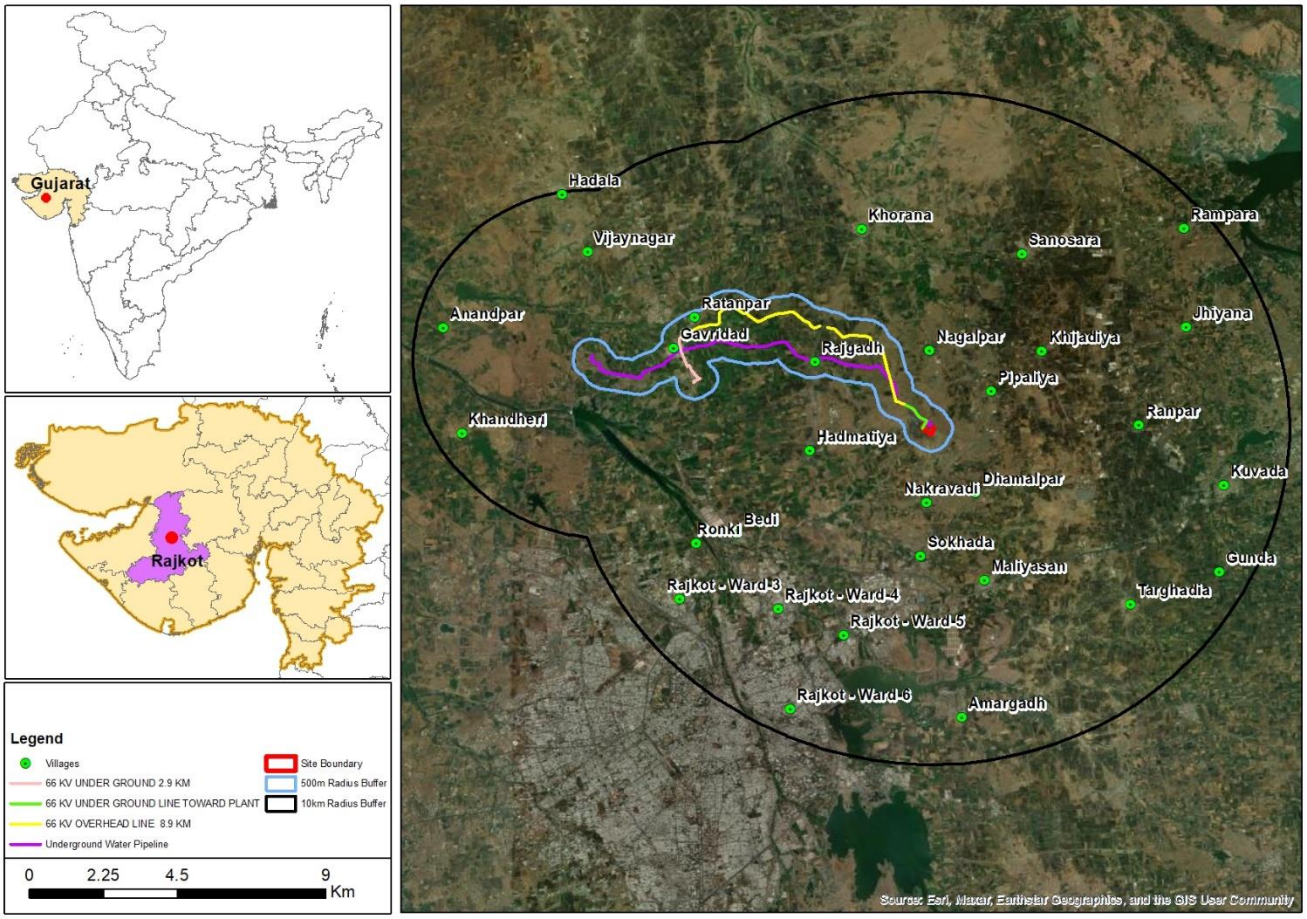
The area of up to ten (10) km radius from the Project boundary has been demarcated as the study area. The study area is demarcated based on the potential direct and indirect impact of the project on the local community.

The key terms used for sub-categorization of the Study Area are:

- Project footprint - The Project Footprint is the area that may reasonably be expected to be physically touched by Project activities – WTE Power Plant, Transmission Line and water pipeline, across all phases.
- Project Villages – We have considered Rajgadh, Gauridad, Rajpar, Nagalpar, Ratanpar and Nakarwadi as "Project Village" as all these villages are directly impacted by the construction of the WtE Plant, Water Pipeline and Transmission line.
- Core zone - The core zone is defined as the radius extending from the Project footprint area which would have majority of the impacts (during mobilization, construction, operation and decommissioning phase). The core zone area for the study is project footprint area i.e. WtE Plant, Water Pipeline and Transmission Line and adjacent area within 500 m radius.
- Buffer Zone - An AoI of 10 km radius from the location of WTE Plant, transmission line and the water pipeline is considered for socioeconomic consultations to determine perceived impacts due to the Project including employment opportunities, loss of livelihood and increased vehicular activity in remote areas.

Study area: Project footprint = Core zone (500 meters) + buffer zone (10 km). ***Figure 5-26*** provide the illustration of the study area.

Figure 5-26 Figure Illustrating Study Area



5.4.3 Primary data/ information collection/ site consultation

As part of the baseline data collection process, consultations were undertaken with the local stakeholders identified for the Project. The Table below provides a list of consultation undertaken as part of the site visit.

Table 5-18 Consultation Undertaken during the site visit

Sr. No.	Stakeholders' details	Objective of the consultation
1	Discussion with the Project site team	• To understand the project design • Progress of construction • Labour & HR welfare policy • Deployment of contractors • Construction schedule • Stakeholder engagement process and grievance handling mechanism
2	Stakeholder Consultations with Sarpanch	• To understand the potential impacts of the project on the community • Potential community concerns & expectations • Occupation , Social stratification Income and Livelihood of the community
3	Telephonic Key informant interview with bio mining contractor and waste collection supervisor	• Waste collection process • Supply chain of ragpickers • Dependence of ragpickers on municipal waste

Sr. No.	Stakeholders' details	Objective of the consultation
		• Disease control
4	In-depth interview with Ragpickers at Transfer station and Landfill, and sample livelihood survey of 17% (34) of the identified 200 ragpickers. Refer to section 5.4.14 for socio-economic profile of sample surveyed Ragpickers.	• Understand the number of families engaged in waste collection. • Waste collection process • Social development indicators such as education, Income, and livelihood dependence of ragpickers on waste collection • Livelihood dependence on rag picking. • Socio-economic vulnerability • Income generation from other source then the rag picking. • Understanding the socio-economic profile of ragpickers • Understanding the livelihood dependency of ragpickers on rag picking • Vulnerability assessment of rag pickers based on socio-economic structure, income, and household member dependency.
5.	Consultation with RMC contracted agency running material recovery facility at the transfer station	• Overview of the facility • Number of workers working at the facility • Earning done by the workers (Male and female wise) • Understanding the waste procurement, segregation and selling of segregated waste

As part of these consultation an attempt has been made to develop an understanding of the stakeholder groups' key concerns and expectations from the Project, the stakeholder groups' perception of the project and to triangulate the secondary information available on the area.

5.4.4 Review of Secondary data

For establishing the social baseline for the study area, a review of the secondary information available in the public domain was undertaken. The list of secondary sources of information used is as follows:

- District Statistical Handbook (Rajkot)
- Primary Census Abstract Data of India, 2011
- Village Directory Census Data of India, 2011

The project falls in the state of Gujarat in Rajkot district. The snapshot of the state and project affected district/ subdistrict is given in the subsequent sections below.

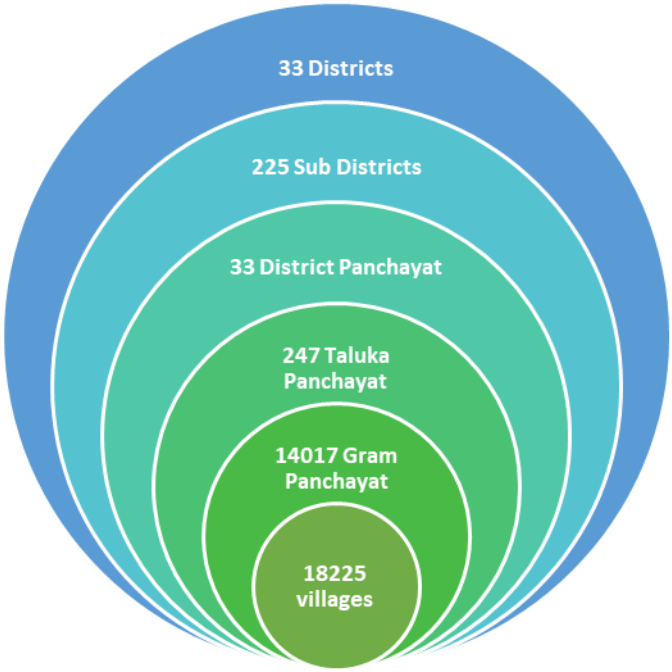
5.4.5 State profile: Gujarat

Gujarat is situated in the western part of India, spreading over an area of 196,024 sq. km. It covers approximately 6.4% of the total geographical area of India (Census 2011). Gujarat State is bounded in the west by the Arabian Sea and in the north by the Rann of Kutch and Rajasthan desert; to the Northeast, and east its limits are marked by the Aravalli ranges, and the hills of Vindhya. Satpura and Western Ghats extend up to Umbergaon and Dadra Nagar Haveli at the Southern tip (Kulkarni, [43]n.d.). The mainland Gujarat extends from Umbergaon (Maharashtra border) in the south to Mt. Abu (Rajasthan) in the north, and from hill ranges with forests in the east to the Arabian Sea, Gulf of Cambay, Saurashtra, and Rann in the west (Kulkarni, n.d.).

There are 33 districts, 225 sub districts, 33 district panchayat, 247 taluka panchayats, 14017-gram panchayat and 18225 villages in Gujarat according to 2011 Census of India.

[43] Kulkarni, V. N. (n.d.). PHYSICAL GEOLOGY OF GUJARAT (https://guj-nwrws.gujarat.gov.in/downloads/phy_geology_gujarat_eng.pdf).

Figure 5-27 Administrative Structure of Gujarat



Source: Primary Census Abstract data of India, 2011

As per the Census of India 2011, the Total geographical area of Gujarat is 196,244 square km. A total population of 6,04,39,692 reside in Gujarat, from which 3,14,91,260 are males, and 2,89,48,432 are females. The total child population of Gujarat (0-6 age) is 14,81,748, from which male children are 7,79,166, and females 7,02,582. A population growth of 19.2% has been recorded compared to 2001 census data.

There is a total of 1,22,48,428 households in Gujarat. About 67,73,558 (55% of the total households) households are in the rural area, and 54,74,870 (45% of the total households) households are in the urban area. An average of 5 people per household has been calculated from the data taken from census 2011. The population density of Gujarat is 308 per sq. km.

The sex ratio of Gujarat state is 919 compared to 943 of the national average of India, census 2011. The sex ratio of the child population (0-6 age) is 890 per 1000 male children. The literacy rate of Gujarat state is 78.03% from which 85.75% of males are literate, and 69.68% of females are literate.

Table 5-19 Demographic Profile of Gujarat

Variables	Gujarat State
Area (sq. km)	1,96,244
Total Population	6,04,39,692
Males	3,14,91,260
Females	2,89,48,432
Population Growth (percentage)	19.2
Total Households	1,22,48,428
Rural Households	67,73,558
Urban Households	54,74,870
Average Household Size	5

Variables	Gujarat State
Sex Ratio[44]	919
Child Sex Ratio	890
Population density (sq. km)	308
Total Child Population (0-6 Age)	14,81,748
Male Population (0-6 Age)	7,79,166
Female Population (0-6 Age)	7,02,582
Total Literacy Rate (percent)[45]	78.03
Male Literacy Rate (percentage)	85.75
Female Literacy Rate (percentage)	69.68

Source: Census of India 2011 data

5.4.6 District Profile: Rajkot

Rajkot is one of the most important districts of Saurashtra. The area falling under most of the district was part of the United States of Saurashtra. Rajkot district lies between Latitude 20°30' & 23°12' North and 70°00' & 71°45' East. It is bounded by Rann of Kachchh in the north, Surendranagar district in the east, Jamnagar district in the west, and Junagadh and Amreli districts in the south (Mohapatra, 2013)[46].

Table 5-20 District Profile

Variables	Rajkot District
Area (sq. km)	11,198
Total Population	38,04,558
Males	19,74,445
Females	18,30,113
Population Growth (percentage)	20.02
Total Households	7,86,586
Rural Households	3,14,961
Urban Households	4,71,625
Average Household Size	5
Sex Ratio	927
Child Sex Ratio	862
Population density (sq. km)	340
Total Child Population (0-6 Age)	4,38,580
Male Population (0-6 Age)	2,35,534
Female Population (0-6 Age)	2,03,046

[44] It is the number of females per 1000 males.
[45] It denotes ability to write a letter in any language.
[46] Mohapatra, B. (2013). District Groundwater Brochure, Rajkot District, Gujarat (http://cgwb.gov.in/district_profile/Gujarat/Rajkot.pdf)

Variables	Rajkot District
Total Literacy Rate (percent)	71.63
Male Literacy Rate (percentage)	76.68
Female Literacy Rate (percentage)	66.17

Source: Census of India 2011 data

As per the Census of India 2011, the Total geographical area of Gujarat is 11,198 square km. A total population of 38,04,558 reside in Rajkot District, from which 19,74,445 are males, and 18,30,113 are females. The total child population of Rajkot District (0-6 age) is 4,38,580, from which male children are 2,35,534, and females 2,03,046. A population growth of 20.02% has been recorded compared to 2001 census data.

There is a total of 7,86,586 households in Rajkot District. About 3,14,961 households are in the rural area, and 4,71,625 households are in the urban area. An average of 5 people per household has been calculated from the data taken from census 2011. The population density of Rajkot District is 340 per sq. km.

The sex ratio of Rajkot District state is 927 which is greater than Gujarat's sex ratio of 912. The sex ratio of the child population (0-6 age) is 862 per 1000 male children. The literacy rate of Rajkot District is 71.63% from which 76.68% of males are literate, and 66.17% of females are literate.

5.4.7 Profile of Sub District (Tehsils)

As per the review of secondary data it was understood that 4 tehsils namely Rajkot, Paddhari Gondal and Tankara are falling under project area of influence. However out of 22 village 19 villages are coming to Rajkot Tehsil. (Some portion of Rajkot municipal corporation) A brief profile of the tehsils coming under AOI is presented in the subheading given below:

5.4.7.1 Tehsil Profile: Rajkot

The total population of Rajkot Tehsil of Rajkot District is 15,33,821. The male population is recorded at 8,03,343, and the female population at 7,30,478. The sex ratio of Rajkot Tehsil is 909, which is less than the district sex ratio of 927 per 1000 males. The literary rate of Rajkot Tehsil is 76.63%, where male literates are 79.98%, and females are 72.96%.

Table 5-21 Tehsil Profile

Variables	Rajkot Tehsil
Total Population	15,33,821
Males	8,03,343
Females	7,30,478
Sex Ratio	909
Total Literacy Rate (percent)	76.63
Male Literacy Rate (percentage)	79.98
Female Literacy Rate (percentage)	72.96

Source: Census of India 2011 data

Working population: Rajkot Tehsil

In the Rajkot Tehsil out of the total population, 5,55,052 were working population. 93% of workers describe their work as their main work (employment of earning more than 6 months) while 7% were involved in Marginal activity providing

livelihood for less than 6 months. Of 5,13,936 workers engaged in main work, 29,039 were cultivators (owner or co-owner) while 16,097 were agricultural labourers.

Table 5-22 Rajkot Tehsil: Working Profile

Rajkot Tehsil	Total	Male	Female
Main Workers	5,13,936	4,48,537	65,399
Cultivators	29,039	21,312	7,727
Agriculture Laborer	16,097	10,699	5,398
Household Industries	10,113	6,890	3,223
Other Workers	4,58,687	4,09,636	49,051
Marginal Workers	41,116	18,850	22,266
Non-Working	9,78,769	3,35,956	6,42,813

Source: Census of India 2011 data

5.4.7.2 Tehsil Profile: Paddhari

The total population of Paddhari Tehsil of Rajkot District is 74,781. The male population is recorded at 38,204, and the female population at 36,577. The sex ratio of Paddhari Tehsil is 957, which is greater than the Rajkot Tehsil sex ratio of 909 per 1000 males. The literary rate of Paddhari Tehsil is 66.61%, where male literates are 73.67%, and females are 59.25%.

Table 5-23 Tehsil Profile

Variables	Paddhari Tehsil
Total Population	74,781
Males	38,204
Females	36,577
Sex Ratio	957
Total Literacy Rate (percent)	66.61
Male Literacy Rate (percentage)	73.67
Female Literacy Rate (percentage)	59.25

Source: Census of India 2011 data

Working population: Paddhari Tehsil

In the Paddhari Tehsil out of the total population, 31,412 were working population. 84% of workers describe their work as main work (employment of earning more than 6 months) while 16% were involved in Marginal activity providing livelihood for less than 6 months. Of 26,352 workers engaged in main work, 12,110 were cultivators (owner or co-owner) while 4,963 were agricultural laborers.

Table 5-24 Paddhari Tehsil working population

Paddhari Tehsil	Total	Male	Female
Main Workers	26,352	21,347	5,005
Cultivators	12,110	10,014	2,096
Agriculture Laborer	4,963	3,369	1,594
Household Industries	359	282	77
Other Workers	8,920	7,682	1,238
Marginal Workers	5,060	1,270	3,790
Non-Working	43,369	15,587	27,782

Source: Census of India 2011 data

5.4.7.3 Tehsil Profile: Gondal Tehsil

The total population of Gondal Tehsil of Rajkot District is 2,85,550. The male population is recorded at 1,47,508, and the female population at 1,38,042. The sex ratio of Gondal Tehsil is 936, which is lesser than Paddhari's sex ratio of 957, but greater than the Gondal Tehsil sex ratio of 909 per 1000 males. The literary rate of Gondal Tehsil is 72.94%, where male literates are 77.44%, and females are 68.13%.

Table 5-25 Tehsil Profile

Variables	Gondal Tehsil
Total Population	2,85,550
Males	1,47,508
Females	1,38,042
Sex Ratio	936
Total Literacy Rate (percent)	72.94
Male Literacy Rate (percentage)	77.44
Female Literacy Rate (percentage)	68.13

Source: Census of India 2011 data

Working population: Gondal Tehsil

In the Gondal Tehsil out of the total population, 1,11,792 were working population. 90% of workers describe their work as their main work (employment of earning more than 6 months) while 10% were involved in Marginal activity providing livelihood for less than 6 months. Of 1,00,137 workers engaged in main work, 33,656 were cultivators (owner or co-owner) while 19,568 were agricultural laborers.

Table 5-26 Gondal Tehsil working population

Gondal Tehsil	Total	Male	Female

Main Workers	1,00,137	82,956	17,181
Cultivators	33,656	27,017	6,639
Agriculture Labourer	19,568	13,444	6,124
Household Industries	962	790	172
Other Workers	45,951	41,705	4,246
Marginal Workers	11,655	4,130	7,525
Non-Working	1,73,758	60,422	1,13,336

Source: Census of India 2011 data

5.4.8 Tehsil Profile: Tankara Tehsil

The total population of Tankara Tehsil of Rajkot District is 87,577. The male population is recorded at 44,516, and the female population at 43,061. The sex ratio of Tankara Tehsil is 967, which is greater than Rajkot Tehsil of 912, Paddhari's sex ratio of 957, and Gondal Tehsil sex ratio of 909 per 1000 males. The literary rate of Tankara Tehsil is 66.71%, where male literates are 74.13%, and females are 59.03%.

Table 5-27 Tehsil profile

Variables	Tankara Tehsil
Total Population	87,577
Males	44,516
Females	43,061
Sex Ratio	967
Total Literacy Rate (percent)	66.71
Male Literacy Rate (percentage)	74.13
Female Literacy Rate (percentage)	59.03

Source: Census of India 2011 data

Working population: Tankara Tehsil

In the Tankara Tehsil out of the total population, 36,211 were working population. 84% of workers describe their work as main work (employment of earning more than 6 months) while 16% were involved in Marginal activity providing livelihood for less than 6 months. Of 30,469 workers engaged in main work, 14,190 were cultivators (owner or co-owner) while 5,591 were agricultural laborers.

Table 5-28 Tankara Tehsil working profile

Tankara Tehsil	Total	Male	Female
Main Workers	30,469	24,757	5,712
Cultivators	14,190	11,694	2,496

Tankara Tehsil	Total	Male	Female
Agriculture Labourer	5,591	4,022	1,569
Household Industries	913	679	234
Other Workers	9,775	8,362	1,413
Marginal Workers	5,742	1,088	4,654
Non-Working	51,366	18,671	32,695

Source: Census of India 2011 data

5.4.9 Study area

The area of up to ten (10) km radius from the Project boundary has been demarcated as the study area. The study area is demarcated based on the potential direct and indirect impact of the project on the local community.

The key terms used for sub-categorization of the Study Area are:

- Project footprint - The Project Footprint is the area that may reasonably be expected to be physically touched by Project activities – WTE Power Plant, Transmission Line and water pipeline, across all phases.
- Project Villages – We have considered Rajgadh, Gauridad, Rajpar, Nagalpar, Ratanpar and Nakarwadi as "Project Village" as all these villages are directly impacted by the construction of the WtE Plant, Water Pipeline and Transmission line.
- Core zone - The core zone is defined as the radius extending from the Project footprint area which would have majority of the impacts (during mobilization, construction, operation and decommissioning phase). The core zone area for the study is project footprint area i.e. WtE Plant, Water Pipeline and Transmission Line and adjacent area within 500 m radius.
- Buffer Zone - An AoI of 10 km radius from the location of WTE Plant, transmission line and the water pipeline is considered for socioeconomic consultations to determine perceived impacts due to the Project including employment opportunities, loss of livelihood and increased vehicular activity in remote areas.

Study area: Project footprint = Core zone (500 meters) + buffer zone (10 km).

It must be noted that the water pipeline passes through Gavirdad village, and transmission line passes along Ratanpar village.
Note: the study area = project village + core zone + buffer zone

Table 5-29 Core village of WTE Plant, and transmission line and water pipeline

Sr. No.	Core Area	Tehsil	District
1	Rajgadh	Rajkot	Rajkot
2	Nagalpar	Rajkot	Rajkot
3	Nakaravadi	Rajkot	Rajkot
4	Ratanpar	Rajkot	Rajkot
5	Gauridad	Rajkot	Rajkot
6	Ranpar	Rajkot	Rajkot

Source: Google Imagery

Table 5-30 Buffer villages of WTE Plant

Sr. No.	Buffer Area	Tehsil	District
1	Dhamalpar	Rajkot	Rajkot
2	Hadmatiya	Paddhari	Rajkot
3	Khijadiya	Rajkot	Rajkot
4	Sokhada	Rajkot	Rajkot
5	Maliyasan	Rajkot	Rajkot
6	Pipaliya	Gondal	Rajkot
7	Bedi	Tankara	Rajkot
8	Khorana	Rajkot	Rajkot
9	Sanosara	Rajkot	Rajkot
10	Jhiyana	Rajkot	Rajkot
11	Kuvadva	Rajkot	Rajkot
12	Ronki	Rajkot	Rajkot
13	Targhadiya	Rajkot	Rajkot
14	Gunda	Rajkot	Rajkot
15	Amargadh	Rajkot	Rajkot
16	Navagam	Rajkot	Rajkot
17	Rampara	Rajkot	Rajkot
18	Rajkot (M Corp.) WARD NO.-0003	Rajkot	Rajkot
19	Rajkot (M Corp.) WARD NO.-0004	Rajkot	Rajkot
20	Rajkot (M Corp.) WARD NO.-0005	Rajkot	Rajkot
21	Rajkot (M Corp.) WARD NO.-0006	Rajkot	Rajkot

Source: Google Imagery

5.4.10 Demographic profile of Study area

This section looks at demographic key indicators of the households to understand existing population dynamics, and how they may be influenced by the project as well as availability in numbers and quality of human resources.

Table 5-31 Demographic profile of core villages

Villages	No. of HH	Population	Average HH Size	Sex Ratio	% SC	% ST	% Lit	% F Lit
Core zone								
Ratanpar	241	1,422	6	983	9.99	0.00	77.92	72.20
Nagalpar	154	880	6	917	13.64	3.07	53.98	43.94
Rajgadh	112	576	5	840	0.00	0.00	56.77	48.29
Gavaridad	690	3,749	5	964	7.90	1.57	64.68	58.42
Nakaravadi	325	1,750	5	1023	0.86	0.00	62.23	55.03
Ranpar	261	1,251	5	1014	0.88	0.00	64.43	55.56

Villages	No. of HH	Population	Average HH Size	Sex Ratio	% SC	% ST	% Lit	% F Lit
Total Core	**1783**	**9628**	**5**	**971**	**6.07**	**0.89**	**64.71**	**57.61**
Buffer zone								
Bedi	217	1,049	5	1037	6.01	0.00	62.73	54.12
Hadmatiya	269	1,369	5	931	14.97	0.44	67.79	61.97
Khorana	454	2,154	5	956	10.86	1.21	58.91	51.28
Sanosara	518	2,574	5	974	20.86	0.12	67.87	58.03
Jhiyana	424	2,212	5	971	8.63	0.00	63.61	55.41
Khijadiya	220	1,324	6	944	7.93	0.08	61.25	50.08
Pipaliya	236	1,222	5	912	2.45	0.00	62.52	57.63
Kuvadva	1,552	8,214	5	937	6.62	0.10	66.80	60.12
Dhamalpar	192	1,054	5	970	0.47	0.00	70.30	65.51
Sokhada	307	1,697	6	980	5.30	0.00	66.29	60.00
Ronki	57	270	5	875	0.00	0.00	49.63	35.71
Maliyasan	630	3,508	6	942	18.02	0.00	79.45	77.44
Targhadiya	357	1,748	5	1028	24.66	0.00	64.02	56.88
Gunda	151	671	4	864	24.59	1.94	63.93	54.66
Amargadh	239	1,351	6	851	2.81	0.00	81.64	81.00
Navagam	98	520	5	926	0.00	0.00	66.15	53.60
Rampara	35	170	5	932	0.00	14.71	52.35	40.24
Rajkot (M Corp.) WARD NO.-000311,380		51,696	5	952	13.44	6.65	79.50	76.79
Rajkot (M Corp.) WARD NO.-00048,546		40,398	5	940	9.10	4.55	76.65	72.53
Rajkot (M Corp.) WARD NO.-000515,991		74,434	5	894	9.81	4.84	69.56	63.55
Rajkot (M Corp.) WARD NO.-000612,119		58,686	5	899	3.45	1.70	72.92	68.65
Total Buffer	**53,992**	**2,56,321**	**5**	**920**	**9.06**	**3.89**	**73.18**	**68.49**
Total Study area	**55,775**	**2,65,949**	**5**	**922**	**8.95**	**3.78**	**72.87**	**68.08**

Source: Census of India 2011 data

The comparison between the highest and lowest values for each parameter in the provided data underscores the significant demographic and socio-economic disparities prevalent across villages within both the core and buffer zones of the study area. In the core zone, six villages are identified: Ratanpar, Nagalpar, Rajgadh, Gavaridad, Nakaravadi, and Ranpar. In the buffer zone, there are several villages listed, along with specific wards of Rajkot Municipal Corporation.

In terms of the number of households, there is a substantial difference between the highest and lowest counts. Gavaridad stands out in the core zone with 690 households, contrasting sharply with Rajgadh's mere 112 households. Similarly, in the buffer zone, Kuvadva boasts the highest number of households at 1,552, while Rampara reports the lowest count with only 35 households.

Population distribution reflects pronounced discrepancies as well. Gavaridad exhibits the highest population density in the core zone, accommodating 3,749 individuals, while Rajgadh records the lowest population count of 576. In the buffer zone, Kuvadva emerges as the most populous village with 8,214 residents, juxtaposed with Rampara's notably lower population of 170 individuals.

Average household size varies considerably across villages. Ratanpar boasts the highest average household size of 6 in the core zone, contrasting with Rajgadh and Ranpar, which have the lowest average household size of 5. Similarly, Jhiyana, Khijadiya, and Ronki report the highest average household size of 6 in the buffer zone, while Gunda registers the lowest at 4.

Sex ratio, a critical demographic indicator, exhibits notable differences as well. Nakaravadi records the highest sex ratio of 1023 females per 1000 males in the core zone, while Rajgadh reports the lowest sex ratio of 840. In the buffer zone, Bedi boasts the highest sex ratio at 1037, whereas Gunda presents the lowest sex ratio at 864.

Moreover, variations in the percentages of Scheduled Castes (SC) and Scheduled Tribes (ST) highlight disparities in social composition. Nagalpar reports the highest percentage of SC population at 13.64% in the core zone, while Targhadiya records the highest SC population percentage at 24.66% in the buffer zone. Additionally, Gunda and Rampara stand out with the highest percentages of ST population at 1.94% and 14.71%, respectively, in the buffer zone.

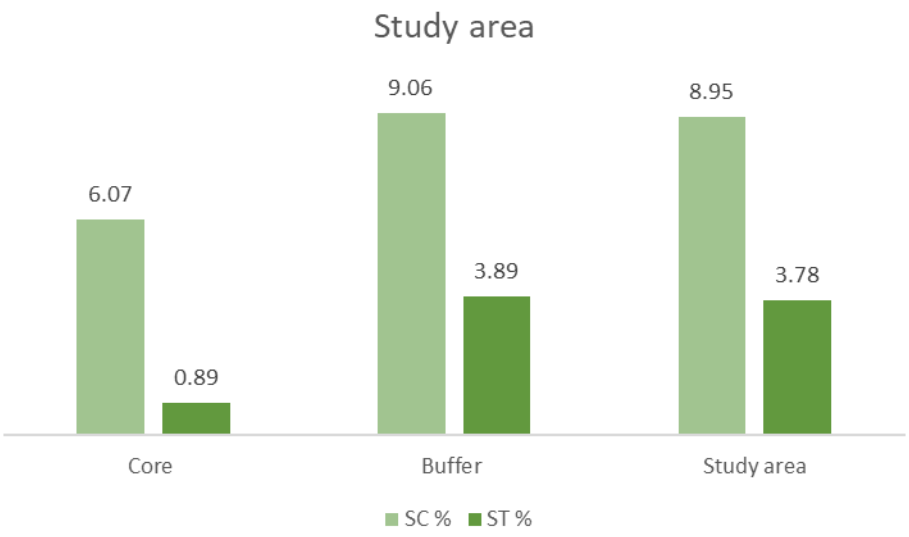
Education indicators, including literacy rates and female literacy rates, reveal significant disparities as well. Amargadh boasts the highest literacy rate at 81.64% and the highest female literacy rate at 81.00% in the core zone. In the buffer zone, Maliyasan reports the highest literacy rate at 79.45% and the highest female literacy rate at 77.44%, while Ronki presents the lowest literacy rate at 49.63% and the lowest female literacy rate at 35.71%.

In summary, these stark variations underscore the necessity for tailored interventions and targeted development initiatives to address the specific socio-economic and demographic needs of each village within the study area.

Social stratification

When comparing the percentages of Scheduled Castes (SC) and Scheduled Tribes (ST) across the core, buffer, and entire study area, notable differences emerge. The core zone exhibits a lower SC percentage (6.07%) and a lower ST percentage (0.89%) compared to the buffer zone, which records higher percentages for both SC (9.06%) and ST (3.89%). These differences suggest a concentration of SC and ST communities in the buffer zone, indicating distinct socio-economic dynamics and settlement patterns between the two zones. Understanding these socio-demographic variations is essential for formulating inclusive development strategies tailored to address the diverse needs of different socio-economic groups within the Abellon project area.

Figure 5-28 Proportion of SC/ST population in the villages of core area

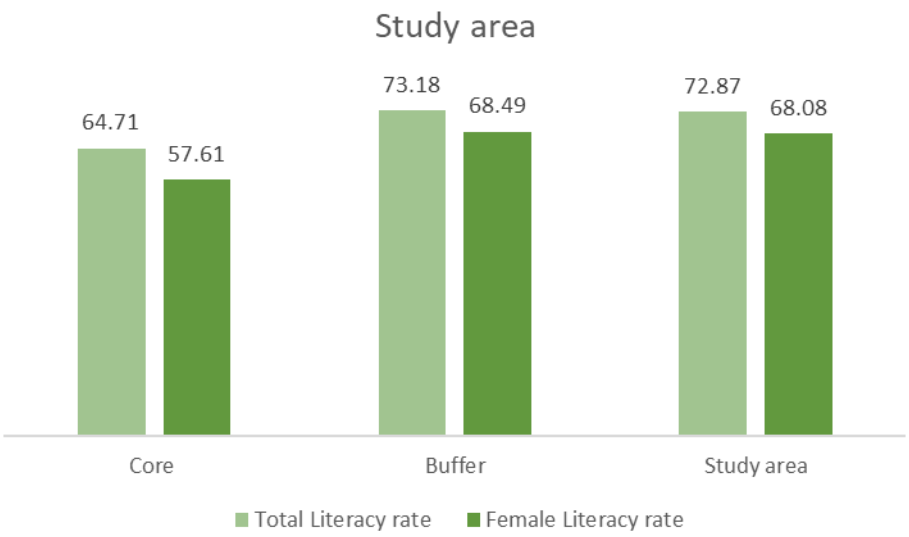


Source: Census of India 2011 data

Literacy and Education

Significant differences in literacy rates are observed between the core and buffer zones of the study area. The core zone has a total literacy rate of 64.71% and a female literacy rate of 57.61%, whereas the buffer zone shows higher rates, with total literacy at 73.18% and female literacy at 68.49%. Across the entire study area, the total literacy rate is 72.87%, slightly higher than the core zone but lower than the buffer zone, with female literacy at 68.08%. These differences highlight disparities in educational attainment, indicating better access to education in the buffer zone. Addressing these disparities is crucial for promoting socio-economic development and equal opportunities across the Abellon project area.

Figure 5-29 Comparative overview of the Literacy rate population in the villages of study area



Source: Census of India 2011 data

5.4.11 Land ownership and usage

This section provides an overview of the ownership and use of land in the study area. According to the Census 2011 data, a significant portion of land is under cultivation. The table below reflects land utilization for agriculture is high. Based on the data, it was understood that most of the land is cultivable. Further, refer to section 5.3.6.3 for details on availability and quality of groundwater in the study area.

Table 5-32 Land use pattern in core area

Name of the village	Total Geographical Area (in Hectares)	Forest Area[47] (in Hectares)	Area under Non-Agricultural Uses[48] (in Hectares)	Barren & Un-cultivable Land Area[49] (in Hectares)	Permanent Pastures and Other Grazing Land Area[50] (in Hectares)	Land Under Miscellaneous Tree Crops etc. Area[51] (in Hectares)	Culturable Waste Land Area[52] (in Hectares)	Fallows Land other than Current Fallows Area[53] (in Hectares)	Current Fallows Area[54] (in Hectares)	Net Area Sown[55] (in Hectares)
Core zone										
Ratanpar	1207.28	0%	0%	25%	9%	0%	0%	0%	0%	65%
Nagalpar	833.22	0%	0%	52%	13%	0%	0%	0%	0%	35%
Rajgadh	623.49	0%	0%	16%	13%	0%	0%	0%	0%	71%
Gavaridad	2591.32	0%	0%	23%	9%	0%	0%	0%	0%	68%
Nakaravadi	765.43	0%	0%	51%	7%	0%	0%	0%	13%	28%
Ranpar	699.99	0%	0%	15%	0%	0%	0%	0%	0%	85%
Total Core	6720.73	0%	0%	29%	9%	0%	0%	0%	1%	61%
Buffer zone										
Bedi	1074.37	1%	1%	4%	8%	1%	4%	9%	0%	72%
Hadmatiya	2008.76	0%	0%	20%	8%	0%	0%	1%	0%	71%
Khorana	2090.68	0%	0%	25%	2%	0%	0%	0%	0%	74%
Sanosara	1997.04	0%	0%	21%	2%	0%	0%	0%	0%	77%
Jhiyana	1735.39	0%	0%	24%	7%	2%	0%	0%	0%	67%
Khijadiya	1177.69	0%	0%	21%	5%	0%	0%	0%	0%	73%
Pipaliya	522.3	0%	0%	33%	0%	0%	0%	0%	0%	67%
Kuvadva	2015.48	2%	0%	16%	13%	0%	0%	0%	0%	69%
Dhamalpar	698.23	0%	0%	32%	23%	0%	0%	0%	0%	45%
Sokhada	557.88	0%	0%	30%	10%	0%	0%	0%	0%	60%
Ronki	356.29	0%	0%	24%	6%	0%	0%	0%	0%	70%
Maliyasan	1183.17	0%	0%	12%	12%	0%	0%	0%	0%	76%

[47] Forest area is land under natural or planted stands of trees
[48] Areas under non-agricultural use include lands occupied by buildings, roads, and railways, or land under water
[49] This includes all land covered by mountains, deserts, etc
[50] A permanent pasture is pastureland that is a result of natural growth
[51] This includes all cultivable land which is not included in 'Net area sown' but is put to some agricultural uses
[52] Land available for cultivation, either taken up or just not taken up once for harvesting, but not harvested over the last five years more than in sequence, including that of the current year
[53] All land which was taken up for cultivation but is temporarily out of cultivation for a period of not less than one year and not more than five years
[54] Cropped area which is kept fallow during the current year
[55] Net sown area represents the total area sown with crops and orchards

Name of the village	Total Geographical Area (in Hectares)	Forest Area[47] (in Hectares)	Area under Non-Agricultural Uses[48] (in Hectares)	Barren & Un-cultivable Land Area[49] (in Hectares)	Permanent Pastures and Other Grazing Land Area[50] (in Hectares)	Land Under Miscellaneous Tree Crops etc. Area[51] (in Hectares)	Culturable Waste Land Area[52] (in Hectares)	Fallows Land other than Current Fallows Area[53] (in Hectares)	Current Fallows Area[54] (in Hectares)	Net Area Sown[55] (in Hectares)
Targhadiya	1231.62	0%	0%	10%	9%	0%	0%	0%	0%	81%
Gunda	717.03	0%	0%	3%	7%	0%	0%	0%	0%	90%
Amargadh	1560.03	8%	0%	13%	5%	0%	0%	0%	0%	73%
Navagam	644.04	0%	0%	41%	7%	0%	0%	0%	0%	52%
Rampara	164.03	0%	0%	19%	0%	0%	0%	0%	0%	81%
Rajkot (M Corp.) WARD NO.-0003	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Rajkot (M Corp.) WARD NO.-0004	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Rajkot (M Corp.) WARD NO.-0005	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Rajkot (M Corp.) WARD NO.-0006	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Total Buffer	19734.03	1%	0%	19%	7%	0%	0%	1%	0%	71%
Total Study area	26454.76	1%	0%	22%	8%	0%	0%	0%	0%	69%

Source: Census of India 2011 data

Comparing the land utilization patterns between the core and buffer zones provides insights into the distribution of resources and human activities within the study area.

In the core zone, Ratanpar has the largest geographical area of 1207.28 hectares, with 65% of the land being utilized for cultivation, making it predominantly agrarian. Other villages like Nagalpar and Rajgadh also show substantial agricultural land use, with 35% and 71% of their respective areas under cultivation. However, Ranpar stands out with 85% of its land area dedicated to agriculture, indicating a heavy reliance on farming activities in this village.

Contrastingly, the buffer zone exhibits diverse land utilization patterns. While villages like Bedi and Kuvadva allocate a significant portion of their land for cultivation (72% and 69% respectively), others such as Pipaliya and Sokhada have relatively smaller proportions of cultivated land, at 67% and 60% respectively. Additionally, Amargadh allocates 73% of its land to cultivation but also reserves 8% for forests, reflecting a mix of agricultural and environmental conservation efforts.

Overall, the core zone appears to prioritize agricultural activities, with a higher percentage of land dedicated to cultivation compared to the buffer zone. In contrast, the buffer zone displays a more varied landscape, with a mix of agricultural, forested, and other land uses. Understanding these land utilization patterns is crucial for planning sustainable development initiatives and preserving the ecological balance within the study area.

5.4.12 Occupational profile

As per the stakeholder consultations it was understood that people are predominantly engaged other economic activities, although agriculture is carried is carried out in the study area however its contribution to overall family income is less as compared to other sources of income. Reportedly as the study area is close to Rajkot city which is an industrial hub therefore significant portions of population is engaged in service and other businesses as well.

The comparison of working population ratios and workforce composition between the core and buffer zones within the study area highlights distinct employment patterns and demographic characteristics.

In the core zone, the overall working population ratio is 45%, indicating that nearly half of the population is engaged in various forms of employment. The main workers, constituting 87% of the working population, predominantly comprise males, accounting for 64% of the total working population. Female main workers represent 22% of the total working population. Marginal workers constitute 13% of the working population, with marginal male workers comprising 5% and marginal female workers comprising 8%. However, a significant portion of the population, accounting for 55%, falls under the category of non-working population.

In contrast, the buffer zone exhibits a slightly lower overall working population ratio of 37%. The main workers constitute 92% of the working population, with males accounting for 79% and females for 13%. Marginal workers represent 8% of the working population, with marginal male workers comprising 3% and marginal female workers comprising 5%. The non-working population in the buffer zone stands at 63%.

Overall, while both the core and buffer zones have high proportions of main workers, with males dominating the workforce, the buffer zone shows a slightly higher percentage of main workers and a lower percentage of non-working population compared to the core zone. These differences in workforce composition and employment patterns underscore the socio-economic dynamics and labor market characteristics within the two zones of the study area.

Table 5-33 Proportion and break-up of working population in the core area

Villages	Working Population Ratio	Main worker(% of total working population)	Main work Male (% of WPR)	Main worker Female (% of WPR)	Marginal (% of total working population)	Marginal worker male (% of WPR)	Marginal worker female (% of WPR)	Non-working population(% of total population)
Core zone								
Ratanpar	34%	86%	82%	5%	14%	10%	4%	66%
Nagalpar	43%	95%	68%	27%	5%	3%	2%	57%
Rajgadh	59%	100%	58%	42%	0%	0%	0%	41%
Gavaridad	40%	97%	78%	19%	3%	1%	2%	60%
Nakaravadi	54%	68%	43%	25%	32%	12%	19%	46%
Ranpar	57%	79%	53%	25%	21%	6%	15%	43%
Total Core	**45%**	**87%**	**64%**	**22%**	**13%**	**5%**	**8%**	**55%**
Buffer zone								
Bedi	65%	50%	48%	2%	50%	3%	47%	35%
Hadmatiya	44%	76%	73%	4%	24%	2%	21%	56%
Khorana	55%	96%	58%	38%	4%	2%	2%	45%
Sanosara	43%	86%	74%	12%	14%	1%	13%	57%
Jhiyana	56%	88%	56%	32%	12%	1%	11%	44%
Khijadiya	51%	72%	55%	18%	28%	5%	23%	49%
Pipaliya	52%	98%	65%	33%	2%	1%	1%	48%
Kuvadva	41%	92%	73%	18%	8%	3%	5%	59%
Dhamalpar	49%	73%	64%	10%	27%	3%	24%	51%
Sokhada	43%	60%	54%	5%	40%	19%	22%	57%
Ronki	57%	95%	61%	34%	5%	2%	3%	43%

Villages	Working Population Ratio	Main worker(% of total working population)	Main work Male (% of WPR)	Main worker Female (% of WPR)	Marginal (% of total working population)	Marginal worker male (% of WPR)	Marginal worker female (% of WPR)	Non-working population(% of total population)
Maliyasan	34%	96%	84%	11%	4%	2%	2%	66%
Targhadiya	52%	67%	58%	9%	33%	3%	30%	48%
Gunda	70%	56%	47%	9%	44%	9%	35%	30%
Amargadh	40%	97%	74%	22%	3%	2%	1%	60%
Navagam	58%	50%	47%	4%	50%	4%	45%	42%
Rampara	62%	59%	40%	19%	41%	7%	34%	38%
Rajkot (M Corp.) WARD NO.-0003	36%	94%	79%	16%	6%	3%	2%	64%
Rajkot (M Corp.) WARD NO.-0004	35%	96%	83%	13%	4%	3%	1%	65%
Rajkot (M Corp.) WARD NO.-0005	37%	92%	81%	11%	8%	4%	4%	63%
Rajkot (M Corp.) WARD NO.-0006	35%	94%	85%	9%	6%	3%	3%	65%
Total Buffer	**37%**	**92%**	**79%**	**13%**	**8%**	**3%**	**5%**	**63%**
Total Study area	**37%**	**92%**	**79%**	**13%**	**8%**	**3%**	**5%**	**63%**

Source: Census of India 2011 data

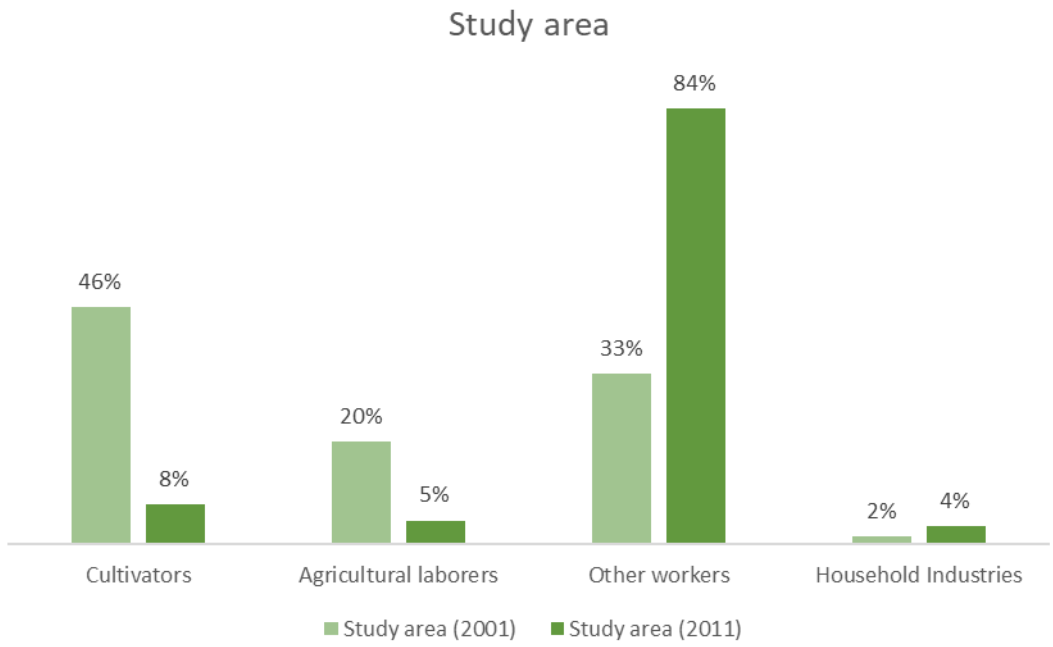
In 2001, the study area had a significant portion of cultivators, accounting for 46% of the workforce, indicating a substantial reliance on agriculture. Agricultural laborers comprised 20% of the workforce, supporting the agricultural sector. Other workers made up 33% of the workforce, suggesting a diverse range of occupations, while household industries contributed a minor share of 2%.

In contrast, by 2011, there was a dramatic shift in the composition of the workforce. The percentage of cultivators sharply decreased to 8%, indicating a significant decline in agricultural activity. Similarly, the proportion of agricultural laborers reduced to 5%, reflecting a diminishing reliance on traditional farming practices. In contrast, other workers surged to 84% of the workforce, indicating a shift towards non-agricultural occupations and economic diversification. Household industries also saw a slight increase to 4%, suggesting some engagement in small-scale, home-based enterprises.

Overall, the transition from 2001 to 2011 highlights a notable transformation in the study area's economic landscape, characterized by a decline in agriculture-based employment and a rise in other forms of employment, signaling economic diversification and possibly urbanization trends.

Note – The ward-level data for the year 2001 was not available in the census records, thus excluding its inclusion in the comparative analysis. However, for the year 2011, ward-level data was accessible and therefore considered for the subsequent comparison.

Figure 5-30 Distribution of main working population in the core area and comparison between 2001 and 2011 Census data of India



Source: Census of India 2011 data

5.4.13 Physical infrastructure

5.4.13.1 Water supply and sanitation

In analyzing the sources of water access across the core and buffer zones of the study area, notable differences emerge.

Within the core zone, hand pumps are the most prevalent water source, with a total of six installed across the villages. Additionally, covered wells and tube wells/boreholes are commonly used, with two each present in the core zone. Notably, Ranpar village stands out for its reliance on river/canal water sources, having one of the only two instances of such access in the core zone.

Conversely, the buffer zone displays a more diverse range of water sources. Hand pumps remain prevalent, with 14 installed across various villages. Tube wells/boreholes are also widely utilized, with six in operation. However, the buffer zone exhibits a higher usage of other water sources such as tank/pond/lake, river/canal, and spring, indicating a more varied approach to water access strategies compared to the core zone.

Overall, while hand pumps are the dominant water source in both zones, the buffer zone shows a more diversified approach, incorporating various water sources to meet the needs of its residents. Understanding these variations in water access is crucial for implementing effective water management and infrastructure development initiatives to ensure adequate and equitable access to clean water resources across the study area.

From the stakeholder consultations it was understood that few villages were having supplied water through pipeline. Water supply is taken care of by RMC, respective gram panchayat and GWSSB.

Table 5-34 Water resource in core area

Name of the village	Tap Water-Treated	Covered Well	Hand Pump	Tube Wells/Borehole	Spring	River/Canal	Tank/Pond/Lake	Others
Core zone								
Ratanpar	0	1	1	0	0	1	0	0

Name of the village	Tap Water-Treated	Covered Well	Hand Pump	Tube Wells/Borehole	Spring	River/Canal	Tank/Pond/Lake	Others
Nagalpar	0	0	1	1	0	0	0	0
Rajgadh	0	0	1	0	0	0	0	0
Gavaridad	0	1	1	1	0	1	0	0
Nakaravadi	0	0	1	0	0	0	0	0
Ranpar	0	0	1	0	0	0	1	0
Total Core	**0**	**2**	**6**	**2**	**0**	**2**	**1**	**0**
Buffer zone								
Bedi	0	1	1	1	0	0	0	0
Hadmatiya	0	0	1	0	0	0	0	0
Khorana	0	0	1	0	0	1	0	0
Sanosara	0	0	1	0	0	0	0	0
Jhiyana	0	0	0	1	0	0	1	0
Khijadiya	0	0	1	0	0	0	1	0
Pipaliya	0	0	1	0	0	0	0	0
Kuvadva	0	0	0	0	0	1	1	0
Dhamalpar	0	0	1	1	0	0	0	0
Sokhada	0	0	1	0	0	0	1	0
Ronki	0	0	1	1	0	0	1	0
Maliyasan	0	0	1	0	0	0	1	0
Targhadiya	0	0	1	1	0	1	1	0
Gunda	0	0	0	0	0	0	0	0
Amargadh	0	0	1	1	0	0	0	0
Navagam	0	0	1	0	0	0	0	0
Rampara	0	0	1	0	0	0	0	0
Rajkot (M Corp.) WARD NO.-0003	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Rajkot (M Corp.) WARD NO.-0004	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Rajkot (M Corp.) WARD NO.-0005	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Rajkot (M Corp.) WARD NO.-0006	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Total Buffer	**0**	**1**	**14**	**6**	**0**	**3**	**7**	**0**
Total Study area	**0**	**3**	**20**	**8**	**0**	**5**	**8**	**0**

Source: Census of India 2011 data

Road and Communication: As per the site visit it was understood all the villages / habitations coming under the project is well connected with the all-weather road.

Electrification: All the villages /habitations coming under the study area are electrified and most of the community member are having basic amenities at the household level.

5.4.13.2 Social Infrastructure

The comparison of government educational institutions between the core and buffer zones within the study area reveals significant differences in access to primary and secondary education.

In the core zone, there are no government pre-primary schools (Nursery/LKG/UKG) present across any of the villages surveyed. However, there is a total of six government primary schools, indicating a focus on providing foundational education at the primary level. Notably, there are no government middle, secondary, or senior secondary schools within the core zone, suggesting a potential gap in access to higher levels of education.

In contrast, the buffer zone exhibits a slightly different educational landscape. Similar to the core zone, there are no government pre-primary schools in the buffer zone. However, there is a higher concentration of government primary schools, totalling 17 across the villages surveyed. Additionally, while there are still no government middle schools present, there are three government secondary schools, indicating some provision for higher-level education within the buffer zone.

Overall, while both zones face challenges in access to pre-primary education and higher-level schooling, the buffer zone shows a slightly more developed educational infrastructure, particularly at the primary and secondary levels. Addressing the gaps in educational access, especially in the core zone, is crucial for promoting holistic development and ensuring equal opportunities for quality education across all communities within the study area.

Table 5-35 Educational infrastructure in the core area

Village Name	Government Pre - Primary School (Nursery/LKG/UKG)	Government Primary School	Government Middle School	Government Secondary School	Government Senior Secondary School
Core zone					
Ratanpar	0	1	0	0	0
Nagalpar	0	1	0	0	0
Rajgadh	0	1	0	0	0
Gavaridad	0	1	0	0	0
Nakaravadi	0	1	0	0	0
Ranpar	0	1	0	0	0
Total Core	0	6	0	0	0
Buffer zone					
Bedi	0	1	0	0	0
Hadmatiya	0	1	0	0	0
Khorana	0	1	0	0	0
Sanosara	0	1	0	1	0
Jhiyana	0	1	0	0	0
Khijadiya	0	1	0	0	0

Village Name	Government Pre - Primary School (Nursery/LKG/UKG)	Government Primary School	Government Middle School	Government Secondary School	Government Senior Secondary School
Pipaliya	0	1	0	0	0
Kuvadva	0	1	0	1	0
Dhamalpar	0	1	0	0	0
Sokhada	0	1	0	0	0
Ronki	0	1	0	0	0
Maliyasan	0	1	0	1	0
Targhadiya	0	1	0	0	0
Gunda	0	1	0	0	0
Amargadh	0	1	0	0	0
Navagam	0	1	0	0	0
Rampara	0	1	0	0	0
Rajkot (M Corp.) WARD NO.-0003	N/A	N/A	N/A	N/A	N/A
Rajkot (M Corp.) WARD NO.-0004	N/A	N/A	N/A	N/A	N/A
Rajkot (M Corp.) WARD NO.-0005	N/A	N/A	N/A	N/A	N/A
Rajkot (M Corp.) WARD NO.-0006	N/A	N/A	N/A	N/A	N/A
Total Buffer	0	17	0	3	0
Total Study area	0	23	0	3	0

Source: Census of India 2011 data

5.4.13.3 Health facilities and Health seeking Behavior

The comparison of healthcare facilities between the core and buffer zones within the study area reveals variations in access to medical services across different villages.

In the core zone, there are limited government healthcare facilities available. Only one primary health sub-centre is operational, located in Gavaridad village. Additionally, there is one veterinary hospital present in Gavaridad, catering to animal healthcare needs. However, there are no community health centres, primary health centres, or maternity and child welfare centres in the core zone. Furthermore, there are no non-government medical facilities outpatient services reported in any of the villages surveyed in the core zone.

In contrast, the buffer zone exhibits a slightly more developed healthcare infrastructure. There is one community health centre and one primary health centre serving the healthcare needs of the buffer zone. Additionally, there are ten primary health sub-centres spread across various villages in the buffer zone, indicating better access to primary healthcare services. Furthermore, there is one veterinary hospital and two dispensaries providing healthcare services to the residents. However, similar to the core zone, there are no maternity and child welfare centres reported in the buffer zone. Nonetheless, there is one non-government medical facility outpatient service available, enhancing healthcare access for the local population.

Overall, while the buffer zone shows a slightly more developed healthcare infrastructure with better access to primary healthcare services compared to the core zone, there remains a need for additional healthcare facilities, particularly maternity and child welfare centres, to ensure comprehensive healthcare coverage for all residents within the study area.

After consultation with the villagers, it was found out that they must travel to nearby towns for proper health checkups. People mostly use local transportation, however during emergencies and in availability of ambulances on time, family members or nearby villagers with vehicles help to transport the patient to the nearby hospital.

Table 5-36 Health facilities in the core area

Name of Village	Community Health Centre	Primary Health Centre	Primary Health Sub Centre	Maternity And Child Welfare Centre	TB Clinic	Dispensary	Veterinary Hospital	Family Welfare Centre	Non-Government Medical facilities Outpatient
Core									
Ratanpar	0	0	0	0	0	0	0	0	0
Nagalpar	0	0	0	0	0	0	0	0	0
Rajgadh	0	0	0	0	0	0	0	0	0
Gavaridad	0	0	1	0	0	0	1	0	0
Nakaravadi	0	0	0	0	0	0	0	0	0
Ranpar	0	0	0	0	0	0	0	0	0
Total Core	**0**	**0**	**1**	**0**	**0**	**0**	**1**	**0**	**0**
Buffer zone									
Bedi	0	0	0	0	0	0	0	0	1
Hadmatiya	0	0	1	0	0	0	1	0	0
Khorana	0	0	1	0	0	0	0	0	0
Sanosara	0	1	1	0	0	0	0	0	0
Jhiyana	0	0	1	0	0	0	0	0	0
Khijadiya	0	0	1	0	0	0	0	0	0
Pipaliya	0	0	0	0	0	0	0	0	0
Kuvadva	1	0	2	0	0	1	1	0	0
Dhamalpar	0	0	0	0	0	0	0	0	0
Sokhada	0	0	0	0	0	0	0	0	0
Ronki	0	0	0	0	0	0	0	0	0
Maliyasan	0	0	1	0	0	0	0	0	0
Targhadiya	0	0	0	0	0	0	0	0	0
Gunda	0	0	1	0	0	0	0	0	0
Amargadh	0	0	0	0	0	0	0	0	0
Navagam	0	0	1	0	0	0	0	0	0
Rampara	0	0	0	0	0	0	0	0	0
Rajkot (M Corp.) WARD NO.-0003	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Rajkot (M Corp.) WARD NO.-0004	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A

Name of Village	Community Health Centre	Primary Health Centre	Primary Health Sub Centre	Maternity And Child Welfare Centre	TB Clinic	Dispensary	Veterinary Hospital	Family Welfare Centre	Non-Government Medical facilities Outpatient
Rajkot (M Corp.) WARD NO.-0005	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Rajkot (M Corp.) WARD NO.-0006	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Total Buffer	**1**	**1**	**10**	**0**	**0**	**1**	**2**	**0**	**1**
Total Study area	**1**	**1**	**11**	**0**	**0**	**1**	**3**	**0**	**1**

Source: Census of India 2011 data

5.4.14 Socio Economic Survey of Impacted Ragpickers

The socio-economic survey has been undertaken on the sample basis. Details of the sampling methodology and the socio-economic profile with vulnerability assessment are provided in sub-sequent sections.

5.4.14.1 Sampling Methodology

The survey has been undertaken for 17% of the identified 200 ragpickers. The total number (200) of ragpickers has been identified based on the consultation with Ragpickers and the identification card issued by Rajkot Municipal Corporation (RMC) – all the 200 ragpickers have received the ID card from RMC. Further, provided below the explanation of the identified sample:

- The survey response of 34 ragpickers out of the identified 200 ragpickers is further explained by the fact that the survey was conducted over a period of two (2) days, on December 11 and 12, 2023. In this survey timeframe, these are the only responders who have provided their consent to take part in the survey process.
- There were ~5 ragpickers who have not provided the consent of taking part in the survey process.

Note: A prior intimation to ragpickers have been provided prior to undertaken the survey and on the first day of survey.

The survey's limited turnout of 34 respondents out of the identified 200 ragpickers when viewed as 17% of the total population, still holds significance as a representative sample. Key points supporting the representativeness of the sample include:

- From a statistical perspective, a sample size of 34, constituting 17% of the total population, has provided meaningful insights and trends when appropriately selected
- The sample size has captured a diverse spectrum of characteristics, providing a reflection of the broader demographic, occupational patterns, and socio-economic statuses within the ragpickers' population.
- A more focused and thorough analysis of this sample has facilitated the extraction of precise insights into the prevailing trends and challenges encountered by the Ragpickers.

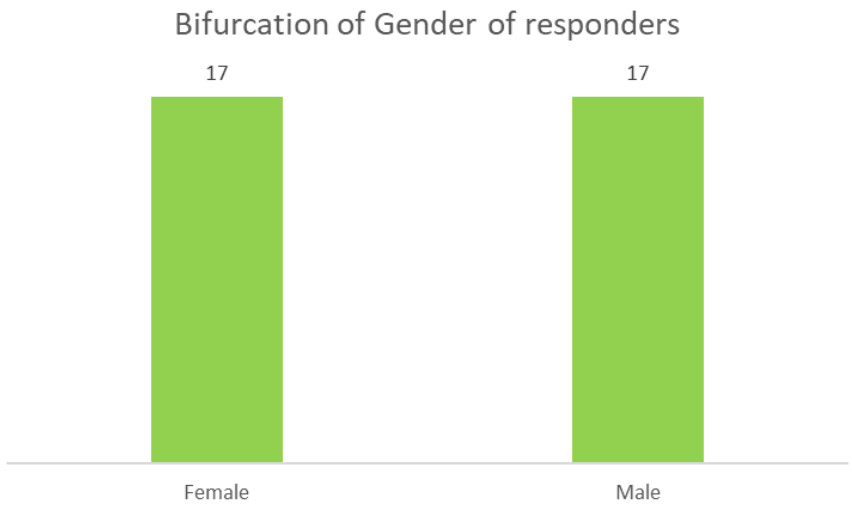
Note: In light of these considerations, the obtained sample size, although limited, stands as a valuable representation, offering nuanced and well-founded observations that can inform targeted interventions and policy recommendations for the ragpickers community.

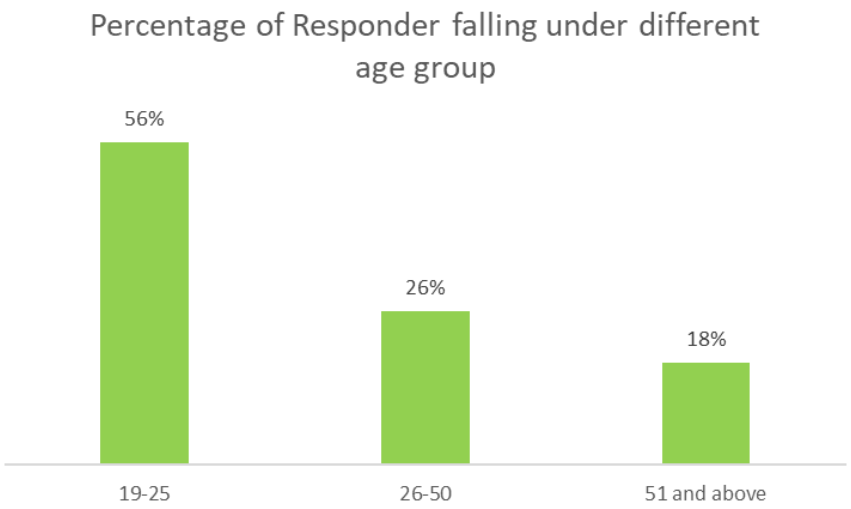
5.4.14.2 Socio-economic Profile of Surveyed Ragpickers (responders)

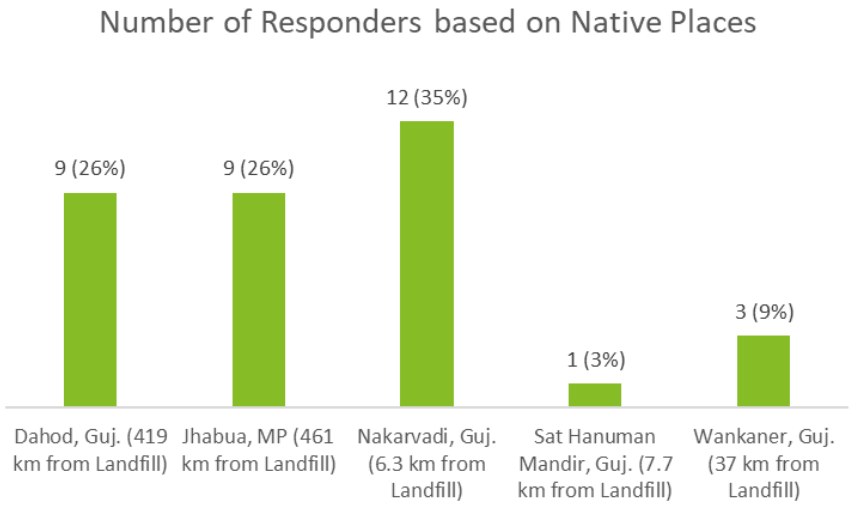
5.4.14.2.1 General Profile of Responders

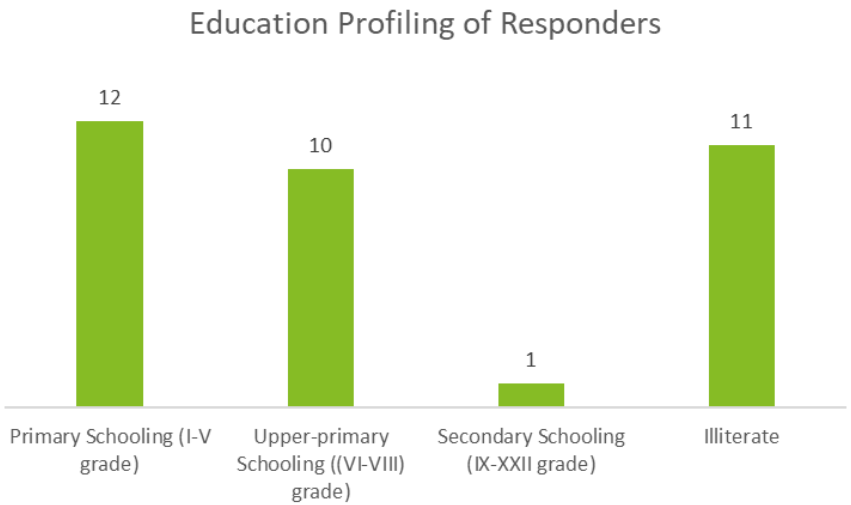
A brief overview in the form of graphical representation of general profiling of responders are provided below:

Figure 5-31 General Profile of Responders







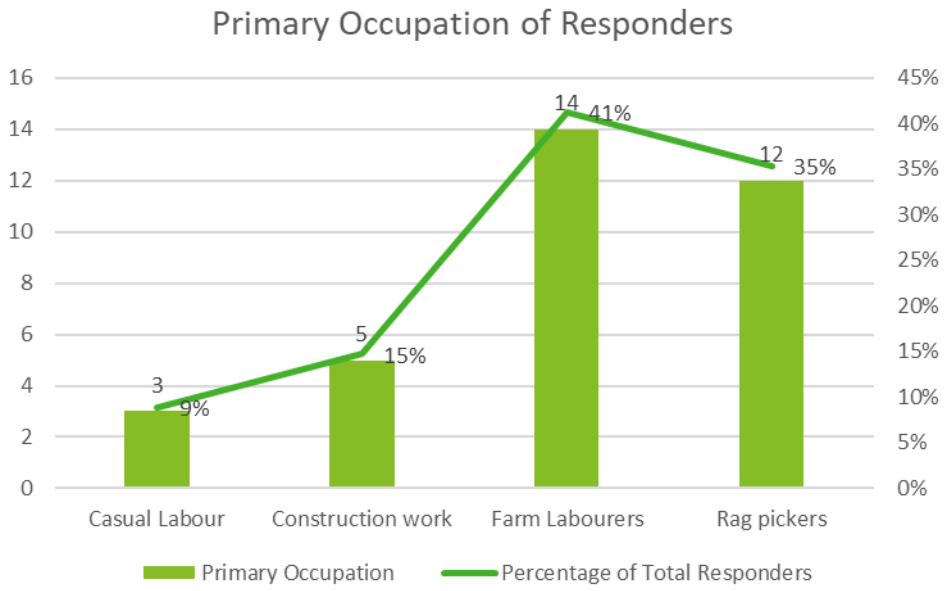


Note: The survey is specifically designed to gain insights into the experiences and perspectives of individual ragpickers actively engaged in rag picking at the landfill in Rajkot city. It is noteworthy that the survey's focus is directed towards individual respondents rather than the entire household.

5.4.14.2.2 Occupational Profile

The occupational Profile of ragpickers is divided into Primary and Secondary Occupation. Respondents self-identified their primary occupation based on the number of days dedicated to specific livelihood activities. Typically, those reporting a primary occupation other than rag picking engaged in alternative livelihood options for 18-20 days per month. Conversely, respondents with rag picking as their primary occupation typically spent 15-16 days per month on rag picking activities.

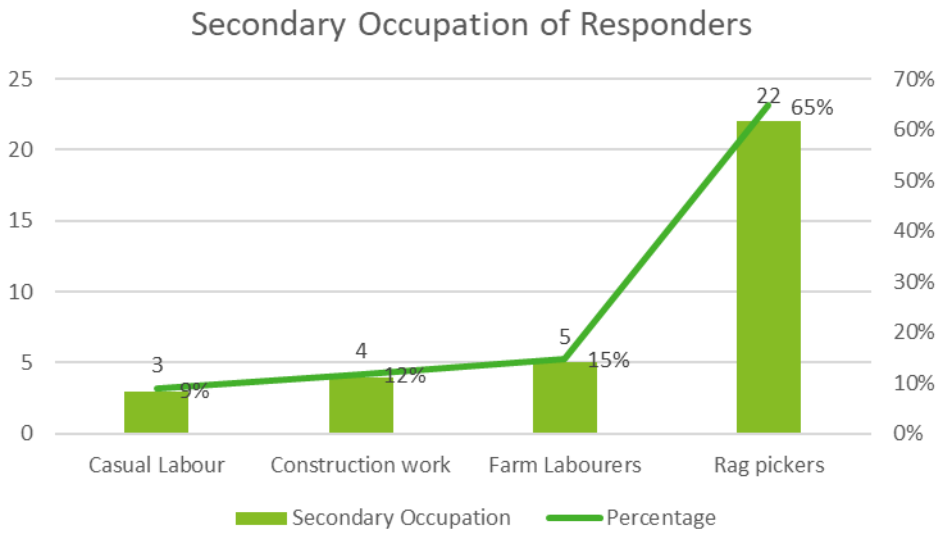
Figure 5-32 Primary Occupation of Responders



1. Casual Labour
   a. This category comprises 3 respondents, accounting for 9% of the total.
   b. Casual labor typically involves irregular, temporary work such as – daily wage workers, domestic workers during any function in a family, loading and unloading workers and events helpers.
2. Construction Workers
   a. There are 5 respondents engaged in construction work, representing 15% of the total.
   b. Construction work involves building and infrastructure development. The percentage indicates a moderate level of representation in this occupation among the respondents.
3. Farm Labourers
   a. The majority of respondents, 14 individuals, are involved in farm labor, constituting 41% of the total.
   b. This suggests that a significant portion of the surveyed population is employed in agriculture or related activities.
4. Ragpickers
   a. Out of the total 34, 12 responders constituting 35% have reported rag picking as their primary occupation.
   b. Rag picking involves collecting and sorting recyclable materials from waste.
   c. As per the findings presented during the consultation, individuals engaged in rag picking, as reported by responders, do not serve as the exclusive providers of livelihood within their respective families. The surveyed ragpickers play a supportive role, supplementing the existing income sources of their households. This assertion is substantiated by an analysis of the age demographics among responders who have identified rag picking as their primary source of income.

Note: Typically, ragpickers involved in casual labor and construction work travel to Rajkot city to undertake their occupation. Additionally, for farm labor, they travel to the outskirts of Rajkot city where farming activities are carried out.

Figure 5-33 Secondary Occupation of Responders

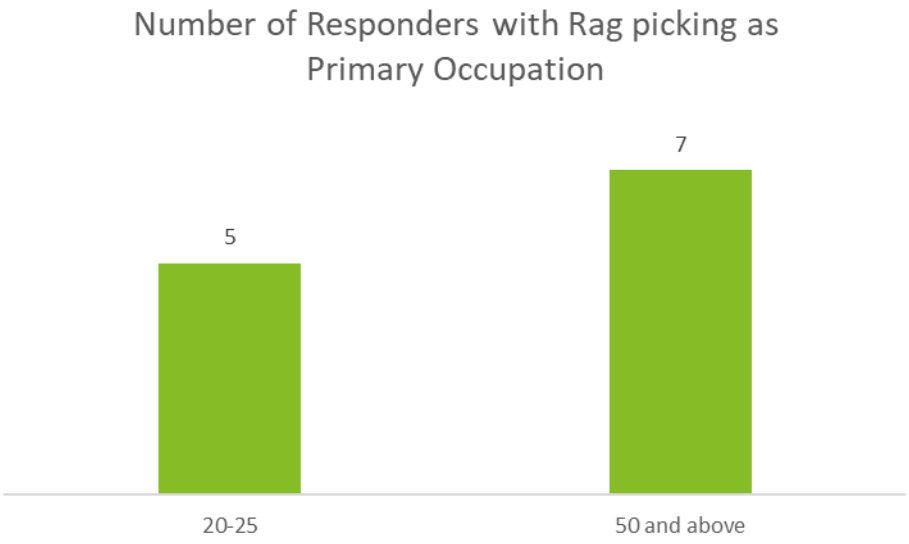


Rag picking seems to be a secondary occupation for 65% individuals with primary occupations in casual labor, construction work, and farm labor.

5.4.14.2.3 Profile of Responders with Rag picking as Primary Occupation

The provided ***Figure 5-34*** presents the distribution of respondents based on age groups and their primary occupation being rag picking.

Figure 5-34 Number of responders with Rag picking as Primary Occupation



1. Age Group 20-25 (5 Responders)
    a. In the age group 20-25, there are 5 responders who have identified rag picking as their primary occupation.
    b. This suggests that a notable portion of younger individuals, within the specified age range, are engaged in rag picking as their primary source of income. This is because out of the five (5) identified ragpickers in this category, all are females. For them, rag picking is less intensive work compared to casual labor, construction workers, and farm laborers
2. Age Group 50 and Above (7 Responders)
    a. The age group 50 and above consists of 7 responders who have reported rag picking as their primary occupation.
    b. This indicates a higher representation of individuals aged 50 and above in the category of ragpickers.

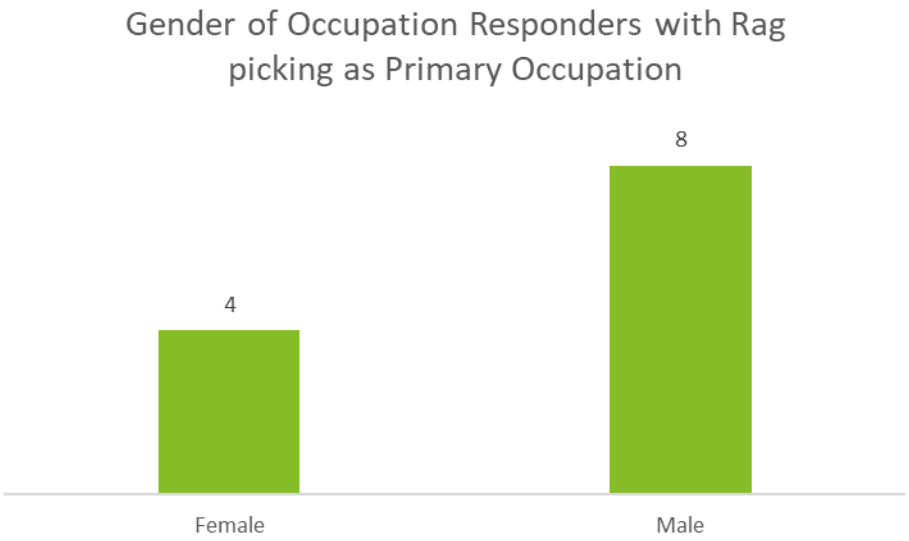
c. Reportedly, before the age of 50, they were involved in casual labor, construction work, and farm labor. However, due to their age, they have now shifted to less labor-intensive work, namely rag picking.

Overall Observation

As per the consultation findings, individuals in this age group, despite their involvement in rag picking, may not be the exclusive providers of livelihood within their families. Instead, they play a supportive role, supplementing the existing income sources of their households

Further analysis reveals that none of the responders who have reported rag picking as their primary occupation falls within the age group of 26-50, considered most of them are female and are undertaking less labor-intensive work

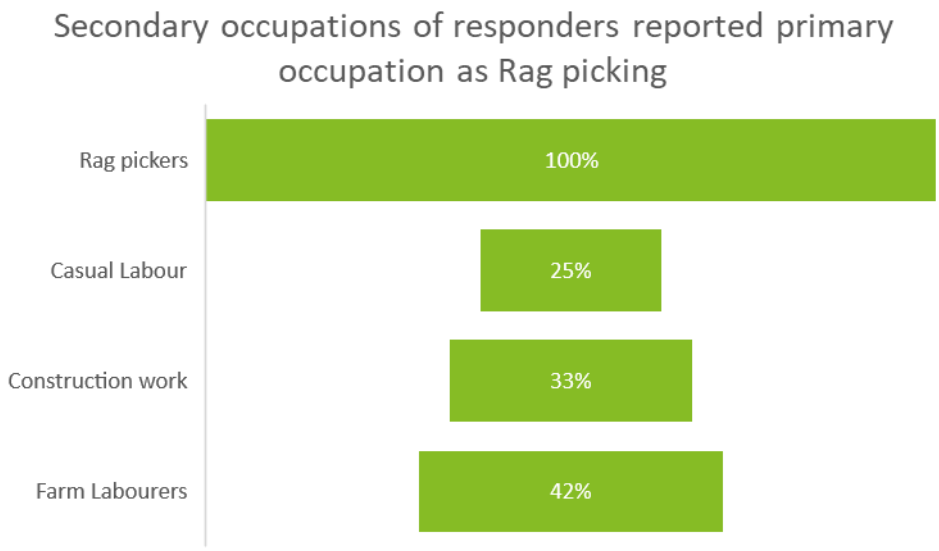
Figure 5-35 Gender profiling of Responders reported Rag picking as their Primary Occupation



1. Female Responders (4)
    a. Four female responders have reported rag picking as their primary occupation.
    b. Notably, all female responders engaged in rag picking fall within the age group of 20-25. This concentration of females in the younger age bracket suggests a specific demographic trend within the community.
2. Male Responders (8)
    a. Eight male responders have identified rag picking as their primary occupation.
    b. Only one (1) male responder falls within the age group of 20-25 (remaining four (4) in the age group is female), indicating that the majority of male respondents engaged in rag picking are in age groups (of 50 and above) beyond the optimal age range for livelihood earning.

    Note: In the age group of 20-25 – four (4) are females and one (1) is male; and in the age group of 50 and above - all seven (7) are males.

Figure 5-36 Profiling of Responders who have reported Rag picking as their primary occupation



1. Rag pickers
   a. All 12 responders who reported rag picking as their primary occupation are included in this category.
   b. This indicates that all the respondents engaged in rag picking also have a secondary occupation.
2. Casual Labour
   a. Among those who are ragpickers, 3 individuals have casual labor as their secondary occupation.
   b. This suggests that a portion of ragpickers is also involved in casual labor as a secondary economic activity.
   c. Typically, casual labour work encompasses of temporary work such as house cleaning, painting, labour support in weddings and other functions, etc. Additionally, the respondents do not engage in both type of work on same day; they choose either casual labour or rag picking. For casual labour, responders usually travel to Rajkot city, which is approximately 10-15 kilometers from their place of residence.
3. Construction Workers
   a. 4 responders engaged in rag picking also have construction work as their secondary occupation.
   b. This shows that some individuals involved in rag picking are simultaneously engaged in construction work.
   c. Construction workers perform various manual tasks on construction sites to support construction operations. Additionally, the respondents do not engage in both types of work on the same day; they choose either construction work or rag picking. For casual labour, responders usually travel to Rajkot city, which is approximately 10-15 kilometers from their place of residence.
4. Farm Labourers
   a. 5 respondents who are ragpickers also have farm labor as their secondary occupation.
   b. This indicates that there is a subgroup of ragpickers who are involved in agricultural activities as well.
   c. Farm laborers perform a range of manual tasks during sowing, harvesting, and regular crop maintenance work. Notably, they do not engage in both types of work on the same day; instead, they choose either construction work or rag picking. Furthermore, most farm laborers do not participate in rag picking activities during sowing and harvesting seasons. When undertaking farm labor, responders typically travel to the outskirts of Rajkot city, which is approximately 5-10 kilometers from their place of residence.

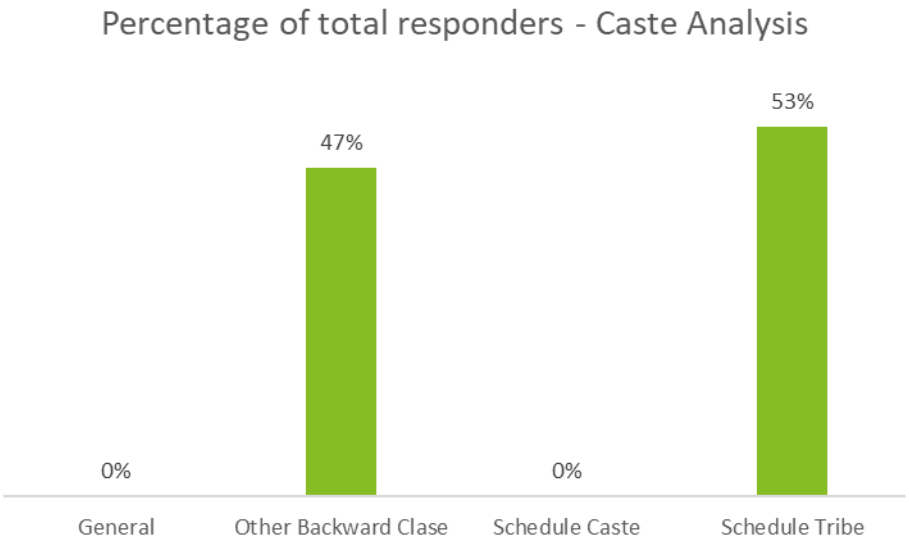
Overall Observations

- All individuals engaged in rag picking, as their primary occupation, have reported having a secondary occupation.
- The data highlights the economic versatility and multiple sources of income for individuals engaged in rag picking.
- Since ragpickers have secondary occupations, they may not be solely dependent on rag picking at landfills for their income.
- The secondary occupations, such as casual labor, construction work, or farm labor, may provide an additional source of income, reducing their reliance on waste collection.
- Having multiple sources of income could make ragpickers more adaptable to changes in waste disposal practices

5.4.14.2.4 Vulnerability Analysis of Responders

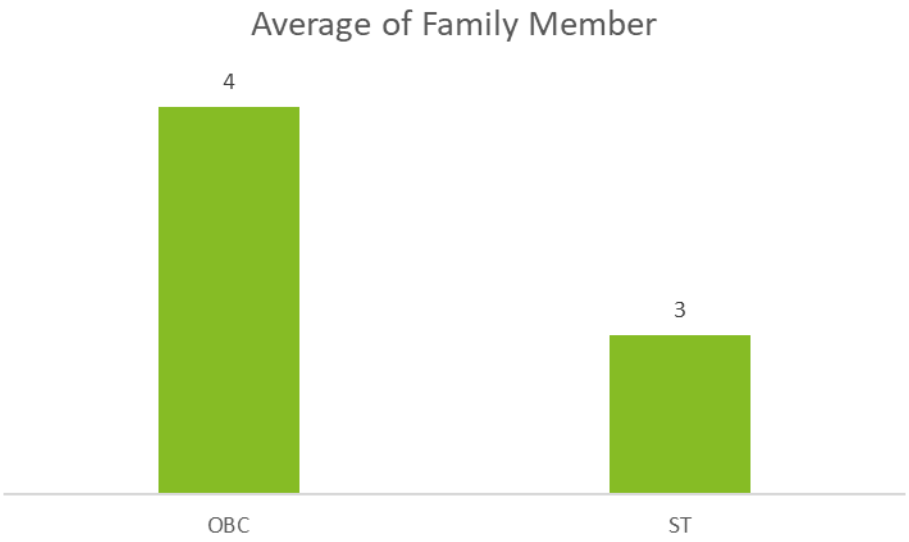
Based on the information collected during the survey, a vulnerability assessment has been of responders, which is provided below:

Figure 5-37 Vulnerability Analysis of Responders



1. General
   a. **Number of Responders:** 0
   b. **Vulnerability Assessment:** The absence of responders identifying as General suggests that individuals from the General category are not engaged in rag picking as their primary or secondary occupation. While this limits the specific vulnerability assessment for this category, it may indicate a potential occupational preference or exclusion from rag picking activities.
2. Other Backward Class
   a. **Number of Responders:** 16
   b. **Vulnerability Assessment:** Individuals belonging to the Other Backward Class (OBC) category, constituting a significant portion of the respondents, may face vulnerabilities associated with historical and social disadvantages. These vulnerabilities could include limited access to education, employment opportunities, and social services.
3. Schedule Caste
   a. **Number of Responders:** 0
   b. **Vulnerability Assessment:** The absence of responders identifying as SC suggests that individuals from the SC category are not engaged in rag picking as their primary or secondary occupation.
4. Schedule Tribe
   a. **Number of Responders:** 18
   b. **Vulnerability Assessment:** Individuals belonging to the Schedule Tribe category, with a substantial presence in the surveyed population, may face vulnerabilities associated with historical marginalization, limited access to resources, and cultural challenges. Majorly, the ST community includes of Koli, Bhil, Dhor, Raabari and Bharwad. Further, their movement is seasonal.

Figure 5-38 Vulnerability Analysis of Responders – OBC and ST Population (household dependence)

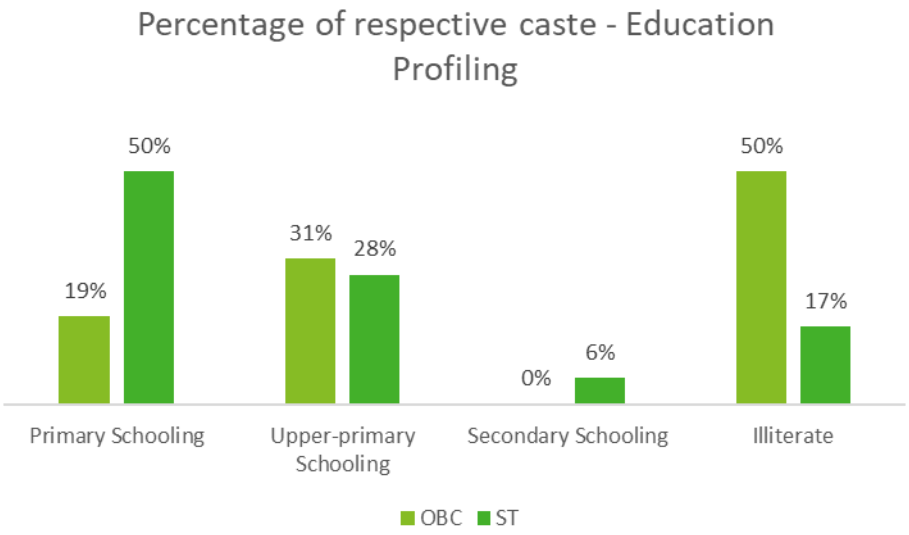


1. Other Backward Class
   a. **Number of Responders:** 16
   b. **Average Family Members:** 4
   c. **Vulnerability Assessment:** The average family size of 4 for OBC responders suggests a relatively larger household structure. Vulnerabilities within OBC families may include challenges in providing for a larger number of family members, including education, healthcare, and overall livelihood. The dependence on the head of the household for economic support becomes crucial in such scenarios.
2. Schedule Tribe
   a. **Number of Responders:** 18
   b. **Average Family Members:** 3
   c. **Vulnerability Assessment:** The average family size of 3 for ST responders indicates a comparatively smaller household structure. While the household size is smaller, vulnerabilities may still exist, particularly if the head of the household faces challenges in providing for the family. Dependency on the head of the household for income and support remains a key factor in addressing vulnerabilities. Significantly, the surveyed ST responders have migrated along with their immediate family members, specifically their spouses and children.

Overall Vulnerability

The vulnerability analysis, considering both caste distribution (OBC and ST) and the average family size, suggests that households with larger family structures (OBC) may face unique challenges in providing for the needs of multiple family members.

Figure 5-39 Vulnerability Analysis of Responders – OBC and ST Population (Education)

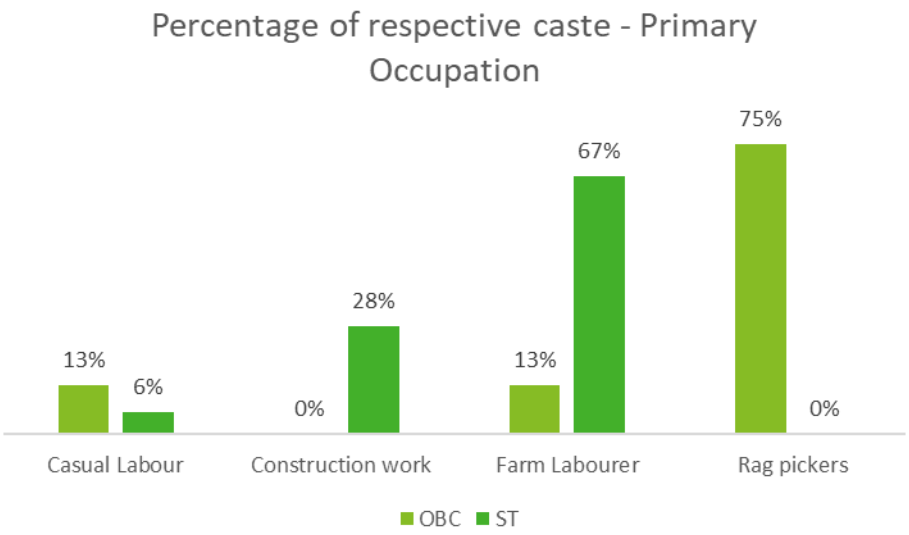


1. Other Backward Class
    a. **Vulnerability Assessment:** (i) The distribution of education levels within OBC responders indicates a mix of educational attainment. While a significant portion has received upper-primary schooling, the presence of illiterate individuals (8) suggests potential vulnerabilities in terms of limited access to higher education and skill development; and (ii) The OBC category displays a significant vulnerability in terms of illiteracy, with half of the respondents being illiterate. This high percentage highlights potential challenges in access to education, limited literacy programs, and the need for targeted interventions to address this vulnerability.
2. Other Backward Class
    a. **Vulnerability Assessment:** (i) ST responders also display a diverse educational distribution. A notable number with only primary schooling (9) raises concerns about the depth of education; and (ii) The ST category shows a lower percentage of illiteracy (17%) compared to OBC.

Overall Vulnerability

The vulnerability assessment based on illiteracy rates indicates a higher vulnerability within the OBC category, where half of the respondents are illiterate. The ST category, while exhibiting a lower percentage of illiteracy, still requires attention to ensure continued progress in literacy and education.

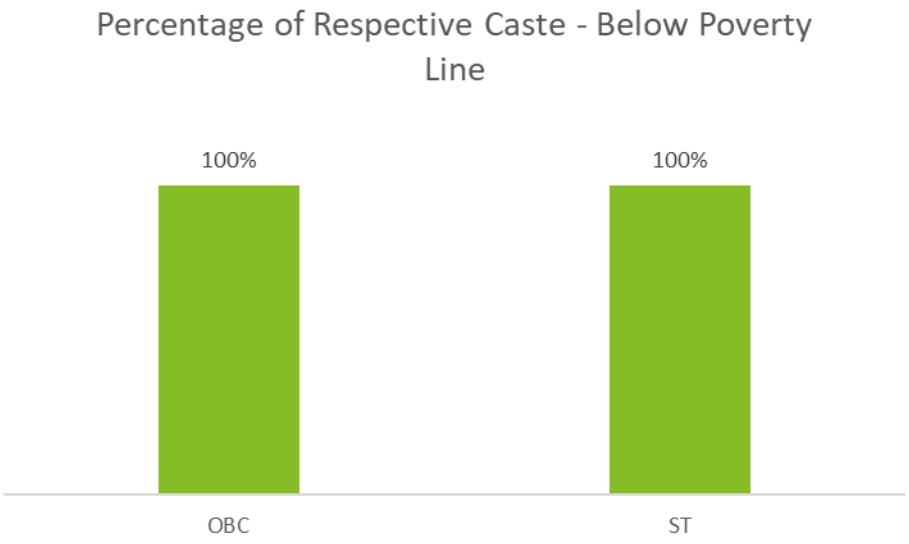
Figure 5-40 Vulnerability Analysis of Responders – Primary Occupation (Caste Analysis)



1. Casual Labour
   a. **OBC:** 2
   b. **ST:** 1
   c. **Vulnerability Assessment:** Both OBC and ST individuals engage in casual labour, with slightly higher participation from OBC (2). Casual labour vulnerabilities may include job insecurity, low wages, and lack of access to social protections. The overall impact is relatively low due to the limited engagement in this category.
2. Casual Labour
   a. **OBC:** 0
   b. **ST:** 5
   c. **Vulnerability Assessment:** The ST category has a higher engagement in construction work (5) compared to OBC (0). Construction work vulnerabilities may include physical strain, job instability. The higher participation of ST individuals indicates potential vulnerability in this occupation.
3. Casual Labour
   a. **OBC:** 2
   b. **ST:** 12
4. **Vulnerability Assessment:** A substantial number of ST individuals (12) engage in farm labour, indicating potential vulnerabilities associated with seasonal work, agricultural uncertainties, and limited access to resources. OBC individuals engaging in farm labour (2) also face similar challenges, but to a lesser extent.
5. Rag picking
   a. **OBC:** 12
   b. **ST:** 0
   c. **Vulnerability Assessment:** Rag picking is predominantly undertaken by OBC individuals (12), while no ST individuals are engaged in this occupation. Considering that ragpickers are considered more vulnerable than other forms of primary occupation, this indicates a heightened vulnerability for OBC individuals in this specific occupation.

Overall Observation
The vulnerability assessment based on primary occupations and caste indicates specific challenges within each category. Rag picking appears to be a significant vulnerability hotspot for OBC individuals.
Note: Surveyed OBC populations are not migrant.

Figure 5-41 Vulnerability Analysis of Responders – Primary Occupation (Caste Analysis)



1. Other Backward Class (OBC)
   a. **Below Poverty Line:** 16 (47% of total 34 responders)
   b. **Vulnerability Assessment:** The number of OBC individuals below the poverty line indicates a significant vulnerability within this caste group. Economic challenges associated with poverty may impact access to education, healthcare, and overall well-being.
2. Scheduled Tribe (ST)
   a. **Below Poverty Line:** 18 (53% of total 34 responders)

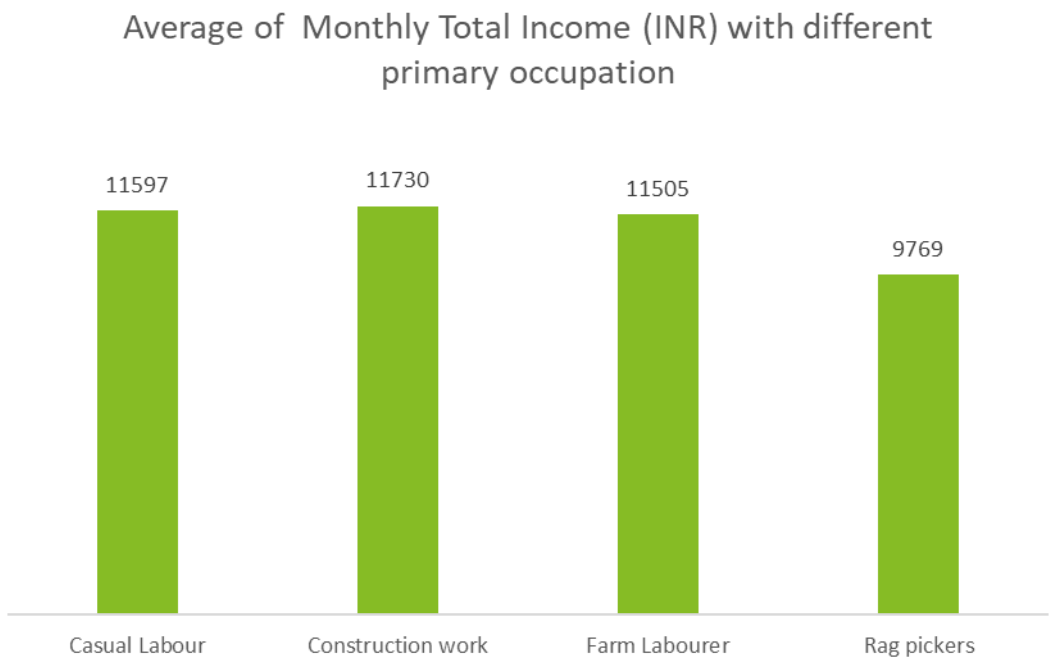
b. **Vulnerability Assessment:** The higher number of ST individuals below the poverty line suggests an increased vulnerability in terms of economic hardships. The impact of poverty may be profound, affecting various aspects of life, including livelihood opportunities and social development.

Overall Vulnerability

The vulnerability assessment based on individuals below the poverty line indicates a substantial vulnerability for both OBC and ST populations. Economic challenges associated with poverty may exacerbate other vulnerabilities, contributing to a complex set of issues.

Note: According to the survey results, all respondents confirmed that they possess Below Poverty Line (BPL) Ration Cards. Therefore, the number provided for responders falling under the BPL category is based on their possession of ration cards

Figure 5-42 Vulnerability Assessment – Monthly Total Income (INR)



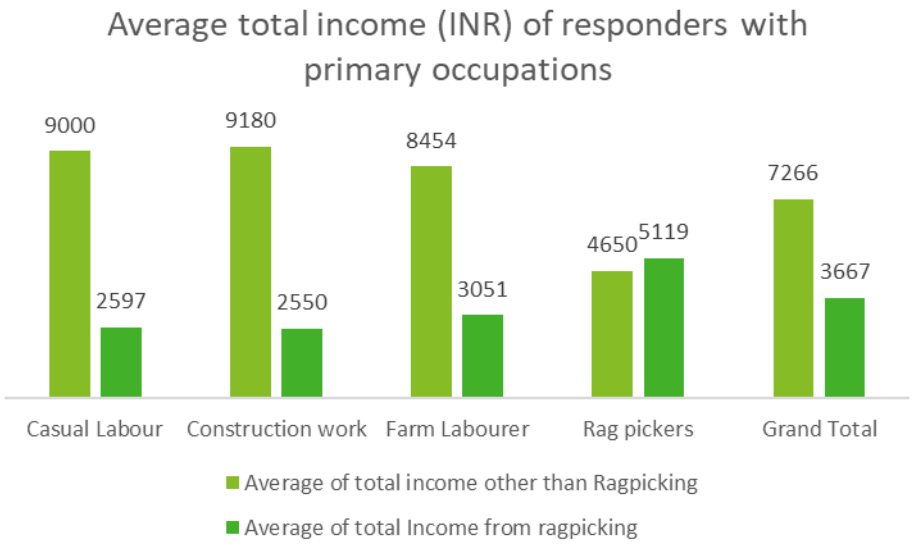
1. **Casual Labour (Average Income: 11597/month):** Casual laborers, on average, earn 11597 as their total income. This occupation represents a significant segment of the surveyed population, and the relatively higher average income may suggest the presence of diverse skill sets or demand for labour in this category.
2. **Construction Work (Average Income: 11730 /month):** Individuals engaged in construction work exhibit the highest average total income among the listed occupations, with an average of 11730. This might be attributed to the specialized skills and physical demands associated with construction activities.
3. **Farm Labourers (Average Income: 11505 /month):** Farm laborers report an average total income of 11505. The agricultural sector often involves seasonal variations, impacting income levels. The relatively stable average income indicates a consistent earning pattern in this occupation.
4. **Rag Pickers (Average Income: 9769 /month):** Rag pickers, on average, have the lowest reported total income among the primary occupations, with an average of 9769. This occupation might involve challenges such as irregular work opportunities and lower remuneration, contributing to the lower average income.

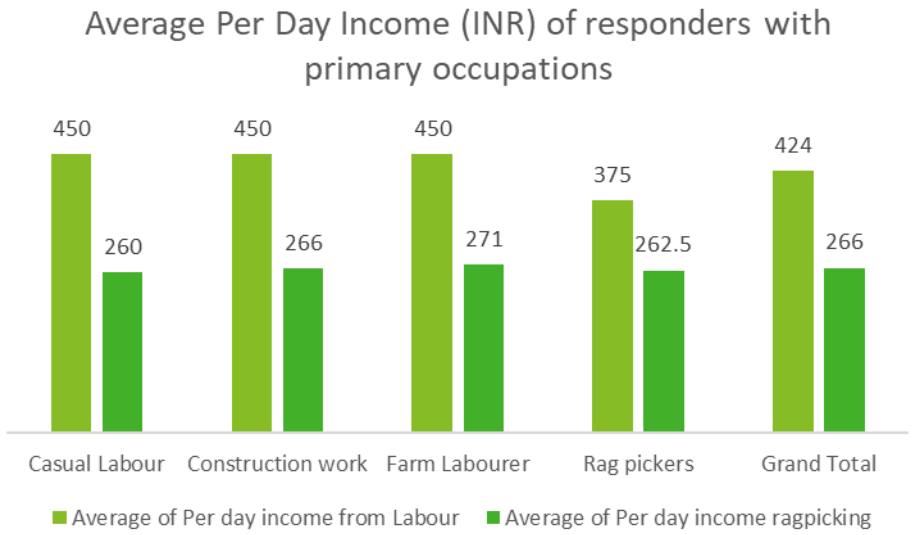
Vulnerability Assessment

Rag pickers face income vulnerability due to the lowest reported average income (9769). This income vulnerability exposes them to economic uncertainties and challenges in meeting basic needs

Rag pickers may have limited alternative opportunities for income generation due to the perceived age groups and low hard labour work required for their occupation. This lack of alternative avenues contributes to their vulnerability, especially when faced with disruptions in rag picking activities.

Figure 5-43 Vulnerability Assessment – Average total income and per day income of responders with primary occupations





Based on the provided data, we can observe the average total income from different primary occupations other than rag picking, as well as the average total income from rag picking. Here is the detailed assessment:

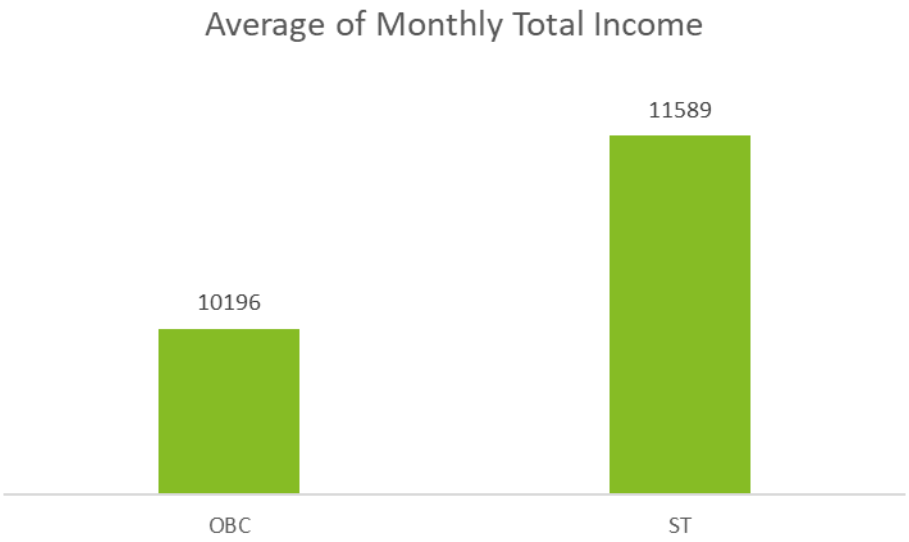
- There is variation in the average total income among different primary occupations. Construction workers have the highest average total income, followed by farm laborers and casual laborers. Rag pickers have relatively lower average total income, both from rag picking and other occupations, indicating income disparity among different occupations.
- For casual laborers, construction workers, and farm laborers, the average income from other sources than rag picking is consistently higher than the income from rag picking. This suggests that rag picking serves as a supplementary income for individuals engaged in these occupations as primary source of income. While they earn more from their primary occupation, rag picking provides an additional source of income, contributing to their overall livelihood.
- Among casual laborers, construction workers, and farm laborers, the difference between the average income from other sources and rag picking is relatively small compared to rag pickers. This indicates that for these occupations, rag picking contributes significantly to the overall income.
- Rag pickers earn more from rag picking compared to other sources, indicating the primary reliance on rag picking for their livelihood.

Vulnerability Assessment

Responders with rag picking as the primary source of income are the most vulnerable group due to their primary reliance on rag picking for income, which exposes them to income instability and economic uncertainties. Further, they earn less as compared to other responders with other livelihood earning activities as their primary source of income.

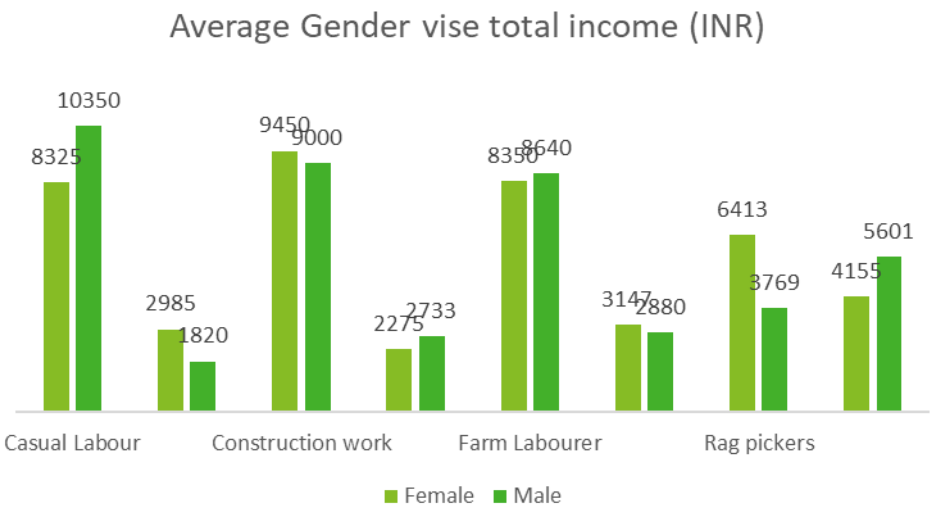
Casual laborers, construction workers, and farm laborers exhibit vulnerability, albeit to a lesser extent, due to fluctuations in income from their primary occupations and supplementary income from rag picking.

Figure 5-44 Vulnerability Analysis – Income assessment (Caste Basis)



1. Other Backward Class (OBC)
   a. **Average Total Income:** 10,196/month
   b. **Vulnerability Assessment:** The relatively lower average total income for OBC individuals suggests a potential vulnerability in terms of economic well-being. Lower income levels may impact access to essential services, education, and overall quality of life.
2. Schedule Tribe (ST)
   a. **Average Total Income:** 11,589/month
   b. **Vulnerability Assessment:** While the average total income for ST individuals is higher than that of OBC individuals, it still indicates a vulnerability in terms of economic conditions. The need for higher income levels to meet various needs may pose challenges for ST individuals.

Figure 5-45 Vulnerability Analysis – Income Assessment (Gender Basis)



- Female casual laborers earn lower average income from other sources compared to male casual laborers.
- Female casual laborers earn higher average income from rag picking compared to males.
- Female construction workers earn slightly higher average income from other sources compared to male construction workers.
- Female farm laborers earn slightly lower average income from other sources compared to male farm laborers.
- Female farm laborers earn higher average income from rag picking compared to males.
- Female rag pickers earn higher average income from other sources compared to male rag pickers.

5.4.14.2.5 Overall Observations

Primary Occupation

- Responders have self-defined their primary occupation based on the number of days dedicated to specific livelihood activities. Generally, those reporting a primary occupation other than rag picking engage in alternative livelihood options for 18-20 days per month. In contrast, responders with rag picking as their primary occupation typically spend 15-16 days per month on rag picking activities.
- Responders whose primary occupation is other than rag picking resort to engaging in rag picking activities if alternative work is not available in the open market. This adaptive approach suggests a flexibility in their economic strategies.
- Individuals with rag picking as their primary occupation cite several reasons for undertaking this activity. Firstly, the age factor plays a role, as these responders do not fall within the optimal age group for intensive labour work. Secondly, rag picking is perceived as less physically demanding compared to other labour-intensive activities, making it a viable supplementary income opportunity for their families.
- Furthermore, respondents highlight that they earn more in other forms of work compared to rag picking. For instance, the reported average income through rag picking is INR 266.47 per day, whereas alternative work yields higher earnings ranging between INR 450-500 per day. This economic rationale underscores the respondents' inclination to undertake rag picking only when alternative opportunities are not available. Furthermore, respondents whose primary occupation lies outside of rag picking emphasize that they engage in rag picking only when alternative employment opportunities are unavailable, with rag picking being regarded as a fallback option under such circumstances.
- In summary, the responders' economic decisions reveal an approach influenced by age considerations, perceived intensity of labour, and the comparative income potential of different livelihood activities. This understanding is vital for developing targeted interventions that address the specific needs and preferences of individuals engaged in rag picking within the surveyed community.

Overall Vulnerability Assessment

- OBC exhibits a higher dependence on household members for various needs compared to the ST community. This vulnerability arises from a higher reliance on internal support systems, possibly indicating lower economic independence and social resilience.
- OBC faces a higher number of illiterate individuals within their community, which contributes to their vulnerability. Limited access to education may hinder socio-economic mobility and opportunities for the OBC population.
- The majority of OBC individuals are involved in rag picking, a profession associated with average low income as compared to other primary occupation
- The average total income of the OBC community is lower than that of the ST community. This economic disparity suggests that OBC individuals face challenges in generating sufficient income, leading to increased vulnerability in terms of meeting basic needs and improving their overall quality of life
- In summary, the combination of higher household member dependence, lower educational attainment, involvement in lower-paying occupations like rag picking, and a lower average income position the OBC community as more vulnerable compared to the ST community.

5.5 Ecological Baseline

To understand the ecological sensitivity and to establish an ecological baseline (flora and fauna) of the study area, an ecological survey was conducted between 16th – 18th May 2023. The main objective of this exercise was to identify the potential impacts on the species and habitats (present in the vicinity) due to the project-related activities, so as to identify suitable impact mitigation and management strategy.

5.5.1 Objectives

The survey was conducted with the following objectives,

- Identification of internationally and/or nationally recognized areas of high biodiversity value e.g., Protected Areas (PAs), Key Biodiversity Areas (KBAs) / Important Bird and Biodiversity Areas (IBAs), Alliance for Zero Extinction (AZE) sites, etc.
- Identification of different habitats (natural, modified, and critical) falling within core and buffer zones.
- Documentation of floral and faunal [specifically herpetofauna (reptiles + amphibians), birds, and mammals] species based on direct sightings, calls, pugmarks (if any), etc.
- Trace out of any endangered or protected or restricted range floral species. Identification of any threatened (as per IUCN Red List), scheduled (as per Wildlife (Protection) Act, 1972), Endemic or restricted-range and migratory or congregatory faunal species (as defined in IFC PS 6) from the study area.
- Identification of wildlife migratory corridors, avian migratory routes, and other important areas for ecological reasons such as breeding, nesting, foraging, resting, etc.

5.5.2 Ecological Baseline - Data Collection Methods

To understand the existing ecological conditions in the study area, an ecological baseline was prepared. This base line was prepared with the help of information gathered under, i. Literature Review and ii. Field Data Collection.

5.5.2.1 Literature Review

A literature review was performed to screen out the presence of internationally and/or nationally recognized areas of high biodiversity value e.g., Protected Areas (PAs), Alliance for Zero Extinction (AZE) sites, etc.; and habitat of IUCN Threatened and Restricted-range species; and Key Biodiversity Areas (KBAs), which include Important Bird and Biodiversity Areas (IBAs) in and around the proposed project location. A list of floral and faunal species was also prepared along with their conservation status (as per IUCN) and their status in the list of scheduled species [as per Wildlife (Protection) Act, 1972] utilizing collected secondary data during literature review. The dominant habitats in and around the project location was also identified with the help of google earth imagery and other available secondary data. The recognized (internationally and/or nationally) wildlife migratory corridors, and avian migratory routes were also identified with the available information.

5.5.2.2 Field Data Collection

A field survey was conducted to determine the existing ecological conditions (habitats, flora and fauna) within the study area. This baseline facilitates an adequate assessment of the project's impacts upon ecology as well as it helps the development of appropriate mitigation measures. Habitats, which may support good biodiversity i.e., forest patches, scrubs, water bodies, etc. will be focused during the survey.

Habitat Survey

Different habitats (natural and modified) available within the study area identified by the desktop review were verified through site visit. Data regarding the type and quality of habitat with reference to flora and fauna supported were collected.

Floral Survey

The floral diversity of the study area was recorded by visual observation during the site visit and identified using published manuals. The information (Scientific publications) dealing with the floristic diversity of the related area available in the public domain were also considered in the survey.

Faunal Survey

I. Faunal species (specifically reptiles, birds, and mammals) from the study areas were recorded based on direct sightings, indirect evidence such as dung, droppings, scats, pugmarks, scratch signs, burrows, nests, etc.;

II. Consultations were carried out by displaying photographs of species anticipated in the area to confirm whether there have been any recent sightings. The photographs of the species were typically obtained from the authentic sources[56][57][58];
III. Identification and classification of any species recognized as Threatened (in accordance with International Union for the Conservation of Nature [IUCN] Red List Online Version 2022-1) and according to the schedules of the Wildlife (Protection) Act, 1972; and
IV. Identification of areas which are important or sensitive for ecological reasons including their breeding, nesting, foraging, resting, overwintering areas including wildlife migratory corridors/avian migratory routes.

5.5.3 Ecological Baseline - Results

5.5.3.1 Literature Review - eBird Database

The historical data regarding the presence of birds in the region was extracted from the eBird Database[58]. The database indicates the presence of at least 249 avifaunal species in the area (10-15 km around the project site) (Appendix 19). The major objective to extract this information was to see the incidence of IUCN threatened birds, vultures, raptors, and migratory birds in the area. The eBird Database indicates the presence of four (04) Vulnerable [Common Pochard (*Aythya ferina*), Greater Spotted Eagle (*Clanga clanga*), Kashmir Flycatcher (*Ficedula subrubra*), & River Tern (*Sterna aurantia*)]; thirteen (13) Near Threatened [Alexandrine Parakeet (*Palaeornis eupatria*), Asian Woollyneck (*Ciconia episcopus*), Black-headed Ibis (*Threskiornis melanocephalus*), Black-necked Stork (*Ephippiorhynchus asiaticus*), Black-tailed Godwit (*Limosa limosa*), Curlew Sandpiper (*Calidris ferruginea*), Dalmatian Pelican (*Pelecanus crispus*), Ferruginous Duck (*Aythya nyroca*), Great Thick-Knee (*Esacus recurvirostris*), Lesser Flamingo (*Phoeniconaias minor*), Oriental Darter (*Anhinga melanogaster*), Painted Stork (*Mycteria leucocephala*), & Pallid Harrier (*Circus macrourus*)]; and 16 Schedule I [Booted Eagle, Brahminy Kite, Eurasian Sparrowhawk, Eurasian Spoonbill, Greater Spotted Eagle, Indian Peafowl, Long-legged Buzzard, Montagu's Harrier, Oriental Honey-buzzard, Osprey, Pallid Harrier, Peregrine Falcon, Red-necked Falcon, Shikra, Short-toed Snake-Eagle & Western Marsh-Harrier] species in the area (***Table 5-37***). This secondary information also reports 20 raptor species from the region (***Table 5-38***); while no vulture was reported from the region. As per the database, at least 103 migratory birds including three Vulnerable [Common Pochard (*Aythya ferina*), Greater Spotted Eagle (*Clanga clanga*), & Kashmir Flycatcher (*Ficedula subrubra*)]; five Near Threatened [Black-tailed Godwit (*Limosa limosa*), Curlew Sandpiper (*Calidris ferruginea*), Dalmatian Pelican (*Pelecanus crispus*), Ferruginous Duck (*Aythya nyroca*), & Pallid Harrier (*Circus macrourus*)] and 09 Schedule I [Booted Eagle, Eurasian Sparrowhawk, Greater Spotted Eagle, Long-legged Buzzard, Montagu's Harrier, Osprey, Pallid Harrier, Red-necked Falcon, & Western Marsh-Harrier] species were reported from the area. As per the available secondary data[59], Demoiselle Crane, Common Coot, Northern Pintail, Dalmatian Pelican, Black-tailed Godwit, Glossy Ibis, Common Crane, Common Teal, Ruff, Bar-headed Goose, Common Pochard, Gadwall, Garganey, & Eurasian Wigeon are the key migratory and/or congregatory species from the area.

Table 5-37 Threatened and Near Threatened birds reported from the region

S.N.	Common English Name	Binomial Scientific Name	Migrant (M) / Resident (R)	IUCN Red List - Categories	Wildlife (Protection) Act - Schedules
1	Common Pochard	*Aythya ferina*	M	Vulnerable	Schedule IV
2	Greater Spotted Eagle	*Clanga clanga*	M	Vulnerable	Schedule I
3	Kashmir Flycatcher	*Ficedula subrubra*	M	Vulnerable	Schedule IV
4	River Tern	*Sterna aurantia*	R	Vulnerable	Schedule IV
5	Black-tailed Godwit	*Limosa limosa*	M	Near Threatened	Schedule IV
6	Alexandrine Parakeet	*Palaeornis eupatria*	R	Near Threatened	Schedule IV
7	Asian Woollyneck	*Ciconia episcopus*	R	Near Threatened	Schedule IV

[56] Grewal, B., Sen, S., Singh, S., Devasar, N. & Bhatia G. (2016) A Pictorial Field Guide to Birds of India, Pakistan, Nepal, Bhutan, Sri Lanka and Bangladesh. Om Books International, Noida, Uttar Pradesh, India.

[57] Menon, V. (2014) Indian Mammals: A Field Guide. Hachette, India

[58] https://ebird.org/barchart?byr=2001&eyr=2023&bmo=1&emo=12&r=L8710211,L6604086,L6596591,L3619186,L5120813,L8988287,L9019832,L4005820

[59] eBird Database [https://ebird.org/hotspot/L4005820; https://ebird.org/hotspot/L5120813; https://ebird.org/hotspot/L9019832; https://ebird.org/hotspot/L6604086; https://ebird.org/hotspot/L6596591; https://ebird.org/hotspot/L3619186; https://ebird.org/hotspot/L8710211; https://ebird.org/hotspot/L8988287]

S.N.	Common English Name	Binomial Scientific Name	Migrant (M) / Resident (R)	IUCN Red List - Categories	Wildlife (Protection) Act - Schedules
8	Black-headed Ibis	*Threskiornis melanocephalus*	R	Near Threatened	Schedule IV
9	Black-necked Stork	*Ephippiorhynchus asiaticus*	R	Near Threatened	Schedule IV
10	Curlew Sandpiper	*Calidris ferruginea*	M	Near Threatened	Schedule IV
11	Dalmatian Pelican	*Pelecanus crispus*	M	Near Threatened	Schedule IV
12	Ferruginous Duck	*Aythya nyroca*	M	Near Threatened	Schedule IV
13	Great Thick-Knee	*Esacus recurvirostris*	R	Near Threatened	Schedule IV
14	Lesser Flamingo	*Phoeniconaias minor*	R	Near Threatened	Schedule IV
15	Oriental Darter	*Anhinga melanogaster*	R	Near Threatened	Schedule IV
16	Painted Stork	*Mycteria leucocephala*	R	Near Threatened	Schedule IV
17	Pallid Harrier	*Circus macrourus*	M	Near Threatened	Schedule I

Table 5-38 Raptors reported from the region

S.N.	Common English Name	Binomial Scientific Name	Migrant (M) / Resident (R)	IUCN Red List - Categories	Wildlife (Protection) Act - Schedules
1	Booted Eagle	*Hieraaetus pennatus*	M	Least Concern	Schedule I
2	Barn Owl	*Tyto alba*	R	Least Concern	Schedule IV
3	Black Kite	*Milvus migrans*	R	Least Concern	Schedule II
4	Black-winged Kite	*Elanus caeruleus*	R	Least Concern	Schedule II
5	Brahminy Kite	*Haliastur indus*	R	Least Concern	Schedule I
6	Common Kestrel	*Falco tinnunculus*	M	Least Concern	Schedule IV
7	Eurasian Hobby	*Falco Subbuteo*	M	Least Concern	Schedule IV
8	Eurasian Sparrowhawk	*Accipiter nisus*	M	Least Concern	Schedule I
9	Greater Spotted Eagle	*Clanga clanga*	M	Vulnerable	Schedule I
10	Long-legged Buzzard	*Buteo rufinus*	M	Least Concern	Schedule I
11	Montagu's Harrier	*Circus pygargus*	M	Least Concern	Schedule I
12	Oriental Honey-buzzard	*Pernis ptilorhynchus*	R	Least Concern	Schedule I
13	Osprey	*Pandion haliaetus*	M	Least Concern	Schedule I
14	Pallid Harrier	*Circus macrourus*	M	Near Threatened	Schedule I
15	Peregrine Falcon	*Falco peregrinus*	R	Least Concern	Schedule I
16	Red-necked Falcon	*Falco ruficollis*	M	Least Concern	Schedule I
17	Shikra	*Accipiter badius*	R	Least Concern	Schedule I
18	Short-toed Snake-Eagle	*Circaetus gallicus*	R	Least Concern	Schedule I
19	Spotted Owlet	*Athene brama*	R	Least Concern	Schedule IV
20	Western Marsh-Harrier	*Circus aeruginosus*	M	Least Concern	Schedule I

5.5.3.2 Habitat Survey

In the literature review, different habitats within the study area, were identified with the help of Google Earth satellite imagery. These habitats were verified during the reconnaissance survey in site visit. The study area consists of natural

habitats[60] (open scrub, water bodies, & Water streams / Rivers), and modified habitats[61] (agricultural lands, & plantations - orchards). The distribution of identified habitats within the study area can be seen in ***Figure 5-46***. Photographs of these habitats have been presented in ***Figure 5-47***.

The project is located on municipal corporation land. The area covered by different habitats in the study area has been provided in ***Table 5-39***. Among the natural habitats, open scrub land is the dominate one with about 49.00 km^2 area, while the agricultural land is the dominant modified habitat with about 257.30 km^2 area of the total land in the study area.

Table 5-39 Area covered by different habitats in the study area

Natural Habitats	Area covered	
	km^2	%
Open Scrub Land	49.00	13.31
Water bodies	13.58	1.71
Water streams / Rivers	3.70	1.01

Modified Habitats	Area covered	
	km^2	%
Agricultural Land & Plantation - orchards	257.30	69.87
Settlements	37.40	10.16
Roads	6.04	1.64
Railway Line	1.21	0.33

[60] Natural habitats are not to be interpreted as untouched or pristine habitats. It is likely that the majority of habitats designated as natural will have undergone some degree of historical or recent anthropogenic impact. The question is the degree of impact. If, in the judgement of a competent professional, the habitat still largely contains the principal characteristics and functions of a native ecosystem(s), it should be considered a natural habitat regardless of some degree of degradation and/or the presence of some invasive alien species, secondary forest, human habitation, or other human-induced alteration.

[61] Modified habitats are areas that may contain a large proportion of plant and/or animal species of non-native origin, and/or where human activity has substantially modified an area's primary ecological functions and species composition. It may include areas managed for agriculture, forest plantations, reclaimed coastal zones, and reclaimed wetlands.

Figure 5-46 Distribution of habitats in the study area

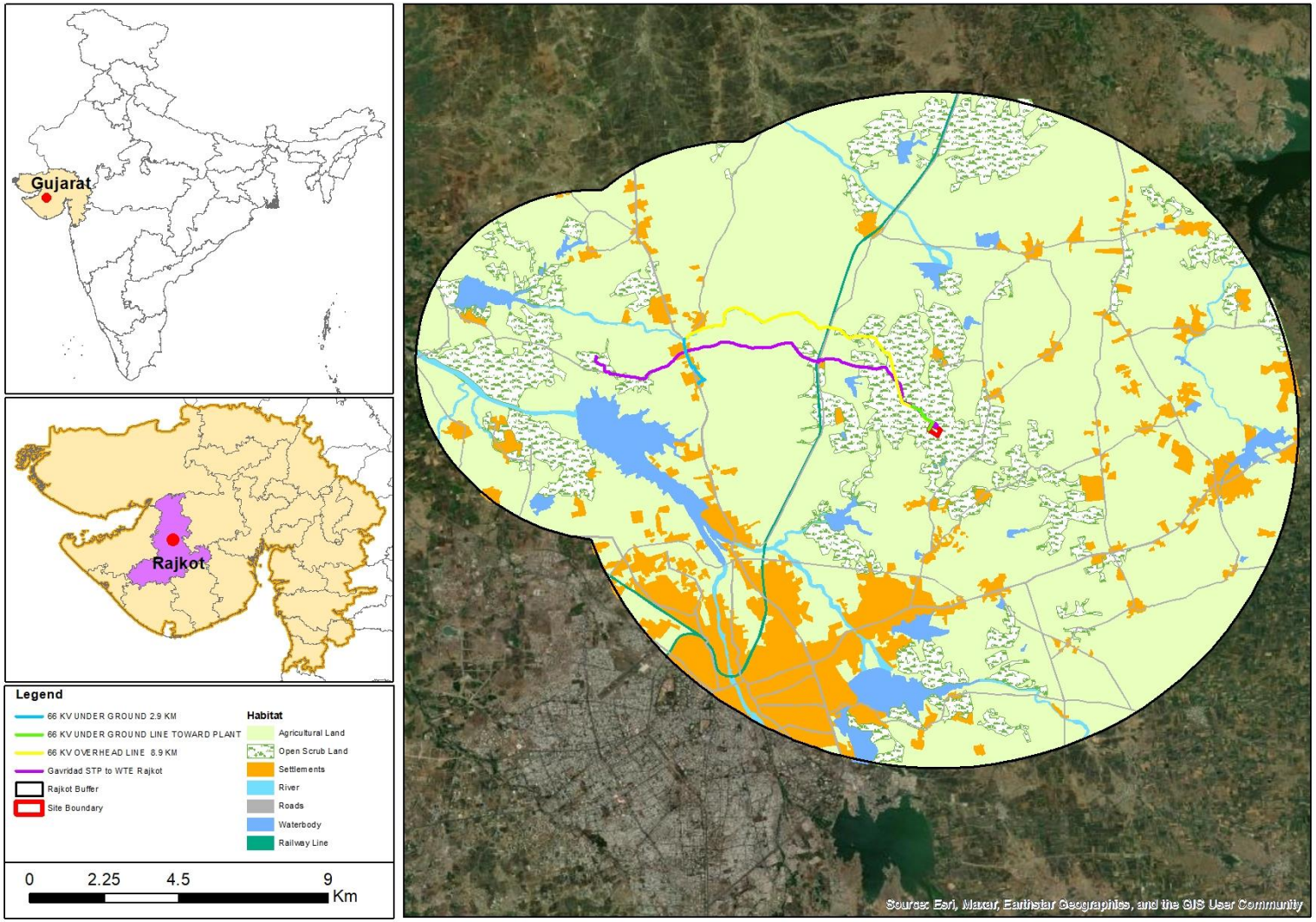
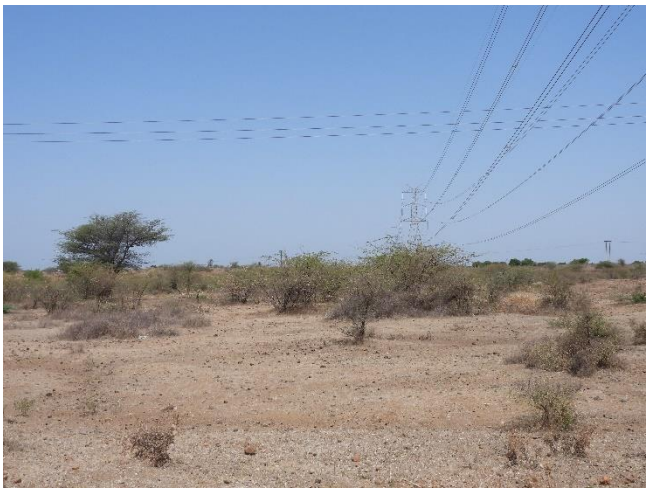


Figure 5-47 Habitats in the study area



Open Scrub

Water Body

Agricultural Land

Plantation

5.5.3.3 Floral Survey

Vegetation Profile

As per the available information, the project is coming on the Semi - Arid – Gujarat Rajputana (4B) Biogeographical Province of India[62], Deccan Plateau (Malwa Plateau, Gujarat plains and Kathiawar peninsula) (Hot, Semi-arid eco-region with moderately deep black soils) Agro-ecological Region[63] and Gujarat plains and hills region (XII) Agro-Climatic Region[64]. The vegetation of the region may be defined as Northern Tropical thorn forest (6B) according to forest classification of Champion and Seth ([651968]).

Floral Diversity

The floral diversity present in the 10 km buffer areas was assessed during the site survey. A total of forty-seven (47) floral species belonging to twenty-one (21) families were observed in the study area. Fabaceae was the most dominating family in the area with 15 species. None of the species identified in the region is threatened and/or restricted range species. A list of encountered floral species with their families and life forms has been given in ***Table 5-40***.

[62] Rodgers W.A., Panwar H.S. and Mathur V.B. (2000) *Wildlife Protected Area Network in India: A Review (Executive Summary)*. Wildlife Institute of India, Dehradun, p. 44.

[63] Mandal D.K., Mandal C. and Singh S.K. (2015) *Delineating Agro-Ecological Regions*. ICAR-NBSSLUP technology, p. 8.

[64] http://iasri.res.in/agridata//12data%5Cchapter1%5Cdb2012tb1_2.pdf

[65] Champion, H. G. and Seth, S. K. (1968). *A Revised Survey of Forest Types of India*. Govt. of India Press, New Delhi, p. 404.

Table 5-40 Floral diversity of the study area

S.N.	Binomial Scientific Name	Family	Life form	IUCN Red List - Categories
1	*Acacia leucophloea* (Roxb.) Willd.	Fabaceae	Tree	Least Concern
2	*Acacia nilotica* (L.) Delile	Fabaceae	Tree	Least Concern
3	*Ailanthus excelsa* Roxb.	Simaroubaceae	Tree	Not assessed
4	*Albizia lebbeck* (L.) Benth.	Fabaceae	Tree	Least Concern
5	*Alstonia scholaris* (L.) R. Br.	Apocynaceae	Tree	Least Concern
6	*Alternanthera philoxeroides* (Mart.) Griseb.	Amaranthaceae	Herb	Not assessed
7	*Alternanthera sessilis* (L.) R.Br. ex DC.	Amaranthaceae	Herb	Least Concern
8	*Argemone mexicana* L.	Papaveraceae	Herb	Not assessed
9	*Azadirachta indica* A.Juss.	Meliaceae	Tree	Least Concern
10	*Butea monosperma* (Lam.) Taub.	Fabaceae	Tree	Least Concern
11	*Butea superba* Roxb.	Fabaceae	Climber / Shrub	Not assessed
12	*Calotropis gigantea* (L.) Dryand.	Apocynaceae	Tree	Not assessed
13	*Calotropis procera* (Aiton) Dryand.	Apocynaceae	Shrub	Least Concern
14	*Capparis decidua* (Forssk.) Edgew.	Capparaceae	Shrub	Least Concern
15	*Chrozophora rottleri* (Geiseler) A.Juss. ex Spreng.	Euphorbiaceae	Herb	Not assessed
16	*Cocos nucifera* L.	Arecaceae	Tree	Not assessed
17	*Cordia dichotoma* G.Forst.	Boraginaceae	Tree	Least Concern
18	*Cryptostegia grandiflora* Roxb. ex R.Br.	Apocynaceae	Climber	Not assessed
19	*Dalbergia sissoo* DC.	Fabaceae	Tree	Least Concern
20	*Eichhornia crassipes* (Mart.) Solms	Pontederiaceae	Herb	Not assessed
21	*Eucalyptus* sp.	Myrtaceae	Tree	-
22	*Euphorbia caducifolia* Haines	Euphorbiaceae	Tree	Not assessed
23	*Euphorbia hirta* L.	Euphorbiaceae	Herb	Not assessed
24	*Ficus benghalensis* L.	Moraceae	Tree	Not assessed
25	*Ficus religiosa* L.	Moraceae	Tree	Least Concern
26	*Ficus virens* Aiton	Moraceae	Tree	Least Concern
27	*Gliricidia sepium* (Jacq.) Steud.	Fabaceae	Tree	Least Concern
28	*Hardwickia binata* Roxb.	Fabaceae	Tree	Least Concern
29	*Heliotropium indicum* L.	Boraginaceae	Herb	Not assessed
30	*Lantana camara* L.	Verbenaceae	Shrub	Not assessed
31	*Leucaena leucocephala* (Lam.) de Wit	Fabaceae	Tree	Not assessed
32	*Mangifera indica* L.	Anacardiaceae	Tree	Data Deficient
33	*Moringa oleifera* Lam.	Moringaceae	Tree	Least Concern
34	*Opuntia elatior* Mill.	Cactaceae	Shrub	Least Concern
35	*Parkinsonia aculeata* L.	Fabaceae	Tree	Least Concern
36	*Peltophorum pterocarpum* (DC.) K.Heyne	Fabaceae	Tree	Not assessed
37	*Phoenix sylvestris* (L.) Roxb.	Arecaceae	Tree	Not assessed

S.N.	Binomial Scientific Name	Family	Life form	IUCN Red List - Categories
38	*Pithecellobium dulce* (Roxb.) Benth.	Fabaceae	Tree	Least Concern
39	*Pongamia pinnata* (L.) Pierre	Fabaceae	Tree	Least Concern
40	*Prosopis juliflora* (Sw.) DC.	Fabaceae	Tree	Not assessed
41	*Ricinus communis* L.	Euphorbiaceae	Small Tree	Not assessed
42	*Salvadora persica* L.	Salvadoraceae	Tree	Least Concern
43	*Senna auriculata* (L.) Roxb.	Fabaceae	Shrub	Not assessed
44	*Solanum sisymbriifolium* Lam.	Solanaceae	Herb	Not assessed
45	*Solanum virginianum* L.	Solanaceae	Herb	Not assessed
46	*Typha domingensis* Pers.	Typhaceae	Herb	Least Concern
47	*Ziziphus nummularia* (Burm. f.) Wight & Arn.	Rhamnaceae	Shrub	Not assessed

5.5.3.4 Faunal Survey

Herpetofauna

As per the literature review[66], local consultation and field survey, 13 herpetofauna (reptiles + amphibians) species were reported / observed from the study area. Indian Flapshell Turtle (*Lissemys punctata*) was categorized as Vulnerable, and Bengal Monitor Lizard (*Varanus bengalensis*) was categorized as Near Threatened category of the IUCN Red List (Online Version 2022-2). Indian Flapshell Turtle and Bengal Monitor Lizard were also listed under the Schedule I category as per the Wildlife (Protection) Act, 1972 (***Table 5-41***).

