Environmental and Social Impact Assessment for Waste to Energy Plant, Gujarat

Project Location: Ahmedabad

Final Report

May 2024

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Abbreviations

Name	Description
ACEL	Abellon Clean Energy Limited
WTE	Waste to Energy
Amsl	Above mean sea level
GETCO	Gujarat Energy Transmission Corporation Limited
GWAPL	Goodwatts WTE Ahmedabad Private Limited
AMC	Ahmedabad 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

Name	Description
CPCB	Central Pollution Control Board
CSR	Corporate Social Responsibility
CTE	Consent to Establish
CTO	Consent to Operate
DG	Diesel Generator
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
KLD	Kilo Liters Per Day
kWh	Kilowatt per hour
Mbgl	Meters below ground level
MNRE	Ministry of New and Renewable Energy
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

Name	Description
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 Shahwadi village, Daskroi tehsil in Ahmedabad district, 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. 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 potentially significant environmental and social 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 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

1.3 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 /Central Public Health and Environmental Engineering Organization (CPHEEO) 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 of 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 Advisor 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 Advisor 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 13th & 14th June (by EHS and social expert) 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 & 18th May	10 km buffer of Project Site	• Discussion with client representative about the project; infrastructures and project activities; • Ecology and Biodiversity Survey of the surrounding area; • Consultations with the locals on ecology and biodiversity aspects.
13th-14th June	• Project Site • Along the proposed ROW for transmission line and pipeline • Existing Dumping ground for Ahmedabad Municipal Corporation (AMC) • Villages/habitations around the Project area	• 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 and Plant walkthrough to understand the EHS implementation and labor issues; • 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. Transit walk /route survey along the TL and water pipeline route to understand the potential issues related to R&R and displacement if any; • 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; • Discussion with the project team regarding HR policy, labor and progress of construction and contractor; • 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.

1.4.3.1 Environmental and Social Impact Assessment Reporting

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 (AAQ).
- 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.

- Soil Quality Monitoring.
- Surface water quality sampling and analysis.
- 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 to 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 Ecological Baseline (Section 5.5).

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 rag 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

Secondary baseline data collection involved identifying and collecting available published material and documents. Information on various environmental aspects like soil, geology, hydrogeology, hydrology, drainage pattern, ecology, meteorology, etc. and 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
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 Ahmedabad Municipal Corporation • AMC & Other line Departments Website • Google open sources

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, 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 GWAPL 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 GWAPL 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.
- The primary data on rag pickers related to their income, livelihood and other social development indicators was collected through informal consultations with the representatives (sample) of stakeholder and most of the primary data was from first hand source hence due to absence of valid evidence the confidence level in the data is low.
- As the site team has limited interactions with the community and reported sensitivity of as well as upcoming cyclone (Biperjoy) alert therefore community consultations could not be facilitated.

1.6 Structure of the Report

Chapter 1	Introduction (This Section)
Chapter 2	Project Description
Chapter 3	Analysis of Alternatives
Chapter 4	Applicable Legislative Regulatory & Administrative Regime
Chapter 5	Environment & Social Baseline Conditions
Chapter 6	Stakeholder Identification & Engagement

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, in line with its Waste to Energy (WTE) Policy of 2016 and amendment in 2022, aimed to promote the sustainable utilization of municipal solid waste for electricity generation and contribute to the Swachh Bharat Abhiyan (Clean India Mission). Following the policy and Government of India's Solid Waste Management Rules, 2016 that impose an obligation on municipal authorities to adopt suitable process for disposal of Municipal Waste, the Ahmedabad Municipal Corporation (AMC) issued a Request for Proposal (RFP) inviting proposals for Design, Build, Own, Finance and Operation of Processing Facility based on waste to energy in Ahmedabad.

Competitive bidders participated in the process, submitting their proposals. After the evaluation, AMC declared Abellon Clean Energy Limited (ACEL) as the successful bidder to set up the waste-to-energy (WTE) plant in accordance with the provisions of the WTE policy and Gujarat Electricity Regulatory Commission (GERC) tariff and issued letter of award (LoA) to ACEL.

To fulfill the conditions stated in the LoA, ACEL established a special purpose vehicle (SPV) called Goodwatts WTE Ahmedabad Private Limited. The SPV was incorporated under the Companies Act 2013, and ACEL requested AMC to accept the SPV as the concessionaire for the project. The SPV, as the concessionaire, would resume the responsibilities outlined in the LoA and the subsequent concession agreement. This arrangement ensures that the waste-to-energy project in Ahmedabad is developed and operated by a dedicated entity, specifically established for this purpose, in accordance with the contractual obligations and provisions set forth by the Ahmedabad Municipal Corporation.

The concession agreement between the Ahmedabad Municipal Corporation (AMC) and Goodwatts WTE Ahmedabad Private Limited was executed on 07.04.2017 for the implementation of a 1000 TPD Municipal Solid Waste Processing Facility at Shahwadi village, Daskroi tehsil, Ahmedabad district in the state of Gujarat, India. The waste-to-energy (WTE) plant, with a capacity of 14.9 MW, is under construction and located on land admeasuring 13 acres. 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 Proposed Project

Sr. No.	Components	Description
1	SPV Name	Goodwatts WTE Ahmedabad Private Limited
2	Project Capacity	14.9MW
3	Project Coordinates	22°57'51.15"N; 72°32'59.01"E
4	Project Location	Shahwadi village, Daskroi tehsil in Ahmedabad District, Gujarat, India
5	Project Current Status	Under construction with 95% construction work completed
6	Commercial Operation Date	March 2025
7	Total Municipal Waste used per day (Proposed)	1000 TPD fresh waste. The fresh waste will be collected through door-to-door collection and then transported to collection centers and from there to the WTE plant.
8	Existing Transfer Stations (Managed by AMC)	Ahmedabad has total eight operational transfer stations as detailed below. As reported by GWAPL, 1000 TPD municipal waste at the WTE plant will be received from the three to four operational transfer stations. • Kankariya Transfer Station: 350 TPD • Naroda Transfer Station: 300 TPD • Rakhiyal Transfer Station: 250 TPD

<table>
<tr><th>Sr. No.</th><th>Components</th><th>Description</th></tr>
<tr><td></td><td></td><td>• Sola Transfer Station: 270 TPD
• Vadaj Transfer Station: 250 TPD
• Vasna Transfer Station: 350 TPD
• Vastral Transfer Station: 250 TPD
• Vatva Transfer Station: 270 TPD</td></tr>
<tr><td>9</td><td>Proposed Boiler no. and capacity</td><td>1 Boiler of 80 tons per hour (TPH) capacity.</td></tr>
<tr><td>10</td><td>Proposed Boiler Stack Height</td><td>62 m (Compliant to CPCB guidelines (national requirements), CTE as well as requirements of WBG EHS guidelines).

For details refer section 2.7.1</td></tr>
<tr><td>11</td><td>Proposed Ash generated from the WTE plant</td><td>214 TPD</td></tr>
<tr><td>12</td><td>Proposed Transmission Line</td><td>66 kV underground transmission line of 7.7 km length connecting the plant to Lambha Substation</td></tr>
<tr><td>13</td><td>Land Requirement for the Project</td><td>The total land requirement for the project is 47.37 acres as below. Further, bifurcation of the land for the various project's component is provided below:
<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></tr>
<tr><td>Waste to energy plant</td><td>13</td><td>0</td><td>13</td></tr>
<tr><td>Underground transmission line</td><td>0</td><td>33.73</td><td>33.73</td></tr>
<tr><td>Underground water pipeline</td><td>0</td><td>0.64</td><td>0.64</td></tr>
<tr><td></td><td>Total</td><td></td><td>47.37</td></tr>
</table>
For more details refer to section 1.1 of this report.</td></tr>
<tr><td>14</td><td>Water Requirement and Source</td><td><u>Construction Phase</u>
Water requirement during construction phase for civil work is met through water tankers whereas for domestic purpose the same is abstracted from one groundwater borewell located within the project premises. GWAPL has obtained permission from Central Groundwater Authority (CGWA) for abstraction of 7.5 m³/day [1] (7.5 KLD) groundwater.
<u>Operation Phase</u>
During operation phase (considering both the phases), the project will require 1528 m³/day water for industrial purpose which will be obtained from 155 MLD[2] STP of Ahmedabad Municipal Corporation (AMC) located 500 m (aerial distance) from site towards north direction and 7.5 m³/day [3] (7.5 KLD) water for domestic purpose from one borewell located within plant premises.
Groundwater can only be used for flushing purpose as it is contaminated as per Phase II groundwater quality results. Recommendation on use of ground water only for flushing has been mentioned in Impact Assessment Section.</td></tr>
<tr><td>15</td><td>Treated Water Pipeline</td><td>The project will lay 1.71 km of underground pipeline of diameter 9 inches connecting the project to the AMC STP. Two pipelines will be laid on the same tranche parallel to each other.</td></tr>
<tr><td>16</td><td>Presence of Indigenous People (ownership of</td><td>The project and its associated facilities are located within the Ahmedabad Municipal Corporation City Limits which is highly urbanized and falls under industrial area, as per the current available information no compulsory land acquisition was done for the proposed project and land was</td></tr>
</table>

[1] 1KLD= 1 m³/day
[2] 1MLD=1000 m³/day
[3] 1KLD= 1 m³/day

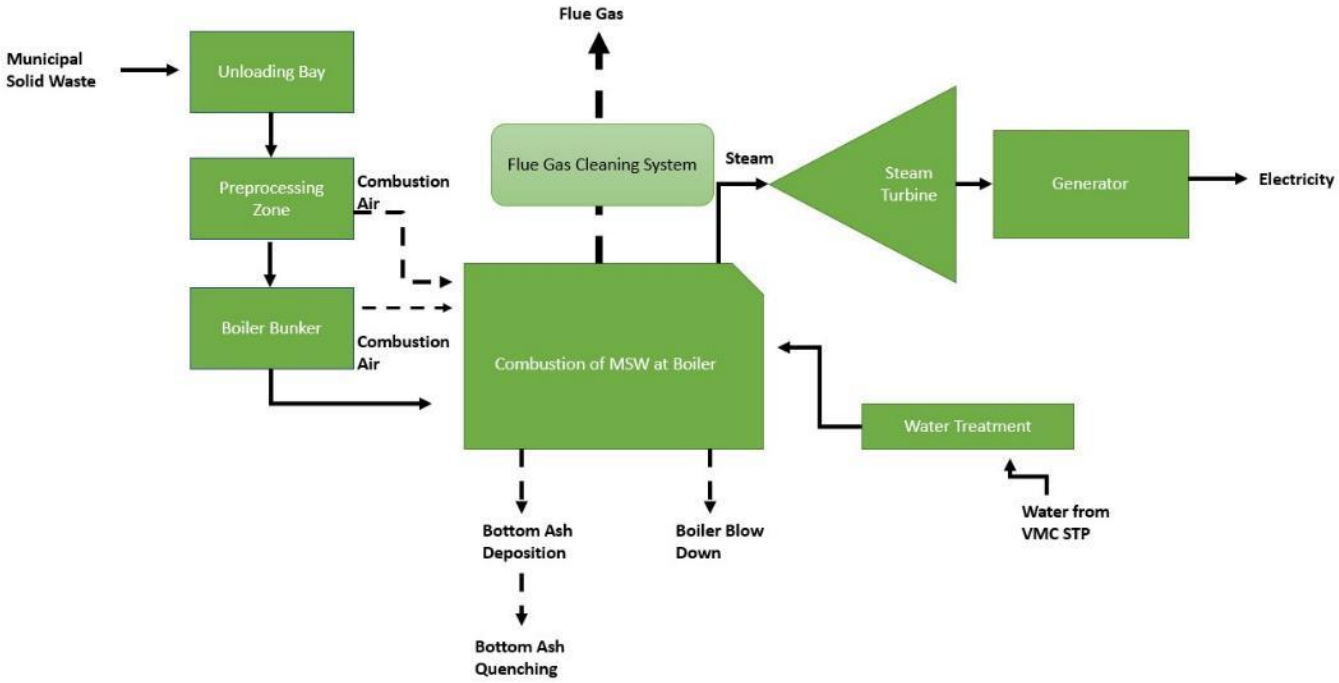
Sr. No.	Components	Description
	procured land or usage on procured land)	owned by AMC and which is leased out to the project for 25 years. As informed land does not belong to indigenous communities including ST s and hence there are no potential or project-induced impact on Indigenous people (schedule tribes in context of India). Further reasoning of impacts is provided below: • **Prior land use of allotted land:** The allotted land falls under the industrial area and reportedly vacant land before the project. As a result, the project does not involve conversion of natural habitats or traditional Indigenous territories. • **Existing Infrastructure:** The allotted land for the project is in a highly urbanized and industrial area, which is having existing infrastructure in place. This includes transportation networks, utilities, and other essential services. • **Presence of Schedule V area:** The proposed project does not fall under designated Schedule V area, nor the land was traditionally occupied lands or heritage of indigenous communities .
17	National Park, Protected Area, or ecologically sensitive sites	There is no protected areas/Ramsar/Important Bird Areas within the 5 km radius. The nearest protected area, Thol Lake Bird Sanctuary (also an Important Bird Area and Ramsar site) is situated about 22 km away from the project location in North-west direction. Wetlands of Kheda, an Important Bird Area is located about 29 km away in South-East. Another Important Bird Area and Ramsar site – Nal Sarovar Sanctuary is located about 48 km away in South-west from project site.
18	River / water bodies	Six water bodies are present within the buffer of 5 km from the Project location. The nearest River Sabarmati is flowing ~ 1.89 km away from the project location in Southwest direction.
19	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[4] have been presented below: • **Earthquake**: The Project is located in an area categorized as Zone III i.e., moderate damage risk zone (MSK VII) • **Wind**: The Project is located in an area categorized as Moderate Damage Risk Zone with wind speed between 39-44 m/s • **Flood**: The Project is located in an area vulnerable to floods. According to District Disaster Management Plan for Ahmedabad, 2021[5] developed by Gujarat State Disaster Management Authority (GSDMA), Daskroi tehsil, where the proposed project is located was affected with heavy rainfall in 2017. As per information available on public domain, there had been instance of flood in Ahmedabad city in 2022 heavy rainfall[6,7]. • **Drought**: According to District Disaster Management Plan for Ahmedabad, 2021, probability of drought for Daskroi tehsil (where proposed project is located) is low. 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.
20	Project' Area of Influence considered as part of the ESIA	• **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. • **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, o **Core Zone:** 0 – 2km from project site o **Buffer Zones** - beyond 2km – 10km of project site.

[4] https://vai.bmtpc.org/
[5] https://ahmedabad.gujarat.gov.in/assets/downloads/District_Disaster_Management_Plan.pdf
[6] https://timesofindia.indiatimes.com/calamities/floods-in-ahmedabad/articleshow/101329964.cms?from=mdr
[7] https://www.outlookindia.com/national/heavy-rains-cause-flood-like-situation-in-gujarat-s-ahmedabad-photos-208512?photo-1

Sr. No.	Components	Description
		• **Social and Cultural:** The study area for the social assessment comprises of the area identified for the Project as well as wards/ 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 5-28*** provide the illustration of the study area.

Source: GWAPL & Site visits undertaken

Figure 2-1 Process Flow



Source: GWRAL 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

S. No	Type of Industry	Waste Name
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: GWAPL

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 Shahwadi village, Daskroi tehsil in Ahmedabad District, Gujarat, India. The project is situated in an industrial area on the outskirts of Ahmedabad city and is surrounded by other industries such as Ahmedabad City Sludge Hygienization plant, Gyaspur landfill site, Warehouses, Torrent Power 400 kV Pirana Substation, Textile Infrastructure etc. within 500-meter radius of the project boundary towards north, east and south direction. The project in north and northwest direction is surrounded by urban forestry, and patches of vacant land towards the west direction. The existing AMC municipal solid waste landfill is located at an aerial distance of 180m from the southwestern project boundary and waste dumping area is located at an aerial distance of 220m from the south eastern project boundary. The project has obtained the land for the WTE plant on a lease for a period of 25 years from Ahmedabad Municipal Corporation. Further, the allocated land for the WTE plant is under the ownership of Ahmedabad Municipal Corporation.

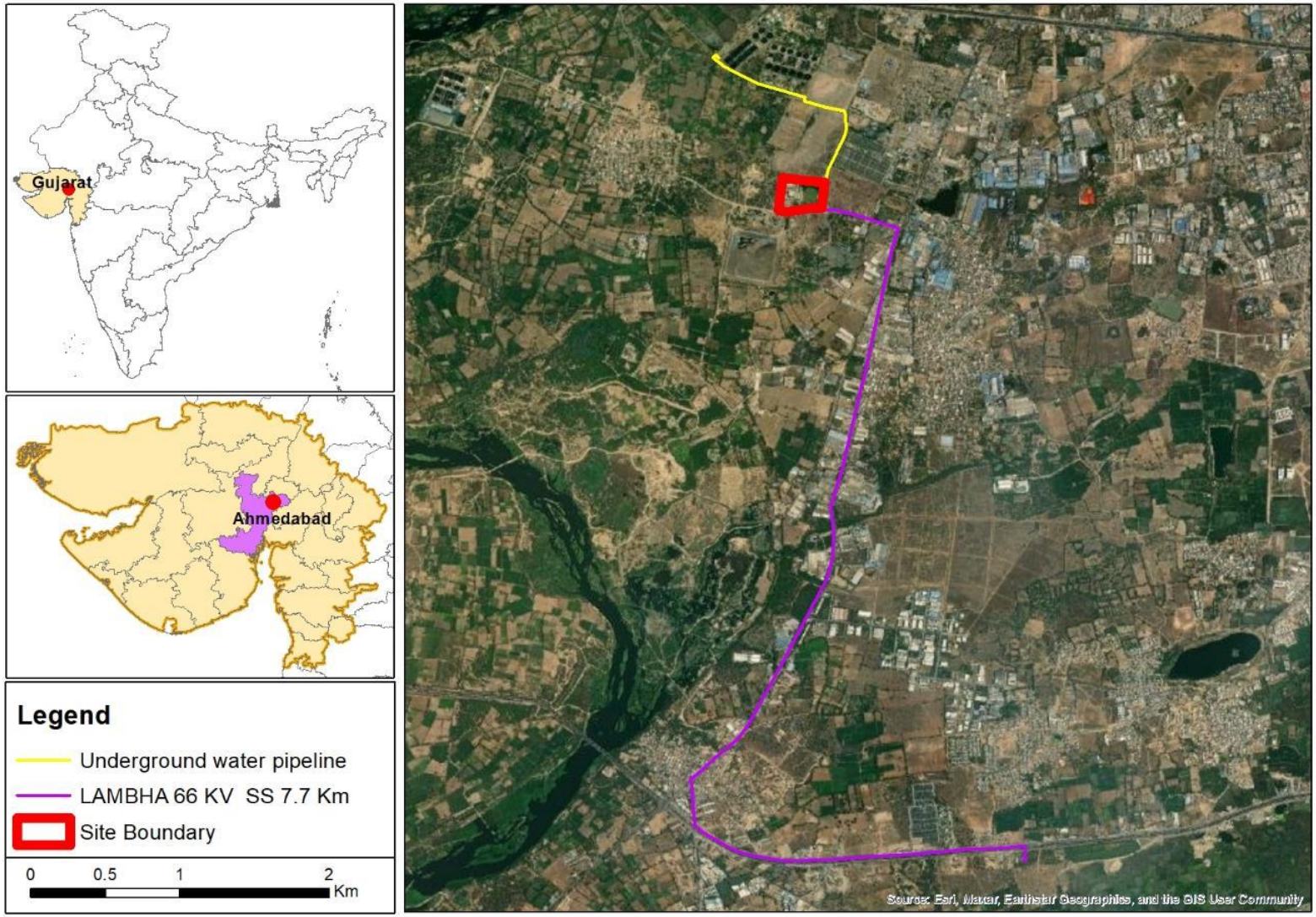
There is no protected areas/Ramsar/Important Bird Areas within the 5 km radius. The nearest protected area, Thol Lake Bird Sanctuary is situated about 22 km away from the project location in North-west direction. Sabarmati river is flowing 2 km (aerial distance) from site towards west direction. A natural perennial water pond is located 570 m (aerial distance) from site towards east direction. Chandola lake is located 4 km (aerial distance) from site towards northeast direction and Kakaria lake is located 6.5 km (aerial distance) from site towards northeast direction. The project is accessible through Dholka Ahmedabad Highway which gets connected to National Highway (NH)-64 at an aerial distance of 1.5 km towards north direction.

The 155 MLD AMC STP is located at 500 m (aerial distance) from the WTE plant towards north direction. Additionally, GETCO Lambha 66kV substation is located at 7.5 km from the WTE plant towards south direction. The nearest settlement to the project site is Gyaspur village located 650 m (aerial distance) towards west direction and Piplaj village located at

900 m (aerial distance) towards east direction. There are no hospitals and schools in the near vicinity to the project location.

Nearest airport to the WTE plant is Ahmedabad airport located at 14 km from the WTE plant towards north direction and nearest commercial railway station is Kalupur railway station located at 8.5 km towards north direction. A tentative Project location map has been presented in ***Figure 2-2***.

Figure 2-2 Project Location Map



Source: Google Earth Imagery

2.3 Project Planning & Strategy

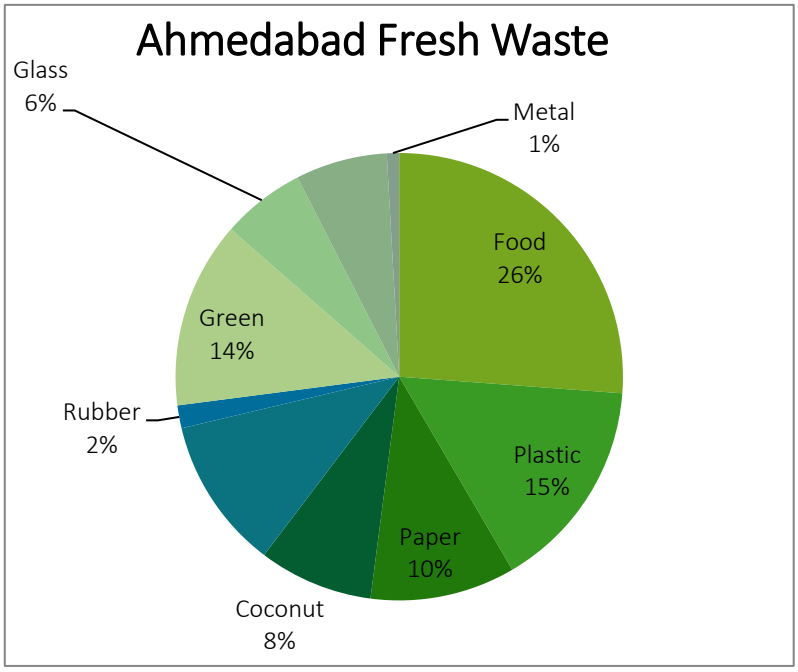
2.3.1 Waste Quantity

At present, Ahmedabad city is approximately producing 4000 TPD of fresh municipal waste. The requirement of the project during the full capacity operation of the WTE Plant is 1000 TPD. Therefore, the project will receive 100% fresh municipal solid waste (MSW) from three to four transfer stations and no legacy waste from the Ahmedabad MSW landfill will be used for the project.

2.3.2 Waste Characteristics

To understand the waste categorization of the area, the samples of waste were collected from 8 garbage stations (each of capacity ranging from 250 to 350 TPD of waste) by Abellon. Total 198 tests were performed on the samples collected between 4th to 8th April 2022. This included qualitative tests like bulk density, moisture, ash, Gross Calorific Value (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 8 garbage stations) Ahmedabad has been presented in ***Figure 2 3***. The Municipal Solid waste collected from these 8 locations majorly comprised of Food (20%), Plastic (17%) and Green (landscape) waste (41%). Other materials like Cloth (9%), Paper (7%), Coconut (4%), Rubber (1%) and Glass (1%) also contributes to the collection.

Figure 2-3 Waste Characterization for Fresh Waste



Source: GWAPL, Abellon

Waste categorization was also undertaken separately for 8 transfer stations to assess the moisture content, ash %, Gross Calorific Value (GCV), Heating value etc, details have been presented in Figure below. fThe waste samples collected from South Zone Vatva RTS recorded to have 48% moisture, whereas waste collected from North Zone Naroda RTS had the lowest moisture content (42%). The highest percentage of dry ash was recorded in West Zone Vasna RTS (23%) and the lowest in East Zone Vastral RTS (16%). Highest GCV value of dry waste was recorded at New West Zone Sola RTS (4331 kcal/kg) and the lowest at West Zone Vasna RTS (3760 kcal/kg). Highest low heating value (LHV) value of wet waste is at New West Zone Sola RTS (2248 kcal/kg) and the lowest is at West Zone Vasna RTS (1761 kcal/kg).

Table 2-2 Transfer Station specific waste characterization.

		Weighted Average values					Derived Composition		
Sr no	Ahmedabad Transfer Station	Moisture (%)	Ash_{dry} (%)	GCV_{dry} (kcal/kg)	GCV_{wet} (kcal/kg)	LHV_{wet} (kcal/kg)	Organic matter (%)	Moisture (%)	Ash + Inert (%)
1	West Zone Vadaj RTS	46	17	4322	2423	2024	44	46	10
2	East Zone Rakhiyal RTS	46	20	4196	2423	1979	43	46	11
3	Central zone Kankariya RTS	44	19	3878	2215	1826	44	44	12
4	North Zone Naroda RTS	42	22	4210	2536	2155	45	42	13
5	South Zone Vatva RTS	48	12	4320	2393	1981	45	48	7
6	New West Zone Sola RTS	44	17	4331	2642	2248	47	44	10
7	East Zone Vastral RTS	43	16	4127	2509	2115	47	43	9
8	West Zone Vasna RTS	43	23	3760	1761	1761	42	43	15

Source: GWAPL Project Parameter Booklet, Abellon

2.4 Waste collection and transportation

The project will obtain 1000 TPD MSW to operate at full capacity of 14.9 MW from three-four (3-4) transfer stations out of the total eight (8) transfer station located in the Ahmedabad city. At present, the project is under construction and will be in operation by March 2025. During the operation phase of the project, the following waste collection and transportation process will be adopted:

The process adopted by Ahmedabad Municipal Corporation (AMC) for door-to-door waste collection, generally involves following steps:

- **Segregation:** Waste generated by households is generally segregated into different categories like biodegradable (organic) waste, recyclable waste, and non-recyclable waste. This step is not universally followed by all household however, some households has adopted the practice of segregation of waste at the household level.
- **Collection Schedule:** AMC sets a collection schedule for each area or locality of the Ahmedabad city. The schedule specifies the time when waste will be collected from each household or area.
- **Collection Staff:** Trained 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.
- **Collection process:** Waste collectors go to each household or area during the designated collection hours and collect the segregated or not segregated waste. They generally use trolleys, bins, or sacks to collect and transport the waste from individual houses to the collection vehicle.
- **Collection vehicles:** Dedicated waste collection vehicles, such as compartmentalized mini trucks, are deployed to collect segregated dry and wet waste.
- **Collection Centers:** The door-to-door collected waste through mini-trucks is dumped at transfer station. Currently, waste from the collection centers is loaded in compactors or big trucks and transported to the landfill. However, during the operation phase of the project, the collected waste from three-four (3-4) transfer station will be transported to the project.

Currently, the collected waste is loaded in compactors or big trucks to transport from collection centres to the dumping site/ landfill. After the dumping of freshly collected waste at the dumping site, 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 informal.

2.5 Waste Handling and Treatment Process

Nearly 90 to 100 trucks and tippers are anticipated to arrive at the plant with fresh MSW waste form 3-4 transfer stations. 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. After visual inspection and weighment, the municipal solid waste will be unloaded at the unloading bay in the pre-processing bunker from where it will be fed into the boiler.

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 AMC trucks which will dispose the inert waste at AMC MSW landfill. Glass and metal will be collected and stored within the plant and further will be disposed of through local scrap vendors.

Bunker of capacity (~6000 m^3) will be built to accommodate approximately waste requirement of 2+ days of prepared waste to ensure round the clock availability of the fuel for the boiler. Boiler will be fed with MSW (also termed as "fuel") with the help of fuel feeding system. The WTE plant at GWAPL is equipped with one boilers of capacity of 80 TPH (Tons per Hour) each with steam pressure and temperature of 42 $kg/cm^2(g)$ and 410+-10^0C and a stack height of 62 meters and stack diameter of 3.0 m. Fuel will enter the boiler at an elevated height of 5.5 m above reciprocating grate which will help in partial combustion of about 40% in suspension and remaining combustion will take place on grate[8]. Combustion of fuel will be undertaken at a temperature more than 900°C. The proposed boiler is of the vertical type with 2 empty passes and one section with superheaters. The first pass is partially covered with refractory lining as protection against high-temperature corrosion, abrasion and erosion, and to fulfil the flue gas residence time requirements. The second vertical pass consists of water-cooled membrane walls with no refractory lining. The transition between the different boiler passes is designed to promote an optimal degree of ash-separation in the first hopper, and a uniform flow distribution through each empty pass. The boiler design is based on a rather long residence time (± 10 sec) of the flue gas before reaching the first superheater tubes. This long residence time at temperatures above 650°C allows not only for the major chemical reactions to reach an equilibrium whereby the corrosion risks are reduced, but also for removal of a maximum of dust and fly ash before entering the convective surfaces.

A comprehensive flue gas cleaning system will be installed at boiler exhaust to control emissions. The flue gas cleaning mechanism will include Activated Carbon Injection System, Dry Sorbent Injection System and Bag filters to control emission in the atmosphere as per EU Norms 2010.

2.6 Project Components

Total site area for the project is 52611 sqm whereas total footprint area of construction is 5354 sqm. Component wise area details of the Project are as presented below in ***Table 2-3*** layout plan for the Project is as presented in ***Figure 2-4***.

Table 2-3 Area Details

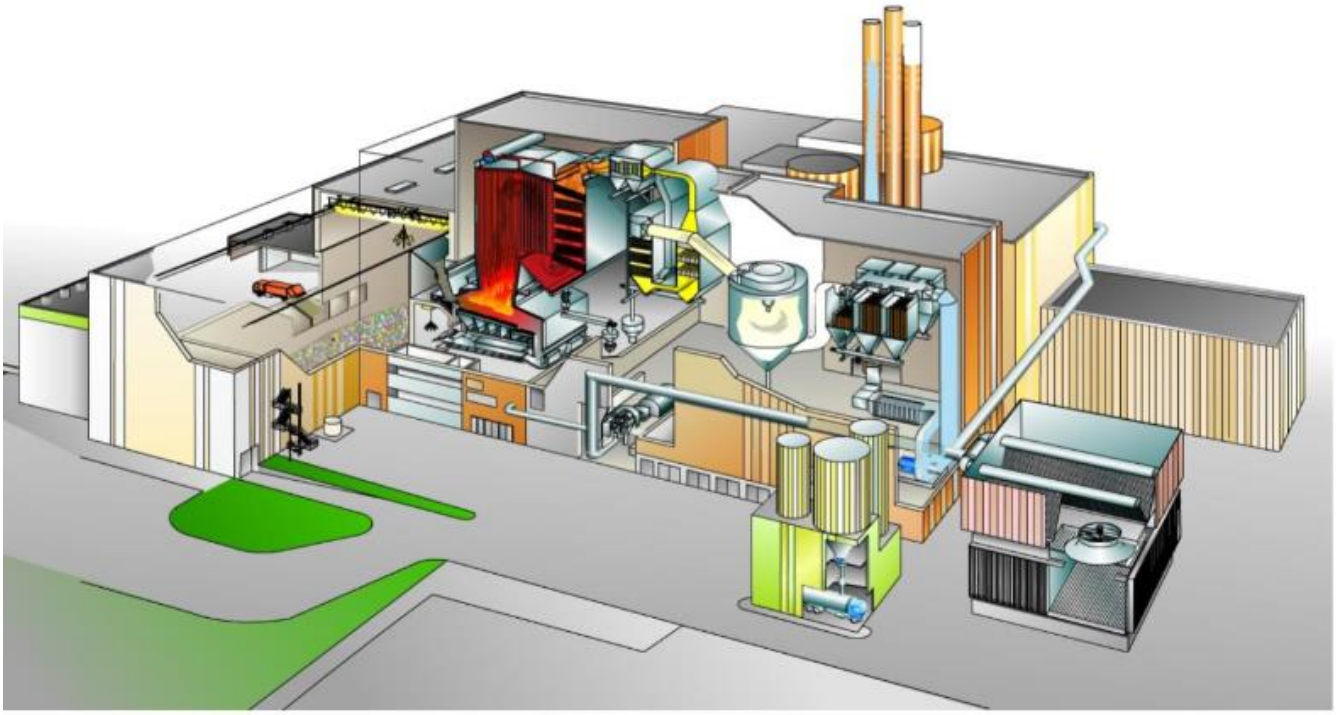
Project Component	Area in Sqm
Mist Cooling Area	2170
Switchyard Area	576
Turbine Building Area	1804
Boiler + FGCS Area	1804
Main Bunker Area	607
Truck Unloading Area	980
Cafeteria Toilet	60
Cafeteria	113
Admin Building	676
Visitor's entrance	170
Staff and Worker Toilet	160
Two wheeler Parking Area	290
Four wheeler Parking Area	425

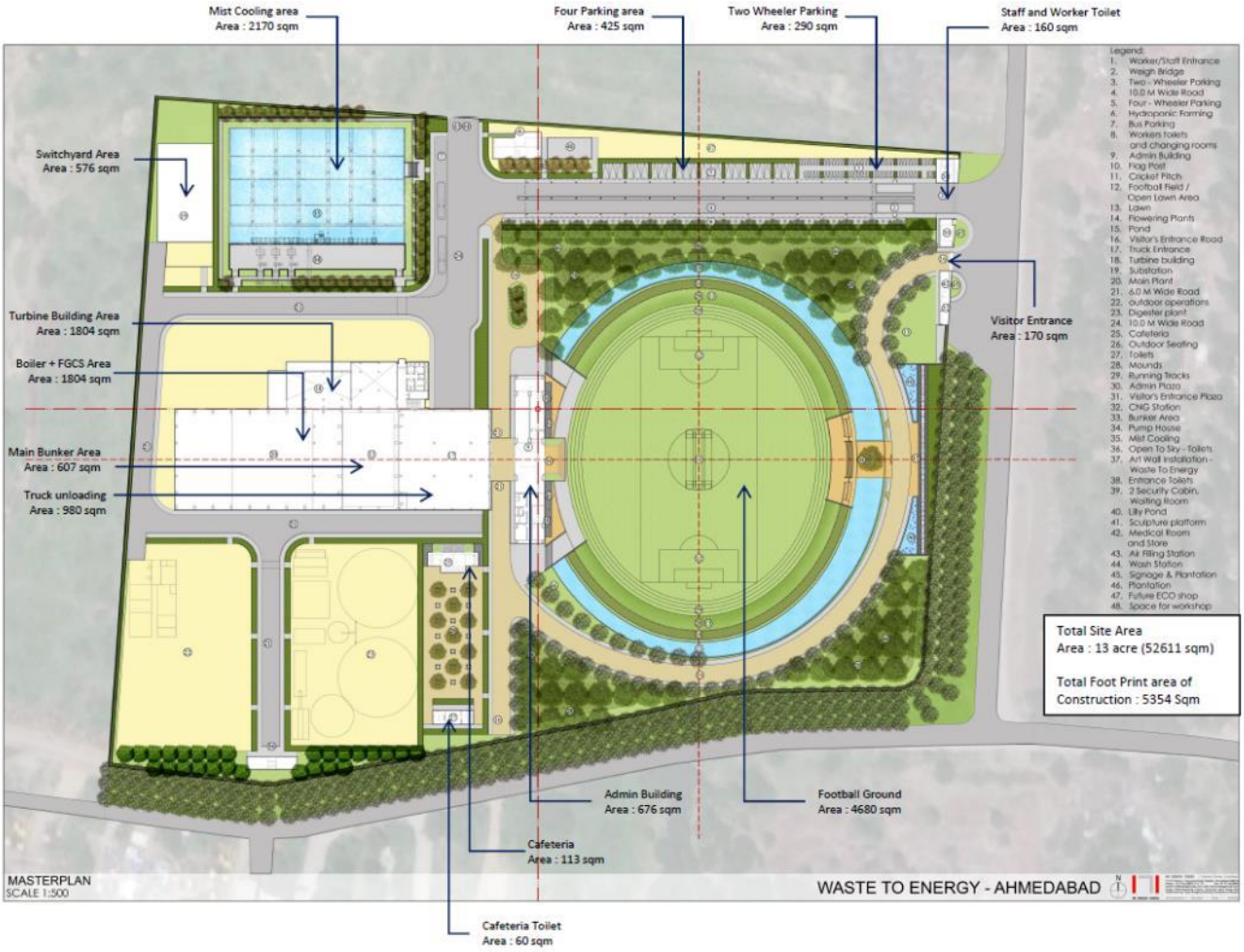
[8] The primary air required for combustion is proposed to be drew from boiler bunker area and preprocessing zone.

Project Component	Area in Sqm
Total Campus Area	52611

Source: GWAPL Project Parameter Booklet, Abellon

Figure 2-4 Project Site Overview & Layout Plan





Source: GWAPL, Abellon

2.6.1 Weighbridge

Weighbridge will be setup at the truck/vehicle entrance and will be used to weigh trucks loaded with waste as well as empty trucks. Two sets of weigh bridges will be installed at Material Entry/Exit gate, which will consist of weighing platforms (02), weighing indicators (02) and common operating station in which operator will log and monitor the gross and net weight of material (fuel) carrying vehicles. After weighment unloading of the waste will be done at unloading bay.

2.6.2 Waste Receipt Bunker

Fresh MSW waste will be received in an enclosed bunker with storage capacity of 6000 m^3. Ahmedabad WTE plant will be equipped with one boiler and the waste will be received at receiving bay which is proposed to be directly connected to the boiler bunker, hence onsite processing will not be done.

2.6.3 Fuel Feeding System

The fuel feeding system consists of feeders for both primary fuel (Fresh MSW) and auxiliary fuel (Piped Natural Gas). Fuel feeding system will consist of the following components:

- **Boiler bunker:** The fresh MSW is received into an enclosed RCC bunker with 2+ days storage capacity. The bunker is used to create buffer stock of Boiler fuel (MSW) and ensures higher Plant Load Factor (PLF).
- **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 feeding hopper and to tumble stored Boiler Fuel (RDF) in bunker to achieve better homogeneity.
- **Feeding Hopper & Fuel feeding chute system:** The waste will be fed from the storage bunker via the feeding hopper into the feeding chute. The hooper walls are proposed to be made of high-quality material reinforced with structural sections capable of withstanding the occasional impact from the grab and the abrasion of the waste as the crane grab will dropping the waste directly here. Feeding hopper will be connected to the chute with a shut off flap located at the lower part of the feeding hooper. The dimensions of the feeding chute will be optimized in order to ensure a good air lock between waste bunker and furnace to minimize the risk of bride formation.
- **Feeding Grate:** These will be located at the bottom of the feeding chute to ensure uniform feeding of the waste across the width of the combustion grate. These are driven by separate hydraulic ram that pushes the waste across the feeding table towards the furnace.

2.6.4 Boiler

Boiler of output 80 TPH will be 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		One
Boiler output – Maximum Continuous Rating	TPH	80
Boiler type		Multi-stage air cooled Combustion grate
Installation		Indoor, Field erected
Steam Pressure at Super heater outlet	Kg/cm2(g)	41 $\pm$ 0.2
Steam temperature at Super heater outlet	^oC	400±10
Fuel Feeding Capacity	TPD	850
Fuel Required quantity	Kg/Hr	35417
Type of firing		Multi Stage Air cooled Grate

Source: GWAPL Project Parameter Booklet, Abellon

2.6.5 Power Generation & Evacuation

Boiler will generate superheated steam which will expand in steam turbine which in turns will rotate 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 turbogenerator is as described below.

2.6.5.1 Steam Turbine

Turbogenerators 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

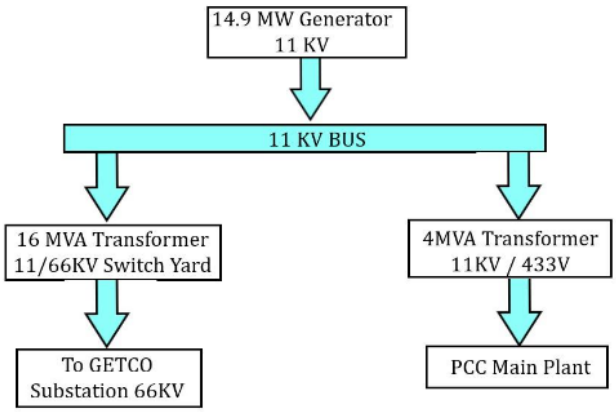
Description	Value
Type	Multistage, impulse/reaction, nozzle governed bleed cum condensing
Casing split	Horizontal
Rotor type	Solidly forged & machined rotor with integral disks
No of Stage	16
Shaft seal	Labyrinth
No. of governing valves	Three (Inlet)
Bearing support	Double pedestal
Rated power	15,000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

Source: GWAPL Project Parameter Booklet, Abellon

2.6.5.2 Power Evacuation

GWAPL 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 Lambha 66 KV Substation through transmission line. Refer ***Section 2.12.2*** for details on transmission line.