Table 5-41 Herpetofauna diversity from the study area

S.N.	Common English Name	Binomial Scientific Name	IUCN Red List - Categories	Wildlife (Protection) Act - Schedules	Reported / Observed
1	Asian Common Toad	*Duttaphrynus melanostictus*	Least Concern	Not listed	Reported
2	Asiatic Water Snake	*Fowlea piscator*	Not assessed	Schedule II	Observed
3	Banded Racer	*Platyceps plinii*	Not assessed	Not listed	Reported
4	Bengal Monitor Lizard	*Varanus bengalensis*	Near Threatened	Schedule I	Reported
5	Common Krait	*Bungarus caeruleus*	Not assessed	Schedule IV	Reported
6	Common Sand Boa	*Eryx conica*	Not assessed	Schedule IV	Reported
7	Common Skittering Frog	*Euphlyctis cyanophlyctis*	Least Concern	Schedule IV	Observed
8	Indian Cobra	*Naja naja*	Least Concern	Schedule II	Reported
9	Indian Bullfrog	*Hoplobatrachus tigerinus*	Least Concern	Schedule IV	Reported
10	Indian Flapshell Turtle	*Lissemys punctata*	Vulnerable	Schedule I	Reported
11	Oriental Garden Lizard	*Calotes versicolor*	Not assessed	Not listed	Observed
12	Oriental Ratsnake	*Ptyas mucosa*	Not assessed	Schedule II	Reported
13	Saw-scaled Vipers	*Echis carinatus*	Least Concern	Not listed	Reported

Avifauna (Birds)

During the field survey, 62 avifaunal species were observed from the study area, which include one Vulnerable [River Tern (*Sterna aurantia*)]; and three Near Threatened [Black-headed Ibis (*Threskiornis melanocephalus*), Oriental Darter (*Anhinga*

[66] https://www.inaturalist.org/observations?iconic_taxa=Amphibia,Reptilia&lat=22.376071385022144&lng=70.861150710410 67&place_id=any&radius=16.453496945343545&subview=map&view=species

melanogaster), & Painted Stork (*Mycteria leucocephala*)] as per IUCN Red List (Online Version 2022-2). Five (05) Schedule I species (as per the Wildlife (Protection) Act, 1972) - Brahminy Kite, Eurasian Spoonbill, Indian Peafowl, Shikra, & Short-toed Snake-Eagle were also observed from the area. Only two (02) Migratory [Common Coot (*Fulica atra*), & Gadwall (*Mareca strepera*)], and 05 Raptors [Black Kite (*Milvus migrans*), Black-winged Kite (*Elanus caeruleus*), Brahminy Kite (*Haliastur indus*), Shikra (*Accipiter badius*), & Short-toed Snake-Eagle (*Circaetus gallicus*)] species were also observed in the study area (***Table 5-42***). The survey was conducted in mid of May 2023, which is outside the migratory season. Thus, based on this primary observation, it may not be concluded that the area has not been supporting migratory bird species in the winter.

Table 5-42 Avifaunal diversity observed from the study area

S.N.	Common English Name	Binomial Scientific Name	Migrant (M) / Resident (R)	IUCN Red List - Categories	Wildlife (Protection) Act - Schedules
1	African Comb Duck	*Sarkidiornis melanotos*	R	Least Concern	Schedule IV
2	Ashy Prinia	*Prinia socialis*	R	Least Concern	Schedule IV
3	Ashy-crowned Sparrow-lark	*Eremopterix griseus*	R	Least Concern	Schedule IV
4	Asian Green Bee-eater	*Merops orientalis*	R	Least Concern	Schedule IV
5	Asian Koel	*Eudynamys scolopaceus*	R	Least Concern	Schedule IV
6	Bank Myna	*Acridotheres ginginianus*	R	Least Concern	Schedule IV
7	Baya Weaver	*Ploceus philippinus*	R	Least Concern	Schedule IV
8	Black Drongo	*Dicrurus macrocercus*	R	Least Concern	Schedule IV
9	Black Kite	*Milvus migrans*	R	Least Concern	Schedule II
10	Black-headed Ibis	*Threskiornis melanocephalus*	R	Near Threatened	Schedule IV
11	Black-winged Kite	*Elanus caeruleus*	R	Least Concern	Schedule II
12	Black-winged Stilt	*Himantopus Himantopus*	R	Least Concern	Schedule IV
13	Brahminy Kite	*Haliastur indus*	R	Least Concern	Schedule I
14	Cattle Egret	*Bubulcus ibis*	R	Least Concern	Schedule IV
15	Common Babbler	*Argya caudata*	R	Least Concern	Schedule IV
16	Common Coot	*Fulica atra*	M	Least Concern	Schedule IV
17	Common Hoopoe	*Upupa epops*	R	Least Concern	Not Listed
18	Common Moorhen	*Gallinula chloropus*	R	Least Concern	Schedule IV
19	Common Myna	*Acridotheres tristis*	R	Least Concern	Schedule IV
20	Eurasian Collared-Dove	*Streptopelia decaocto*	R	Least Concern	Schedule IV
21	Eurasian Spoonbill	*Platalea leucorodia*	R	Least Concern	Schedule I
22	Gadwall	*Mareca strepera*	M	Least Concern	Schedule IV
23	Great Cormorant	*Phalacrocorax carbo*	R	Least Concern	Schedule IV
24	Great Egret	*Ardea alba*	R	Least Concern	Schedule IV
25	Greater Coucal	*Centropus sinensis*	R	Least Concern	Schedule IV
26	Grey Francolin	*Francolinus pondicerianus*	R	Least Concern	Schedule IV
27	House Crow	*Corvus splendens*	R	Least Concern	Schedule V
28	House Sparrow	*Passer domesticus*	R	Least Concern	Schedule IV
29	Indian Cormorant	*Phalacrocorax fuscicollis*	R	Least Concern	Schedule IV
30	Indian Peafowl	*Pavo cristatus*	R	Least Concern	Schedule I
31	Indian Pond Heron	*Ardeola grayii*	R	Least Concern	Schedule IV
32	Indian Robin	*Saxicoloides fulicata*	R	Least Concern	Schedule IV

S.N.	Common English Name	Binomial Scientific Name	Migrant (M) / Resident (R)	IUCN Red List - Categories	Wildlife (Protection) Act - Schedules
33	Indian Roller	*Coracias benghalensis*	R	Least Concern	Schedule IV
34	Indian Silverbill	*Euodice malabarica*	R	Least Concern	Schedule IV
35	Indian Spot-billed Duck	*Anas poecilorhyncha*	R	Least Concern	Schedule IV
36	Intermediate Egret	*Ardea intermedia*	R	Least Concern	Schedule IV
37	Jungle Babbler	*Turdoides striatus*	R	Least Concern	Schedule IV
38	Large-billed Crow	*Corvus macrorhynchos*	R	Least Concern	Schedule IV
39	Laughing Dove	*Streptopelia senegalensis*	R	Least Concern	Schedule IV
40	Little Cormorant	*Microcarbo niger*	R	Least Concern	Schedule IV
41	Little Egret	*Egretta garzetta*	R	Least Concern	Schedule IV
42	Little Grebe	*Tachybaptus ruficollis*	R	Least Concern	Schedule IV
43	Little Ringed Plover	*Charadrius dubius*	R	Least Concern	Schedule IV
44	Oriental Darter	*Anhinga melanogaster*	R	Near Threatened	Schedule IV
45	Oriental Magpie-Robin	*Copsychus saularis*	R	Least Concern	Schedule IV
46	Painted Stork	*Mycteria leucocephala*	R	Near Threatened	Schedule IV
47	Purple Sunbird	*Nectarinia asiatica*	R	Least Concern	Schedule IV
48	Purple Swamphen	*Porphyrio porphyrio*	R	Least Concern	Schedule IV
49	Red-naped Ibis	*Pseudibis papillosa*	R	Least Concern	Schedule IV
50	Red-vented Bulbul	*Pycnonotus cafer*	R	Least Concern	Schedule IV
51	Red-wattled Lapwing	*Vanellus indicus*	R	Least Concern	Schedule IV
52	River Tern	*Sterna aurantia*	R	Vulnerable	Schedule IV
53	Rock Dove	*Columba livia*	R	Least Concern	Schedule IV
54	Rose-ringed Parakeet	*Psittacula krameria*	R	Least Concern	Schedule IV
55	Shikra	*Accipiter badius*	R	Least Concern	Schedule I
56	Short-toed Snake-Eagle	*Circaetus gallicus*	R	Least Concern	Schedule I
57	White-breasted Kingfisher	*Halcyon smyrnensis*	R	Least Concern	Schedule IV
58	White-breasted Waterhen	*Amaurornis phoenicurus*	R	Least Concern	Schedule IV
59	White-browed Wagtail	*Motacilla maderaspatensis*	R	Least Concern	Schedule IV
60	White-eared Bulbul	*Pycnonotus leucotis*	R	Least Concern	Schedule IV
61	Wire-tailed Swallow	*Hirundo smithii*	R	Least Concern	Not Listed
62	Yellow-wattled Lapwing	*Vanellus malabaricus*	R	Least Concern	Schedule IV

Mammals

As per the literature review[67], local consultation and field survey, 14 mammals were recorded (reported and observed) from the study area. One species, Sambar (*Rusa unicolor*) was categorized under Vulnerable, and another species, Striped Hyaena (*Hyaena hyaena*) categorized as Near Threatened category of the IUCN Red List (Online Version 2022-2); six species, Bengal Fox (*Vulpes bengalensis*), Chinkara (*Gazella bennetti*), Golden Jackal (*Canis aureus*), Indian Porcupine

[67] https://www.inaturalist.org/observations?iconic_taxa=Mammalia&lat=22.376071385022144&lng=70.86115071041067&place_id=any&radius=16.453496945343545&subview=map&view=species

(*Hystrix indica*), Indian Wolf (*Canis lupus pallipes*), Jungle Cat (*Felis chaus*), Sambar (*Rusa unicolor*), Striped Hyaena (*Hyaena hyaena*) were listed under the Schedule I category as per the Wildlife (Protection) Act, 1972 (***Table 5-43***).

Only one observation of the Vulnerable specie Sambar (*Rusa unicolor*) was reported, but the presence of this species in the study area may be overlooked, as the species has not been reported from the nearest protected area[68], no suitable habitat is available and has not been reported in the local consultation.

Table 5-43 Mammals from the study area

S.N.	Common English Name	Binomial Scientific Name	IUCN Red List - Categories	Wildlife (Protection) Act. 1972 - Schedules	Reported / Observed
1	Bengal Fox	*Vulpes bengalensis*	Least Concern	Schedule I	Reported
2	Chinkara	*Gazella bennetti*	Least Concern	Schedule I	Reported
3	Five-striped Palm Squirrel	*Funambulus pennantii*	Least Concern	Schedule IV	Observed
4	Golden Jackal	*Canis aureus*	Least Concern	Schedule I	Reported
5	Indian Grey Mongoose	*Herpestes edwardsii*	Least Concern	Schedule II	Observed
6	Indian Hare	*Lepus nigricollis*	Least Concern	Schedule II	Observed
7	Indian Porcupine	*Hystrix indica*	Least Concern	Schedule I	Reported
8	Indian Wolf	*Canis lupus pallipes*	Least Concern	Schedule I	Reported
9	Jungle Cat	*Felis chaus*	Least Concern	Schedule I	Reported
10	Nilgai	*Boselaphus tragocamelus*	Least Concern	Schedule II	Observed
11	Rhesus Monkey	*Macaca mulatta*	Least Concern	Schedule II	Observed
12	Sambar	*Rusa unicolor*	Vulnerable	Schedule I	Reported
13	Striped Hyaena	*Hyaena hyaena*	Near Threatened	Schedule I	Reported
14	Wild Boar	*Sus scrofa*	Least Concern	Schedule II	Observed

5.5.3.5 Protected and Key Biodiversity Areas

No protected area and Important Bird and Biodiversity Area (IBA) is available in the buffer of 10 km from the project site[69, 70]. The nearest protected area, Rampara Wildlife Sanctuary is and situated about 17.5 km away from the project location in North-Northeast direction[71] (***Figure 5-48***).

Rampara Wildlife Sanctuary[72, 73]

Rampara Wildlife Sanctuary was declared a sanctuary in November 1988 and spread over an area of 15.01 km^2 in between 22 31' 82" to 22 34'88'' N and 70 55'54'' to 70 58'59'' E. Forest sub-types in Rampara Sanctuary are Dry deciduous scrub (5/DS1), Dry Savannah (*Acacia nilotica* forest) (5/DS2); Dry Savannah (5/DS2); *Acacia senegal* forests (Northern tropical thorn forests) (6/E2). It is one of the richest and most compact bio-diversity patches with a total of 270 species of plants which include 52 species of trees, 39 species of shrubs, 41 species of climbers, 97 species of herbs and 41 grasses. Indian Wolf, Chinkara, Hyana, Jackal, Jungle Cat, Bengal Fox, Porcupine, Wild boar, Nilgai, Hare, etc. are the key faunal species of the sanctuary.

[68] Rahmani, A.R., Islam, M.Z. and Kasambe, R.M. (2016) Important Bird and Biodiversity Areas in India: Priority Sites for Conservation (Revised and updated). Bombay Natural History Society, Indian Bird Conservation Network, Royal Society for the Protection of Birds and BirdLife International (U.K.). Pp. 1992 + xii

[69] http://wiienvis.nic.in/Database/Maps_PAs_1267.aspx

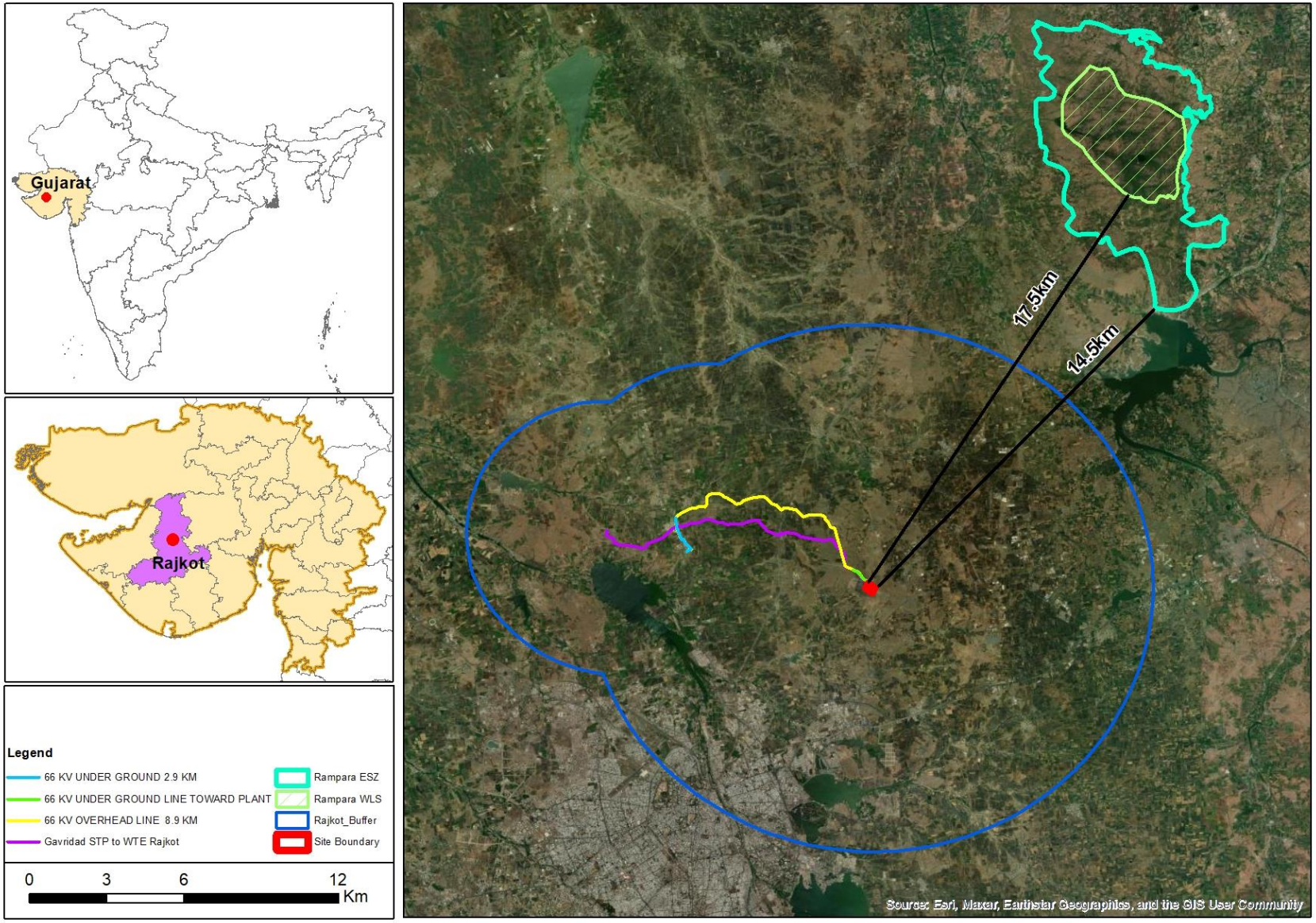
[70] Rahmani A.R., Islam M.Z. and Kasambe R.M. (2016) Important Bird and Biodiversity Areas in India: Priority Sites for Conservation (Revised and updated). Bombay Natural History Society, Indian Bird Conservation Network, Royal Society for the Protection of Birds and BirdLife International (U.K.), p. 1992 + xii.

[71] http://wiienvis.nic.in/Database/Maps_PAs_1267.aspx

[72] https://moef.gov.in/wp-content/uploads/2017/06/rampara.pdf

[73] https://forests.gujarat.gov.in/rampara-sanctuary.htm

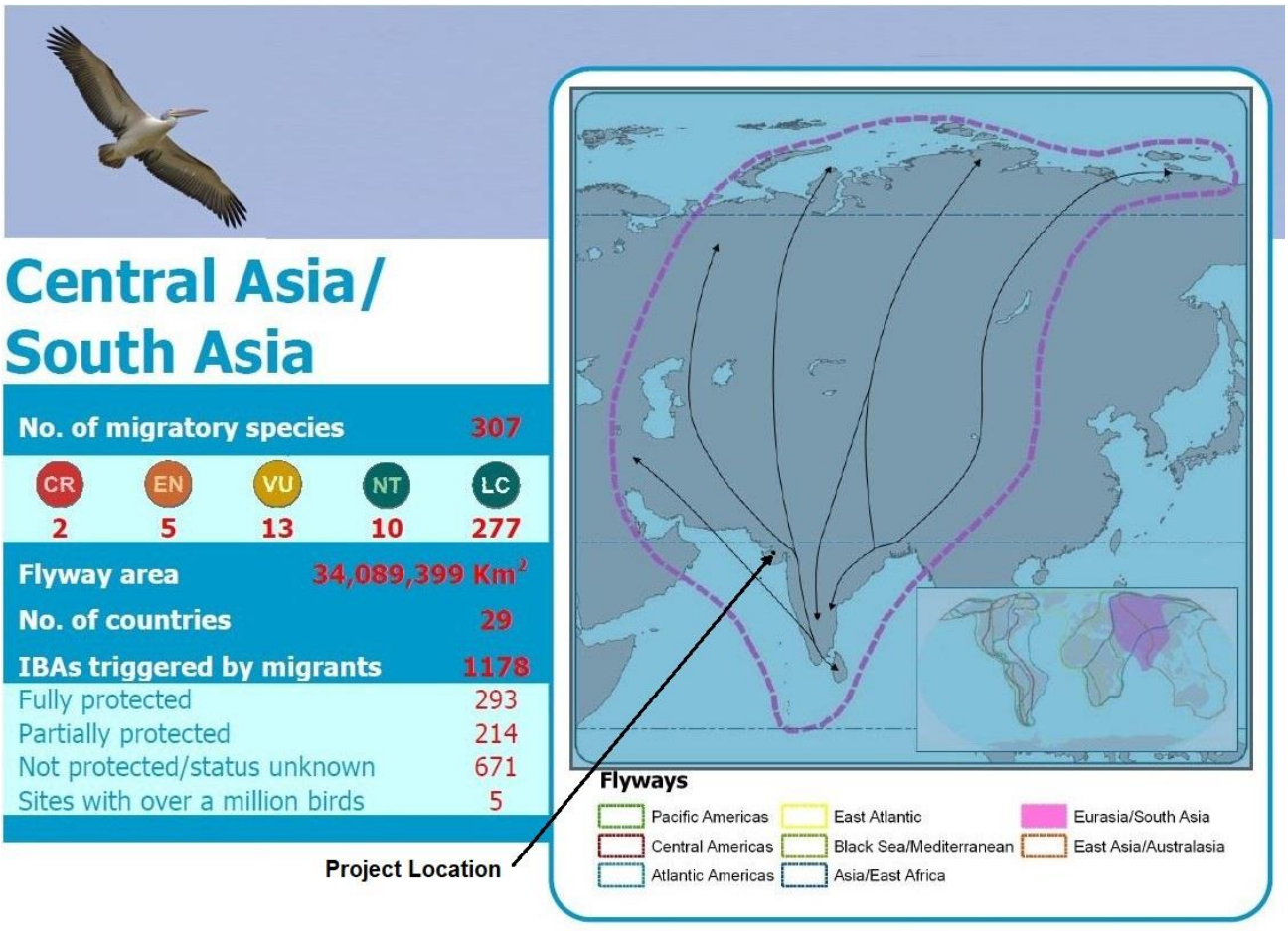
Figure 5-48 Ecological Sensitivity around the proposed site



5.5.3.6 Bird Migration Flyways

India majorly lies in the Central Asian Flyway[74] (***Figure 5-49***). More than 300 species travel along the Central Asian Flyway, including a significant movement of the family Anatidae (Ducks, Geese and Swan), Gruidae (Cranes), etc. that travel from Europe/North Asia to the Indian subcontinent and occupy medium to large water bodies.
As per the eBird Database[75], at least 103 migratory birds including three Vulnerable [Common Pochard (*Aythya ferina*), Greater Spotted Eagle (*Clanga clanga*), & Kashmir Flycatcher (*Ficedula subrubra*)]; five Near Threatened [Black-tailed Godwit (*Limosa limosa*), Curlew Sandpiper (*Calidris ferruginea*), Dalmatian Pelican (*Pelecanus crispus*), Ferruginous Duck (*Aythya nyroca*), & Pallid Harrier (*Circus macrourus*)] and 09 Schedule I [Booted Eagle, Eurasian Sparrowhawk, Greater Spotted Eagle, Long-legged Buzzard, Montagu's Harrier, Osprey, Pallid Harrier, Red-necked Falcon, & Western Marsh-Harrier] species were reported from the region (***Table 5-37***). This secondary information also reports 11 raptor species from the region (***Table 5-38***). Demoiselle Crane, Common Coot, Northern Pintail, Dalmatian Pelican, Black-tailed Godwit, Glossy Ibis, Common Crane, Common Teal, Ruff, Bar-headed Goose, Common Pochard, Gadwall, Garganey, & Eurasian Wigeon are the key congregatory species from the region[76]. To reduce the risk of collision and electrocution of this bird, some mitigation measures have been suggested under the section, ***Impacts on Biological Environment***.

Figure 5-49 Location of Project Site in the Central Asian Flyway



[74] http://datazone.birdlife.org/userfiles/file/sowb/flyways/7_Central_Asia_Factsheet.pdf
[75] https://ebird.org/barchart?byr=2001&eyr=2023&bmo=1&emo=12&r=L8710211,L6604086,L6596591,L3619186,L5120813,L8988287,L9019832,L4005820
[76] eBird Database [https://ebird.org/hotspot/L4005820; https://ebird.org/hotspot/L5120813; https://ebird.org/hotspot/L9019832; https://ebird.org/hotspot/L6604086; https://ebird.org/hotspot/L6596591; https://ebird.org/hotspot/L3619186; https://ebird.org/hotspot/L8710211; https://ebird.org/hotspot/L8988287]

5.5.3.7 Critical Habitat Screening

Conceptualisation of Ecologically Appropriate Areas of Assessment (EAAA)

In accordance with paragraph 59 of IFC PS6, the determination of the ecologically appropriate area of analysis/assessment (EAAA) is crucial for identifying critical habitat presence. Therefore, a provisional EAAA with a 15-kilometer radius from the project's boundary was established. This decision was guided by considerations of species or ecosystem distribution, within the project's area of influence, as well as the ecological patterns, processes, features, and functions essential for their preservation. It's important to understand that this conceptualized EAAA is provisional and subject to change following a comprehensive survey for Critical Habitat Assessment.

Species of Conservation Significance

The Integrated Biodiversity Assessment Tool (IBAT) was used to identify threatened species likely to occur within or nearby the Project Area. Apart from IBAT, extensive publicly available documents and research materials were reviewed to identify additional sensitivities and finalize the checklist of species of conservation significance. An initial desk-based screening of species likely to occur in and around the project location is presented in ***Appendix 22***. Based on this exercise, a single species has been identified and screened-in for Critical Habitat Assessment (***Table 5-44***). The species has significant records from the edge of the area of influence (AoI).

Table 5-44 List of Species Screened In for Critical Habitat Assessment

S.N.	Common English Name	Binomial Scientific Name	CHA Criteria
1	Dalmatian Pelican	(*Pelecanus crispus*)	3a

The above species would need to be confirmed through the detailed site assessment as per the scope of Critical Habitat Assessment, to confirm the presence and abundance of these species as well as their suitable habitat(s); undertake stakeholder consultations; and discuss with species-specific experts in the area to further assess whether the Project site can be classified as 'Critical Habitat'.

6 Stakeholder Identification and Engagement

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/company's actions, objectives, and policies". Stakeholders thus vary in terms of the degree of interest, influence and control they have over the Project. While those 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. Considering the nature of the Project and its setting, the stakeholders have been identified and listed in the table given below:

Table 6-1 List of Stakeholders

Category	Primary Stakeholders	Secondary Stakeholder
Community	• Rag Pickers with primary occupation as rag picking • Rag Pickers with secondary occupation as rag picking • Female Ragpickers • OBC caste ragpickers – most vulnerable ragpickers • Opinion holders • Community leaders • Female and children involved in Rag picking. • Local Communities living near the plants	
Institutional Stakeholders	• Local Gram Panchayats • Project Investors	• Village Institutions (education and health department) • Political Parties
Government Bodies	• Rajkot Municipal Corporation • Regulatory Authorities • District Administration	• State Administration
Other Groups	• Recyclers/recycling entities that buy recyclable waste from rag pickers. • Organization running material recovery facility (MRF) centers at the transfer stations. • Employees • Contractors and sub-contractors • Contractual workers	• Media • Local NGOs

This section provides stakeholder identification and mapping for the project based on the current planning stage. The identification is based on present status and understanding of the project. The analysis of the identified stakeholders is based on stakeholders' profiling and the significance of impact/influence each stakeholder in relation to the Project.

The influence and priority have both been primarily rated as:

- High Influence: This implies a high degree of influence of the stakeholder on the project in terms of participation and decision making or high priority to engage with the stakeholder.
- Medium Influence: Which implies a moderate level of influence and participation of the stakeholder in the project as well as a priority level to engage the stakeholder which is neither highly critical nor insignificant in terms of influence.
- Low Influence: This implies a low degree of influence of the stakeholder on the project in terms of participation and decision making or low priority to engage that stakeholder.

The intermediary categories of low to medium or medium to high primarily imply that their influence and importance could vary in that range subject to context specific conditions 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 project. Keeping this wide scope of inclusion in stakeholder category and the long life of project, it is difficult to identify all potential stakeholders and gauge their level of influence over 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 periodically and update the same as per the nature of the project lifecycle

Table 6-2 Stakeholder Mapping (Profile of stakeholder identified, their key interests and concerns and the way they may be involved in the project lifecycle)

Relevant Stakeholders	Profile	Concerns and Expectations from the project	Influence of Stakeholder on Project	Influence of Project on Stakeholder	Influence Rating
Primary Stakeholders					
Rag Pickers – with primary occupation as rag picking	According to the findings derived from a sample survey conducted on ragpickers, 35% of the total respondents (34 individuals) identified rag picking as their primary occupation. Applying this percentage to the entire population of identified ragpickers, which stands at 200, it can be inferred that approximately 70 individuals engage in rag picking as their primary means of livelihood.	Ragpickers with primary occupation as rag picking may have several concerns and expectations related to the Project: • The establishment of the project might lead to a decrease in the availability of fresh waste at landfill sites, affecting the livelihoods of ragpickers heavily dependent on this source. • A potential reduction in the quantity of recyclable waste due to the Project will impact the income of ragpickers, who rely on the collection and sale of recyclables. • Changes in waste management practices, such as direct waste delivery to the Project instead of landfilling, may alter the working conditions for ragpickers, potentially leading to job displacement. • Ragpickers may expect the project to provide alternative livelihood options or support in transitioning to other income-generating activities. • Expectations could include social and economic support, such as training programs, financial assistance, or cooperative initiatives that empower ragpickers economically.	The influence of ragpickers with a primary occupation as rag picking on the Project can manifest in several ways: • Ragpickers, being directly impacted by changes in waste management practices, may provide valuable insights and input during the project planning and implementation phases. • The project will need to consider the social impact on ragpickers, recognizing their role in the informal waste management sector. Engaging with them can help identify potential challenges and formulate strategies for mitigating negative impacts. • Ragpickers may influence the economic dynamics of waste management in the project area. Their involvement or displacement can affect the local economy, and understanding this dynamic is essential for effective project management. • The relationship between the project and the ragpicker community can significantly influence the project's acceptance and success. Building positive relations involves addressing concerns, providing support, and considering the socio-economic aspects of the ragpicker community. • If the Project results in changes to waste management practices, it might impact the employment of ragpickers. Planning for a smooth transition and considering alternative livelihood options could mitigate potential conflicts.	The influence of the Project on ragpickers with primary occupation in rag picking, are provided below: • The project will alter waste management practices, particularly in waste disposal, ragpickers may experience changes in employment. • If the Project results in changes to waste management practices, it might impact the employment of ragpickers. Planning for a smooth transition and considering alternative livelihood options could mitigate potential conflicts. • Changes in waste management practices can affect the economic conditions of ragpickers. The project may provide support programs to address any negative economic impacts • The project could offer training programs to help ragpickers transition to other roles within the waste management sector or get employment at the plant. • The project's approach to engaging with and mitigating the impacts on the ragpickers community will significantly influence community relations Ensuring transparency, providing clear information, and involving the community in decision-making processes can foster positive relations. • The project might provide access to resources such as education, healthcare, or housing as part of its corporate social responsibilities (CSR) initiatives. This can contribute to the overall well-being of the ragpicker community. • The project could provide a platform for ragpickers to voice their concerns and needs related to the Project's activities.	• Influence of Stakeholder: **HIGH** • Influence of Project: **HIGH**
Ragpickers – rag picking as secondary occupation	According to the findings derived from a sample survey conducted on ragpickers, 65% of the total respondents (34 individuals) identified rag picking as their secondary occupation. Applying this percentage to the entire population of identified ragpickers, which stands at 200, it can be inferred that approximately 130 individuals engage in rag picking as their secondary means of livelihood.	Ragpickers with secondary occupations in rag picking may have distinct concerns and expectations from the Project. Here are some potential considerations: • Rag picking is a supplementary source of income, there shall be concerns about potential disruption or reductions in earnings. • Changes in waste management practices may affect access to recyclable materials, impacting the ability to engage in rag picking. • Changes in waste management might affect relationships within the ragpicker community or with other stakeholders. • As the Project is affecting rag picking activities, there shall be an expectation for	The influence of ragpickers with secondary occupations in rag picking on the Project could be significant, impacting various aspects of the Project. Here are potential influences: • Ragpickers, as part of the local community, may contribute positively to the success of the project through collaboration, knowledge sharing, and community support. • Changes in waste management methods may disrupt social dynamics within the ragpicker community, leading to potential tensions or challenges. • If the project limits access to recyclables due to altered waste management practices, it may impact the ability of ragpickers to engage in their secondary occupation.	The influence of the Project on ragpickers with secondary occupations in rag picking can have several implications. Here are potential influences: • The project may introduce alternative livelihood opportunities or support programs that enable ragpickers to transition into other income-generative activities. • Project-led community development initiatives could positively impact ragpickers by providing access to education, healthcare, or other socio-economic improvements. • Changes in waste management practices will disrupt the traditional rag picking model, affecting the income of ragpickers with potential economic consequences.	• Influence of Stakeholder: **HIGH** • Influence of Project: **HIGH**

Relevant Stakeholders	Profile	Concerns and Expectations from the project	Influence of Stakeholder on Project	Influence of Project on Stakeholder	Influence Rating
		the provision of alternative livelihood opportunities or skills development programs. • Expectation for the project to contribute to social welfare initiatives, such as healthcare, education, or housing, especially as rag picking is linked to socio-economic vulnerability. • Ragpickers may expect to be included in decision-making process that impact their livelihoods and community		• The introduction of new waste management methods may alter the social dynamics of the ragpicker community, potentially leading to displacement or tensions. • Changes in waste collection methods may limit the access of ragpickers to recyclables, affecting their ability to sustain their secondary occupation.	
Female Ragpickers	According to the sample survey conducted for ragpickers, 50% of the total respondents (34 individuals) were identified as females. Applying the same percentage to the total identified ragpickers, which is 200, it can be estimated that the total number of female ragpickers is 100.	The concerns and expectations of female ragpickers from the Project are likely to revolve around several key aspects: • Female ragpickers may be concerned about potential disruptions to their livelihoods as a result of changes in waste management practices or the operation of the Project. • Concerns regarding access to the waste stream and potential restrictions on their ability to collect recyclables from the landfill or other waste sources. • Expectations for support in transitioning to alternative livelihoods or ensuring that existing waste collection activities are not unduly disrupted. • Expectations for continued access to the waste stream, ensuring that female ragpickers can collect recyclables and sustain their income. • Expectations for meaningful engagement and consultation in the decision-making processes related to waste management and the Project.	The influence of female ragpickers on the Waste-to-Energy (WTE) Plant Project can manifest in various ways: • Female ragpickers may play a role in advocating for their rights and raising awareness about the potential impact of the project on their livelihoods and the community. • Female ragpickers could be representatives or key stakeholders in community engagement sessions, providing valuable insights into their needs and concerns. • The project's impact on female ragpickers may influence the overall social perception of the project. Positive engagement and support can enhance the project's social standing. • Insights from female ragpickers may lead to adaptations in project plans, especially in aspects related to livelihood restoration, and community development. • The influence of female ragpickers may encourage the project to adopt gender-inclusive policies, ensuring that the concerns and needs of women in the community are adequately addressed. • The project's engagement with female ragpickers can contribute to fulfilling CSR goals related to community development, gender equality, and sustainable livelihoods. • Insights from female ragpickers may guide the development of customized mitigation measures to minimize the impact on their livelihoods.	The influence of the Project on female ragpickers engaged in rag picking can encompass both positive and negative aspects: • The project might create new employment opportunities, providing an alternative source of income for female ragpickers who might be affected by changes in waste management practices. • The project could offer skill development programs to enhance the capabilities of female ragpickers, enabling them to transition into alternative livelihoods. • The project may contribute to community development initiatives, addressing the needs of female ragpickers and enhancing overall living conditions in the community. • Changes in waste management practices, such as direct waste disposal to the project instead of open dumping, may disrupt the traditional livelihoods of female ragpickers. • Economic displacement might occur if the project significantly reduces the demand for manually collected recyclables, impacting the income of female ragpickers. • The project might inadvertently neglect the specific needs and concerns of female ragpickers if there is not a gender-sensitive approach in project planning and execution.	• Influence of Stakeholder: **HIGH** • Influence of Project: **HIGH**
Most vulnerable Ragpickers – Other Backward Clase (OBC) with primary and/or secondary occupations as rag picking.	According to the sample survey conducted for ragpickers, 47% of the total respondents (34 individuals) were identified as OBC ragpickers with primary and/or secondary occupation as rag picking. Applying the same percentage to the total identified ragpickers, which is 200, it can be estimated that the total number of as OBC ragpickers with primary and/or secondary occupation as rag picking is 94. **Vulnerability Assessment**	Concerns and Expectations of OBC Ragpickers from the Project: • OBC ragpickers may be concerned about potential disruptions to their primary source of livelihood due to changes in waste management practices resulting from the Waste-to-Energy project. • There could be concerns about the stability of income, as rag picking may be their primary or secondary occupation, and any alteration in waste management dynamics might impact on their earnings. • Ragpickers might be worried about restrictions or changes in their access to	Influence of OBC Ragpickers on the Project: • OBC ragpickers, being an integral part of the waste management ecosystem, have a significant influence on the social dynamics of the project. Their interactions and relationships within the community contribute to the overall social fabric. • OBC ragpickers, due to their involvement in the informal sector, showcase resilience and adaptability in responding to changes in waste management practices. Their ability to adapt can influence the overall success of the project.	Influence of the Project on OBC Ragpickers: • The Project may influence the livelihoods of OBC ragpickers, potentially disrupting their traditional roles in waste collection and recycling. The project's impact on their income-generating activities will be a critical consideration. • Depending on the project's design and policies, there could be opportunities for OBC ragpickers to transition into formal employment within the waste management value chain created by the project. • The project might offer training and skill development programs, potentially	• Influence of Stakeholder: **HIGH** • Influence of Project: **HIGH**

Relevant Stakeholders	Profile	Concerns and Expectations from the project	Influence of Stakeholder on Project	Influence of Project on Stakeholder	Influence Rating
	• OBC exhibits a higher dependence on household members for various needs compared to the ST community. This vulnerability arises from a higher reliance on internal support systems, possibly indicating lower economic independence and social resilience. • OBC faces a higher number of illiterate individuals within their community, which contributes to their vulnerability. Limited access to education may hinder socio-economic mobility and opportunities for the OBC population. • The majority of OBC individuals are involved in rag picking, a profession associated with average low income as compared to other primary occupation. • The average total income of the OBC community is lower than that of the ST community. This economic disparity suggests that OBC individuals face challenges in generating sufficient income, leading to increased vulnerability in terms of meeting basic needs and improving their overall quality of life. • In summary, the combination of higher household member dependence, lower educational attainment, involvement in lower-paying occupations like rag picking, and a lower average income position the OBC community as more vulnerable compared to the ST community.	waste sources, particularly if the project alters waste collection and disposal practices. • There might be concerns related to social and economic inclusion, especially if the project affects the existing dynamics of waste collection and the informal recycling sector. • OBC ragpickers may expect support or alternative livelihood opportunities if their current mode of income generation is affected by the project. • Expectations may include inclusive policies that ensure the participation and benefit-sharing of ragpickers, acknowledging their role in waste management. • OBC ragpickers may expect active community engagement, where their voices are heard, and they are included in decision-making processes related to waste management and livelihood restoration initiatives.	• OBC ragpickers can serve as an informal feedback mechanism for the project. Their insights and observations regarding the impact of the Project on waste collection and their livelihoods can provide valuable information for project's induced livelihood restoration measures adjustments. • The perception of the project within the OBC community, particularly among ragpickers, can influence broader community sentiments. Positive engagement with this demographic can enhance community relations and project acceptance. • OBC ragpickers, when organized, can have advocacy potential. They may collectively voice their needs, concerns, or suggestions, influencing project decisions and policies related to livelihood restoration mitigations measures.	enhancing the capabilities of OBC ragpickers to participate in different aspects of waste management beyond traditional rag picking. • OBC ragpickers may benefit from improved access to essential services facilitated by the project, such as healthcare, education, and housing. The project's impact on overall community development will influence the well-being of OBC ragpickers. • The project may empower OBC ragpickers by providing a platform for advocacy, ensuring that their concerns are heard, and enabling their participation in decision-making forums. • The project's positive impact on the local economy may indirectly benefit OBC ragpickers by creating new economic opportunities, stimulating business activities, and contributing to overall economic development.	
Local Gram Panchayats	This stakeholder group is comprised of the lowest level of local governance. The gram panchayats consist of one or more revenue villages and are the lowest level of decision-making bodies for development activities in the villages	• The expectations and concerns of this group from the project: – Receiving benefits from the project in terms of employment and development of infrastructure – Implementation of community development programmes in consultation with the Gram Panchayat and the local community – Preference to the local community in contractor and employment opportunities from the project – Regular updates on the project activities and the opportunities from the project	• The panchayat members can influence the decision-making process of the landowners and the entire community, at large; and • This stakeholder may also play an important role in the implementation CSR activities planned and the execution of other plans such as stakeholder engagement and grievance management.	The project can play an important role in the development of the villages by undertaking CSR activities in collaboration with the Gram Panchayat, especially in areas where there is a paucity of government funds	• Influence of Stakeholder: **High** • Influence of Project: **LOW**
Local Communities living near the plants	Refer to section 5.4.10 for socio economic baseline of local community of Nakharvadi .	The key concerns and expectations of this group from the project are: • Concerns about increased noise from the operation of the waste-to-energy (WTE) plant. • Concerns about air pollution resulting from the transportation of waste. • Concerns about increased noise and unpleasant odors emanating from transportation of waste. • Concerns about increased traffic, congestion, and potential safety hazards associated with the transportation of waste to the WTE plant,	The local community living near the waste-to-energy plant can exert a considerable influence on the project's success and sustainability. The community's concerns, support, and engagement play a vital role in shaping the project's overall impact. Here are key aspects of the local community's influence on the Project: • The local community's acceptance and support are crucial for obtaining a social license to operate. Positive sentiment from the community can facilitate a smoother project approval process.	The influence of the Waste-to-Energy (WtE) plant project on the local community living nearby can be substantial, affecting various aspects of their daily lives, environment, and overall well-being. Here are some key areas where the project can have an impact: • If the project incorporates advanced technologies and practices, it can contribute to reducing environmental pollution, minimizing reliance on landfills, and promoting a more sustainable waste management solution.	• Influence of Stakeholder: **MEDIUM** • Influence of Project: **MEDIUM**

Relevant Stakeholders	Profile	Concerns and Expectations from the project	Influence of Stakeholder on Project	Influence of Project on Stakeholder	Influence Rating
		particularly if transportation routes of big trucks pass through residential areas. • Expectation for the implementation of stringent health and safety measures to safeguard the well-being of the local community during the transportation of waste. • Expectation for well-planned and efficient traffic management strategies during waste transportation to minimize disruptions and ensure the safety of residents.	• Active engagement and participation of the local community in project-related discussions and decision-making processes contribute to a collaborative approach. Involving residents in planning and mitigation strategies fosters a sense of ownership and cooperation. • The community's concerns about environmental impacts, and safety should be acknowledged and addressed. Successful projects often implement mitigation measures based on community feedback. • An informed community is more likely to support the project. Educational initiatives and transparent communication about the waste-to-energy process, benefits, and potential challenges help build understanding and trust. • The local community's concerns about potential health and safety risks should be taken seriously. Implementing robust health and safety measures and addressing community health concerns are vital for project acceptance. • The community's concerns about increased traffic and transportation-related issues should be addressed. Clear communication about waste transportation routes and efforts to minimize disruptions are essential for community satisfaction. • Establishing effective mechanisms for community feedback and grievance redressal enhances transparency and ensures that concerns are promptly addressed, fostering a positive relationship	• The implementation of proper safety measures and adherence to environmental regulations can positively contribute to community health and safety. • Active engagement with the local community, including regular communication, public consultations, and addressing concerns, can foster positive relations. • The project may lead to the development or improvement of local infrastructure, such as roads or utilities, benefiting the entire community. • Implementing educational programs about waste management, environmental benefits, and the project's positive contributions can enhance community awareness and support. • If the project is well-managed, environmentally friendly, and brings tangible benefits to the community, it can enhance the overall perception and acceptance of the waste-to-energy (WTE) plant.	
Rajkot Municipal Corporation (RMC)	The Rajkot Municipal Corporation (RMC) serves as the local governing body entrusted with the oversight of civic infrastructure and administration in the city of Rajkot, Gujarat, India. Positioned as a pivotal local government entity, RMC assumes responsibility for the management of diverse urban services, with a particular emphasis on waste management. In the context of the Waste-to-Energy Plant project within the city, RMC assumes a central role as the governing authority. This is underscored by the formal agreement issued by RMC, sanctioning the construction and operation of the Project. Notably, RMC is exclusively tasked with the collection of waste through an organized door-to-door collection process. Additionally, it oversees the efficient transportation of the collected waste to the Project (WTE plant). This delineation of responsibilities underscores RMC's pivotal role in the execution and success of the Project.	The Rajkot Municipal Corporation (RMC) likely has various concerns and expectations from the Project. These considerations can encompass environmental, economic, social, and operational aspects. Here are some common concerns and expectations that RMC may have: • Ensuring strict adherence to all relevant local and national regulations pertaining to waste management, emissions, and energy production • Verifying the reliability and effectiveness of the waste-to-energy technology employed to ensure optimal and consistent power generation. • Considering the social and economic impact of the project on the local community, including potential job creation, community development, and associated benefits • Expecting the Project to contribute significantly to the generation of renewable energy for the city. • Anticipating a notable reduction in the volume of municipal waste through effective waste-to-energy conversion processes	The Rajkot Municipal Corporation (RMC) can have a significant influence on the Project at various stages of its lifecycle. Provided below key aspects of RMC's potential influence on the Project: • RMC holds the authority to grant approval and authorization for the establishment and operation of the Project within its jurisdiction. The project's initiation is contingent upon obtaining necessary permits and approvals from RMC. • RMC plays a pivotal role in the selection of the site for the waste-to-energy plant, ensuring compliance with local zoning regulations and municipal planning considerations. • As the entity responsible for waste management in the city, RMC directly influences the supply of municipal waste to the WTE plant. The efficiency of the waste collection and transportation process is essential for the Project's success. • RMC can influence community perceptions and support for the project by engaging in transparent communication, addressing	The influence of the Project on the Rajkot Municipal Corporation (RMC) can manifest in several ways, impacting various aspects of municipal governance, waste management, and community development. Provided below key potential areas of influence of the Project: • The project can contribute to the improvement of waste management practices in Rajkot by providing an alternative and sustainable method for waste disposal. It may lead to reduced landfill through usage of bio mined waste in the energy producing process. • Project's environmentally friendly technologies, can positively influence RMC's efforts to mitigate the environmental impact of waste disposal, addressing concerns related to pollution and land use. • The project can enhance RMC's efforts to meet energy needs sustainably by contributing to the generation of renewable energy. • The Project will create job opportunities within the municipality, contributing to local	• Influence of Stakeholder: **HIGH** • Influence of Project: **HIGH**

Relevant Stakeholders	Profile	Concerns and Expectations from the project	Influence of Stakeholder on Project	Influence of Project on Stakeholder	Influence Rating
		• Expecting the waste-to-energy facility to operate efficiently, minimizing downtime and ensuring a consistent power supply. • Expecting the waste-to-energy project to operate in accordance with the terms and conditions outlined in the agreement between RMC and the Project.	concerns, and involving local residents in the decision-making process. • RMC monitors the ongoing operations of the Project to ensure compliance with agreed-upon standards, regulations, and environmental practices. This oversight contributes to the project's sustained performance. • The renewal or modification of agreements between RMC and the project developers depends on the performance, compliance, and mutual satisfaction. RMC's influence is evident in negotiations for contract renewals	employment and skill development. This can positively impact the socio-economic landscape of the community. • Project involves public-private partnerships, it can enhance RMC's capacity to implement large-scale waste management projects. Collaboration with private entities may bring in expertise and resources that benefit the municipality. • The Project can contribute to reducing the reliance on traditional landfills, potentially extending the lifespan of existing landfill sites and minimizing environmental degradation. • A successful and environmentally responsible waste-to-energy project can enhance RMC's public image. Positive community perceptions may result in increased trust and support for municipal initiatives. • The project's compliance with environmental and waste management regulations can set a precedent for other municipal initiatives. RMC may be motivated to replicate successful models in future projects	
Regulatory Authorities	This stakeholder group is comprised of the central, state and district level regulatory authorities. 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	The key expectations and concerns of the group from the project include: • Project's compliance to the regulatory requirements; and • Timely disclosure of information and provisioning of updated information throughout the life of the project.	• The failure of the project to comply with the various rules and regulations applicable can affect the timely implementation of the project. • This stakeholder group is also critical for various permits/clearances required for the commissioning of the project	The influence of the project on the stakeholders pertains to the role the project will play in the development of the Project in the area	• Influence of Stakeholder: **HIGH** • Influence of Project: **LOW**
District Administration	This stakeholder group is comprised of the government bodies at the district level. These bodies are vested with funds and decision-making authority through the decentralization process.	The key expectations and concerns of the group from the project include: • Project's compliance to the regulatory requirements • Timely disclosure of information and provisioning of updates throughout the life of the project	• This stakeholder group is critical for obtaining various permits/clearances required for the commissioning of the project and its smooth functioning thereafter • This group serves as important points of contact between the state level authorities and the local community	The influence of the project on the stakeholders pertains to the role the project will play in the development of the Project in the area	• Influence of Stakeholder: **HIGH** • Influence of Project: **LOW**
Recyclers/recycling entities that buy recyclable waste from rag pickers	Following consultations with ragpickers at the landfill, it has been understood that all ragpickers engage in selling their collected recyclable waste to various Recyclers and recycling entities located in Nakharvadi and Sokhada villages. According to the feedback received from ragpickers, a single ragpicker can purchase waste from them ranging from INR 3000-4000. The area is host to approximately 8-10 recyclers/recycling entities. Moreover, these recycling entities extend their operations beyond procuring waste solely from ragpickers at the landfill. They also source recyclable waste from other individuals who collect or purchase such materials in the surrounding areas or within Rajkot city.	Recyclers and recycling entities involved in the collection and processing of recyclable waste may have various concerns and expectations related to the Project. Here are some potential considerations: • Recyclers may be concerned about the Project affecting the supply of recyclable waste. If the waste is directed to the WTE plant, recyclers might experience a reduction in the quantity and quality of materials they purchase from ragpickers. • Recyclers may face increased competition for obtaining recyclable materials, leading to potential financial implications.	Provided below potential factors that might influence the relationship: • Recyclers often have connections within local communities. Their influence may be reflected in community perceptions and support for or against the WTE plant based on how it aligns with recycling practices. • Collaboration between the WTE plant and recyclers can lead to more effective waste management.	The influence of a waste-to-energy (WTE) project on recyclers or recycling entities can vary based on several factors. Here are some considerations: • The Project could introduce shifts in the local waste market, affecting the pricing and demand for recyclable materials. Recycling entities might need to adapt to these changes. • There could be opportunities for collaboration between the Project and recyclers. For instance, joint initiatives could be established to ensure efficient waste management and resource recovery.	• Influence of Stakeholder: **MEDIUM** • Influence of Project: **LOW**
Organization running material recovery facility (MRF) centers at the transfer stations	In accordance with discussions held with the representative of the Material Recovery Facility (MRF) situated at the K.S.D Garbage Station in the Kabadi Market, Rajkot, the facility serves as an	Provided below the potential concerns and expectation of the Material Recovery Facility from the Project:	Provided below the potential influences: • The MRF can influence the waste stream composition by recovering recyclable materials before they reach the Project.	The influence of the waste-to-energy project on Material Recovery Facilities (MRFs) can have several dimensions:	• Influence of Stakeholder: **LOW** • Influence of Project: **LOW**

Relevant Stakeholders	Profile	Concerns and Expectations from the project	Influence of Stakeholder on Project	Influence of Project on Stakeholder	Influence Rating
	authorized outlet for recycling and waste procurement entities sanctioned by RMC. The entity handle waste gathered by the drivers and assistants of tippers, which are mini trucks deployed by the Rajkot Municipal Corporation (RMC) for the collection and transportation of waste from individual households to the transfer stations. The Material Recovery Facility is staffed by approximately 50 workers dedicated to the segregation of various categories of recyclable waste	• The MRF may be concerned about the potential reduction in the supply of recyclable waste if a significant portion of the waste is diverted to the waste-to-energy project if stringent action implemented by RMC to not collect the waste during collection and all the waste shall be transported to the Project. • The MRF may have concerns about any changes in waste management regulations or policies by RMC that could impact their operations or require adjustments to their processes. • Expectations might include collaboration between the waste-to-energy project and the MRF to optimize the overall waste management system, ensuring that both energy recovery and recycling goals are met.	• The MRF often has direct interactions with the local community through the drivers, thus, it can contribute to the positive or negative image of the project.	• The waste-to-energy project may alter the waste composition by diverting certain materials for energy recovery. This can affect the type and quantity of materials available for sorting and recycling at MRFs. • The waste-to-energy project might provide opportunities for collaboration with MRFs. Collaboration could lead to integrated waste management strategies, optimizing the recovery of recyclables. • The waste-to-energy project's waste diversion strategies can impact the quantity and quality of materials reaching MRFs.	
Staff & Contractors and Sub-Contractors	This stakeholder group is comprised of the technical & non-technical staff of Abellon and staff and workers of subcontractors.	The primary concerns and expectations of the group from the project include: • Timely completion of the project • The role of the project is in continued economic opportunity and work generation. • Avoidance of any reputational risks associated with the project due to any future community unrest or project activities. • Clarity in terms of scope of work, expectations, key performance indicators and timelines. • Timely and adequate disclosure of information to allow the project activities to be carried out. • Fair business opportunities and contract closure • Business continuity • Payment of wages and other concerns related to Labor welfares • Ensuring the health and safety of staff, contractors, and sub-contractors is a top priority • Contractors must comply with all relevant environmental and safety regulations. • Promoting a strong safety culture among contractors ensures that safety is prioritized in all project activities • Providing necessary training to contractors on EHS procedures and standards • Effective communication between the project team and contractors ensures that everyone is aligned with project goals and expectations. • Encouraging collaboration between contractors and different project teams enhances overall project performance	• This stakeholder group is critical for the smooth functioning and timely implementation of the project. • This group may also play an important role in the formation of public opinion towards the project. • Their efficiency in executing tasks, managing resources, and coordinating with other entities directly impacts operational success. • Their adherence to safety and environmental regulations is crucial to mitigate risks and ensure responsible project execution. • Their ability to deliver on time and manage potential delays impacts the overall project schedule. • Clear communication channels between different entities are essential for project success.	The influence of the project on the group pertains to the role of the project in business opportunities and the process of contract closure. Provided below the key influences: • The project creates employment opportunities for a range of skilled and unskilled workers, contributing to local job creation. • Direct and indirect economic benefits for staff through salaries, benefits, and potential skill development. • Opportunities for skill enhancement and professional development through training programs provided by the project. • Adherence to rigorous health and safety standards to ensure the well-being of the project workforce.	• Influence of Stakeholder: **HIGH** • Influence of Project: **HIGH**
Contractual workers	This group is comprised of skilled and semi-skilled workers, involved in the project on a contractual basis. This group is most likely to be comprised of	The primary concerns and expectations of the stakeholder group pertaining to the project is as follows:	• This stakeholder group is critical for the smooth functioning and timely implementation of the project.	The influence of the project on the group pertains to the roles of the project in the continuance of	• Influence of Stakeholder: **MEDIUM** • Influence of Project: **HIGH**

Relevant Stakeholders	Profile	Concerns and Expectations from the project	Influence of Stakeholder on Project	Influence of Project on Stakeholder	Influence Rating
	the semi-skilled workers involved in the construction work of the project.	• The role of the project is continued economic opportunity, work generation and a source of income. • Timely settlement of dues and payments in keeping with the legal requirements • Continued work opportunities. • Safety at work.	• This group may also play an important role in the formation of public opinion towards the project	economic opportunities, timely payment of wages and ensuring the health and safety of the workers	
Secondary Stakeholders					
Village Institutions	This stakeholder group is comprised of health, education institutions and training centres at the village level. The institutions in the immediate vicinity of the project are the primary schools in the villages	The main concerns and expectations of the group from the project pertain to: • Adequacy of community development activities in the area • Contribution of the project towards the overall development of the area • Involvement in the formulation and implementation of the community development activities; and • Timely and adequate disclosure of information pertaining to the project.	The influence of the group on the project pertains to the role of the played by these institutions in the opinion formation and implementation of community development programmes and CSR activities	The influence of the project on the group pertains to the role of the project in the development of these institutions	• Influence of Stakeholder: **LOW** • Influence of Project: **LOW**
Political Parties	This stakeholder group is comprised of political parties, which are active in the area. This group plays a critical role in the sensitization of the population and the creation of the public opinion	The key expectations and concerns of the group from the project include: • The role of the project in the overall development of the area • The impact of the project on the local community • Adequate community development activities throughout the life of the project; and • Timely disclosure of information pertaining to the project activities.	The influence of this stakeholder group on the project pertains to the role of the political parties in the formulation of public opinion towards the project.	The influence of the project on the group is expected to be extremely limited, pertaining to the role of the project in the development of the area	• Influence of Stakeholder: **MEDIUM** • Influence of Project: **LOW**
State Administration	The state administration is comprised of the state level agencies of the various departments/authorities such as industries department, revenue department, labour department and land department etc.	The main expectations and concerns of the stakeholder group from the project include: • Compliance to the regulatory requirements for the project • Project's role in the development of the area • Timely disclosure of information pertaining to the project activities	This stakeholder group is also critical for the obtaining of the various permits/clearances required for the commissioning of the project	The influence of the project on the stakeholders pertains to the role in achieving the goals of Swachh Bharat Mission and renewable energy generation in the state.	• Influence of Stakeholder: **HIGH** • Influence of Project: **LOW**
Media	The media, comprising of both print and visual media, has a presence in the district. They are known to have played an extremely important role in generating awareness amongst the community.	The main expectations and concerns of the stakeholder from the project include: • Media may express concerns about the potential environmental impact of the Project, such as air emissions, ash disposal, and overall sustainability. • Questions about the impact of the project on public health and safety may arise, especially if there are perceived risks associated with emissions or by transportation of waste or other by-products. • Lack of or insufficient community engagement and communication strategies may be a concern, leading to questions about transparency in the project's planning and execution. • Compliance to the regulatory requirements for the project • Project's role in the development of the area • Maintenance of positive relationship with the local community and other stakeholders	The influence of the media on the project can be significant, shaping public perception, influencing stakeholders, and impacting the project's overall success. Here are several potential influences: project • Media coverage shapes public perception of the WTE project. Positive coverage can generate support, while negative stories may lead to scepticism or opposition. • Media can influence community engagement. Positive stories highlighting the benefits of the project may encourage local support, while negative coverage might fuel community concerns and opposition. • Media attention can attract regulatory scrutiny. Environmental agencies and authorities may respond to media reports, impacting the project's regulatory approvals and compliance .	The influence of the project on the stakeholder is likely to be limited. However, provided below the include of the project on the media: • The project can provide accurate and timely information to the media. Transparent communication helps journalists and reporters in creating well-informed narratives. • The project can facilitate media access to key information, experts, and project sites. Open communication fosters a more accurate representation of the project. • The project can organize media tours and briefings to offer journalists a first-hand look at the operations, technologies, and benefits of the waste-to-energy facility. • The project can actively engage in fact-checking and correction of any inaccuracies in media coverage. Timely	• Influence of Stakeholder: **HIGH** • Influence of Project: **LOW**

Relevant Stakeholders	Profile	Concerns and Expectations from the project	Influence of Stakeholder on Project	Influence of Project on Stakeholder	Influence Rating
		• Timely disclosure of information in regard to the project activities • Media expects transparency from project developers and relevant authorities. Open communication about project details, progress, and any issues is crucial. • Expectations are set regarding how the project will benefit the local community, either through job creation, economic development, or community programs supported by the project. • Expectations include clear information on safety measures in place to protect both workers and the surrounding community from potential hazards. • Media may expect the project to demonstrate a commitment to environmental stewardship, including measures to minimize emissions, handle waste responsibly, and contribute to sustainable practices.	• Positive media coverage can enhance investor confidence in the project. On the other hand, negative publicity may raise concerns among investors and financiers. • Media coverage can influence political decisions. If a project gains public support through positive media, it may influence politicians to endorse or prioritize the project. Negative coverage could lead to political opposition. • The media can impact the brand image of project developers and stakeholders. Positive coverage enhances reputations, while negative stories can tarnish the image of the entities associated with the project. • Media coverage can influence public engagement and participation in public hearings, consultations, or advocacy efforts related to the WTE project.	corrections contribute to accurate reporting. • Sharing successful case studies and examples of waste-to-energy projects in other locations can provide context and showcase positive outcomes. •	

6.1.1 Engagement undertaken – Pre-impact assessment

According to the discussions undertaken with the local community and the project team, it is understood that no community engagements have been carried out by the project proponent and the engagement at present are limited to local regulatory authority (electricity, water supply and Road) which includes department of Industries, district administration and Rajkot municipal corporation.

Engagement as part of the Impact assessment – this assignment

As part of EISA process, consultations were carried out with the project team, sarpanch, rag pickers and RMC, contractor engaged in bio mining and supervisor at RMC land fill site These consultations were carried to assess the potential impacts of the project on the different stakeholders, socio-economic profile of the community as well as the potential risks and concerns of the stakeholders. The subsequent section provides an understanding of the engagement activities undertaken as part of the ESIA process. The summary of the discussion carried out during the ESIA process is given in table below:

Table 6-3 Summary of Stakeholder Consultations

Location	Participants	Key Points of Discussion
Project Site	Project In charge, HR, and other technical support staff	Discussion was carried out with the project team regarding Project design, layout, project construction schedule, mobilisation of contractor and labour management, land procurement process, payment of compensation etc.
Project Site	Contracted labour	Discussion with contracted labour was carried out to understand the labour welfare practice followed at project level and grievance if any
RMC Land Fill Site	Ragpickers and land fill supervisor	Detailed discussion with rag pickers community was carried out in order to understand the economics of waste collection. As informed nearly 200 rag pickers are collecting waste at land fill site and earning nearly 1000-1500 from the sale of the waste. Most of the waste collected is from bio mining and there is very little sellable material in freshly dumped waste at land fill site. Most of the rag pickers want to continue to collect wate at land fill site Currently they express that they want to continue the waste collection at the land fill site without any disruption. And concerned that once the project becomes operational there might be some restriction on the waste collection.
Telephonic	RMC Bio mining contractor	Discussion was caried to understand the waste collection process. It was understood that currently waste is collected at household level and the sellable waste is sorted out at the household level and then waste send to collection centre where again sorting for sellable waste is done and such material is salvaged by the respective packers and then same is dumped to land fill site. Once the project becomes operational the waste forms from the collection centres will go to the plant for further processing.
Own shop along the state highway	Sarpanch	Discussion with sarpanch was caried out to understand the potential concerns if any about the project. As informed the community is aware about the project and has welcomed the project, because it will provide employment and other economic opportunities to the locals. Currently most of the community living close to the land fill site are having complaints about the bad smell coming from land fill site. They expect that the proposed project should reduce the bad smell and does not pollute their environment further.

7 Impact Assessment & Mitigation Measures

This section assesses the manner in which the Project will interact with elements of the physical, ecological or social environment to produce impacts on resources/ receptors. It has been organized as per the construction and operation phases of the project life cycle to understand the risks and impacts associated with each phase.

7.1 Project Activities

An overview of the activities during construction and operation phases of the Project has been summarised below.

Note: *For the project, 56% of the civil project activities during construction phase are already complete. Hence, impacts for the completed construction activities and Pre-construction and mobilization Phase has been scoped out. However, impacts due to construction of TL and water pipeline which are linked to the Project has been assessed and required mitigation measures has been suggested.*

Table 7-1 Project Activities

Sr. No.	Project Phase	Activities
1.	Pre-Construction Phase	• Site Survey • Land Identification and land acquisition/lease • Project approvals and licenses • Design & plan finalization for construction activities • Finalization of contractor
2.	Construction Phase	• Contractor mobilization • Site preparation includes fencing, clearing of land, pit filling, levelling and grading. • Setting up batching plant, labour camp, site office, temporary storage areas, internal roads etc. • Transportation of Construction Machinery • Labour Engagement • Transportation and unloading of construction material. • Handling and disposal of construction wastes including hazardous and non-hazardous wastes. • Setting up of Project facilities such as boiler, fuel handling plant, ash handling plant, water treatment plant, etc. • Transportation of heavy construction equipment's and vehicles • Abstraction of water for civil work
3.	Operation and Maintenance Phase	• Storage and pre-processing of received waste • Operation and maintenance (O&M) of the waste to energy plant including boiler, ash handling plant, Demineralization Plant • O&M of transmission line and water pipeline • Leachate management, sewage management, process wastewater management, handling & disposal of hazardous waste • Regular transportation and disposal of ash generated due to operation of the WTE plant • Compliance monitoring and reporting (Monthly & Quarterly) • Regular Emission Monitoring • Power Transmission through overhead and underground transmission line

7.2 Scoping

As part of ESIA study, scoping has been undertaken to identify the potential area of influence for the project to identify potential interactions between the project and resources/receptors in the area of influence and the impacts that could result from these interactions and to prioritize these impacts in terms of their likely significance. This scoping exercise has been done in keeping with the present Project footprint and is intended to ensure that the impact assessment focuses on the issues that are most important for decision-making and stakeholder interest.

Potential impacts have been identified through a systematic process whereby the features and activities (planned and unplanned) associated with the ongoing and remaining construction activities and operation phases of the project have been considered with respect to their potential to interact with resources/receptors. Potential impacts have been classified in one of three categories:

a. No interaction: Where the project is unlikely to interact with resources/receptor;

b. Likely interaction: Where this is likely to be an interaction, but the resultant impact is unlikely to change the baseline conditions in an appreciable/detectable way; and
c. Significant interaction: Where the resultant impact has a reasonable potential to cause a significant effect on the resource/receptor.

The impact interaction matrix highlighting the potential interaction between project activities and resources/receptors has been presented in ***Table 7-4***

7.2.1 Potential Impacts

All environmental, ecological and social impacts and risks described in IFC's Performance Standards and E&S Guidelines have been considered for the interaction matrix as presented in ***Table 7-4***. Key environmental and social impacts due to project interaction are presented in ***Table 7-2*** below.

Table 7-2 Key Environmental, Social and Ecological Risks and Impacts due to Project interaction with E&S receptors

Sr. No.	Potential Risk/ Impact	Risks Identified
1	Impact on Soil	• During construction phase, activities such use of drilling fluids that can leave trace amounts of chemicals, improper waste disposal, discharge from site office may affect the existing soil quality. • During operation phase, soil quality will be impacted due to deposition of ash generated from combustion, improper handling and storage of received waste, fly ash, handling of sewage, improper leachate storage and disposal and other waste generated on site including hazardous waste. Also, leakage or chemical spill due to handling of hazardous material, chemicals, fuel etc. • In the operational phase, accidental spillage of stored chemicals and untreated effluents and leachate may impact the soil quality
2	Impact on Water Resources	• Water requirement during construction phase is primarily for civil work, domestic purpose and drinking purpose. During operation phase, water requirement will be as make up water for mist cooling, make up water for blow down loss from boiler, regeneration for demineralised water plant and other miscellaneous activities including domestic consumption. As per CGWB Rajkot tehsil falls is an area marked as "safe" in terms of groundwater development, • Approximately 2343 m3/day water will be obtained from the STP, of which 1478 m3/day treated water and sent to the plant and 7.5 m3/day will be freshwater requirement for domestic purposes. • Improper waste disposal including leachate and sewage management, improper management and disposal of hazardous material and waste, ash deposition, any leakage/spill from site may contaminate the soil and ground water of the area. • In the operational phase, accidental spillage of stored chemicals and untreated effluents, inadequate storm water management, contamination risk due to flooding, and leachate may impact the water quality as well as soil quality of surrounding habitats (water bodies and open scrub / barren land
3	Impact on Air Quality	• During construction phase, air quality may be impacted largely due to the following activities: o Fugitive dust emissions from, piling work, handling of construction materials, emission due to movement of vehicles on unpaved roads, plying of vehicles, etc. o Vehicular emissions due to increased traffic movement on site and on the approach roads. o Exhaust emissions from construction machinery and other equipment; and o Emissions from diesel generators required to be run for construction power purposes

Sr. No.	Potential Risk/ Impact	Risks Identified
		• During operation phase, air quality may be impacted due to flue gas emissions from the boiler, fugitive emission due to transportation of waste/fly ash, vehicular emission due to deployment of vehicles for municipal waste transportation and other operations related activities including chemical handling, and fugitive emissions during ash handling and disposal. Therefore, it is anticipated that air emissions during construction and operation phase may have impact on the aforementioned receptors.
4	Impact on Ambient Noise	• The primary sources of noise during the construction phase may be heavy earth moving vehicles and various construction equipment's. The sources of noise in the construction phase also include construction activities, operation of D.G. sets and movement of vehicles. There will also be increased noise levels because of increased anthropogenic movement in the area • The main sources of noise pollution from the WtE plant during operation phase would be operation of boilers, blowers cooling system, turbines and generator, vehicular movements, unloading of waste and loading and management of fly ash etc.
5	Occupational Health & Safety	• The engagement with various construction and operation activities will involve a range of occupational health and safety risks and hazards mainly for the contractors and workers (local and/or migrant) who are involved in the construction and operation phase. • Lack of relevant PPEs, training on health and safety, absence of adequate H&S system will increase the risk of worker's exposure to construction and operation hazards. Some of the serious risks during construction and operation phase without adequate PPE include risk of fall while working at heights, confined spaces during maintenance, risk of accidents, exposed to faulty electrical devices, such as cables, cords, hand tools, being struck in machinery or moving equipment or parts, etc. During operation phase, workers may be exposed to odour, pathogens, flue gas emission from boiler, exposure to fly ash which may cause skin and respiratory disorders. • Impacts of Accidental Spillage of Stored Chemicals and Untreated Effluents
6	Economic Displacement of Ragpickers	• As per the current understanding of the project there will be potential negative impact of the project on the livelihood of approx. 200 ragpicker occupied in rag picking at RMC land fill site.
7	Potential business disruption	• It was understood that project involves the excavation work for underground transmission line and water pipeline most of the excavation work will be done in the govt. land along the existing ROW of Roads. • It was observed that a few places informal squatters (kiosk) and opportunistic encroachers are using the ROW. And excavation work may potentially hamper the occupation and can cause temporary business disruption or traffic inconvenience, although the excavation is limited to 1 m therefore the magnitude of impact may be negligible.
8	Increased employment and livelihood	• Based on the current understanding of the project the project is having potential to generate employment both during construction as well as operations stage. Nearly 125 staff, including subcontracted staff, will be working during the operation phase.
9	Impacts on the Habitat and Species due to Construction Activities	Installation of transmission lines; underground water pipeline, increases movement of people and goods; noise; and the potential for sedimentation/pollution of water resources due to construction in the study area. These activities are evaluated in terms of habitat and species disturbance. Construction activities, vehicular movement and increases human activities directly impacts the burrowing faunal species (i.e. Bengal Monitor Lizard, Bengal Fox, Indian Hare, etc.) and indirectly impacts flora and fauna of the surrounding open scrub habitat. There is a possibility, that the anthropogenic migration has resulted in increased stress on the fauna of the region, requiring them to remain vigilant for extended periods of time, preventing proper reproduction, nesting, mating, socialization, and foraging.

Sr. No.	Potential Risk/ Impact	Risks Identified
10	Collision and Electrocution Risk to the Avifaunal species	In any power generation project, collision and electrocution are the universally recognized risks due to the transmission infrastructures. During the ecological survey, several species of birds were found perching on existing wires and poles in the study area. 66 kV transmission line (8.9 km Overhead and 2.9 km Underground; total length 11.8 km) as well as transmission towers (48 in numbers) can possibly cause electrocution and collision risks to birds.
11	Human-Wildlife Conflicts	The Project is situated very close to an active garbage dumping site of municipal corporation and surrounded by natural (open scrub) & modified (agricultural land) habitats. These habitats support several herpetofauna, avifauna, and mammals (as described in the ecological baseline). Access of these wildlife in the project compound as well as their movement along the boundary of the project during operation phase may cause a risk of Human-Wildlife conflicts.
12	Impact of increased traffic / vehicle movement	Although the transportation of municipal waste to the Waste to Energy plant comes under the scope of Rajkot Municipal Corporation (RMC), however the potential impact of Increased Traffic / Vehicle Movement has been assessed here as this is an associated activity.

7.2.2 Scoped Out-Potential Interactions

Based on interactions defined in *Table above*, the impacts on the following resources have been scoped out.

Table 7-3 Scoped Out-Potential Interactions

S.no.	Aspect	Rationale for Scoping Out
1.	Pre-construction and Mobilization activities	56% of the construction activities for the project have already been completed. Therefore, impact pertaining to pre-operation and mobilization phase have been scoped out.
2.	Land Use	The previous land use for the project was barren and waste land. Waste land which was used by municipality for waste dumping has been allocated to the company, hence change is land use is scoped out Also, laying of underground water pipeline and portion of underground transmission line will not impact the land use of the route, therefore has been scoped out
3	Impact on Soil- Construction Phase	Since, the time of site visit, the 56% of the construction was complete majority of civil works, therefore the impacts pertaining to activities such as site excavation, movement of heavy vehicles and equipment on unpaved roads, foundation work and backfilling have been scoped out
4.	Soil Erosion during construction phase	The project has already undertaken site clearing and excavation activities, therefore the same has been scoped out from the study.
5	Impact on Topography & Drainage during construction phase	At the time of the site visit, 56% of the construction was complete majority of civil works including land clearing activities. Therefore, impacts due to Preparation of designated area of land for subsequent development activities involves levelling the ground surface, removal of vegetation, stockpiling and generation of construction waste has been scoped out.
6	Transmission Line & Water Pipeline: Ambient Air Quality Impacts during Operation Phase	During operation phase, no significant impact on air quality is envisaged since transmission line is non-polluting and will not lead to increase in air emissions. Also, since the O&M work will be undertaken once or twice a year, the air emissions are envisaged to be negligible. Hence the project activity and receptor interaction has been scoped out.
7	Topography and Drainage-Transmission Line and Water Pipeline	Since construction of transmission tower, laying if underground water pipeline and transmission line does not require major levelling work, the impact on topography and drainage due to the project is assessed to be very limited to negligible. Therefore, the project activity and receptor interaction has been scoped out.
8.	Habitat Modification and Loss due to Vegetation Clearance	The municipal corporation land is being used for the WTE power project, which was initially a part of dumping site of municipal solid waste (MSW). The land was

S.no.	Aspect	Rationale for Scoping Out
		already disturbed because of dumping activities. Thus, the impact of habitat modification and loss due to site clearance has been scoped out.

Table 7-4 Impact Interaction Matrix

Potential Impact Interaction Matrix	Resource													
	Topography and Drainage	Land Use	Soil and Sediment Environment	Water Availability	Marine Environment	Air Environment	Noise Environment	Terrestrial Ecology	Aquatic Ecology	Land Based Livelihood	Economic Environment / Employment	Social and Cultural Environment	Occupational Health and Safety	Community Health & Safety
Construction Phase														
Labour Engagement											√	√	√	√
Handling and disposal of construction wastes including hazardous and non-hazardous wastes	√		√	√	√	√	√	√	√				√	√
Abstraction of water for civil work				√										√
Setting up project facilities and ancillary facilities such as batching plant, labour camp, site office, temporary storage areas, internal roads etc.	√	√	√	√	√	√	√	√	√				√	√
Transport of raw materials, heavy construction equipment's, project components and vehicles			√			√	√	√			√		√	√
Operation and Maintenance Phase														
Operation and maintenance (O&M) of the waste to energy plant including boiler, ash handling plant, compressed air plant, fuel handling plant, Demineralization Plant	√	√	√	√	√	√	√	√	√	√	√	√	√	√
Waste Generation and Disposal			√	√	√	√	√	√	√				√	√
O&M of project linked facilities such as transmission line and towers and water pipeline	√	√	√				√	√					√	√

No interaction	
Potential Interaction	√

7.3 Impact Assessment Methodology

This section assesses the manner in which the Project will interact with elements of the physical, ecological or social environment to produce impacts to resources/ receptors. It has been organized as per the construction and operation phases of the project life cycle to understand the risks and impacts associated with each phase.

7.3.1 Impact Estimation and Assessment

Criteria	Sub-Classification	Defining Limit
Spread: refers to area of direct influence from the impact of a project activity	Local spread	impact is confined within project footprint and/or within 500m of the project boundary
	Medium Spread	impact is spread beyond 500m up to 2 km of the Project boundary
	High spread	impact is spread beyond 2 km to 5 km from footprint boundary of the Project
Duration: based on duration of impact and the time taken by an environmental component to recover back to its best possible pre-project state	Short Duration	when impact is likely to be restricted for duration of l1 month;
	Medium Duration	when impact is likely to be restricted for duration of more than 1 month to 3 years
	Long Duration	when impact is likely to be extended up to 10 years
	Permanent	when impact is likely to be extended beyond 10 years
Intensity: defines the magnitude of Impact	Insignificant intensity	when resulting in changes in the environmental baseline conditions is up to 10%
	Low intensity	when resulting in changes in the baseline conditions up to 20%
	Moderate intensity	when resulting in changes in the baseline conditions for up to 30%
	High intensity	when change resulting in the baseline conditions beyond 30%
Nature: refers to whether the effect is considered positive or negative	Positive	When impact will result in positive or beneficial change in the project area
	Negative	When impact will result in negative or adverse change in the project area
Frequency: refers to extent of occurrence of any activity/ task	Intermittent	Activities which may be undertaken intermittently but may not be continuous or have impact only when undertaken beyond certain intensity
	Routine	Activities which will be undertaken on regular and daily basis as part of construction or operation of the project

The potential impacts from Construction and Operation phases of the project are discussed in the subsequent sections.

7.3.2 Impact Significance Criteria

Spread	Duration	Intensity	Magnitude
Local	Short	Low	**Negligible**
Local	Short	Moderate	
	Medium	Low	**Small**

Spread	Duration	Intensity	Magnitude
	Long	Low	
	Long	Moderate	
	Permanent	Low	
Medium	Short	Low	
	Medium	Low	
Local	Medium	Moderate	Substantial
	Medium	High	
	Short	High	
	Long	High	
	Permanent	Moderate	
Medium	Short	Moderate	
	Medium	High	
	Long	Low	
	Long	Moderate	
	Permanent	Low	
	Permanent	Moderate	
High	Short	Low	
	Short	Moderate	
	Medium	Low	
	Medium	Moderate	
	Long	Low	
	Long	Moderate	
	Permanent	Low	
Local	Permanent	High	Major
Medium	Short	High	
	Long	High	
	Permanent	High	
High	Short	High	
	Medium	High	
	Long	High	
	Permanent	Moderate	
	Permanent	High	

In case of social and ecological impacts due to the project activities, vulnerability of the impacted receptor shall also be assessed in addition to characterising the magnitude of impact. Multiple factors have been considered while defining the vulnerability of the resource/receptor, which may be biological, cultural or human as presented in table below. Other factors have been also considered while characterising vulnerability, such as legal protection, government policy, stakeholder views and economic value.

The ***vulnerability characterization*** used herein for social and ecological receptors are

- Low
- Medium
- High.

Furthermore, for health and safety impacts due to the project activities, probability of incidence occurrence has been considered. The probability of an incidence occurrence has been established via qualitative scale as presented in ***Table 7-5***
The ***probability*** used herein for health and safety incidence are: Unexpected

- Possible
- Expected

Table 7-5 Criteria for Receptor Vulnerability

Receptors	Sub criteria	Low	Medium	High
Impact on Local Community	The impact on local community of their socio-economic condition would be raised due to: • Potential loss of land-based livelihood • Potential Loss of Livelihood • Labour Influx • Employment Opportunities	• Minimum vulnerability consequently with a high ability to adapt to changes brought by the Project and opportunities associated with it	• Some but few areas of vulnerability; but still retaining an ability to at least in part adapt to change brought by the Project	• Profound or multiple levels of vulnerability that undermine the ability to adapt to changes brought by the Project
Habitat Sensitivity	Not Applicable	• Habitats with negligible interest for biodiversity. • Habitats with no, or only a local designation / recognition, habitats of significance for species listed as of Least Concern (LC) on IUCN Red List of Threatened Species • Habitats which are common and widespread within the region, or with low conservation interest based on expert opinion	• Habitats within nationally designated or recognized areas • Habitats of significant importance to globally Vulnerable (VU) Near Threatened (NT), or Data Deficient (DD) species • Habitats of significant importance for nationally restricted range species • Habitats supporting nationally significant concentrations of migratory species and / or congregator species • Low value habitats used by species of medium value	• Habitats within internationally designated or recognized areas • Habitats of significant importance to globally Critically Endangered (CR) or Endangered (EN) species • Habitats of significant importance to endemic and/or globally restricted-range species • Habitats supporting globally significant concentrations of migratory species and / or congregator species • Highly threatened and/or unique ecosystems, areas associated with key evolutionary species • Low or medium value habitats used by high value species
Species Sensitivity	Not Applicable	• Species with no specific value or importance attached to them • Species and sub-species of Least Concern (LC) on the IUCN Red List of Threatened Species • Not meeting criteria for medium or high value	• Species on IUCN Red List as Vulnerable (VU) Near Threatened (NT), or Data Deficient (DD) • Species protected under national legislation • Nationally restricted range species, nationally important numbers of migratory, or congregator species • Species not meeting criteria for high value, and species vital to the survival of a medium value species	• Species on IUCN Red List as Critically Endangered (CR) or Endangered (EN) • Species having a globally restricted range (i.e., plants endemic to a site, or found globally at fewer than 10 sites, fauna having a distribution range (or globally breeding range for bird species) less than 50,000 km2) • Internationally important numbers of migratory, or congregator species • Key evolutionary species, and species vital to the survival of a high value species

Table 7-6 Probability of Incidence Occurrence

Probability	Defining Limit
Unexpected	The incident is unexpected but may happen at any time during routine operations (probability less than 20%)
Possible	The incident is expected to happen at any time during routine operations (probability greater than 20% and less than 50%)
Expected	The incident will occur during normal routine operations (probability greater than 50%)

7.4 Impacts on Physical Environment

The Project site is located in area with no major industrial/ anthropogenic activities except for waste dumping and management activities. This section outlines the potential impacts on the physical environment due to project activities planned during different phases of the Project lifecycle.

7.4.1 Impacts during Construction Phase

Table 7-7 Activities and Sources of Impacts during Construction Phase

Activities	Sources of Pollution
Excavation of site layout- Scoped out as the site excavation is already complete	Dust from excavation activities. Dust and exhaust gases discharged by dump trucks, ground leveling materials.
Gather, store and preserve fuels and materials in service of works- Scoped out as the civil activity phase of the site visit is complete	Trucks transporting construction materials such as cement, steel, sand, stone will cause dust and exhaust. Leaks, dispersal of pollutants, dumps of raw materials, petrol.
Construction of associated Infrastructure such as water supply pipeline, transmission line	Air pollution from the transportation of machinery and equipment used in construction. Soil and water contamination due to solid wastes Pollution of catchment area to receive wastewater, rainwater overflows.
Installation of civil equipment, electrical equipment, etc.	Emissions, dust, transportation equipment, raw materials for installation and operation of machinery
Transportation of raw materials for the project	Exhaust emissions, noise caused by the truck transporting materials into the works
Post-completion process, to increase durability and aesthetics, workers will paint a layer of waterproofing, moisture-proof works	Exhaust gases from the painting process. The surface coating process produces vapors and volatile organic compounds (VOCS: Volatile Organic Compounds) such as formaldehyde, benzene, xylene and they can evaporate in the air
Welding the steel structures,	The chemicals in the welding sticks are burned and emitted smoke containing toxic substances, potentially polluting the air environment and affecting the health of workers
Operation of machinery, tool & tackles and other construction activities	Noise Impact

7.4.1.1 Air Quality

The fugitive emissions from the construction activities (laying of TL, water pipeline and construction activities on site) and emissions exhaust from transportation vehicles, generators include SO2, CO2, CO, NOx are likely to remain highly localized and confined to the identified waste to energy project area but would require adequate mitigation measures to prevent their spread outside the footprint of the WTE plant.

Based on ambient air quality monitoring conducted at four locations twice a week for 4 weeks within 10 km radius of the, parameters such as Sulphur Dioxide (SO_2), Oxides of Nitrogen (NO_X) and Carbon Monoxide (CO), Cadmium, Lead, Mercury (Hg), Nickel (Ni), Arsenic (Ar), Hydrogen Fluoride (HF), Hydrochloric Acid (HCL) were found to be within NAAQS CPCB permissible limits as well as WBG EHS guidelines, whereas exceedance was observed for PM 10 and PM 2.5 values, where the 24 hours sample values were found to be exceeding the NAAQS as well as WBG Interim target-1 and 2 (refer ***Table 5-14 and Table 5-15***), therefore it can be considered that the project is located in a degraded airshed The WTE plant is spread across an area of 15 acres of land and the air quality impacts would be confined to 500 m of the construction activity area and the access route. There are no settlements and industries located within 500 m of the plant, however a municipal dump site and landfill is located adjacent to the Plant. Workers working in the waste dumping area and landfill area that is currently under biomining are the receptors and anticipated to be impacted by air emissions. Also, a temporary labour camp set up by contractors engaged in biomining of legacy waste is present adjacent to the project site in the southwest direction. Further the construction activities will also involve increase in the number of vehicles entering the region for transportation of equipment & material and manpower. Villages along the access roads are anticipated to be impacted due to increased emissions.

The laying of underground water pipeline, transmission lines and setting up of treatment system at the Gauridad STP can have several air quality impacts, especially during the construction phase.

- Vehicle Emissions: The transportation of construction equipment, machinery, and materials to the transmission line and water pipeline route can result in vehicle emissions. This includes nitrogen oxides (NOx), volatile organic compounds (VOCs), and particulate matter released by construction vehicles, contributing to local air pollution and increase in traffic movement.
- Construction Machinery Emissions: The operation of construction machinery, such as excavators, backhoes, and compactors emit exhaust gases and other pollutants that affect air quality in the vicinity of the construction site.
- Asphalt and Concrete Production: The production of asphalt and concrete materials, which are used for road restoration after pipeline installation, can also generate emissions from the mixing and curing processes.
- Fugitive dust emissions from site clearance, excavation, levelling, foundation and erection work at the transmission line, stacking of soils, handling & transportation of construction material
- Exhaust emissions from construction machineries, other heavy equipment like cement mixer, JCB, and trucks
- Exhaustive emission due to excavation work at transmission line and water pipeline route

The transmission line length is 11.8 km and underground water pipeline is of length 12.2km and the pre- treatment will be setup at the vacant land within the Gauridad STP premises, the air quality impacts would be confined to 500 m of the construction activity area, material storage area, route and settlements located within 500 m of the transmission line and water pipeline. The Project will not have any long-term impact on the ambient air quality of the study area. The construction activities will involve an increase in the number of vehicles entering the region causing fugitive emissions from vehicular engines. State Highways will be utilized along with village roads for transportation of construction materials. Settlements along the access roads in Project AoI is anticipated to be impacted due to increased emissions.

Adopted Control Measures

- The speed of vehicles on site is limited to 10-15km/h, which helps in minimizing fugitive dust emissions due to vehicular movement.
  No heavy construction work was undertaken. Most of the super structures are prefabricated. All earth work was not carried out simultaneously, and was undertaken in phases for minimization of dust and particulate matter during excavation and other construction activities.

Specific to linked facilities (TL and Water pipeline)

- Excavated soil at the construction site will be handled adequately and topsoil is heaped and water sprinkling is done to minimize dust generation
- Emissions from the D.G. set and other stationary machines will be controlled by ensuring that the engines are always properly tuned and maintained
- Minimizing of stockpiling by coordinating excavations, spreading, re-grading and compaction activities
- Preventive measures such as storage of construction material in sheds, covering of construction materials during transportation will be undertaken, for reducing dust emissions

Impact Magnitude

Impacts on ambient air quality during remaining construction activities for WtE Plant and construction activities of linked facilities will be for limited period i.e. 10 months going forward therefore, the impact duration has been assessed to be short. Furthermore, since there will be dust emissions due to construction activities at the project site and along the access routes and for construction and laying of above ground and underground transmission line and underground water pipeline, the spread has been assessed to be local, i.e. limited to 500m from the project site as well as access roads. The intensity and frequency have been classified as moderate and routine respectively as the construction activities will be undertaken regularly during the construction period. Therefore, the impact magnitude based on the impact significance criteria has been classified as Small.

- Adequately sized construction yard will be identified at the site for storage of construction materials, equipment tools, earthmoving equipment, etc.
- Fuel tanks adequately designed to minimize fugitive emissions and welding gas cylinders will be stored in a secluded area within project site

	Nature of Impact	Spread of Impact	Duration	Intensity	Frequency	Significance of Impact
Without Mitigation Measures	Negative	Local	Short	Moderate	**Routine**	**Small**
With Mitigation Measures	Negative	Local	Short	Low	**Routine**	**Negligible**

7.4.1.2 Ambient Noise

During construction of the project, all activities, equipment on site generate noise. The level of noise propagation depends on the sound level and the distance from the location to the receiving environment. Noise affects the health of workers in the construction site and in the area surrounding the project site. Construction noise occurs discontinuously, depending on the type of operation of the machinery and equipment used. However, since 56% of the construction activities are complete including the majority of civil works within the Plant. Pending works during the construction phase includes laying of transmission line, water pipeline, electrical supply connection and electrical erection works.

The sources of noise for construction of associated TL and water pipeline during the construction phase include civil work, operation of batching plant, operation of DG sets and construction machineries such as cranes, drillers, bull dozers etc. and movement of vehicles for loading and unloading, fabrication, etc. General noise levels generated from the operation of the equipment and machinery is provided below:

Machinery & Equipment	Noise				Vibration
	Noise at 2m distance (dBA)	Distance of 100m (dBA)	Distance of 200m (dBA)	Distance of 500m (dBA)	At the distance 10m from source of vibration
Dump truck	83 – 94	71.5	68.5	64.5	74
Crane	83 – 94	70.5	67.5	63.5	74
Piling machine	83 – 91	70	67	63	98
Generator	78 – 83	63.5	60.5	56.5	74
Bulldozers	93	76	73	69	81
Excavator	84 – 92	71	68	64	73
Compactor	85 – 90	70.5	67.5	63.5	90
Diesel compressor	87	70	67	63	72
Mortar pump	82 – 89	68.5	65.5	61.5	66
Concrete mixers	80 – 94	70	67	63	88
Concrete pump trucks	81 – 84	65.5	62.5	58.5	74
Water pumps	70	53	50	46	60

Machinery & Equipment	Noise				Vibration
	Noise at 2m distance (dBA)	Distance of 100m (dBA)	Distance of 200m (dBA)	Distance of 500m (dBA)	At the distance 10m from source of vibration
Cutting machines	78 – 86	65	62	58	68
Welder	71 – 82	59.5	56.5	52.5	61

Source: https://www.ruidos.org/Noise/WHO_Noise_guidelines_2.html

Noise levels and vibrations will only directly affect workers on construction site. However, all the equipment's do not operate at the same time, the noise level will not be more than 75dB(A). Impacts caused by the noise and vibration of the construction process of the project are anticipated to be local and the impact on the surrounding area is relatively low due to the short construction time of the machines and the wide spread of the space. The project will use winching machine for stringing of transmission line. The winching machine produces a noise level of more than 70 dB (A). This can cause disturbance to the settlement located within 500 m of the transmission route and workers working at the transmission line.

Based on the ambient noise quality monitoring conducted at four locations within study area (refer ***Table 5-16)***, Leq Day and Leq Night values of N1 which is located in an industrial area was found to be within limits as prescribed by CPCB as well as WBG EHS guidelines, whereas for sample N2 & N4 (both of the locations considered as residential area), was found to be within the limit prescribed by CPCB for residential area. But the values of N3 for Leq day is 59.8 dB(A) and Leq night is 52.15 dB(A) found to be exceeding the limit of residential area i.e. 55dB(A) and 45 dB(A) respectively. The construction work for the associated TL and pipeline is envisaged to increase the existing noise level at the project study area. Since there are settlements located within 500 m of the associated TL and water pipeline, these settlements are anticipated to be impacted from increased noise levels due to their proximity to the project site. Additionally, there will be increase in noise level due to transportation of construction material and manpower at under construction site. However, the impact is envisaged to be limited since the construction phase will last for a short period of time i.e., 10 months.

Impact Magnitude

Impacts on ambient noise quality during construction activities will be for a limited period going forward i.e. 10 months, therefore, the impact duration has been assessed to be short. Also, there are no permanent settlements located within 500 m of the WtE plant, except for temporary labour camp and the resting & residential structure present within the Rajkot dumping yard and the transmission line and the water pipeline are passing from the vicinity of the residential as well as commercial areas, there will be increase in noise level during movement of vehicles and construction materials and installation of Transmission tower and laying of the underground TL and pipelines for the project. Furthermore, since there will be noise emissions due to construction activities at the project site and along the access routes due to movement of construction vehicles and construction, the spread has been assessed to be local. The intensity and frequency have been classified as moderate and routine respectively as the construction work will be undertaken on a daily basis, which will contribute towards increasing the noise levels. Therefore, the impact magnitude based on the impact significance criteria has been classified as Small.

Adopted Control Measures

- The working hours for construction activities are defined i.e. from 8 am to 6pm.
- Operation of high noise level construction machineries are restricted during daytime only. If work is extended beyond the defined hours, it was reported, that it is limited to activities that do not produce noise
- Periodic inspection of machineries and vehicles are done and appropriate lubrication and tightening of moving parts are done in case of increased noise levels during operation
- All vehicles entering the WTE plant are instructed to obey speed limits and not to blow horns unless absolutely necessary.

Additional Mitigation Measures

- Only well-maintained equipment should be operated on-site;
- Anti-honking sign boards to be placed in the parking areas and at entry / exit points
- If it is noticed that any particular equipment is generating too much noise then lubricating moving parts, tightening loose parts and replacing worn out components should be carried out to bring down the noise

- Machinery and construction equipment that may be in intermittent use should be shut down or throttled down during non-work periods
- Noise generating equipment should be located away from settlement to reduce the disturbance;
- Noise limits for construction equipment to be installed at the project area during peak construction such as front loaders concrete mixers, cranes (moveable), 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;
- Machinery and construction equipment that may be in intermittent use should be shut down or throttled down during non-work periods

	Nature of Impact	Spread of Impact	Duration	Intensity	Frequency	Significance of Impact
Without Mitigation Measures	Negative	Local	Short	High	**Routine**	**Small**
With Mitigation Measures	Negative	Local	Short	Low	**Routine**	**Negligible**

7.4.1.3 Soil Compaction & Contamination

The volume of waste generated during the construction and installation of the project items includes soil, rock, wood, building materials, cement, broken bricks, construction materials, iron excess. The volume of these sources of waste is difficult to quantify, depending on the raw material saving, skill level of the worker and the method of re-use of the waste produced for other purposes. Municipal waste including food waste will be generated from site office and contractor facilities. The project may also generate hazardous waste in the form of used oil from diesel generators and construction machineries, empty containers of paints, contaminated cotton rags, hydraulic fluids etc. Any leaks or spills of oil and lubricants from heavy equipment during drilling activities at site and/or improper discharge of wastewater at site may lead to long term negative impact on soil quality.

Daily general waste of workers in the construction site (organic matter, wastepaper, etc.) is 0.74kg/person/day[77]. The number of employees/workers working on the site during construction phase is 85. The daily workload of workers on the project area is about 0.74kg/person/day x 85 person = 62.9 kg/day. The amount of waste generated is not large, however if not collected and managed daily, it increases the chances of degradation and increases the risk of contamination and surrounding.

During the construction of the project and associated TL and water pipeline, an amount of hazardous waste will be mainly generated from the maintenance of construction machinery and equipment. The waste generated needs to be collected and stored on the construction site, affecting the water, soil and air environment in the project area and the surrounding area.

As for soil compaction, excavation and collection of topsoil during construction of associated TL and water pipeline may lead to soil compaction, thus increasing surface run-off and decreasing the percolation rate of the soil. However, the excavation work will be limited only to the associated TL and water pipeline area and no larger area will be excavated due to the project.

Impact Magnitude

Since the ongoing construction phase will last for a limited period of time i.e., 10 months, the duration has been classified as short. Furthermore, since the soil erosion and compaction may occur due to movement of vehicles on unpaved roads, excavation work at construction site and any leaks and spills of oil from project activities may contaminate the soil in project site and immediate areas, therefore the spread has been classified as local. The intensity has been classified as low to moderate and the frequency has been classified as routine. Therefore, based on impact significance criteria, the impact magnitude is assessed to be **Small.**

Adopted Control Measures

- Sewage generated onsite is being treated and disposed through septic tanks and soak pits
- Construction waste generated at the site is reused to the extent possible
- Spoil generated from excavation work is being reused to the extent possible for backfilling purpose within project boundary etc.
- Using existing roads to access the site to the extent possible

[77] https://datatopics.worldbank.org/what-a-waste/trends_in_solid_waste_management.html

- Stripping of topsoil was not conducted earlier than required (vegetation cover will be maintained for as long as possible) in order to prevent the erosion (wind and water) of soil and the excavated soil for the underground transmission line and water pipeline will be used for backfilling of the excavated area as well.

Additional Mitigation Measures

- Dedicated waste storage areas should be developed at site
- Onsite workers should be provided with adequate training in waste management. The requirement to impart EHS training to the workers should be included in the contractor's agreement.
- Remaining construction waste which cannot be reused such as scraps, metals etc. should be disposed through authorized vendor.
- Hazardous waste generated at site should be stored on impervious floor with secondary containment and disposed to authorized vendor in accordance with Hazardous and other Wastes (Management & Transboundary Movement) Rules, 2016
- During servicing/repair of equipment or vehicles, a suitable drip tray shall be used to prevent oil/grease spills onto the soil, especially in case of emergency repairs
- Oil spill kits should be maintained onsite to handle minor leaks and spillage
- Unloading and loading protocols should be prepared for diesel, oil and used oil respectively and onsite workers should be trained to prevent/contain spills and leaks.
- Soil which cannot be reused should be disposed through authorized vendor
- SPV to implement the developed waste management plan along with the ESMP onsite.
- The stockpiles of the soil should be kept moist to avoid wind erosion of the soil;
- Soil to be ploughed in compacted area after completion of the construction work;
- Topsoil that has been stripped should be stored for landscaping, if feasible at the transmission line area or connecting substations;
- As a best practice, site clearance, piling, excavation will not be carried out during the monsoon season to minimize erosion, compaction and run-off;
- Site to be restored at the end;
- EPC Contractors deployed for construction of associated TL and water pipeline should ensure that no unauthorized dumping of used oil and other hazardous waste is undertaken along the transmission and waterpipe line route
- Construction and Demolition Waste should be stored separately and be periodically collected by an authorized vendor.
- All waste should be stored in a shed that is protected from the elements (wind, rain, storms, etc.) and away from natural drainage channels.
- Records should be maintained for quantity and type of hazardous waste generated.
- It is to be ensured that hazardous waste is not stored for more than 90 days. Hazardous waste should be disposed through SPCB authorized hazardous waste vendor only.
- Use of spill control kits to contain and clean minor spills and leaks.
- Unloading and loading protocols should be prepared for diesel and used oil (if generated) respectively and workers trained to prevent/contain spills and leaks.
- In case of accidental/unintended spillage, the contaminated soil should be immediately collected and stored as hazardous waste.
- Limited movement of vehicles should be permitted for stringing of transmission line near to settlements.
- EPC contractor should restore the project site and surrounding area (if used for any temporary structure) to its original condition. GWRPL should inspect the site and ensure the project site is properly restored prior to issuing completion certificate to the EPC contractors.

	Nature of Impact	Spread of Impact	Duration	Intensity	Frequency	Significance of Impact
Without Mitigation Measures	Negative	Local	Short	Low-Moderate	**Routine**	**Small**
With Mitigation Measures	Negative	Local	Short	Low	**Routine**	**Negligible**

7.4.1.4 Water Resources

During the construction of the project, sources of water pollution include:

- Domestic wastewater from workers at the site mainly contains debris, decomposing organic matter, nutrients (N, P) and microorganisms.
- Construction wastewater.

Water is a critical requirement for the execution of civil works (transmission line, water pipeline), particularly for the preparation of raw materials such as concrete, etc. (i.e. tower foundation and installation, casting, construction of substation, laying of underground water and transmission line pipeline, by extension, pumping station etc.). It is also required for dust suppression activities, domestic and drinking purposes.

Source water for domestic purpose and remaining construction activities at the WTE plant is currently ground water via a borewell installed within the WTE plant. With regards to drinking water, water campers are being sourced from local vendors.
As per CGWB, Rajkot tehsil falls is an area marked as safe with the stage of ground water development in year 2017 at 64.23 %. Furthermore, as per CGWA notification dated 24 September 2020, in safe assessment units, No Objection Certificate shall be granted for ground water abstraction to any new industry while paying ground water abstraction charges and along with compliance to terms and conditions as mentioned in the NOC. Therefore, the Project has obtained NOC from CGWA for abstraction of 7.5 m3/day of water from the borewell for the Project. Also, the project is located in an area where legacy waste has been dumped in the nearby vicinity. Based on the ground water quality monitoring results (as presented in section 5.3.6.4.1), most of the parameters (as per IS 10500:2012) for the groundwater sample are within the desirable and permissible limit as per IS 10500:2012 and WHO guidelines for drinking water except for turbidity, TDS and chloride. Also, there are no densely populated residential area in the 2 km radius, therefore with the project extracting ground water during the construction phase will not affect the water levels in the area as the water will only be used during the remainder of construction phase (10 months).

As understood, the source of water for the construction of associated TL and water pipeline will be water tankers. However, it could not be confirmed at this stage, if the source of water in the tanker will be ground water from the project site or another source will be identified.

There is a potential for contamination of groundwater resources resulting from improper management of sewage. Furthermore, the accidental spillage of chemical and fuel may contaminate the ground water in the project area. However, the type of soil found in the project study area is loam and loamy sand which has low water mention capacity.

According to the drainage map (refer ***Figure 5-12***), there are multiple dendritic drainage channels located within 10 km of the Project area and within the water pipeline as well as transmission line. Improper handling of waste or leaks and spill of chemical and oil may contaminate the drainage located close to the project site, water pipeline as well as the transmission line route.

Adopted Control Measures

- Stored Rainwater is also being used for construction and landscaping activities during the construction phase

Impact Magnitude

Since the associated TL and water pipeline for the project are not situated within the project site, abstraction of water will be along the route of the construction area (TL and water pipeline) and for WTE plant, most of the civil activities are complete therefore the spread has been classified as local. Furthermore, water requirement for construction phase will last for limited period i.e., 10 months, the impact duration has been considered as short. Thus, the impact intensity has been classified as low to moderate. Therefore, based on impact significance criteria, the impact magnitude has been classified as small.

Additional Mitigation Measures

- Sensitize workers on water conservation and encourage optimal use of water. The requirement to conduct such training should be included in the contractor's agreement.
- Project should ensure it is compliant to the regulatory requirements for abstraction of water during project construction.
- Reuse and recycle water to the extent possible
- Regular inspection should be carried out for identifying water leaks and preventing water wastage
- Optimum use of water during sprinkling on roads for dust settlement, washing of vehicles, concrete mixing for etc.
- Groundwater quality monitoring should be conducted onsite quarterly during the construction phase

	Nature of Impact	Spread of Impact	Duration	Intensity	Significance of Impact
Without Mitigation Measures	Negative	Local	Short	Low to Moderate	Small
With Mitigation Measures	Negative	Local	Short	Low	Negligible

7.4.2 Impacts during Operation Phase

Table 7-8 Activities and Sources of Impacts during operation phase

Aspect	Source	Impact
Dust	Dust arising from internal traffic MSW transportation to the site	Air environment Water environment
Emission Odor	Emissions from Boiler Air emissions from MSW collection and transport include, dust and bio-aerosols, odors, and vehicle emissions	Air environment Water environment Occupational Health & Safety
Bottom Ash & Fly Ash	Boiler	Water environment Air environment Soil environment Occupational Health & Safety
Waste generated during the project operations (Hazardous waste, domestic waste, wastewater, leachate, and e-waste)	Project Operations and operation of water Pre-treatment systems	Air environment Soil environment Occupational Health & Safety Water environment

7.4.2.1 Air Quality

During operation phase, primary sources of air emission from the project will include the following:

- Vehicular emission due to traffic movement within and outside the plant premises and from the waste collection centers to the project site
- Waste Pre-processing and handling
- Dust generation during legacy waste collection, sorting and transportation
- Flue gas emission from boiler/furnace due to incineration of waste
- Fugitive fly ash emission from ash handling units and boilers and during ash transportation
- Exhaust emissions from diesel generators used for power back up

During the operation phase of the project, dust emissions from the vehicles are anticipated during transportation of waste to the plant. Assuming the project operates at 100% capacity throughout the day, approximately 80-100 Vehicles are anticipated to bring fresh waste to the WTE plant. Legacy waste using 10-15 trucks will be brought from the dumping area as well.

Specialized transportation vehicles for the transportation of fresh waste from the garbage stations will be done using 5 tonne trucks with average waste transportation distance of about 20 km/vehicle and for legacy waste the average transportation distance is about 3km. The fresh waste generated by Rajkot city is currently being dumped at the existing dumping site (adjacent to the Project site) and post operation of the plant, the waste will be dumped at the bunker (within the Project site). The dust emissions from the waste transportation will not increase due to the project. Also, waste collection and dumping are in the scope of the municipality.

Emissions from the project activities are mainly emissions during the incineration process and fugitive emission from fly ash and bottom ash generated due to combustion of waste (~ 140TPD of ash will be generated from WTE plant).

The high-temperature flue gas generated by the combustion of waste in the incinerator is cooled by the heat recovery boiler to 190°C and then enters the flue gas purification system. Refer to ***Section 2.7.1.2*** on details of flue gas cleaning mechanism. The boiler will operate at 40 bar pressure and 410-degree temperature. Major emissions from the boiler stack is anticipated to be Poly Chlorinated-p-dioxins (PCDD) and related furans (PCDF), SOx, NOx, CO, HCL,HF, Mercury and its compounds, PM10, PM2.5, Cadmium +Thorium and their compounds, Scandium+ Arsenic + Lead+ cobalt+ Chromium+ Copper + Manganese+ Nickel+ Vanadium and their compounds. The flue gas emission from the boilers may disperse in the air up to a significant distance depending upon the meteorological condition of the Project area.

Flue gas cleaning system (FGCS) refers to a range of processes imposed on untreated combustion gas to limit harmful pollutants such as emissions of dust, acidic gases, heavy metals, and dioxins to levels well below legal emission limits. This flue gas cleaning system requires water, steam and chemicals for removal of pollutants substance from flue gas. Removal of pollutants in flue gas requires two processes physical and chemical. Selection of Technology/Combination of equipment's/ technologies proposed to be used to clean the flue gas to achieve the prescribed norms is as tabulated hereunder

Table 7-9 Technology adopted for cleaning of Flue gas

Flue Gas Component	Proposed Technology
Poly Chlorinated-p-dioxins (PCDD) and related furans (PCDF)	• Effective Combustion • Prevention of Re-formation • Adsorption of PCDD/F by injection of activated carbon or of other adsorbents
NOx	• Air supply, gas mixing and temperature control • Flue-gas recirculation
CO	Effective Combustion
HCl & SOx	• Dry Sorbent Injection System
HF	HF is highly soluble in water. HF can be controlled by acid emission control techniques, i.e. use of hydrated lime and sodium bicarbonate
Mercury and its compounds	• Activated carbon injection for mercury adsorption
PM10, PM2.5	Bag Filter
Cadmium +Thorium and their compounds	Cadmium & Thallium Compounds: Adsorption of metal by injection of activated carbon or other reagents in combination with a dry sorbent injection system is used to reduce acid gas emissions
Scandium + Arsenic + Lead + cobalt + Chromium + Copper + Manganese + Nickel + Vanadium and their compounds	Metals in incineration are converted mainly into non-volatile oxides and deposited with fly ash. Thus becomes a part of particulate matter and are managed by Bag Filters and ESP's

Formation of Dioxin and Furan generally takes place between temperature zone of 200°C to 400°C, subject to presence of chlorine, oxygen and available organic matter (benzene ring). GWRPL intends to suppress the formation of dioxin and furan by reducing the retention time in the above-mentioned temperature.

Odour arising from the handling, storage and treatment of waste and leachate includes H_2S, ammonia, methyl mercaptan. During operation, accumulation of a large amount of waste in the bunker (capacity of 1500 Tonne) with incoming waste ~ 600 tonnes per day (Phase 1 and 1000 TPD when the plant is 100% operational) will generate odour due to the decomposition of organic substances. Odour generated will impact the workers present within the project site, especially H_2S, when inhaling in high concentrations.

7.4.2.1.1 Air Quality Dispersion Modelling

To assess the impact of air emissions from various sources, an air dispersion modelling study was conducted as part of the ESIA. AERMOD View 9.8.3 model software was run with the Meteorological data of 2022 (1st January 2022- 31st December 2022) for normal and worst-case condition and following Incremental Ground Level Concentration was obtained.

Modelling Details and Computation Framework

The predictions for air quality during operation phase were carried using CPCB/MoEF&CC/SEIAA approved "AERMOD (AMS/EPA Regulatory Model) View" which is developed by the AERMIC (American Meteorological Society (AMS)/United States Environmental Protection Agency (EPA) Regulatory Model Improvement Committee). The model is based on planetary boundary layer theory which incorporated the popular USEPA models into one interface. Aermod View fully incorporates the building wash algorithms, advanced depositional parameters, local terrain effects and advanced meteorological turbulence for the prediction of pollutants dispersion.

AERMOD View 9.8.3 model has been used to calculate the Ground Level Concentration (GLC) which can simultaneously simulate many sources with different shapes, at ground or elevated, buoyant or non-buoyant, emitting one or more pollutants and is capable of accounting for the non-homogeneous vertical structure of the boundary layer. Vertical mixing is limited in case of stable conditions. The dispersion for unstable conditions is non-Gaussian, so as to correctly describe the high concentrations of pollutants that can be observed close to stacks under convective conditions.

AERMOD includes the several improvements of the standard Gaussian models as follows:

- Turbulence: Aermod uses the vertical continuous profiles of horizontal and vertical turbulence that are measured/computed as compared to the ground level releases of the dispersion parameters corresponding to the stability classes.
- Dispersion under Convective Conditions: Under the convective conditions the plume is made of the three components – direct plume, indirect plume and a third plume (penetrating the mixing lid and dispersion more slowly in the stable layer above and re-enter in the mixing lid and reach the ground). AERMOD describes the non-Gaussian vertical dispersion under convective conditions that are characterized by the presence of updraft and downdraft motions with different probability of occurrence and different intensity.
- Dispersion under stable conditions: AERMOD took into account the boundary layer as compared to the assumption of infinite boundary layer for describing the horizontal and vertical dispersion.
- Plume Buoyancy: Under stable atmospheric conditions: AERMOD uses the values at stack height at half distance from the final height due to buoyancy, while under convective conditions it superimposes the random displacements due to the random fluctuations of the convective velocities.
- Nature of Source: Sources can be treated as rural or urban independently.
- Complex Terrain: AERMOD has a terrain processor (AERMAP) that prepares the data for their use within the model by advanced algorithms that discriminate the streamline division based on a critical height.

Methodology

There are two input data processors that are regulatory components of the AERMOD modeling system: AERMET, a meteorological data preprocessor that incorporates air dispersion based on planetary boundary layer turbulence structure and scaling concepts, and AERMAP, a terrain data preprocessor that incorporates complex terrain using USGS Digital Elevation Data

Considerations/Control and model Input

There are following considerations/model inputs for this project based on the detailed project report provided, USEPA and various research Papers

1. Two stacks are considered for calculation of emission factor to get ground level concentration
2. Emission parameter values have been calculated based on 7% oxygen, as expected according to EU Norms 2000.
3. Two Conditions are considered for Plant operation one is Normal condition with APCD installed and another is worst condition with failure of APCD
4. 24 hours value is utilized in Normal condition to run AERMOD.
5. Worst Case Scenario has also been considered for 1 Hours, taking into account failure of APCD.
6. 99% efficiency of Air Pollution Control Devices (ESP and Bag house filter) has been considered.
7. For the removal of gases (NO2 and SO2), a 50% removal efficiency of the Air Pollution Control Device (Hydrated lime injection System) is considered, with approximately 50% of gas released from the stack into the ambient.
8. CO values are considered for both conditions. In normal conditions, values align with 24-hour EU Norms 2000, while in worst-case scenarios, a 50% increase from normal CO concentration is considered due to less efficient combustion.
9. For fugitive dust emission AP 42 has been considered to calculate the emission factor.
10. Fugitive dust emission calculated for PM10 and PM2.5 in Normal condition.
11. For worst condition only point source considered only in PM10, PM2.5 only.
12. Emission rate(g/s), base elevation, coordinates (UTM), release height (m), gas Exit temperature (K), gas exit velocity (m/s), stack inside diameter (m) have been considered in input source file.
13. Wind speed at stack level is calculated by power law as given below

Ustack =U10 (Stack height/10) p

Where U10 is the wind speed at 10-meter level and p is the power law coefficient (0.07, 0.10, 0.15, 0.35 and 0.55 for stability classes A, B, C, D, E and F respectively) as per Irwin for rural areas (USEPA. 1987).

14. All the inputs related to positions of source and receptors are taken in UTM (Universal Transverse Mercator).
15. Rectangular grids receptors are considered for dispersion result with 500m x 500m grid.
16. Location is falling under datum 42Q
17. Orientation Angle has been taken 0° as North and accordingly locations of sources have been defined in clockwise direction.
18. Operating data limits have been calculated along with efficiency of APCD for calculation of emission factors for Normal and worst-case conditions.
19. The ground level concentration on settlements has been calculated on the basis of isopleth superimposed on Google Earth.

Identification of Source

The under-construction plant is waste to energy-based power plant, two stacks have been considered as the point source for emission. RDF, segregated waste and legacy waste will be considered as fuel for generation of electricity. Flue Gas cleaning system will be installed after complete heat recovery from hot gas. This will control all defined emissions as per emission norms before it leaves to atmosphere through boiler Chimney (stack). Transportation has been considered as line source. The major pollutants are considered as PM_{10}, $PM_{2.5}$, SO_2, NOx, CO only. Sources of pollutants considered are as below:

- Process Stack - PM10, PM2.5, SO2, NOx, CO
- Road transportation – Fugitive dust

Table 7-10 Details of Boilers

Sr. No.	Parameter	Unit	Operation of Boilers	
			Boiler-1	Boiler-2
1.	Capacity	TPH	2 boilers of capacity 40 TPH each	
2.	Stack Height	m	50 (Boiler-1)	50 (Boiler-1)
3.	Stack Diameter	m	2.093 (Boiler-1)	2.093 (Boiler-2)
4.	Velocity	m/s	10-15	10-15

Table 7-11 Traffic Flow

Sr. No.	Material Type	Vehicle Type	Vehicle Make	Vehicle Model	Loading Capacity in MT	Avg Moving Vehicle / Day
1	MSW	Dumper (BS IV), diesel based	Tata	SK 1613 / LPT 2518	12 / 25	16
2	MSW	Container (BS IV), diesel based	Ashok Leyland	2820	4	8
3	MSW	Compactor (BS IV), diesel based	Tata	LPT 1618	15	18
4	RDF	Truck (BS IV), diesel based	Tata / Ashok Leyland	3118	24	4

Table 7-12 Emissions in Normal and Worst-Case Scenario

Emissions in Normal and Worst-Case Scenario (from boilers)				
Sr. No	Pollutant	Emission rate in Normal Condition (g/s)	Emission Worst Case Condition (g/s)	Emission Rate (mg/Nm3)
1.	PM10	0.4128	41.28	10

Emissions in Normal and Worst-Case Scenario (from boilers)				
Sr. No	Pollutant	Emission rate in Normal Condition (g/s)	Emission Worst Case Condition (g/s)	Emission Rate (mg/Nm3)
2.	PM2.5	0.4128	41.28	10
3.	NOx	8.256	16.512	200
4.	SO_2	2.064	4.128	50
5.	CO	2.064	3.096	50

Fugitive Dust Emission			
S. No	Pollutant	Emission rate in Normal Condition (g/s-m2)	
		Paved Road	Unpaved Road
1.	PM10	1.75E-06	2.59E-07
2.	PM2.5	4.17E-07	2.59E-08

Identification of receptors

To identify the impact on receptors in a 10 km radius a grid has been taken of 20 km x 20 km in North and East of the site considering center of Project as the centre of the grid. A total of 41 points taken on both sides and interval of 500m has been taken. All the intersection points are considered as the receptors and accordingly results have been obtained in form of isopleths showing the Ground Level Concentration (GLC).

Meteorological Data

1st January 2022- 31st December 2022 data has been considered for calculating the Maximum peak for whole period and worst-case scenario. Meteorological data is procured for the period January-December 2022 and consists of wind direction, wind speed, temperature (in K), mixing height, stability class (urban and rural) and cloud cover. The life of the plant is 25 years, significant changes in the met data in another 25 years are not anticipated.

Analysis of Results

AERMOD View 9.8.3 model software was run with the Metrological data of 2022 (1st January 2022- 31st December 2022) for normal and worst-case condition. Ground Level Concentration (GLC) on sensitive receptors (village settlements) in 10 km radius for all the pollutants was modelled.

Based on the 24-hour averaging period results, maximum concentration of the pollutants is limited to 500m radius. The maximum incremental GLC (24 hours averaging period, in normal conditions) for the PM10, PM2.5, NOx, SO_2 and CO (8 hours averaging period, in normal conditions) on the baseline conditions will be:

Normal Case (24-hour average)

- PM10 – 0.89723 ug/m^3
- PM2.5 – 0.82 ug/m^3
- NOx – 15.27665 ug/m^3
- CO- 10.47790 ug/m^3
- SO2 - 4.80 ug/m^3

Worst Case

- PM10 –510.12 ug/m^3
- PM2.5 – 510.12 ug/m^3
- NOx – 207.71 ug/m^3
- CO – 40.9956 ug/m^3 (8-hour average)
- SO_2 – 50.83 ug/m^3

Detailed Results for 24 hour averaging period (for PM 10, PM2.5, SO_2 & NOx) and 8 hour averaging period for CO with peak concentration at Normal and Worst Conditions and Isopleths been attached as ***Appendix 15***. Result for GLC for the villages falling within 10 km radius has been presented in *Table* below.

Referring to the modeling results:

- PM10: Maximum GLC observed to be 0.897 µg/m^3 which is at the Project Site. With the increase in distance from Project Site, GLC is getting reduced and by 570 m distance, the concentration is further reduced to less than 0.4 µg/m^3.
- PM2.5: Maximum GLC observed to be 0.82 µg/m^3 which is at the Project Site. With the increase in distance from Project Site, GLC is getting reduced and by 575m distance, the concentration is further reduced to less than 0.4 µg/m^3.
- NO_x: Maximum GLC observed to be 15.27 µg/m^3 which is at the Project Site. With the increase in distance from project site, GLC is getting reduced and by 645 m distance, the concentration is further reduced to less than 5.0 µg/m^3
- SO_2: Maximum GLC observed to be 4.80 µg/m^3 at the Project Site. With the increase in distance from the project site, GLC is getting reduced and by 463 m from the Project Site, the concentration is further reduced to 3.0 µg/m^3.
- CO: Maximum GLC observed to be 10.5 µg/m^3 which is at project site itself. With the increase in distance from project site, GLC is getting reduced and by 565 m distance, the concentration is further reduced even less than 5.0 µg/m^3.

Table 7-13 Results for Incremental Ground Level Concentrations

S.No	Villages within 10 km radius	X coordinates	Y Coordinates	Distance & Direction	Ground level concentration (µg/m^3)			Applicable Standards
					Normal Condition (24 hour)	Worst case Condition (24 hour)	Worst case Condition (1 hour)	
	NO_x[78]							
1	Nagalpar	691764	2477690	2.6 Km; N	3.0	6	60	**NAAQS Permissible Limits for NO_2 (24 Hr):** 80 µg/m^3 **WBG EHS Ambient Air Quality Standards for NO_2 (WHO Guidelines):** 1 year: 40 µg/m^3 1 hour: 200 µg/m^3
2	Rajgadh	690885	2475223	756 M; SW	7.0	10	60	
3	Nakaravadi	691778	2473382	2.0 Km; S	7.0	10	80	
4	Hadmatiya	688440	2474888	3.2 Km; SW	3.0	8	60	
5	Sokhada	691705	2471568	3.8 Km; S	5.0	10	60	
6	Maliyasan	693555	2470902	4.9 Km; SE	3.0	8	60	
7	Khijadiya	694969	2477858	3.8 Km; NE	3.0	9	50	
8	Navin Nagar	693282	2477077	2.2 Km; NE	5.0	10	60	
9	Dhamalpar	693209	2473611	2.3 Km; SE	5.0	10	90	
10	Rajkot	686174	2467582	2.3 Km; SW	3.0	6	40	
11	Rohidaspra	687622	2468564	8.0 Km; SW	3.0	8	50	
12	Ronki	685371	2471977	7.3 Km; SW	1.0	5	40	
13	Bhichari	692258	2467461	8.0 Km; S	1.0	4	40	
14	Targhadia	697427	2470409	7.6 Km; SE	3.0	6	60	
15	Gunda	699969	2471303	9.2 Km; SE	3.0	5	50	
16	Kuvadva	700356	2474028	8.6 Km; SE	3.0	6	30	

[78] There are no Ambient Air quality standards for NOx as per National and International Standards. Furthermore, NO_2 is a part of NOx emissions, and since the NOx values are complying with the national as well as international ambient air quality standards, therefore it is understood that the values of NO_2 will also comply with the Air Quality Standards. . Therefore, if the Ground Level concentration (GLC) of NO_x at the villages due to emissions from WtE plant are well within the Ambient Air Quality Standards for NO_2 (as there are no Air Quality Standards for NO_x values), it can be considered that the NO_2 concentrations will also be within the Ambient Air Quality Standards.

S.No	Villages within 10 km radius	X coordinates	Y Coordinates	Distance & Direction	Ground level concentration (µg/m³)			Applicable Standards
					Normal Condition (24 hour)	Worst case Condition (24 hour)	Worst case Condition (1 hour)	
17	Ranpar	698224	2475298	6.4 Km; E	3.0	8	50	
18	Jhiyana	699016	2478634	7.9 Km; NE	1.0	5	30	
19	Gavridad	684576	2477826	7.5 Km; NW	1.0	4	50	
20	Ratanpar	685167	2478741	7.3 Km; NW	1.0	4	30	
21	Khorana	689853	2481373	6.1 Km; NW	1.0	5	40	
22	Sanosara	694451	2481227	6.2 Km; NE	1.0	5	40	
23	Rampara	698993	2481673	9.4 Km; NE	1.0	4	30	
24	Bedi	686315	2472345	6.2 Km; SW	3.0	6	50	
25	Navagam	689633	2469044	6.8 Km; SW	5.0	10	50	
		PM_{10}						
1	Nagalpar	691764	2477690	2.6 Km; N	0.1	10	100	**NAAQS Permissible Limits (24 Hr):** 100 µg/m³ **WBG EHS Ambient Air Quality Standards (WHO Guidelines): 24-hour values** 150 µg/m³ (Interim target 1) 100 µg/m³ (Interim target 2) 75 µg/m³ (Interim target 3) 50 µg/m³ (guideline)
2	Rajgadh	690885	2475223	756 M; SW	0.4	20	100	
3	Nakaravadi	691778	2473382	2.0 Km; S	0.4	20	200	
4	Hadmatiya	688440	2474888	3.2 Km; SW	0.1	20	100	
5	Sokhada	691705	2471568	3.8 Km; S	0.1	20	100	
6	Maliyasan	693555	2470902	4.9 Km; SE	0.1	20	100	
7	Khijadiya	694969	2477858	3.8 Km; NE	0.1	20	100	
8	Navin Nagar	693282	2477077	2.2 Km; NE	0.1	20	100	
9	Dhamalpar	693209	2473611	2.3 Km; SE	0.1	20	200	
10	Rajkot	686174	2467582	2.3 Km; SW	0.1	10	100	
11	Rohidaspra	687622	2468564	8.0 Km; SW	0.1	20	100	
12	Ronki	685371	2471977	7.3 Km; SW	0.1	10	100	
13	Bhichari	692258	2467461	8.0 Km; S	0.1	10	100	
14	Targhadia	697427	2470409	7.6 Km; SE	0.1	10	100	
15	Gunda	699969	2471303	9.2 Km; SE	0.1	10	100	
16	Kuvadva	700356	2474028	8.6 Km; SE	0.1	10	90	
17	Ranpar	698224	2475298	6.4 Km; E	0.1	20	100	
18	Jhiyana	699016	2478634	7.9 Km; NE	0.1	10	90	
19	Gavridad	684576	2477826	7.5 Km; NW	0.1	10	100	
20	Ratanpar	685167	2478741	7.3 Km; NW	0.1	10	80	
21	Khorana	689853	2481373	6.1 Km; NW	0.1	10	100	
22	Sanosara	694451	2481227	6.2 Km; NE	0.1	10	100	
23	Rampara	698993	2481673	9.4 Km; NE	0.1	10	70	

S.No	Villages within 10 km radius	X coordinates	Y Coordinates	Distance & Direction	Ground level concentration (µg/m³)			Applicable Standards
					Normal Condition (24 hour)	Worst case Condition (24 hour)	Worst case Condition (1 hour)	
24	Bedi	686315	2472345	6.2 Km; SW	0.1	10	100	
25	Navagam	689633	2469044	6.8 Km; SW	0.1	20	100	
		$PM_{2.5}$						
1	Nagalpar	691764	2477690	2.6 Km; N	0.1	10	100	
2	Rajgadh	690885	2475223	756 M; SW	0.4	20	100	**NAAQS Permissible Limits (24 Hr):** 60 µg/m³
3	Nakaravadi	691778	2473382	2.0 Km; S	0.1	20	200	
4	Hadmatiya	688440	2474888	3.2 Km; SW	0.1	20	100	**WBG EHS Ambient Air Quality Standards (WHO Guidelines): 24-hour values (µg/m³)**
5	Sokhada	691705	2471568	3.8 Km; S	0.1	20	100	75 (Interim target 1)
6	Maliyasan	693555	2470902	4.9 Km; SE	0.1	20	100	50 (Interim target 2)
7	Khijadiya	694969	2477858	3.8 Km; NE	0.1	20	100	37.5 (Interim target 3)
8	Navin Nagar	693282	2477077	2.2 Km; NE	0.1	20	100	25 (guideline)
9	Dhamalpar	693209	2473611	2.3 Km; SE	0.1	20	200	
10	Rajkot	686174	2467582	2.3 Km; SW	0.1	10	100	
11	Rohidaspra	687622	2468564	8.0 Km; SW	0.1	20	100	
12	Ronki	685371	2471977	7.3 Km; SW	0.1	10	100	
13	Bhichari	692258	2467461	8.0 Km; S	0.1	10	100	
14	Targhadia	697427	2470409	7.6 Km; SE	0.1	10	100	
15	Gunda	699969	2471303	9.2 Km; SE	0.1	10	100	
16	Kuvadva	700356	2474028	8.6 Km; SE	0.1	10	90	
17	Ranpar	698224	2475298	6.4 Km; E	0.1	20	100	
18	Jhiyana	699016	2478634	7.9 Km; NE	0.1	10	90	
19	Gavridad	684576	2477826	7.5 Km; NW	0.1	10	100	
20	Ratanpar	685167	2478741	7.3 Km; NW	0.1	10	80	
21	Khorana	689853	2481373	6.1 Km; NW	0.1	10	100	
22	Sanosara	694451	2481227	6.2 Km; NE	0.1	10	100	
23	Rampara	698993	2481673	9.4 Km; NE	0.1	10	70	
24	Bedi	686315	2472345	6.2 Km; SW	0.1	10	100	
25	Navagam	689633	2469044	6.8 Km; SW	0.1	20	100	
		SO_2						
1	Nagalpar	691764	2477690	2.6 Km; N	0.9	1	10	**NAAQS Permissible Limits (24 Hr):** 80 µg/m³
2	Rajgadh	690885	2475223	756 M; SW	1.0	2	10	
3	Nakaravadi	691778	2473382	2.0 Km; S	1.0	2	10	
4	Hadmatiya	688440	2474888	3.2 Km; SW	1.0	2	10	

S.No	Villages within 10 km radius	X coordinates	Y Coordinates	Distance & Direction	Ground level concentration (µg/m³)			Applicable Standards
					Normal Condition (24 hour)	Worst case Condition (24 hour)	Worst case Condition (1 hour)	
5	Sokhada	691705	2471568	3.8 Km; S	1.0	2	10	**WBG EHS Ambient Air Quality Standards (WHO Guidelines): 24-hour values (µg/m³)** 125 (Interim target 1) 50 (Interim target 2) 20 (guideline)
6	Maliyasan	693555	2470902	4.9 Km; SE	1.0	2	10	
7	Khijadiya	694969	2477858	3.8 Km; NE	1.0	2	10	
8	Navin Nagar	693282	2477077	2.2 Km; NE	1.0	2	10	
9	Dhamalpar	693209	2473611	2.3 Km; SE	1.0	2	10	
10	Rajkot	686174	2467582	2.3 Km; SW	0.7	1	7	
11	Rohidaspra	687622	2468564	8.0 Km; SW	1.0	1	10	
12	Ronki	685371	2471977	7.3 Km; SW	0.6	1	10	
13	Bhichari	692258	2467461	8.0 Km; S	0.5	1	10	
14	Targhadia	697427	2470409	7.6 Km; SE	0.7	1	10	
15	Gunda	699969	2471303	9.2 Km; SE	0.6	1	10	
16	Kuvadva	700356	2474028	8.6 Km; SE	0.7	1	10	
17	Ranpar	698224	2475298	6.4 Km; E	1.0	2	7	
18	Jhiyana	699016	2478634	7.9 Km; NE	0.6	1	10	
19	Gavridad	684576	2477826	7.5 Km; NW	0.5	0.9	7	
20	Ratanpar	685167	2478741	7.3 Km; NW	0.5	0.9	10	
21	Khorana	689853	2481373	6.1 Km; NW	0.6	1	7	
22	Sanosara	694451	2481227	6.2 Km; NE	0.7	1	9	
23	Rampara	698993	2481673	9.4 Km; NE	0.5	0.9	6	
24	Bedi	686315	2472345	6.2 Km; SW	0.7	1	10	
25	Navagam	689633	2469044	6.8 Km; SW	1.0	2	10	
Carbon Monoxide (CO)- 8 hour								
1	Nagalpar	691764	2477690	2.6 Km; N	2	3	10	**NAAQS Permissible Limits (8 Hr)**: 2 mg/m³ (2000 µg/m³)
2	Rajgadh	690885	2475223	756 M; SW	5	7	10	
3	Nakaravadi	691778	2473382	2.0 Km; S	2	7	10	
4	Hadmatiya	688440	2474888	3.2 Km; SW	2	3	10	
5	Sokhada	691705	2471568	3.8 Km; S	2	5	10	
6	Maliyasan	693555	2470902	4.9 Km; SE	2	3	10	
7	Khijadiya	694969	2477858	3.8 Km; NE	2	3	10	
8	Navin Nagar	693282	2477077	2.2 Km; NE	2	3	10	
9	Dhamalpar	693209	2473611	2.3 Km; SE	2	3	10	
10	Rajkot	686174	2467582	2.3 Km; SW	1	1	7	
11	Rohidaspra	687622	2468564	8.0 Km; SW	2	3	10	

S.No	Villages within 10 km radius	X coordinates	Y Coordinates	Distance & Direction	Ground level concentration (µg/m³)			Applicable Standards
					Normal Condition (24 hour)	Worst case Condition (24 hour)	Worst case Condition (1 hour)	
12	Ronki	685371	2471977	7.3 Km; SW	1	1	8	
13	Bhichari	692258	2467461	8.0 Km; S	1	1	8	
14	Targhadia	697427	2470409	7.6 Km; SE	2	3	10	
15	Gunda	699969	2471303	9.2 Km; SE	1	1	8	
16	Kuvadva	700356	2474028	8.6 Km; SE	1	1	6	
17	Ranpar	698224	2475298	6.4 Km; E	2	3	10	
18	Jhiyana	699016	2478634	7.9 Km; NE	1	1	7	
19	Gavridad	684576	2477826	7.5 Km; NW	1	1	10	
20	Ratanpar	685167	2478741	7.3 Km; NW	1	1	6	
21	Khorana	689853	2481373	6.1 Km; NW	2	3	8	
22	Sanosara	694451	2481227	6.2 Km; NE	1	1	7	
23	Rampara	698993	2481673	9.4 Km; NE	1	1	5	
24	Bedi	686315	2472345	6.2 Km; SW	2	3	10	
25	Navagam	689633	2469044	6.8 Km; SW	2	3	10	

The ground level concentration (GLC) of various pollutants due to the emission from the waste to energy plant for all the sensitive receptors (village settlements) within 10 km radius are well within the National Ambient Air Quality Standards as well as WBG EHS Ambient Air Quality Standards (WHO Guidelines) for normal scenarios for 24 hours values. As confirmed by the GWRPL, the plant will always have operational APCD, in case of any failure of APCD's the plant will be shut down and will not be operated without APCD's. Faulty or non-operational APCD's can be immediately detected as a Continuous Emission Monitoring System (CEMS) will be installed at both the stacks to monitor the pollutants.

The impact during normal case scenario will be limited to a 10 km radius from the project site. With proper functioning of Air Pollution Control Devices, Incremental ground level concentration will have minimal impact. Also, the emissions from the plant (***refer Table 7-13 and Table 7-12***) are well within the WBG EHS Air emission standards for MSW incinerators as well as the Standards for Incineration as per SWM Rules 2016 **(*Refer Table 4-8)***.

The table below (**refer**

Table 7-14***)*** presents the Resultant Pollution Load in normal working conditions (i.e. all the Air Pollution Control Devices (APCD) devices are fully functional) of the plant. The resultant pollution load for the project area was calculated wrt Existing Baseline Ambient Air Quality and Incremental Ground Level Concentration due to waste to energy plant at the ambient air quality monitoring locations.

Analysis of results from ambient air quality monitoring undertaken for the project, parameters such as Sulphur Dioxide (SO_2), Oxides of Nitrogen (NO_X) and Carbon Monoxide (CO), Cadmium, Lead, Mercury (Hg), Nickel (Ni), Arsenic (Ar), Hydrogen Fluoride (HF), Hydrochloric Acid (HCL) were within NAAQS CPCB permissible limits as well as IFC EHS guidelines, whereas exceedance was observed for PM 10 and PM 2.5 values, where the 24 hours sample values were found to be exceeding the IFC guideline value. (Refer ***section 5.3.8.2.1***).

The modeling results (**refer**

Table 7-14**)**, indicate that there will be no significant change in the existing ambient air quality parameters due to the project operations. As per modeling results, ground level concentration of PM 10, PM2.5, NO_X, SO_2, and CO at the nearest receptors from the project where baseline monitoring was conducted was recorded to be 68.19-285.79 µg/m^3, 36.12-116.77 µg/m^3, 37.89-40.77 µg/m3, 14.10-15.20 µg/m^3 and 0.51-0.61mg /m^3 respectively. The PM10 and PM2.5 values are exceeding the NAAQS standard at 2 receptors. PM10 and PM 2.5 values are also exceeding IFC EHS guidelines and interim target-1, interim target -2 and interim target 3. For parameters NO_X, SO_2, and CO the values are well within the NAAQS as well as IFC AAQ standards.

The airshed is already degraded, the % increase in the pollutant load in ambient air quality lies in the range of 0.31-1.33 % and 0.76-2.5% respectively for 24 hours values with APCD devices for PM 10 & PM 2.5. Projects located within poor quality airsheds should ensure that any increase in pollution levels is as small as feasible and amounts to a fraction of the applicable short-term and annual average air quality guidelines or standards as established in the project-specific environmental assessment. The emissions are “a fraction” of the air quality guideline for a degraded airshed for PM 10 & PM 2.5. The modelled contribution due to emissions from the project are well within the reference point of “a fraction” of the air quality guideline for a degraded airshed.

For parameters such as CO, SO_2 and NO_x, where the air shed is considered as non-degraded, the % increase in the pollutant load in ambient air quality lies in the range of 59.91-67.54%, 46.18.51.64% and 59.91-69.54% respectively for 24 hours values with APCD devices. The baseline values for CO, SO_2 and NO_x are quite low and well within limits and the emission by the plant are also well below the NAAQ standards.