Figure 2-5 Power Flow Diagram

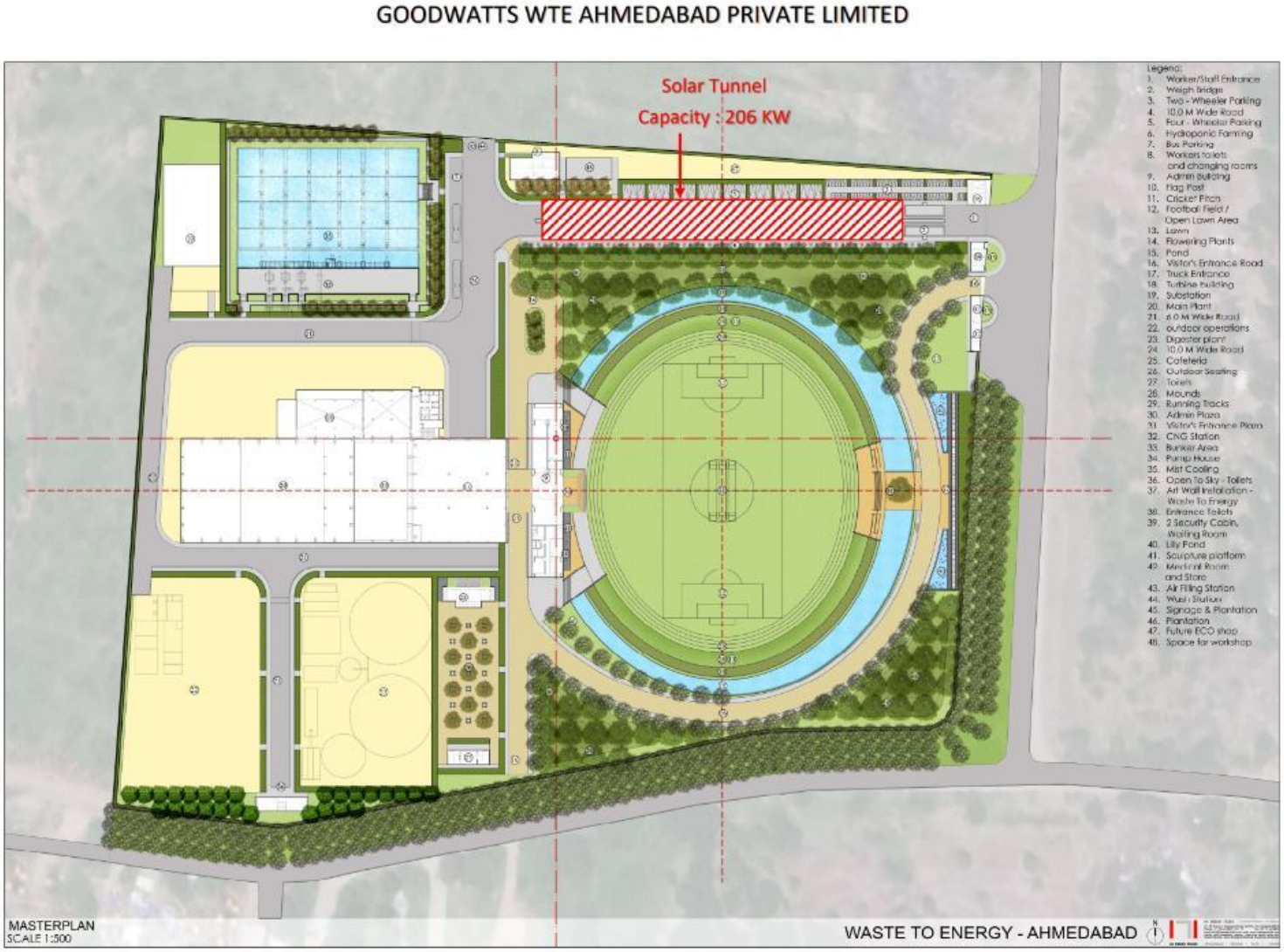


Source: GWAPL Project Parameter Booklet, Abellon

Project will also use 15% 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 within the WtE Plant

Project is also going to setup a solar power plant of capacity of 206 KW 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 of the solar tunnel has been presented in ***Figure 2-6.***

Figure 2-6 Solar Tunnel Location & Capacity



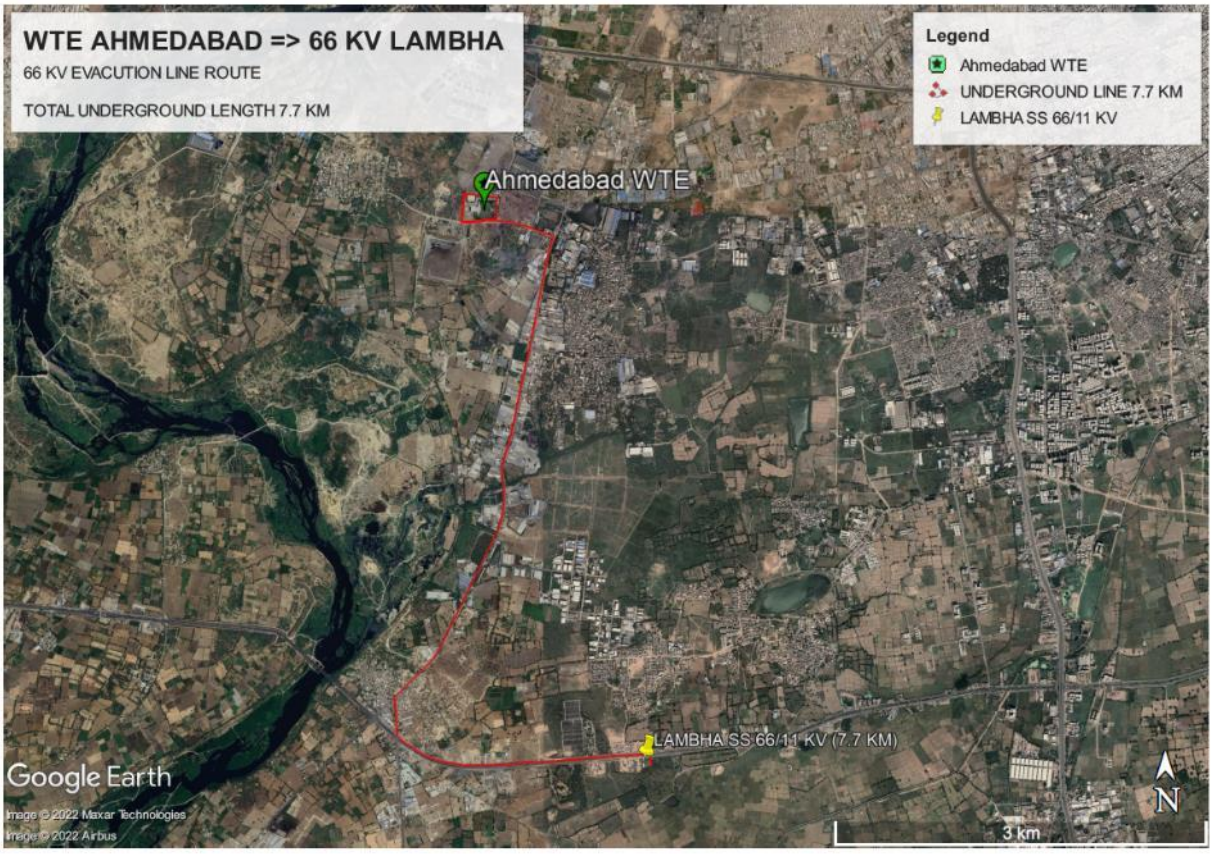
Source: *GWAPL, Abellon*

2.6.5.3 Transmission Line

The total length of the 66 kV underground transmission line from the project location to nearby Gujarat Energy Transmission Corporation Limited (GETCO) Substation is 7.7 kilometres.

The transmission line is not associated facilities[9] 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 2-7 Transmission Line Route



Source: Project Parameter Booklet, GWAPL

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 m3 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.

2.7 Air Pollution

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

2.7.1 Stack Height

GWAPL will be setting up a boiler with 80 TPH steam generation capacity and will be using waste as primary fuel for the boiler. The flue gas will be released through stack at a height of 62 m in compliance to CPCB guidelines (national

[9] 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.

requirements) as well as requirements of WBG EHS guidelines. Stack height as mentioned in consent to establish obtained from GPCB dated is 50 m. Project is also in compliance with stack height as per CTE obtained from GPCB.

Stack Design for the boiler

- **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 47.50 meters

So, total height of the chimney will be 62 meters from the Ground Level at the plant

As per the Environment (Protection) Amendment Rules, 2023, published on 16th May 2023[10], 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 ton/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. As per the Environment Protection rules, the minimum chimney height is to be 30 m or as per above formula. Stack height for the Project as calculated based on the above-mentioned formula is 61.87m.

Table 2-6 Stack height calculation as per The Environment Protection Rule-1986

Particulars	Units	Value	Remark / Formula
Fuel Feeding Rate (F)	Kg/hr	35,416.67	--
Sulphur Content in Fuel (S)	%	0.20	--
Emission Rate of SO_2 (Q)	Kg/hr	141.6	Q = (F*S%*2)/ 100
Stack Height (H)	metre	61.87	H = 14*(Q^0.3)

Source: GWAPL Project Parameter Booklet, Abellon

As per the WBG EHS[11] guidelines the stack height should be as per following formula:

Hg[12]= H+1.5L,

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

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[13] is present at a distance of 660m from GWAPL plant in north west 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 20 m and width of 26 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 ~59 m (considering H= 20m, L= 26m).

Since the stack height is 62 m which higher than the minimum stack height requirement for the project i.e., 59 m, therefore the stack height of the boilers is compliant to WBG EHS guidelines.

2.7.2 Flue Gas Cleaning Mechanism

GWAPL'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

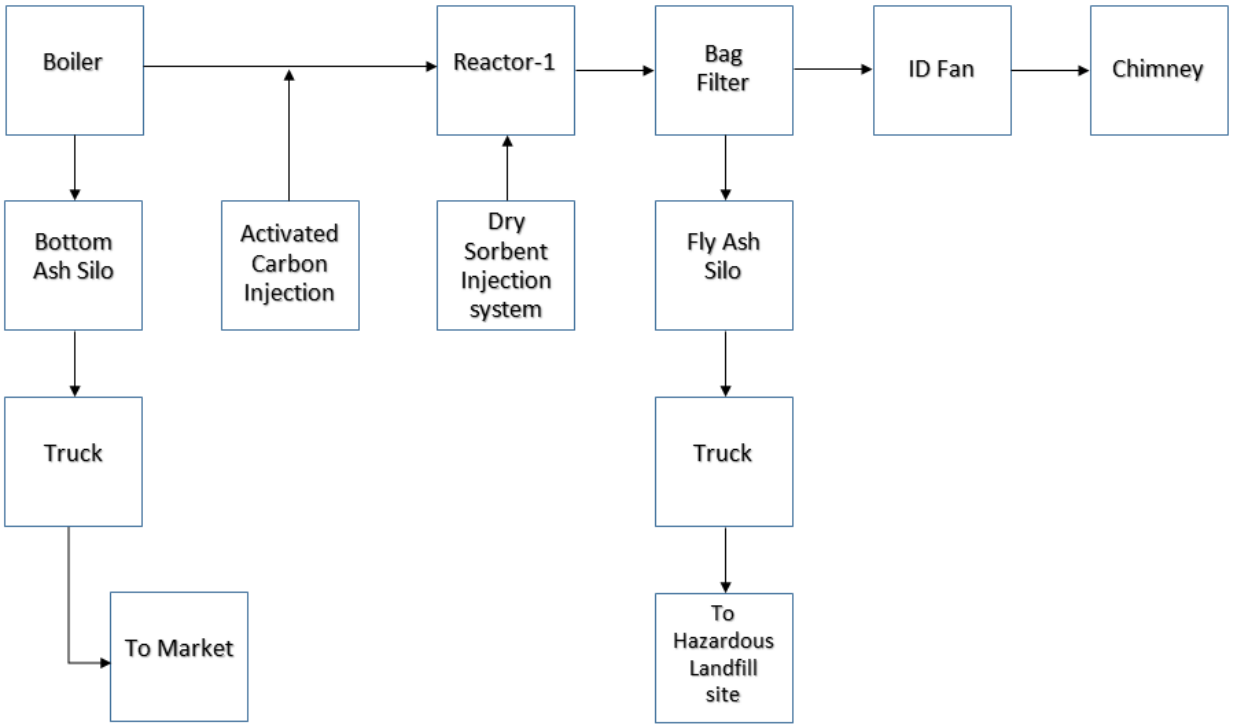
[10] https://cpcb.nic.in/displaypdf.php?id=SW5kdXN0cnktU3BlY2lmaWMtU3RhbmRhcmRzL0VmZmx1ZW50LzQ1OS0xLnBkZg==
[11] Air Emissions and Ambient Air Quality (Environmental, Health & Safety Guidelines: General EHS Guidelines: Environmental))
[12] GEP stack height measured from the ground level elevation at the base of the stack
[13] This is a nearest residential structure at the nearest Residential area which is Gyaspur

(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 which will be collecting ash from various sources such as Boiler Ash, Bag Filter etc. By separating all fly ash in different fly ash silo, salability of various types of Fly Ash will be improved. The Fly Ash free from Lime and Activated Carbon is proposed to be utilized as one of the ingredients of Ash Brick. It will also reduce the burden on Hazardous Landfill site.

The bag filters (Hose Bag Type) 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. There will be only 1 unit of flue gas cleaning train with Semi-wet reactor, Reaction Tower, DSI system[14] and Bag Filter, Refer ***Figure 2-8*** below for details. Technical details and design parameters for Acid Control Reactor Tower, Dry Sorbent Injection (DSI) system, Filter bag house have been added as ***Appendix 3.***

Figure 2-8 Flue Gas & Ash Circuit



Source: GWAPL Project Parameter Booklet, Abellon

2.7.3 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°C to 200°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.

[14] 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

GWAPL 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 1000^0C.

2.7.4 Ash Conveying System

The boiler of capacity 80 TPH will have Suspended Firing Combustion System, therefore, about 20% of total cash generated during incineration process will be "Fly Ash". Fly Ash will be collected at different points i.e., Boiler Ash and Bag filter. The estimated fly ash quantity generated at the WTE plant will be about 214 TPD. Details for types of Fly Ash has been detailed below.

Table 2-7 Fly Ash Mass Balance

Description	Kg/h	TPD	%	Potential Ash Use[15]
Total Ash	**8935**	**214**	**25%**	--
Bottom ash	7210	173	81%	Most of It can be used as void material for construction purpose subject to proper screening.
Shifting ash	1328	32	15%	Most of It can be used as void material for construction purpose subject to proper screening and drying process. There are other ingredients like metal pieces, glass material, some portion of unburnt needs scientific separation and its disposal.
Boiler ash	397	10	4%	it can be utilized to produce concrete pavers, aerated concrete blocks, etc.

Source: Project Parameter Booklet, GWAPL

The bottom ashes will be quenched below 60°C before evacuation to the ash transport. The bottom ash extractor will be water-bath type with bottom ash removal by a hydraulic pusher. The water bath will form an air tight sealing of the furnace under all operating conditions. At the outlet of each bottom ash extractor, the ashes will drop onto a conveyor system. These conveyors will transport the ashes outside the building to a handling system. 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. Refer Figure 2-8 for ash disposal mechanism.

2.7.5 Continuous Emission Monitoring Systems (CEMS)

The Continuous Emission Monitoring (CEM) System will be installed to determine the concentration of gaseous emission and/or particulate matter concentration and/or emission rate using analytical measurements and a computer program to provide results in units of the applicable emission limits or standards. The data recorded/observed will be gathered through analog outputs to a recording system or send directly to a DAS (Data Acquisition System) for storage and onward transmission.

Data Acquisition System includes special modules for data treatment and further transmission to the Central Data Acquisition and Handling System in SPCB/ CPCB central office.

2.7.6 Odor Control Mechanism

Primary air required for combustion will be sucked from boiler bunker area. This will result into negative draft inside boiler bunker. The suction of forced draft fan will be taken from top of the bunker which will suck all the dust and odour from bunker and truck unloading area connected with the bunker. Thus, there will be a control on dust particles, 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. Further, retention time of the waste in the bunker and pre-processing area will be around 10 hours, which gives less time for disintegration of the waste which results in odor.

[15] Please note, the ash uses are potential uses and the ash is not currently used. The Ash generated are currently disposed.

Further, project propose to undertake odour modelling and recommendation based on modelling will be implemented at Site.

2.8 Water Requirement & Treatment Systems

2.8.1 Water Requirement

GWAPL will lay underground pipeline of diameter 9-inch (1.5 m below natural ground level), 1.71 km length connecting the Pirana Sewage Treatment Plant (STP) Ahmedabad to the project site. Project will undertake secondary treatment of the water received from STP prior to its use within the WTE plant. The underground water pipeline will facilitate the supply of water to various components of the project infrastructure.

The underground water pipeline is not considered as associated facilities[16] 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.

Figure 2-9 Water Pipeline from STP to WTE Project Site

Source: Project Parameter Booklet, GWAPL

~ 1528 m3/day water will be required for project operations which will be sourced from the STP. According to the water balance diagram *(refer* Figure 2-10) the daily water requirement for industrial purpose within the WTE plant will be 1528 m3/day, for which pre-treatment is required for 2412 m3/day at the STP. The project has received permission for receiving 2 MLD water from the AMC STP, post pre-treatment of 2412 m3/day at STP, reject water (884 m3/day) will be returned to the STP itself. Refer ***section 2.8.2*** for details on Pre-Treatment of treated STP water.

Approximately, 66 m3/day of water is used for boiler feed and 1408 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 makeup water (treated wastewater from STP) to bring down TDS level to less than or equal to 2100 PPM, which will further be used for gardening on premise[17].

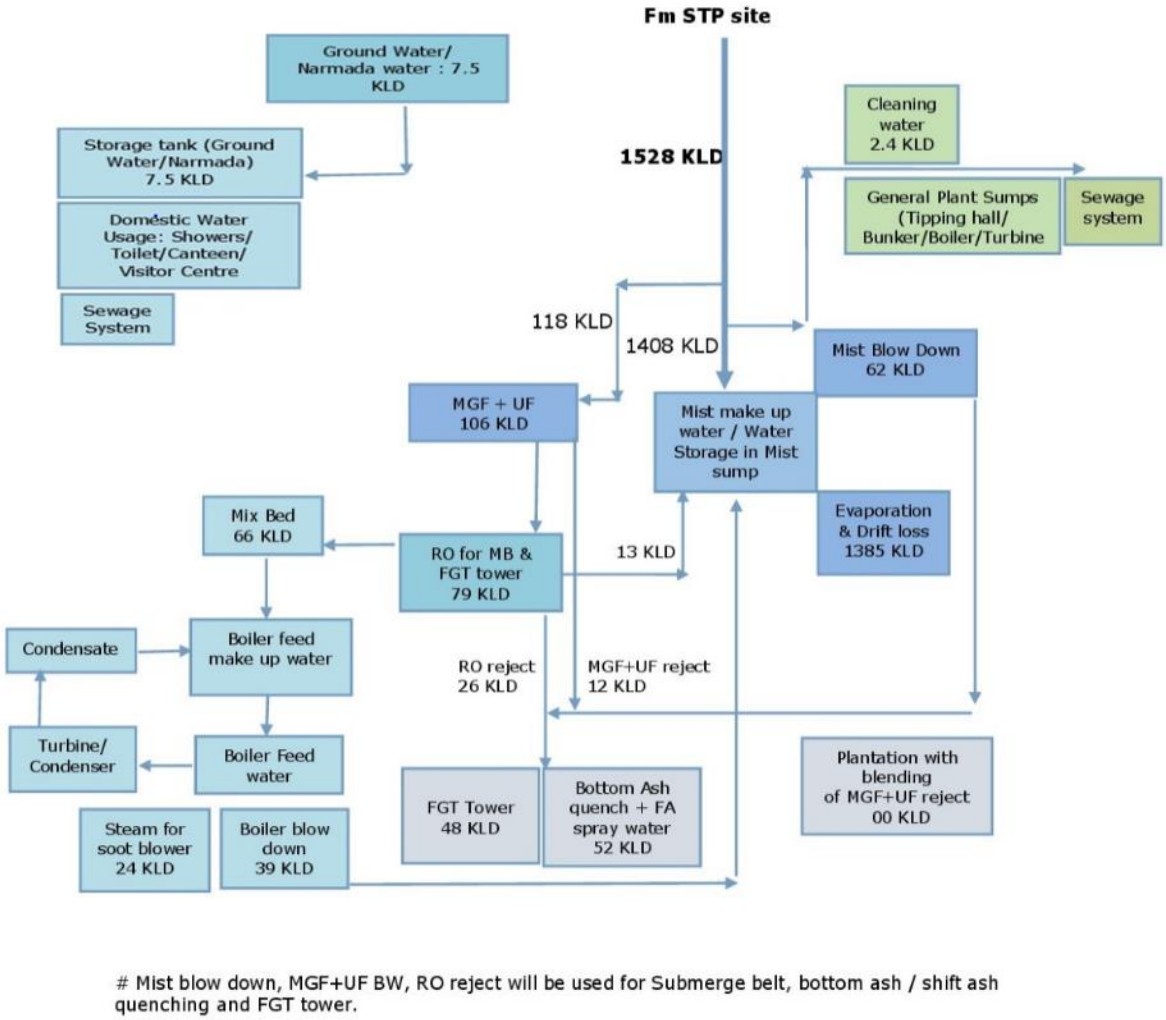
[16] As per the International Finance Corporation's (IFC) performance standard (PS), associated facilities are defined as facilities that are not funded as part of the project and that would not have been constructed or expanded if the project did not exist and without which the project would not be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

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

For domestic purpose, the project has obtained permission to developed 1 borewell within the project premises via application no 21-4/5537/GJ/IND/2019 valid up to 6th February 2025 for abstraction of 7.5 m3/day of fresh water. As per the categorization, Ahmedabad falls in an area categorized as Semi Critical 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 5.3.6.3.2).

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 project operations and Ground water usage has been presented in *Figure 2-10*

Figure 2-10 Water Balance for project operations and ground water usage



Source: Project Parameter Booklet, GWAPL

GWAPL 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 rainwater harvesting, storage of pre-treated water from STP and Fire Reservoir.

2.8.2 Water Treatment

2.8.2.1 Pretreatment Process (Water Treatment of treated water at STP)

To meet the water requirement for WTE plant operations, GWAPL has obtained permission vide letter dated 7th May 2022 from the Ahmedabad Municipal Corporation, Solid Waste Management Branch, WOW cell for lease of land within

the existing STP Premises, laying of pipeline network for plant and pumping house and for further treatment of water (Pre-Treatment) at Pirana STP (referred to as AMC STP) and for sourcing 2 MLD secondary treated water from the 155 MLD Sewage Treatment Plant (STP) located at 1.22 km (aerial distance) from site towards north direction. The primary source of water for the project operations will be from Pirana STP. However, as understood, the GWAPL is under

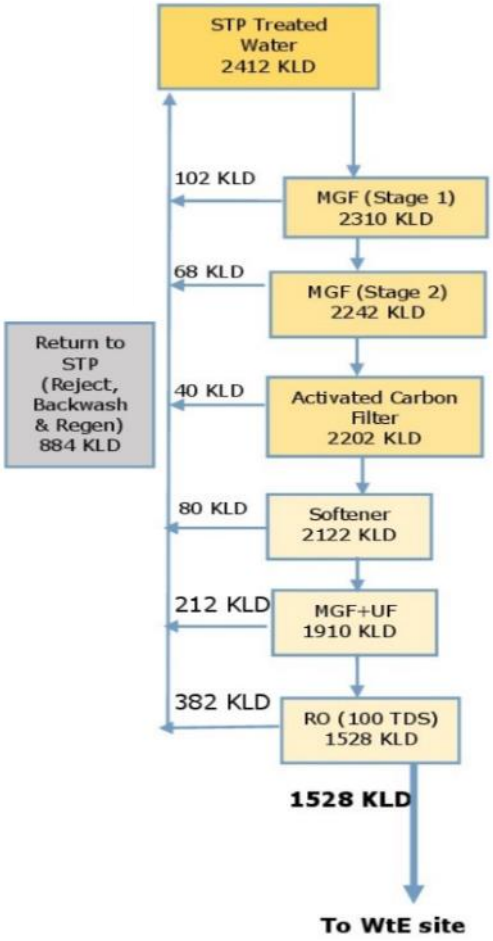
GWAPL will setup a treatment plant ("Pre-Treatment" at STP) within the boundary of the Pirana 155 MLD STP area and further treat the treated STP water within the premises. The Pre-treatment will comprise three stage process,

- Stage 1: Removal of Total Suspended Solids (TSS), color and odor via Multi Grade Filter & Activated Carbon Filter (ACF)
- Stage 2: Water softening
- Stage 3: Reduction of Total Dissolved Solids (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 2-11***. The project will treat 2412 m3/day of treated STP water and all reject water (884 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. 1528 m3/day will be transported via underground water pipeline of ~1.71 km length to the WTE plant. GWAPL will undertake the Pre-Treatment process at the STP as the treated water from the Pirana STP does not meet the quality requirement.

The sewage treatment plant, which has been established by AMC, 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 Ahmedabad city sewage water and is not specifically tailored to the needs or financing of the Project.

Figure 2-11 Pre-Treatment Process at STP



Source: Project Parameter Booklet, GWAPL

Table 2-8 Inlet and Outlet water quality for the Pre-Treatment Process

Parameters	Inlet water quality	Outlet water quality
Appearance	Little Turbid-Dark Grey	Clear
pH	7.37	7.37
Total dissolved solid (ppm)	720	100
Total suspended solid (ppm)	10	<5
Alkalinity (mg/L)	260	Nil
Sulphate as SO4 (ppm)	73.15	Nil
Chloride as Cl (ppm)	308	<8
Sodium (ppm)	242	Nil
Potassium (ppm)	2	Nil
Calcium (ppm)	157	Nil
Total Hardness (ppm)	240	<5
Silica (ppm)		Nil
Conductivity (µS/cm)	0.75	30-40

Parameters	Inlet water quality	Outlet water quality
Biological Oxygen Demand (mg/l)	19.84	Nil
Chemical Oxygen Demand (mg/l)	49.6	Nil
Dissolved Oxygen Demand (mg/l)	4.5	Nil

Source: Project Parameter Booklet, GWAPL

2.8.2.2 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:

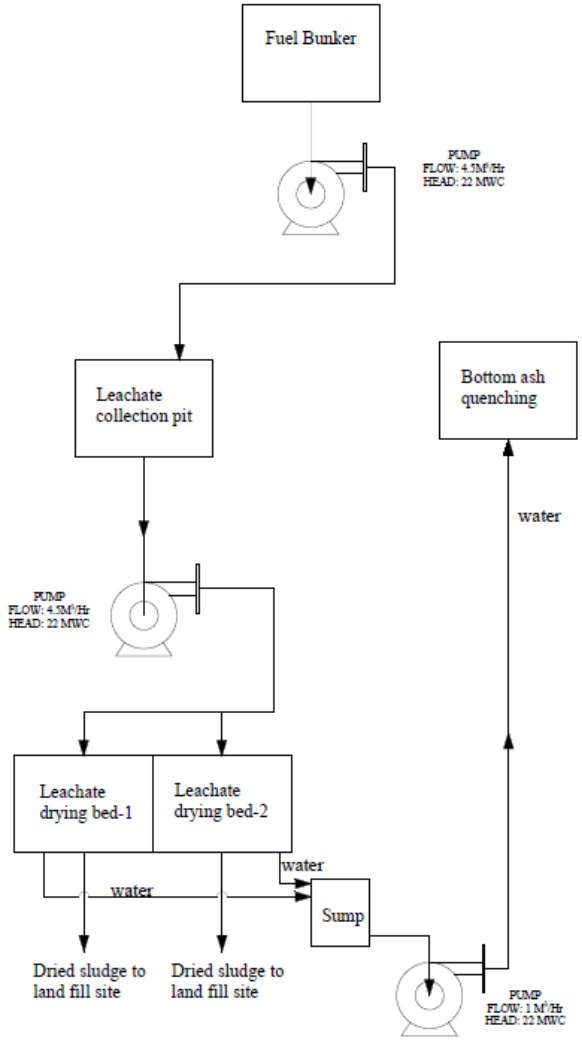
- Boiler Feed Water Treatment Plant will comprise of De-mineralization Plant, Reverse Osmosis and Mix Bed.
- Water used in Mist Cooling will be further treated via MGF & Water Softener and further used within the mist cooling system.

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

2.8.3 Leachate Management

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

Figure 2-12 Leachate Management

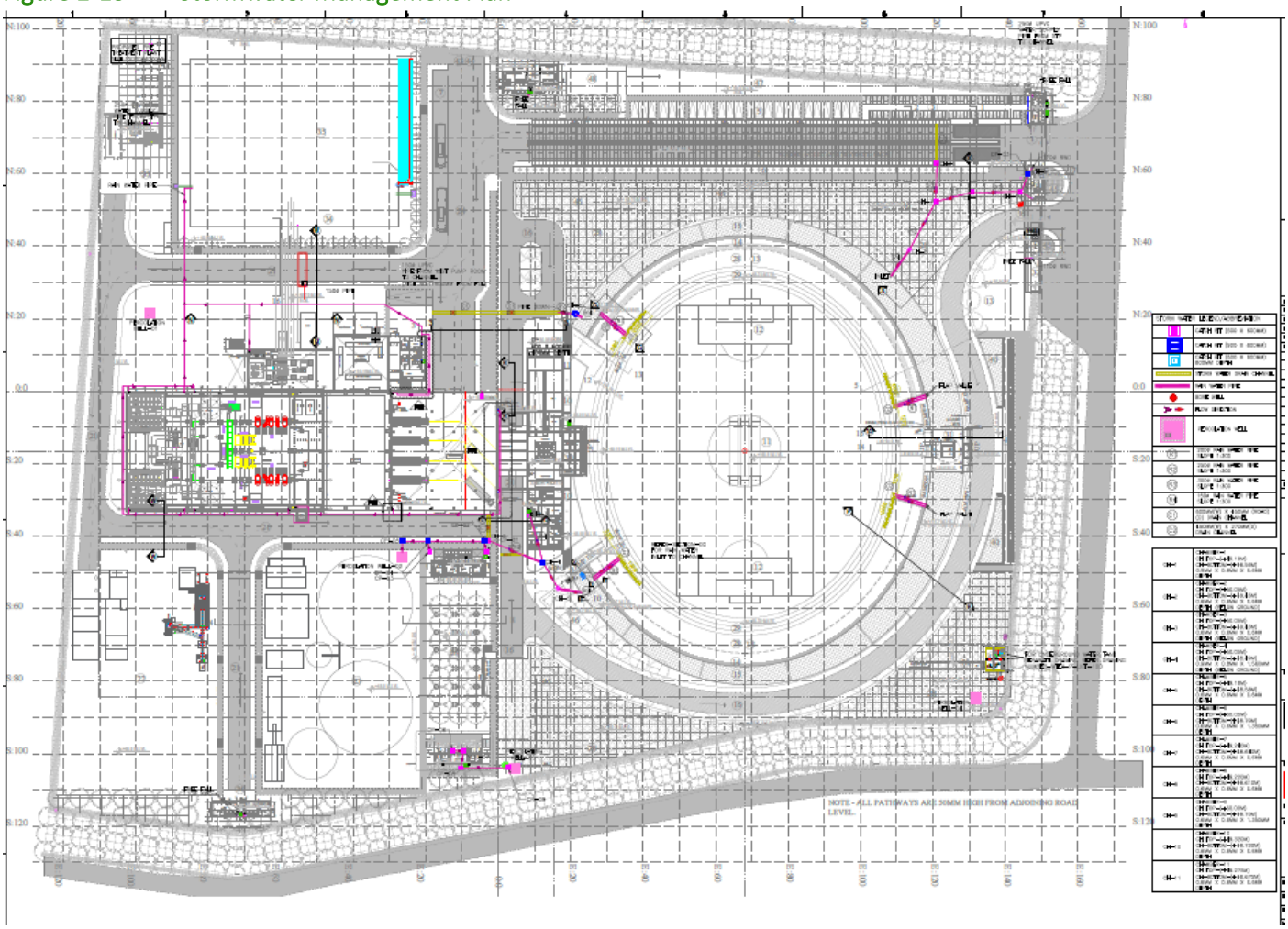


Source: Project Parameter Booklet, GWAPL

2.8.4 Storm Water Control & Management and Rainwater Harvesting

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. Water collected in the catch pits installed within the Project site will be collected through rainwater pipe and will be discharged into the percolation wells. 4 Percolation wells are proposed within the Project for recharging 28000 m^3/annum of ground water. Layout plan showing location of the catch pits and percolation wells is presented in ***Figure 2-13*** below.

Figure 2-13 Stormwater Management Plan



Source: Project Parameter Booklet, GWAPL

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, GWAPL intends to use water available in the water storage body in campus in-case of fire. Fire Hydrant System is also 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 2-9 Details of proposed fire extinguishers

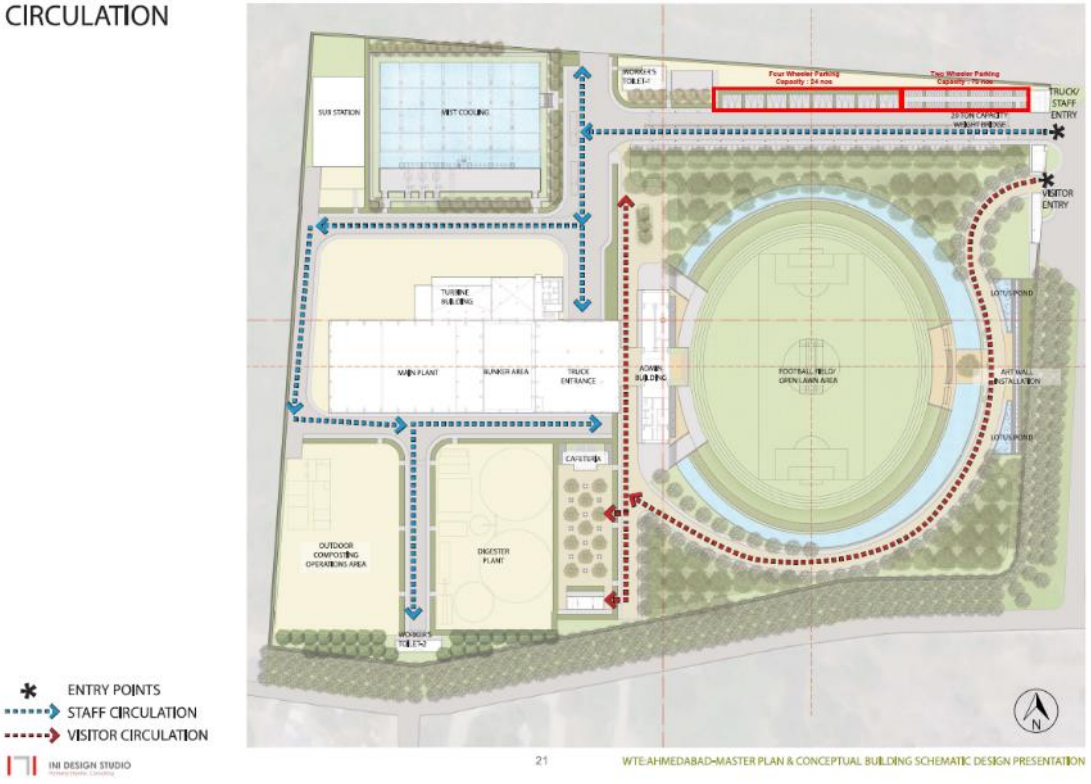
S. No	Detail	Qty	UOM
1	ABC 6 Kg Fire Extinguisher Mono Ammonium Phosphate Powder 50, Stored Pressure Type, Pressure Gauge, Controllable discharge mechanism Class A Rating 3A & Class B rating 21B as per IS 15683	11	Nos
2	CO2 type Fire Extinguisher of capacity 4.5 kg filled with Co2 Gas as per IS 15222 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.

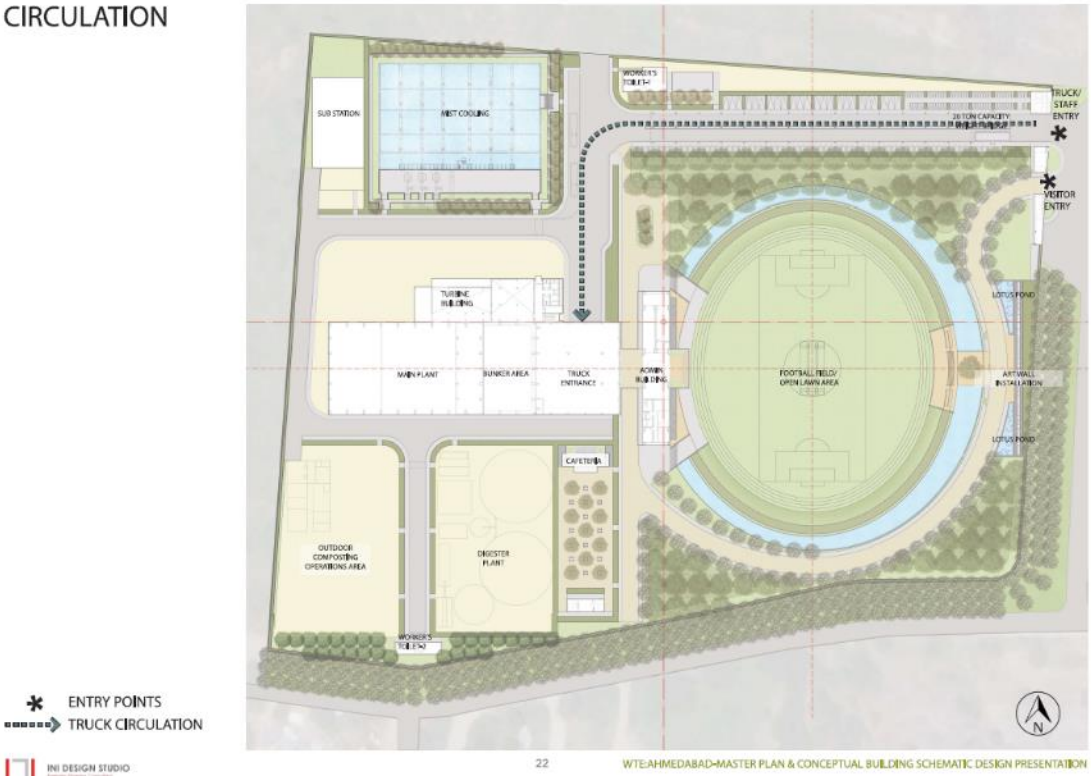
Source: GWAPL

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 2-14*** below:

Figure 2-14 Manpower, Material, and visitor movement





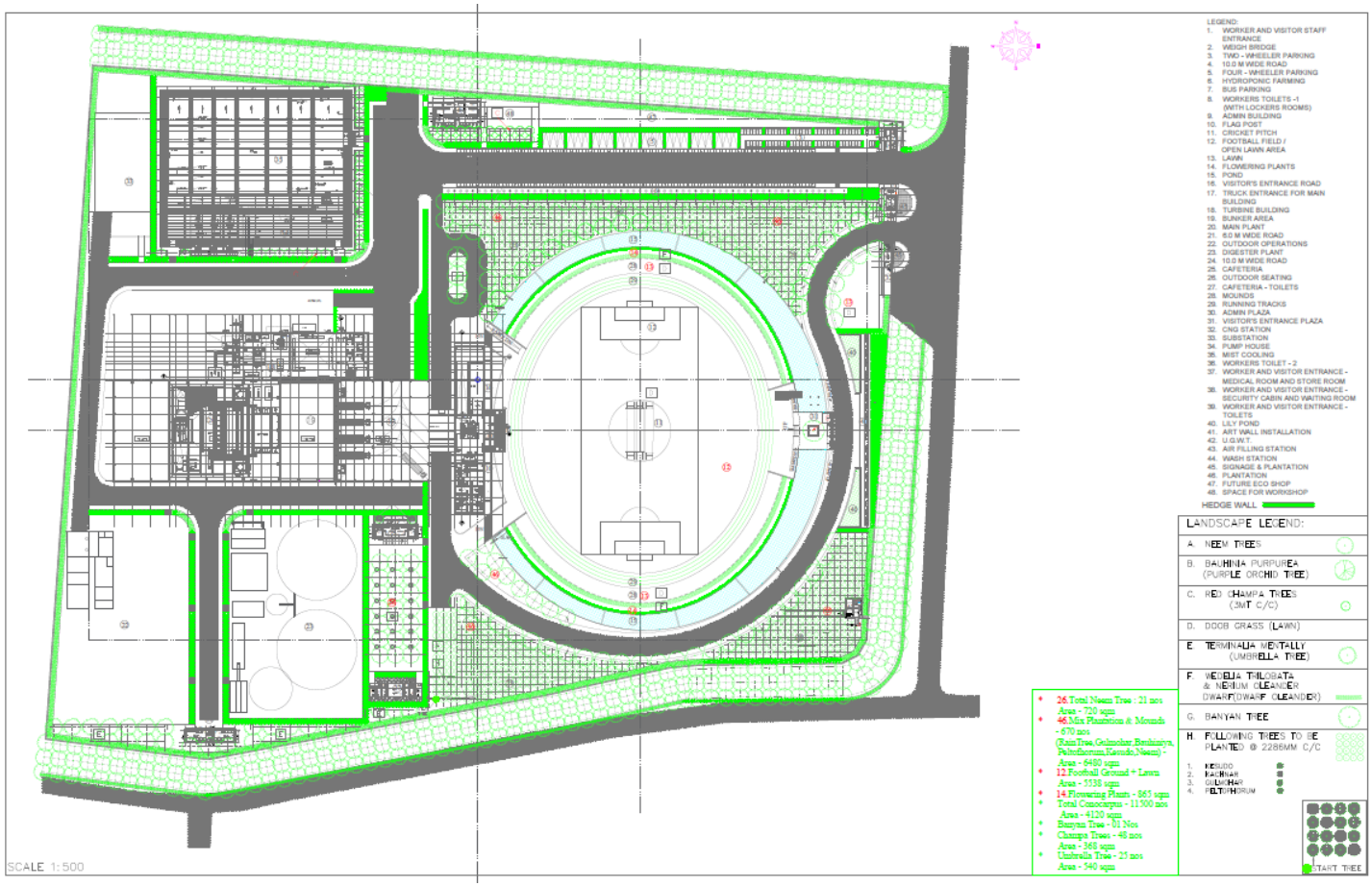
2.11 Greenbelt & Landscape

A developed Greenbelt and Landscape observed within the Plant during the time of site visit. The plant species included Neem, Conocarpus, Champa, *Bauhinia,* Baniyan, flowering plants and etc. The list of the plant planted given following table.