Table 7-14 Resultant Concentration for Pollutants at the Monitoring Locations (Receptors within 3km radius)

Sample	Location	Baseline concentration (average) (µg/m³)	Incremental GLC (as obtained from Dispersion Modelling) (µg/m³)		Location of max. incremental GLC	Total Concentration (µg/m³) (Incremental GLC + Baseline Maximum Concentration Values)		% Incremental GLC wrt standard		% Increase of the Pollutants (Incremental GLC/baseline *100)		Applicable Standards (IFC EHS Guidelines & NAAQS Standards
			24 Hour- 1st Highest (With APCD)	1 Hour (without APCD)		24 Hour- 1st Highest (With APCD)	1 Hour (without APCD)	24 Hour (1st Highest) With APCD	24 Hour without APCD	24 Hour- 1st Highest (With APCD)	1 Hour (without APCD)	
PM10												
AAQ1	Project Site	284.9	0.89723	510.12	Project Site	285.79723	795.02	0.89723	510.12	0.22	8.82	**NAAQS Permissible Limits (24 Hr):** 100 µg/m³ **WBG EHS Ambient Air Quality Standards (WHO Guidelines): 24-hour values** • 150 (Interim target 1) • 100 (Interim target 2) • 75 (Interim target 3) 50 (IFC EHS guideline)
AAQ2	Pipaliya Primary School Pipaliya (Sukal)	121.72				122.61723	631.84			0.51	20.65	
AAQ3	Nagalpar Pri Govt School	85.23				86.12723	595.35			0.73	29.50	
AAQ4	Dhamalpar	67.3				68.19723	577.42			0.92	37.36	
PM2.5												
AAQ1	Project Site	115.9	0.82	510.12	Project Site	116.77987	626.02	1.47	850.19	0.76	440.13	**NAAQS Permissible Limits (24 Hr):** 60 µg/m³ **WBG EHS Ambient Air Quality Standards (WHO Guidelines): 24-hour values** • 75 (Interim target 1) • 50 (Interim target 2) • 37.5 (Interim target 3) 25 (IFC EHS guideline)
AAQ2	Pipaliya Primary School Pipaliya (Sukal)	62.05				62.92987	572.17			1.42	822.10	
AAQ3	Nagalpar Pri Govt School	43.92				44.79987	554.04			2.00	1161.46	
AAQ4	Dhamalpar	35.24				36.11987	545.36			2.50	1447.55	

Sample	Location	Baseline concentration (average) (µg/m³)	Incremental GLC (as obtained from Dispersion Modelling) (µg/m³)		Location of max. incremental GLC	Total Concentration (µg/m³) (Incremental GLC + Baseline Maximum Concentration Values)		% Incremental GLC wrt standard		% Increase of the Pollutants (Incremental GLC/baseline *100)		Applicable Standards (IFC EHS Guidelines & NAAQS Standards
			24 Hour- 1st Highest (With APCD)	1 Hour (without APCD)		24 Hour- 1st Highest (With APCD)	1 Hour (without APCD)	24 Hour (1st Highest) With APCD	24 Hour without APCD	24 Hour- 1st Highest (With APCD)	1 Hour (without APCD)	
						NOx						
AAQ1	Project Site	25.5				40.77665	233.21396			59.91	814.56	NAAQS Permissible Limits (24 Hr): 80 µg/m³ WBG EHS Ambient Air Quality Standards (WHO Guidelines): • 1 year: 40 1 hour: 200
AAQ2	Pipaliya Primary School Pipaliya (Sukal)	24.21	15.27665	207.71396	Project Site	39.48665	231.92396	19.10	259.64	63.10	857.97	
AAQ3	Nagalpar Pri Govt School	22.62				37.89665	230.33396			67.54	918.28	
AAQ4	Dhamalpar	23.50				38.77665	231.21396			65.01	883.89	
						SO2						
AAQ1	Project Site	10.4				10.53151	11.78299			46.18	488.72	NAAQS Permissible Limits (24 Hr): 80 µg/m³ WBG EHS Ambient Air Quality Standards (WHO Guidelines): 24-hour values • 125 (Interim target 1) • 50 (Interim target 2) 20 (guideline)
AAQ2	Pipaliya Primary School Pipaliya (Sukal)	9.47				8.56151	9.81299			50.72	536.72	
AAQ3	Nagalpar Pri Govt School	9.9	4.80	50.83	Project Site	9.23151	10.48299	6.004	63.5341375	48.51	513.41	
AAQ4	Dhamalpar	9.3				8.49151	9.74299			51.64	546.53	
						CO (8 hour)						
AAQ1	Project Site	0.72 (mg/m³)	10.47790 (µg/m³)	40.99562 (µg/m³)		0.510	0.541			2.096	8.199	NAAQS Permissible Limits (8 Hr): 2 mg/m³ (2000 µg/m³)
AAQ2	Pipaliya Primary School Pipaliya (Sukal)	0.60 (mg/m³)	0.010478(mg/m³)	0.040996 (mg/m³)	Project Site	0.510	0.541	0.524	2.050	2.096	8.199	

Sample	Location	Baseline concentration (average) (µg/m³)	Incremental GLC (as obtained from Dispersion Modelling) (µg/m³)		Location of max. incremental GLC	Total Concentration (µg/m³) (Incremental GLC + Baseline Maximum Concentration Values)		% Incremental GLC wrt standard		% Increase of the Pollutants (Incremental GLC/baseline *100)		Applicable Standards (IFC EHS Guidelines & NAAQS Standards
			24 Hour- 1st Highest (With APCD)	1 Hour (without APCD)		24 Hour- 1st Highest (With APCD)	1 Hour (without APCD)	24 Hour (1st Highest) With APCD	24 Hour without APCD	24 Hour- 1st Highest (With APCD)	1 Hour (without APCD)	
AAQ3	Nagalpar Pri Govt School	0.54 (mg/m³)				0.610	0.641			1.746	6.833	
AAQ4	Dhamalpar	0.50 (mg/m³)				0.610	0.641			1.746	6.833	

Proposed Control Measures

- Adequate air pollution control measures such as a flue gas cleaning system and adequate stack height shall be provided before commissioning of the Plant. Additional facilities required, if any, to achieve the standards laid down by the statutory authority shall also be made along with.
- The waste will be transported in closed and covered waste collection trucks
- Provision of closed waste handling and storage areas
- Internal Roads are made of Concrete instead of asphalt and least distance will be travelled by the material within the facility.
- Separate waste segregation/MRF Facility with AI driven technology will be developed with no human intervention
- Use negative pressure in processing buildings to manage odor
- Waste will be incinerated at high temperatures and no chemical treated with any chlorinated disinfectants will be undertaken prior to incineration
- Plant shall be operated (combustion chambers) with such temperature, retention time and turbulence, as to achieve total Organic carbon (TOC) content in the bottom ash less than 3%, or their loss on ignition is less than 5% of the dry weight.
- Ensure temperature within combustion/gasification chambers (always above 850 °C) avoid the formation of dioxins and furans
- Mist cooling is planned to keep down dusts, especially during and prior to loading or other handling procedures
- Waste segregation and/or presorting to avoid incineration of wastes that contain metals and metalloids that may volatilize during combustion and be difficult to control through air emission technology (e.g., mercury and arsenic)
- Waste introduction into the incinerator only after the optimum temperature is reached in the final combustion chamber
- Waste will be incinerated at high temperatures and no chemical treatment with any chlorinated disinfectants will be undertaken prior to incineration
- The waste charging system is interlocked with the temperature monitoring and control system to prevent waste additions if the operating temperature falls below the required limits
- Provision of flue gas treatment system to control acid gases, particulate matter, and other air pollutants
- Minimize formation of dioxins and furans by maintaining the boiler temperature above 800°C
- Periodic monitoring of concentrations of PCDDs, PCDFs, other combustion products, and heavy metals in flue gas
- Reduction in the generation and emission of PCDDs and PCDFs, by ensuring rapid cooling of flue gas as well as good turbulence of the combustion gas, high temperature, adequate oxygen content, and adequate residence time.
- Use odor-neutralizing sprays where necessary
- Design stack heights according to Good International Industry Practice (GIIP) to avoid excessive ground level concentrations and minimize impacts, including acid deposition
- Implementation of Air Pollution Control Devices to manage emissions from the facility
- Implementation of continuous emission monitoring systems (CEMS) to monitor the plant's emissions in real-time. Regular reporting of emissions data to relevant environmental authorities promotes transparency and compliance with air quality regulations.
- Provision of greenbelt and landscape area within the Project premises.
- All the vehicles and other equipment will be periodically checked to ensure compliance with the emission standards.
- Provision of Ash handling system with silos, hoppers, and submerging of bottom ash
- Bag Filters with PTFE bag material will be used for fly ash collection and bottom ash will be collected
- GWRPL will implement a combination of both ESP and high efficiency of bag filters in series. ESP will act as a pre-dedusting mechanism (Efficiency of ESP design is around 90-95%) before addition of Activated Carbon and Lime dosing for removal of Dioxin & Furan Compound, heavy metal oxide, HF removal and acid gas control. Bag house acts as final filtration system with high efficiency PTFE fabric filters (99%-99.7%).
- Development of belt area within the plant premises that may support in suppression of fugitive emissions
- Periodic maintenance of the bag filter & ESP will be carried out to avoid dust emissions during removal of fly ash.
- A continuous emission monitoring system to be installed at site as per conditions stipulated in the CTO to display emissions for NOx, PM (PM10 & PM2.5), CO or as included in CTO

- Steam Turbine shall comply with the relevant International Electro-technical Commission (IEC) standards or equivalent
- Internal Roads will be made of Concrete instead of asphalt and least distance will be travelled by the material within the facility.

Additional Mitigation Measures

- According to the Point Source Air Emissions Prevention and Control Technologies provided in WBG EHS guidelines for air emissions and ambient air quality, the reduction efficiency of fabric filter should be 99-99.7% and that of ESP should be 97-99%.
- Periodic monitoring (quarterly) of concentrations of PCDDs, PCDFs, other combustion products, and heavy metals in flue gas, i.e. stack monitoring as well as ambient air quality monitoring to be undertaken on quarterly basis
- Use extraction system to remove dust from working areas, buildings, and storage vessels, and treat as needed to control particulate emissions
- Manual segregation and removal of chlorinated plastic and other elements unsuitable for thermal treatment.
- Water Sprinkling to be done at the access road to manage dust emissions from the vehicles transporting waste to the plant.
- Implement good housekeeping practices to reduce fugitive emissions and control dust and particulate matter within the facility.
- As stated in the General EHS Guidelines, emissions from a single project should not contribute more than 25% of the applicable ambient air quality standards to allow additional, future sustainable development in the same airshed[79].
- Fly Ash will be transported in covered trucks and tippers to the fly ash recipients. Fly ash generated from bag filter should be sent to cement plants. GWRPL to discuss with RMC for disposal of ash in line with MoEFCC draft notification no. G.S.R. 285(E) dated 22/04/2021, with previous notification in 2016.

	Nature of Impact	Spread of Impact	Duration	Intensity	Significance of Impact
Without Mitigation Measures	Negative	Medium	Permanent	Moderate	Substantial
With Mitigation Measures	Negative	Medium	Permanent	Low	Small

7.4.2.2 Ambient Noise

During the operation phase, noise might be generated due to industrial activities involved in handling, transporting, processing of solid waste or RDF and generation of electricity and same will be felt upon work personnel and nearby settlements. Impacts are evaluated qualitatively taking into consideration the noise generating sources together with environmental conditions and the receptors in the project influence area.

Major sources of noise generation in the proposed Waste to Energy (WTE) plant are handling, transporting, processing of solid waste or RDF and generation of electricity units during operational phase and are classified into two categories:

- Stationary sources due to operation of heavy-duty machinery at the project site like Fuel handling and feeding systems, Boiler and steam generation system, Steam turbine generator, Flue gas cleaning systems, Compressors, Pumps, Ancillary equipment including hydraulics, waste pre-processing equipments (such as grabber, moving belt feeder, splitter, shredder, star screen) compressed air supply etc.
- Mobile sources corresponding to mainly vehicular traffic for staff mobilization, solid waste transportation etc.

According to the noise monitoring results presented in ***Table 5-16***, Leq Day and Leq Night values of N1 which is located in an industrial area was found to be within limits as prescribed by CPCB as well as WBG EHS guidelines, whereas for sample N2 & N4 (both of the locations considered as residential area), were found to be within the limit prescribed by CPCB for residential area.

[79] For example, the US EPA Prevention of Significant Deterioration Increments Limits applicable to non-degraded airsheds provide the following: SO2 (91 µg/m3 for 2nd highest 24-hour, 20 µg/m3 for annual average), NO2 (20 µg/m3 for annual average), and PM10 (30 µg/m3 for 2nd highest 24-hour, and 17 µg/m3 for annual average).

The values of N3 for Leq day is 59.8 dB(A) and Leq night is 52.15 dB(A) found to be exceeding the limit of 55dB(A) and 45 dB(A) respectively which is approximately at a distance of 2km. The operation of the project may contribute to increasing the noise levels in the project study area.

The project will deploy approximately 60 on roll workers during operation phase who will be exposed to the noise emissions along with the workers and rag pickers engaged at the dumping and biomining sites within the Rajkot dumping area. Furthermore, the nearest settlement (standalone settlement) is located at an aerial distance of 750m southeast from site. There are no permanent residential settlements present within 1km radius of the project, only 3-4 scattered standalone houses are present within the 1km radius. These residential structures are present adjacent to the agricultural patch cultivated by the owners. No permanent residential receptors within 500 m are anticipated to be impacted due to the Project activities, however temporary labour camps and residences within the existing dumping site may be impacted.

7.4.2.2.1 Noise Modeling

7.4.2.2.1.1 Sources of Noise

An inventory of noise equipment at the project site, encompassing various machinery and systems associated with the waste-to-energy process, is provided in Table below along with their corresponding noise level data.

Table 7-15 Inventory of Noise Equipment

S. No	Equipment	Number of Equipment	Noise level dB(A)	
1.	**Boiler fuel feeding**		70.1	59.2
	Boiler fuel bunker	1		
	Orange peel grabber	2		
	Fuel pushing mechanism	4		
	Hydraulic pusher	-		
	Auxiliary burner	-		
	Start-up burner	-		
	Vibro feeder	4		
2.	**Boiler Aux fuel feeding**		70.1	59.2
	Aux fuel silo	1		
	Orange peel grabber	-		
	Drag chain conveyor	2		
	Screw conveyors	8		
	Fuel feeding chutes	8		
3.	**Steam Boiler**		72.2	61.5
	Combustion grate	2		
	Furnace and refractory wall	Lot		
	Boiler feed pump	3		
	Safety valves	13		
	Steam drum	2		
	Steam coil Air preheater	2		

S. No	Equipment	Number of Equipment	Noise level dB(A)	
	Sec air preheater	2		
	Primary air preheater	4		
	Evaporator	2 Lot		
	Superheater	2 Lot		
	Attemperator	2 Lot		
	Economizer	2 Lot		
	Boiler cleaning system	2 Lot		
	Blow down tank	2		
4.	**Fans (boiler)**		72.2	61.5
	Primary fan	2		
	Secondary fans	2		
	Flue gas rec fan	2		
	Induced draft fan	2		
5.	**Flue gas cleaning system**		70.2	63.6
	Electrostatic precipitator	2		
	Acid control reactor tower	2		
	Dry sorbent injection	2		
	Filter bag house	2		
	Continuous emission monitoring system	2		
	Stack	2		
6.	**Ash Handling System**		72.2	61.5
	Submerged belt conveying system	2		
	Bank zone ash conveying system	2		
	ESP ash conveying system	2		
	Bag filter ash conveying system	2		
	Ash extractor	-		
	Shifting ash conveyor	-		
	Shifting ash add on conveyor	-		
7.	**Stream Turbine**		86.0	82.0
	Generator	1		
	Distributed control system	1		
	SIGMA control system	-		
8.	**Primary Water Treatment Plant**		70.2	63.6

S. No	Equipment	Number of Equipment	Noise level dB(A)	
	Multi grade filter	5		
	Activated carbon filter	2		
	Softener	2		
	Soft water storage tank	2		
	Soft water transfer pump	3		
	Ultra filtration	2		
	UF storage tank	2		
	UF water transfer pump	2		
	Reverse osmosis plant	2		
	RO transfer pump	3		
9	**Boiler Water Treatment Plant**		73.5	68
	Dual media filter	1		
	Ultra filtration	1		
	RO plant	1		
	De mineralize system	1		
	DM storage tank	4		
10.	**Condenser Water Cooling System**		73.5	68
	Mist Cooling system	-		
	Induced draft cooling tower	1		
	Cooling water circulation pump	3		
11.	**Air Compressor - Boiler House (ACBH)**	3	71	60
12.	**Power evacuation - Substation**		71.8	59.7
	HT panel (Breaker)	5		
	Power Transformer	1		
	Lighting arrestor	6		
	Isolator	2		
	Current transformer	6		
	Potential transformer	6		
	Main ABT meter	1		
	Check ABT meter	1		
	Auxiliary transformer	1		
13	**Pre-processing area**		70.8	60.8
	Orange peel Grabber	1		
	Radial grabber	-		
	Moving bed feeder	2		
	Splitter	2		

S. No	Equipment	Number of Equipment	Noise level dB(A)
	Shredder	2	
	Star screen	4	
	Magnetic separators	4	
	Belt conveyors for intermittent transfer	Lot	
	Residue collection conveyors	Lot	
	Control station for pre processing	1	

7.4.2.2.1.2 Methodology

The noise modeling methodology entails utilizing software such as Dhwani Pro to simulate noise propagation from sources to receptors. This involves collecting input data such as terrain features, emission characteristics, and receptor locations to accurately predict noise levels. The software uses mathematical algorithms and models to simulate the propagation of noise from sources to receptors in the study area. For modeling purposes, a base map with a radius of 1.5 kilometers was used. The map is divided into a grid of 500 x 500.The data used for running of model is as follow:

Table 7-16 Details of Point Sources

Source ID	X-Coordinate	Y-Coordinate	SPL (dB(A))
Processing	691721	2475476	70.8
Boiler Fuel Feeding	691701	2475483	69.79
Boiler Aux fuel feeding	691701	2475480	69.79
Boiler	691672	2475485	71.95
Boiler Fan	691670	2475484	71.95
Flue Gas Cleaning System	691652	2475485	71.79
Ash Handling System	691668	2475480	71.95
Steam Turbine	691668	2475517	89.3
Boiler Water Treatment Plant	691661	2475484	75.76
Condenser Water Cooling	691686	2475580	75.76
Air Compressor	691659	2475484	70.65
Substation	691606	2475491	71.13

Table 7-17 Traffic Flow

Sr. No.	Material Type	Vehicle Type	Vehicle Make	Vehicle Model	Loading Capacity in MT	Avg Moving Vehicle / Day
1	MSW	Dumper	Tata	SK 1613 / LPT 2518	12 / 25	16
2	MSW	Container	Ashok Leyland	2820	4	8
3	MSW	Compactor	Tata	LPT 1618	15	18

Sr. No.	Material Type	Vehicle Type	Vehicle Make	Vehicle Model	Loading Capacity in MT	Avg Moving Vehicle / Day
4	RDF	Truck	Tata / Ashok Leyland	3118	24	4

Table 7-18 Boundary Details

Source ID	X1-Coordinate	Y1-Coordinate	X2-Coordinate	Y2-Coordinate	Height
B_002	691674	2475661	691588	2475491	5
B_003	691588	2475491	691829	2475331	5
B_004	691829	2475331	691917	2475503	5
B_006	691674	2475667	691579	2475488	3
B_007	691579	2475488	691831	2475323	3
B_008	691831	2475323	691921	2475503	3
B_009	691921	2475503	691901	2475515	3
B_010	691901	2475515	691821	2475567	3
B_011	691821	2475567	691714	2475635	3
B_012	691714	2475635	691679	2475661	3
B_013	691679	2475661	691674	2475667	3

7.4.2.2.1.3 Modelling Results

During the operation phase of the project, the turbine is identified as the major source of noise. To model the noise propagation and assess the potential impact on receptors, a sound wave propagation model was run considering a worst-case scenario.

- All equipment, including the turbine, are assumed to be running simultaneously.
- The analysis is conducted with and without a boundary wall (barrier) in place.

The purpose of running the model under these conditions is to evaluate the cumulative noise levels at the receptors (points where noise is monitored). By considering both scenarios (with and without the barrier), the effectiveness of the barrier in mitigating noise is assessed. The analysis likely involves simulating the propagation of sound waves from the turbine and other equipment to the receptors, considering factors such as distance, terrain, atmospheric conditions, and the presence of barriers. The results would provide insights into the expected noise levels at the receptors under different conditions.

Table 7-19 Predicted noise level without boundary wall at receptors resulting from project activities

Receptor ID	X-Coordinate	Y-Coordinate	Predicted Level (dB(A))*	Baseline (dB(A))	Resultant (dB(A))	Incremental Noise (dB(A))
Pipaliya Primary School Pipaliya (Sukal) (NA2)	693170	2476488	17.8	52.9	52.9	0
Nagalpar Pri Govt School (NQ3)	691769	2477581	15.6	59.53	59.53	0
SRCOE College (NQ4)	689014	2475919	11.2	51.49	51.5	0.01
Project Site (NQ1)	691620	2475647	39.7	66.68	66.7	0.02

**noise level for traffic flow less than 1000 vehicles / 18 hours is not computable in Dhwani Pro Software*

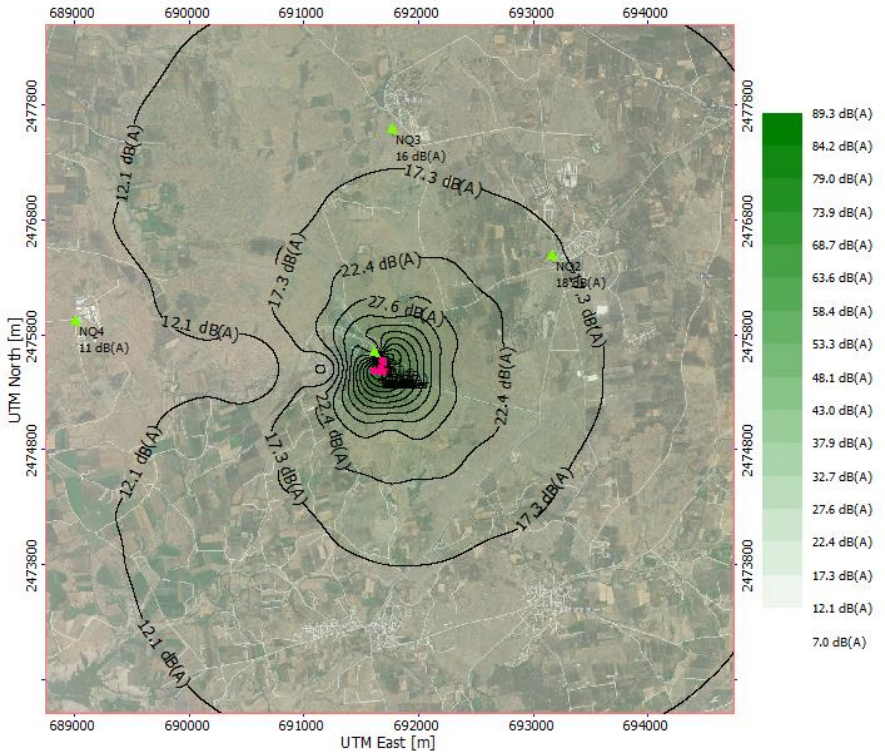
Table 7-20 Predicted noise level with boundary wall at receptors resulting from project activities

Receptor ID	X-Coordinate	Y-Coordinate	Predicted Level (dB(A))*	Baseline (dB(A))	Resultant (dB(A))	Incremental Noise
Pipaliya Primary School Pipaliya (Sukal) (NA2)	693170	2476488	12.4	52.9	52.9	0
Nagalpar Pri Govt School (NQ3)	691769	2477581	11.7	59.53	59.53	0
SRCOE College (NQ4)	689014	2475919	11.1	51.49	51.5	0.01
Project Site (NQ1)	691620	2475647	27.3	66.68	66.7	0.02

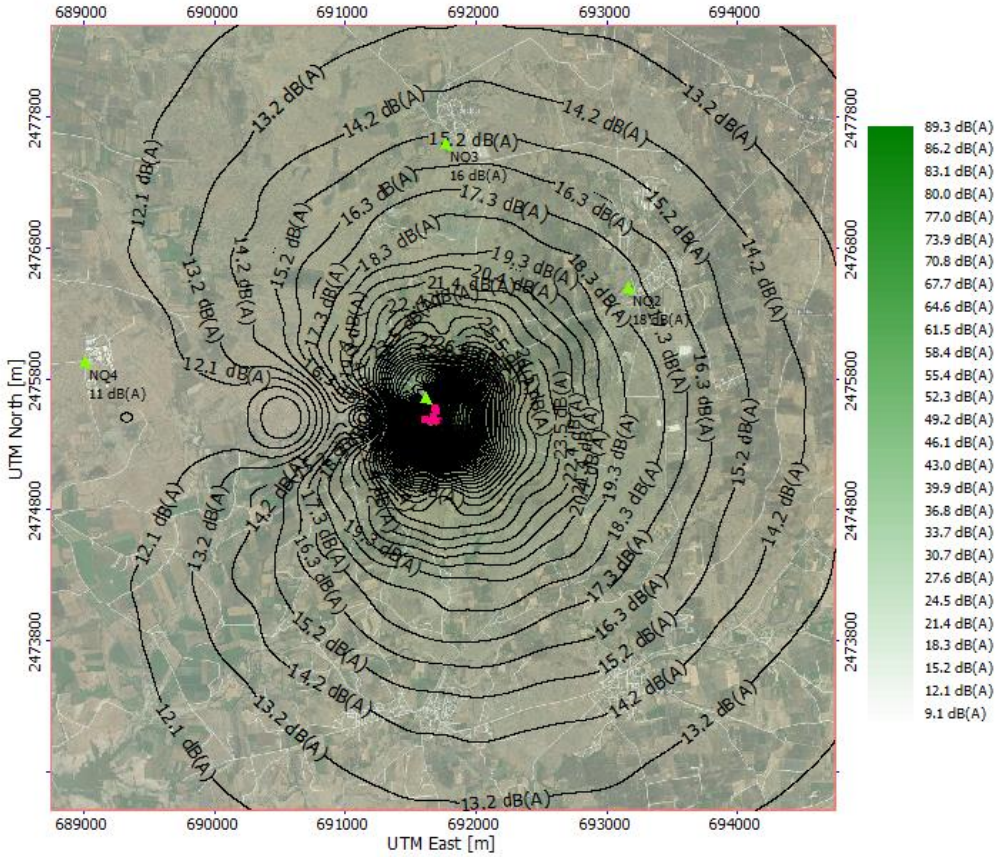
**noise level for traffic flow less than 1000 vehicles / 18 hours is not computable in Dhwani Pro Software*

Figure 7-1 Predicted Noise contour at Receptor Without Boundary Wall (Barrier)

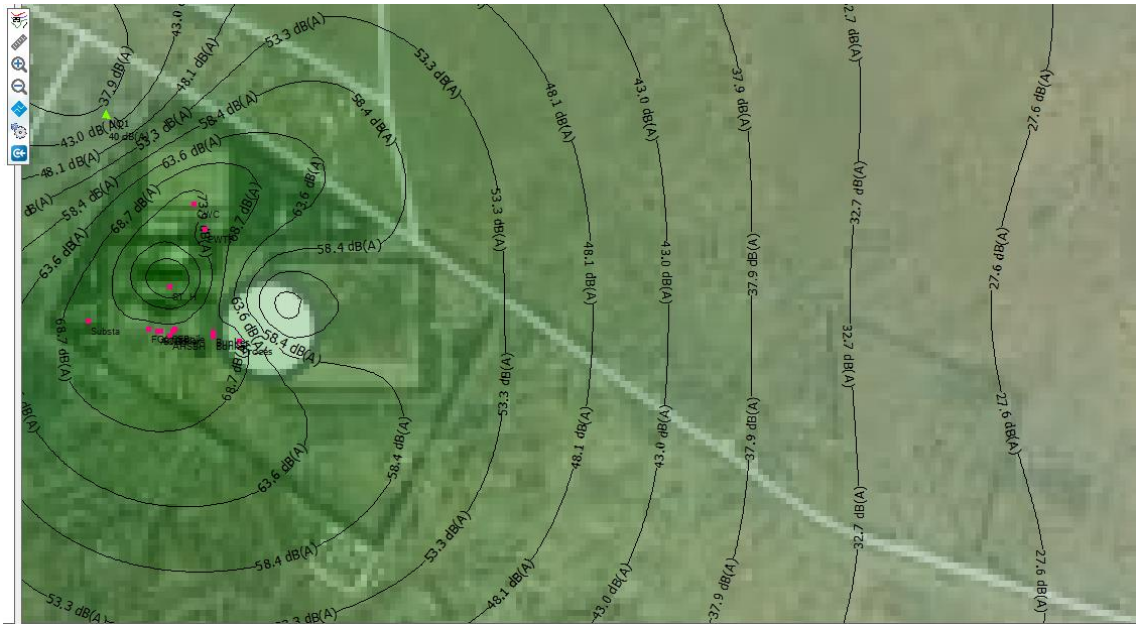
Figure 7-2 Contour Level – Project Site and its Surroundings



Noise Level Contour Near NQ2, NQ3, NQ4



Noise Level Contour Near NQ2, NQ3, NQ4 at interval of 1 dB(A)



Noise Contour near NQ1

Figure 7-3 Predicted Noise Contour at Receptor with Boundary Wall (Barrier)

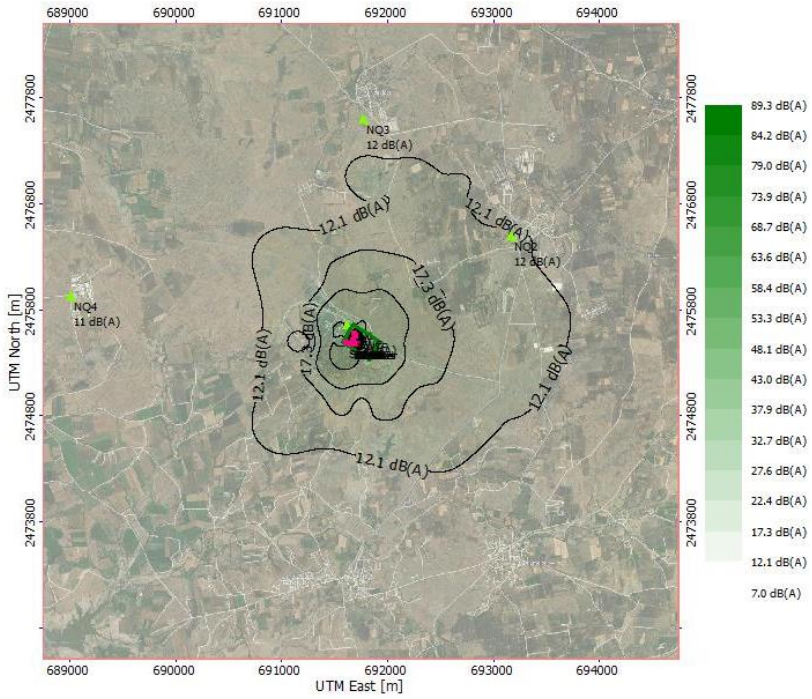
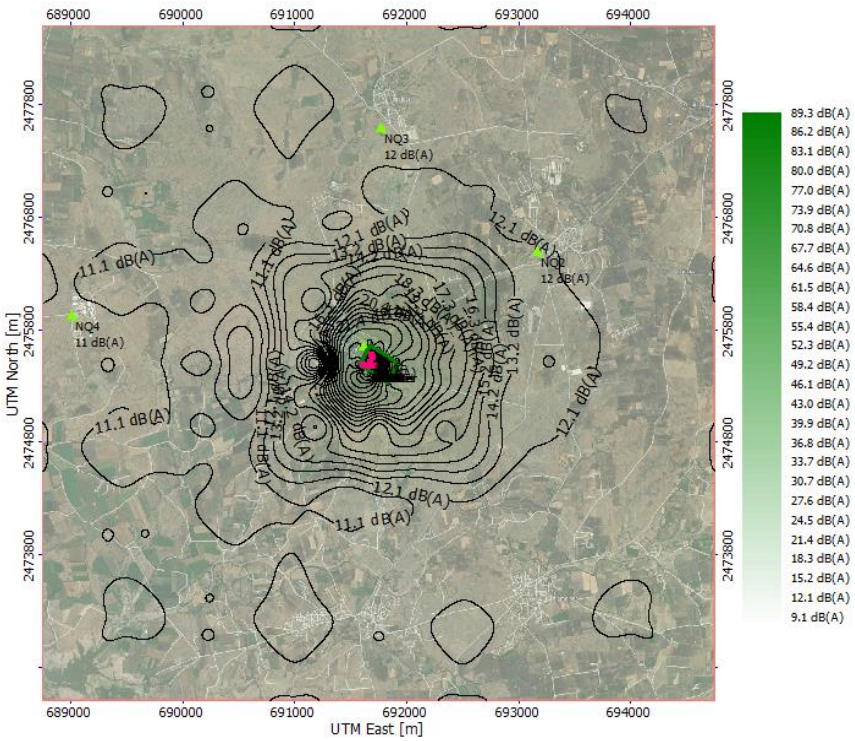
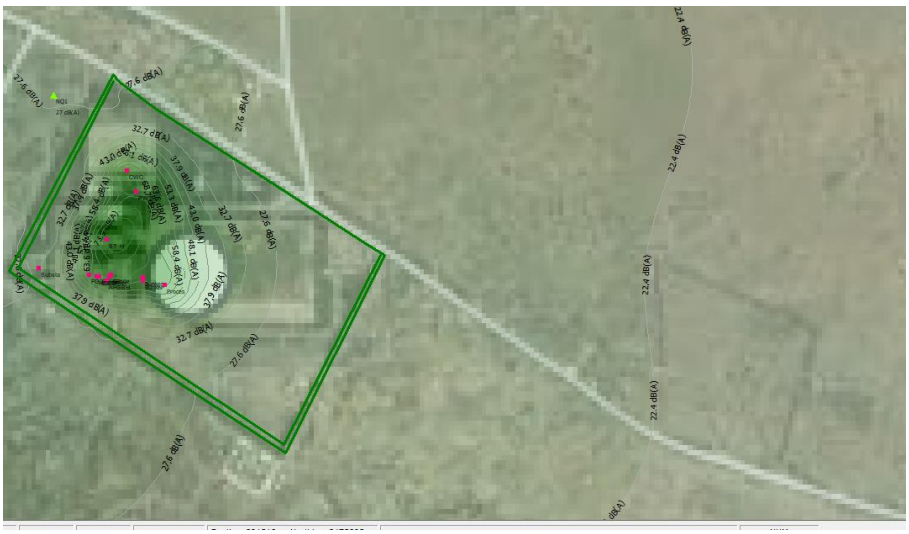


Figure 7-4 Contour Level at different Receptors

Contour near NQ2, NQ3, NQ4



Contour near NQ1



It is to be noted that the baseline noise level of the receptor is already significantly high. As per the noise modeling results, incremental noise due to project operations is negligible. Therefore project is expected to have negligible impacts on the overall cumulative noise.

Proposed Control Measures

- The project will restrict the noise generation from steam turbine generator and other major equipment ≤ 85 dB(A) at a distance of 1 m to comply with the Central Electricity Authority (Technical Standards for Construction of Electrical Plants and Electric Lines) Regulations, 2010.
- The area of the greenbelt will not be less than 33% of the total area of the site. Greenbelt with tall growing trees has been developed along the boundary of the site

- Provision of sound-insulated control rooms with noise levels below 60 dBA[80]

Impact Magnitude

The project is located in an Industrial area with no residential settlements present within 1km radius of the project, however workers present within the plant will be impacted as they will be working with high noise emitting/generating equipment's or machineries. It is anticipated that noise levels during operation phase can exceed the anticipated noise limits if the embedded measures are not incorporated. Furthermore, overall baseline noise level at N3 also exceeds the applicable standard for residential area areas during day and night-time. Therefore, the spread has been classified as local spread with permanent duration. The noise generation will be a routine activity as the machineries and equipment will be operational during the working hours (18-24 hours/day). The intensity has been assessed as moderate considering the project equipment will comply with the regulatory norms as per embedded controls. Therefore, based on impact significance criteria, the impact magnitude has been classified as small.

Additional Mitigation Measures

- Enclosures, noise and vibration mufflers, acoustic barriers and anti-vibration mats to be provided at places with high noise generation process or machineries
- Installing silencers for fans and suitable mufflers on engine exhausts and compressor components
- Pump operators (near STP, storage tanks, hoppers etc.) are generally exposed to higher noise. Housing / casing will be provided for all noise generating machines
- Periodic maintenance of the equipment to be used in the developmental works will be carried out. Worn out parts will be replaced, and rotating parts will be lubricated to minimize noise emissions
- Adequate PPE's (earmuffs, earplugs) to be provided to employees working in high noise generation areas and machineries
- The occupational noise exposure to the workers in the form of eight hour timely weighted average will be maintained well within the prescribed Occupational Safety and Health Administration (OSHA) standard limits
- Quarterly indoor noise monitoring to be undertaken (while the plant is fully operational) to mitigate or manage high noise levels and implementation of noise management measures
- Periodic noise monitoring should be conducted on a quarterly basis or as mentioned in the CTO (to be obtained) for the project operations at site to ensure noise parameters are within prescribed MoEFCC guideline as well as WBG EHS guidelines.
- The noise sampling and monitoring should be conducted for 48 hours with the use of noise monitors that should be capable of logging data continuously over this time period
- Strict adherence to maintenance schedule of generators, as specified by vendors
- Anti-honking sign boards to be placed in the parking areas and at entry / exit points

	Nature of Impact	Spread of Impact	Duration	Intensity	Frequency	Significance of Impact
Without Mitigation Measures	Negative	Local	Permanent	Moderate	**Routine**	**Substantial**
With Mitigation Measures	Negative	Local	Permanent	Low-Moderate	**Routine**	**Small**

7.4.2.3 Soil Contamination due to Improper waste management

During operation phase of the project, the following types of wastes will be generated:

- Ash (Hazardous and Nonhazardous wastes)
- Leachate
- E-waste, battery waste etc. from site office and the plant
- Biodegradable waste from the kitchen and canteen
- Hazardous wastes including used oil from DG sets, transformers, gear box; contaminated rags; chemical waste, organic residue, salts, spent solvents waste oils, used oils, detoxified containers or drums, discarded bags & liners, oily wastewater from transformers, switchyard, and boiler area etc.

[80] Recommendation of 60 dBA as GIIP, with an understanding that up to 65 dBA can be accepted for reciprocating engine power plants if 60 dBA is economically difficult to achieve.

- Accidental spillage of chemicals and materials.

Potential impacts on soil environment are envisaged due to hazardous and non-hazardous wastes generated due to operations of Waste to Energy (WtE) plants. Sludge, used & waste oil slurry, batteries, fly ash, bottom ash etc. are the hazardous waste anticipated due to project operations.

The chemical composition of fly ash contains heavy metals such as arsenic (As), lead (Pb), zinc (Zn), nickel (Ni), copper (Cu), manganese (Mn), cadmium (Cd), Chromium (Cr) and selenium (Se). Poor management of bottom ash and fly ash and other wastes including hazardous waste from the operations may lead to soil contamination.

According to the soil monitoring conducted at the project site, the soil type within 5 km radius of the plant can be characterized as loamy to sandy loam soil which is non calcareous in nature with low concentration of soluble salts.

Therefore, improper handling of aforementioned wastes at site may lead to soil contamination in the project area. Any leaks or spills of used oil, chemicals and effluents may have potential negative impact on the soil quality

Proposed Control Measure

- Bottom ash and Fly ash will be collected separately from other flue gas treatment residues to avoid contamination of the bottom ash
- Fly ash collected from bag houses will be contaminated and will be categorized as hazardous in nature. ESP will be added as pre-deduster which will significantly reduce the quantity of hazardous fly ash from bag house.
- The hazardous waste generated, if any, will be stored in temporary storage for a period of 90 days. Hazardous waste such as waste oil from transformers and other machineries will be stored in designated enclosed hazardous waste storage area on paved surface
- Hazardous waste will be sent to nearby TSDF and management shall be done as per Hazardous and Other Waste (Management and Transboundary Movement) Rules, 2016 and amendment thereof
- Silos will be developed for Fly ash handling and the bottom ash will be submerged and sent to sludge drying bed
- Bottom Ash quenching will be done using the waste water generated from the secondary treatment process
- Environmental monitoring for soil will be conducted on half yearly basis.
- Glass and metal will be collected and stored within the plant and further will be disposed of through local scrap vendors.

Impact Magnitude

Nature of impact due to hazardous and hon hazardous waste generation during operation phase is anticipated to be negative with direct impact. The geographical extent of impact is assessed to be limited to local-medium. The duration of impact is assessed to be long-term and would be restricted to the project site with the implementation of embedded control measures. The impact intensity has been assessed as moderate-high based on the nature of the waste and the embedded controls for treatment, management and disposal respectively and the type of soil in the area that have medium-high percolation rate and low water retention, therefore, any leaks/spillage of hazardous oil may seep into the soil and further into groundwater. Therefore, the impact magnitude as per impact significance criteria has been assessed to be small to substantial.

Additional Mitigation Measures

- Separate remaining ferrous and non-ferrous metals from bottom ash as far as practicably and economically viable, for their recovery
- GWRPL to develop non-leachable concrete floor with dedicated leachate collection pit for bottom ash area and to dispose the generated bottom ash on daily basis. GWRPL to ensure that the covered trucks are used by RMC to dispose the bottom ash in the nearest sanitary landfill. GWRPL to track bottom ash generation and disposal. Hazardous waste inventory to be managed and recorded and to include a summary table with the information such as: Name and description (e.g. composition of a mixture) of the Hazmat, Classification (e.g. code, class or division), Internationally accepted regulatory reporting threshold quantity or national equivalent, Quantity of Hazmat used/generated per month, Characteristic(s) that make(s) the Hazmat hazardous (e.g. flammability, toxicity)
- GWRPL to conduct characterization analysis of ash (occasionally) as per IS 3812 covering all the parameters stipulated by BIS to identify any hazardous content before its disposal through RMC trucks. If fly ash is identified as hazardous, it is to be sent to hazardous waste landfill site through authorized recyclers. Records of hazardous ash generation and disposal to be maintained.

- Hazardous ash to be stored and handled as per the hazardous and other waste (management and transboundary movement) rules, 2016 as amended.
- GWRPL is recommended to obtain chain of custody documents from Rajkot Municipal Corporation for final disposal destination to ensure that the hazardous waste is being disposed at the authorized hazardous waste landfill as per the applicable Hazardous and Other Wastes (Management and Transboundary Movement) Rules, 2016, as amended.
- GWRPL to also establish through relevant agencies whether disposal site (where hazardous ash is disposed) is being operated to acceptable standards before disposal. If this is not established, GWRPL shall consider alternative disposal options, including the possibility of developing its own recovery or disposal facility at the project site or else reduce generation of hazardous ash.
- If GWRPL is uncertain that the disposal conducted by RMC is as per the applicable rules, GWRPL will themselves take the responsibility of disposal and will ensure disposal is conducted to the hazardous waste authorized site as per the applicable norms.
- Non-hazardous ash may be disposed of in an MSW landfill or considered for recycling in construction materials or provided to cement and fly ash brick manufacturers
- Promote use of fly ash generated from bank zone and ESP for making non-leachable concrete pavers.
- Good housekeeping and best practices of waste handling shall be adopted to eliminate/minimize the risks of soil contamination
- Only covered and closed trucks will be allowed to enter the site for unloading of municipal solid waste
- E-waste generated onsite should be channelized through collection center or dealer of authorized producer or dismantler or recycler or through the designated take back service provider of the producer to authorized dismantler or recycler. It should be ensured to keep the records of e-waste generated and sending out to authorized agencies
- Battery waste to be disposed via buy back policy with the battery supplier/manufacturer. It should be ensured to keep the records of waste generated and sending out to authorized agencies.
- Generated biodegradable waste from the canteen, kitchen, office etc. will be utilized within the plant
- Description or SOP's of response activities in the event of a spill, release, or other chemical emergency or including Internal and external notification procedures, Specific responsibilities of individuals or groups, Decision process for assessing severity of the release, and determining appropriate actions, evacuation routes, Post-event activities such as clean-up and disposal, incident investigation, employee re-entry, and restoration of spill/equipment/area to be developed.
- Since hazardous waste and material will be generated and present within the project premises, GWRPL to develop hazardous material management plan which includes potential risks along with the objectives of protection of the workforce and the prevention and control of releases and accidents.

	Nature of Impact	Spread of Impact	Duration	Intensity	Significance of Impact
Without Mitigation Measures	Negative	Local-Medium	Permanent	Moderate	Substantial
With Mitigation Measures	Negative	Local	Permanent	Low	Small

7.4.2.4 Water Resources - Availability & Quality

During operation phase, sources of water pollution includes

- Sewage generated from domestic activities of workers at the site
- Wastewater Discharge: Wastewater generated during the project operation, primarily from flue gas cleaning processes and other cooling systems.
- The wastewater streams in a WTE plant include cooling system blowdown; ash handling wastewater; wet FGD system discharges; material storage runoff; metal cleaning wastewater; and low-volume wastewater, such as air heater and precipitator wash water, boiler blowdown, boiler chemical cleaning waste, floor and yard drains and sumps, laboratory wastes, and backflush from ion exchange boiler water purification units
- Utility operations such as mist cooling and demineralization systems will result in potential release of high temperature water containing high dissolved solids, residues of biocides, residues of other cooling system anti-fouling agents, etc.

- Leachate Generation: Leachate generated on site will be from the waste pre-processing bay, Pre-Processing area and Fuel Bunker and bottom ash handling. Leachate from waste caused by exposure to precipitation and from residual liquids in the waste itself contain organic matter, nutrients, metals, salts, pathogens, and hazardous chemicals. If allowed to migrate, leachate will further contaminate soil, surface water, and groundwater potentially causing additional impacts such as eutrophication and acidification of surface water and contamination of water supplies.
- Air Emissions and Acid Rain: Some pollutants released during the combustion of waste in the WtE process, such as sulfur dioxide (SO2) and nitrogen oxides (NOx), can contribute to the formation of acid rain when then interact with water vapor in the atmosphere. Acid rain can harm aquatic ecosystems and lower the pH of water bodies.
- Contamination from Accidents or Spills: Accidents, equipment failures, or improper waste handling at WtE plants can lead to spills or releases of pollutants into water sources, causing acute water quality issues and potential harm to aquatic life.
- Heavy Metals and Toxic Compounds: Waste materials processed in WtE plants may contain heavy metals, dioxins, and other toxic compounds. If these pollutants are not effectively managed and treated, they can find their way into water bodies and accumulate in the food chain, posing health risks to aquatic organisms and potentially to humans through the consumption of contaminated fish.

According to the drainage map (Figure 5-12) there are no dendritic drainage channels passing through out the project area, however, there are some dendritic channels crossing over from the underground water pipeline route.

According to the water utilization plan, approximately 1478 m3/day water is required for project operations, the water requirement will be sourced from the STP[81]. According to the water balance diagram ***(refer Figure 2-11***) the daily water requirement for industrial purpose within the WTE plant is 1478 m3/day, for which primary-treatment is required for 2343 m3/day of water at the STP. The project has received permission for receiving 2 MLD water from the RMC STP, the project will treat 2343m3/day of treated STP water and all reject water (865m3/day) in the form of backwash/regeneration/reject from MGF, ACF, softener & RO etc. will sent back to STP Inlet for further treatment at the STP plant itself. Thus, reduction in quantity of treated water i.e. 1478m3/day will be transported to WTE plant, i.e., 12.2 km via underground water pipeline.

The Pre-treated water will be further treated (secondary treatment) on-site prior to be used in the boiler (Refer ***section 2.8.1.2.2***)

As per Central Groundwater Authority (CGWA), Ministry of Jal Shakti, Notification dated 24 September 2020[82], industries will have to obtain authorization from CGWA before abstraction and use of groundwater. The project has obtained permission to extract water from the existing borewell within the project premises. As per the categorization, Rajkot falls in an area categorized as safe in terms of availability of ground water. As per the NOC, the project can abstract 7.5 m3/day water from one existing borewell within the project premises. Results of Phase II study undertaken at site indicates that ground water is not fit for domestic purpose and can be only used for flushing.

Contamination in the blow down and waste water generated within the WtE plant arises from demineralizers; lubricating and auxiliary fuel oils; trace contaminants in the fuel (introduced through the ash-handling wastewater and wet FGD system discharges); and chlorine, biocides, and other chemicals used to manage the quality of water in cooling systems. Cooling mist blowdown tends to be very high in total dissolved solids but is generally classified as non-contact cooling water and, as such, is typically subject to limits for pH, residual chlorine, and toxic chemicals that may be present in cooling tower additives (including corrosion inhibiting chemicals containing chromium and zinc whose use should be eliminated)

Control Measures Planned

- Leachate collection will be done in a designated leachate collection tank using a series of underground pipes connecting the leachate collection area to the tank
- Impervious surface area will be developed for leachate collection and a Screen will be provided at the leachate collection area so as to screen waste particles going to the leachate collection tank
- Groundwater monitoring wells within the project perimeter have been installed at four locations and depths sufficient to evaluate whether leachate is migrating into the uppermost groundwater unit.
- Silos will be developed for Fly ash handling and the bottom ash will be submerged and sent to sludge drying bed
- Treated Water obtained from the STP will be further treated at the Pre-Treatment plant at the STP premises and Secondary treatment at the project site.

[81] For obtaining water 1478m3/day of treated water, 2343m3/day needs to be treated at STP and the reject water of 865 m3/day will be returned to the STP itself. Currently, the project has received permission for receiving 2 MLD water from the RMC STP, the excess 343 m3/day water the project will apply for revision of the permission to receive 2.5 MLD treated water from the STP

[82] Central Groundwater Authority (CGWA), Ministry of Jal Shakti ((Department Of Water Resources, River Development and Ganga Rejuvenation), Notification dated 24 September 2020. Link: http://jalshakti-dowr.gov.in/sites/default/files/CGWA_GWExtraction_Notification_24-09-2020.pdf

- GWRPL has obtained No Objection Certificate from RMC dated to procure secondary treated water from Rajkot STP for meeting water requirement for industrial purpose. GWRPL has also obtained permission to lay underground pipeline connecting the STP to the Project's pump house.
- In addition to the above, GWRPL has also obtained permission from RMC to return excess STP water (if any) and treated reject water for further treatment back to the STP during project lifecycle.
- The rejected water generated from secondary treatment and mist blow down will also be used in bottom ash quenching and plantation after verification of the Total Dissolved Solid (TDS) to ensure suitability of rejected water for plantation purpose
- Reject water form Secondary treatment will be blended water from STP and used for landscaping. Also, Zero discharge concepts will be adopted.
- Separate storm water drains have been developed to harvest the rainwater and recharge the ground water. Rain water harvesting will be undertaken. Rainwater harvesting tanks with recharge pits of diameter 2mtrs and depth of 4 mtrs will be constructed for recharge of groundwater aquifers
- Ensure that no natural watercourse and/or water resources will be obstructed due to any industrial operations.
- Use of treated water for cooling using misting systems

Additional Mitigation Measures

- Alternative source of water to be identified for domestic use and ground water to not be used for domestic purpose except flushing
- The waste storage areas of the plant should have a leachate barrier system that forms a secure barrier between the groundwater, soil, and substrata and the composting or stored organics.
- Secondary containment for leachate to be included with volumes greater than 220 liters. The available volume of secondary containment should be at least 110 percent of the largest storage container, or 25 percent of the total storage capacity (whichever is greater), in this specific location, considering the area is susceptible to rains and cyclones.
- Segregated collection for storm water from operations/waste and ash handling areas and from non operations areas to be undertaken to avoid contamination of storm water and further risk of contamination of ground water due to ground water recharge.
- Reduce the potential for leachate generation from bottom ash prior to final disposal
- SOPs for the management of secondary containment structures, specifically the removal of any accumulated fluid, such as rainfall, to ensure that the intent of the system is not accidentally or willfully defeated
- Measure and record the quantity and quality of leachate generated. Changes in leachate quantity or quality not attributable to weather or other factors to be accounted for.
- A dedicated leachate management plan should be developed for proper collection, storage and disposal of leachate from the Project to avoid contamination of subsurface soil and groundwater. The plan should include leachate collection system designed for the project and installation of additional leachate collection pits, drainage (if required) along with process flow for leachate generation, collection, storage and final disposal.
- Effluents from the DM plant generally acidic from the cation units and alkaline from the anion units, should be neutralized. The neutralized effluent shall have less than 5 ppm suspended solids and a pH value of about 7.5 to 8.0 in line with CPCB standards. The DM plant should have pH meter and turbidity meter to ensure the neutralized effluent, suspended solids and pH are within limit prior to be used for plantation activities and can also be used for bottom ash quenching
- Waste storage areas should be located away from drainage lines
- Spill kits to be maintained at site for cleaning minor spills/leaks
- Workers should be trained on proactive use of designated bins/areas for waste disposal.
- Provide magnetic flow meters with totalizers at the outlet of facility
- Operate and maintain online real time monitoring system along with web camera facilities and shall ensure that it is connected to GPCB / CPCB websites as per CPCB directions
- Workers should be sensitized on water conservation measures and encourage optimal use of water
- Regular inspection should be carried out for identifying water leaks and preventing water wastage
- Explore installation of water efficient plumbing fixtures that use less water without any reduction in quality and service
- Regular monitoring of ground water level and quality will be carried out by establishing a network of existing wells in and around project area in consultation with the competent Ground Water Department. Data thus collected should be sent at regular intervals to MoEF&CC, CGWA and CGWB

- Water audit to be undertaken on annual basis to understand water usage and to identify measures for water reduction
- Water utilization to be documented
- Display online data outside the main gate on quantity and nature of hazardous chemicals being used in the plant, water & air emissions and solid waste generated within the factory premises, as per Hon'ble Supreme Court order.
- A wastewater and water quality monitoring program with adequate resources and management plan should be developed and implemented to meet the objective(s) of the monitoring program. The wastewater and water quality monitoring plan should include monitoring parameters, monitoring type and frequency locations, data quality,

Impact Magnitude

The nature of impact of water availability and quality was assessed to be negative due to project with direct impact. The duration of the impact is assessed to be long-term, as the ground water is proposed to be abstracted throughout the operation phase for domestic activities and the transportation of treated water from STP are being considered as a routine activity. Also, considering the characteristics of wastewater generated, the WTE plant will be a zero discharge and waste water will be reused within the site. The quality of groundwater is anticipated not to be impacted with the proper management and implementation of embedded control measures. Treated wastewater after confirming to the discharge standards will be used for landscaping purpose. The fresh water intake is only limited to the domestic water requirement, thereby reducing the stress on the ground water availability. The geographical extent of impact is assessed to be limited to medium spread. Therefore, intensity of the impact is assessed as moderate and the overall impact significance on ground water resource and quality is assessed as substantial.

	Nature of Impact	Spread of Impact	Duration	Intensity	Frequency	Significance of Impact
Without Mitigation Measures	Negative	Medium	Long	Moderate	Routine	Substantial
With Mitigation Measures	Negative	Local-medium	Long	Moderate-Low	Routine	Small-Substantial

7.4.2.5 Overview of climate change impacts

According to Climate Change Department, Government of Gujarat[32], the state has longest coastline in India (~1,663 km) and it is susceptible to Climate Change impacts. Extending from Kutch in the north to Valsad in the south, the State of Gujarat lies exposed to the likely sea level rise and changes in sea surface temperatures, which may probably increase storm surge occurrence and cyclonic activity in the Arabian Sea. The changes in rainfall patterns may potentially lead to reduced surface flow in Luni, Mahi, Sabarmati, and Narmada rivers which could affect both domestic and agriculture water availability. This in turn, along with temperature variations, could affect crop productivity adversely. The Government of Gujarat has thus established a standalone Climate Change Department to take actions required for mitigation and adaptation to Climate Change.

According to the Gujarat State Action Plan on Climate Change (GSAPCC), 2021[33], the critical climate change risks to which the state is vulnerable include temperature, precipitation extremes and sea level rise. Since Gujarat has India's longest coastline with 9.9 million people living in 40 coastal talukas (as per Census, 2011), the state is vulnerable to the impacts of sea-level rise, cyclonic events, salinity ingress and shifts in fish

breeding patterns, which may result in future migration and climate refugees (UN's World Migration Report, 2020). It is anticipated that climate change may impact temperature patterns and cause an increase in the frequency of extreme temperature events. According to World Bank, 19 of the 26 districts in Gujarat may become climate change hotspots by 2050, with temperatures expected to rise by 2-2.5°C.

The projected climate trends in the state of Gujarat have been presented in the subsequent sections based on projections from Coupled Model Intercomparison Project (CMIP6), which was featured in Intergovernmental Panel on Climate Change (IPCC) Sixth Assessment Report (AR6) and available in World Bank Climate Change Knowledge Portal[34].

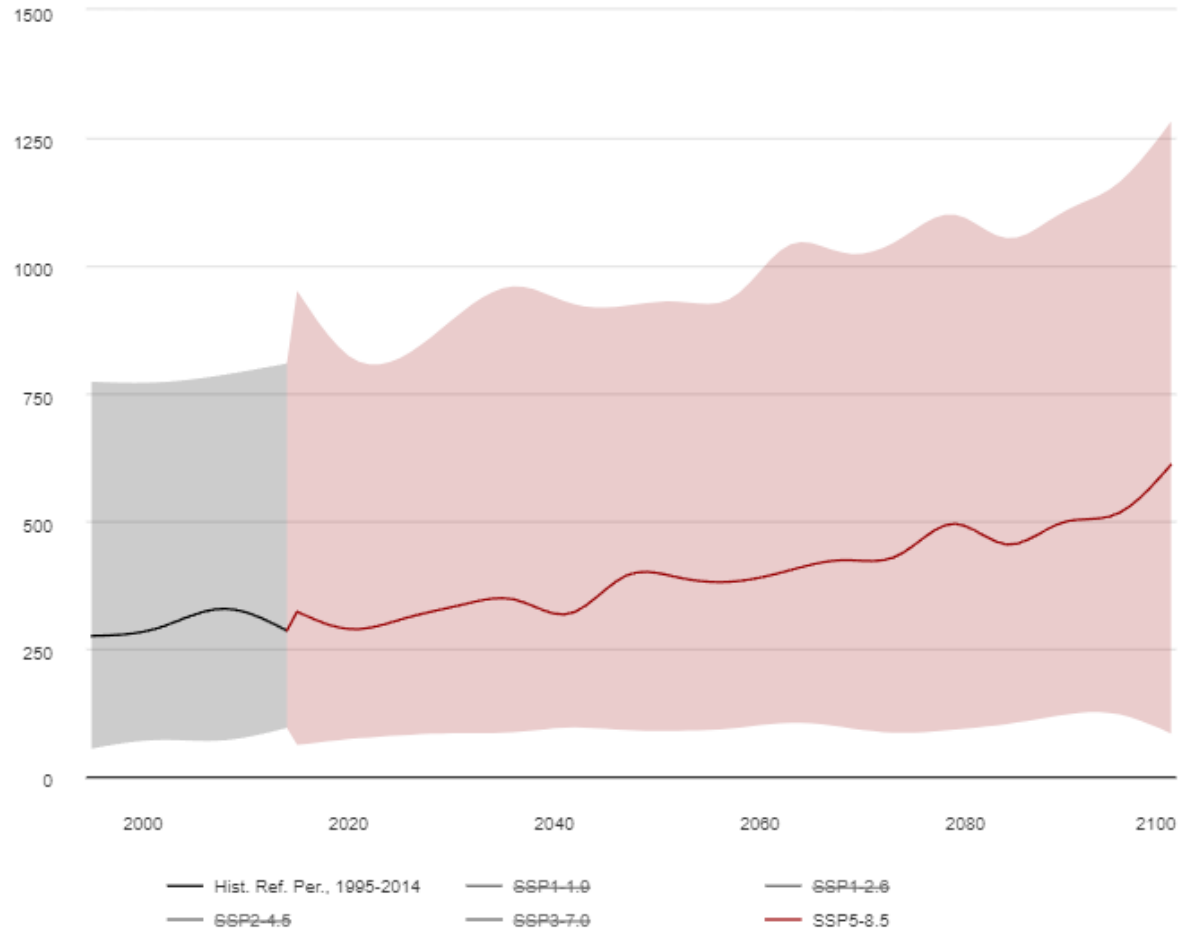
Note: It should be noted that this is a very high-level review of publicly available information, and no detailed site-specific analysis or modelling has been undertaken. Hence, further investigation may be required to quantify the risks in more detail for consideration of adaptation.

Precipitation

The projection period for precipitation has been considered as 2020-2039. The projected precipitation anomaly for Gujarat has been presented in ***Figure 7-5*** (reference period as 1995-2014) for selected scenarios i.e., CMIP6 SSP5-8.5 . Average precipitation anomaly is the indicator for precipitation increase, where any change greater than 0 signals precipitation increase from historical trend.

As per the figure below, there will be gradual increase in precipitation in Gujarat, where the median (50th percentile) precipitation for selected scenario SSP5-8.5 in the year 2039 is projected to be between 318.25 mm as compared to the historic reference base period 1995-2014, where it was 285.15 mm in 2014.

Figure 7-5 Mean Projected Precipitation in Gujarat for 2020-2039 (reference period: 1995-2014)

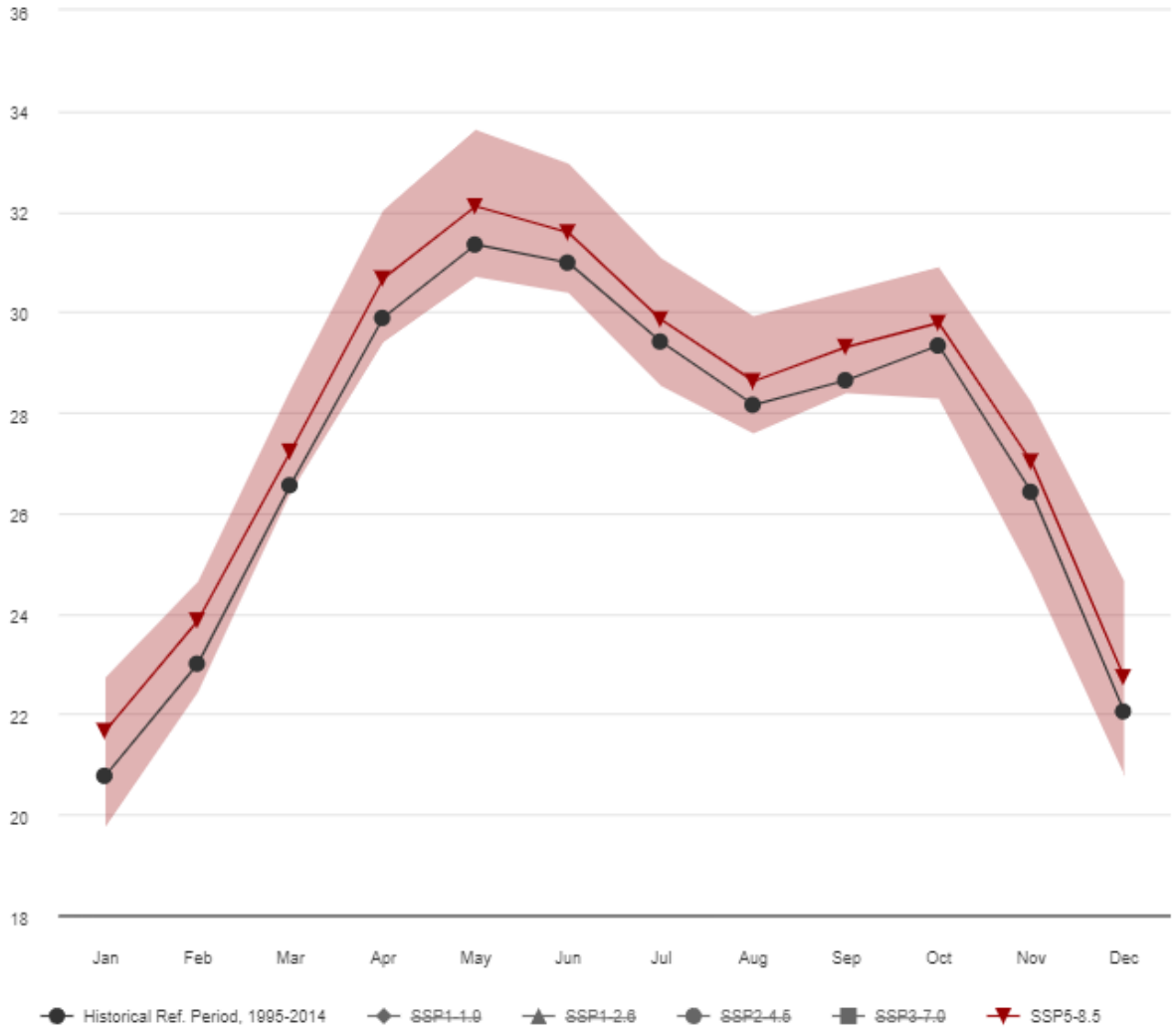


Source: World Bank Climate Change Knowledge Portal

Temperature

As per World Bank Climate Change Knowledge Portal, the temperature in Gujarat state has an increasing trend over the historical record. The projected monthly mean temperature for 2020-2039 has been presented in ***Figure 7-6.*** The projected temperature for the period 2020-2039 for selected scenario SSP5-8.5 was highest in the month of May i.e., 32.10°C as compared to historical data (1995-2014) where the temperature was recorded to be 31.34 °C in the same month. The projection indicates 0.76 °C increase in temperature for scenario SSP5-8.5 in 2020-2039 as compared to historical record.

Figure 7-6 Projected Mean Temperature in Gujarat for 2020-2039 (reference period: 1995-2014)



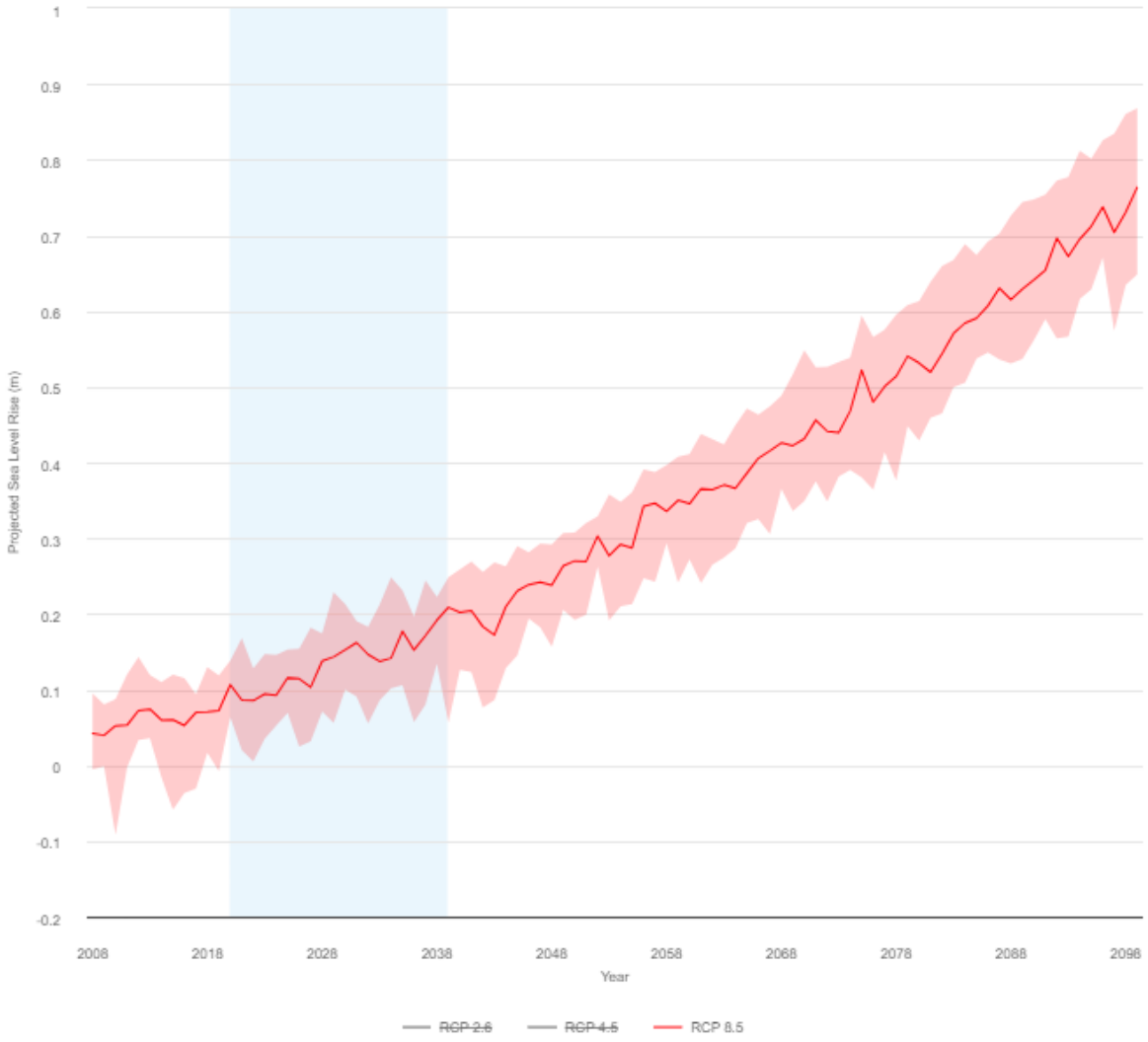
Source: World Bank Climate Change Knowledge Portal

Sea Level Rise

According to World Bank Climate Change Knowledge Portal, rising sea levels create not only stress on the physical coastline, but also on coastal ecosystems. Saltwater intrusions can contaminate freshwater aquifers, many of which sustain municipal and agricultural water supplies and natural ecosystems. As global temperatures continue to warm, sea level will keep rising for a long time because there is a substantial lag to reaching an equilibrium. As per GSAPCC, sea level rise poses a threat to the coastal infrastructure as it can lead to inundations, flood and storm damages in form of cyclones, erosion, saltwater intrusion into groundwater and wetland loss.

The Projected sea level rise for period 2020-2039 with selected scenario SSP5-8.5 has been presented in ***Figure 7-7.*** According to the data presented below, an increasing trend in projected sea level rise can be observed in the selected period (2020-2039) and beyond as compared to the historical record. As observed the sea level rise in 2008 was 0.04 m and the same has been projected to be 0.15 m in 2030 and 0.21 m in 2039 for SSP5-8.5 scenario. Therefore, it is projected that there will be 0.11 m increase in 2030 and 0.17 m increase in 2039 in sea level as compared to the historical year of 2008.

Figure 7-7 Projected Sea Level Rise for Coastal Gujarat (2020-2039)



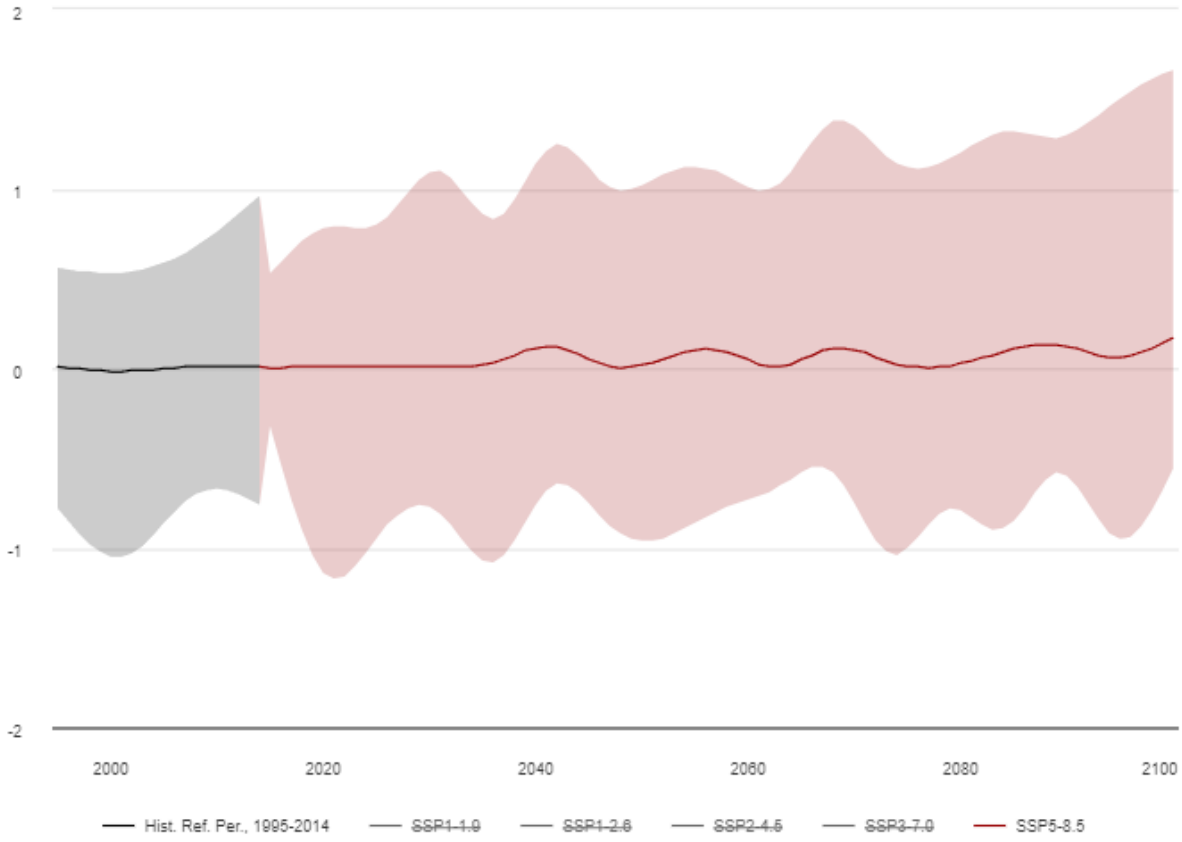
Source: World Bank Climate Change Knowledge Portal

Drought

World Bank Climate Change Knowledge Portal has been used to estimate annual Standardized Precipitation Evapotranspiration Index (SPEI). Negative value of SPEI indicates decrease in drought and increased water availability, positive value indicates increased drought and decreased water availability and no changes in SPEI Index means no change in water availability.

The projected annual SPEI drought index for Gujarat state has been presented in ***Figure 7-8.*** The annual SPEI Drought Index average value indicated small positive value in the period 2020-2039 for scenario CMIP6 SSP5-8.5 as compared to historical base period 1995-2014. Therefore, it is anticipated that the state will not be significantly impacted due to drought in the selected future period (2020-2039).

Figure 7-8 Projected Annual SPEI Drought Index, Gujarat, India (Reference Period: 1995-2014)

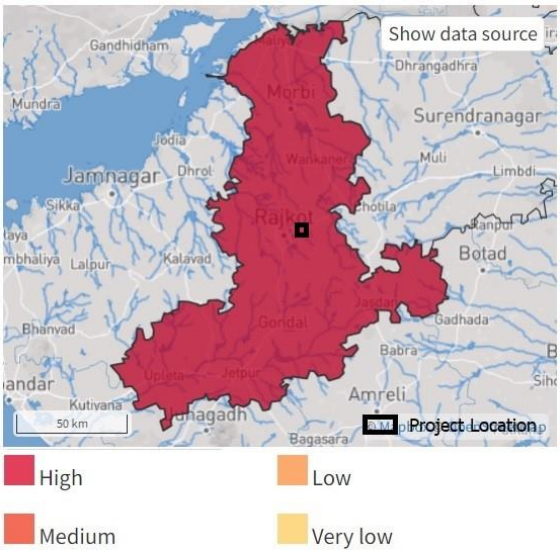


Source: World Bank Climate Change Knowledge Portal

Cyclone

The Cyclone Hazard Map as per ThinkHazard is as presented below. The area is classified as high risk according to the information that is currently available. The present hazard level in areas currently affected by tropical cyclones may increase in the long-term.

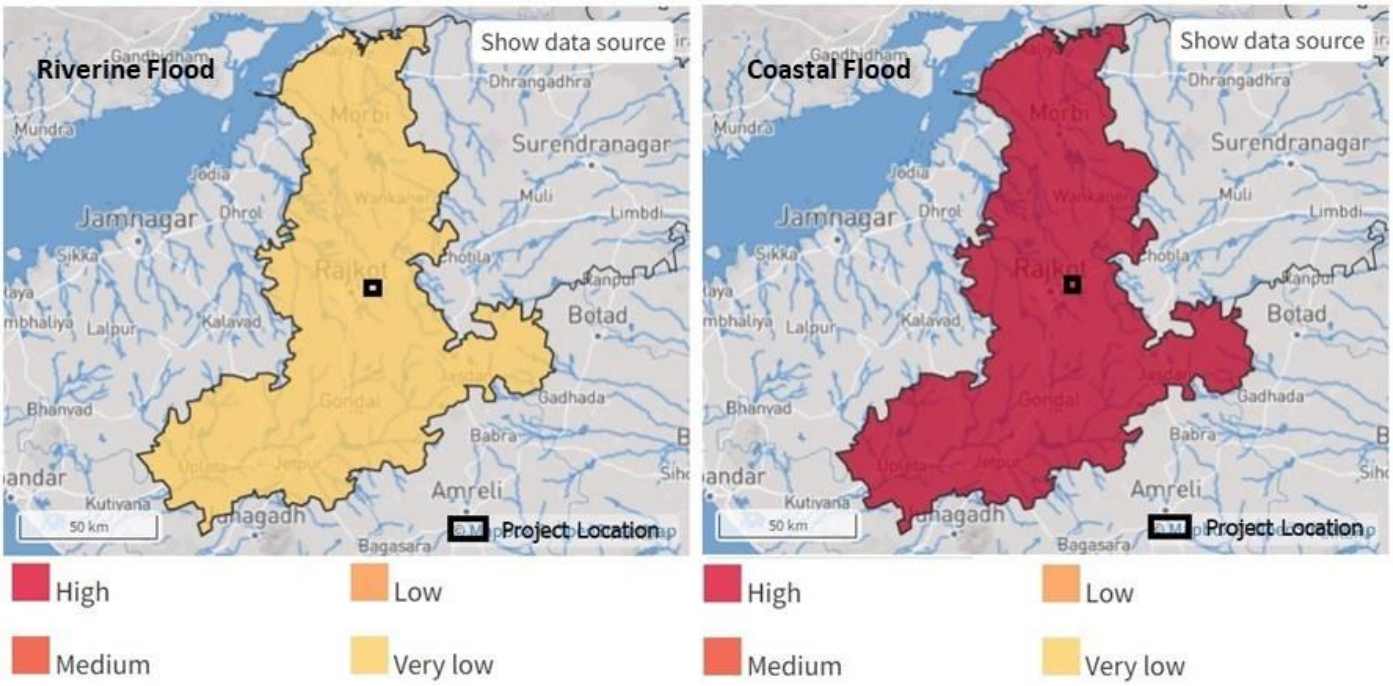
Figure 7-9 Cyclone Hazard Map



Flood

As per the information available in ThinkHazard, riverine flood hazard risk is considered to be very low and coastal flood hazard is classified as high in the project location as presented in Figure below.

Figure 7-10 Flood Risk Map



Project's Vulnerability to Climate Change

The GWRPL project located in Rajkot is anticipated to be vulnerable to precipitation and increased temperature based on the projected climate trends described above. The projected increase in precipitation in the project area in future may lead to increase in leachate deposition at the site due to storage of 1000 TPD municipal solid waste at the bunker area. Increase in precipitation may potentially expose the project to flood and local water logging. Furthermore, since the project is also anticipated to be vulnerable to high temperature with heat wave, this may lead to decrease in water availability in future for domestic as well as industrial purpose.

According to BMTPC, the project is located in any area with high to moderate risk zone in terms of earthquake hazard, very high damage risk zone in terms of wind. Additionally, though the project area is not vulnerable to floods, however, there have been instances of flood in Rajkot city in 2021 and 2022 due to heavy rainfall.

The project has been designed in a way such that the stormwater flow from the upstream side of the campus is restricted and stormwater collected within the plant will flow through the rainwater harvesting design and utilized as cooling water. Therefore, flood like situation in and outside the campus is not expected. Also the floor level and foundation level of the project equipment will include expected rainfall and topographical details of the area to avoid impact due to heavy rainfall within the plant.

Further, the project design has considered earthquake zone classification and wind velocity as per classification by BMTPC and Gujrat State Disaster Management Authority (GSDMA) to avoid impact of natural hazards on the project.

7.5 Impacts on Biological Environment

7.5.1 Construction Phase: Impact Assessment

During the site survey, it was observed that the basic construction activities (vegetation clearance, boundary wall formation, etc.) have already been completed. Transmission towers had also been installed. Thus, the impact of vegetation clearance has not been assessed here.

7.5.1.1 Impacts on the Habitat and Species due to Construction Activities

Installation of associated transmission lines; underground water pipeline, increases movement of people and goods; noise; and the potential for sedimentation/pollution of water resources due to construction in the study area. These activities are evaluated in terms of habitat and species disturbance. Construction activities, vehicular movement and increases human activities directly impacts the burrowing faunal species (i.e. Bengal Monitor Lizard, Bengal Fox, Indian Hare, etc.) and indirectly impacts flora and fauna of the surrounding open scrub habitat. There is a possibility, that the anthropogenic migration has resulted in increased stress on the fauna of the region, requiring them to remain vigilant for extended periods of time, preventing proper reproduction, nesting, mating, socialization, and foraging. Anthropogenic movements (transportation of people and goods) and noise from construction activities can also disturb the fauna of the surrounding area.

Three Vulnerable (IUCN Red List) [Indian Flapshell Turtle (*Lissemys punctata*), Sambar (*Rusa unicolor*), & River Tern (*Sterna aurantia*)], five Near Threatened [Bengal Monitor Lizard (*Varanus bengalensis*), Striped Hyaena (*Hyaena*), Black-headed Ibis (*Threskiornis melanocephalus*), Oriental Darter (*Anhinga melanogaster*), & Painted Stork (*Mycteria leucocephala*); 09 Schedule I (Wildlife (Protection) Act, 1972) [Indian Flapshell Turtle, Bengal Monitor Lizard, Chinkara, Indian Wolf, Brahminy Kite, Eurasian Spoonbill, Indian Peafowl, Shikra, & Short-toed Snake-Eagle] species were observed/reported in the study area; which may be impacted due to the above-mentioned construction activities.

Control Measures planned for the Project

Not Available.

Impact Magnitude

During the construction phase, the above-mentioned activities will be performed for a limited period i.e., 8-10 months, thus the **Duration** has been *short*. As the construction activities will be performed in the project boundary, as well as along the routes of transmission lines and underground water pipeline, the **Spread** has been classified as *medium to high*. The **Intensity** has been classified as *moderate* based on the diversity and numbers of species inhabiting the area impacted by the construction activities. Thus, the impact magnitude has been classified as ***Substantial*** based on the impact significance criteria (***7.3.2***).

Proposed Mitigation Measures

The mitigations proposed to minimize the impact(s) on Habitat and Species have been given as,

- The construction activities should be restricted to the project area, routes of transmission line and underground water pipeline
- Night-time (6:00 pm to 6:00 am) construction and transportation activities should be avoided
- The areas of high animal activity (such as natural habitats), the construction and transportation activities should be avoided during dawn (6:00 am to 7:30 am) and dusk (5:00 pm to 6:30 pm)
- Hazardous materials should be avoided to store near water bodies and drains
- Sites with existing burrows or roosts should be avoided where possible, and temporary fencing should be installed over excavated areas (for underground water pipeline)
- Efforts should be made to minimize construction noise and sound barriers should be considered if noise levels are high
- Construction activities must implement proper housekeeping, properly dispose of discarded packaging materials, and provide labour camps with adequate sanitary facilities
- Movement of workers between camps and construction sites should be restricted and they should not be allowed to visit in natural areas (not included the planned construction activities)

	Nature of Impact	Spread of Impact	Duration	Intensity	Receptor Vulnerability	Significance of Impact
Without Mitigation Measures	Negative	Medium to High	Short	Moderate	Medium (Habitat) Medium (Species)	Substantial
With Mitigation Measures	Negative	Medium	Short	Low	Medium (Habitat) Medium (Species)	Small

7.5.2 Operation Phase: Impact Assessment

7.5.2.1 Collision and Electrocution Risk due to the Power Transmission

In any power generation project, collision and electrocution are the universally recognized risks due to the transmission infrastructures. During the ecological survey, several species of birds were found perching on existing wires and poles in the study area. 66 kV transmission line (8.9 km Overhead and 2.9 km Underground; total length 11.8 km) as well as transmission towers (48 in numbers) can possibly cause electrocution and collision risks to birds.

As per the baseline, at least 249 avifaunal species were recorded (reported/observed) from the study area. Four Vulnerable (IUCN Red List) [Common Pochard (*Aythya ferina*), Greater Spotted Eagle (*Clanga clanga*), Kashmir Flycatcher (*Ficedula subrubra*), & River Tern (*Sterna aurantia*)]; thirteen (13) Near Threatened [Alexandrine Parakeet (*Palaeornis eupatria*), Asian Woollyneck (*Ciconia episcopus*), Black-headed Ibis (*Threskiornis melanocephalus*), Black-necked Stork (*Ephippiorhynchus asiaticus*), Black-tailed Godwit (*Limosa limosa*), Curlew Sandpiper (*Calidris ferruginea*), Dalmatian Pelican (*Pelecanus crispus*), Ferruginous Duck (*Aythya nyroca*), Great Thick-Knee (*Esacus recurvirostris*), Lesser Flamingo (*Phoeniconaias minor*), Oriental Darter (*Anhinga melanogaster*), Painted Stork (*Mycteria leucocephala*), & Pallid Harrier (*Circus macrourus*)]; 16 Schedule I [Booted Eagle, Brahminy Kite, Eurasian Sparrowhawk, Eurasian Spoonbill, Greater Spotted Eagle, Indian Peafowl, Long-legged Buzzard, Montagu's Harrier, Oriental Honey-buzzard, Osprey, Pallid Harrier, Peregrine Falcon, Red-necked Falcon, Shikra, Short-toed Snake-Eagle & Western Marsh-Harrier]; 20 Raptors; and 103 Migratory species have been recorded (reported/observed) from the area. But during the survey, a single Vulnerable- River Tern (*Sterna aurantia*); three Near Threatened- Black-headed Ibis (*Threskiornis melanocephalus*), Oriental Darter (*Anhinga melanogaster*), & Painted Stork (*Mycteria leucocephala*)] as per IUCN Red List (Online Version 2022-2); and five (05) Schedule I species (as per the Wildlife (Protection) Act, 1972) - Brahminy Kite, Eurasian Spoonbill, Indian Peafowl, Shikra, & Short-toed Snake-Eagle were also observed from the area.

Control Measures planned for the Project

Waste received from the municipal corporation will not be stored in the open.

Impact Magnitude

During the operation phase, power evacuation will remain till the life of the project, thus the **Duration** has been *permanent*. The length of overhead 66 kV transmission line (TL) is 8.9 km and not passing close to any large waterbody/reservoir/dam, but at two locations [22.400542, 70.797398 and 22.402381, 70.800158] medium size waterbodies are present on the seasonal stream which are very close to the TL route (***Figure 5-46***); therefore, the **Spread** has been classified as *medium*. The **Intensity** has been classified as *moderate* as the numbers and ecological significance of species under the risk of collision and electrocution. Thus, the impact magnitude has been classified as ***Substantial.***

Proposed Mitigation Measures

The mitigations proposed to minimize the impact(s) on bird species have been given as,

- Cross arms transmission tower, and suspended insulators should be utilized.
- Bird flight diverters[83] should be applied on transmission line, specifically near the water bodies located at 22.400542, 70.797398 and 22.402381, 70.800158.

[83] Galis, M. and Sevcik, M. (2019) Monitoring of effectiveness of bird flight diverters in preventing bird mortality from powerline collisions in Slovakia. *Raptor Journal* 13: 45–59.

- Frequent checking of the transmission towers to avoid bird nesting.
- Disposal of corpses / garbage near the power lines should be restricted and carcasses observed along the transmission line should be immediately removed to avoid attracting raptors.
- Bird carcasses monitoring should be conducted along the TL route to record the incident of collision and/or electrocution. If the carcass of an ecological sensitive species reported during the monitoring, a separate bird & bat survey should be conducted

	Nature of Impact	Spread of Impact	Duration	Intensity	Receptor Vulnerability	Significance of Impact
Without Mitigation Measures	Negative	Medium	Permanent	Moderate	Medium (Species)	**Substantial**
With Mitigation Measures	Negative	Medium	Permanent	Low to Moderate	Medium (Species)	**Small to Substantial**

7.5.2.2 Human-Wildlife Conflicts

The Project is situated very close to an active garbage dumping site of municipal corporation and surrounded by natural (open scrub) & modified (agricultural land) habitats. These habitats support several herpetofauna, avifauna, and mammals (as described in the ecological baseline). Access of these wildlife in the project compound as well as their movement along the boundary of the project during operation phase may cause a risk of Human-Wildlife conflicts.
As per the baseline, one Schedule I reptiles, Bengal Monitor Lizard (*Varanus bengalensis*) (Wild Life (Protection) Act, 1972) and three mammals, Bengal Fox (*Vulpes bengalensis*), Indian Grey Mongoose (*Herpestes edwardsii*), Rhesus Monkey (*Macaca mulatta*), etc. are capable to climb and thus can enter within the project compound. Beside these species, Banded Racer (*Platyceps plinii*), Common Krait (*Bungarus caeruleus*), Indian cobra (*Naja naja*), Oriental Ratsnake (*Ptyas mucosa*) and Saw-scaled Vipers (*Echis carinatus*) were also reported from the study area which can also access the project boundary.

Control Measures planned for the Project

Pre-casted wall is present around the plant to eliminate any possibility of wildlife entrance within the plant.

Impact Magnitude

As the project will be established for a long time, thus the **Duration** has been *permanent*. As the impact is restricted within the footprints of the Project boundary or within 500 m of the boundary wall, the **Spread** has been classified as *local*. The **Intensity** has been classified as *moderate* as the numbers and ecological significance of species under the risk. Thus, the impact magnitude has been classified as ***Small*** based on the impact significance criteria (***7.3.2***).

Proposed Mitigation Measures

The mitigations proposed to minimize the impact(s) on bird species have been given as,

- Frequent checking of the boundary wall to avoid any space for wildlife entrance into project compound
- Good housekeeping practices in the project compound could help to reduce the faunal attraction
- Awareness and training programs should be conducted to explain the dos and don'ts to minimize the risk of Human-Wildlife Conflict

	Nature of Impact	Spread of Impact	Duration	Intensity	Receptor Vulnerability	Significance of Impact
Without Mitigation Measures	Negative	Local	Permanent	Moderate	Low (Species)	**Small**

With Mitigation Measures	Negative	Local	Permanent	Low	Low (Species)	Small

7.6 Impacts on Socio- Economics

7.6.1 Impact during construction phase

7.6.1.1 Unhygienic and unsafe living conditions due to labor influx

The project will employee skilled, semi-skilled and unskilled workers which include contractual and regular employees as well as local. The regular skilled workers comprise of workers, from different districts and states in the country depending upon the need for technical expertise. Semi-skilled/unskilled laborer are hired locally as well as other states. The details regarding the workforce of the Project site are estimated to 125 contractual workers, However site visit confirms that nearly 56 % of the construction works is over. During the site visit following issues were observed at site

- During the site visit it was observed that temporary labor camps were built for construction phase migrant workers, where they were not providing adequate space for living and rooms were over crowed. Without proper ventilation, and safe electrical connections.
- These camps were not having adequate basic amenities which includes but not limited to sanitation, safe drinking water, separate & safe place for cooking, adequate measures for firefighting .
- Due to poor sanitary conditions there might be outbreak of vector bone and other diseases including covid which might affect the workers and adjoining communities.

The ESDD report confirms labor camps were designed as per EBRD/IFC guidelines for workers accommodation.

Control Measures Planned for the Project

- EHS conditions were included sub-contractor agreement, which also mentions overall requirement including Health and Safety (including government mandated COVID-19 guidelines).
- Regular cleaning of the camps, review, and inspections.

Impact Magnitude

As the constriction of the project is already completed 56% and duration of remaining work is short, and spread is local hence the intensity of the impact is evaluated as **Negligible.**

Proposed Mitigation Measures

The intensity of labor influx and welfare is understood to be **low**, and hence the following measures should be put in place to ensure that the overall health & safety and convenience of labor:

- As the construction of the project was already started the camps should be retrofitted to meet the basic requirements of the EBRD/IFC guidelines on workers accommodation including well-ventilated rooms with adequate bed and beddings, windows & doors should have insect nets, proper electrical connections with fan or any other arrangements for thermal comfort. In addition, there should be separate toilet blocks for men and women and separate bathing and washing space.
- Separate space for cooking, washing utensils and storage of food and fuel
- The camps should be equipped to handle fire emergency.
- Regular spray and other mechanism for disease control including health monitoring
- Develop check list for regular review & monitoring of the camps especially of the health and sanitation aspect and Dos & Don'ts to check any potential violence, substance, and alcohol abuse.
- The Project shall provide training or induction program related to the gender sensitization and gender-based violence to all employees at the time of commencement of their job

	Nature of Impact	Spread of Impact	Duration	Intensity	Significance of Impact
Without Mitigation Measures	Negative	Local	Short	insignificant	**Negligible**
With Mitigation Measures	Negative	Local	Short	insignificant	**Negligible**

7.6.1.2 Temporary income opportunity impact on local community due to installation of transmission line

As an integral component of the Project, an 11.586 km transmission line is proposed. The transmission infrastructure will consist of two types: (i) overhead transmission line spanning 8.648 km, and (ii) underground transmission line also extending over a length of 2.938 km. The trajectory of the transmission line is passes through the localities of Gauridad, Rajpar, Nagalpar, and Ratanapur villages (for a comprehensive understanding of the baseline conditions of these villages, kindly refer to Section 5.4.2). Furthermore, a spatial assessment of the route has identified specific land categories falling within the Right of Way (RoW) of the transmission line:

Land Use	Area (acres)
Overhead Transmission Line	
Agricultural Land	1.2
Open Scrub Land	15.62
Nala Land	20.22
Sub total	**37.04**
Underground Transmission Line	
Agricultural Land	0.017
Open Scrub Land	0.23
Road Land	0.41
Railway Land	0.01
Substation Land	0.009
WTE Plant Land	0.032
Sub-total	**0.708**
Grand Total	**37.748**

Note: The proposed Right of Way (RoW) for the overhead transmission line spans 18 meters, while for the underground transmission line, it is designated at 1 meter. It is pertinent to note that the information pertaining to the RoW for the underground transmission line has been provided by the Project, as no government-issued standards currently exist to determine the RoW for underground transmission lines.

7.6.1.2.1 Impact due to installation of transmission line

Overhead transmission Line

As outlined in ***Section 2.12.3,*** the installation of the transmission line has affected 12 private landowners. The designated contractor responsible for the installation of the transmission line has appropriately disbursed compensation to these 12 affected landowners, following the prescribed guidelines articulated in the Government of Gujarat Circular No. JET-11-2015-GOI-199-K, dated 14.08.2017, and 31.12.2021.

According to information provided by the project, compensation has indeed been distributed to the impacted landowners. In order to ensure compliance with the provisions detailed in the Gujarat Circular No. JET-11-2015-GOI-199-K, dated 14.08.2017, and 31.12.2021, as well as adherence to prevailing market rates, both the service provider and the Project have formally sought

information from Gujarat Electricity Transmission Company Limited (GETCO). However, it is noted that GETCO has not disclosed the specific amount of compensation disbursed to the landowners.

Underground Transmission Line

As evident from the provided land use table, the impact of the underground transmission line is confined to a mere 0.017 acres of agricultural land and is impacting one (1) private landowner. In alignment with the process followed for the overhead transmission line, the designated contractor has duly compensated the impacted landowners and has submitted a comprehensive report to GETCO. However, it is noteworthy that GETCO has not disclosed the specific details regarding the compensation disbursed to the affected landowners (refer to ***Section 2.12.5*** for more details).section 2.12.5 for more details).

Moreover, the installation of a 300-meter section of the underground transmission line is anticipated to affect 20 roadside vendors and kiosks situated in the main market and habitation area of Gavridad. This impact is primarily related to the disruption of business activities for these vendors and kiosks, given that they operate within the Right of Way (RoW) of the state highway, which coincides with the identified route for laying down the underground transmission line.

7.6.1.2.2 Control Measures Planned for the Project

Overhead Transmission Line

The project, in collaboration with its designated contractor responsible for the installation of the transmission line, is mandated to carry out construction activities in strict adherence to the stipulations outlined in Gujarat Circular No. JET-11-2015-GOI-199-K, dated 14.08.2017, and subsequent updates on 31.12.2021. Compensation to the affected landowners must be disbursed in accordance with the guidelines specified in the aforementioned circular, subject to mutual negotiations with the landowners.

Furthermore, the contractor is obligated to submit a comprehensive compensation payment report to GETCO. Construction of the transmission line is contingent upon GETCO's satisfaction with the compensation disbursement process, ensuring alignment with regulatory standards and the fulfillment of contractual obligations before proceeding with the construction activities.

Underground Transmission Line

In a manner parallel to the approach taken for the overhead transmission line, the contractor has diligently compensated the impacted landowners (three) through a process of mutual negotiation, subsequently submitting the compensation report to GETCO.

In an effort to mitigate the impact on the 20 roadside vendors and kiosks located in the primary market and habitation area of Gavridad, the project has implemented strategic measures. Construction activities are scheduled during night-time, minimizing disruptions to vendors and kiosks. Furthermore, the construction process is phased, with the contractor addressing 10 meters at a time, allowing for the restoration of the land to a state conducive for the resumption of business activities by these entities.

In the event that full restoration proves challenging, the contractor is committed to covering the impacted area with metal planks. This proactive step aims to ensure continued access for roadside vendors and kiosk owners, preventing any prolonged disruption resulting from the construction activity.

7.6.1.2.3 Impact Magnitude

1. Land Use and Access
    - **Magnitude:** Small to Negligible
    - **Description:** Construction activities may temporarily disrupt land use patterns, especially where the transmission line passes through residential or agricultural areas. However, the duration and spread of the impact is short and local in nature.
2. Economic Impact on Roadside vendors, kiosks owners, and Private Landowners
    - **Magnitude:** Small to Negligible
    - **Description:** The compensation to impacted landowners shall be paid in accordance with the government regulation and mutually negotiated with the owners. The compensation report shall be submitted to GETCO for their approval. Further, the project has already put in place the mitigation measures to mitigate the access stoppage or business disruption impact for roadside vendors and kiosks owners. Additionally, the spread and duration of the impact is Local and short to medium.

7.6.1.2.4 Proposed Mitigation Measures

In addition to the planned mitigation measures, following mitigation measures shall be implemented by the Project:

- Establish a grievance mechanism that allows affected stakeholders to raise concerns, provide feedback, and seek resolution for any project-related issues,
- Ensure accessibility, transparency, and fairness in the grievance resolution process.
- Implement the established Stakeholder Engagement Plan outlining how the project will engage with and involve stakeholders throughout the transmission line.
- Ensure that engagement is inclusive, transparent, and facilitates meaningful participation.
- Undertake the practice of conducting construction activities (especially for the underground transmission line) during nighttime to minimize disruption to businesses and daily activities.
- Maintain a phased approach to construction, allowing for the gradual restoration of affected areas.
- Implement a comprehensive restoration plan, ensuring that areas impacted by construction activities are returned to a usable state.
- Establish mechanisms for ongoing monitoring of the impact on stakeholders during and after construction.
- Prepare regular reports outlining the progress of restoration efforts and addressing any challenges encountered.
- Furthermore, in the event of any physical damage to the structures of roadside vendors and kiosk owners or any other form of privately owned or used physical structure resulting from the installation of the underground or overhead transmission line, the project shall fully compensate for the loss or damage to these structures' owner or user at replacement cost[84] or construct the structure as it was earlier to the construction activities.

	Nature of Impact	Spread of Impact	Duration	Intensity	Significance of Impact
Without Mitigation Measures	Negative	Local	Short	Moderate	**Small**
With Mitigation Measures	Negative	Local	Short	Insignificant	**Negligible**

7.6.1.3 Impact Due to Laying Down of Water Pipeline

As an integral component of the Project, a 12.033 km water pipeline is proposed. The water pipeline will be connecting Gauridad sewage treatment plant to the WTE plant, and crossing through Gauridad, Rajgadh, Nagalpar, and Nakarwadi (for comprehensive understanding of the baseline conditions of these villages, kindly refer to ***Section 5.4.2***). Furthermore, a spatial assessment of the route of the route has identified specific land categories falling within the Right of Way (RoW) of the water pipeline:

Land Use	Area (acres)
STP Plant Land	0.0037
Open Scrub Land	0.108
Road Land	2.86
WTE Plant Land	0.0017
Total	**2.9734**

Note: The proposed Right of Way (RoW) for the water pipeline is designated at 1 meter. It is pertinent to note that the information pertaining to the RoW for the water pipeline has been provided by the Project, as no government-issued standards currently exist to determine the RoW for laying down of water pipeline.

7.6.1.3.1 Impact due to installation of water pipeline

The installation of water pipeline is not impacting any private landowners and is majorly laying down through the existing RoW of state highways and municipal roads. However, the installation of a 300-meter section of the water pipeline is anticipated to affect 20 roadside vendors and kiosks situated in the main market and habitation area of Gavridad. This impact is primarily related to the disruption of business activities for these vendors and kiosks, given that they operate within the Right of Way (RoW) of the state highway, which coincides with the identified route for laying down the water pipeline.

[84] The replacement cost as per IFC Performance Standard 5 (PS5) refers to the value required to allow Affected Communities and persons to replace lost assets with assets of similar value. It includes the market value of assets plus transaction costs and does not take depreciation into account.

7.6.1.3.2 Control Measures Planned for the Project

In an effort to mitigate the impact on the 20 roadside vendors and kiosks located in the primary market and habitation area of Gavridad, the project has implemented strategic measures. Construction activities are scheduled during night-time, minimizing disruptions to vendors and kiosks. Furthermore, the construction process is phased, with the contractor addressing 10 meters at a time, allowing for the restoration of the land to a state conducive for the resumption of business activities by these entities.

In the event that full restoration proves challenging, the contractor is committed to covering the impacted area with metal planks. This proactive step aims to ensure continued access for roadside vendors and kiosk owners, preventing any prolonged disruption resulting from the construction activity.

7.6.1.3.3 Impact Magnitude

Economic Impacts on Roadside vendors and kiosks owners

- **Magnitude:** Small to Negligible
- **Description:** The construction may disrupt the business activities of roadside vendors and kiosk owners, leading to a temporary loss of income. However, the project has already put in place the mitigation measures to mitigate the access stoppage or business disruption impact for roadside vendors and kiosks owners. Additionally, the spread and duration of the impact is local and short.

7.6.1.3.4 Proposed Mitigation Measures

In addition to the planned mitigation measures, following mitigation measures shall be implemented by the Project:

- Establish a grievance mechanism that allows affected stakeholders to raise concerns, provide feedback, and seek resolution for any project-related issues,
- Ensure accessibility, transparency, and fairness in the grievance resolution process.
- Implement the established Stakeholder Engagement Plan outlining how the project will engage with and involve stakeholders throughout the project lifecycle.
- Ensure that engagement is inclusive, transparent, and facilitates meaningful participation.
- Continue with the practice of conducting construction activities during nighttime to minimize disruption to businesses and daily activities.
- Maintain a phased approach to construction, allowing for the gradual restoration of affected areas.
- Implement a comprehensive restoration plan, ensuring that areas impacted by construction activities are returned to a usable state.
- Establish mechanisms for ongoing monitoring of the impact on stakeholders during and after construction.
- Prepare regular reports outlining the progress of restoration efforts and addressing any challenges encountered.
- Furthermore, in the event of any physical damage to any form of privately owned or used physical structure resulting from the laying down of the underground water pipeline, the project shall fully compensate for the loss or damage to impacted structures' owner at replacement cost or construct the structure as it was earlier to the construction activities.

	Nature of Impact	Spread of Impact	Duration	Intensity	Significance of Impact
Without Mitigation Measures	Negative	Local	Short	Moderate	**Small**
With Mitigation Measures	Negative	Local	Short	insignificant	**Negligible**

7.6.1.4 Increased local employment & livelihood

As per the available data it was understood that total manpower requirement for the project is nearly 85 persons, which will include both skilled and nonskilled workers. The work force will mostly engage the migrant workers working for different contractors. Besides that some unskilled jobs shall also be provided to local labors.

Besides direct employment opportunities project will also be instrumental in creating other local livelihood opportunities in the surrounding localities in terms of giving more business to local grocery shops, fruit/ vegetables & other items related to supply of food & ration, fuel, rents, taxi, tractors, water tankers, trucks hotel, restaurants /Dhaba's etc.

Enhancement Measures adopted

As per the discussions with the management (although there are no specific policies towards local employment etc.) where possible efforts are made to use the available local resources which broadly includes local procurement of ration, engaging local labor, tanker for water supply, project managerial staff/ officers are encouraged to live close to the plant on rented accommodation etc.

Impact Magnitude

As the project is likely to employ workers across different regions and states therefore the project is having high spread and most of the project construction activities are over (56%) so the duration of the impact is short hence based on the impact assessment matrix the magnitude of the impact is evaluated as **small**

Proposed Enhancement Measures for the Project

While the significance of the impact on economy and employment opportunities during the construction phase is understood to be positive, the following enhancement measures should be put in place to ensure that the local community receive maximum benefit from the presence of the Project:

- Project should develop guidelines/policies towards local employment and livelihood opportunity enhancement and include the local employment reporting the annual report .
- Project should proactively disclose the local labor and other requirement at notice board and there should be open door policy towards local vendors registration.
- Preference should be provided to local labor. However, the preference shall be based on available skillset and knowledge.
- Project shall provide equal access to both female and male local population in available employment opportunities and for greater employability of residents, technical/vocational training may be arranged for female and male, if required
- Establish the functional stakeholder engagement including external communication plan and roll out grievance handling mechanism which should have provisions for receiving external grievances as well.
- The project proponent will establish a mechanism to audit sub-contractors and suppliers with respect to compliance of utilizing local labor and resources.

	Nature of Impact	Spread of Impact	Duration	Intensity	Frequency	Receptors' Vulnerability	Magnitude of Impact
Without Mitigation Measures	**Positive**	High	Short	**Short**	**Intermittent**	**Low**	**Small**
With Mitigation Measures	Positive	High	Short	**Short**	**Intermittent**	**Low**	**Small**

7.6.1.5 Occupational Health & Safety

The engagement with various construction activities will involve a range of occupational health and safety risks and hazards mainly for the contractors and workers (local and/or migrant) who are involved in the construction works. Lack of relevant PPE's will increase the risk of worker's exposure to construction hazards. Some of the serious risks during construction phase without adequate PPE include risk of fall while working at heights, risk of accidents, exposed to faulty electrical devices, such as cables, cords, hand tools etc. Following potential occupational health and safety risks are envisaged due to construction activities:

- Fall from height during erection and installation of project components such as boilers, steam turbines, transmission towers and transmission lines etc.
- Risk while working at confined spaces at excavated areas.
- Accidents during driving heavy duty vehicles for transportation of construction material at site including sorting stations.
- Fire hazards and accidents while handling chemicals and oils and operating construction machineries including cranes and mechanical lifting equipment.
- Electrocution while working with live electrical components like electrical parts, transmission line etc.

- Diseases due to unhygienic conditions at site including contaminated drinking water for workers.
- Hearing problems due to noise generation from construction machineries.
- Respiratory problems due to dust emissions from construction site.
- Exposure to extreme heat while working at site during summers.
- Risk of accidents from being struck in machinery or moving equipment or parts.
- Exposed to faulty electrical devices, such as cables, cords, hand tools etc.
- The emission load from welding is will directly affect welders and workers on the site.
- Dust arising during construction of the project can have a direct impact staff working at the construction site.

Implemented Control Measures

- In line with the concession agreement, all the workers are provided with adequate PPE such as Safety helmet, Safety shoes, face mask and Safety vest. Additionally, workers working with scaffold are being provided with safety belts.
- HSE manual developed by the EPC contractor is currently being implemented on the Project site. The HSE manual included training requirements such as first aid training, job specific training, daily work instructions and toolbox talk.
- Adequate personal protective equipment such as ear plugs, safety helmet, safety shoes etc. are provided to the workers.
- Health and safety training on working at height, material handling, working at confined space are imparted to the workers.
- Cranes and other lifting equipment are operated by trained and authorized persons.
- First aid box's with adequate medicines are provided at the site.

Impact Magnitude

The nature of impact was assessed to be negative due to project with direct impact. The duration of the impact is assessed to be short .i.e., during construction phase only. The geographical spread of impact is expected to be local, mainly confined to the project construction site and/or within 500m of the boundary. Therefore, intensity of the impact is assessed as moderate-high, and the overall impact significance is assessed as small-substantial.

Additional Mitigation Measures

- GWRPL to develop dedicated environmental, health and safety (EHS) plan, Occupational Health & Safety Plan and emergency response plan (ERP) applicable to all project phases, i.e. construction as well as operation. Measures provided in the respective plans with respect to health and safety to be implemented at site. Refer ***Appendix 16***
- The Project to develop a training calendar and associated training materials to impart trainings at regular intervals to the contractors and workers. The trainings as per the training calendar should be provided to all the workers at the WTE plant, workers involved in construction of transmission line and underground water pipeline.
- GWRPL to develop and maintain hazard identification and risk assessment (HIRA) for the project and its associated TL and water pipeline and communicate the same to the workers. The HIRA register should be update whenever a new hazard is identified at the site.
- In line with the concession agreement, monthly/quarterly safety meetings should be conducted on site to discuss the unsafe work practices or conditions and suggest corrective actions. The minutes of the meeting (MoM) along with implementation of corrective actions to be shared with the EHS Manager at the corporate level.
- The Project to develop a training calendar and associated training materials as part of the OHS to impart trainings at regular intervals to the contractors and workers. The trainings as per the training calendar should be provided to all the workers at the WTE plant, workers involved in construction of transmission line and underground water pipeline
- Project should conduct full body check-up of workers as part of premedical check-up and annual medical check-up. These should include blood test, ECG, Pulmonary Function test, urine test etc.
- GWRPL to develop a formal procedure to record near miss, incident, and minor accidents onsite.
- Permit-required confined spaces to be provided with safety measures for venting, monitoring, and rescue operations, to the extent possible. The area adjoining an access to a confined space should provide ample room for emergency and rescue operations.
- Workers who are engaged in welding works will be provided with welder's protective eye shields;
- Electrical and maintenance work should not be carried out during poor weather and during lightning strikes;
- Obtain and check safety method statements from contractors;
- Monitor health and safety performance and have an operating audit system.
- Training of the workers on climbing techniques, and rescue of fall- arrested workers;

- Appoint a trained person to take charge of the first aid boxes. The location of first aid arrangements to be displayed on site;
- The nearest hospital, ambulance, fire station and police station should be identified in the implemented emergency management plan;
- Establish a grievance redressal mechanism in place, to allow for the employees and workers to report any concern or grievance related to work activities.
- GWRPL to develop a systematic monitoring and auditing mechanism for monitoring the contractors and sub-contractors in terms of resources, migrant workers, child labour and forced labour, health and safety, payment of wages etc.

	Nature of Impact	Spread of Impact	Duration	Intensity	Frequency	Significance of Impact
Without Mitigation Measures	Negative	Local	Short	High	Intermittent	**Substantial**
With Mitigation Measures	Negative	Local	Short	Moderate-High	Intermittent	**Small to Substantial**

7.6.2 Impact during Operation Phase

7.6.2.1 Operation of underground transmission Line

The project will install 2.938 km of underground transmission line and operate the same during the operation phase. The underground transmission line will be passes through the Gauridad village. As stated above in ***Section 7.6.1.2***, the underground transmission line is majorly crossing through the existing RoW of municipal roads.

7.6.2.1.1 Impact due to operation of underground transmission line

As reported by the Project, during the operational phase of the underground transmission line, no physical structures will be erected within the Right of Way (RoW) allocated for the underground transmission line, which is approximately 1 meter. The predominant section of this transmission line traverses existing RoW areas designated for road use, administered by the relevant government authority. The project has successfully obtained a No Objection Certificate (NOC) from the said authority, ensuring compliance with regulations, and confirming that no structures will be constructed on this land.

While the underground transmission line impacts a fractional 0.017 acres of agricultural land, the project imposes a restriction on the construction of any physical structures over the RoW. Notably, the landowners retain the right to engage in agricultural activities within the RoW during the transmission line's operational phase, up to a depth of 2 feet.

Importantly, the project assures that the operation of the underground transmission line will not impede the access of local communities, thereby mitigating disruptions and preserving community mobility.

7.6.2.1.2 Control Measures Planned for the Project

The project will not impose any access stoppage during the operation of the transmission line. Further, the project will allow the agricultural activities on the land where the transmission line is crossing through the agricultural land.

7.6.2.1.3 Impact magnitude

The impact **negligible** of the operation of the underground transmission line is expected to be minimal. The project has outlined measures to ensure that there is no disruption of access for the local community, and agricultural activities are permitted on the land traversed by the transmission line. The overall impact is anticipated to be limited, given the adherence to specified guidelines and commitments to facilitate normal community activities in the affected areas.

7.6.2.1.4 Proposed Mitigation Measures

In addition to the planned mitigation measures, following mitigation measures shall be implemented by the project:

- Establish a grievance mechanism that allows affected stakeholders to raise concerns, provide feedback, and seek resolution for any project-related issues.
- Ensure accessibility, transparency, and fairness in the grievance resolution process.
- Implement the established Stakeholder Engagement Plan outlining how the project will engage with and involve stakeholders throughout the transmission line operation.

- Ensure that engagement is inclusive, transparent, and facilitates meaningful participation.
- The project commits to ensuring that there will be no stoppage of access for the local community during the operation of the transmission line. This ensures that the normal flow of activities in the community remains unaffected.
- The project shall pay the crop loss during the operation phase of the transmission line is destroyed during the maintenance phase of the project.
- The project shall proactively inform stakeholders in advance of any scheduled maintenance activities related to the underground transmission line. This advance notice ensures that stakeholders are prepared for any temporary disruptions and can plan accordingly.
- In the case of emergency maintenance, the project shall promptly provide information to stakeholders before initiating any maintenance activities. This proactive communication is crucial, particularly for stakeholders such as roadside vendors and kiosk owners, allowing them to evacuate the Right of Way (RoW) if necessary.
- Following the completion of maintenance work, the project shall restore the RoW to its pre-maintenance condition.
- Furthermore, in the event of any physical damage to any form of privately owned or used physical structure resulting from the maintenance activity of the transmission line, the project shall fully compensate for the loss or damage to impacted structures' owner at replacement cost or construct the structure as it was earlier to the construction activities.

	Nature of Impact	Spread of Impact	Duration	Intensity	Significance of Impact
Without Mitigation Measures	Negative	Local	Short	Insignificant	**Negligible**
With Mitigation Measures	Negative	Local	Short	Insignificant	**Negligible**

7.6.2.2 Operation of Underground Water Pipeline

The project will install 12.033 km of underground water pipeline and operate the same during the operation phase. As stated above in section 7.6.1.3, the underground transmission line is majorly crossing through the existing RoW of municipal roads.

7.6.2.2.1 Impact due to operation of underground water pipeline

As reported by the Project, during the operational phase of the underground water pipeline, no physical structures will be erected within the Right of Way (RoW) allocated for the underground transmission line, which is approximately 1 meter. The predominant section of this transmission line traverses existing RoW areas designated for road use, administered by the relevant government authority. The project has successfully obtained a No Objection Certificate (NOC) from the said authority, ensuring compliance with regulations, and confirming that no structures will be constructed on this land.

7.6.2.2.2 Control Measures Planned for the Project.

The project will not impose any access stoppage during the operation of the water pipeline.

7.6.2.2.3 Impact Magnitude

The impact **negligible** of the operation of the underground transmission line is expected to be minimal. The project has outlined measures to ensure that there is no disruption of access for the local community.

7.6.2.2.4 Proposed Mitigation Measures

In addition to the planned mitigation measures, following mitigation measures shall be implemented by the project:

- Establish a grievance mechanism that allows affected stakeholders to raise concerns, provide feedback, and seek resolution for any project-related issues,
- Ensure accessibility, transparency, and fairness in the grievance resolution process.
- Implement the established Stakeholder Engagement Plan outlining how the project will engage with and involve stakeholders throughout the project lifecycle.
- Ensure that engagement is inclusive, transparent, and facilitates meaningful participation.
- The project commits to ensuring that there will be no stoppage of access for the local community during the operation of the water pipeline. This ensures that the normal flow of activities in the community remains unaffected.
- The project shall proactively inform stakeholders in advance of any scheduled maintenance activities. This advance notice ensures that stakeholders are prepared for any temporary disruptions and can plan accordingly.

- In the case of emergency maintenance, the project shall promptly provide information to stakeholders before initiating any maintenance activities. This proactive communication is crucial, particularly for stakeholders such as roadside vendors and kiosk owners, allowing them to evacuate the Right of Way (RoW) if necessary.
- Following the completion of maintenance work, the project shall restore the RoW to its pre-maintenance condition.
- Furthermore, in the event of any physical damage to any form of privately owned or used physical structure resulting from the maintenance of the underground water pipeline, the project shall fully compensate for the loss or damage to impacted structure's owner at replacement cost or construct the structure as it was earlier to the construction activities.

	Nature of Impact	Spread of Impact	Duration	Intensity	Significance of Impact
Without Mitigation Measures	Negative	Local	Short	Insignificant	**Negligible**
With Mitigation Measures	Negative	Local	Short	Insignificant	**Negligible**

7.6.2.3 Occupational Health & Safety

The significant occupational health and safety impacts typically associated with workers at waste management facilities occur during the operational phase and include:

- Accidents and injuries
- Chemical exposure
- Exposure to pathogens and vectors
- Heat
- Noise & Vibrations
- Confined spaces
- Electrical hazards
- Fire and explosion hazards
- Dust
- Wounds from equipment or sharp objects
- Extreme/adverse weather
- Manual handling
- Machinery & vehicles - accidents may occur in the use of machines and vehicles, including worker transportation, waste transportation. These may include vehicle collisions; vehicle and machinery roll-overs; uncontrolled movement resulting in personal injury (e.g., crushing by moving vehicles); damage or loss of asset; injury, entrapment, or death due to faulty or unguarded equipment and machinery.

Solid waste workers are particularly prone to accidents involving trucks and other moving equipment, so traffic management systems and traffic controllers are recommended.

Processing of MSW can also generate bioaerosols, suspensions of particles in the air consisting partially or wholly of microorganisms, such as bacteria, viruses, molds, and fungi. These microorganisms can remain suspended in the air for long periods of time, retaining viability or infectivity. Workers may also be exposed to endotoxins, which are produced within a microorganism and released upon destruction of the cell, and which can be carried by airborne dust particles.

Workers can be exposed to pathogens contained in manure and animal excreta found in MSW from the disposal of sludge, carcasses, diapers, and yard trimmings containing domestic animal waste.

Apart from the project operations, GWRPL will also develop and operate wastewater treatment facility at the exiting STP itself where the operators may be exposed to physical, chemical, and biological hazards. Examples of these hazards include the potential for trips and falls into tanks, confined space entries for maintenance operations, and inhalation of VOCs, bioaerosols, and methane, contact with pathogens and vectors, and use of potentially hazardous chemicals, including chlorine, sodium and calcium hypochlorite, and ammonia.

Vibrations are expected to be generated by various activities associated with the project during operational phase. The impact of vibrations beyond the site would be negligible during normal operation phase. However, the impacts on workers engaged in the plant area would be considerable due to occupational exposure.

Impact Magnitude

The nature of impact was assessed to be negative due to project with direct impact. The duration of the impact is assessed to be short-long. The geographical spread of impact is expected to be local, mainly confined to the WtE plant. Therefore, intensity of the impact is assessed as moderate-high, and the overall impact significance is assessed as small-substantial.

Planned Control Measures

- Adequate ventilation of enclosed processing areas (e.g., dust in waste size reduction areas, VOCs driven off by high temperatures during composting)
- The pre-processing area including boiler main bunker will always remain in negative air pressure, forced draft fan will suck primary air from these areas. Thus any formation of methane due stacking of prepared RDF in main boiler bunker will be sucked into the boiler.
- All other areas of pre-processing and transfer will have adequate volume of overall processing area. The average height of preprocessing is about 8 mtr from finish floor level which will ensure adequate presence of oxygen in pre-processing area.
- It is further to note that boiler bunker has huge void area which eliminate any deficiency of oxygen.
- Largely use of automatic (non-manual) waste handling methods in pre-processing and processing area
- Provision of suitable personal protection equipment (PPE- footwear, masks, protective clothing and goggles in appropriate areas), emergency eyewash and shower stations, ventilation systems, and sanitary facilities
- Provision of annual health checkup and provision of prompt medical attention for cuts and bruises.
- Provision adequate personnel facilities, including washing areas and areas to change clothes before and after work;
- The plant will be equipped with fire detectors, alarm systems, and fire-fighting equipment.
- Adequate no of lavatory facilities (toilets and washing areas) will be provided for the number of people expected to work in the plant and allowances will be made for segregated facilities. Toilet facilities will also be provided with adequate supplies of running water, soap, and hand drying devices.
- Passageways for pedestrians and vehicles have been segregated within the plant premises to provide for easy, safe, and appropriate access
- Hand, knee and foot railings will be installed on stairs, fixed ladders, platforms, permanent and interim floor openings etc.
- Negative air pressure for management of Odor
- Greenbelt development along the layout boundary along with adequate green buffers between facilities and utilities/common areas

Additional Mitigation Measures

- Job safety analysis to undertaken to identify specific potential occupational hazards and industrial hygiene surveys, as appropriate, to monitor and verify chemical exposure levels, and compare with applicable occupational exposure standards.
- Since hazardous waste and material will be generated and present within the project premises, GWRPL to develop hazardous material management plan which includes potential risks along with the objectives of protection of the workforce and the prevention and control of releases and accidents.
- Provide adequate and suitable personal protective clothing and equipment.
- Provide worker immunization (e.g. for Hepatitis B and tetanus).
- Provision of dust masks or respirators for workers engaged in pre-processing area.
- Maintain good housekeeping in waste processing and storage areas.
- Regular inspection and maintenance of pressure vessels and piping.
- Reducing the time required for work in elevated temperature environments and ensuring access to drinking water.
- Shielding surfaces where workers come in close contact with hot equipment, including generating equipment, pipes etc.
- Consider installation of hazard warning lights inside electrical equipment enclosures to warn of inadvertent energization.

- 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.
- Hazardous areas (electrical rooms, compressor rooms, etc.), installations, materials, safety measures, and emergency exits, etc. should be marked appropriately. Signage should be in accordance with international standards and be well known to, and easily understood by workers, visitors and the general public as appropriate.
- The ERP developed should include fire escape route for the WTE plant and the same should be displayed with adequate illumination at designated locations and should be updated with details of the authority responsible to respond in case of emergency beyond 500 m (in case, appointed Disaster Control Director declare "NO RESPONSIBILITY OF THE PLANT" to the emergency beyond 500m).
- Fire Exit sign boards to be displayed in local language along with English for clear understanding of the workers.
- The Fire exit doors should be made up of fire resisting material in compliance to the Gujarat Factories Rules, 1963.
- GWRPL should provide at least two exits at the pre-processing unit which can be used by workers for evacuation in case of fire emergency.
- First aid box at the Plant to be maintained in accordance with the Rule 70 of The Gujarat Factories Rules, 1963. Regular inspection of the first aid box to be conducted and all the expired shall be replaced regularly.
- Workplace monitoring programme to be developed and implemented which should include temperature, ventilation, lux levels, humidity levels, noise etc. for the workplace.
- The occupational noise exposure to the workers in the form of eight hour timely weighted average will be maintained well within the prescribed Occupational Safety and Health Administration (OSHA) standard limits.
- Vibration generating sources and their platforms should be maintained properly to minimize vibrations and related impacts.
- Implementation of inspection programs to maintain the mechanical integrity and operability of pressure vessels, tanks, piping systems, relief and vent valve systems, containment infrastructure, emergency shutdown systems, controls and pumps, and associated process equipment.
- OHS orientation training to be provided for all new employees to ensure they are apprised of the basic site rules of work at / on the site and of personal protection and preventing injury to fellow employees.
- Training should consist of basic hazard awareness, sites specific hazards, safe work practices, and emergency procedures for fire, evacuation, and natural disaster, as appropriate. Any site-specific hazard or color coding in use should be thoroughly reviewed as part of orientation training.
- Training of operators on release prevention, including drills specific to hazardous materials as part of emergency preparedness response training. Also 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.
- Documentation of availability of specific personal protective equipment and provision of training needed to respond to an emergency.

	Nature of Impact	Spread of Impact	Duration	Intensity	Frequency	Significance of Impact
Without Mitigation Measures	Negative	Local	Short-Long	High	Routine	Substantial
With Mitigation Measures	Negative	Local	Short-Long	Low	Routine	Small Substantial

7.6.2.4 Community Health & Safety

Limited applicability for operation phase. As there are no community settlements within 1km radius of the project and the associated TL and water pipeline are also not impacting the residential areas. After the construction there will be no potential disturbance to the local community. And material movement (waste) will be done by RMC as it is done currently with a minor difference that instead of dumping to land fill site the same will be unloaded at the plant. Also, the civil work for WtE plant is 56% complete, also the transmission towers have also been erected. Further the project/ landfill site is outside the city limit and it does not have vending zone /hawkers in the close vicinity of the project.

The major community health and safety risks include community dissatisfaction, public accessibility and management of emergency situations, outbreak of viral or contagious disease etc. The movement of vehicles, material and commuters via the main access road may be a potential risk for daily commuters and cattle of nearby village. The specific receptors may include daily commuters from nearby villages, animals grazing in nearby vacant land parcels.

Possible sources of impacts to community health and safety, considering, mobility of vehicles carrying construction materials etc. operational phase impacts are as follows:

- Potential risk of accidents on access/ village road by trucks and vehicles engaged at the Facility for supply of construction materials during construction phase;
- Transportation of waste to the project site
- Any spread of disease, virus by influx of migrant workers; and
- Safety of the workers and road commuters etc.

Community health and safety impacts which occur during the operational and decommissioning phases of WtE plant include: General occupational and environmental health issues associated with waste scavenging, Physical, chemical, and biological hazards , Litter, Noise, Dust and odors.

Limited applicability for operation phase. The plant is located in an area where legacy waste has been dumped in the vicinity. There are no densely populated residential area in the 2 km radius with no residential settlements present within 1km radius of the project apart from only 3-4 scattered standalone houses present within the 1km radius. These residential structures are present adjacent to the agricultural patch cultivated by the owners.

The major community health and safety risks include movement of vehicles and waste collection trucks and commuters via the main access road may be a potential risk for daily commuters. The specific receptors may include daily commuters and the residential settlements in the waste transportation routes from the waste collection centres to the WtE plant.

Emissions from wastewater treatment operations include hydrogen sulfide, methane, volatile organic compounds (e.g., chloroform generated from chlorination activities and other volatile organic compounds (VOCs)), gaseous or volatile chemicals used for disinfection processes (e.g., chlorine and ammonia), and bioaerosols. Odors from treatment facilities will impact the workers and the surrounding community.

Visitors and trespassers at waste management facilities may be subject to many of the hazards described for site workers.

Control Measures Planned

- Dense green cover fencing perimeter of adequate height around the site, with guarded site access gate and buildings
- Fully enclosed the waste management site with fencing so that no livestock or wildlife is able to come in contact with the waste, which contains significant potential to enable the spread of livestock and zoonotic disease, as well as spillover disease to wildlife
- Security cameras at key access points linked to recording equipment and remote access CCTV, where required
- Use of a site visitor register
- Management of incoming vehicle in coordination with the garbage stations

Construction Phase for linked facilities

- High noise generating activities such as blasting, piling and drilling will not be scheduled during night time to minimize noise impacts
- Time bound construction activities will be carried out; so as to avoid concurrent effect of noise from the construction activities
- Personnel exposed to noise levels beyond threshold limits will be provided with protective gears such as earplugs, muffs, etc. especially construction personnel involved in pile driving operations. Rotation of personnel will also be adopted.
- Periodic maintenance of the equipment to be used in the developmental works will be carried out. Worn out parts will be replaced and rotating parts will be lubricated to minimize noise emissions
- Adequate PPE for noise mitigation need to be used for labors that are exposed to high noise

Impact Magnitude

The nature of impact was assessed to be negative due to project with direct impact. The duration of the impact is assessed to be short-long. The geographical spread of impact is expected to be local, mainly confined to the 500m radius of the access roads. Therefore, intensity of the impact is assessed as low-moderate and the overall impact significance is assessed as small-substantial.

Additional Mitigation Measures

- Limiting the hours of operation for specific pieces of equipment or operations, especially mobile sources operating through community areas
- Reducing project traffic routing through community areas wherever possible
- Noise monitoring to be carried out for the purposes of establishing the existing ambient noise levels in the area, or for verifying operational phase noise levels
- Traffic management of vehicles engaged during both ongoing construction phase and upcoming operational phase. Traffic management plan to be followed
- Limiting the use of access road during daytime to avoid congestion and risks of accidents
- Trucks/ dumpers will be covered by tarpaulin sheets during off site transportation
- As part of the stakeholder engagement and information disclosure process, the community will be provided with an understanding of the activities to be undertaken and the precautions taken for safety;
- Installing mandatory suitable mufflers on engine exhausts and compressor components as the ambient noise levels are already exceeding the ambient air quality standards
- Dedicated route for deployment of heavy-duty vehicles should be defined.
- Put in place a grievance mechanism to allow for the workers and community members to report any concern or grievance related to project activities
- Drivers need to be captioned or trained to avoid frequent use of horn unless otherwise it is required and educated for Silent zones and off hours between midnight and 6 am

	Nature of Impact	Spread of Impact	Duration	Intensity	Frequency	Significance of Impact
Without Mitigation Measures	Negative	Local	Short-Long	Moderate	Routine	Substantial
With Mitigation Measures	Negative	Local	Short-Long	Moderate-Low	Routine	Small Substantial

7.6.2.5 Loss of income & Livelihood of Ragpicker Community

The operation of the Waste-to-Energy (WTE) Power Plant in Rajkot has raised concerns about the potential economic displacement of approximately 200 ragpickers. These ragpickers are operating at Rajkot Municipal Corporation (RMC) landfill. Further, the ragpickers, predominantly from the nearby villages (Nakravadi and Sokhra), rely on collecting recyclable waste from the landfill for their livelihood. However, the implementation of the Waste to Energy Plant, which primarily will use fresh waste, will impact their income and livelihood opportunities. As the waste collection by ragpickers are heavily dependent on the freshly dumped waste. Thus, the impact on the ragpickers due to the diversion of fresh waste from landfill to the Project is need to be assess as part of the ESIA. The details of the current situation of waste collection and the impact on the ragpickers due to plant's operation are provided below:

Current Situation:

- **Ragpickers' involvement:** The ragpickers are actively engaged in collecting recyclables from the freshly dumped waste only and are not collecting recyclables from the legacy waste.
- **Process of collection of waste and selling by Ragpickers:** Ragpickers collects the recyclable from the freshly dumped waste at the landfill. Once waste is collected, ragpickers meticulously segregate the waste based on its nature and composition. This sorting process is essential to ensure that different type of recyclable materials are properly separated, enhancing their value, and facilitating their recycling process. Ragpickers typically classify waste into categories such as plastic, glass, shoe soles, hairs, etc. After segregation, ragpickers take the sorted recyclables to local markets, scrap dealers, or recycling centres to sell them. These local markets, scrap dealers, and recycling centers are available throughout Rajkot city. The selection by ragpickers for selling the collected waste is based on the purchase price of the

waste. Although there is no fixed distance they have to travel to sell the collected waste, the ragpickers gather the segregated waste at the landfill in one place and then transport it to the purchaser using motorized vehicles.

- **Waste usage by WTE plant:** The WTE Power Plant's daily waste requirement will be 1,000 tonnes, while at present the Rajkot city and rural areas (falling under the jurisdiction of Rajkot Municipal Corporation) produce approximately 725 to 230 tonnes, respectively, of fresh waste per day (as per the official website of RMC, the total waste produced by the city is 500 TPD; however, the website was updated in year 2021). The plant will utilize everyday door-to-door collected 730 tons waste and the remaining 270 tons per day will be used from biomining waste. Thus, considering the waste requirement by the power plant and total waste per day produced by Rajkot, it can be concluded that no fresh waste will be dumped at landfill site once the plant starts operating.
- **Increase rate of generation of waste of Rajkot city:** As reported by RMC's representative, the waste generation in the Rajkot city is increasing at the rate of 25% annually of the yearly collected waste; therefore, considering the waste generation of 725 TPD in 2023, waste generation in 2024 will be approx. 900 TPD and 1,130 TPD in 2025. Thus by 2025, waste generation is projected to surpass the power plant's total requirement. This could potentially lead to a resumption of fresh waste dumping at the landfill and may provide earning opportunities to ragpickers again. This assumes that the quantum of waste from legacy waste/bio-mining holds steady.

Impact on Ragpickers:

- **Loss of Earning:** With the diversion of fresh waste to the Waste to Energy Plant, the livelihood of the ~200 ragpickers will be directly impacted. Their primary source of income, collecting recyclable waste from the landfill, will diminish or even cease during the operation period of the project.
- **Challenging Alternatives:** Collecting waste from legacy dumps is a challenging option for ragpickers. Legacy dumps typically contain lower volumes of recyclable materials compared to fresh waste, making it difficult to extract valuable items efficiently.
- **Safeguard for livelihood loss:** As a safeguard to reduce the impact of livelihood loss of these ragpickers, the Rajkot Municipal Corporation (RMC) issued a letter with reference number R.M.C./C.Z./S.W.M./Outward no.: 3067, dated September 09, 2023. The letter, issued by the Environment Engineer of RMC, provides assurance for the livelihood support of ragpickers at the RMC landfill. It explicitly states that impacted ragpickers are allowed to engage in rag-picking activities at the ward-level transfer station. The issued letter is specifically directed to the Director (Plant Head) of Goodwatts WTE Rajkot Private Limited. Moreover, if any ragpicker which is not relocated and engaged at MRF/Transfer station for earning livelihood, then the project evaluate the Rag pickers on merit basis and if their experience and skill set matches with Project's requirement, the Project will consider for employment

7.6.2.5.1 Socio-economic profile of Surveyed Ragpickers

Refer to section 5.4.14.2 for details.

7.6.2.5.2 Vulnerability assessment of Ragpickers

Refer to section 5.4.14.2 for details.

7.6.2.5.3 Control measures

The project has formally communicated its apprehensions regarding the potential livelihood impact on ragpickers to the Rajkot Municipal Corporation (RMC). In an ongoing dialogue, the project is actively engaged in discussions with RMC to explore viable solutions. Specifically, there is a proposition under consideration to provide alternative opportunities for ragpickers at the transfer station. The transfer station, currently serving as an intermediary point for door-to-door collected waste before its ultimate disposal in the landfill, is envisaged to play a pivotal role in the waste management process, potentially serving the future waste-to-energy plant. Refer to **Appendix 18** for letter of support to the impacted ragpickers issued by RMC.

7.6.2.5.4 Requirement of standalone Livelihood Restoration Plan

Upon comprehensive examination of the survey data and analysis, it is evident that the implementation of a standalone livelihood restoration plan may not be imperative. The rationale behind this conclusion is expounded below:

Diversity in Livelihood Options – (i) The data underscores that rag picking is not the exclusive livelihood option for individuals at the landfill site; and (ii)Respondents engaging in rag picking activities also participate in other livelihood options, indicating a diversified approach to income generation.

Supplementary Nature of Rag picking – (i) Rag picking is perceived as an additional source of income for the family by those involved in the activity; and (ii) Rather than being the sole means of livelihood, rag picking is regarded as supplementary, suggesting that individuals have multiple economic avenues.

However, it is crucial to note that due to the operation of the plant, there will be a cessation of fresh waste dumping at the landfill, which serves as the primary source of income for ragpickers. Consequently, the Project recognizes the need for livelihood

restoration measures to mitigate or minimize the anticipated livelihood loss associated with rag picking activities. The adoption of targeted measures will aim to support affected individuals in transitioning to alternative livelihood options and sustaining their economic well-being.

7.6.2.5.5 Magnitude of Impacts

The magnitude of the impact of the project's operation on the livelihoods of ragpickers is considered **significant**. With the transition from traditional waste management practices to the waste-to-energy plant model, there is a foreseeable reduction in the availability of fresh waste at landfills. This shift poses a challenge to the existing rag picking activities, which heavily rely on the accessibility to such waste for their livelihoods.

7.6.2.5.6 Proposed Mitigations Measure

- Identification and Engagement:
  - Undertake a thorough survey covering all households to identify the affected ragpickers. This survey should also include an assessment of their socio-economic profiles at the household level.
  - Engage with the RMC to secure access cards or identification for these ragpickers, granting them entry to both the existing and proposed Transfer Stations (TS).
  - Facilitate Connections with NGOs and Material Recovery Facilities (MRFs): Connect the ragpickers with relevant non-governmental organizations (NGOs) or organizations operating MRFs at the existing or upcoming transfer station. Additionally, when developing new transfer stations with new MRF facilities, collaborate with the RMC to prioritize employment opportunities for the impacted ragpickers within these new MRF facilities.
- Absorption in Waste Sorting activities at the Project:
  - *Vulnerability Assessment and Prioritization:* (i) Conduct a comprehensive assessment of the vulnerability level among ragpickers based on the household census survey; (ii) Prioritize employment opportunities for the most vulnerable ragpickers within the project, provided they possess the requisite skills; and (iii) If vulnerable ragpickers lack the necessary skills, the project should offer training to enable them to qualify for employment.
  - *Targeting Vulnerable Groups:* (i) Based on the sample survey, it has been observed that the most vulnerable category of ragpickers comprises those belonging to the Other Backward Class (OBC) who rely on rag picking as their primary occupation. However, the project must finalize the vulnerability index based on the results of the 100% household survey.

    The critical number on vulnerability to consider bases of sample survey undertaken:

Attributes	Total Numbers	Remarks
Numbers of livelihood survey undertaken for sample ragpickers		
Sample Size	34	17% of total 200 ragpickers involved in rag picking at Rajkot Landfill
Number of responders with Rag picking as primary Occupation	12	35% of total 34 responders
Most vulnerable population (OBC)	16	47% of total 34 responders
Critical numbers out of total 200 ragpickers based on the percentage obtained from the sample survey		
Total number of ragpickers with primary occupation as rag picking	70	35% of 200 ragpickers
Most Vulnerable population (OBC)	94	47% of 200 ragpickers

- Improvement of working conditions of ragpickers:
  - *Strengthen Collaboration with RMC for Ragpickers' Welfare*: (i) Collaborate closely with the Rajkot Municipal Corporation (RMC) to improve the working conditions of ragpickers at both the transfer stations and Material Recovery Facilities (MRFs); and (ii) Prioritize safety practices, including the provision of Personal Protective Equipment (PPE), and ensure access to clean drinking water for these workers.
  - *Corporate Social Responsibility (CSR) Initiatives*: The project can undertake the following above activity of improving working conditions as part of the Corporate Social Responsibility (CSR) activities.

- Skill training and alternate livelihoods:
  - Implement skill training programs designed to create alternate employment and livelihood opportunities within the waste value chain, specifically focusing on the impacted ragpickers and waste recycling industry.
  - Prioritize individuals who express a desire to transition away from rag picking. Empower them with skills relevant to other sectors, ensuring that they can successfully transition to more sustainable livelihoods.
  - Preference should be given to impacted ragpickers and waste recyclers whose livelihoods are directly tied to the recyclable waste collected by these impacted ragpickers.
  - The skill training program can also be implemented or run as part of the CSR activity.
- Implementation of Livelihood Restoration Plan (LRP) note:
  - Once the LRP note's plan is implemented, conduct a comprehensive household survey of all ragpickers (200) impacted by the Project.
  - Utilize the survey data to tailor the livelihood plan according to the specific needs and aspirations of each ragpickers, ensuring their socio-economic well-being is adequately addressed.
- Monitoring Plan:
  - *Regular Site visit:* (i) Conduct regular site visits to the Transfer Stations (TS) and waste sorting facilities to ensure that ragpickers have access and are effectively engaged in the provided mitigation measures; and (ii) Document observations regarding working conditions, provision of PPE, access to clean water, and participation in skill training programs.
  - *Data Collection and Analysis:* (i) Collect data on the number of ragpickers provided with access/ID cards to TS, absorbed into waste sorting facilities, and enrolled in skill training programs; and (ii) Analyze the data to assess the effectiveness of the mitigation measures in mitigating the impact on ragpickers and facilitating their transition to alternate livelihoods.
  - *Stakeholder Engagement:* (i) Engage with ragpickers, NGOs, Rajkot Municipal Corporation (RMC), and other relevant stakeholders to gather feedback on the implementation of mitigation measures; and (ii) Organize periodic meetings or workshops to solicit inputs, address concerns, and gather suggestions for improvement.
  - *Performance Indicators:* (i) Develop key performance indicators (KPIs) to measure the success of the mitigation measures, such as the percentage of ragpickers provided access to TS, percentage absorbed into waste sorting facilities, percentage enrolled in skill training; and 100% employment or enrollment at transfer station of the most vulnerable ragpickers' group; and (ii) Monitor these indicators on quarterly basis and adjust mitigation strategies as needed based on the results.
- Grievance Redressal mechanism:
  - *Establish Grievance Redressal Mechanism:* (i) Set up a dedicated grievance redressal mechanism to address concerns and complaints raised by ragpickers regarding the implementation of mitigation measures; and (ii) Designate a focal point within the project team responsible for receiving and addressing grievances in a timely manner.
  - *Accessibility and Transparency:* (i) Ensure that the grievance redressal mechanism is easily accessible to ragpickers, with clear information provided on how to submit grievances and the expected timeline for resolution; and (ii) Maintain transparency throughout the grievance resolution process, keeping affected individuals informed of the status of their grievances and any actions taken.
  - *Confidentiality and Protection:* (i) Treat all grievances with confidentiality and sensitivity, respecting the privacy and dignity of the complainants; and (ii) Implement measures to protect individuals who raise grievances from any form of retaliation or discrimination.
  - *Continuous Improvement:* (i) Regularly review and evaluate the effectiveness of the grievance redressal mechanism, soliciting feedback from ragpickers and other stakeholders on its accessibility, responsiveness, and fairness; and (ii) Use feedback to identify areas for improvement and implement corrective actions to enhance the effectiveness of the grievance redressal process.

	Nature of Impact	Spread of Impact	Duration	Intensity	Frequency	Significance of Impact
Without Mitigation Measures	Negative	Local	Long	Moderate	Routine	**Substantial**
With Mitigation Measures	Negative	Local	Long	Moderate-Low	Routine	**Small Substantial**

7.6.2.6 Supply chain management

The supply chain of the Project is a complex network that involves the efficient management of resources, waste streams, technology, and partnerships. It encompasses various stages from waste collection to the generation of electricity. Here is an overview of the key components of the supply chain:

- The supply chain initiates with the collection of municipal solid waste (MSW) from households' door-to-door collection. The door-to-door collection of the waste will be undertaken by Rajkot Municipal Corporation (RMC) through its authorised contractor and vendors. The household waste is collected through small trucks (tippers), the waste is then transported to transfer stations for preliminary sorting and transportation in bulk quantity.
- The sorted waste, including fresh waste, is transported from transfer stations to the Waste-to-Energy plant. The trans Efficient logistics and transportation are vital to maintaining the continuity of waste supply to the plant
- The project will also deal with legacy waste obtained through biomining activities. Biomining includes the extraction of valuable materials from existing landfill sites. This phase is crucial for sourcing additional waste for the WTE plant. The biomining activity is the critical part of the supply chain of the project.

7.6.2.6.1 Control measures planned for the Project's supply chain

The operational phase of the project has not commenced, and consequently, definitive control measures for its supply chain are yet to be implemented by the project.

7.6.2.6.2 Impact Magnitude

The magnitude of the supply chain of the project is considered as **Significant.** In the comprehensive assessment of the waste-to-energy project's supply chain, several critical observations and concerns have been identified:

1. Door-to-door Waste Collection and Transportation
   - **Process Overview:** The key component involves the collection and transportation of household waste to the transfer station.
   - **Contractor Responsibility:** The waste collection process is executed by contractors engaged by the Rajkot Municipal Corporation (RMC).
   - **Risk of Child Labour:** During site visits, it was noted that the appointment of drivers and helpers by the contractors lacks direct supervision by RMC, potentially posing a risk of child labour (especially for helpers) in this stage.
2. Waste Collector Employment Practices:
   - **Pre-Transportation Stage:** Waste collectors, responsible for house-to-house waste collection, may be employed directly by the municipality or contracted through private companies.
   - **Lack of Monitoring:** In cases where waste collectors are employed by private companies, there is a notable absence of effective monitoring mechanisms to ensure the non-employment of child labour.
3. Biomining Waste Operations
   - **Independent Contractor Involvement:** Biomining activities, a crucial phase in waste processing, are outsourced to independent contractors.
   - **Child Involvement:** Site visits have revealed the presence of children in biomining activities, indicating a significant risk of child labour within this aspect of the Project's supply chain.

7.6.2.6.3 Proposed Mitigation Measures

1. Strengthened Contractor Oversight:
   - Action Steps:
     - Implement stringent monitoring mechanisms for contractors involved in waste collection and transportation. The project shall request RMC to undertake the monitoring, or the project shall undertake the monitoring in support of RMC.
     - Conduct regular audits to ensure compliance with ethical employment practices.
     - Establish a clear framework for the appointment of drivers and helpers, and waste collectors, emphasizing the prohibition of child labour.
2. Contractual Obligations on Biomining Contractors:
   - Action Steps:
     - Embed child labour prohibition clauses in the contracts with biomining contractors.
     - Include stringent penalties for non-compliance with ethical employment practices.
     - Mandate biomining contractors to provide evidence of their commitment to child labour-free operations.
3. Capacity Building and Training:

- Action Steps:
  - Provide training sessions for contractors and subcontractors on the prohibition of child labour.
  - Raise awareness about the legal and ethical implications of employing children in the waste-to-energy supply chain.
  - Empower contractors with the knowledge and resources to implement and uphold child labour-free practices.

4. Child Labour Due Diligence:
   - Action Steps:
     - Conduct periodic due diligence assessments on all stages of the supply chain to identify and address child labour risks.
     - Engage with local child protection organizations to enhance the effectiveness of monitoring efforts.
     - Regularly update and refine the due diligence process to align with evolving standards and regulations.

	Nature of Impact	Spread of Impact	Duration	Intensity	Frequency	Significance of Impact
Without Mitigation Measures	Negative	Local	Short-Long	High	Routine	Substantial
With Mitigation Measures	Negative	Local	Short-Long	Low	Routine	Negligible

7.6.3 Construction and Operation Phase

7.6.3.1 Contractor Management

As part of this assessment, contractor management refers to the process of overseeing and managing contractors who are hired by the project to provide human resource to perform specific tasks for operation of the WTE plant.

As reported, throughout the operational phase of the project, contractors will be enlisted to furnish contractual workers proficient in various skill levels, ranging from skilled to semi-skilled and unskilled. The primary areas of engagement for these contractors will predominantly include tasks such as waste handling and the provision of security personnel.

Further, the compliance status of the contractor in against the applicable labour national regulations is provided as part of the Appendix 20 .

7.6.3.1.1 Control Measures in Place

The key considerations covered by the Project's adopted procedure for contractor management[85] are provided below:

- Contractual Agreement: As a process, GWRPL has established clear and detailed contracts that outline the terms and conditions of the employment relationship between the project and the contractor. The contact includes information about compliance with related laws on working hours, wages or compensation, duration of the contract, termination clauses, and working conditions and terms of employment related specific obligations or requirement. Contractors sign the established contract.
- Monitoring and audition of contractors on their compliance with labour laws: Contract workers, are entitled to certain rights and protection under applicable Indian labour laws. Therefore, to ensure that the contract workers' working condition comply with applicable labour laws and regulations, GWRPL has prepared a legal and statutory compliance period checklist. The checklist is filled by GWRPL against the compliance status of the appointed contractor. The key acts and their requirements covered by the checklist is outlined below:

Table 7-21 Internal HR auditing checklist with details of key acts covered and frequency of auditing

Sr. No.	Key Acts and associated rules	Acts' Requirements with frequency of auditing			
		Daily	Monthly	Half-yearly	Yearly
1	The Contract Labour (Regulation & Abolition) Act, 1970 and the Contract	a. Muster Roll b. Attendance Card	a. Wage bill	-	c. Labour License

[85]

Sr. No.	Key Acts and associated rules	Acts' Requirements with frequency of auditing			
		Daily	Monthly	Half-yearly	Yearly
	Labour (Regulation & Abolition) Rules, 1971		b. Employee of Contractor register c. Employment Card d. Service certificate e. Wage Register f. Wage Slips g. Damage/loss register h. Fine Register i. Advance Register j. Overtime Register		d. Service Agreement
2	The Factories Act, 1948 & the Gujarat Factories Rules, 1963	-	a. Adult Register b. Leave with wage register c. Leave Book	-	-
3	Statutory compliance	-	a. PF – Challan b. ESI – Challan c. Provisional tax – challan	a. LWF - Challan	-
4	The Payment of Bonus Act, 1965 and the Payment of Bonus Rules, 1975	-	-	-	a. Computation of allocable surplus b. Set-on and set-off of allocable surplus c. Bonus paid to employees d. Annual return – Bonus paid to employees
5	The Payment of Gratuity Act, 1972 and the Payment of Gratuity Rules, 1973	-	a. Nomination form	-	-
6	The Employees' Provident Fund & Miscellaneous Provisions Act, 1952	-	a. Nomination Form	-	-
7	The Employees' State Insurance Act, 1948	-	a. Nomination Form	-	-

- **Non-discrimination and equal opportunity:** Contract workers should be treated fairly and without discrimination based on factors such as race, gender, age, religion, disability, or any other protected characteristics. To ensure, the non-discrimination and equal opportunity, Abellon has established an Equal Opportunity and Non-discrimination policy.
- **Grievance Redressal Mechanism:** The provision of grievance redressal mechanism as per Abellon's Grievance Redressal Policy has been implemented at the Project level to resolve the grievance raised by the contractual workers

7.6.3.1.2 Impact magnitude

The impact magnitude of contractor management is classified as **substantial**, the reasoning for the same is provided below:

- Given the complexity of the Waste-to-Energy Project, any delays in operational phases can significantly impact overall energy producing efficiency. Effective contractor management is crucial for minimizing delays and ensuring timely completion.

- The Waste-to-Energy Project involves potentially hazardous activities. The impact on health and safety is of utmost importance, making effective contractor management critical to minimize accidents and ensure a safe working environment
- The Waste-to-Energy sector is subject to stringent environmental and labour regulatory standards. Failure to comply can result in legal and reputational consequences. Proper contractor management is vital to ensure all activities align with established standards.

7.6.3.1.3 Proposed Mitigation Measures

Proposed mitigation measures for contractor management:

- Provide comprehensive training to contractors on the established contractual agreements, emphasizing compliance with labour laws, working conditions, and terms of employment. Regular awareness sessions should be conducted to ensure contractors understand and adhere to project expectations.
- Strengthen the monitoring process by conducting regular audits on contractor compliance. Increase the frequency of internal HR audits outlined in the checklist. This includes daily checks on items like muster rolls and attendance cards, monthly checks on wage-related documents, and yearly audits on critical acts such as the Contract Labour (Regulation & Abolition) Act.
- Organize capacity-building workshops for contractors, focusing on educating them about key labour laws, safety regulations, and ethical labour practices. This proactive approach can contribute to improved contractor understanding and compliance.
- Reinforce non-discrimination and equal opportunity principles through targeted training sessions. Contractors should be educated on the Equal Opportunity and Non-discrimination policy, emphasizing the importance of treating all workers fairly regardless of race, gender, age, religion, disability, or any other protected characteristics.
- Strengthen the existing grievance redressal mechanism by promoting transparency and accessibility. Ensure that contractual workers are aware of the grievance redressal process and can easily report concerns. Regularly review and update the mechanism based on feedback and evolving needs.
- Foster a collaborative partnership with contractors through regular communication channels. Conduct joint workshops and forums to address challenges, share best practices, and build a sense of shared responsibility for the success of the project.
- Conduct periodic reviews of policies, ensuring they remain aligned with evolving labour laws and industry best practices. Regularly update contractors on policy changes and provide the necessary support for implementation.
- The project shall ensure that appointed contractor shall obtain the registration as per the requirement of Employees' Provident Funds and Miscellaneous Provisions Act, 1952 (refer to **Appendix 20** for more details).

	Nature of Impact	Spread of Impact	Duration	Intensity	Frequency	Significance of Impact
Without Mitigation Measures	Negative	Local	Short-Long	High	Routine	Substantial
With Mitigation Measures	Negative	Local	Short-Long	Low	Routine	Small

7.7 Impacts of Increased Traffic / Vehicle Movement

Although the transportation of municipal waste to the Waste to Energy plant comes under the scope of Rajkot Municipal Corporation (RMC), however the potential impact of Increased Traffic / Vehicle Movement has been assessed here as it is a linked activity.

During the operation phase, the municipal waste will be collected from different area of the city and transported to the Waste to Energy plant. Approximately 80-100 Vehicles are anticipated to bring fresh waste to the Waste to Energy plant. Legacy waste using 10-15 trucks will be brought from the dumping area as well. This will contribute to the overall traffic / vehicle movement on the major roads of the city; increase in fugitive emissions and noise level. This may also have risk of accidents while transportation. Positively, no movement of these trucks was identified in the wildlife prone protected area.

One Schedule I reptiles, Bengal Monitor Lizard (*Varanus bengalensis*) (Wild Life (Protection) Act, 1972) and three Schedule I mammals, Bengal Fox (*Vulpes bengalensis*), Chinkara (*Gazella bennetti*), Golden Jackal (*Canis aureus*), Indian Porcupine (*Hystrix indica*), Indian Wolf (*Canis lupus pallipes*) & Jungle Cat (*Felis chaus*) have been recorded from the study area. Beside these species, Nilgai (*Boselaphus tragocamelus*), Wild Boar (*Sus scrofa*), Banded Racer (*Platyceps plinii*), Common Krait (*Bungarus caeruleus*), Indian cobra (*Naja naja*), Oriental Ratsnake (*Ptyas mucosa*) and Saw-scaled Vipers (*Echis carinatus*) were also reported from the study area. Any addition to the regular traffic / vehicle movement may raise the risk of road hits/kills of wildlife.

Control Measures planned for the Project

- Transportation of municipal waste is in the scope of Rajkot Municipal Corporation (RMC).
- Transportation is done through covered vehicles.
- Specified route will be used for transportation

Impact Magnitude

As the project is established for a long time and transportation of municipal waste will continue till the life of the project, thus the **Duration** has been *permanent*. The **Spread** has been classified as *medium*. The **Intensity** has been classified as *moderate* as the numbers and ecological significance of species under the risk. Thus, the impact magnitude has been classified as ***Substantial*** based on the impact significance criteria (***refer 7.3.2***).

Additional Mitigation Measures

The proposed mitigations to minimize the impacts of increased traffic / vehicle movement have been given as,

- Adequate training on defensive driving and handling of waste to be provided to the drivers.
- Adequate parking to be proposed within the plant premises to prevent discomfort to the local community.
- It is to be ensure that trucks are covered well while transporting MSW/ legacy waste to site and while transporting ash from site.
- The trucks/trailers drivers should be instructed not to blow horns unnecessary
- The drivers should follow the speed limit instructed by highway authorities (in the form of signboards)
- Annual awareness/training programs should be conducted for drivers to minimize the risk of wildlife hitting and/or being killed on highways and road safety
- Water sprinkling to be carried out, as required, on the unpaved road
- Sudden acceleration or de-acceleration of vehicles produces more pollution than a vehicle maintaining a constant speed. Smoother flow of traffic within the parking area and within the project premises would ensure lesser pollution from the vehicles
- Anti-honking sign boards to be placed in the parking areas and at entry / exit points
- Regular inspection / maintenance of vehicles to be carried out

	Nature of Impact	Spread of Impact	Duration	Intensity	Receptor Vulnerability	Significance of Impact
Without Mitigation Measures	Negative	Medium	Permanent	Moderate	Low (Species)	Substantial

With Mitigation Measures	Negative	Local	Permanent	Low	Low (Species)	**Small**

7.8 Cumulative Impacts

There are no new projects proposed in immediate proximity of the WTE plant. Nor any other developmental projects are proposed in immediate future. Therefore, no cumulative impacts are anticipated from the construction and operation of the Project.

8 Environment & Social Management and Monitoring Plan

This section presents the Environmental and Social Management Plan (ESMP) for the Project. The purpose of this ESMP is to specify the standards and controls required to manage and monitor environmental and social impacts during construction and operation phase. 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 with the applicable reference standards which emphasizes the importance of managing social and environmental performance throughout the lifecycle of the Project.

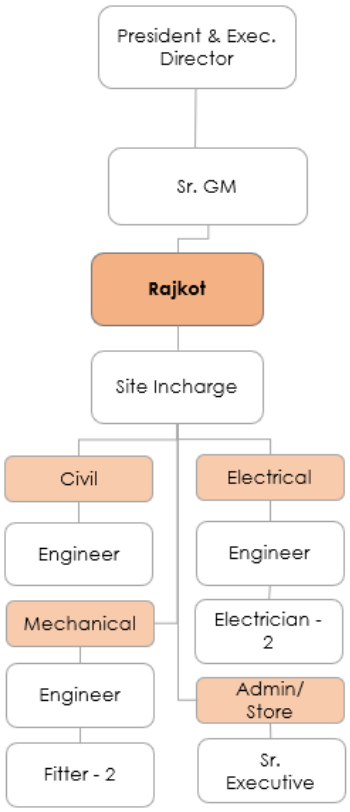
8.1 Organizational Structure

The Project at the corporate level is headed by the ACEL's President and Executive Director who is supported by Senior General Manager. Currently EHS officer position at the corporate level is vacant and ACEL is under process to hire a dedicated EHS officer at the corporate level to monitor EHS aspects at all the ACEL's WTE sites including the under construction 14.90 MW project at Rajkot.

At site level, the under-construction project is being monitored by GWRPL's team comprising of Site In charge who is supported by Civil and Electrical Engineers, Mechanical Engineer, Senior Executive and Electricians.

The project is being developed by the EPC contractor (Dave Construction & Engineering Company) who has deployed a dedicated site in-charge for day-to-day construction monitoring at site who is supported by Senior Site Engineer, site supervisor, QA/QC Engineer, and accountant/store in-charge. The EPC contractor has also deployed a cluster specific construction safety engineer who is responsible for managing safety aspects of Dave Construction & Engineering Company. As reported, the construction Safety Engineer visit the project site on random basis to monitor the health and safety aspects associated with the project.

Figure 8-1 Organizational Structure- Construction Phase



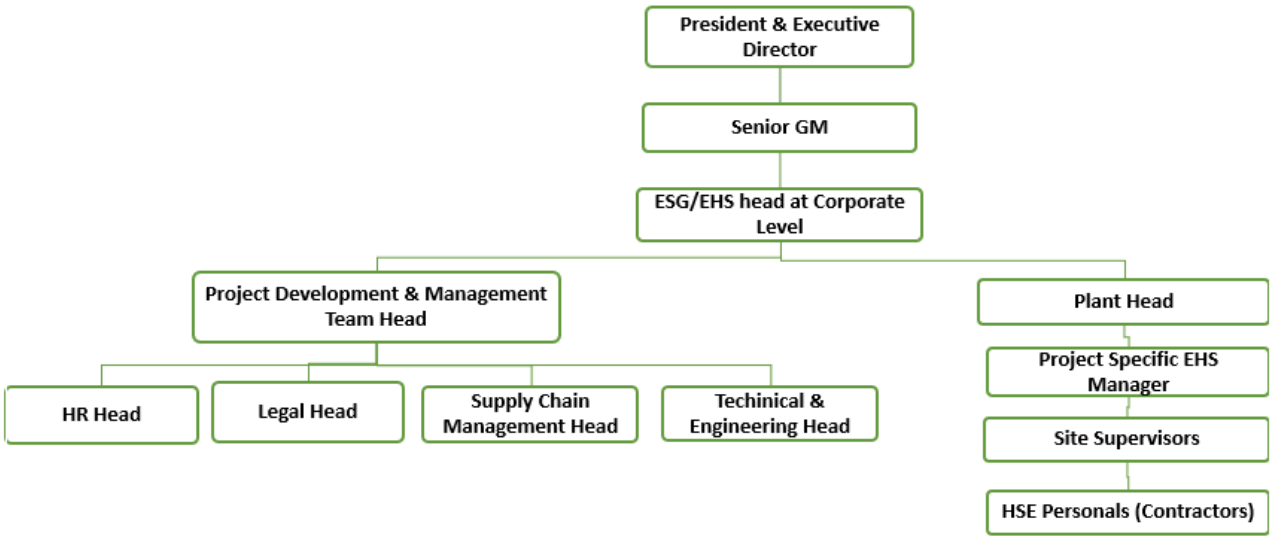
To ensure the efficacy of environmental and social management plan, certain institutional mechanism with well-defined roles and responsibilities is essential for effective implementation of identified mitigation measures both during construction and operation phases. GWRPL will have ultimate responsibility for implementing the provisions of the ESMP. This role will include the on-going management of environmental and social impacts, monitoring of contractor's performance as well as development of mechanisms for dealing with day to day environmental and social issues. GWRPL will also ensure that the activities of its

contractors are conducted in accordance with good practice measures, implementation of which will be required through contractual documentation.

GWRPL during the operation phase of the project will have a dedicated HSE team (refer ***Figure 8-2***) comprising of 3 members, i.e., Project head, EHS Manager & Site Supervisor. The HSE Team which will be responsible for overall management of the project site, which will be headed by Project Manager and will be supported by EHS Manager. A dedicated EHS Manager will be appointed for overall HSE management of the site and will be supported by the Site Supervisor. EHS personal of the contractors will be reporting to the site supervisor.

Project Head will act as bridging gap between the corporate (ACEL) and the project SPV (GWRPL). Project Manager will be responsible for overlooking the on-going management of environmental and social impacts, monitoring of contractor's performance as well as development of mechanisms for Project SPV for dealing with environmental and social problems at site level. Project Head along with EHS Manager will also ensure that the activities of its contractors are conducted in accordance with good practice measures, implementation of which will be required through contractual documentation

Figure 8-2 Organizational Structure- Operation Phase



8.1.1 Roles and Responsibilities

The HSE team will be headed by Project Head. An outline for responsibilities of the proposed HSE team as mentioned ***in Figure 8-2*** is given below:

Role	Responsibility
Project Specific EHS Team	• Preparation of required documents on environmental and social management. • Ensuring availability of resources and appropriate institutional arrangements for 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;

Role	Responsibility
	• 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 • Reviewing and updating the ESMP as and when required for its effective implementation
WTE Plant Head	• Implementation of on-site procedures related to the E&S • Tracking of E&S compliance related aspects for regulatory and lenders' requirements • Ensuring incident reporting to corporate level • Identifying training and capacity building needs at Plants and coordinating with HR on training • Supervision of implementation of the ESMP, ESAP and other action plans developed for the Plants • Communication and reporting to corporate level. • Development of KPI's, resolution of issues and managing the manpower and the project.
Project Specific EHS Manager	• Conduct relevant EHS trainings for the site staffs. • Prepare and Collate E&S reports at the site level and share the same to the Project Head • Monitoring initiatives and progress against policy and other management systems to be submitted at the frequency established • Ensuring contractors, sub-contractors and vendors adhere to practices, trainings, etc. in line with E&S Policies and practices; • To supervising contractors and workers in reporting E&S violations and assisting them to effective implementation of corrective action & preventive action
Project Management Team	• To assisting the Project Manager in conducting assessment of social and environmental risks of project sites; • To coordinate with the State regulatory authorities for environmental approvals / permits; • Liaison and coordinate with the local community, local administration, police, medical facilities, fire station, etc.; • Initiate local labour recruitment and management, and • To conducting meetings with the local communities

8.2 Existing Policies & Management Plans

8.2.1 Environmental Health and Safety Policy

Abellon Clean Energy Limited at the corporate level has a dedicated Environment Health and Safety Policy duly signed by Managing Director and CEO. The policy highlights ACEL's commitment to carry out business operations with due regards to environment, safety and wellbeing of its people and the community. The policy mandate ACEL to comply with all legal requirements and regulations pertaining to health, safety, and environment. It also mandates ACEL to continually improve its management systems, processes and practices that enable a safe work environment, protect the health of workers, respect biodiversity, optimize use of natural resources, minimize pollution, and ensure integrity of the assets.

The Policy is applicable to all the ACEL's WTE plants including the GWRPL project. The overall responsibility of implementing the policy at the project site remains with the Operation Head or Project Head, as the case may be.

8.2.2 Social Policies

8.2.2.1 Human Recourse management

HR Policy : Abellon at the group level has established group level policies which refers to a set of guidelines and rules established by the Abellon to govern all of its waste-to-energy projects' practices and procedures related to managing its on-roll and contractual employees or human resources. These policies serve as a framework for HR decision-making and help ensure consistency, fairness, and compliance with legal and ethical standards. Here are some common areas covered by Abelson's human resource policies:

Contractor worker attendance policy: The policy aims at devising the guidelines with respect to attendance of contract workers, in compliance to the legal requirements and applicable laws, and commitment to the company's values of discipline and work-life balance. The policy defines three (3) shifts – each working for 8 hours, including break and charge handover time. Timing of shifts are as below:

- 1st shift – from 08:00 am to 04:00 pm (with a break of half an hour in rotation)
- 2nd shift – from 04:00 pm to 12:00 am (with a break of half an hour in rotation)
- 3rd shift – from 12: 00 am to 08:00 am (with a break of half an hour in rotation)
- General shift – 09:30 am to 06:00 pm (generally for manager level contractual employees)

Contract workers leave policy: The policy aims at devising the guidelines with respect to leave rules for contract workers, in accordance with various acts enacted as per the law and so applicable to the project's contractor, and commitment to the project's value of work-life balance and workers' well-being. The entitlement to leave will be subject to the leave rules made and amended by contract management forum from time to time.

Contract worker statutory benefits policy: The policy identifies the following benefits for all the contract workers:

- Provident Fund (PF) – as per provisions of the Employees' Provident Fund & Miscellaneous Provisions Act, 1952
- Employees' State Insurance (ESI) – as per provisions of the Employees' State Insurance Act, 1948
- Bonus – As per provisions of the Payment of Bonus Act, 1965
- Gratuity – As per provisions of the payment of Gratuity Act, 1972
- Employee's Compensation (EC) – As per provisions of the Employees' Compensation Act, 1923

Contractor Appointment Policy: The policy aims at devising the guidelines with respect to new contractor appointment, in compliance to the legal requirements and applicable laws. The following key aspects covered by the policy:

- Contractor shall submit necessary legal documents with seven (7) days of appointment and the personnel department will check the documents
- Contractor shall obtain applicable legal licenses and registrations
- Contractor must provide sufficient workers and maintain the workforce for assigned work as per terms and conditions of service agreement.
- Contractor must adhere to the company's 'Prohibition of child labour at workplace' policy.
- Contractor must issue gates pass, identity card and attendance card to all the workers deployed, and distribute wages to the workers
- Contractor must pay the workers as per the Minimum Wages Act, 1948, and must comply with the Factories Act, 1948; Building and other Construction workers' Act, 1996; Payment of Wages Act, 1936; and maintain compliance with other applicable Acts
- Contractor must submit the proof of remittance of Employee State Insurance (ESI) and Employee Provident Fund (EPF) every month on time
- Contractor shall ensure that the workers follow all safety rules at the workplace

Employee Retrenchment Policy: The policy aims at devising the guidelines with respect to retrenchment, in accordance with the provisions of Industrial Disputes Act, 1947 or clauses of agreement (appointment letter) between the company and employee, and commitment to the company's value of security, harmony, and fairness. The policy detailed out the following guidelines and process:

- No Employee will be retrenched under normal circumstances
- In inevitable circumstances, if the company retrenches the employees whose continuous service is not less than a year, then the company will serve one month's notice in writing, indicating the reasons for retrenchment and the period of notice. Also mentioned would be whether the period of notice has expired, or the employees has been paid in lieu of such notice, or salary has been paid for the period of notice
- The company will follow the rule of 'last person to be employed to be retrenchment first' in that category
- The company will give preference to the retrenched employees for re-employment at the time of future recruitment and selection
- The company will abide by the provision of legal laws, and obtain necessary permission as applicable

Equal Opportunity and Non-discrimination policy: The policy aims at devising the guidelines with respect to providing equal opportunity and adopting non-discriminatory practices, in accordance with the relevant provisions under the Equal Remuneration Act, 1976, and commitment to the company's value of equity, diversity, and fairness. The scope of the policy covers with on-roll employee and contract workers

Grievance Handling Policy: The key objective of the policy is to lay down the guidelines with respect to grievance handling, in accordance with the relevant provisions of the Industrial Disputes Act, 1947 that will form an integral part of overall policies, and commitment to the company's values of fairness, openness, and zero tolerance towards any misdeed. The scope of the policy covers with on-roll employee and contract workers.

Overtime and Compensation Policy: The scope of the policy covers on-roll employees and contract workers. The policy details out the following policy and processes:

- No employees/contract workers will be compelled or allowed to work at the WTE plant for more than 48 hours a week
- All employees/contract workers will be allowed half an hour rest in a day, after continuously working for 5 hours
- Overtime might be needed to handle emergencies, heavy workloads, or other issues. But frequent and excessive overtime work will not be allowed
- Total hours of work along with overtime of employee/contract worker will not exceed 60 hours of work a week in any case. Total number of hours of overtime will not exceed 50 hours a quarter
- The company will advise employees/contract workers to work overtime only when they have to finish urgent work, and up to the stipulated hours
- When employees/contract workers work at the WTE plant for more than 8 hours a day or more than 48 hours a week, she/he, with respect to overtime done, will be entitled for allowance at the rate of twice her/his ordinary rate of salary/wage

Prevention of Sexual Harassment at Workplace Policy: The policy aims of the policy to lay down guidelines with respect to prevention of sexual harassment, in accordance with the recently laid down statue of the Sexual Harassment of Women at Workplace (Prevention, Prohibition, and Redressal) Act, 2013 and the Sexual Harassment of Women at Workplace (Prevention, Prohibition and Redressal) Rules, 2013, and commitment to the Abellon's value of fairness, equality, and zero tolerance any misdemeanour. The scope of the policy covers both category of on-roll employees and contract workers.

Prohibition of Child Labour at Workplace Policy: The primary objective of the policy is to prohibit employment of child labour at workplace, in accordance with the relevant provisions under the Child Labour (Prohibition and Regulation) Act, 1986, and commitment to the Abellon's values of sensitivity and compassion, thereby, ensuring no human exploitation, especially children. The scope of the policy covers both category of on-roll employees and contract workers

8.2.2.2 Contractor Management

As part of this assessment, contractor management refers to the process of overseeing and managing contractors who are hired by the project to provide human resource to perform specific tasks for operation of the WTE plant. The key considerations covered by the Project's adopted procedure for contractor management are provided below:

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- Monitoring and audition of contractors on their compliance with labour laws: Contract workers, are entitled to certain rights and protection under applicable Indian labour laws. Therefore, to ensure that the contract workers' working condition comply with applicable labour laws and regulations, GWRPL has prepared a legal and statutory compliance period checklist. The checklist is filled by GWRPL against the compliance status of the appointed contractor. The key acts and their requirements covered by the checklist is outlined below:

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9	The Factories Act, 1948 & the Gujarat Factories Rules, 1963	-	• Adult Register • Leave with wage register • Leave Book	-	-
10	Statutory compliance	-	• PF – Challan • ESI – Challan • Provisional tax – challan	a. LWF - Challan	-
11	The Payment of Bonus Act, 1965 and the Payment of Bonus Rules, 1975	-	-	-	• Computation of allocable surplus • Set-on and set-off of allocable surplus • Bonus paid to employees • Annual return – Bonus paid to employees
12	The Payment of Gratuity Act, 1972 and the Payment of Gratuity Rules, 1973	-	Nomination form	-	-
13	The Employees' Provident Fund & Miscellaneous Provisions Act, 1952	-	Nomination Form	-	-
14	The Employees' State Insurance Act, 1948	-	Nomination Form	-	-

As part of ESIA, the following management plans have been developed.

- Emergency Preparedness and Response Plan: The Project SPV shall maintain an Emergency Preparedness and Response Plan (EPRP) for the WTE plant's operations in collaboration with all relevant stakeholders such as the contractors, TL and water pipeline operators, residential areas, labour colonies, district authorities etc. It shall address identification of areas where accidents and emergency situations may occur, communities and individuals that may be impacted, response procedures, provision of equipment and resources, designation of responsibilities, communications, and periodic training to ensure effective response. Emergency Preparedness and Response Plan has been attached as ***Appendix 4***
- Traffic Management Plan: A traffic management plan assists in the prevention of personal injury, damage to WTE plant / vehicles and property, risk to community health & safety, etc. associated with the construction and operations of the

WTE plant. Construction phase involves transportation of raw material and manpower to the site and operations involve transportation of waste, export of waste residue & fly ash and movement of manpower to the WTE plant. Such activities will thus have a significant impact on the nearby community and surrounding villages, especially near schools and hospitals. In order to ensure compliance and good practice measures, a traffic management plan proposes certain planned activities along with control actions followed by the GWRPL, its contractors, and subcontractors involved. A Traffic Management Plan is provided as ***Appendix 7***

- Community Health & Safety: The project SPV has identified community health and safety risks and hazards associated with project life cycle and included mitigation for effectively managing the risks and minimize any incidents and accidents. Community Health & Safety Plan has been presented ***Appendix 16***.
- Occupational Health & Safety: Workers working in Waste to Energy (WTE) Plant will be exposed to hazards. These occupational H&S risks need to be identified and controlled. Site specific plan for occupational health and safety has been included as ***Appendix 14***
- Environmental and Social Monitoring Plan and Key Performance Indicators (KPI): Environmental and social monitoring is to assess environmental and working conditions and trends within the project site to monitor and ensure conformity with laws and regulations and to mitigate risks on the natural environment and protect the health of human beings. The monitoring will cover construction and operation phases. Site specific plan for environment and social monitoring has been included as ***Appendix 13***
- Contractor Management Plan: Using contractors involves engaging with an external organization which are outside the company's risk control activities and can place the workers, staff and company at risk. Contractor Management Plan ***(Appendix 5)*** covers contractor/ supplier selection criteria, specific and generic contract requirements on EHS&S compliance management, management measures around construction health and safety, labour accommodation, pollution prevention, resource efficiency, traffic safety, emergency response, and capacity requirements, as well as criteria for their performance evaluation.
- Pollution Prevention and Management: The construction and operation activities of projects, have a potential to generate a range of pollution sources that require proper planning from the outset to avoid resulting in impacts to human, ecological or other environmental receptors. These pollutants includes emissions to air, water and soil, amongst others. This Plan ***(Refer Appendix 6)*** applies to all activities undertaken by each project site and their Contractor/ Sub-contractors during construction/upgradation/expansion, operation & maintenance.
- Resource Efficiency and Conservation Management Plan: Proper resource efficiency and management planning of will enable GWRPL to promote sustainable growth while improving organizational efficiency and cost effectiveness of its business operations. Addressing resource efficiency should be a key goal for the business and something to be actively managed in order to be sustainable. ***Appendix 8*** enlists the steps for improving efficiency.
- Biodiversity Management Plan: In this plan, suggested selective measures have been agreed upon and are set to be implemented to mitigate the impact of identified risks and manage the existing biodiversity in the project area. (***Appendix 9***)
- Security Risk and management plan (Appendix 10): As WTE plant operations are limited in terms minimal workforce and there are no adverse impact on the general community, as well as WTE plant does not have armed security risk related to private security is not foreseen however in order to negate any possible risk , security management plan is prepared. Details are given in Appendix 10
- Stakeholder Engagement Plan & Grievance Handling and Redressal (Appendix 11): The stakeholder engagement is critical aspect for every project for maintaining strong relationships with every community. In order to carry out engagement activities detailed stakeholder engagement plan is given in Appendix 11. The Grievances and its management is essential for maintaining heathy relations with the concerned stakeholder which includes but not limited to community , workers/ staff and investors and other external stakeholders. Details of GRM is given in ***Appendix 11***.
- Labor Management and Working Conditions including labor camps (Appendix 12): As per the site conditions most of the civil work is already completed and the requirement of labour and labor camps management plan is limited as most of the labor force is already demobilized from the respective sites. However based on the need same can be implemented at site to manage the potential risk/ impacts. Details are given in ***Appendix 12***.

8.3 E&S Review and Communication

Regular inspection and monitoring of the environmental and social aspects as part of construction and operation phase activities will increase the effectiveness of the implementation of this system and will ensure that Policies, Management Plan and ESMP is addressing the most relevant risks. Through the process of inspection, audit and monitoring, GWRPL will ensure that all the requirements of the applicable framework, as suggested in the report, are effectively met. The inspections and audits will be done by GWRPL (project team) as well as Corporate team (ACEL) and the entire process of inspections and audits/ monitoring will be documented.

GWRPL 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 acceptable level of detail. Reporting will be done in form of environmental checklist, incident record register, training records, and environmental and social performance reports (weekly, monthly, quarterly, half-yearly, yearly etc.) for example environmental check list, incident record register, training records etc.

8.3.1 Key Performance Indicators

GWRPL will also consider mapping its activities against international standards and benchmarks and identify key performance indicators based on risks and opportunities associated with project portfolio operations.

Table 8-2 Key Performance Indicators

Overarching Themes	Performance Indicators
E&S Management	• Number of trainings conducted on EHS & Social Policy and ESMS • Regulatory issues identified proactively and resolved • Number of notices of regulatory violations • Number of internal EHS compliance audits conducted during a year • Numbers of E&S findings and corrective actions from the audits
Labour Management & Working Conditions	• Adoption of a practices governing safe working conditions (including as access to water, sanitation) and PPE usage • Number and nature of internal grievances received, and time taken to redress the same • Improved % of women and differently abled as on roll employees and contractual workers • Voluntary and involuntary turnover rates of all employees
Pollution Prevention & Resource Efficiency	• Identification of organization wide opportunities or goals & targets to reduce consumption of resources such as electricity, water, fuel (diesel) etc. • Total water consumption in a year • Zero discharge of waste water • Percentage reduction of greenhouse gas emissions • Percentage Reduction in air emissions; • Reduction in quantity of waste from the combustion process • Waste management targets (Fly ash and leachate management) • Reportable environmental incidents • Number of trainings conducted on sustainability aspects such as resource efficiency/resource conservation (e.g. water), GHG emission management amongst others
Health &Safety	• Number of EHS training/mock drills conducted during a year • Number of recordable injuries / illnesses that resulted in lost time • Number of near misses reported and recorded • Number of recordable incidents involving public/ community
Stakeholder Engagement	• Number of community outreach activities implemented by company. • Number of grievance registered and redressed.

Based on the above identified KPIs, Project Manager in coordination with department heads will review the significant aspects/ risks/ opportunities and consider for setting as organisational targets/ objectives. Also, whenever an aspects/ risks/ opportunity is leading to a business concern, it can be taken up as an objective along with the other set objectives. The final targets/ objectives will be approved by the ESG Head at corporate level.

The E&S objectives and targets will thus be established based on:

- Environment & Social Policy commitments of the organization;
- Legal and other requirements;
- Technological options - whether it is technically possible to reduce the scale of the risk;

- Financial requirements - whether a financial budget is available for implementing the necessary change;
- Operational requirements - what will be the operational control to reduce the impact/ risk;
- Business requirements - whether the objective will be important from a business point of view.

GWRPL will maintain a record of targets to introduce more resource efficient technology. New techniques develop over time so these should be referred to regularly. The E&S objectives and targets shall be communicated to all the relevant personnel for effective implementation of action plans and achievement of targets. The objectives and targets shall be reviewed every year by, in light of new regulations, new projects and commitments and changes in operations and updated.

8.3.2 Inspection, Review and Audit

Inspection and monitoring of the environmental impacts of the Project activities will increase the effectiveness of Management Plans and ESMP. Through the process of inspection and auditing, GWRPL will ensure that the conditions stipulated in various permits are complied. The inspections and audits will be done by trained personnel of GWRPL and conducted by EHS experts or external experts. The inspection and audit findings are to be implemented by the Project Manager in their respective projects.

EHS Team at project level will ensure that permits for the Project under all applicable laws under national legislations are in place, current and valid. The EHS Personal, if necessary, in consultation with Legal and Compliance Team will regularly review the regulatory environmental and social licenses applicable to the Project. Based on the required licenses, the EHS Personnel will maintain a document on monthly basis and update the license files. Project specific legal register should be available which include details of the existing permits and licenses, their validity and next renewal date, conditions stipulated under the particular permit, and how the project is complying with the condition. Any non-compliances will be immediately identified and corrective action will be taken accordingly.

Internally, the personnel delegated EHS roles, will share inspection and audit findings with their suggested measures regularly to the senior management and further to corporate level for their consideration. The same are also to be communicated within the staff working on the project. To maintain an open communication between the staff and management on EHS and social issues the followings are being used:

- Team Briefings
- On-site work group meetings; and
- Work Specific Instructions

Table 8-3 Review & Reporting Schedule

S. No	Type of Report	Development Responsibility	Supervisory Responsibility	Frequency
1	Report on Compliance to Work Plan including tool box talks, incident accident records, environment checklist, etc	Contractor EHS Personal	Project level EHS Manager	Weekly or Fortnightly
2	Progress reports on ESMP	Project level EHS Manager	Project Manager	Monthly
3	Training registers for staff and workers	Contractor's EHS Personal	Project level HR/ Project Specific EHS Manager	Monthly
4	Compliance to Environmental, Social/Labour related requirements	Project level HR and EHS Manager	Legal Head & Project Manager	Quarterly
5	Internal Audit Report	Project specific EHS Manager	Corporate Level ESG Head	Quarterly
6	Environment and Social Monitoring	Project specific EHS Manager	Project Manager & Corporate Level ESG Head	Quarterly and Half Yearly based on the requirements as specific

8.4 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, EHS department in coordination with personnel delegated EHS will be responsible for making the amendments in the ESMP and seeking approval from the authorities. The amended ESMP will be communicated to all the staff on the Project. Also, review and updation of the ESMP to be undertaken on regular intervals, i.e., once every two years to update and amend the ESMP (Please note this annual review of the ESMP is to be undertaken in addition to regular amendments to ESMP).

8.5 Trainings and Capacity Building

Training is needed for effective implementation of ESMP. The training programme will ensure that all concerned members of the team understand the following aspects:

- Purpose of management plan for the project activities
- Requirements of the management plan and specific action plans
- Understanding the sensitive environmental and social features within and surrounding the project areas
- Aware of the potential risks from the Project activities
- GWRPL will ensure that environmental health and safety induction training and job specific trainings are identified and given to the concerned personnel during both construction and operation phase.
- Also general environmental awareness will be increased among the project team to encourage the implementation of environmentally sound practices and compliance requirements of the project activities. This will help in minimizing adverse environmental impacts, compliance with the applicable regulations and standards, and achieving performance beyond compliance. The same level of awareness and commitment should be imparted to the contractors and sub-contractors prior to the commencement of the project.

Some of the specific trainings that will be carried out on routine basis have been provided below

Table 8-4 Training Requirement

SN	Type of Training	Project Team	Contractors & Subcontractors
1.	Environmental, Health & Safety	√	√
2.	Occupational Health & Safety	√	√
3.	Safety Induction	√	√
4.	Fire Safety and Prevention	√	√
5.	Electrical Safety	√	√
6.	Equipment Handling and Machinery Use	√	√
7.	Material Handling	√	√
8.	Training of security personnel on behavioral aspects	√	√
9.	Emergency Response Preparedness	√	√
10.	Lock Out & Tag Out	√	√
11.	Operational Training	√	√
12.	Hazard Identification & Risk Assessment	√	√
13.	First Aid	√	√
14.	Incident/Accident Reporting and Investigation	√	√
15.	Near Miss Reporting	√	√
16.	HR Induction Training	√	√
17.	Transportation	√	√
18.	Handling of Chemicals and Hazardous waste	√	√
19.	Spill Control	√	√

SN	Type of Training	Project Team	Contractors & Subcontractors
20.	Contractor Management Training	√	×
21.	PPE Training	√	√
22.	Biodiversity conservation, water management, pollution prevention	√	√
23.	Stakeholder engagement and grievance management	√	×

The above listed trainings are the mandatory trainings which will be undertaken at the inception stage once the employee/worker joins the Company and/or Project. Post that, monthly refresher trainings can be undertaken, especially for the workers as per their skill level. Any other applicable training will be identified and implemented during the project lifecycle as per the need assessment, as part of mitigation measure and also capacity building of the staffs.

Also, general environmental awareness will be increased among the project's team and workers to encourage the implementation of environmentally sound practices and compliance requirements of the project. This will help in minimizing adverse environmental impacts, compliance with the applicable regulations and standards, and achieving performance beyond compliance.

The same level of awareness and commitment will be imparted to the contractors and sub-contractors prior to the commencement of the project. In case of subcontractors, the training and capacity building will be done by the GWRPL EHS Team. Trainings will be conducted in a language and format understandable to the target audience.

Trainings imparted at the Project will be documented. The documentary proof of trainings imparted will be held as hard copy and as soft / digital copy. The records of each training will include the following details:

- Day / Date;
- Name of personnel providing the training, and their designation;
- Training topic and coverage;
- Location;
- Time and Duration of training;
- List of equipment used;
- Name of all participants, along with signatures; and
- Photo log with time stamp

8.6 Environment and Social Management Plan

This section outlines the potential impacts, mitigation measures, monitoring and management responsibilities during construction and operation phases of the Project. The purpose of ESMP is to:

- Provide an institutional mechanism with well-defined roles and responsibilities for ensuring that measures identified in ESIA designated to mitigate potential impacts are implemented
- List all suggested mitigation measures and control techniques, safeguards identified through the ESIA process
- Provide project monitoring program for effective implementation of the mitigation measures and ascertain efficacy of the environmental & social management and risk control system in place
- Assist in ensuring compliance with all relevant legislations at local, state and national level for the Project.

The ESMP for the project has been presented in ***Table 8-5.***

8.7 Documentation

Documentation is an important step in the implementation of 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:

- Legal Register
- Operation control procedures
- Incident reports
- Emergency preparedness and response procedures

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

Table 8-5 Construction Phase: Environment and Social Management Plan

Sr. No.	Environmental/Social Resources	Impact/Issues	Mitigation Measures	Responsibility for ensuring implementation of the suggested mitigation	Means of verification that mitigation has been met	Timeline/Frequency of Monitoring	Responsibility for implementation of monitoring	Supervisor responsibility	Reporting Requirements
			Physical Environment						
1.	Air Quality	Particulate, fugitive and vehicular emission	• The Project should update the existing CTE and ensure to include procurement of 1000 TPD MSW for operation of the project instead of 850 TPD mentioned in the CTE. Project to also discuss on the stack height with GPCB. • Vehicles entering site should be Pollution Under Control (PUC) certified • Periodic inspection of construction equipment and DG sets should be conducted by the onsite contractor. • DG sets (If any) used for power back up should be provided with adequate stack height as per CPCB norms[86] • A strict Project speed limit of 30 km/hr to be enforced for vehicles using un-metaled tracks and the RoW • Regular maintenance of construction vehicles and machinery • Use of Low-Emission Equipment's for minimize air pollution during the construction process. • Scheduling construction activities during off-peak hours to reduce exposure to pollutants. • Idling of vehicles and equipment must be prevented • Cease or phase down work if excess fugitive dust is observed. Investigate the source of dust and ensure proper suppression measures • Using windbreaks, netting screens or semi-permeable fences to reduce dust emissions from working areas close to sensitive, residential or agricultural locations or natural habitats • Adequately sized construction yard will be identified at the site for storage of construction materials, equipment tools, earthmoving equipment, etc. • Fuel tanks adequately designed to minimize fugitive emissions and welding gas cylinders will be stored in a secluded area within project site	Contractor's EHS representative	EHS Inspection	Monthly	Project EHS representative of GWRPL	EHS Manager at GWRPL	Report from Contractor EHS team to GWRPL EHS team
2.	Noise Quality	Impact on receptors	• Only well-maintained equipment should be operated on-site; • Anti-honking sign boards to be placed in the parking areas and at entry / exit points • If it is noticed that any particular equipment is generating too much noise then lubricating moving parts, tightening loose parts and replacing worn out components should be carried out to bring down the noise • Machinery and construction equipment that may be in intermittent use should be shut down or throttled down during non-work periods • Noise generating equipment should be located away from settlement to reduce the disturbance; • Noise limits for construction equipment to be installed at the project area during peak construction such as front loaders concrete mixers, cranes (moveable), 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; • Machinery and construction equipment that may be in intermittent use should be shut down or throttled down during non-work periods	Contractor's EHS representative	Visual Observation and EHS Inspection	Monthly	Project EHS representative of GWRPL	EHS Manager at GWRPL	Report from Contractor EHS team to GWRPL EHS team
3.	Soil Environment	Compaction and Contamination	• Dedicated waste storage areas should be developed at site • Onsite workers should be provided with adequate trainings on waste management. Requirement to impart EHS trainings to the workers should be included in the contractor's agreement. • Remaining construction waste which cannot be reused such as scraps, metals etc. should be disposed through authorized vendor. • Hazardous waste generated at site should be stored on impervious floor with secondary containment and disposed to authorized vendor in accordance with Hazardous and other Wastes (Management & Transboundary Movement) Rules, 2016 • Municipal waste generated onsite should be segregated and proper collection and handover to local municipal body/ local authority should be ensured for further disposal	Contractor's EHS representative	Visual Observation and EHS Inspection	Monthly	Project EHS representative of GWRPL	EHS Manager at GWRPL	Report from Contractor EHS team to GWRPL EHS team

[86] https://cpcbenvis.nic.in/scanned%20reports/EMISSION%20REGULATIONS%20PART_4.pdf

Sr. No.	Environmental/Social Resources	Impact/Issues	Mitigation Measures	Responsibility for ensuring implementation of the suggested mitigation	Means of verification that mitigation has been met	Timeline/Frequency of Monitoring	Responsibility for implementation of monitoring	Supervisor responsibility	Reporting Requirements
			• During servicing/repair of equipment or vehicles, a suitable drip tray shall be used to prevent oil/grease spills onto the soil, especially in case of emergency repairs • Oil spill kits should be maintained onsite to handle minor leaks and spillage • Unloading and loading protocols should be prepared for diesel, oil and used oil respectively and onsite workers should be trained to prevent/contain spills and leaks. • Spoils which cannot be reused should be disposed through authorized vendor • SPV to implement the developed waste management plan along with the ESMP onsite. • The stock piles of the soil should be kept moist to avoid wind erosion of the soil; • Soil to be ploughed in compacted area after completion of the construction work; • Top soil that has been stripped should be stored for landscaping, if feasible at the transmission line area or connecting substations; • As a best practice, site clearance, piling, excavation will not be carried out during the monsoon season to minimize erosion, compaction and run-off; • Site to be restored at the end; • EPC Contractors deployed for construction of associated TL and water pipeline should ensure that no unauthorized dumping of used oil and other hazardous waste is undertaken along the transmission and waterpipe line route • Construction and Demolition Waste should be stored separately and be periodically collected by an authorized vendor. • All waste should be stored in a shed that is protected from the elements (wind, rain, storms, etc.) and away from natural drainage channels. • Records should be maintained for quantity and type of hazardous waste generated. • It is to be ensured that hazardous waste is not stored for more than 90 days. Hazardous waste should be disposed through SPCB authorized hazardous waste vendor only. • Use of spill control kits to contain and clean minor spills and leaks. • Unloading and loading protocols should be prepared for diesel, and used oil (if generated) respectively and workers trained to prevent/contain spills and leaks. • In case of accidental/unintended spillage, the contaminated soil should be immediately collected and stored as hazardous waste. • Limited movement of vehicles should be permitted for stringing of transmission line near to settlements. • EPC contractor should restore the project site and surrounding area (if used for any temporary structure) to its original condition. GWRPL should inspect the site and ensure, the project site is properly restored prior to issuing completion certificate to the EPC contractors.						
4.	Water Resources	Availability & Contamination	• Sensitize workers on water conservation and encourage optimal use of water. Requirement to conduct such trainings should be included in the contractor's agreement. • Project should ensure it is compliant to the regulatory requirements for abstraction of water during project construction. • Reuse and recycle water to the extent possible • Regular inspection should be carried out for identifying water leaks and preventing water wastage • Optimum use of water during sprinkling on roads for dust settlement, washing of vehicles, concrete mixing for etc. • Groundwater quality monitoring should be conducted onsite quarterly during the construction phase	Contractor's EHS representative	Visual Observation and EHS Inspection	Monthly	Project EHS representative of GWRPL	EHS Manager at GWRPL	Report from Contractor EHS team to GWRPL EHS team
			Socioeconomics						
5.	Labor Influx	Unhygienic and unsafe living conditions	• As per the requirements of the EBRD/IFC guidelines on workers accommodation including well ventilated rooms with adequate bed and beddings, windows & doors should have insect nets, proper electrical connections with fan or any other arrangements for thermal comfort. • In addition, there should be separate toilet blocks for men and women and separate bathing and washing space. • Separate space for cooking , washing utensils and storage of food and fuel • The camps should be equipped to handle fire emergency. • Regular spray and other mechanism for disease control including health monitoring	Project in charge / HR/ EHS/ Contractor's EHS	Site inspection & visual observation and house keeping records	Weekly	Contractor site manager	Project in charge / EHS team	Housekeeping check list , photograph , inspection report

Sr. No.	Environmental/Social Resources	Impact/Issues	Mitigation Measures	Responsibility for ensuring implementation of the suggested mitigation	Means of verification that mitigation has been met	Timeline/Frequency of Monitoring	Responsibility for implementation of monitoring	Supervisor responsibility	Reporting Requirements
			• Develop check list for regular review & monitoring of the camps especially of the health and sanitation aspect and Dos & Don'ts to check any potential violence, substance, and alcohol abuse. • The Project shall provide training or induction program related to the gender sensitization and gender-based violence to all employees at the time of commencement of their job						
6.	Impact due to installation of transmission line	Temporary access and economic impact on roadside vendors, kiosks owners, and private landowners – construction phase	• Establish a grievance mechanism that allows affected stakeholders to raise concerns, provide feedback, and seek resolution for any project-related issues, • Ensure accessibility, transparency, and fairness in the grievance resolution process. • Implement the established Stakeholder Engagement Plan outlining how the project will engage with and involve stakeholders throughout the transmission line construction • Ensure that engagement is inclusive, transparent, and facilitates meaningful participation. • Undertake the practice of conducting construction activities (especially for the underground transmission line) during nighttime to minimize disruption to businesses and daily activities. • Maintain a phased approach to construction, allowing for the gradual restoration of affected areas. • Implement a comprehensive restoration plan, ensuring that areas impacted by construction activities are returned to a usable state. • Establish mechanisms for ongoing monitoring of the impact on stakeholders during and after construction. • Prepare regular reports outlining the progress of restoration efforts and addressing any challenges encountered. • Furthermore, in the event of any physical damage to the structures of roadside vendors and kiosk owners or any other form of privately owned or used physical structure resulting from the installation of the underground or overhead transmission line, the project shall fully compensate for the loss or damage to these structures' owner or user at replacement cost[87] or construct the structure as it was earlier to the construction activities.	Project Incharge / HR/ EHS/ Contractor's EHS	Site inspection & visual observation and verification of records	Daily	Contractor site manager	Project Incharge / EHS team	photograph , inspection report feedback and community complaints
7.	Impact due to laying down of water pipeline	installation of a 300-meter section of the water pipeline is anticipated to affect 20 roadside vendors and kiosks situated in the main market and habitation area of Gavridad. This impact is primarily related to the disruption of business activities for these vendors and kiosks, given that they operate within the Right of Way (RoW) of the state highway, which coincides with the identified route for laying down the water pipeline.	• Establish a grievance mechanism that allows affected stakeholders to raise concerns, provide feedback, and seek resolution for any project-related issues, • Ensure accessibility, transparency, and fairness in the grievance resolution process. • Implement the established Stakeholder Engagement Plan outlining how the project will engage with and involve stakeholders throughout the project lifecycle. • Ensure that engagement is inclusive, transparent, and facilitates meaningful participation. • Continue with the practice of conducting construction activities during nighttime to minimize disruption to businesses and daily activities. • Maintain a phased approach to construction, allowing for the gradual restoration of affected areas. • Implement a comprehensive restoration plan, ensuring that areas impacted by construction activities are returned to a usable state. • Establish mechanisms for ongoing monitoring of the impact on stakeholders during and after construction. • Prepare regular reports outlining the progress of restoration efforts and addressing any challenges encountered. • Furthermore, in the event of any physical damage to any form of privately owned or used physical structure resulting from the laying down of the underground water pipeline, the project shall fully compensate for the loss or damage to impacted structures' owner or user at replacement cost or construct the structure as it was earlier to the construction activities.	Project Incharge / HR/ EHS/ Contractor(s)' EHS	Site inspection & visual observation and verification of records	Daily	Contractor site manager	Project Incharge / EHS team	photograph, inspection report feedback and community complaints
8.	Increased local employment and Livelihood	Local employment & livelihood	• Project should develop guidelines/policies towards local employment and livelihood opportunity enhancement and include the local employment reporting the annual report . • Project should proactively disclose the local labor and other requirement at notice board and there should be open door policy towards local vendors registration. • Preference should be provided to local labor. However, the preference shall be based on available skillset and knowledge.	Project in charge /HR/ Contractor	Stakeholder engagement, verification of records	Monthly	HR/ Contractor	Project In charge	Job cards, PF records, wage register etc.

[87] The replacement cost as per IFC Performance Standard 5 (PS5) refers to the value required to allow Affected Communities and persons to replace lost assets with assets of similar value. It includes the market value of assets plus transaction costs and does not take depreciation into account.

Sr. No.	Environmental/Social Resources	Impact/Issues	Mitigation Measures	Responsibility for ensuring implementation of the suggested mitigation	Means of verification that mitigation has been met	Timeline/Frequency of Monitoring	Responsibility for implementation of monitoring	Supervisor responsibility	Reporting Requirements
			• Project shall provide equal access to both female and male local population in available employment opportunities and for greater employability of residents, technical/vocational training may be arranged for female and male, if required • Establish the functional stakeholder engagement including external communication plan and roll out grievance handling mechanism which should have provisions for receiving external grievances as well. • The project proponent will establish a mechanism to audit sub-contractors and suppliers with respect to compliance of utilizing local labor and resources,						
9.	Occupational Health & Safety	Electrocution, accident, fire hazard, respiratory and hearing problems while working at site	• GWRPL to develop dedicated environmental, health and safety (EHS) plan, Occupational Health & Safety Plan and emergency response plan (ERP) applicable to all project phases, i.e. construction as well as operation. Measures provided in the respective plans with respect to health and safety to be implemented at site. Refer ***Appendix 16*** • The Project to develop a training calendar and associated training materials to impart trainings at regular intervals to the contractors and workers. The trainings as per the training calendar should be provided to all the workers at the WTE plant, workers involved in construction of transmission line and underground water pipeline. • GWRPL to develop and maintain hazard identification and risk assessment (HIRA) for the project and its associated TL and water pipeline and communicate the same to the workers. The HIRA register should be update whenever a new hazard is identified at the site. • In line with the concession agreement, monthly/quarterly safety meetings should be conducted on site to discuss the unsafe work practices or conditions and suggest corrective actions. The minutes of the meeting (MoM) along with implementation of corrective actions to be shared with the EHS Manager at the corporate level. • The Project to develop a training calendar and associated training materials as part of the OHS to impart trainings at regular intervals to the contractors and workers. The trainings as per the training calendar should be provided to all the workers at the WTE plant, workers involved in construction of transmission line and underground water pipeline. • Project should conduct full body check-up of workers as part of premedical check-up and annual medical check-up. These should include blood test, ECG, Pulmonary Function test, urine test etc. • GWRPL to develop a formal procedure to record near miss, incident, and minor accidents onsite. • Permit-required confined spaces to be provided with safety measures for venting, monitoring, and rescue operations, to the extent possible. The area adjoining an access to a confined space should provide ample room for emergency and rescue operations. • Workers who are engaged in welding works will be provided with welder's protective eye shields; • Electrical and maintenance work should not be carried out during poor weather and during lightning strikes; • Obtain and check safety method statements from contractors. • Monitor health and safety performance and have an operating audit system. • Training of the workers on climbing techniques, and rescue of fall- arrested workers; • Appoint a trained person to take charge of the first aid boxes. The location of first aid arrangements to be displayed on site; • The nearest hospital, ambulance, fire station and police station should be identified in the implemented emergency management plan; • Establish a grievance redressal mechanism in place, to allow for the employees and workers to report any concern or grievance related to work activities. • GWRPL to develop a systematic monitoring and auditing mechanism for monitoring the contractors and sub-contractors in terms of resources, migrant workers, child labour and forced labour, health and safety, payment of wages etc.	Contractor's EHS representative	Visual Observation and EHS Inspection	Quarterly	Project EHS representative of GWRPL	EHS Manager at GWRPL	Report from Contractor EHS team to GWRPL EHS team
10.	Contractor Management	Contractor Management	• Provide comprehensive training to contractors on the established contractual agreements, emphasizing compliance with labor laws, working conditions, and terms of employment. Regular awareness sessions should be conducted to ensure contractors understand and adhere to project expectations. • Strengthen the monitoring process by conducting regular audits on contractor compliance. Increase the frequency of internal HR audits outlined in the checklist. This includes daily checks on items like muster	Project Incharge / HR/ EHS/ Contractor head/ Contractor(s)' EHS	Site inspection & visual observation and verification of records	During Maintenance	Contractor site manager	Project Incharge / EHS team	Internal Monitoring report

Sr. No.	Environmental/Social Resources	Impact/Issues	Mitigation Measures	Responsibility for ensuring implementation of the suggested mitigation	Means of verification that mitigation has been met	Timeline/Frequency of Monitoring	Responsibility for implementation of monitoring	Supervisor responsibility	Reporting Requirements
			rolls and attendance cards, monthly checks on wage-related documents, and yearly audits on critical acts such as the Contract Labour (Regulation & Abolition) Act. • Organize capacity-building workshops for contractors, focusing on educating them about key labor laws, safety regulations, and ethical labor practices. This proactive approach can contribute to improved contractor understanding and compliance. • Reinforce non-discrimination and equal opportunity principles through targeted training sessions. Contractors should be educated on the Equal Opportunity and Non-discrimination policy, emphasizing the importance of treating all workers fairly regardless of race, gender, age, religion, disability, or any other protected characteristics. • Strengthen the existing grievance redressal mechanism by promoting transparency and accessibility. Ensure that contractual workers are aware of the grievance redressal process and can easily report concerns. Regularly review and update the mechanism based on feedback and evolving needs. • Foster a collaborative partnership with contractors through regular communication channels. Conduct joint workshops and forums to address challenges, share best practices, and build a sense of shared responsibility for the success of the project. • Conduct periodic reviews of policies, ensuring they remain aligned with evolving labor laws and industry best practices. Regularly update contractors on policy changes and provide the necessary support for implementation • The project shall ensure that appointed contractor shall obtain the registration as per the requirement of Employees' Provident Funds and Miscellaneous Provisions Act, 1952 (refer to **Appendix 20** for more details)					
Biological Environment									
11.	Increase Anthropogenic movement	Increased Human activities, Noise and Sedimentation	• The construction activities should be restricted to the project area, routes of transmission line and underground water pipeline • Night-time (6:00 pm to 6:00 am) construction and transportation activities should be avoided • The areas of high animal activity (such as natural habitats), the construction and transportation activities should be avoided during dawn (6:00 am to 7:30 am) and dusk (5:00 pm to 6:30 pm) • Hazardous materials should be avoided to store near water bodies and drains • Sites with existing burrows or roosts should be avoided where possible, and temporary fencing should be installed over excavated areas (for underground water pipeline) • Efforts should be made to minimize construction noise and sound barriers should be considered if noise levels are high • Construction activities must implement proper housekeeping, properly dispose of discarded packaging materials, and provide labour camps with adequate sanitary facilities • Movement of workers between camps and construction sites should be restricted and they should not be allowed to visit in natural areas not included the planned construction activities	Contractor's EHS representative	Visual Observation and EHS Inspection	Quarterly	Project EHS representative of GWRPL	EHS Manager at GWRPL	Quarterly Report from Contractor EHS team to GWRPL EHS Manager

Table 8-6 Operation Phase: Environment and Social Management Plan

S. No	Environmental/Social Resources	Impact/Issues	Mitigation Measures	Responsibility for ensuring implementation of the suggested mitigation	Means of verification that mitigation has been met	Timeline/Frequency of Monitoring	Responsibility for implementation of monitoring	Supervisor responsibility	Reporting Requirements
			Physical Environment						
12.	Air Quality	Flue gas emission, dust emission and vehicular emission, particulate matter etc.	• Manual segregation and removal of chlorinated plastic and other elements unsuitable for thermal treatment. • Use extraction system to remove dust from working areas, buildings, and storage vessels, and treat as needed to control particulate emissions • Implement good housekeeping practices to reduce fugitive emissions and control dust and particulate matter within the facility. • According to the Point Source Air Emissions Prevention and Control Technologies provided in IFC EHS guidelines for air emissions and ambient air quality, the reduction efficiency of fabric filter should be 99-99.7% and that of ESP should be 97-99%.	GWRPL EHS Manager	EHS Inspection	Quarterly	GWRPL Project Head	EHS Head at ACEL	Report from EHS team to Project head and further to corporate team

S. No	Environmental/Social Resources	Impact/Issues	Mitigation Measures	Responsibility for ensuring implementation of the suggested mitigation	Means of verification that mitigation has been met	Timeline/Frequency of Monitoring	Responsibility for implementation of monitoring	Supervisor responsibility	Reporting Requirements
			• Use extraction system to remove dust from working areas, buildings, and storage vessels, and treat as needed to control particulate emissions • Implement good housekeeping practices to reduce fugitive emissions and control dust and particulate matter within the facility. • As stated in the General EHS Guidelines, emissions from a single project should not contribute more than 25% of the applicable ambient air quality standards to allow additional, future sustainable development in the same airshed . • Fly Ash will be transported in covered trucks and tippers to the fly ash recipients						
13.	Noise Quality	Impact on receptors	• Enclosures, noise and vibration mufflers, acoustic barriers and anti-vibration mats to be provided at places with high noise generation process or machineries • Installing silencers for fans and suitable mufflers on engine exhausts and compressor components • Pump operators (near STP, storage tanks, hoppers etc.) are generally exposed to higher noise. Housing / casing will be provided for all noise generating machines • Installing acoustic barriers without gaps and with a continuous minimum surface density of 10 kg/m2 in order to minimize the transmission of sound through the barrier from high noise areas and/or high noise generating machineries. Barriers should be located as close to the source or to the receptor location to be effective • Periodic maintenance of the equipment to be used in the developmental works will be carried out. Worn out parts will be replaced and rotating parts will be lubricated to minimize noise emissions • Adequate PPE's (earmuffs, earplugs) to be provided to employees working in high noise generation area's and machineries • The occupational noise exposure to the workers in the form of eight hour timely weighted average will be maintained well within the prescribed Occupational Safety and Health Administration (OSHA) standard limits • Quarterly indoor noise monitoring to be undertaken (while the WTE plant is fully operational) to mitigate or manage high noise levels and implementation of noise management measures • Periodic noise monitoring should be conducted on quarterly basis or as mentioned in the CTO (to be obtained) for the project operations at site to ensure noise parameters are within prescribed MoEFCC guideline as well as IFC EHS guidelines. • The noise sampling and monitoring should be conducted for 48 hours with the use of noise monitors that should be capable of logging data continuously over this time period • Strict adherence to maintenance schedule of generators, as specified by vendors • Anti-honking sign boards to be placed in the parking areas and at entry / exit points	GWRPL EHS Manager	EHS Inspection	Quarterly	GWRPL Project Head	EHS Head at ACEL	Report from EHS team to Project head and further to corporate team
14.	Soil Environment	Contamination	• Separate remaining ferrous and non-ferrous metals from bottom ash as far as practicably and economically viable, for their recovery • Treat bottom ash on or off-site (e.g., by screening and crushing) to the extent that is required to meet the specifications set for its use or at the receiving treatment or disposal site (e.g., to achieve a leaching level for metals and salts that is in compliance with the local environmental conditions at the place of use); • Hazardous waste inventory to be managed and recorded and to include a summary table with the information such as: Name and description (e.g. composition of a mixture) of the Hazmat, Classification (e.g. code, class or division), Internationally accepted regulatory reporting threshold quantity or national equivalent, Quantity of Hazmat used/generated per month, Characteristic(s) that make(s) the Hazmat hazardous (e.g. flammability, toxicity) • GWRPL to conduct characterization analysis of ash (occasionally) as per IS 3812 covering all the parameters stipulated by BIS to identify any hazardous content before its disposal through RMC trucks. If fly ash is identified as hazardous, it is to be sent to hazardous waste landfill site through authorized recyclers. Records of hazardous ash generation and disposal to be maintained. • Hazardous ash to be stored and handled as per the hazardous and other waste (management and transboundary movement) rules, 2016 as amended.	GWRPL EHS Manager	EHS Inspection	Quarterly	GWRPL Project Head	EHS Head at ACEL	Report from EHS team to Project head and further to corporate team

S. No	Environmental/Social Resources	Impact/Issues	Mitigation Measures	Responsibility for ensuring implementation of the suggested mitigation	Means of verification that mitigation has been met	Timeline/Frequency of Monitoring	Responsibility for implementation of monitoring	Supervisor responsibility	Reporting Requirements
			• GWRPL is recommended to obtain chain of custody documents from Rajkot Municipal Corporation for final disposal destination to ensure that the hazardous waste is being disposed at the authorized hazardous waste landfill as per the applicable Hazardous and Other Wastes (Management and Transboundary Movement) Rules, 2016, as amended. • GWRPL to also establish through relevant agencies whether disposal site (where hazardous ash is disposed) is being operated to acceptable standards before disposal. If this is not established, GWRPL shall consider alternative disposal options, including the possibility of developing its own recovery or disposal facility at the project site or else reduce generation of hazardous ash by proper screening of industrial hazardous waste proposed to be handled and used as feedstock.. • If GWRPL is uncertain that the disposal conducted by RMC is as per the applicable rules, GWRPL will themselves take the responsibility of disposal and will ensure disposal is conducted to the hazardous waste authorized site as per the applicable norms. • Non-hazardous ash may be disposed of in an MSW landfill or considered for recycling in construction materials or provided to cement and fly ash brick manufacturers • Good housekeeping and best practices of waste handling shall be adopted to eliminate/minimize the risks of soil contamination • Only covered and closed trucks will be allowed to enter the site for unloading of municipal solid waste • E-waste generated onsite should be channelized through collection center or dealer of authorized producer or dismantler or recycler or through the designated take back service provider of the producer to authorized dismantler or recycler. It should be ensured to keep the records of e-waste generated and sending out to authorized agencies • Battery waste to be disposed via buy back policy with the battery supplier/manufacturer. It should be ensured to keep the records of waste generated and sending out to authorized agencies. • Generated biodegradable waste from the canteen, kitchen, office etc. will be utilized within the WTE plant and will be • Description or SOP's of response activities in the event of a spill, release, or other chemical emergency or including Internal and external notification procedures, Specific responsibilities of individuals or groups, Decision process for assessing severity of the release, and determining appropriate actions, evacuation routes, Post-event activities such as clean-up and disposal, incident investigation, employee re-entry, and restoration of spill/equipment/area to be developed. • Since hazardous waste and material will be generated and present within the project premises, GWRPL to develop hazardous material management plan which includes potential risks along with the objectives of protection of the workforce and the prevention and control of releases and accidents						
15.	Water Resources	Availability & Contamination	• Alternative source of water to be identified for domestic use and ground water to not be used for domestic purpose except flushing • The waste storage areas of the WTE plant should have a leachate barrier system that forms a secure barrier between the groundwater, soil, and substrata and the composting or stored organics. • Secondary containment for leachate to be included with volumes greater than 220 liters. The available volume of secondary containment should be at least 110 percent of the largest storage container, or 25 percent of the total storage capacity (whichever is greater), in this specific location, considering the area is susceptible to rains and cyclones. • SOPs for the management of secondary containment structures, specifically the removal of any accumulated fluid, such as rainfall, to ensure that the intent of the system is not accidentally or willfully defeated • Measure and record the quantity and quality of leachate generated. Changes in leachate quantity or quality not attributable to weather or other factors to be accounted for. • A dedicated leachate management plan should be developed for proper collection, storage and disposal of leachate from the Project to avoid contamination of subsurface soil and groundwater. The plan should include leachate collection system designed for the project	GWRPL EHS Manager	EHS Inspection	Quarterly	GWRPL Project Head	EHS Head at ACEL	Report from EHS team to Project head and further to corporate team

S. No	Environmental/Social Resources	Impact/Issues	Mitigation Measures	Responsibility for ensuring implementation of the suggested mitigation	Means of verification that mitigation has been met	Timeline/Frequency of Monitoring	Responsibility for implementation of monitoring	Supervisor responsibility	Reporting Requirements
			and installation of additional leachate collection pits, drainage (if required) along with process flow for leachate generation, collection, storage and final disposal. • Effluents from the DM plant generally acidic from the cation units and alkaline from the anion units, should be neutralized. The neutralized effluent shall have less than 5 ppm suspended solids and a pH value of about 7.5 to 8.0 in line with CPCB standards. The DM plant should have pH meter and turbidity meter to ensure the neutralized effluent, suspended solids and pH are within limit prior to be used for plantation activities • Waste storage areas should be located away from drainage lines • Spill kits to be maintained at site for cleaning minor spills/leaks • Workers should be trained on proactive use of designated bins/areas for waste disposal. • Provide magnetic flow meters with totalizers at the outlet of facility • Operate and maintain online real time monitoring system along with web camera facilities and shall ensure that it is connected to GPCB / CPCB websites as per CPCB directions • Workers should be sensitized on water conservation measures and encourage optimal use of water • Regular inspection should be carried out for identifying water leaks and preventing water wastage • Explore installation of water efficient plumbing fixtures that use less water without any reduction in quality and service • Regular monitoring of ground water level and quality will be carried out by establishing a network of existing wells in and around project area in consultation with the competent Ground Water Department. Data thus collected should be sent at regular intervals to MoEF&CC, CGWA and CGWB • Water audit to be undertaken on annual basis to understand water usage and to identify measures for water reduction • Water utilization to be documented • Display online data outside the main gate on quantity and nature of hazardous chemicals being used in the WTE plant, water & air emissions and solid waste generated within the factory premises, as per Hon'ble Supreme Court order. • A wastewater and water quality monitoring program with adequate resources and management plan should be developed and implemented to meet the objective(s) of the monitoring program. The wastewater and water quality monitoring plan should include monitoring parameters, monitoring type and frequency locations, data quality,						
		Socioeconomics							
16.	Occupational Health & Safety	Electrocution, accident, fire hazard, respiratory and hearing problems etc. while working at site	• Provide adequate personnel facilities, including washing areas and areas to change clothes before and after work; • Job safety analysis to undertaken to identify specific potential occupational hazards and industrial hygiene surveys, as appropriate, to monitor and verify chemical exposure levels, and compare with applicable occupational exposure standards • Since hazardous waste and material will be generated and present within the project premises, GWRPL to develop hazardous material management plan which includes potential risks along with the objectives of protection of the workforce and the prevention and control of releases and accidents. • Provide adequate and suitable personal protective clothing and equipment. • Provide worker immunization (e.g. for Hepatitis B and tetanus). • Provision of dust masks or respirators for workers engaged in pre-processing area • Maintain good housekeeping in waste processing and storage areas • Regular inspection and maintenance of pressure vessels and piping • Reducing the time required for work in elevated temperature environments and ensuring access to drinking water • Shielding surfaces where workers come in close contact with hot equipment, including generating equipment, pipes etc. • Consider installation of hazard warning lights inside electrical equipment enclosures to warn of inadvertent energization	GWRPL EHS Manager	Visual Observation and EHS Inspection	Quarterly	GWRPL Project Head	EHS Head at ACEL	Report from EHS team to Project head and further to corporate team

S. No	Environmental/Social Resources	Impact/Issues	Mitigation Measures	Responsibility for ensuring implementation of the suggested mitigation	Means of verification that mitigation has been met	Timeline/Frequency of Monitoring	Responsibility for implementation of monitoring	Supervisor responsibility	Reporting Requirements
			• 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 • Hazardous areas (electrical rooms, compressor rooms, etc.), installations, materials, safety measures, and emergency exits, etc. should be marked appropriately. Signage should be in accordance with international standards and be well known to, and easily understood by workers, visitors and the general public as appropriate • The occupational noise exposure to the workers in the form of eight hour timely weighted average will be maintained well within the prescribed Occupational Safety and Health Administration (OSHA) standard limits • Vibration generating sources and their platforms should be maintained properly to minimize vibrations and related impacts. • Implementation of inspection programs to maintain the mechanical integrity and operability of pressure vessels, tanks, piping systems, relief and vent valve systems, containment infrastructure, emergency shutdown systems, controls and pumps, and associated process equipment • OHS orientation training to be provided for all new employees to ensure they are apprised of the basic site rules of work at / on the site and of personal protection and preventing injury to fellow employees. • Training should consist of basic hazard awareness, sites specific hazards, safe work practices, and emergency procedures for fire, evacuation, and natural disaster, as appropriate. Any site-specific hazard or color coding in use should be thoroughly reviewed as part of orientation training • Training of operators on release prevention, including drills specific to hazardous materials as part of emergency preparedness response training. Also 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 • Documentation of availability of specific personal protective equipment and provision of training needed to respond to an emergency						
17.	Community Health & Safety	Construction & Operation Phase	• Limiting the hours of operation for specific pieces of equipment or operations, especially mobile sources operating through community areas • Reducing project traffic routing through community areas wherever possible • Noise monitoring to be carried out for the purposes of establishing the existing ambient noise levels in the area, or for verifying operational phase noise levels • Traffic management of vehicles engaged during both ongoing construction phase and upcoming operational phase. Traffic management plan to be followed • Limiting the use of access road during day time to avoid congestion and risks of accidents • Trucks/ dumpers will be covered by tarpaulin sheets during off site transportation • As part of the stakeholder engagement and information disclosure process, the community will be provided with an understanding of the activities to be undertaken and the precautions taken for safety; • Installing mandatory suitable mufflers on engine exhausts and compressor components as the ambient noise levels are already exceeding the ambient air quality standards • Dedicated route for deployment of heavy-duty vehicles should be defined. • Put in place a grievance mechanism to allow for the workers and community members to report any concern or grievance related to project activities • Drivers need to be captioned or trained to avoid frequent use of horn unless otherwise it is required and educated for Silent zones and off hours between midnight and 6 am	GWRPL EHS Manager	Visual Observation and EHS Inspection	Quarterly	GWRPL Project Head	EHS Head at ACEL	Report from EHS team to Project head and further to corporate team
18.	Operation of underground transmission line	Restriction in change in land use, construction of	• Establish a grievance mechanism that allows affected stakeholders to raise concerns, provide feedback, and seek resolution for any project-related issues • Ensure accessibility, transparency, and fairness in the grievance resolution process.	Project incharge / HR/ EHS/ Contractor(s)' EHS	Site inspection & visual observation	During operation	Contractor site manager	Project incharge / EHS team	photograph, inspection report feedback

S. No	Environmental/Social Resources	Impact/Issues	Mitigation Measures	Responsibility for ensuring implementation of the suggested mitigation	Means of verification that mitigation has been met	Timeline/Frequency of Monitoring	Responsibility for implementation of monitoring	Supervisor responsibility	Reporting Requirements
		physical activities, and access restriction during maintenance	• Implement the established Stakeholder Engagement Plan outlining how the project will engage with and involve stakeholders throughout the transmission line's operation. • Ensure that engagement is inclusive, transparent, and facilitates meaningful participation. • The project commits to ensuring that there will be no stoppage of access for the local community during the operation of the transmission line. This ensures that the normal flow of activities in the community remains unaffected. • The project shall pay the crop loss during the operation phase of the transmission line is destroyed during the maintenance phase of the project. • The project shall proactively inform stakeholders in advance of any scheduled maintenance activities related to the underground transmission line. This advance notice ensures that stakeholders are prepared for any temporary disruptions and can plan accordingly. • In the case of emergency maintenance, the project shall promptly provide information to stakeholders before initiating any maintenance activities. This proactive communication is crucial, particularly for stakeholders such as roadside vendors and kiosk owners, allowing them to evacuate the Right of Way (RoW) if necessary. • Following the completion of maintenance work, the project shall restore the RoW to its pre-maintenance condition. • Furthermore, in the event of any physical damage to any form of privately owned or used physical structure resulting from the maintenance activity of transmission line, the project shall fully compensate for the loss or damage to impacted structure's owner at replacement cost or construct the structure as it was earlier to the construction activities.		and verification of records				and community complaints
19.	Operation of underground water pipeline	Temporary access disruption during the maintenance of water pipeline	• Establish a grievance mechanism that allows affected stakeholders to raise concerns, provide feedback, and seek resolution for any project-related issues, • Ensure accessibility, transparency, and fairness in the grievance resolution process. • Implement the established Stakeholder Engagement Plan outlining how the project will engage with and involve stakeholders throughout the operation of underground water pipeline. • Ensure that engagement is inclusive, transparent, and facilitates meaningful participation. • The project commits to ensuring that there will be no stoppage of access for the local community during the operation of the water pipeline. This ensures that the normal flow of activities in the community remains unaffected. • The project shall proactively inform stakeholders in advance of any scheduled maintenance activities. This advance notice ensures that stakeholders are prepared for any temporary disruptions and can plan accordingly. • In the case of emergency maintenance, the project shall promptly provide information to stakeholders before initiating any maintenance activities. This proactive communication is crucial, particularly for stakeholders such as roadside vendors and kiosk owners, allowing them to evacuate the Right of Way (RoW) if necessary. • Following the completion of maintenance work, the project shall restore the RoW to its pre-maintenance condition. • Furthermore, in the event of any privately owned or used physical damage to any form of physical structure resulting from the maintenance activity of the underground water pipeline, the project shall fully compensate for the loss or damage to impacted structures' owner at replacement cost or construct the structure as it was earlier to the construction activities.	Project Incharge / HR/ EHS/ Contractor(s)' EHS	Site inspection & visual observation and verification of records	During operation	Contractor site manager	Project Incharge / EHS team	Photograph , inspection report feedback and community complaints
20.	Contractor Management	Contractor Management	• Provide comprehensive training to contractors on the established contractual agreements, emphasizing compliance with labor laws, working conditions, and terms of employment. Regular awareness sessions should be conducted to ensure contractors understand and adhere to project expectations. • Strengthen the monitoring process by conducting regular audits on contractor compliance. Increase the frequency of internal HR audits outlined in the checklist. This	Project Incharge / HR/ EHS/ Contractor head/ Contractor(s)' EHS	Site inspection & visual observation and verification of records	During operation	Contractor site manager	Project Incharge / EHS team	Internal Monitoring report

S. No	Environmental/Social Resources	Impact/Issues	Mitigation Measures	Responsibility for ensuring implementation of the suggested mitigation	Means of verification that mitigation has been met	Timeline/Frequency of Monitoring	Responsibility for implementation of monitoring	Supervisor responsibility	Reporting Requirements
			includes daily checks on items like muster rolls and attendance cards, monthly checks on wage-related documents, and yearly audits on critical acts such as the Contract Labour (Regulation & Abolition) Act. • Organize capacity-building workshops for contractors, focusing on educating them about key labor laws, safety regulations, and ethical labor practices. This proactive approach can contribute to improved contractor understanding and compliance. • Reinforce non-discrimination and equal opportunity principles through targeted training sessions. Contractors should be educated on the Equal Opportunity and Non-discrimination policy, emphasizing the importance of treating all workers fairly regardless of race, gender, age, religion, disability, or any other protected characteristics. • Strengthen the existing grievance redressal mechanism by promoting transparency and accessibility. Ensure that contractual workers are aware of the grievance redressal process and can easily report concerns. Regularly review and update the mechanism based on feedback and evolving needs. • Foster a collaborative partnership with contractors through regular communication channels. Conduct joint workshops and forums to address challenges, share best practices, and build a sense of shared responsibility for the success of the project. • Conduct periodic reviews of policies, ensuring they remain aligned with evolving labor laws and industry best practices. Regularly update contractors on policy changes and provide the necessary support for implementation • The project shall ensure that appointed contractor shall obtain the registration as per the requirement of Employees' Provident Funds and Miscellaneous Provisions Act, 1952 (refer to **Appendix 20** for more details)					
21.	Supply Chain Management	Supply Chain Management	• Implement stringent monitoring mechanisms for contractors involved in waste collection and transportation. The project shall request RMC to undertake the monitoring, or the project shall undertake the monitoring in support of RMC. • Conduct regular audits to ensure compliance with ethical employment practices. • Establish a clear framework for the appointment of drivers and helpers, and waste collectors, emphasizing the prohibition of child labour. • Embed child labour prohibition clauses in the contracts with biomining contractors. • Include stringent penalties for non-compliance with ethical employment practices. • Mandate biomining contractors to provide evidence of their commitment to child labour-free operations. • Provide training sessions for contractors and subcontractors on the prohibition of child labour. • Raise awareness about the legal and ethical implications of employing children in the waste-to-energy supply chain. • Empower contractors with the knowledge and resources to implement and uphold child labour-free practices. • Conduct periodic due diligence assessments on all stages of the supply chain to identify and address child labour risks. • Engage with local child protection organizations to enhance the effectiveness of monitoring efforts. • Regularly update and refine the due diligence process to align with evolving standards and regulations	Project Incharge / HR/ EHS	Site inspection & visual observation and verification of records	During operation	Contractor site manager	Project Incharge / EHS team	Internal Monitoring report
22.	Loss of income & livelihood of ragpicker community	The operation of the Waste-to-Energy (WTE) Plant in Rajkot has raised concerns about the potential economic displacement of approximately 200 ragpickers.	• **Identification and Engagement:** • Undertake a thorough survey covering all households to identify the affected ragpickers. This survey should also include an assessment of their socio-economic profiles at the household level. • Engage with the RMC to secure access cards or identification for these ragpickers, granting them entry to both the existing and proposed Transfer Stations (TS). • Facilitate Connections with NGOs and Material Recovery Facilities (MRFs): Connect the ragpickers with relevant non-governmental organizations (NGOs) or organizations	Project Head/ HR/ CSR	Meetings, review of reports and audit	Monthly and Quarterly	HR/CSR	Project Head	LRP, and its implementation, training reports, funds utilization, photographs etc..

S. No	Environmental/Social Resources	Impact/Issues	Mitigation Measures	Responsibility for ensuring implementation of the suggested mitigation	Means of verification that mitigation has been met	Timeline/Frequency of Monitoring	Responsibility for implementation of monitoring	Supervisor responsibility	Reporting Requirements

operating MRFs at the existing or upcoming transfer station. Additionally, when developing new transfer stations with new MRF facilities, collaborate with the RMC to prioritize employment opportunities for the impacted ragpickers within these new MRF facilities.

- **Absorption in Waste Sorting activities at the Project:**
  - *Vulnerability Assessment and Prioritization:* (i) Conduct a comprehensive assessment of the vulnerability level among ragpickers based on the household census survey; (ii) Prioritize employment opportunities for the most vulnerable ragpickers within the project, provided they possess the requisite skills; and (iii) If vulnerable ragpickers lack the necessary skills, the project should offer training to enable them to qualify for employment.
  - *Targeting Vulnerable Groups:* (i) Based on the sample survey, it has been observed that the most vulnerable category of ragpickers comprises those belonging to the Other Backward Class (OBC) who rely on rag picking as their primary occupation. However, the project must finalize the vulnerability index based on the results of the 100% household survey.
- **Improvement of working conditions of ragpickers:**
  - *Strengthen Collaboration with RMC for Ragpickers' Welfare:* (i) Collaborate closely with the Rajkot Municipal Corporation (RMC) to improve the working conditions of ragpickers at both the transfer stations and Material Recovery Facilities (MRFs); and (ii) Prioritize safety practices, including the provision of Personal Protective Equipment (PPE), and ensure access to clean drinking water for these workers.
  - *Corporate Social Responsibility (CSR) Initiatives:* The project can undertake the following above activity of improving working conditions as part of the Corporate Social Responsibility (CSR) activities.
- **Skill training and alternate livelihoods:**
  - Implement skill training programs designed to create alternate employment and livelihood opportunities within the waste value chain, specifically focusing on the impacted ragpickers and waste recycling industry.
  - Prioritize individuals who express a desire to transition away from rag picking. Empower them with skills relevant to other sectors, ensuring that they can successfully transition to more sustainable livelihoods.
  - Preference should be given to impacted ragpickers and waste recyclers whose livelihoods are directly tied to the recyclable waste collected by these impacted ragpickers.
  - The skill training program can also be implemented or run as part of the CSR activity.
- **Implementation of Livelihood Restoration Plan (LRP) note:**
  - Once the LRP note's plan is implemented, conduct a comprehensive household survey of all ragpickers (200) impacted by the Project.
  - Utilize the survey data to tailor the livelihood plan according to the specific needs and aspirations of each ragpickers, ensuring their socio-economic well-being is adequately addressed.
- **Monitoring Plan:**
  - *Regular Site visit:* (i) Conduct regular site visits to the Transfer Stations (TS) and waste sorting facilities to ensure that ragpickers have access and are effectively engaged in the provided mitigation measures; and (ii) Document observations regarding working conditions, provision of PPE, access to clean water, and participation in skill training programs.
  - *Data Collection and Analysis:* (i) Collect data on the number of ragpickers provided with access/ID cards to TS, absorbed into waste sorting facilities, and enrolled in skill training programs; and (ii) Analyze the data to assess the effectiveness of the mitigation measures in mitigating the impact on ragpickers and facilitating their transition to alternate livelihoods.
  - *Stakeholder Engagement:* (i) Engage with ragpickers, NGOs, Rajkot Municipal Corporation (RMC), and other relevant stakeholders to gather feedback on the implementation of mitigation measures; and (ii) Organize periodic meetings or

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			workshops to solicit inputs, address concerns, and gather suggestions for improvement. • *Performance Indicators:* (i) Develop key performance indicators (KPIs) to measure the success of the mitigation measures, such as the percentage of ragpickers provided access to TS, percentage absorbed into waste sorting facilities, percentage enrolled in skill training; and 100% employment or enrollment at transfer station of the most vulnerable ragpickers' group; and (ii) Monitor these indicators on quarterly basis and adjust mitigation strategies as needed based on the results. • **Grievance Redressal mechanism:** • *Establish Grievance Redressal Mechanism:* (i) Set up a dedicated grievance redressal mechanism to address concerns and complaints raised by ragpickers regarding the implementation of mitigation measures; and (ii) Designate a focal point within the project team responsible for receiving and addressing grievances in a timely manner. • *Accessibility and Transparency:* (i) Ensure that the grievance redressal mechanism is easily accessible to ragpickers, with clear information provided on how to submit grievances and the expected timeline for resolution; and (ii) Maintain transparency throughout the grievance resolution process, keeping affected individuals informed of the status of their grievances and any actions taken. • *Confidentiality and Protection:* (i) Treat all grievances with confidentiality and sensitivity, respecting the privacy and dignity of the complainants; and (ii) Implement measures to protect individuals who raise grievances from any form of retaliation or discrimination. • *Continuous Improvement:* (i) Regularly review and evaluate the effectiveness of the grievance redressal mechanism, soliciting feedback from ragpickers and other stakeholders on its accessibility, responsiveness, and fairness; and (ii) Use feedback to identify areas for improvement and implement corrective actions to enhance the effectiveness of the grievance redressal process.						
Biological Environment									
23.	Power Transmission	Collision and Electrocution	• Cross arms transmission tower, and suspended insulators should be utilized. • Bird flight diverters[88] should be applied on transmission line, specifically near the water bodies located at 22.400542, 70.797398 and 22.402381, 70.800158. • Frequent checking of the transmission towers to avoid bird nesting. • Disposal of corpses / garbage near the power lines should be restricted and carcasses observed along the transmission line should be immediately removed to avoid attracting raptors. • Bird carcasses monitoring should be conducted along the TL route to record the incident of collision and/or electrocution. If the carcass of an ecological sensitive species reported during the monitoring, a separate bird & bat survey should be conducted	GWRPL EHS Manager	Visual Observation and EHS Inspection	Quarterly	GWRPL Project Head	EHS Head at ACEL	Quarterly Report from EHS team to Project head and further to corporate team
24.	Access of Wildlife to the Project Compound	Human-Wildlife Conflicts	• Frequent checking of the boundary wall to avoid any space for wildlife entrance into project compound. • Good housekeeping practices in the project compound could help to reduce the faunal attraction. • Awareness and training programs should be conducted to explain the dos and don'ts to minimize the risk of Human-Wildlife Conflict	GWRPL EHS Manager	Visual Observation and EHS Inspection	Quarterly	GWRPL Project Head	EHS Head at ACEL	Quarterly Report from EHS team to Project head and further to corporate team
25.	Impacts of Increased Traffic / Vehicle Movement	Transportation of waste to the site will contribute to the overall traffic / vehicle movement on the major roads of the city. Vehicular movement will contribute to vehicular emission,	• Implementation of proper safety measures and adherence to environmental regulations can positively contribute to community health and safety. • Active engagement with the local community, including regular communication, public consultations, and addressing concerns, can foster positive relations. • The trucks/trailers drivers should be instructed not to blow horns unnecessary. • The drivers should follow the speed limit instructed by highway authorities (in the form of signboards) • Annual awareness/training programs should be conducted for drivers to minimize the risk of wildlife hitting and/or being killed on highways and road safety • Water sprinkling to be carried out, as required, on the unpaved road	GWRPL EHS Manager	EHS inspection	Quarterly	GWRPL Project Head	EHS Head at ACEL	Quarterly Report from EHS team to Project head and further to corporate team

[88] Galis, M. and Sevcik, M. (2019) Monitoring of effectiveness of bird flight diverters in preventing bird mortality from powerline collisions in Slovakia. *Raptor Journal* 13: 45–59.

S. No	Environmental/Social Resources	Impact/Issues	Mitigation Measures	Responsibility for ensuring implementation of the suggested mitigation	Means of verification that mitigation has been met	Timeline/Frequency of Monitoring	Responsibility for implementation of monitoring	Supervisor responsibility	Reporting Requirements
		fugitive dust emission (unpaved roads), noise and soil contamination in case of accidental leakage and road hits/kills	• Sudden acceleration or de-acceleration of vehicles produces more pollution than a vehicle maintaining a constant speed. Smoother flow of traffic within the parking area and within the project premises would ensure lesser pollution from the vehicles • Anti-honking sign boards to be placed in the parking areas and at entry / exit points • Regular inspection / maintenance of vehicles to be carried out						

9 Impact Summary and Conclusion

9.1 Introduction

This Environmental and Social Impact Assessment (ESIA) has been conducted to evaluate the impacts associated with the Waste to Energy (WTE) Plant. The impact assessment has been conducted in compliance with the requirement of applicable reference framework (refer to ***Section 4***).

9.2 Significance of Impacts

The ESIA focused on interaction between the Project activities and various resources/receptors that could result in significant impacts. The table below presents the outcome of the comprehensive assessment of identified impacts due to various project activities

Table 9-1 Impact Assessment Summary

Impact Description	Period	Impact Classification	Phase of the Project	Significance of Impact	
				Without Mitigation	With Mitigation
Environment					
Ambient Air	Short Term	Negative	Construction Phase	Small	Negligible
	Long Term	Negative	Operation Phase	Substantial	Small
Ambient Noise	Short Term	Negative	Construction Phase	Small	Negligible
	Long Term	Negative	Operation Phase	Substantial	Small
Soil Compaction and Contamination	Long-term	Negative	Construction Phase	Small	Negligible
Soil Contamination	Long Term	Negative	Operation Phase	Substantial	Small
Water Resources	Long Term	Negative	Construction Phase	Small	Negligible
Water- Availability & Quality	Long Term	Negative	Operation Phase	Substantial	Small- Substantial
Social					
Occupational Health & Safety	Short Term	Negative	Construction Phase	Substantial	Small- Substantial
	Long Term	Negative	Operation Phase	Substantial	Small- Substantial
Community Health & Safety	Short Term	Negative	Construction & Operation Phase	Substantial	Small- Substantial
Labour influx	Short term	Negative	Construction Phase	Negligible	Negligible
Local employment & livelihood	Short term	Positive	Construction Phase	Negligible	Negligible
Temporary Income Opportunity impact on local community due to installation of transmission line	Short term	Negative	Construction Phase	Small	Negligible
Impact Due to Laying Down of water pipeline	Short term	Negative	Construction Phase	Small	Negligible
Impact due to operation of underground transmission line	Short-term	Negative	Operation Phase	Negligible	Negligible
Impact due to operation of underground water pipeline	Short-term	Negative	Operation Phase	Negligible	Negligible

Impact Description	Period	Impact Classification	Phase of the Project	Significance of Impact	
				Without Mitigation	With Mitigation
Supply chain management	Long term	Negative	Operation Phase	Substantial	Negligible
Contractor Management	Long term	Negative	Construction and Operation phase	Substantial	Small
Livelihood impact of ragpickers at the Rajkot Landfill	Long term	Negative	Operation Phase	Substantial	Small
Ecology					
Impacts on the Habitat and Species due to Construction Activities	Short	Negative	Construction Phase	Substantial	Small
Collision and Electrocution Risk due to Power Transmission, etc.	Permanent	Negative	Operation Phase	Substantial	Small to Substantial
Human-Wildlife Conflicts	Permanent	Negative	Operation Phase	Small	Small
Impacts of Increased Traffic / Vehicle Movement	Permanent	Negative	Operation Phase	Substantial	Small

9.3 Project Categorization

IFC's Environmental and Social Review Procedure Manual has provided a provisional categorization tool for projects. The tool assigns an E&S category based on risk inherent to the particular sector, as well as on the likelihood of a development taking place and on what can be reasonably ascertained about the environmental and social characterization of the Project's likely geographical setting. The categories are defined as follows:

1. **Category A:** Projects with potential significant adverse environmental or social risks and/or impacts that is diverse, irreversible or unprecedented.
2. **Category B:** Projects with potential limited adverse environmental or social risks and/or impacts that is few in number, generally site-specific, largely irreversible and readily addressed through mitigation measures.
3. **Category C:** Projects with minimal or no adverse environmental or social risks and/or impacts.

This Project has been categorized as **Category B** as per the IFC guidelines. Rationale for categorization includes:

- The waste to energy is being developed within a plot area which is currently being used for waste dumping. The land for the facility has been allocated for development of the waste to energy plant.
- The construction activities involve air emission, noise emission, water consumption and soil contamination and may impact the Project surrounding area if adequate measures are not implemented. However, the impacts can be minimized and/or avoided by implementing adequate mitigation measures suggested in ESMP of this report.
- During operation phase, the Project will involve flue gas emission, ash deposition, leachate generation, noise, occupational health, and safety risks such as exposure to pathogens and community health and safety risks. However, the impacts can be minimized and/or avoided by implementing adequate mitigation measures suggested in ESMP of this report.
- The project is sourcing treated water from the STP and impact on water resources are not anticipated on ground water or surface water of the region.
- The identified impacts on the ecology and biodiversity are site specific, irreversible and could be addressed through suggested mitigation measures.
- Due to the proposed project, there will be the shift in waste management practices, that is the fresh waste will no more be dumped at existing landfill site. Currently dumping of waste at the landfill provides a source of income to the ragpickers. However, due to change in the waste management practices the ragpickers will no longer have access to the freshly dumped waste from which they collect recyclables. As a result, their income-generating activities will be impacted, and they may face challenges in finding alternative livelihood opportunities.

- The operation of the project is likely to result in economic displacement of ~200 ragpickers at Nakrawadi Landfill site. However, the Rajkot Municipal Corporation (RMC) has confirmed that the potentially economically displaced ragpickers will be relocated and engaged in the Material Recovery Facilities (MRF) at Transfer Stations across the Rajkot City. Moreover, if there are any remaining ragpickers who could not be relocated or engaged at MRF/Transfer station, then the project will identify those ragpickers and will ensure the alternate livelihood arrangement for such ragpickers.
- The potential temporary displacement of the shops and kiosks due to laying of transmission line & water pipelines does not involve long-term or permanent economic displacement, as the businesses can resume their operations once the installation is complete.

APPENDIX 1: DOCUMENTS REVIEWED

Abellon's Environment 8 Social Policies
Project Layouts and Components details
Details for water management
Project Booklet
Dust Control Systems
Ash Handling Systems
Leachate Management Systems
Process Flow
Master Plan
Details pertaining to waste sourcing
Permits obtained for the Project
Details for Green belt etc

APPENDIX 2: PHOTOLOG

Some representatives of the floral diversity


Ailanthus excelsa Roxb.


Leucaena leucocephala (Lam.) de Wit


Parkinsonia aculeata L.


Acacia leucophloea (Roxb.) Willd.


Azadirachta indica A.Juss.


Phoenix sylvestris (L.) Roxb.


Acacia nilotica (L.) Delile


Euphorbia caducifolia Haines


Calotropis gigantea (L.) Dryand.


Capparis decidua (Forssk.) Edgew.


Ziziphus nummularia (Burm. f.) Wight & Arn.


Chrozophora rottleri (Geiseler) A.Juss. ex Spreng.

Senna auriculata (L.) Roxb.

Argemone mexicana L.

Solanum sisymbriifolium Lam.

Some representatives of the faunal diversity


Oriental Garden Lizard


Five-striped Palm Squirrel


Nilgai


Brahminy Kite


Black-winged Kite


River Tern


Painted Stork


Eurasian Spoonbill


Gadwall


African Comb Duck


Common Coot


Indian Spot-billed Duck


Great Cormorant


Red-naped Ibis


Black-headed Ibis

APPENDIX 3: DESIGN SPECIFICATION FOR FLUE GAS CLEANING SYSTEM

Electrostatic Precipitator

Design Parameters	Unit	Value
Inlet Flue Gases flow rate @ 180 °C	Am^3/hour	1,44,000
Inlet gas temperature	°C	150-180
Dust load at the inlet	g/Nm^3	7.0
Dust load at the outlet	g/Nm^3	1.0-1.5
No. of fields	Nos.	Single Field
Type		Horizontal, Dry Type
Collecting Area	m^2	1040
No. of Emitting Electrodes	Nos.	270
Electrode Type		HE-Rigid Pipe and Multi Spike
No. of Collecting Plates	Nos.	330
Flue Gas Velocity inside ESP	m/s	0.96
Treatment Time	Sec	5.21
Wrapping Mechanism		Tumbling Hammer driven by gear motor

Acid Control Reactor Tower

Design Parameters	Unit	Value
Tower Volume	m^3	122
Water Requirement	m^3/hour	2
Dimensions (Dia. X Height)	m	3.3 Ø x 14.3

Dry Sorbent Injection (DSI) System

Design Parameters	Value	
Source of Sorbent/Reagents/Lime and carbon:	1)Lime Unloading station 2) Activated carbon Unloading station	
Injection Point:	Activated carbon: In the Duct before reaction tower Hydrated lime: In the reaction tower	
Material Handled	Hydrated Lime Powder	Activated Carbon
Dosing capacity	275 kg/hr	7.5 kg/hr

Filter Bag House

Description	Unit	Value
Flue gas flow @ 150 °C	$Am^3/hr.$	1,44,000
Type of Bag filter		Reverse Jet Pulse
Bag Cleaning		Online
Bags Fabric		PTFE felt with PTFE lamination
Fabric Withstanding Capacity	°C	250
Estimated Flue gas Temperature	°C	160
No. of bags	Nos.	1320
Filter Bag Type		Hose Bag Type
Bags Dimension	mm	Dia. 150 X Length 5000
Bag Fabric area - Gross	m^2	3111
Bag Fabric area - Net	m^2	2876
Gross Air to Cloth	$m^3/min/m^2$	0.77
Net Air to Cloth	$m^3/min/m^2$	0.83
Ash Discharge		Through RAV and Screw Conveyor

APPENDIX 4: EMERGENCY PREPAREDNESS AND RESPONSE PLAN

This plan is designed to facilitate understanding of the Emergency Preparedness & Response Plan for site employees, contractors, and other agencies engaged at the facility. The emergency response plan should be updated by GWRPL to include measures to handle emergency situations at the collection centers, once the locations of the collection centers are finalized.

The emergency scenarios presented in the EPRP along with the measures to be taken in case of emergency should be communicated to the nearby local community.

Scope

This procedure shall be applicable for all employees, contractors, and other agencies for the management of emergency incident involving Personnel, Projects, Environment, and Reputation under the influence of Company during construction as well as operation phase.

Definitions

Emergency: An emergency means a situation arising out of or as a result of any type of hazards like fire, explosion, uncontrolled gas release, or chemical spill which is likely to adversely affect the persons or population working on or near the site or residing in the adjacent or nearby areas around the work site.

Hazard: Source or situation with a potential for harms in terms of injury or ill health, damage to property, damage to the workplace environment, or a combination of these.

Incident: The event that gave rise to an accident or had the potential to lead to an accident.

NOTE: An incident where no ill health, injury, damage, or other loss referred to as a "near miss". The term "incident" includes "near-misses".

Risk: Combination of the likelihood and consequences of a specified hazardous event occurring.

Sub Agency/ Contractors/ Material Supplier: A company directly employed by GWRPL to undertake activities on behalf of the Company.

Levels of Emergencies

Level 0: An incident that can be resolved by site personnel or officer without outside agency involvement. May require an Incident/Accident report as documentation.

Level 1: Any incident, potential or actual, which will not seriously affect the overall functional capacity of the site. Can require an outside agency to respond, short-term evacuation and may involve injuries.

Level 2: Any incident, potential or actual, which affects an entire building or buildings, and which will disrupt the overall operation of the project site. Outside emergency services will probably be required.

Level 3: Any incident or occurrence that has taken place and has seriously impaired or halted the operations of the site. Level 3 situations will be where mass casualties and severe property damage may be sustained. A coordinated effort of all resources is required to effectively control the situation. Outside emergency services will be essential. Major policy considerations and decisions will usually be required from top management during times of crisis.

Potential Emergencies

- The collapse of the structure, building, cranes, boiler, turbine etc.
- Gas leakage
- Spillage of Hazardous fuels/ chemicals like diesel, concrete admixture etc.
- Fall from height with a severe consequence while erection.
- Personnel electrocuted/ electrical Hazards.

- Men being trapped under soil/in the Confined Space
- Fire or Explosion involving storage of flammable materials of a gas cylinder, Oil/Diesel storage, Chemical, boiler etc.
- The collision between moving vehicles/toppling Person falls in deep tanks.
- Food poisoning
- Floods
- Bomb Threat
- Earthquake
- Heavy Rains

WTE Plant Emergency Facilities

The List of emergency facilities made available at the WTE plant will be as follows:

- Tie up with the nearest hospital.
- Emergency rescue Vehicle/Ambulance.
- Emergency alarm system and audio announcement system
- Trained first Aid personnel from the working group & supervisor:
- Fire Extinguisher and Fire Buckets placed at different locations (both ABC & CO2 type).
- Other firefighting arrangements shall be as per the norms.
- Emergency Assembly Points at various places for easy access

Responsibilities of Emergency Response Team

1. Emergency Control Coordinator
   - Overall in-charge to control emergency, recovery & operation continuity.
   - Authorize resources.
   - Coordinate Emergency Control through on-site emergency teams.
   - Communicate with the interested parties including Head office, Local Authorities, mutual aids, etc.
   - Authorize for raise request for resources and its use at the site.
   - Coordinate with Medical Team, Rescue Team, Fire Fighting Team, etc. to facilitate control, rescue & treatment of victims.
   - Communicate with the Emergency Control Coordinator and apprise him of the emergency the situation at the site.
   - Responsible to assess and inform the end of an emergency at the site.
   - Responsible to call the end of the emergency.
2. Technical Support Team
   - Act in the capacity of the advisor to the Emergency Control Coordinator.
   - Coordinate with Administration & Legal support team to handle the labour unrest, local authority, treatment options, HR issues, PR issues, etc.
   - Investigate the causes of the Emergency & recommend corrective action.
   - Log the sequence of events so that the report of the emergency operation can be prepared to identify the deficiencies in the Emergency preparedness system and recommend improvement.
   - Evaluate the technical aspects of the control/ mitigation of the emergency operation continuity.
   - Review the technical documents and recommend feasibility.
   - Evaluate the need for emergency, understand the recovery measures, arrange for the resources, and supervise the recover till initiation of operation.
   - Arranging for cranes, equipment, and electrical assistance and coordinating with the emergency team.
   - Ensure the damage is controlled, removed from the site and the site is reinstated for the operation to start smoothly.
3. Administration & Legal Support Team
   - Coordinate with the Hospitals for the treatment of the injured.
   - Coordinate with the Local Authorities including the Police etc.

- Communicate with the sub Agencies and ensure no Labor Unrest takes place.
- Ensure communication to the relatives in case of a fatality.
- Ensure coordination and communication with local communities
- Manage the Media with assistance from the Emergency Control Coordinator.
- Arrange for the food/ welfare facilities etc. if the rescue, recovery & operation continuity activity extends beyond the regular working hours.

4. Medical Team

- Coordinate with the WTE Plant Emergency Controller.
- Communicate & coordinate with the first aider to provide first aid to the injured.
- Coordinate with the ambulance & rescue vehicle & other mutual Aid Ambulance to remove the victim to the nearest Hospital.
- Assist the First Aider to organize personnel for assistance.
- Record the victims' details and communicate with the Project Site Emergency controller

5. Emergency/Fire Fighting Team

- Coordinate with the WTE Plant Emergency Controller.
- Communicate & coordinate with the first fighters to control the fire in the initial stages.
- Coordinate with the fire brigade in the event of a big fire and extend necessary assistance especially in case of chemical fire provide MSDS & quantity etc.
- Ensure the fire is controlled and does not pose any threat to the people or property.
- Responsible to declare the fire is controlled to the Project Site Emergency Controller.

6. Rescue Team

- Coordinate with the WTE Plant Emergency Controller.
- Organize the search and rescue operation.
- Coordinate Head Count operation, obtain the Missing details & initiate a rescue operation.

Actions In Case of Emergency

In the event of an Emergency is declared:

- Do not panic.
- Stop all the jobs and report to the Safe Assembly Point.
- Stop all the Hot Jobs in the area including Welding, Gas Cutting, Grinding, etc. ensure no sparks are left.
- Stop all the machinery and park in a secure place, ensure it does not obstruct any movement of the fire engine etc.
- Communicate not to have any further entry to the site.
- Do not stop to collect personal belongings
- Turn Off generators, Compressors and other powered equipment, unless these provide power for emergency services.
- Attack fire with the equipment provided, if it is safe to do so and you know to operate the equipment.
- Obey the instruction manual and handbook of the H & S.
- Assist the Fire Fighting Team, Medical Team, Rescue Team, and technical team to control the emergency.

1. Safe Assembly Points

Three Assembly points have been identified for emergencies.

Assembly Point 1:

Assembly Point 2:

Assembly Point 3:

2. Evacuation procedures

General

- In declared emergency on-site, all personnel are to leave their area and proceed towards safe assembly points.
- Every person on-site shall know a minimum of two assembly points.
- DO NOT return to an evacuated building/areas unless told to do so by an authorized personnel.
- After any evacuation, report to your designated area assembly point. Stay there until an accurate headcount is taken.

Fire or explosion

- Know the location of the nearest fire extinguisher, exit in your area and how to use them training and information can be provided by the HSE Department.
- If a minor fire appears controllable, IMMEDIATELY contact the area safety steward or area engineer.
- Then upon selection of the appropriate fire extinguisher promptly direct the charge of the fire extinguisher towards the base of the flame source.
- If a suspected fire-related emergency exists, alert others by intermittent shouting as “fire”.
- Report to HSE engineer or site engineer.
- Proceed towards assembly points and alert others to do the same.
- In case of declared emergencies and alarm raised to leave the site, proceed towards safe clear area, which is at least 500 m away from the affected area or towards the side exit.

Collapse of structure, buildings, cranes

- In case of potential emergency of collapse is felt, proceed towards designated assembly points. Alert others to the same. CALL for Help.
- Wait for headcount.
- In case of declared emergencies and alarm raised to leave the site, proceed towards safe clear area, which is at least 500m away from the affected area or towards the side exit.
- Immediately after a collapse, the debris of the building is very unstable and prone to additional movement. Do not attempt to remove debris without any standing instruction which may lead to further damage of debris or trapped personnel.
- HSE engineer is the command person in this scenario.
- The preliminary effort in this scenario will be to concentrate on areas where people were last seen or known to be. Provide HSE department with this information.
- Administration department to provide with a list of the people in the damaged area. Additional information can be gathered from the people who survived the collapse.
- Barricade the area to restrict entry.
- Call firefighting crew, ambulance for rescue.
- Notify legal authorities in this regard.

Chemical/oil spillage

- Leave the spill area; alert others in the area and direct/assist them in leaving.
- Without endangering yourself: remove victims to fresh air, remove contaminated clothing and flush contaminated skin and eyes with water for 15 minutes
- Report to area EHS Manager or area engineer.
- Barricade the spill area to restrict further entry
- Shut off electrical equipment and power supply in the spill area.
- Do not attempt to go back into an area where a chemical spill has occurred.
- If the spill has occurred in confined space or closed room, isolate the area.
- Close the doors and barricade by means of tapes or posting warning signs.
- Establish exhaust ventilation if possible.

- Vent fumes only to the outside of the building.
- Open windows, if possible without exposing yourself to fumes
- Wait for spill control team for clean up

Trapped under soil/in the Confined Space

An emergency in a confined space or under soil could vary widely in degree or type, and include:

a) Employees are uninjured and evacuate themselves,
b) Employees are injured, but still capable of evacuating themselves,
c) Employees are assisted to evacuate by persons remaining outside the space,
d) Entry is required in order to evacuate employees,
e) Entry is required to provide medical treatment.

For situations a, b, c

- Inform the area officer or site engineer
- Rescue personnel

For Situation d & e

- Inform the area officer or site engineer
- Check for the presence of hazardous gases with the help of explosive meter or oximeter
- Provide appropriate PPE
- Rescue personnel.

Emergency Drills, Records & Reviews

The Emergency drill shall be carried out at least once in six months and the findings shall be recorded. Mock drills shall be carried out for all the levels covering identified emergencies. This procedure shall be reviewed in the event of major modification recommended by the Technical Team following an emergency/ emergency drill and or in the event of the major Re-shuffle of the team. The records of the drills and the recommendations/findings shall be maintained until the completion of the Project.

The person who is responsible for recordkeeping shall keep the following records:

- Emergency Response Plan
- Evacuation Drills
- Equipment Inspection/Testing:
- Employee Training

Training on fire fighting and first aid shall also be undertaken and records shall be maintained.

Record Keeping/ Outcome

The table below provides the formats for the various lists and records that need to be maintained by the WTE plant team to ensure the emergency response is provided in an efficient and timely manner. The lists need to be prepared as per the personnel and systems in place at WTE plant and must be unique to each WTE plant.

S.NO	Formats	NAME
1	Format I	List of key persons during emergency
2	Format II	List of key contacts: Internal Corporate
3	Format III	List of authorities: External
4	Format IV	Emergency line of communication

S.NO	Formats	NAME
5	Format V	List of chemicals / material safety data sheets
6	Format VI	Spill kit's locations
7.	Format VII	List of firefighting equipment's
8.	Format VIIII	List of first-aid boxes
9.	Format IX	List of assembly points
10.	Format X	List of first aid trained personnel's
11.	Format XI	Emergency drill form
12.	Format XII	Training records

Format I: Emergency Contact List

This list is to be made available at WTE plant, to be displayed at various locations and must be updated regularly.

Personnel	Contact Details	External contact details
Project Manager		
Site Supervisor		
Safety Manager		
Control Room		
Fire Station (nearest location)		
Fire Station (location)		
Fire Station (location)		
Fire Station (location)		
Police Station (nearest location)		
Ambulance		
Hospital (nearest location)		
Hospital (nearest location)		
Disaster Helpline		
Blood Bank		
Traffic Police Control Room		
First-aid trained professionals		

Format V: List of Chemicals/Material Safety Data Sheets

S. No	Name of Chemical	Name of manufacturer	Manufacturer contact number	MSDS Sheet

Format VI: Spill Kits location

This list is to be made available at WTE plant site must be updated regularly. The list to be communicated to the employees, contractors and other staff during the trainings.

S. No	Spill Kit Number	Location of Spill Kit	Person in-charge	Last inspection date

Format VII: List of firefighting equipment

S. No	Location	Type	Capacity	Last inspection date

Format VIII: List of First-Aid boxes

This list is to be maintained at WTE plant site must be updated regularly. The list to be communicated to the employees, contractors and other staff during the trainings.

S. No	Location of First Aid box	Name of Person in-charge	Contact details of person in-charge	Inspection date

Format IX: List of assembly points

S. No	Assembly point number	Location of assembly point

Format XII: Mock Drill Format

This format is to maintain in the records to ensure that records for mock drills are maintained and that the mock drills are conducted regularly during the project operation.

Mock Drill No.	
Date:	
Event:	
Emergency declared at (time):	
In-charge of Mock Drill:	

Name of Controller:				
Name of Observer:				
Drill attended by :				
Sl. No.	Time	Message from	Message	Action taken	Remarks
No. of mock casualties (if any) :				
No. of DCP / Fire Extinguisher used (Description):				
Observations:				
Controller:			Observer:	
Shortcomings:				
Members present:				
Corrective Action suggested:				
Designated EHS Manager			Authorized Signatory of Project	

Format XIII: Training Records

This list is to be maintained in the records to ensure that trainings are conducted regularly during the project operation.

Department:
Date & Time:
Person-in-charge:
Training name:
List of attendees:
Next date of training:
Prepared by:

Format XV: Records of past accidents/ occupational diseases/ dangerous occurrence/ emergency

Sr. No.	Accident Details	Detected Occupational Diseases	Incident /Dangerous Occurrence/ Emergency

	Date	Time	Place	Type of Accident	Nature of Injury	No of Person Injured	No. of Death	Days Lost	Name of Disease	Chemical Involved	Date of Detection	No. of Persons involved	Type of effect	Remedial Measures	Date	Time	Place	Chemical Involved/ Type of Incident /D.O	Person Affected				Duration of Emergency	Other Details
																			Inside		Out side			
																			Injured	Died	Injured	Died		
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25
1.																								
2.																								
3.																								
4.																								

APPENDIX 5: CONTRACTOR MANAGEMENT PLAN

The management plan defines responsibilities of the project and provides requirements for selection and monitoring of subcontractors and suppliers by the project and its contractors. The purpose of these requirement is to minimize or eliminate risk to the environment and health & safety, and social (EHS&S) through the Project phases. This plan contains information regarding the procedure of selection of contractor and suppliers, contractual agreement, safeguards on EHS&S aspects, regular monitoring and reporting of EHS&S aspects. The management plan is intended to outline the relationship between the project and its contractors and sub-contractors, and to describe the process on how the overall contract will be managed.

Scope

In further details, the scope of the management plan is to:

- Summarize the contractors and sub-contractors' engagement and management processes, procedures and systems used
- Set out the procedure for selection of sub-contractors and suppliers by adopting commitment, capacity and track record methodology
- Set out the processes to ensure the implementation, by sub-contractors, of all requirements, their commitments, conditions and procedures – intended to assure the work to be done in compliance of the Applicable Reference Framework of this ESIA
- Define monitoring and reporting procedures including Key Performance Indicators (KPIs), to monitor the performance of sub-contractors and suppliers

Contractors and Supplier's selection, Contracting and Induction

GWRPL and its contractors shall adopt the contractor and suppliers process that will involve a multidisciplinary team, with one (1) or more qualified EHS&S professional. The participation and engagement of the EHS&S professional in the selection process is aimed to providing an early consideration of EHS&S matters and variables.

1. Prequalification

The contractors should be asked to provide details including (but not limited to):

- Past EHS performance
- Provision of E&S Policies and management systems
- Number and qualification of EHS personnel
- Occupational health and safety procedures and controls
- Human Rights Policies and code of conduct
- Grievance Redressal Mechanism, including means to address harassment
- Human Rights safeguard policy or system
- Supply chain management as criteria for inclusion (specific consideration for child and forced labour).

The number of documents, and level of information and detail that are requested to sub-contractor(s) shall be commensurate to the scope of work and other specific features that the sub-contractor(s) is being pre-qualified against.

2. Request for Proposal from contractor(s) and supplier(s)

The section will provide the details of the general EHS&S requirements to come in the Request for Proposal (RfP) for all the sub-contractor(s) and suppliers.

General Requirement for all Sub-contractors

GWRPL and its contractors shall include following general EHS&S requirement in the RfP or other solicitations to prospective all categories of sub-contractors:

- Documentation showing compliance with in-country EHS&S legal requirements

- An affirmative statement or other commitment by prospective sub-contractor(s) that they will be responsible for EHS&S performance of their appointed contractors and suppliers

Raw material and other material supplier(s)

The specific requirement on EHS&S aspects for materials suppliers are provided below:

- Provide a copy of the supplier(s)' environmental, health & safety and social polices
- Provide details of any accreditation related to EHS&S such as (but not limited to) ISO 14001/OSHAS 18001 and/or alignment with ISO 26000, and other social responsibility standards/guidelines/formal initiatives
- Organisational chart that shows how EHS&S issues are managed
- Provide appropriate EHS&S metrics for the past three (3) calendar year, including spills, releases to the environment, number of labours related or environmental fines or regulatory administrative processes
- Provide appropriate health and safety metrics for the past two (2) calendar years, including:
    - Total recordable fatalities
    - Total recordable injury frequency rate
    - Total recordable disease frequency rate
- Provide details on how the supplier(s) typically manages solid waste, both hazardous and non-hazardous, generated by its activities
- Provided details on how the supplier(s) typically manages wastewater generated by its activities

Contractor(s) for Providing Human Resources

The specific requirement on EHS&S aspects for sub-contractor(s) providing human resources are provided below:

- Provide details of any accreditations such as (but not limited to) ISO 26000, and other social responsibility standards/guidelines/formal initiatives
- Provide details of the sub-contractor(s) HR policies and grievance mechanism, and describe how there will be communicated to all workers on-site
- Provide details on how the sub-contract(s) will comply with national labour and employment laws
- Provided information on past social and labour performance. The information required from sub-contractor(s) include (but not limited) to past violation of labour regulations, reports of sexual harassment or discrimination, training provided on applicable laws and regulations and labour inspection reports
- Provide details how the sub-contractor(s) will manage equal opportunities and non-discrimination, sexual harassment issues, migrant labour and retrenchment among its workforces
- Provide details of the sub-contractor(s)' policy for adequate protection of human rights of workforce

3. Proposal evaluation and contractor(s) and supplier(s) selection

GWRPL and its contractor shall establish an evaluation criterion alongside the RfP and that these are included with the RfP so that contractor(s) and supplier(s) can see early on the relative weightings of the EHS&S aspects of their proposal.

Evaluation methodology, criteria, KPIs and weightings will be established in discussion with the Project team and EHS&S team. Primarily, the evaluation will be done based on the contractor(s)' and suppliers' existing policies, their capacity to implement EHS&S requirements, and the provided information on past EHS&S performance shall be among the key criteria to evaluate.

While the evaluation methodology will vary according to the different category of contractor(s), scope of work, and any specific features, it will be agreed on by the project team and EHS team. However, at minimum following will be considered as grounds for disqualification:

- Failure to provided information on past E&S performance, including health and safety records
- Reports of past performance deemed unacceptable for the current phase of the Project
- Notices of material labour issues between workers and management
- Fines and sanction imposed by EHS and labour regulators and authorities
- Material community grievances and high-profile adverse press report on EHS&S matters

Further, among the team evaluating proposal at least one (1) qualified and experienced EHS&S professional who have been involved in the development of RfP and the establishment of the criteria that be used to evaluate contractor(s) and supplier(s)' EHS&S qualifications.

4. Contracting

Based on the pre-qualification (commitment, capacity and track record analysis) and selection procedure, the identification of EHS&S plans to be developed by the contractor(s) will be identified. The same plans will be incorporated in the EHS&S conditions of the contract. The EHS&S condition will have all EHS&S management plans and associated documentation that must be prepared or refined and implemented by the sub-contractor(s) and require that these documents by submitted for review and approval of GWRPL within an agreed timeline.

Specific provisions of EHS&S requirement will be included in the contract only after they are deemed to be acceptable by the evaluation panel, including the EHS&S representative(s) and approved by GWRPL management.

General terms and condition for all contractors

While onboarding contractors, after the screening and evaluation, The contractors will have to be introduced to policies and requirements that they may have not been practicing or aware of before their engagement with GWRPL. Some of the indicative clauses to be included as part of the Contractor Agreements are suggested below. GWRPL shall ensure that their contracts and the sub contracts include key EHS&S requirement (but not limited to):

- Explicit commitment to compliance with applicable EHS&S rules and regulations, IFC PS Requirement and WBG EHS Guidelines, conditions of approval and acquisition of all required permits, license, consent and approval prior to undertaking the activities being permitted or otherwise approved
- Submission of relevant documents to regulatory authorities as agreed with/required and maintenance of relevant records of the same (such as the contract labour license, inter-state migrant worker's registration etc.);
- Preparation of all relevant plans and other documentation, as identified through the ESMP or other commitments of GWRPL;
- Adherence to E&S management Plan for the site;
- Notice of any incident/accident on site or off-site to GWRPL within 24 hours; and
- Acknowledgement and agreement to ongoing monitoring and periodic audits during the project lifecycle.
- Creation and maintenance of records on EHS&S performance
- Penalties or incentives for EHS&S performance
- Clear contract statement that the contractor(s) is responsible for the EHS&S performance of their appointed contractor(s)
- Statement that invoices of sub-contractor(s) will be approved based on the EHS&S performance of contractor(s), and GWRPL and its contractors have authority to temporary or permanently withhold the payment
- Contract statement that on the contractor(s) failure to meet the EHS&S requirements in such a way as to prevent significant impacts to workers, local communities or individual or environmental resources, and on the contractor(s) failure to correct such deficiencies upon receiving proper notice, GWRPL has the right to appoint and pay another party to repair damage or otherwise remedy the impacts and reduce payment to the contractor(s) in the amount paid to the appointed such third-party.

Specific EHS&S terms and condition for material supplier(s)

- Number and qualification of EHS&S personnel required to be on staff – including those responsible for HR; workers' health and safety; environmental management; community health; safety and security and emergency response
- Monitoring of environmental parameters (such as noise, air emissions and air quality, water flows and quality, waste generation and management) that supplier(s) requires to carry out

Specific EHS&S terms and condition for sub-contractor(s) providing human resources

- Development and adoption of social and labour policies or commitment to adhere to the GWRPL EHS&S systems, as necessary
- Number and qualification of EHS&S personnel required to be on staff – including those responsible for HR; worker grievances; and worker accommodation (if provided)

- Induction and training programs for workforce, including training on applicable HR policy provisions, grievance mechanism, and occupational health and safety
- Implementation of a grievance redressal mechanism for workers either through a grievance redressal mechanism implemented and managed by GWRPL's contractors or through extending the grievance redressal mechanism of the GWRPL

Health and Safety clauses in Contract Agreements

In case of big contracts requiring mobilization of more than 50 workers, separate HSE plan should be prepared by the contractor. At minimum following clauses should be included in the contract agreement

- All the workers must be provided with adequate personal protective equipment (PPEs) such as safety helmet, safety shoes, safety glasses, safety harness and gloves etc. as required for different construction and operation activities;
- Adequate and appropriate safety precautions (as per applicable standards and good industry practices) shall be taken by the contractor while conducting their activities onsite;
- The PPE requirement and adequacy for their work shall be decided by GWRPL and the contractor shall implement and maintain 100% PPE compliance;
- Tool box talks should be conducted daily before starting the routine activities. A suitable format for recording the tool box talk should be filled and maintained at a site by the site safety in-charge or site manager;
- Areas being used for activities such as welding, bar cutting, bending, excavated areas and material stacking areas should be barricaded with a barricading tape and hard barricade;
- At areas in a construction or operation site, where work such as welding, cutting is carried out with aid of electrical power, proper care should be taken so that electrical wire with open joints are not spread on ground in haywire condition posing risk of electrocution and trip hazard to workers;
- Adequate safety signages indicating use of PPEs, different hazards etc. should be conspicuously displayed in local language at adequate locations within a construction and operation site;
- Walking pathways for the workers and the drive ways for the vehicles should be kept separate and properly marked;
- Vehicle parking areas should be maintained outside the areas of construction and operation activities and should be conspicuously marked;
- Adequate lighting arrangements should be made within the site if construction or operation activities are undertaken after sun set or in absence of day light;
- Heavy equipment such as hydra cranes and bulldozers or other earthmover equipment must be equipped with alert siren for reverse gear;
- Cranes, other lifting equipment, slings should be inspected thoroughly as per standard inspection procedures. Copy of such inspection records should be kept readily available for review with the respective equipment;
- GWRPL sites are strictly 'No Smoking' zones. Smoking, naked fires, possession of matchboxes, lighters (other than industrial lighters) shall be strictly prohibited inside the premises. Appropriate fire extinguishers and buckets filled with dry sand should be maintained at appropriate locations;
- First aid kits should be maintained at site at appropriate locations and workers should be made aware of whom to contact in case of injuries requiring first aid. First aid kit should be kept in charge of a responsible person who shall be readily available during the working hours. Supervisors at site should have obtained formal first aid training;
- A site specific emergency contact numbers which should include, nearest police station, hospital, fire station and the site in-charge should be conspicuously displayed;
- An ambulance van or an arrangement with a nearby hospital should be made for transportation of serious cases of accidents or sickness of any worker/s;
- Standard operating/working procedures with respect to safety should be implement for undertaking works such as working in confined spaces, working at heights, lifting of heavy parts with cranes and other lifting equipment;
- In addition to the aforementioned activities, adequate safety measures, as required, during different phases of project development shall be implemented; and
- The contractor shall comply with all HSE instructions and guidelines of GWRPL that may be updated from time to time.

Labour Clauses in Contractor Agreements

In case of labour contractors, the key labour clauses to be included in the contractor agreements are indicated below:

- Compliance to the GWRPL's terms (as per the Contract Agreement- payment terms, special terms and conditions, code of ethics and general terms and conditions etc.);

- The contractor must be registered and have a valid license under the Contract Labour Regulation and Abolition Act, 1970 and the Inter-State Migrant Workmen Act, 1979 (where applicable);
- All workers shall be provided with appointment letters, clearly stating the following:
    - Name of worker;
    - Father's Name;
    - Mother's Name;
    - Spouse Name;
    - Present Address;
    - Permanent Address;
    - Contact Number;
    - Designation;
    - Type of work;
    - Date of joining;
    - Class of worker;
    - Wages or pay scale;
    - Other payables and benefits;
    - Terms and conditions of employment and the job description; and Service rules applicable
- The contractor shall maintain a copy (duly signed) of the letter of appointment in the worker's personnel file;
- Each worker shall be provided with an identity card, clearly stating Name, class of worker, age and validity;
- The identity card and letter of appointment shall be issued once the worker clears the physical fitness to work test at the site;
- The workers shall be organized into shifts of 8 hours each. Any worker working more than 8 hours shall be paid overtime for the extra hours worked, in keeping with the labour regulations;
- No worker shall be forcibly required to work for more than 8 hours a day or 48 hours in a week without payment of overtime. Overtime should not exceed the regulatory requirement as mandated by law;
- Every worker shall be given one day off in a week;
- Each worker shall be eligible for the following leaves:
    - Casual Leave;
    - Sick Leave;
    - Festivals;
    - Maternity Leave; and
    - Annual Leave.
- All Workers shall be paid at least minimum wages;
- GWRPL shall put in place the following clauses in its contractor agreements in keeping with the labour regulations:
    - Prohibition of Child Labour and forced labour;
    - Abolition of Discrimination
    - Working Hours and Overtime policy;
    - Leave policy;
    - Conviction and misconduct policy;
    - Punishment and termination policy ;
    - Wages and remuneration policy;
    - Bonus policy ;
    - Maternity benefits
- The contractor shall provide wages and benefits in keeping with the labour regulations, including service benefits, Provident Fund, ESIC (or workmen compensation), festival bonuses etc.,
- The contractor must maintain but not limited to the following registers, in keeping with the labour regulations:
    - Labour/Worker's Register;
    - Leave Register;
    - Wage register;
    - Overtime Register;
    - Register for night duty female workers;
    - Register for advance amounts ;
    - Proof of age and competence of all workers;
    - Register of cleanliness;
    - Register of the accidents and report of half yearly accidents.

- In case of sudden natural disasters or an emergency outside of human control, which results in laying off of workers, the contractor shall be liable to pay the legal arrears or full pay to the workers in keeping with the labour rules. These costs shall be invoiced and claimed from the project;
- The contractor shall initiate a group insurance policy for all of its workers; and
- No worker shall be disbarred from seeking membership in a trade union or association

Contractor Induction

Once the contractor agreement is signed, and prior to initiation of work, an initiation training will be provided to each contractor and all the contractual workers involved. This training will typically be a day long training and will be undertaken by the EHS team and HR team (possibly supported by Legal team). The intent of this training will be in keeping with the specific scope of work and aimed at familiarizing the contractor and workers with the terms of EHS and labour law compliance aspects and duties and rights of contractors and contractual workers. Job specific H & S trainings may be provided if required. In case required, the EHS team and HR/ legal team may also consider a longer capacity building workshop/ training of the contractors, depending upon present capacity.