Table 2-10 Trees planted as part of Greenbelt and Landscape

Sr.no	Tree	Number	Area in sqm
1	Neem	21	720
2	Mix plantation and Mounds (Rain tree *Albizia saman*, Gulmohar *Delonix regia, Bauhinia sp.,* Peltofhorum, Kesudo	670	6480
2	Flowering Plants	---	865
3	Conocarpus	11500	4120
5	Champa	48	368
6	Conocarpus	10875	4894
7	Football Ground + Lawn		5538
8	Banyan	1	--
	Umbrella tree	25	540

Figure 2-15 Layout showing Landscape and Greenbelt Area



2.12 Land Requirement and Procurement

The Total land required for the under construction WTE Plant and underground transmission line and water pipeline is 47.37 acres. Details of the total land requirement for the project is provided in table below and further elaborated in subsequent sub-sections: Summary of required land for the project is given in ***Table 2-11***

Table 2-11 Summary of Land Requirements for the proposed project

Project Component	Total Leased out Land Size (in acres)	Easement Rights (in acres)	Total land requirement (acres)	Land Category		Remarks
Waste to energy plant	13	0	13	Government leased out land		The project has obtained the land on a lease for a period of 25 years from Ahmedabad Municipal Corporation
Underground transmission line	0	33.73	33.73	**Land Category**	**Total Area (Acre)**	The underground transmission line does not pass through any private land. Instead, the entire section of the underground transmission line passes through government land or the right-of-way (ROW) of state highways and/or roads and building department, Government of Gujarat owned roads, and is not impacting any private land.
				WTE Power Plan	0.12	
				Open Scrub	1.15	
				Road Land	32.17	
				Substation	0.30	
				Total	**33.73**	
Underground water pipeline	0	0.64	0.64	**Land Category**	**Total Area (Acre)**	Based on the site visit, it has been determined that the final route of the water pipeline, which has been shared for review, passes through government land or the right-of-way (RoW) of state highways. Additionally, there is no expected impact on any private land.
				WTE Plant	0.10	
				Road Land	0.29	
				Open Scrub	0.24	
				STP Plant	0.02	
				Total	**0.64**	
Workers' accommodation	NA	NA	NA	NA		The majority of the construction of the project has already been completed and the project or its appointed contractor has not provided any workers' accommodation.
	Total		**47.37 acres**			

2.12.1 Land Requirement for the WTE Plant

The 13 acres of Land for the under construction WTE Plant is taken on lease from the Ahmedabad Municipal Corporation (AMC) for a period of 25 years. Prior to the project, the allotted land was categorized as unused land and was owned by AMC. The land allotted land (13 acres) falls under one (1) survey number – 337/P. The possession of land was given in the name of Goodwatts WTE Ahmedabad Private Limited vide land registration number 2018005029563 dated November 15, 2018.

2.12.2 Land Requirement for Underground transmission Line

The project will lay the underground transmission line of 7.587 km connecting the WTE plant to the Lambha substation. The total land requirement for the transmission line is 33.73 acres details are given in ***Table 2-12***.

Table 2-12 Land requirement for underground transmission line

Transmission Line type	Width of Right of Way (in meters) /area per tower	Total Length/Number	Total Land (acres)
Underground transmission line	1 meter	7.587	33.73

Note: The land categorization of the imp[acted land is provided in Table 2-11.

2.12.2.1 Determination of rate of compensation and its payment for underground transmission line

Based on the site visit, it has been observed that the entire route of the underground transmission line is passing through the right of way of existing state roads and building department and these roads are owned by Government of Gujarat, and as informed laying of transmission line does not impact private land. Therefore, no compensation needs to be paid to any of the private landowners.

During the construction phase of the 7.587-kilometer transmission line, there may be potential temporary impacts related to access. Specifically, this could result in a temporary business disruption for the 50 kiosk owners (located within 0.3 kilometers along the right-of-way) near the vegetable market in Mod Kamod, Ahmedabad. However, as previously communicated, the project team is considering laying the transmission line on the opposite side of the road, which could mitigate the loss of access and potential business disruption.

2.12.3 Land Requirement for Water Pipeline

The project will lay down 1.717 km of underground water pipeline from 155 MLD AMC STP to WTE plant. The total land requirement for the underground water pipeline is 0.63 acres details are provided in ***Table 2-13*** below:

Table 2-13 Land requirement for underground water pipeline

Total Length of water pipeline	Width of trench for underground water pipeline	Total Land (Acres)
1.717 km	1 meter	0.64

Note: The land categorization of the impacted land is provided in ***Table 2-11***.

Based on the site visit, proposed design it was understood that proposed pipeline, passes through government land or the right-of-way (RoW) of municipal road. Additionally, there is no expected impact on any private land. Further, laying down of water pipeline will not change the characteristic and usage of impacted land.

2.13 Manpower Requirement

The project has appointed one (1) contractor for providing contractual workers and one (1) private security personnel at the waste to energy plant. In addition to the contractual workers, GWAPL also has deployed its on-roll employee at the waste to energy plant.

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

Table 2-14 Details of on-roll employee and contractual workers

Sr. No.	Employer name	Nature of work	Total number of employees/contract workers		
			Male	Female	Total
On-roll employees					
1.	Goodwatts WTE Ahmedabad Private Limited	Overall operation of the project	10	0	10
Contractual workers					
2.	Thambee Engineering Private Limited	Installation of boiler and other mechanical work	35	0	35
3.	Golden Crown Security Allied Services	Security	5	0	5
4.	Operations Phase	Staff 70 and contracted 50 total 120			

Further, it is to be noted that out of the total 35 contractual workers, 27 workers are local from Gujarat.

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 has been carried out. This step will ensure all reasonable alternatives or options are considered, 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 TL and water pipeline

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 Ahmedabad.

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 demand upto 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 Ahmedabad, it is evident that the waste management practices need urgent attention. As per Census 2011, Ahmedabad City has population base 72,14,225. The municipal solid waste management in the city limits is the responsibility of Ahmedabad Municipal Corporation (AMC). At present, Ahmedabad city is producing 4000 TPD of fresh municipal waste. The waste generation of the city is increasing at a rate of 25% per year. Waste collected is dumped into the landfill and dumping site. Since the Ahmedabad 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 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	• Larger capital investment • Technology dependent • Ash generation and disposal • Potential for dioxin and furan emissions

Type of waste treatment	Advantages	Disadvantages
	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	

The waste to energy plant being constructed by Abellon in Ahmedabad would thus help process approximately 1000 TPD of MSW thereby reducing the quantity of municipal solid waste that would otherwise have collected at the landfill in Ahmedabad. 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 Ahmedabad WTE project is also being set up in line with this policy requirement.

3.3 Alternate Source of 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[18]	367
Solar PV	85
Biomass	45
Nuclear	29

[18] https://www.ieabioenergy.com/wp-content/uploads/2013/10/40_IEAPositionPaperMSW.pdf

Technology	Average tonnes (CO2e/GWh)
Hydroelectric	26
Wind	26

Source: World Nuclear Association (WNA), 2011[19]

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 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.

[19] https://www.world-nuclear.org/uploadedfiles/org/wna/publications/working_group_reports/comparison_of_lifecycle.pdf

- 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 TL and water pipeline

The Project is proposed to be set up in the close proximity of the existing landfill (located at an aerial distance of 180m from the southwestern project boundary) and waste dumping area (located at an aerial distance of 220m from the south-eastern project boundary. The location of the Project site was finalized by AMC, on land already owned by AMC and is provided on lease to Abellon for development of WTE plant. The waste will be collected on daily basis by AMC from door to door and supplied to the WTE plant. Since the project site is in the close vicinity of the landfill and the waste dumping area, the AMC 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 AMC, thus minimizing any additional community disturbance issues.

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

- Proximity to Landfill site & Dumping Area
- Minimum utilization of the proposed land for farming purpose by the farmers
- Land is not located within 5 km of any reserved forest or cultural heritage site.
- 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 underground transmission line of length 7.587 km connecting to GETCO Lambha Substation. The project will also lay down two 1.717 km of underground water pipeline from the project location to the Sewage Treatment Plant (STP) Ahmedabad.

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.
- 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 – Deceleration 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 , “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 03.06.2019 valid till 15.01.2026.

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,2016. 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.

Table 4-1 Relevant Enforcement Agencies

Sr. No	Agency	Function
Central Level		

Sr. No	Agency	Function
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	The National Green Tribunal (NGT)	National Green tribunal was constituted in 2010 for effective and expeditious disposal of cases relating to environmental protection and conservation of forests and other natural resources including enforcement of any legal right relating to environment and giving relief and compensation for damages to persons and property and for matters connected therewith or incidental thereto. It is a specialized body equipped with the necessary expertise to handle

Sr. No	Agency	Function
		environmental disputes involving multi-disciplinary issues. The tribunal will have jurisdiction over all civil cases relating to implementation of the following regulations: • The Water Act, 1974 • The Water Cess Act, 1977 • The Forest Conservation Act, 1980 • The Air Act, 1981 • The Environment Protection Act, 1986 • The Public Liability Insurance Act, 1991 • The Biological Diversity Act, 2002.
6	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: • 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. • Manufacture, Storage, and Import of Hazardous Chemical Rules, 1989 and amendment, 2000.
State Level		
7	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
8	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.
9	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 is to 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

Sr. No	Agency	Function
		• 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.
10	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.
11	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.
12	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 workplace. • 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.
13	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.

Sr. No	Agency	Function
		• 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.

- Registration of projects
- Respond to queries and problems of Project Developers
- Accreditation and recommending WTE Projects for registering with Central Agency under REC Mechanism
- 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. Status of applicable permits has been presented as ***Appendix 18***.

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.

<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>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</td></tr>
<tr><td>2</td><td>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</td><td>✓</td><td>✓</td><td>GPCB
CPCB</td><td>As per latest notification from the CPCB, dated 07/03/2016 (Ref No: B-29012/ ESS (CPA)/2015-2016[20] and GPCB[21] “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.

The Project will obtain the Consent to Operate prior to the project operational phase.</td></tr>
<tr><td>3</td><td>The Noise (Regulation & Control) Rules, 2000 and as amended up to 2010 Ambient Noise Standards</td><td>✓</td><td>✓</td><td>GPCB
CPCB</td><td>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 WBG and MoEFCC vide gazette notification dated 14th February 2000

<table><tr><th>Area Code</th><th>Category of Area</th><th>Day Time limits in d B(A)Leq</th><th>Night-time limits in d B(A)Leq</th></tr><tr><td>A</td><td>Industrial Area</td><td>75</td><td>70</td></tr><tr><td>B</td><td>Commercial Area</td><td>65</td><td>55</td></tr><tr><td>C</td><td>Residential Area</td><td>55</td><td>45</td></tr><tr><td>D</td><td>Silence Zone**</td><td>50</td><td>40</td></tr></table>**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.</td></tr>
<tr><td>4</td><td>Guidelines on usage of RDF in various industries (waste management sector included) by Ministry of Housing and Urban Affairs, 2018</td><td>×</td><td>✓</td><td>GPCB</td><td>Criteria for waste to energy process
(i) Non-recyclable waste having calorific value of 1500 Kcal/kg or more shall not be disposed of 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.</td></tr>
</table>

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

Sr. No.	Applicable Regulation/Permit	Construction	Operation	Responsible Authority	Applicability to the Project/ Status
					GWAPL will comply with the above requirements during operation phase of the project
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.

Sr. No.	Applicable Regulation/Permit	Construction	Operation	Responsible Authority	Applicability to the Project/ Status
					All types of waste received at the facility and will be managed by GWAPL 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. GWAPL will comply with the above requirements during operation phase of the project
7	Fly Ash Utilization Notification, 2022	×	✓	GPCB CPCB	The project will generate 214 TPD 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.
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, 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.

Sr. No.	Applicable Regulation/Permit	Construction	Operation	Responsible Authority	Applicability to the Project/ Status
					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 during construction as well as operation phase. Authorised hazardous waste vendor to be engaged during the construction and operation phase for management and disposal of hazardous waste generated onsite. 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 Ahmedabad, 2020, the Ahmedabad block where the under construction Project fall is categorised as ***Semi Critical*** 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. GWAPL has obtained No Objection Certificate (NOC) from CGWA on 07.02.2022 valid up to 06.02.2025. 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. 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 GWAPL, 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.

Sr. No.	Applicable Regulation/Permit	Construction	Operation	Responsible Authority	Applicability to the Project/ Status
					• 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 – • 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”.

Sr. No.	Applicable Regulation/Permit	Construction	Operation	Responsible Authority	Applicability to the Project/ Status
					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

Sr. No.	Applicable Regulation/Permit	Construction	Operation	Responsible Authority	Applicability to the Project/ Status
					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[22] and ensure basic welfare measures to be made available to the contract workers by the employer, which includes: • Canteens • Restrooms • First aid facilities • Liability of principal employer • Responsibility for payment of wages • Penalties and procedure Registers and other records to be maintained[23] **Not Applicable** M/S Tambe Engineering Private Limited has employed 35 workers which is less than required applicability of the Act in Gujarat – Gujarat government has amended the Act on July 20, 2020, to increase the applicability threshold to 50 or more workers. **Not Applicable on Golden Crown Security Allied Services** The number of security personnel employed (which is 15) 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

[22] 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

[23] 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

Sr. No.	Applicable Regulation/Permit	Construction	Operation	Responsible Authority	Applicability to the Project/ Status
					• 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. **Not Applicable** The project is in the construction phase.
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 **Applicable** It has been conformed through consultation and a review of the wage register that all workers and security personnel at the project are receiving wages over and above the minimum wages prescribed by the

<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>Gujarat State notification[24], 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>Mechanical work</td><td>18,000/month and 692/day</td><td>Skilled</td><td>474</td></tr>
<tr><td>Workers 2</td><td>Mechanical work</td><td>20,000/ month and 769/day</td><td>Skilled</td><td>474</td></tr>
<tr><td>Workers 3</td><td>Security personnel</td><td>15,000/month and 615/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</td></tr>
</table>

[24] 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
					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.

25	The Sexual Harassment of Women at Workplace (Prevention, Prohibition and Redressal) Act, 2013	✓	✓	Labour Department	• 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:-
					  • 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.

Sr. No.	Applicable Regulation/Permit	Construction	Operation	Responsible Authority	Applicability to the Project/ Status
					Applicable The applicability and status of the registration of contractor and security personnel are provided below: Contractor/Project SPV | Applicability | Status Tambe Engineering Private Limited | The Act is applicable on the contractor | The contractor has obtained the PF registration vide establishment code DSSHD195570300. Further, based on the consultation with workers and review of PF deposit message on workers' mobile, it is confirmed that the contractor has obtained the PF registration and all the workers are receiving benefits as per the Act. 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. **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 date 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**

Sr. No.	Applicable Regulation/Permit	Construction	Operation	Responsible Authority	Applicability to the Project/ Status
					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** 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

Sr. No.	Applicable Regulation/Permit	Construction	Operation	Responsible Authority	Applicability to the Project/ Status
					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. **Applicability** **Not Applicable** As per the consultation with workers, the appointed contractual workers do not fall under the definition of Inter-state migrant workmen[25] provided by Section 2(e) of the Inter-State Migrant Workmen (Regulation of Employment and Conditions of Service) Act, 1979.
35	The building and other Construction Workers Act, 1996	✓	✓	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

[25] 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 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** 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. **Applicable** GWAPL has obtained BOCW registration with registration number DDISH/AHD/BOCW/415/2019 dated 05.09.2019. The completion date provided in the registration was 31.12.2021. however, the construction work of the power plant has not been completed yet. Thus, it is required to update the registration with update the completion date of construction work of the Project.
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. • 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 of 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**

Sr. No.	Applicable Regulation/Permit	Construction	Operation	Responsible Authority	Applicability to the Project/ Status
					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- o Blindness or low vision; o Bearing impairment; o 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** **Applicable** 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.

Sr. No.	Applicable Regulation/Permit	Construction	Operation	Responsible Authority	Applicability to the Project/ Status
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 agency has obtained the PSARA license vide license number 19083828 and is valid till 19.08.2024.
41	Factories Act, 1948 and Gujarat Factories Rules, 1963	×	✓	Factories Inspector from Labour Department	The occupier or manager of every factory to which the Act applies shall submit to the Chief Inspector an application in triplicate in Form No. 2 for the registration of the factory accompanied by an application in Form No. 3 for the grant of a license therefore: Provided that the occupier manager of a place to which the provisions of the Act are made applicable by a notification under Sec. 15 of the Act shall submit an application within 30 days of the date of the notification. **Not Applicable** The project is in construction phase, thus, the Act is not applicable.
	Ecology				
42	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.

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.

Sr. No.	IFC Performance Standards	Applicability/ Compliance/Details
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 Land acquisition and involuntary resettlement	**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 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. As per the available information land for the project is taken on lease and prior to the project land was classified as barren and was reportedly vacant . Since, the land procurement does not involve involuntary resettlement as well as there are no potential impacts associated to economic displacement of ragpickers. However, laying of underground transmission line may likely to cause temporary (1 or 2 days) loss of access or business disruption but such loss of access or business disruption may not cause loss of livelihood. Further as informed the tranche for laying of transmission line will be less than 1 m therefore impacts if any will be negligible and affected persons if any may continue to carry on their routine

Sr. No.	IFC Performance Standards	Applicability/ Compliance/Details
		business. Further as informed to avoid potential impacts associated to loss of access /business disruption project might consider the modification in the route and can consider laying of transmission line on the opposite site of the road in the vacant ROW, therefore the applicability of the PS 5 is scoped out.
6	Performance Standard 6	**Applicable** The specific requirements of PS 6 encompass several key aspects, including: (i) Protection and conservation of biodiversity, including modified, natural, critical habitat, legally protected, and internationally recognized areas, as well as addressing issues related to invasive alien species. (ii) Management of ecosystem services to ensure their sustainability. (iii) Sustainable management of natural resources to minimize environmental impacts. (iv) Consideration of the supply chain in the context of environmental responsibility. In the case of our project, although it is situated in proximity to urbanized areas, it is important to note that the western boundary of the plant is adjacent to natural and modified habitats, specifically the Sabarmati River. The distance between the plant boundary and the Sabarmati River varies from 2 to 5 kilometers, forming an arc of approximately 7.5 kilometers, where exist both natural habitats (such as water bodies, seasonal water streams, open scrub, and grassland) and modified habitats (agricultural lands). These habitats play a crucial role in supporting aquatic and terrestrial avifauna movement. Considering the potential impacts of our project activities on these habitats and the associated wildlife, PS6 (Performance Standard 6) is applicable to our project. It is imperative that we adhere to the guidelines and requirements outlined in PS6 to ensure the protection and conservation of biodiversity, sustainable management of natural resources, and responsible management of ecosystem services within this sensitive and diverse ecosystem.
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.

4.5 Applicable National and International Standards

4.5.1 Ambient Air Quality Standards

4.5.1.1 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) µg/m^3	Annual Average*	50	20
	24 Hours**	80	80
Oxides of Nitrogen (NO_X) µg/m^3	Annual Average*	40	30
	24 Hours**	80	80

Pollutant	Time Weighted Avg.	Concentration in Ambient Air	
		Industrial, Residential, Rural & Other Areas	Ecologically Sensitive Areas (notified by Central Government)
Particulate Matter (PM 10) µg/m^3	Annual Average*	60	60
	24 Hours**	100	100
Particulate Matter (PM 2.5) µg/m^3	Annual Average*	40	40
	24 Hours**	60	60
Ozone (O_3) µg/m^3	8 Hours**	100	100
	1 Hour**	180	180
Lead (Pb) µg/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) µg/m^3	Annual*	100	100
	24 Hours**	400	400
Benzene (C_6H_6) µg/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[26] 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

4.5.1.2 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 primarily developed through clinical, toxicological, and epidemiological evidence (such as those

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

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 4-5*** and ***Table 4-4,*** 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.

4.5.2 Ambient Noise Quality Standards

4.5.2.1 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.

4.5.2.2 WBG Ambient Noise Standards

As per the WBG, 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 Ambient Noise Standards

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

Since the project is be set up Industrial Area, the noise limits of industrial area has been considered for the project. Based on **Table 4-7** and ***Table 4-6***, 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.

4.5.3 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.	Parameters	UOM	India SWM Rules 2016	MSW Incinerators, WBG EHS Guidelines[27] (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.

4.6 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.

- **World Bank Group 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 cover the following aspects:
  - Industry specific environmental, occupational health and safety, community health and safety impacts and management
  - EHS Performance Indicators

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

- General Description of Power Transmission and Distribution Industry

- World Bank Group 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

5.1 Study Area

The area of up to 10 km radius from the Project boundary (14.9 MW) Waste to Energy plant including the associated transmission line) 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, location of labour sites, 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 WTE Plant, storage area, site office, storage of material and equipment, labour camps, transmission line infrastructure and water pipeline installed for the Project. 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
- Vulnerability 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 project components, as well as the immediate surroundings that will see increase movement of vehicles, personnel, and land-use change. 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:

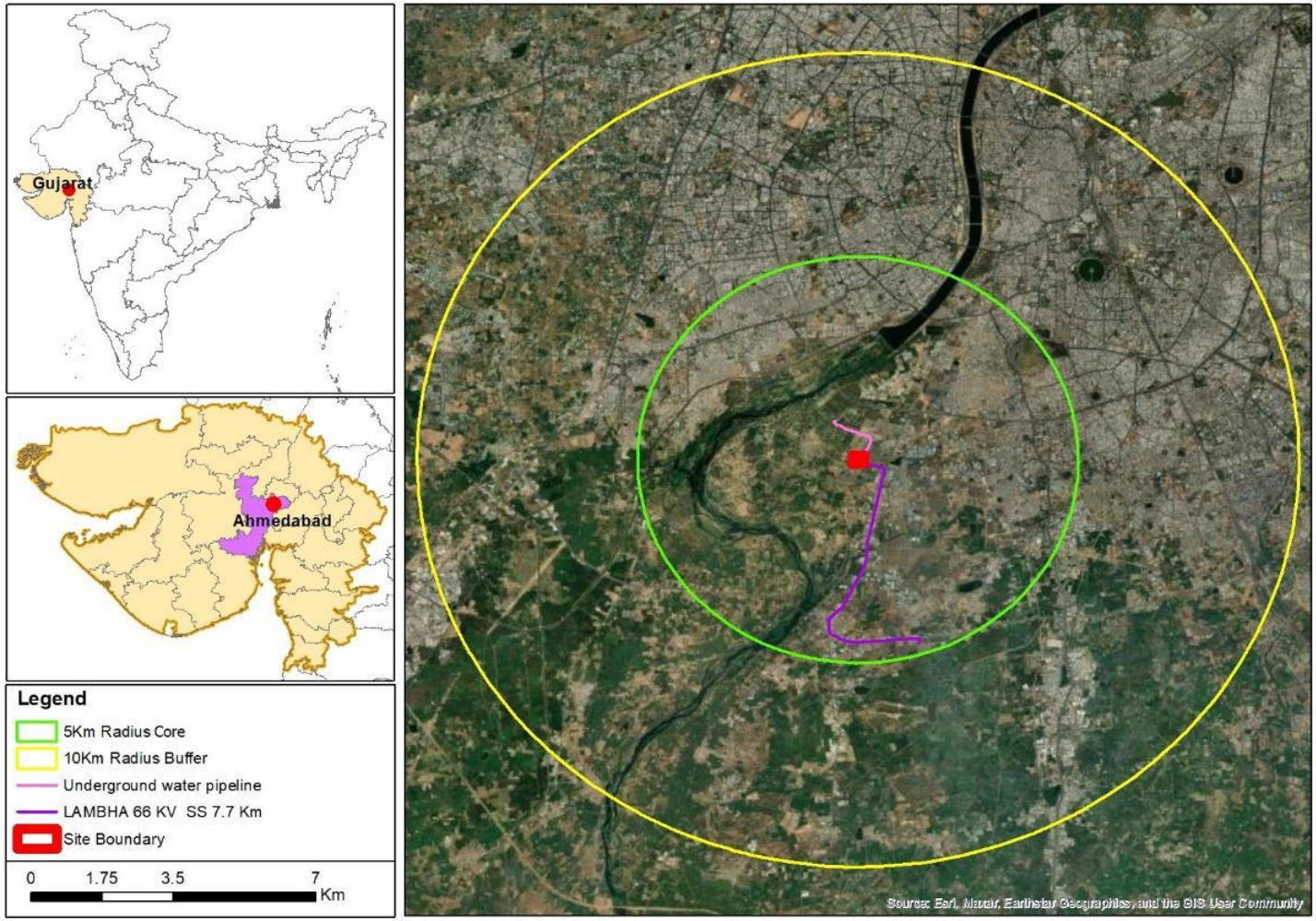
- **Ecological Parameters:** Based on identified sensitivity during desk-based review and previous experiences, the study area for ecological assessment was demarcated as,
    - **Core Area:** Boundary of the proposed project, and
    - **Buffer Area:** 10 km radius from the project boundary.
- **Environmental 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 zone:** 0 – 2km from project site
    - **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 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 5-28 provide the illustration of the study area.

Figure 5-1 Identified Study area for the Project



Source: Developed by E&S Advisor

5.2 Primary Environmental Baseline Monitoring

Primary environmental baseline monitoring was conducted within the study area by a National Accreditation Board for Testing and Calibration Laboratories (NABL) to understand the baseline conditions of the project study area. Monitoring locations considered for the project 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.

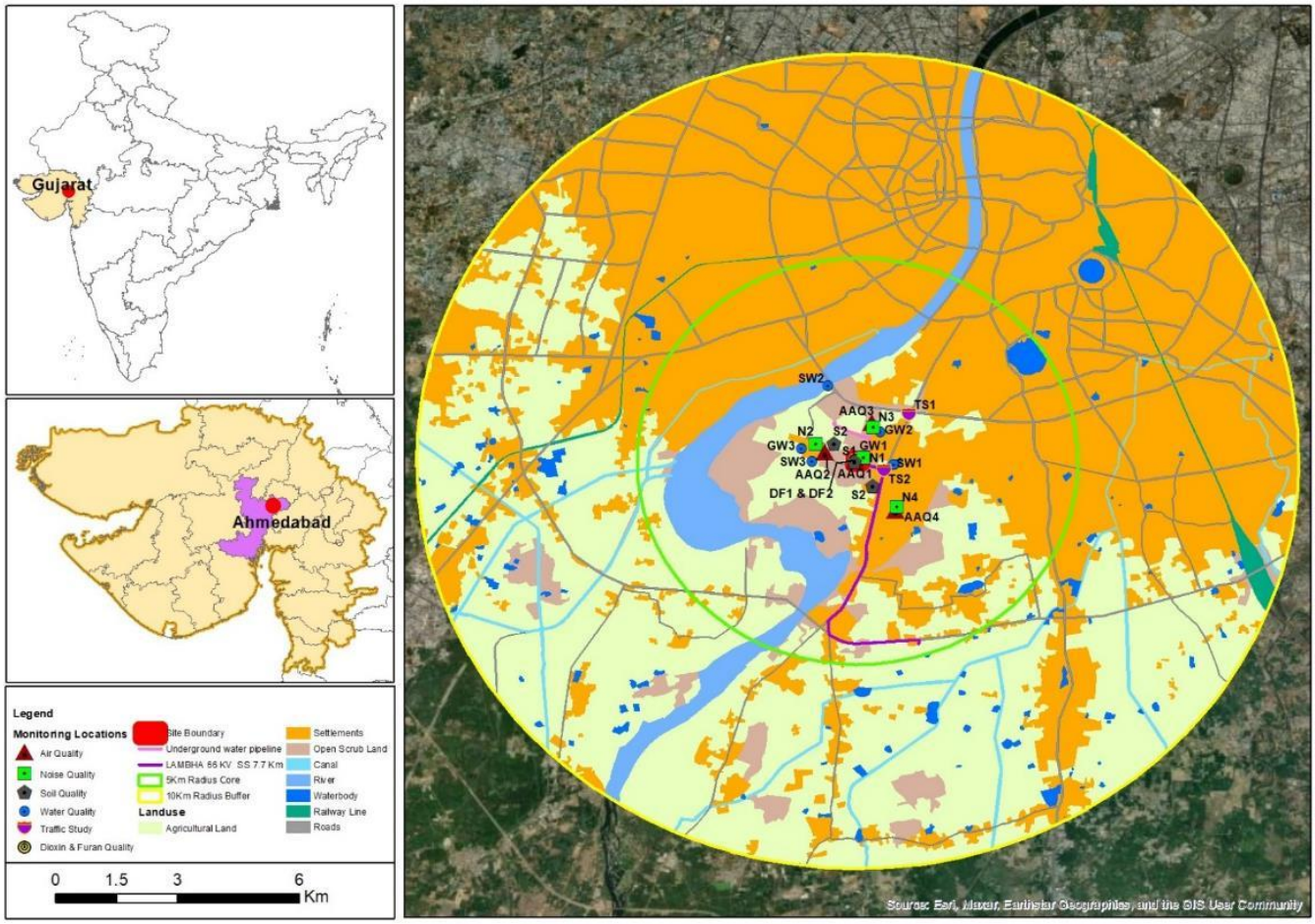
Table 5-1 Monitoring Locations considered for the Project

Parameter	Location code	Sampling location	Coordinates	Distance and Direction from Project Site	Frequency / Remarks
Ground Water	GW 1	Borewell, Abellon Clean Energy WTE Project	22°57'52.6"N 72° 33'02.9"E	Project Site	Physical, chemical and Biological parameters as per ISO10500:2012 drinking water standards were assessed for the samples
	GW 2	Borewell, Near Pirana Torrent Power substation	22°58'14.1"N 72°33'16.6"E	0.89 Km North East upstream	
	GW 3	Borewell, Gyaspur Primary School	22°58'01.1"N 72°32'13.9"E	1.25 Km West downstream	Once during the monitoring period in May 2023
Surface Water	SW 1	Lake near Sadaf Industries, Piplaj Gam	22°57'47.9"N 72°33'27.5"E	0.88 Km East	Once during the monitoring period to understand the surface water quality in the study area in May 2023
	SW 2	Sabarmati River, Narol- Vishalla bridge, Gyaspur Village	22°58'51.0"N 72°32'35.0"E	1.95 Km North West	
	SW 3	Pond, Near Primary School, Gyaspur Village	22°57'50.7"N 72°32'22.3"E	0.96 Km West	
Ambient Air	AAQ 1	Abellon Clean Energy WTE Project Premises	22°57'51.0"N 72°32'56.7"E	Project Site	Twice a week for 4 weeks from the nearest residential receptors covering all directions 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.
	AAQ 2	Near Brilliant Computer Gyaspur Village	22°57'57.5"N 72°32'32.6"E	0.71 Km West in the downwind direction	
	AAQ 3	Excel International Company Premises, Gyaspur	22°58'21.4"N 72°33'09.6"E	1 Km North in the downwind direction	
	AAQ 4	Near Piplaj Gam Thakar Mandir	22°57'11.4"N 72°33'28.7"E	1.50 Km South East in the downwind direction	
Ambient Noise	NQ 1	Abellon Clean Energy WTE Project Premises	22°57'53.5"N 72°33'03.2"E	Project Site	Noise Levels in dB(A), day and night for 48 hours, once at the selected locations covering all directions in the 3 km radius of the project site as per MOEFCC guidelines in June 2023.
	NQ 2	At Gyaspur Primary School	22°58'04.3"N 72°32'25.4"E	1 Km North West	
	NQ 3	At Pirana Sewage Treatment Plant (180 MLD)	22°58'17.5"N 72°33'10.9"E	0.90 Km North	
	NQ 4	At Piplaj Primary School	22°57'14.5"N 72°33'29.9"E	1.44 Km South East	
Soil	SQ 1	Near, Abellon Clean Energy WTE Project	22°57'49.9"N 72°32'55.8"E	Project Site	Sample were assessed for parameters such as pH, Conductivity , Moisture Content,
	SQ 2	Gyaspur Village	22°58'04.7"N 72°32'39.5"E	0.68 Km North West	

Parameter	Location code	Sampling location	Coordinates	Distance and Direction from Project Site	Frequency / Remarks
	SQ 3	Piplaj Gam	22°57'30.8"N 72°33'10.6"E	0.71 Km South East	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
Traffic Survey	TS 1	Near, Pirana Torrent Power Substation at Dhokla Ahmedabad Highway	22°58'28.1"N 72°33'39.4"E	1.65 Km North East	Access Road used for the project site in June 2023.
	TS 2	Piplaj Gam, Pirana Road	22°57'43.5"N 72°33'19.6"E	0.65 Km East	
Dioxin and Furan	D&F 1 & 2	Near, Abellon Clean Energy WTE Project	22°57'51.6"N 72°32'56.7"E	Project Site	To assess the presence of D&F in the ambient air in June 2023

Source: Site Visit by Independent E&S Advisor

Figure 5-2 Monitoring Location Map



Source: Developed by E&S Advisor

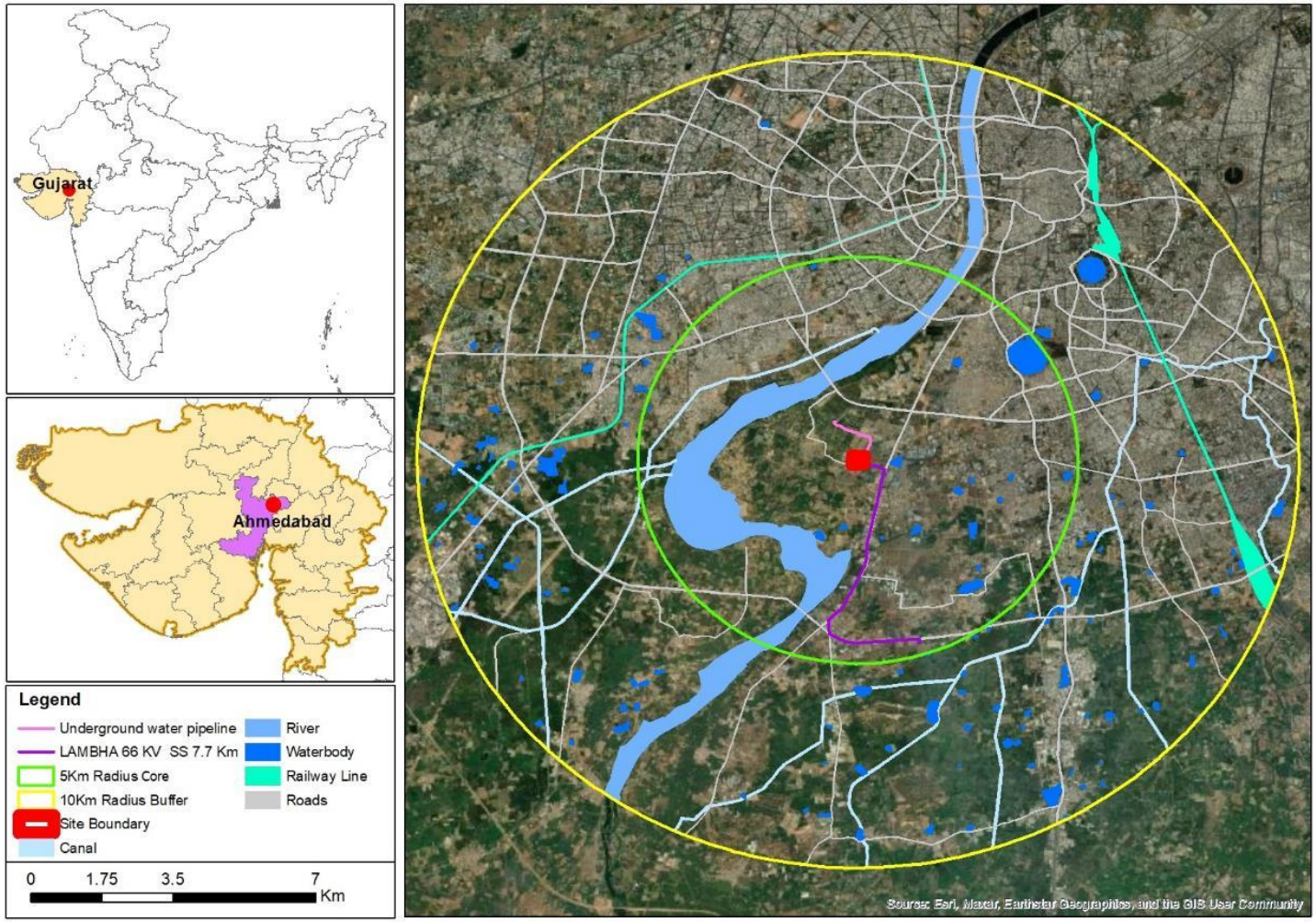
5.3 Physical Environmental Sensitivities

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 5 & 10 km radius from the Project site:

- The location of the proposed Project site and transmission line route
- Villages within 5 km radius
- Road network around the site, comprising of village roads and National Highway
- Railway Network
- Water bodies and settlements

Figure 5-3 Physical Feature Map for study area



Source: Developed by E&S Advisor

5.3.2 Climatology & Meteorology

According to the groundwater scenario for Ahmedabad District, 2020 by Central Ground Water Board (CGWB), the climate of the Ahmedabad is characterized by hot summer and general dryness except during the southwest monsoon seasons. The year can be divided into four seasons.

- March to May is the hot season (summer)
- June to September (southwest monsoon)
- October and November (post monsoon or retreating monsoon season)
- December to February (winter)

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

Month	Temperature				Relative Humidity (%)		Rainfall		Mean Wind speed (m/s)	Predominant direction from
	Mean Max	Mean Min	Highest	Lowest	Max	Min	Monthly (mm)	No of rainy days		
January	27.9	12.4	32.2	7.9	64	35	1.2	0.2	5.7	NE
February	31.0	14.6	35.7	9.1	57	26	0.6	0.1	5.8	NW
March	35.8	19.6	40.6	14.0	49	21	1.1	0.2	6.3	NW
April	39.7	24.2	43.1	19.8	54	20	2.5	0.3	7.3	NW
May	41.8	27.3	44.5	24.5	63	25	5.5	0.3	10.6	SW
June	39.0	27.7	43.2	24.1	73	44	84.3	3.9	11.3	SW
July	33.7	26.1	38.1	23.5	84	69	310.1	11.3	9.9	SW
August	32.2	25.3	35.1	23.5	87	72	242.2	10.3	8.4	SW
September	33.6	24.9	37.0	22.8	83	63	120.2	6.1	6.6	W
October	35.6	21.8	37.8	17.2	65	43	13.1	0.9	4.4	N
November	33.1	17.2	35.8	12.8	58	39	1.9	0.3	4.6	NE
December	29.5	13.6	33.0	9.0	61	38	0.9	0.1	5.3	NE

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

Temperature: According to the above table from Meteorological Data for *Ahmedabad* District from IMD (1991-2020), the mean maximum temperature and highest temperature was recorded at 41.8°C and 44.5 °C respectively the month of May. The mean minimum temperature recorded is 12.4 °C and the lowest temperature is 7.9 °C recorded in the month of January.

Wind: According from Meteorological Data for *Ahmedabad* District from IMD (1991-2020), the seasonal cycle leads to strong winds from March through September and relatively weak winds from November through March and since 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 highest wind speed i.e. 11.3 m/s. The wind speed decreases gradually in the month of October to about 4.4 m/s.

Rainfall: According to the above table from Meteorological Data for *Ahmedabad* District from IMD (1991-2020), the months of June, July, August and September constitute the monsoon season (refer **Table 5-2**). 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 310.1mm in the last 30 years with at least 11.3 rain days. During this month the relative maximum and minimum average relative humidity over 3 decades has been recorded as 84% and 69% respectively.

5.3.3 Land Use

According to the Aquifer Mapping and Management of Ground Water Resources, Ahmedabad District, 2021, the majority of district is covered by agriculture and fallow land and spread over all parts of districts (refer ***Table 5-3*** the project lies in an area categorized as fallow land.

Table 5-3 District and category wise distribution of Land Use / Land Cover in Gujarat (2015-2016)

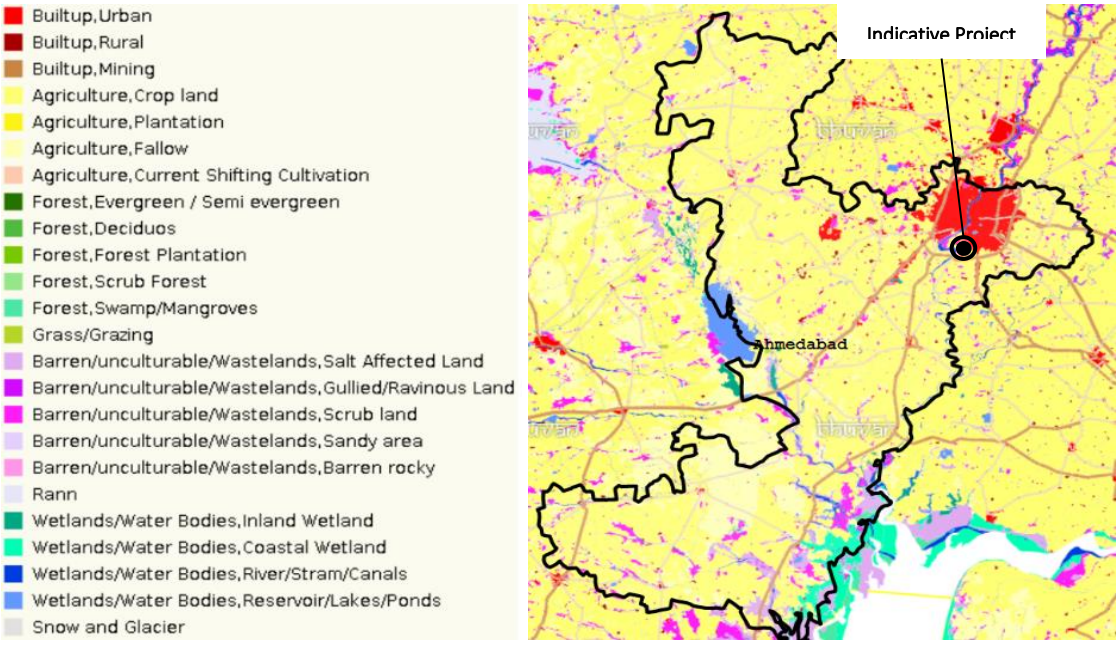
LU Category (Level 1)	LU Category (Level 2)	Area (in Hectares)
Agriculture	Crop land	6248
	Current Shifting cultivation	0
	Fallow	811.40
	Plantation	4
Barren/unculturable/ Wastelands	Barren Rocky	0
	Gullied / Ravinous Land	0
	Rann	0
	Salt Affected Land	256
	Sandy Area	0
	Scrub Land	396.30
Built up	Mining	0
	Rural	130
	Urban	446
Forest	Deciduous	2.60
	Evergreen/Semi evergreen	0
	Forest Plantation	0
	Scrub Forest	4.30
	Swamp / Mangroves	10
Grass / Grazing	Grass / Grazing	4
Snow and Glacier	Snow and Glacier	0.00
Wet lands / Water bodies	Inland Wetland	16
	Coastal Wetland	118
	River/Stream/Canals	133
	Water bodies	127

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

According to Ahmedabad NAQUIM Report at a glance December 2021[28], the dominant land use in the Ahmedabad City was mostly built-up area as given in below ***Figure 5-4***

[28]https://agriculture.rajasthan.gov.in/content/dam/agriculture/Agriculture%20Department/agriculturalstatistics/rajasthan%20agriculture%20statistics%20at%20a%20glance%202017-18-merged.pdf

Figure 5-4 Land use Map of Ahmedabad District



Source: Bhuvan Indian Geo Platform of ISRO

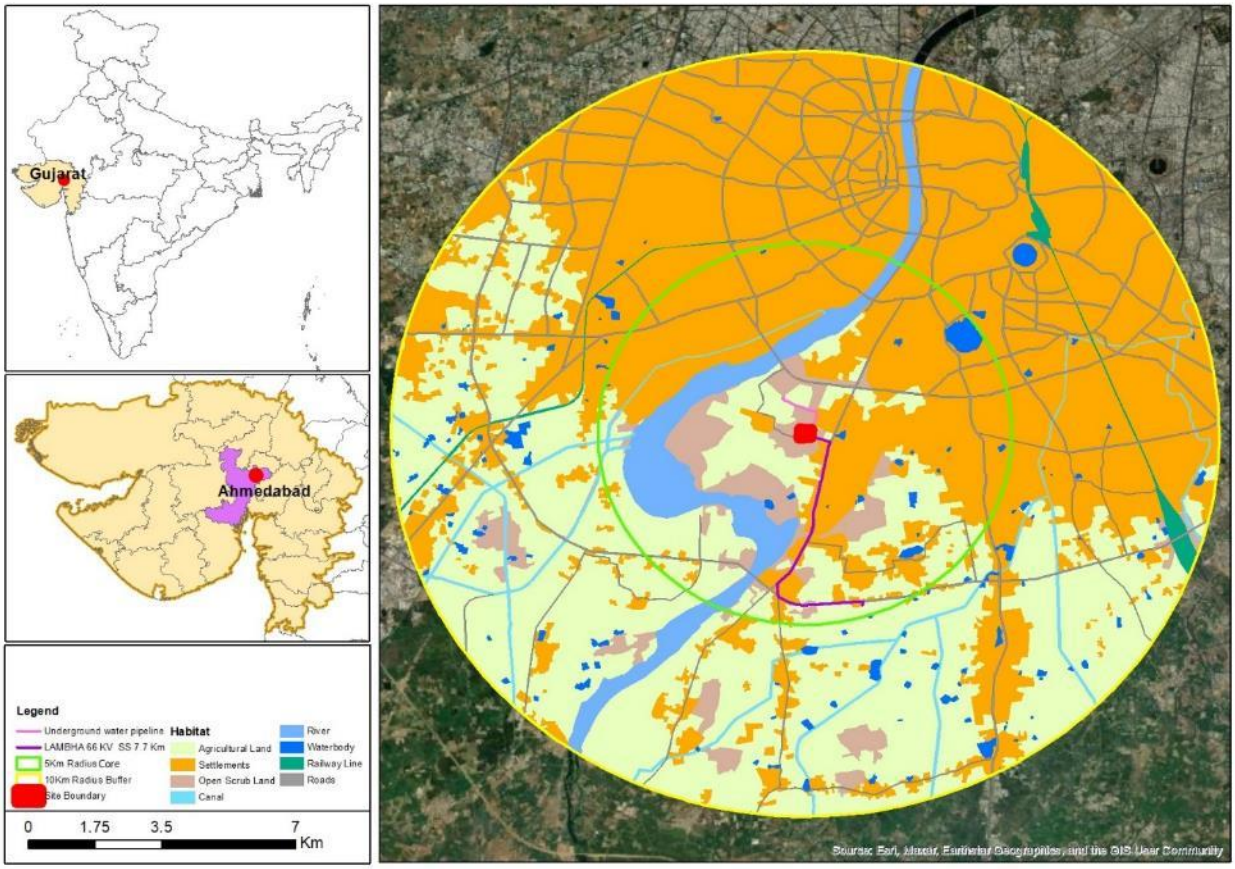
As observed during site visit, the site area and vicinity are categorized as barren and unculturable waste land. Land use map showing the land use pattern of the Project study area has been presented in **Figure 5-5**. A snapshot of the land use pattern of the project study area has been presented in ***Table 5-3***.

Table 5-3 Land use Distribution of the Study Area

LU Category	Area (in Hectares)	%
Agricultural Land	113.9544	36.36
Settlements	151.0156	48.19
River	12.7018	4.05
Canal	4.3460	1.39
Open Scrub Land	13.0327	4.16
Waterbody	4.1845	1.34
Roads	11.6219	3.71
Railway Line	2.5458	0.81
Total Area	**313.4027**	**100.00**

Source: ARC GIS, E&S Advisor

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



Source: Developed by E&S Advisor

5.3.4 Topography

According to groundwater scenario for Ahmedabad district 2021 by CGWB, Ahmedabad lies on the banks of the Sabarmati River and is characterized by diverse topography. The topography of Ahmedabad district can be divided into three main regions

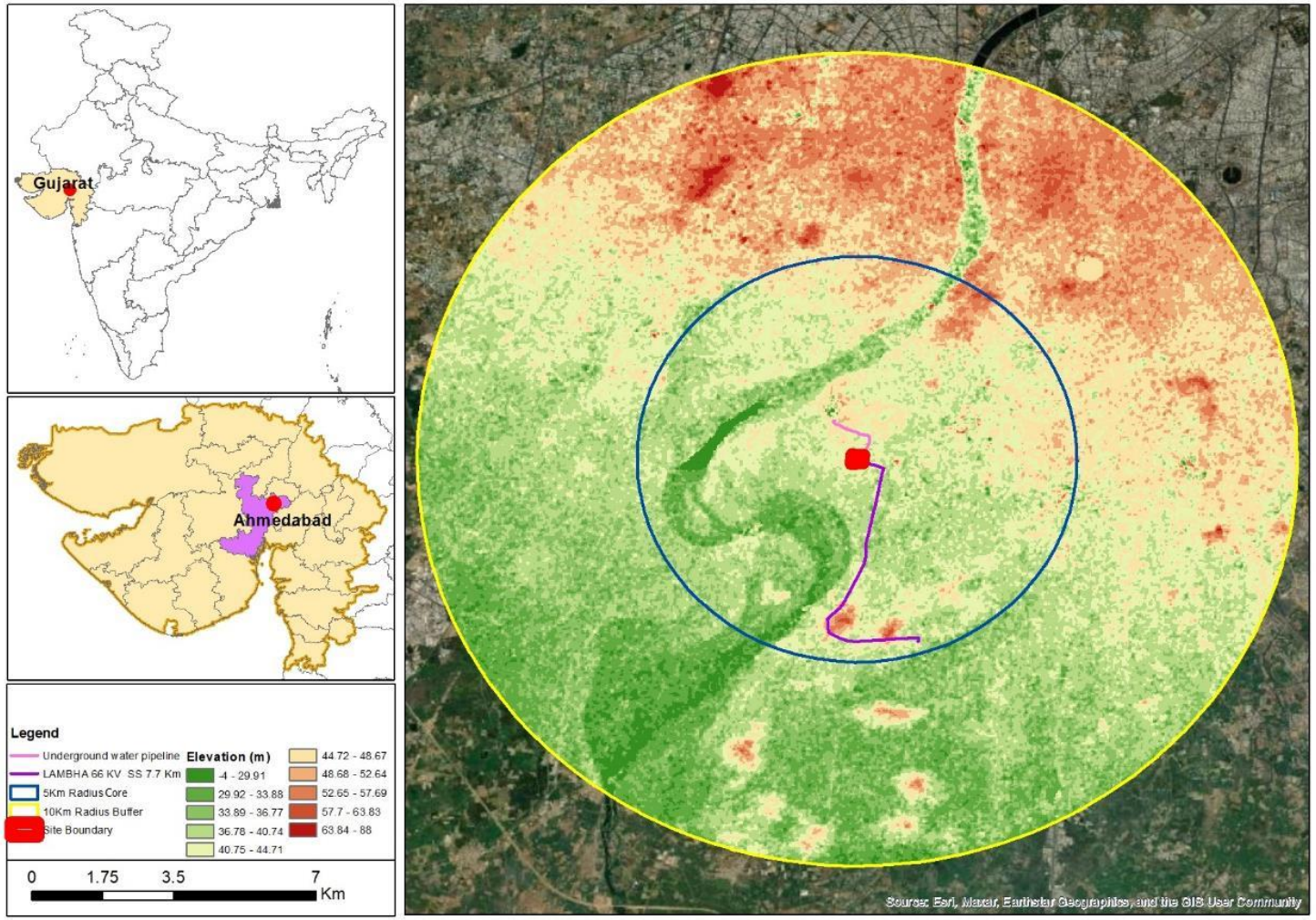
- **Plains:** The eastern and central parts of the district consist of fertile plains. These plains are relatively flat and are ideal for agricultural activities. The soil in this region is rich and suitable for cultivating crops such as cotton, wheat, and vegetables.
- **Sabarmati River Basin:** The district is traversed by the Sabarmati River, which flows from north to south. The river basin area is marked by the presence of riverine plains and alluvial deposits. The river and its tributaries have shaped the landscape, creating fertile plains along their banks.
- **Aravalli Range:** The western part of Ahmedabad district is encompassed by the Aravalli Range, a series of rugged hills and ridges. The Aravalli Range forms a natural boundary between Gujarat and Rajasthan. These hills are characterized by rocky terrain, and the elevation gradually increases as one moves towards the west. The highest peak in Ahmedabad district is the Karkavati Hills, which reaches an elevation of around 524 meters (1,719 feet) above sea level.

Overall, the topography of Ahmedabad district offers a mix of fertile plains, riverine areas, and hilly regions. The presence of the Sabarmati River and the Aravalli Range adds to the scenic beauty of the district and provides diverse geographical feature.

Based on satellite imagery dated 11.04.2022 and site visit, it was observed from the Topography map as presented in ***Figure 5-6*** that the project site is located at an elevation of 40-48m above mean sea level with almost flat surface. Analysis of contour map presented in ***Figure 5-7*** below for Project area shows a trend in elevations ranging from 40-50 which is

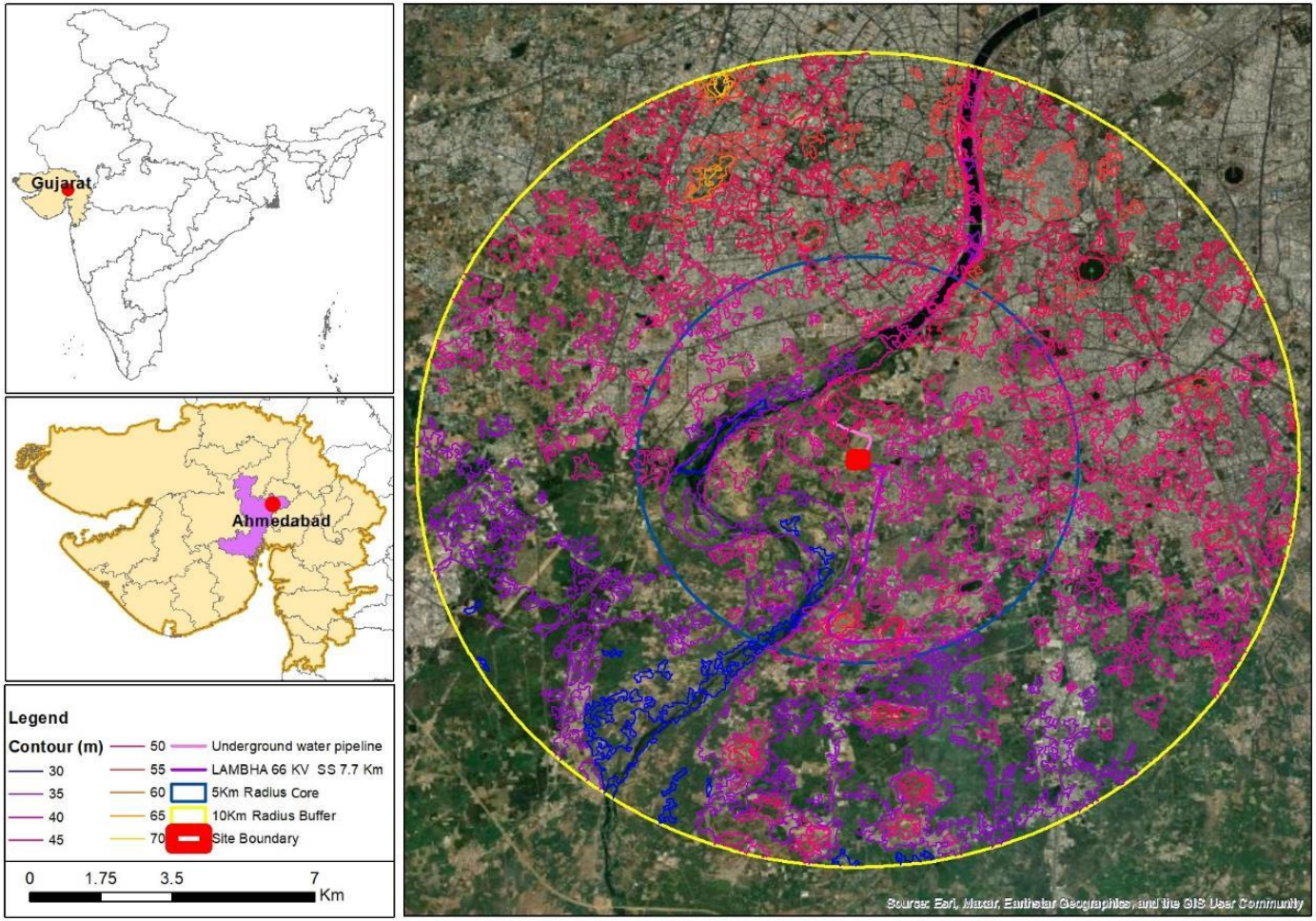
indicative of flat to slightly undulating land and the study area presents a trend of elevation ranging from 30-50amsl for the which is indicative of flat to undulating land in Project AoI.

Figure 5-6 Topography Map of Study Area



Source: Developed by E&S Advisor

Figure 5-7 Contour Map of the Study Area



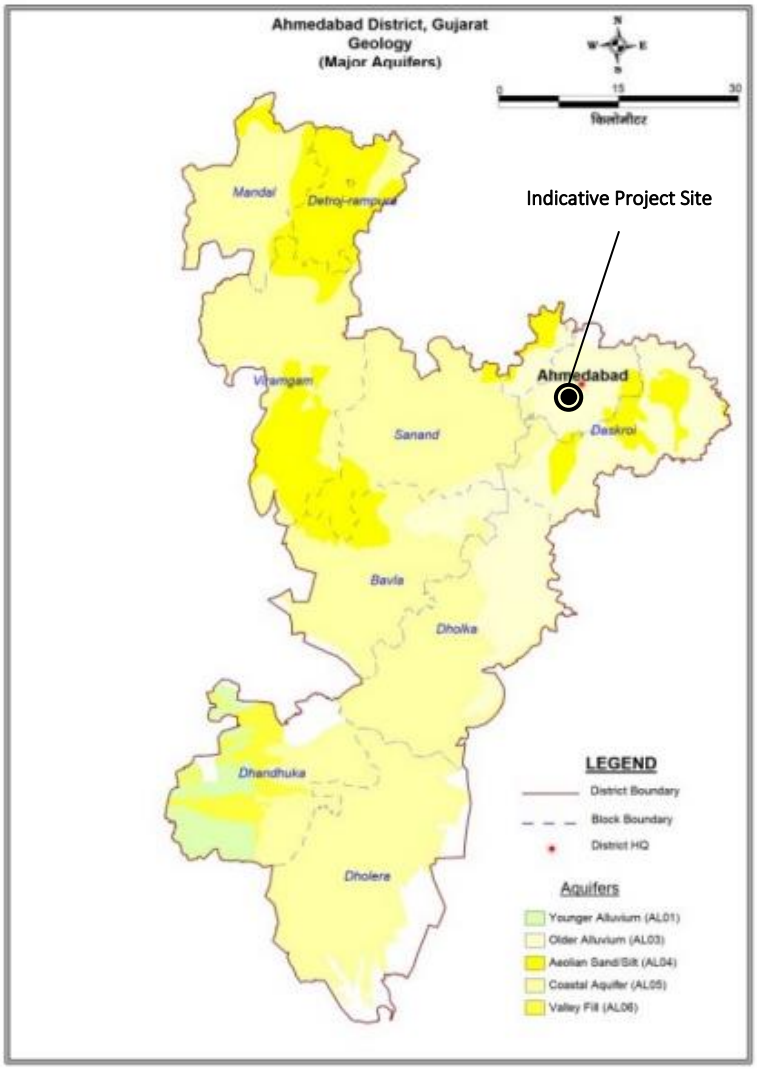
Source: Developed by E&S Advisor

5.3.5 Geology and Geomorphology

Geology

The district is predominantly located on the Cambay Shale formation, which consists of shale, sandstone, and limestone and was formed during the Tertiary period. The region also has geological faults, with the main fault line being the northward extension of the Cambay Rift Zone associated with Deccan volcanic activity. Most of the district has a flat and planar topography, with some rocky features in the extreme southern portion. The flat alluvial peneplain includes low-lying land characterized by marshy areas that were believed to be under the sea in the past. Water logging is common during high tides in the monsoon season. Along the banks of the Sabarmati River and its tributaries, there are alluvial deposits containing sand, silt, clay, and gravel. The western and southwestern parts of the district are characterized by fertile but flat and monotonous black soil. Along the coast, from Dholka to Bavliari creek, the land is salty and marshy. The western border has a reddish form. Additionally, there are low hills located in various parts of the district, including west of Rampur, Ninana, Vasai, Miroli, Thaltej, Gota, Chandisar, and Vastrapur. The area is seismically active due to these faults. Major geological formation is the tehsil is older Alluvium (refer ***Figure 5-8***).

Figure 5-8 Map showing Geology of Ahmedabad District

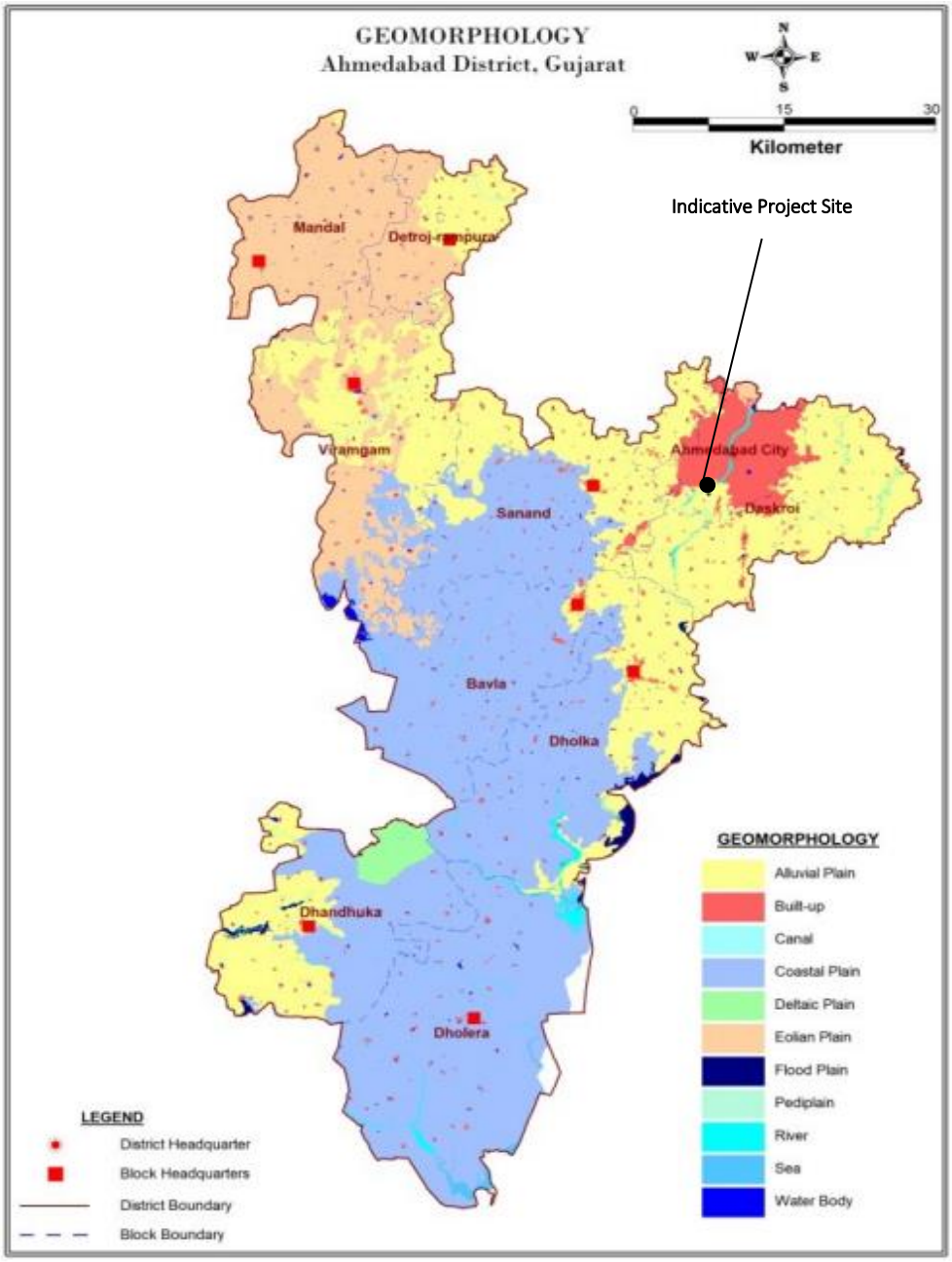


Source: Ahmedabad NAQUIM Report 2021

Geomorphology

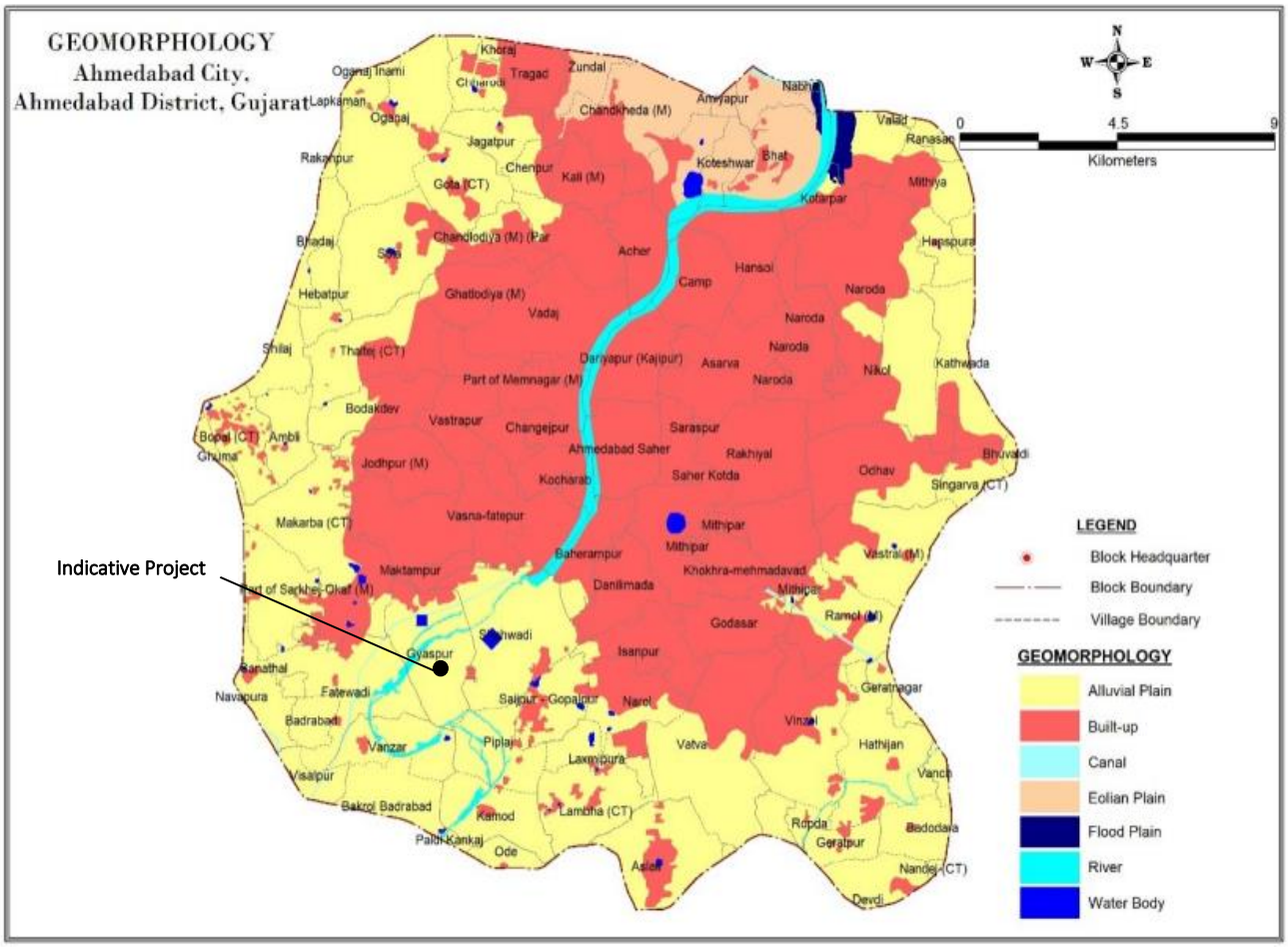
The Ahmedabad district has a diverse geomorphology comprising of plains, a riverine system, hilly areas, and ravines. Most of the district consists of fertile plains formed by the deposition of alluvial sediments (refer ***Figure 5-9***) carried by rivers. The proposed project site lies in Alluvial Plain of Ahmedabad City (refer ***Figure 5-10***). The Sabarmati River and its tributaries have shaped the district through erosion and deposition, creating riverine valleys and floodplains. The western part of the district is characterized by the presence of the Aravalli Range, which adds to the geomorphological diversity with its hills and rocky terrain. Ravines, formed by erosion, can be found near the Sabarmati River and in areas with higher slopes and sandy soil.

Figure 5-9 Geomorphology Map of Ahmedabad District



Source: Ahmedabad NAQUIM Report 2021

Figure 5-10 Geomorphology Map of Ahmedabad City



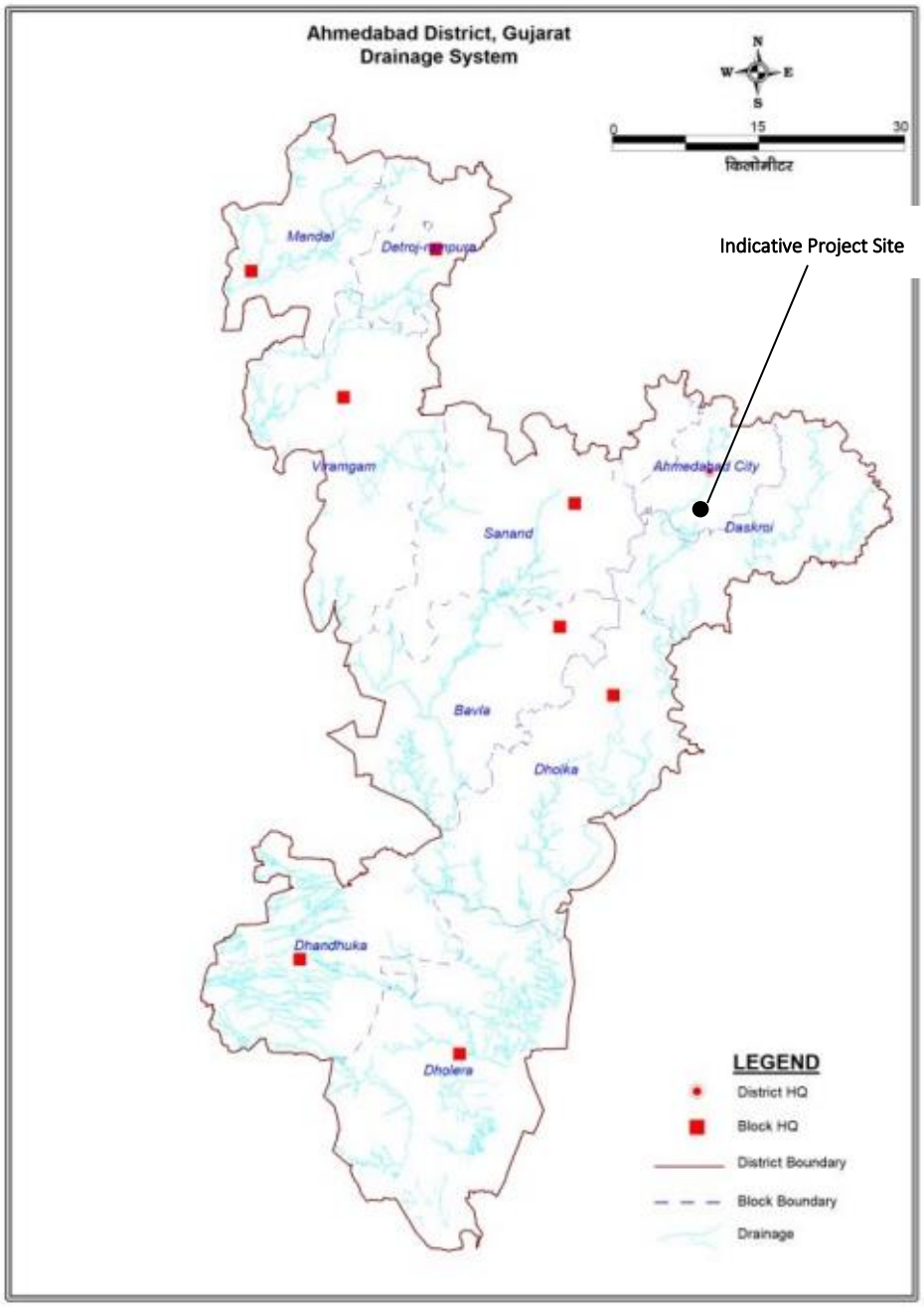
Source: Ahmedabad NAQUIM Report 2021

5.3.6 Water Resources

According to Ahmedabad NAQUIM report, alluvial formations form aquifers in the area namely Sand of various sizes and Gravel. The groundwater quality is saline at shallow depths and there is wide variation in quality regionally. It is noticed that the ground water is relatively more saline in southern part comprising alluvium and soft rocks.

The river Sabarmati is the principal river in Ahmedabad district, which originates in Rajasthan State. It flows in the Ahmedabad city and passes through the Dascroi and on the borders of Dholka talukas with Kheda district before it debauches into the Gulf of Khambat (refer ***Figure 5-11***). The river Bhogavo with its branches Chatori and Omkar drains Dholka and Dholera talukas. The Bhadar River with branch Goma, river Lilka, Utavali and Ghela drains Dhadnhuka and Dholera talukas of the district. River Rodh drains Sanand and Dholka talukas. Rivers Shelwa and Andhli drain Dholka talukas.

Figure 5-11 Drainage System Map of Ahmedabad District

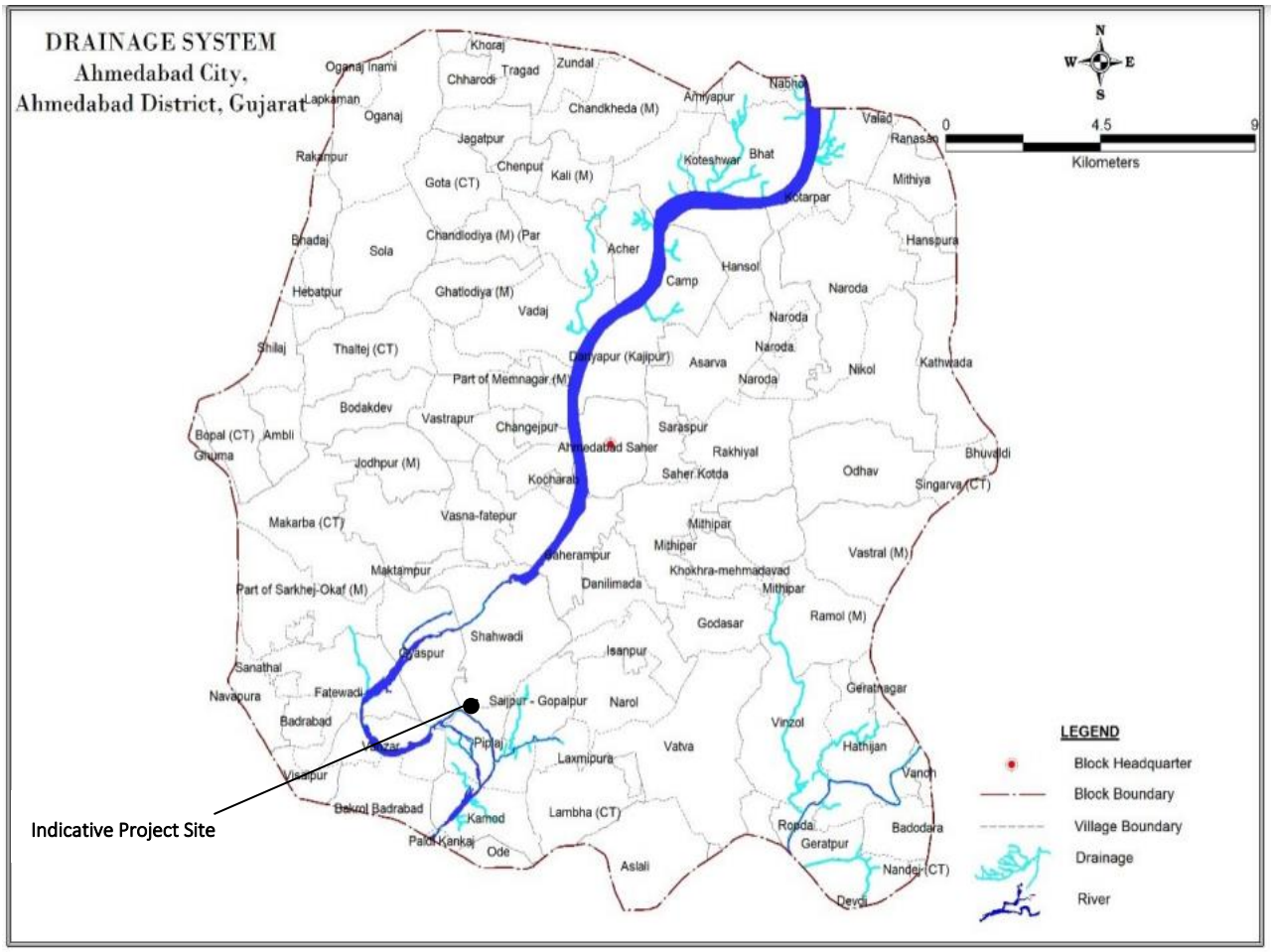


Source: Ahmedabad NAQUIM Report 2021

The river Vatrak flows on the eastern border of the Dahegam talukas for a smaller length and joins Sabarmati. The Khari River and the Meshavo river drain the Dahegam and Dascroi talukas. The river Bhogavo with its branches Chatori and Omkar drains Dholka and Dholera talukas. The Bhadar river with branch Goma, river Lilka, Utavali and Ghela drains

Dhadnhuka and Dholera talukas of the district. River Rodh drains Sanand and Dholka talukas. Rivers Shelwa and Andhli drain Dholka talukas. The major drainage in Ahmedabad city is Sabarmati River (***refer Figure 5-11***) and the project site lies adjacent to its bank.

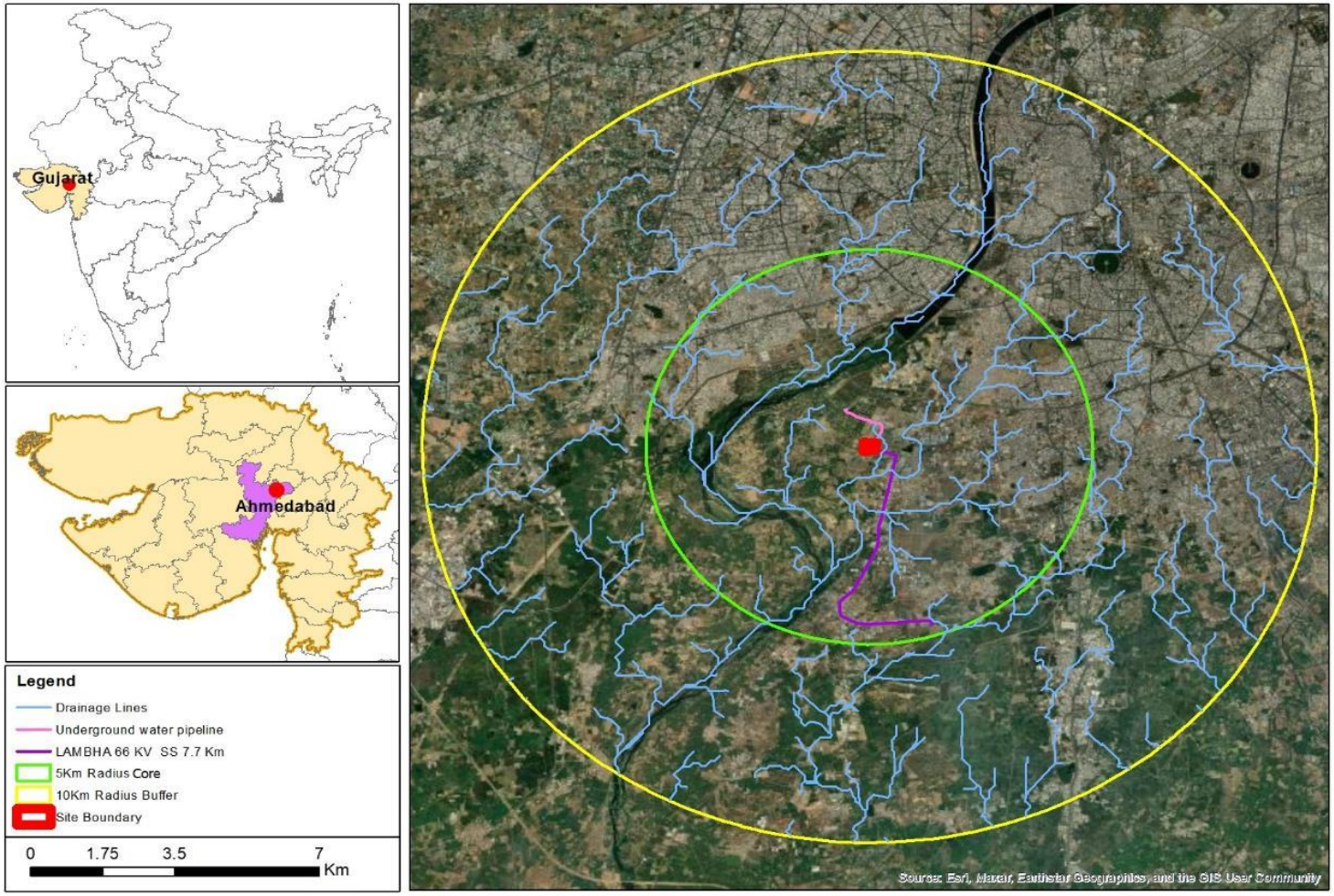
Figure 5-12 Drainage System of Ahmedabad City



Source: Ahmedabad NAQUIM Report 2021

As per the drainage map (refer ***Figure 5-13***) there are multiple dendritic drainage channels located within 10 km of the Project area and as well as within the underground water pipeline as well as transmission line route. A natural perennial water pond is located 570 m (aerial distance) from site towards east direction, Chandola lake is located 4 km (aerial distance) from site towards northeast direction and Kakaria lake is located 6.5 km (aerial distance) from site towards north east direction and Sabarmati river flows at a distance of 2.7 km west from the project site.

Figure 5-13 Drainage Map of the Study Area



Source: Developed by E&S Advisor

1.1.1.1 Surface Water

According to a report published by CPCB's on Polluted River Stretches For Restoration Of Water Quality November 2022, the patch from Raysan to Vautha on Sabarmati river falls under the Priority- I list for polluted river stretch of India. The BOD level observed in this region is 292 mg/L. About 2.7km north of the project site is Vasana Barage, which is on the Sabarmati River which is connected to a seasonal river. Water from Narmada canal is periodically directed towards Sabarmati River to maintain ground water table of surrounding aquifers. ***Table 5-4*** represents the water quality of Sabarmati River.

Table 5-4 Water Quality data of Sabarmati river near the Project Site (Vill. Miroli Taluka Dascroi)

TEMPERATURE (°C)		DISSOLVED OXYGEN (mg/L)		pH		CONDUCTIVITY (µmhos/cm)		BIO- CHEMICAL OXYGEN DEMAND		NITRATE (mg/ L)		FECAL COLIFORM (MPN/100 ML)		TOTAL COLIFORM (MPN/100 ML)		FECAL STREPTOCOCCI (MPN/100ML)	
Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max
26.0	36.0	0.3	4.7	7.0	8.1	1371	2716	13.0	47.0	0.32	1.45	1600	1600	1600	1600	1600	1600

Source: NWMP Data 2021

Lakes and Ponds: According to Water Quality Data Of Lakes, Ponds, Tanks & Wetland Under Nwmp-2021 [29]the following 2 lakes have been identified within the buffer area of Project site.