In addition to this class room training, a day of hands on training shall also be provided to contractual workers, if required. Once all these trainings are complete, an assessment shall be undertaken of the contractors and contractual workers. Only those contractors and contractual workers, who successfully pass these assessments will be issued a Contractor/ Worker Safety Card and ID number to print as proof of successful induction completion. If the contractor or contractual worker fails to pass the training, an option of a refresher training shall be provided. A documentary proof of these inductor trainings will need to be maintained outlining the duly signed list of participants, training covered and the minutes thereunder

Monitoring of sub-contractors and suppliers

GWRPL shall monitor E&S performance of contractors and suppliers, throughout construction, from mobilization through demobilization and operations. The monitoring shall involve both visits to work locations and reviews of records kept by the sub-contractors. The frequency of site visit shield be commensurate with the magnitude of the E&S risks of the activities being carried out and permanence of potential impacts that could result from ongoing activities.

Project E&S personnel should review one or more recent inspection reports and the contractor's previous month's E&S progress report prior to visiting the site to monitor the contractor's E&S performance. Further, Project's E&S personnel shall review contractor reports and follow up as needed to ensure timely resolution of issues of non-compliance with E&S requirements. This may include further communications with contractors E&S personnel, issuance of notices of deficiency or warnings to the contractor. Further, at any stage of construction or operation or other work, if the sub-contractor has not taken appropriate action to achieve compliance with E&S requirements after repeated notices of violation and warnings of noncompliance, and significant E&S impacts are occurring or imminent, the Project should order the sub-contractor to stop work until E&S performance is brought under control and up to acceptable standards

Contractor Monitoring and Reporting

GWRPL should require contractor to monitor and keep records on E&S performance in accordance with the applicable E&S management system and plans. This may include monitoring of E&S matters, scheduled and unscheduled inspections to work locations, observations made during routine activities, desk reviews, drills, and any other monitoring protocols implemented by the contractors to ensure E& compliance. The project E&S personnel must be familiar with the contractor's monitoring and record keeping system so this aspect of the contractor's performance can itself be monitored.

Responsibilities for monitoring need to be clear between the project and contractor, and results (if project and contractor are both collecting data) must be comparable. Project should require contractor to report on E&S performance on at least a monthly basis through the construction phase and once in three (3) months during operation phase. Reported E&S information should include the following:

i. *Safety:* hours worked, recordable incidents and corresponding Root Cause Analysis (lost time incidents, medical treatment cases), first aid cases, high potential near misses, and remedial and preventive activities required (for example, revised job safety analysis, new or different equipment, skills training, and so forth).
ii. *Environmental incidents and near misses:* environmental incidents and high potential near misses and how they have been addressed what is outstanding, and lessons learned.
iii. *Major work:* those undertaken and completed, progress against project schedule, and key work fronts (work areas)

iv. *E&S staffing:* new hires and departures, and listing of current staff and titles
v. *E&S requirement:* noncompliance incidents with permits and national laws (legal noncompliance), project commitments, or other E&S requirements
vi. *E&S inspections and audits:* by sub-contractor, engineer, or others, including authorities – to include date, inspector or auditor name, sites visited and records reviewed, major findings, and action take
vii. *Workers:* number of workers, indication of origin (expatriate, local, nonlocal nationals), gender, and skill level (unskilled, skilled, supervisory, professional, management)
viii. *Training on E&S issues:* including dates, number of trainees, number of trainees, and topics
ix. *Footprint management:* detail of any work outside boundaries or major off-site impacts cause by ongoing construction – to include date, location, impacts, and action taken
x. *Details of any security risks:* details of risks the contractor may be exposed to while performing its work – the threats may come from third parties external to the project or from inappropriate conduct from security forces employed either by the project or public security forces
xi. *External stakeholder grievances:* grievance and date submitted, action(s) taken and date(s), resolution (if any) and date, and follow-up yet to be taken – grievances listed should include those received since the preceding report and those that were unresolved at the time of that report
xii. *Deficiency and performance management:* actions taken in response to previous notices of deficiency or observations regarding E&S performance and/or plans for action to be taken – these should continue to be reported until the Project determines the issues is resolved satisfactorily.

This monitoring shall be carried out by the following teams.

GWRPL Team	Aspects to be covered	Monitoring Mechanism	Timeline for Monitoring
EHS team	• PPE usage by Workers • Maintenance of Documentation	Accident Register Review	Weekly and Monthly
		Visual observation	At least weekly
		Discussion with Workers	Monthly
		Discussion with Contractor	Monthly
		Review of grievances (if any)	Monthly
HR & Legal Team	• Maintenance of Registers as required by labour laws. • Valid registrations under labour laws • Payment of wages • Overtime work done and payment for the same • Labour working conditions- especially labour camp monitoring • Child labour and forced labour issues • Other compliances against labour law	Registration and certifications review	Based on validity of documents submitted
		Registers required by law	Monthly
		Records/ Registers of wage payments and overtime	Monthly
		Review of identification documentation of workers	At the time of contractor signing and renewal
		Visual reconnaissance of labour camp	Weekly
		Discussion with Workers	Monthly
		Discussion with Contractor	Monthly
		Review of grievances (if any)	Monthly
Finance Team	• Compliance to general terms and conditions of contract • Compliance to timeline • Compliance to invoicing terms and conditions	Visual reconnaissance Documentation review	In keeping with milestones identified in agreement

Approving Invoices for Payment

EHS Manager or representative will be part of the process for signing of all payment to contractor(s) and supplier(s) EHS Manager will work closely with the Project manager or finance department to determine if there are any outstanding EHS&S items and whether including the full or partial payment under specific line item of the bill of quantities will be withheld, either temporary or permanently.

E&S Review of Contractor(s) Invoices

- Temporary withholding shall be done in case of repeated minor violation of EHS&S requirement that are not leading to significant impacts on workers, external parties or resources; minor violations that are not corrected after repeated warnings of first-time major violation that can be corrected easily and that have not led to permanent EHS&S impacts. The withheld amounts shall be paid upon sub-contractor(s) correction of the defiance to the GWRPL's satisfaction
- Permanent withholding will be done for minor violations that are not corrected after repeated warnings and that could result in significant impacts. Some portion of such withholding may be released upon satisfactory resolution of the issues, but some significant portion will be permanently withheld as a penalty to discourage repeated incidents
- Payment that are withheld either temporarily or permanently will be all or part of the payment specified for a line time in the bill or quantities, which in turn will be the payment due for a separate portion of the total workers. GWRPL and its contractor EHS&S personnel will work with the project managed and others as need to arrive at the amount to be withheld This amount will not base directly on the cost of compliance but rather will be somewhat higher than this amount, and based on a specific percentage of the line item in question
- sub-contractor(s) will be notified of the specific amount that must be taken in order to receive further payments for the works in question or to receive payment that has been temporarily withheld.

In case if the contractor(s) does not take timely action to reach compliance with EHS&S requirement, GWRPL EHS Manager and the project manager or finance department will continue to appropriate action to encourage compliance, which could include orders to stop work, withholding of further payments or escalation of the issue to higher management of GWRPL. If significant impacts are occurring or imminent. GWRPL may notify the contractor(s) that another external party will be brough in to deal with the issue and the payment of the contractor(s) will reduced by the amount paid to the appointed external party.

APPENDIX 6: POLLUTION PREVENTION AND MANAGEMENT PLAN

Project construction and operation activities have the potential to generate a range of pollution sources that require proper planning from the outset to avoid resulting in impacts to human, ecological or other environmental receptors. These includes accidental emissions to air, water and soil, amongst others. GWRPL seeks to proactively manage such potential pollution sources and to this effectively will undertake the following management plan into consideration. The management plan is applicable to all GWRPL staff, contractors and sub-contractors. The Plan covers air emission, odour, leachate, fly ash, water, noise, waste management and outlines actions and measures necessary for the effective prevention.

Scope

- Outlines actions and measures necessary for the effective prevention of pollution;
- Covers both accidental and intended emissions to air, noise, water and soil;
- Specific control measures to be implemented by GWRPL and its contractors (and subcontractors), to achieve this.

Responsibility & Requirement

GWRPL will be obtaining all necessary consents, licenses and permissions for their activities as required by current legislation governing the protection of the environment. The Project also needs to be aligned with the requirements of IFC PS and WBG guidelines.

This plan should be viewed as an evolving document(s), tailored to suit specific activities or work areas, and be continually reviewed at meetings for the duration of the works.

Pollution Prevention & Mitigation

There are a number of potential sources of pollution from a waste to energy plant which may adversely impact upon the nearby sensitive receptors.

1. Air Emission Management

Air emissions from a WTE plants depends on the specific waste composition and the presence and effectiveness of air pollution control systems. Polluting emissions includes carbon dioxide (CO2), CO, NOX, sulphur dioxide (SO2), particulate matter, ammonia, amines, acids (HCL, HF), VOCs, dioxins/furans, polychlorinated biphenyls (PCBs), polycyclic aromatic hydrocarbons (PAHs), metals (Hg), and sulphides, etc., depending on the waste content and combustion conditions.

The following measures will be undertaken to prevent, minimize, and control air emissions:

Activity	Mitigation Measures
Construction phase The likely emissions from construction activities will include the following • Fugitive emissions from site clearing, digging, filling, material handling, transportation, use of construction machinery, etc.; • Fugitive dust emission from unpaved roads; • Dust emissions from batching plant; • Vehicular emission from increased traffic volume from vehicles used for transport of construction material; equipment and accessories; • Emissions from operation of emergency diesel generator;	Proposed Control Measures • The speed of vehicles on site is limited to 10-15km/h, which helps in minimizing fugitive dust emissions due to vehicular movement. • No heavy construction work was undertaken. Most of the super structures are prefabricated. All earth work was not carried out simultaneously, and was undertaken in phases for minimization of dust and particulate matter during excavation and other construction activities. Specific to linked facilities (TL and Water pipeline) • Excavated soil at the construction site will be handled adequately and topsoil is heaped and water sprinkling is done to minimize dust generation • Emissions from the D.G. set and other stationary machines will be controlled by ensuring that the engines are always properly tuned and maintained Minimizing of stockpiling by coordinating excavations, spreading, re-grading and compaction activities • Preventive measures such as storage of construction material in sheds, covering of construction materials during transportation will be undertaken, for reducing dust emissions

Activity	Mitigation Measures
	Additional Measures Recommended • Adequately sized construction yard will be identified at the site for storage of construction materials, equipment tools, earthmoving equipment, etc. • Fuel tanks adequately designed to minimize fugitive emissions and welding gas cylinders will be stored in a secluded area within project site
Operation phase Flue gas emissions, particulate matter emissions Leakages & shutdowns	**Proposed Control Measures** • Adequate air pollution control measures such as a flue gas cleaning system and adequate stack height shall be provided before commissioning of the Plant. Additional facilities required, if any, to achieve the standards laid down by the statutory authority shall also be made along with. • The waste will be transported in closed and covered waste collection trucks • Provision of closed waste handling and storage areas • Internal Roads are made of Concrete instead of asphalt and least distance will be travelled by the material within the facility. • Separate waste segregation/MRF Facility with AI driven technology will be developed with no human intervention • Use negative pressure in processing buildings to manage odor • Waste will be incinerated at high temperatures and no chemical treated with any chlorinated disinfectants will be undertaken prior to incineration • Plant shall be operated (combustion chambers) with such temperature, retention time and turbulence, as to achieve total Organic carbon (TOC) content in the bottom ash less than 3%, or their loss on ignition is less than 5% of the dry weight. • Ensure temperature within combustion/gasification chambers (always above 850 °C) avoid the formation of dioxins and furans • Mist cooling is planned to keep down dusts, especially during and prior to loading or other handling procedures • Waste segregation and/or presorting to avoid incineration of wastes that contain metals and metalloids that may volatilize during combustion and be difficult to control through air emission technology (e.g., mercury and arsenic) • Waste introduction into the incinerator only after the optimum temperature is reached in the final combustion chamber • Waste will be incinerated at high temperatures and no chemical treatment with any chlorinated disinfectants will be undertaken prior to incineration • The waste charging system is interlocked with the temperature monitoring and control system to prevent waste additions if the operating temperature falls below the required limits • Provision of flue gas treatment system to control acid gases, particulate matter, and other air pollutants • Minimize formation of dioxins and furans by maintaining the boiler temperature above 800°C • Periodic monitoring of concentrations of PCDDs, PCDFs, other combustion products, and heavy metals in flue gas • Reduction in the generation and emission of PCDDs and PCDFs, by ensuring rapid cooling of flue gas as well as good turbulence of the combustion gas, high temperature, adequate oxygen content, and adequate residence time. • Use odor-neutralizing sprays where necessary • Design stack heights according to Good International Industry Practice (GIIP) to avoid excessive ground level concentrations and minimize impacts, including acid deposition

Activity	Mitigation Measures
	• Implementation of Air Pollution Control Devices to manage emissions from the facility • Implementation of continuous emission monitoring systems (CEMS) to monitor the plant's emissions in real-time. Regular reporting of emissions data to relevant environmental authorities promotes transparency and compliance with air quality regulations. • Provision of greenbelt and landscape area within the Project premises. • All the vehicles and other equipment will be periodically checked to ensure compliance with the emission standards. • Provision of Ash handling system with silos, hoppers, and submerging of bottom ash • Bag Filters with PTFE bag material will be used for fly ash collection and bottom ash will be collected • GWRPL will implement a combination of both ESP and high efficiency of bag filters in series. ESP will act as a pre-dedusting mechanism (Efficiency of ESP design is around 90-95%) before addition of Activated Carbon and Lime dosing for removal of Dioxin & Furan Compound, heavy metal oxide, HF removal and acid gas control. Bag house acts as final filtration system with high efficiency PTFE fabric filters (99%-99.7%). • Development of belt area within the plant premises that may support in suppression of fugitive emissions • Periodic maintenance of the bag filter & ESP will be carried out to avoid dust emissions during removal of fly ash. • A continuous emission monitoring system to be installed at site as per conditions stipulated in the CTO to display emissions for NOx, PM (PM10 & PM2.5), CO or as included in CTO • Steam Turbine shall comply with the relevant International Electro-technical Commission (IEC) standards or equivalent • Internal Roads will be made of Concrete instead of asphalt and least distance will be travelled by the material within the facility Additional Measures • According to the Point Source Air Emissions Prevention and Control Technologies provided in WBG EHS guidelines for air emissions and ambient air quality, the reduction efficiency of fabric filter should be 99-99.7% and that of ESP should be 97-99%. • Periodic monitoring (quarterly) of concentrations of PCDDs, PCDFs, other combustion products, and heavy metals in flue gas, i.e. stack monitoring as well as ambient air quality monitoring to be undertaken on quarterly basis • Use extraction system to remove dust from working areas, buildings, and storage vessels, and treat as needed to control particulate emissions • Manual segregation and removal of chlorinated plastic and other elements unsuitable for thermal treatment. • Water Sprinkling to be done at the access road to manage dust emissions from the vehicles transporting waste to the plant. • Implement good housekeeping practices to reduce fugitive emissions and control dust and particulate matter within the facility. • As stated in the General EHS Guidelines, emissions from a single project should not contribute more than 25% of the applicable ambient air quality standards to allow additional, future sustainable development in the same airshed[89].

[89] For example, the US EPA Prevention of Significant Deterioration Increments Limits applicable to non-degraded airsheds provide the following: SO2 (91 µg/m3 for 2nd highest 24-hour, 20 µg/m3 for annual average), NO2 (20 µg/m3 for annual average), and PM10 (30 µg/m3 for 2nd highest 24-hour, and 17 µg/m3 for annual average).

Activity	Mitigation Measures
	Fly Ash will be transported in covered trucks and tippers to the fly ash recipients. Fly ash generated from bag filter should be sent to cement plants. GWRPL to discuss with RMC for disposal of ash in line with MoEFCC draft notification no. G.S.R. 285(E) dated 22/04/2021, with previous notification in 2016.

2. Odour Management

The most aggravating problem in a WTE plant is odour generated from the MSW waste and its components. Odours occur due to the presence of various gases such as ammonia, methane, etc. Limiting odour from the waste recycling facility can best be achieved through employing effective site management and good general practice. For this purpose, GWRPL will ensure the following:

- Odours from MSW delivery vehicles will be minimised by the use of enclosed vehicle containers. Also, the containers will be closed after unloading, so that the empty trucks are also not open to the atmosphere.
- The storage bunker will be designed to provide a slight negative pressure, minimising the risk of any odours being released.
- When the WTE plant is in operation, odour control will be achieved by drawing air from the storage bunker through into the combustion system, which will need air to ensure effective combustion of the MSW.
- Odour levels will be monitored regularly around the WTE plant perimeter to assess the effectiveness of the odour control measures being applied.
- In case any complaint regarding odour generated at the WTE plant is received, it will be managed in accordance with the Grievance Redressal Mechanism and will include an investigation into the source of the odour and whether any additional mitigation measures are required (such as use of the deodorising spray). If necessary, operational procedures will be amended as appropriate following the outcome of the investigation.
- Compact and cover waste promptly after discharge from the vehicle delivering the waste;
- Minimize open tipping face area;
- Dispose of odorous sludge in covered trenches;
- Restrict acceptance of loads known to be particularly odorous;
- Restrict tipping activities during periods of adverse weather (e.g., wind toward sensitive receptors);
- Aerate leachate storage areas.

GWRPL will also undertake sampling of odours and conduct odour monitoring in high odorous areas of the WTE plant with the help of the third party laboratories. Odour monitoring and management shall be as per the Guidelines issued by Central Pollution Control Board (CPCB) from time to time, for waste management sites. They may undertake workplace monitoring of various gases within the WTE plant premises and adopt adequate measures.

3. Leachate Management

Leachate from the waste storage bunkers contains dissolved constituents derived from the interstitial waters of the disposed waste as well as its degradation products. It also may contain some suspended solids, including pathogens. If not collected and treated, leachate can migrate and contaminate soil, groundwater, and surface water. GWRPL will ensure to install a leachate filtration and injection system, to collect leachate from bunker, fuel collection area and waste processing area into raw leachate collection pit, to be later disposed by pumping into the furnace; step of which are mentioned below

- All leachate collected from all different sources will be collected in separate storage areas.
- Leachate will be collected from pre-processing unit and main bunker. This leachate will be pumped to sludge drying beds
- From storage tank, leachate can also be pumped to into furnace by crusher type two pumps (one in operation, one in stand-by) via injection lances with retractable mechanism (pneumatically operated) on the furnace.
- The leachate injection system will be provided with automatic flushing system to avoid clogging of nuzzles.

4. Fly Ash Management

Combustion of wastes generates ash and other material remaining after incineration. GWRPL will ensure that fly ash will be temporarily collected and stored in the WTE plant premises to be later disposed-off as per the Fly Ash notification, 2016 and the amendments thereafter; in all the plants. Also, ensure to quench the ash with treated wastewater to avoid fugitive dust emissions

In additions to above, GWRPL will ensure to undertake following measures to prevent, minimize, and control solid waste from incineration:

- Design the furnace to, as far as possible, physically retain the waste within the combustion chamber (e.g. narrow grate bar spacing for grates, rotary or static kilns for appreciably liquid wastes), and use a waste throughput rate that provides sufficient agitation and residence time of the waste in the furnace at sufficiently high temperatures, including any ash burn-out areas, in order to achieve a total organic carbon (TOC) value in the ash residues of below 3 weight percent and typically between 1 and 2 weight percent;
- Manage bottom ash separately from fly ash and other flue gas treatment residues to avoid contamination of the bottom ash for its potential recovery;
- Fly ash collected from bag houses will be contaminated and will be categorized as hazardous in nature. ESP will be added as pre-deduster which will significantly reduce the quantity of hazardous fly ash from bag house.
- Silos will be developed for Fly ash handling and the bottom ash will be submerged and sent to sludge drying bed
- Bottom Ash quenching will be done using the waste water generated from the secondary treatment process

Additional Mitigation Measures Recommended includes:

- Separate remaining ferrous and non-ferrous metals from bottom ash as far as practicably and economically viable, for their recovery;
- Treat bottom ash on or off-site (e.g., by screening and crushing) to the extent that is required to meet the specifications set for its use or at the receiving treatment or disposal site (e.g., to achieve a leaching level for metals and salts that is in compliance with the local environmental conditions at the place of use);
- Bottom ash and residuals should be managed based on their classification as hazardous or non-hazardous materials. Hazardous ash should be managed and disposed of as hazardous waste. Non-hazardous ash to be sent to fly ash utilizing units
- Fly ash shall be conveyed in closed conveying systems that end up in storage silos whose exhaust air can be dedusted via a central dedusting system
- The top of the bag filter housing shall be enclosed and shall be connected to the central dedusting system (while pulling/replacing bag-filter hoses)
- GWRPL to conduct characterization analysis of ash (occasionally) as per IS 3812 covering all the parameters stipulated by BIS to identify any hazardous content before its disposal through RMC trucks. If fly ash is identified as hazardous, it is to be sent to hazardous waste landfill site through authorized recyclers. Records of hazardous ash generation and disposal to be maintained.
- Hazardous ash to be stored and handled as per the hazardous and other waste (management and transboundary movement) rules, 2016 as amended.
- GWRPL is recommended to obtain chain of custody documents from Rajkot Municipal Corporation for final disposal destination to ensure that the hazardous waste is being disposed at the authorized hazardous waste landfill as per the applicable Hazardous and Other Wastes (Management and Transboundary Movement) Rules, 2016, as amended.
- GWRPL to also establish through relevant agencies whether disposal site (where hazardous ash is disposed) is being operated to acceptable standards before disposal. If this is not established, GWRPL shall consider alternative disposal options, including the possibility of developing its own recovery or disposal facility at the project site or else reduce generation of hazardous ash.
- If GWRPL is uncertain that the disposal conducted by RMC is as per the applicable rules, GWRPL will themselves take the responsibility of disposal and will ensure disposal is conducted to the hazardous waste authorized site as per the applicable norms.
- Non-hazardous ash may be disposed of in an MSW landfill or considered for recycling in construction materials or provided to cement and fly ash brick manufacturers
- Promote use of fly ash generated from bank zone and ESP for making non-leachable concrete pavers.

5. Noise Management

GWRPL will ensure to restrict noise level within the permissible limit, as per the statutory requirements. To confirm this, following measures will be undertaken:

- Noise emission generated from DG sets to be used for emergency power supply will be minimized through provision of acoustic enclosures and other noise generating activities will be restricted to day time only.
- Most of the noise generating activities and operation will be restricted to daytime only, if possible.
- Principal sources include exhaust fans and resulting in noise from the outlet of the stack; cooling system (for evaporation cooling and especially for air cooling); and turbine generators. Therefore, efficient and less noise generating machinery will be used for such purposes and regular maintenance and upkeep of the machinery will be done to ensure smooth operations.
- Noise emission from vehicular traffic for staff mobilization, waste & ash transportation – noise monitoring is conducted on half yearly basis, anti honking sign boards are placed in parking area and entry/ exit points.

6. Storm Water Management

Based on the master planning and contours, Plant area has been segregated in such a way to prevent crisscross movement of storm water drainage between operations area, ash handling area and landscape area. Slope of the site is predominantly towards southwest. Water collected in the catch pits installed within the Project site will be collected through rain water pipe and will be discharged into the percolation wells. Total 2 no. of percolation wells are proposed within the Project (towards south and east) for recharging 22000 m^3/annum of ground water.

7. Waste Management

Solid waste and hazardous waste will be generated due to WTE plant construction and operation activities. The solid waste generated by the project will consist of labour camp waste, garbage waste, metal scrap, and excess construction materials. The main types of waste that will be generated during construction, operation phase are mentioned below.

S. No.	Waste Type	Source	Method of Disposal
Non-hazardous waste			
1	Domestic solid waste	Labour activities	Waste will be segregated onsite and will be disposed of at site as approved by local authority.
2	Construction Debris (excavated earth)	Construction of WTE plant, access road, etc.	Excavated materials to be used for backfilling and levelling and other debris shall be used for road construction.
3	Sludge from Wastewater Septic Tanks	Labour Camp	Mobile toilets with temporary septic tanks will be provided at the construction site as per IS 2470-1995 Part I and Part II specifications. The septic tanks will be emptied periodically through truck mounted tanker for offsite treatment and disposal by approved vendors. Collected and disposed of through contractors
4	Wastewater	Project	A water treatment system will be developed within the project area and the wastewater will be treated as required. Also, the waste water generated will be reused within the project site
5	All non- recyclables	Construction activities and Labour camps	Collected and disposed of by the contractor at designated landfill sites.
Hazardous waste			
6	Used oil/ waste oil, Waste Drum (Oil drums/ Chemical drum/ Misc. drum)	DG set, construction machinery	Collected and disposed of through approved recyclers in accordance to The Hazardous and Other Wastes (Management and Transboundary Movement) Rules, 2016.

S. No.	Waste Type	Source	Method of Disposal
7	Oil contaminated rags, Oil Sludge, Oil-Soaked Cotton, Used insulation Material (Glass wool /Mineral Wool), Used Grease	Maintenance activities	

General Procedures

- The checklist shall be circulated to the respective contractors to inventories the solid waste generated in weekly basis. Record of all Solid Waste and Solid Waste Disposal on construction site shall be maintained.
  - Waste Storage and Handling, Management and Disposal
- A source-segregated waste storage system is recommended to be adopted inside the premises. The biodegradable waste shall not be mixed with any other type of wastes such as domestic hazardous wastes or construction and demolition waste.
- The concept of 3 Rs- Reduce, Recycle and Reuse shall be adopted to manage the non- hazardous solid waste generated within the premises.
- Quality housekeeping should be maintained by regular inspection and checking.
- Training on solid waste management procedures shall be part of the induction training for workers/ employees.

Construction and Demolition (C&D) Waste Management

- The construction waste largely comprises of earth, stones, concrete, bricks, lumber, roofing materials, plumbing materials, electrical wires etc. The components of construction waste include – major components - cement concrete, bricks, cement plaster, rubble, steel (from RCC, door/window frames, roofing support, railings of staircase etc.), stone (marble, granite, sand stone); and minor components - conduits (iron, plastic), pipes (GI, iron, plastic), electrical fixtures (copper/ aluminum wiring, Bakelite/ plastic switches, wire insulation), panels (wooden, laminated), others (glazed tiles, glass panes).
- The civil contractor responsible for the construction activities shall be responsible for sound handling and management of the C&D and municipal waste at the construction site including handling, storage, collection, re-use and clearing of the wasted construction material. The non-utilizable and utilizable C&D waste generated at site will be stored in a segregated manner at the construction site.
- Dumping of C&D waste in non-designated sites shall be strictly prohibited.
- All construction/demolition waste will be stored within the site itself. Metal mesh screen or GI screens will be provided so that the waste does not get scattered.
- C&D waste shall be stored separately and not allowed to get mixed with other waste (e.g., municipal / biomedical / e-waste / hazardous etc.).
- C&D waste shall be stored at the construction site in either skips or suitable containers and shall be directly transported to a suitable disposal facility by engaging services of an authorized collection agency
- Scrap metals shall be stored separately and shall be hauled to scrap metal dealers. The scrap metal skip should be covered when not in active use.
- Scrap metal from construction, renovation, or maintenance work shall be deposited separately. Oils shall be purged prior to disposal of metals into this container.
- The storage bins/ designated area shall be in accordance with the quantum and nature of the C&D waste.
- Clearly label the containers, preferably with waterproof signage, detailing which material can be disposed of in each one.
- Efforts shall be made to reduce the rate of waste generation by adopting efficient construction techniques and limiting waste generating activities. The measures for controlling construction waste may include limiting site clearance activities, planned stocking and gathering of construction materials and equipment, fencing around the construction yard, maintaining existing right of way to carry construction materials, adopting proper sanitation system for employees, banning of waste burning, and quality housekeeping.
- A designated place shall be identified and well-labelled for waste stocking with appropriate impermeable linings.
- For controlling runoff from construction yard and liquid waste, appropriate measures such as provision of a garland drain will be made.

- In case of road construction within the premises, empty containers of paint, prime coat, tack coat (considered as hazardous waste) shall be stored at a designated place / or a skip and sent to an authorized hazardous waste handler. All the records of the sale of items to authorized hazardous waste vendors will be preserved 7 years after completion and final payment of the contract.
- Company shall pay relevant charges for collection, transportation, processing and disposal of C&D waste generated by them, as notified by the concerned authorities. Payment shall be as per the provisions made under the Construction and Demolition Waste Management Rules, 2016 and is dependent on the quantum of C&D waste generated. [if Company generates more than 20 tons or more in one day or 300 tons in a month, then payment for waste processing and disposal shall also be made along with charges for storage and collection]

Biodegradable waste including Horticultural waste (Green Waste)

- All the biodegradable waste shall be stored separately at their source of generation and not be mixed with any other types of waste such as hazardous waste, C&D waste, dry recyclables. The biodegradable waste generated can be used in the boiler.

Dry Trash (Recyclables) Management

- All the dry recyclable items such as paper, plastic sheets, plastic cups, plastic cans, PET bottles, metal scrap, cardboard box etc. shall be collected and stored separately and not be mixed with any other types of waste such as hazardous waste, C&D waste. Such waste can be fed in the boiler and the material which cannot be fed in the boiler can be sold to scrap dealers .
- Glass waste including empty glass bottles, broken glass, window panes shall be stored separately in a container/ skip and sold off.
- The dry trash items waste shall be collected from all the points of generation, by the housekeeping staff and brought to Blue colored, high capacity waste containers, located at designated locations within the premises.

Sewage Disposal

- Appropriate number of toilets, separate for male and female employees and workers shall be provided in office area and shop floor and shall be maintained in hygienic conditions. The toilets shall be connected to sewerage system for its ultimate treatment in Sewage Treatment Plant for suitable capacity or connected to soak pit and septic tank systems.

Hazardous Waste Management

Legal Compliances:

- Company to identify all the hazardous waste generated during construction and operation phase as per the Hazardous and Other Wastes (Management and Trans-Boundary Movement) Rules, 2016 (HMR 2016).
- Company shall make an application in Form 1 to the State Pollution Control Board (SPCB) and obtain an authorization for managing hazardous and other wastes. SPCB, upon being satisfied, will grant an authorization in Form 2 which shall be valid for Five Years.
- Company shall be responsible for safe and environmentally sound management of hazardous and other wastes by sending or selling the waste to authorized actual user or by disposing it in an authorized disposal facility.

Storage of Wastes:

- As per Rule 8 of the HMR 2016, hazardous wastes cannot be stored on-site for a period exceeding 90 days. In case of storage of hazardous wastes on-site for a period in exceedance of that specified by the SPCB, management is required to intimate the same to the SPCB and obtain written permission to do so.
- A hazardous waste inventory form shall be maintained onsite by EHS Manager;
- Company shall ensure that potential hazardous solid and liquid wastes (such as used/ waste oils, etc.) are not disposed off in dumpsters designated for general domestic trash.
- Company shall ensure provision of secured storage (with adequate secondary containment) for all hazardous wastes generated on site.
- All containers containing liquid hazardous material (such as used oil, used transformer oil) should be kept in bunded storage or on bund trays.
- The designated hazardous waste storage area shall have proper enclosures with conspicuous signage, including safety requirements such as fire extinguishers, appropriate PPE and spill management kit (s).
- In order to have appropriate measures to prevent percolation of spills, leaks etc. to the soil and groundwater, the facility shall ensure that the storage area is provided with impervious flooring.

- Oil soaked rags, used filters, used Personal Protective Equipment (PPE) (such as gloves, masks, etc.), empty chemical containers and liners are considered as hazardous and need to be disposed off as hazardous waste to SPCB authorized waste vendors.
- The hazardous waste containers shall be provided with a label in the prescribed format under the HMR 2016. The labelling shall be done as per Form 8 of HMR 2016.
- Company shall maintain a record of hazardous and other wastes managed by them in Form 3 and prepare and submit to the SPCB, an annual return containing the details specified in Form 4 on or before the 30th day of June following the financial year to which that return relates.
- In case of spills / leaks, the facility shall ensure usage of spill management kit for cleaning instead of water. All areas where there is a likelihood of spillages to occur should be provided with a drain outlet that outfalls into a sump. The sump should be constructed of impervious material and its integrity tested periodically. The sump should be cleaned on a regular basis. Contents of the sump are to be treated as hazardous wastes and should be disposed off to SPCB authorized waste vendors only.

Authorized Access

- The facility shall ensure usage of adequate locks; control the issue of keys; and provision of fencing where appropriate.
- The hazardous waste storage area should be fenced properly and sign of "Danger" should be placed at the storage site.
- Signboards showing "Restricted Entry", "Hazardous Waste Storage Area" and the “Category of Wastes stored-", shall be displayed outside the earmarked area for storage of hazardous waste. "No Smoking" signs should also be placed conspicuously wherever any ignitable or reactive waste is stored.

Disposal of Waste

- The facility shall ensure disposal of the hazardous waste to a SPCB authorized vendor/ facility only.
- The facility shall ensure issuance of gate pass (challan) for all the hazardous wastes entering/leaving the site
- The facility shall ensure that the hazardous waste authorization of the vendor is checked and copies of the vendor operating permits and authorizations are maintained.
- Before transportation of hazardous wastes, the facility shall provide the transporter with relevant information in Form 10 (Waste Manifest) and Form 11 regarding the hazardous nature of the wastes and steps to be taken in case of emergency.
- Used/ Waste lead acid batteries (for e.g. lead-acid batteries associated with diesel generators) are to be handed over to a SPCB registered recycler as per the Batteries (Management & Handling) Amendment Rules, 2010 or to the supplier on a buy-back basis.

NOTE:

- Import and export of hazardous waste is not permitted for dumping and disposal.

Import and export of hazardous waste is permitted as raw materials for recycling and reuse, subject to the compliance of procedure prescribed involving the grant permission from MoEFCC for such import and export hazardous waste.

Monitoring

- The ACEL at corporate level will regularly inspect GWRPL’s work to ensure compliance with the Pollution Prevention Plan;
- WTE plant level EHS Manager will perform regular checks of WTE plant and equipment to identify any exhaust gas leakages/ odour leakages to confirm the condition of the WTE plant;
- Regular checks for visual evidence of pollution, contamination, hygiene and safety will also be made in the WTE plant premises and working areas;

- On site meetings/Inspections will be carried out as necessary to confirm the appropriate use of mitigation measures identified within the GWRPL's environmental plans relating to pollution control. These meetings/Inspections will highlight any further issues/measures which may be relevant either prior to commencement or during the works;
- Records will be kept of all inspections / findings for review for discussion during regular meetings; and
- WTE plant level EHS Manager will maintain a Pollution Prevention Measures Register (PPMR) in which all mitigation measures put into place will be listed and will be audited monthly to assess the requirement for maintenance.

Records

Following records but not limited to the following shall be maintained by GWRPL at its WTE plant:

- Reports on Pollution control equipment installed;
- Environmental monitoring reports (air, noise, water and soil) as prescribed by the SPCB in the consents;
- Ash generation and its disposal;
- Waste water generated and treated;
- Waste register for recording the generation and disposal of various categories of waste produced at sites;
- Hazardous waste manifests copies; and
- Environmental Statements reports.

The records will be kept for all initial, final and routine monitoring / inspections of construction areas, as well as ecological and environmental issues. These records will be stored in an agreed location within the WTE plant and be available for internal and external monitoring as required; and

Record sheets will detail the date, location of inspection, frequency, findings, appropriate person/s notified and identified actions, as required

Training

- All employees, subcontractors, suppliers and visitors to the site will be notified via induction of the requirements on site for pollution prevention;
- Through tool box talks, site personnel and subcontractors will be educated on those aspects of environmental management as appropriate to the task assigned to them;
- Consultation meetings will include discussion on the works to be undertaken, review of other plans and agreement on required mitigation and pollution prevention measures. Measures agreed at such consultation meetings will be disseminated to the relevant employees, subcontractors, suppliers and other appropriate persons via tool box talks and formal communications (email / memo), particularly where required for record purposes (e.g. variations, auditing and monitoring records);
- GWRPL will ultimately be responsible for overseeing and enforcing pollution prevention procedures such that potential adverse impacts to human health or the environment from any activities involving handling of potential pollutants are avoided or mitigated. For the avoidance of doubt, pollution prevention procedures include, but are not necessarily limited to: all aspects of traffic, plant and materials management, air emission management, noise level management, surface water and drainage management.

APPENDIX 7: TRAFFIC MANAGEMENT PLAN

Traffic Management Plan includes waste transportation of RDF from biomining site and fresh waste from the waste collection centres) to the project location. A traffic management plan is crucial to ensure the safe and efficient movement of vehicles, minimize health and safety impact on community, and address potential impacts on the surrounding road network. The plan includes (but not limited to) following elements:

2 Route Selection: Identify the most suitable routes for transporting booming waste from the landfill to the project site. Consider factors such as road capacity, existing traffic conditions, proximity to residential areas, and any specific requirement or restriction related to heavy vehicle transportation

3 Timing and scheduling: Determine appropriate timing and scheduling for waste transportation to minimize congestion during peak traffic hours. Coordinate with local authorities and stakeholder to identify optimal timeframes for waste transport that have minimal impact on traffic flow

4 Vehicle Management: Ensure that vehicles used for waste transportation comply with relevant regulations and standards, including proper licensing vehicle maintenance, and driver qualifications.

5 Communication and coordination: Establish effective communication channel with relevant stakeholders, including local authorities, law enforcement agencies and the project team, to inform them about waste transportation schedules, and potential disruptions. Regular coordination and information sharing will help address any concerns and facilitate smooth traffic flow

6 Monitoring and Evaluation: Continuously monitor and evaluate the effectiveness of the traffic management plan. Collect data on traffic volume, travel times, and any incidents or issues encountered during waste transportation. Use this information to identify areas for improvement and make necessary adjustment to the plan.

7 It is essential to consult with local authorities, and relevant stakeholders to develop a comprehensive traffic management plan tailored to the specific project context. The plan should prioritize the safety of road use and local communities, minimize disruption to local communities, and ensure the efficient delivery of booming waste to the project site.

Scope

GWRPL to include the following information in the project specific traffic management plan:

8 Traffic Management inside the WTE Plant

9 Traffic Management for the transportation of material and movement of staff

10 Traffic Management for pedestrian

11 Any effect on existing neighboring property traffic or access.

Traffic Management

The project in construction and operation phase will add to traffic on the access roads (Sokhada Road connecting the site with Rajkot city and 150 Feet Ring Road) from morning to evening hours. Considering the present scenario, where the waste collection vehicles from Rajkot city and the waste collection centers are transporting the waste using the same roads to dump the waste at waste dumping site which is adjacent to the Project so no major increase in traffic due to the project is anticipated. However, it is to be noted that the fresh waste brought in to the project site from Rajkot city is managed and handled by Rajkot Municipal Corporation and GWRPL has not role in fresh waste transportation from the city to the collection centres and then further to the Project site. However, GWRPL will ensure that the community safety and vehicle maintenance and management measures are communicated to the waste transportation contractors bringing the fresh waste to the project site.

Following mitigation measures shall be incorporated by GWRPL at the project site:

12 Proper management of vehicular movement within the site, especially during peak hours;

13 Different time slots will be allotted to different waste collection centres. The same will be conveyed to all to prevent any inconvenience to others.

14 GWRPL shall ensure adequate lighting is provided within the WTE plant premises.

15 Stopping/Parking of vehicles in between the roads to be discouraged.

16 Loading/ unloading area will be located within the WTE plant premises. Entry/ exit of all the vehicles will be made via the separate truck entry area designated by GWRPL. Vehicular movements within the premises will be managed by trained traffic management operatives. All vehicles will enter and exit the site premise in forward facing direction. It will be ensured that vehicle driver is aware of the WTE plant layout and safe working procedures within the WTE plant premises.

17 The movement of heavy, wide or slow-moving loads will be planned at times when traffic volume on the roads concerned is least.

18 Appropriate supervision will be provided to control flow of traffic when machinery needs to cross roads.

19 Wheel washing on site and road sweeping will be carried out to keep the local highway clear of mud and debris.

20 Training and testing of heavy equipment operators and drivers, including vision tests, with records kept of all trainings.

21 GWRPL shall dedicate a separate area for staff who will require daily access parking area within the WTE Plant. Dedicated parking area for visitors shall be provided.

Transport of construction materials

22 Impose and enforce speed limits (20 km/h on the internal access road and max speed limit of 80 km.hr on NH) on all haulage vehicles.

23 Vehicle route planning and alternative route map will be prepared and explained to the drivers.

24 Vehicles carrying fine and coarse materials like sand, gravel, cement etc. will be covered appropriately so as to avoid any deposition of loose materials on approach roads.

25 Maintaining records of all accidents involving project vehicles and implementing a traffic complaint and corrective action procedure.

26 Liaison with the police and other authorities prior to the movement of any abnormal loads or any over dimensioned consignment.

27 The contractor should avoid over-loading of the trucks that transport material to construction sites.

28 Peak hours inroads with moderate to high traffic should be avoided.

29 The contractor shall minimize possible public nuisance due to dust, traffic congestion, air pollution, etc., due to such haulage.

30 If local roads are used, routes are to be selected based on the truckload; loads should be divided to prevent damages to local roads and bridges.

31 Speed limits as nationality stipulated for haulage must be maintained.

32 All vehicles used for haulage should be in good condition.

33 If there are damages to local roads and other utilities due to hauling inroads caused by the contractor. The contractor shall attend to repair all damaged infrastructure/ roads if needed through relevant authorities.

34 A detailed plan for signage around the construction areas to facilitate traffic movement, parking facilities, provide directions to various components of the works, provide safety advice and warnings will be prepared. All signs shall be posted in both English and regional dialect.

35 The parking of vehicles along footpaths, single lane roads shall be prohibited on community roads and public roads in the vicinity of the project site.

36 The project traffic or any project activity will not obstruct the access to neighbouring properties.

37 Ambulance and fire services will be consulted regarding road diversions. Road diversions will not increase the response time of these services to local communities.

Transportation of Bio mined Legacy Waste

38 Vehicle route planning and alternative route map will be prepared and explained to the drivers

39 Impose and enforce speed limits (20 km/h on the internal access road and max speed limit of 80 km.hr on NH) on all haulage vehicles

40 Wheel washing on site and road sweeping will be carried out to keep the local highway clear of mud and debris.

41 Vehicles carrying fine and coarse materials like sand, gravel, cement etc. will be covered appropriately so as to avoid any deposition of loose materials on approach roads.

42 Maintaining records of all accidents involving project vehicles and implementing a traffic complaint and corrective action procedure.

43 Liaison with the police and other authorities prior to the movement of any abnormal loads or any over dimensioned consignment.

44 The vehicles entry will be via identified gates/routes and will make use of dedicated route to the loading/unloading area/ parking area. Sufficient number of loading/ unloading bays will be provided. A dedicated area for the turning of such vehicles will (if feasible) be formed and a banksmen (helper) will oversee these movements whilst vehicles are manoeuvring.

45 The parking of vehicles along footpaths, single lane roads shall be prohibited on community roads and public roads in the vicinity of the project site.

46 The project traffic or any project activity will not obstruct the access to neighbouring properties.

47 Ambulance and fire services will be consulted regarding road diversions. Road diversions will not increase the response time of these services to local communities.

48 Clear road markings like reflective paint and signs should be used to alert pedestrians and vehicle operators to traffic hazards in the WTE plant. Signs may indicate:

48.1 Entry point
48.2 Exclusion and safety zones
48.3 Parking and no parking zones
48.4 Speed limits
48.5 Vehicle crossings

49 Signs and road markings should be regularly checked and maintained so they can be easily seen and read and sealed when they fade.

Vehicle Maintenance & Management

This shall include the compliance of all vehicles with all safety related specifications (such as the fitting of the correct Tyres, with adequate reserves of tread, safe for movement in snow areas, inflated to manufacturer recommended levels), as well as

mechanically maintaining vehicles to manufacturer specifications so as to minimize fuel consumption as well ensure safety on road. The following requirements to be communicated to the contractor deploying vehicle.

GWRPL will ensure the following in respect of vehicle compliance, maintenance, noise and emission standards:

50 Regular vehicle inspection to ensure compliance with statutory requirements (PUC, etc.)

51 All vehicles shall be maintained so that their noise and emissions do not cause nuisance to workers or local people.

52 New vehicles/equipment purchased 'as new' after contract award shall comply with emission standards in force on the purchase date.

53 Older vehicles/equipment not purchased 'as new' after contract award shall be maintained so that noise and emissions levels are no greater than when the vehicle/ equipment was new.

54 Avoidance of passage through and near settled areas during night time hours.

55 Oil and fuel leaks must be addressed within 24 hrs of observation or reporting on any vehicle or construction equipment.

56 Vehicle maintenance and management parameters will form a critical component of key performance indictor for the contractor responsible to maintain their vehicles.

57 All heavy vehicles like cranes, battery operated trolleys etc. will be provided with reversing siren.

58 Provision for dedicated parking area will be made near the project office for parking the private vehicles of construction personnel.

59 Concrete paved areas will be provided for parking of vehicles and overhaul provisions will be made for any accidental spill of oil or fuel during parking or whenever the vehicle is idling

60 Sufficient parking area will be provide within the WTE plant or sufficient parking space will be provided outside the premises. Parking outside the WTE plant will be managed by GWRPL and will be ensure that transportation vehicles do not cause inconvenience to the surrounding community.

61 Different time slots will be allotted to different suppliers. The same will be conveyed to all to prevent any inconvenience to others

Driver Training

The project EHS requirements and Indian regulatory requirements specify the requirements for driver training. GWRPL will ensure that all drivers and driver trainers are suitably trained in accordance with driver training requirements. Driver training can be either be provided by municipal corporation since the drivers are engaged by municipal corporation, as the waste transportation is responsibility of municipal corporation. In case the trainings are not being provided by the municipal corporation, GWRPL to either include driver training on-site, or can collaborate with municipal corporation to be provided offsite.

The following issues and documents are to be addressed during driver training in a language (regional dialect) mostly understood by drivers:

62 Trip Management Plan;

63 Daily pre-use vehicle inspection by the driver;

64 Safety kit in vehicle;

65 Health and Safety Standards and Practices and;

66 National and local legal requirements to drive a vehicle.

Unauthorized passengers in project related vehicles will be strictly prohibited. All the personnel who drive vehicles as a part of contract will have to be in possession of a driving license and will adhere to the general Driver's Safety code and Passenger's Safety code.

Drivers of project vehicles will be required to undertake first aid training and all project vehicles will carry first aid kit which should be adequate to cater for the number of passengers present on the vehicle.

Periodic Road Safety Trainings will be provided to the driver, to ensure smooth transportation of materials during construction and operation phase

Driver Safe Practice Checklist

The following checklists/ records are to be maintained on a monthly basis by Site Safety/EHS Officer present at the site. Any discrepancies must be flagged and relevant action should be taken. It is to be noted that all the vehicles entering the facility during construction and operation phase are not owned or managed by Abellon.

S.No.	Safe Practice	Remarks
1	Only operate vehicles if you are competent and authorised to drive them	
2	Do not drive when your abilities are impaired by ill health, poor vision, prescribed/illegal drugs or alcohol	
3	Make sure you fully understand the operating procedures of the vehicles you control	
4	Know the site routes and follow them. Take care at pedestrian cross-overs	
5	Understand the system of signals used on site	
6	Visiting drivers: seek appropriate authority to enter the site and operate vehicles	
7	Know the safe operating limitations of your vehicles, particularly relating to safe maximum loads and gradients	
8	Carry out daily checks on your vehicles and report all defects immediately to supervisors	
9	Follow site procedures and comply with all site rules	
10	Do not drive at excessive speeds	
11	Wear appropriate PPE when out of the vehicle	
12	Ensure that windows and mirrors are kept clean and clear	
13	Keep the vehicle tidy and free from items which may hinder the operation of vehicle controls	
14	Do not allow passengers to ride on vehicles unless safe seating is provided	
15	Park vehicles on flat ground wherever possible, with the engine switched off, the handbrake and trailer brake applied and where necessary use wheel	
16	Do not reverse without reversing aid or banksman assistance	
17	Where visibility from the driving position is restricted, use visibility aids or a signaller. Stop if you lose site of the signaller or the visibility aids become defective	
18	Do not remain on vehicles during loading operations, unless the drivers position is adequately protected	
19	Ensure loads are safe to transport	
20	Do not attempt to get on or off moving vehicles	
21	Do not make adjustments with the engine running and guards removed	
22	Do not smoke during refuelling operations	
23	Do not use a mobile phone whilst driving on site	

S.No.	Safe Practice	Remarks
	Sign Below	
	Drivers Name	
	Drivers Signature	

APPENDIX 8: RESOURCE EFFICIENCY AND CONSERVATION MANAGEMENT PLAN

Scope

GWRPL business operations shall always be cognizant of its resource consumption, resource conservation and their efficient management. This plan has been developed with the following objectives-

- To promote sustainable use of resources (water, materials, energy);
- To improve power generation efficiency

Management Plan

Performance of the WTE plant can be measured by undertaking following:

- Monitoring the resource consumption;
- Conduct energy audits, water balance study, water audit etc.;
- Monitor greenhouse gases including its quantification as applicable.
- Resources consumption and resource efficiency analysis result shall be kept as record for continuous improvement of resource efficiency management.

Once the gaps are identified while monitoring, corrective action plan of the same shall be developed. This shall also include the department/ personnel responsible for closing the identified gaps along with a timeline of closure. WTE plant Head and ESG/EHS Head at corporate level will undertake regular follow ups to close the gaps within the specified timeframe

Training, Monitoring and Inspection

Maintenance and inspection program shall be implemented to ensure that equipment and processes operate at their desire energy efficiency and optimum resource utilization. At a minimum, this includes:

- Compliance with inspection and maintenance specified as per electrical safety regulation.
- Compressed air system: annual, perform a leak survey and address any findings;
- Regarding process heating and cooling system, implement a defined schedule for Inspection of air filters on air handling units, with replacement as needed and Cooling of heating / cooling coils, etc.;
- Water pipelines: monthly, inspect for water leaks and repair or replace any defective steam traps, valves, flanges, piping, or other equipment as necessary, once intimation to respective departmental Heads or responsible personnel at WTE plant

Responsibility

This plan is to be used by Plant Head in consultation with the department heads to identify:

- Opportunities for maximizing power generation;
- Energy Conservation,
- Water conservation measures
- Measures to reduce emissions and waste derivatives; and
- Set targets for resource consumption (targets can be set in coordination with Head of department and EHS manager).

Records

- Each resource used shall be mapped and recorded for its consumption by concerned contractors / department (during operation phase) and all consumption records shall be submitted to Plant Head for further analysis on identification of new opportunities, its effectiveness and efficiency as per identified targets;
- All identified resource conservation opportunities shall be documented and a resource conservation plan shall be initiated for the opportunities giving significant reductions;
- Resources consumption analysis result shall be kept as record for continuous improvement in resource efficiency;
- Plant shall complete the Self-Assessment Checklist and provide records to Corporate ESG Manager; and
- Corporate ESG manager shall periodically track the progress of resource efficiency improvements at project level.

Table below presents the typical causes of high resource consumption/wastage and can be used for analysis and put forward conservation measures.

S. No.	Typical causes of high resource consumption/losses	Examples
1.	Technology	• Continuation of non-efficient technology • Lack of proper process and control equipment; • Lack of availability of trained manpower; and • Lack of information.
2.	Poor process / equipment design	• Mismatched capacity of equipment; • Wrong material selection; • Maintenance prone design; • Adoption of avoidable process steps; and • Lack of information / design capability.
3.	Poor layout	• Unplanned / ad hoc expansion; • Poor space utilization plan; and • Improper waste and material movement plan.
4.	Poor raw material quality	• Lack of quantity & quality specification; • Improper purchase management system
5.	Operational and maintenance negligence	• Sub optimal loading; • Unchecked water / air consumption; • Unnecessary running of equipment; • Lack of preventive maintenance, inadequate maintenance
6.	Poor housekeeping	• Leaking taps / valves / flanges; and • Worn out equipment/and its accessories.
7.	Inadequately trained personnel	• Increased dependence on casual / contract labour; • Lack of formalized training system and facilities; and • Lack of availability of personnel.

Self-Assessment Checklist

S. No.	Question	Yes/ No	Additional Information
General questions			
1.	Are the implications of local/national legislations for the business/ sector reviewed, and clearly communicated to the relevant departments/ personnel?		
2.	Have all the regulatory requirements applicable for purchase of material (includes technical components and battery) water/energy/ been identified and reviewed?		
3.	Is the technology used for power generation is efficient in terms of units generated per sq km?		
4.	Are the organizational goals and objectives for improving efficiency/resource conservation (water/energy)/ exploration of carbon credit by project operation, clearly defined by the senior management? For example, • Improvement in power generation efficiency by xx%, • Reduction in water requirement by xx%; • Identification of energy conservation opportunities;		
5.	Are the resource conservation programs initiated within the organization?		
6.	Has the staff training need on water and energy conservation been identified and provided?		
1.	Records of technical components and batteries received and installed and maintained and kept up to date?		
2.	Are periodic spot checks conducted to verify the quantity and condition of material and waste stored, on the stock records?		
3.	Are adequate and proper steps taken to care and preserve storage items, so that losses are minimized?		
Water			

1. Is the water consumption being monitored on continuous basis, are the water meters installed at site and are they calibrated?

2. Are you frequently monitoring the water systems for any leakages and losses?

3. Is the water recycling system efficient and working properly?

4. Have you conducted the water balance study? Or any comprehensive water audits for the plant operations?

Energy

1. Have you identified the type of data that will be essential for the energy mapping exercise and to study the energy consumption patterns?
   For example is the following data/information available?
   - Details of energy consumption, energy demand breakdown (process/equipment wise).
   - Details on energy generated
   - Is the master list of energy using plant and equipment available?
   - Are the electricity bills and invoices for representative period (one/two years) available?
   - Is the past/historical representative data/information on all energy streams available?

2. Are any walk-through energy audit/similar exercise to identify energy losses and to increase power generation efficiency?

3. Is preliminary energy usage analysis being carried? For example

Energy Type	Total Annual Use	Units	Total annual cost
Fuel consumption -Vehicular fuel			
Electricity			

4. Is there an energy management team in place? And do they have relevant experience on energy management? Have they received any formal training in energy management?

5. Have the significant energy usage points been identified?

6. Is the identification of significant energy users and their consumption as a percentage of total energy consumption available? And is this documented?

7. Is the monitoring & tracking system established for energy?
   For example – deployment of meters at critical locations.

8. Implement a routine lighting maintenance schedule, including cleaning fixtures to reduce degradation of lighting quality

Carbon Saving

1. Do you have any team which is responsible for dealing with carbon performance? Do they have an understanding of
   - GHG emission calculations; and
   - Quantification methodology.

2. Has other areas for reducing GHG emissions identified?
   For example
   - Reduction in vehicular/indirect type of emissions.
   - Reduction in Scope 3 emissions?

APPENDIX 9: BIODIVERSITY MANAGEMENT PLAN

Abellon Clean Energy Limited will follow the given framework for protecting biodiversity in the project area throughout the project lifecycle.

Scope

- Outlines actions and measures necessary for biodiversity conservation and management;
- Covers plan of action according to national and international standards for protection of biodiversity in Project Sites location;
- Specific control and protection measures to be implemented by Abellon Clean Energy Limited and its contractors (and subcontractors), to achieve this.

Risks and Control Measures

The construction phase of the project may cause impacts on the habitat and species due to the installation of transmission lines; underground water pipeline, increases movement of people and goods; noise; and the potential for sedimentation/pollution of water resources. While the operation of Waste to Energy (WTE) project may have impact on fauna such as risks of collision & electrocution from operational transmission line; risk of Human-Wildlife Conflicts; and Impacts of Increased Traffic / Vehicle Movement.

Some of the broad level measures followed during construction phase includes:

Impacts on the Habitat and Species due to Construction Activities

- The construction activities will be restricted to the project area, routes of transmission line and underground water pipeline
- Night-time (6:00 pm to 6:00 am) construction and transportation activities will be avoided
- The areas of high animal activity (such as natural habitats), the construction and transportation activities will be avoided during dawn (6:00 am to 7:30 am) and dusk (5:00 pm to 6:30 pm)
- Hazardous materials will not be stored near water bodies and drains
- Sites with existing burrows or roosts will be avoided where possible, and temporary fencing will be installed over excavated areas (for underground water pipeline)
- Efforts will be made to minimize construction noise and sound barriers will be considered if noise levels are high
- Construction activities will implement proper housekeeping, properly dispose of discarded packaging materials, and provide labour camps with adequate sanitary facilities
- Movement of workers between camps and construction sites will be restricted and they will not be allowed to visit in natural areas (not included the planned construction activities)

Some of the broad level measures followed during operation phase includes:

Collision and Electrocution Risks from Transmission Line

- Cross arms transmission tower, and suspended insulators will be utilized.
- Bird flight diverters[90] will be applied on transmission line, specifically near the water bodies located at 22.400542, 70.797398 and 22.402381, 70.800158.
- Frequent checking of the transmission towers to avoid bird nesting.
- Disposal of corpses / garbage near the power lines will be restricted and carcasses observed along the transmission line would be immediately removed to avoid attracting raptors.
- Bird carcasses monitoring will be conducted along the TL route to record the incident of collision and/or electrocution. If the carcass of an ecological sensitive species reported during the monitoring, a separate bird & bat survey will be conducted.

Human-Wildlife Conflicts

[90] Galis, M. and Sevcik, M. (2019) Monitoring of effectiveness of bird flight diverters in preventing bird mortality from powerline collisions in Slovakia. *Raptor Journal* 13: 45–59.

- Frequent checking of the boundary wall to avoid any space for wildlife entrance into project compound
- Good housekeeping practices in the project compound will help to reduce the faunal attraction
- Awareness and training programs will be conducted to explain the dos and don't to minimize the risk of Human-Wildlife Conflict

Impacts of Increased Traffic / Vehicle Movement

- The trucks/trailers drivers will be instructed not to blow horns unnecessary.
- The drivers will follow the speed limit instructed by highway authorities (in the form of signboards)
- Annual awareness/training programs will be conducted for drivers to minimize the risk of wildlife hitting and/or being killed on highways and road safety.

Trainings

To reduce the possible risks because of Waste to Energy power project during the operational phase following awareness and training should be conducted,

- Training will be conducted regarding the bird carcass monitoring along the TL routes to monitor the incident of collision and/or electrocution.
- General awareness and training will be provided to the project staff, contractors, and laborers regarding the anti-poaching, trapping and hunting policy to be strictly enforced.
- Awareness and training programs will be conducted to explain the dos and don'ts to minimize the risk of Human-Wildlife Conflict.
- Awareness/training programs for drivers, will be conducted to minimize the risk of wildlife hitting and/or being killed on highways and roads.

APPENDIX 10: SECURITY RISK AND MANAGEMENT PLAN

Introduction

The genesis of this security risk management plan lies in UN **Voluntary Principles on Security and Human Rights.** The Voluntary Principles on Security and Human Rights is a collaborative effort by governments, major multinational extractive companies, and NGOs to provide guidance to companies on tangible steps that they can take to minimize the risk of human rights abuses in communities located near extraction sites. The principles documents provide guidance to companies in developing practices that maintain the safety and security of their operations while respecting the human rights of those who come into contact with security forces related to those operations. The principles give guidance on risk assessment, public safety and security, human rights abuses, and the interaction between companies and private and public security[91]. The implementation of the principles provides companies the tools and support to effectuate high standards of human rights conduct and to have a positive impact on local governance, peace and stability

Objectives

- To better anticipate situations in which human rights abuses are most likely to occur.
- Develop effective on-the-ground strategies to mitigate potential risks ; and
- Enhance participation of stakeholder and , policies and procedures with internationally recognized human rights principles regarding security of their operations.

Scope

The management plan provides a general guideline to the project to manager or fore see the potential Human Rights volitation risks associated with the private security arrangement during the life cycle of the proposed project

The polices entrusted in the management shall be applicable to all the company staff , contractor and especially private security agency.

Key Fundamental Aspects for Voluntary Principles

Assessing impacts

.The first key step is to identify the potential impacts of the business's security arrangements on people and communities. The accuracy of assessments depends on consideration of a broad range of factors, using regularly updated information and bringing in the perspectives of a wide range of stakeholders

Engaging stakeholders

The case for effective engagement with communities and governments on security includes being able to test the reliability of information used for risk assessments and being able to help ensure security is provided in an ethical and appropriate manner. But there are also pitfalls in communicating in a way that fails to take account of political, cultural and legal sensitivities and security concerns.

Supporting training and awareness

The ability of security providers to respond to incidents in a proportionate and ethical manner can be critical for a business's relations with local communities and its ability to sustain the safety and security of its operations. The Voluntary Principles identify support for training and education as a key means by which companies can work to achieve this goal. Developing awareness among our own relevant staff is also important.

Contracting security

[91] As per the current understanding of the proposed project, the project is related to generating electricity through municipal waste. The generation of energy from waste is not extractive in nature. It is closely related to sustainable waste management. As informed the risk associated with deployment of private security agency is not foreseen. The project will only deploy guards / watchman without any firearms. There role will be mostly limited to look after the entry and exit to the WTE plant, traffic management and as well as first person point of contact with stakeholders.

Through contracts, businesses can exercise influence over the conduct and performance of their private security provider. With a greater degree of influence comes a greater degree of responsibility, so it is essential for businesses to ensure their standards and expectations are communicated, understood, and enforced.

Providing security

Giving assistance to public security to support provision of security, whether through finance, donations or loans of equipment, or help-in-kind, can leave a business open to accusations of complicity in human rights abuses. It needs careful management. The case for businesses to follow a consistent approach to evaluating any request, assessing risks, putting in place safeguards and monitoring how assistance is used is compelling.

Responding to incidents

Allegations or actual cases of human rights violations associated with a business can, if inadequately managed or left unaddressed, impact operability, create exposure to legal risk, and damage the business and Group's reputation. Just as response plans for safety and environmental incidents are essential, procedures to respond to allegations of human rights violations should be standard practice where the business identifies a genuine risk.

Evaluating and reporting performance

In evaluating and reporting Voluntary Principles performance, businesses should aim to make a reasonable assessment of their performance, to take action where gaps exist and to continuously improve. The goal is not primarily to demonstrate compliance but to facilitate the appraisal and reporting of issues and concerns and to enable informed input to help solve problems on the ground.

Security Risk Management Action Plan

Sr no	UN - VP	Activity	Methods	Frequency	Responsibility
1	**Risk Assessment** Comprehensiveness and timeliness of risk assessments conducted by the business to identify the potential impact of its security arrangements on people and communities	• Carry out Human Rights risk assessment due to the proposed security arrangement, assessment typically involve the identification of a range of security risks that might impact any business, such as theft, robbery, vandalism, fraud, workplace violence, terrorism, and social unrest • Based on the risk develop plan for security arrangements • Develop required skills sets of people managing and providing security services • Develop formats for reporting and investigation of incidence •	Staff Meeting Stakeholder Consultations (Staff , civil society , Community labours , police and	Annual	Project in charge / security head/ HR / CSR
2	**Engaging stakeholders** Transparency of security arrangements Degree of transparency and public access to information regarding the security arrangements in place for the business.	• Develop external communication strategy on project security arrangement • Communicate to the concerned stakeholders	Community meetings: Publications: Toll Free Numbers Suggestion Box	Quarterly	Project in charge / security head/ HR / CSR
3	**Response procedures** Existence of procedures for recording and responding to credible human rights-related allegations, for referring such allegations to the appropriate authority, and for urging investigation.	• Project should develop response plan to effectively respond at the to issues and events with a human rights dimension. Depending on the circumstances, a human right related incident may prompt a response, crisis management. The flexibility of the system is able to provide for a robust response to all types of incidents, including for those with a potential human rights aspect • Establish Grievance handling Mechanism of expand the existing GRM to cover the potential Human Rights violation • Appoint /designate executive to investigate the potential issues of human rights violations	Formation Grievance cell Information disclosure to the stakeholders	Monthly Review	Project in charge / security head/ HR / CSR

	• Form committee and procedure to resolve issues related to human rights violation			
Private security training Extent to which private security personnel are trained to observe human rights-related policies and procedures relevant to their duties and to the business's operations	Based on our understanding most of the security agencies / security guards are not trained on human rights issues. The project should develop training modules for security guards . and it was also observed that there is high iteration rate among security agency therefore training of trainings will be instrumental in maintaining the standards across the lifecycle of the project. Following should be considered for developing training module: The curriculum may include four core sessions. 1. Introduction to human rights 2. Voluntary Principles on Security and Human Rights 3. Communications and conflict resolution skills 4. Principles governing the use of force	Develop training material Hire agency of training preferable from civil society background having experience in training and capacity building on human rights issues Develop core team of trainers within the project staff Develop training calendar Allocate funds for training and maintain the proper training records	Induction on Joining and refresher on every quarter	Project in charge / security head/ HR
Private security contracting Inclusion of Voluntary Principles-related provisions in contracts with private security companies.	As understood the security arrangement will be taken care off by the private security agency. Therefore project should try to cover following aspects in their contract agreements with private security agency: **Compliance with the Voluntary Principles** The contractor will provide security in a manner that complies with the Voluntary Principles and with the Sarajevo Code of Conduct for Private Security Companies[92] **Employment and Vetting** The contractor will carry out pre-employment vetting for criminal records, human rights violations and records of misconduct. Unless otherwise agreed, it will recruit employees from local communities where it operates.	Develop standard contract agreement	Before entering into contract agreement / renewal	Project in charge / security head/procurement

[92] The Sarajevo Code was launched in 2006 and sets out basic standards of professionalism and service delivery for employers and employees in the private security industry

	Deployment and Conduct The contractor will provide defensive services only, refraining from any activity that is the responsibility of public security services. (police) It will maintain policies on standards of conduct, including on acting in a lawful manner and observing principles of proportionality and necessity in use of force. Under no circumstances will it permit employees to carry firearms. **Training The contractor** will maintain high levels of professional proficiency through continuous training of its employees, including on relevant human rights standards and guidelines and on appropriate use of force. Training security personnel to exhibit appropriate conduct towards plant workers and neighboring communities; train security personnel to manage mock sessions of labor unrest and protests; and to receive grievances; also train security personnel on firefighting. **Monitoring and investigations** the contractor will provide any information requested to enable performance monitoring by the client, such as with respect to training records and incidents involving the use of force. It will promptly investigate any incident involving use of force and credible allegations of unlawful or abusive conduct that involve its employees		
Evaluating and reporting performance	**It** is imperative to evaluate performance of the management system and where necessary bridge the gaps. • The performance evaluation should consider the review of systems and procedure and where necessary recommendations for necessary update may be provided • Evaluation of effectiveness of engagement process , methods and frequency. • Number of recorded incidence and including the human rights violations if any and resolution of stakeholder grievances • Training of staff and security guards	Develop checklist of monitoring and evaluation Hire agency or train staff doing evaluation Develop format and tools for evaluation Reporting / documentation / Sharing of learnings, case studies and	Annual	in charge / security head/procurement

APPENDIX 11: STAKEHOLDER ENGAGEMENT PLAN AND GRIEVENACE HANDLING & REDRESSAL

Stakeholder Engagement is defined as "the basis for building a strong constructive and responsive relationship that is essential for the successful management of a Project's environmental and social impacts. Stakeholder engagement is an ongoing process that may involve, in varying degrees, the following elements: stakeholder analysis and planning, disclosure and dissemination of information, consultation and participation, grievance mechanism and ongoing reporting to Affected Communities" Stakeholder Engagement is thus an umbrella term which encompasses a range of activities or interactions between a company and its internal and external stakeholders, through the life of the project.

Stakeholders for the Project are those people or groups that will have an interest in the operations or have an ongoing relationship with the project and can influence its operations. This document puts a plan that shall guide the stakeholder identification, analysis and engagement process for the project. This plan applies to the construction and operation phases of the Project.

This document presents SEP and GRM for the Project. The SEP is aimed at managing and facilitating future engagement activities with identified stakeholders through the various stages of the Project's lifecycles (construction and operation). Th primary purpose of this plan is to allow for the Project development to be undertaken in a manner that is consistent with the principle of information disclosure and stakeholder engagement of IFC.

Objective of the Stakeholder Engagement and Grievance Redressal

Stakeholder Engagement is fundamental to building trust with the local communities and other identified stakeholders The purpose of SEP is to enable the project to identify key stakeholders, ensure vulnerable groups are identified early on, understand sensitivities within each stakeholder groups and develop appropriate engagement mechanism to ensure all identified stakeholders are aware of the Project and its impacts, are consulted on a regular basis, and establish a two-way communication with the identified stakeholders.

The SEP is aide to guiding and facilitating the engagement of the Project with identified stakeholders in a systematic, inclusive, transparent, and culturally appropriate approach. The goal of the SEP is to facilitate decision making for the project and create an atmosphere of active participation of the stakeholders in timely manners, such that they can voice their concerns and influence Project decisions.

The purpose of the SEP and GRM is three (3) fold:

- To identify Project's specific external and internal stakeholder groups, who will be mapped, consulted, and engaged (as applicable) through the project's lifecycle
- To demonstrate commitments and mechanisms to help align the stakeholder engagement process to the applicable standards
- To provide a consistent framework to document stakeholder engagement and inform decision making and project execution through redressal mechanism.

Grievance Redressal is one of the most critical components of effective stakeholder engagement. As defined the grievance mechanism as a system or specified procedures for methodically addressing grievances or complaints and resolving disputes[93]. Further, for the purpose of this document grievance is defined as "a concern or compliant raised by an individual or a group affected by the project. Both concerns and complaints can result from either real or perceived impacts of project's operation and may be filed in the same manner and handled with the same procedure". The purpose of the GRM is to provide a forum to the identified external and internal stakeholders to voices their concerns, queries, complaints, and issues with the Project. The mechanism will provide the stakeholder with one (1) project personnel or one channel through which their complaints will be channeled as well as ensure timely responses to each complaint. The specific objectives of the GRM are as follows:

- To allow stakeholders the opportunity to raise comments/concerns
- To structure and manage the handling of comments, responses, and grievances, and allow monitoring of the effectiveness of the mechanism

[93] Grievances and complaints are used interchangeably in the document.

- To ensure that comments, responses, and grievances are handled in a fair and transparent manner, in line with the IFC's Policies

Scope of the SEP and GRM

This SEP and GRM applies to the entire Project, including any associated TL and water pipeline. This document is applicable to the entire life cycle of the Project. This document shall be a "living" document and will be updated regularly based on the emerging needs and patterns for engagement with various stakeholders.

Applicable Reference Framework

Applicable National Acts and Rules

The Industries Disputes (Amendment) Act, 2010:

- Every industrial establishment employing twenty or more workmen shall have one or more Grievance Redressal Committee for the resolution of disputes arising out of individual grievances.
- The Grievance Redressal Committee shall consist of equal number of members from the employer and the workmen.
- The chairperson of the Grievance Redressal Committee shall be selected from the employer and from among the workmen alternatively on rotation basis every year.
- The total number of members of the Grievance Redressal Committee shall not exceed more than six: Provided that there shall be, as far as practicable, one-woman member if the Grievance Redressal Committee has two members and in case the number of members is more than two, the number of women members may be increased proportionately.
- Notwithstanding anything contained in this section, the setting up of Grievance Redressal Committee shall not affect the right of the workman to raise industrial dispute on the same matter under the provisions of this Act.
- The Grievance Redressal Committee may complete its proceedings within forty-five days on receipt of a written application by or on behalf of the aggrieved party.
- The workman who is aggrieved of the decision of the Grievance Redressal Committee may prefer an appeal to the employer against the decision of Grievance Redressal Committee and the employer shall, within one month from the date of receipt of such appeal, dispose off the same and send a copy of his decision to the workman concerned.
- Nothing contained in this section shall apply to the workmen for whom there is an established Grievance Redressal Mechanism in the establishment concerned

Stakeholder Identification and Analysis

This section provides the stakeholder identification and mapping for the Project based on the current planning stage. The identification is based on present status and understanding developed during the consultations with Project proponent. The analysis of the identified stakeholder is based on stakeholders' profiling and the significance of impact/influence of each stakeholder in relation to the Project.

Stakeholder Identification and Characterization

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/company's actions, objectives, and policies"*. Stakeholder thus vary in terms of degree of interest, influence and control they have over the Project. While those 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 given below:

Table 9-2 Stakeholder Group Categorization

Category	Primary Stakeholders	Secondary Stakeholder
Community	• Rag Pickers • Opinion holders • Community leaders	Nil
Institutional Stakeholders	• Local Gram Panchayats • Project Investors	• Village Institutions (education and health department) • Political Parties
Government Bodies	• Regulatory Authorities • District Administration	• State Administration
Other Groups	• Employees • Contractors and sub-contractors • Contractual workers	• Media • Local NGOs

Stakeholder Mapping

"Stakeholder mapping" is a process of examining the relative influence that different stakeholders have over the Project as well as the influence of the Project over them. The purpose of stakeholder mapping is to:

- Identify each stakeholder group
- Study their profile and the nature of the stakes
- Understand each group's specific issues, concerns as well as expectations from the Project
- Gauge their influence on the Project

Based on such an understanding, the stakeholders are categorized into High influence/priority, medium influence/priority, and low influence/priority.

The stakeholder engagement starts in the early stages of the Project, also need to be included in the impact assessment and risk identification process and continues across the life cycle of the Project. The stakeholder analysis also shapes the stakeholder engagement strategy for the Project and needs to be continuously update the stakeholder analysis and helps in integrating the impacts and risk identified in the Project designing and during the implementation stages to help the company better addresses the associated impacts with the Project.

This section provides the stakeholder identification and mapping for the project based on the current planning stage. The identification is based on present status and understanding of the project. The analysis of the identified stakeholders is based on stakeholders' profiling and the significance of impact/influence each stakeholder in relation to the Project.

The influence and priority have both been primarily rated as:

- High Influence: This implies a high degree of influence of the stakeholder on the project in terms of participation and decision making or high priority to engage with the stakeholder

- Medium Influence: Which implies a moderate level of influence and participation of the stakeholder in the project as well as a priority level to engage the stakeholder which is neither highly critical nor are insignificant in terms of influence

- Low Influence: This implies a low degree of influence of the stakeholder on the project in terms of participation and decision making or low priority to engage that stakeholder

The intermediary categories of low to medium or medium to high primarily imply that their influence and importance could vary in that range subject to context specific conditions 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 project. Keeping this wide scope of inclusion in stakeholder category and the long life of project, it is difficult to identify all potential stakeholders and gauge their level of influence over 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 periodically and update the same as per the nature of the project lifecycle

Stakeholder Mapping (Profile of stakeholder identified, their key interests and concerns and the way they may be involved in the project lifecycle)

Relevant Stakeholders	Profile	Concerns and Expectations from the project	Influence of Stakeholder on Project	Influence of Project on Stakeholder	Influence Rating
Primary Stakeholders					

Relevant Stakeholders	Profile	Concerns and Expectations from the project	Influence of Stakeholder on Project	Influence of Project on Stakeholder	Influence Rating
Rag Pickers	The stakeholder group is spread across the 2 villages in the study area and currently collecting waste at land fill site, collection centre and household level. This stakeholder group consist of Rag Pickers who are engaged in collection of waste and selling the waste to the respective scarp dealers. WTE project has potential to influence their income and livelihood.	• The expectations and concern of this group from the project: – The Key expectations are to continue the waste collection at RMC land fill site , collection centers and household level – Get employment in the proposed plant – Proposed project should not negatively affect their livelihood and there should be no risk economic displacement	• Currently the influence of the stakeholder on the project is negligible however they constitute important linkage for waste collection and recycling process and their livelihood is primarily dependent on waste collection. • If there are any potential treats to their income these stakeholders can become hostile there might be fringe elements which can potentially negatively influence the project	• The project can prove to be potential source of livelihood /employer for the people engaged in the waste collection • Project can be instrumental in bringing community development in their areas through CSR activities.	• Influence of Stakeholder: **Medium** • Influence of Project: **HIGH**
Opinion Holder and Community Leaders	This stakeholder group is comprised of those individuals of the local community who hold traditional and rational power. These stakeholder group members include the elders, community and political leaders in the village and play a critical role	• The expectations and concerns of this group from the project includes: – Receiving benefits from the project in terms of employment and development of infrastructure	• This group is powerful enough to affect the functioning of the Project in their vicinity • This stakeholder group may play an important role in the public opinion formation, implementation of the CSR activities planned by the project	These groups due to their social status, may already have access to several economic benefits from the other Projects, and thus may not be completely dependent upon the Project for access to development opportunities	• Influence of Stakeholder: **Low/ MEDIUM** • Influence of Project: **LOW/MEDIUM**

Relevant Stakeholders	Profile	Concerns and Expectations from the project	Influence of Stakeholder on Project	Influence of Project on Stakeholder	Influence Rating
	in the decision making in the local community	and the community – Regular updates on the project activities and the opportunities from the same			
Local Gram Panchayats	This stakeholder group is comprised of the lowest level of local governance. The gram panchayats consist of one or more revenue villages and are the lowest level of decision-making bodies for development activities in the villages	• The expectations and concerns of this group from the project: – Receiving benefits from the project in terms of employment and development of infrastructure – Implementation of community development programmes in consultation with the Gram Panchayat and the local community – Preference to the local community in contractor and employment opportunities from the project – Regular updates on the project activities and	• The panchayat members can influence the decision-making process of the landowners and the entire community, at large; and • This stakeholder may also play an important role in the implementation CSR activities planned and the execution of other plans such as stakeholder engagement and grievance management.	The project can play an important role in the development of the villages by undertaking CSR activities in collaboration with the Gram Panchayat, especially in areas where there is a paucity of government funds	• Influence of Stakeholder: **LOW** • Influence of Project: **LOW**

Relevant Stakeholders	Profile	Concerns and Expectations from the project	Influence of Stakeholder on Project	Influence of Project on Stakeholder	Influence Rating
		the opportunities from the project			
Regulatory Authorities	This stakeholder group is comprised of the central, state and district level regulatory authorities including RMC & PWD. 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	The key expectations and concerns of the group from the project include: • Project's compliance to the regulatory requirements; and • Timely disclosure of information and provisioning of updated information throughout the life of the project.	• The failure of the project to comply with the various rules and regulations applicable can affect the timely implementation of the project • This stakeholder group is also critical for various permits/clearances required for the commissioning of the project	The influence of the project on the stakeholders pertains to the role the project will play in the development of the Project in the area	• Influence of Stakeholder: **HIGH** • Influence of Project: **LOW**
District Administration	This stakeholder group is comprised of the government bodies at the district level. These bodies are vested with funds and decision-making authority through the decentralization process.	The key expectations and concerns of the group from the project include: • Project's compliance to the regulatory requirements • Timely disclosure of information and provisioning of updates throughout the life of the project	• This stakeholder group is critical for obtaining various permits/clearances required for the commissioning of the project and its smooth functioning thereafter • This group serves as important points of contact between the state level authorities and the local community	The influence of the project on the stakeholders pertains to the role the project will play in the development of the Project in the area	• Influence of Stakeholder: **HIGH** • Influence of Project: **LOW**

Relevant Stakeholders	Profile	Concerns and Expectations from the project	Influence of Stakeholder on Project	Influence of Project on Stakeholder	Influence Rating
Staff & Contractors and Sub-Contractors	This stakeholder group is comprised of the technical & non-technical staff of Abellon and staff and workers of sub-contractors	The primary concerns and expectations of the group from the project include: • Timely completion of the project • The role of the project in continued economic opportunity and work generation • Avoidance of any reputational risks associated with the project due to any future community unrest or project activities • Clarity in terms of scope of work, expectations, key performance indicators and timelines • Timely and adequate disclosure of information to allow the project activities to be carried out • Fair business opportunities and contract closure • Business continuity • Payment of wages and other	• This stakeholder group is critical for the smooth functioning and timely implementation of the project • This group may also play an important role in the formation of public opinion towards the project	The influence of the project on the group pertains to the role of the project in business opportunities and the process of contract closure	• Influence of Stakeholder: **HIGH** • Influence of Project: **HIGH**

Relevant Stakeholders	Profile	Concerns and Expectations from the project	Influence of Stakeholder on Project	Influence of Project on Stakeholder	Influence Rating
		concerns related to Labor welfare s			
Contractual workers	This group is comprised of skilled and semi-skilled workers, involved in the project on a contractual basis. This group is most likely to be comprised of the semi-skilled workers involved in the construction work of the project.	The primary concerns and expectations of the stakeholder group pertaining to the project is as follows: • The role of the project in continued economic opportunity, work generation and a source of income • Timely settlement of dues and payments in keeping with the legal requirements • Continued work opportunities • Safety at work.	• This stakeholder group is critical for the smooth functioning and timely implementation of the project • This group may also play an important role in the formation of public opinion towards the project	The influence of the project on the group pertains to the roles of the project in the continuance of economic opportunities, timely payment of wages and ensuring the health and safety of the workers	• Influence of Stakeholder: **MEDIUM** • Influence of Project: **HIGH**
Secondary Stakeholders					
Village Institutions	This stakeholder group is comprised of health, education institutions and training centres at the village level. The institutions in the immediate vicinity of the project are the primary schools in the villages	The main concerns and expectations of the group from the project pertain to: • Adequacy of community development activities in the area • Contribution of the project towards the overall development of the area	The influence of the group on the project pertains to the role of the played by these institutions in the opinion formation and implementation of community development programmes and CSR activities	The influence of the project on the group pertains to the role of the project in the development of these institutions	• Influence of Stakeholder: **LOW** • Influence of Project: **LOW**

Relevant Stakeholders	Profile	Concerns and Expectations from the project	Influence of Stakeholder on Project	Influence of Project on Stakeholder	Influence Rating
		• Involvement in the formulation and implementation of the community development activities; and • Timely and adequate disclosure of information pertaining to the project.			
Political Parties	This stakeholder group is comprised of political parties, which are active in the area. This group plays a critical role in the sensitization of the population and the creation of the public opinion	The key expectations and concerns of the group from the project include: • The role of the project in the overall development of the area • The impact of the project on the local community • Adequate community development activities throughout the life of the project; and • Timely disclosure of information pertaining to the project activities.	The influence of this stakeholder group on the project pertains to the role of the political parties in the formulation of public opinion towards the project.	The influence of the project on the group is expected to be extremely limited, pertaining to the role of the project in the development of the area	• Influence of Stakeholder: **MEDIUM** • Influence of Project: **LOW**
State Administration	The state administration is comprised of the state level agencies of the various	The main expectations and concerns of the stakeholder group from the project include:	This stakeholder group is also critical for the obtaining of the various permits/clearances required for the	The influence of the project on the stakeholders pertains to the role in achieving the goals of Swachh Bharat	• Influence of Stakeholder: **HIGH**

Relevant Stakeholders	Profile	Concerns and Expectations from the project	Influence of Stakeholder on Project	Influence of Project on Stakeholder	Influence Rating
	departments/authorities such as industries department, revenue department, labour department and land department etc.	• Compliance to the regulatory requirements for the project • Project's role in the development of the area • Timely disclosure of information pertaining to the project activities	commissioning of the project	Mission and renewable energy generation in the state.	• Influence of Project: **LOW**
Media	The media, comprising of both print and visual media, has a presence in the district. They are known to have played an extremely important role in generating awareness amongst the community.	The main expectations and concerns of the stakeholder from the project include: • Compliance to the regulatory requirements for the project • Project's role in the development of the area • Maintenance of positive relationship with the local community and other stakeholders • Timely disclosure of information in regard to the project activities	The influence of the stakeholder group on the project is likely to pertain to the opinion formation amongst other stakeholders towards the project	The influence of the project on the stakeholder is likely to be extremely limited due to the nature of the project activities	• Influence of Stakeholder: **Low** • Influence of Project: **LOW**

Propose Stakeholder Engagement Activities

This section provides the stakeholder engagement plan for the Project lifecycle going forward. This engagement plan builds on the activities undertaken thus far, the existing relationship with the stakeholders and their expectations and the requirements of the IFC. This section puts in place, the principle to be followed for stakeholder engagement through the Project lifecycle, the methods that may be used and the engagement plan This section provides an overall plan for the entire project lifecycle and a detailed plan for the land procurement and other phases of the Project. This is a living document and will be reviewed and updated on a regular basis.

Principle of Engagement

The stakeholder engagement process is informed by a set of core values that determines consultation, negotiation, and grievance management. The stakeholder engagement and grievance redress for the Project will be based on the following principles:

Commitment	Transparency and Fairness	Trust and Respect	Accessibility and Cultural Appropriateness	Open and Inclusive Mechanism
Description				
It is established when the process of engagement is started early on during the Project. It is demonstrated when the need to understand, identify and engage with every member of the affected community is recognized and acted upon from the planning stage of the Project.	The Process for Grievance resolution shall be transparent, in harmony with the local culture, and in the appropriate language. It should explicitly assure potential users that the mechanism would not impede their access to other judicial or administrative remedies	Meaningful information is provided to create open dialogue in the local language format that is easy to understand and adaptable to local context. The SE process should respect the local traditions, values and interests of the stakeholders.	Every member of the community or groups should have access to the grievance procedure. To allow all stakeholders to have access to the mechanism, the grievance redressal will be published in the local language of the community	The process of communication will be two-way, giving both the Project and the stakeholder (s) opportunity to exchange views, opinions, to listen and have their issues heard and addressed. It should be inclusive in representation of views, and hence provide additional support to vulnerable groups (women, elderly, physically disable, minorities) to participate in the communication process

Methods of Engagement

The methods of engagement incorporate individual profiles. Concerns, and expectations of the groups. Need to include the stakeholder engagement plan for the identified stakeholders for continued engagement during the operation stage. Further, different modes of engagement is necessary because the utilization of a common modes of engagement for all the stakeholders and for the whole project duration may result in the failure of the engagement process to achieving its intended goals. Therefore, the following methods have been identified for the purpose of this Project.

- One to One interviews and interactions
- Focus group discussions
- Meetings –Public meetings, and meetings with the community in the Project footprint
- Formal Communication (written)
- Awareness campaigns

In deciding the appropriate engagement method and frequency of such method used for the identified stakeholders, the following criteria has been considered:

- The acceptability of the engagement method

- The current level of engagement and desired level of engagement
- The aimed outcome of the engagement activity

Grievance Redressal Mechanism (GRM)

Grievance redressal is another critical component of effective stakeholder engagement. The purpose of GRM is to provide a framework to the internal and external stakeholders to voice their complaints, concerns, queries, and issues with the project. Such a mechanism provides the stakeholders with one channel of communication through which their complaints and queries can be raised, and timely response can be ensured. This allows for trust building amongst the stakeholders and prevents the accumulation of multitude of small issues into major community unrest. The GRM is aimed at being accessible and understandable to all stakeholders in the project and for the entire project life. The GRM will also be applicable for any contractor appointed during the construction and operations phases of the Project.

- This section contains the following:
- Objectives of GRM
- Grievance definition and categories, and GRM principles
- The process of receiving, documenting, addressing, and closing grievances

Objective of GRM

- To provide stakeholders with a clear process for providing comment and raising grievances
- To allow stakeholders the opportunity to raise comments/complaints through using the grievance redressal committee established
- To structure and manage the handling of comments, responses, and grievance are handled in a fair and transparent manner, in line with internal policies, and international best practices

Grievance Definition and Categories

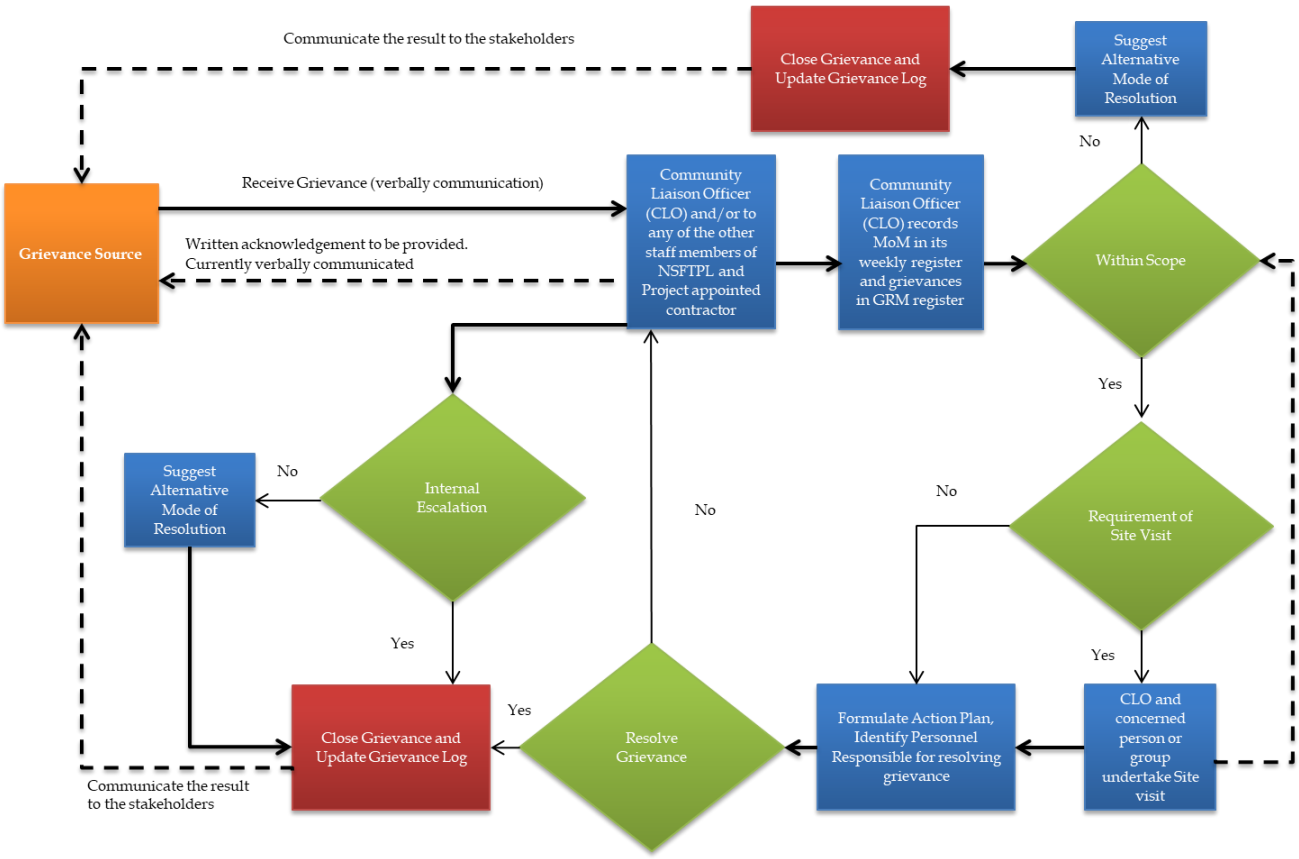
A grievance is a concern or complaint raised by an individual or a group within stakeholders affected by the company's operations. Both concerns and complaints can result from either real or perceived impacts of the company's operations and may be filed in the same manner and handled with the same procedure. Grievances may take the form of specific complaints for actual damages or injury, general concerns about Project activities, incidents and impacts or perceived impacts.

Anonymous complaint

The project shall also consider anonymous compliant as part of this GRM and the resolution of the compliant shall be in accordance with the provisions of this management plan

Internal and External Grievance Mechanism

The Process to be followed for the redressal of the external stakeholder grievances is summarized below:



In the above diagram. The bold lines represent the grievance escalated from stakeholder to concern staffs and then from concern staff to further escalated. The dotted lines are the representation of communicating back of resolution to the stakeholder.

Publication and Disclosure of the GRM

The GRM will be disclosed to the stakeholders through written and verbal communication. The medium to use for this purpose are public meetings, group discussions, and display of GRM provisions in Gram Panchayat , Land fill site , collection centers and plant centers , and other key locations. As part of the public meetings, the project will provide a refresher of the provisions of the GRM, and the way grievances can be communicated.

Receiving and Recording Grievances

A complaint can be submitted to Project through the following methods:

- During regular meeting held between stakeholder's and project team
- By submitting verbal complaint to appointed contractors and other to the project management team & HR
- For written communication of complaints, a sample grievance register is provided below:
-

S. No	Date	Village/ Location	Topic of grievance	Summary of grievance	Stakeholder Group	Acknowledgement date	First response date	Follow-up (if applicable)	Unique Grievance ID	Status
1.										
2.										

3.

Maintaining a Grievance Register

A grievance register will be created and maintain at the Project site by the Community Liaison Officer (CLO). Details of the stakeholder(s) communicating issues/compliant are noted along with the summary of the grievance. Depending upon the nature of the grievance, the option of legal redressal can be taken if requires.

The grievance register will regularly be updated at each stage of grievance redressal. Once the grievance is recorded in the register, a preliminary analysis will be undertaken by the concerned staff to ensure that the grievance is within the scope of the GRM. The grievance will be registered in the grievance register by CLO.

Acknowledgment of Grievance

Project will establish a timeline of communication such that – once the grievance is received and recorded, the stakeholder will be provided with an acknowledgment of the receipt within seven (7) working days, along with a summary of the grievance, as specific below:

GRIEVANCE REGISTRATION

Grievance No.:	Date:
Name:	Father's/Spouse's Name:
Village:	Taluka:
Phone no.	
Category of grievance:	
Summary	
Name of person recording grievances:	
Designation of recording person:	
Proposed date of response to grievance:	
Signature of recording person	Signature of complainant

ACKNOWLEDGEMENT RECIEPT

This receipt is acknowledgement of grievance registration by_____ _____, resident of village _____ on date _____. His case number is _____ and the date for response is _____.

Name of the person recording grievances:

Designation of the recording person:

GRIEVANCE REDRESSAL RESPONSE

Date of redresses:

Decision of CLO (give full details):

Claimant accepts the outcome: Accepted Not accepted

Signature of claimant:

Signature of CLO:

Note:

Please note, if at any time the grievant is unsatisfied with the resolution of the grievance, they may choose to ask for an escalation to the next level or may resort to legal redress.

Providing Initial Response

The stakeholder that lodged the initial comment is then contacted within seven (7) working days to acknowledge that the Project site team will log the grievance and provide feedback in the written format. A copy of this notification is submitted to the stakeholder. The notification contains details of the next steps to be taken for investigation.

Investigation and Resolution

Depending upon the sensitivity of the grievance, and nature of the complaint, a site inspection may be required, but not in all cases. The purpose of the site inspection is to check the validity and severity of the grievance. For this purpose, the personnel may also undertake discussions with the external stakeholder concerned. The inspection is undertaken within fifteen (15) working days of receiving the grievance. After site inspection, the assigned individual then works with other relevant members of the Project team to investigate the problem, communicate an update to the concerned complainant, and identify measures to resolve the grievance as appropriate.

The update on the grievance is communicated to the aggrieved person, on a weekly basis or at frequency suitable for the nature of the case by the Project team.

Resolution, Escalation and Closure

The CLO, in consultation with the staff concerned, will identify a suitable resolution to the issue. This resolution is accordingly communicated to the aggrieved stakeholder within seven (7) working days of completing the investigation.

Update of Records

The records of the grievance register are updated every working week with the present status of the grievance. Once the grievance is resolved, and the same has been communicated to the complainant, the grievance is closed in the grievance register. The grievance register also provides an understanding of the manner in which the grievance was resolved. These instances shall then serve as references for any future grievances of a similar nature. However, the project will ensure that all grievances communicated will be maintained in a confidential manner.

Monitoring and Review

It is vitally important to monitor the effectiveness of the comment response and grievance mechanism. Appropriate measures/KPIs for this include monthly reporting on the number of grievances received, resolved and outstanding. In order to track the performance of grievance resolution process, analysis of the trends of the GRM will be undertaken. Project Team will involve the views of the stakeholders to improve the effectiveness of SEP and GRM.

Implementation Roles and Responsibilities

For the purpose of ensuring the proper and effective implementation of the SEP and GRM, this engagement and grievance redressal process is given importance as the other Project activities. Resources, both manpower, and financial, are made available for the same. The following sub-sections discuss both these resources requirements, in detail.

Responsibilities of implementation entities

The table given below outline the responsibility of each entity under grievance redressal committee

Entity	Responsibility
Project Director /	• Approves and is accountable for implementation of the stakeholder engagement and GRM • Provide support for implementation of the grievance resolution process and enforcement of specific agreements, if required or escalated by the project stakeholder engagement and grievance redressal committee • Intervenes when the proposed resolution is not accepted by the stakeholder and identified additional actions to address the grievance • Approves the close-out of grievance when an agreement cannot be reached with the stakeholder
Project stakeholder engagement and grievance redressal committee	It has been set up specifically for stakeholder engagement and grievance resolution. The main responsibilities of the committee will be involved but are not limited to: • Manage all community liaison related tasks • Implement community engagement strategy and oversee all community liaison related matters • Manage the grievance mechanism at the project level and if required escalate the grievance to the top management team • Oversee implementation and monitoring project CSR activities or community development plans • Establish a monitoring and evaluation plan and other tools established such as the grievance register, and consultation register • Ensure that all individuals with responsibilities under the stakeholder engagement and grievance mechanism are made aware of the existence of the process and receive adequate training
Construction and operation heads	The role of construction and operations heads includes (but is not limited to): • Finalization of contractors on internally decided sustainability criteria, undertake due diligence of contractors' EHS&S process and regular monitoring of contractors' compliance towards applicable regulatory requirements • Integrating contractors in internal activities tap knowledge and further resources when, for example, selecting contractors or assessing existing contractors and striving for standards and certification

Entity	Responsibility
	• Addressing contractors' requirements at the internal dimensions' centers on transparency through one-way or two-way communication
Project HR and HSE Head	The role of Project HR and HSE head includes (but is not limited to): • Describe regulatory, company and/or other requirements for consultation and disclosure of information • Provide strategy and timetable for sharing information and consulting with each of internal groups (e.g., employees, contractual workers, another department) • Implement and regular monitoring of internal grievance redressal mechanisms for employees, contractual workers, etc. • Update or prepare policies, or SOPs related to labor welfare, terms and employment and Health & safety • Provide regular training one labor welfare, terms and employment and Health & safety • Regular auditing and monitoring of Human resources providing contractors on their compliance with applicable regulatory requirements
Community Liaison officer/CSR head	The CLO will be appointed or delegate of duty of existing employee to maintain stakeholder relations between project and the community and to implement social management process and GRM, and improvement in community development program or CSR activities as per the feedback received from community. The role of the CLO is as follows: • Establish and maintain an affective relationship between the local community and the Project • Build and foster an environment that supports community involvement, continuous community engagement • Provide community members with opportunities to express their concerns and raise issues • Provide regular and timely information and project updates to the local community and relevant stakeholders • Create stakeholder database, develop, and regularly update community profiles and expectations • Deliver weekly and monthly reports on activities • Identify and develop proposals for community development projects aligned with the established CSR policy and commitment • Serves as principal point of contact and liaison with complainants • Ensure communication with the complainant and follow specified procedures and timelines • Maintains a log of complaints received

Entity	Responsibility
	• Resolves complaints that do not need a substantives expert • Supports the substantive expert, if necessary • Serves as a liaison between the project and the third parties, as required • Monitors resolution of complaints • Prepares monitoring reports • Provides feedback on the effectiveness of the GRM to management

Training Requirements

Project/ HR /responsible employee will regularly undertake a review of the existing skill set and the need for skill enhancement in the resource identified related to SEP and GRM. This will also be done in keeping with the evolving project's changing stakeholder dynamics on the ground. The following compulsory training shall be done for the effective implementation of the SEP and GRM:

- **Training contractor(s)**: for the construction and operation phase, the HR department or CLO will orient the contractors on the established SEP and GRM. The appointed contractors shall be inducted on the standards and guideline regarding the SEP and GRM, and the profile and importance of each stakeholder group associated with the Project.

Financial Resources

The project shall ensure that the budget formulated for the purpose of the SEP and GRM is sufficient to meet the expenses of the same. In case of grievance requiring monetary compensation, the amount for the same shall be provided through dedicated budget set up for the Project.

Documentation, Monitoring and Reporting

As the SEP is a 'live document', it will be regularly reviewed keeping in mind attributes such as the stakeholders, the evolving priority level, changing dynamics and the engagement process for each stakeholder and the reporting time for each. The documentation will be at two (2) levels – minutes of meetings including signatures/names of attendees and photographs (attendance of every meeting). All such documentation will be linked to a database maintained for SEP that contains the engagement activities undertaken in chronological order. This SEP database is available for review of project management and the Project team.

Monitoring

The monitoring will be carried based on the below provided process:

Figure 9-1 Monitoring of the SEP and GRM Implementation

The annual monitoring and review will include:

- Auditing the implementation of the SEP in keeping with the principles and engagement plan developed
- Monitoring the effectiveness of the engagement process in managing impacts and expectations by:
    - Tracking feedback received from engagement activities
    - Recording and tracking updates given to the stakeholder
    - Assessing the efficacy of the engagement activities in terms of the purpose of engagement and the participation of the stakeholder groups
- Tracking of grievances received and their resolution status
    - Number of grievances received
    - Nature of grievances received
    - Proportion of grievances closed in satisfaction to the complainant
    - Proportion of grievances closed within seven (7) working days of receiving the grievances
    - Proportion of grievances escalated due to internal non-resolution
    - Proportion of grievances escalated by complainants due to non-satisfactory outcomes

Reporting

Based on the documentation and monitoring process, the following reporting is maintained for the SEP and GRM.

- Weekly reports:
    - The CLO maintains a register of its weekly meeting that is conducted on a regular basis. The register contains two (2) parts – attendance of the participants and minutes of meeting. In addition, the GRM register is maintained and updated by the CLO in the local language format
    - These weekly reports are shared by CLO with the Project SE and GRM committee, and translated into English language for of understanding of other management
- Monthly report: the CLO will prepare monthly reports on stakeholder engagement activities for the Project SE and GRM committee. It will include:
    - Activities conducted during each month
    - Public outreach activities (type of engagement and stakeholder attendance)
    - Entries to the grievance register
    - Number of grievances raised to the Project SE and GRM committee
    - Progress on partnership and other social projects
    - New stakeholder groups identified (where relevant)
    - Plan for the next month.

Reporting back to stakeholders

Project SE and GRM committee will share the reports with stakeholders as part of the information disclosure process on matters relating to:

- Main findings from the annual monitoring review of the Project
- Progress on implementation of social investment initiatives or CSR activities
- Trends in Grievance redressal and analysis of grievance categories

APPENDIX 12: LABOR MANAGEMENT AND WORKING CONDITIONS INCLUDING LABOUR CAMPS

Objective

The contractor and labour management plan have been developed with the objective of defining the procedure to manage and regulate the standards of labour and working conditions for the labourers hired by project and its contractors.

In the context of the project, requires a management plan that could provide guidance and become monitoring tool to assess and align the labour and working conditions as per IFC PS 2.

Scope

This plan applies to the construction and operational phases of the Project. This plan will be applicable for project and its contractors and their workers that are going to be engaged in the two (2) phases (construction and operation) of the Project.

Aspects for Ensuring Proper Labour Management

There shall be a well-document set of policies defined for the Project and the workforce to be engaged for it. The indicative set of policies to be developed is entitled below:

- Human resource Policy
- Working Relationship Policy
- Working Conditions & Terms of Employment Policy
- Workers' Organizations
- Non-Discrimination & Equal Opportunity
- Retrenchment
- Grievance Mechanism
- Child Labour
- Forced Labour
- Occupational Health & Safety
- Non-Employee Workers

Applicable Legislations

There is a wide array of central and state level regulations that cover every aspect of labour related issues. These Acts are further supplemented by rules, notifications and standing orders of the central and state governments. Aspects like minimum wage rate, working hours, and welfare benefits get revised and updated from time to time. Therefore, it is important to keep track for the most recent developments in amendments of labour laws and rules. Acts and regulations pertaining to the migrant workers assume much more importance especially in the Indian context, wherein migrant workers constitute a huge section of the building and construction activities, or for that matter any form of labour-intensive activity. The plan, therefore, captures almost all the key laws and regulations pertaining to the management of labour issues in the country

National & State Legislations regarding contractor labour relationship

There are several laws and rules governing labour issues in India. The local legislations likely to get triggered for the contractual labour relations are:

- The Contract Labour (Regulation and Abolition) Act, 1970 and Rules
- The Child labour (Prohibition and Regulation) Act, 1986
- The Bonded Labour (Abolition) Act, 1976
- The Trade Union Act, 1926
- Workmen's Compensation Act, 1923

- Minimum Wages Act, 1948
- The Payment of Wages Act, 1936, amended in 2005
- The E.P.F. and Miscellaneous Provisions Act, 1952
- Public Provident Fund Act, 1968
- Payment of Gratuity Act, 1972
- Employees State Insurance Act, 1948
- Employer's Liability Act, 1938 (as amended)
- The Industrial Employment (Standing Orders) Act, 1946 (as amended)
- The Industrial Dispute Act, 1947
- Payment of Bonus Act, 1965 and Amendment Act No. 43 of 1977 and No. 48 of 1978 and amendments
- The Personal Injuries (Compensation Insurance) Act, 1963 (as amended)
- Shops and Establishment Act
- Interstate Migrant Workers Act, 1979
- Maternity Benefits Act, 1961
- Equal Remuneration Act, 1976
- Building and Other Construction Workers Act, 1996, amended in 2020

Rules include:

- Industrial Disputes (Central) Rules, 1957
- Minimum Wages (Central) Rules, 1950
- Payment of Bonus Rules, 1975
- The Personal Injuries (Compensation Insurance) Rules, 1972
- Standing Orders Rules, 1946
- ILO's eleven (11) fundamental instruments:
- Freedom of Association and Protection of the Right to Organize Convention
- Right to Organize and Collective Bargaining Convention
- Forced Labour Convention
- Abolition of Forced Labour Convention
- Minimum age convention
- Worst Form of Child Labour Convention
- Equal Remuneration Convention
- Discrimination (Employment and Occupation) Convention
- Occupational Safety and Health Convention

Contractor and Labour Management – Specific Issues

The challenges that the project is likely to encounter during construction and operational phases regarding the maintenance of labour standards could be:

- Lack of defined terms of employment for some worker or labour by sub-contractors might be possible

- Likelihood of child labour at varying scale, particularly during development/construction phase on account of migrant labour
- Discrimination in remuneration between male and female labour or between local and outside labour
- Inappropriate living arrangement in labour camp
- Conflict with local population

Defined Human Resource Policy, working conditions and terms of employment

Management Plan

Project and its contractor shall require taking the following mentioned measures to regulate and manage the workforce engaged during construction as well as the operational phase of the Project.

- Adequately cover the contract labourers that will be engaged in the construction phase of the Project within the HR policy
- Maintain consistency with the applicable labor laws
- The Policy should be commensurate with the size and type of workforce
- Policy should be clear and, in a language, understandable to workers
- Procedure to make provisions of the policy very clear to each worker at the outset of joining
- Working condition[94] and terms of employment[95] should be document and communicated properly to all workers
- Wage and benefits must be clearly communicated and understood by workers
- Provide all workers with a contract in a language understood by them
- Routinely provide workers with a clear record of wage calculation and deduction
- Ongoing internal verification that all workers are receiving wages and benefits as prescribed by law
- Ongoing communication and training on legal labour rights and company personnel policies
- Worker representatives meet regularly with HR and project management
- Training on minim legal benefits for all workers, including contractors, and employment agencies

Monitoring Mechanism

The project shall implement the monitoring based on the monitoring indicators provided in the table below:

[94] Working Condition is defined as the conditions in the workplace and treatment of workers. Condition in workplace include the physical environment, health and safety precautions, and access to sanitary facilities. Treatment of workers includes disciplinary practices, reason and process for termination of workers and respect for workers personal dignity

[95] Terms of employment includes wages and benefits, wage deduction, hours of worker, rest days, overtime arrangements, overtime compensation, medical insurance, pension, leave for illness, vacation, maternity and so on

Table 9-3 Aspects for Ensuring Proper Contractor and Labour Management

Sr. No.	Guiding Principles	Desired Actions	Special Remarks and Suggestions	Monitoring Indicators
Human Resource Policies				
1.	• Project and its contractor shall have a documented policy and procedure related to human resources • Project and its contractor will inform workers of their rights under national labour and employment laws • Policy must be clear and understandable to all workers	• Centrally organize all policies and procedures • Identify and record responsible person and last date modified • Conduct an annual review of all policies and procedures • Prominently display policies and procedures in all local languages, especially which the staffs and workers understand • Appoint a person responsible for monitoring policies and procedures related to labour law implementation • Implement standardized routine training	• Contractor shall be required to put in place a well-defined and documented Human Resource policy at the outset of the project in order to ensure efficient and fair management of workers engaged in the overall process of work. In case the contractor has existing GR policy, the same can be made applicable for the workers to be engaged for the Project	• Complete review of all policies and procedures • Review of management – worker committee meeting minutes • Communication (memos, letters, etc.) to workers, suppliers, contractors and multi-stakeholder groups • Interviews with management and workers • Interviews with external stakeholders • Budget related to implementing labour policy • Training curricula and logs
Working Relationship Policy				
2.	• Project & its contractors will document and communicate working conditions and terms of employment to all workers	• Provide all workers with a contract in their native language • Provide documented training on contracts, wages, benefits and	• The working relationship policy can be a separate document, or it can be integrated with the HR policy. The working relationship policy will essentially ensure	• Contracts for all workers • Policies and procedures related to worker contracts and wages • Communication and training on

Sr. No.	Guiding Principles	Desired Actions	Special Remarks and Suggestions	Monitoring Indicators
	• Wages and benefits must be clearly communicated and understood by all workers	deductions for all workers • Routinely provide workers with a clear record of pay calculations in the form of wage slips	• Coverage of each category of workers including direct workers, contract workers and supply chain workers who will be engaged in operation • Consistent with regulatory requirements on labour as per the national and state labour regulations:	wage calculation, including local laws • Payroll records, time sheets • Piece rate or performance pay calculations verified against minimum wage • Worker interviews
Working Condition and Terms of employment				
3.	• If there is a collective bargaining agreement, project & its contractors will respect its terms • Project & its contractors must provide reasonable working conditions and terms of employment, at a minimum complying with the various local laws as described in this plan	• On-going internal verification that all workers are receiving wages and benefits as prescribed by law • On-going communication and training on legal labour rights and company personnel policies • Worker representatives meets regularly with HR and company management • Training on minimum legal benefits for all workers, including contractors, and employment agencies	• Defined Terms of Employment and procedure for sharing the same with each new worker in a transparent manner • Procedure for establishing and updating records of employment relationship conditions.	• Collective bargaining agreement (if one exists) • Worker contracts • Policies and procedures related to wages, benefits, hours and leave • Wage calculations as they relate to local laws • Worker and external stakeholder interviews • National law as it relates to wage and benefit minimums • Employment and termination records
Workers' Organization				
4.	• Project & its contractors will	• Clear communication to	• The purpose of forming a trade	• Documented policy regarding

Sr. No.	Guiding Principles	Desired Actions	Special Remarks and Suggestions	Monitoring Indicators
	recognize workers' rights to form and to join workers' organizations • Project & its contractors cannot interfere with or discriminate against workers who choose to organize • Worker representatives must have access to management • Worker organizations are expected to fairly represent the workforce	workers on their rights to collective bargaining • Allow workers to raise workplace related issues • Regular training on worker-manager communications • Regular meetings of management and worker representatives • Periodic documented communication with local unions and NGOs	union/workers organization is to create a platform for collective bargaining to protect the interest and rights of the workers with regard to working conditions and the terms of employment. The contractors will have to abide by the Indian regulations on provision for trade union and the workers should not be restricted by the contractors to form trade union if they wish. • The construction phase is likely to engage migrant labour and is expected to be over in 15-18 months after getting started. During this phase, the laborer should be provided a suitable mechanism to raise their grievances and genuine work-related issues, alternatively allow them to create a platform for collective bargaining. • During operational phase of the project, contractors will be required to consider following mentioned measures to ensure	collective bargaining • Minutes and records from collective bargaining sessions, reviews or other actions • Procedure for workers to select worker representative without management interference • Interviews with workers, NGOs and trade unions • Collective bargaining agreements • Grievance mechanism

Sr. No.	Guiding Principles	Desired Actions	Special Remarks and Suggestions	Monitoring Indicators
			freedom of association for workers and provide them an alternate grievance mechanism • The contractors shall have clear communication with the workers on their right to form trade union and collective bargaining • There will be regular trainings on worker-manager communications • There will be regular meetings of the contractor's management and their workers	
Non-discrimination and Equal Opportunity				
5.	• People should be hired, promoted and compensated solely based on their ability to do the job • All workers should have equal access to training, tools and opportunities for advancement • All workers should be free from harassment by management or other workers	• Clearly define anti-discrimination policy in hiring, training, promotions and compensation • Regularly review worker and manager demographics • Develop long term remediation plan to address past discrimination • Provide regular training to workers and managers • Establish confidential and	• The contractors will be required to make employment decisions on the principle of equal opportunity and fair treatment and will not discriminate with respect to aspect of the employment relationship like recruitment and hiring, compensation, working conditions and terms of employment, promotion etc.	• Discrimination policy and related employment policies and procedures • Company policy and procedure to address and manage discrimination issues when found • Comparative demographics of workers and managers • Documentation of handled discrimination cases

Sr. No.	Guiding Principles	Desired Actions	Special Remarks and Suggestions	Monitoring Indicators
	• Positive discrimination may be allowable in cases where it protects disadvantaged or excluded groups and provides them special opportunities	secure communication channels for workers to reach managers • Actively promote a harassment-free workplace		• Diversity training curriculum and attendance log • Interviews with workers and managers, including those who may be likely to be discriminated against • Interviews with local NGOs and trade unions • Hiring, promotion and termination records • Local laws related to discrimination • Hiring of the local residents/ PAFs in the various jobs
Retrenchment				
6.	• Project and its contractors will develop and implement a plan to mitigate the adverse impact of retrenchment if it anticipates a large number of layoffs • The plan will incorporate non-discrimination principles and include the input of workers, their organizations, where appropriate, the government	• Policy and procedure for workforce reduction, including worker selection • Analysis of alternatives to workforce reduction • Engage workers in discussions with workers related to workforce reduction as early as possible • Communication to all workers about why and how the	• The contractors may be asked to prepare such a lay off plan especially if the local community is engaged as laborer, as most of the migrant laborer are shifted to other sites for work by the contractor itself.	• Policy and procedure related to workforce reduction, severance and transition • Analysis of alternatives employed for workforce reduction. • Procedures for selecting workers impacted by workforce reduction • Documentation of prior instances of

Sr. No.	Guiding Principles	Desired Actions	Special Remarks and Suggestions	Monitoring Indicators
		reduction will take place • Discussions with local NGOs about how the community impact of workforce reduction could be minimized		workforce reductions • Minutes from management meetings and discussions • Communications with workers related to workforce reduction • Communications with external stakeholders and community groups
Grievance Mechanism				
7.	• Project & its contractors will establish a transparent process for workers to express concerns and file grievances • There will be no retaliation or discrimination against those that express grievances • Project & its contractors will treat the grievances seriously and take appropriate action • Project & its contractors grievance mechanism does not replace other channels as	• Establish clear policies and procedures for grievances • Communicate the grievance process to all workers in a clear, understandable manner • Provide on-going training to all workers • Document all grievances and the resulting actions • Make worker representatives a key part of the process	• For a healthy work environment, contractors should create an atmosphere where workers feel safe expressing their concerns and the grievances are settled mostly through informal channel and workers don't feel the need to lodge the complaint. However, there should be a formal grievance redress mechanism which is simple and secure; free from fear of retaliation; responsive and fair and allow workers to file anonymous complaints as well. The grievance mechanism system should not impede the aggrieved to access to court in	• Documented policy and procedure for worker grievances • Worker and manager interviews • Training curriculum and log on grievance handling • Communications to workers, supervisors and managers • Records of complaints lodged, and actions taken on grievances • Employment and termination records

Sr. No.	Guiding Principles	Desired Actions	Special Remarks and Suggestions	Monitoring Indicators
	defined by law or collective bargaining agreements		case he/she is not satisfied with the outcome derived from the formal system. • For an effective grievance redress system, the contractors will have to: o Establish clear policies and procedures for grievances based on above outlined principles o Communicate the grievance process to all workers in a clear, understandable manner o Document all grievances and the resulting actions; and o Make worker representatives a key part of the grievance redressal process.	
Child Labour				
8.	• Project & its contractors will not employ workers under the minimum age for employment as defined by national law (.i.e. below 18 years of age) • Workers between the minimum age	• Write clearly defined policies and procedures for age verification – make them publicly available • Develop remediation plan for use in cases where children are unknowingly employed	• The migrant contract laborer may be expected to bring their family along during the construction phase of the project. The family might also accompany the laborer to their workplace thus enhances the possibility of child labour at varying	• Policies and procedures for age verification in hiring • Interviews with workers, local children, trade unions and NGOs • Visual observation

Sr. No.	Guiding Principles	Desired Actions	Special Remarks and Suggestions	Monitoring Indicators
	and 18 will not be employed in dangerous work or work that interferes with their education or development • The Indian regulation recognizes a person as a child who has not completed his/her 14 years of age.	• Engage with local stakeholders to develop proactive plans to address child labour issues • Communicate child labour policies to projects suppliers and contractors – and provide them with the training and tools to address the issue	scale. Further during the operational phase of the project, the possibility of adolescent workers (between 14 to 18 years) entering hazardous working conditions cannot be ruled out. • The contractors will need to adopt suitable proactive mechanisms to prevent child labour in any form. Some of the measures in this regard could be as follows • Identify the types of activities during the entire project operation that could have a possibility of child labour • Clearly defined policies and procedures for age verification • Visual observation and verification thereupon • Develop remediation plan for use in cases where children are unknowingly employed despite the clear policy and procedure of contractors on no-child labour.	• Pay records, medical records, birth certificates, panchayat certificate
	Forced Labour			

Sr. No.	Guiding Principles	Desired Actions	Special Remarks and Suggestions	Monitoring Indicators
9.	• Project & its contractors will not employ forced labour • Workers have the right to retain their personal documents and money • Workers are free to leave the workplace after work • Workers have the right to resign	• Clearly define worker's freedom in employment contract • Provide employment contracts to all workers in their language - direct or contracted • Define and enforce policy regarding use of employment agencies and expectations • If employment agencies are used, audit relationship between the agency and the workers • Provide training for all workers to explain their rights • Pay all job-related training and equipment expenses	• Any involuntary work which is performed under threat of force or penalty, is considered as forced labour. It can be in form of bonded labour, indentured labour or similar labour arrangement, slavery or slavery like situation. There can be a possibility of forced labor by sub-contractors or petty contractors during the construction or operational phase of the project; however, the likelihood of forced labour is expected to be negligible for the regular workers during operational phase in view of hiring system structures in place and an adequate HR management department.	• Employment contracts in all appropriate languages • Contracts with employment or recruitment agencies • Payroll records, timesheets and wage deduction calculations • List of permanent workers and contracted workers at the Project • Worker IDs • Interviews with all workers, employment agencies and external stakeholders • Interviews with security guards
Occupational Health and Safety				
10	• Project & its contractors will take all reasonable precaution actions to protect the health and safety of workers • Ensure that workers are not exposed to unnecessary or unreasonable	• Structuring an OHS team and an OHS accountability framework (including production area) • Conducting a comprehensive job safety or job hazard analyses • Developing a Corrective OHS Action Plan based	• Projects and its contractors is expected to have its own OHS system. *Some examples of things to be done include:* • Integrity of Workplace Structures – reachable, easy to	• Visual observation • Exposure to hazardous agents monitoring log • Manager and worker interviews • Accident and medical treatment logs

Sr. No.	Guiding Principles	Desired Actions	Special Remarks and Suggestions	Monitoring Indicators
	risks at the workplace, dormitories etc. • Implement an OHS management system consistent with international standards such as OHSAS 18001. • Systematically assess all OHS risks, conducting a comprehensive job safety or job hazard analyses. • implement preventive and protective measures according to the order of priority: Eliminating the hazard, Controlling the hazard at its source, Minimizing the hazard, Providing appropriate personal protective equipment • Document, investigate and report all accidents and occupational diseases. • Investigate and identify the root causes of all accidents with working time	on the likelihood and severity of the consequence of exposure to the identified hazards • Proper equipment design, maintenance and procedures, such as: Designing machines and equipment's like stairs, to eliminate trap hazards • Turning off, disconnecting, isolating, and de-energizing (Locked Out and Tagged Out) machinery with exposed or guarded moving parts or being serviced • Marking and checking all energized electrical devices, cords and lines with warning signs • Implementing proper monitoring systems of hazardous agents and proper control measures (eliminating risk, PPC, PPE) •	clean, fore resistant, floors • Workspace and exits – unobstructed, clearly marked, consider disabilities • Fire Precautions • Amenities- toilets, potable water, lighting • Safe Access –even pathways, falling objects, railings • First Aid- training • Fresh air supply • Physical Hazards- Working at heights, Vibrations, Electrical, Ergonomics, illumination • PPEs • Communication[96]- Induction orientation, training	• Equipment maintenance logs • Fire and safety drill logs • Health and safety risk analysis • Health and safety inspection logs with test results • Government health inspection reports • Training curriculum and logs

Sr. No.	Guiding Principles	Desired Actions	Special Remarks and Suggestions	Monitoring Indicators
	loss, and implement appropriate corrective actions • Note: This can be done through the involved contractors also.			

Labour camps / Workers' Accommodation Management Plan

The requirement of workers' accommodation stems from the type of workforce that will be required during the development and operational phase of the Project. Below guidelines are made with due consideration of European Bank for Reconstruction and Development (EBRD) and International Finance Corporation (IFC) guidelines on workers' accommodation[97], and the Building and Other Construction (Regulations of Employment and Condition of Service) (BOCW) Act, 1996, which will be followed for accommodation facilities.

Code of Conduct for Workers in Labour Accommodation

Project and its contractor would be recommended to process of addressing issues raised by workers' accommodation. These are:

- Assessing whether housing is needed for the Project and is so, what sort
- Assessing impacts on local communities and planning mitigation of potential negative impacts

If there is no alternative and it is necessary to provided accommodation to workers, then project and its contractors will rent or construct workers' accommodation (labour camp) facilities for the construction and operation workers, away from the existing local community so as to have a minimum possible adverse impact upon the local community. The code of conduct will maintain for worker accommodation. The details of code of conduct are delineated below:

- Renting arrangement should be fair or free of cost. If it is charged then, adequate, and decent housing should not cost the workers more than a reasonable proportion of their income and should never include a speculative profit
- Worker should not be mandatory required to stay in the accommodation provided by project or its contractor but should be free to choses their own if they wish to do so
- Project and its contractor should help to ensure that, where workers obtain their accommodation, they are not being exploited, and offer advice and help as requested
- Project and its contractor should ensure that accommodation which is provided is not overcrowded and does not pose a risk to the health and safety of the workers living there
- Project and its contractor should be entitled to repossess the accommodation within n a reasonable time in the event of the termination of the workers' contract of employment, and the workers should be entitled to a reasonable period of continued occupancy and/or fair compensation when he/she ceases to exercise his/her employment

[97] https://www.ebrd.com/downloads/about/sustainability/Workers_accomodation.pdf (Accessed on October 13, 2022)

- During the time workers spend in the workers' accommodation they should enjoy their fundamental human rights. Workers' accommodation arrangements should not restrict workers' right and freedoms

Further, as per the BOCW Act, 1996, project and its contractor shall provide temporary accommodation facilities to the construction laborer free of cost and as soon as construction work is over, the employer at his own cost will remove the temporary structure and restore ground in as it was before.

Dos and Don'ts of Workers' Accommodation (Labour camp)

Project and its contractors shall abide by all applicable rules and regulations pertaining to the design and construction of the workers' accommodation building or structure as well as facilities to be provided therein while planning for the accommodation. Further, as suggestive guideline for workers accommodation arrangement based on the EBRD and IFC's guidelines on worker accommodation and BOCW Act as prescribed below:

Table 9-4 Standards for Workers' Accommodation

Standard Parameter	Requirement as well monitoring indicators
Location	• Reasonable distance from the project site • Adequate transportation arrangement • Reasonable distance from the vulnerable local community
Rooms/Dormitory facilities	• Rooms/dormitories are aired and cleaned at regular intervals • Sanitary facilities are located within the same building and provided separately for male and female workers' • Density standards are express wither in terms of minimal volume per resident or of minimal floor space. Usual standards range from 10 to 12.5 cubic meters (volume) or 4 to 5.5 square meters (surface) • A minimum ceiling height of 2.10 meters shall be provided • In case of collective room or dormitory, reasonable number of workers allowed – 2 to 8 workers per room • Rooms should be adequate ventilated and lit
Drainage	• Proper drainage system • Avoid Accumulation of stagnant water
Ventilation and lighting	• Adequate ventilation or air condition system shall be provided • Natural Lighting (if available) shall be provided • Artificial lighting shall be provided • Emergency lighting shall be provided Note: As a best practise the window area shall represent not less than 5% to 10% of the floor area
Water	• - Adequate and convenient water supply • Drinking water meeting national and WHO standards • Regular monitoring of drinking water Note: Depending on climate, weather conditions and accommodation standards – 80 to 180 litre per person per day should be available
Wastewater	• Proper discharge of wastewater and sewage • Establish Sewage Treatment Plant (STP) if required • Solid Waste Management System • Pest Control Mechanism Note: In addition, it is best practice to locate rubbish containers 30 meters from each shelter on a wooden, metal, or concrete stand. Such containers must be emptied at regular intervals (to determined based on temperatures and volumes generate) to avoid unpleasant odours associated with decaying organic materials
Toilet Facilities	• Adequate number of toilets • Convenient location • Construction of good materials that are easily cleanable • Facilities are cleaned frequently and kept in working conditions • Separate for male and female except for family accommodation Note on Toilet construction • An adequate number of toilets is provided to workers. Standard range from 1 unit for 15 persons to 1 unit to 6 persons

Standard Parameter	Requirement as well monitoring indicators
Bathrooms and other Sanitary Facilities	• For urinal, usual standards are 1 unit for 15 persons • Standards distance are from 30 to 60 meters from rooms/dormitories • Made of anti-slip washable materials • Adequate number of bathroom and hand wash facilities • Tapes are kept in working condition • Convenient location: Separate for male and female except for family accommodation • Adequate availability of hot and cold running water **Note:** Adequate number of shower/bathroom facilities – range from 1 unit to 15 persons to 1 unit per 6 persons
Canteen and cooking arrangement	• Adequate space • Constructed of good and easy to clean material • Option for separate cooking facilities • Separate kitchen space shall be provided from sleeping area • Hygiene in canteen/dining halls and cooking facilities • Adequate facilities for cleaning, disinfecting and storage of cooking utensils and equipment's • Adequate food waste disposal **Note:** canteen shall have a reasonable amount of space per workers. Standard range from 1 square meter to 1.5 square meters
Laundry	• Provide Laundry facility • Facilities shall be built in adequate and easy to clean materials
Medical Facilities	• Adequate number of first aid kits to the number of residents (workers) • Where possible a 24x7 first aid service/facility shall be made available • An adequate number of staff/workers shall be employed to provide first aid
Workers' rights, rules and regulations on workers' accommodation	• Restriction of workers' freedom of movement to and from the site is limited and duly justified. It is good practice to provide workers 24/7 access to the accommodation site. Any restrictions based on security reasons should be balanced by the necessity to respect workers' freedom of movement • Where possible, an adequate transport system to surrounding communities is provided. It is good practice to provide workers with free transportation to project location and from accommodation facility • Withholding workers' ID papers is prohibited • Workers' gender and religious, cultural and social backgrounds are respected. In particular, workers should be provided with the possibility of celebrating religious holidays and observances

Checklist on workers' accommodation monitoring

Detail checklist of workers' accommodation monitoring is provided below:

Table 9-5 Checklist on workers' accommodation

Aspects	Yes	No	Not Applicable (N/A)	Comments
Assessing the need for workers' accommodation				
Has there been an assessment of workers' availability in the neighbouring communities?				
Has there been an assessment of the skills and competencies of the local workforce and how do those skills and competencies fit the project's need?				
Has there been an assessment of the possibility of training a local workforce in order to fulfil the project's needs?				
Availability of housing				
Has there been a comprehensive assessment of the different type of housing available in the surrounding communities prior to building any workers' accommodation?				
Has there been an assessment of the impact on the communities of using existing housing opportunities?				
Have measures to mitigate adverse impacts on the local housing market been identified?				
Assessing Impacts of workers' accommodation on communities				
Have the potential health and safety impacts and consequences of land acquisition and involuntary resettlement occurring during the construction phase of the workers' accommodation been included in the assessment?				
Have the impacts of workers' accommodation on community infrastructures, services and facilities been included in the assessment?				
Have the impacts on local community's businesses and local employment been included in the assessment?				
Have general impacts of workers' accommodation on communities' health, (notably the increased risk of road accidents and of communicable diseases), and community social cohesion been included in the assessment?				
Does the assessment include appropriate mitigation measures to address any adverse impacts identified?				
Types of workers' accommodation				
Has consideration been given to provision of family accommodation?				

Aspects	Yes	No	Not Applicable (N/A)	Comments
Are individual accommodations comprising bedrooms, sanitary and cooking facilities provided as part of the family accommodation?				
Are adequate nursery/school facilities provided?				
Is special attention paid to providing adequate safety for children?				
Standards for workers' accommodation				
Have the relevant national/local regulations been identified and implemented?				
Is the location of the facilities designed to avoid flooding or other natural hazards?				
Are the living facilities located within a reasonable distance from the worksite?				
Is transport provided to worksite safe and free?				
Are the living facilities built using adequate materials, kept in good repair and kept clean and free from rubbish and other refuse?				
Is the site adequately drained?				
Depending on climate are living facilities provided with adequate heating, ventilation, air conditioning and light systems including emergency lighting?				
Do workers have easy access to a supply of clean/ potable water in adequate quantities?				
Does the quality of the water comply with national/local requirements or WHO standards?				
Are tanks used for the storage of drinking water constructed and covered to prevent water stored therein from becoming polluted or contaminated?				
Is the quality of the drinking water regularly monitored?				
Are wastewater, sewage, food and any other waste materials adequately discharged in compliance with local or World Bank standards and without causing any significant impacts on camp residents, the environment or surrounding communities?				
Are specific containers for rubbish collection provided and emptied on a regular basis?				
Are pest extermination, vector control and disinfection undertaken throughout the living facilities?				
Are the rooms/dormitories kept in good condition?				
Are the rooms/dormitories aired and cleaned at regular intervals?				

Aspects	Yes	No	Not Applicable (N/A)	Comments
Are the rooms/dormitories built with easily cleanable flooring material?				
Are the rooms/dormitories and sanitary facilities located in the same buildings?				
Are residents provided with enough space?				
Is the ceiling height high enough?				
Is the number of workers sharing the same room/dormitory minimized?				
Are the doors and windows lockable and provided with mosquito screens when necessary?				
Are mobile partitions or curtains provided?				
Is suitable furniture such as table, chair, mirror, bedside light provided for every worker?				
Are separate sleeping areas provided for men and women?				
Is there a separate bed provided for every worker?				
Is there a minimum space of 1 meter between beds?				
When double deck bunks are in use, is there enough clear space between the lower and upper bunk of the bed?				
Are triple deck bunks prohibited?				
Are adequate facilities for the storage of personal belongings provided?				
Are sanitary and toilet facilities constructed from materials that are easily cleanable?				
Are sanitary and toilet facilities cleaned frequently and kept in working condition?				
Are toilets, showers/bathrooms and other sanitary facilities designed to provide workers with adequate privacy including ceiling to floor partitions and lockable doors?				
Are separate sanitary and toilet facilities provided for men and women?				
Is there an adequate number of toilets and urinals?				
Are toilet facilities conveniently located and easily accessible?				
Is the shower flooring made of anti-slip hard washable materials?				
Is there an adequate number of hand wash basins and showers/bathrooms facilities provided?				
Are the sanitary facilities conveniently located?				

Aspects	Yes	No	Not Applicable (N/A)	Comments
Are shower facilities provided with an adequate supply of cold and hot running water?				
Are canteen, cooking and laundry facilities built with adequate and easy to clean materials?				
Are the canteen, cooking and laundry facilities kept in clean and sanitary condition?				
If workers cook their own meals, is kitchen space provided separately from the sleeping areas?				
Are adequate facilities for washing and drying clothes provided?				
Are workers provided with enough space in the canteen?				
Are canteens adequately furnished?				
Are kitchens provided with the facilities to maintain adequate personal hygiene?				
Are first aid kits provided in adequate numbers?				
Are first-aid kits adequately stocked?				
Is there an adequate number of staff/workers trained to provide first aid?				
Are there any other medical facilities/services provided on site? If not, why?				
Are workers provided with dedicated places for religious observance?				
Management and Staff				
Are there carefully designed worker camp management plans and policies especially in the field of health and safety (including emergency responses), security, workers' rights and relationships with the communities?				
Where contractors are used, have they clear contractual management responsibilities and duty to report?				
Does the person appointed to manage the accommodation have the required background, competency and experience to conduct his mission and is he/ she provided with the adequate responsibility and authority to do so?				
Is there enough staff to ensure the adequate implementation of housing standards (cleaning, cooking and security in particular)?				
Are staff members recruited from surrounding communities?				
Have the staff received basic health and safety training?				

Aspects	Yes	No	Not Applicable (N/A)	Comments
Are the persons in charge of the kitchen particularly trained in nutrition and food handling and adequately supervised?				
Charging fees for accommodation and services				
Are the renting arrangements fair and transparent?				
Are workers provided with adequate information about payment made?				
Where appropriate, are renting arrangements and regulations clearly included in workers' employment contracts?				
Are food and other services provided for free or reasonably priced, that is, not above the local market price?				
Is the payment in kind for accommodation and services prohibited?				
Health and Safety on Site				
Have health and safety management plans including electrical, mechanical, structural and food safety been designed and implemented?				
Has the accommodation manager a duty to report to the health authority specific diseases, food poisoning or casualties?				
Is there an adequate number of staff/workers trained in providing first aid?				
Has a specific and adequate fire safety management plan been designed and implemented?				
Is guidance on alcohol, drug and HIV/AIDS and other health risk-related activities provided to workers?				
Do workers have an easy access to medical facilities and medical staff, including female doctors/nurses where appropriate?				
Have emergency plans on health and fire safety been prepared?				
Depending on circumstances, have specific emergency plans (earthquakes, floods, tornadoes) been prepared?				
Security on workers' accommodation				
Has a security plan including clear measures to protect workers against theft and attack been designed and implemented?				

Aspects	Yes	No	Not Applicable (N/A)	Comments
Has a security plan including clear provisions on the use of force been designed and implemented?				
Have the backgrounds of security staff been checked for previous crimes or abuses?				
Has the recruitment of security staff from both genders been considered?				
Have security staff received clear instruction about their duty and responsibility?				
Have security staff been adequately trained in dealing with domestic violence and the use of force?				
Are body searches only performed in exceptional circumstances by specifically trained security staff of both genders?				
Do security staff have a good understanding about the importance of respecting workers' rights and the rights of the surrounding communities and adopt appropriate conduct?				
Do workers and communities have specific means to raise concerns about security arrangements and staff?				
Workers' rights, rules and regulations on workers' accommodation				
Are limitations on workers' freedom of movement limited and justified?				
Is an adequate transport system to the surrounding communities provided?				
Is the practice of withholding workers' ID papers prohibited?				
Is freedom of association expressly respected?				
Are workers' religious, cultural and social backgrounds respected?				
Are workers made aware of their rights and obligations and provided with a copy of the accommodations' internal rules, procedures and sanction mechanisms in a language or through a media they understand?				
Are house regulations nondiscriminatory, fair and reasonable?				
Are regulations on alcohol, tobacco and third parties' access to the camp clear and communicated to workers?				
Is a fair and non-discriminatory procedure to implement disciplinary procedures, including the right for workers to defend themselves, set up?				
Consultation and Grievance mechanism				

Aspects	Yes	No	Not Applicable (N/A)	Comments
Have mechanisms for workers' consultation been designed and implemented?				
Have workers subjected to disciplinary proceedings arising from conduct in the accommodation had access to a fair and transparent hearing with the possibility to appeal the decision?				
Are there fair conflict resolution mechanisms in place?				
In cases where serious offences occur, are there mechanisms to ensure full cooperation with police authorities?				
Management of community relations				
Have community relation management plans addressing issues around community development, community needs, community health and safety and community social and cultural cohesion been designed and implemented?				
Do community relation management plans include the setting up of liaison mechanisms to allow a constant exchange of information and consultation of the surrounding communities?				
Is there a senior manager in charge of implementing the community relation management plan?				
Is there a senior manager in charge of liaising with the surrounding communities?				
Are the impacts generated by workers' accommodation periodically reviewed, mitigated or enhanced?				
Are community representatives provided with easy means to voice their opinions and lodge complaints?				
Source: Workers' Accommodation: process and Standards – A guidance note by IFC and the EBRD ***Note: A above checklist shall be adopted by the project to undertake workers' accommodation audits.***				

APPENDIX 13: ENVIRONMENTAL AND SOCIAL MONITORING PLAN

With regards to sustainable development, GWRPL will to carry out all its business activities in a way which causes minimum or insignificant impacts on environmental and social parameters in the project area or its surroundings.

Scope

The Environmental Monitoring Plan has been formulated to provide guidance to GWRPL on periodic measuring and monitoring of such E&S parameters in the projects' area of influence. The plan is applicable during the entire project cycle included works contractually assigned to third party agencies (contractors) adhere to this monitoring plan.

Timelines for Env Monitoring

Monitoring Type	Monitoring Frequency	No of Samples
Ambient Air Quality	Quarterly	Minimum 3
Point Air Emission	Quarterly	all air emission discharge points (e.g. process stacks, power generation stacks, DG sets etc.)
Ambient Noise	Quarterly	Minimum 3
Liquid Effluent & Sludge Discharge	Quarterly	Minimum 2 (Outlet)
Ground water sample	Quarterly	Can vary on the number of ground water abstraction structures
Soil Quality	Half Yearly	Minimum 3
Fly Ash Quality	Half Yearly	One sample each for Bottom Ash & Fly Ash
Leachate Monitoring	Half Yearly	One sample from the storage tank and One sample from the source (Either bunker or waste incoming bunker)
Odour Monitoring	Quarterly	2-4 locations within plant and 1 downwind at the nearest resident
Surface Water Quality	Half Yearly	Upstream and downstream of nearby surface water body (River lalpari)
Analysis of Sludge	Half Yearly	1 sample

Records

Following records but not limited to the following shall be maintained by GWRPL.

- Environmental monitoring reports (air, noise, water and soil) as prescribed by the SPCB in the consents;
- Ash generation and its disposal;
- Waste water generated and treated;
- Waste register for recording the generation and disposal of various categories of waste produced at sites; and
- Environmental Statements reports.

The records will be kept for all initial, final and routine monitoring / inspections of construction and operation areas. These records will be stored in an agreed location within the plant and be available for internal and external monitoring as required; and

Record sheets will detail the date, location of inspection, frequency, findings, appropriate person/s notified and identified actions, as required.

Environment Monitoring

GWRPL is required to engage reputed and authorized laboratories to collect representative samples of ambient air/noise/water/fly ash/leachate/point air emissions at an agreed number of locations within as well as outside the property boundary fence and submit collected samples for analysis and report the results to ACEL. The monitoring parameters and

frequency for the concerned project will be as per the environmental clearances / consent issued by regulatory authority or will be agreed upon by the GWRPL and ACEL at corporate level as per the IFC/World Bank/ WHO guidelines.

1. Ambient Air Quality

The ambient air quality monitoring shall be applicable to both construction and operation phases.

Sample Frequency (e.g. quarterly)	Ambient Air Quality Parameter	WHO Permissible Limits *	India Regulatory Limits and units *	Monitoring results (in comparable units) **
Particulate Matter (PM_{10})				
	Annual arithmetic mean	15 µg/m³	60 µg/m³	µg/m³
	Maximum 24 hour average	45 µg/m³	100 µg/m³	µg/m³
Particulate Matter ($PM_{2.5}$)				
	Annual arithmetic mean	5 µg/m³	40 µg/m³	µg/m³
	Maximum 24 hour average	15 µg/m³	60 µg/m³	µg/m³
Sulphur Dioxide (SO_2)				
	Annual arithmetic mean	µg/m³	50 µg/m³	µg/m³
	Maximum 24 hour average	40 µg/m³	80 µg/m³	µg/m³
Oxides of Nitrogen (NOx)				
	Annual arithmetic mean	10 µg/m³	50 µg/m³	µg/m³
	Maximum 24 hour average	25 µg/m³	80 µg/m³	µg/m³
Ozone (O_3)				
	8-hour daily maximum	100 µg/m³	100 µg/m³	µg/m³
	8-hour mean, peak season	80 µg/m³		µg/m³

* Current standards as per the latest WHO norms for ambient air pollution

** Monitoring results should be accompanied by reports submitted by laboratory.

2. Point Air Emissions Monitoring

Point air emission monitoring will be conducted during operation phase

Sample Frequency (e.g. quarterly)	Air Emission Parameter	Flue Gas emission standards as IFC EHS Guidelines for Thermal Power Plant	India Regulatory Limits and units	Monitoring results (in comparable units) **
	Particulate matter (PM_{10})	mg/Nm³	mg/Nm³	
	Sulphur Dioxide (SO_2)	mg/Nm³	mg/Nm³	
	Oxides of Nitrogen (NOx)	mg/Nm³	mg/Nm³	
	Carbon Monoxide	mg/Nm³	mg/Nm³	
	Particulate matter (PM2.5)	mg/Nm³	mg/Nm³	
	Cadmium as Cd	mg/Nm³	mg/Nm³	
	Lead (Pb)			

Sample Frequency (e.g. quarterly)	Air Emission Parameter	Flue Gas emission standards as IFC EHS Guidelines for Thermal Power Plant	India Regulatory Limits and units	Monitoring results (in comparable units) **
	Mercury (Hg)			
	Nickel (as Ni)			
	Arsenic as As			
	HCL			
	HF			
	Dioxin/Furan			

** Monitoring results should be accompanied by reports submitted by laboratory

3. Ambient Noise

Ambient Noise Monitoring is applicable during both construction and operation phases. The results should be maintained for each monitoring locations and sampling should be done during day and night for 48 hours.

Sample Frequency (e.g. quarterly)	Sample Location	Ambient Noise Parameters	Permissible WHO limits	Indian Regulatory Limits and Units	Monitoring results (in comparable units)**
		Residential, institutional, educational receptors, Daytime (07:00-22:00 hours)	L_{eq} (hourly), 55 dB(A)	55	dB(A)
		Residential, institutional, educational receptors, Nighttime (22:00-07:00 hours)	L_{eq} (hourly), 45 dB(A)	45	dB(A)
		Industrial, commercial receptors Daytime (07:00-22:00 hours)	L_{eq} (hourly), 70 dB(A)	75 for industrial 65 for commercial	dB(A)
		Industrial, commercial receptors, Nighttime (22:00-07:00 hours)	L_{eq} (hourly), 70 dB(A)	70 for industrial 55 for commercial	dB(A)

** Monitoring results should be accompanied by reports submitted by laboratory.

4. Liquid Effluent Discharges and Sludge

Applicable during construction as well as operation phase

- ❑ *Please describe the water course(s) which the effluent is discharged into (e.g. river, municipal system, sea).*
- ❑ *If the effluent is treated prior to discharge from the site please describe the level of treatment provided.*
- ❑ *If the effluent is discharged into a municipal system please confirm the level of treatment provided and where the municipal system discharges to.*

Sample Frequency (e.g. quarterly)	Treated Effluent Quality Parameters	WBG/IFC Permissible limits	Indian Regulatory Limits and Units *	Monitoring results in comparable units **
	pH	6-9		
	Biochemical oxygen demand (BOD_5)	50 mg/L		mg/L
	Chemical oxygen demand (COD)	250 mg/L		mg/L

Sample Frequency (e.g. quarterly)	Treated Effluent Quality Parameters	WBG/IFC Permissible limits	Indian Regulatory Limits and Units *	Monitoring results in comparable units **
	Oil and grease	10 mg/L		mg/L
	Total suspended solids (TSS)	50 mg/L		mg/L
	Total coliform bacteria, Most Probable Number (MPN) or plate count (PC)	400 /100 ml		/100 mls
	Ambient temperature of receiving waters at edge of zone where mixing with effluent takes place (if not defined, 100 meters from discharge point).	3^{0}C (maximum increase is 3^{0}C)		^{0}C
	Heavy Metals, Total	10 mg/L		mg/L
	(list other parameters)*	mg/L		mg/L

** Monitoring results should be accompanied by reports submitted by laboratory.

* List other parameters as well. The parameters listed are not detailed.

Indicative parameters for sludge includes the following. Please note, the sludge parameter and compliance requirements to be followed as mentioned in the CTO for the project.

S.No.	Parameters	Unit	Sludge Sample
1.	Temperature	^{o}C	
2.	pH	-	
3.	Alkalinity	-	
4.	BOD	mg/l	
5.	COD	mg/l	
6.	Total suspended solid	mg/l	
7.	Volatile Suspended Solid	mg/l	
8.	Moisture Content	%	
9.	Heavy metals	mg/l	

5. Ground Water Monitoring

Groundwater monitoring is applicable during both construction and operation phases.

Sample Frequency (e.g. quarterly)	Ground Water Quality Parameters	WBG/IFC Permissible limits	Indian Regulatory Limits and Units *	Monitoring results in comparable units **
	pH	6-9		
	Biochemical oxygen demand (BOD_5)	50 mg/L		mg/L
	Chemical oxygen demand (COD)	250 mg/L		mg/L
	Oil and grease	10 mg/L		mg/L
	Total suspended solids (TSS)	50 mg/L		mg/L
	Total coliform bacteria, Most Probable Number (MPN) or plate count (PC)	400 /100 ml		/100 mls

Sample Frequency (e.g. quarterly)	Ground Water Quality Parameters	WBG/IFC Permissible limits	Indian Regulatory Limits and Units *	Monitoring results in comparable units **
	Heavy Metals, Total	10 mg/L		mg/L
	(list other parameters)*	mg/L		mg/L

6. Soil Quality Monitoring

S.No	Sample Frequency E.g. Quarterly	Parameter	Units	Sample 1	Sample 2	Sample n
1.		pH Value (1:2.5) at 25℃	None			
2.		Texture	None			
3.		Electrical Conductivity (1:2.5) at 25℃	µs/cm			
4.		Permeability	Cm/hr			
5.		Phosphate (as PO4)	mg/kg			
6.		Sand	%			
7.		Silt	%			
8.		Clay	%			
9.		Porosity	%			
10.		Nitrites (as NO2)	mg/kg			
11.		Nitrates (as NO3)	mg/kg			
12.		Total Petroleum Hydrocarbon as TPH	mg/kg			
13.		Iron (as Fe)	mg/kg			
14.		Lead (as Pb)	mg/kg			
15.		Manganese (as Mn)	mg/kg			
16.		Nickel (as Ni)	mg/kg			
17.		Barium (as Ba)	mg/kg			
18.		Zinc (as Zn)	mg/kg			
19.		Copper (as Cu)	mg/kg			
20.		Cadmium (as Cd)	mg/kg			
21.		Total Chromium (as Cr)	mg/kg			
22.		Arsenic (as As)	mg/kg			
23.		Mercury (as Hg)	mg/kg			
24.		Total Hydrocarbon	mg/kg			
25.		Cation Exchange Capacity	Meq/10			

7. Fly Ash Quality Monitoring

Fly Ash Quality Monitoring to be undertaken twice a year during operation phase to assess the quality of fly ash and to ensure that the fly ash Is not hazardous in nature.

The indicative parameters to be monitored as part of the fly ash monitoring are as follows.

S.No.	Parameters	Unit	Sample Results
1.	Silica	% by Mass	
2.	Alumina	% by Mass	
3.	Iron Oxide	% by Mass	
4.	Titanium Oxide	% by Mass	
5.	Calcium Oxide	% by Mass	
6.	Magnesium Oxide	% by Mass	
7.	Sodium Oxide	% by Mass	
8.	Potassium Oxide	% by Mass	
9.	Manganese Oxide	% by Mass	
10.	Sulphate	% by Mass	
11.	Phosphate	% by Mass	
12.	Chloride	% by Mass	
13.	Copper Oxide	% by Mass	
14.	Zinc Oxide	% by Mass	
15.	Strontium	% by Mass	

Corrective Actions

If any of the WHO/World Bank Group/IFC or Indian regulatory standards in any of the above tables are exceeded please explain the cause and, if appropriate, describe the planned corrective actions to prevent re-occurrence.

Parameter Exceeded	Cause of Exceedance	Corrective Action and Completion Schedule

Monitoring

- The Project Head and EHS Manager will regularly inspect the monitoring reports to ensure compliance with the applicable standards;
- Plant level Site Manager/Supervisor will perform regular checks of plant and equipment to identify any exhaust gas leakages/ odor leakages/any leakages to confirm the condition of the plant;
- Regular checks for visual evidence of pollution, contamination, hygiene and safety will also be made in the plant premises and working areas;
- On site meetings/Inspections will be carried out as necessary to confirm the appropriate use of mitigation measures identified within the ACEL environmental plans relating to pollution control. These meetings/Inspections will highlight any further issues/measures which may be relevant either prior to commencement or during the works;
- Records will be kept of all inspections / findings for review for discussion during regular meetings; and

Training

- All employees, subcontractors, suppliers and visitors to the site will be notified via induction of the requirements on site for pollution prevention;
- Through tool box talks, site personnel and subcontractors will be educated on those aspects of environmental management as appropriate to the task assigned to them;
- Consultation meetings will include discussion on the works to be undertaken, review of other plans and agreement on required mitigation and pollution prevention measures. Measures agreed at such consultation meetings will be disseminated to the relevant employees, contractors, subcontractors, suppliers and other appropriate persons via tool box talks and formal communications (email / memo), particularly where required for record purposes (e.g. variations, auditing and monitoring records);
- ACEL will ultimately be responsible for overseeing and enforcing pollution prevention procedures such that potential adverse impacts to human health or the environment from any activities involving handling of potential pollutants are avoided or mitigated. For the avoidance of doubt, pollution prevention procedures include, but are not necessarily limited to all aspects of traffic, plant and materials management, air emission management, noise level management, surface water and drainage management.

Applicable Standards

Emission Standards for Boiler

- The emission from boiler from the facility shall meet the following standards

Table 6 (C) - Emission Guidelines (in mg/Nm³ or as indicated) for Boiler

Note:
- **Guideline values are applicable for new facilities**
- **Nationally legislated limits should be applied if they are more stringent**
- **EA may justify more stringent or less stringent guideline values due to environmental, community health, technical and economic considerations, whilst not exceeding nationally legislated limits In all cases, the EA should demonstrate that ambient impacts from emissions are in compliance with the requirements of Section 1.1 of the General EHS Guidelines.**
- **For fuels other than those specified below, the EA should justify the required emission guidelines taking account of environmental, community health, technical and economic considerations**
- **For projects to rehabilitate existing facilities, emission guidelines should be established by the EA considering (i) the existing emission levels and impacts on the environment and community health, and (ii) economic and technical feasibility of ensuring the existing emission levels meet the Guideline values for new facilities.**

Combustion Technology / Fuel	Particulate Matter (PM)		Sulfur Dioxide (SO_2)		Nitrogen Oxides (NO_x)		Excess Dry gas O_2 Content (%)
Boiler	NDA	DA	NDA	DA	NDA	DA	
Natural Gas	N/A	N/A	N/A	N/A	200	180	3
Other Gaseous Fuels	50	30	400	300	240	200	3
Liquid Fuels (Plant ≥50MWth to <600MWth)	50	30	400 – 1000[a]	400	400	200	3
Liquid Fuels (Plant ≥600MWth)	40	25	200 – 600[a]	200	400	200	3
Solid Fuels (Plant ≥50MWth to <600MWth)	50	30	400 – 1000[a]	400	500	200	6
Solid Fuels (Plant ≥600MWth)	40	25	200 – 600[a]	200			6

Notes:

(a) Targeting the lower guidelines values and recognizing variability in approaches to the management of SO_2 emissions (fuel quality vs. use of secondary controls) and the potential for higher energy conversion efficiencies. Selection of the emission level in the range is to be determined by EA taking account of environmental, community health, technical and economic considerations.

General notes:
- MWth = Megawatt thermal input on HHV basis.
- N/A = not applicable.
- NDA = Non-degraded airshed; DA = Degraded airshed; Airshed should be considered as degraded if relevant ambient air quality standards (as defined in the **General EHS Guidelines**) are exceeded; DA/NDA to be determined for each pollutant.
- Nm^3 is at one atmospheric pressure, 0 degree Celsius, dry gas.
- MWth category is to apply to the entire facility consisting of multiple units.
- Guideline values apply to facilities operating more than a combined total of 500 hours per year (i.e., if multiple units are present, the combined total of all operational units at the facility).
- See Section 2.1 for information on how facility performance is compared with these emission guidelines. The use of fuels with a low volatile content may lead to higher emission levels of NOx which should be justified in the EA.
- In the event that natural gas contains elevated sulfur levels, SO_2 emissions should be no greater than that for liquid fuels.
- PM defined as total suspended particulates.

Comparison of the Guideline values with standards of selected countries / region (as of January 2017):
- Natural Gas-fired Boiler – NO_x
  - EU: 100mg/Nm^3
  - US: 88ng/J gross energy output
  - China: 100mg/Nm^3
- Solid Fuels-fired Boiler - PM
  - EU: 20mg/Nm^3, 10 (> 300MWth for coal and lignite)
  - US: 11ng/J gross energy output
  - China: 30mg/Nm3
  - India: 350mg/Nm3 (<210MWth), 140mg/Nm3 (=>210MWth)
- Solid Fuels-fired Boiler – SO_2
  - EU: 400mg/Nm^3 (50 – 100MWth), 200mg/Nm^3 (>300MWth)
  - US: 130ng/J gross energy output or 97% reduction
  - China: 50 – 200mg/Nm^3 (subject to location)

Source: EU (Directive 2010/75/EU), US (40 CFR Part 60 Subpart JJJJ), Final Rule – June 13, 2007), China (GB13223-2011), India (The Environment (Protection) Rules, 1986).

Standards for Incineration as per SWM Rule 2016

The emission from incinerator / thermal technologies in solid waste treatment/ disposal facility shall meet the following standards

Parameter	Emission standard	
(1)	(2)	(3)
Particulates	50 mg/Nm^3	Standard refers to half hourly average value
HCl	50 mg/Nm^3	Standard refers to half hourly average value
SO2	200 mg/Nm^3	Standard refers to half hourly average value
CO	100 mg/Nm^3	Standard refers to half hourly average value
	50 mg/Nm^3	Standard refers to daily average value
Total Organic Carbon	20 mg/Nm^3	Standard refers to half hourly average value
HF	4 mg/Nm^3	Standard refers to half hourly average value
NOx (NO and NO2 expressed as NO2)	400 mg/Nm^3	Standard refers to half hourly average value
Total dioxins and furans	0.1 ng TEQ/Nm^3	Standard refers to 6-8 hours sampling. Please refer guidelines for 17 concerned congeners for toxic equivalence values to arrive at total toxic equivalence.
Cd + Th + their compounds	0.05 mg/Nm^3	Standard refers to sampling time anywhere between 30 minutes and 8 hours.
Hg and its compounds	0.05 mg/Nm^3	Standard refers to sampling time anywhere between 30 minutes and 8 hours.
Sb + As + Pb + Cr + Co + Cu + Mn + Ni + V + their compounds	0.5 mg/Nm^3	Standard refers to sampling time anywhere between 30 minutes and 8 hours.

Note.- *All values corrected to 11% oxygen on a dry basis.*

National Ambient Air Quality Standards, CPCB 2009

Pollutant	Time Weighted Avg.	Concentration in Ambient Air	
		Industrial, Residential, Rural & Other Areas	Ecologically Sensitive Areas (notified by Central Government)
Sulphur dioxide (SO2) □g/m^3	Annual Average*	50	20
	24 Hours**	80	80
Oxides of Nitrogen (NOx) □g/m^3	Annual Average*	40	30
	24 Hours**	80	80
Particulate Matter (PM 10) □g/m^3	Annual Average*	60	60
	24 Hours**	100	100
Particulate Matter (PM 2.5) □g/m3	Annual Average*	40	40
	24 Hours**	60	60
Ozone (O3) □g/m3	8 Hours**	100	100
	1 Hour**	180	180
Lead (Pb) □g/m3	Annual Average*	0.50	0.50
	24 Hours**	1.0	1.0
Carbon monoxide (CO) mg/m3	8 Hours**	02	02
	1 Hour**	04	04
Ammonia (NH3) □g/m3	Annual*	100	100
	24 Hours**	400	400
Benzene (C6H6) □g/m3	Annual*	05	05
Benzo(α)Pyrene-particulate phase ng/m3	Annual*	01	01
Nickel (Ni) ng/m3	Annual*	20	20
Arsenic (As) ng/m3	Annual*	06	06

Note: *Annual arithmetic mean of minimum 104 measurements in a year at a particular site taken twice a week 24 hourly at uniform interval.

** 24 hourly/8 hourly/1 hourly monitored values, as applicable shall be complied with 98% of the time in a year. 2% of the time, it may exceed but not on two consecutive days of monitoring.

National Ambient Noise Standards

Area Code	Category of Area	Limits in dB(A) Leq	
		Day time*	Night Time
A	Industrial Area	75	70
B	Commercial Area	65	55
C	Residential Area	55	45
D	Silence Zone**	50	40

Note: *Daytime is from 6 am to 10 pm, Night time is10.00 pm to 6.00 am;

**Silence zone is an area comprising not less than 100 meters around premises of hospitals, educational institutions, courts, religious places or any other area, which is declared as such by the competent authority. Use of vehicle horns, loud speakers and bursting of crackers are banned in these zones.

Source: Noise Pollution (Regulation and control) Rules, 2000

Soil Quality standards

S.No.	Soil Test Parameters	Classification
1	pH	<4.5 Extremely acidic 4.51-5.00 Very strongly acidic 5.00-5.50 slightly acidic 5.51-6.0 moderately acidic 6.01-6.50 slightly acidic 6.51-7.30 Neutral 7.31-7.80 slightly alkaline 7.81-8.50 moderately alkaline 8.51-9.0 strongly alkaline 9.01 very strongly alkaline
2	Salinity Electrical Conductivity (mmhos/cm) (1 ppm = 640 mhos/cm)	Up to 1.00 Average 1.01-2.00 harmful to germination 2.01-3.00 harmful to crops (sensitive to salts)
3	Organic Carbon	Up to 0.2: very less 0.21-0.4: less 0.41-0.5 medium, 0.51-0.8: on an average sufficient 0.81-1.00: sufficient >1.0 more than sufficient
4	Nitrogen (kg/ha)	Up to 50 very less 51-100 less 101-150 good 151-300 Better >300 sufficient
5	Phosphorus (kg/ha)	Up to 15 very less 16-30 less 31-50 medium, 51-65 on an average sufficient 66-80 sufficient >80 more than sufficient
6	Potash (kg/ha)	0-120 very less 120-180 less 181-240 medium 241-300 average 301-360 better >360 more than sufficient

Source: Handbook of agriculture, Indian Council of Agricultural Research, New Delhi, India

IS10500:2012 Drinking Water Standards

S.N	Substance/ Characteristics	Requirement (Acceptable limit)	Permissible limit in absence of alternate source
1.	Colour, Hazen units, max	5	15
2.	Odor	Unobjectionable	-
3.	Taste	Agreeable	-
4.	Turbidity, NTU, max	5	5
5.	pH value	6.5 - 8.5	No Relaxation
6.	Total hardness (as CaCO3) mg/l, max	200	600
7.	Iron (as Fe) mg/l, max	0.3	No relaxation
8.	Chlorides (as Cl) mg/l, max	250	1000
9.	Free residual chlorine, mg/l, min	0.2	1
10.	Dissolved solids mg/l, max	500	2000
11.	Calcium (as Ca) mg/l, max	75	200
12.	Magnesium (as Mg) mg/l, max	30	100
13.	Copper (as Cu) mg/l, max	0.05	1.5
14.	Manganese (as Mn) mg/l, max	0.1	0.3
15.	Sulphate (as SO4) mg/l, max	200	400
16.	Nitrate (as NO3) mg/l, max	45	No relaxation
17.	Fluoride (as F) mg/l, max	1.0	1.5
18.	Phenolic compounds (as C6H6OH) mg/l, max	0.001	0.002
19.	Mercury (as Hg) mg/l, max	0.001	No relaxation
20.	Cadmium (as Cd) mg/l, max	0.003	No relaxation
21.	Selenium (as Se) mg/l, max	0.01	No relaxation
22.	Arsenic (as As) mg/l, max	0.01	0.05
23.	Cyanide (as CN) mg/l, max	0.05	No relaxation
24.	Lead (as Pb) mg/l, max	0.01	No relaxation
25.	Zinc (as Zn) mg/l, max	5	15
26.	Anionic detergents (as MBAS) mg/l, max	0.2	1.0
27.	Total Chromium (as Cr) mg/l, max	0.05	No relaxation
28.	Polynuclear aromatic hydrocarbons (as PAH) g/l, max	0.0001	No relaxation
29.	Mineral Oil mg/l, max	0.5	No relaxation
30.	Pesticide's mg/l, max	Absent	0.001
31.	Radioactive materials: a) Alpha emitters Bq/l, max b) Beta emitters pci/l, max	0.1 1.0	 No relaxation No relaxation
32.	Total Alkalinity (as CaCO3), mg/l, max	200	600
33.	Aluminum (as Al) mg/l, max	0.03	0.2

34.	Boron, mg/l, max	0.5	1.0
35.	Ammonia (as total ammonia-N). mg/l, max	0.5	No relaxation
36.	Barium (as Ba), mg/l, max	0.7	No relaxation
37.	Chloramines (as Cl2), mg/l, max	4.0	No relaxation
38.	Silver (as Ag), mg/l, max	0.1	No relaxation
39.	Sulphide (as H2S), mg/l, max	0.05	No relaxation
40.	Molybdenum (as Mo), mg/l, max	0.07	No relaxation
41.	Nickel (as Ni), mg/l, max	0.02	No relaxation
42.	Polychlorinated biphenyls, mg/l, max	0.0005	No relaxation
43.	Trilomethanes: a) Bromoform, mg/l, max b) Dibromochloromethane, mg/l, max c) Bromodichloromethane, mg/l, max d) Chloroform, mg/l, max	0.1 0.1 0.06 0.2	No relaxation No relaxation No relaxation No relaxation
Bacteriological Quality			
1.	All water intended for drinking: a) E. coli or thermotolerant coliform bacteria	Shall not be detectable in any 100 ml sample	-
2.	Treated water entering the distribution system: a) E. coli or thermotolerant coliform bacteria b) Total coliform bacteria	Shall not be detectable in any 100 ml sample; Shall not be detectable in any 100 ml sample.	-
3.	Treated water in the distribution system: a) E. coli or thermotolerant coliform bacteria b) Total coliform bacteria	Shall not be detectable in any 100 ml sample; Shall not be detectable in any 100 ml sample.	-

Source: Central Pollution Control Board

General Standard for Treated waste water from STP

S. N	Parameter	Standards		
		Inland surface water	Public sewers	Land for Irrigation
1.	Colour and odor	Refer to Note 1	-	Refer to Note 1
2	Suspended solids mg/l, max.	100	600	200
3	Particle size of suspended solids	Shall 850 micron IS sieve	-	-
4	PH value	5.5 to 9.0	5.5 to 9.0	5.5 to 9.0
5	Temperature	Shall not exceed 50 C above the receiving water temperature	-	-
6	Oil and grease, mg/l max,	10	20	10
7	Total residual chlorine, mg/l max	1.0	-	-
8	Ammonical nitrogen (as N), mg/l max.	50	50	-
9	Total Kjeldahl nitrogen (as N); mg/l max	100	-	-
10	Free ammonia (as NH3), mg/l max	5.0	-	-
11	Biochemical oxygen demand (3 days at 270 C), mg/l max	30	350	100
12	Chemical oxygen demand, mg/l max	250	-	-
13	Arsenic (as As) mg/l, max	0.2	0.2	0.2
14	Mercury (As Hg) mg/l max.	0.01	0.01	-
15	Lead (as Pb) mg/l, max	0.1	1.0	-
16	Cadmium (as Cd) mg/l, max	2.0	1.0	-
17	Hexavalent chromium (as Cr +6) mg/1 max	0.1	2.0	-
18	Total chromium (as Cr) mg/1 max	2.0	2.0	-
19	Copper (as Cu) mg/1, max	3.0	3.0	-
20	Zinc (as Zn)	5.0	15	-
21	Selenium (as Se)	0.05	0.05	-
22	Nickel (as Ni) mg/1,max	3.0	3.0	-
23	Cyanide (as CN) mg/1,max	0.2	2.0	0.2
24	Fluoride (as F) mg/1,max	2.0	15	-
25	Dissolved phosphates (as P) mg/1,max	5.0	-	-
26	Sulphide (as S) mg/1,max	2.0	-	-
27	Phenolic compounds (as C6H5OH) mg/1,max	1.0	5.0	-
28	Radioactive materials: (a) Alpha emitters micro curie mg/1,max (b) Beta emitters micro curie mg/1	10-7 10-6	10-7 10-6	10-8 10--7
29	Bio-assay test	90% survival of fish after 96 hours in 100% effluent	90% survival of fish after 96 hours in 100% effluent	90% survival of fish after 96 hours in 100% effluent
30	Manganese	2 mg/1	2 mg/1	-

31	Iron (as Fe)	3mg/1	3mg/1	-
32	Vanadium (as V)	0.2 mg/1	0.2 mg/1	-
33	Nitrate Nitrogen	10 mg/1	-	-

Source: as per G.S.R 422 (E) dated 19.05.1993 and G.S.R 801 (E) dated 31.12.1993 issued under the provisions of E (P) Act 1986.

Emission Limits for New Diesel Engines (up to 800 KW) for Generator Sets

Emission standards for diesel engines (engine rating more than 0.8 MW (800 KW)) for WTE plant, generator set application and other requirements is as follows:

Parameter		Area Category	Total engine rating of the plant (includes existing as well as new generator sets)	Generator sets commissioning date		
				Before 1.7.2003	Between 1.7.2003 and 1.7.2005	On or after 1. 7. 2005
NOx (as NO_2) (AT 15% O_2) , dry basis, in ppmv		A	Upto 75 MW	1100	970	710
		B	Upto 150 MW			
		A	More then 75 MW	1100	710	360
		B	More then 150 MW			
NMHC (as C)(at 15% O_2), mg/Nm^3		Both A and B		150	100	
PM (at 15% O_2), mg/Nm^3	Diesel Fuels-HSD & LDO	Both A and B		75	75	
	Furnace Oils-LSHS & FO	Both A and B		150	100	
CO (at 15% O_2), mg/Nm^3		Both A and B		150	150	
Sulphur Content in fuel		A		< 2%		
		B		< 4%		
Fuel specification		For A only	Up to 5MW	Only Diesel fuels (HSD, LDO) shall be used.		
Stack height (for generator sets commissioned after 1.7.2003)		Stack height shall be maximum of the following, in meter: (i) 14 $Q^{0.3}$, Q= Total SO_2 emission from the plant in kg/hr. (ii) Minimum 6 m. above the building where generator set is installed. (iii) 30 m.				

Standard for treated leachate as per SWM rules 2016

The disposal of treated leachate shall meet the following standards

S. No	Parameter	Standards (Mode of Disposal)		
		Inland surface water	Public sewers	Land disposal
(1)	(2)	(3)	(4)	(5)
1.	Suspended solids, mg/l, max	100	600	200
2.	Dissolved solids (inorganic) mg/l, max.	2100	2100	2100
3	pH value	5.5 to 9.0	5.5 to 9.0	5.5 to 9.0
4	Ammonical nitrogen (as N), mg/l, max.	50	50	-
5	Total Kjeldahl nitrogen (as N), mg/l, max.	100	-	-
6	Biochemical oxygen demand (3 days at 27^0 C) max.(mg/l)	30	350	100
7	Chemical oxygen demand, mg/l, max.	250	-	-
8	Arsenic (as As), mg/l, max	0.2	0.2	0.2
9	Mercury (as Hg), mg/l, max	0.01	0.01	-
10	Lead (as Pb), mg/l, max	0.1	1.0	-
11	Cadmium (as Cd), mg/l, max	2.0	1.0	-
12	Total Chromium (as Cr), mg/l, max.	2.0	2.0	-
13	Copper (as Cu), mg/l, max.	3.0	3.0	-
14	Zinc (as Zn), mg/l, max.	5.0	15	-
15	Nickel (as Ni), mg/l, max	3.0	3.0	-
16	Cyanide (as CN), mg/l, max.	0.2	2.0	0.2
17	Chloride (as Cl), mg/l, max.	1000	1000	600
18	Fluoride (as F), mg/l, max	2.0	1.5	-
19	Phenolic compounds (as C_6H_5OH) mg/l, max.	1.0	5.0	-

APPENDIX 14: OCCUPATIONAL HEALTH & SAFETY PLAN

This management plan is applicable to both construction and operation phases of the project. GWRPL will implement occupational health and safety management during construction activities, major maintenance works and routine operations and maintenance activities.

The procedures will include first aid management, health surveillance, general health and safety, permit to work system, etc. The EHS Manager of the project will be responsible for effective implementation of these procedures throughout the project lifecycle and will ensure that the requirements are abided by all the employees, contractors and their workers.

Scope

The plan developed shall be adhered to by the Contractors and the Sub-Contractors engaged during the lifecycle of the project. The following have been included in this OHS Plan.

- First Aid Management
- Health Surveillance
- Permit to Work
- General Health & Safety
- Hot work
- PPE enforcement & Verification
- Safety Requirements of Pressure Vessels
- Safety Requirements of Boilers
- Work at Height
- Confined Spaces
- Noise Management

Management Plan

1. First Aid Management

For the safety of workers and other staff, and any other contingency situation, medical service should be available at the project office. Following guidelines with respect to first aid requirements and responsibilities for the provision of immediate medical services will be adopted:

- First aid kits will be provided at the project site, as well as in vehicles used by staff for transportation of good and materials. First aid signs shall be displayed for assisting in easy locating of first aid equipment and facilities.
- One person from the SPV team will be nominated to maintain the first aid kits (a trained first aider). The person will undertake regular checks (after each use or, if the kit is not used, at least once every 12 months) to ensure the kit contains a complete set of the required items (an inventory list in the kit should be signed and dated after each check). At no time will over-the-counter medications be stored in the kits without the prior approval of a health care professional (where permitted by local legislation) and inclusion in the kit's listed inventory.
- The first aid kit should provide basic equipment for administering first aid for injuries including:
    - cuts, scratches, punctures, grazes and splinters
    - muscular sprains and strains
    - minor burns
    - amputations and/or major bleeding wounds
    - broken bones
    - eye injuries
    - Shock.
- The EHS In-charge shall identify and train an adequate number of staff/ workers to provide first aid during medical emergencies.
- First aid register will be maintained onsite

2. Health Surveillance

Effective health management is necessary for preventing disease or adverse health effects among employees, workers and labour. The following medical facilities shall be provided by SPV:

- Annual health check-ups shall be carried out for all SPV on roll employees and health records shall be maintained. Workers engaged through contractors shall also have periodic medical check-ups arranged through their respective contractors. Related records shall be furnished to the SPV.
- Information and awareness of communicable diseases, AIDS etc. shall be provided to contract workers.
- Records on reported medical cases amongst workers and staff shall be maintained by the EHS In-charge or HR & Admin Officer of the SPV.
- An ambulance shall be made available at the project site for transportation of injured persons to the nearest hospital or health centre. The ambulance will be supplied with first aid boxes, stretchers and oxygen cylinders.

3. Permit to Work

- A permit-to-work (PTW) system is a formal written system used to control certain types of work that are potentially hazardous such as hot work, work at height (above 2 m), confined space, excavation work, electrical maintenance (e.g., display panels, lighting systems, etc.) and chemical related work. The permit specifies the work to be done, and the precautions to be taken. Permits-to-work form an essential part of safe systems of work for many construction activities and routine maintenance work.
- During construction phase, the EPC contractor shall either adopt this procedure or implement their own Permit to Work (PTW) System after taking an approval from the PM and SPV. Non-compliance with the requirements would result in disciplinary action.
- A work request shall be initiated whenever any potentially hazardous work / activity is required to be carried out by SPV employee or any contract workers, using Permit to Work Form and Energized Electrical Work Permit. The work permit will have a PTW number, date and completing section (1) Permit Description of PTW form: Location of Work, System/ Equipment ID, Description of Work, Estimated Time of Completion (approximate) etc.
- The SPV's EHS Manager shall be authorized to approve a PTW during routine maintenance activities, while during construction or major maintenance works, the EPC contractor's EHS representative / site supervisor shall approve the PTW. The PTW will be issued only after ensuring that the person requesting for the permit is trained to perform the concerned work and has the necessary PPEs. A copy of PTW to be displayed at worksite and completed PTW will be kept in 'Active' folder till the completion of work. After completion of the work, the same issuing authority will close the PTW after ensuring all works have been satisfactorily and safely completed. All PTW records will be maintained by the SPV.

4. General health and safety

- Potable (drinking) water shall be made available free of cost to all workers and staff at the site office and toll plazas. Potable water outlets/ dispensers, if provided, shall be clearly labelled for identification. Periodic testing of water quality using external testing laboratories shall be carried out and records shall be maintained.
- Toilet facilities shall be available for all staff and workers. Separate facilities shall be provided for male and female employees and workers. Public toilets, if provided, will be maintained as per the good hygiene standards.
- All staff and workers will be issued personal protective equipment (PPE). The PPE shall be kept clean at all times and maintained in accordance with the manufacturer's requirements.
- The project site office, toll plazas and patrolling vehicles will be provided with portable extinguishers (such as CO2). Automated fire extinguishers shall be provided at strategic locations with a clear labelling of the extinguisher so the type of the extinguisher is easily identifiable. Automated fire detection system and fire alarms will be provided in the office buildings. Firefighting system shall be tested periodically for proper functioning. Toll plazas will be provided with public announcement (PA) system to notify the general public of any emergency situation such as fire.
- A safe assembly area will be identified near the toll plazas and site offices, and evacuation / emergency response procedures will be practiced regularly through mock drills.
- Safety measures in the form of Do's and Don'ts shall be displayed at strategic locations.
- In material storage areas, hazardous materials shall be stored based on their compatibility characteristics. Chemicals stored, if any, will be accompanied by material safety data sheet (MSDS).

5. PPE Enforcement and Verification:

- Employees shall wear the PPE identified for their job task. Supervisors shall enforce PPE use. If employees are not complying, then enforcement actions (verbal or written) shall be documented and forwarded to the Human Resources Department per local disciplinary agreement.

- No employee or worker shall enter into the construction or operation area without minimum mandatory PPEs such as safety shoes, safety helmet, high visibility vest etc.
- All personnel are responsible to ensure the proper PPE is being used for designated job tasks.
- PPE requirements for particular areas must be communicated with signs placed in such areas or by any feasible means of communication as determined by each site for those tasks that require PPE but are off site and/or temporary (e.g. short-term task.) This must be documented and put up as signage. The lack of signage for any reason must not be construed as an excuse for not wearing appropriate PPE.
- PPE distribution and maintenance register to be maintained.

6. Hot Work

- Prior to hot work activities being conducted by employees, the Person In charge (Contractor/Supervisor) should issue a Permit to Work- Hot Work to the employee who will carry out the hot work.
- The Person In charge shall ensure the requirements are met before beginning a hot work:
    - A Fire Watch must be maintained in: A fire watch will observe conditions in the immediate and adjacent areas to assure that hot work is performed safely.
    - Relocation of all movable combustible fire hazards in the vicinity to a safe location
    - Drains and Vents within 50 feet must be covered with a material suitable for preventing sparks from entering the drain
    - A fire extinguisher in the immediate vicinity.
- Activities requiring a Permit to Work include but not limited to:
    - Work on vessels, including tanks and pipes, that have contained flammable materials or are lined or coated with flammable or combustible materials,
    - Work in areas that contain flammable or combustible materials that cannot be protected by following the Safe Operating Procedure alone,
    - Work in locations that could expose other users of the area to hazards, e.g. work above building entrances or on circulation routes (unless this is a regular activity for which a Standard Operating Procedure is available).
- A work site must be ready for hot work when the requirements have been addressed, all signatures obtained and the Hot Work Permit has been posted on site. Work must be stopped in case of any leakage, spill or accident .The area must be reinspected and confirmed safe before the work may resume. Work also be stopped in case the fire watch leaves the site.
- A fire watch must remain in the area for 30 minutes after hot work has been completed to assure that all metal surfaces are cool and there are no smoldering materials.
- On completion of work, the supervisor in direct control of the employee shall acknowledge in writing that the work has been completed and all the persons employed have left the work area safely.
- The supervisor/contractor shall also conduct a fire check of the work area after the work has been completed to ensure the hot work area is completely safe.
- EHS Manager shall maintain Hot Work Permits in relation to the hot work after the completion of hot work and Training Records.

7. Safety Requirements of Pressure Vessels

- Pressure vessel inspections for licensing purposes are to be inspected by certified professionals. GWRPL to maintain a list of agencies who may be commissioned to perform boiler and pressure vessel inspections and employ individuals who have been certified.
- All pressure vessels shall be inspected for insurance and safety purposes after installation, at prescribed frequencies, and after any welding, alterations, repair or relocation
- The owner of a new or existing pressure vessel is responsible for maintaining the pressure vessel in accordance with the manufacturer's instructions
- Pressure vessels shall be rated to no less than 4 times the maximum allowable working pressure MAWP.
- Pressure sources shall be limited to the MAWP of the lowest rated system component by a regulator and relief device (valve or disk) downstream of the regulator.

- Gauges shall be graduated to the MAWP (but preferable 20% - 30% above MAWP). Materials shall be compatible with the fluid.
- Rupture disks, where used, shall be approved.
- Pressure control or any other switches which control pressure shall not be bypassed.
- Nonflexible metal pipe, tubing, fittings, and valves appropriate for the system fluid and rated at or above the system MAWP shall be used. Special flexible metal hose shall be used where flexing is required.
- Certificates must be turned in for pressure vessels that are no longer operational.

8. Safety Requirements of Boilers

- Proper registration: Contractors and inspectors should be registered with the appropriate regulatory agency (often at the state level) prior to installing or making any repairs or modifications to boilers.
- Review previous inspection reports and documents: GWRPL should make available all previous inspection reports and other documentation to the inspector for review prior to the date of inspection.
- Ensure proper construction and installation: High-pressure boilers should be constructed, stamped, and installed in accordance with the requirements outlined by Inspectorate of Boilers (IoB), GoA.
- Assess safety controls: Boilers installed require appropriate safety controls, safety limit switches, and burners, as well as electrical requirements, based on the applicable national or international standard.
- Assess remote shutdown: High-pressure boilers must have a manually operated remote shutdown switch, marked clearly for easy identification and positioned outside the boiler room door.
- Assess instruments, fittings, and controls: A variety of requirements related to gages, gage glass, operating pressure, shutoff valves, pressure-temperature ratings, water columns, connections, and other controls. Assess the boiler's instruments, fittings, and controls to ensure compliance with IoB.

9. Work at Height

- Person to work at height must be trained;
- Medical testing for people required to work at height should be conducted and the tests should include conditions such as vertigo or illness that may affect the person or the work;
- As much as possible, work from the ground;
- Ensure workers can get safely to and from where they work at height;
- Ensure equipment is suitable, stable and strong enough for the job, maintained and checked regularly;
- Take precautions when working on or near fragile surfaces;
- Provide protection from falling objects; and
- Consider emergency evacuation and rescue procedures.

10. Confined Spaces

- The engineering control commonly used in confined spaces is mechanical ventilation. The Entry Permit system is an example of an administrative control used in confined spaces. Personal protective equipment (respirators, gloves, ear plugs) is commonly used in confined spaces as well.
- The important thing to remember is that each time a worker plans to enter any work space, the worker should determine if that work space is considered a confined space. Be sure the confined space hazard assessment and control program has been followed.
- Before entering any confined space, a trained and experienced person should identify and evaluate all the existing and potential hazards within the confined space. Evaluate activities both inside and outside the confined space.
- Air quality testing: The air within the confined space should be tested from outside of the confined space before entry into the confined space. Care should be taken to ensure that air is tested throughout the confined space - side-to-side and top to bottom. A trained worker using detection equipment which has remote probes and sampling lines should do the air quality testing. Always ensure the testing equipment is properly calibrated and maintained. The sampling should show that:
- The oxygen content is within safe limits - not too little and not too much.
- A hazardous atmosphere (toxic gases, flammable atmosphere) is not present.
- Ventilation equipment is operating properly.
- The results of the tests for these hazards are to be recorded on the Entry Permit along with the equipment or method(s) that were used in performing the tests. Air testing may need to be ongoing depending on the nature of the potential hazards and the nature of the work.

- Implement permit to work system for confined space entry.

11. Noise Management

- All areas within the project premises which have a potential to be affected by noise and vibration shall be identified using and an inventory of such areas shall be maintained.
- Noise emissions shall be regularly monitored and recorded as appropriate
- Where necessary, vibration caused due to any machinery, equipment installed within GWRPL premises shall be monitored to ensure that no damage is being caused to adjacent buildings and services.
- Where any monitoring is being carried out, all records will be retained and reported as appropriate.
- All personnel on site will be made aware of their responsibilities to ensure noise is managed correctly.
- GWRPL shall provide noise control measures such as acoustic hoods, silencers, enclosures etc. on the sources of noise generation.
- Heavy construction activity shall be done during the day time.
- Working hour for worker working in high noise area shall be rotated. Hearing protection such as earplugs/muffs will be provided to those working very close to the noise generating machinery.
- Examples of high noise areas within premises include:
    - Construction sites
    - Maintenance work location
    - Transformer room
    - Boiler Area
    - Loading and unloading areas
- Employees or workers engaged through the contractors shall not be exposed to a noise level greater than 85 dB for duration of more than 8 hours per day without hearing protection. In addition, no unprotected ear should be exposed to a peak sound pressure level (instantaneous) of more than 140 dB.
- The use of hearing protection shall be enforced actively when the equivalent sound level over 8 hours reaches 85 dB, the peak sound levels reach 140 dB, or the average maximum sound level reaches 110dB. Hearing protective devices such as Earplugs/Muffs provided shall be capable of reducing sound levels at the ear to at least 85 dB
- Although hearing protection is preferred for any period of noise exposure in excess of 85 dB, an equivalent level of protection can be obtained, but less easily managed, by limiting the duration of noise exposure. For every 3 dB increase in sound levels, the 'allowed' exposure period or duration should be reduced by 50 percent.
- Prior to the issuance of hearing protective devices as the final control mechanism, use of acoustic insulating materials, isolation of the noise source, and other engineering controls should be investigated and implemented, where feasible.
- Periodic half yearly medical hearing checks i.e. audiometric test shall be conducted by a certified doctor on workers exposed to high noise level.

Incident Reporting

The accident/incident reporting and investigation procedure at the GWRPL (operation and construction phase) will cover, at minimum, the following:

- *Accident*: An unplanned event which results in loss or damage to the person, the property or on or off site environmental harm.
- *Incident*: An unplanned event which results in loss or damage to the property or environment. It includes incidences of fire, natural disasters. Incident is referred as unusual occurrences on the site.
- *Near Miss*: Incidences that cause no actual harm but could cause harm if repeated.
- *Lost Time Injury*: Where injured person is unable to attend work for one or more days because of accident or illness. This does not include absence on the day or shift of the accident.
- *Reportable Lost Time Injury*: Lost time injury which prevent employee from working for a period of 48 hours or more following the day of accident, under Factory Act 1948.
- *Dangerous Occurrences*: Events such as explosions, collapse, fire, bursting out etc.
- *Investigation*: Systematic & scientific evaluation of the event to identify root causes, probable solutions & actions planning to implement the optimum solution to avoid reoccurrence.

Procedure for reporting accidents/incidents

- All accidents/incidents including first aid cases must be reported to ensure prompt medical treatment to injured person, timely investigation with root cause analysis to avoid reoccurrence;
- Project Manager/ Service Engineer/ Project Management representative at site should fill up the appropriate information of accident/ incident report & send it to Project Manager within 24hrs of the accident/ incident;
- Site Safety/EHS Officer should initiate the investigation by involving Project Manager / Service Engineer/ Project Management representative within 24 hours of the accident/incident;
- Investigation should be completed within 7 days of the event, in case of complex situation interim report must be submitted within 7 days;
- Involve affected employees, employee group & subject matter expert during the investigation;
- Select the cause of the accident identify the unsafe practices & unsafe conditions;
- Identify corrective measures to be implemented.

Procedure for Investigation of Accidents/Incidents

- All accidents / incidents must be investigated. The scale of investigation will depend on the actual or potential seriousness of the event;
- Key personnel undertaking the investigation must be adequately trained;
- Involve employees, subject matter experts, Site Safety/EHS Manager during the investigation;
- Carry out EHS risk assessment for the probable solutions before implementation;
- If the root cause elimination is a long term action plan, interim corrective measures should be implemented e.g. use of PPE, additional control, supervision etc.;
- Investigations must focus on identifying systemic root cause rather than targeting affected employee or employee groups.

Reporting guidelines covering:

- Notifications about injury/incident;
- Accident/incident site visit;
- Meeting/ discussion with injured/witness/ who provided assistance;
- Recording the facts;
- Investigation covering the following (though not limited to):
    - Determining the underlying cause/factor that may have caused/ contributed to occurrence of accident/incident;
    - Analyzing the cause to be immediate/ basic /root cause;
    - Identifying need for corrective action;
    - Identifying the opportunities for preventive action;
    - Identifying the opportunities for continual improvement.

Responsibilities

Following people at GWRPL projects will be made responsible for incident investigation and reporting

- ***Project Manager:*** Responsible for resource allocation, ensure compliance and approvals
- ***Site Safety/EHS Officer:*** Responsible for ensuring incident investigation and implementation of corrective actions.
- ***Service Engineer*** would be responsible for investigation related to maintenance activities during operation phase.
- ***Project Management representative*** would be responsible in investigations related to module cleaning activities.

Records

Incident and Accident Reporting Format

Incident/ Accident Report Form	
1.	Site/Plant Name:
2.	Site/Plant Address:

3.	Capacity:
4.	Site Manager/Service Engineer/another reporter:
5.	EPC Contractor/Cleaning Contractor
6.	Date of Incident: Time of Incident:
7.	Specify the Incident: □ Accident (Personnel Injury, property, environmental damage) □ Near miss (No Personnel Injury, property, environmental damage) □ Incident (loss or damage to the property or environment due to fire, natural disaster or any other unusual occurrences on the site)
8.	Location of the Incident:
9.	Who was involved in the incident: □ Employee □ Contractor Worker □Public □ Visitor □ Other
10.	Name of Person(s) involved in an incident:
11.	Name and Contact details of any witness of the incident:
12.	Incident Description including any events leading to or immediately following the incident:
13.	Root cause of the accident/incident:
14.	Attach Photograph of the Incident:
15.	Immediate Corrective Measures:

Signature of Reporter:	Date:
Name of Reporter:	
Signature of Reviewer:	Date:
Name of Reviewer:	

APPENDIX 15: DETAILED AEROMOD RESULTS

Normal Scenario

Worst Case Scenario

PM10

Result summary of 24 hour averaging period at Normal Condition

Results Summary

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PM10 - Concentration - Source Group: ALL

Averaging Period	Rank	Peak	Units	X (m)	Y (m)	ZELEV (m)	ZFLAG (m)	ZHILL (m)	Peak Date, Start Hour
24-HR	1ST	0.89723	ug/m^3	691752.00	2475501.00	167.00	0.00	167.00	01-04-2022, 24
24-HR	2ND	0.78259	ug/m^3	692252.00	2475501.00	167.00	0.00	167.00	03-08-2022, 24
24-HR	3RD	0.73965	ug/m^3	691752.00	2475501.00	167.00	0.00	167.00	13-02-2022, 24
24-HR	4TH	0.70451	ug/m^3	691752.00	2475501.00	167.00	0.00	167.00	02-04-2022, 24
24-HR	5TH	0.69486	ug/m^3	691752.00	2475501.00	167.00	0.00	167.00	06-03-2022, 24
24-HR	6TH	0.67715	ug/m^3	691752.00	2475501.00	167.00	0.00	167.00	02-12-2022, 24
24-HR	7TH	0.67497	ug/m^3	692252.00	2475501.00	167.00	0.00	167.00	16-05-2022, 24
24-HR	8TH	0.67472	ug/m^3	692252.00	2475501.00	167.00	0.00	167.00	13-05-2022, 24
24-HR	9TH	0.66974	ug/m^3	692252.00	2475501.00	167.00	0.00	167.00	13-09-2022, 24
24-HR	10TH	0.66550	ug/m^3	692252.00	2475501.00	167.00	0.00	167.00	16-09-2022, 24
24-HR	11TH	0.64951	ug/m^3	692252.00	2475501.00	167.00	0.00	167.00	20-09-2022, 24
24-HR	12TH	0.64028	ug/m^3	692252.00	2475501.00	167.00	0.00	167.00	24-05-2022, 24
24-HR	13TH	0.63890	ug/m^3	692252.00	2475501.00	167.00	0.00	167.00	21-09-2022, 24
24-HR	14TH	0.62646	ug/m^3	692252.00	2475501.00	167.00	0.00	167.00	15-09-2022, 24
24-HR	15TH	0.62333	ug/m^3	692252.00	2475501.00	167.00	0.00	167.00	15-06-2022, 24
24-HR	16TH	0.62272	ug/m^3	692252.00	2475501.00	167.00	0.00	167.00	03-06-2022, 24
24-HR	17TH	0.61813	ug/m^3	692252.00	2475501.00	167.00	0.00	167.00	19-06-2022, 24
24-HR	18TH	0.61635	ug/m^3	692252.00	2475501.00	167.00	0.00	167.00	22-05-2022, 24
24-HR	19TH	0.61527	ug/m^3	692252.00	2475501.00	167.00	0.00	167.00	27-08-2022, 24
24-HR	20TH	0.61415	ug/m^3	692252.00	2475501.00	167.00	0.00	167.00	30-07-2022, 24
24-HR	21ST	0.61185	ug/m^3	692252.00	2475501.00	167.00	0.00	167.00	22-09-2022, 24
24-HR	22ND	0.61075	ug/m^3	692252.00	2475501.00	167.00	0.00	167.00	17-05-2022, 24
24-HR	23RD	0.61012	ug/m^3	692252.00	2475501.00	167.00	0.00	167.00	20-06-2022, 24
24-HR	24TH	0.60521	ug/m^3	692252.00	2475501.00	167.00	0.00	167.00	13-07-2022, 24
ANNUAL		0.23772	ug/m^3	692252.00	2475501.00	167.00	0.00	167.00	

Result summary of 24 hour averaging period at Worst Condition

Results Summary

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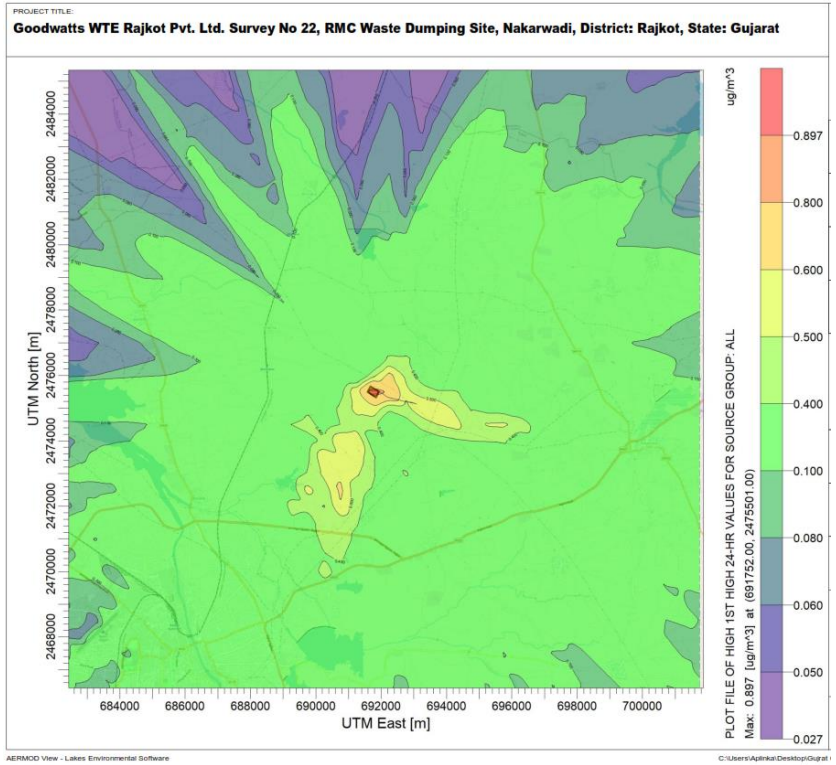
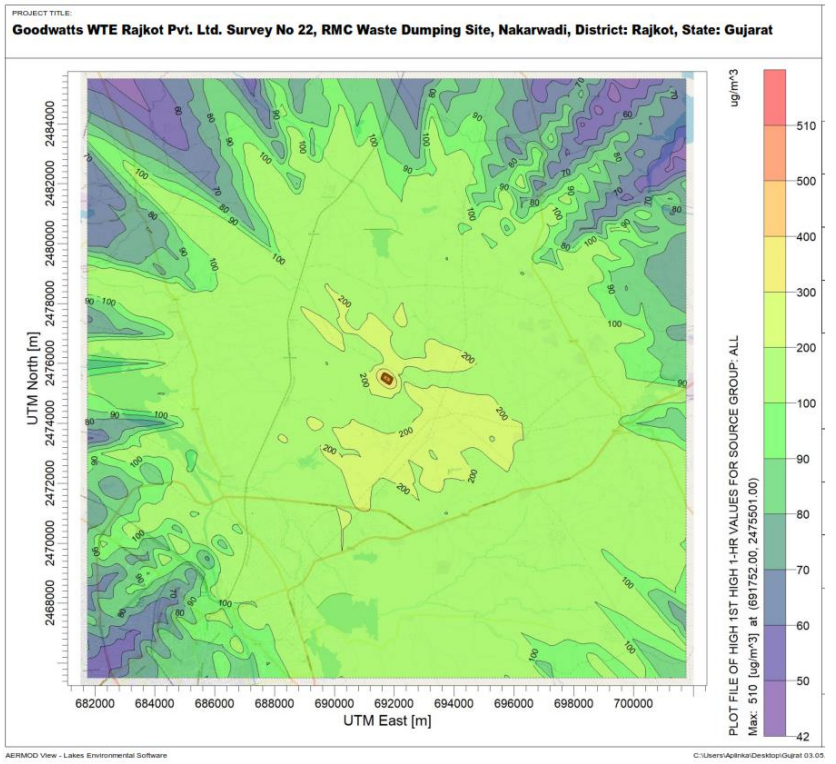
PM10 - Concentration - Source Group: ALL

Averaging Period	Rank	Peak	Units	X (m)	Y (m)	ZELEV (m)	ZFLAG (m)	ZHILL (m)	Peak Date, Start Hour
1-HR	1ST	510.11536	ug/m^3	691752.00	2475501.00	167.00	0.00	167.00	13-02-2022, 13
24-HR	1ST	73.67923	ug/m^3	691752.00	2475501.00	167.00	0.00	167.00	01-04-2022, 24
ANNUAL		15.83206	ug/m^3	692252.00	2475501.00	167.00	0.00	167.00	

Isopleth For Normal Conditions ("First highest") 24 hour concentration (PM_{10})

Isopleth For Worst Conditions ("First highest") 1 hour concentration (PM10)





PM2.5

Result summary of 24 hour averaging period at Normal Condition

Result summary of 24 hour averaging period at Worst Condition

Results Summary

C:\Users\Aplinka\Desktop\2) Abellon Clean Energy Limited\1) RAJKOT\P

PM2.5 - Concentration - Source Group: ALL

Averaging Period	Rank	Peak	Units	X (m)	Y (m)	ZELEV (m)	ZFLAG (m)	ZHILL (m)	Peak Date, Start Hour
1-HR	1ST	510.11536	ug/m^3	691752.00	2475501.00	167.00	0.00	167.00	13-02-2022, 13
24-HR	1ST	73.67923	ug/m^3	691752.00	2475501.00	167.00	0.00	167.00	01-04-2022, 24
ANNUAL		15.83206	ug/m^3	692252.00	2475501.00	167.00	0.00	167.00	

Results Summary

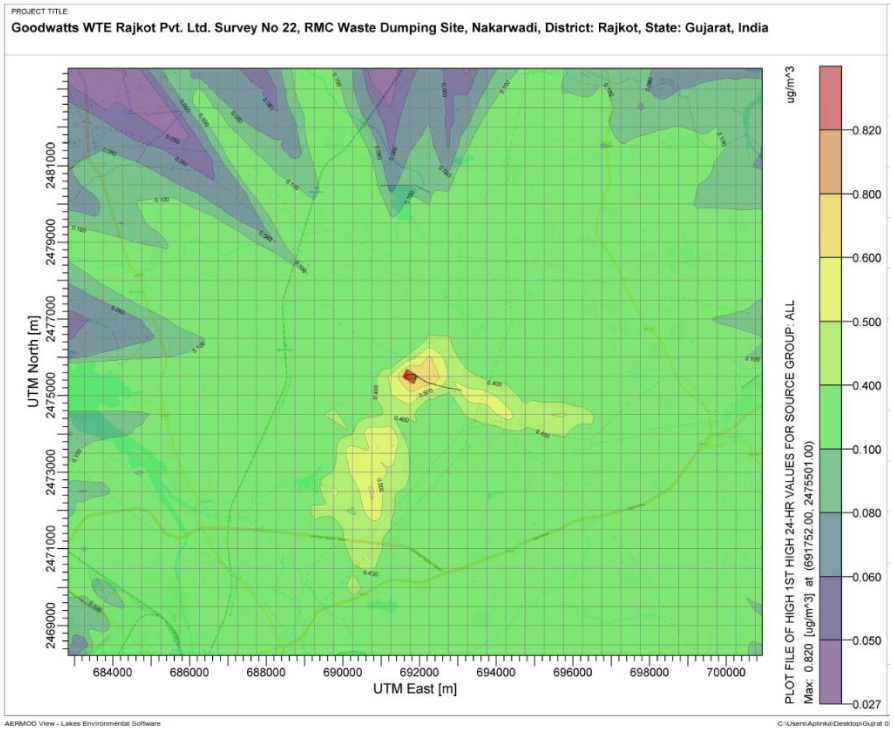
C:\Users\Aplinka\Desktop\2) Abellon Clean Energy Limited\1) RAJKOT\P

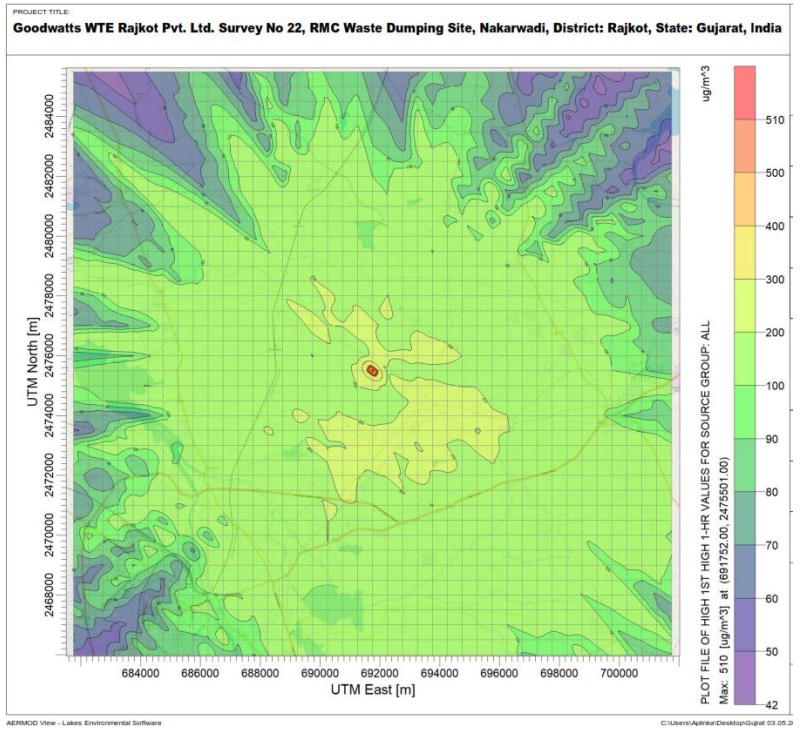
PM2.5 - Concentration - Source Group: ALL

Averaging Period	Rank	Peak	Units	X (m)	Y (m)	ZELEV (m)	ZFLAG (m)	ZHILL (m)	Peak Date, Start Hour
24-HR	1ST	0.81987	ug/m^3	691752.00	2475501.00	167.00	0.00	167.00	01-04-2022, 24
24-HR	2ND	0.68400	ug/m^3	692252.00	2475501.00	167.00	0.00	167.00	03-08-2022, 24
24-HR	3RD	0.63797	ug/m^3	692252.00	2475501.00	167.00	0.00	167.00	02-06-2022, 24
24-HR	4TH	0.63483	ug/m^3	692252.00	2475501.00	167.00	0.00	167.00	11-07-2022, 24
24-HR	5TH	0.62454	ug/m^3	692252.00	2475501.00	167.00	0.00	167.00	16-05-2022, 24
24-HR	6TH	0.62104	ug/m^3	692252.00	2475501.00	167.00	0.00	167.00	13-05-2022, 24
24-HR	7TH	0.60624	ug/m^3	692252.00	2475501.00	167.00	0.00	167.00	24-05-2022, 24
24-HR	8TH	0.59676	ug/m^3	692252.00	2475501.00	167.00	0.00	167.00	16-09-2022, 24
24-HR	9TH	0.58711	ug/m^3	692252.00	2475501.00	167.00	0.00	167.00	22-05-2022, 24
24-HR	10TH	0.58049	ug/m^3	692252.00	2475501.00	167.00	0.00	167.00	28-08-2022, 24
24-HR	11TH	0.57484	ug/m^3	692252.00	2475501.00	167.00	0.00	167.00	19-06-2022, 24
24-HR	12TH	0.57074	ug/m^3	692252.00	2475501.00	167.00	0.00	167.00	20-06-2022, 24
24-HR	13TH	0.56764	ug/m^3	692252.00	2475501.00	167.00	0.00	167.00	15-09-2022, 24
24-HR	14TH	0.56707	ug/m^3	692252.00	2475501.00	167.00	0.00	167.00	03-06-2022, 24
24-HR	15TH	0.56592	ug/m^3	692252.00	2475501.00	167.00	0.00	167.00	15-06-2022, 24
24-HR	16TH	0.55877	ug/m^3	692252.00	2475501.00	167.00	0.00	167.00	17-05-2022, 24
24-HR	17TH	0.55719	ug/m^3	692252.00	2475501.00	167.00	0.00	167.00	21-05-2022, 24
24-HR	18TH	0.55459	ug/m^3	692252.00	2475501.00	167.00	0.00	167.00	13-09-2022, 24
24-HR	19TH	0.55397	ug/m^3	692252.00	2475501.00	167.00	0.00	167.00	13-07-2022, 24
24-HR	20TH	0.55136	ug/m^3	692252.00	2475501.00	167.00	0.00	167.00	20-09-2022, 24
24-HR	21ST	0.54330	ug/m^3	692252.00	2475501.00	167.00	0.00	167.00	21-09-2022, 24
24-HR	22ND	0.54076	ug/m^3	692252.00	2475501.00	167.00	0.00	167.00	30-07-2022, 24
24-HR	23RD	0.53420	ug/m^3	692252.00	2475501.00	167.00	0.00	167.00	16-06-2022, 24
24-HR	24TH	0.53418	ug/m^3	692252.00	2475501.00	167.00	0.00	167.00	22-09-2022, 24
ANNUAL		0.18238	ug/m^3	692252.00	2475501.00	167.00	0.00	167.00	

Isopleth For Normal Conditions (“First highest”) 24 hour concentration

Isopleth For Worst Conditions (“First highest”) 1 hour concentration





SOx

Result summary of 24 hour averaging period at Normal Condition

Result summary of 24 hour averaging period at Worst Condition

Results Summary

C:\Users\Aplinka\Desktop\2) Abellon Clean Energy Limited\1) RAJKOT\N

SO2 - Concentration - Source Group: ALL

Averaging Period	Rank	Peak	Units	X (m)	Y (m)	ZELEV (m)	ZFLAG (m)	ZHILL (m)	Peak Date, Start Hour
1-HR	1ST	50.82731	ug/m^3	691752.00	2475501.00	167.00	0.00	167.00	13-02-2022, 13
24-HR	1ST	7.43262	ug/m^3	691752.00	2475501.00	167.00	0.00	167.00	01-04-2022, 24
ANNUAL		1.58697	ug/m^3	692252.00	2475501.00	167.00	0.00	167.00	

Results Summary

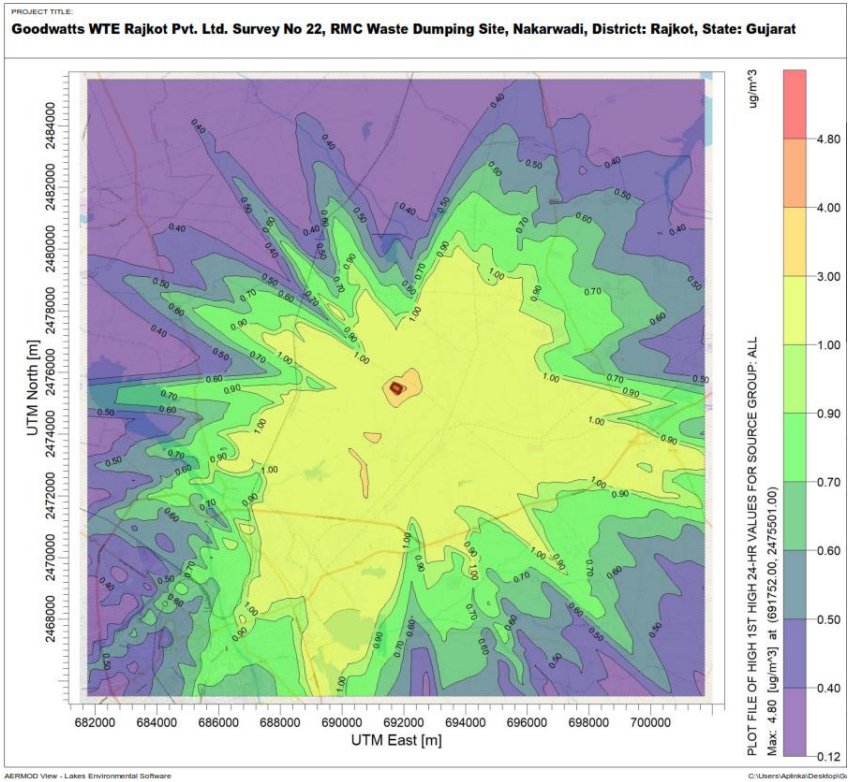
C:\Users\Aplinka\Desktop\2) Abellon Clean Energy Limited\1) RAJKOT\N

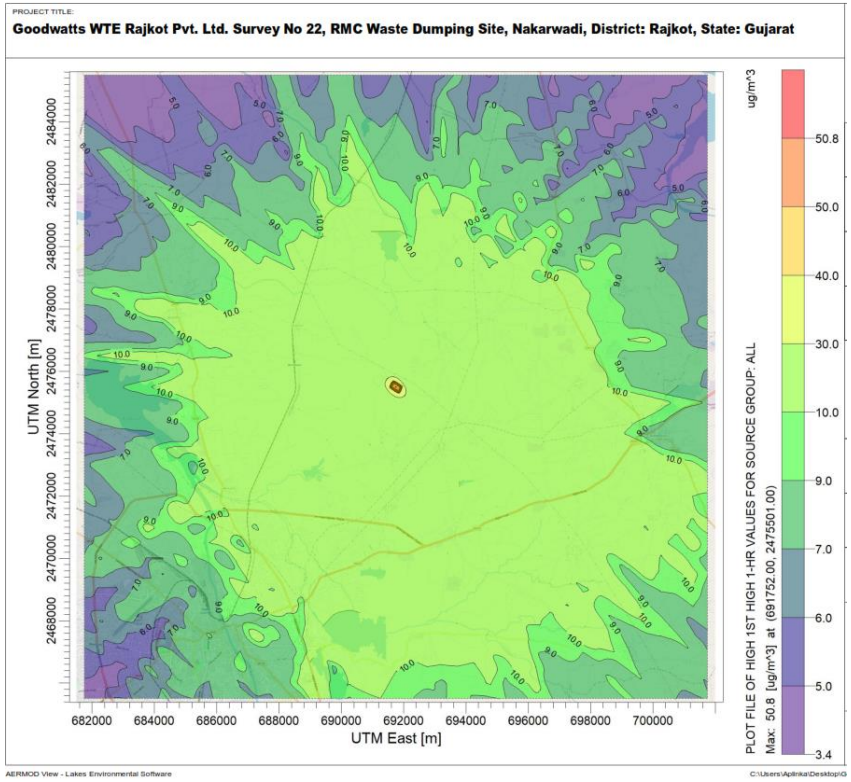
SO2 - Concentration - Source Group: ALL

Averaging Period	Rank	Peak	Units	X (m)	Y (m)	ZELEV (m)	ZFLAG (m)	ZHILL (m)	Peak Date, Start Hour
24-HR	1ST	4.80294	ug/m^3	691752.00	2475501.00	167.00	0.00	167.00	01-04-2022, 24
24-HR	2ND	3.62553	ug/m^3	692252.00	2475501.00	167.00	0.00	167.00	03-08-2022, 24
24-HR	3RD	3.47763	ug/m^3	692252.00	2475501.00	167.00	0.00	167.00	02-06-2022, 24
24-HR	4TH	3.33904	ug/m^3	692252.00	2475501.00	167.00	0.00	167.00	11-07-2022, 24
24-HR	5TH	3.31529	ug/m^3	692252.00	2475501.00	167.00	0.00	167.00	16-05-2022, 24
24-HR	6TH	3.30455	ug/m^3	692252.00	2475501.00	167.00	0.00	167.00	13-05-2022, 24
24-HR	7TH	3.19281	ug/m^3	692252.00	2475501.00	167.00	0.00	167.00	24-05-2022, 24
24-HR	8TH	3.15335	ug/m^3	692252.00	2475501.00	167.00	0.00	167.00	16-09-2022, 24
24-HR	9TH	3.08719	ug/m^3	692252.00	2475501.00	167.00	0.00	167.00	22-05-2022, 24
24-HR	10TH	3.06619	ug/m^3	692252.00	2475501.00	167.00	0.00	167.00	13-09-2022, 24
24-HR	11TH	3.06583	ug/m^3	692252.00	2475501.00	167.00	0.00	167.00	03-06-2022, 24
24-HR	12TH	3.03624	ug/m^3	692252.00	2475501.00	167.00	0.00	167.00	28-08-2022, 24
24-HR	13TH	3.02091	ug/m^3	692252.00	2475501.00	167.00	0.00	167.00	19-06-2022, 24
24-HR	14TH	3.01912	ug/m^3	692252.00	2475501.00	167.00	0.00	167.00	15-09-2022, 24
24-HR	15TH	2.98762	ug/m^3	692252.00	2475501.00	167.00	0.00	167.00	15-06-2022, 24
24-HR	16TH	2.97420	ug/m^3	692252.00	2475501.00	167.00	0.00	167.00	20-06-2022, 24
24-HR	17TH	2.93589	ug/m^3	692252.00	2475501.00	167.00	0.00	167.00	17-05-2022, 24
24-HR	18TH	2.91274	ug/m^3	692252.00	2475501.00	167.00	0.00	167.00	20-09-2022, 24
24-HR	19TH	2.87934	ug/m^3	692252.00	2475501.00	167.00	0.00	167.00	21-05-2022, 24
24-HR	20TH	2.85720	ug/m^3	692252.00	2475501.00	167.00	0.00	167.00	13-07-2022, 24
24-HR	21ST	2.83238	ug/m^3	692252.00	2475501.00	167.00	0.00	167.00	30-07-2022, 24
24-HR	22ND	2.81796	ug/m^3	692252.00	2475501.00	167.00	0.00	167.00	21-09-2022, 24
24-HR	23RD	2.81120	ug/m^3	692252.00	2475501.00	167.00	0.00	167.00	07-06-2022, 24
24-HR	24TH	2.79198	ug/m^3	692252.00	2475501.00	167.00	0.00	167.00	22-09-2022, 24
ANNUAL		0.92105	ug/m^3	692252.00	2475501.00	167.00	0.00	167.00	

Isopleth For Normal Conditions ("First highest") 24 hour concentration

Isopleth For Worst Conditions ("First highest") 1 hour concentration





NOx

Result summary of 24 hour averaging period at Normal Condition

Result summary of 24 hour averaging period at Worst Condition

Results Summary

C:\Users\Aplinka\Desktop\2) Abellon Clean Energy Limited\1) RAJKOT\N

NOX - Concentration - Source Group: ALL

Averaging Period	Rank	Peak	Units	X (m)	Y (m)	ZELEV (m)	ZFLAG (m)	ZHILL (m)	Peak Date, Start Hour
1-HR	1ST	207.71396	ug/m^3	691752.00	2475501.00	167.00	0.00	167.00	13-02-2022, 13
24-HR	1ST	29.99659	ug/m^3	691752.00	2475501.00	167.00	0.00	167.00	01-04-2022, 24
ANNUAL		6.39460	ug/m^3	692252.00	2475501.00	167.00	0.00	167.00	

Results Summary

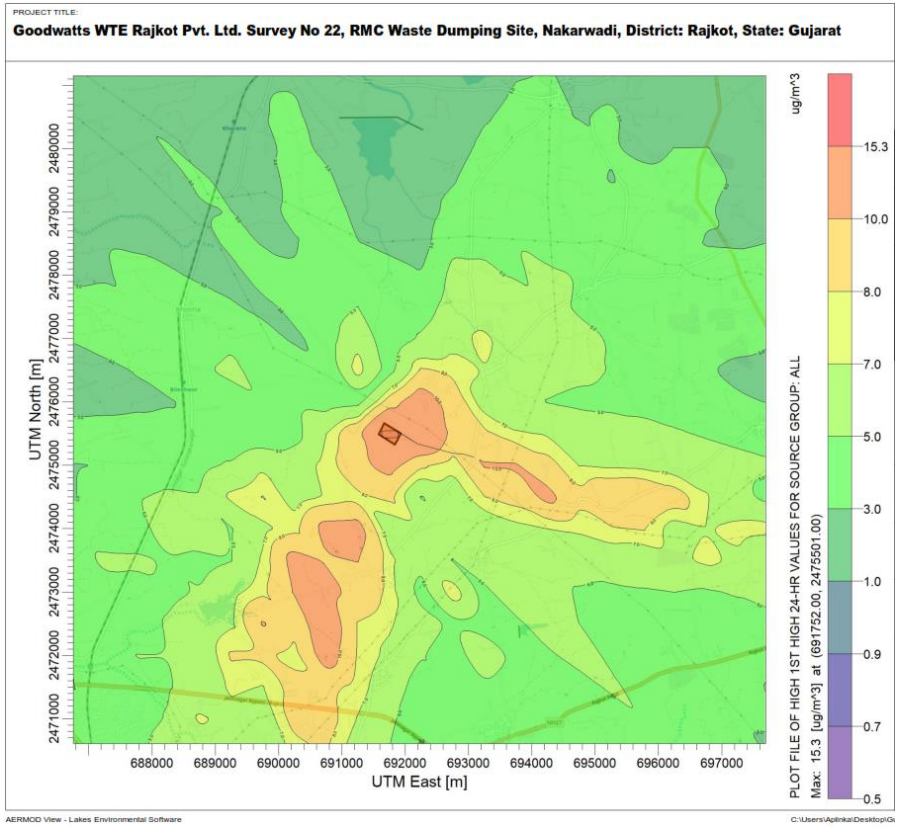
C:\Users\Aplinka\Desktop\2) Abellon Clean Energy Limited\1) RAJKOT\N

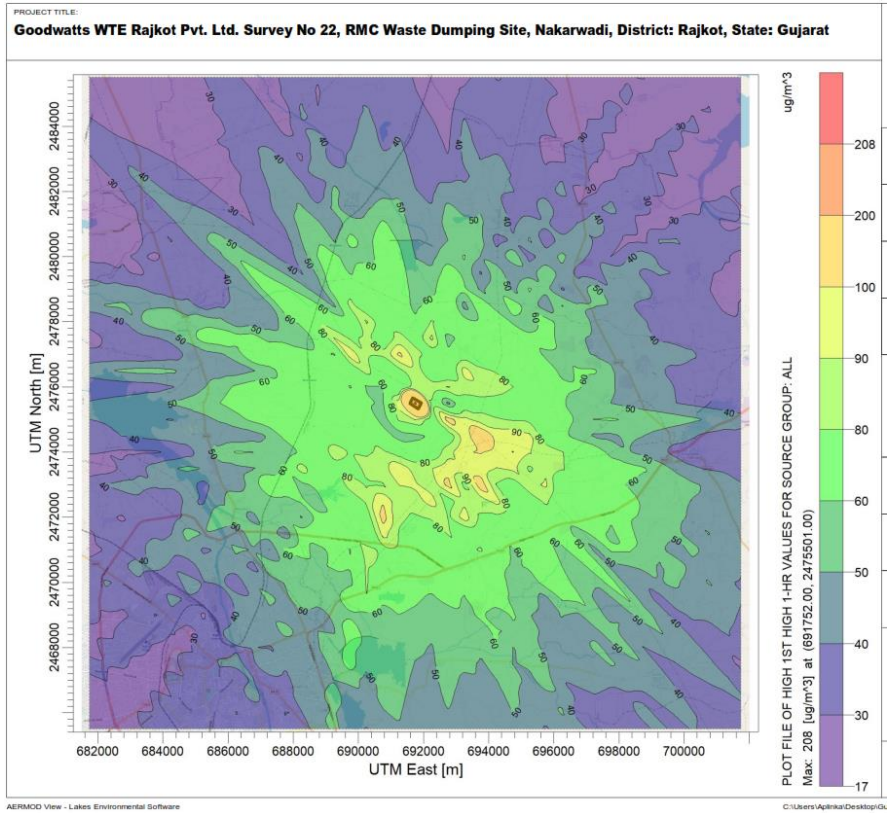
NOX - Concentration - Source Group: ALL

Averaging Period	Rank	Peak	Units	X (m)	Y (m)	ZELEV (m)	ZFLAG (m)	ZHILL (m)	Peak Date, Start Hour
24-HR	1ST	15.27665	ug/m^3	691752.00	2475501.00	167.00	0.00	167.00	01-04-2022, 24
24-HR	2ND	12.68963	ug/m^3	692252.00	2475501.00	167.00	0.00	167.00	03-08-2022, 24
24-HR	3RD	12.05413	ug/m^3	692252.00	2475501.00	167.00	0.00	167.00	11-07-2022, 24
24-HR	4TH	11.99755	ug/m^3	692252.00	2475501.00	167.00	0.00	167.00	02-06-2022, 24
24-HR	5TH	11.83958	ug/m^3	692252.00	2475501.00	167.00	0.00	167.00	16-05-2022, 24
24-HR	6TH	11.76198	ug/m^3	692252.00	2475501.00	167.00	0.00	167.00	13-05-2022, 24
24-HR	7TH	11.62743	ug/m^3	692252.00	2475501.00	167.00	0.00	167.00	24-05-2022, 24
24-HR	8TH	11.30015	ug/m^3	692252.00	2475501.00	167.00	0.00	167.00	22-05-2022, 24
24-HR	9TH	11.20028	ug/m^3	692252.00	2475501.00	167.00	0.00	167.00	16-09-2022, 24
24-HR	10TH	10.93565	ug/m^3	692252.00	2475501.00	167.00	0.00	167.00	19-06-2022, 24
24-HR	11TH	10.92061	ug/m^3	692252.00	2475501.00	167.00	0.00	167.00	20-06-2022, 24
24-HR	12TH	10.71935	ug/m^3	692252.00	2475501.00	167.00	0.00	167.00	28-08-2022, 24
24-HR	13TH	10.71437	ug/m^3	692252.00	2475501.00	167.00	0.00	167.00	21-05-2022, 24
24-HR	14TH	10.66096	ug/m^3	692252.00	2475501.00	167.00	0.00	167.00	15-06-2022, 24
24-HR	15TH	10.65600	ug/m^3	692252.00	2475501.00	167.00	0.00	167.00	15-09-2022, 24
24-HR	16TH	10.65319	ug/m^3	692252.00	2475501.00	167.00	0.00	167.00	03-06-2022, 24
24-HR	17TH	10.56671	ug/m^3	692252.00	2475501.00	167.00	0.00	167.00	17-05-2022, 24
24-HR	18TH	10.52711	ug/m^3	692252.00	2475501.00	167.00	0.00	167.00	13-07-2022, 24
24-HR	19TH	10.11197	ug/m^3	692252.00	2475501.00	167.00	0.00	167.00	20-09-2022, 24
24-HR	20TH	10.06916	ug/m^3	692252.00	2475501.00	167.00	0.00	167.00	30-07-2022, 24
24-HR	21ST	10.01947	ug/m^3	692252.00	2475501.00	167.00	0.00	167.00	21-09-2022, 24
24-HR	22ND	10.01325	ug/m^3	692252.00	2475501.00	167.00	0.00	167.00	16-06-2022, 24
24-HR	23RD	10.01284	ug/m^3	692252.00	2475501.00	167.00	0.00	167.00	07-06-2022, 24
24-HR	24TH	9.91658	ug/m^3	692252.00	2475501.00	167.00	0.00	167.00	22-09-2022, 24
ANNUAL		3.23006	ug/m^3	692252.00	2475501.00	167.00	0.00	167.00	

Isopleth For Normal Conditions (“First highest”) 24 hour concentration

Isopleth For Worst Conditions (“First highest”) 1 hour concentration





CO

Result summary of 8 hour averaging period at Normal Condition

Result summary of 8 hour averaging period at Worst Condition

Results Summary

C:\Users\Aplinka\Desktop\2) Abellon Clean Energy Limited\1) RAJKOT\C

CO - Concentration - Source Group: ALL

Averaging Period	Rank	Peak	Units	X (m)	Y (m)	ZELEV (m)	ZFLAG (m)	ZHILL (m)	Peak Date, Start Hour
1-HR	1ST	40.99562	ug/m^3	691752.00	2475501.00	167.00	0.00	167.00	13-02-2022, 13
8-HR	1ST	15.21428	ug/m^3	691752.00	2475501.00	167.00	0.00	167.00	01-04-2022, 16
ANNUAL		1.23350	ug/m^3	692252.00	2475501.00	167.00	0.00	167.00	

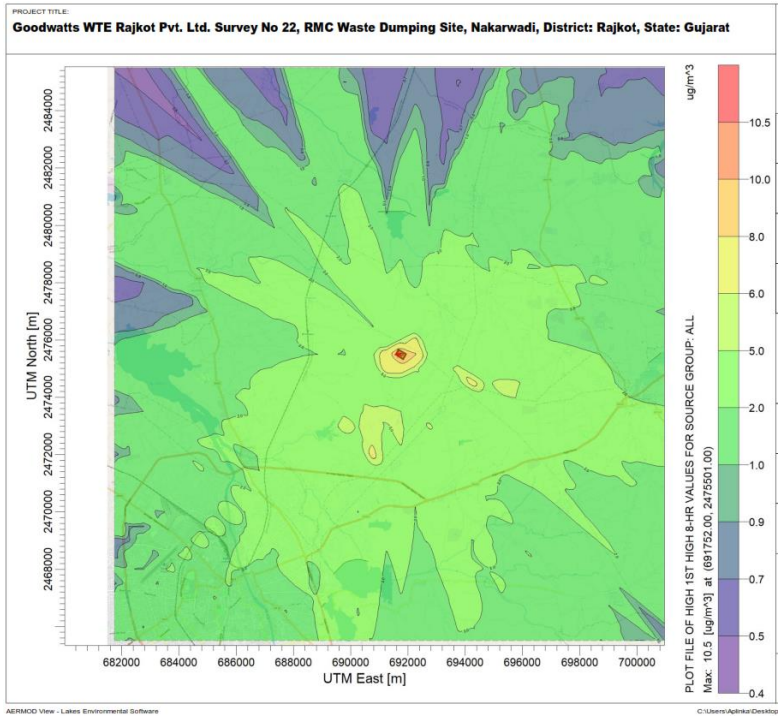
Results Summary

C:\Users\Aplinka\Desktop\2) Abellon Clean Energy Limited\1) RAJKOT\C

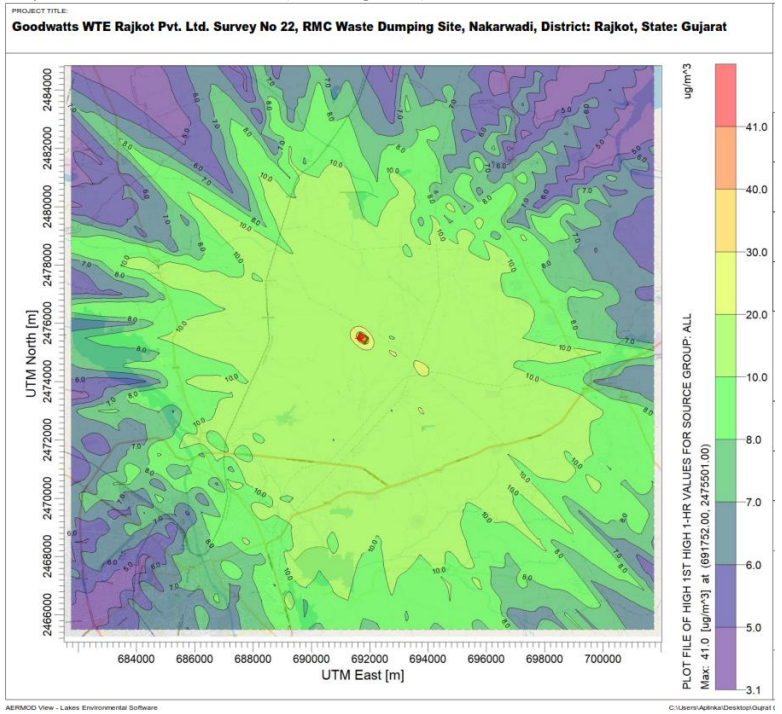
CO - Concentration - Source Group: ALL

Averaging Period	Rank	Peak	Units	X (m)	Y (m)	ZELEV (m)	ZFLAG (m)	ZHILL (m)	Peak Date, Start Hour
8-HR	1ST	10.47790	ug/m^3	691752.00	2475501.00	167.00	0.00	167.00	01-04-2022, 16
8-HR	2ND	9.04606	ug/m^3	691752.00	2475501.00	167.00	0.00	167.00	02-04-2022, 16
8-HR	3RD	8.04457	ug/m^3	691752.00	2475501.00	167.00	0.00	167.00	22-06-2022, 16
8-HR	4TH	7.36486	ug/m^3	692252.00	2475501.00	167.00	0.00	167.00	13-07-2022, 16
8-HR	5TH	7.18758	ug/m^3	692252.00	2475501.00	167.00	0.00	167.00	23-09-2022, 16
8-HR	6TH	6.65933	ug/m^3	692252.00	2475501.00	167.00	0.00	167.00	16-05-2022, 16
8-HR	7TH	6.62279	ug/m^3	692252.00	2475501.00	167.00	0.00	167.00	28-08-2022, 16
8-HR	8TH	6.60801	ug/m^3	692252.00	2475501.00	167.00	0.00	167.00	22-01-2022, 16
ANNUAL		0.83793	ug/m^3	692252.00	2475501.00	167.00	0.00	167.00	

Isopleth For Normal Conditions ("First highest") 8 hour concentration



Isopleth For Worst Conditions ("First highest") 1 hour concentration



APPENDIX 16: COMMUNITY HEALTH & SAFETY

The receptors for impacts on community health and safety will include settlements located in proximity to the project site, access roads, water pipeline and transmission route. The Community Health & Safety plan to be updated by GWRPL basis the hazard analysis or HIRA to be undertaken prior to the construction & operation phase. Threats to community health and safety due to Project activities are as follows:

- Trips and falls;
- Road accidents;
- Electrocution;
- Increased level of noise;
- Soil erosion and impact on ambient air quality;
- Transportation of waste by RMC and the third-party vendor contracted for transportation of legacy waste
- Groundwater pollution due to mismanagement of waste, especially hazardous.

The increased number of vehicles used to deliver materials and supplies for construction and operational phase may result in a higher number of injuries and mortalities from traffic accidents, as well as spills of hazardous materials being transported. During construction, the potential for traffic accidents may be exacerbated by low community awareness and low exposure to increased volumes of traffic in the area. Construction activities will also limit access to natural resources in the Project area, thereby influencing income generating / subsistence opportunities from these livelihoods. Furthermore, influx of migrant workers may cause an increase in vector borne and communicable disease, community conflict over land and resources, etc.

Control Measures to be adopted during construction and operation phase

- Labour management plan (comprising of measures for maintaining relations with labour and community) will be developed and implemented
- As part of the stakeholder engagement, the community will be provided with an understanding of the activities to be undertaken during construction phase and the precautions taken for safety.
- The project will also propagate emergency scenarios and health awareness amongst the community including pregnant women, infants and senior citizens.
- Measures to avoid respiratory and hearing problem among community residing in proximity to the proposed project will be adopted
- Traffic Management: To ensure selection of routes and timings to decrease community threat to accidents and incident. This will be done through a Traffic Management Plan (please refer to the site-specific Traffic Management Plan);
- The traffic movement for the project in the area will be regulated to ensure road and pedestrian (including livestock) safety.
- Waste Management: To ensure management of solid, hazardous and non-hazardous waste disposal in a manner that does not lead to littering and land and groundwater pollution. This will be done through a Waste Management Plan (please refer to the site specific Waste Management Plan);
- Grievance Redressal Mechanism: To ensure all grievances of the community are heard and recorded, and mitigation measures for the same are implemented. This will be done through establishment and implementation of a grievance redressal mechanism (please refer to the site specific Grievance Redressal Mechanism for the Community);
- Community Liaison Officer: A Community Liaison Officer will need to be nominated by project SPV to ensure liasoning with nearby community. The Officer will be s single point of contact for the community;
- Project should conduct hazard analysis to identify areas of influence in case of accident in light of the distance to the nearest community area and action items as per the hazard analysis should be implemented and communicated to the nearby settlements.
- A fire safety plan and an onsite and offsite emergency response plan should be developed and implemented onsite.
- The onsite and offsite emergency response plan should be communicated to the nearby Community and they should be involved in mock drills and other emergency drills.
- Community located within 100 m of the project boundary to be involved in emergency mock drills and communication protocol to be communicated. In case, multiple residences are located within 100 m of the project, fire marshals to be designated and trained from the community
- Dedicated safety sign boards in local language should be provided around the project site and under construction transmission tower location and other associated TL and water pipeline of the WTE plant.
- Vehicles sourcing construction materials, and waste (during operation phase) should be covered to avoid dust emission.

- The consequences of emergency events are likely to extend beyond the project boundary and it can also affect community health and safety due to labour influx. Emergency Response Plan developed for the Project should be communicated to the nearby community.
- Ensure pollution norms compliant vehicles are used for transportation.
- Any road diversions and closures will be informed in advance to the local community. Usage of horns by project vehicles will be restricted near sensitive receptors such as schools, settlements etc.
- Adequate training on traffic and road safety operations will be imparted to the drivers of project vehicles. Road safety awareness programs will be organized in coordination with local authorities to sensitize target groups viz. school children, commuters on traffic safety rules and signage.
- Barricades and Boundary: GWRPL will be required to install barricades and boundaries around all of the construction sites and operational sites, such as the WtE plant and pooling substation, ash silos, to ensure that the community does not enter said sites and increase exposure to associated hazards and risks.
- Warning signs: GWRPL will need to install warning and danger signs at the construction site, areas with risk of electrocution and other relevant areas. Project SPV will also need ensure that signage and boards are provided at the gates and approach roads to the site so that the nearby community and road users are aware of the location of the construction/operational Project site.
- Behavioral training for site security: Behavioral training will be provided to the site security team to ensure that the security team manages any conflicts with the nearby community in a way that it does not affect community health and safety

APPENDIX 17: DETAILED ENVIRONMENTAL MONITORING RESULTS

AMBIENT AIR QUALITY

S.N.	Date of Monitoring	AAQ	PM 10	PM 2.5	SO2	NOx	CO	Cadmium as Cd	Lead (Pb)	Mercury (Hg)	Nickel (as Ni)	Arsenic as As	Hydrogen fluoride (HF)	Hydrochloric Acid (HCl)
1	22.05.2023 to 23.05.2023	AAQ 2	96.6	51.8	<6.0	27.3	0.52	<0.01	<0.01	<0.002	<5.0	<1.0	<0.01	7.48
2	22.05.2023 to 23.05.2023	AAQ 3	154.6	84.7	<6.0	26.7	0.36	<0.01	0.05	<0.002	5.5	<1.0	<0.01	<0.01
3	23.05.2023 to 24.05.2023	AAQ 1	421.6	123.9	12.6	24.2	0.85	<0.01	0.12	<0.002	8.5	<1.0	<0.01	2.23
4	23.05.2023 to 24.05.2023	AAQ 4	68.5	34.6	<6.0	23.6	0.52	<0.01	<0.01	<0.002	<5.0	<1.0	<0.01	<0.01
5	25.05.2023 to 26.05.2023	AAQ 1	335.3	105.1	9.6	32.3	0.65	<0.01	0.08	<0.002	6.9	<1.0	<0.01	2.52
6	25.05.2023 to 26.05.2023	AAQ 4	62.2	30.5	<6.0	19.9	0.48	<0.01	<0.01	<0.002	<5.0	<1.0	<0.01	<0.01
7	26.05.2023 to 27.05.2023	AAQ 2	156.4	92.5	<6.0	23.6	0.64	<0.01	0.04	<0.002	<5.0	<1.0	<0.01	1.76
8	26.05.2023 to 27.05.2023	AAQ 3	92.5	51.3	8.5	23.0	0.45	<0.01	<0.01	<0.002	<5.0	<1.0	<0.01	<0.01
9	29.05.2023 to 30.05.2023	AAQ 2	181.4	97.9	9.7	19.4	0.48	<0.01	0.07	<0.002	6.3	<1.0	<0.01	<0.01
10	29.05.2023 to 30.05.2023	AAQ 3	129.4	57.5	<6.0	19.4	0.58	<0.01	0.04	<0.002	<5.0	<1.0	<0.01	1.97
11	30.05.2023 to 31.05.2023	AAQ 1	410.4	154.2	8.5	24.8	0.81	<0.01	0.1	<0.002	8.2	<1.0	<0.01	7.58

12	30.05.2023 to 31.05.2023	AAQ 4	44.7	16.7	8.5	31.5	0.32	<0.01	<0.01	<0.002	<5.0	<1.0	<0.01	<0.01
13	01.06.2023 to 02.06.2023	AAQ 1	361.8	141.3	11.5	23.6	0.74	<0.01	0.1	<0.002	7.5	<1.0	<0.01	2.03
14	01.06.2023 to 02.06.2023	AAQ 4	83.0	48.4	9.1	22.4	0.56	<0.01	0.1	<0.002	7.9	<1.0	<0.01	<0.01
15	02.06.2023 to 03.06.2023	AAQ 2	233.5	87.9	8.5	32.7	0.59	<0.01	0.08	<0.002	6.8	<1.0	<0.01	<0.01
16	02.06.2023 to 03.06.2023	AAQ 3	69.6	35.4	9.7	26.6	0.47	<0.01	<0.01	<0.002	<5.0	<1.0	<0.01	<0.01
17	05.06.2023 to 06.06.2023	AAQ 2	87.8	49.6	<6.0	29.6	0.67	<0.01	<0.01	<0.002	<5.0	<1.0	<0.01	<0.01
18	05.06.2023 to 06.06.2023	AAQ 3	48.3	24.6	10.3	24.2	0.72	<0.01	<0.01	<0.002	<5.0	<1.0	<0.01	<0.01
19	06.06.2023 to 07.06.2023	AAQ 1	182.0	97.9	<6.0	21.2	0.68	<0.01	0.06	<0.002	5.9	<1.0	<0.01	2.07
20	06.06.2023 to 07.06.2023	AAQ 4	57.8	31.3	<6.0	26.0	0.36	<0.01	<0.01	<0.002	<5.0	<1.0	<0.01	1.87
21	08.06.2023 to 09.06.2023	AAQ 1	174.5	86.7	10.3	19.4	0.75	<0.01	<0.01	<0.002	<5.0	<1.0	<0.01	2.43
22	08.06.2023 to 09.06.2023	AAQ 4	85.5	51.7	<6.0	24.8	0.54	<0.01	<0.01	<0.002	<5.0	<1.0	<0.01	1.98
23	09.06.2023 to 10.06.2023	AAQ 2	96.6	56.7	<6.0	16.3	0.75	<0.01	<0.01	<0.002	<5.0	<1.0	<0.01	2.48
24	09.06.2023 to 10.06.2023	AAQ 3	65.5	33.8	<6.0	19.4	0.68	<0.01	<0.01	<0.002	<5.0	<1.0	<0.01	<0.01
25	12.06.2023 to 13.06.2023	AAQ 2	58.9	30.4	10.3	25.4	0.69	<0.01	<0.01	<0.002	<5.0	<1.0	<0.01	2.27

26	12.06.2023 to 13.06.2023	AAQ 3	59.4	29.6	11.3	20.0	0.55	<0.01	<0.01	<0.002	<5.0	<1.0	<0.01	<0.01
27	13.06.2023 to 14.06.2023	AAQ 1	125.8	78.8	<6.0	26.6	0.67	<0.01	<0.01	<0.002	<5.0	<1.0	<0.01	<0.01
28	13.06.2023 to 14.06.2023	AAQ 4	75.5	38.3	10.3	20.6	0.69	<0.01	<0.01	<0.002	<5.0	<1.0	<0.01	<0.01
29	15.06.2023 to16.06.2023	AAQ 1	110.0	63.8	9.7	31.5	0.63	<0.01	0.05	<0.002	5.8	<1.0	<0.01	<0.01
30	15.06.2023 to16.06.2023	AAQ 4	62.2	30.4	<6.0	19.4	0.51	<0.01	<0.01	<0.002	<5.0	<1.0	<0.01	<0.01
31	16.06.2023 to 17.06.2023	AAQ 2	62.6	29.6	<6.0	19.4	0.45	<0.01	<0.01	<0.002	<5.0	<1.0	<0.01	<0.01
32	16.06.2023 to 17.06.2023	AAQ 3	62.6	34.6	<6.0	21.8	0.49	<0.01	<0.01	<0.002	<5.0	<1.0	<0.01	<0.01
	Min		44.73	16.67	8.46	16.33	0.32	0.00	0.04	0.00	5.50	0.00	0.00	1.76
	Max		421.64	154.20	12.61	32.66	0.85	0.00	0.12	0.00	8.50	0.00	0.00	7.58
	Mean		134.89	61.92	9.88	23.94	0.59	<0.01	0.08	0.00	6.93	0.00	0.00	2.97
	Percentile 98%		414.69	146.20	12.27	32.43	0.83	0.00	0.12	0.00	8.45	0.00	0.00	7.56

TRAFFIC MONITORING

LOCATION : (T-1 RAJKOT SITE) Date of Monitoring : 15.06.2023

SL. NO.	TIME (Hours)	MOTORIZED VEHICLES			NON-MOTORIZED VEHICLES	TOTAL
		Heavy Motor Vehicles	Light Motor Vehicles	Two/Three Wheelers		
		(Truck, Bus, Dumper, Tanker, Trailer)	(Car, Jeep, Van, Metador, Tractor, Tempo, Mini Bus)	(Scooter, Motor Cycle, Auto, Moped)	(Bicycle, Tricycle)	
1	9.00-10.00	31	22	90	22	**165**
2	10.00-11.00	28	29	84	27	**168**
3	11.00-12.00	31	29	62	17	**139**
4	12.00-13.00	27	28	70	22	**147**
5	13.00-14.00	28	32	49	7	**116**
6	14.00-15.00	32	28	39	9	**108**
7	15.00-16.00	23	28	53	12	**116**
8	16.00-17.00	33	28	48	14	**123**
9	17.00-18.00	32	31	59	22	**144**
10	18.00-19.00	42	23	73	25	**163**
11	19.00-20.00	27	28	55	10	**120**
12	20.00-21.00	27	29	61	18	**135**
13	21.00-22.00	28	31	40	4	**103**
14	22.00-23.00	24	27	27	7	**85**
15	23.00-00.00	27	28	28	2	**85**
16	00.00-01.00	16	27	21	3	**67**
17	01.00-02.00	17	23	25	2	**67**
18	02.00-03.00	13	13	27	2	**55**
19	03.00-04.00	14	18	17	0	**49**
20	04.00-05.00	12	17	13	0	**42**
21	05.00-06.00	13	13	14	6	**46**
22	06.00-07.00	12	17	27	12	**68**
23	07.00-08.00	27	27	60	16	**130**
24	08.00-09.00	31	28	86	17	**162**
Total Numbers		**595**	**604**	**1128**	**276**	**2603**

LOCATION : (T-2 RAJKOT SITE) Date of Monitoring : 17.06.2023

SL. NO.	TIME (Hours)	MOTORIZED VEHICLES			NON-MOTORIZED VEHICLES	TOTAL
		Heavy Motor Vehicles (Truck, Bus, Dumper, Tanker, Trailer)	Light Motor Vehicles (Car, Jeep, Van, Metador, Tractor, Tempo, Mini Bus)	Two/Three Wheelers (Scooter, Motor Cycle, Auto, Moped)	(Bicycle, Tricycle)	
1	9.00-10.00	82	92	82	40	**296**
2	10.00-11.00	99	126	69	52	**346**
3	11.00-12.00	102	103	92	62	**359**
4	12.00-13.00	69	118	92	60	**339**
5	13.00-14.00	72	65	79	37	**253**
6	14.00-15.00	64	80	66	33	**243**
7	15.00-16.00	82	92	89	28	**291**
8	16.00-17.00	90	97	57	27	**271**
9	17.00-18.00	77	66	73	32	**248**
10	18.00-19.00	102	86	94	31	**313**
11	19.00-20.00	97	92	108	35	**332**
12	20.00-21.00	82	80	88	23	**273**
13	21.00-22.00	62	69	72	31	**234**
14	22.00-23.00	72	82	66	22	**242**
15	23.00-00.00	86	56	72	16	**230**
16	00.00-01.00	96	67	36	11	**210**
17	01.00-02.00	82	77	60	12	**231**
18	02.00-03.00	72	66	62	8	**208**
19	03.00-04.00	61	58	52	9	**180**
20	04.00-05.00	82	69	49	7	**207**
21	05.00-06.00	92	82	82	17	**273**
22	06.00-07.00	76	76	72	27	**251**
23	07.00-08.00	83	62	92	37	**274**
24	08.00-09.00	72	72	72	43	**259**
Total Numbers		**1954**	**1933**	**1776**	**700**	**6363**

Noise Monitoring

Time	NQ-1		NQ-2		NQ-3		NQ-4	
Date	04.06.2023		05.06.2023		06.06.2023		08.06.2023	
Classification	Abellon Clean Energy Ltd		Pipaliya Primary School Pipaliya (Sukal)		NAGALPAR PRI GOVT SCHOOL		SRCOE College	
Dist of Measurement from Src								
Leq dB (A)-6.00 am	43.5	44.5	50.0	51.7	47.1	48.3	49.0	48.7
Leq dB (A)-7.00 am	49.4	47.2	59.8	61.5	55.4	55.3	51.3	50.9
Leq dB (A)-8.00 am	52.2	54.5	54.4	56.1	59.1	56.6	48.4	50.5
Leq dB (A)-9.00 am	54.5	50.2	51.0	52.7	60.7	55.5	45.1	46.7
Leq dB (A)-10.00 am	67.5	65.7	53.8	55.5	58.9	62.9	45.1	43.5
Leq dB (A)-11.00 am	71.7	71.1	48.8	50.5	58.9	60.6	52.0	47.9
Leq dB (A)-12.00 pm	72.3	73.1	51.2	52.9	63.2	58.6	51.3	45.3
Leq dB (A)-13.00 pm	72.2	73.3	52.7	54.4	66.5	61.7	45.7	39.2
Leq dB (A)-14.00 pm	70.2	72.8	54.1	55.8	63.8	56.1	38.4	51.8
Leq dB (A)-15.00 pm	71.1	72.5	48.2	55.1	67.7	57.6	44.7	46.5
Leq dB (A)-16.00 pm	71.4	72.0	47.0	49.3	62.0	60.1	42.8	44.6
Leq dB (A)-17.00 pm	63.9	66.5	52.8	52.2	56.9	53.3	44.0	48.9
Leq dB (A)-18.00 pm	53.8	55.0	44.7	45.5	55.8	52.5	48.2	47.5
Leq dB (A)-19.00 pm	54.5	55.7	47.8	48.9	59.4	54.5	48.7	46.1
Leq dB (A)-20.00 pm	52.9	54.2	37.6	38.3	56.7	59.9	46.1	44.5
Leq dB (A)-21.00 pm	49.8	51.1	41.6	42.4	47.9	49.8	46.7	47.9
Leq dB (A)-22.00 pm	46.5	47.8	40.8	41.5	56.6	53.4	43.1	45.0
Leq dB (A)-23.00 am	43.7	44.9	35.2	37.4	57.3	52.8	42.9	44.6
Leq dB (A)-24.00 am	45.1	46.2	34.6	36.6	53.8	51.5	43.8	43.6
Leq dB (A)-1.00 am	46.4	47.6	34.3	36.0	42.5	47.5	41.4	43.0
Leq dB (A)-2.00 am	43.4	44.6	34.5	36.2	55.0	48.8	42.1	44.4
Leq dB (A)-3.00 am	44.9	46.4	35.4	37.1	41.6	44.9	43.8	47.0
Leq dB (A)-4.00 am	41.1	42.5	38.4	40.1	40.5	48.9	42.2	44.2
Leq dB (A)-5.00 am	40.2	41.2	40.0	41.7	42.9	54.2	45.4	41.1
Lday	**67.7**	**68.6**	**52.4**	**54.2**	**61.5**	**58.1**	**47.9**	**47.8**

Lnight	44.4	45.6	37.4	38.9	53.1	51.2	43.3	44.4
L MAX	72.3	73.3	59.8	61.5	67.7	62.9	52.0	51.8
LMIN	40.2	41.2	34.3	36.0	40.5	44.9	38.4	39.2

Water Quality Results

Mitra S. K. Private Limited

MSK TESTING • INSPECTION

Scan for Portal

TEST REPORT

Report No. : MSKGL/FD/2023-24/001163
Date : 03/07/2023
Sample No. : MSKGL/FD/2023-24/05/00309
Drawn/Submitted on : 22/05/2023
Customer Ref No & Date Wed, Feb 15, 7:03/PM, Date - 01/05/2023

We hereby certify that the following sample Drawn by us has been analyzed with the following results:

1. Description of sample (As declared by customer)	RAJKOT GW- 01
2. Sample Mark (if any, given by the customer)	MSKGDM/ED/W10
3. Date of sampling	19/05/2023
4. Place of sampling	Abellon CleanEnergy Ltd
5. Environmental conditions during sampling	Ambient Temperature : 31
6. Sampling Plan & Procedures used	IS:10500-2012

Report No. : MSKGL/FD/2023-24/001163 **Sample No. :** MSKGL/FD/2023-24/05/00309

ANALYSIS RESULT (As per DW (IS:10500-2012))

Physical

Sl No.	Test Parameters	Unit	Test Method	Desirable Limit	Permissible Limit	Result
1	Colour	Hazen	3025 (Part 4)-1983; Rffm:2002	5	15	BDL(DL:1.0)
2	Odour	None	3025 (Part 5)-1983; Rffm:2002	Agreeable	Agreeable	AGREEABLE
3	pH	at 25 Deg C	IS 3025 (Part 11)-1984 Rffm: 2012	6.5-8.5	No Relaxation	7.64
4	Taste	None	IS 3025 (Part 8)- 1983 Rffm: 2012	Agreeable	Agreeable	AGREEABLE
5	Turbidity	N.T.U.	3025 (Part 10)-1984; Rffm:2002	1	5	BDL(DL:1.0)
6	Total Dissolved Solids	mg/l	IS 3025 (Part 16) : 1984	500	2000	960.00

Chemical

Sl No.	Test Parameters	Unit	Test Method	Desirable Limit	Permissible Limit	Result
7	Aluminium as Al	mg/l	IS 3025 (Part 2) : 2004	0.03	0.2	BDL(DL:0.01)
8	Ammonia (as total ammonia-N)	mg/l	IS 3025 (Part 34): 1988	0.5	No Relaxation	BDL(DL:0.1)
9	Anionic Detergents (as MBAS)	mg/l	IS 13428 (ANNEX K): 2005	0.2	1.0	BDL(DL:0.05)
10	Barium as Ba	mg/l	IS 3025 (Part 2) : 2004	0.7	No relaxation	BDL(DL:0.1)
11	Boron as B	mg/l	IS 3025 (Part 2) : 2004	0.5	1.0	BDL(DL:0.25)
12	Calcium as Ca	mg/l	IS 3025 (Part 40) : 1991	75	200	31.36
13	Chloramines	mg/l	IS 3025 (Part 26) : 1986	4.0	No Relaxation	BDL(DL:0.1)
14	Chloride as Cl	mg/l	IS 3025 (Part 32) : 1988	250	1000	460.46

* *This results relate only to the item(s) tested.*
* *This Test Report shall not be reproduced except in full, without the permission of Mitra S. K. Private Limited.*

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Page 1 of 3

Mitra S. K. Private Limited

MSK TESTING • INSPECTION

Report No. : MSKGL/FD/2023-24/001163 **Sample No. :** MSKGL/FD/2023-24/05/00309

ANALYSIS RESULT (As per DW (IS:10500-2012))

Chemical						
Sl No.	**Test Parameters**	**Unit**	**Test Method**	**Desirable Limit**	**Permissible Limit**	**Result**
15	Copper as Cu	mg/l	IS 3025 (Part 2) : 2004	0.05	1.5	BDL(DL:0.02)
16	Fluoride as F	mg/l	IS 3025 (Part 60) : 2008	1.0	1.5	0.38
17	Residual Free Chlorine	mg/l	IS 3025 (Part 26) : 1986	0.2	1.0	BDL(DL:0.1)
18	Iron as Fe	mg/l	IS 3025 (Part 53): 2003	0.3	No Relaxation	0.09
19	Magnesium as Mg	mg/l	IS 3025 (Part 46) : 1994	30	100	9.41
20	Manganese as Mn	mg/l	IS 3025 (Part 2) : 2004	0.1	0.3	BDL(DL:0.02)
21	Mineral Oil	mg/l	IS 3025 (Part 39) : 1991	0.5	No Relaxation	BDL(DL:0.5)
22	Nitrate as NO3	mg/l	IS 3025 (Part 34) : 1988	45	No Relaxation	1.12
23	Phenolic Compounds as C6H5OH	mg/l	IS 3025 (Part 43) : 1992	0.001	0.002	BDL(DL:0.001)
24	Selenium as Se	mg/l	IS 3025 (Part 2) : 2004	0.01	No Relaxation	BDL(DL:0.005)
25	Silver as Ag	mg/l	IS 3025 (Part 2) : 2004	0.1	No Relaxation	BDL(DL:0.005)
26	Sulphate as SO4	mg/l	IS 3025 (Part 24) : 1986	200	400	8.90
27	Sulphide as H2S	mg/l	IS 3025 (Part 29) : 1986	0.05	No Relaxation	BDL(DL:0.02)
28	Total Alkalinity as CaCO3	mg/l	IS 3025 (Part 23) : 1986	200	600	81.60
29	Total Hardness as CaCO3	mg/l	IS 3025 (Part 21) : 2009	200	600	117.60
30	Zinc as Zn	mg/l	IS 3025 (Part 2) : 2004	5	15	BDL(DL:0.02)
31	Cadmium as Cd	mg/l	IS 3025 (Part 2) : 2004	0.003	No Relaxation	BDL(DL:0.001)
32	Cyanide as CN	mg/l	IS 3025 (Part 27) : 1986	0.05	No Relaxation	BDL(DL:0.01)
33	Lead as Pb	mg/l	IS 3025 (Part 2) : 2004	0.01	No Relaxation	BDL(DL:0.005)
34	Mercury as Hg	mg/l	IS 3025 (Part 48) : 1994	0.001	No Relaxation	BDL(DL:0.0002)
35	Molybdenum as Mo	mg/l	IS 3025 (Part 2) : 2004	0.07	No Relaxation	BDL(DL:0.05)
36	Nickel (as Ni)	mg/l	IS 3025 (Part 2) : 2004	0.02	No Relaxation	BDL(DL:0.01)
37	Polychlorinated biphenyls (PCB)	mg/l	USEPA 8082: 2007	0.0005	No Relaxation	BDL(DL:0.0005)
38	Polynuclear Aromatic Hydrocarbons (PAH)	mg/l	APHA (23rd Edition) 6440C: 2017	0.0001	No Relaxation	BDL(DL:0.0001)
39	Arsenic as As	mg/l	IS 3025 (Part 2) : 2004	0.01	0.05	BDL(DL:0.005)
40	Total Chromium as Cr	mg/l	IS 3025 (Part 2) : 2004	0.05	No Relaxation	BDL(DL:0.01)
41	Bromoform	mg/l	APHA (23rd Edition) 6232 B: 2017	0.1	No Relaxation	BDL(DL:0.01)
42	Dibromochloromethane	mg/l	APHA (23rd Edition) 6232 B: 2017	0.1	No Relaxation	BDL(DL:0.01)
43	Bromodichloromethane	mg/l	APHA (23rd Edition) 6232 B: 2017	0.06	No Relaxation	BDL(DL:0.01)
44	Chloroform	mg/l	APHA (23rd Edition) 6232 B: 2017	0.2	No Relaxation	BDL(DL:0.01)
45	Alachlor	micro gm/l	USEPA 525.2	Not specified	20	BDL(DL:0.02)
46	Atrazine	micro gm/l	USEPA 8141A: 2007	Not specified	2.0	BDL(DL:0.02)
47	Aldrin	micro gm/l	AOAC (21st edition), 990.06: 2019	Not specified	0.03	BDL(DL:0.01)
48	Dieldrin	micro gm/l	AOAC (21st edition), 990.06: 2019	Not specified	0.03	BDL(DL:0.01)
49	Alpha- HCH	micro gm/l	AOAC (21st edition), 990.06: 2019	Not specified	0.01	BDL(DL:0.01)
50	Beta- HCH	micro gm/l	AOAC (21st edition), 990.06: 2019	Not specified	0.04	BDL(DL:0.01)
51	Butachlor	micro gm/l	USEPA 8141A: 2007	Not specified	125	BDL(DL:0.02)
52	Chlorlopyrfos	micro gm/l	USEPA 8141 A	Not specified	30	BDL(DL:0.02)
53	Delta-HCH	micro gm/l	AOAC (21st edition), 990.06: 2019	Not specified	0.04	BDL(DL:0.01)
54	2,4-Dichlorophenoxyacetic acid	micro gm/l	USEPA 515: 1981	Not specified	30	BDL(DL:0.01)
55	o,p DDT	micro gm/l	AOAC (21st edition), 990.06: 2019	Not specified	1.0	BDL(DL:0.01)

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MSK TESTING • INSPECTION

Report No. : MSKGL/FD/2023-24/001163 **Sample No. :** MSKGL/FD/2023-24/05/00309

ANALYSIS RESULT (As per DW (IS:10500-2012))

Chemical

Sl No.	Test Parameters	Unit	Test Method	Desirable Limit	Permissible Limit	Result
56	p,p DDT	micro gm/l	AOAC (21st edition), 990.06: 2019	Not specified	1.0	BDL(DL:0.01)
57	o,p DDE	micro gm/l	AOAC (21st edition), 990.06: 2019	Not specified	1.0	BDL(DL:0.01)
58	p,p DDE	micro gm/l	AOAC (21st edition), 990.06: 2019	Not specified	1.0	BDL(DL:0.01)
59	o,p DDD	micro gm/l	AOAC (21st edition), 990.06: 2019	Not specified	1.0	BDL(DL:0.01)
60	p,p DDD	micro gm/l	AOAC (21st edition), 990.06: 2019	Not specified	1.0	BDL(DL:0.01)
61	Alpha-Endosulfan	micro gm/l	AOAC (21st edition), 990.06: 2019	Not specified	0.4	BDL(DL:0.01)
62	Beta-Endosulfan	micro gm/l	AOAC (21st edition), 990.06: 2019	Not specified	0.4	BDL(DL:0.01)
63	Endosulfan Sulphate	micro gm/l	AOAC (21st edition), 990.06: 2019	Not specified	0.4	BDL(DL:0.01)
64	Ethion	micro gm/l	US EPA 8141A: 2007	Not specified	3.0	BDL(DL:0.02)
65	Gama-HCH (Lindane)	micro gm/l	AOAC (21st edition), 990.06: 2019	Not specified	2.0	BDL(DL:0.01)
66	Isoproturon	micro gm/l	USEPA 532: 2000	Not specified	9	BDL(DL:0.02)
67	Malathion	micro gm/l	USEPA 8141A: 2007	Not specified	190	BDL(DL:0.02)
68	Methyl Parathion	micro gm/l	USEPA 8141A: 2007	Not specified	0.3	BDL(DL:0.02)
69	Monocrotophos	micro gm/l	USEPA 8141A: 2007	Not specified	1.0	BDL(DL:0.02)
70	Phorate	micro gm/l	USEPA 8141A: 2007	Not specified	2.0	BDL(DL:0.02)

Micro Biology

Sl No.	Test Parameters	Unit	Test Method	Desirable Limit	Permissible Limit	Result
71	E. coli	/100ml	IS 15185:2016	NA	Not Detectable	Not Detected
72	Total coliform	/100ml	IS 15185:2016	NA	Not Detectable	Not Detected

DL : Detection Limit BDL : Below Detection Limit

Opinion :

----------END OF REPORT----------

Report Verified By

For Mitra S. K. Private Limited

Authorised Signatory

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MSK TESTING • INSPECTION

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TEST REPORT

Report No. : MSKGL/FD/2023-24/001162
Date : 03/07/2023
Sample No. : MSKGL/FD/2023-24/05/00310
Drawn/Submitted on : 22/05/2023
Customer Ref No & Date Wed, Feb 15, 7:03/PM, Date - 01/05/2023

We hereby certify that the following sample Drawn by us has been analyzed with the following results:

1. Description of sample (As declared by customer)	RAJKOT GW- 02
2. Sample Mark (if any, given by the customer)	MSKGDM/ED/W11
3. Date of sampling	19/05/2023
4. Place of sampling	NEAR, Ranuja Mandir
5. Environmental conditions during sampling	Ambient Temperature : 31
6. Sampling Plan & Procedures used	IS:10500-2012

Report No. : MSKGL/FD/2023-24/001162 **Sample No. :** MSKGL/FD/2023-24/05/00310

ANALYSIS RESULT (As per DW (IS:10500-2012))

Physical

Sl No.	Test Parameters	Unit	Test Method	Desirable Limit	Permissible Limit	Result
1	Colour	Hazen	3025 (Part 4)-1983; Rffm:2002	5	15	BDL(DL:1.0)
2	Odour	None	3025 (Part 5)-1983; Rffm:2002	Agreeable	Agreeable	BDL(DL:1.0)
3	pH	at 25 Deg C	IS 3025 (Part 11)-1984 Rffm: 2012	6.5-8.5	No Relaxation	7.37
4	Taste	None	IS 3025 (Part 8)- 1983 Rffm: 2012	Agreeable	Agreeable	AGREEABLE
5	Turbidity	N.T.U.	3025 (Part 10)-1984; Rffm:2002	1	5	1.4
6	Total Dissolved Solids	mg/l	IS 3025 (Part 16) : 1984	500	2000	975.00

Chemical

Sl No.	Test Parameters	Unit	Test Method	Desirable Limit	Permissible Limit	Result
7	Aluminium as Al	mg/l	IS 3025 (Part 2) : 2004	0.03	0.2	BDL(DL:0.01)
8	Ammonia (as total ammonia-N)	mg/l	IS 3025 (Part 34): 1988	0.5	No Relaxation	BDL(DL:0.1)
9	Anionic Detergents (as MBAS)	mg/l	IS 13428 (ANNEX K): 2005	0.2	1.0	BDLDL:0.05)
10	Barium as Ba	mg/l	IS 3025 (Part 2) : 2004	0.7	No relaxation	BDL(DL:0.1)
11	Boron as B	mg/l	IS 3025 (Part 2) : 2004	0.5	1.0	BDL(DL:0.25)
12	Calcium as Ca	mg/l	IS 3025 (Part 40) : 1991	75	200	31.36
13	Chloramines	mg/l	IS 3025 (Part 26) : 1986	4.0	No Relaxation	BDL(DL:0.1)
14	Chloride as Cl	mg/l	IS 3025 (Part 32) : 1988	250	1000	480.05

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Report No. : MSKGL/FD/2023-24/001162 **Sample No. :** MSKGL/FD/2023-24/05/00310

ANALYSIS RESULT (As per DW (IS:10500-2012))

Chemical						
Sl No.	**Test Parameters**	**Unit**	**Test Method**	**Desirable Limit**	**Permissible Limit**	**Result**
15	Copper as Cu	mg/l	IS 3025 (Part 2) : 2004	0.05	1.5	BDL(DL:0.02)
16	Fluoride as F	mg/l	IS 3025 (Part 60) : 2008	1.0	1.5	0.40
17	Residual Free Chlorine	mg/l	IS 3025 (Part 26) : 1986	0.2	1.0	BDL(DL:0.1)
18	Iron as Fe	mg/l	IS 3025 (Part 53): 2003	0.3	No Relaxation	0.07
19	Magnesium as Mg	mg/l	IS 3025 (Part 46) : 1994	30	100	14.11
20	Manganese as Mn	mg/l	IS 3025 (Part 2) : 2004	0.1	0.3	BDL(DL:0.02)
21	Mineral Oil	mg/l	IS 3025 (Part 39) : 1991	0.5	No Relaxation	BDL(DL:0.5)
22	Nitrate as NO3	mg/l	IS 3025 (Part 34) : 1988	45	No Relaxation	1.09
23	Phenolic Compounds as C6H5OH	mg/l	IS 3025 (Part 43) : 1992	0.001	0.002	BDL(DL:0.001)
24	Selenium as Se	mg/l	IS 3025 (Part 2) : 2004	0.01	No Relaxation	BDL(DL:0.005)
25	Silver as Ag	mg/l	IS 3025 (Part 2) : 2004	0.1	No Relaxation	BDL(DL:0.005)
26	Sulphate as SO4	mg/l	IS 3025 (Part 24) : 1986	200	400	8.74
27	Sulphide as H2S	mg/l	IS 3025 (Part 29) : 1986	0.05	No Relaxation	BDL(DL:0.02)
28	Total Alkalinity as CaCO3	mg/l	IS 3025 (Part 23) : 1986	200	600	81.60
29	Total Hardness as CaCO3	mg/l	IS 3025 (Part 21) : 2009	200	600	137.20
30	Zinc as Zn	mg/l	IS 3025 (Part 2) : 2004	5	15	BDL(DL:0.02)
31	Cadmium as Cd	mg/l	IS 3025 (Part 2) : 2004	0.003	No Relaxation	BDL(DL:0.001)
32	Cyanide as CN	mg/l	IS 3025 (Part 27) : 1986	0.05	No Relaxation	BDL(DL:0.01)
33	Lead as Pb	mg/l	IS 3025 (Part 2) : 2004	0.01	No Relaxation	BDL(DL:0.005)
34	Mercury as Hg	mg/l	IS 3025 (Part 48) : 1994	0.001	No Relaxation	BDL(DL:0.0002)
35	Molybdenum as Mo	mg/l	IS 3025 (Part 2) : 2004	0.07	No Relaxation	BDL(DL:0.05)
36	Nickel (as Ni)	mg/l	IS 3025 (Part 2) : 2004	0.02	No Relaxation	BDL(DL:0.01)
37	Polychlorinated biphenyls (PCB)	mg/l	USEPA 8082: 2007	0.0005	No Relaxation	BDL(DL:0.0005)
38	Polynuclear Aromatic Hydrocarbons (PAH)	mg/l	APHA (23rd Edition) 6440C: 2017	0.0001	No Relaxation	BDL(DL:0.0001)
39	Arsenic as As	mg/l	IS 3025 (Part 2) : 2004	0.01	0.05	BDL(DL:0.005)
40	Total Chromium as Cr	mg/l	IS 3025 (Part 2) : 2004	0.05	No Relaxation	BDL(DL:0.01)
41	Bromoform	mg/l	APHA (23rd Edition) 6232 B: 2017	0.1	No Relaxation	BDL(DL:0.01)
42	Dibromochloromethane	mg/l	APHA (23rd Edition) 6232 B: 2017	0.1	No Relaxation	BDL(DL:0.01)
43	Bromodichloromethane	mg/l	APHA (23rd Edition) 6232 B: 2017	0.06	No Relaxation	BDL(DL:0.01)
44	Chloroform	mg/l	APHA (23rd Edition) 6232 B: 2017	0.2	No Relaxation	BDL(DL:0.01)
45	Alachlor	micro gm/l	USEPA 525.2	Not specified	20	BDL(DL:0.02)
46	Atrazine	micro gm/l	USEPA 8141A: 2007	Not specified	2.0	BDL(DL:0.02)
47	Aldrin	micro gm/l	AOAC (21st edition), 990.06: 2019	Not specified	0.03	BDL(DL:0.01)
48	Dieldrin	micro gm/l	AOAC (21st edition), 990.06: 2019	Not specified	0.03	BDL(DL:0.01)
49	Alpha- HCH	micro gm/l	AOAC (21st edition), 990.06: 2019	Not specified	0.01	BDL(DL:0.01)
50	Beta- HCH	micro gm/l	AOAC (21st edition), 990.06: 2019	Not specified	0.04	BDL(DL:0.01)
51	Butachlor	micro gm/l	USEPA 8141A: 2007	Not specified	125	BDL(DL:0.02)
52	Chlorlopyrfos	micro gm/l	USEPA 8141 A	Not specified	30	BDL(DL:0.02)
53	Delta-HCH	micro gm/l	AOAC (21st edition), 990.06: 2019	Not specified	0.04	BDL(DL:0.01)
54	2,4-Dichlorophenoxyacetic acid	micro gm/l	USEPA 515: 1981	Not specified	30	BDL(DL:0.01)
55	o,p DDT	micro gm/l	AOAC (21st edition), 990.06: 2019	Not specified	1.0	BDL(DL:0.01)

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MSK TESTING • INSPECTION

Report No. : MSKGL/FD/2023-24/001162 **Sample No. :** MSKGL/FD/2023-24/05/00310

ANALYSIS RESULT (As per DW (IS:10500-2012))

Chemical

Sl No.	Test Parameters	Unit	Test Method	Desirable Limit	Permissible Limit	Result
56	p,p DDT	micro gm/l	AOAC (21st edition), 990.06: 2019	Not specified	1.0	BDL(DL:0.01)
57	o,p DDE	micro gm/l	AOAC (21st edition), 990.06: 2019	Not specified	1.0	BDL(DL:0.01)
58	p,p DDE	micro gm/l	AOAC (21st edition), 990.06: 2019	Not specified	1.0	BDL(DL:0.01)
59	o,p DDD	micro gm/l	AOAC (21st edition), 990.06: 2019	Not specified	1.0	BDL(DL:0.01)
60	p,p DDD	micro gm/l	AOAC (21st edition), 990.06: 2019	Not specified	1.0	BDL(DL:0.01)
61	Alpha-Endosulfan	micro gm/l	AOAC (21st edition), 990.06: 2019	Not specified	0.4	BDL(DL:0.01)
62	Beta-Endosulfan	micro gm/l	AOAC (21st edition), 990.06: 2019	Not specified	0.4	BDL(DL:0.01)
63	Endosulfan Sulphate	micro gm/l	AOAC (21st edition), 990.06: 2019	Not specified	0.4	BDL(DL:0.01)
64	Ethion	micro gm/l	US EPA 8141A: 2007	Not specified	3.0	BDL(DL:0.02)
65	Gama-HCH (Lindane)	micro gm/l	AOAC (21st edition), 990.06: 2019	Not specified	2.0	BDL(DL:0.01)
66	Isoproturon	micro gm/l	USEPA 532: 2000	Not specified	9	BDL(DL:0.02)
67	Malathion	micro gm/l	USEPA 8141A: 2007	Not specified	190	BDL(DL:0.02)
68	Methyl Parathion	micro gm/l	USEPA 8141A: 2007	Not specified	0.3	BDL(DL:0.02)
69	Monocrotophos	micro gm/l	USEPA 8141A: 2007	Not specified	1.0	BDL(DL:0.02)
70	Phorate	micro gm/l	USEPA 8141A: 2007	Not specified	2.0	BDL(DL:0.02)

Micro Biology

Sl No.	Test Parameters	Unit	Test Method	Desirable Limit	Permissible Limit	Result
71	E. coli	/100ml	IS 15185:2016	NA	Not Detectable	Not Detected
72	Total coliform	/100ml	IS 15185:2016	NA	Not Detectable	Not Detected

DL : Detection Limit BDL : Below Detection Limit

Opinion :

----------END OF REPORT----------

Report Verified By

For Mitra S. K. Private Limited

Authorised Signatory

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MSK TESTING • INSPECTION

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TEST REPORT

Report No. : MSKGL/FD/2023-24/001164
Date : 03/07/2023
Sample No. : MSKGL/FD/2023-24/05/00311
Drawn/Submitted on : 22/05/2023
Customer Ref No & Date Wed, Feb 15, 7:03/PM, Date - 01/05/2023

We hereby certify that the following sample Drawn by us has been analyzed with the following results:

1. Description of sample (As declared by customer)	RAJKOT GW-03
2. Sample Mark (if any, given by the customer)	MSKGDM/ED/W12
3. Date of sampling	19/05/2023
4. Place of sampling	SRCOE College
5. Environmental conditions during sampling	Ambient Temperature : 31
6. Sampling Plan & Procedures used	IS:10500-2012

Report No. : MSKGL/FD/2023-24/001164 **Sample No. :** MSKGL/FD/2023-24/05/00311

ANALYSIS RESULT (As per DW (IS:10500-2012))

Physical

Sl No.	Test Parameters	Unit	Test Method	Desirable Limit	Permissible Limit	Result
1	Colour	Hazen	3025 (Part 4)-1983; Rffm:2002	5	15	BDL(DL:1.0)
2	Odour	None	3025 (Part 5)-1983; Rffm:2002	Agreeable	Agreeable	AGREEABLE
3	pH	at 25 Deg C	IS 3025 (Part 11)-1984 Rffm: 2012	6.5-8.5	No Relaxation	8.02
4	Taste	None	IS 3025 (Part 8)- 1983 Rffm: 2012	Agreeable	Agreeable	AGREEABLE
5	Turbidity	N.T.U.	3025 (Part 10)-1984; Rffm:2002	1	5	9.6
6	Total Dissolved Solids	mg/l	IS 3025 (Part 16) : 1984	500	2000	258

Chemical

Sl No.	Test Parameters	Unit	Test Method	Desirable Limit	Permissible Limit	Result
7	Aluminium as Al	mg/l	IS 3025 (Part 2) : 2004	0.03	0.2	BDL(DL:0.01)
8	Ammonia (as total ammonia-N)	mg/l	IS 3025 (Part 34): 1988	0.5	No Relaxation	BDL(DL:0.1)
9	Anionic Detergents (as MBAS)	mg/l	IS 13428 (ANNEX K): 2005	0.2	1.0	BDL(DL:0.05)
10	Barium as Ba	mg/l	IS 3025 (Part 2) : 2004	0.7	No relaxation	BDL(DL:0.1)
11	Boron as B	mg/l	IS 3025 (Part 2) : 2004	0.5	1.0	BDL(DL:0.25)
12	Calcium as Ca	mg/l	IS 3025 (Part 40) : 1991	75	200	15.68
13	Chloramines	mg/l	IS 3025 (Part 26) : 1986	4.0	No Relaxation	BDL(DL:0.1)
14	Chloride as Cl	mg/l	IS 3025 (Part 32) : 1988	250	1000	97.97

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MSK TESTING • INSPECTION

Report No. : MSKGL/FD/2023-24/001164 **Sample No. :** MSKGL/FD/2023-24/05/00311

ANALYSIS RESULT (As per DW (IS:10500-2012))