- Chandola Lake, which is 4.24 km to the east of the site, and
- Kankoria Lake, which is roughly 4 km to the south.

Table 5-5 Water Quality data of major Lakes near the Project Site

Name of Monitoring Location	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)	
	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max
Chandola Lake	25	30	4.1	6.9	7.3	8.4	499	699	2.4	19	0.3	1.68	26	920	130	1600
Kankoria Lake	25	30	4.8	8.4	8.5	9.1	2571	3999	7	22	0.32	1.63	33	920	280	1600

Source: NWMP Data 2021

5.3.6.1 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 June 2023 to understand the surface water quality in the study area. SW1 sample of surface water was collected from lake, SW2 sample is collected from Sabarmati River and S3 sample is collected from a pond within 5 km radius of the project and the samples were analyzed against IS 2296 Inland surface Water class C. 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 5-6.*** Map showing monitoring locations has been presented in ***Figure 5-2***

Table 5-6 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 :

[29] https://cpcb.nic.in/wqm/2021/Water_pond_tanks_2021.pdf

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		
							2017
2.	pH at 25 deg C	None	7.25 at 25 deg C	8.07 at 25 deg C	7.78 at 25 deg C	6.5-8.5	APHA (23rd Edition) 4500 -H- B : 2017
3.	Turbidity	NTU	12	60	128	--	APHA (23rd Edition) 2130B : 2017
4.	Total Dissolved Solid (TDS)	mg/l	842	3124	228	1500 max	APHA (23rd Edition) 2540C : 2017
General Parameters							
5.	Calcium (Ca)	mg/l	88	82	32	--	APHA (23rd Edition) 3500 Ca B,2017_(O)
6.	Chloride (Cl)	mg/l	216	1185	26	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	0.52	0.15	1.5	APHA (23rd Edition) 4500 -FC/ D: 2017
9.	Iron (Fe)	mg/l	1	4.9	9.3	50	APHA (23rd Edition) 3500 Fe B : 2017
10.	Magnesium (Mg)	mg/l	18	29	7.7	--	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
12.	Nitrate (NO_3)	mg/l	2.2	<0.5	11	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	253	350	20	400	APHA (23rd Edition) 4500 - SO42- E : 2017
15.	Total Alkalinity	mg/l	88	604	112	--	APHA (23rd Edition) 2320B 2017_(O)
16.	Total Hardness	mg/l	296	324	112	--	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	<0.005	<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

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		
							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	26	232	426	--	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	1414	5210	373	--	APHA (23rd Edition) 2510B: 2017
27.	Biochemical Oxygen Demand (BOD)	mg/l	17	94	22	3	APHA (23rd Edition) 5210B : 2017
28.	Chemical Oxygen Demand(COD)	mg/l	56	280	80	---	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	0.85 in respect to KCl equivalent salinity 35	3.35 In respect to KCl equivalent salinity 35.	0.21 in respect to KCl equivalent salinity 35	---	APHA (23rd Edition)2520B, 2017_(O)
31.	Phosphate (PO_4)	mg/l	0.27	2.0	2.5	---	APHA (23rd Edition) 4500- P D, 2017_(O)
32.	DO	mg/l	5.7	5.4	5.9	4 minimum	APHA 23rd Ed. 2017-4500-OC/G_(O)
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	17	9.3	17	--	APHA 23rd Edition 9221 B_(O)
35.	Total coliform bacteria	/100ml	32	24	40	5000	APHA 23rd Edition 9221 B_(O)

Source: NABL Accredited Lab

Represents value exceeding the permissible limit

5.3.6.1.1 Analysis of Surface Water Quality Monitoring

As per the results from above table, the parameters like Fluoride (1.5 mg/l), Iron(50 mg/l), Nitrate (50 mg/l), Sulphate (400 mg/l), Cadmium (0.01 mg/l), Lead (0.1 mg/l), Arsenic (0.2 mg/l), Zinc (15 mg/l) are found to be within the permissible limits as prescribed by IS 2296 Inland surface Water class C. However, the following parameters are found to be exceeding:

- **Total Dissolved Solids (TDS):** The TDS level of surface water samples S2 (3124 mg/l) is exceeding the permissible limit of 1500 mg/l.

- **Chloride:** The Chloride level of surface water samples S2 (1185 mg/l) is exceeding the permissible limit of 1500 mg/l.
- **Biochemical Oxygen Demand (BOD):** The BOD level of surface water samples S1, S2 and S3 are exceeding the permissible limit of 3 mg/l.
- **Oil and Grease:** Oil and Grease of the Samples S1, S2 and S3 are exceeding the permissible limits.

Th exceedance in the surface water bodies can be attributed to rapid urbanization, industrial growth around Ahmedabad City. Anthropogenic activities such as direct and indirect discharges in the water body, uncontrolled chemical wastes dumping nearby the industries, industrial effluent mixed with sewage and runoff water has arguably turned the local rivers into polluted streams, which ultimately leads to contaminate the ground water after leaching.

Also, while comparing the surface water quality data via secondary sources (refer ***Table 5-4*** and ***Table 5-5***) and surface water Monitoring in Study Area from primary sources (refer ***Table 5-6***), values for most of the parameters like Temperature, Dissolved Oxygen, pH, BOD, Nitrate N + Nitrite N, Fecal Coliform and Total Coliform are similar.

5.3.6.2 Ground Water

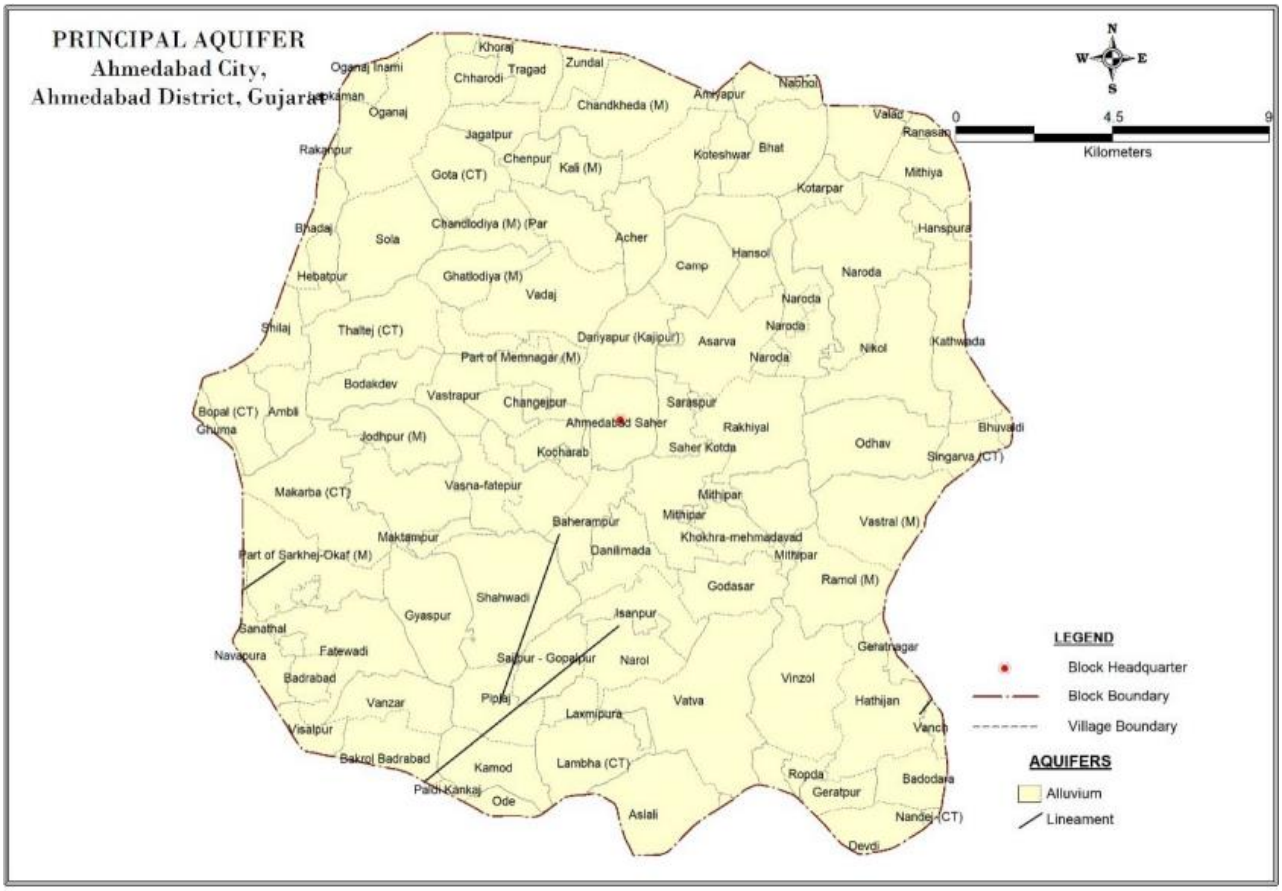
According to Aquifer Mapping and Ground Water Management Plan for Ahmedabad, 2020, alluvial formations form aquifers in the area namely Sand of various sizes and Gravel. The groundwater quality is saline at shallow depths and there is wide variation in quality regionally. It is noticed that the ground water is relatively more saline in southern part of the district comprising alluvium and soft rocks. Majority of the district is covered by the unconsolidated alluvial deposits whose alternate sand and clay formations form the prolific multi-aquifer systems. Ground water occurs both under phreatic as well as confined condition. There are 3 types of Aquifers identified in Ahmedabad district:

- Aquifer - I: These are the unconfined aquifer, occurring up to the depth from 0 to 78 meters below ground level.
- Aquifer -II: These are confined aquifers occur between the depth range of 43 to 136 meters below ground level.
- Aquifer Group - III (Confined III & Confined IV): These are confined aquifers occurring in the depth range of 78 to 350 meters below ground level.

The project site and the transmission line route lies under Aquifer-I category which is an unconfined shallow aquifer. The unconfined aquifer is in the upper horizons and consists of medium to fine-grained sand, silt, and clay. It is present in the northeastern part of the district, characterized by phreatic conditions. The groundwater in this aquifer is generally of good quality in the northeastern part and eastern part of Dascroi taluka. It is accessed through dug wells, dug-cum-bored wells, and tube wells.

The Deccan trap basement is encountered at the boreholes drilled in the southern part of the district in the Dhandhuka taluka and at the western margin of Dholka taluka. The oldest sedimentary formations encountered in the boreholes drilled for Ground water exploration and development are the Miocene formations of Tertiary age. It consists of medium grained sand, sandstone and siltstone inter bedded with bluish grey or grey clay deposited in a shallow marine and brackish environment. The post Miocene sediments of the districts consist mainly of sands, gravel intercalated with silt, clay and kankar. Sands are fine to coarse grained with occasional gravel. It thicknesses ranges between 65 to more than 251 m in Dhdhuka taluka in south and around 248 m in the western Dholka and around 390 m at Viramgam taluka in the Northwest.

Figure 5-14 Map showing Principal Aquifer in Ahmedabad City



Source: Ahmedabad NAQUIM Report 2021

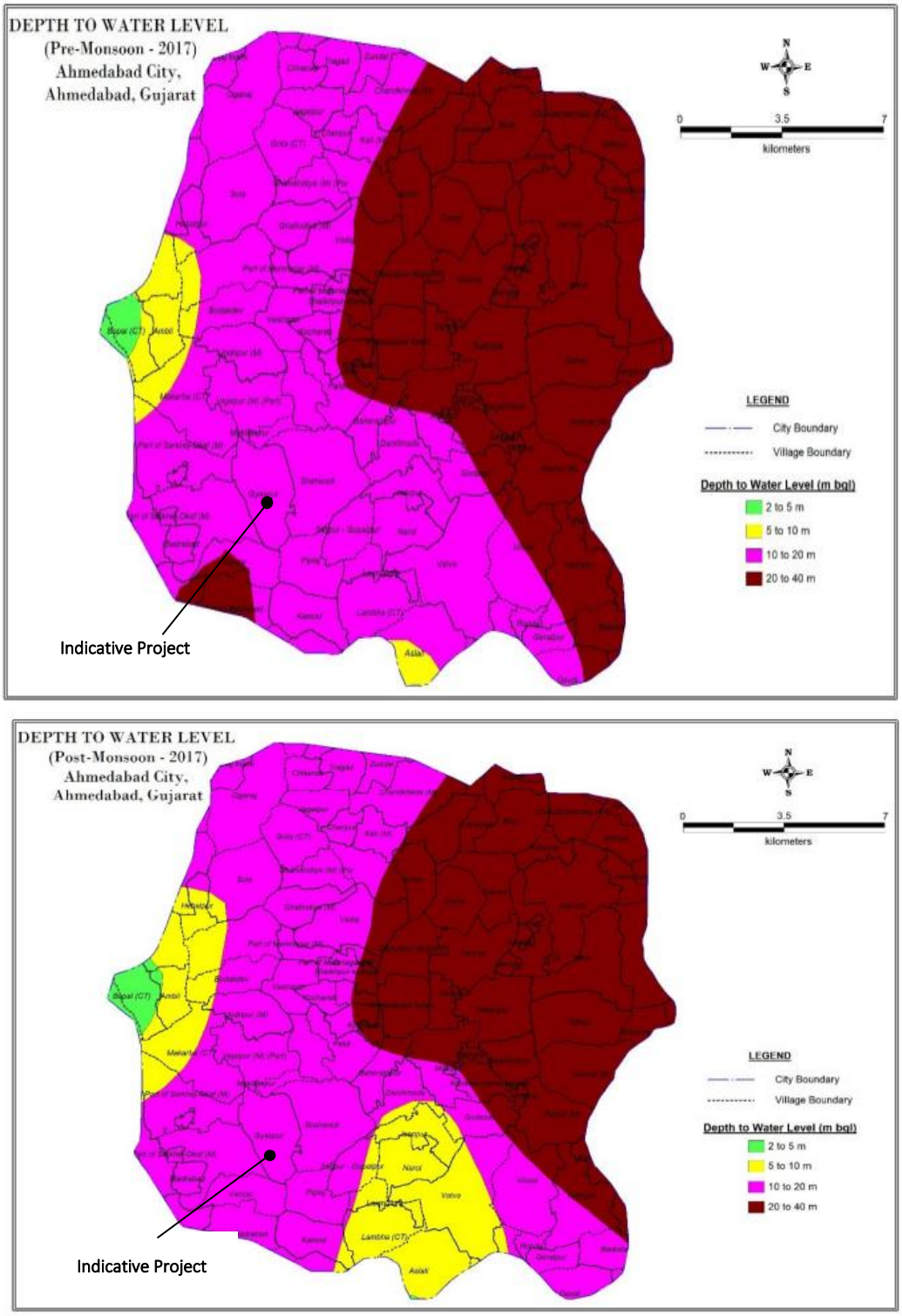
According to the below ***Table 5-7*** presented below, the stage of ground water development for the project taluka, is 72.01% and have been categorized as Semi-critical, based on the stages of ground water development and the long-term trend of pre and post monsoon ground water levels.

Table 5-7 Ground Water Resources, Availability, Utilization and Stage of Ground Water Development (2017) for Ahmedabad District

Assessment Unit Name	Total Ground Water Recharge (Ham)	Total Natural Discharges	Annual Extractable Ground Water Recharge (Ham)	Current Annual Ground Water Extraction (Ham)	Net Ground Water Availability for future use	Stage of Ground Water Extraction (%)	Categorization
Ahmedabad	578.46	28.92	549.54	395.72	165.72	72.01	Semi-Critical

As observed from ***Figure 5-15***, the pre-monsoon decadal average depth to water level in the district, ranges between 10 m and 40 m bgl in most part of the district. Shallow water levels were observed in the western most and southernmost part of the district, while deeper levels were found across. Post-monsoon water levels showed a similar pattern, with shallow levels in the southern and western parts, and deeper levels in the eastern, northeastern, and northwestern areas of the district. As Presented, water levels at the project site falls under 10 to 20m bgl during pre and Post monsoon.

Figure 5-15 Depth of Water Level (Pre-Monsoon & Post Monsoon) in Ahmedabad District



Source: Ahmedabad NAQUIM Report 2021

According to the results below (refer ***Table 5-8***) of Groundwater Quality Data of borewells from the study area as recorded by CPCB, all the values are within the limit except TDS, Total and Fecal Coliform, Fluoride where the values are exceeding the desirable limit as well as the permissible limit as per 10500:2010. Presence of total and fecal coliform bacteria indicating disease-causing organisms (water borne pathogens) within the water.

Table 5-8 Water Quality data of nearby bore wells to the Project Site

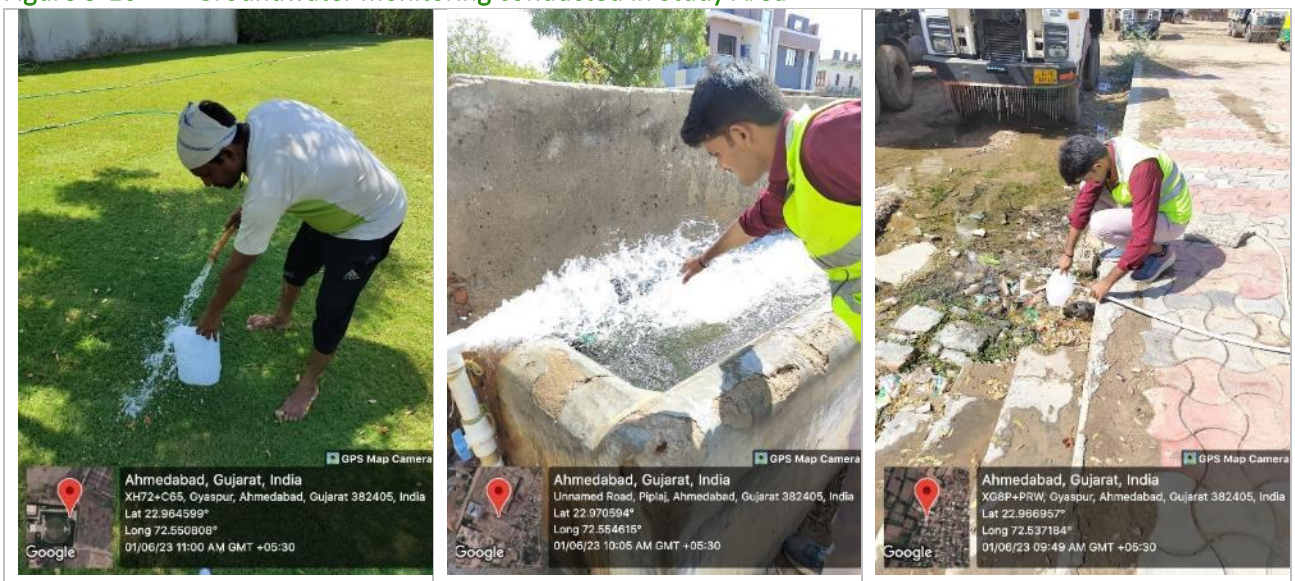
Location	Temperature °C		pH		Conductivity (µmhos/cm)		BOD (mg/L)		Nitrate N (mg/L)		Faecal Coliform (MPN/100ml)		Total Coliform (MPN/100ml)		Total Dissolved Solids (mg/L)		Fluoride (mg/L)		Arsenic (mg/L)	
	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max
Pirana	27.0	28.0	7.1	7.9	2780	3180	1.0	1.0	0.30	0.90	2	2	2	2	1576	1816	0.6	1.3	0.001	0.001
Gidc Vatva	27.0	30.0	7.4	8.5	2265	2307	1.0	1.0	0.30	0.34	2	2	2	2	940	1276	0.6	0.9	0.001	0.001
Msw Site Narol	26.0	28.0	7.2	8.2	3401	3895	1.0	1.0	0.30	1.20	2	2	2	2	1922	2362	0.7	2.0	-	-
Vatva	27.0	30.0	7.4	8.2	2708	2855	1.0	1.3	0.30	0.38	2	2	2	2	1402	1486	0.7	0.9	0.001	0.001
Vasna	28.0	29.0	7.6	7.9	1917	2028	1.0	1.0	0.91	1.30	2	2	2	2	1072	1240	0.7	0.9	0.001	0.001

Source: NWMP Data 2021

5.3.6.3 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 5-8*** and the results of the assessment has been presented in **Table 5-9.** Map showing monitoring locations has been presented in ***Figure 5-6***

Figure 5-16 Groundwater monitoring conducted in Study Area



GW 1 Location	GW 2 Location	GW 3 Location

Table 5-9 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									
1.	Colour	Hazen	BDL(DL:1.0)	BDL(DL:1.0)	BDL(DL:1.0)	5	15	No visible colour	3025 (Part 4)-1983;
2.	Odor	None	Agreeable	Agreeable	Agreeable	Agreeable	Agreeable	--	Rffm:2002
3.	pH	None	7.02 AT 25 DEG C	7.05 AT 25 DEG C	7.13 at 25 deg C	6.5-8.5	No Relaxation	--	3025 (Part 5)-1983;
4.	Turbidity	NTU	BDL(DL:1.0)	BDL(DL:1.0)	1.4	1	5	--	Rffm:2002
5.	Total Dissolved Solid (TDS)	mg/l	145	148	150	500	2000	--	3025 (Part 11)-1983; Rffm:
General Parameters									
6.	Aluminum (Al)	mg/l	BDL(DL:0.01)	BDL(DL:0.01)	BDL(DL:0.01)	0.03	0.2		IS 3025 (Part 2) : 2004
7.	Ammonia (N)	mg/l	BDL(DL:0.1)	BDL(DL:0.1)	BDL(DL:0.1)	0.5	No Relaxation	1.5	IS 3025 (Part 34): 1988
8.	Anionic Detergent	mg/l	BDL(DL:0.05)	BDL(DL:0.05)	BDL(DL:0.05)	0.2	1		IS 13428 (ANNEX _ K): 2005
9.	Barium (Ba)	mg/l	BDL(DL:0.1)	BDL(DL:0.1)	BDL(DL:0.1)	0.7	No Relaxation	0.7	IS 3025 (Part 2) : 2004
10.	Boron (B)	mg/l	BDL(DL:0.3)	BDL(DL:0.3)	BDL(DL:0.3)	0.5	1.0	0.5	IS 3025 (Part 40) : 1991
11.	Calcium (Ca)	mg/l	23.76	23.76	27.72	75	200	--	IS 3025 (Part 26) : 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				
12.	Chloramines (Cl2)	mg/l	BDL(DL:0.1)	BDL(DL:0.1)	BDL(DL:0.1)	4	No Relaxation	0.5-1.5	IS 3025 (Part 32) : 1988
13.	Chloride (Cl)	mg/l	29.39	39.19	34.29	250	1000	200-300	IS 3025 (Part 2) : 2004
14.	Copper (Cu)	mg/l	BDL(DL:0.02)	BDL(DL:0.02)	BDL(DL:0.02)	0.05	1.5	2.0	IS 3025 (Part 60) : 2008
15.	Fluoride (F)	mg/l	0.28	0.27	0.30	1	1.5	1.5	IS 3025 (Part 26) : 1986
16.	Free Residual Chlorine	mg/l	BDL(DL:0.1)	BDL(DL:0.1)	BDL(DL:0.1)	0.2	1	--	IS 3025 (Part 53) : 1988
17.	Iron (Fe)	mg/l	BDL(DL:0.05)	0.07	0.08	0.3	No Relaxation	--	IS 3025 (Part 46) : 1994
18.	Magnesium (Mg)	mg/l	9.50	4.75	7.13	30	100	--	IS 3025 (Part 2) : 2004
19.	Manganese (Mn)	mg/l	BDL(DL:0.02)	BDL(DL:0.02)	BDL(DL:0.02)	0.1	0.3	0.4	IS 3025 (Part 39) : 1991
20.	Mineral Oil	mg/l	BDL(DL:0.5)	BDL(DL:0.5)	BDL(DL:0.5)	0.5	No Relaxation	--	IS 3025 (Part 34) : 1988
21.	Nitrate (NO_3)	mg/l	0.92	1.10	0.96	45	No Relaxation	50	IS 3025 (Part 43) : 1992
22.	Phenolic Compounds (C_6H_5OH)	mg/l	BDL(DL:0.001)	BDL(DL:0.001)	BDL(DL:0.001)	0.001	0.002	--	IS 3025 (Part 2) : 2004
23.	Selenium (Se)	mg/l	BDL(DL:0.005)	BDL(DL:0.005)	BDL(DL:0.005)	0.01	No Relaxation	0.01	IS 3025 (Part 2) : 2004
24.	Silver (Ag)	mg/l	BDL(DL:0.005)	BDL(DL:0.005)	BDL(DL:0.005)	0.1	No Relaxation	--	IS 3025 (Part 24) : 1986
25.	Sulphate (SO_4)	mg/l	2.98	3.26	4.52	200	400	--	IS 3025 (Part 29) : 1986
26.	Hydrogen Sulphide (H_2S)	mg/l	BDL(DL:0.02)	BDL(DL:0.02)	BDL(DL:0.02)	0.05	No Relaxation	--	IS 3025 (Part 23) : 1986
27.	Total Alkalinity	mg/l	81.6	61.2	71.4	200	600	--	IS 3025 (Part 21) : 2009
28.	Total Hardness	mg/l	99.0	79.20	99	200	600	--	IS 3025 (Part 2) : 2004
29.	Zinc (Zn)	mg/l	BDL(DL:0.02)	BDL(DL:0.02)	BDL(DL:0.02)	5	15	--	
Toxic Substances									
30.	Cadmium (Cd)	mg/l	BDL(DL:0.001)	BDL(DL:0.001)	BDL(DL:0.001)	0.003	No Relaxation	0.003	IS 3025 (Part 2) : 2004
31.	Cyanide (CN)	mg/l	BDL(DL:0.01)	BDL(DL:0.01)	BDL(DL:0.01)	0.05	No Relaxation	0.07	IS 3025 (Part 27) : 1986
32.	Lead (Pb)	mg/l	BDL(DL:0.005)	BDL(DL:0.005)	BDL(DL:0.005)	0.01	No Relaxation	0.01	IS 3025 (Part 2) :2004

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				
33.	Mercury (Hg)	mg/l	BDL(DL:0.0002)	BDL(DL:0.0002)	BDL(DL:0.0002)	0.001	No Relaxation	0.006	IS 3025 (Part 48) : 1994
34.	Molybdenum (Mo)	mg/l	BDL(DL:0.05)	BDL(DL:0.05)	BDL(DL:0.05)	0.07	No Relaxation	0.07	IS 3025 (Part 2) :2004
35.	Nickel (Ni)	mg/l	BDL(DL:0.01)	BDL(DL:0.01)	BDL(DL:0.01)	0.02	No Relaxation	0.07	IS 3025 (Part 2) :2004
36.	Polychlorinated Biphenyl (PCB)	mg/l	BDL(DL:0.0005)	BDL(DL:0.0005)	BDL(DL:0.0005)	0.0005	No Relaxation	--	USEPA 8082: 2007
37.	Polynuclear Aromatic Hydrocarbons (PAH)	mg/l	BDL(DL:0.0001)	BDL(DL:0.0001)	BDL(DL:0.0001)	0.0001	No Relaxation	--	APHA (23rd Edition) 6440C:2017
38.	Arsenic (As)	mg/l	BDL(DL:0.005)	BDL(DL:0.005)	BDL(DL:0.005)	0.01	0.05	0.01	IS 3025 (Part 2) :2004
39.	Total Chromium (Cr)	mg/l	BDL(DL:0.01)	BDL(DL:0.01)	BDL(DL:0.01)	0.05	No Relaxation	0.05	IS 3025 (Part 2) :2004
Trihalomethanes									
40.	Bromoform	mg/l	BDL(DL:0.01)	BDL(DL:0.01)	BDL(DL:0.01)	0.1	No Relaxation	0.1	APHA (23rd Edition) 6232 B: 2017
41.	Dibromochloromethane	mg/l	BDL(DL:0.01)	BDL(DL:0.01)	BDL(DL:0.01)	0.1	No Relaxation	--	APHA (23rd Edition) 6232 B: 2017
42.	Bromodichloromethane	mg/l	BDL(DL:0.01)	BDL(DL:0.01)	BDL(DL:0.01)	0.06	No Relaxation	0.06	APHA (23rd Edition) 6232 B: 2017
43.	Chloroform	mg/l	BDL(DL:0.01)	BDL(DL:0.01)	BDL(DL:0.01)	0.2	No Relaxation	0.3	APHA (23rd Edition) 6232 B: 2017
Pesticides Residues									
44.	Alachlor	µg/l	BDL(DL:0.02)	BDL(DL:0.02)	BDL(DL:0.02)	20	20	--	USEPA 525.2
45.	Atrazine	µg/l	BDL(DL:0.02)	BDL(DL:0.02)	BDL(DL:0.02)	2	2	0.002	USEPA 8141A: 2007
46.	Aldrin	µg/l	BDL(DL:0.01)	BDL(DL:0.01)	BDL(DL:0.01)	0.03	0.03	0.00003	AOAC (21st edition), 990.06: 2019
47.	Dieldrin	µg/l	BDL(DL:0.01)	BDL(DL:0.01)	BDL(DL:0.01)	0.03	0.03	0.00003	AOAC (21st edition), 990.06: 2019
48.	Alpha-HCH	µg/l	BDL(DL:0.01)	BDL(DL:0.01)	BDL(DL:0.01)	0.01	0.01	--	AOAC (21st edition), 990.06: 2019
49.	Beta-HCH	µg/l	BDL(DL:0.01)	BDL(DL:0.01)	BDL(DL:0.01)	0.04	0.04	--	AOAC (21st edition), 990.06: 2019
50.	Butachlor	µg/l	BDL(DL:0.02)	BDL(DL:0.02)	BDL(DL:0.02)	125	125	--	USEPA 8141AOAC (21st edition), 990.06: 2019A: 2007

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				
51.	Chlorpyrifos	µg/l	BDL(DL:0.02)	BDL(DL:0.02)	BDL(DL:0.02)	30	30	0.03	USEPA 8141 A
52.	Delta-HCH	µg/l	BDL(DL:0.01)	BDL(DL:0.01)	BDL(DL:0.01)	0.04	0.04	--	AOAC (21st edition), 990.06: 2019
53.	2,4-Dichlorophenoxyacetic acid	µg/l	BDL(DL:0.01)	BDL(DL:0.01)	BDL(DL:0.01)	30	30	0.03	USEPA 515: 1981
54.	o, p-DDT	µg/l	BDL(DL:0.01)	BDL(DL:0.01)	BDL(DL:0.01)	1	1	0.01	AOAC (21st edition), 990.06: 2019
55.	p,p-DDT	µg/l	BDL(DL:0.01)	BDL(DL:0.01)	BDL(DL:0.01)	1	1	0.01	AOAC (21st edition), 990.06: 2019
56.	o, p-DDE	µg/l	BDL(DL:0.01)	BDL(DL:0.01)	BDL(DL:0.01)	1	1	0.01	AOAC (21st edition), 990.06: 2019
57.	p,p-DDE	µg/l	BDL(DL:0.01)	BDL(DL:0.01)	BDL(DL:0.01)	1	1	0.01	AOAC (21st edition), 990.06: 2019
58.	o,p-DDD	µg/l	BDL(DL:0.01)	BDL(DL:0.01)	BDL(DL:0.01)	1	1	0.01	AOAC (21st edition), 990.06: 2019
59.	p,p-DDD	µg/l	BDL(DL:0.01)	BDL(DL:0.01)	BDL(DL:0.01)	1	1	0.01	AOAC (21st edition), 990.06: 2019
60.	Alpha - endosulfan	µg/l	BDL(DL:0.01)	BDL(DL:0.01)	BDL(DL:0.01)	0.4	0.4	--	AOAC (21st edition), 990.06: 2019
61.	Beta-Endosulfan	µg/l	BDL(DL:0.01)	BDL(DL:0.01)	BDL(DL:0.01)	0.4	0.4	--	AOAC (21st edition), 990.06: 2019
62.	Endosulfan sulfate	µg/l	BDL(DL:0.01)	BDL(DL:0.01)	BDL(DL:0.01)	0.4	0.4	--	AOAC (21st edition), 990.06: 2019
63.	Ethion	µg/l	BDL(DL:0.02)	BDL(DL:0.02)	BDL(DL:0.02)	3	3	--	US EPA 8141A: 2007
64.	Gama-HCH(Lindane)	µg/l	BDL(DL:0.01)	BDL(DL:0.01)	BDL(DL:0.01)	2	2	--	AOAC (21st edition), 990.06: 2019
65.	Isoproturon	µg/l	BDL(DL:0.02)	BDL(DL:0.02)	BDL(DL:0.02)	9	9	0.009	USEPA 532: 2000
66.	Malathion	µg/l	BDL(DL:0.02)	BDL(DL:0.02)	BDL(DL:0.02)	190	190	--	USEPA 8141A: 2007
67.	Methyl parathion	µg/l	BDL(DL:0.02)	BDL(DL:0.02)	BDL(DL:0.02)	0.3	0.3	--	USEPA 8141A: 2007
68.	Monostrophes	µg/l	BDL(DL:0.02)	BDL(DL:0.02)	BDL(DL:0.02)	1	1	--	USEPA 8141A: 2007
69.	Phorate	µg/l	BDL(DL:0.02)	BDL(DL:0.02)	BDL(DL: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

Represents value exceeding the WHO guidelines

5.3.6.3.1 Analysis of Groundwater Quality Results

Based on the results presented in Table 5 12, 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:** Turbidity of GW3 (1.4) is exceeding the Desirable Limit.
- **Pesticides Residue:** Atrazine, Atrazine, Aldrin and Isoproturon residues of all the ground water samples were below the desirable limit but exceeding the Standard Limits as per WHO guidelines.

As per NWMP Data for borewells from secondary sources (refer ***Table 5-8***) and results of groundwater quality from primary sources (refer ***Table 5-9)***, the parameters are within the desirable limits for all except TDS level (2342 mg/l), where the sample from MSW site Narol is exceeding the desirable limit of 2000mg/l. This has been attributed to the fact that the high TDS level may be due to the aquifer structure of the area.

5.3.6.3.2 ESA Phase II Groundwater Quality Results

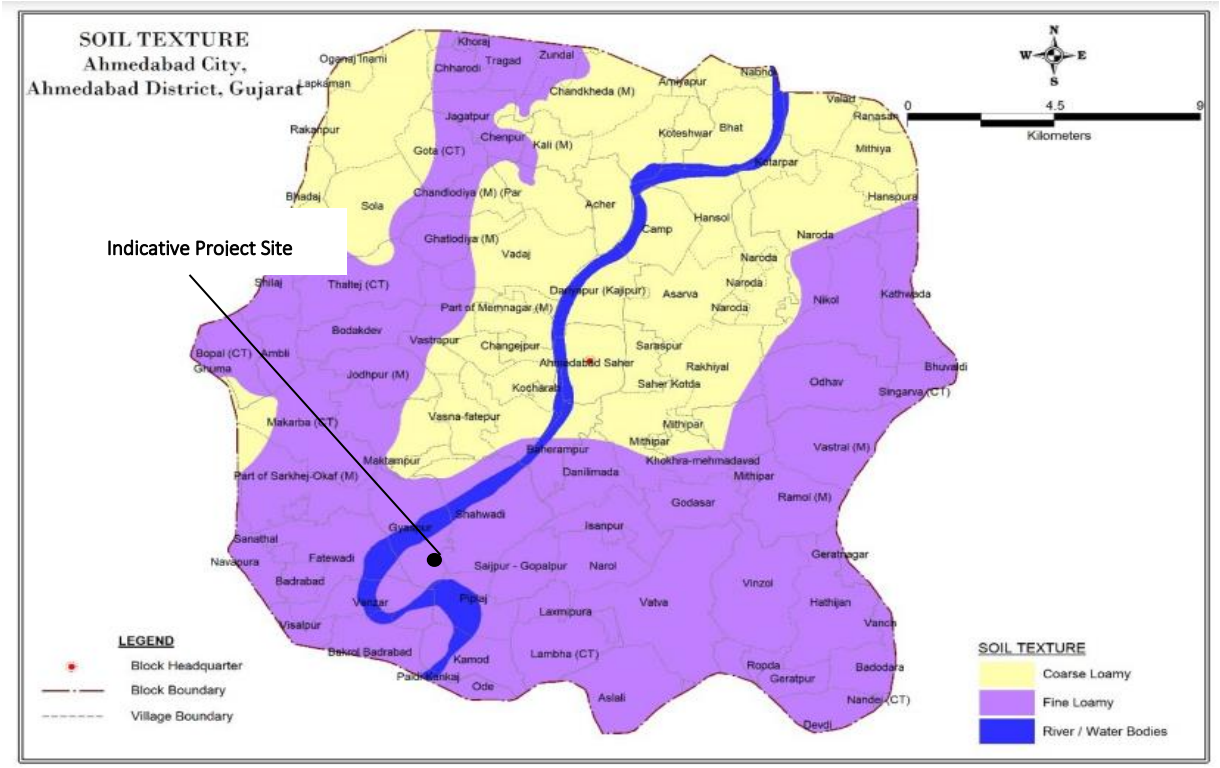
ESA Phase II assessment (undertaken separately) for ground water was undertaken for the facility for which groundwater samples across the Site were undertaken to assess the ground water quality as well as groundwater flow direction.

As per the Phase II report, as per the analytical results of groundwater samples, heavy metals (arsenic, barium, chromium, cobalt, copper, lead, nickel and zinc) were reported in concentration exceeding the Dutch Intervention Values (DIVs) standards. 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 into shallow groundwater. It may be concluded, based on field visual observation and laboratory analytical results that groundwater at site that currently not impacted adversely due to past or current practices at site.

5.3.7 Soil Type

According to Aquifer Mapping and Ground Water Management Plan for Ahmedabad, 2020, the project site features fine loamy soil, according to the NAQUIM assessment show in ***Figure 5-17***. It isn't particularly clayey and comprises more than 20% clay and roughly 40% sand. There are always horizons of lime nodules in the subsoil. The primary crop grown on this type of soil is rabi wheat, which is very well suited for cultivation.

Figure 5-17 Soil Texture of Ahmedabad district



Source: Ahmedabad NAQUIM Report 2021

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 by NABL accredited Lab in May-June 2023. Soil sampling locations are shown in ***Figure 5-18***. Soil analysis and results have been presented in ***Table 5-10***. Map showing monitoring locations has been presented in ***Figure 5-2.***

Figure 5-18 Soil test and monitoring conducted in Study Area

		
S 1 Location	S 2 Location	S 3 Location

Table 5-10 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	1.38	1.42	1.48	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	100	40	20	TPM/MSK/P&E/1/10_(O)
5	Clay	%	13	6	3	TPM/MSK/P&E/1/36A_(O)
6	Conductivity at 25 deg C	Micro S/cm	268 (1:2) at 25 deg C	176 (1:2) at 25 deg C	98 (1:2) at 25 deg C	IS 14767:2000,RA 2016_(O)
7	Copper (as Cu)	mg/kg	12	5.0	5.4	EPA 6010 D (ICP-OES)
8	Heavy metals	mg/kg	10922	6226	6214	TPM/MSK/P&E/3/60_(O)
9	Lead (as Pb)	mg/kg	4.9	2.3	2.8	EPA 6010D_(O)
10	Mercury (as Hg)	mg/kg	<0.1	<0.1	<0.1	USEPA 245.5
11	Moisture	%	21	18	15	TPM/MSK/P&E/1/17_(O)
12	Nickel (as Ni)	mg/kg	15	5.8	6.7	EPA 6010 D (ICP-OES)
13	Organic Matter	%	0.59	0.31	0.24	IS 2720 (Part 22): 1972
14	Particle Size Distribution	%	Sand: 72% Silt 15% Clay 13%	Sand: 85% Silt 9% Clay 6%	Sand: 90% Silt 7% Clay 3%	TPM/MSK/P&E/1/36A_(O)
15	Sand	%	72	85	90	TPM/MSK/P&E/1/36A_(O)
16	Silt	%	15	9	7	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	Sand	Sand	TPM/MSK/P&E/1/36A, Issue date- April 02 Issue no-03: 2018
19	Total Chromium (as Cr)	mg/kg	21	11	14	EPA 6010D_(O)
20	Total Nitrogen (as N)	mg/kg	274	202	157	IS 14684 : 1999
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	23	9.3	9.4	EPA 6010 D (ICP-OES)
23	pH Value at 25 deg C	None	7.26 (1:2.5) at 25 deg C	8.47 (1:2.5) at 25 deg C	8.90 (1:2.5) at 25 deg C	IS 2720 (Part 26) - 1987

Source: Monitoring conducted by NABL accredited lab in August 2022

Table 5-11 Soil Classification 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

S.No.	Soil Test Parameters	Classification
		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 7.26 (S1), 8.47 (S2) and 8.90 (S3). As per the standard soil classification, S1 is neutral, S2 is moderately alkaline and S3 are strongly alkaline.
- **Texture:** The texture of soil samples S2 and S3 were found to be sandy in nature with low concentrations of clay and silt having low water retention capacity and poor fertility. Texture of soil sample S1 was found to be Loamy sand.
- **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 268 µs/cm, 176 µs/cm and 98 µs/cm respectively. This indicates low concentration of nutrients in the soil samples S2 and S3 whereas the value of S1 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 all the samples are within 640 mhos/cm..
- **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 12 mg/kg, 5 mg/kg and 5.4 mg/kg for S1,S2 and S3 respectively. The level of zinc in the soil samples were found to be 23 mg/kg (S1), 9.3 mg/kg (S2) and 9.4 mg/kg (S3)

5.3.8 Ambient Air Quality Assessment

5.3.8.1 Secondary Ambient Air Quality Data for Study Area

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 program (AAQM) including Ahmedabad. The ambient air quality samples are collected as per the standard norms for ambient air quality monitoring.