Chemical						
Sl No.	**Test Parameters**	**Unit**	**Test Method**	**Desirable Limit**	**Permissible Limit**	**Result**
15	Copper as Cu	mg/l	IS 3025 (Part 2) : 2004	0.05	1.5	BDL(DL:0.02)
16	Fluoride as F	mg/l	IS 3025 (Part 60) : 2008	1.0	1.5	0.26
17	Residual Free Chlorine	mg/l	IS 3025 (Part 26) : 1986	0.2	1.0	BDL(DL:0.1)
18	Iron as Fe	mg/l	IS 3025 (Part 53): 2003	0.3	No Relaxation	0.21
19	Magnesium as Mg	mg/l	IS 3025 (Part 46) : 1994	30	100	9.41
20	Manganese as Mn	mg/l	IS 3025 (Part 2) : 2004	0.1	0.3	BDL(DL:0.02)
21	Mineral Oil	mg/l	IS 3025 (Part 39) : 1991	0.5	No Relaxation	BDL(DL:0.5)
22	Nitrate as NO3	mg/l	IS 3025 (Part 34) : 1988	45	No Relaxation	0.89
23	Phenolic Compounds as C6H5OH	mg/l	IS 3025 (Part 43) : 1992	0.001	0.002	BDL(DL:0.001)
24	Selenium as Se	mg/l	IS 3025 (Part 2) : 2004	0.01	No Relaxation	BDL(DL:0.005)
25	Silver as Ag	mg/l	IS 3025 (Part 2) : 2004	0.1	No Relaxation	BDL(DL:0.005)
26	Sulphate as SO4	mg/l	IS 3025 (Part 24) : 1986	200	400	3.56
27	Sulphide as H2S	mg/l	IS 3025 (Part 29) : 1986	0.05	No Relaxation	BDL(DL:0.02)
28	Total Alkalinity as CaCO3	mg/l	IS 3025 (Part 23) : 1986	200	600	61.2
29	Total Hardness as CaCO3	mg/l	IS 3025 (Part 21) : 2009	200	600	78.40
30	Zinc as Zn	mg/l	IS 3025 (Part 2) : 2004	5	15	BDL(DL:0.02)
31	Cadmium as Cd	mg/l	IS 3025 (Part 2) : 2004	0.003	No Relaxation	BDL(DL:0.001)
32	Cyanide as CN	mg/l	IS 3025 (Part 27) : 1986	0.05	No Relaxation	BDL(DL:0.01)
33	Lead as Pb	mg/l	IS 3025 (Part 2) : 2004	0.01	No Relaxation	BDL(DL:0.005)
34	Mercury as Hg	mg/l	IS 3025 (Part 48) : 1994	0.001	No Relaxation	BDL(DL:0.0002)
35	Molybdenum as Mo	mg/l	IS 3025 (Part 2) : 2004	0.07	No Relaxation	BDL(DL:0.05)
36	Nickel (as Ni)	mg/l	IS 3025 (Part 2) : 2004	0.02	No Relaxation	BDL(DL:0.01)
37	Polychlorinated biphenyls (PCB)	mg/l	USEPA 8082: 2007	0.0005	No Relaxation	BDL(DL:0.0005)
38	Polynuclear Aromatic Hydrocarbons (PAH)	mg/l	APHA (23rd Edition) 6440C: 2017	0.0001	No Relaxation	BDL(DL:0.0001)
39	Arsenic as As	mg/l	IS 3025 (Part 2) : 2004	0.01	0.05	BDL(DL:0.005)
40	Total Chromium as Cr	mg/l	IS 3025 (Part 2) : 2004	0.05	No Relaxation	BDL(DL:0.01)
41	Bromoform	mg/l	APHA (23rd Edition) 6232 B: 2017	0.1	No Relaxation	BDL(DL:0.01)
42	Dibromochloromethane	mg/l	APHA (23rd Edition) 6232 B: 2017	0.1	No Relaxation	BDL(DL:0.01)
43	Bromodichloromethane	mg/l	APHA (23rd Edition) 6232 B: 2017	0.06	No Relaxation	BDL(DL:0.01)
44	Chloroform	mg/l	APHA (23rd Edition) 6232 B: 2017	0.2	No Relaxation	BDL(DL:0.01)
45	Alachlor	micro gm/l	USEPA 525.2	Not specified	20	BDL(DL:0.02)
46	Atrazine	micro gm/l	USEPA 8141A: 2007	Not specified	2.0	BDL(DL:0.02)
47	Aldrin	micro gm/l	AOAC (21st edition), 990.06: 2019	Not specified	0.03	BDL(DL:0.01)
48	Dieldrin	micro gm/l	AOAC (21st edition), 990.06: 2019	Not specified	0.03	BDL(DL:0.01)
49	Alpha- HCH	micro gm/l	AOAC (21st edition), 990.06: 2019	Not specified	0.01	BDL(DL:0.01)
50	Beta- HCH	micro gm/l	AOAC (21st edition), 990.06: 2019	Not specified	0.04	BDL(DL:0.01)
51	Butachlor	micro gm/l	USEPA 8141A: 2007	Not specified	125	BDL(DL:0.02)
52	Chloriopyrifos	micro gm/l	USEPA 8141 A	Not specified	30	BDL(DL:0.02)
53	Delta-HCH	micro gm/l	AOAC (21st edition), 990.06: 2019	Not specified	0.04	BDL(DL:0.01)
54	2,4-Dichlorophenoxyacetic acid	micro gm/l	USEPA 515: 1981	Not specified	30	BDL(DL:0.01)
55	o,p DDT	micro gm/l	AOAC (21st edition), 990.06: 2019	Not specified	1.0	BDL(DL:0.01)

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MSK TESTING • INSPECTION

Report No. : MSKGL/FD/2023-24/001164 **Sample No. :** MSKGL/FD/2023-24/05/00311

ANALYSIS RESULT (As per DW (IS:10500-2012))

Chemical

Sl No.	Test Parameters	Unit	Test Method	Desirable Limit	Permissible Limit	Result
56	p,p DDT	micro gm/l	AOAC (21st edition), 990.06: 2019	Not specified	1.0	BDL(DL:0.01)
57	o,p DDE	micro gm/l	AOAC (21st edition), 990.06: 2019	Not specified	1.0	BDL(DL:0.01)
58	p,p DDE	micro gm/l	AOAC (21st edition), 990.06: 2019	Not specified	1.0	BDL(DL:0.01)
59	o,p DDD	micro gm/l	AOAC (21st edition), 990.06: 2019	Not specified	1.0	BDL(DL:0.01)
60	p,p DDD	micro gm/l	AOAC (21st edition), 990.06: 2019	Not specified	1.0	BDL(DL:0.01)
61	Alpha-Endosulfan	micro gm/l	AOAC (21st edition), 990.06: 2019	Not specified	0.4	BDL(DL:0.01)
62	Beta-Endosulfan	micro gm/l	AOAC (21st edition), 990.06: 2019	Not specified	0.4	BDL(DL:0.01)
63	Endosulfan Sulphate	micro gm/l	AOAC (21st edition), 990.06: 2019	Not specified	0.4	BDL(DL:0.01)
64	Ethion	micro gm/l	US EPA 8141A: 2007	Not specified	3.0	BDL(DL:0.02)
65	Gama-HCH (Lindane)	micro gm/l	AOAC (21st edition), 990.06: 2019	Not specified	2.0	BDL(DL:0.01)
66	Isoproturon	micro gm/l	USEPA 532: 2000	Not specified	9	BDL(DL:0.02)
67	Malathion	micro gm/l	USEPA 8141A: 2007	Not specified	190	BDL(DL:0.02)
68	Methyl Parathion	micro gm/l	USEPA 8141A: 2007	Not specified	0.3	BDL(DL:0.02)
69	Monocrotophos	micro gm/l	USEPA 8141A: 2007	Not specified	1.0	BDL(DL:0.02)
70	Phorate	micro gm/l	USEPA 8141A: 2007	Not specified	2.0	BDL(DL:0.02)

Micro Biology

Sl No.	Test Parameters	Unit	Test Method	Desirable Limit	Permissible Limit	Result
71	E. coli	/100ml	IS 15185:2016	NA	Not Detectable	Not Detected
72	Total coliform	/100ml	IS 15185:2016	NA	Not Detectable	Not Detected

DL : Detection Limit BDL : Below Detection Limit

Opinion :

----------END OF REPORT----------

Report Verified By

For Mitra S. K. Private Limited

Authorised Signatory

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MSK TESTING • INSPECTION

TEST REPORT

Report No. : MSKGL/ED/2023-24/000218
Date : 03/07/2023
Sample No. : MSKGL/ED/2023-24/05/01105
Drawn/Submitted on : 22/05/2023
Reference No. & Date : Wed, Feb 15, 7:03/PM, Date - 01/05/2023

We hereby certify that the following sample drawn by us / submitted by the customer has been analyzed with the following results:

1. Description of sample (As declared by customer)	Rajkot SW-1
2. Sample Mark (if any, given by the customer)	MSKGDM/ED/W10
3. Date of sampling	19/05/2023
4. Place of sampling	NEAR, Pragati Pride
5. Environmental conditions during sampling	Ambient Temperature : 31
6. Sampling Plan & Procedures used	APHA (23rd Edition)

Report No. : MSKGL/ED/2023-24/000218 **Sample No. :** MSKGL/ED/2023-24/05/01105

ANALYSIS RESULT

Chemical

Sl No.	Test Parameters	Unit	Test Method	Desirable Limit	Permissible	Result
1	Colour	Hazen	APHA (23rd Edition) 2120B : 2017			<5.0
2	pH value	None	APHA (23rd Edition) 4500 -H-B : 2017			7.91 at 25 deg C
3	Turbidity	N.T.U.	APHA (23rd Edition) 2130B : 2017			220
4	Total Dissolved Solids (as TDS)	mg/l	APHA (23rd Edition) 2540C : 2017			574
5	Calcium (as Ca)	mg/l	APHA (23rd Edition) 3500 Ca B,2017 (O)			53
6	Chloride (as Cl)	mg/l	APHA (23rd Edition) 4500 -Cl B : 2017			180
7	Copper (as Cu)	mg/l	APHA (23rd Edition) 3120 B : 2017			<0.02
8	Fluoride (as F)	mg/l	APHA (23rd Edition) 4500 -F-C/D: 2017			0.53
9	Iron (as Fe)	mg/l	APHA (23rd Edition) 3500 Fe B : 2017			16
10	Magnesium (as Mg)	mg/l	APHA (23rd Edition) 3500 Mg B,2017 (O)			11
11	Manganese (as Mn)	mg/l	APHA (23rd Edition) 3120 B : 2017			<0.02
12	Nitrate (as NO3)	mg/l	APHA (23rd Edition) 4500 - NO3 - E : 2017			0.8
13	Phenolic Compounds (as C6H5OH)	mg/l	APHA (23rd Edition) 5530C : 2017			<0.001
14	Sulphate (as SO4)	mg/l	APHA (23rd Edition) 4500 - SO42- E : 2017			30
15	Alkalinity (as CaCO3)	mg/l	APHA (23rd Edition) 2320B 2017 (O)			200
16	Total Hardness (as CaCO3)	mg/l	APHA (23rd Edition) , 2340 C : 2017			176

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MSK TESTING • INSPECTION

Report No. : MSKGL/ED/2023-24/000218 **Sample No. :** MSKGL/ED/2023-24/05/01105

ANALYSIS RESULT

Chemical

Sl No.	Test Parameters	Unit	Test Method	Desirable Limit	Permissible	Result
17	Cadmium (as Cd)	mg/l	APHA (23rd Edition)3120B 2017_(O)			<0.001
18	Lead (as Pb)	mg/l	APHA (23rd Edition) 3120 B : 2017			<0.005
19	Mercury (as Hg)	mg/l	IS 3025 (Part 48): 1994			<0.001
20	Nickel (as NI)	mg/l	APHA (23rd Edition) 3120 B : 2017			<0.02
21	Arsenic(as As)	mg/l	APHA (23rd Edition)3120B 2017 (ICP OES)_(O)			<0.005
22	Zinc (as Zn)	mg/l	APHA (23rd Edition) 3120 B : 2017			<0.02
23	Cobalt (as Co)	mg/l	APHA (23rd Edition)3120B 2017 (ICP OES)_(O)			<0.05
24	Total Suspended Solid (as TSS)	mg/l	APHA (23rd Edition) 2540D : 2017			420
25	Temperature	Deg C	APHA 23rd EDITION,2550 B_(O)			25
26	Conductivity	us/cm	APHA (23rd Edition) 2510B: 2017			915
27	Biochemical Oxygen Demand (as BOD)	mg/l	APHA (23rd Edition) 5210B : 2017			56
28	Chemical Oxygen Demand (COD)	mg/l	APHA (23rd Edition) 5220B : 2017			180
29	Oil and Grease	mg/l	APHA (23rd Edition) 5520B : 2017			<5.0
30	Salinity	None	APHA (23rd Edition)2520B, 2017_(O)			0.54 In respect to KCl equivalent salinity 35.
31	Phosphate (as PO4)	mg/l	APHA (23rd Edition) 4500- P D, 2017_(O)			1.1
32	DO	mg/l	APHA 23rd Ed. 2017-4500-O-C/G_(O)			5.5
33	Chromium as Cr	mg/l	APHA (23rd Edition)3120B 2017 (ICP OES)_(O)			<0.01

Micro Biology

Sl No.	Test Parameters	Unit	Test Method	Desirable Limit	Permissible	Result
34	Faecal coliform	MPN/100ml	APHA 23rd Edition 9221 E_(O)			350
35	Total coliform	MPN/100ml	APHA 23rd Edition 9221 B_(O)			2200

DL : Detection Limit ***BDL : Below Detection Limit***

Opinion :

Report Verified By

For Mitra S. K. Private Limited

Authorised Signatory

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MSK TESTING • INSPECTION

TEST REPORT

Report No. : MSKGL/ED/2023-24/000210
Date : 03/07/2023
Sample No. : MSKGL/ED/2023-24/05/01106
Drawn/Submitted on : 22/05/2023
Reference No. & Date : Wed, Feb 15, 7:03/PM, Date - 01/05/2023

We hereby certify that the following sample drawn by us / submitted by the customer has been analyzed with the following results:

1. Description of sample (As declared by customer)	Rajkot SW-2
2. Sample Mark (if any, given by the customer)	MSKGDM/ED/W11
3. Date of sampling	19/05/2023
4. Place of sampling	Lake Of Vidi Pir
5. Environmental conditions during sampling	Ambient Temperature : 31
6. Sampling Plan & Procedures used	APHA (23rd Ediition)

Report No. : MSKGL/ED/2023-24/000210 **Sample No. :** MSKGL/ED/2023-24/05/01106

ANALYSIS RESULT

Chemical

Sl No.	Test Parameters	Unit	Test Method	Desirable Limit	Permissible	Result
1	Colour	Hazen	APHA (23rd Edition) 2120B : 2017			<5.0
2	pH value	None	APHA (23rd Edition) 4500 -H-B : 2017			7.50 at 25 deg C
3	Turbidity	N.T.U.	APHA (23rd Edition) 2130B : 2017			540
4	Total Dissolved Solids (as TDS)	mg/l	APHA (23rd Edition) 2540C : 2017			1076
5	Calcium (as Ca)	mg/l	APHA (23rd Edition) 3500 Ca B,2017 (O)			147
6	Chloride (as Cl)	mg/l	APHA (23rd Edition) 4500 -Cl B : 2017			320
7	Copper (as Cu)	mg/l	APHA (23rd Edition) 3120 B : 2017			<0.02
8	Fluoride (as F)	mg/l	APHA (23rd Edition) 4500 -F-C/D: 2017			0.23
9	Iron (as Fe)	mg/l	APHA (23rd Edition) 3500 Fe B : 2017			48
10	Magnesium (as Mg)	mg/l	APHA (23rd Edition) 3500 Mg B,2017 (O)			111
11	Manganese (as Mn)	mg/l	APHA (23rd Edition) 3120 B : 2017			<0.02
12	Nitrate (as NO3)	mg/l	APHA (23rd Edition) 4500 - NO3 - E : 2017			3.6
13	Phenolic Compounds (as C6H5OH)	mg/l	APHA (23rd Edition) 5530C : 2017			<0.001
14	Sulphate (as SO4)	mg/l	APHA (23rd Edition) 4500 - SO42- E : 2017			300
15	Alkalinity (as CaCO3)	mg/l	APHA (23rd Edition) 2320B 2017 (O)			172
16	Total Hardness (as CaCO3)	mg/l	APHA (23rd Edition) , 2340 C : 2017			832

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MSK TESTING • INSPECTION

Report No. : MSKGL/ED/2023-24/000210 **Sample No. :** MSKGL/ED/2023-24/05/01106

ANALYSIS RESULT

Chemical

Sl No.	Test Parameters	Unit	Test Method	Desirable Limit	Permissible	Result
17	Cadmium (as Cd)	mg/l	APHA (23rd Edition)3120B 2017_(O)			<0.001
18	Lead (as Pb)	mg/l	APHA (23rd Edition) 3120 B : 2017			<0.004
19	Mercury (as Hg)	mg/l	IS 3025 (Part 48): 1994			<0.001
20	Nickel (as NI)	mg/l	APHA (23rd Edition) 3120 B : 2017			<0.02
21	Arsenic(as As)	mg/l	APHA (23rd Edition)3120B 2017 (ICP OES)_(O)			<0.005
22	Zinc (as Zn)	mg/l	APHA (23rd Edition) 3120 B : 2017			<0.02
23	Cobalt (as Co)	mg/l	APHA (23rd Edition)3120B 2017 (ICP OES)_(O)			<0.05
24	Total Suspended Solid (as TSS)	mg/l	APHA (23rd Edition) 2540D : 2017			1385
25	Temperature	Deg C	APHA 23rd EDITION,2550 B_(O)			25
26	Conductivity	us/cm	APHA (23rd Edition) 2510B: 2017			1816
27	Biochemical Oxygen Demand (as BOD)	mg/l	APHA (23rd Edition) 5210B : 2017			38
28	Chemical Oxygen Demand (COD)	mg/l	APHA (23rd Edition) 5220B : 2017			136
29	Oil and Grease	mg/l	APHA (23rd Edition) 5520B : 2017			<5.0
30	Salinity	None	APHA (23rd Edition)2520B, 2017_(O)			1.10 In respect to KCl equivalent salinity 35.
31	Phosphate (as PO4)	mg/l	APHA (23rd Edition) 4500- P D, 2017_(O)			0.15
32	DO	mg/l	APHA 23rd Ed. 2017-4500-O-C/G_(O)			5.1
33	Chromium as Cr	mg/l	APHA (23rd Edition)3120B 2017 (ICP OES)_(O)			<0.01

Micro Biology

Sl No.	Test Parameters	Unit	Test Method	Desirable Limit	Permissible	Result
34	Faecal coliform	MPN/100ml	APHA 23rd Edition 9221 E_(O)			<1.8
35	Total coliform	MPN/100ml	APHA 23rd Edition 9221 B_(O)			120

DL : Detection Limit BDL : Below Detection Limit

Opinion :

Report Verified By

For Mitra S. K. Private Limited

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MSK TESTING • INSPECTION

TEST REPORT

Report No. : MSKGL/ED/2023-24/000219
Date : 03/07/2023
Sample No. : MSKGL/ED/2023-24/05/01107
Drawn/Submitted on : 22/05/2023
Reference No. & Date : Wed, Feb 15, 7:03/PM, Date - 01/05/2023

We hereby certify that the following sample drawn by us / submitted by the customer has been analyzed with the following results:

1. Description of sample (As declared by customer)	Rajkot SW-3
2. Sample Mark (if any, given by the customer)	MSKGDM/ED/W12
3. Date of sampling	19/05/2023
4. Place of sampling	Anandpar lake
5. Environmental conditions during sampling	Ambient Temperature : 31
6. Sampling Plan & Procedures used	APHA (23rd Ediition)

Report No. : MSKGL/ED/2023-24/000219 **Sample No. :** MSKGL/ED/2023-24/05/01107

ANALYSIS RESULT

Chemical

Sl No.	Test Parameters	Unit	Test Method	Desirable Limit	Permissible	Result
1	Colour	Hazen	APHA (23rd Edition) 2120B : 2017			<5.0
2	pH value	None	APHA (23rd Edition) 4500 -H-B : 2017			7.86 at 25 deg C
3	Turbidity	N.T.U.	APHA (23rd Edition) 2130B : 2017			52
4	Total Dissolved Solids (as TDS)	mg/l	APHA (23rd Edition) 2540C : 2017			688
5	Calcium (as Ca)	mg/l	APHA (23rd Edition) 3500 Ca B,2017 (O)			53
6	Chloride (as Cl)	mg/l	APHA (23rd Edition) 4500 -Cl B : 2017			212
7	Copper (as Cu)	mg/l	APHA (23rd Edition) 3120 B : 2017			<0.02
8	Fluoride (as F)	mg/l	APHA (23rd Edition) 4500 -F-C/D: 2017			0.22
9	Iron (as Fe)	mg/l	APHA (23rd Edition) 3500 Fe B : 2017			11
10	Magnesium (as Mg)	mg/l	APHA (23rd Edition) 3500 Mg B,2017 (O)			37
11	Manganese (as Mn)	mg/l	APHA (23rd Edition) 3120 B : 2017			<0.02
12	Nitrate (as NO3)	mg/l	APHA (23rd Edition) 4500 - NO3 - E : 2017			12
13	Phenolic Compounds (as C6H5OH)	mg/l	APHA (23rd Edition) 5530C : 2017			<0.001
14	Sulphate (as SO4)	mg/l	APHA (23rd Edition) 4500 - SO42- E : 2017			86
15	Alkalinity (as CaCO3)	mg/l	APHA (23rd Edition) 2320B 2017 (O)			175
16	Total Hardness (as CaCO3)	mg/l	APHA (23rd Edition) , 2340 C : 2017			284

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MSK TESTING • INSPECTION

Report No. : MSKGL/ED/2023-24/000219 **Sample No. :** MSKGL/ED/2023-24/05/01107

ANALYSIS RESULT

Chemical

Sl No.	Test Parameters	Unit	Test Method	Desirable Limit	Permissible	Result
17	Cadmium (as Cd)	mg/l	APHA (23rd Edition)3120B 2017_(O)			<0.001
18	Lead (as Pb)	mg/l	APHA (23rd Edition) 3120 B : 2017			<0.005
19	Mercury (as Hg)	mg/l	IS 3025 (Part 48): 1994			<0.001
20	Nickel (as Ni)	mg/l	APHA (23rd Edition) 3120 B : 2017			<0.02
21	Arsenic(as As)	mg/l	APHA (23rd Edition)3120B 2017 (ICP OES)_(O)			<0.005
22	Zinc (as Zn)	mg/l	APHA (23rd Edition) 3120 B : 2017			<0.02
23	Cobalt (as Co)	mg/l	APHA (23rd Edition)3120B 2017 (ICP OES)_(O)			<0.05
24	Total Suspended Solid (as TSS)	mg/l	APHA (23rd Edition) 2540D : 2017			66
25	Temperature	Deg C	APHA 23rd EDITION,2550 B_(O)			25
26	Conductivity	us/cm	APHA (23rd Edition) 2510B: 2017			1127
27	Biochemical Oxygen Demand (as BOD)	mg/l	APHA (23rd Edition) 5210B : 2017			14
28	Chemical Oxygen Demand (COD)	mg/l	APHA (23rd Edition) 5220B : 2017			56
29	Oil and Grease	mg/l	APHA (23rd Edition) 5520B : 2017			<5.0
30	Salinity	None	APHA (23rd Edition)2520B, 2017_(O)			0.67 In respect to KCl equivalent salinity 35.
31	Phosphate (as PO4)	mg/l	APHA (23rd Edition) 4500- P D 2017_(O)			0.55
32	DO	mg/l	APHA 23rd Ed. 2017-4500-O-C/G_(O)			5.7
33	Chromium as Cr	mg/l	APHA (23rd Edition)3120B 2017 (ICP OES)_(O)			<0.01

Micro Biology

Sl No.	Test Parameters	Unit	Test Method	Desirable Limit	Permissible	Result
34	Faecal coliform	MPN/100ml	APHA 23rd Edition 9221 E_(O)			700
35	Total coliform	MPN/100ml	APHA 23rd Edition 9221 B_(O)			2800

DL : Detection Limit BDL : Below Detection Limit

Opinion :

Report Verified By

For Mitra S. K. Private Limited

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APPENDIX 18: LETTER FROM RMC

Rajkot Municipal Corporation

Solid Waste Management

Dr. Ambedkar Bhavan, Dhebar Road, Rajkot.

SWACHH SURVEKSHAN 2023

R.M.C./C.Z./S.W.M./ Outward No.: 3067 Dt. 27/ 9 /2023

To,
Director,
Goodwatts WTE Rajkot Pvt. Ltd.
Sangeeta Complex,
Ellis Bridge
Ahmedabad.

Subject: Assurance for livelihood of Rag-pickers at Dump-site (Nakrawadi- Rajkot)
Ref: Your letter dated: 28/08/2023 vide ref.GWRPL/RMC/WTE/230828.

We RMC also concern for livelihood of Rag-pickers, after commissioning of WTE plant at Rajkot, since waste will come from wards, the said rag-pickers may at their choice carry out their activities at the wards level at Rajkot city.

Environment Engineer
Solid Waste Management
Rajkot Municipal Corporation

APPENDIX 19: BIRDS REPORTED FROM THE REGION

S.N.	Common English Name	Binomial Scientific Name	Migrant (M) / Resident (R)	IUCN Red List - Categories	Wildlife (Protection) Act - Schedules
1	African Comb Duck	*Sarkidiornis melanotos*	R	Least Concern	Schedule IV
2	Alexandrine Parakeet	*Palaeornis eupatria*	R	Near Threatened	Schedule IV
3	Ashy Drongo	*Dicrurus leucophaeus*	M	Least Concern	Schedule IV
4	Ashy Prinia	*Prinia socialis*	R	Least Concern	Schedule IV
5	Ashy-crowned Sparrow-lark	*Eremopterix griseus*	R	Least Concern	Schedule IV
6	Asian Green Bee-eater	*Merops orientalis*	R	Least Concern	Schedule IV
7	Asian Koel	*Eudynamys scolopaceus*	R	Least Concern	Schedule IV
8	Asian Openbill	*Anastomus oscitans*	R	Least Concern	Schedule IV
9	Asian Palm-swift	*Cypsiurus balasiensis*	R	Least Concern	Schedule IV
10	Asian Woollyneck	*Ciconia episcopus*	R	Near Threatened	Schedule IV
11	Baillon's Crake	*Zapornia pusilla*	M	Least Concern	Schedule IV
12	Bank Myna	*Acridotheres ginginianus*	R	Least Concern	Schedule IV
13	Bar-headed Goose	*Anser indicus*	M	Least Concern	Schedule IV
14	Barn Owl	*Tyto alba*	R	Least Concern	Schedule IV
15	Barn Swallow	*Hirundo rustica*	M	Least Concern	Not Listed
16	Barred Buttonquail	*Turnix suscitator*	R	Least Concern	Schedule IV
17	Baya Weaver	*Ploceus philippinus*	R	Least Concern	Schedule IV
18	Bay-backed Shrike	*Lanius vittatus*	R	Least Concern	Not Listed
19	Black Drongo	*Dicrurus macrocercus*	R	Least Concern	Schedule IV
20	Black Kite	*Milvus migrans*	R	Least Concern	Schedule II
21	Black Redstart	*Phoenicurus ochruros*	M	Least Concern	Schedule IV
22	Black-breasted Weaver	*Ploceus benghalensis*	R	Least Concern	Schedule IV
23	Black-crowned Night-heron	*Nycticorax Nycticorax*	R	Least Concern	Schedule IV
24	Black-headed Bunting	*Emberiza melanocephala*	M	Least Concern	Schedule IV
25	Black-headed Cuckooshrike	*Lalage melanoptera*	R	Least Concern	Schedule IV
26	Black-headed Gull	*Chroicocephalus ridibundus*	M	Least Concern	Schedule IV
27	Black-headed Ibis	*Threskiornis melanocephalus*	R	Near Threatened	Schedule IV
28	Black-naped Monarch	*Hypothymis azurea*	R	Least Concern	Schedule IV
29	Black-necked Stork	*Ephippiorhynchus asiaticus*	R	Near Threatened	Schedule IV
30	Black-tailed Godwit	*Limosa limosa*	M	Near Threatened	Schedule IV
31	Black-winged Kite	*Elanus caeruleus*	R	Least Concern	Schedule II
32	Black-winged Stilt	*Himantopus Himantopus*	R	Least Concern	Schedule IV
33	Blue Rock-Thrush	*Monticola solitarius*	M	Least Concern	Schedule IV
34	Blue-cheeked Bee-eater	*Merops persicus*	R	Least Concern	Not Listed
35	Bluethroat	*Cyanecula svecica*	M	Least Concern	Schedule IV

S.N.	Common English Name	Binomial Scientific Name	Migrant (M) / Resident (R)	IUCN Red List - Categories	Wildlife (Protection) Act - Schedules
36	Blyth's Reed Warbler	*Acrocephalus dumetorum*	M	Least Concern	Schedule IV
37	Booted Eagle	*Hieraaetus pennatus*	M	Least Concern	Schedule I
38	Booted Warbler	*Iduna caligata*	M	Least Concern	Schedule IV
39	Brahminy Kite	*Haliastur indus*	R	Least Concern	Schedule I
40	Brahminy Starling	*Sturnia pagodarum*	R	Least Concern	Schedule IV
41	Bronze-winged Jacana	*Metopidius indicus*	R	Least Concern	Schedule IV
42	Brown Crake	*Zapornia akool*	R	Least Concern	Schedule IV
43	Brown Shrike	*Lanius cristatus*	M	Least Concern	Not Listed
44	Brown-breasted Flycatcher	*Muscicapa muttui*	M	Least Concern	Schedule IV
45	Brown-headed Gull	*Larus brunnicephalus*	M	Least Concern	Schedule IV
46	Caspian Tern	*Hydroprogne caspia*	M	Least Concern	Schedule IV
47	Cattle Egret	*Bubulcus ibis*	R	Least Concern	Schedule IV
48	Chestnut-bellied Sandgrouse	*Pterocles exustus*	R	Least Concern	Schedule IV
49	Chestnut-shouldered Bush-sparrow	*Gymnoris xanthocollis*	R	Least Concern	Schedule IV
50	Cinnamon Bittern	*Ixobrychus cinnamomeus*	R	Least Concern	Schedule IV
51	Citrine Wagtail	*Motacilla citreola*	M	Least Concern	Schedule IV
52	Clamorous Reed Warbler	*Acrocephalus stentoreus*	R	Least Concern	Schedule IV
53	Collared Pratincole	*Glareola pratincole*	R	Least Concern	Not Listed
54	Common Babbler	*Argya caudata*	R	Least Concern	Schedule IV
55	Common Chiffchaff	*Phylloscopus collybita*	M	Least Concern	Schedule IV
56	Common Coot	*Fulica atra*	M	Least Concern	Schedule IV
57	Common Crane	*Grus grus*	M	Least Concern	Schedule IV
58	Common Greenshank	*Tringa nebularia*	M	Least Concern	Schedule IV
59	Common Gull-billed Tern	*Gelochelidon nilotica*	M	Least Concern	Schedule IV
60	Common Hawk-cuckoo	*Hierococcyx varius*	R	Least Concern	Schedule IV
61	Common Hoopoe	*Upupa epops*	R	Least Concern	Not Listed
62	Common Iora	*Aegithina tiphia*	R	Least Concern	Schedule IV
63	Common Kestrel	*Falco tinnunculus*	M	Least Concern	Schedule IV
64	Common Kingfisher	*Alcedo atthis*	R	Least Concern	Schedule IV
65	Common Moorhen	*Gallinula chloropus*	R	Least Concern	Schedule IV
66	Common Myna	*Acridotheres tristis*	R	Least Concern	Schedule IV
67	Common Pochard	*Aythya ferina*	M	Vulnerable	Schedule IV
68	Common Redshank	*Tringa tetanus*	M	Least Concern	Schedule IV
69	Common Rosefinch	*Carpodacus erythrinus*	M	Least Concern	Schedule IV
70	Common Sandpiper	*Actitis hypoleucos*	M	Least Concern	Schedule IV
71	Common Snipe	*Gallinago gallinago*	M	Least Concern	Schedule IV

S.N.	Common English Name	Binomial Scientific Name	Migrant (M) / Resident (R)	IUCN Red List - Categories	Wildlife (Protection) Act - Schedules
72	Common Tailorbird	*Orthotomus sutorius*	R	Least Concern	Schedule IV
73	Common Teal	*Anas crecca*	M	Least Concern	Schedule IV
74	Common Woodshrike	*Tephrodornis pondicerianus*	R	Least Concern	Schedule IV
75	Coppersmith Barbet	*Psilopogon haemacephalus*	R	Least Concern	Schedule IV
76	Cotton Pygmy-goose	*Nettapus coromandelianus*	R	Least Concern	Schedule IV
77	Crested Lark	*Galerida cristata*	R	Least Concern	Schedule IV
78	Curlew Sandpiper	*Calidris ferruginea*	M	Near Threatened	Schedule IV
79	Dalmatian Pelican	*Pelecanus crispus*	M	Near Threatened	Schedule IV
80	Demoiselle Crane	*Grus virgo*	M	Least Concern	Schedule IV
81	Desert Wheatear	*Oenanthe deserti*	M	Least Concern	Schedule IV
82	Dusky Crag-Martin	*Ptyonoprogne concolor*	R	Least Concern	Not Listed
83	Eastern Orphean Warbler	*Sylvia crassirostris*	M	Least Concern	Schedule IV
84	Eurasian Collared-Dove	*Streptopelia decaocto*	R	Least Concern	Schedule IV
85	Eurasian Hobby	*Falco Subbuteo*	M	Least Concern	Schedule IV
86	Eurasian Sparrowhawk	*Accipiter nisus*	M	Least Concern	Schedule I
87	Eurasian Spoonbill	*Platalea leucorodia*	R	Least Concern	Schedule I
88	Eurasian Wigeon	*Mareca Penelope*	M	Least Concern	Schedule IV
89	Eurasian Wryneck	*Jynx torquilla*	M	Least Concern	Schedule IV
90	Ferruginous Duck	*Aythya nyroca*	M	Near Threatened	Schedule IV
91	Gadwall	*Mareca strepera*	M	Least Concern	Schedule IV
92	Garganey	*Spatula querquedula*	M	Least Concern	Schedule IV
93	Glossy Ibis	*Plegadis falceinellus*	M	Least Concern	Schedule IV
94	Great Cormorant	*Phalacrocorax carbo*	R	Least Concern	Schedule IV
95	Great Crested Grebe	*Podiceps cristatus*	R	Least Concern	Schedule IV
96	Great Egret	*Ardea alba*	R	Least Concern	Schedule IV
97	Great Grey Shrike	*Lanius excubitor*	R	Least Concern	Not Listed
98	Great Thick-Knee	*Esacus recurvirostris*	R	Near Threatened	Schedule IV
99	Great White Pelican	*Pelecanus onocrotalus*	R	Least Concern	Schedule IV
100	Greater Coucal	*Centropus sinensis*	R	Least Concern	Schedule IV
101	Greater Flamingo	*Phoenicopterus roseus*	R	Least Concern	Schedule IV
102	Greater Painted-snipe	*Rostratula benghalensis*	R	Least Concern	Not Listed
103	Greater Short-toed Lark	*Calandrella brachydactyla*	M	Least Concern	Schedule IV
104	Greater Spotted Eagle	*Clanga clanga*	M	Vulnerable	Schedule I
105	Green Sandpiper	*Tringa ochropus*	M	Least Concern	Schedule IV
106	Green Warbler	*Phylloscopus nitidus*	M	Least Concern	Schedule IV
107	Greenish Warbler	*Phylloscopus trochiloides*	M	Least Concern	Schedule IV
108	Grey Francolin	*Francolinus pondicerianus*	R	Least Concern	Schedule IV

S.N.	Common English Name	Binomial Scientific Name	Migrant (M) / Resident (R)	IUCN Red List - Categories	Wildlife (Protection) Act - Schedules
109	Grey Heron	*Ardea cinerea*	R	Least Concern	Schedule IV
110	Grey Wagtail	*Motacilla cinerea*	M	Least Concern	Schedule IV
111	Grey-breasted Prinia	*Prinia hodgsonii*	R	Least Concern	Schedule IV
112	Grey-headed Canary-flycatcher	*Culicicapa ceylonensis*	M	Least Concern	Schedule IV
113	Greylag Goose	*Anser answer*	M	Least Concern	Schedule IV
114	Grey-necked Bunting	*Emberiza buchanani*	M	Least Concern	Schedule IV
115	House Crow	*Corvus splendens*	R	Least Concern	Schedule V
116	House Sparrow	*Passer domesticus*	R	Least Concern	Schedule IV
117	Hume's Leaf-warbler	*Phylloscopus humei*	M	Least Concern	Schedule IV
118	Indian Bushlark	*Mirafra erythroptera*	R	Least Concern	Schedule IV
119	Indian Cormorant	*Phalacrocorax fuscicollis*	R	Least Concern	Schedule IV
120	Indian Courser	*Cursorius coromandelicus*	R	Least Concern	Schedule IV
121	Indian Golden Oriole	*Oriolus kundoo*	M	Least Concern	Schedule IV
122	Indian Nightjar	*Caprimulgus asiaticus*	R	Least Concern	Schedule IV
123	Indian Paradise-flycatcher	*Terpsiphone paradisi*	M	Least Concern	Schedule IV
124	Indian Peafowl	*Pavo cristatus*	R	Least Concern	Schedule I
125	Indian Pitta	*Pitta brachyura*	R	Least Concern	Schedule IV
126	Indian Pond Heron	*Ardeola grayii*	R	Least Concern	Schedule IV
127	Indian Robin	*Saxicoloides fulicata*	R	Least Concern	Schedule IV
128	Indian Roller	*Coracias benghalensis*	R	Least Concern	Schedule IV
129	Indian Silverbill	*Euodice malabarica*	R	Least Concern	Schedule IV
130	Indian Spot-billed Duck	*Anas poecilorhyncha*	R	Least Concern	Schedule IV
131	Indian Thick-knee	*Burhinus indicus*	R	Least Concern	Not Listed
132	Indian White-eye	*Zosterops palpebrosus*	R	Least Concern	Schedule IV
133	Intermediate Egret	*Ardea intermedia*	R	Least Concern	Schedule IV
134	Isabelline Shrike	*Lanius isabellinus*	M	Least Concern	Not Listed
135	Isabelline Wheatear	*Oenanthe isabelline*	M	Least Concern	Schedule IV
136	Jacobin Cuckoo	*Clamator jacobinus*	R	Least Concern	Schedule IV
137	Jungle Babbler	*Turdoides striatus*	R	Least Concern	Schedule IV
138	Kashmir Flycatcher	*Ficedula subrubra*	M	Vulnerable	Schedule IV
139	Kentish Plover	*Charadrius alexandrines*	M	Least Concern	Schedule IV
140	Large Grey Babbler	*Argya malcolmi*	R	Least Concern	Schedule IV
141	Large-billed Crow	*Corvus macrorhynchos*	R	Least Concern	Schedule IV
142	Laughing Dove	*Streptopelia senegalensis*	R	Least Concern	Schedule IV
143	Lesser Black-backed Gull	*Larus fuscus*	M	Least Concern	Schedule IV
144	Lesser Flamingo	*Phoeniconaias minor*	R	Near Threatened	Schedule IV
145	Lesser Sand-Plover	*Charadrius mongolus*	M	Least Concern	Schedule IV

S.N.	Common English Name	Binomial Scientific Name	Migrant (M) / Resident (R)	IUCN Red List - Categories	Wildlife (Protection) Act - Schedules
146	Lesser Whistling-duck	*Dendrocygna javanica*	R	Least Concern	Schedule IV
147	Lesser Whitethroat	*Sylvia curruca*	M	Least Concern	Schedule IV
148	Little Cormorant	*Microcarbo niger*	R	Least Concern	Schedule IV
149	Little Egret	*Egretta garzetta*	R	Least Concern	Schedule IV
150	Little Grebe	*Tachybaptus ruficollis*	R	Least Concern	Schedule IV
151	Little Pratincole	*Glareola lacteal*	R	Least Concern	Not Listed
152	Little Ringed Plover	*Charadrius dubius*	R	Least Concern	Schedule IV
153	Little Stint	*Calidris minuta*	M	Least Concern	Schedule IV
154	Little Swift	*Apus affinis*	R	Least Concern	Not Listed
155	Little Tern	*Sternula albifrons*	R	Least Concern	Schedule IV
156	Long-billed Pipit	*Anthus similis*	M	Least Concern	Schedule IV
157	Long-legged Buzzard	*Buteo rufinus*	M	Least Concern	Schedule I
158	Long-tailed Shrike	*Lanius schach*	R	Least Concern	Not Listed
159	Mallard	*Anas platyrhynchos*	M	Least Concern	Schedule IV
160	Marsh Sandpiper	*Tringa stagnatilis*	M	Least Concern	Schedule IV
161	Montagu's Harrier	*Circus pygargus*	M	Least Concern	Schedule I
162	Northern Pintail	*Anas acuta*	M	Least Concern	Schedule IV
163	Northern Shoveler	*Spatula clypeata*	M	Least Concern	Schedule IV
164	Oriental Darter	*Anhinga melanogaster*	R	Near Threatened	Schedule IV
165	Oriental Honey-buzzard	*Pernis ptilorhynchus*	R	Least Concern	Schedule I
166	Oriental Magpie-Robin	*Copsychus saularis*	R	Least Concern	Schedule IV
167	Osprey	*Pandion haliaetus*	M	Least Concern	Schedule I
168	Pacific Golden-Plover	*Pluvialis fulva*	M	Least Concern	Schedule IV
169	Paddyfield Pipit	*Anthus rufulus*	R	Least Concern	Schedule IV
170	Paddyfield Warbler	*Acrocephalus Agricola*	M	Least Concern	Schedule IV
171	Painted Stork	*Mycteria leucocephala*	R	Near Threatened	Schedule IV
172	Pallas's Gull	*Larus ichthyaetus*	M	Least Concern	Schedule IV
173	Pallid Harrier	*Circus macrourus*	M	Near Threatened	Schedule I
174	Peregrine Falcon	*Falco peregrinus*	R	Least Concern	Schedule I
175	Pheasant-tailed Jacana	*Hydrophasianus chirurgus*	R	Least Concern	Schedule IV
176	Pied Avocet	*Recurvirostra avosetta*	M	Least Concern	Schedule IV
177	Pied Bushchat	*Saxicola caprata*	R	Least Concern	Schedule IV
178	Pied Kingfisher	*Ceryle rudis*	R	Least Concern	Schedule IV
179	Plain Prinia	*Prinia inornate*	R	Least Concern	Schedule IV
180	Plum-headed Parakeet	*Psittacula cyanocephala*	R	Least Concern	Schedule IV
181	Purple Heron	*Ardea purpurea*	R	Least Concern	Schedule IV
182	Purple Sunbird	*Nectarinia asiatica*	R	Least Concern	Schedule IV

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183	Purple Swamphen	*Porphyrio porphyrio*	R	Least Concern	Schedule IV
184	Rain Quail	*Coturnix coromandelica*	R	Least Concern	Schedule IV
185	Red Avadavat	*Amandava amandava*	R	Least Concern	Schedule IV
186	Red Collared-Dove	*Streptopelia tranquebarica*	R	Least Concern	Schedule IV
187	Red-breasted Flycatcher	*Ficedula parva*	M	Least Concern	Schedule IV
188	Red-naped Ibis	*Pseudibis papillosa*	R	Least Concern	Schedule IV
189	Red-necked Falcon	*Falco ruficollis*	M	Least Concern	Schedule I
190	Red-rumped Swallow	*Cecropis daurica*	R	Least Concern	Schedule IV
191	Red-throated Flycatcher	*Ficedula albicilla*	M	Least Concern	Schedule IV
192	Red-vented Bulbul	*Pycnonotus cafer*	R	Least Concern	Schedule IV
193	Red-wattled Lapwing	*Vanellus indicus*	R	Least Concern	Schedule IV
194	River Tern	*Sterna aurantia*	R	Vulnerable	Schedule IV
195	Rock Bush-Quail	*Perdicula argoondah*	R	Least Concern	Schedule IV
196	Rock Dove	*Columba livia*	R	Least Concern	Schedule IV
197	Rose-ringed Parakeet	*Psittacula krameria*	R	Least Concern	Schedule IV
198	Rosy Starling	*Pastor roseus*	M	Least Concern	Schedule IV
199	Ruddy Shelduck	*Tadorna ferruginea*	M	Least Concern	Schedule IV
200	Ruff	*Calidris pugnax*	M	Least Concern	Schedule IV
201	Rufous Treepie	*Dendrocitta vagabunda*	R	Least Concern	Schedule IV
202	Rufous-fronted Prinia	*Prinia buchanani*	R	Least Concern	Schedule IV
203	Rufous-tailed Lark	*Ammomanes phoenicura*	R	Least Concern	Schedule IV
204	Shikra	*Accipiter badius*	R	Least Concern	Schedule I
205	Short-toed Snake-Eagle	*Circaetus gallicus*	R	Least Concern	Schedule I
206	Siberian Stonechat	*Saxicola maurus*	M	Not Listed	Schedule IV
207	Slender-billed Gull	*Larus genei*	R	Least Concern	Schedule IV
208	Small Minivet	*Pericrocotus cinnamomeus*	R	Least Concern	Schedule IV
209	Spotted Crake	*Porzana porzana*	M	Least Concern	Schedule IV
210	Spotted Flycatcher	*Muscicapa striata*	M	Least Concern	Schedule IV
211	Spotted Owlet	*Athene brama*	R	Least Concern	Schedule IV
212	Spotted Redshank	*Tringa erythropus*	M	Least Concern	Schedule IV
213	Streak-throated Swallow	*Petrochelidon fluvicola*	R	Least Concern	Schedule IV
214	Striated Heron	*Butorides striata*	M	Least Concern	Schedule IV
215	Sulphur-bellied Warbler	*Phylloscopus griseolus*	M	Least Concern	Not Listed
216	Sykes's Lark	*Galerida deva*	R	Least Concern	Schedule IV
217	Sykes's Warbler	*Iduna rama*	M	Least Concern	Not Listed
218	Tawny Pipit	*Anthus campestris*	M	Least Concern	Schedule IV
219	Temminck's Stint	*Calidris temminckii*	M	Least Concern	Schedule IV

S.N.	Common English Name	Binomial Scientific Name	Migrant (M) / Resident (R)	IUCN Red List - Categories	Wildlife (Protection) Act - Schedules
220	Tickell's Blue Flycatcher	*Cyornis tickelliae*	R	Least Concern	Schedule IV
221	Tree Pipit	*Anthus trivialis*	M	Least Concern	Schedule IV
222	Tufted Duck	*Aythya fuligula*	M	Least Concern	Schedule IV
223	Ultramarine Flycatcher	*Ficedula superciliaris*	M	Least Concern	Schedule IV
224	Variable Wheatear	*Oenanthe picata*	M	Least Concern	Schedule IV
225	Verditer Flycatcher	*Eumyias thalassinus*	M	Least Concern	Schedule IV
226	Watercock	*Gallicrex cinerea*	R	Least Concern	Schedule IV
227	Western Marsh-Harrier	*Circus aeruginosus*	M	Least Concern	Schedule I
228	Western Reef-Egret	*Egretta gularis*	R	Least Concern	Schedule IV
229	Western Yellow Wagtail	*Motacilla flava*	M	Least Concern	Schedule IV
230	Whiskered Tern	*Chlidonias hybrida*	R	Least Concern	Schedule IV
231	White stork	*Ciconia Ciconia*	M	Least Concern	Schedule IV
232	White Wagtail	*Motacilla alba*	M	Least Concern	Schedule IV
233	White-bellied Drongo	*Dicrurus caerulescens*	R	Least Concern	Schedule IV
234	White-breasted Kingfisher	*Halcyon smyrnensis*	R	Least Concern	Schedule IV
235	White-breasted Waterhen	*Amaurornis phoenicurus*	R	Least Concern	Schedule IV
236	White-browed Fantail	*Rhipidura aureola*	R	Least Concern	Schedule IV
237	White-browed Wagtail	*Motacilla maderaspatensis*	R	Least Concern	Schedule IV
238	White-eared Bulbul	*Pycnonotus leucotis*	R	Least Concern	Schedule IV
239	White-tailed Iora	*Marshall's Iora*	R	Least Concern	Schedule IV
240	White-tailed Lapwing	*Vanellus leucurus*	M	Least Concern	Schedule IV
241	White-Winged Tern	*Chlidonias leucopterus*	M	Least Concern	Schedule IV
242	Wire-tailed Swallow	*Hirundo smithii*	R	Least Concern	Not Listed
243	Wood Sandpiper	*Tringa glareola*	M	Least Concern	Schedule IV
244	Yellow Bittern	*Ixobrychus sinensis*	R	Least Concern	Schedule IV
245	Yellow-crowned Woodpecker	*Leiopicus mahrattensis*	R	Least Concern	Schedule IV
246	Yellow-eyed Babbler	*Chrysomma sinense*	R	Least Concern	Schedule IV
247	Yellow-footed Green-Pigeon	*Treron Phoenicopterus*	R	Least Concern	Schedule IV
248	Yellow-wattled Lapwing	*Vanellus malabaricus*	R	Least Concern	Schedule IV
249	Zitting Cisticola	*Cisticola juncidis*	R	Least Concern	Schedule IV

APPENDIX 20: COMPLIANCE STATUS OF THE APPOINTED CONTRACTOR INVOLVED IN CONSTRUCTION ACTIVITIES

S. No	Applicable Policies and Regulations	Institution Responsible	Applicability/Coverage	Recommendation
1.	Building and other Construction Worker (BOCW) registration	Assistant Labour Commissioner Officer	**Applicable** GWRPL has obtained BOCW registration with registration number JDISH/RJT/BOCW/174/2022 dated 03.01.2023. The registration is valid till 31.12.2023	Nil
2.	Principle Employers' Registration as per the section 7 of the Contract Labour (Regulation and Abolition) Act, 1970	Assistant Labour Commissioner Office	**Applicable** GWRPL has obtained the principal employer license with the registration number RJT/2020/CLRA/17. The license has covered both the contractors employed at the project – 1. Golden Crown Security Allied Services 2. M&N Infra Construction Private Limited	Nil
3.	Contract Labour License under the Contract Labour (Regulation & Abolition) Act 1970 And	Assistant Labour Commissioner Office	**Applicable on M&N Infra Construction Private Limited** M&M Infra construction Private Limited has obtained the contractual labour license with license number CLRA/License/CLRA/RJT/2022/CLL/32 **Not Applicable on Golden Crown Security Allied Services** The number of security personnel employed (which is 5) by the agency are below the mandatory applicability limit of 20 workers as per the Act. Therefore, as per the section 4 of the Act, the contractor labour license is not applicable on the agency.	Nil
4.	Registration under Gujarat. Inter-State Migrant Workmen (Regulation of	Office of the licensing officer, Government of India	**Applicable**	Nil

S. No	Applicable Policies and Regulations	Institution Responsible	Applicability/Coverage	Recommendation
	Employment and Conditions of Service) Rules, 1983, The Inter-State Migrant Workmen (Regulation of Employment And Conditions Of Service) Act, 1979		The Act is not applicable to M&M Infra Construction Private Limited. The employed workers by contractor are not falling under the purview of Inter-state migrant workmen[98]. The act requires the registration of such establishments and contractors with the local authorities, and the issuances of passbooks to the migrant workers with full details of their employment. The act also provides for various benefits and facilities to the migrant workers, such as displacement allowance, journey allowance, residential accommodation, medical facilities, protective clothing, equal pay for equal work, etc.[99].	
5.	The Child Labour (Prohibition and Regulation) Amendment Act, 2016	Labour Commissioner Officer	**Applicable** The project has not employed any child labour, as observed through consultation with workers and the review of personal files. This demonstrates a commitment to complying with the provisions of the Child Labour (Prohibition and Regulation) Amendment Act, 2016. Additionally, as a good practice, the project asks potential workers to submit a copy of their age proof document prior to employment. This helps in ensuring that only eligible workers above the legal age are employed and further strengthens the project's compliance with labour regulations. By implementing these measures, the project is taking proactive steps to prevent child labour and uphold the rights and welfare of workers. It is important to continue monitoring and maintaining such practice to	Nil

[98] Inter-state migrant workmen mean any person who is recruited by or through a contractor in one State under an agreement or other arrangement for employment in an establishment in another State, whether with or without the knowledge of the principal employer in relation to such establishment

[99] Interstate Migrant Workmen Act | Chief Labour Commissioner (clc.gov.in) (Accessed on June 06, 2023)

S. No	Applicable Policies and Regulations	Institution Responsible	Applicability/Coverage	Recommendation
			ensure ongoing compliance with applicable laws and regulations related to labour and child protection.	
6.	The Bonded Labour System (Abolition) Act, 1976	Labour Commissioner Office	**Applicable** Based on the consultation with the workers, it has been confirmed that there is no form of bonded labour employed at the Project level. Additionally, it is important to note that no workers have taken any form of debt from the contractor or the project, which would require them to work at the project as a means of repayment. This observation aligns with the provisions of the Bonded Labour System (Abolition) Act, 1976, which prohibits the practice of bonded labour. It is crucial to ensure that workers are not subjected to any form of forced labour or exploitation and that their rights are respected and protected. By complying with the Act and ensuring the absence of bonded labour, the project demonstrates a commitment to ethical and lawful practices in worker management. It is essential to maintain vigilance and regularly assess labour practices to prevent any potential instances of bonded labour and uphold the rights and dignity of all workers involved in the project.	Nil
7.	The Minimum Wages Act, 1948 The Payment of Gratuity Act, 1972	Labour Commissioned Office	**Applicable** It has been confirmed through consultation and a review of the wage register that all workers and security personnel at the project are receiving wages equivalent to the minimum wages prescribed by the Gujarat state notification[100], it indicates the compliance with the provisions of the Minimum Wages Act, 1948. The review of sample of wages received by the workers are provided below:	Nil (As a future looking recommendation, the project intends to ensure that all workers receive wages above and beyond the updated minimum wages notification issued by the state government. Paying workers' wages higher

[100] https://col.gujarat.gov.in/Portal/News/998_3_minimum_wages_46_Schedule_Employment_27.03.2023.pdf (Accessed on May 27, 2023)

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<tr><td>Workers 3</td><td>Security personnel</td><td>15,000/month and 577/day</td><td>Skilled</td><td>474</td></tr>
</table>
</td><td>than the minimum wage demonstrates a commitment to fair compensation and upholding workers' rights).</td></tr>
<tr><td>8.</td><td>Registration under the Private security Agencies (Regulation) Act, 2005</td><td>Department of Police</td><td>Applicable

Golden Crown Security and Allied Services – the private security providing agency has obtained the PSARA license vide license number 19083828 and is valid till 19.08.2024.</td><td>Nil</td></tr>
<tr><td>9.</td><td>Registration under the Employees’ Provident Funds and Miscellaneous Provisions Act, 1952</td><td>Employees’ Provident Fund Organization</td><td>Applicable

The applicability and status of the registration of contractor and security personnel are provided below:
<table>
<tr><th>Contractor/Project SPV</th><th>Applicability</th><th>Status</th></tr>
<tr><td>M&M Infra Construction Private Limited</td><td>The Act is not applicable on the contractor</td><td>As per the Act, an employee whose salary applicable for PF is more than INR 15,000 per month and first time covered under the</td></tr>
</table>
</td><td>The project shall ensure that M/s M&M Infra Construction Private Limited obtain the registration as per the provisions of the Act.

Further, all workers receive individual PF registration ID and shall receive the benefits.</td></tr>
</table>

S. No	Applicable Policies and Regulations	Institution Responsible	Applicability/Coverage			Recommendation
					Act, is an Excluded employee. **Note:** All the workers employed by the contractor are earning more than INR 15,000 per month and have not been covered under the Act before employing at the Project.	
			Golden Crown Security Allied Services	The Act is applicable on the contractor	The security agency has obtained the PF registration vide establishment code GJAH1910947000. Further, based on the consultation with security personnel, they are receiving benefits as per the Act.	
10.	Registration under the Employees' State Insurance Act, 1948	Employees' State Insurance Corporation	**Not Applicable – construction workers** Based on Hon'ble Supreme Court of India order dated 06.07.2018, ESIC is not applicable on the construction workers during the stay order. However, till date the stay order is applicable across India. Further, Employees State Insurance Corporation through its letter no.			Nil

S. No	Applicable Policies and Regulations	Institution Responsible	Applicability/Coverage	Recommendation
			T.11/13/03/2015 Rev.II dated 26.09.2018 – also clarifies that no ESIC contribution may be collected from construction site workers. **Applicable – Security personnel** Golden Crown Security and Allied Services has obtained the ESIC registration, and the employee code of the agency is 37001136390001018	

APPENDIX 21: STATUS OF PERMITS

S. No	Applicable Policies and Regulations	Institution Responsible	Applicability/Coverage	Recommendation
1.	The Environmental (Protection) Act 1986; EIA Notification 2020	MoEF&CC	***Not Applicable*** According to EIA Notification 2006 and amendment dated 25.06.2014, the Thermal Power plant up to 15MW, based on non-hazardous municipal waste and using auxiliary fuel such as coal / lignite / petroleum products up to 15% are exempted from prior environmental clearance. Additionally, Thermal Power plants using waste heat boiler without any auxiliary fuel are exempted from prior environmental clearance. Since the capacity of the project is 14.9 MW and MSW will be used as fuel for the boiler, therefore, environmental clearance is not applicable to the project	Nil
2.	Consent to Operate (CTO) under the air (Prevention and control of pollution) Act 1981 (the Air Act 1981) the water (Prevention and control of pollution) Act, 1974 9the Water Act, 1974	Gujarat Pollution Control Board	***Applicable*** The project has received Consent to Establish (CTE) under Air Act, 1981, Water Act 1974 dated 09.07.2019 valid till 10.06.2026. According to the conditions of the CTE, the project is entitled to use 500 TPD MSW and 350 TPD Refuse Derived Fuel (RDF) as fuel for the WTE plant. However, based on discussion with GWRPL, it is understood that approximately 1000 TPD MSW will be required for the operation of the WTE plant which is not aligned to the condition of the CTE.	The Project should update the existing CTE and ensure future CTO include procurement of 1000 TPD MSW for operation of the project instead of 850 TPD mentioned in the CTE.
3.	Hazardous and other waste (Management & Transboundary Movement Rules) 2016 as amended	Gujarat Pollution Control Board	Forward Looking Requirement The project will generate, store, and handle hazardous wastes such as used oil from operating equipment and DG sets, fly ash from ESP during operational phase which shall require hazardous waste authorization under Hazardous and other waste (Management & Transboundary Movement Rules) 2016	The Project should ensure Hazardous waste authorization is obtained prior to start of operation phase for the project.
4.	NOC for Ground water Abstraction	Central Groundwater Authority	***Applicable*** GWRPL has obtained No Objection Certificate (NOC) from CGWA on 02.11.2020 valid up to 01.11.2023. As per the NOC, the project can abstract 7.5 KLD water from one existing borewell within the project premises. Based on review of waterlog, it was observed that project is abstracting 7.5 KLD water from the borewell which is in compliance to the NOC obtained.	-
5.	Fire NOC	Fire and Emergency Services, Rajkot	***Applicable during operation Phase***	The Project should share application with Fire and Emergency Services, Rajkot

S. No	Applicable Policies and Regulations	Institution Responsible	Applicability/Coverage	Recommendation
		Municipal Corporation	The Project will apply for fire NOC or necessary approval (as applicable) for the project prior to start of operation phase	Municipal Corporation for obtaining necessary approval.
6.	Forest Clearance under The Forest (Conservation) Act, 1980 Wildlife Clearance under the Wildlife (Protection)Act, 1972		**Not Applicable** Since there are no protected areas such as national parks, wildlife sanctuaries, biosphere reserved within 10 km of the project area, therefore forest clearance and wildlife clearance are not applicable to the project.	Nil
7.	Building and other Construction Worker (BOCW) registration	Assistant Labour Commissioner Officer	**Applicable** GWRPL has obtained BOCW registration with registration number JDISH/RJT/BOCW/174/2022 dated 03.01.2023. The registration is valid till 31.12.2023	Nil
8.	Principle Employers' Registration as per the section 7 of the Contract Labour (Regulation and Abolition) Act, 1970	Assistant Labour Commissioner Office	**Applicable** GWRPL has obtained the principal employer license with the registration number RJT/2020/CLRA/17. The license has covered both the contractors employed at the project – 3. Golden Crown Security Allied Services 4. M&N Infra Construction Private Limited	Nil
9.	Contract Labour License under the Contract Labour (Regulation & Abolition) Act 1970 And	Assistant Labour Commissioner Office	**Applicable on M&N Infra Construction Private Limited** M&M Infra construction Private Limited has obtained the contractual labour license with license number CLRA/License/CLRA/RJT/2022/CLL/32 **Not Applicable on Golden Crown Security Allied Services** The number of security personnel employed (which is 5) by the agency are below the mandatory applicability limit of 20 workers as per the Act. Therefore, as per the section 4 of the Act, the contractor labour license is not applicable on the agency.	Nil
10.	Registration under Gujarat. Inter-State Migrant Workmen (Regulation of Employment and	Office of the licensing officer, Government of India	**Applicable** The Act is not applicable to M&M Infra Construction Private Limited. The employed workers by contractor are not falling under the purview of Inter-state migrant workmen[101].	Nil

[101] Inter-state migrant workmen mean any person who is recruited by or through a contractor in one State under an agreement or other arrangement for employment in an establishment in another State, whether with or without the knowledge of the principal employer in relation to such establishment

S. No	Applicable Policies and Regulations	Institution Responsible	Applicability/Coverage	Recommendation
	Conditions of Service) Rules, 1983, The Inter-State Migrant Workmen (Regulation of Employment And Conditions Of Service) Act, 1979		The act requires the registration of such establishments and contractors with the local authorities, and the issuances of passbooks to the migrant workers with full details of their employment. The act also provides for various benefits and facilities to the migrant workers, such as displacement allowance, journey allowance, residential accommodation, medical facilities, protective clothing, equal pay for equal work, etc.[102].	
11.	The Child Labour (Prohibition and Regulation) Amendment Act, 2016	Labour Commissioner Officer	**Applicable** The project has not employed any child labour, as observed through consultation with workers and the review of personal files. This demonstrates a commitment to complying with the provisions of the Child Labour (Prohibition and Regulation) Amendment Act, 2016. Additionally, as a good practice, the project asks potential workers to submit a copy of their age proof document prior to employment. This helps in ensuring that only eligible workers above the legal age are employed and further strengthens the project's compliance with labour regulations. By implementing these measures, the project is taking proactive steps to prevent child labour and uphold the rights and welfare of workers. It is important to continue monitoring and maintaining such practice to ensure ongoing compliance with applicable laws and regulations related to labour and child protection.	Nil
12.	The Bonded Labour System (Abolition) Act, 1976	Labour Commissioner Office	**Applicable** Based on the consultation with the workers, it has been confirmed that there is no form of bonded labour employed at the Project level. Additionally, it is important to note that no workers have taken any form of debt from the contractor or the project, which would require them to work at the project as a means of repayment. This observation aligns with the provisions of the Bonded Labour System (Abolition) Act, 1976, which prohibits the practice of bonded labour. It is crucial to ensure that workers are not subjected to any form of forced labour or exploitation and that their rights are respected and protected. By complying with the Act and ensuring the absence of bonded labour, the project demonstrates a commitment to ethical and	Nil

[102] Interstate Migrant Workmen Act | Chief Labour Commissioner (clc.gov.in) (Accessed on June 06, 2023)

<table>
<tr><th>S. No</th><th>Applicable Policies and Regulations</th><th>Institution Responsible</th><th>Applicability/Coverage</th><th>Recommendation</th></tr>
<tr><td></td><td></td><td></td><td>lawful practices in worker management. It is essential to maintain vigilance and regularly assess labour practices to prevent any potential instances of bonded labour and uphold the rights and dignity of all workers involved in the project.</td><td></td></tr>
<tr><td>13.</td><td>The Minimum Wages Act, 1948

The Payment of Gratuity Act, 1972</td><td>Labour Commissioned Office</td><td>Applicable

It has been confirmed through consultation and a review of the wage register that all workers and security personnel at the project are receiving wages equivalent to the minimum wages prescribed by the Gujarat state notification[103], it indicates the compliance with the provisions of the Minimum Wages Act, 1948.

The review of sample of wages received by the workers are provided below:

<table><tr><th>Workers</th><th>Employment</th><th>Wages Received</th><th>Class of employee</th><th>Wages as per notification</th></tr><tr><td>Workers 1</td><td>Construction workers</td><td>700/day</td><td>Skilled</td><td>474</td></tr><tr><td>Workers 2</td><td>Helper in construction activities</td><td>500-600/day</td><td>Semi-skilled and unskilled</td><td>462</td></tr><tr><td>Workers 3</td><td>Security personnel</td><td>15,000/month and 577/day</td><td>Skilled</td><td>474</td></tr></table></td><td>Nil

(As a future looking recommendation, the project intends to ensure that all workers receive wages above and beyond the updated minimum wages notification issued by the state government. Paying workers’ wages higher than the minimum wage demonstrates a commitment to fair compensation and upholding workers' rights).</td></tr>
<tr><td>14.</td><td>Registration under the Private security Agencies (Regulation) Act, 2005</td><td>Department of Police</td><td>Applicable

Golden Crown Security and Allied Services – the private security providing agency has obtained the PSARA license vide license number 19083828 and is valid till 19.08.2024.</td><td>Nil</td></tr>
<tr><td>15.</td><td>Registration under the Employees’ Provident Funds and Miscellaneous Provisions Act, 1952</td><td>Employees’ Provident Fund Organization</td><td>Applicable

The applicability and status of the registration of contractor and security personnel are provided below:</td><td>The project shall ensure that M/s M&M Infra Construction Private Limited obtain the registration as per the provisions of the Act.

Further, all workers receive individual PF registration ID and shall receive the benefits.</td></tr>
</table>

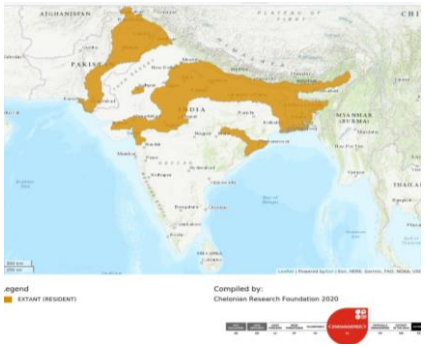
[103] https://col.gujarat.gov.in/Portal/News/998_3_minimum_wages_46_Schedule_Employment_27.03.2023.pdf (Accessed on May 27, 2023)

S. No	Applicable Policies and Regulations	Institution Responsible	Applicability/Coverage			Recommendation
			Contractor/Project SPV	Applicability	Status	
			M&M Infra Construction Private Limited	The Act is not applicable on the contractor	As per the Act, an employee whose salary applicable for PF is more than INR 15,000 per month and first time covered under the Act, is an Excluded employee. **Note:** All the workers employed by the contractor are earning more than INR 15,000 per month and have not been covered under the Act before employing at the Project.	
			Golden Crown Security Allied Services	The Act is applicable on the contractor	The security agency has obtained the PF registration vide establishment code GJAH1910947000. Further, based on the consultation with security personnel, they are receiving benefits as per the Act.	
16.	Registration under the Employees' State Insurance Act, 1948	Employees' State Insurance Corporation	**Not Applicable – construction workers** Based on Hon'ble Supreme Court of India order dated 06.07.2018, ESIC is not applicable on the construction workers during the stay order. However, till date the stay order is applicable across India. Further, Employees State Insurance Corporation through its letter no. T.11/13/03/2015 Rev.II dated 26.09.2018 – also clarifies that no ESIC contribution may be collected from construction site workers. **Applicable – Security personnel**			Nil

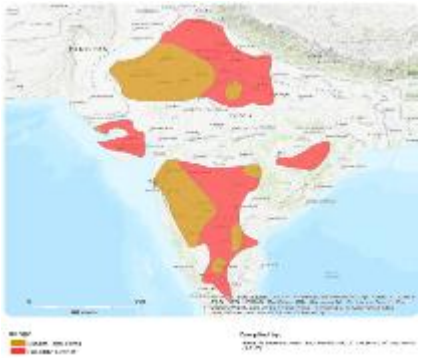
S. No	Applicable Policies and Regulations	Institution Responsible	Applicability/Coverage	Recommendation
			Golden Crown Security and Allied Services has obtained the ESIC registration, and the employee code of the agency is 37001136390001018	

APPENDIX 22: CRITICAL HABITAT SCREENING

Appendix 22: Critical Habitat Screening (Rajkot Site)

S.N.	Common English Name (Binomial Scientific Name) Distribution Map	IUCN[1] Categories IWP[2] Schedules Endemicity Migratory Status	CHA Criteria	Screening Argument	Screened In or Out
Herpetofauna					
1	Indian Softshell Turtle (*Nilssonia gangetica*)  https://www.iucnredlist.org/species/39618/2930943	**IUCN:** Endangered **IWP:** Schedule I **Restricted range:** No **Migratory:** No	1 a, c	Indian Softshell Turtle occurs throughout the northern plains of the Indian Subcontinent, in the Indus, Ganga, Narmada and Mahanadi basins[3] They inhabit mostly in rivers, and large canals, preferably with turbid water, muddy bottom and some current. Lakes, oxbows, ponds and temporary waterbodies are used occasionally. It basks on riverine sandbanks[4] and feeds on a variety of items, including animal matter (actively predating birds, reptiles, fish and invertebrates as well as eating carrion) and aquatic plants[5]. They can be found to occupy various types of habitats such as the sea (marine turtles), land (terrestrial turtles), and around lakes, ponds and streams (freshwater turtles). Freshwater testudines feed on algal bloom and some even on dead matter, keeping our water clean. These animals are also known to contribute to seed dispersal and germination.[6] Although the species distribution map includes its presence in the coasts of the country (India) i.e. West Bengal, Odisha, and Gujrat. In Gujrat, its distribution restricted in the Gujrat mainland, portion of Saurashtra and coast of Gulf of Khambhat. As per the available secondary information[7, 8, 9], the species is available in the Gujarat, but no records are available from the Rajkot area specifically project's EAAA.	Screened Out
Birds					
2	Great Indian Bustard (*Ardeotis nigriceps*)	**IUCN:** Critically Endangered **IWP:** Schedule I	1 a, c	Great Indian Bustard inhabits arid and semi-arid grasslands with scattered short scrub, bushes and low intensity cultivation in flat or gently	Screened Out

[1] IUCN RedList - Online Version 2023-1
[2] Indian Wildlife (Protection) Act. 1972
[3] www.iucnredlist.org/species/pdf/2930943
[4] Minton Jr., S.A. 1966. A contribution to the herpetology of West Pakistan. Bulletin of the American Museum of Natural History 134(2): 27-184.
[5] Bhupathy, S. 1990. Observations on the food of the Ganges softshell turtle Trionyx gangeticus in Keoladeo National Park, Bharatpur. Journal of the Bombay Natural History Society 87: 460–461.
[6] https://wildlifesos.org/anti-poaching/introducing-the-indian-softshell-turtle/
[7] https://www.inaturalist.org/observations?place_id=any&subview=map&taxon_id=73648
[8] https://www.gbif.org/species/2442542
[9] https://indiabiodiversity.org/species/show/238650

	 https://www.iucnredlist.org/species/22691932/134188105	**Restricted range:** Yes **Migratory:** No		undulating terrain. These birds congregate in traditional less disturbed grassland patches to breed during mid-summer and monsoon[10] Great Indian Bustard has been extirpated from 90% of its former range and is now principally confined to Rajasthan. In 2014 a survey of the Thar Desert, Rajasthan, estimated the species was present at a density of 0.61 ± 0.36 individuals/100 km^2. Smaller populations (likely to be considerably fewer than 15-20 birds[11]) are present in Gujarat, Maharashtra, Andhra Pradesh, and Karnataka states of India. In India, their population is confined mostly to Rajasthan and Gujarat. Small population occur in Maharashtra, Karnataka and Andhra Pradesh[12]. Historically the species was present throughout the Kachchh and Saurashtra, but now only restricted in the Kutch Bustard Wildlife Sanctuary and Chhari Dhand[13], and there are no recent records of the species from the Rajkot and surrounding area[14, 15].	
3	Indian Vulture (*Gyps indicus*)	**IUCN:** Critically Endangered **IWP:** Schedule I **Restricted range:** No **Migratory:** No	1 a, c	Indian Vulture is found in cities, towns and villages near cultivated areas, and in open and wooded areas. This species feeds almost entirely on carrion, and often associates with White-rumped Vulture (*Gyps bengalensis*) when scavenging at carcass dumps and slaughterhouses. It nests almost exclusively in colonies on cliffs and ruins, and although reported nesting in trees, where cliffs are absent[16]. It was common until very recently, but since the mid-1990s has suffered a catastrophic decline (over 97%) throughout its range (peninsular India, south of the Gangetic plain, north to Delhi, east through Madhya Pradesh, south to the Nilgiris, and occasionally further south)[17].	Screened Out

[10] Dutta, S., Bhardwaj, G.S., Bhardwaj, D.K. and Jhala, Y.V. 2014. Status of Great Indian Bustard and Associated Wildlife in Thar. Wildlife Institute of India, Dehradun and Rajasthan Forest Department, Jaipur.

[11] Patil, P. 2011. Joint meeting to discuss conservation of Great Indian Bustard sanctuary. Protected Area Update 17(3): 13.

[12] https://www.wwfindia.org/about_wwf/priority_species/threatened_species/great_indian_bustard/#:~:text=Habitat%20and%20distribution&text=Its%20stronghold%20was%20once%20the,Maharashtra%2C%20Karnataka%20and%20Andhra%20Pradesh.

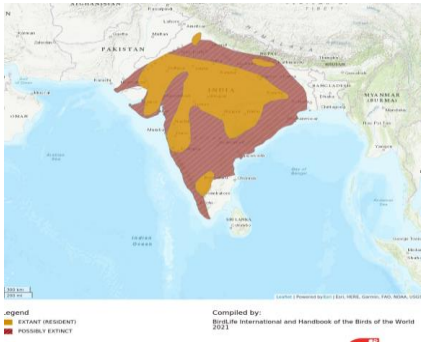
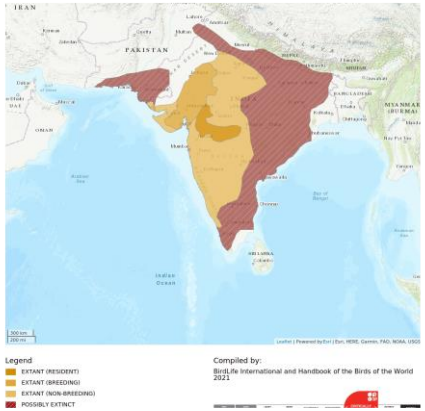
[13] Rahmani, A.R., Islam, M.Z. and Kasambe, R.M. (2016) Important Bird and Biodiversity Areas in India: Priority Sites for Conservation (Revised and updated). Bombay Natural History Society, Indian Bird Conservation Network, Royal Society for the Protection of Birds and BirdLife International (U.K.). Pp. 1992 + xii

[14] https://ebird.org/map/indbus1?neg=true&env.minX=71.6063984938414&env.minY=21.67832696029772&env.maxX=74.4188984938414&env.maxY=22.80957374465867&zh=true&gp=true&ev=Z&excludeExX=false&excludeExAll=false&mr=1-12&bmo=1&emo=12&yr=all&byr=1900&eyr=2024

[15] https://www.inaturalist.org/observations?place_id=any&subview=map&taxon_id=114

[16] BirdLife International. 2021. Gyps indicus. The IUCN Red List of Threatened Species 2021: e.T22729731A204672586

[17] Collar, N., Chen, H. and Crosby, M. 2001. Threatened Birds of Asia: the BirdLife International Red Data Book. BirdLife International, Cambridge, UK.

	 https://www.iucnredlist.org/species/22729731/204672586			The species distribution map includes Gujrat state (Banni Grassland and Chhari Dhand, Gir National Park and Wildlife Sanctuary, Rampura Grassland, Thol Lake Bird Sanctuary, Velavadar National Park, Wild Ass Wildlife Sanctuary & Nanda Island and Nikol-Samadhiyala-Malan Wetlands Complex)[18]. Last time the species was observed (with maximum 2 individuals) during Feb. 1996 from the surroundings of Randarda Lake[19]. Thus, is less likely to meet the threshold i.e. 50-150 (≥1 percent of the global population[20]) for the EAAA.	
4	Lesser Florican (*Sypheotides indicus*)  https://www.iucnredlist.org/species/22692024/199959007	**IUCN:** Critically Endangered **IWP:** Schedule I **Restricted range:** No **Migratory:** No	1 a, c	Lesser Florican breeds in India in Gujarat, Rajasthan, Maharashtra, Madhya Pradesh and Andhra Pradesh, with some dispersal to south-east India in the non-breeding season. It is a very rare summer visitor (<10 birds) to the terai of Nepal[21]. In India, the total population has been calculated from a recent and robust survey over most of the range which estimated 340 displaying males (95% CI 162–597)[22]. The Lesser Florican occurs in dry grasslands with scattered bushes, scrub and to a lesser extent in tall crops of millet and cotton. The species is a local migrant with movements apparently determined by rainfall patterns. As such migration is considered partial and opportunistic with birds concentrating in areas that receive more rainfall, however there is believed to be a high level of site fidelity among males[23]. Breeding coincides with the south-west monsoon, May-September, with birds congregating in north-central and west India for males to perform extraordinary leaping aerial displays. Sufficient grass cover is particularly important during the breeding season.	Screened Out

[18] Rahmani, A.R., Islam, M.Z. and Kasambe, R.M. (2016) Important Bird and Biodiversity Areas in India: Priority Sites for Conservation (Revised and updated). Bombay Natural History Society, Indian Bird Conservation Network, Royal Society for the Protection of Birds and BirdLife International (U.K.). Pp. 1992 + xii

[19] https://ebird.org/checklist/S29440035

[20] https://www.iucnredlist.org/species/22729731/204672586#population

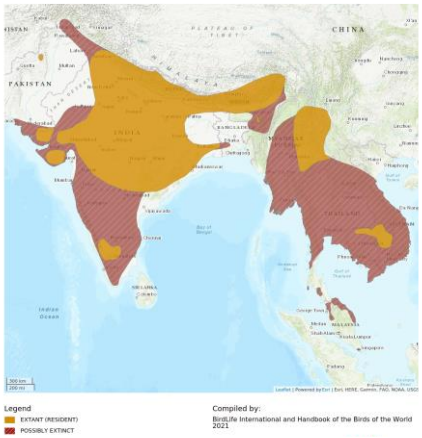
[21] BirdLife International. 2021. Sypheotides indicus. The IUCN Red List of Threatened Species 2021: e.T22692024A199959007

[22] Dutta, S., Narwade, S., Bipin, C. M., Gadhavi, D., Uddin, M., *et. al.* 2018. Status of the Lesser Florican Sypheotides indicus and implications for its conservation. Dehradun: Wildlife Institute of India.

[23] Dutta, S., Narwade, S., Bipin, C. M., Gadhavi, D., Uddin, M., et. al. 2018. Status of the Lesser Florican Sypheotides indicus and implications for its conservation. Dehradun: Wildlife Institute of India.

				Although the species distribution map includes few of the coasts of the country (India), however as per the available secondary information, the species has been reported from the Gujarat state and not from the surroundings of Jamnagar area[24] As per the Important Bird and Biodiversity Areas in India: Priority Sites for Conservation (Revised and updated Edition - 2016) [25], the species is reported from Banni Grassland & Chhari Dhand, Bhal Area, Gir National Park and Wildlife Sanctuary, Naliya Grassland (Wildlife Kutch Bustard Sanctuary), Rampura Grassland, Velavadar National Park and Wild Ass Wildlife Sanctuary & Nanda Island, and all the above-mentioned areas are away from the Rajkot. The available secondary data[26, 27] reports a single observation from the Rajkot district (from the Gondal town)[28] which is about 30 km away from the project's EAAA. The absence of suitable habitat, increased level of human activities and lack of recent records indicates unlikelihood of this species in EAAA.	
5	Red-headed Vulture (*Sarcogyps calvus*)	**IUCN:** Critically Endangered **IWP:** Schedule I **Restricted range:** No **Migratory:** No	1 a, c	Red-headed Vultures are widely distributed across India, Indian subcontinent, China, Thailand, Laos, Viet Nam, Cambodia, Malaysia, and Singapore. Historical reports indicate that it was widespread and generally abundant, but it has undergone a massive population and range decline in recent decades. Recent information indicates that in India the species started undergoing a rapid decline (41% per year) in about 1999 and declined by 91% between the early 1990s and 2003[29]. It frequents open country usually away from human habitation, well-wooded hills and dry deciduous forest with rivers, usually below 2,500 m. Nesting has been recorded in tall trees[30] Although the species distribution map includes few of the coasts of the country (India), however as per the available secondary information, the species has been reported from the Gujarat state and not from the surroundings of Jamnagar area[31] In Gujrat state, the species has been reported from Banni Grassland and Chhari Dhand, Gir National Park and Wildlife Sanctuary, Khijadia Bird Sanctuary, Wild Ass Wildlife	Screened Out

[24] https://ebird.org/region/IN-GJ-JA
[25] Rahmani, A.R., Islam, M.Z. and Kasambe, R.M. (2016) Important Bird and Biodiversity Areas in India: Priority Sites for Conservation (Revised and updated). Bombay Natural History Society, Indian Bird Conservation Network, Royal Society for the Protection of Birds and BirdLife International (U.K.). Pp. 1992 + xii
[26] https://ebird.org/region/IN-GJ-RA?yr=all
[27] https://www.inaturalist.org/observations?place_id=any&subview=map&taxon_id=130
[28] https://ebird.org/map/lesflo2?neg=true&env.minX=70.82915857681866&env.minY=22.289301818353294&env.maxX=70.85113123306866&env.maxY=22.298136732288615&zh=true&gp=true&ev=Z&excludeExX=false&excludeExAll=false&mr=1-12&bmo=1&emo=12&yr=all&byr=1900&eyr=2024
[29] Cuthbert, R.; Green, R.E.; Ranade, S.; Saravanan, S.; Pain, D.J.; Prakash, V.; Cunningham, A. A. 2006. Rapid population declines of Egyptian Vulture (Neophron percnopterus) and Red-headed Vulture (Sarcogyps calvus) in India. Animal Conservation 9(3): 349-354.
[30] BirdLife International. 2021. Sarcogyps calvus. The IUCN Red List of Threatened Species 2021: e.T22695254A205031246
[31] https://ebird.org/region/IN-GJ-JA

	 https://www.iucnredlist.org/species/22695254/205031246			Sanctuary & Nanda Island and Nikol-Samadhiyala-Malan Wetlands Complex[32]. In Saurashtra region, the species has stray records from Junagarh, Gir Somnath, Amreli and Bhavnagar districts[33]; however, there is no record of the species from the Rajkot city as well as EAAA[34, 35].	
6	Sociable Lapwing (*Vanellus gregarious*)	**IUCN:** Critically Endangered **IWP:** Schedule I **Restricted range:** No **Migratory:** Yes	1 a, c	Sociable Lapwing breeds in northern and central Kazakhstan and south-central Russia (and, at least formerly, Xinjiang province, western China[36], dispersing through Kyrgyzstan, Tajikistan, Uzbekistan, Turkmenistan, Afghanistan, Armenia, Georgia, Azerbaijan, Iran, Iraq, Saudi Arabia, Syria, Turkey and Egypt for wintering in Sudan, Saudi Arabia, Oman, UAE, Pakistan, and north-west India (45 birds in the Little Rann of Kutch in November 2007[37], 30 at Great Rann of Kutch in November 2008 and 2012[38]. Sociable lapwing uses dry wastelands, cultivated, ploughed and stubble fields[39]. It winters in Sudan, Eritrea, Israel, Arabian Peninsula, Pakistan and India, possibly also in Iraq and Iran[40].	Screened Out

[32] Rahmani, A.R., Islam, M.Z. and Kasambe, R.M. (2016) Important Bird and Biodiversity Areas in India: Priority Sites for Conservation (Revised and updated). Bombay Natural History Society, Indian Bird Conservation Network, Royal Society for the Protection of Birds and BirdLife International (U.K.). Pp. 1992 + xii

[33] https://ebird.org/species/rehvul1

[34]https://ebird.org/region/IN-GJ-RA?yr=all

[35]https://www.inaturalist.org/observations?iconic_taxa=Aves&place_id=32163&subview=map&view=species

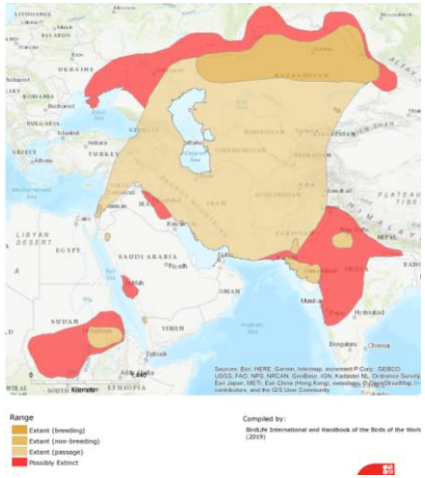
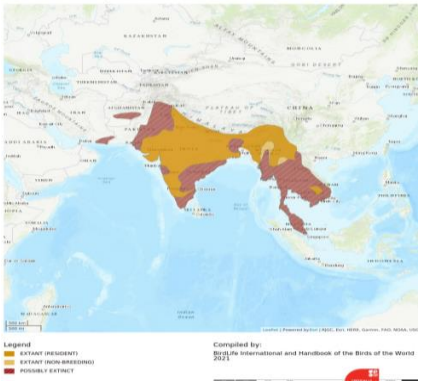
[36] Kamp, J.; Koshkin, M. A.; Sheldon, R. D. 2010. Historic breeding of Sociable Lapwing (Vanellus gregarius) in Xinjiang. Chinese Birds 1(1): 70-73.

[37] Deomurari, A. 2007. Western India: Gujarat Kutch Birding and Wildlife Tour, November 2007.

[38] Sheldon, R. 2013. The Sociable Lapwing - Interim short report to the BirdLife International Preventing Extinctions Programme. BirdLife International Preventing Extinctions Programme.

[39] https://www.iucnredlist.org/species/22694053/155545788#habitat-ecology

[40] https://birdsoftheworld.org/bow/species/soclap1/cur/introduction?login

	 https://www.iucnredlist.org/species/22694053/155545788			As per the Important Bird and Biodiversity Areas in India: Priority Sites for Conservation (Revised and updated Edition - 2016) [41], the species is reported from Flamingo City and Naliya Grassland (Wildlife Kutch Bustard Sanctuary). Both the IBAs are located in the Kutch region, and there is no record of this Migratory species from the Rajkot and surrounding areas[42, 43]. Thus, the presence of the species in the project's EAAA is less likely.	
7	White-rumped Vulture (*Gyps bengalensis*) 	**IUCN:** Critically Endangered **IWP:** Schedule I **Restricted range:** No **Migratory:** No	1 a, c	White-rumped Vulture is seen in Pakistan, India, Bangladesh, Nepal, Bhutan, Myanmar, Thailand, Laos, Cambodia and southern Viet Nam, and may be extinct in southern China and Malaysia[44]. It has been recorded from south-east Afghanistan and Iran where its status is currently unknown. They are found mostly in plains and less frequently in hilly regions where it utilises light woodland, villages, cities, and open areas. They feed on carrion, both putrid and fresh. While feeding considerable aggregations can form, and regular communal roost sites are used[45]. This species suffered dramatic population declines during the 1990s across its range. The total population is therefore estimated to be c. 6,000-9,000 individuals, equating to 4,000-6,000 mature individuals. There are now an estimated c.6,000 individuals in India[46]. Declines in the major part of the population throughout the Indian Subcontinent probably began in the 1990s and were very rapid, resulting in an overall population decline of greater than 99% over a 10-15 year period.	Screened Out

[41] Rahmani, A.R., Islam, M.Z. and Kasambe, R.M. (2016) Important Bird and Biodiversity Areas in India: Priority Sites for Conservation (Revised and updated). Bombay Natural History Society, Indian Bird Conservation Network, Royal Society for the Protection of Birds and BirdLife International (U.K.). Pp. 1992 + xii

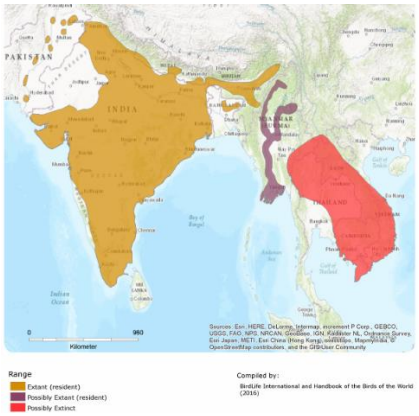
[42] https://ebird.org/region/IN-GJ-RA?yr=all

[43] https://www.inaturalist.org/observations?iconic_taxa=Aves&place_id=32163&subview=map&view=species

[44] BirdLife International. 2001. Threatened birds of Asia: the BirdLife International Red Data Book. BirdLife International, Cambridge, U.K.

[45] BirdLife International. 2021. Gyps bengalensis. The IUCN Red List of Threatened Species 2021: e.T22695194A204618615

[46] BirdLife International. 2021. Gyps bengalensis. The IUCN Red List of Threatened Species 2021: e.T22695194A204618615

	https://www.iucnredlist.org/species/22695194/204618615			Although the species distribution map includes the entire Gujarat state (Banni Grassland and Chhari Dhand, Charakla Saltworks, Gir National Park and Wildlife Sanctuary, Nalsarovar Wildlife Sanctuary, Rampura Grassland, Salt Pans of Bhavnagar, Thol Lake Bird Sanctuary, Velavadar National Park, Wild Ass Wildlife Sanctuary & Nanda Island, Bhaskarapra wetland and Nikol-Samadhiyala-Malan Wetlands Complex)[47]. Lastly the species (with maximum 5 individuals) was reported from the Rajkot city (Randarda Lake) in 1996[48], after that the most recent observation of a single individual was recorded in 2001 from the Nyari-1 Dam[49]. Thus, is less likely to meet the threshold i.e. 60-90 (≥1 percent of the global population) for the EAAA.	
8	Black-bellied Tern (*Sterna acuticauda*)  https://www.iucnredlist.org/species/22694711/207933556	**IUCN:** Endangered **IWP:** Schedule I **Restricted range:** No **Migratory:** No	1 a, c	The Black-bellied Tern is widespread throughout India, but there are signs of local decline and regional extinction. It is found on large rivers (usually breeding on sand spits and islands) and marshes, occasionally on smaller pools and ditches, in lowlands (but not on the coast), up to 730 m[50]. The presence of Black-bellied Tern is uncertain, as per the Important Bird and Biodiversity Areas in India: Priority Sites for Conservation (Revised and updated Edition - 2016) [51], the species is reported from Khijadia Bird Sanctuary, Nalsarovar Wildlife Sanctuary, Thol Lake Bird Sanctuary, Gosabara (Mokarsar) Wetland Complex, and Nikol-Samadhiyala-Malan Wetlands Complex. The species also has a good presence in the Nalsarovar area[52], which is about 130 km from the Rajkot city as well as from the project area. As per the available secondary data[53, 54], there is no record of the species from the Rajkot area. Thus, there is less likelihood of the presence of this species in project's EAAA.	Screened Out

[47] Rahmani, A.R., Islam, M.Z. and Kasambe, R.M. (2016) Important Bird and Biodiversity Areas in India: Priority Sites for Conservation (Revised and updated). Bombay Natural History Society, Indian Bird Conservation Network, Royal Society for the Protection of Birds and BirdLife International (U.K.). Pp. 1992 + xii

[48] https://ebird.org/checklist/S29440035

[49] https://ebird.org/india/checklist/S120982626

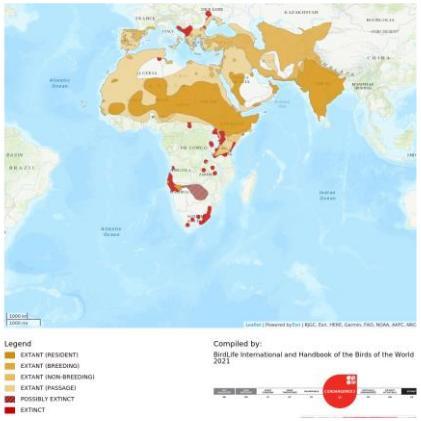
[50] https://www.iucnredlist.org/species/22694711/207933556

[51] Rahmani, A.R., Islam, M.Z. and Kasambe, R.M. (2016) Important Bird and Biodiversity Areas in India: Priority Sites for Conservation (Revised and updated). Bombay Natural History Society, Indian Bird Conservation Network, Royal Society for the Protection of Birds and BirdLife International (U.K.). Pp. 1992 + xii

[52] https://ebird.org/map/blbter1?neg=true&env.minX=71.77370535326625&env.minY=21.50086923400874&env.maxX=74.58620535326625&env.maxY=22.633537917591244&zh=true&gp=true&ev=Z&excludeExX=false&excludeExAll=false&mr=1-12&bmo=1&emo=12&yr=all&byr=1900&eyr=2024

[53] https://ebird.org/region/IN-GJ-RA?yr=all

[54] https://www.inaturalist.org/observations?place_id=any&subview=map&taxon_id=4461

9	Egyptian Vulture (*Neophron percnopterus*)  https://www.iucnredlist.org/species/22695180/205187871	**IUCN:** Endangered **IWP:** Schedule I **Restricted range:** No **Migratory:** No	1 a, c	Egyptian Vulture occupies a large range with isolated resident populations in the Cabo Verde and Canary Islands in the west. In Europe, the breeding population is estimated to number 3,000-4,500 breeding pairs, equating to 6,100-9,000 mature individuals. Europe forms 25-49% of the global range, so a very preliminary estimate of the global population size is 12,400-36,000 mature individuals, roughly equating to 18,600-54,000 individuals, although further validation of this estimate is needed[55]. Egyptian Vulture forages in lowland and montane regions over open, often arid, country, and also scavenges at human settlements. It has a broad diet including carrion, tortoises, organic waste, insects, young vertebrates, eggs and even faeces[56, 57, 58]. Usually solitary, individuals congregate at feeding sites, such as rubbish tips, or vulture restaurants (i.e. supplementary feeding stations), and form roosts of nonbreeding birds[59]. As per the Important Bird and Biodiversity Areas in India: Priority Sites for Conservation (Revised and updated Edition - 2016) [60], the species is reported from Banni Grassland & Chhari Dhand, Bhal Area, Gir National Park and Wildlife Sanctuary, Khijadia Bird Sanctuary, Nalsarovar Wildlife Sanctuary, Velavadar National Park, and Wild Ass Wildlife Sanctuary & Nanda Island. Undoubtedly the species has a presence in the surroundings of Rajkot area[61], however based on available secondary information extracted from eBird Database[62] (which reports maximum 7 individuals from the Sat Hanuman Pond in 1998[63]); while the most resent, one individual was reported from the same locality in 2004[64]). Thus, it is less likely to meet the threshold i.e. 186-540 (≥1 percent of the global population[65]) for the EAAA.	Screened Out

[55] BirdLife International. 2021. Neophron percnopterus. The IUCN Red List of Threatened Species 2021: e.T22695180A205187871

[56] Margalida, A.; Benitez, J. R.; Sanchez-Zapata, J. A.; Ávila, E.; Arenas, R.; Donázar, J. A. 2012. Long-term relationship between diet breadth and breeding success in a declining population of Egyptian Vultures Neophron percnopterus. Ibis 154: 184-188.

[57] Dobrev, V.; Boev, Z.; Oppel, S.; Arkumarev, V.; Dobrev, D.; Kret, E.; Vavylis, D.; Saravia, V.; Bounas, A.; Nikolov, S. C. 2015. Diet of the Egyptian vulture (Neophron percnopterus) in Bulgaria and Greece (2005-2013). Technical report under action A5 of the LIFE+ project "The Return of the Neophron" (LIFE10NAT/BG/000152). BSPB.

[58] Dobrev, V.; Boev, Z.; Arkumarev, V.; Dobrev, D.; Kret, E.; Saravia, V.; Bounas, A.; Vavylis, D.; Nikolov, S. C.; Oppel, S. 2016. Diet is not related to productivity but to territory occupancy in a declining population of
Egyptian Vultures Neophron percnopterus. Bird Conservation International (in press).

[59] Ceballos, O.; Donázar, J. A. 1990. Roost-tree characteristics, food habits and seasonal abundance of roosting Egyptian Vultures in northern Spain. Journal of Raptor Research 24: 19-25.

[60] Rahmani, A.R., Islam, M.Z. and Kasambe, R.M. (2016) Important Bird and Biodiversity Areas in India: Priority Sites for Conservation (Revised and updated). Bombay Natural History Society, Indian Bird Conservation Network, Royal Society for the Protection of Birds and BirdLife International (U.K.). Pp. 1992 + xii

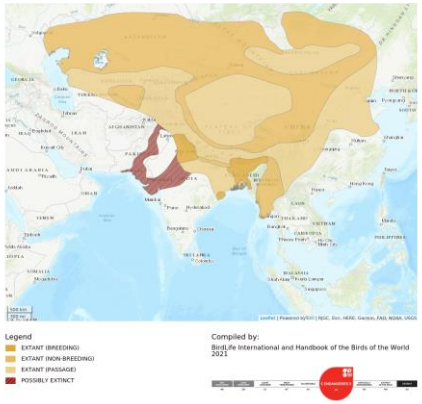
[61] https://ebird.org/barchart?r=IN-GJ-VD&yr=all&m=

[62] https://ebird.org/map/egyvul1?neg=true&env.minX=72.96040721661194&env.minY=21.971868749158293&env.maxX=73.31196971661194&env.maxY=22.1134799101479 87&zh=true&gp=true&ev=Z&excludeExX=false&excludeExAll=false&mr=1-12&bmo=1&emo=12&yr=all&byr=1900&eyr=2024

[63] https://ebird.org/india/checklist/S120880003

[64] https://ebird.org/india/checklist/S121483812

[65] https://www.iucnredlist.org/species/22696027/203868747#population

10	Pallas's Fish-eagle (*Haliaeetus leucoryphus*)  https://www.iucnredlist.org/species/22695130/199521572	**IUCN:** Endangered **IWP:** Schedule I **Restricted range:** No **Migratory:** Yes	1 a, c	Pallas's Fish-eagle previously thought to be a migratory breeder north of the Himalayas, with a stronghold in Mongolia, and a resident population in the Indian subcontinent, recent evidence and re-evaluation of historical data has since suggested that this is not, and may never have been, the case. The species may instead breed only in northern India (apparent strongholds in Assam and Uttarakhand), Bangladesh and Myanmar, with very small numbers in Bhutan, dispersing north of the Himalayas to Kazakhstan, Russia and Mongolia in its non-breeding season (May to September)[66]. Based on surveys and available data from across the species's extant distribution, the population is estimated to fall in the band 1,000-2,499 mature individuals[67]. It is closely associated with wetlands, principally large lakes and rivers, from the lowlands to 5,000 m. It generally nests in trees near water. Breeding takes place from September-February in northern India and Myanmar[68] and in Bangladesh it returns to nest sites in late August[69]. Although the species was historically reported from Khijadia Bird Sanctuary and Nalsarovar Wildlife Sanctuary[70]; however, the species has not been reported from Gujrat since long time[71, 72] and this area also comes under the area where the species has been possibly extinct i.e. not recorded since long time (as per the IUCN map of species distribution)[73].	Screened Out
11	Saker Falcon (*Falco cherrug*)	**IUCN:** Endangered **IWP:** Schedule I **Restricted range:** No **Migratory:** Yes	1 a, c	Saker Falcon occurs in a wide range across the Palearctic region from eastern Europe to western China, breeding in Armenia, Austria, Bulgaria, Croatia, Czechia, Hungary, Moldova, Romania, Russia, Serbia, Slovakia, Turkey, Ukraine, Iran (Islamic Republic of), Uzbekistan, Tajikistan, Kyrgyzstan, Kazakhstan, Mongolia and China, occasionally in Georgia, and at least formerly in Turkmenistan and probably Afghanistan, possibly Iraq and India (Ladakh), with wintering or passage populations regularly in Italy, Malta, Cyprus, Israel, Jordan, Egypt, Libya, Sudan, South Sudan, Tunisia, Ethiopia, Kenya, Saudi Arabia, Yemen, Oman, U.A.E., Bahrain, Kuwait, Iran, Pakistan, India, Nepal, Afghanistan and Azerbaijan[74].	Screened Out

[66] BirdLife International. 2021. Haliaeetus leucoryphus. The IUCN Red List of Threatened Species 2021: e.T22695130A199521572

[67] Steele, M. L. 2017. Where in the World are Pallas's Fish Eagles? Migration and Ecology of Haliaeetus leucoryphus in Asia. Theses and Dissertations. 2015.

[68] BirdLife International. 2001. Threatened birds of Asia: the BirdLife International Red Data Book. BirdLife International, Cambridge, U.K.

[69] Sourav, M.S.H., Ahmed, B. & Thompson, P. 2011. Pallas's Fish Eagle Haliaeetus leucoryphus in Bangladesh. BirdingASIA 16: 101-105.

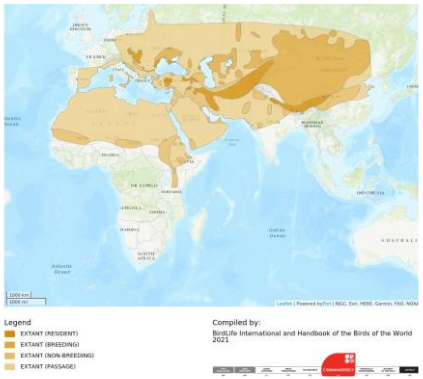
[70] Rahmani, A.R., Islam, M.Z. and Kasambe, R.M. (2016) Important Bird and Biodiversity Areas in India: Priority Sites for Conservation (Revised and updated). Bombay Natural History Society, Indian Bird Conservation Network, Royal Society for the Protection of Birds and BirdLife International (U.K.). Pp. 1992 + xii

[71] https://ebird.org/map/pafeag1?neg=true&env.minX=69.91982114224402&env.minY=21.188626630240094&env.maxX=75.54482114224402&env.maxY=23.449755903684757&zh=true&gp=true&ev=Z&excludeExX=false&excludeExAll=false&mr=1-12&bmo=1&emo=12&yr=all&byr=1900&eyr=2024

[72] https://www.inaturalist.org/observations?place_id=any&subview=map&taxon_id=5312

[73] https://www.iucnredlist.org/species/22695130/199521572

[74] BirdLife International. 2021. Falco cherrug. The IUCN Red List of Threatened Species 2021: e.T22696495A204182473

	 https://www.iucnredlist.org/species/22696495/204182473			A total population of c.6,100-14,900 pairs (median c.10,500), equating to 12,200-29,800 mature individuals, was calculated as part of the Saker Falcon Action Plan[75]. Saker Falcon is physically adapted to hunting close to the ground in open terrain, combining rapid acceleration with high manoeuvrability, thus specialising on mid-sized diurnal terrestrial rodents (especially ground squirrels Spermophilus) of open grassy landscapes such as desert edge, semi-desert, steppes, agricultural and arid montane areas. Gir National Park and Wildlife Sanctuary, Salt Pans of Bhavnagar, and Gosabara (Mokarsar) Wetland Complex are the possible habitats for this migratory species in Gujarat[76]. All the above mentioned IBAs are located away from the Rajkot city and the available secondary data[77, 78] also supports the unlikelihood of this species in Rajkot and project's EAAA.	
12	Steppe Eagle (*Aquila nipalensis*)	**IUCN:** Endangered **IWP:** Schedule I **Restricted range:** No **Migratory:** Yes	1 a, c	Steppe Eagle breeds east of 43°E in European Russia from the Republic of Kalmykia, across Kazakhstan into Kyrgyzstan, China and Mongolia[79]. The global population of the species has been estimated below 37,000 (26,014-36,731) pairs[80]. It inhabits areas of steppe and semi-desert and is recorded breeding up to 2,300 m in mountainous regions[81]. It feeds mainly on small mammals on its breeding grounds, with susliks forming the vast majority of its diet in some areas[82].	Screened Out

[75] Kovács, A.; Williams, N. P.; Galbraith, C. A. 2014. Saker Falcon Falco cherrug Global Action Plan (SakerGAP), including a management and monitoring system, to conserve the species. Raptors MOU Technical Publication No. 2. CMS Technical Series No. 31. Coordinating Unit - CMS Raptors MOU, Abu Dhabi, United Arab Emirates.

[76] Rahmani, A.R., Islam, M.Z. and Kasambe, R.M. (2016) Important Bird and Biodiversity Areas in India: Priority Sites for Conservation (Revised and updated). Bombay Natural History Society, Indian Bird Conservation Network, Royal Society for the Protection of Birds and BirdLife International (U.K.). Pp. 1992 + xii

[77] https://ebird.org/map/sakfal1?neg=true&env.minX=59.07915156761513&env.minY=17.91177192850224&env.maxX=81.57915156761513&env.maxY=26.93767697091607&zh=true&gp=true&ev=Z&excludeExX=false&excludeExAll=false&mr=1-12&bmo=1&emo=12&yr=all&byr=1900&eyr=2024

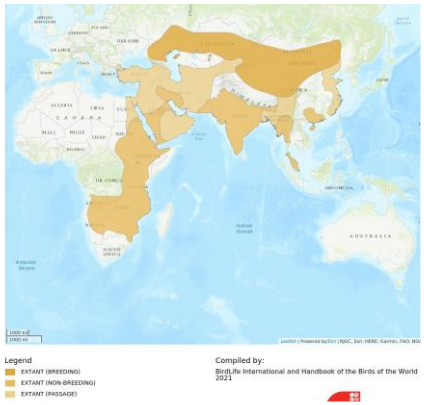
[78] https://www.inaturalist.org/observations?place_id=any&subview=map&taxon_id=4691

[79] Meyburg, B.U. and Boesman, P. 2013. Steppe Eagle (Aquila nipalensis). In: del Hoyo, J., Elliott, A., Sargatal, J., Christie, D.A. and de Juana, E. (eds), Handbook of the Birds of the World Alive, Lynx Edicions, Barcelona.

[80] Karyakin, I. V., Zinevich L. S., Schepetov D. M., Sorokina S.Y. 2016. Population Structure of the Steppe Eagle Range and Preliminary Data on the Population Genetic Diversity and Status of Subspecies. Raptors Conservation 32: 67-88.

[81] del Hoyo, J.; Elliott, A.; Sargatal, J. 1994. Handbook of the Birds of the World, vol. 2: New World Vultures to Guineafowl. Lynx Edicions, Barcelona, Spain.

[82] BirdLife International. 2021. Aquila nipalensis. The IUCN Red List of Threatened Species 2021: e.T22696038A205452572

	 https://www.iucnredlist.org/species/22696038/205452572			Undoubtedly the species has a presence in the surroundings of Rajkot[83], however based on available secondary information extracted from eBird Database[84] (which reports a single individual from the Rampara Wildlife Sanctuary [85]), it is less likely to meet the threshold i.e. 370 (≥1 percent of the global population) for the EAAA.	
13	Asian Houbara (*Chlamydotis macqueenii*)	**IUCN:** Vulnerable **IWP:** Schedule I **Restricted range:** No **Migratory:** Yes	3a	Asian Houbara extends from Egypt east of the Nile, through Israel, Palestine, Jordan, Syria, Saudi Arabia, Yemen, Oman, U.A.E., Bahrain, Qatar, Iraq, Kuwait, Iran, Afghanistan, Pakistan, India, Turkmenistan, Uzbekistan, Tajikistan, Kyrgyzstan, Kazakhstan and Mongolia to China [86]. This species inhabits open, arid and sparsely vegetated steppe and semi-desert[87,88]. It favours scattered shrubby vegetation, typically comprising xerophytic or halophytic plants[89]. The distribution map of the species covers majorly Gujrat and Rajasthan states of India. In Gujrat[90], it has historical records from Banni Grassland and Chhari Dhand, Bhal Area, Naliya Grassland (Wildlife Kutch Bustard Sanctuary), Velavadar National, Wild Ass Wildlife Sanctuary & Nanda	Screened Out

[83] https://ebird.org/region/IN-GJ-RA?yr=all

[84] https://ebird.org/map/steeag1?neg=true&env.minX=65.52069438960507&env.minY=19.685900961910654&env.maxX=76.77069438960507&env.maxY=24.218779635291323&zh=true&gp=true&ev=Z&excludeExX=false&excludeExAll=false&mr=1-12&bmo=1&emo=12&yr=all&byr=1900&eyr=2024

[85] https://ebird.org/checklist/S129358302

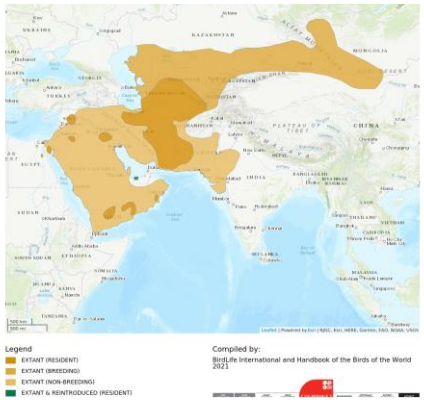
[86] BirdLife International. 2021. Chlamydotis macqueenii. The IUCN Red List of Threatened Species 2021: e.T22733562A205364424

[87] Launay, F.; Roshier, D.; Loughland, R.; Aspinall, S. J. 1997. Habitat use by houbara bustard (*Chlamydotis undulata macqueenii*) in arid shrubland in the United Arab Emirates. Journal of Arid Environments 35(1): 111–121.

[88] Mian, A. 2003. On biology of houbara bustard (*Chlamydotis macqueenii*) in Balochistan, Pakistan: animal populations sharing habitat. Pakistan Journal of Biological Science 6(14): 1282-1295.

[89] Collar, N. J. 1996. Otididae (Bustards). In: del Hoyo, J.; Elliott, A.; Sargatal, J. (ed.), Handbook of the birds of the world, pp. 240-273. Lynx Edicions, Barcelona, Spain.

[90] Rahmani, A.R., Islam, M.Z. and Kasambe, R.M. (2016) Important Bird and Biodiversity Areas in India: Priority Sites for Conservation (Revised and updated). Bombay Natural History Society, Indian Bird Conservation Network, Royal Society for the Protection of Birds and BirdLife International (U.K.). Pp. 1992 + xii

	 https://www.iucnredlist.org/species/22733562/205364424			Island, and Gosabara (Mokarsar) Wetland Complex. All the above mentioned IBAs are away from the Rajkot area. The species was a single report from the Rajkot district in 2020 near Khambhala Vidi[91], no other record of the species is available from the Rajkot area[92, 93]. Thus, is less likely to meet the threshold i.e. 330-670 (≥1 percent of the global population[94]) for the EAAA.	
14	Common Pochard (*Aythya ferina*)	**IUCN:** Vulnerable **IWP:** Schedule I **Restricted range:** No **Migratory:** Yes	3a	Common Pochard breeds from western Europe through central Asia to south-central Siberia and northern China[95]. The global population is estimated to number 760,000-790,000 mature individuals, which equates to 1,140,000- 1,180,000 million individuals in total[96]. This species requires well-vegetated eutrophic to neutral freshwater swamps, marshes, lakes and slow-flowing rivers with areas of open water and abundant emergent fringing vegetation[97]. Sometimes it also breeds on saline, brackish and soda lakes and occasionally even in sheltered coastal bays[98].	Screened Out

[91] https://ebird.org/checklist/S74766709

[92] https://ebird.org/map/macbus1?neg=true&env.minX=70.58786147727736&env.minY=22.442625974920503&env.maxX=71.29098647727736&env.maxY=22.724752583701246&zh=true&gp=true&ev=Z&excludeExX=false&excludeExAll=false&mr=1-12&bmo=1&emo=12&yr=all&byr=1900&eyr=2024

[93] https://www.inaturalist.org/observations?place_id=any&subview=map&taxon_id=144471

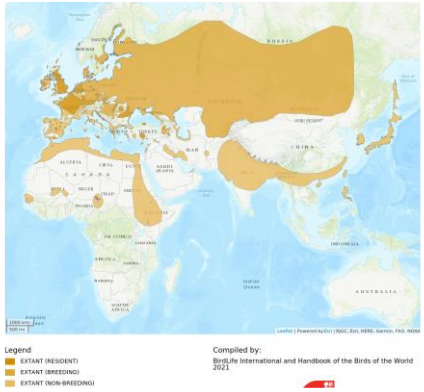
[94] https://www.iucnredlist.org/species/22733562/205364424#population

[95] Carboneras, C. and Kirwan, G.M. 2014. Common Pochard (Aythya ferina). In: J. del Hoyo, A. Elliott, J. Sargatal, D.A. Christie and E. de Juana (eds), Handbook of the Birds of the World Alive, Lynx Edicions, Barcelona.

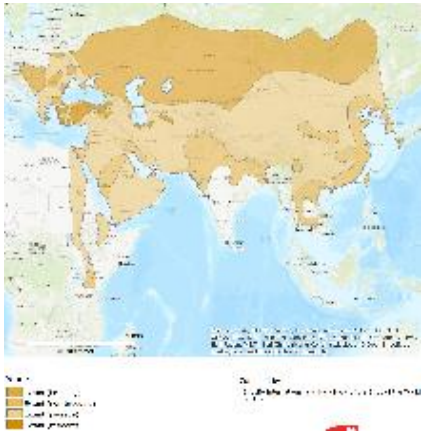
[96] https://www.iucnredlist.org/species/22680358/205288455#population

[97] BirdLife International. 2021. Aythya ferina. The IUCN Red List of Threatened Species 2021: e.T22680358A205288455

[98] Kear, J. 2005. Ducks, geese and swans volume 2: species accounts (Cairina to Mergus). Oxford University Press, Oxford, U.K.

	 https://www.iucnredlist.org/species/22680358/205288455			Undoubtedly the species has a presence in the surroundings of Rajkot[99, 100], however based on available secondary information extracted from eBird Database[101] the maximum 300 individuals were reported from Lalpari Lake about 34 years before (in 1989)[102], while in recent five years maximum 90 individuals were reported from Randarda Lake during Jan. 2019[103]. Thus, it is less likely to meet the threshold i.e. 11,400-11,800 (≥1 percent of the global population) for the EAAA.	
15	Eastern Imperial Eagle (*Aquila heliaca*)	**IUCN:** Vulnerable **IWP:** Schedule I **Restricted range:** No **Migratory:** Yes	3a	Eastern Imperial Eagle breeds in Austria, Azerbaijan, Bulgaria, China, Czech Republic, Macedonia, Georgia, Greece, Hungary, Kazakhstan, Russia, Mongolia, Serbia, Slovakia, Turkey and Ukraine[104]. On passage and in winter, birds are found in the Middle East, east Africa south to Tanzania, the Arabian Peninsula, Indian Subcontinent and south as well as East Asia (Thailand to Korea)[105]. This is a lowland species that has been pushed to higher altitudes by persecution and habitat loss in Europe. It breeds in forests up to 1,000 m and also in steppe and agricultural areas with large trees, and nowadays also on electricity pylons. In the Caucasus region, it occurs in steppe, lowland and riverine forests and semi-deserts[106].	Screened Out

[99] https://ebird.org/barchart?r=IN-GJ-VD&yr=all&m=
[100] https://www.inaturalist.org/observations?iconic_taxa=Aves&place_id=32168&subview=map&view=species
[101] https://ebird.org/map/compoc?neg=true&env.minX=69.34927133113273&env.minY=21.795612987890674&env.maxX=72.16177133113273&env.maxY=22.92591411959911&zh=true&gp=true&ev=Z&excludeExX=false&excludeExAll=false&mr=1-12&bmo=1&emo=12&yr=all&byr=1900&eyr=2024
[102] https://ebird.org/india/checklist/S82135724
[103] https://ebird.org/india/checklist/S52224258
[104] Horváth, M.; Béres, I.; Juhász, T.; Kleszó, A.; Kovács, A.; Isfendiyaroglu S.; Tavares, J. 2014. Population surveys of Eastern Imperial Eagles in Anatolia between 2009 and 2013. Proceedings from VII. International Conference on the Conservation of the Eastern Imperial Eagle, 2-5 October 2013, Bratislava, Slovakia. Slovak Raptor Journal 8: 63-64.
[105] BirdLife International. 2019. Aquila heliaca (amended version of 2017 assessment). The IUCN Red List of Threatened Species 2019: e.T22696048A155464885
[106] BirdLife International. 2019. Aquila heliaca (amended version of 2017 assessment). The IUCN Red List of Threatened Species 2019: e.T22696048A155464885

	 https://www.iucnredlist.org/species/22696048/155464885			Banni Grassland and Chhari Dhand, Bhal Area, Flamingo City, Gir National Park and Wildlife Sanctuary, Kaj Lake (Pipalava Bhandharo), Khijadia Bird Sanctuary, Nalsarovar Wildlife Sanctuary, Naliya Grassland (Wildlife Kutch Bustard Sanctuary), Salt Pans of Bhavnagar, Velavadar National Park, and Wild Ass Wildlife Sanctuary & Nanda Island are the possible habitats for this migratory raptor in Gujarat[107]. Undoubtedly the species has a presence in the surroundings of Rajkot[108], however based on available secondary information extracted from eBird Database[109] (which reports maximum 2 individuals from the Rajkot area[110]), which is less likely to meet the threshold i.e. 25-100 (≥1 percent of the global population[111]) for the EAAA.	
16	Greater Spotted Eagle (*Clanga clanga*)	**IUCN:** Vulnerable **IWP:** Schedule I **Restricted range:** No **Migratory:** Yes	3a	Greater Spotted Eagle occupies a fragmented range, breeding in Estonia, Lithuania, Finland, Poland, Belarus, Russia, Ukraine, Kazakhstan, mainland China and Mongolia[112]; and potentially in tiny numbers in Pakistan and north-west India[113]. It occurs in lowland forests near wetlands, nesting in different types of (generally tall) trees. Individuals wintering in the Mediterranean Basin preferentially use salt marshes, coastal lagoons and water courses[114]. It feeds on unretrieved quarry, small mammals, waterbirds, frogs and snakes, hunting over swamps, and wet meadows[115]. The Important Bird and Biodiversity Areas in India: Priority Sites for Conservation (Revised and updated Edition - 2016)[116], reports the presence of the species in Banni Grassland & Chhari Dhand, Bhal Area, Flamingo City, Gir National Park and Wildlife	Screened Out

[107] Rahmani, A.R., Islam, M.Z. and Kasambe, R.M. (2016) Important Bird and Biodiversity Areas in India: Priority Sites for Conservation (Revised and updated). Bombay Natural History Society, Indian Bird Conservation Network, Royal Society for the Protection of Birds and BirdLife International (U.K.). Pp. 1992 + xii

[108] https://ebird.org/region/IN-GJ-RA?yr=all

[109] https://ebird.org/map/impeag1?neg=true&env.minX=69.74535347132353&env.minY=22.106319663015057&env.maxX=71.59105659632353&env.maxY=22.848655378514714&zh=true&gp=true&ev=Z&excludeExX=false&excludeExAll=false&mr=1-12&bmo=1&emo=12&yr=all&byr=1900&eyr=2024

[110] https://ebird.org/checklist/S93685808

[111] https://www.iucnredlist.org/species/22696048/155464885#population

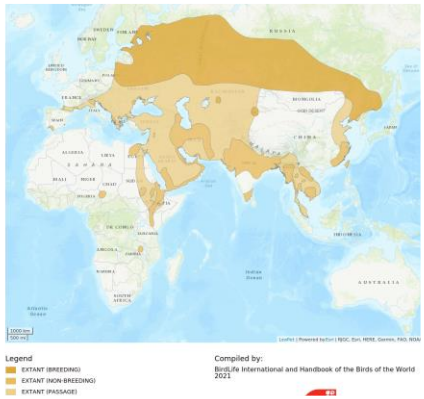
[112] Meyburg, B.-U.; Haraszthy, L.; Strazds, M.; Schäffer, N. 1999. European species action plan for Greater Spotted Eagle (Aquila clanga).

[113] BirdLife International. 2001. Threatened birds of Asia: the BirdLife International Red Data Book. BirdLife International, Cambridge, U.K.

[114] Maciorowski, G., Galanaki, A., Kominos, T., Dretakis, M. and Mirski, P. 2019. The importance of wetlands for the Greater Spotted Eagle Clanga clanga wintering in the Mediterranean Basin. Bird Conservation International 29: 115-123.

[115] Lõhmus A, Väli Ü. 2001. Interbreeding of the Greater Aquila clanga and Lesser Spotted Eagle A. pomarina. Acta Ornithoecologica 4: 377–384.

[116] Rahmani, A.R., Islam, M.Z. and Kasambe, R.M. (2016) Important Bird and Biodiversity Areas in India: Priority Sites for Conservation (Revised and updated). Bombay Natural History Society, Indian Bird Conservation Network, Royal Society for the Protection of Birds and BirdLife International (U.K.). Pp. 1992 + xii

	 https://www.iucnredlist.org/species/22696027/203868747			Sanctuary, Kaj Lake (Pipalava Bhandharo), Khijadia Bird Sanctuary, Marine National Park and Wildlife Sanctuary, Nalsarovar Wildlife Sanctuary, Thol Lake Bird Sanctuary, Velavadar National Park, Wetlands of Kheda, Wild Ass Wildlife Sanctuary & Nanda Island, and Gosabara (Mokarsar) Wetland Complex. Undoubtedly the species has a presence in the surroundings of Rajkot[117], however based on available secondary information extracted from eBird Database[118] (which reports single individual near Randarda Lake[119], and Vagudad[120]), it is less likely to meet the threshold i.e. 39-100 (≥1 percent of the global population[121]) for the EAAA.	
17	Yellow-eyed Pigeon (*Columba eversmanni*)	**IUCN:** Vulnerable **IWP:** Schedule I **Restricted range:** No **Migratory:** Yes	3a	Yellow-eyed Pigeon breeds in southern Kazakhstan, Uzbekistan, Turkmenistan, Tajikistan, Kyrgyzstan, Afghanistan, north-east Iran and extreme north-west China[122]. It winters in Pakistan and north-west India, historically as far east as Bihar, and southern Xinjiang and western Gansu, China. During the 19th & early 20th centuries, it was recorded in huge flocks in its wintering grounds, particularly in the Punjab, India[123]. The population size is preliminarily suspected to fall into the band 10,000-19,999 mature individuals[124]. This equates to 15,000-29,999 individuals in total, rounded here to 15,000-30,000 individuals. It breeds (during April to August) in holes in trees, buildings, cliffs, earth banks, and potentially on power lines in steppe, semi-arid and desert areas, including around human settlement and (at least in Kazakhstan) in woodland[125]. It may also occur on mountain valleys close to water sources[126]. In winter, it occurs in open areas with scattered trees,	Screened Out

[117] https://ebird.org/region/IN-GJ-RA?yr=all

[118] https://ebird.org/map/grseag1?neg=true&env.minX=68.75658209605483&env.minY=21.603854418044335&env.maxX=72.44798834605483&env.maxY=23.089880632829846&zh=true&gp=true&ev=Z&excludeExX=false&excludeExAll=false&mr=1-12&bmo=1&emo=12&yr=all&byr=1900&eyr=2024

[119] https://ebird.org/india/checklist/S52224258

[120] https://ebird.org/checklist/S49533055

[121] https://www.iucnredlist.org/species/22696027/203868747#population

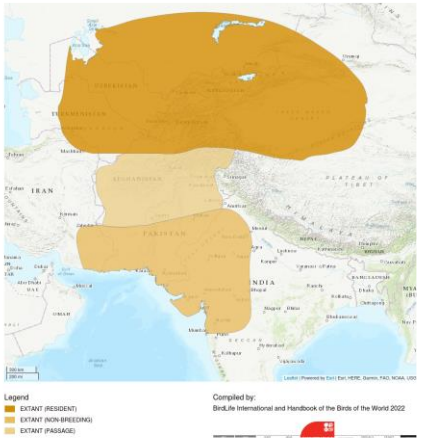
[122] BirdLife International. 2001. Threatened birds of Asia: the BirdLife International Red Data Book. BirdLife International, Cambridge, U.K.

[123] BirdLife International. 2022. Columba eversmanni. The IUCN Red List of Threatened Species 2022: e.T22690097A217014626

[124] Baptista, L. F., Trail, P. W., Horblit, H. M., de Huana, E., Boesman, P. F. D., and Garcia, E. F. J. 2020. Yellow eyed Pigeon (Columba eversmanni), version 1.0. In Birds of the World (J. del Hoyo, A. Elliott, J. Sargatal, D. A. Christie, and E. de Juana, Editors). Cornell Lab of Ornithology, Ithaca, NY, USA.

[125] BirdLife International. 2022. Columba eversmanni. The IUCN Red List of Threatened Species 2022:e.T22690097A217014626

[126] Baptista, L. F., Trail, P. W., Horblit, H. M., de Huana, E., Boesman, P. F. D., and Garcia, E. F. J. 2020. Yellow eyed Pigeon (Columba eversmanni), version 1.0. In Birds of the World (J. del Hoyo, A. Elliott, J. Sargatal, D. A. Christie, and E. de Juana, Editors). Cornell Lab of Ornithology, Ithaca, NY, USA.

	 https://www.iucnredlist.org/species/22690097/217014626			often with agricultural crops, and in areas with suitable fruiting trees, where it roosts and feeds gregariously. It is reportedly on the rise in the western part of the Thar Desert where it experiences extreme temperatures, within a habitat of sparse thorny vegetation and grasses[127]. Last time, the species was recorded from Little Rann of Kachchh in 2005[128], after that there is no record of this migratory species from the Gujarat state [129, 130, 131].	
18	Bar-tailed Godwit (*Limosa lapponica*)	**IUCN:** Near Threatened **IWP:** Schedule IV **Restricted range:** No **Migratory:** Yes	3a	Bar-tailed Godwit breeds across the Arctic from northern Europe through Siberia to Alaska (U.S.A.), wintering along the coasts of western Europe, Africa, the Middle East, south- and south-east Asia, Australia and New Zealand. The global population is estimated to number c. 1,099,000-1,149,000 individuals[132]. The species breeds in marshy, swampy areas in lowland moss and shrub tundra, near wet river valleys, lakes and sedge bogs, as well as on swampy heathlands in the willow and birch zone near the Arctic treeline, in open larch Larix spp. woodland close to water, and occasionally on open bogs in the extreme north of the coniferous forest zone. It winters in intertidal areas along muddy coastlines, estuaries, inlets, mangrove-fringed lagoons and sheltered bays with tidal mudflats or sandbars[133].	Screened Out

[127] BirdLife International. 2022. Columba eversmanni. The IUCN Red List of Threatened Species 2022:e.T22690097A217014626

[128] https://ebird.org/hotspot/L3315807

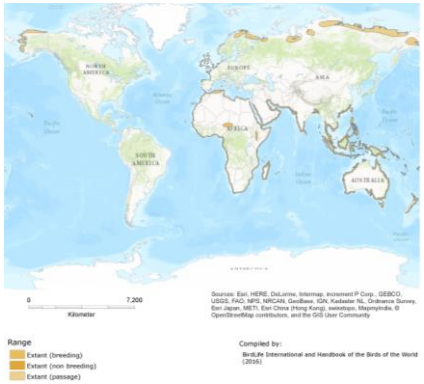
[129] Rahmani, A.R., Islam, M.Z. and Kasambe, R.M. (2016) Important Bird and Biodiversity Areas in India: Priority Sites for Conservation (Revised and updated). Bombay Natural History Society, Indian Bird Conservation Network, Royal Society for the Protection of Birds and BirdLife International (U.K.). Pp. 1992 + xii

[130] https://ebird.org/map/pabpig1?neg=true&env.minX=69.66844917444853&env.minY=21.882354221973273&env.maxX=71.51415229944853&env.maxY=22.625881720733656&zh=true&gp=true&ev=Z&excludeExX=false&excludeExAll=false&mr=1-12&bmo=1&emo=12&yr=all&byr=1900&eyr=2024

[131] https://www.inaturalist.org/observations?place_id=any&subview=map&taxon_id=3015

[132] https://www.iucnredlist.org/species/22693158/111221714#population

[133] BirdLife International. 2017. Limosa lapponica. The IUCN Red List of Threatened Species 2017: e.T22693158A111221714

	 https://www.iucnredlist.org/species/22693158/111221714			Undoubtedly the species has a presence in the surroundings districts of Rajkot, but not from the Rajkot[134, 135]. Thus, the presence of the species in the EAAA is less likely, and it is also unlikely to meet the threshold i.e. 10,990-11,490 (≥1 percent of the global population) for the EAAA.	
19	Black-tailed Godwit (*Limosa limosa*)	**IUCN:** Near Threatened **IWP:** Schedule IV **Restricted range:** No **Migratory:** Yes	3a	Black-tailed Godwit has a large discontinuous breeding range extending from Iceland to the Russian far east, with wintering populations in Europe, Africa, the Middle East and Australasia[136]. The global population is estimated at 614,000-809,000 individuals[137]. Its breeding range it mostly inhabits areas with high but not dense grass and soft soil, occasionally using sandy areas; although other information suggests it may prefer short vegetation. Its preferred habitats include cattle pastures, hayfields, lowland wet grasslands, grassy marshland, raised bogs and moorland, lake margins and damp grassy depressions in steppes. It winter in saline habitats such as sheltered estuaries and lagoons with large intertidal mudflats, sandy beaches, salt-marshes and salt-flats[138]. Undoubtedly the species has a presence in Rajkot[139, 140], however based on available secondary information extracted from eBird Database[141] (which reports maximum 1600	Screened Out

134 https://ebird.org/map/batgod?neg=true&env.minX=63.75416894226026&env.minY=19.723419335958354&env.maxX=78.51979394226026&env.maxY=25.64958889182095&zh=true&gp=true&ev=Z&excludeExX=false&excludeExAll=false&mr=1-12&bmo=1&emo=12&yr=all&byr=1900&eyr=2024

135 https://www.inaturalist.org/observations?place_id=any&subview=map&taxon_id=3951

136 Van Gils, J., Wiersma, P., Christie, D.A. & Garcia, E.F.J. 2017. Black-tailed Godwit (Limosa limosa). In: del Hoyo, J., Elliott, A., Sargatal, J., Christie, D.A. & de Juana, E (ed.), Handbook of the Birds of the World Alive. Lynx Edicions, Barcelona.

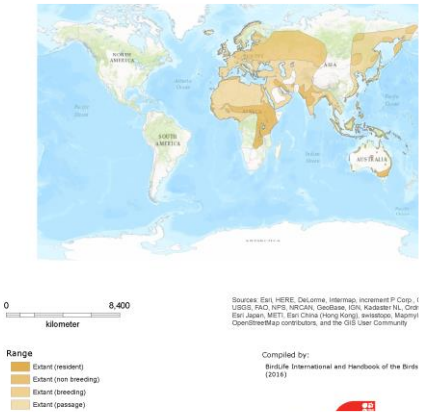
137 https://www.iucnredlist.org/species/22693150/111611637#population

138 BirdLife International. 2017. Limosa limosa. The IUCN Red List of Threatened Species 2017: e.T22693150A111611637

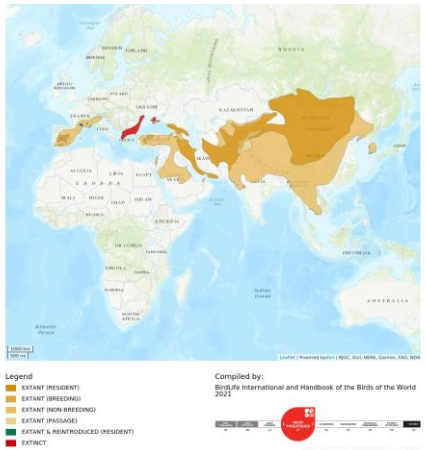
139 https://ebird.org/region/IN-GJ-RA?yr=all

140 https://www.inaturalist.org/observations?place_id=any&subview=map&taxon_id=3947

141 https://ebird.org/map/bktgod?neg=true&env.minX=67.07204741208506&env.minY=20.863158746250193&env.maxX=74.45485991208506&env.maxY=23.834831473308025&zh=true&gp=true&ev=Z&excludeExX=false&excludeExAll=false&mr=1-12&bmo=1&emo=12&yr=all&byr=1900&eyr=2024

	 https://www.iucnredlist.org/species/22693150/111611637			individuals from Nyari-1 Dam[142]), it is less likely to meet the threshold i.e. 6,140-8,090 (≥1 percent of the global population) for the EAAA.	
20	Cinereous Vulture (*Aegypius monachus*)	**IUCN:** Near Threatened **IWP:** Schedule I **Restricted range:** No **Migratory:** Yes	3a	Cinereous Vulture breeds in Spain, Bulgaria, Greece, Turkey, Armenia, Azerbaijan, Georgia, Ukraine, Russia, Uzbekistan, Kazakhstan, Tajikistan, Turkmenistan, Kyrgyzstan, Iran, Afghanistan, north India, northern Pakistan[143], Mongolia and mainland China, with a small reintroduced population in France[144, 145]. There are wintering areas in Sudan, Saudi Arabia, Iran, Pakistan, north-west India, Nepal, Bhutan, Myanmar, Lao People's Democratic Republic, North Korea and South Korea[146]. The global population is estimated to number 8,400-11,400 pairs, equating to 16,800-22,800 mature individuals, or c. 25,200-34,200 individuals. This consists of 2,900-3,400 pairs in Europe and 5,500-8,000 pairs in Asia[147]. The population in Korea has been estimated at c.50-10,000 wintering individuals[148]. The species inhabits forested areas in hills and mountains at 300-1,400 m in Spain, but higher in Asia, where it also occupies scrub and arid and semi-arid alpine steppe and grasslands up to 4,500 m[149]. It forages over many kinds of open terrain, including forest, bare mountains, steppe and open grasslands. Nests are built in trees or on rocks (the	Screened Out

[142] https://ebird.org/checklist/S53664718
[143] BirdLife International. 2021. Aegypius monachus. The IUCN Red List of Threatened Species 2021: e.T22695231A154915043
[144] Heredia, B. 1996. Action plan for the Cinereous Vulture (Aegypius monachus) in Europe. In: Heredia, B.; Rose, L.; Painter, M. (ed.), Globally threatened birds in Europe: action plans, pp. 147-158. Council of Europe, and BirdLife International, Strasbourg.
[145] Heredia, B.; Yarar, M.; Parr, S. J. 1997. A baseline survey of Cinereous Vultures Aegypius monachus in Western Turkey.
[146] BirdLife International. 2021. Aegypius monachus. The IUCN Red List of Threatened Species 2021: e.T22695231A154915043
[147] BirdLife International. 2021. Aegypius monachus. The IUCN Red List of Threatened Species 2021: e.T22695231A154915043
[148] Brazil, M. 2009. Birds of East Asia: eastern China, Taiwan, Korea, Japan, eastern Russia. Christopher Helm, London.
[149] Thiollay, J.-M. 1994. Family Accipitridae (Hawks and Eagles). In: del Hoyo, J.; Elliott, A.; Sargatal, J. (ed.), Handbook of the birds of the world, pp. 52-205. Lynx Edicions, Barcelona, Spain.

	 https://www.iucnredlist.org/species/22695231/154915043			latter extremely rarely in Europe but more frequently in parts of Asia), often aggregated in very loose colonies or nuclei. As per the Important Bird and Biodiversity Areas in India: Priority Sites for Conservation (Revised and updated Edition - 2016)[150], the species is reported from Banni Grassland & Chhari Dhand, Bhal Area, Gir National Park and Wildlife Sanctuary, Nalsarovar Wildlife Sanctuary, and Wild Ass Wildlife Sanctuary & Nanda Island. All the above-mentioned areas are away from the Rajkot and the available secondary data[151, 152] also indicates unlikelihood of this species in Rajkot and project's EAAA.	
21	Dalmatian Pelican (*Pelecanus crispus*)	**IUCN:** Near Threatened **IWP:** Schedule II **Restricted range:** No **Migratory:** Yes	3a	Dalmatian Pelican breeds in eastern Europe and east-central Asia, in Montenegro, Albania, Armenia, Greece, Romania, Bulgaria, Georgia, Russia, Azerbaijan, Turkey, Ukraine, Mongolia, Iran, Turkmenistan, Uzbekistan and Kazakhstan[153, 154]. European breeders winter in the eastern Mediterranean countries, Russian and central Asian breeders in Iran, Iraq and the Indian subcontinent, and Mongolian birds along the east coast of China[155], including Hong Kong (China). The population was previously estimated to number 4,350-4,800 individuals in the Black Sea and Mediterranean; 6,000-9,000 individuals in South-East Asia and south Asia, and 50 individuals in east Asia, totalling 10,000-13,900 individuals, which roughly equates to 6,700-9,300 mature individuals[156]. However, the total global population (mature individuals) has been estimated as 11400-13400[157].	Screened in

[150] Rahmani, A.R., Islam, M.Z. and Kasambe, R.M. (2016) Important Bird and Biodiversity Areas in India: Priority Sites for Conservation (Revised and updated). Bombay Natural History Society, Indian Bird Conservation Network, Royal Society for the Protection of Birds and BirdLife International (U.K.). Pp. 1992 + xii

[151] https://ebird.org/map/cinvul1?neg=true&env.minX=70.59600983069747&env.minY=22.16549314408045&env.maxX=70.71136627600997&env.maxY=22.211985714271126&zh=true&gp=true&ev=Z&excludeExX=false&excludeExAll=false&mr=1-12&bmo=1&emo=12&yr=all&byr=1900&eyr=2024

[152] https://www.inaturalist.org/observations?place_id=any&subview=map&taxon_id=5382

[153] Crivelli, A. J. 1996. Action plan for the Dalmatian Pelican (Pelecanus crispus). In: Heredia, B.; Rose, L.; Painter, M. (ed.), Globally threatened birds in Europe: action plans, pp. 53-66. Council of Europe, and BirdLife International, Strasbourg.