Table 5-12 Ahmedabad Air Quality Annual Average 2017-18

Location	PM10 µg/m³	PM2.5 µg/m3	SO2 µg/m3	NOX µg/m3
Cadila Laboratories Ltd	163.75	49.59	16.65	28.15
L D College of engineering, Navrangpura	133.08	44.54	13.32	26.05
Shardaben Hospital, Saraspur	144.58	47.62	13.56	28.75
R.C Technical schhol, Mirzapur	138.33	45.48	13.48	28.34
Behrampura Referral hospital	147.17	47.59	14.33	29.96
Satellite area Jodhpur Shraddha Pumping station	158.83	49.12	13.77	27.58
On the terrace of traffic booth, Ashram road	163.42	49.78	13.96	30.23
Pumping station rakhiyal	144.42	46.65	13.72	29.31
Dynowash, Illaben Estate, Narol	192.33	53.51	15.30	31.48
Sola chanakyapuri pumping station, nr. Kargil char rast	155.08	49.20	15.08	28.41
Udyog Nagar Police Chowky, GIDC-Naroda	155.8	49.5	14.5	27.2
Mukesh Industry, Narol	154.8	49.8	16.3	31.2
H.P. Petrol Pump, S.P. Ring Road, Odhav-Naroda Road	146.6	47	14.8	28.9
VIA Hall, GIDC-Vatva	150.8	47.7	15.3	29.6
National Ambient Air Standards (Annual)	**60**	**40**	**50**	**40**

Source: GPCB

According to Action Plan for Control of Air Pollution in Non-Attainment city of Gujarat, PM10 and PM2.5 have been named as the primary air pollutants. This is primarily caused by the re-suspension of road dust, emissions from cars and D.G. sets, construction activities, burning of domestic fossil fuels, open burning of solid wastes, transportation of building materials without covering, and emissions from brick kilns in the Ahmedabad area. Higher NO2 levels are brought about using outdated automobiles and traffic congestion. It has been noted that Ahmedabad's wintertime air quality deteriorates significantly due to the condensation of fine particulate matter in the lower atmosphere.

5.3.8.2 Ambient Air Quality in Study Area

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. The monitoring parameters included 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 & 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, dioxin and furan which were monitored twice within the plant premises.

The locations of the ambient air quality monitoring have been presented in ***Figure 5-19*** and results of the air quality monitoring has been presented in ***Table 5-13*** and ***Table 5-14.*** And the below ***Table 5-13*** shows the air quality monitoring results. Map showing monitoring locations has been presented in ***Figure 5-2.***

Figure 5-19 Ambient Air Quality Monitoring conducted in Study Area

<table>
<tr><td> 
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<tr><td>AAQ 1 Location</td><td>AAQ 2 Location</td></tr>
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<tr><td>AAQ 3 Location</td><td>AAQ 4 Location</td></tr>
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Table 5-13 Results of Ambient Air Quality Monitoring in Study Area

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 as	Hydrogen fluoride (HF)	Hydrochloric Acid (HCl)
AAQ-1	23.05.2023 to 24.05.2023	Sample 1	110.1	58.3	11.4	50.9	0.92	<0.01	<0.01	<0.002	<5.0	<1.0	<0.01	0.33
	25.05.2023 to 26.05.2023	Sample 2	145.1	78.3	16.2	35.4	0.98	<0.01	<0.01	<0.002	<5.0	<1.0	<0.01	0.23
	30.05.2023 to 31.05.2023	Sample 3	166.3	97.9	19.8	41.6	0.85	<0.01	<0.01	<0.002	<5.0	<1.0	<0.01	0.35
	01.06.2023 to 02.06.2023	Sample 4	100.3	53.8	12.6	42.9	0.95	<0.01	<0.01	<0.002	<5.0	<1.0	<0.01	0.23
	06.06.2023 to 07.06.2023	Sample 5	103.1	57.5	16.3	42.3	0.87	<0.01	<0.01	<0.002	<5.0	<1.0	<0.01	0.36
	08.06.2023 to 09.06.2023	Sample 6	159.1	88.8	18.7	45.4	0.75	<0.01	<0.01	<0.002	<5.0	<1.0	<0.01	0.23
	13.06.2023 to 14.06.2023	Sample 7	132.3	74.6	12.1	38.7	0.95	<0.01	<0.01	<0.002	<5.0	<1.0	<0.01	0.33
	15.06.2023 to16.06.2023	Sample 8	148.8	86.7	10.9	41.7	0.95	<0.01	<0.01	<0.002	<5.0	<1.0	<0.01	0.24
	Values for AAQ-1	**Min**	100.28	53.76	10.88	35.40	0.75	0.00	0.00	0.00	0.00	0.00	0.00	0.23
		Max	166.32	97.94	19.82	50.92	0.98	0.00	0.00	0.00	0.00	0.00	0.00	0.36
		Average	133.13	74.50	14.76	42.37	0.90	0.00	0.00	0.00	0.00	0.00	0.00	0.29
		98 Percentile	165.31	96.66	19.67	50.14	0.98	0.00	0.00	0.00	0.00	0.00	0.00	0.36
AAQ-2	22.05.2023 to 23.05.2023	Sample 1	91.6	40.4	9.6	35.4	0.96	<0.01	<0.01	<0.002	<5.0	<1.0	<0.01	0.29
	26.05.2023 to 27.05.2023	Sample 2	92.3	42.9	8.4	37.3	0.85	<0.01	<0.01	<0.002	<5.0	<1.0	<0.01	0.25

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 as	Hydrogen fluoride (HF)	Hydrochloric Acid (HCl)
	29.05.2023 to 30.05.2023	Sample 3	72.4	33.3	9.6	29.8	0.78	<0.01	<0.01	<0.002	<5.0	<1.0	<0.01	0.21
	02.06.2023 to 03.06.2023	Sample 4	51.5	30.8	10.3	35.1	0.69	<0.01	<0.01	<0.002	<5.0	<1.0	<0.01	0.25
	05.06.2023 to 06.06.2023	Sample 5	55.1	33.3	10.9	46.0	0.95	<0.01	<0.01	<0.002	<5.0	<1.0	<0.01	0.25
	09.06.2023 to 10.06.2023	Sample 6	62.1	26.7	9.7	48.4	0.98	<0.01	<0.01	<0.002	<5.0	<1.0	<0.01	0.25
	12.06.2023 to 13.06.2023	Sample 7	48.4	20.8	8.5	26.6	0.87	<0.01	<0.01	<0.002	<5.0	<1.0	<0.01	0.24
	16.06.2023 to17.06.2023	Sample 8	53.6	32.9	11.5	35.1	0.92	<0.01	<0.01	<0.002	<5.0	<1.0	<0.01	0.25
	Values for AAQ-2	**Min**	48.41	20.84	8.41	26.61	0.69	0.00	0.00	0.00	0.00	0.00	0.00	0.21
		Max	92.28	42.93	11.48	48.39	0.98	0.00	0.00	0.00	0.00	0.00	0.00	0.29
		Average	65.88	32.66	9.80	36.70	0.88	0.00	0.00	0.00	0.00	0.00	0.00	0.25
		98 Percentile	92.18	42.58	11.40	48.05	0.98	0.00	0.00	0.00	0.00	0.00	0.00	0.28
AAQ-3	22.05.2023 to 23.05.2023	Sample 1	80.8	31.3	9.0	32.3	0.98	<0.01	<0.01	<0.002	<5.0	<1.0	<0.01	0.28
	26.05.2023 to 27.05.2023	Sample 2	70.1	32.9	8.4	35.4	0.78	<0.01	<0.01	<0.002	<5.0	<1.0	<0.01	0.21
	29.05.2023 to 30.05.2023	Sample 3	80.3	37.1	9.6	43.5	0.93	<0.01	<0.01	<0.002	<5.0	<1.0	<0.01	0.26
	02.06.2023 to 03.06.2023	Sample 4	62.1	31.3	11.5	46.6	0.82	<0.01	<0.01	<0.002	<5.0	<1.0	<0.01	0.21

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 as	Hydrogen fluoride (HF)	Hydrochloric Acid (HCl)
	05.06.2023 to 06.06.2023	Sample 5	75.5	37.9	10.3	38.1	0.68	<0.01	<0.01	<0.002	<5.0	<1.0	<0.01	0.28
	09.06.2023 to 10.06.2023	Sample 6	84.5	35.4	9.7	37.5	0.87	<0.01	<0.01	<0.002	<5.0	<1.0	<0.01	0.22
	12.06.2023 to 13.06.2023	Sample 7	63.6	31.3	8.5	21.2	0.92	<0.01	<0.01	<0.002	<5.0	<1.0	<0.01	0.29
	16.06.2023 to17.06.2023	Sample 8	70.5	30.4	11.5	23.6	0.63	<0.01	<0.01	<0.002	<5.0	<1.0	<0.01	0.24
	Values for AAQ-3	**Min**	62.10	30.42	8.41	21.17	0.63	0.00	0.00	0.00	0.00	0.00	0.00	0.21
		Max	84.54	37.93	11.48	46.57	0.98	0.00	0.00	0.00	0.00	0.00	0.00	0.29
		Average	73.44	33.45	9.80	34.76	0.83	0.00	0.00	0.00	0.00	0.00	0.00	0.25
		98 Percentile	84.01	37.81	11.48	46.14	0.97	0.00	0.00	0.00	0.00	0.00	0.00	0.29
AAQ-4	23.05.2023 to 24.05.2023	Sample 1	55.9	27.1	12.6	31.1	0.55	<0.01	<0.01	<0.002	<5.0	<1.0	<0.01	0.3
	25.05.2023 to 26.05.2023	Sample 2	68.3	29.6	9.6	40.4	0.45	<0.01	<0.01	<0.002	<5.0	<1.0	<0.01	0.23
	30.05.2023 to 31.05.2023	Sample 3	71.8	32.5	13.8	37.3	0.52	<0.01	<0.01	<0.002	<5.0	<1.0	<0.01	0.24
	01.06.2023 to 02.06.2023	Sample 4	62.4	28.8	8.4	39.8	0.56	<0.01	<0.01	<0.002	<5.0	<1.0	<0.01	0.24
	06.06.2023 to 07.06.2023	Sample 5	63.8	25.4	13.3	38.1	0.35	<0.01	<0.01	<0.002	<5.0	<1.0	<0.01	0.3
	08.06.2023 to 09.06.2023	Sample 6	84.1	45.0	9.1	35.7	0.49	<0.01	<0.01	<0.002	<5.0	<1.0	<0.01	0.2

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 as	Hydrogen fluoride (HF)	Hydrochloric Acid (HCl)
	13.06.2023 to 14.06.2023	Sample 7	69.6	33.8	11.5	36.3	0.31	<0.01	<0.01	<0.002	<5.0	<1.0	<0.01	0.29
	15.06.2023 to16.06.2023	Sample 8	60.2	30.8	9.7	30.2	0.47	<0.01	<0.01	<0.002	<5.0	<1.0	<0.01	0.22
	Values for AAQ-4	Min	55.91	25.42	8.41	30.24	0.31	0.00	0.00	0.00	0.00	0.00	0.00	0.20
		Max	84.13	45.01	13.82	40.37	0.56	0.00	0.00	0.00	0.00	0.00	0.00	0.30
		Average	67.02	31.62	11.00	36.09	0.46	0.00	0.00	0.00	0.00	0.00	0.00	0.25
		98 Percentile	82.41	43.44	13.75	40.28	0.56	0.00	0.00	0.00	0.00	0.00	0.00	0.30
	--	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)	--	--	--	--	--	--	--	--

Source: Monitoring Results, NABL Accredited Lb

Table 5-14 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	--	
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	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	
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	

Parameter	Units	Method	D&F1	D&F 2	SWM Rules, 2016 (Stack Monitoring)	WBG EHS guidelines for Waste Management facilities (Stack Monitoring)
Octachlorodibenzofuran	ng.TEQ/N m^3	Method TO-9A /QA.16.4.73	<0.000015	<0.000015	0.1	
Total Dioxins & Furans	ng.TEQ/N m^3	Method TO-9A /QA.16.4.73	<0.01	<0.01	0.1	

Source: NABL Accredited Lab

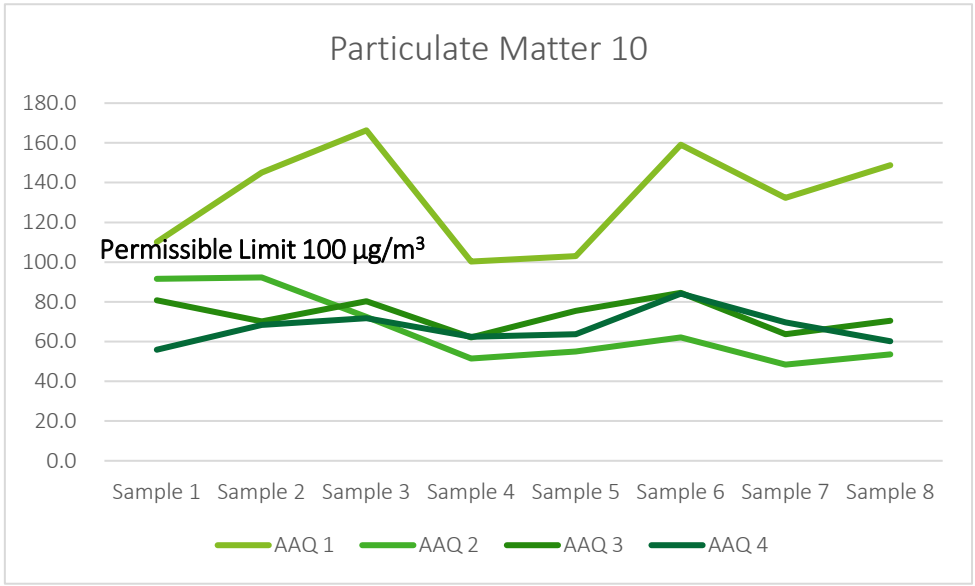
5.3.8.2.1 Analysis of Ambient Air Quality Monitoring

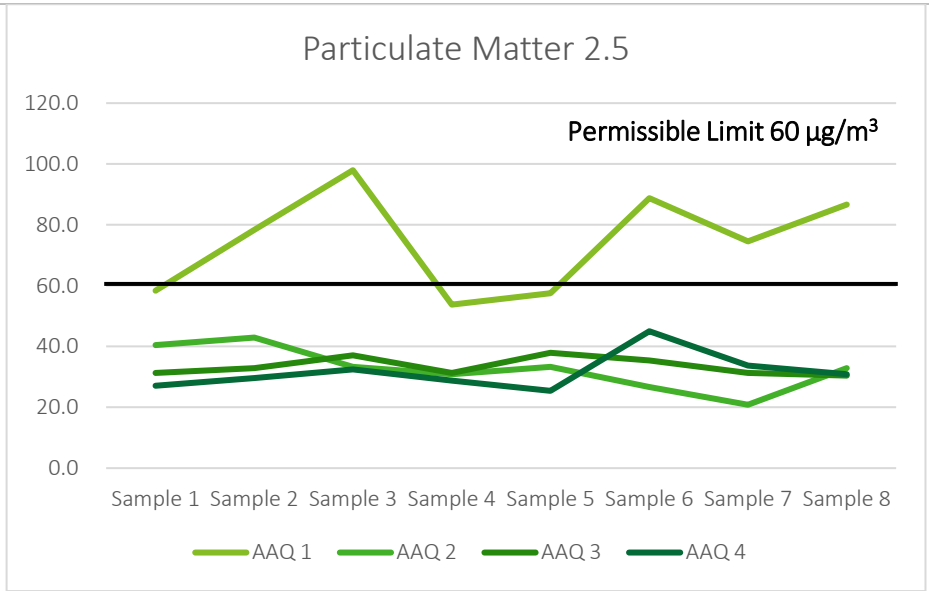
As per the above results, parameters such as Sulphur Dioxide (SO2), oxides of Carbon Monoxide (CO), Cadmium, Lead, Mercury (Hg), Nickel (Ni), Arsenic (Ar), Hydrogen Fluoride (HF), Hydrochloric Acid (HCL) were found to be within NAAQS CPCB permissible limits as well as WBG EHS guidelines, whereas exceedance was observed for PM 10 and PM 2.5 and Oxides of NOx values, where the 24 hours sample values were found to be exceeding the NAAQS as well as WBG EHS Interim Target-1 and WBG EHS Guidelines.

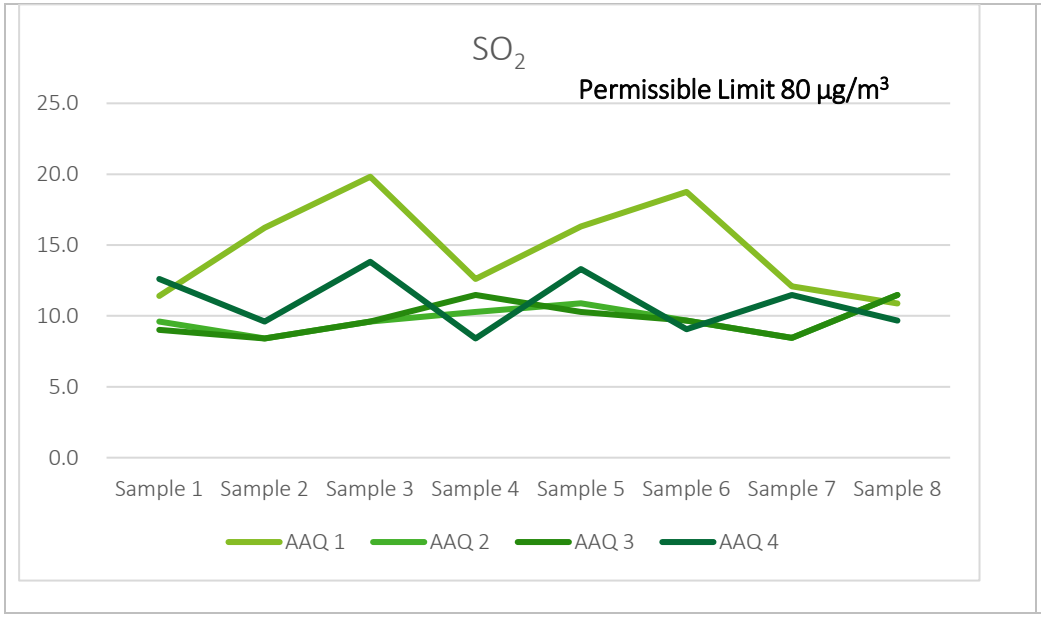
	PM10	PM 2.5	NOx
AAQ-1	All samples are exceeding the NAAQS as well as WBG Interim Target-2	5 samples are exceeding the NAAQS and 4 samples were exceeding WBG Interim Target-1	6 Samples are within the NAAQs levels but exceeding the WBG EHS guideline.
AAQ-2	All samples are within the NAAQS as well as WBG Interim Target-1	All samples are within the NAAQS as well as WBG Interim Target-1.	2 Samples are within the NAAQs levels but exceeding the WBG EHS guideline.
AAQ-3	All samples are within the NAAQS as well as WBG Interim Target-1	All samples are within the NAAQS as well as WBG Interim Target-1	2 Samples are within the NAAQs levels but exceeding the WBG EHS guideline.
AAQ-4	All samples are within the NAAQS as well as WBG Interim Target-1	All samples are within the NAAQS as well as WBG Interim Target-1	1 Sample are within the NAAQs levels but exceeding the WBG EHS guideline.

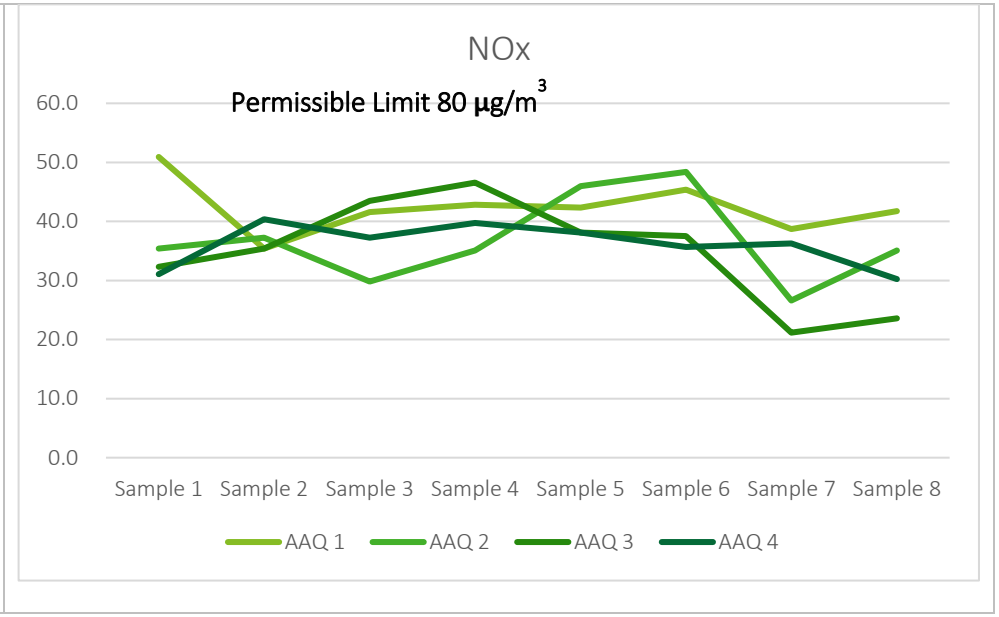
As understood, based on the site visit and the secondary data, the airshed is considered to be as degraded for 24 hour mean and annual mean PM10 and PM2.5 levels as per WBG EHS guidelines

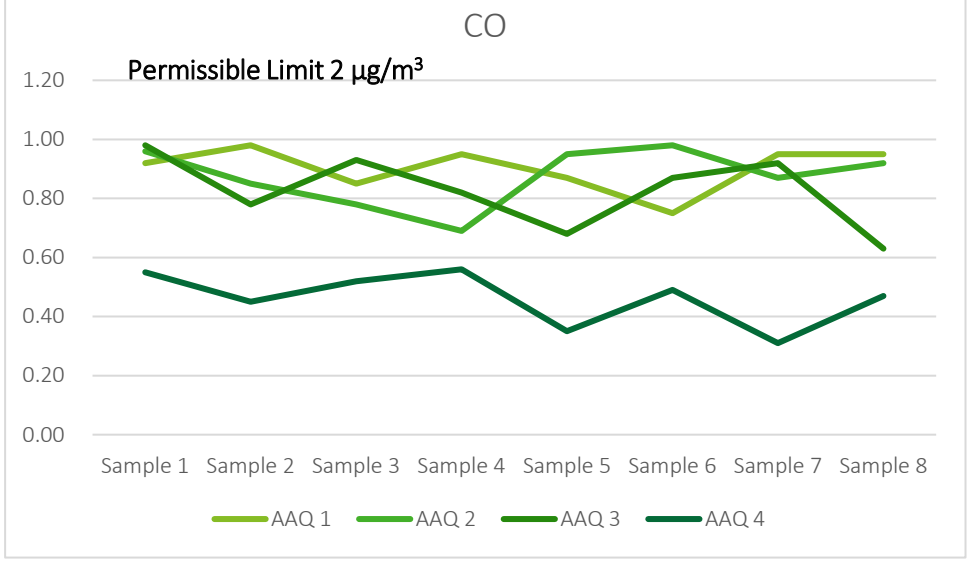
Figure 5-20 Results of Air Quality Analysis

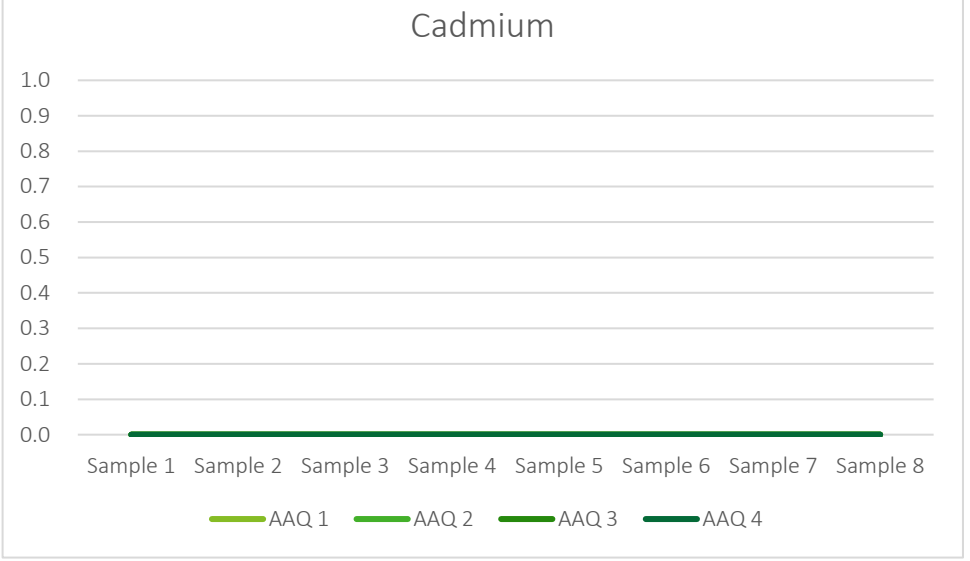


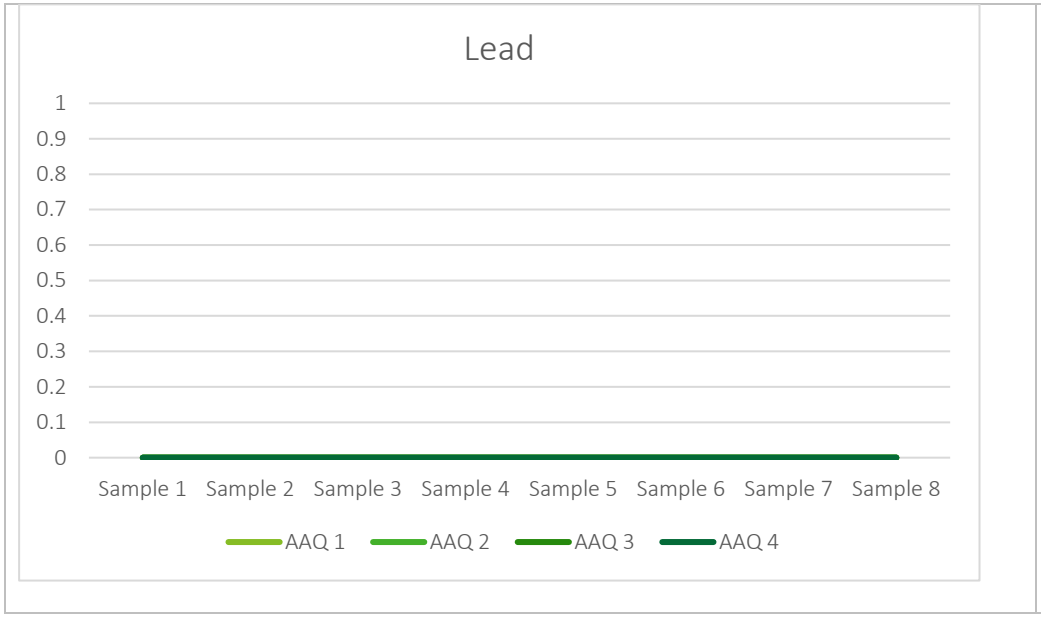


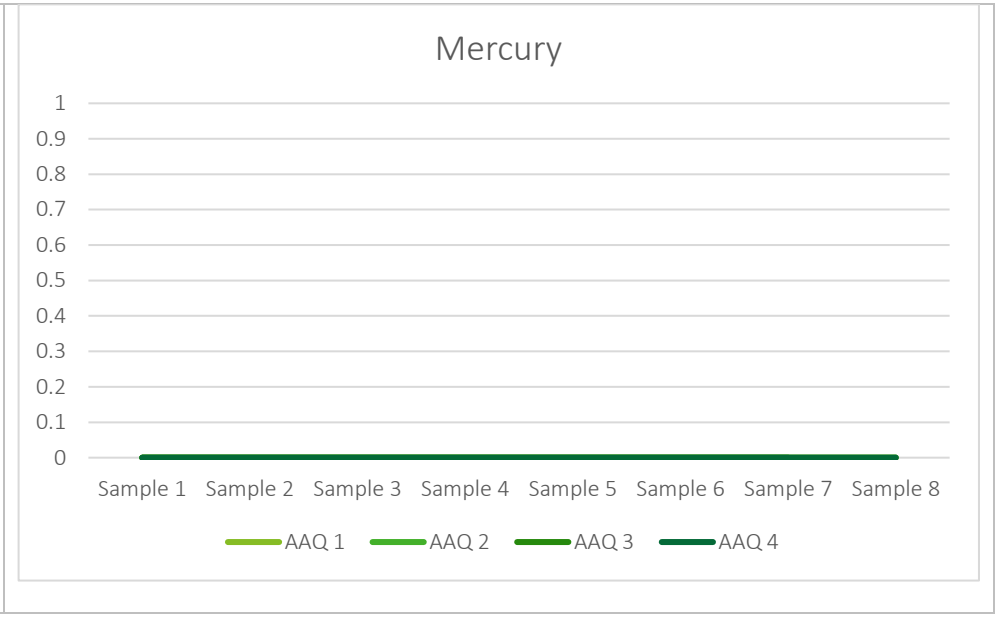


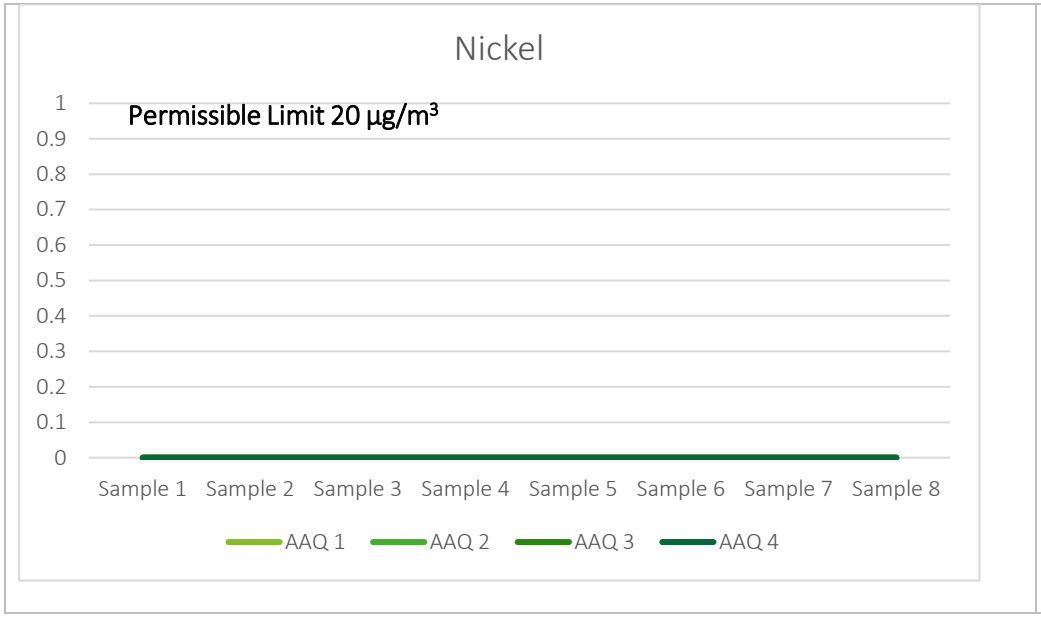


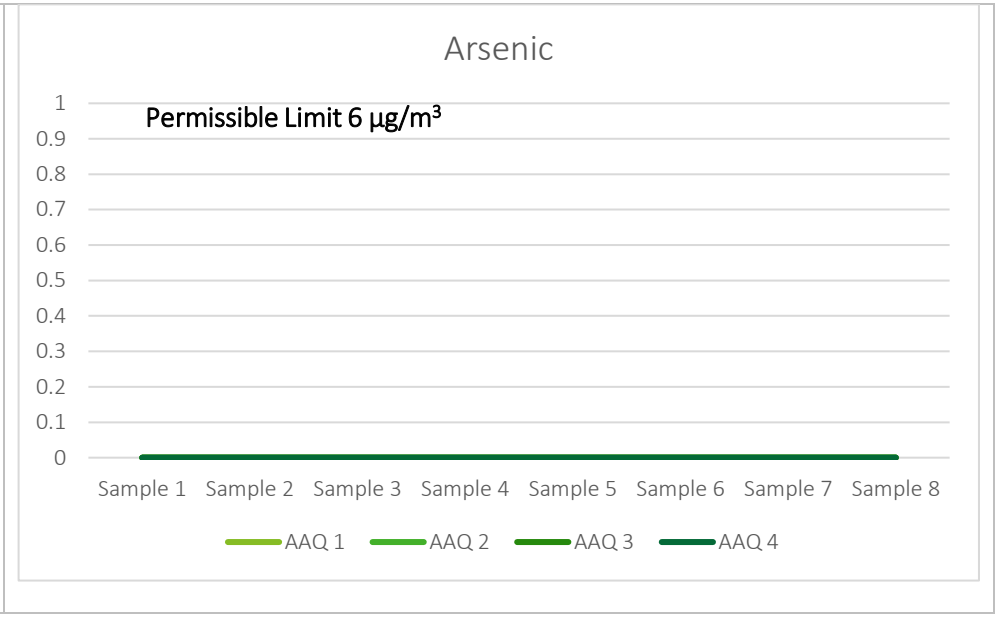


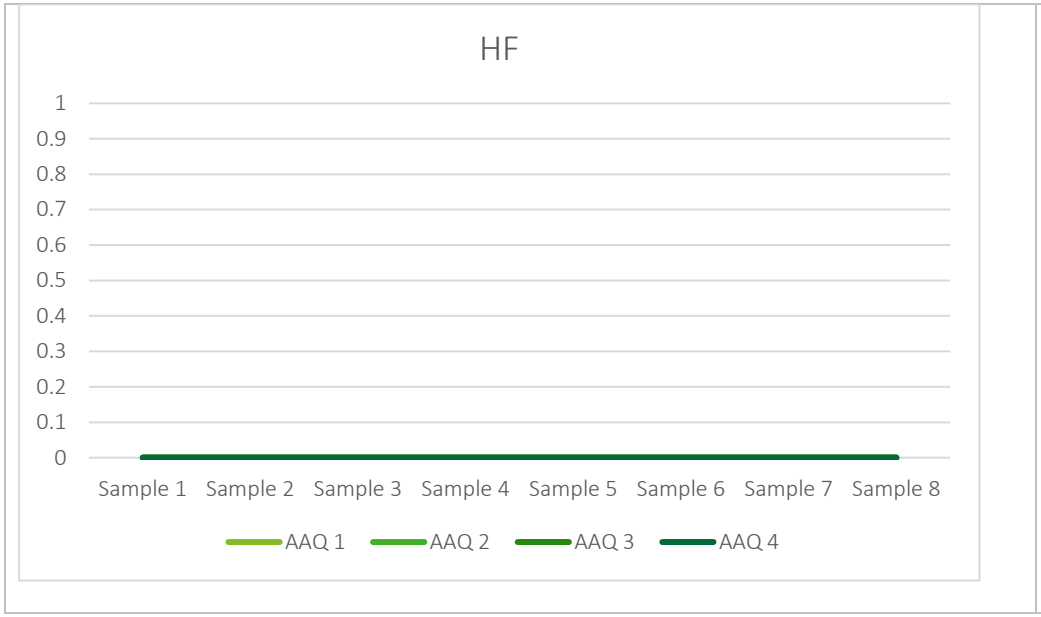


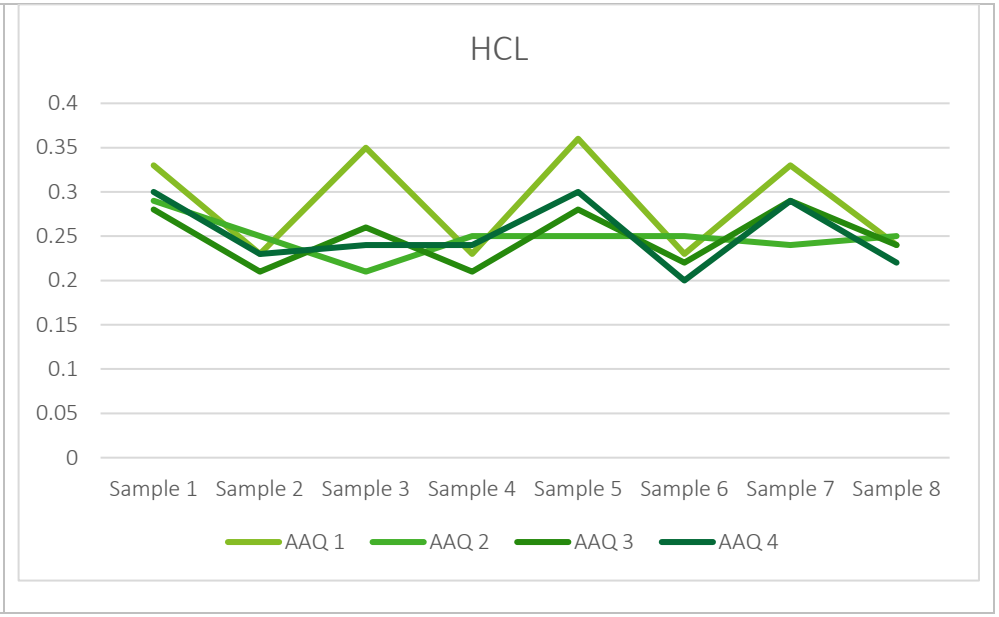








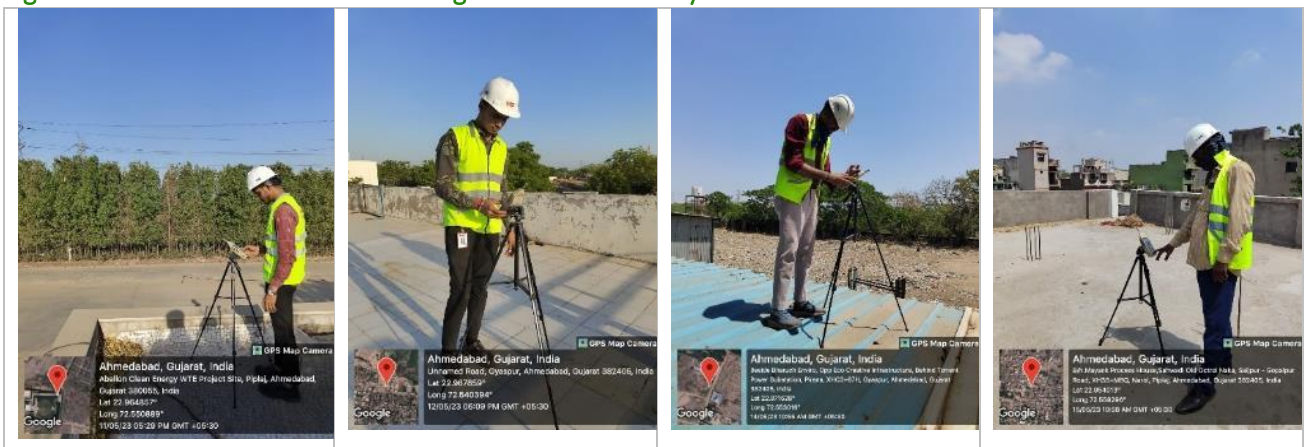




5.3.9 Noise Quality Assessment

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 have been presented in ***Table 5-1*** and the results of the ambient noise monitoring has been presented in ***Table 5-15.*** Map showing monitoring locations has been presented in ***Figure 5-21.***

Figure 5-21 Noise Level monitoring conducted in Study Area



N 1 Location	N 2 Location	N 3 Location	N 4 Location

Table 5-15 Ambient Noise Quality Monitoring in Study Area

S .No.	Sampling ID	Results Leq dB(A)	
		Leq Day	Leq Night
1.	N1 (Industrial Area)	73.2	69.9
2.	N2 (Residential Area)	63.1	53
3.	N3 (Industrial Area)	61.5	54.1
4.	N4 (Residential Area)	63.8	56.5
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 sampling locations are located in industrial (N1 & N3) and residential areas (N2 & N4). As per the above results the Leq Night value for N1 & N3 located in an industrial area were found to be within limits as prescribed by CPCB as well as WBG Guideline values, whereas for Leq Day, value of N1 was well within limits as prescribed by CPCB but was exceeding the values as per WBG Guideline. The values for N3 & N4 were exceeding Leq Day and Leq Night limits as prescribed by CPCB as well as WBG guidelines.

The exceedance in the noise limits can be attributed to high wind speeds in the region during the months of May and June. Months of May and June are characterized high wind speeds with the highest wind speeds in the month of June (Refer ***Section 5.3.2***).