[154] BirdLife International. 2015. European Red List of Birds. Office for Official Publications of the European Communities, Luxembourg.

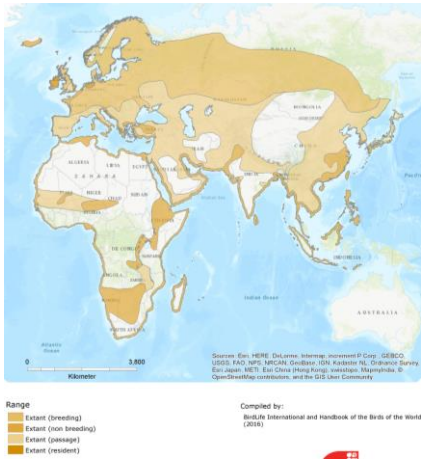
[155] Mix, H. M.; Bräunlich, A. 2000. Dalmatian Pelican. In: Reading, R.P.; Miller, B. (ed.), Endangered animals: a reference guide to conflicting issues, pp. 78-83. Greenwood Press, London.

[156] BirdLife International. 2018. Pelecanus crispus (amended version of 2017 assessment). The IUCN Red List of Threatened Species 2018: e.T22697599A122838534

[157] https://www.iucnredlist.org/species/22697599/122838534#population

	 https://www.iucnredlist.org/species/22697599/122838534			It occurs mainly at inland, freshwater wetlands but also at coastal lagoons, river deltas & estuaries[158, 159, 160, 161], small islands in freshwater lakes[162] or in dense aquatic vegetation[163], and often in hilly terrain[164]. On migration, large lakes form important stop-over sites[165]. It typically winters on *Jheels* and lagoons in India, and ice-free lakes in Europe[166]. It sometimes fishes inshore along sheltered coasts[167]. Banni Grassland and Chhari Dhand, Charakla Saltworks, Flamingo City, Gir National Park and Wildlife Sanctuary, Kaj Lake (Pipalava Bhandharo), Khijadia Bird Sanctuary, Marine National Park and Wildlife Sanctuary, Nalsarovar Wildlife Sanctuary, Salt Pans of Bhavnagar, Thol Lake Bird Sanctuary, Velavadar National Park, Wild Ass Wildlife Sanctuary & Nanda Island, Bhaskarapra wetland, and Gosabara (Mokarsar) Wetland Complex are the possible habitats for this migratory species in Gujarat[168]. The species has a presence in the surroundings of Rajkot[169, 170]. Based on available secondary information extracted from eBird Database[171] (which reports maximum 150 individuals from Aji-2 Dam[172] during Jan. 2021), it is likely to meet the threshold i.e. 114-134 (≥1 percent of the global population) for the EAAA.	
22	Eurasian Curlew (*Numenius arquata*)	**IUCN:** Near Threatened **IWP:** Schedule II **Restricted range:** No **Migratory:** Yes	3a	Eurasian Curlew is widely distributed, breeding across Europe from the British Isles, through north-western Europe and Scandinavia into Russia extending east into Siberia, east of Lake Baikal. It winters around the coasts of north-west Europe, the	Screened Out

[158] del Hoyo, J., Elliot, A. and Sargatal, J. 1992. Handbook of the Birds of the World, Vol. 1: Ostrich to Ducks. Lynx Edicions, Barcelona, Spain.
[159] Peja, N.; Sarigul, G.; Siki, M.; Crivelli, A. J. 1996. The Dalmatian Pelican, Pelecanus crispus, nesting in Mediterranean lagoons in Albania and Turkey. Colonial Waterbirds 19: 184-189.
[160] Crivelli, A. J.; Catsadorakis, G.; Hatzilacou, D.; Nazirides, T. 1997. Pelicanus crispus Dalmatian Pelican. Birds of the Western Palearctic Update 1(3): 149-153.
[161] Mix, H. M.; Bräunlich, A. 2000. Dalmatian Pelican. In: Reading, R.P.; Miller, B. (ed.), Endangered animals: a reference guide to conflicting issues, pp. 78-83. Greenwood Press, London.
[162] del Hoyo, J., Elliot, A. and Sargatal, J. 1992. Handbook of the Birds of the World, Vol. 1: Ostrich to Ducks. Lynx Edicions, Barcelona, Spain.
[163] del Hoyo, J., Elliot, A. and Sargatal, J. 1992. Handbook of the Birds of the World, Vol. 1: Ostrich to Ducks. Lynx Edicions, Barcelona, Spain.
[164] Nelson, J. B. 2005. Pelicans, cormorants and their relatives. Pelecanidae, Sulidae, Phalacrocoracidae, Anhingidae, Fregatidae, Phaethontidae. Oxford University Press, Oxford, U.K.
[165] Nelson, J. B. 2005. Pelicans, cormorants and their relatives. Pelecanidae, Sulidae, Phalacrocoracidae, Anhingidae, Fregatidae, Phaethontidae. Oxford University Press, Oxford, U.K.
[166] del Hoyo, J., Elliot, A. and Sargatal, J. 1992. Handbook of the Birds of the World, Vol. 1: Ostrich to Ducks. Lynx Edicions, Barcelona, Spain.
[167] del Hoyo, J., Elliot, A. and Sargatal, J. 1992. Handbook of the Birds of the World, Vol. 1: Ostrich to Ducks. Lynx Edicions, Barcelona, Spain.
[168] Rahmani, A.R., Islam, M.Z. and Kasambe, R.M. (2016) Important Bird and Biodiversity Areas in India: Priority Sites for Conservation (Revised and updated). Bombay Natural History Society, Indian Bird Conservation Network, Royal Society for the Protection of Birds and BirdLife International (U.K.). Pp. 1992 + xii
[169] https://ebird.org/region/IN-GJ-RA?yr=all
[170] https://www.inaturalist.org/observations?place_id=any&subview=map&taxon_id=4333
[171] https://ebird.org/map/dalpel1?neg=true&env.minX=-59.622292059177106&env.minY=-7.164538081861491&env.maxX=176.6277079408229&env.maxY=68.66519688257966&zh=true&gp=true&ev=Z&excludeExX=false&excludeExAll=false&mr=1-12&bmo=1&emo=12&yr=all&byr=1900&eyr=2024
[172] https://ebird.org/checklist/S85944606



https://www.iucnredlist.org/species/22693190/117917038

Mediterranean, Africa, the Middle East, the Indian Subcontinent, South-East Asia, Japan and the Sundas[173].

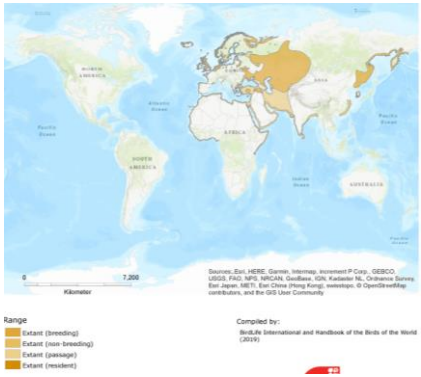
The global population is estimated to number c.835,000-1,310,000 individuals (Wetlands International 2016). The European population is estimated at 212,000-292,000 pairs, which equates to 425,000-584,000 mature individuals, and is roughly equivalent to 647,500-876,000 individuals[174].

The species breeds on upland moors, peat bogs, swampy and dry heathlands, fens, open grassy or boggy areas in forests, damp grasslands, meadows, dune valleys & coastal marshlands[175], and non-intensive farmland in river valleys[176]. During the winter the species frequents inland lakes & rivers, muddy coasts, bays & estuaries, wet grassland & arable fields[177], tidal mudflats & sandflats[178], rocky & sandy beaches with many pools, muddy shores of coastal lagoons, mangroves, saltmarshes[179, 180], and coastal meadows & pasture[181].

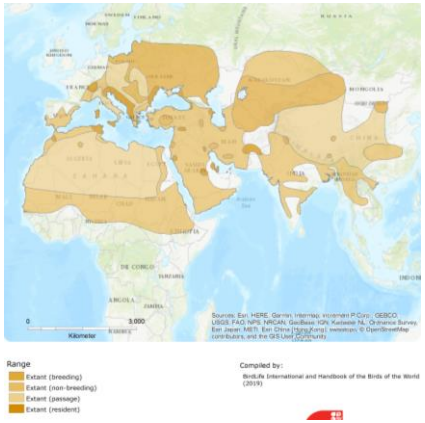
Banni Grassland and Chhari Dhand, Bhal Area, Charakla Saltworks, Gir National Park and Wildlife Sanctuary, Khijadia Bird Sanctuary, Marine National Park and Wildlife Sanctuary, Nalsarovar Wildlife Sanctuary, Salt Pans of Bhavnagar, Velavadar National Park, Wetlands of Kheda, Wild Ass Wildlife Sanctuary & Nanda, and Gosabara (Mokarsar) Wetland Complex are the possible habitats for this migratory species in Gujarat[182].

Undoubtedly the species has a presence in the surroundings of Rajkot[183], however based on available secondary information extracted from eBird Database[184](which reports maximum 3 individuals from the Nyari-2 Dam [185]), it is less likely to meet the threshold i.e. 8,350-13,100 (≥1 percent of the global population) for the EAAA.

[173] BirdLife International. 2017. Numenius arquata. The IUCN Red List of Threatened Species 2017: e.T22693190A117917038
[174] BirdLife International. 2015. European Red List of Birds. Office for Official Publications of the European Communities, Luxembourg.
[175] del Hoyo, J., Elliott, A., and Sargatal, J. 1996. Handbook of the Birds of the World, vol. 3: Hoatzin to Auks. Lynx Edicions, Barcelona, Spain.
[176] Hayman, P.; Marchant, J.; Prater, A. J. 1986. Shorebirds. Croom Helm, London.
[177] del Hoyo, J., Elliott, A., and Sargatal, J. 1996. Handbook of the Birds of the World, vol. 3: Hoatzin to Auks. Lynx Edicions, Barcelona, Spain.
[178] Snow, D.W. and Perrins, C.M. 1998. The Birds of the Western Palearctic, Volume 1: Non-Passerines. Oxford University Press, Oxford.
[179] Johnsgard, P. A. 1981. The plovers, sandpipers and snipes of the world. University of Nebraska Press, Lincoln, U.S.A. and London.
[180] Snow, D.W. and Perrins, C.M. 1998. The Birds of the Western Palearctic, Volume 1: Non-Passerines. Oxford University Press, Oxford.
[181] Navedo, J. G.; Arranz, D.; Herrera, A. G.; Salmón, P.; Juanes, J. A.; Masero, J. A. 2013. Agroecosystems and conservation of migratory waterbirds: importance of coastal pastures and factors influencing their use by wintering shorebirds. Biodiversity and Conservation 22(9): 1895-1907.
[182] Rahmani, A.R., Islam, M.Z. and Kasambe, R.M. (2016) Important Bird and Biodiversity Areas in India: Priority Sites for Conservation (Revised and updated). Bombay Natural History Society, Indian Bird Conservation Network, Royal Society for the Protection of Birds and BirdLife International (U.K.). Pp. 1992 + xii
[183] https://ebird.org/region/IN-GJ-RA?yr=all
[184] https://ebird.org/map/eurcur?neg=true&env.minX=68.44248937194658&env.minY=21.735961665660113&env.maxX=72.13389562194658&env.maxY=23.2205828651657&zh=true&gp=true&ev=Z&excludeExX=false&excludeExAll=false&mr=1-12&bmo=1&emo=12&yr=all&byr=1900&eyr=2024
[185] https://ebird.org/checklist/S23956799

23	Eurasian Oystercatcher (*Haematopus ostralegus*)  https://www.iucnredlist.org/species/22693613/154998347	**IUCN:** Near Threatened **IWP:** Schedule II **Restricted range:** No **Migratory:** Yes	3a	Eurasian Oystercatcher has a wide range comprising three flyway populations. Out of which, *Haematopus ostralegus longipes* breeds from west and central Russia south to the Black, Caspian and Aral Seas, and east to western Siberia, and winters on coasts from East Africa through Arabia to India[186]. The global population is estimated to number c. 925,000-1,030,000 individuals, based on expert opinion (Wetlands International 2019), including three subspecies *Haematopus ostralegus ostralegus* (820,000), *Haematopus ostralegus longpipes* (100,000-200,000) and *Haematopus ostralegus osculans* (5,000-10,000)[187]. This is roughly equivalent to 616,667-686,667 mature individuals. The species breeds (during April to July) on coastal saltmarshes, sand and shingle beaches, dunes, cliff-tops with short grass and occasionally rocky shores, as well as inland along the shores of lakes, reservoirs and rivers or on agricultural grass and cereal fields, often some distance from water[188, 189]. Outside of the breeding season the species is chiefly coastal, frequenting estuarine mudflats, saltmarshes & sandy & rocky shores[190]. In Gujarat the species has been mostly recorded along the coastal area or around the salt marshes. However, 2 individuals of the species were reported from the Nyari-1 Dam during Mar. 1998[191]. After that no record of the species is available from the city[192]. Thus, the presence of the migratory species from the project's EAAA is less likely as well as unless likely to meet the threshold i.e. 9,250-10,300 (≥1 percent of the global population) for the EAAA.	Screened Out
24	Ferruginous Duck (*Aythya nyroca*)	**IUCN:** Near Threatened **IWP:** Schedule II **Restricted range:** No **Migratory:** Yes	3a	Ferruginous Duck breeds principally in south-western Asia (east to China and south to Pakistan and India), central and eastern Europe, and north Africa[193, 194]. The wintering range overlaps with the breeding range and extends to the Middle East, north-east and West Africa and South-East Asia. The most recent population estimates c. 180,000–240,000 individuals based separate estimations from different regions[195].	Screened Out

[186] BirdLife International. 2019. Haematopus ostralegus. The IUCN Red List of Threatened Species 2019: e.T22693613A154998347
[187] Wetlands International. 2019. Waterbird Population Estimates. Available at: wpe.wetlands.org.
[188] Hayman, P.; Marchant, J.; Prater, A. J. 1986. Shorebirds. Croom Helm, London.
[189] del Hoyo, J.; Elliott, A.; Sargatal, J. 1996. Handbook of the Birds of the World, vol. 3: Hoatzin to Auks. Lynx Edicions, Barcelona, Spain.
[190] del Hoyo, J.; Elliott, A.; Sargatal, J. 1996. Handbook of the Birds of the World, vol. 3: Hoatzin to Auks. Lynx Edicions, Barcelona, Spain.
[191] https://ebird.org/india/checklist/S120878899
[192] https://ebird.org/map/euroys1?neg=true&env.minX=69.7147265664197&env.minY=22.041012717667314&env.maxX=71.5604296914197&env.maxY=22.783697112832755&zh=true&gp=true&ev=Z&excludeExX=false&excludeExAll=false&mr=1-12&bmo=1&emo=12&yr=all&byr=1900&eyr=2024
[193] Callaghan, D. A. 1999. European Union Species Action Plan: Ferruginous Duck (Althea nervosa). Council of Europe Publishing, Strasbourg.
[194] Vinicombe, K. E. 2000. Identification of Ferruginous Duck and its status in Britain and Ireland. British Birds 93: 4-21.
[195] https://www.iucnredlist.org/species/22680373/152620862#population

	 https://www.iucnredlist.org/species/22680373/152620862			The species shows a strong preference for fresh standing water and is very rarely found on flowing streams or rivers[196]. It requires shallow water 30-100 cm deep close to littoral vegetation for feeding and generally avoids large open areas[197, 198, 199]. It is also found on shallow mudflats, possibly as a result of more accessible and abundant invertebrate food sources in this habitat[200]. Indeed, the species has a presence in the surroundings of Rajkot[201], however based on available secondary information extracted from eBird Database[202] (which reports maximum 20 individuals from Aji-2 Dam[203] during Jan. 2021), it is less likely to meet the threshold i.e. 1,800–2,400 (≥1 percent of the global population) for the EAAA.	
25	Lesser Flamingo (*Phoeniconaias minor*)	**IUCN:** Near Threatened **IWP:** Schedule IV **Restricted range:** No **Migratory:** Yes	3a	Lesser Flamingo breeds mainly in the Rift Valley lakes of East Africa in Ethiopia, Kenya and Tanzania. Three smaller breeding congregations occur in West Africa, in southern Africa, and in Rann of India and Pakistan. The global population has been estimated at c. 2,220,000-3,240,000 individuals. Regional estimates include 15,000-25,000 individuals in West Africa, 1,500,000-2,500,000 in East Africa, 55,000-65,000 in South Africa and Madagascar, and 650,000 in south Asia[204]. The species breeds on large undisturbed alkaline and saline lakes, salt pans or coastal lagoons, usually far out from the shore, after seasonal rains have provided the flooding necessary to isolate remote breeding sites from terrestrial predators and the soft muddy material for nest building[205, 206].	Screened Out

[196] Snow, D.W.; Perrins, C.M. 1998. The Birds of the Western Palearctic, Volume 1: Non-Passerines. Oxford University Press, Oxford.
[197] del Hoyo, J.; Elliot, A.; Sargatal, J. 1992. Handbook of the Birds of the World, Vol. 1: Ostrich to Ducks. Lynx Edicions, Barcelona, Spain.
[198] Scott, D. A.; Rose, P. M. 1996. Atlas of Anatidae populations in Africa and western Eurasia. Wetlands International, Wageningen, Netherlands.
[199] Kear, J. 2005. Ducks, geese and swans volume 2: species accounts (Cairina to Mergus). Oxford University Press, Oxford, U.K.
[200] BirdLife International. 2019. Aythya nyroca. The IUCN Red List of Threatened Species 2019: e.T22680373A152620862
[201] https://ebird.org/region/IN-GJ-RA?yr=all
[202] https://ebird.org/map/ferduc?neg=true&env.minX=66.2265618546761&env.minY=20.482662707301063&env.maxX=73.6093743546761&env.maxY=23.462301547672364&zh=true&gp=true&ev=Z&excludeExX=false&excludeExAll=false&mr=1-12&bmo=1&emo=12&yr=all&byr=1900&eyr=2024
[203] https://ebird.org/checklist/S85944606
[204] BirdLife International. 2018. Phoeniconaias minor. The IUCN Red List of Threatened Species 2018: e.T22697369A129912906
[205] McCulloch, G.; Irvine, K. 2004. Breeding of Greater and Lesser Flamingos at Sua Pan, Botswana, 1998-2001. Ostrich 75: 236-242.
[206] BirdLife International. 2018. Phoeniconaias minor. The IUCN Red List of Threatened Species 2018: e.T22697369A129912906

	 https://www.iucnredlist.org/species/22697369/129912906			Indeed, the species has a presence in the surroundings of Rajkot[207], however based on available secondary information extracted from eBird Database[208] (which reports maximum 50 individuals from Randarda Lake during Dec. 2016[209]), it is less likely to meet the threshold i.e. 22,200-32,400 (≥1 percent of the global population) for the EAAA.	
26	Marbled Teal (*Marmaronetta angustirostris*)	**IUCN:** Near Threatened **IWP:** Schedule I **Restricted range:** No **Migratory:** Yes	3a	Marbled Teal has a fragmented distribution in the western Mediterranean (Spain, Morocco, Algeria, Libya, Tunisia, Italy (Sicily and Sardinia) wintering in north and Sub-Saharan west Africa), the eastern Mediterranean (Türkiye)[210, 211]; Israel, Jordan, Syria, wintering south to Egypt) and western and southern Asia (Azerbaijan, Armenia, Russia (where it is on the verge of extinction) [212]; Turkmenistan, Uzbekistan, Tajikistan, Kazakhstan, Iraq, Iran, Afghanistan, Pakistan, India and extreme northwest China, wintering in Iran, Pakistan and north-west India[213]. There are estimates of the species four flyway populations as follows: west Mediterranean and west Africa 6,000-7,500 individuals, Eastern Mediterranean 20-100 individuals, south-west Asia 46,000-50,000 individuals, and South Asia c. 5,000 individuals[214].	Screened Out

[207] https://ebird.org/region/IN-GJ-RA?yr=all

[208] https://ebird.org/map/lesfla1?neg=true&env.minX=66.90597663214957&env.minY=20.500157054730053&env.maxX=74.28878913214957&env.maxY=23.479432421606347&zh=true&gp=true&ev=Z&excludeExX=false&excludeExAll=false&mr=1-12&bmo=1&emo=12&yr=all&byr=1900&eyr=2024

[209] https://ebird.org/india/checklist/S32848225

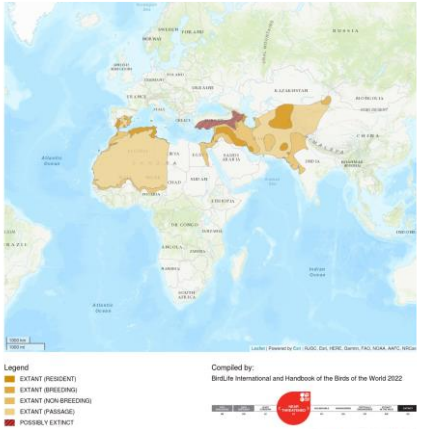
[210] Boyla, K.A., Sinav, L. and Dizdaroğlu D.E. 2019. Turkey Breeding Bird Atlas. WWF-Turkey, Wildlife Conservation Foundation, İstanbul.

[211] Keller, V., Herrando, S., Voříšek, P., Franch, M., Kipson, M., Milanesi, P., Martí, D., Anton, M., Klvaňová, A., Kalyakin, M.V., Bauer, H.-G. and Foppen, R.P.B. 2020. European Breeding Bird Atlas 2: Distribution, Abundance and Change. European Bird Census Council & Lynx Edicions, Barcelona.

[212] Van Impe, J. 2013. Esquisse de l'avifaune de la Sibérie Occidentale: une revue bibliographique. Alauda 81(4): 269-296.

[213] Green, A. J. 1996. International action plan for the Marbled Teal (Marmaronetta angustirostris). In: Heredia, B.; Rose, L.; Painter, M. (ed.), Globally threatened birds in Europe: action plans, pp. 99-117. Council of Europe, and BirdLife International, Strasbourg.

[214] Wetlands International. 2022. Waterbird Populations Portal. Available at: wpp.wetlands.org.

	 https://www.iucnredlist.org/species/22680339/205917761			It is adapted to temporary, unpredictable, Mediterranean-type wetlands[215, 216]; and breeds in fairly dry, steppe-like areas on shallow freshwater, brackish or alkaline ponds with well vegetated shorelines, rich emergent and submergent vegetation[217, 218, 219]; delta marshes where receding waters leave behind large areas of shallow water with abundant sedges and bulrushes[220]; slow rivers and saline coastal lagoons, & man-made wetlands including fish-rearing ponds, small reservoirs and sewage farms[221, 222]. It uses similar habitat during the non-breeding season, although may make more use of shallow, mixed zones of emergent and saltmarsh vegetation during the summer[223]. Banni Grassland and Chhari Dhand, and Nalsarovar Wildlife Sanctuary are the possible habitats for this migratory species in Gujarat[224]. Both the above mentioned IBAs are away from the Rajkot and the available secondary data[225, 226] also supports the unlikelihood of this species in the project's EAAA.	
27	Pallid Harrier (*Circus macrourus*)	**IUCN:** Near Threatened **IWP:** Schedule I **Restricted range:** No **Migratory:** Yes	3a	Pallid Harrier breeds primarily in the steppes of Asiatic Russia, Kazakhstan and north-west China[227]. The global population is estimated at 9,000-15,000 pairs[228], equating to 18,000-30,000 mature individuals.	Screened Out

[215] Green, A. J. 2000. The habitat requirements of the Marbled Teal (Marmaronetta angustirostris), Ménétr., a review. In: Comín, F. A.; Herrera, J. A.; Ramírez, J. (ed.), Limnology and aquatic birds: monitoring, modelling and management, pp. 147-163. Universidad Autónoma del Yucatán, Mérida.

[216] Green, A. J. 2007. Cerceta pardilla - Marmaronetta angustirostris. In: Carrascal, L. M.; Salvador, A. (ed.), Enciclopedia Virtual de los Vertebrados Españoles, Museo Nacional de Ciencias Naturales, Madrid.

[217] Green, A. J. 1993. The status and conservation of the Marbled Teal Marmaronetta angustirostris. International Waterfowl and Wetlands Research Bureau, Slimbridge, U.K.

[218] Kear, J. 2005. Ducks, geese and swans volume 2: species accounts (Cairina to Mergus). Oxford University Press, Oxford, U.K.

[219] Sebastián-González, E., Fuentes, C., Ferrández, M., Echevarrías, J. L., Green, A. J. 2013. Habitat selection of Marbled Teal and White-headed Duck during the breeding and wintering seasons in south-eastern Spain. Bird Conservation International 23(3): 344–359.

[220] Johnsgard, P.A. 1978. Ducks, geese and swans of the World. University of Nebraska Press, Lincoln and London.

[221] Green, A. J. 1993. The status and conservation of the Marbled Teal Marmaronetta angustirostris. International Waterfowl and Wetlands Research Bureau, Slimbridge, U.K.

[222] BirdLife International. 2022. Marmaronetta angustirostris. The IUCN Red List of Threatened Species 2022: e.T22680339A205917761

[223] Sebastián-González, E., Fuentes, C., Ferrández, M., Echevarrías, J. L., Green, A. J. 2013. Habitat selection of Marbled Teal and White-headed Duck during the breeding and wintering seasons in south-eastern Spain. Bird Conservation International 23(3): 344–359.

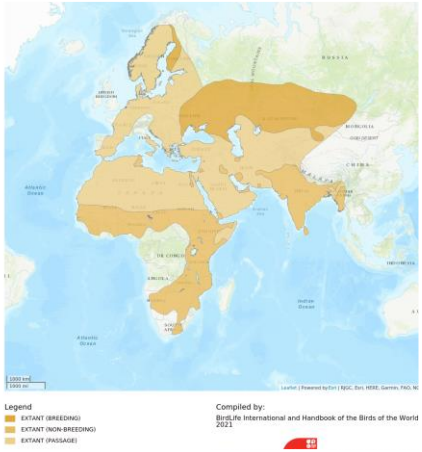
[224] Rahmani, A.R., Islam, M.Z. and Kasambe, R.M. (2016) Important Bird and Biodiversity Areas in India: Priority Sites for Conservation (Revised and updated). Bombay Natural History Society, Indian Bird Conservation Network, Royal Society for the Protection of Birds and BirdLife International (U.K.). Pp. 1992 + xii

[225] https://ebird.org/map/martea1?neg=true&env.minX=70.55043159969749&env.minY=22.31192611951599&env.maxX=70.78114449032249&env.maxY=22.40479856558772&zh=true&gp=true&ev=Z&excludeExX=false&excludeExAll=false&mr=1-12&bmo=1&emo=12&yr=all&byr=1900&eyr=2024

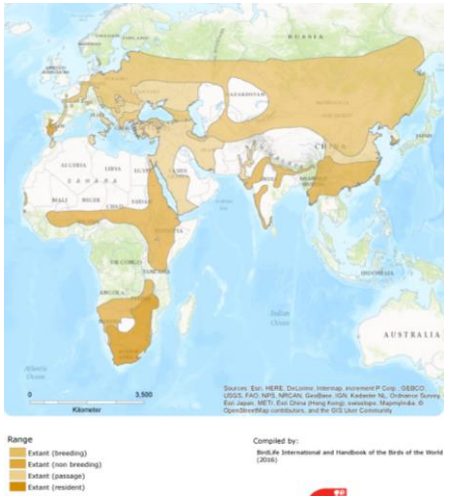
[226] https://www.inaturalist.org/observations?place_id=any&subview=map&taxon_id=7139

[227] BirdLife International. 2021. Circus macrourus. The IUCN Red List of Threatened Species 2021: e.T22695396A201209093

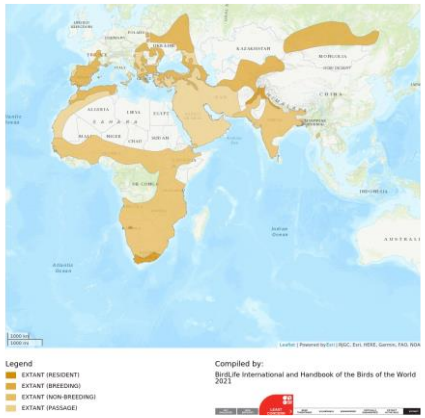
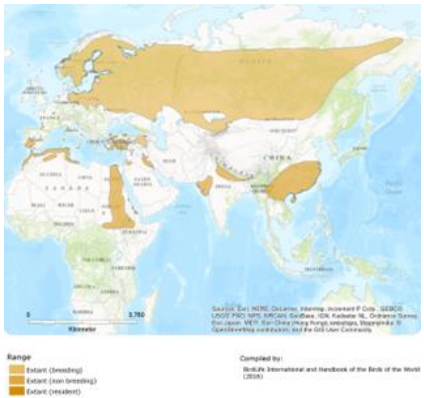
[228] Galushin, V.; Clarke, R.; Davygora, A. 2003. International Action Plan for the Pallid Harrier (Circus macrourus).

	 https://www.iucnredlist.org/species/22695396/201209093			It breeds in semi-desert, steppe and forest-steppe up to 2,000 m, where its favoured nesting sites are wet grasslands close to small rivers and lakes, and marshlands[229, 230]. The species has also been found to breed in agricultural areas, at least when agriculture is non intensive[231]. A minority of the population breeds in the boreal forest and tundra forest zones, north of its main breeding range[232], where it nests in clearings and other open areas[233]. The species is migratory, with most birds wintering in sub-Saharan Africa or south-east Asia, where they use mosaics of forest/ shrubland and grassland and, to a lesser extent, agricultural land for wintering[234]. Undoubtedly the species has a presence in the surroundings of Rajkot[235], however based on available secondary information extracted from eBird Database[236] (which reports maximum 4 individuals from the Khirasara Vidi [237]), it is less likely to meet the threshold i.e. to 180-300 (≥1 percent of the global population) for the EAAA.	
28	Black Stork (*Ciconia nigra*)	**IUCN:** Least Concern **IWP:** Schedule II **Restricted range:** No **Migratory:** Yes	3a	Black Stork has a wide range of distribution from Spain to Russia to South Korea; Mali to Ethiopia and Egypt to South Africa; Arabian Peninsula to Indian Subcontinent to Taiwan[238]. The global population is estimated to number c. 24,000-44,000 individuals[239]. The species inhabits old, undisturbed, open forests - from sea-level up to mountainous regions (e.g. 2,000-2,500 m in altitude)[240, 241, 242].	Screened Out

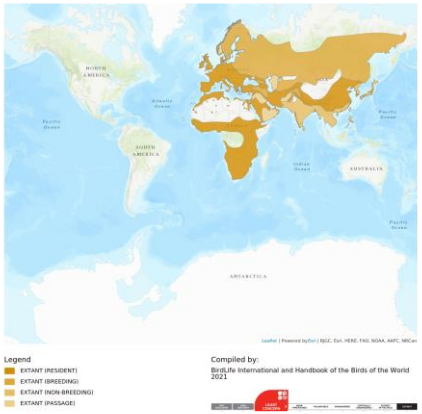
[229] Snow, D.W. and Perrins, C.M. 1998. The Birds of the Western Palearctic, Volume 1: Non-Passerines. Oxford University Press, Oxford.
[230] Galushin, V.; Clarke, R.; Davygora, A. 2003. International Action Plan for the Pallid Harrier (Circus macrourus).
[231] Terraube, J.; Arroyo, B. E.; Mougeot, F.; Madders, M.; Watson, J.; Bragin, E. A. 2009. Breeding biology of the Pallid Harrier Circus macrourus in north-central Kazakhstan: implications for the conservation of a near threatened species. Oryx 43(1): 104-112.
[232] Kuznetsov, A. V. 1994. Birds of prey of the Kostroma lowland. In: Kurochkin, E.N. (ed.), Modern ornithology, pp. 86-93. Nauka, Moscow.
[233] Galushin, V.; Clarke, R.; Davygora, A. 2003. International Action Plan for the Pallid Harrier (Circus macrourus).
[234] Limiñana, R., Arroyo, B., Terraube, J., McGrady, M., & Mougeot, F. 2015. Using satellite telemetry and environmental niche modelling to inform conservation targets for a long-distance migratory raptor in its wintering grounds. Oryx 49(2): 329-337.
[235] https://ebird.org/region/IN-GJ-RA?yr=all
[236] https://ebird.org/map/palhar1?neg=true&env.minX=67.06789802281575&env.minY=21.05981008353915&env.maxX=74.45071052281575&env.maxY=24.02731590116718&zh=true&gp=true&ev=Z&excludeExX=false&excludeExAll=false&mr=1-12&bmo=1&emo=12&yr=all&byr=1900&eyr=2024
[237] https://ebird.org/checklist/S49554856
[238] BirdLife International. 2017. Ciconia nigra. The IUCN Red List of Threatened Species 2017: e.T22697669A111747857
[239] BirdLife International. 2017. Ciconia nigra. The IUCN Red List of Threatened Species 2017: e.T22697669A111747857
[240] Hancock, J. A.; Kushlan, J. A.; Kahl, M. P. 1992. Storks, ibises and spoonbills of the world. Academic Press, London.
[241] del Hoyo, J., Elliot, A. and Sargatal, J. 1992. Handbook of the Birds of the World, Vol. 1: Ostrich to Ducks. Lynx Edicions, Barcelona, Spain.
[242] Snow, D.W. and Perrins, C.M. 1998. The Birds of the Western Palearctic, Volume 1: Non-Passerines. Oxford University Press, Oxford.

	 https://www.iucnredlist.org/species/22697669/111747857			It forages in shallow streams, pools, marshes, occasionally grasslands[243], swampy patches[244], damp meadows[245], flood-plains, pools in dry riverbeds[246], especially where there are stands of reeds or long grass[247]. Undoubtedly the species has a presence in the surroundings of Rajkot[248], however based on available secondary information extracted from eBird Database[249] (which reports maximum 4 individuals from Anandpar check dam [250]), it is less likely to meet the threshold i.e. 240-440 (≥1 percent of the global population) for the EAAA.	
29	Booted Eagle (*Hieraaetus pennatus*)	**IUCN:** Least Concern **IWP:** Schedule I **Restricted range:** No **Migratory:** Yes	3a	Booted eagle has breeding populations in many different regions in both the northern and southern hemisphere. These include southern Europe, North Africa and across Asia, and also in western South Africa and Namibia. The northern populations are migratory spending November to February in Sub-Saharan Africa and South Asia[251]. Its European population is estimated at 23,300-30,300 pairs (equates to 46,600-60,500 mature individuals). Europe forms ca. 31% of the global range, so a very preliminary estimate of the global population size is 150,000-195,000 mature individuals[252].	Screened Out

[243] del Hoyo, J., Elliot, A. and Sargatal, J. 1992. Handbook of the Birds of the World, Vol. 1: Ostrich to Ducks. Lynx Edicions, Barcelona, Spain.
[244] Snow, D.W. and Perrins, C.M. 1998. The Birds of the Western Palearctic, Volume 1: Non-Passerines. Oxford University Press, Oxford.
[245] Hancock, J. A.; Kushlan, J. A.; Kahl, M. P. 1992. Storks, ibises and spoonbills of the world. Academic Press, London.
[246] Hockey, P.A.R., Dean, W.R.J. and Ryan, P.G. 2005. Roberts birds of southern Africa. Trustees of the John Voelcker Bird Book Fund, Cape Town, South Africa.
[247] Brown, L.H., Urban, E.K. and Newman, K. 1982. The Birds of Africa, Volume I. Academic Press, London.
[248] https://ebird.org/region/IN-GJ-RA?yr=all
[249] https://ebird.org/map/blasto1?neg=true&env.minX=70.60789905994382&env.minY=22.14460233595937&env.maxX=70.72325550525632&env.maxY=22.191101815938197&zh=true&gp=true&ev=Z&excludeExX=false&excludeExAll=false&mr=1-12&bmo=1&emo=12&yr=all&byr=1900&eyr=2024
[250] https://ebird.org/india/checklist/S120876905
[251] https://web.archive.org/web/20160327005804/http://www.biodiversityexplorer.org/birds/accipitridae/aquila_pennatus.htm
[252] https://www.iucnredlist.org/species/22696092/206456835#population

	 https://www.iucnredlist.org/species/22696092/206456835			It is a species of open woodland, preferring patches of forest interspersed with open areas; it is recorded up to 3,000 m[253]. Definitely, the species has a presence in the surroundings of Rajkor[254], however based on available secondary information extracted from eBird Database[255] (which reports maximum 2 individuals around Khirasara Vidi [256]), it is less likely to meet the threshold i.e. 1,500-1,950 (≥1 percent of the global population) for the EAAA.	
30	Common Crane (*Grus grus*) 	**IUCN:** Least Concern **IWP:** Schedule IV **Restricted range:** No **Migratory:** Yes	3a	During the breeding season this species utilises a wide variety of shallow wetlands, including high altitude, treeless moors or bogs (where the main vegetation is Sphagnum moss or Ericaceae) usually with some standing water, swampy forest clearings, reedy marshes and rice paddies. The species requires inaccessible ground nesting-sites, so is commonly associated with quaking bogs and other impassible mires, especially in the vicinity of Alnus carr woodland or seasonally flooded riverine forest. The global population is estimated to number c. 491,000-503,000 individuals[257]. The non-breeding wintering and migration habitats of the species include floodland, swampy meadows, shallow sheltered bays, rice paddies, pastures and savannah-like areas (such as open holm oak woodlands in the Iberian Peninsula). The species may also be found roosting on mudflats or sandbanks along rivers, lakes and reservoirs[258].	Screened Out

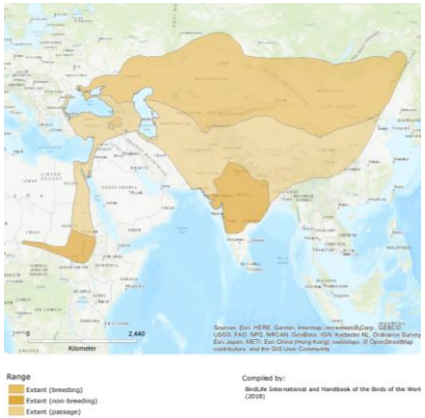
[253] del Hoyo, J.; Elliott, A.; Sargatal, J. 1994. Handbook of the Birds of the World, vol. 2: New World Vultures to Guineafowl. Lynx Edicions, Barcelona, Spain.
[254] https://ebird.org/region/IN-GJ-RA?yr=all
[255] https://ebird.org/map/booeag1?neg=true&env.minX=69.70492019720552&env.minY=21.96334503558733&env.maxX=71.55062332220552&env.maxY=22.706442859365968&zh=true&gp=true&ev=Z&excludeExX=false&excludeExAll=false&mr=1-12&bmo=1&emo=12&yr=all&byr=1900&eyr=2024
[256] https://ebird.org/checklist/S61219836
[257] https://www.iucnredlist.org/species/22692146/86219168#population
[258] BirdLife International. 2016. Grus grus. The IUCN Red List of Threatened Species 2016: e.T22692146A86219168

	https://www.iucnredlist.org/species/22692146/86219168			Definitely, the species has a presence in the surroundings of Rajkot[259], [260], however based on available secondary information extracted from eBird Database[261] (which reports maximum 500 individuals from Nyari-1 Dam[262]), it is less likely to meet the threshold i.e. 4,910-5,030 (≥1 percent of the global population) for the EAAA.	
31	Common Kestrel (*Falco tinnunculus*)  https://www.iucnredlist.org/species/22696362/206316110	**IUCN:** Least Concern **IWP:** Schedule IV **Restricted range:** No **Migratory:** Yes	3a	Common Kestrel occurs over a large range. It is widespread in Europe, Asia, and Africa, as well as occasionally reaching the east coast of North America[263]. These birds are sedentary but in the cold parts of their range, they migrate south in winter. The European population is estimated at 411,000-631,000 pairs (equates to 823,000-1,270,000 mature individuals). As Europe forms ca. 19% of the global range, a very preliminary estimate of the global population size is 4,330,000-6,680,000 mature individuals, therefore placed in the band 4,300,000-6,700,000 mature individuals[264]. The species can tolerate a wide range of open and partially forested habitats and has been recorded up to 4,500 m[265]. Undoubtedly the species has a presence in the surroundings of Rajkot[266], however based on available secondary information extracted from eBird Database[267] (which reports maximum 10 individuals near Mesvada[268], followed by 6 individuals from Khirasara Vidi[269]), it is less likely to meet the threshold i.e. 240-440 (≥1 percent of the global population) for the EAAA.	Screened Out
32	Common Teal (*Anas crecca*)	**IUCN:** Least Concern **IWP:** Schedule IV **Restricted range:** No	3a	Common Teal migrates from Europe & formal USSR and winter in coasts of Northern Africa, East Africa, Central Asia, Indian Subcontinent, & Eastern Asia[270].	Screened Out

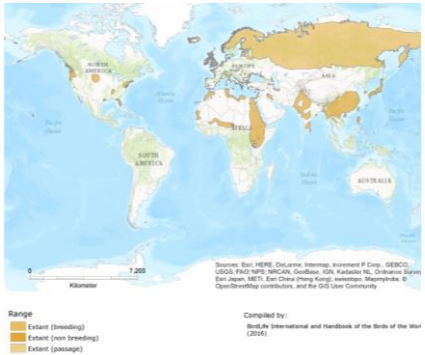
[259] https://ebird.org/region/IN-GJ-RA?yr=all
[260] https://www.inaturalist.org/observations?iconic_taxa=Aves&place_id=32163&subview=map&view=species
[261] https://ebird.org/map/comcra?neg=true&env.minX=69.7673921367614&env.minY=21.89631994657082&env.maxX=71.6130952617614&env.maxY=22.639773459075077&zh=true&gp=true&ev=Z&excludeExX=false&excludeExAll=false&mr=1-12&bmo=1&emo=12&yr=all&byr=1900&eyr=2024
[262] https://ebird.org/india/checklist/S80171025
[263] https://www.beautyofbirds.com/commonkestrels.html
[264] https://www.iucnredlist.org/species/22696362/206316110#population
[265] del Hoyo, J.; Elliott, A.; Sargatal, J. 1994. Handbook of the Birds of the World, vol. 2: New World Vultures to Guineafowl. Lynx Edicions, Barcelona, Spain.
[266] https://ebird.org/region/IN-GJ-RA?yr=all
[267] https://ebird.org/map/eurkes?neg=true&env.minX=70.64402060616483&env.minY=22.385513339132636&env.maxX=71.10544638741483&env.maxY=22.571097805227588&zh=true&gp=true&ev=Z&excludeExX=false&excludeExAll=false&mr=1-12&bmo=1&emo=12&yr=all&byr=1900&eyr=2024
[268] https://ebird.org/checklist/S93685808
[269] https://ebird.org/checklist/S83930695
[270] BirdLife International. 2020. Anas crecca. The IUCN Red List of Threatened Species 2020: e.T22680321A181692388

	 https://www.iucnredlist.org/species/22680321/181692388		**Migratory:** Yes	The global population is estimated at c. 2,800,000 mature individuals[271, 272]. The European population is estimated at 557,000-915,000 pairs, which equates to 1,110,000-1,830,000 mature individuals[273]. Its habitats include Forest, Shrubland, Wetlands (inland), Marine Intertidal, Marine Coastal/Supratidal, Artificial/Terrestrial, Artificial/Aquatic & Marine[274]. Definitely, the species has a presence in the surroundings of Rajkot[275], however based on available secondary information extracted from eBird Database[276] (which reports maximum 100 individuals from Lalpari Lake[277] and from the Fofal Dam[278]), it is less likely to meet the threshold i.e. 28,000 (≥1 percent of the global population) for the EAAA.	
33	Demoiselle Crane (*Anthropoides virgo*)		**IUCN:** Least Concern **IWP:** Schedule IV **Restricted range:** No **Migratory:** Yes	3a	Demoiselle Crane breeds eastwards from Central Asia to Mongolia and winters almost entirely in western India (Gujarat and Rajasthan specifically)[279]. The global population is estimated to number c. 230,000-261,000 individuals[280]. In both its breeding and wintering ranges this species shows a preference for grassland habitats in close proximity to streams, shallow lakes and other wetlands, mudflats surrounded by water, cultivated areas, also frequenting desert areas where water is available[281, 282, 283, 284]. In India a wider range of habitat types are used, including	Screened Out

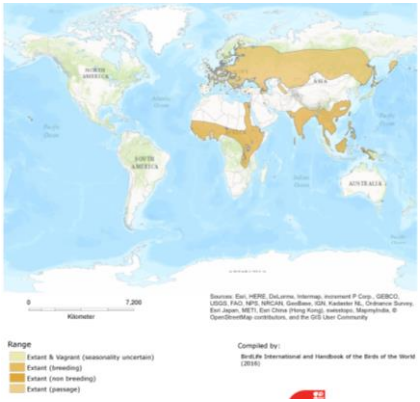
[271] Partners in Flight. 2019. Avian Conservation Assessment Database, version 2019. Available at: http://pif.birdconservancy.org/ACAD.
[272] Wetlands International. 2020. Waterbird Population Estimates. Available at: wpe.wetlands.org.
[273] BirdLife International. 2015. European Red List of Birds. Office for Official Publications of the European Communities, Luxembourg.
[274] BirdLife International. 2020. Anas crecca. The IUCN Red List of Threatened Species 2020: e.T22680321A181692388
[275] https://ebird.org/region/IN-GJ-RA?yr=all
[276] https://ebird.org/map/gnwtea?neg=true&env.minX=70.55189506275636&env.minY=22.197899726715846&env.maxX=70.78260795338136&env.maxY=22.290847987529244&zh=true&gp=true&ev=Z&excludeExX=false&excludeExAll=false&mr=1-12&bmo=1&emo=12&yr=all&byr=1900&eyr=2024
[277] https://ebird.org/checklist/S42674208
[278] https://ebird.org/checklist/S99107021
[279] https://birdcount.in/migration-map/demcra1/
[280] Wetlands International. 2015. Waterbird Population Estimates. Available at: wpe.wetlands.org.
[281] Johnsgard, P. A. 1983. Cranes of the world. Croom Helm, London.
[282] Ellis, D.H., Gee, G.F. and Mirande, C.M. 1996. Cranes: their biology, husbandary, and conservation. Gazelle Books, Lancaster, U.K.
[283] del Hoyo, J.; Elliott, A.; Sargatal, J. 1996. Handbook of the Birds of the World, vol. 3: Hoatzin to Auks. Lynx Edicions, Barcelona, Spain.
[284] Meine, C. D. and Archibald, G. W. 1996. The cranes - status survey and conservation action plan. International Union for Conservation of Nature and Natural Resources, Gland, Switzerland, and Cambridge, U.K.

	 https://www.iucnredlist.org/species/22692081/131927771			marshes, freshwater lakes, rivers[285], cultivated fields and rice stubble[286], sandy riverbeds, the flat and open margins of seasonal pans and farm ponds[287], and hot desert (if water is readily available) [288, 289]. Kaj Lake (Pipalava Bandharo), Salt Pans of Bhavnagar, Wild Ass Wildlife Sanctuary & Nanda Island, and Gosabara (Mokarsar) Wetlands Complex area are the possible habitats for this migratory species in Gujarat[290]. Indeed, the species has a presence in the surroundings of Rajkot[291, 292], however based on available secondary information extracted from eBird Database[293] (which reports maximum 300 individuals from Fofal Dam--Kuvadva[294] and Aji-2 Dam[295] in 2021), it is less likely to meet the threshold i.e. 2300-2610 (≥1 percent of the global population) for the EAAA.	
34	Eurasian Wigeon (*Mareca penelope*)	**IUCN:** Least Concern **IWP:** Schedule IV **Restricted range:** No **Migratory:** Yes	3a	Eurasian wigeons breed in the northernmost areas of Europe and the Palearctic. They are strongly migratory and winters further south than their breeding range. They spend winter in southern Asia and Africa. The global population is estimated to number c.2,800,000-3,300,000 individuals[296]. This species breeds in lowland freshwater marshes, slow-flowing large rivers[297] and shallow lakes and lagoons with ample submerged, floating and emerging vegetation[298]. Ideal wetland habitats for this species are those surrounded by sparse open forest,	Screened Out

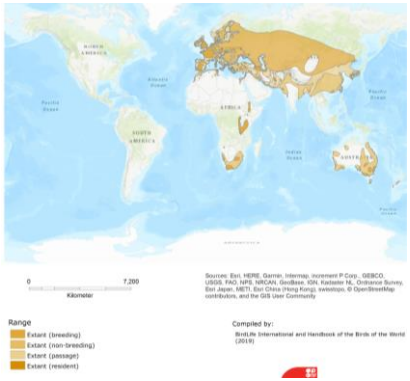
[285] Urban, E.K.; Fry, C.H.; Keith, S. 1986. The Birds of Africa, Volume II. Academic Press, London.
[286] del Hoyo, J.; Elliott, A.; Sargatal, J. 1996. Handbook of the Birds of the World, vol. 3: Hoatzin to Auks. Lynx Edicions, Barcelona, Spain.
[287] Johnsgard, P. A. 1983. Cranes of the world. Croom Helm, London.
[288] Ellis, D.H., Gee, G.F. and Mirande, C.M. 1996. Cranes: their biology, husbandary, and conservation. Gazelle Books, Lancaster, U.K.
[289] Meine, C. D. and Archibald, G. W. 1996. The cranes - status survey and conservation action plan. International Union for Conservation of Nature and Natural Resources, Gland, Switzerland, and Cambridge, U.K.
[290] Rahmani, A.R., Islam, M.Z. and Kasambe, R.M. (2016) Important Bird and Biodiversity Areas in India: Priority Sites for Conservation (Revised and updated). Bombay Natural History Society, Indian Bird Conservation Network, Royal Society for the Protection of Birds and BirdLife International (U.K.). Pp. 1992 + xii
[291] https://ebird.org/region/IN-GJ-RA?yr=all
[292] https://www.inaturalist.org/observations?iconic_taxa=Aves&place_id=32163&subview=map&view=species
[293] https://ebird.org/map/demcra1?neg=true&env.minX=70.32146897801192&env.minY=22.122068037869806&env.maxX=71.24432054051192&env.maxY=22.493691492939124&zh=true&gp=true&ev=Z&excludeExX=false&excludeExAll=false&mr=1-12&bmo=1&emo=12&yr=all&byr=1900&eyr=2024
[294] https://ebird.org/checklist/S99107021
[295] https://ebird.org/checklist/S85944606
[296] Wetlands International. 2015. Waterbird Population Estimates. Available at: wpe.wetlands.org.
[297] Kretchmar, A. V. 1994. Eurasian wigeon (Anas penelope) in north-eastern Asia. Zoologichesky Zhurnal 73(5): 68-79.
[298] Kear, J. 2005. Ducks, geese and swans volume 2: species accounts (Cairina to Mergus). Oxford University Press, Oxford, U.K.

	 https://www.iucnredlist.org/species/22680157/111892532			woodland and especially agricultural land. In the non-breeding season this species shows a preference for coastal salt-marshes, freshwater, brackish and saline lagoons, flooded grasslands, estuaries, intertidal mudflats, and other sheltered marine habitats [299, 300]. Nalsarovar Wildlife Sanctuary, and Salt Pans of Bhavnagar are the possible habitats for this migratory species in Gujarat[301]. Indeed, the species has a presence in the surroundings of Rajkot[302], however based on available secondary information extracted from eBird Database[303] (which reports maximum 80 individuals near Gadhka road[304] followed by 50 individuals from Lalpari Lake[305] and Fofal Dam[306]), it is less likely to meet the threshold i.e. 28,000-33,000 (≥1 percent of the global population) for the EAAA.	
35	Garganey (*Spatula querquedula*)	**IUCN:** Least Concern **IWP:** Schedule IV **Restricted range:** No **Migratory:** Yes	3a	Garganey breed Europe and Northwest Asia. They move to Africa, Indian Subcontinent (particularly South India), Australia, New Zealand, New Guinea and neighbouring islands for wintering[307]. The global population is estimated to number c. 2,600,000-2,800,000 individuals[308]. In the breeding season this species frequents small, shallow ponds and lakes with abundant floating, emergent and fringing vegetation, grass dominated environments (i.e. swampy meadows, flooded fields), shallow freshwater marshes[309, 310, 311, 312, 313]. During	Screened Out

[299] Cramp, S.; Simmons, K. E. L. 1977. Handbook of the birds of Europe, the Middle East and Africa. The birds of the western Palearctic, vol. I: ostriches to ducks. Oxford University Press, Oxford.
[300] Kear, J. 2005. Ducks, geese and swans volume 2: species accounts (Cairina to Mergus). Oxford University Press, Oxford, U.K.
[301] Rahmani, A.R., Islam, M.Z. and Kasambe, R.M. (2016) Important Bird and Biodiversity Areas in India: Priority Sites for Conservation (Revised and updated). Bombay Natural History Society, Indian Bird Conservation Network, Royal Society for the Protection of Birds and BirdLife International (U.K.). Pp. 1992 + xii
[302] https://ebird.org/region/IN-GJ-RA?yr=all
[303] https://ebird.org/map/eurwig?neg=true&env.minX=70.22393527310277&env.minY=22.140278246131576&env.maxX=71.14678683560277&env.maxY=22.511853286340337&zh=true&gp=true&ev=Z&excludeExX=false&excludeExAll=false&mr=1-12&bmo=1&emo=12&yr=all&byr=1900&eyr=2024
[304] https://ebird.org/checklist/S100906907
[305] https://ebird.org/checklist/S42674208
[306] https://ebird.org/checklist/S99107021
[307] https://indianbirds.thedynamicnature.com/2015/03/garganey-spatula-querquedula.html#google_vignette
[308] Wetlands International. 2015. Waterbird Population Estimates. Available at: wpe.wetlands.org.
[309] Cramp, S.; Simmons, K. E. L. 1977. Handbook of the birds of Europe, the Middle East and Africa. The birds of the western Palearctic, vol. I: ostriches to ducks. Oxford University Press, Oxford.
[310] Johnsgard, P.A. 1978. Ducks, geese and swans of the World. University of Nebraska Press, Lincoln and London.
[311] del Hoyo, J., Collar, N.J., Christie, D.A., Elliott, A. and Fishpool, L.D.C. 2014. HBW and BirdLife International Illustrated Checklist of the Birds of the World. Lynx Edicions BirdLife International, Barcelona, Spain and Cambridge, UK.
[312] Green, A. J. 1998. Habitat selection by the Marbled Teal Marmaronetta angustirostris, Ferruginous Duck Aythya nyroca and other ducks in the Göksu Delta, Turkey in late summer. Revue d'Ecologie (La Terre et la Vie) 53: 225-243.
[313] Schricke, V. 2002. Elements for a garganey (Anas querquedula) management plan. Game and Wildlife Science 18(1): 9-41.

	 https://www.iucnredlist.org/species/22680313/86016410			nonbreeding season the species shows a preference for large freshwater or occasionally brackish lakes, again with abundant floating, emergent and fringing vegetation[314], also shallow flood plains, shallow dams, pans and sewage ponds (in South Africa)[315]. The species also frequents coastal saltmarshes and lagoons on passage[316] and may spend the day resting on marine inshore waters when migrating[317]. Although the Important Bird and Biodiversity Areas in India: Priority Sites for Conservation (Revised and updated Edition - 2016)[318] reports the species from Salt Pans of Bhavnagar. However, the species has been reported throughout the state (Gujarat)[319]. Indeed, the species has a presence in the surroundings of Rajkot[320], however based on available secondary information extracted from eBird Database[321] (which reports maximum 65 individuals from Randarda Lake[322] followed by 54 individuals from Aji-2 Dam[323]), it is less likely to meet the threshold i.e. 26,000-28,000 (≥1 percent of the global population) for the EAAA.	
36	Great Crested Grebe (*Podiceps cristatus*)	**IUCN:** Least Concern **IWP:** Schedule IV **Restricted range:** No **Migratory:** Yes	3a	Great Crested Grebe is found across most of Europe and central Asia, though it also winters in parts of southern Asia (e.g. northern India). Colonies can also be found scattered throughout Africa, from Tunisia and Egypt in the north and a few colonies in central Africa down to South Africa. Nesting colonies are also found in southern Australia and New Zealand, with individuals wintering in eastern and northern Australia[324]. The global population is estimated to number c. 915,000-1,400,000 individuals[325]. The species breeds on fresh or brackish waters with abundant emergent and submerged vegetation, showing a preference for non-acidic eutrophic waterbodies with flat or sloping banks and muddy or sandy substrates, usually 0.5-5 m deep and with large areas	Screened Outs

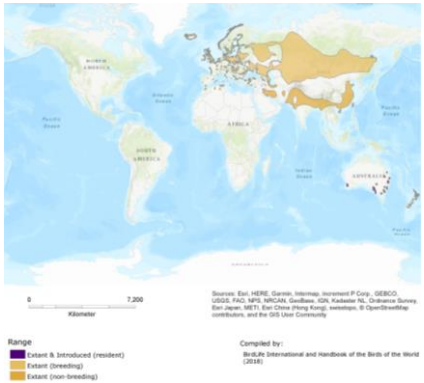
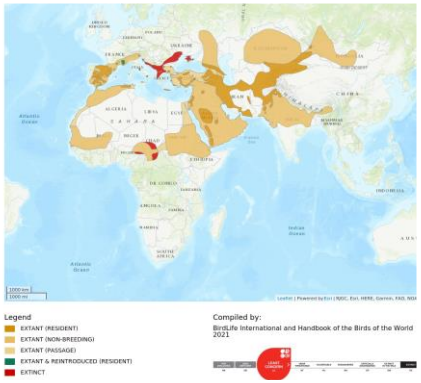
[314] Kear, J. 2005. Ducks, geese and swans volume 2: species accounts (Cairina to Mergus). Oxford University Press, Oxford, U.K.
[315] Hockey, P.A.R., Dean, W.R.J. and Ryan, P.G. 2005. Roberts birds of southern Africa. Trustees of the John Voelcker Bird Book Fund, Cape Town, South Africa.
[316] del Hoyo, J.; Elliot, A.; Sargatal, J. 1992. Handbook of the Birds of the World, vol. 1: Ostrich to Ducks. Lynx Edicions, Barcelona, Spain.
[317] Madge, S.; Burn, H. 1988. Wildfowl. Christopher Helm, London.
[318] Rahmani, A.R., Islam, M.Z. and Kasambe, R.M. (2016) Important Bird and Biodiversity Areas in India: Priority Sites for Conservation (Revised and updated). Bombay Natural History Society, Indian Bird Conservation Network, Royal Society for the Protection of Birds and BirdLife International (U.K.). Pp. 1992 + xii
[319] https://ebird.org/map/gargan?neg=true&env.minX=70.26954747026299&env.minY=22.1725462824543&env.maxX=71.19239903276299&env.maxY=22.544035440921657&zh=true&gp=true&ev=Z&excludeExX=false&excludeExAll=false&mr=1-12&bmo=1&emo=12&yr=all&byr=1900&eyr=2024
[320] https://ebird.org/region/IN-GJ-RA?yr=all
[321] https://ebird.org/map/gargan?neg=true&env.minX=70.26954747026299&env.minY=22.1725462824543&env.maxX=71.19239903276299&env.maxY=22.544035440921657&zh=true&gp=true&ev=Z&excludeExX=false&excludeExAll=false&mr=1-12&bmo=1&emo=12&yr=all&byr=1900&eyr=2024
[322] https://ebird.org/checklist/S84444670
[323] https://ebird.org/india/checklist/S80348370
[324] del Hoyo, J.; Elliot, A.; Sargatal, J. 1992. Handbook of the Birds of the World, Vol. 1: Ostrich to Ducks. Lynx Edicions, Barcelona, Spain.
[325] Wetlands International. 2015. Waterbird Population Estimates. Available at: wpe.wetlands.org.

	 https://www.iucnredlist.org/species/22696602/154250080			of open water[326, 327]. Suitable habitats include small pools or lakes, backwaters of slow-flowing rivers and artificial waterbodies (e.g. reservoirs, fish-ponds, gravel pits and ornamental lakes)[328]. The species overwinters on large exposed ice-free lakes and reservoirs, moving to sheltered coastal inshore waters less than 10 m deep, such as brackish estuaries, deltas, tidal channels and tidal lagoons during cold spells[329, 330, 331]. The Important Bird and Biodiversity Areas in India: Priority Sites for Conservation (Revised and updated Edition - 2016)[332] reports the species from Charakla Saltworks, Khijadiya Bird Sanctuary, and Gosabara Wetland. Definitely, the species has a presence in the surroundings of Rajkot[333, 334], however based on available secondary information extracted from eBird Database[335] (which reports maximum 27 individuals from Nyari-1 Dam[336] followed by 20 individuals from Lalpari Lake[337] and Aji-2 Dam[338]), it is less likely to meet the threshold i.e. 9,150-14,000 (≥1 percent of the global population) for the EAAA.	
37	Greater Flamingo (*Phoenicopterus roseus*)	**IUCN:** Least Concern **IWP:** Schedule IV **Restricted range:** No **Migratory:** Yes	3a	This species is regularly seen from West Africa eastward throughout the Mediterranean to Southwest and South Asia, and throughout sub-Saharan Africa. In India it is a winter migrant but can be seen throughout the year in Rann of Gujarat. The overall population is estimated at 550,000-680,000 individuals[339]. The species inhabits shallow (c.1 m deep over a large area) eutrophic waterbodies such as saline lagoons, saltpans and large saline or alkaline lakes (up to pH 11). It will also frequent sewage treatment pans, inland dams, estuaries and coastal waters, seldom alighting on freshwater but commonly bathing and drinking from freshwater inlets	Screened Out

[326] del Hoyo, J.; Elliot, A.; Sargatal, J. 1992. Handbook of the Birds of the World, Vol. 1: Ostrich to Ducks. Lynx Edicions, Barcelona, Spain.
[327] Snow, D.W.; Perrins, C.M. 1998. The Birds of the Western Palearctic, Volume 1: Non-Passerines. Oxford University Press, Oxford.
[328] del Hoyo, J.; Elliot, A.; Sargatal, J. 1992. Handbook of the Birds of the World, Vol. 1: Ostrich to Ducks. Lynx Edicions, Barcelona, Spain.
[329] del Hoyo, J.; Elliot, A.; Sargatal, J. 1992. Handbook of the Birds of the World, Vol. 1: Ostrich to Ducks. Lynx Edicions, Barcelona, Spain.
[330] Snow, D.W.; Perrins, C.M. 1998. The Birds of the Western Palearctic, Volume 1: Non-Passerines. Oxford University Press, Oxford.
[331] Fjeldså, J. 2004. The grebes. Oxford University Press, Oxford, U.K.
[332] Rahmani, A.R., Islam, M.Z. and Kasambe, R.M. (2016) Important Bird and Biodiversity Areas in India: Priority Sites for Conservation (Revised and updated). Bombay Natural History Society, Indian Bird Conservation Network, Royal Society for the Protection of Birds and BirdLife International (U.K.). Pp. 1992 + xii
[333] https://ebird.org/barchart?r=IN-GJ-VD&yr=all&m=
[334] https://www.inaturalist.org/observations?iconic_taxa=Aves&place_id=32163&subview=map&view=species
[335] https://ebird.org/map/grcgre1?neg=true&env.minX=70.64247986052823&env.minY=22.232062996291685&env.maxX=70.75783630584073&env.maxY=22.278533506811367&zh=true&gp=true&ev=Z&excludeExX=false&excludeExAll=false&mr=1-12&bmo=1&emo=12&yr=all&byr=1900&eyr=2024
[336] https://ebird.org/india/checklist/S110951367
[337] https://ebird.org/checklist/S47837254
[338] https://ebird.org/checklist/S85944606
[339] https://www.iucnredlist.org/species/22697360/155527405#population

	 https://www.iucnredlist.org/species/22697360/155527405			entering alkaline or saline lakes[340, 341]. It nests and roosts nests in large dense colonies on sandbanks, mudflats, islands or boggy, open shores[342, 343]. Flamingo City, Nalsarovar Wildlife Sanctuary, Salt Pans of Bhavnagar, Thol Lake Bird Sanctuary, and Wild Ass Wildlife Sanctuary & Nanda Island are the possible habitats for this migratory species in Gujarat[344]. Indeed, the species has a presence in the surroundings of Rajkot[345, 346], however based on available secondary information extracted from eBird Database[347] (which reports maximum 300 individuals from Nyari-2 Dam[348] fallowed by 200 individuals from Aji-2 Dam[349]), it is less likely to meet the threshold i.e. 5,500-6,800 (≥1 percent of the global population) for the EAAA.	
38	Greylag Goose (*Anser anser*)	**IUCN:** Least Concern **IWP:** Schedule IV **Restricted range:** No **Migratory:** Yes	3a	Greylag Goose is widespread species, from the north of its range in Europe and Asia often migrating southwards to spend the winter in warmer places, although many populations are resident, even in the north. The global population is estimated to number c. 1,000,000-1,100,000 individuals[350]. During the breeding season the species inhabits wetlands surrounded by fringing vegetation in open grassland[351], sedge or heather moorland[352], arctic tundra, steppe or	Screened Out

[340] Hockey, P.A.R.; Dean, W.R.J.; Ryan, P.G. 2005. Roberts Birds of Southern Africa. Trustees of the John Voelcker Bird Book Fund, Cape Town, South Africa.
[341] BirdLife International. 2019. Phoenicopterus roseus (amended version of 2018 assessment). The IUCN Red List of Threatened Species 2019: e.T22697360A155527405
[342] Brown, L.H.; Urban, E.K.; Newman, K. 1982. The Birds of Africa, Volume I. Academic Press, London.
[343] del Hoyo, J.; Elliot, A.; Sargatal, J. 1992. Handbook of the Birds of the World, Vol. 1: Ostrich to Ducks. Lynx Edicions, Barcelona, Spain.
[344] Rahmani, A.R., Islam, M.Z. and Kasambe, R.M. (2016) Important Bird and Biodiversity Areas in India: Priority Sites for Conservation (Revised and updated). Bombay Natural History Society, Indian Bird Conservation Network, Royal Society for the Protection of Birds and BirdLife International (U.K.). Pp. 1992 + xii
[345] https://ebird.org/region/IN-GJ-RA?yr=all
[346] https://www.inaturalist.org/observations?iconic_taxa=Aves&place_id=32163&subview=map&view=species
[347] https://ebird.org/map/grefla3?neg=true&env.minX=70.31821221138746&env.minY=22.127660265131322&env.maxX=71.24106377388746&env.maxY=22.49926885631428&zh=true&gp=true&ev=Z&excludeExX=false&excludeExAll=false&mr=1-12&bmo=1&emo=12&yr=all&byr=1900&eyr=2024
[348] https://ebird.org/checklist/S23956799
[349] https://ebird.org/checklist/S85944606
[350] Wetlands International. 2015. Waterbird Population Estimates. Available at: wpe.wetlands.org.
[351] del Hoyo, J., Elliot, A. and Sargatal, J. 1992. Handbook of the Birds of the World, Vol. 1: Ostrich to Ducks. Lynx Edicions, Barcelona, Spain.
[352] Johnsgard, P.A. 1978. Ducks, geese and swans of the World. University of Nebraska Press, Lincoln and London.

	 https://www.iucnredlist.org/species/22679889/131907747			semi-desert from sea-level up to 2,300 m[353]. In the winter the species inhabits lowland farmland in open country, swamps, lakes, reservoirs, coastal lagoons, and estuaries[354, 355]. Indeed, the species has a presence in the surroundings of Rajkot[356], however based on available secondary information extracted from eBird Database[357] (which reports maximum 10 individuals from Rajkot[358]), it is less likely to meet the threshold i.e. 10,000-11,000 (≥1 percent of the global population) for the EAAA.	
39	Griffon Vulture (*Gyps fulvus*) 	**IUCN:** Least Concern **IWP:** Schedule I **Restricted range:** No **Migratory:** Yes	3a	Griffon Vulture has a very large range, across the Middle East, North Africa, and Europe, from India to Portugal and Spain, most commonly found in countries that border the Mediterranean. The biggest population is in Spain, being more than three-quarters of the European population[359]. The European population is estimated at 34,800-44,700 pairs, which equates to 69,600-89,400 mature individuals[360]. Approximately 10% of the global range for this species falls within Europe, so a very preliminary estimate of the global population size is 696,000-894,000 mature individuals. Thus, it is placed in the band 80,000-900,000 mature individuals. It is a species of expansive open areas in a wide array of environments, from mountains to semi-desert, and is recorded regularly from sea level up to c.3,000 m[361].	Screened Out

[353] Snow, D.W.; Perrins, C.M. 1998. The Birds of the Western Palearctic, Volume 1: Non-Passerines. Oxford University Press, Oxford.
[354] del Hoyo, J., Elliot, A. and Sargatal, J. 1992. Handbook of the Birds of the World, Vol. 1: Ostrich to Ducks. Lynx Edicions, Barcelona, Spain.
[355] Madge, S.; Burn, H. 1988. Wildfowl. Christopher Helm, London.
[356] https://ebird.org/region/IN-GJ-RA?yr=all
[357] https://ebird.org/map/gragoo?neg=true&env.minX=70.6560516933678&env.minY=22.369384307621978&env.maxX=70.71372991602405&env.maxY=22.39259864868522&zh=true&gp=true&ev=Z&excludeExX=false&excludeExAll=false&mr=1-12&bmo=1&emo=12&yr=all&byr=1900&eyr=2024
[358] https://ebird.org/checklist/S156782547
[359] https://animalia.bio/griffon-vulture?letter=v#distribution
[360] BirdLife International. In prep. European Red List of Birds. Deliverable to the European Commission (DG Environment) in 2021 under Service Contract ENV.D.3/SER/2018/0018.
[361] del Hoyo, J.; Elliott, A.; Sargatal, J. 1994. Handbook of the Birds of the World, vol. 2: New World Vultures to Guineafowl. Lynx Edicions, Barcelona, Spain.

	https://www.iucnredlist.org/species/22695219/157719127			Although the Important Bird and Biodiversity Areas in India: Priority Sites for Conservation (Revised and updated Edition - 2016)[362] reports the species from Nikol-Samadhiyala-Malan Wetlands Complex. However, the species has been reported from throughout the state (Gujarat)[363]. Definitely, the species has a presence in the Saurashtra region[364], however based on available secondary information[365, 366], the species has not been reported from the Rajkot area since long time. Thus, it is unlikely to meet the threshold i.e. 800-9,000 (≥1 percent of the global population) for the EAAA.	
40	Lesser Kestrel (*Falco naumanni*)	**IUCN:** Least Concern **IWP:** Schedule II **Restricted range:** No **Migratory:** Yes	3a	Lesser Kestrel breeds in Spain, Portugal, Gibraltar (to UK), France, Italy, Bosnia-Herzegovina, FYRO Macedonia, Albania, Greece, Turkey, Morocco, Algeria, Tunisia, Libya, Israel, Palestinian Authority Territories, Jordan, Iran, Iraq, Armenia, Azerbaijan, Georgia, Russia, Ukraine, Afghanistan, Turkmenistan, Uzbekistan, Kazakhstan, China and Mongolia. Birds winter in southern Spain, southern Turkey, Malta and across much of Africa, particularly South Africa[367]. The European population is estimated at 32,900-42,600 pairs, which equates to 65,800-85,200 mature individuals[368]. The population in China has been estimated at c.100-10,000 breeding pairs and c.50-1,000 individuals on migration[369]. The population in Kazakhstan has been estimated at 5,000-10,000 pairs[370]. The population in North Africa is estimated to be at least 2,500-3,000 breeding pairs[371]. The global population is therefore roughly estimated at 80,000-134,000 mature individuals[372]. It is usually a colonial breeder, often in the vicinity of human settlements. It forages in steppe-like habitats, natural and managed grasslands, and non-intensive cultivation. It is	Screened Out

[362] Rahmani, A.R., Islam, M.Z. and Kasambe, R.M. (2016) Important Bird and Biodiversity Areas in India: Priority Sites for Conservation (Revised and updated). Bombay Natural History Society, Indian Bird Conservation Network, Royal Society for the Protection of Birds and BirdLife International (U.K.). Pp. 1992 + xii

[363] https://ebird.org/map/eurgri1?neg=true&env.minX=72.35875139565407&env.minY=22.01334821835036&env.maxX=73.76500139565407&env.maxY=22.578770176796517&zh=true&gp=true&ev=Z&excludeExX=false&excludeExAll=false&mr=1-12&bmo=1&emo=12&yr=all&byr=1900&eyr=2024

[364] https://ebird.org/map/eurgri1?neg=true&env.minX=27.730860830720275&env.minY=11.825598556483765&env.maxX=86.79336083072027&env.maxY=35.174858131962054&zh=true&gp=true&ev=Z&excludeExX=false&excludeExAll=false&mr=1-12&bmo=1&emo=12&yr=all&byr=1900&eyr=2024

[365] https://ebird.org/region/IN-GJ-RA?yr=all

[366] https://www.inaturalist.org/observations?iconic_taxa=Aves&place_id=32163&subview=map&view=species

[367] https://www.iucnredlist.org/species/22696357/205768513#geographic-range

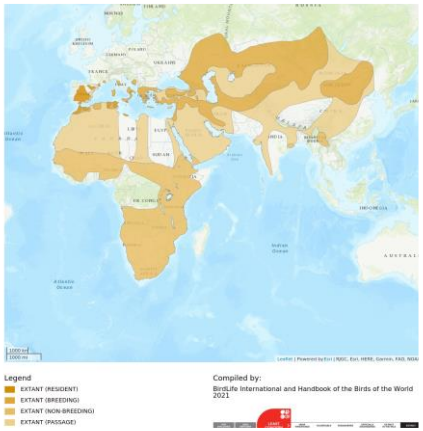
[368] BirdLife International. In prep. European Red List of Birds. Deliverable to the European Commission (DG Environment) in 2021 under Service Contract ENV.D.3/SER/2018/0018.

[369] Brazil, M. 2009. Birds of East Asia: eastern China, Taiwan, Korea, Japan, eastern Russia. Christopher Helm, London.

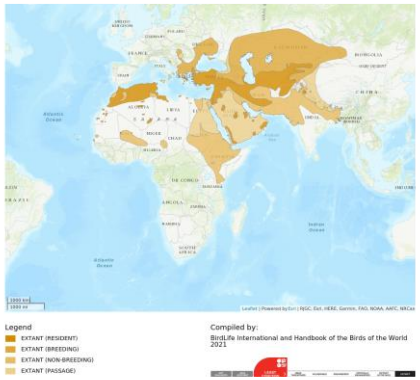
[370] Orta, J. & Kirwan, G. M. 2020. Lesser Kestrel (Falco naumanni), version 1.0. In: J. del Hoyo, A. Elliott, J. Sargatal, D. A. Christie, and E. de Juana (eds), Birds of the World, Cornell Lab of Ornithology, Ithaca, NY.

[371] Garrido, J. R., Numa, C., Barrios, V. et al. In prep. The conservation status and distribution of the breeding birds of prey in Northern Africa. The IUCN Red List of Threatened Species - Regional Assessment .

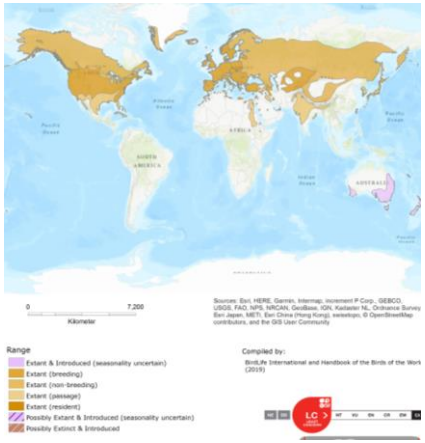
[372] https://www.iucnredlist.org/species/22696357/205768513#population

	 https://www.iucnredlist.org/species/22696357/205768513			mainly migratory, with most breeders overwintering in sub-Saharan Africa, although some travel to parts of north-west Africa, southern Europe and southern Asia[373]. Although the global distribution map of the species includes Rajkot area[374] however based on available secondary information[375, 376], the species has not been reported from the Rajkot and surrounding areas.	
41	Long-legged Buzzard (*Buteo rufinus*)	**IUCN:** Least Concern **IWP:** Schedule IV **Restricted range:** No **Migratory:** Yes	3a	Long-legged Buzzard inhabits dry open plains of northern Africa, southeastern Europe, west and central Asia east to China, and across central India[377]. The European population is estimated at 13,800-22,900 pairs, which equates to 27,600-45,800 mature individuals[378]. Europe forms approximately 17% of the global range, so a very preliminary estimate of the global population size is 162,000-269,000 mature individuals, although further validation of this estimate is needed. It is placed in the band 100,000 to 499,999 mature individuals. It is a species of open areas, particularly steppe and semi-desert, and has been recorded up to 3,500 m[379]. Indeed, the species has a presence in the surroundings of Rajkot[380], however based on available secondary information extracted from eBird Database[381] (which reports	Screened Out

[373] https://www.iucnredlist.org/species/22696357/205768513#habitat-ecology
[374] https://www.iucnredlist.org/species/22696357/205768513
[375] https://ebird.org/map/leskes1?neg=true&env.minX=73.21378684032818&env.minY=22.264152671461943&env.maxX=73.22477316845318&env.maxY=22.2685709927211&zh=true&gp=true&ev=Z&excludeExX=false&excludeExAll=false&mr=1-12&bmo=1&emo=12&yr=all&byr=1900&eyr=2024
[376] https://www.inaturalist.org/observations?place_id=any&subview=map&taxon_id=59845
[377] https://www.thainationalparks.com/species/long-legged-buzzard
[378] BirdLife International. In prep. European Red List of Birds. Deliverable to the European Commission (DG Environment) in 2021 under Service Contract ENV.D.3/SER/2018/0018.
[379] del Hoyo, J.; Elliott, A.; Sargatal, J. 1994. Handbook of the Birds of the World, vol. 2: New World Vultures to Guineafowl. Lynx Edicions, Barcelona, Spain.
[380] https://ebird.org/region/IN-GJ-RA?yr=all
[381] https://ebird.org/map/lolbuz1?neg=true&env.minX=66.69267108906925&env.minY=20.584862411990766&env.maxX=74.07548358906925&env.maxY=23.562374080680513&zh=true&gp=true&ev=Z&excludeExX=false&excludeExAll=false&mr=1-12&bmo=1&emo=12&yr=all&byr=1900&eyr=2024

				solitary observations from Randarda Lake[382], and around Chibhda area[383]), it is less likely to meet the threshold i.e. 1,000 to 4,999 (≥1 percent of the global population) for the EAAA.	
42	Mallard (*Anas platyrhynchos*)	**IUCN:** Least Concern **IWP:** Schedule IV **Restricted range:** No **Migratory:** Yes	3a	Mallard is widely distributed across the Northern (in northern Europe, North America and Asia) and Southern Hemispheres (Australia). It migrates southwards to Africa, Southeast Asia, Indian Subcontinent, China, Mexico and Cuba[384]. The global population is estimated to number > c. 19,000,000 individuals[385], while the European population is estimated at 2,850,000-4,610,000 pairs[386]. Habitats commonly frequented include flooded swampy woodlands, seasonal flood lands[387], wet grassy swamps and meadows, oxbow lakes[388], open waters with mudflats, banks or spits, irrigation networks, reservoirs, ornamental waters[389, 390], canals and sewage farms[391]. During the winter the species may also be found in saline habitats along the coast[392] where water is shallow, fairly sheltered and within site of land i.e. brackish lagoons, brackish estuaries and bays[393, 394].	Screened Out

[382] https://ebird.org/hotspot/L4005820
[383] https://ebird.org/checklist/S164901370
[384] https://indianbirds.thedynamicnature.com/2015/03/mallard-anas-platyrhynchos.html
[385] Wetlands International. 2015. Waterbird Population Estimates. Available at: wpe.wetlands.org.
[386] BirdLife International. 2015. European Red List of Birds. Office for Official Publications of the European Communities, Luxembourg.
[387] Snow, D.W.; Perrins, C.M. 1998. The Birds of the Western Palearctic, Volume 1: Non-Passerines. Oxford University Press, Oxford.
[388] Flint, V.E.; Boehme, R.L.; Kostin, Y.V.; Kuznetsov, A.A. 1984. A field guide to birds of the USSR. Princeton University Press, Princeton, New Jersey.
[389] del Hoyo, J.; Elliot, A.; Sargatal, J. 1992. Handbook of the Birds of the World, Vol. 1: Ostrich to Ducks. Lynx Edicions, Barcelona, Spain.
[390] Scott, D. A.; Rose, P. M. 1996. Atlas of Anatidae populations in Africa and western Eurasia. Wetlands International, Wageningen, Netherlands.
[391] Snow, D.W.; Perrins, C.M. 1998. The Birds of the Western Palearctic, Volume 1: Non-Passerines. Oxford University Press, Oxford.
[392] Madge, S.; Burn, H. 1988. Wildfowl. Christopher Helm, London.
[393] Snow, D.W.; Perrins, C.M. 1998. The Birds of the Western Palearctic, Volume 1: Non-Passerines. Oxford University Press, Oxford.
[394] del Hoyo, J.; Elliot, A.; Sargatal, J. 1992. Handbook of the Birds of the World, Vol. 1: Ostrich to Ducks. Lynx Edicions, Barcelona, Spain.

	 https://www.iucnredlist.org/species/22680186/155457360			Undoubtedly the species has a presence in the surroundings of Rajkot[395], however based on available secondary information extracted from eBird Database[396] (which reports maximum 10 individuals from Lalpari Lake[397], and Khirasara area[398]), it is less likely to meet the threshold i.e. 1,90,000 (≥1 percent of the global population) for the EAAA.	
43	Montagu's Harrier (*Circus pygargus*)	**IUCN:** Least Concern **IWP:** Schedule IV **Restricted range:** No **Migratory:** Yes	3a	Montagu's Harrier is distributed from Europe to central Asia and southward to Armenia, Iran and Kazakhstan. In the western Palaearctic, it nests from southern England, southern Sweden and Denmark to the northern coast of the Mediterranean, with a limited presence in Tunisia and Morocco. Migrant, it winters south of the Sahara to South Africa. The largest migratory movements are through Gibraltar, but also occur in the Straits of Messina and at Eilat, Israel[399]. The European population is estimated at 69,700-110,000 breeding females, which equates to 139,000- 219,000 mature individuals[400]. Europe forms approximately 41% of the global range, so a very preliminary estimate of the global population size is 339,000-534,000 mature individuals, although further validation of this estimate is needed. It is placed in the band 300,000 to 550,000 mature individuals[401]. It is a bird of open country, usually in lowlands but occurring up to 1,500 m in central Asia, and on its African wintering grounds up to 4,000 m[402].	Screened Out

[395] https://ebird.org/region/IN-GJ-RA?yr=all

[396] https://ebird.org/map/mallar3?neg=true&env.minX=69.81348045413316&env.minY=21.900333312081642&env.maxX=71.65918357913316&env.maxY=22.643765554862707&zh=true&gp=true&ev=Z&excludeExX=false&excludeExAll=false&mr=1-12&bmo=1&emo=12&yr=all&byr=1900&eyr=2024

[397] https://ebird.org/checklist/S42674208

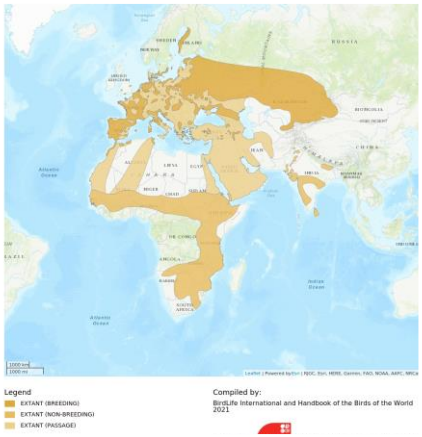
[398] https://ebird.org/checklist/S42380900

[399] https://www.iucn.it/documenti/flora.fauna.italia/3-uccelli-2/files/Falconiformes/albanella_minore/albanella_minore_gb.htm

[400] BirdLife International. In prep. European Red List of Birds. Deliverable to the European Commission (DG Environment) in 2021 under Service Contract ENV.D.3/SER/2018/0018.

[401] https://www.iucnredlist.org/species/22695405/201058261#population

[402] del Hoyo, J.; Elliott, A.; Sargatal, J. 1994. Handbook of the Birds of the World, vol. 2: New World Vultures to Guineafowl. Lynx Edicions, Barcelona, Spain.

	 https://www.iucnredlist.org/species/22695405/201058261			The Important Bird and Biodiversity Areas in India: Priority Sites for Conservation (Revised and updated Edition - 2016)[403] reports the species from Velavadar National Park only; though, the species has been reported from throughout the state (Gujarat)[404]. Indeed, the species has a presence in the surroundings of Rajkot[405, 406], however based on available secondary information extracted from eBird Database[407] (which reports maximum 7 individuals around the Khirasara Vidi area [408] in Oct. 2018), it is less likely to meet the threshold i.e. 3,000 – 5,500 (≥1 percent of the global population) for the EAAA.	
44	Northern Pintail (*Anas acuta*)	**IUCN:** Least Concern 3a **IWP:** Schedule IV **Restricted range:** No **Migratory:** Yes		Northern Pintail is a duck species with wide geographic distribution that breeds in the northern areas of Europe and across the Palearctic and North America. It is migratory and winters south of its breeding range to the equator. The population is estimated to number 7,100,000-7,200,000 individuals[409]; while the European population is estimated at 210,000-269,000 pairs[410]. The species shows a preference for open lowland grassland, prairie or tundra habitats containing freshwater marshes, brackish & saline wetlands with shallow water (10-30 cm deep), marshy lakes, wet meadows, floodplains, sewage ponds, dense marginal	Screened Out

[403] Rahmani, A.R., Islam, M.Z. and Kasambe, R.M. (2016) Important Bird and Biodiversity Areas in India: Priority Sites for Conservation (Revised and updated). Bombay Natural History Society, Indian Bird Conservation Network, Royal Society for the Protection of Birds and BirdLife International (U.K.). Pp. 1992 + xii

[404] https://ebird.org/map/monhar1?neg=true&env.minX=69.59531877068646&env.minY=21.991143888579927&env.maxX=71.44102189568646&env.maxY=22.73409389341053&zh=true&gp=true&ev=Z&excludeExX=false&excludeExAll=false&mr=1-12&bmo=1&emo=12&yr=all&byr=1900&eyr=2024

[405] https://ebird.org/region/IN-GJ-RA?yr=all

[406] https://www.inaturalist.org/observations?iconic_taxa=Aves&place_id=32163&subview=map&view=species

[407] https://ebird.org/map/monhar1?neg=true&env.minX=69.59531877068646&env.minY=21.991143888579927&env.maxX=71.44102189568646&env.maxY=22.73409389341053&zh=true&gp=true&ev=Z&excludeExX=false&excludeExAll=false&mr=1-12&bmo=1&emo=12&yr=all&byr=1900&eyr=2024

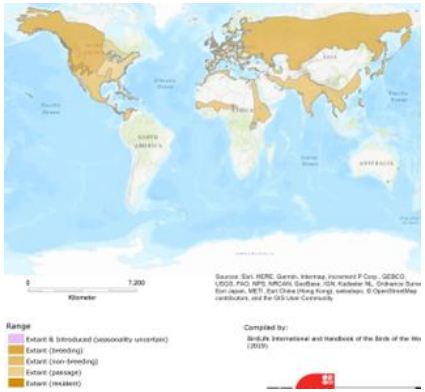
[408] https://ebird.org/checklist/S49363911

[409] Wetlands International. 2006. Waterbird Population Estimates – Fourth Edition. Wageningen, The Netherlands.

[410] BirdLife International. 2015. European Red List of Birds. Office for Official Publications of the European Communities, Luxembourg.

	 https://www.iucnredlist.org/species/22680301/153882797			vegetation and wetlands interspersed with brushy thickets or copses[411, 412, 413, 414, 415, 416]. During the winter, it frequents large inland lakes, brackish coastal lagoons, brackish & saline marshes, shallow fresh or brackish estuaries, tidal flats and river deltas with adjacent agricultural land (e.g. stubble fields) and scattered impoundments[417, 418, 419, 420, 421, 422, 423]. Nalsarovar Wildlife Sanctuary, and Salt Pans of Bhavnagar are the possible habitats for this migratory species in Gujarat as per the Important Bird and Biodiversity Areas in India: Priority Sites for Conservation (Revised and updated Edition - 2016)[424]. Undoubtedly the species has a presence in the surroundings of Rajkot[425], however based on available secondary information extracted from eBird Database[426] (which reports maximum 250 individuals from Rupavati area[427]), it is less likely to meet the threshold i.e. 71,000-72,000 (≥1 percent of the global population) for the EAAA.	
45	Northern Shoveler (*Spatula clypeata*)	**IUCN:** Least Concern **IWP:** Schedule IV **Restricted range:** No **Migratory:** Yes	3a	Northern Shoveler generally occur in North America, North Europe and North Asia during the breeding season. In winter, they migrate to Central and South America, Southern Europe, Africa, Indian Subcontinent, China and Southeast Asia.	Screened Out

[411] Johnsgard, P.A. 1978. Ducks, geese and swans of the World. University of Nebraska Press, Lincoln and London.
[412] Madge, S.; Burn, H. 1988. Wildfowl. Christopher Helm, London.
[413] del Hoyo, J.; Elliot, A.; Sargatal, J. 1992. Handbook of the Birds of the World, Vol. 1: Ostrich to Ducks. Lynx Edicions, Barcelona, Spain.
[414] Snow, D.W.; Perrins, C.M. 1998. The Birds of the Western Palearctic, Volume 1: Non-Passerines. Oxford University Press, Oxford.
[415] Hockey, P.A.R.; Dean, W.R.J.; Ryan, P.G. 2005. Roberts Birds of Southern Africa. Trustees of the John Voelcker Bird Book Fund, Cape Town, South Africa.
[416] Kear, J. 2005. Ducks, geese and swans volume 2: species accounts (Cairina to Mergus). Oxford University Press, Oxford, U.K.
[417] Johnsgard, P.A. 1978. Ducks, geese and swans of the World. University of Nebraska Press, Lincoln and London.
[418] Brown, L.H.; Urban, E.K.; Newman, K. 1982. The Birds of Africa, Volume I. Academic Press, London.
[419] Madge, S.; Burn, H. 1988. Wildfowl. Christopher Helm, London.
[420] del Hoyo, J.; Elliot, A.; Sargatal, J. 1992. Handbook of the Birds of the World, Vol. 1: Ostrich to Ducks. Lynx Edicions, Barcelona, Spain.
[421] Scott, D. A.; Rose, P. M. 1996. Atlas of Anatidae populations in Africa and western Eurasia. Wetlands International, Wageningen, Netherlands.
[422] Steele, B.B., Reitsma, L.R., Racine, C.H., Burson, S.L. III., Stuart, R. and Theberge, R. 1997. Different susceptibilities to white phosphorous poisoning among five species of ducks. Environmental Toxicology and Chemistry 16(11): 2275-2282.
[423] Snow, D.W.; Perrins, C.M. 1998. The Birds of the Western Palearctic, Volume 1: Non-Passerines. Oxford University Press, Oxford.
[424] Rahmani, A.R., Islam, M.Z. and Kasambe, R.M. (2016) Important Bird and Biodiversity Areas in India: Priority Sites for Conservation (Revised and updated). Bombay Natural History Society, Indian Bird Conservation Network, Royal Society for the Protection of Birds and BirdLife International (U.K.). Pp. 1992 + xii
[425] https://ebird.org/region/IN-GJ-RA?yr=all
[426] https://ebird.org/map/norpin?neg=true&env.minX=70.30713851702406&env.minY=22.11031782495804&env.maxX=71.22999007952406&env.maxY=22.481972500071794&zh=true&gp=true&ev=Z&excludeExX=false&excludeExAll=false&mr=1-12&bmo=1&emo=12&yr=all&byr=1900&eyr=2024
[427] https://ebird.org/checklist/S103317151



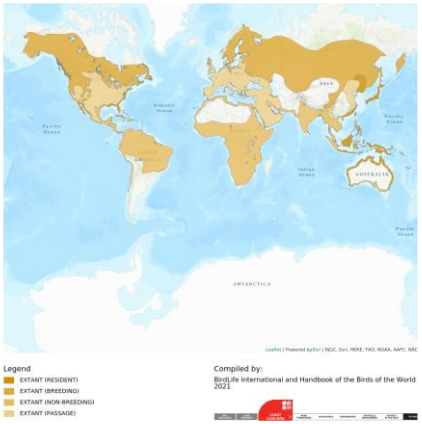
https://www.iucnredlist.org/species/22680247/153875944

The global population is estimated to number 6,500,000-7,000,000 individuals[428]; while the European population is estimated at 170,000-233,000 pairs[429].

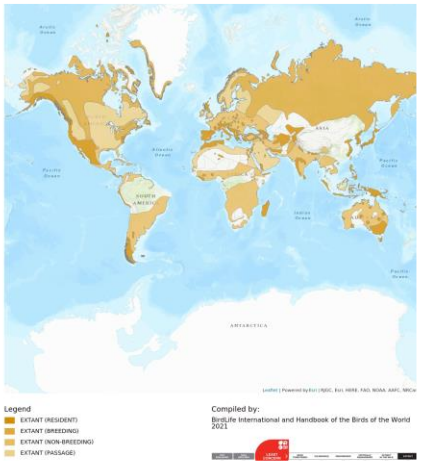
It inhabits from sea level up to 2,900 m (Ethiopia) in permanent shallow well-vegetated (surrounded by dense stands of reeds or other emergent vegetation) freshwater lakes & marshes/wetlands with muddy shores and substrates in open country (e.g. grasslands)[430, 431, 432, 433], oxbow lakes, channels and swamps[434, 435, 436, 437, 438, 439], artificial waters bordered by lush grassland such as sewage farms, rice-fields and fish ponds[440, 441, 442]. In the winter it can be found on coastal brackish lagoons, tidal muflats, estuaries, coastal shorelines, fresh and brackish estuarine marshes, inland seas and brackish or saline inland waters, occasionally occurring (briefly) on marine waters during migration (although it generally avoids very saline habitats)[443, 444, 445, 446, 447].

Undoubtedly the species has a presence in the surroundings of Rajkot[448], however based on available secondary information extracted from eBird Database[449] (which reports maximum 500 individuals from Nyari-1 Dam[450]), it is less likely to meet the threshold i.e. 65,000-70,000 (≥1 percent of the global population) for the EAAA.

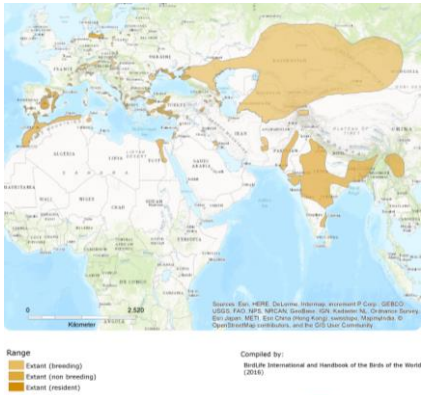
[428] Wetlands International. 2015. Waterbird Population Estimates. Available at: wpe.wetlands.org.
[429] BirdLife International. 2015. European Red List of Birds. Office for Official Publications of the European Communities, Luxembourg.
[430] Johnsgard, P.A. 1978. Ducks, geese and swans of the World. University of Nebraska Press, Lincoln and London.
[431] Brown, L.H.; Urban, E.K.; Newman, K. 1982. The Birds of Africa, Volume I. Academic Press, London.
[432] del Hoyo, J.; Elliot, A.; Sargatal, J. 1992. Handbook of the Birds of the World, Vol. 1: Ostrich to Ducks. Lynx Edicions, Barcelona, Spain.
[433] Snow, D.W.; Perrins, C.M. 1998. The Birds of the Western Palearctic, Volume 1: Non-Passerines. Oxford University Press, Oxford.
[434] Johnsgard, P.A. 1978. Ducks, geese and swans of the World. University of Nebraska Press, Lincoln and London.
[435] Brown, L.H.; Urban, E.K.; Newman, K. 1982. The Birds of Africa, Volume I. Academic Press, London.
[436] Flint, V.E.; Boehme, R.L.; Kostin, Y.V.; Kuznetsov, A.A. 1984. A field guide to birds of the USSR. Princeton University Press, Princeton, New Jersey.
[437] Madge, S.; Burn, H. 1988. Wildfowl. Christopher Helm, London.
[438] del Hoyo, J.; Elliot, A.; Sargatal, J. 1992. Handbook of the Birds of the World, Vol. 1: Ostrich to Ducks. Lynx Edicions, Barcelona, Spain.
[439] Kear, J. 2005. Ducks, geese and swans volume 2: species accounts (Cairina to Mergus). Oxford University Press, Oxford, U.K.
[440] Snow, D.W.; Perrins, C.M. 1998. The Birds of the Western Palearctic, Volume 1: Non-Passerines. Oxford University Press, Oxford.
[441] Kear, J. 2005. Ducks, geese and swans volume 2: species accounts (Cairina to Mergus). Oxford University Press, Oxford, U.K.
[442] Musil, P. 2006. A review of the effects of intensive fish production on waterbird breeding populations. In: G. Boere, C. Galbraith and D. Stroud (eds), Waterbirds around the world, pp. 520-521. The Stationary Office, Edinburgh, U.K.
[443] Johnsgard, P.A. 1978. Ducks, geese and swans of the World. University of Nebraska Press, Lincoln and London.
[444] Madge, S.; Burn, H. 1988. Wildfowl. Christopher Helm, London.
[445] del Hoyo, J.; Elliot, A.; Sargatal, J. 1992. Handbook of the Birds of the World, Vol. 1: Ostrich to Ducks. Lynx Edicions, Barcelona, Spain.
[446] Snow, D.W.; Perrins, C.M. 1998. The Birds of the Western Palearctic, Volume 1: Non-Passerines. Oxford University Press, Oxford.
[447] Kear, J. 2005. Ducks, geese and swans volume 2: species accounts (Cairina to Mergus). Oxford University Press, Oxford, U.K.
[448] https://ebird.org/region/IN-GJ-RA?yr=all
[449] https://ebird.org/map/norsho?neg=true&env.minX=69.81831366454001&env.minY=22.195206359068475&env.maxX=71.66401678954001&env.maxY=22.93706596333272&zh=true&gp=true&ev=Z&excludeExX=false&excludeExAll=false&mr=1-12&bmo=1&emo=12&yr=all&byr=1900&eyr=2024
[450] https://ebird.org/india/checklist/S80171026

46	Osprey (*Pandion haliaetus*)  https://www.iucnredlist.org/species/22694938/206628879	**IUCN:** Least Concern **IWP:** Schedule I **Restricted range:** No **Migratory:** Yes	3a	Osprey is the second most widely distributed raptor species, after the peregrine falcon, and is one of only six land-birds with a worldwide distribution[451]. It is found in temperate and tropical regions of all continents, except Antarctica. In North America it breeds from Alaska and Newfoundland south to the Gulf Coast and Florida, wintering further south from the southern United States through to Argentina[452]. The European population is estimated at 9,600-13,600 pairs, which equates to 19,200-27,200 mature individuals. As Europe forms ca. 14% of the global range, so a very preliminary estimate of the global population size is 137,000-200,000 mature individuals[453]. It inhabits the areas around shallow waters, being sufficiently tolerant of human settlement to persist in suburban and sometimes urban environments[454]. Undoubtedly the species has a presence in the surroundings of Rajkot[455], however based on available secondary information extracted from eBird Database[456] (which reports maximum 3 individuals from Aji-2 Dam[457] and near Madhapar Pond[458]), it is less likely to meet the threshold i.e. 96-136 (≥1 percent of the global population) for the EAAA.	Screened Out
47	Peregrine Falcon (*Falco peregrinus*)	**IUCN:** Least Concern **IWP:** Schedule IV **Restricted range:** No **Migratory:** Yes	3a	Peregrine Falcon is one of the most widespread birds in the world. It is found on all continents except Antarctica, and on many oceanic islands[459]. The European population is estimated at 16,100-31,100 pairs, which equates to 32,200-62,100 mature individuals[460]. Europe forms approximately 13% of the global range, so a very preliminary estimate of the global population size is 248,000-478,000 mature individuals, although further validation of this estimate is needed. Thus, the population is therefore placed in the band 100,000-499,999 mature individuals[461].	Screened Out

[451] https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4650845
[452] https://archive.org/details/audubonsocietyfi0000bull/page/469
[453] BirdLife International. 2021. Pandion haliaetus. The IUCN Red List of Threatened Species 2021: e.T22694938A206628879
[454] del Hoyo, J.; Elliot, A.; Sargatal, J. 1992. Handbook of the Birds of the World, Vol. 1: Ostrich to Ducks. Lynx Edicions, Barcelona, Spain.
[455] https://ebird.org/region/IN-GJ-RA?yr=all
[456] https://ebird.org/map/osprey?neg=true&env.minX=70.64997023180514&env.minY=22.369384307621978&env.maxX=70.70764845446139&env.maxY=22.39259864868522&zh=true&gp=true&ev=Z&excludeExX=false&excludeExAll=false&mr=1-12&bmo=1&emo=12&yr=all&byr=1900&eyr=2024
[457] https://ebird.org/checklist/S85944606
[458] https://ebird.org/checklist/S51110477
[459] https://www.allaboutbirds.org/guide/Peregrine_Falcon/overview
[460] BirdLife International. In prep. European Red List of Birds. Deliverable to the European Commission (DG Environment) in 2021 under Service Contract ENV.D.3/SER/2018/0018.
[461] https://www.iucnredlist.org/species/45354964/206217909#population

	 https://www.iucnredlist.org/species/45354964/206217909			It inhabits an extreme variety of habitats, tolerating wet and dry, hot and cool climates, from sea level up to c.4,000 m[462]. Undoubtedly the species has a presence in the surroundings of Rajkot[463], however based on available secondary information extracted from eBird Database[464] (which reports five solitary observations from the Rajkot City and surroundings between 2016-2022), it is less likely to meet the threshold i.e. 1,000-4,999 (≥1 percent of the global population) for the EAAA.	
48	Red-crested Pochard (*Netta rufina*)	**IUCN:** Least Concern **IWP:** Schedule IV **Restricted range:** No **Migratory:** Yes	3a	Red-crested Pochard is distributed in Southern Europe and extends from Black Sea to Central Asia and Mongolia. Indian Subcontinent and Africa are the wintering areas. The global population is estimated at 420,000-600,000 individuals[465, 466]. The species inhabits inland deep fresh or brackish[467] reed-fringed lakes, rivers, or saline and alkaline lagoons[468] in open country[469], also occurring (less often) on estuaries, river deltas and other sheltered coastal habitats[470] on passage[471] or during the winter[472].	Screened Out

[462] del Hoyo, J.; Elliott, A.; Sargatal, J. 1994. Handbook of the Birds of the World, vol. 2: New World Vultures to Guineafowl. Lynx Edicions, Barcelona, Spain.
[463] https://ebird.org/region/IN-GJ-RA?yr=all
[464] https://ebird.org/map/perfal?neg=true&env.minX=70.29379078227473&env.minY=22.09787590451255&env.maxX=71.21664234477473&env.maxY=22.46956362055116&zh=true&gp=true&ev=Z&excludeExX=false&excludeExAll=false&mr=1-12&bmo=1&emo=12&yr=all&byr=1900&eyr=2024
[465] Wetlands International. 2015. Waterbird Population Estimates. Available at: wpe.wetlands.org.
[466] https://www.iucnredlist.org/species/22680348/86012189
[467] del Hoyo, J.; Elliot, A.; Sargatal, J. 1992. Handbook of the Birds of the World, Vol. 1: Ostrich to Ducks. Lynx Edicions, Barcelona, Spain.
[468] Kear, J. 2005. Ducks, geese and swans volume 2: species accounts (Cairina to Mergus). Oxford University Press, Oxford, U.K.
[469] del Hoyo, J.; Elliot, A.; Sargatal, J. 1992. Handbook of the Birds of the World, Vol. 1: Ostrich to Ducks. Lynx Edicions, Barcelona, Spain.
[470] del Hoyo, J.; Elliot, A.; Sargatal, J. 1992. Handbook of the Birds of the World, Vol. 1: Ostrich to Ducks. Lynx Edicions, Barcelona, Spain.
[471] Madge, S.; Burn, H. 1988. Wildfowl. Christopher Helm, London.
[472] Scott, D. A.; Rose, P. M. 1996. Atlas of Anatidae populations in Africa and western Eurasia. Wetlands International, Wageningen, Netherlands.

	 https://www.iucnredlist.org/species/22680348/86012189			Undoubtedly the species has a presence in the surroundings of Rajkot[473], however based on available secondary information extracted from eBird Database[474] (which reports only 2 records with maximum 2 individuals from the Lalpari Lake[475] and Randarda Lake[476]), it is less likely to meet the threshold i.e. 4200-6000 (≥1 percent of the global population) for the EAAA.	
49	Ruff (*Calidris pugnax*)	**IUCN:** Least Concern **IWP:** Schedule IV **Restricted range:** No **Migratory:** Yes	3a	Ruff is a medium-sized wading bird that breeds in marshes and wet meadows across northern Eurasia. Its winter grounds, include southern and western Europe, Africa, southern Asia and Australia[477]. The European population is estimated at 265,000-1,650,000 calling or lekking males, which equates to 797,000-4,970,000 individuals. As Europe forms approximately 50% of the global range so a very preliminary estimate of the global population size is 1,594,000-9,940,000[478, 479]. The species inhabits tundra habitats from the coast to the Arctic treeline[480, 481] during the breeding season, requiring adjacent foraging, lekking and nesting areas[482]. Suitable foraging habitats include littoral belts, deltas, coastal saltmarshes, extensive lowland freshwater wetlands such as small shallow lakes with marginal vegetation, grassy	Screened Out

[473] https://ebird.org/region/IN-GJ-RA?yr=all

[474] https://ebird.org/map/recpoc?neg=true&env.minX=70.20482635498048&env.minY=22.154816843175155&env.maxX=71.12767791748048&env.maxY=22.526353203272464&zh=true&gp=true&ev=Z&excludeExX=false&excludeExAll=false&mr=1-12&bmo=1&emo=12&yr=all&byr=1900&eyr=2024

[475] https://ebird.org/india/checklist/S54890396

[476] https://ebird.org/checklist/S29440035

[477] https://www.thainationalparks.com/species/ruff

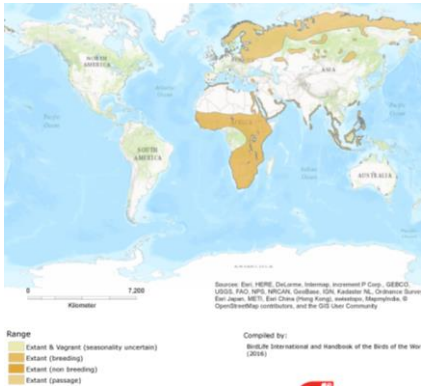
[478] BirdLife International. 2015. European Red List of Birds. Office for Official Publications of the European Communities, Luxembourg.

[479] https://www.iucnredlist.org/species/22693468/86591264

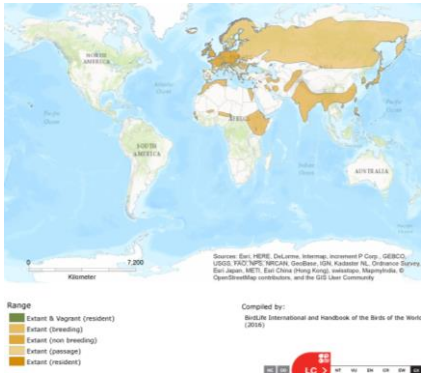
[480] Johnsgard, P. A. 1981. The plovers, sandpipers and snipes of the world. University of Nebraska Press, Lincoln, U.S.A. and London.

[481] del Hoyo, J., Elliott, A., and Sargatal, J. 1996. Handbook of the Birds of the World, vol. 3: Hoatzin to Auks. Lynx Edicions, Barcelona, Spain.

[482] del Hoyo, J., Elliott, A., and Sargatal, J. 1996. Handbook of the Birds of the World, vol. 3: Hoatzin to Auks. Lynx Edicions, Barcelona, Spain.

	 https://www.iucnredlist.org/species/22693468/86591264			hummocky marshes, damp swampy grasslands and with shallow pools or ditches[483, 484, 485, 486]. During the non-breeding season the species occupies the muddy margins of brackish, saline and alkaline lakes, ponds, pools, rivers, marshes, food-plains, freshly mown or grazed short-sward grasslands, wheat- or rice-fields, usually roosting at night in the shallow waters of lake shores[487, 488]. The species rarely utilises intertidal habitats[489] but may frequent tidal mudflats and lagoons in India[490]. Indeed, the species has a presence in the surroundings of Rajkot[491], however based on available secondary information extracted from eBird Database[492] (which reports maximum 1800 individuals from the Nyari-1 Dam[493] during Mar. 2019), it is less likely to meet the threshold i.e. 15,940-99,400 (≥1 percent of the global population) for the EAAA.	
50	Tufted Duck (*Aythya fuligula*)	**IUCN:** Least Concern **IWP:** Schedule IV **Restricted range:** No **Migratory:** Yes	3a	Tufted Duck has a wide distribution throughout northern Canada and Eurasia, localised in parts of America, Africa, southern Europe, the middle east, India through to southern China and Japan[494]. The global population is estimated to number c. 2,600,000-2,900,000 individuals[495]. The species breeds in lowland regions and shows a preference for eutrophic waters 3-5 m deep (avoiding lakes deeper than 15 m) with open water, islands for breeding and abundant marginal and emergent vegetation[496, 497]. It is common on large, freshwater	Screened Out

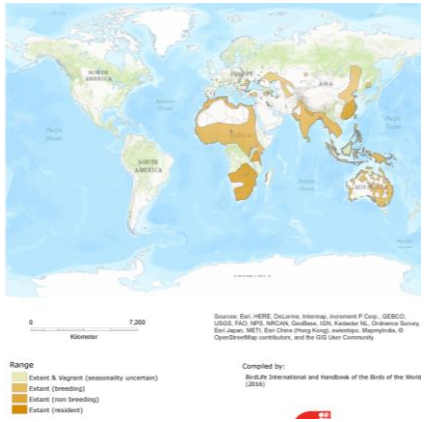
[483] Johnsgard, P. A. 1981. The plovers, sandpipers and snipes of the world. University of Nebraska Press, Lincoln, U.S.A. and London.
[484] Hayman, P.; Marchant, J.; Prater, A. J. 1986. Shorebirds. Croom Helm, London.
[485] del Hoyo, J., Elliott, A., and Sargatal, J. 1996. Handbook of the Birds of the World, vol. 3: Hoatzin to Auks. Lynx Edicions, Barcelona, Spain.
[486] Snow, D.W.; Perrins, C.M. 1998. The Birds of the Western Palearctic, Volume 1: Non-Passerines. Oxford University Press, Oxford.
[487] Hayman, P.; Marchant, J.; Prater, A. J. 1986. Shorebirds. Croom Helm, London.
[488] del Hoyo, J., Elliott, A., and Sargatal, J. 1996. Handbook of the Birds of the World, vol. 3: Hoatzin to Auks. Lynx Edicions, Barcelona, Spain.
[489] Hayman, P.; Marchant, J.; Prater, A. J. 1986. Shorebirds. Croom Helm, London.
[490] del Hoyo, J., Elliott, A., and Sargatal, J. 1996. Handbook of the Birds of the World, vol. 3: Hoatzin to Auks. Lynx Edicions, Barcelona, Spain.
[491] https://ebird.org/region/IN-GJ-RA?yr=all
[492] https://ebird.org/map/ruff?neg=true&env.minX=70.57801864948125&env.minY=22.21242799592791&env.maxX=71.03944443073125&env.maxY=22.39824343487994&zh=true&gp=true&ev=Z&excludeExX=false&excludeExAll=false&mr=1-12&bmo=1&emo=12&yr=all&byr=1900&eyr=2024
[493] https://ebird.org/checklist/S53664718
[494] https://www.brickfieldspark.org/data/ducktufted.htm
[495] Wetlands International. 2015. Waterbird Population Estimates. Available at: wpe.wetlands.org.
[496] del Hoyo, J.; Elliot, A.; Sargatal, J. 1992. Handbook of the Birds of the World, vol. 1: Ostrich to Ducks. Lynx Edicions, Barcelona, Spain.
[497] Kear, J. 2005. Ducks, geese and swans volume 2: species accounts (Cairina to Mergus). Oxford University Press, Oxford, U.K.

	 https://www.iucnredlist.org/species/22680391/86013549			lakes, ponds, reservoirs, gravel-pits and quiet stretches of wide slow-flowing rivers during this season[498, 499]. During the winter the species frequents large freshwater lakes, reservoirs and sheltered coastal locations such as brackish lagoons, brackish inland seas (e.g. Caspian Sea), tidal bays and estuaries although it avoids strong wave action and very exposed maritime conditions unless all inland freshwaters become frozen[500, 501, 502, 503, 504]. Indeed, the species has a presence in the surroundings of Rajkpt[505], however based on available secondary information extracted from eBird Database[506] (which reports maximum 50 individuals from Khirasara Pond[507] fallowed by 40s individuals from Lalpari Lake[508] and near Vagudad road [509]), it is less likely to meet the threshold i.e. 26,000-29,000 (≥1 percent of the global population) for the EAAA.	
51	Western Marsh-harrier (*Circus aeruginosus*)	**IUCN:** Least Concern **IWP:** Schedule I **Restricted range:** No **Migratory:** Yes	3a	Western Marsh-harrier has a wide breeding range from Europe and northwestern Africa to Central Asia and the northern parts of the Middle East. It breeds in almost every country of Europe but is absent from mountainous regions and subarctic Scandinavia[510]. In Europe, the breeding population is estimated to number 151,000-243,000 breeding females, which equates to 303,000-485,000 mature individuals[511]. Europe forms ca. 48% of the global range, so a very preliminary estimate of the global population size is 631,000-1,010,000 mature individuals, although further validation of this estimate is needed, thus, it is placed in the band 600,000 to 1,100,000 mature individuals.	Screened Out

[498] del Hoyo, J.; Elliot, A.; Sargatal, J. 1992. Handbook of the Birds of the World, vol. 1: Ostrich to Ducks. Lynx Edicions, Barcelona, Spain.
[499] Kear, J. 2005. Ducks, geese and swans volume 2: species accounts (Cairina to Mergus). Oxford University Press, Oxford, U.K.
[500] Madge, S.; Burn, H. 1988. Wildfowl. Christopher Helm, London.
[501] del Hoyo, J.; Elliot, A.; Sargatal, J. 1992. Handbook of the Birds of the World, vol. 1: Ostrich to Ducks. Lynx Edicions, Barcelona, Spain.
[502] Scott, D. A.; Rose, P. M. 1996. Atlas of Anatidae populations in Africa and western Eurasia. Wetlands International, Wageningen, Netherlands.
[503] Snow, D.W.; Perrins, C.M. 1998. The Birds of the Western Palearctic, Volume 1: Non-Passerines. Oxford University Press, Oxford.
[504] Kear, J. 2005. Ducks, geese and swans volume 2: species accounts (Cairina to Mergus). Oxford University Press, Oxford, U.K.
[505] https://ebird.org/region/IN-GJ-RA?yr=all
[506] https://ebird.org/map/tufduc?neg=true&env.minX=70.44895947553535&env.minY=22.098847483752298&env.maxX=70.91038525678535&env.maxY=22.28481357012976&zh=true&gp=true&ev=Z&excludeExX=false&excludeExAll=false&mr=1-12&bmo=1&emo=12&yr=all&byr=1900&eyr=2024
[507] https://ebird.org/checklist/S98980577
[508] https://ebird.org/india/checklist/S52224253
[509] https://ebird.org/checklist/S163520690
[510] https://animalia.bio/western-marsh-harrier#distribution
[511] BirdLife International. In prep. European Red List of Birds. Deliverable to the European Commission (DG Environment) in 2021 under Service Contract ENV.D.3/SER/2018/0018.

	 https://www.iucnredlist.org/species/22695344/203357709			The species inhabits extensive areas of dense marsh vegetation, in fresh or brackish water, generally in lowlands but up to 2,000 m in Asia and 3,000 m on its wintering grounds in Cameroon[512]. Definitely, the species has a presence in the surroundings of Rajkot[513], however based on available secondary information extracted from eBird Database[514] (which reports maximum 8 individuals from the Aji-2 Dam[515] fallowed by 4 individuals from Vagudad[516] and Randarda Lake[517]), it is less likely to meet the threshold i.e. 6,000 - 11,000 (≥1 percent of the global population) for the EAAA.	
52	Whiskered Tern (*Chlidonias hybrida*)	**IUCN:** Least Concern **IWP:** Schedule IV **Restricted range:** No **Migratory:** Yes	3a	Whiskered Tern has a wide distribution range covering four continents: Africa, Asia, Europe, and Australia. In South Asia, it is known as a breeding resident in the Gangetic Plains and is likely to breed in Afghanistan. It is a winter visitor and passage migrant in most of parts of the Indian Subcontinent[518]. The global population is estimated to number c. 300,000-1,500,000 individuals[519, 520]. The species utilises a variety of wetland habitats but shows a preference for freshwater marshlands with scattered pools, particularly where the surrounding vegetation is grazed by cattle or horses[521]. It frequents inland lakes, rivers, marshes, temporary pans, artificial fish-ponds and drainage-ponds covered with water-lilies, swamps, river pools, reservoirs, large dams, sewage-ponds, flooded saltmarshes, arable fields and rice-	Screened Out

[512] del Hoyo, J.; Elliott, A.; Sargatal, J. 1994. Handbook of the Birds of the World, vol. 2: New World Vultures to Guineafowl. Lynx Edicions, Barcelona, Spain.
[513] https://ebird.org/region/IN-GJ-RA?yr=all
[514] https://ebird.org/map/wemhar1?neg=true&env.minX=69.74633294283542&env.minY=22.054463892031844&env.maxX=71.59203606783542&env.maxY=22.797076548422748&zh=true&gp=true&ev=Z&excludeExX=false&excludeExAll=false&mr=1-12&bmo=1&emo=12&yr=all&byr=1900&eyr=2024
[515] https://ebird.org/checklist/S85944606
[516] https://ebird.org/checklist/S49533055
[517] https://ebird.org/checklist/S84444670
[518] https://indianbirds.in/pdfs/IB_17_1_Ranade_WhiskeredTern.pdf
[519] Wetlands International. 2015. Waterbird Population Estimates. Available at: wpe.wetlands.org.
[520] https://www.iucnredlist.org/species/22694764/111750380
[521] Richards, A. 1990. Seabirds of the northern hemisphere. Dragon's World Ltd, Limpsfield, U.K.

	 https://www.iucnredlist.org/species/22694764/111750380			fields[522, 523]. It also occurs along the coast on estuaries, coastal lagoons, creeks in mangrove swamps[524] and tidal mudflats[525]. Definitely, the species has a presence in the surroundings of Rajkot[526, 527], however based on available secondary information extracted from eBird Database[528] (which reports maximum 1200 individuals from the Randarda Lake[529]), it is less likely to meet the threshold i.e. 3,000-15,000 (≥1 percent of the global population) for the EAAA.	
53	White Stork (*Ciconia ciconia*)	**IUCN:** Least Concern **IWP:** Schedule IV **Restricted range:** No **Migratory:** Yes	3a	White storks are found across Europe, Asia Minor, the northern part of Africa, and the Middle East. By the winter months, they migrate into tropical regions of Africa, some parts of the Middle East, and the Indian subcontinent[530]. The global population size is estimated at 700,000-704,000 individuals[531, 532]. The species inhabits open areas, generally avoiding regions with persistent cold, wet weather or large tracts of tall, dense vegetation such as reedbeds or forests, shallow marshes, lakesides, lagoons, flood-plains, rice-fields and arable land especially where there are scattered trees for roosting[533, 534, 535]. During the winter the species shows a	Screened Out

[522] Higgins, P. J.; Davies, S. J. J. F. 1996. Handbook of Australian, New Zealand and Antarctic birds vol 3: snipe to pigeons. Oxford University Press, Oxford.
[523] del Hoyo, J., Elliott, A., and Sargatal, J. 1996. Handbook of the Birds of the World, vol. 3: Hoatzin to Auks. Lynx Edicions, Barcelona, Spain.
[524] Snow, D.W.; Perrins, C.M. 1998. The Birds of the Western Palearctic, Volume 1: Non-Passerines. Oxford University Press, Oxford.
[525] del Hoyo, J., Elliott, A., and Sargatal, J. 1996. Handbook of the Birds of the World, vol. 3: Hoatzin to Auks. Lynx Edicions, Barcelona, Spain.
[526] https://ebird.org/region/IN-GJ-RA?yr=all
[527] https://www.inaturalist.org/observations?iconic_taxa=Aves&place_id=32163&subview=map&view=species
[528] https://ebird.org/map/whiter2?neg=true&env.minX=70.48993375161018&env.minY=22.187409387528277&env.maxX=70.95135953286018&env.maxY=22.37325807249547&zh=true&gp=true&ev=Z&excludeExX=false&excludeExAll=false&mr=1-12&bmo=1&emo=12&yr=all&byr=1900&eyr=2024
[529] https://ebird.org/checklist/S55258716
[530] https://animalia.bio/white-stork
[531] Wetlands International. 2015. Waterbird Population Estimates. Available at: wpe.wetlands.org.
[532] https://www.iucnredlist.org/species/22697691/86248677
[533] Hancock, J. A.; Kushlan, J. A.; Kahl, M. P. 1992. Storks, ibises and spoonbills of the world. Academic Press, London.
[534] del Hoyo, J.; Elliot, A.; Sargatal, J. 1992. Handbook of the Birds of the World, vol. 1: Ostrich to Ducks. Lynx Edicions, Barcelona, Spain.
[535] Snow, D.W.; Perrins, C.M. 1998. The Birds of the Western Palearctic, Volume 1: Non-Passerines. Oxford University Press, Oxford.

	 https://www.iucnredlist.org/species/22697691/86248677			preference for drier habitats such as grasslands, steppe, savanna and cultivated fields, often gathering near lakes, ponds, pools, slow-flowing streams, ditches or rivers[536, 537]. Bhal Area and Velavadar National Park are the possible habitats for this migratory species in Gujarat[538]. The available secondary information[539, 540, 541] also supports the less likelihood of the species in the Vadodara city and more specifically in the project's EAAA. Definitely, the species has a presence in the surroundings of Rajkot[542], however based on available secondary information extracted from eBird Database[543] (which reports maximum 7 individuals from the Aji-2 Dam[544]), it is less likely to meet the threshold i.e. 7000-7,040 (≥1 percent of the global population) for the EAAA.	
Mammals					
54	Indian Pangolin (*Manis crassicaudata*)	**IUCN:** Endangered **IWP:** Schedule I **Restricted range:** No **Migratory:** No	1 a	Indian Pangolin is distributed in South Asia from northern and southeastern Pakistan through much of India south of the Himalayas (excluding far northeastern portions of the country), southern Nepal, and Sri Lanka[545]. The species is understood to occur in various types of tropical forests as well as open land, grasslands and degraded habitats, including in close proximity to villages. The	Screened Out

[536] Hancock, J. A.; Kushlan, J. A.; Kahl, M. P. 1992. Storks, ibises and spoonbills of the world. Academic Press, London.
[537] del Hoyo, J.; Elliot, A.; Sargatal, J. 1992. Handbook of the Birds of the World, vol. 1: Ostrich to Ducks. Lynx Edicions, Barcelona, Spain.
[538] Rahmani, A.R., Islam, M.Z. and Kasambe, R.M. (2016) Important Bird and Biodiversity Areas in India: Priority Sites for Conservation (Revised and updated). Bombay Natural History Society, Indian Bird Conservation Network, Royal Society for the Protection of Birds and BirdLife International (U.K.). Pp. 1992 + xii
[539] https://ebird.org/map/whisto1?neg=true&env.minX=72.4303731032164&env.minY=22.03138830734687&env.maxX=73.8366231032164&env.maxY=22.596737384381402&zh=true&gp=true&ev=Z&excludeExX=false&excludeExAll=false&mr=1-12&bmo=1&emo=12&yr=all&byr=1900&eyr=2024
[540] https://www.inaturalist.org/observations?place_id=any&subview=map&taxon_id=4733
[541] https://www.gbif.org/occurrence/map?taxon_key=2481912
[542] https://ebird.org/region/IN-GJ-RA?yr=all
[543] https://ebird.org/map/whisto1?neg=true&env.minX=70.62986112540054&env.minY=22.368794505979775&env.maxX=70.74521757071304&env.maxY=22.415219510300922&zh=true&gp=true&ev=Z&excludeExX=false&excludeExAll=false&mr=1-12&bmo=1&emo=12&yr=all&byr=1900&eyr=2024
[544] https://ebird.org/checklist/S150266604
[545] Mahmood, T., Challender, D., Khatiwada, A., Andleeb, S., Perera, P., Trageser, S., Ghose, A. & Mohapatra, R. 2019. Manis crassicaudata. The IUCN Red List of Threatened Species 2019: e.T12761A123583998

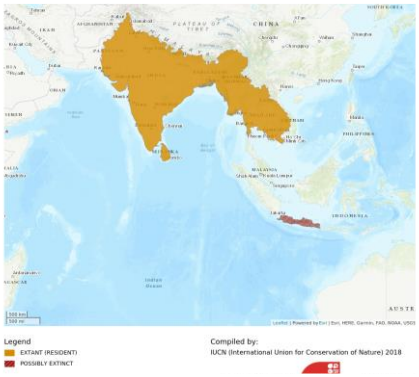
				species can adapt well to modified habitats, provided its ant and termite prey remains abundant. Indian Pangolin is widely distributed in India, except the arid region, high Himalayas and the North-East[546]. Although, the distribution map of Indian Pangolin includes the entire Gujarat state, however no information about the presence of the species has been reported from the nearest protected forest (Rampara Wildlife Sanctuary)[547], and Rajkot city specifically from the project's EAAA[548, 549, 550].	

https://www.iucnredlist.org/species/12761/123583998

Other Aquatic Fauna

55	Wallago (*Wallago attu*)	**IUCN:** Vulnerable **IWP:** Not Available **Restricted range:** No **Migratory:** Yes (Longitudinal)	3a	This freshwater species is widespread, occurring all across India, Pakistan, Sri Lanka, Nepal, Bangladesh, Myanmar, Laos, Thailand, Vietnam, Cambodia and Java in Indonesia. Its Extent of Occurrence (EOO) is estimated at 10,446,620 km^2, based on a minimum convex polygon calculated from georeferenced records in GBIF[551] and the literature[552, 553]. This species is widely distributed and hence has a very large population. However, it is overfished, and this has caused a considerable decline in the population in most of the Indian subcontinent. The population is estimated to have declined by 30% over the last 60 years (3 generations), based on the average of these local declines reported throughout its range[554]. It inhabits freshwater and tidal waters, in a variety of habitats including large rivers, lakes, tanks, channels and reservoirs. It is one of the largest, most voracious and	Screened Out

[546] https://www.wwfindia.org/about_wwf/priority_species/threatened_species/indian_pangolin/
[547] https://moef.gov.in/wp-content/uploads/2017/06/rampara.pdf
[548] https://www.inaturalist.org/observations?place_id=any&subview=map&taxon_id=43362
[549] https://indiabiodiversity.org/species/show/257364
[550] https://www.gbif.org/species/5219633
[551] GBIF. 2018. Global Biodiversity Information Facility. Available at: http://data.gbif.org/species/.
[552] Bleeker, P. 1858. De visschen van den Indischen Archipel. Beschreven en toegelicht. Siluri. Acta Societatis Regiae Scientiarum Indo-Neêrlandicae 4: i-xii+1-470.
[553] Roberts, T.R. 1982. Systematics and geographical distribution of the Asian silurid catfish genus Wallago, with a key to the species. Copeia 1982(4): 890–894.
[554] https://www.iucnredlist.org/species/166468/174784999#population

	 https://www.iucnredlist.org/species/166468/174784999			predatory of the local catfish which thrives well in rivers and tanks, especially in jheels with grassy margins. It mostly hides under holes in river banks and canals and it prefers muddy tanks subject to periodical flooding from a nullah or river. It is rather sluggish and stays at the bottom of water in search of food[555]. Although, the species has a presence in the Gujarat State[556, 557], intensely from Tapti River & tributary[558]. A single report of the species is available from the adjacent of Bhukhi village, Dhoraji Taluka, Rajkot[559] in 2019, which is about 65 km away from the project's EAAA. Due to the non-existence of any historical record, the presence of the species is less likely in the Rajkot City, specifically from the project's EAAA[560, 561, 562].	
56	Indian Butter Catfish (*Ompok bimaculatus*)	**IUCN:** Near Threatened **IWP:** Not Available **Restricted range:** No **Migratory:** Yes (Longitudinal)	3a	Indian Butter Catfish (*Ompok bimaculatus*) is widely distributed in Pakistan, India, Sri Lanka, Bangladesh and Myanmar[563]. However, given the uncertainties surrounding the identity of this species, it is possible that its range is more geographically circumscribed[564]. This species is relatively abundant throughout its distribution. No empirical data on declines in its entire range is available, although Mishra et al. (2009)[565] report an average population decline of 29.3% over a period of four decades (1960-2000) for this species in southwestern Bengal. The average decline per decade since 1980 is about 60%[566]. However, the difficulty in extrapolating data from a localized study and the taxonomic uncertainties surrounding the populations from throughout the subcontinent make it difficult to definitively consider this species to be in decline[567].	Screened Out

[555] https://www.iucnredlist.org/species/166468/174784999#habitat-ecology
[556] https://www.gbif.org/species/2337651
[557] https://indiabiodiversity.org/species/show/232938
[558] https://www.fao.org/3/v5930e/V5930E11.htm
[559] https://www.entomoljournal.com/archives/2020/vol8issue2/PartP/8-2-119-215.pdf
[560] https://www.gbif.org/species/2337651
[561] https://indiabiodiversity.org/species/show/232938
[562] https://www.inaturalist.org/observations?place_id=any&subview=map&taxon_id=115010
[563] Ng, H.H. and R.K. Hadiaty. 2009. Ompok brevirictus, new catfish (Teleostei: Siluridae) from Sumatra. Zootaxa 2232: 50-60.
[564] Ng, H.H., Tenzin, K. & Pal, M. 2010. Ompok bimaculatus (errata version published in 2020). The IUCN Red List of Threatened Species 2010: e.T166616A174788267.
[565] Mishra, S. S., Acherjee, S. K. and Chakraborty, S. K. 2009. Development of tools for assessing conservation categories of siluroid fishes of fresh water and brackish water wetlands of South West Bengal, India. Environmental Biology of Fishes 84(4): 395–407.
[566] Mishra, S. S., Acherjee, S. K. and Chakraborty, S. K. 2009. Development of tools for assessing conservation categories of siluroid fishes of fresh water and brackish water wetlands of South West Bengal, India. Environmental Biology of Fishes 84(4): 395–407.
[567] https://www.iucnredlist.org/species/166616/174788267#population

	 https://www.iucnredlist.org/species/166616/174788267			Inhabits plains and submontane regions, and is found in rivers, lakes, tanks and ponds[568]. Although, the species has a presence in the Gujarat State[569, 570], intensely from Narmada River & tributary[571]; however, no record of the species is available from the Rajkot area[572, 573, 574], specifically from the project's EAAA[575].	
57	Shortfin Eel (*Anguilla bicolor*)	**IUCN:** Near Threatened **IWP:** Not Available **Restricted range:** No **Migratory:** Yes (Longitudinal)	3a	Shortfin Eel has diverged between the Indian and Pacific Oceans giving rise to two subpopulations[576]. The subpopulation found in the Indian Ocean (sometimes referred to as *Anguilla bicolor bicolor*) is genetically homogeneous in this ocean, but significantly different from that in the Pacific Ocean (sometimes referred to as *Anguilla bicolor pacifica*)[577]. The Indian Ocean subpopulation is distributed from the east coast of Africa, the Arabian Peninsula (Oman and Yemen, including Socotra, in coastal drainages of the Gulf of Oman, Arabian Sea, and Gulf of Aden[578]), it is widespread in the tropical Indian Ocean	Screened Out

[568] https://www.iucnredlist.org/species/166616/174788267#habitat-ecology
[569] https://www.gbif.org/species/2337651
[570] https://indiabiodiversity.org/species/show/232938
[571] Bhakta, D., Anand Meetei, W., Vaisakh, G., Kamble, S., Das, S. K., & Das, B. K. (2019). Finfish diversity of Narmada estuary in Gujarat of India. *Proceedings of the Zoological Society*, 72: 257-262.
[572] https://www.gbif.org/species/2337651
[573] https://indiabiodiversity.org/species/show/232938
[574] https://www.inaturalist.org/observations?place_id=any&subview=map&taxon_id=107557
[575] https://www.researchgate.net/profile/Pradeep-Mankodi/publication/216408431_DIVERSITY_OF_FISHES_FROM_FRESH_WATER_RESERVOIR_NYARI_II_OF_RAJKOT_DISTRICT_GUJARAT/links/0912f5059499fd8bc0000000/DIVERSITY-OF-FISHES-FROM-FRESH-WATER-RESERVOIR-NYARI-II-OF-RAJKOT-DISTRICT-GUJARAT.pdf
[576] Ege, V.A. 1939. A revision of the genus Anguilla Shaw. DANA Report 16: 8-256.
[577] Minegishi, Y., Gagnaire, P-A., Aoyama, J., Bosc, P., Feunteun, E., Tsukamoto, K. and Berrebi, P. 2012. Present and past genetic connectivity of the Indo-Pacific tropical eel Anguilla bicolor. Journal of Biogeography 39: 408-420.
[578] Environment and Protected Areas Authority (EPAA). 2002. Conservation Assessment and Management Plan (CAMP) for the Threatened Fauna of Arabia's Mountain Habitat. BCEAW/EPAA, Sharjah; UAE.

https://www.iucnredlist.org/species/166894/176494582

(Seychelles, Madagascar and Mascarenes), east to India, Sri Lanka, Bangladesh, Myanmar, Indonesia, & north-western Australia[579, 580].

There is little quantitative information available to infer the population status of *Anguilla bicolor*. It is reasonable to assume that there will have been some effects as a result of the identified threats, although considerably more information would be necessary to determine accurate estimates and associated changes[581].

The Shortfin Eel's habitat ecology encompasses freshwater and marine environments. It thrives in inland wetlands and coastal areas, ranging from neritic to oceanic zones. Additionally, it utilizes artificial aquatic and marine habitats. This adaptability allows the Shortfin Eel to inhabit a diverse range of aquatic ecosystems throughout its lifecycle[582].

Although, the species has a presence in the Gujarat State[583]; however, no record of the species is available from the Rajkot area, specifically from the project's EAAA[584, 585, 586].

[579] Allen, G.R., Midgley, S.H. and Allen, M. 2002. Field guide to the Freshwater Fishes of Australia. Western Australian Museum, Perth.
[580] Pike, C., Crook, V., Jacoby, D. & Gollock, M. 2020. Anguilla bicolor (amended version of 2019 assessment). The IUCN Red List of Threatened Species 2020: e.T166894A176494582.
[581] https://www.iucnredlist.org/species/166894/176494582#population
[582] https://www.iucnredlist.org/species/166894/176494582#habitat-ecology
[583] https://www.entomoljournal.com/archives/2020/vol8issue5/PartQ/8-4-538-214.pdf
[584] https://www.gbif.org/species/5712355
[585] https://indiabiodiversity.org/species/show/231624
[586] https://www.inaturalist.org/observations?place_id=any&subview=map&taxon_id=94107