5.3.10 Traffic Survey

The primary traffic survey was conducted near the access roads for the Ahmedabad site. 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 5-2*** and the results of the survey has been presented in ***Table 5-16.***

Figure 5-22 Traffic Survey Monitoring conducted in Study Area

Traffic Survey at T1 Location (Up and Down)

Traffic Survey at T2 Location (Up and Down)

Table 5-16 Traffic Density Monitoring Results in Study Area

S.No.	Motorised Vehicles			Non-Motorised 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.	1814	5521	16583	400	24318
T2 (Up and Down)					
2.	686	3124	11835	153	15798

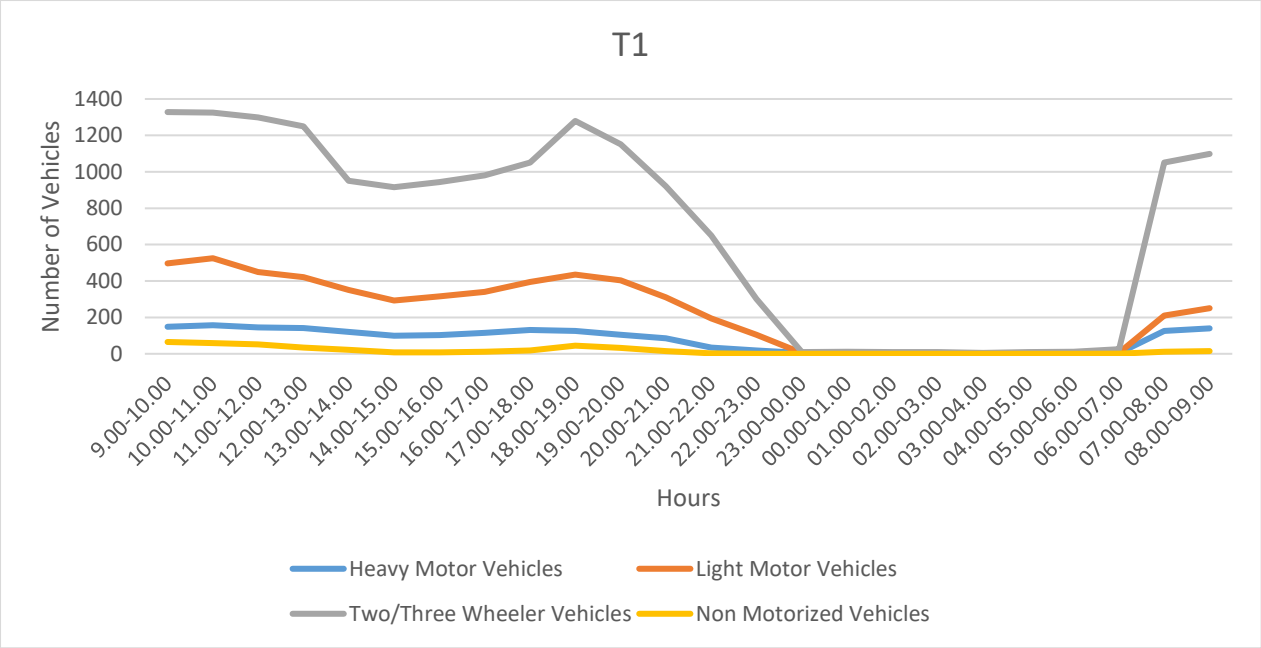
Source: Survey conducted by NABL accredited lab in June 2023

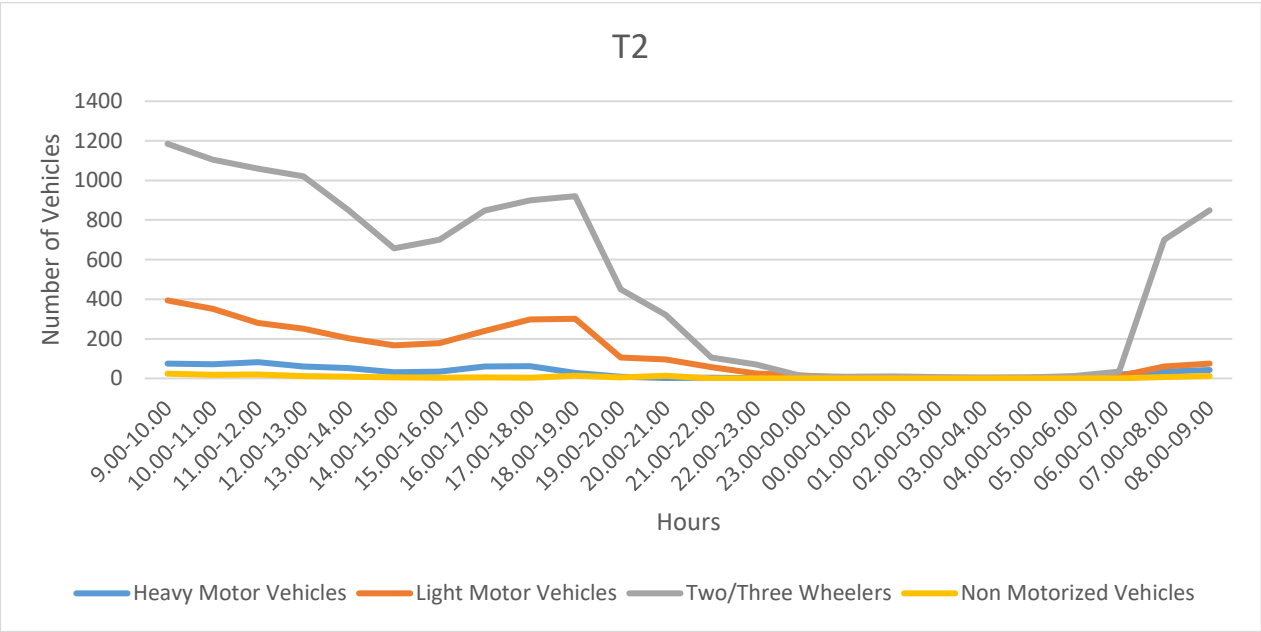
1.1.1.2 Analysis of Traffic Survey

Based on the traffic survey data presented in ***Table 5-16*** and hourly traffic scenario presented in ***Figure 5-23***, it is observed that T1 is busier than T2 with daily traffic accounting for 24,318 vehicles. The hourly traffic scenario depicted that the majority of traffic in the T1 road is due to movement of Two/Three Wheelers (Scooter, M. Cycle, Auto, Moped)

travelling up and down the roads followed by Light Motor Vehicles (Car, Jeep, Van, Metador, Tractor, Tempo). Similar trend is represented at T2 location.

Figure 5-23 Hourly Road Traffic Scenario





5.3.11 Natural Hazards

District Disaster Management Plan, 2022, and Building Materials & Technology Promotion Council (BMTPC), Government of India, have published hazard maps of Gujarat. Ahmedabad, with its unique geo-climatic conditions, has a history of vulnerability to natural disasters. According to District Disaster Management Plan - Ahmedabad 2021, Ahmedabad is prone to floods, droughts, road accidents, industrial accidents, and earthquakes. The entire district falls under Seismic Zone-III for earthquakes, with one coastal taluka prone to cyclones and four talukas prone to floods.

Earthquake: According to District Disaster Management Plan - Ahmedabad 2022, the district is highly vulnerable to earthquakes, as indicated by the 2021 District disaster management report. In 2001, an earthquake affected 30,000 people in 20 villages, leading to the reconstruction of houses in Ahmedabad, Dholka, Viramgam, and Bavla.

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 damage risk zone in terms of earthquake occurrence. The earthquake map in shown ***Figure*** 5-26

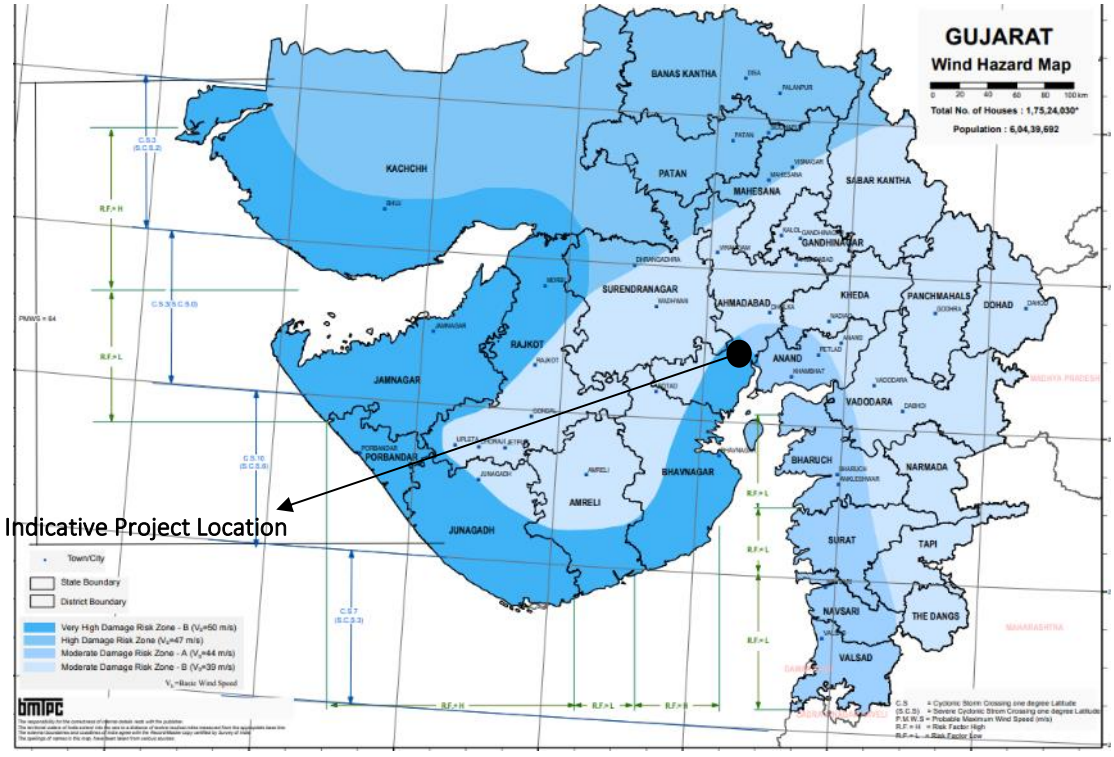
Flood: According to the Building Materials & Technology Promotion Council (BMTPC), Government of India, the Project site falls in an area which is not prone to flooding incidents. The below ***Figure*** 5-25 presents the flood prone map showing the project area does not lie in the flood prone zone. However, as per the report published by District Disaster Management Plan, 2022, the Ahmedabad city taluka is prone to flood due to Sabarmati River/Dharoi Dam.

According to District Disaster Management Plan for Ahmedabad, 202130 developed by Gujarat State Disaster Management Authority (GSDMA), Daskroi tehsil, where the proposed project is located was affected with heavy rainfall in 2017. As per information available on public domain, there had been instance of flood in Ahmedabad city in 2022 heavy rainfall31,32.

Wind/Cyclone: According to the Building Materials & Technology Promotion Council (BMTPC), Government of India, the Project site is located in an area that experiences moderate wind velocities Vb= 39 m/s and the zone is classified as moderate damage risk zone for cyclones. The below ***Figure*** 5-24 presents the wind hazard map which indicates the project area lies in the moderate damage risk zone. Also, as per District Disaster Management Plan - Ahmedabad 2022, Ahmedabad District is in an area characterized by high wind speeds and is affected by cyclones. Ahmedabad district was affected due to cyclone Taukte (2021) and was also moderately affected by the cyclone Biparjoy in 2023.

Drought: According to District Disaster Management Plan - Ahmedabad 2022, last drought in Ahmedabad District occurred in the 2018-19, resulting in water scarcity in three talukas Viramgam, Detroj, Mandal. Project site is not under drought prone regions of Ahmedabad district.

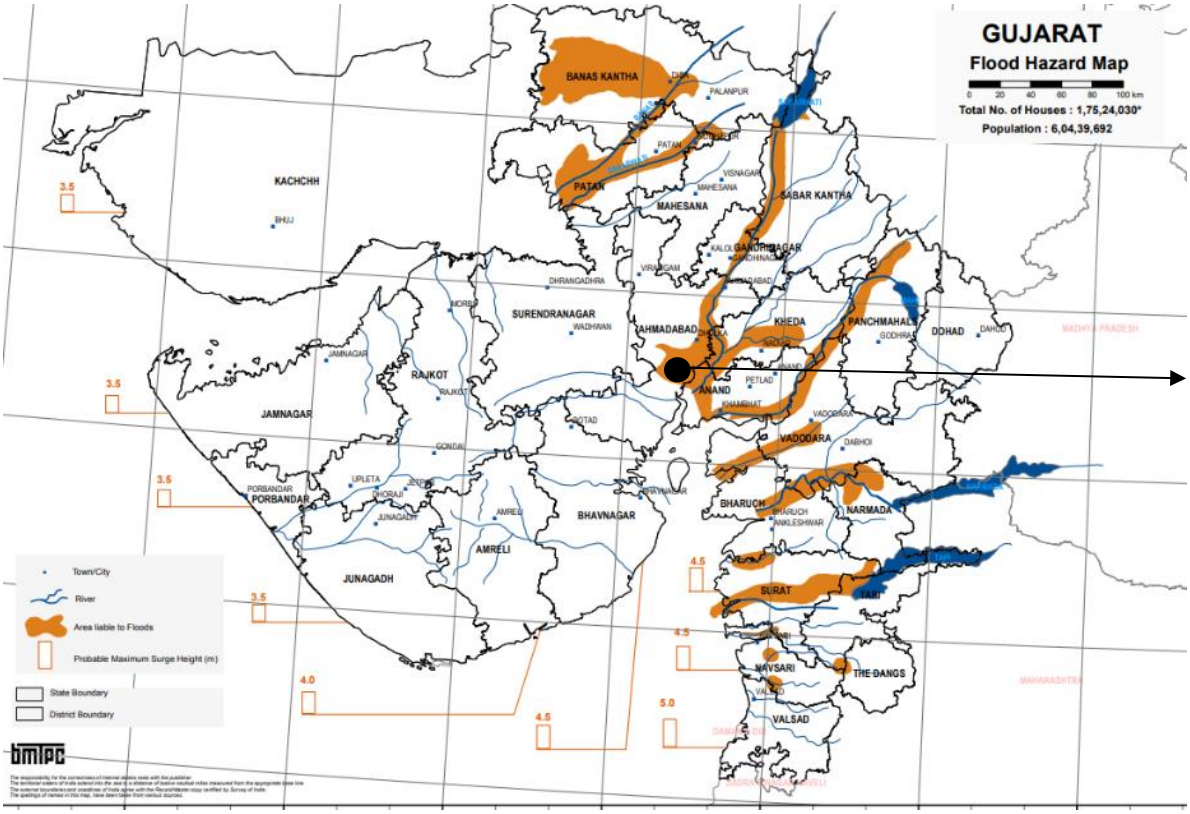
Figure 5-24 Map showing Wind Hazard of the Gujarat State



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

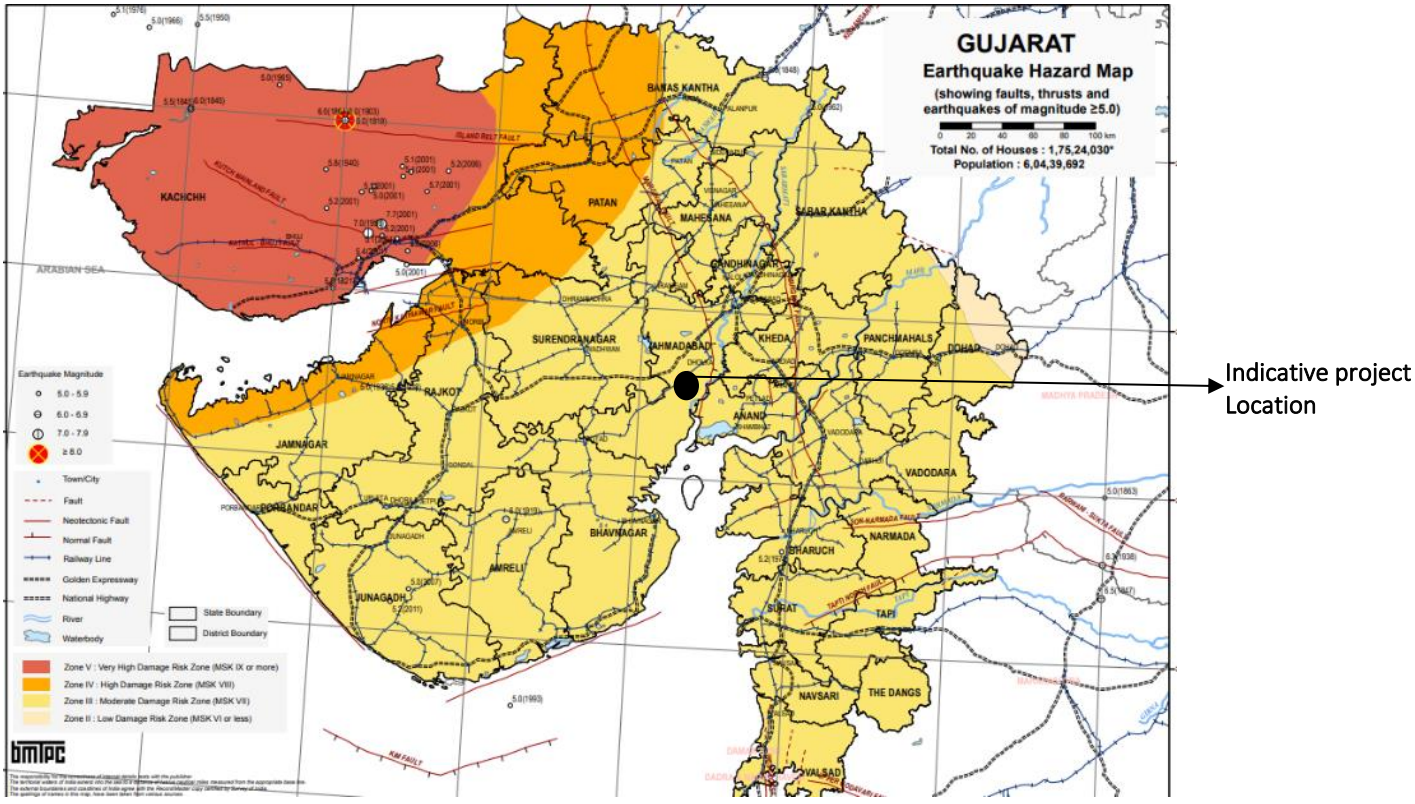
[30] https://ahmedabad.gujarat.gov.in/assets/downloads/District_Disaster_Management_Plan.pdf
[31] https://timesofindia.indiatimes.com/calamities/floods-in-ahmedabad/articleshow/101329964.cms?from=mdr
[32] https://www.outlookindia.com/national/heavy-rains-cause-flood-like-situation-in-gujarat-s-ahmedabad-photos-208512?photo-1

Figure 5-25 Map showing Flood Prone Areas



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

Figure 5-26 Map showing Earthquake Hazard of the Gujarat State



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

5.4 Socio-economic Baseline

5.4.1 Approach

For the purpose of establishing the social baseline for the Project and undertaking the scoping of social impact of the Project, a phased participatory approach was adopted. Through this approach an attempt was made to integrate the local understanding and perspective into the scoping 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 based on 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 necessary mitigation measures.

1.1.1 Study Area

In order to establish the social baseline for the project, data with respect of social development indicators was collected at three levels that is District , Sub district (Tehsil) and the villages / habitations falling under the study area. And for the better understanding and spread of the social development indicators the study area was further divided into core and buffer respectively:

- 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 5-28 provide the illustration of the study area.

5.4.2 Primary Data/ Information Collection/ Site Consultation

As part of the baseline collection process, consultations were undertaken with the local stakeholders identified for the project. The ***Table 5-17*** provides list of the consultation undertaken as part of the site visit.

Table 5-17 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	Interview with Ragpickers (No sample survey has been, the consultation was done based on the availability of the Ragpickers. During the site visit consultation with approximately 20 ragpickers has been done)	• Understand the number of families engaged in waste collection. • Waste collection process and average earning from ragpicking activity. • Social development indicators such as education, Income, and livelihood dependence of ragpickers on waste collection

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.

5.4.3 Review of Secondary Information

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 used is as follows (but not limited to):

- District Census Handbook, Ahmedabad
- District Human Development Report, 2016
- Primary Census Abstract data of India, 2011
- Village Directory Census Data of India, 2011
- Agriculture Contingency plan for Ahmedabad
- Performance Grading Index for Districts in India (PGI-D)
- Gender Profile Gujarat
- AMC & Other line Department website
- Google open sources

The Project is located in the state of Gujarat in the city of Ahmadabad. The subsequent subsections provides the baseline of the study area. The baseline sections provides the overall view of state, district and study area (Core & Buffer)

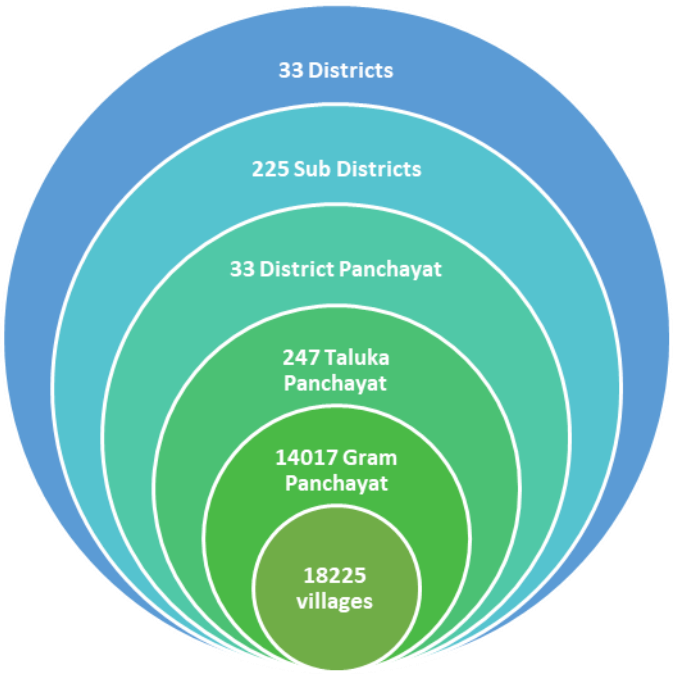
5.4.4 State Profile: Gujarat

Gujarat covers an area of 1,96,024 square kilometers (75,685 sq. mile) or 5.96 per cent of the total geographical area of India. The state is the largest Indian state by area and the seventh largest by population. Located on the western coast of India, has the longest coastline of 1,600 Km. It is bordered by Rajasthan to the northeast, Dadra and Nagar Haveli and Daman and Diu to the south, Maharashtra to the southeast, Madhya Pradesh to the east, and the Arabian Sea and the Pakistani province of Sindh to the west.

Gujarat has total 33 district, 225 tehsil, 33 district panchayats, 247 taluka panchayat, 14,017 Gram Panchayat and 18,225 Villages.

Figure 5-27 Administrative Structure of Gujarat

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.



Source: Primary Census Abstract data of India, 2011

The state comprises of a population of 1,96,244 household, which is pre-dominantly living in rural area (55.3 percent of the total households). The sex ratio in the state is 919, which is significantly lower than that of India which stands at 943 females per 1000 males.

The literacy rate of Gujarat is nearly 67.99 per cent which is lower than that of the country, at 74.04 per cent. The male literacy rate is relatively higher in the state, at 74.5 per cent and female literacy rate is 60.8 per cent are also lower than the national literacy rate of 82.14 % and 65.46%, respectively.

Table 5-18 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
Sex Ratio[33]	919
Child Sex Ratio	890

[33] It is the number of females per 1000 males.

Variables	Gujarat State
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)[34]	78.03
Male Literacy Rate (percentage)	85.75
Female Literacy Rate (percentage)	69.68

Source: Census of India 2011 data

5.4.5 District Profile: Ahmedabad

Per the census 2011, Ahmedabad had a population of 72,14,225 of which male and female were 37,88,051 and 34,26,174 respectively. In 2001 census, Ahmedabad had a population of 58,16,519 of which males were 30,74,556 and remaining 27,41,963 were females. Ahmedabad district population constitutes 11.93 per cent of total Gujarat population.

There was a change of 23.45 per cent in the total population compared to population as per 2001.

Table 5-19 District Profile

Variables	Ahmedabad District
Area (sq. km)	8,107
Total Population	72,14,225
Males	37,88,051
Female	34,26,174
Population Growth (percentage)[35]	84.04
Sex Ratio[36]	904
Child Sex Ratio (0-6 age)	857
Population density[37] (sq. km)	890
Total Child Population (0-6 Age)	842518
Male Population (0-6 Age)	453790
Female Population (0-6 Age)	388728
Total Literacy Rate[38] (percent)	85.31
Male Literacy Rate (percentage)	90.74
Female Literacy Rate (percentage)	79.35

5.4.5.1 Ahmedabad District Density

Per the census 2011, the density of the district for 2011 is 890 people per sq. km. In 2001, the district density was at 719 people per sq. km.

[34] It denotes ability to write a letter in any language.
[35] Population Growth from year 2001 to 2011
[36] It is the number of females per 1000 males.
[37] Population Density is a measurement of population per square kilometer
[38] It denotes ability to write a letter in any language. Literacy status assessment made for population 7 years and over.

5.4.5.2 Ahmedabad Literacy Rate

Average literacy rate of the district in 2011 was 85.31 compared to 79.5 of 2001. The male and female literacy were 90.74 and 79.35, respectively. For 2001 census, the male and female literacy rate stood at 87.3 and 70.8 respectively in the district. Total literates in the district in 2011 were 54,35,760 of which male and female were 30,25,463 and 24,10,297 respectively.

5.4.5.3 Ahmedabad Sex Ratio

With regards to sex ratio in Ahmedabad, it stood at 904 per 1000 male compared to 2001 census figure of 892. The average national sex ratio in India is 940 as per the census 2011 directorate.

5.4.5.4 Ahmedabad District urban/rural

According to the Census 2011, out of the total population of the district 15.95 percent lives in rural areas while 84.05 percent lives in urban areas. The total urban population in the district is 60,63,047 persons comprising 31,92,468 males and 28,70579 females. The total rural population in this district comes to 11,51,178 persons comprising 5,95,583 males and 5,55,595 females. The sex ratio for rural and urban areas of the district is 933 and 899 respectively, showing the higher sex ratio in rural areas. The sex ratio for the children of 0-6 years of age is 856 for the district. In rural areas this ratio is 894 while in urban areas the sex ratio of child population is 847 females per 1,000 males. The literacy rates of rural and urban areas are 61.07 and 78.05 percent respectively. The proportion of male and female literates in rural area is 71.01 and 50.41 percent. In urban areas this proportion is 81.51 and 74.20 percent.

As per the 2001 Census, out of the total population of the district, 19.8 percent lives in rural areas while 80.2 percent lives in urban areas. The total urban population in the district is 46,63,533 persons comprising 24,73,431 males and 21,90,102 females. The total rural population in this district comes to 11,52,986 persons comprising 6,01,125 males and 5,51,861 females. The sex ratio for the children of 0-6 years of age is 836 for the district. In rural areas this ratio is 877 while in urban areas the sex ratio of child population is 823 females per 1,000 males. The literacy rates of rural and urban areas are 62.3 and 83.6 per cent respectively. The proportion of male and female literates in rural area is 77.2 and 46.2 per cent. In urban areas this proportion is 89.7 and 76.8 per cent.

5.4.6 Tehsil Profile: Ahmedabad City

Ahmedabad City tehsil of the Ahmedabad district has a total population of 55,85,528 as per the Census 2011. Out of which 29,42,922 are males while 26,42,606 are females. There were a total 11,81,269 families residing in the Tehsil. The average sex ratio of the tehsil is 897 females per 1000 males.

The population of children of age 0-6 years in the tehsil is 6,21,829 which is 11.13% of the total population. There were 3,36,468 male children and 2,85,361 female children between the age of 0-6 years. Thus, as per the Census 2011, the child sex ratio of the tehsil is 848 which is lower than average child sex ratio (857) of the district.

The total literacy rate of the tehsil was 78.46% in 2011. The male literacy rate was 81.75% and the female literacy rate is 74.79% in the tehsil in 2011.

Table 5-20 Tehsil Profile

Variables	Ahmedabad City Tehsil
Total Population	55,85,528
Males	29,42,922
Female	26,42,606
Sex Ratio[39]	897
Total Literacy Rate[40] (percent)	78.46
Male Literacy Rate (percentage)	81.75
Female Literacy Rate (percentage)	74.79

[39] It is the number of females per 1000 males.
[40] It denotes ability to write a letter in any language. Literacy status assessment made for population 7 years and over.

Source: Primary Census Abstract data of India, 2011

5.4.6.1 Working Population – Ahmedabad City Tehsil

In the tehsil out of the total population, 19,54,050 (34.98 per cent of the total population) were engaged in work activities. 92.49% of workers describe their work as main work (employment of earning more than 6 months) while 7.51% were involved in marginal activity providing livelihood for less than 6 months. Of 18,07,450 workers engaged in main work, 9,057 were cultivators (owner or co-owner) while 9,767 were agricultural laborer.

Table 5-21 Ahmedabad City Tehsil - Working Profile

	Total	Male	Female
Main Workers	18,07,450	15,64,426	2,43,024
Cultivators	9,057	7,226	1,831
Agriculture Laborer	9,767	7,738	2,029
Household Industries	35,288	23,383	11,905
Other Workers	17,53,338	15,26,079	2,27,259
Marginal Workers	1,46,600	81,995	64,605
Non-Working	36,31,478	12,96,501	23,34,977

Source: Primary Census Abstract data of India, 2011

5.4.7 Tehsil Profile: Daskroi

Daskroi tehsil of the Ahmedabad district has a total population of 3,21,817 as per the Census 2011. Out of which 1,66,727 are males while 1,55,090 are females. There were a total 67,131 families residing in the Tehsil. The average sex ratio of the tehsil is 930 females per 1000 males.

The population of children of age 0-6 years in the tehsil is 42,904 which is 13.33% of the total population. There were 23,004 male children and 19,900 female children between the age of 0-6 years. Thus, as per the Census 2011, the child sex ratio of the tehsil is 865 which is higher than average child sex ratio (857) of the district.

The total literacy rate of the tehsil was 70.80% in 2011. The male literacy rate was 77.27% and the female literacy rate is 63.84% in the tehsil in 2011.

Table 5-22 Tehsil Profile

Variables	Daskroi Tehsil
Total Population	3,21,817
Males	1,66,727
Female	1,55,090
Sex Ratio[41]	930
Total Literacy Rate[42] (percent)	70.80
Male Literacy Rate (percentage)	77.27
Female Literacy Rate (percentage)	63.84

Source: Primary Census Abstract data of India, 2011

5.4.7.1 Working Population – Daskroi Tehsil

In the tehsil out of the total population, 1,18,355 (36.77 per cent of the total population) were engaged in work activities. 85.84% of workers describe their work as main work (employment of earning more than 6 months) while 14.16% were involved in marginal activity providing livelihood for less than 6 months. Of 1,01,607 workers engaged in main work, 19,355 were cultivators (owner or co-owner) while 21,817 were agricultural laborer.

[41] It is the number of females per 1000 males.
[42] It denotes ability to write a letter in any language. Literacy status assessment made for population 7 years and over.

Table 5-23 Working Profile

	Total	Male	Female
Main Workers	1,01,607	88,169	1,34,38
Cultivators	19,355	18,235	1,120
Agriculture Laborer	21,817	17,631	4,186
Household Industries	1,138	865	273
Other Workers	59,297	51,438	7,859
Marginal Workers	16,748	7,409	9,339
Non-Working	2,03,462	71,149	1,32,313

Source: Primary Census Abstract data of India, 2011

5.4.8 Tehsil Profile: Dhandhuka

Dhandhuka tehsil of the Ahmedabad district has a total population of 1,45,252 as per the Census 2011. Out of which 75,784 are males while 69,468 are females. There were a total 26,922 families residing in the Tehsil. The average sex ratio of the tehsil is 916 females per 1000 males.

The population of children of age 0-6 years in the tehsil is 18,969 which is 13.05% of the total population. There were 10,094 male children and 8,875 female children between the age of 0-6 years. Thus, as per the Census 2011, the child sex ratio of the tehsil is 879 which is higher than average child sex ratio (857) of the district.

The total literacy rate of the tehsil was 64.08% in 2011. The male literacy rate was 73.31% and the female literacy rate is 54.02% in the tehsil in 2011.

Table 5-24 Tehsil Profile

Variables	Dhandhuka Tehsil
Total Population	1,45,252
Males	75,784
Female	69,468
Sex Ratio[43]	916
Total Literacy Rate[44] (percent)	64.08
Male Literacy Rate (percentage)	73.31
Female Literacy Rate (percentage)	54.02

Source: Primary Census Abstract data of India, 2011

5.4.8.1 Working Population- Dhandhuka Tehsil

In the tehsil out of the total population, 58,585 (40.33 per cent of the total population) were engaged in work activities. 77.67% of workers describe their work as main work (employment of earning more than 6 months) while 22.33% were involved in marginal activity providing livelihood for less than 6 months. Of 45,505 workers engaged in main work, 9,430 were cultivators (owner or co-owner) while 19,567 were agricultural laborer.

Table 5-25 Dhandhuka Tehsil -Working Profile

	Total	Male	Female
Main Workers	45,505	37,307	81,98
Cultivators	9,340	8,675	665
Agriculture Laborer	19,567	14,321	5,246

[43] It is the number of females per 1000 males.
[44] It denotes ability to write a letter in any language. Literacy status assessment made for population 7 years and over.

	Total	Male	Female
Household Industries	495	364	131
Other Workers	16,103	13,947	2,156
Marginal Workers	13,080	4,942	8,138
Non-Working	86,667	33,535	53,132

Source: Primary Census Abstract data of India, 2011

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:

- 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 5-28* provide the illustration of the study area.

It must be noted that the water pipeline and transmission line pass through Ward 16 of AMC.

Table 5-26 Core Zone

S. No.	Core Zone	Tehsil	District
1	Ward 35, AMC	Ahmedabad City	Ahmedabad
2	Ward 46, AMC	Ahmedabad City	Ahmedabad

Source: Google Imagery

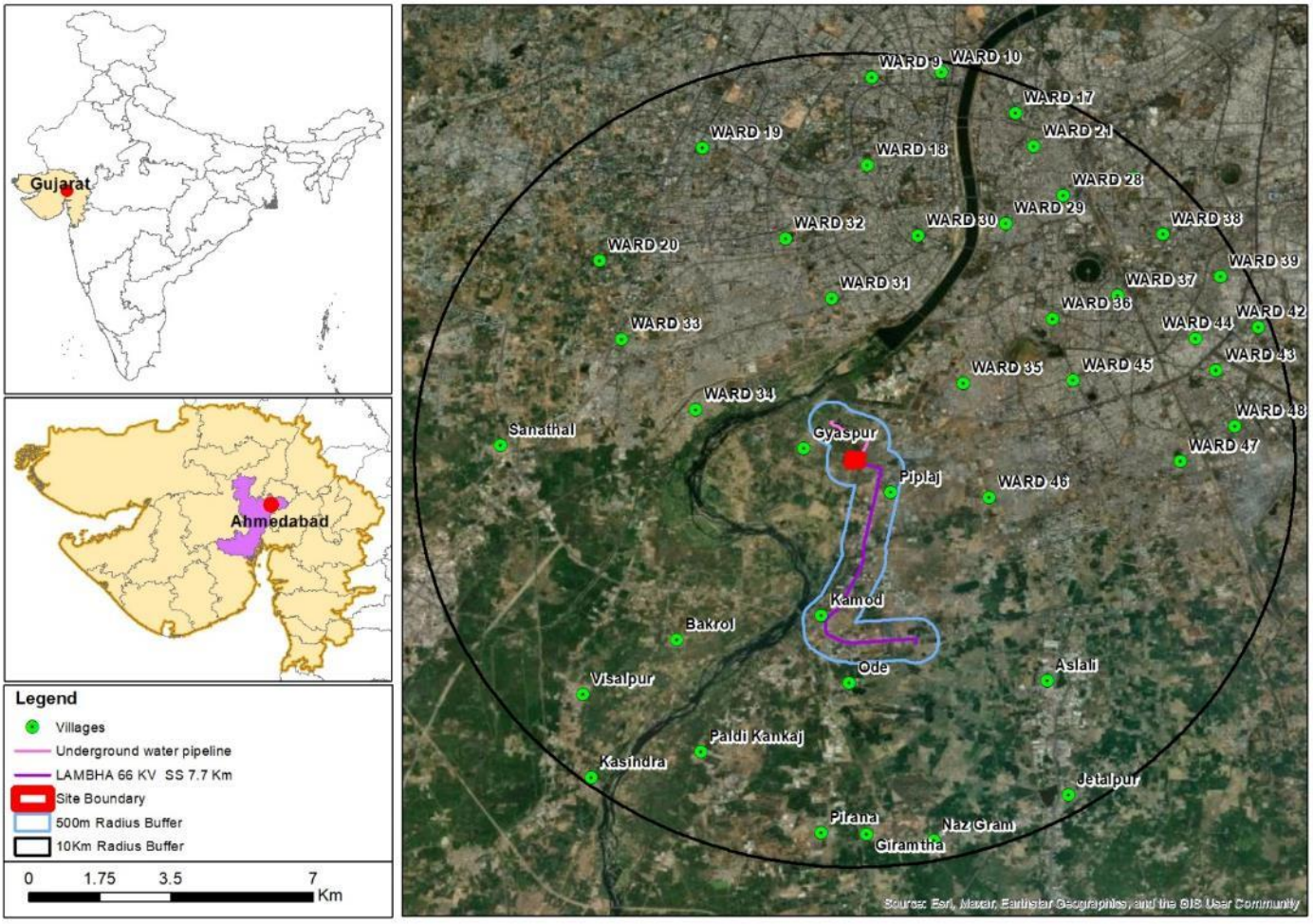
Table 5-27 Buffer Area

S. No.	Buffer Area	Tehsil	District
Ahmedabad Municipal Corporation			
1	Ward 8	Ahmedabad City	Ahmedabad
2	Ward 9	Ahmedabad City	Ahmedabad
3	Ward 10	Ahmedabad City	Ahmedabad
4	Ward 15	Ahmedabad City	Ahmedabad
5	Ward 16	Ahmedabad City	Ahmedabad
6	Ward 17	Ahmedabad City	Ahmedabad
7	Ward 18	Ahmedabad City	Ahmedabad
8	Ward 19	Ahmedabad City	Ahmedabad
9	Ward 20	Ahmedabad City	Ahmedabad

S. No.	Buffer Area	Tehsil	District
10	Ward 21	Ahmedabad City	Ahmedabad
11	Ward 27	Ahmedabad City	Ahmedabad
12	Ward 28	Ahmedabad City	Ahmedabad
13	Ward 29	Ahmedabad City	Ahmedabad
14	Ward 30	Ahmedabad City	Ahmedabad
15	Ward 31	Ahmedabad City	Ahmedabad
16	Ward 32	Ahmedabad City	Ahmedabad
17	Ward 33	Ahmedabad City	Ahmedabad
18	Ward 34	Ahmedabad City	Ahmedabad
19	Ward 36	Ahmedabad City	Ahmedabad
20	Ward 37	Ahmedabad City	Ahmedabad
21	Ward 38	Ahmedabad City	Ahmedabad
22	Ward 39	Ahmedabad City	Ahmedabad
23	Ward 42	Ahmedabad City	Ahmedabad
24	Ward 43	Ahmedabad City	Ahmedabad
25	Ward 44	Ahmedabad City	Ahmedabad
26	Ward 45	Ahmedabad City	Ahmedabad
27	Ward 47	Ahmedabad City	Ahmedabad
28	Ward 48	Ahmedabad City	Ahmedabad
Villages			
29	Shela	Dhandhuka	Ahmedabad
30	Visalpur	Daskroi	Ahmedabad
31	Paldi Kankaj	Daskroi	Ahmedabad
32	Giramtha	Daskroi	Ahmedabad
33	Aslali	Daskroi	Ahmedabad
34	Jetalpur	Daskroi	Ahmedabad
35	Gamdi	Daskroi	Ahmedabad

Source: Google Imagery

Figure 5-28 Figure Illustrating villages and wards falling under the Study Area



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 5-28 Demographic profile of study area

Villages/ Ward	No. of HH	Population	Average HH Size	Sex Ratio	% SC	% ST	% Lit	% F Lit
Core area								
Ward 35	29,817	1,37,543	4.61	833	12.72	0.82	74.91	69.05
Ward 46	26,320	1,20,137	4.56	867	3.57	1.26	78.64	74.77
Total core area	**56,137**	**2,57,680**	**4.59**	**850**	**8.15**	**1.04**	**76.77**	**71.91**
Buffer area								
Ahmedabad Municipal Corporation								
Ward 8	27,754	1,23,116	4.44	945	11.38	2.32	77.36	74.39
Ward 9	16,138	68,911	4.27	898	16.69	2.70	82.88	80.46

Villages/ Ward	No. of HH	Population	Average HH Size	Sex Ratio	% SC	% ST	% Lit	% F Lit
Ward 10	12,839	55,647	4.33	982	3.03	1.16	80.33	77.63
Ward 15	14,362	68,566	4.77	912	20.18	3.14	76.33	71.18
Ward 16	12,946	66,470	5.13	907	12.23	1.28	70.52	64.15
Ward 17	13,308	66,778	5.02	887	10.52	1.27	76.48	71.97
Ward 18	12,742	64,713	5.08	925	27.87	5.37	80.06	76.17
Ward 19	10,523	55,983	5.32	912	9.40	0.95	74.79	68.74
Ward 20	14,896	79,926	5.37	898	20.61	0.61	73.45	66.57
Ward 21	13,491	68,670	5.09	906	17.02	1.09	77.25	72.12
Ward 27	23,919	1,09,922	4.60	894	6.68	0.97	79.82	76.64
Ward 28	17,766	93,835	5.28	893	11.70	0.32	77.95	73.88
Ward 29	13,454	76,838	5.71	897	15.52	0.40	73.56	68.33
Ward 30	13,223	70,015	5.29	915	37.95	0.40	75.97	71.42
Ward 31	13,684	79,409	5.80	883	10.16	0.53	71.28	66.14
Ward 32	16,573	80,638	4.87	857	23.60	1.01	74.93	68.53
Ward 33	24,720	1,14,146	4.62	860	25.16	1.18	76.71	71.49
Ward 34	28,852	1,37,840	4.78	859	5.40	0.63	79.61	75.65
Ward 36	15,896	69,545	4.38	932	5.98	0.82	84.76	82.90
Ward 37	21,516	95,481	4.44	935	3.44	0.81	83.40	81.85
Ward 38	13,740	67,110	4.88	918	30.85	1.03	76.27	71.01
Ward 39	15,886	81,636	5.14	911	36.35	1.04	68.59	62.09
Ward 42	35,480	1,64,730	4.64	870	3.05	1.59	73.85	68.88
Ward 43	34,211	1,59,181	4.65	884	9.92	1.29	78.70	75.17
Ward 44	20,757	94,077	4.53	885	9.13	2.06	78.62	74.10
Ward 45	24,960	1,20,152	4.81	841	10.91	2.11	81.48	79.27
Ward 47	47,229	2,06,893	4.38	900	2.14	0.64	84.15	82.14
Ward 48	21,749	98,240	4.52	916	3.49	1.07	82.06	79.59
Villages								
Shela	256	1,515	5.92	891	0.13	0.07	68.25	52.94
Visalpur	912	4,508	4.94	944	4.99	2.64	69.63	62.86
Paldi Kankaj	896	4,751	5.30	884	9.32	2.32	67.67	59.80
Giramtha	856	4,151	4.85	943	15.47	4.22	71.07	64.42

Villages/ Ward	No. of HH	Population	Average HH Size	Sex Ratio	% SC	% ST	% Lit	% F Lit
Aslali	1,791	8,214	4.59	925	6.51	9.47	68.48	60.96
Jetalpur	1,326	6,516	4.91	910	12.66	5.03	72.42	67.05
Gamdi	332	1,533	4.62	921	15.79	2.41	69.80	61.09
Total Buffer area	**5,58,983**	**26,69,656**	**4.89**	**904**	**13.29**	**1.83**	**75.96**	**70.90**
Total Study area	**6,15,120**	**29,27,336**	**4.74**	**877**	**10.72**	**1.43**	**76.37**	**71.41**

Source: Census of India 2011 data

In the core area, Ward 35 has the highest number of households, with 29,817 households, while Ward 46 has the lowest, with 26,320 households. Consequently, Ward 35 boasts the highest population count, totaling 137,543 individuals, whereas Ward 46 has the lowest population count, with 120,137 residents.

When it comes to average household size, Ward 35 exhibits the highest value at 4.61, while Ward 46 maintains a slightly lower average household size of 4.56.

Regarding sex ratio, Ward 35 holds the record for the highest ratio at 833, while Ward 46 has a slightly higher sex ratio of 867.

In terms of social composition, Ward 35 has the highest percentage of Scheduled Caste population, accounting for 12.72%, whereas Ward 46 has a relatively lower percentage of 3.57%.

Similarly, Ward 35 also leads in the percentage of Scheduled Tribe population, with 0.82%, while Ward 46 has a relatively lower percentage of 1.26%.

Regarding literacy rates, Ward 46 boasts the highest percentage of literate individuals, standing at 78.64%, while Ward 35 has a slightly lower literacy rate of 74.91%.

However, when considering female literacy rates, Ward 46 maintains its position with the highest percentage of 74.77%, followed closely by Ward 35 with 69.05%.

In the buffer area under the Ahmedabad Municipal Corporation, Ward 30 has the highest number of households, with 33,281 households, while Shela has the lowest, with only 256 households. Despite its low population count, Shela has the highest average household size, standing at 5.92, whereas Ward 30 maintains a slightly lower average household size of 5.29.

When it comes to population, Ward 30 also leads with the highest count, totaling 148,894 individuals, while Shela remains at the lowest end with only 1,515 residents.

In terms of sex ratio, Ward 30 exhibits the highest ratio at 932, while Paldi Kankaj has the lowest, with 884.

Turning to social demographics, Ward 30 has the highest percentage of Scheduled Caste population, accounting for 37.95%, whereas Ward 38 has the lowest percentage at 30.85%.

Similarly, Ward 30 also boasts the highest percentage of Scheduled Tribe population, with 0.40%, while Ward 38 maintains the lowest percentage at 1.03%.

Overall, these comparisons highlight significant variations in demographic characteristics and socio-economic indicators between the different wards and villages within the study area.

Social Stratification

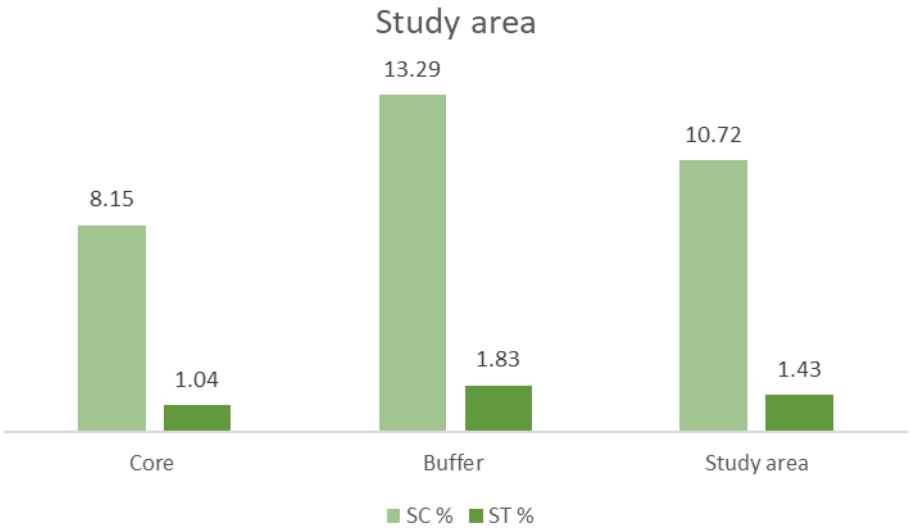
This section provides insights on the social stratification of study area, highlighting the scheduled caste and scheduled tribe populations present.

In the core area, the percentage of Scheduled Caste (SC) population is 8.15%, while in the buffer area, it is higher at 13.29%. However, the study area's SC population percentage falls between these two values, standing at 10.72%.

Similarly, regarding the percentage of Scheduled Tribe (ST) population, the core area has a relatively low value of 1.04%. In contrast, the buffer area exhibits a slightly higher percentage of 1.83%. The study area's ST population percentage falls between these two, at 1.43%.

These comparisons reveal variations in the distribution of Scheduled Caste and Scheduled Tribe populations across the core area, buffer area, and the study area, reflecting different socio-economic and demographic characteristics in these regions.

Figure 5-29 Proportion of SC/ST population in the villages of study area and the Tehsils



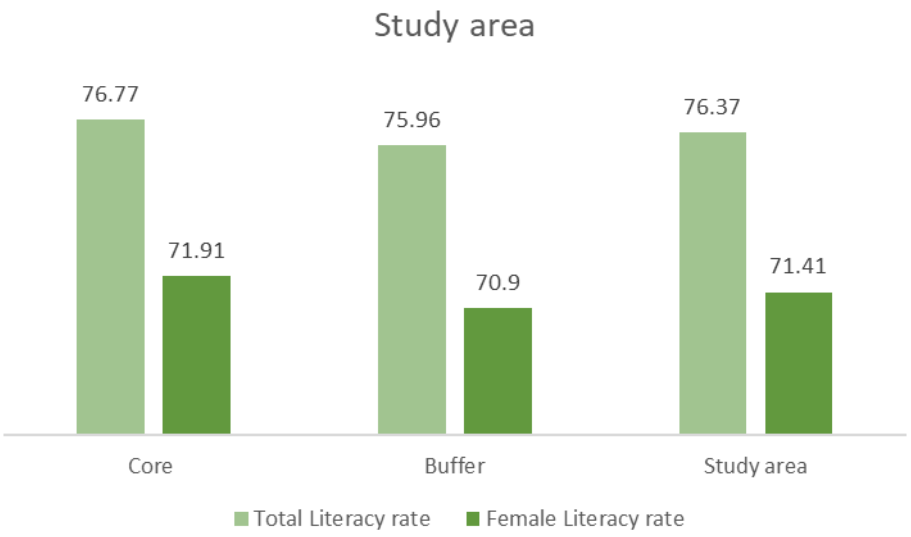
Source: Census of India 2011 data

Literacy and Education

In the core area, the total literacy rate stands at 76.77%, which is slightly higher than in the buffer area, where it is 75.96%. However, the overall study area's total literacy rate falls in between these values, at 76.37%.

For female literacy rates, the core area again shows a slightly higher percentage at 71.91%, compared to the buffer area's 70.90%. The study area's female literacy rate aligns closely with the core area, standing at 71.41%.

These comparisons indicate relatively similar literacy rates between the core and buffer areas, with the study area reflecting an overall literacy rate that is close to the average of both regions. However, slight variations exist, highlighting potential differences in educational access or initiatives between these areas.



Source: Census of India 2011 data

5.4.11 Land ownership and usage

This section presents an overview of the ownership and use of land in the study area, based on the census 2011.

Note – data for Land ownership and usage is not available for the wards in 2011 Census of India. However, data for buffer zone village are provided in ***Table 5-29***

Table 5-29 Land use pattern in buffer area villages

Name of the village	Total Geographical Area (in Hectares)	Forest Area[45] (in Hectares)	Area under Non-Agricultural Uses[46] (in Hectares)	Barren & Un-cultivable Land Area[47] (in Hectares)	Permanent Pastures and Other Grazing Land Area[48] (in Hectares)	Land Under Miscellaneous Tree Crops etc. Area[49] (in Hectares)	Culturable Waste Land Area[50] (in Hectares)	Fallows Land other than Current Fallows Area[51] (in Hectares)	Current Fallows Area[52] (in Hectares)	Net Area Sown[53] (in Hectares)
Buffer zone - villages										
Aslali	0.2	0%	0%	0%	0%	0%	0%	0%	0%	100%
Visalpur	1751.77	0%	6%	0%	7%	0%	15%	0%	4%	68%
Paldi Kankaj	1425.3	14%	7%	0%	18%	0%	0%	0%	0%	61%
Gamdi	512.49	0%	5%	0%	2%	0%	7%	0%	0%	85%

[45] Forest area is land under natural or planted stands of trees
[46] Areas under non-agricultural use include lands occupied by buildings, roads, and railways, or land under water
[47] This includes all land covered by mountains, deserts, etc.
[48] A permanent pasture is pastureland that is a result of natural growth
[49] This includes all cultivable land which is not included in 'Net area sown' but is put to some agricultural uses
[50] 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
[51] 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
[52] Cropped area which is kept fallow during the current year
[53] Net sown area represents the total area sown with crops and orchards

Name of the village	Total Geographical Area (in Hectares)	Forest Area[45] (in Hectares)	Area under Non-Agricultural Uses[46] (in Hectares)	Barren & Un-cultivable Land Area[47] (in Hectares)	Permanent Pastures and Other Grazing Land Area[48] (in Hectares)	Land Under Miscellaneous Tree Crops etc. Area[49] (in Hectares)	Culturable Waste Land Area[50] (in Hectares)	Fallows Land other than Current Fallows Area[51] (in Hectares)	Current Fallows Area[52] (in Hectares)	Net Area Sown[53] (in Hectares)
Jetalpur	1290.03	0%	1%	1%	1%	0%	0%	14%	0%	82%
Giramtha	735.72	0%	7%	8%	7%	0%	0%	0%	0%	78%
Shela	593.99	0%	1%	6%	7%	0%	0%	4%	0%	82%
Total	**6309.5**	**3%**	**5%**	**2%**	**8%**	**0%**	**5%**	**3%**	**1%**	**73%**

Source: Census of India 2011 data

In the buffer zone villages, the distribution of land usage varies significantly across different categories. Aslali, with a relatively small geographical area of 0.2 hectares, is entirely dedicated to net area sown, indicating its focus on agricultural activities. Visalpur, with the largest geographical area of 1751.77 hectares, demonstrates a more diverse land usage pattern. While a significant portion is under net area sown (68%), a considerable amount is also allocated to non-agricultural uses (6%) and permanent pastures and other grazing lands (7%). Paldi Kankaj, with 14% of its area designated as forest land, emphasizes a balance between agricultural and forested areas. Gamdi, Jetalpur, Giramtha, and Shela also exhibit varying degrees of land usage, with Jetalpur having the highest percentage of net area sown (82%) among them. Barren and uncultivable land, fallow land, and miscellaneous tree crops are distributed across the villages but to varying extents. Overall, while agriculture remains a predominant land use, the villages also allocate significant portions of land to non-agricultural purposes, grazing, and forest areas, reflecting the diverse land use needs within the buffer zone.

5.4.12 Occupational Profile

The following table provides a break-up of working population in the study area.

Table 5-30 Proportion and break-up of working population in the study area

Villages /Wards	Total Working Population (% of Total Population)	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 area								
Ward 35	35.47	94.66	91.57	8.43	5.34	54.41	45.59	64.53
Ward 46	35.27	91.98	89.12	10.88	8.02	53.50	46.50	64.73
Total core area	**35.37**	**93.32**	**90.34**	**9.66**	**6.68**	**53.96**	**46.04**	**64.63**
Buffer area								
Ahmedabad Municipal Corporation								
Ward 8	36.60	94.90	80.73	19.27	5.10	53.37	46.63	63.40

Villages /Wards	Total Working Population (% of Total Population)	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)
Ward 9	37.95	94.71	78.85	21.15	5.29	54.59	45.41	62.05
Ward 10	36.70	89.42	81.01	18.99	10.58	53.10	46.90	63.30
Ward 15	33.67	91.91	88.05	11.95	8.09	75.60	24.40	66.33
Ward 16	34.53	92.05	87.00	13.00	7.95	59.43	40.57	65.47
Ward 17	34.33	91.87	88.19	11.81	8.13	57.48	42.52	65.67
Ward 18	34.82	92.19	83.74	16.26	7.81	55.77	44.23	65.18
Ward 19	32.78	93.46	86.28	13.72	6.54	61.12	38.88	67.22
Ward 20	34.38	93.50	85.33	14.67	6.50	55.54	44.46	65.62
Ward 21	34.56	93.52	85.64	14.36	6.48	56.28	43.72	65.44
Ward 27	34.02	93.70	88.25	11.75	6.30	59.55	40.45	65.98
Ward 28	34.28	94.15	86.86	13.14	5.85	50.13	49.87	65.72
Ward 29	33.72	93.37	86.16	13.84	6.63	57.02	42.98	66.28
Ward 30	34.35	94.47	84.82	15.18	5.53	56.80	43.20	65.65
Ward 31	33.39	92.05	88.23	11.77	7.95	53.89	46.11	66.61
Ward 32	35.15	94.88	88.15	11.85	5.12	58.58	41.42	64.85
Ward 33	37.44	90.82	86.24	13.76	9.18	46.38	53.62	62.56
Ward 34	34.48	91.20	91.15	8.85	8.80	59.63	40.37	65.52
Ward 36	36.06	95.79	81.47	18.53	4.21	46.69	53.31	63.94
Ward 37	35.24	94.71	82.15	17.85	5.29	60.42	39.58	64.76
Ward 38	35.86	91.51	84.30	15.70	8.49	65.35	34.65	64.14
Ward 39	35.14	92.35	85.35	14.65	7.65	57.02	42.98	64.86
Ward 42	34.31	93.22	90.26	9.74	6.78	54.06	45.94	65.69
Ward 43	34.76	92.25	87.63	12.37	7.75	59.10	40.90	65.24
Ward 44	34.17	92.09	88.24	11.76	7.91	64.35	35.65	65.83
Ward 45	33.89	93.83	89.11	10.89	6.17	71.05	28.95	66.11
Ward 47	35.46	94.59	85.02	14.98	5.41	53.23	46.77	64.54
Ward 48	35.82	91.61	82.86	17.14	8.39	52.95	47.05	64.18
Villages								
Shela	50.89	90.66	66.95	33.05	9.34	9.72	90.28	49.11

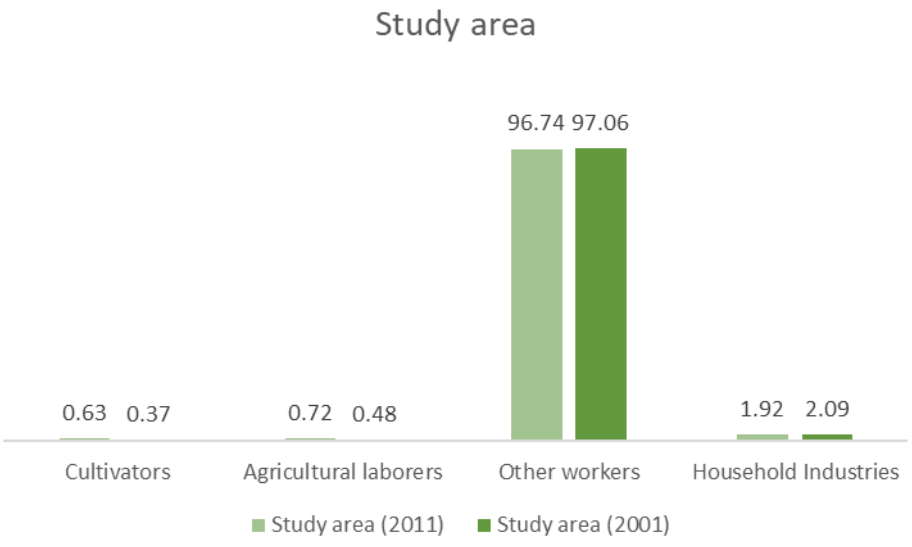
Villages /Wards	Total Working Population (% of Total Population)	Main worker (% of total working population)	Main work Male (% of WPR)	Main worker Female (% of WPR)	Marginal (% of total working population)	Marginal worker male (% of WPR)	Marginal worker female (% of WPR)	Non-working population (% of total population)
Visalpur	35.29	98.68	87.83	12.17	1.32	28.57	71.43	64.71
Paldi Kankaj	32.31	89.97	93.99	6.01	10.03	79.87	20.13	67.69
Giramtha	38.33	89.50	82.65	17.35	10.50	34.73	65.27	61.67
Aslali	34.75	91.17	88.16	11.84	8.83	25.40	74.60	65.25
Jetalpur	32.43	92.71	92.45	7.55	7.29	51.30	48.70	67.57
Gamdi	39.14	91.17	81.90	18.10	8.83	69.81	30.19	60.86
Total Buffer area	**35.46**	**92.80**	**85.57**	**14.43**	**7.20**	**54.51**	**45.49**	**64.54**
Total Study area	**35.41**	**93.06**	**87.96**	**12.04**	**6.94**	**54.23**	**45.77**	**64.59**

Source: Census of India 2011 data

An average of 35.41% of the total population in the study area are working. Thus, 64.59% of the total population constitute the non-working population.

According to ***Figure 5-30***, the data between the study areas in 2011 and 2001 reveals several notable shifts in labor distribution. Over this decade, there has been a discernible increase in the proportions of both cultivators and agricultural laborers, with the percentage of cultivators rising from 0.37% in 2001 to 0.63% in 2011, and agricultural laborers increasing from 0.48% to 0.72% during the same period. This suggests a potential emphasis on agricultural activities or a shift in workforce engagement towards these sectors. Conversely, there has been a slight decline in the proportions of other workers and household industries. The percentage of other workers decreased marginally from 97.06% to 96.74%, indicating a minor reallocation of labor away from this category. Similarly, the proportion of household industries saw a slight reduction from 2.09% to 1.92%, suggesting a slight decrease in engagement in household-based economic activities. Overall, these changes reflect subtle but discernible shifts in labor dynamics within the study areas, possibly influenced by various socio-economic factors and changes in the agricultural and industrial landscapes over the decade.

Figure 5-30 Distribution of main working population in the study area



Source: Census of India 2011 data

Working Profile of Ahmedabad City

- Economic Base:
  - Ahmedabad serves as an industrial hub for various sectors, including chemicals, textiles, drugs, pharmaceuticals, and agro-food processing industries.
  - Textiles and chemicals have been major areas of investment and employment in the district since the 1980s[54]
  - The city accounts for 21.5% of factories and employs 18% of workers in the state[55]
- Trade and Commerce
  - Historically, Ahmedabad has been a crucial center for trade and commerce in western India.
  - It contributes significantly to the Indian economy, with about 14% of total investments in all stock exchanges across the country and 60% of the state's productivity[56]

5.4.13 Physical Infrastructure

5.4.13.1 Water Supply and Sanitation

According to ICRIER report "Water Supply and Sanitation in Ahmedabad City", 2013,[57] Ahmedabad city has 4 water treatment plants, 143 water distribution stations, 250km of water trunk mains and a water distribution network spread across 3830 km, with a total water supply of 1060 MLD. 90% of the population in Ahmedabad Municipal corporation received water supply, out of which 90% use surface water and 10% use ground water. AMC undertakes disinfection treatment through Gas Chlorination Plants (141 No.s) at water distribution stations and dozers (287 Nos.) at isolated borewells.

In 2013, daily sewage generation was 800 MLD, from approximately 85% of the total AMC population covering 90% of the geographical area. AMC has a sewerage network spread across 1750km and a storm water drain network spread across 732 km. There are total 45 drainage pumping stations and 9 sewage treatment plants with total treatment capacity of 1075 MLD.

Note** – data for water supply is not available for the wards in 2011 Census of India, hence secondary data has been provided above. However, data for buffer zone village are provided in **Table 5-31.

Table 5-31 Water resource in buffer area villages

Name of the village	Tap Water-Treated	Covered Well Hand Pump	Tube Wells/Borehole	Spring	River/Canal	Tank/Pond/LakeOthers	
Buffer zone - villages							
Aslali	0	0	0	1	0	0	0	0
Visalpur	0	0	0	1	0	0	1	0
Paldi Kankaj	0	0	0	1	0	1	0	0
Gamdi	0	0	0	1	0	0	0	0
Jetalpur	0	0	1	1	0	1	1	0
Giramtha	0	0	0	1	0	0	1	0
Shela	0	0	0	0	0	0	1	0
Total	**0**	**0**	**1**	**6**	**0**	**2**	**4**	**0**

[54] globalgujarat.com/images/ahmedabad-district-profile.pdf (Accessed on February 5, 2024)
[55] globalgujarat.com/images/ahmedabad-district-profile.pdf (Accessed on February 5, 2024)
[56] AMC (ahmedabadcity.gov.in) (Accessed on February 5, 2024)
[57] https://icrier.org/pdf/ahemadbad_water.pdf

Source: Census of India 2011 data

In the buffer zone villages analyzed, access to various water sources varies considerably. Treated tap water and covered wells are entirely absent, indicating a reliance on alternative sources for water supply. The presence of hand pumps is limited to just one village, Jetalpur, suggesting a scarcity of this traditional water extraction method across the area. However, tube wells or boreholes emerge as the primary source of water across most villages, with only Shela lacking them. River or canal water is available in Jetalpur and Giramtha, while tanks, ponds, or lakes serve as water sources in Visalpur, Paldi Kankaj, Jetalpur, and Giramtha. Despite the absence of springs, these communities exhibit a diverse array of water sources, with tube wells/boreholes being the most prevalent, followed by tank/pond/lake water.

5.4.13.2 Road and Communication

As per the data Ahmedabad has grown in form of circular rings around the walled city area which is traditional central business district. The street network evolved historically as ring-radial form, comprising of 5 rings and 19 well defined radials: 11 in the west and 8 in the east. Ashram road, running along the river Sabarmati on the western side, acts as north south arbital. Total road network length within AMC area is 2399 Km (AMC diary, 2011).

The share of area under the roads constitutes 7.5% of the entire city area. Within the developed area, the area under roads is about 18%. This translates to an average road width of 12m and about 10 kms per sq.km of developed area.

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

5.4.13.3 Electrification

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

5.4.14 Social Infrastructure

5.4.14.1 Educational Infrastructure

Schools in Ahmedabad are run either by the AMC or privately by individuals and trusts. Majority of the schools are affiliated to the Gujarat Secondary and Higher Secondary Education Board (GSEB). Some schools like the Delhi Public School and the Kendriya Vidyalayas are associated with the Central Board for Secondary Education. Colleges in the city are affiliated to the Gujarat University and offer courses in Medicine, Arts, Science, Commerce, Law and Management. Engineering colleges of the city are affiliated to Gujarat Technological University. Other deemed universities in Ahmedabad are Ahmedabad University, Gujarat Vidyapeeth, Nirma University of Science & Technology and Dr. Babasaheb Ambedkar Open University. Ahmedabad is home to prestigious institutes like the Indian Institute of Management, National Institute of Design, Mudra Institute of Communications Ahmedabad, National Institute of Fashion Technology, the Center for Environmental Planning and Technology, and B.J. Medical College.

As per the AMC data city is divided into Zones. Currently Ahmedabad city is divided in to seven zones namely - Central, East, Northwest, Southwest, North, South & West Zones respectively. Currently there are 459 schools affiliated to Ahmedabad Municipal Corporation offering primary and secondary education in English, Hindi, Urdu & Gujarati languages.

Note *– data for education infrastructure is not available for the wards in 2011 Census of India, hence secondary data has been provided above. However, data for buffer zone village are provided in* ***Table 5-32***

Table 5-32 Educational infrastructure in the buffer area villages

Village Name	Government Pre - Primary School (Nursery/LKG/UKG)	Government Primary School	Government Middle School	Government Secondary School	Government Senior Secondary School
Buffer zone - villages					
Aslali	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
Visalpur	0	1	0	0	1
Paldi Kankaj	0	1	0	1	0
Gamdi	0	1	0	0	0
Jetalpur	0	1	0	0	0
Giramtha	0	1	0	0	0
Shela	0	1	0	0	0
Total	**0**	**7**	**0**	**1**	**1**

Source: Census of India 2011 data

In the buffer zone villages, access to government educational institutions varies across the different levels. Government pre-primary schools (Nursery/LKG/UKG) are absent in all villages, indicating a gap in early childhood education services. However, government primary schools are present in all villages, with each village having at least one. At the middle school level, there are no government institutions across the villages, highlighting a potential deficiency in educational infrastructure for students in the middle grades. At the secondary school level, there is only one government institution, located in Paldi Kankaj, suggesting limited access to government secondary education within the buffer zone. Similarly, there is only one government senior secondary school, which is located in Visalpur, further underscoring the scarcity of higher secondary education options. Overall, while primary education seems relatively accessible with government schools in all villages, there is a significant lack of provision for pre-primary, middle, and higher secondary education within the buffer zone.

5.4.14.2 Health Facilities and Health Seeking Behavior

The state government of Gujarat has a large Civil Hospital of more than 2000 beds in Ahmedabad city. The Employee State Insurance (ESI) Corporation of the Government of India administers its scheme through 50 ESI dispensaries and 2 ESI hospitals in Ahmedabad. Over and above the public healthcare facilities (offered by the AMC, State and Central Governments), Ahmedabad city also has a large network of more than 3000 private healthcare facilities. Most of the health facilities are confined to the original 100 sq. km area of Ahmedabad city, the additional area of 92 sq. km added to the city limits in 1986 is very poorly served.

Note *– data for health facility is not available for the wards in 2011 Census of India, hence secondary data has been provided above. However, data for buffer zone village are provided in table below.*

Table 5-33 Health facilities in the buffer area villages

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
Buffer zone									
Aslali	0	1	1	1	0	0	0	0	0
Visalpur	0	0	1	1	0	0	1	0	0
Paldi Kankaj	0	0	1	1	0	0	0	0	0
Gamdi	0	0	1	1	0	0	0	0	0

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
Jetalpur	0	1	1	1	0	0	0	0	0
Giramtha	0	0	1	1	0	0	0	0	0
Shela	0	0	0	0	0	0	0	0	0
Total	**0**	**2**	**6**	**6**	**0**	**0**	**1**	**0**	**0**

Source: Census of India 2011 data

In the buffer zone villages, the availability of healthcare facilities varies across different levels of service provision. Community Health Centers (CHCs) are notably absent in all villages, indicating a lack of centralized healthcare hubs within the immediate vicinity. However, Primary Health Centers (PHCs) are present in two villages, Jetalpur and Aslali, offering essential medical services at a more local level. At the Primary Health Sub Centre (PHSC) level, all villages except Shela have facilities, ensuring that basic healthcare needs are addressed within the community. Similarly, Maternity and Child Welfare Centers are available in all villages except Shela, emphasizing the importance placed on maternal and child health services. TB clinics and dispensaries are not present in any of the villages, suggesting potential gaps in specialized healthcare services and medication access. Moreover, veterinary hospitals and family welfare centers are scarce, with only one of each found in Visalpur and Paldi Kankaj, respectively. Non-government medical facilities outpatient services are entirely absent across all villages, indicating a reliance on government-run healthcare establishments for outpatient care. Overall, while primary healthcare services are relatively accessible through PHCs and PHSCs, there are notable deficiencies in specialized care, veterinary services, and non-government medical facilities within the buffer zone villages.

5.4.15 Brief Profile of Ragpickers

Based on the information provided by the project and from the secondary source (especially from AMC official website), the waste generated by Ahmedabad City is significantly higher than the waste requirement for the WTE plant. With a waste generation of ~4,000 tonnes per day and a requirement of 1,000 tonnes per day for the project, there is still a substantial amount of waste that needs to be dumped at Ahmedabad landfill site.

The waste will continue to be dumped at the landfill area where approximately 1,000 ragpickers are collecting recyclable waste from freshly dumped waste. Given that there is sufficient waste available at the landfill site, it is envisaged that the ragpickers will continue their activities without being economically displaced due to the development of the WTE plant.

Provided the below the brief socio-economic profile of ragpickers:

Aspects	Description
Total Number of Ragpickers involved in rag picking	~1000 ragpickers
Demography of the family of ragpickers	On average, the household size comprises 4-5 individuals. Ragpicker households typically consist of nuclear families, including a husband, wife, and their children. It is noteworthy that all ragpickers belong to the Schedule Caste (SC), Schedule Tribe (ST) and Other Backward Class (OBC).
Migration	Majority of the ragpickers have migrated from Madhya Pradesh, Rajasthan, and Uttar Pradesh to Gujarat in search of better income opportunities. Reportedly, in Ahmedabad for majority of ragpickers rag picking is the primary occupations this due to the sufficient amount of waste generated by the Ahmedabad city.
Literacy among the family	Majority of the family members of ragpickers are illiterate.
Number of years since involved in rag picking	10-15 years

<table>
<tr><th>Aspects</th><th>Description</th></tr>
<tr><td>Average income from repicking</td><td>The income of ragpickers is primarily derived from the sale of the collected recyclable materials. The value of the recyclables can vary depending on market demand, material type, and overall quality. On average, ragpickers earns ranging from INR 10,000 to INR 15,000 per month income ranging from INR 1,500 to INR 2,000 based on the quantity and quality of recyclables they collect. Provide below the selling prices of recyclables collected by ragpickers:
<table>
<tr><th>Type of Recyclables</th><th>Selling Price (INR/kg)</th></tr>
<tr><td>Hair</td><td>4,000</td></tr>
<tr><td>Plastic bottles</td><td>23</td></tr>
<tr><td>Used milk plastic packets</td><td>13</td></tr>
<tr><td>Corrugated box</td><td>19-20</td></tr>
<tr><td>Used Cement bags</td><td>8</td></tr>
<tr><td>Aluminum</td><td>200</td></tr>
<tr><td>Copper</td><td>1,000</td></tr>
<tr><td>Iron</td><td>27</td></tr>
<tr><td>Shoe soles</td><td>14</td></tr>
</table></td></tr>
<tr><td>Process of collection of waste and selling by Ragpickers</td><td>• Sorting and segregation: Once at the landfill, ragpickers sort through the waste and segregate different types of recyclable materials. They use their expertise and experience to identify and separate items that can be sold or recycled. This process involves manually picking and separating materials by hands.
• Collection and Storage: Ragpickers collect the sorted recyclable materials and store them in bags, sacks or carts they carry with them. They often use basic tools such as hooks, gloves, or trolleys to facilitate the collection and transportation of the waste.</td></tr>
<tr><td>Stoppage in rag picking activities</td><td>As informed, there is no stoppage of rag picking activities at the landfill.</td></tr>
<tr><td>Accessibility of health infrastructure</td><td>All the ragpickers are going to the government owned hospital at the Ahmedabad to avail the health facilities.</td></tr>
</table>

Further, based on the secondary data research[58][59][60], in Ahmedabad, the city's ragpickers face unique challenges. The challenges can be observed based on the ragpickers' stories:

1. **Bharti (20 years old):**
    a. Bharti comes from a family of ragpickers. They work together at the Pirana dumpsite in Ahmedabad.
    b. Their daily routine involves collecting all kinds of materials: plastic, glass, toys, bottles, aluminum, and even human hair.
    c. Accidents are common; sharp glass pieces often cause injuries. They use old cloth scraps to wrap wounds.
    d. Despite the tiring work and health risks, Bharti's family has no other option. Education was never an option for the; they were born into this life of sorting waste.
2. **Freedom Amidst Hard Work:**
    a. Another ragpicker, who workers as a farmer in the village of Sanand, moved to Ahmedabad's Kodiyarnagar slum area.
    b. She and her sister started rag picking at the Pirana Dumpsite, where all garbage is piled onto one huge hill.

[58] On 55m-high hell, life goes on for 1,000 ragpickers | Ahmedabad News - Times of India (indiatimes.com) (Accessed on March 22, 2024)
[59] Woman rag-pickers on the rise: Survey | Ahmedabad News - Times of India (indiatimes.com) (Accessed on March 22, 2024)
[60] The ragpickers of Ahmedabad | Arianne Gijsenbergh (Accessed on March 22, 2024)

   c. The work is hot and heavy, but she values the freedom it provides compared to the competition in the city.
   d. Education was never a priority for her family, and rag picking became a way of life.
3. Life on the 55 meters – High Hill:
   a. Around 1,000 ragpickers spend nearly 11 hours daily at the towering Pirana dumpsite in Ahmedabad.
   b. They collect plastic, bottles, iron, and other scrap material, earning modest incomes ranging from INR 10,000 to 12,000 per month.
4. Rising Women Ragpickers:
   a. More women from backward classes are turning to rag picking in Ahmedabad's southern suburbs and urban areas.

5.5 Ecological Baseline

Between the dates of 14th to 15th May 2023, ecological survey was undertaken with the aim of establishing a baseline understanding of the study area's ecosystem. The primary objective of this endeavour was to assess and determine the potential effects that project-related activities could have on the species and habitats located nearby surroundings of the project site. The information gathered from this survey was used to identify appropriate mitigation and management strategies to minimize any adverse impacts.

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.
- 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

In order to gain insights into the current ecological conditions of the study area, an ecological baseline was established. This baseline was developed by utilizing information obtained through two key methods: 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 for 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. Additionally, a comprehensive list of the floral and faunal species was compiled, accompanied by their respective conservation statuses according to the International Union for Conservation of Nature (IUCN) and their designation within the list of scheduled species as outlined in the Wildlife (Protection) Act of 1972. This compilation was based on the analysis of secondary data collected during the literature review phase. Furthermore, the primary habitats within and in the vicinity of the project site were determined through a combination of on-site ground observations, analysis of Google Earth imagery, and examination of other relevant secondary data sources. These efforts aimed to identify the dominant ecological zones and provide a comprehensive understanding of the surrounding habitat composition. Moreover, available information was utilized to identify internationally and/or nationally recognized wildlife migratory corridors as well as avian migratory routes.

5.5.2.2 Field Data Collection

A field survey was undertaken during the 13th to 15th May 2023 to assess the current ecological conditions, encompassing habitats, flora, and fauna, within the designated study area. This baseline data serves as a crucial foundation for effectively evaluating the potential impacts of the project on the local ecology and enables the

formulation of suitable mitigation strategies. During the survey, special attention was given to habitats with the potential to support significant biodiversity, such as forest patches, scrubs, and water bodies.

5.5.2.1.1 Habitat Survey

The various habitats present in the study area, including both natural and modified as identified in the desktop review, were verified during on-site visits. Detailed data pertaining to the type and quality of each habitat, particularly in relation to the flora and fauna it sustains, was systematically collected.

5.5.2.1.2 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.

5.5.2.1.3 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 was typically obtained from the authentic sources[61,62],

5.5.3 Ecological Baseline – Results

5.5.3.1 Literature Review - eBird Database

Historical data concerning the occurrence of avian species in the region was retrieved from the eBird Database[63,64]. The database revealed the presence of a minimum of 366 avifauna species in the Ahmedabad region. The primary aim of extracting this information was to investigate the prevalence of IUCN threatened birds, including vultures, raptors, and migratory bird species in the designated area.

The eBird Database indicates the presence of Three (3) Critically Endangered **CR** (Indian Vulture *Gyps indicus*, Lesser Florican *Sypheotides indicus* and White-rumped *Vulture Gyps bengalensis*), Three (3) Endangered **EN** (Egyptian Vulture *Neophron percnopterus*, Saker Falcon *Falco cherrug* and Steppe Eagle *Aquila nipalensis*) and 11 Vulnerable **VL**, (Common Pochard *Aythya ferina*, Greater Spotted Eagle *Clanga*, Imperial Eagle *Aquila heliacal*, Indian Spotted Eagle *Clanga hastata*, Lesser White-fronted Goose *Anser erythropus*, Macqueen's Bustard *Chlamydotis macqueenii*, Red-breasted Goose *Branta ruficollis*, River Tern *Sterna aurantia*, Sarus Crane *Antigone*, Sociable Lapwing *Vanellus gregarious* and Tawny Eagle *Aquila rapax*) and 16 Near Threatened **NT** (Alexandrine Parakeet *Psittacula eupatria*, Asian Woolly-necked Stork *Ciconia episcopus*, Black-headed Ibis *Threskiornis melanocephalus*, Black-necked Stork *Ephippiorhynchus asiaticus*, Black-tailed Godwit *Limosa limosa*, Cinereous Vulture *Aegypius monachus*, Dalmatian Pelican *Pelecanus crispus*, Eurasian Curlew *Numenius arquata*, Ferruginous Duck *Aythya nyroca*, Great Thick-knee *Esacus recurvirostris*, Himalayan Griffon *Gyps himalayensis* Laggar Falcon *Falco jugger*, Lesser Flamingo *Phoeniconaias minor*, Oriental Darter *Anhinga melanogaster*, Painted Stork *Mycteria leucocephala*, Pallid Harrier *Circus macrourus*) the IUCN Red List of Threatened Species. Version 2022-2.

Along with IUCN threatened list, 44 species which are listed under Schedule-I (Amur Falcon *Falco amurensis*, Barn Owl *Tyto alba*, Black Kite *Milvus migrans*, Bonelli's Eagle *Aquila fasciata*, Booted Eagle *Hieraaetus pennatus*, Brahminy Kite *Haliastur indus*, Cinereous Vulture *Aegypius monachus*, Common Buzzard *Buteo*, Common Crane *Grus grus*, Common Pochard *Aythya ferina*, Cotton Pygmy-Goose *Nettapus coromandelianus*, Demoiselle Crane *Anthropoides virgo*, Egyptian Vulture *Neophron percnopterus*, Eurasian Griffon *Gyps fulvus*, Eurasian Marsh-Harrier *Circus aeruginosus*, Eurasian Moorhen *Gallinula chloropus*, Eurasian Sparrowhawk *Accipiter nisus*, Eurasian Spoonbill *Platalea leucorodia*, Eurasian Wigeon *Mareca penelope*, Ferruginous Duck *Aythya nyroca*, Greater Spotted Eagle *Clanga*, Gull-billed Tern *Gelochelidon nilotica*, , Himalayan Griffon *Gyps himalayensis,* Imperial Eagle *Aquila heliaca*, Indian Peafowl *Pavo cristatus*, Indian Spotted Eagle *Clanga hastata*, Indian Vulture *Gyps indicus*, Laggar Falcon *Falco jugger*, Lesser Florican *Sypheotides indicus*, Lesser White-fronted Goose *Anser erythropus*, Macqueen's Bustard *Chlamydotis macqueenii*, Osprey *Pandion haliaetus*, Pallid Harrier

[61] 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
[62] Menon, V. (2014) Indian Mammals: A Field Guide. Hachette, India
[63] https://ebird.org/region/IN-GJ-AH?yr=all (accessed on 1st August 2023)
[64] https://www.inaturalist.org/check_lists/34909-Ahmadabad-Check-List

Circus macrourus, Red-breasted Goose *Branta ruficollis*, River Tern *Sterna aurantia*, Rock Eagle-Owl *Bubo bengalensis*, Saker Falcon *Falco cherrug*, Sarus Crane *Antigone antigone,* Short-eared Owl *Asio flammeus*, Short-toed Snake-Eagle *Circaetus gallicus*, Sociable Lapwing *Vanellus gregarius*, Steppe Eagle *Aquila nipalensis*, Tawny Eagle *Aquila rapax,* and White-rumped Vulture *Gyps bengalensis*) according to the Wildlife Protection Act 1972 were reported.

As per the database, at least 111 migratory birds among them one (1) Endangered **EN** (Saker Falcon *Falco cherrugl*), Six (6) Vulnerable **VL** Common Pochard *Aythya ferina,* Imperial Eagle *Aquila heliacal,* Lesser White-fronted Goose *Anser erythropus,* Macqueen's Bustard *Chlamydotis macqueenii,* Red-breasted Goose *Branta ruficollis* and Sociable Lapwing *Vanellus gregarius*), Seven (7) Near Threatened **NT** (Black-tailed Godwit *Limosa limosa*, Cinereous Vulture *Aegypius monachus*, Dalmatian Pelican *Pelecanus crispus*, Eurasian Curlew *Numenius arquata*, Ferruginous Duck *Aythya nyroca*, Lesser Flamingo *Phoeniconaias minor* and Pallid Harrier *Circus macrourus*) were reported.

31 birds of prey (Raptors) were reported in the region, among them two (2) are Endangered **EN** (Saker Falcon *Falco cherrug* and Steppe Eagle *Aquila nipalensis*), four (4) are Vulnerable **VL** (Greater Spotted Eagle *Clanga clanga*, Imperial Eagle *Aquila heliacal*, Indian Spotted Eagle *Clanga hasghtata,* Tawny Eagle *Aquila rapax*), and two (2) are Near Threatened **NT** (*Laggar Falcon Falco jugger and Pallid Harrier Circus macrourus*) as per the IUCN Red List of Threatened Species. Version 2022-2.

Other than the common raptors, 6 vultures also reported from the region, among them two (2) are Critically Endangered **CR** (Indian Vulture *Gyps indicus* and White-rumped Vulture *Gyps bengalensis*) and one (1) is Endangered (Egyptian Vulture *Neophron percnopterus*) and one (1) is Near Threatened **NT** (Cinereous Vulture *Aegypius monachus*) *the IUCN Red List of Threatened Species. Version 2022-2.*

Table 5-34 Threatened and Near Threatened birds reported from the region

S.N.	Common English Name	Binomial Scientific Name	Migratory/Resident	IUCN Red List - Categories	Wildlife (Protection) Act - Schedules
1	Alexandrine Parakeet	*Psittacula eupatria*	R	Near Threatened	Schedule II
2	Asian Woolly-necked Stork	*Ciconia episcopus*	R	Near Threatened	Schedule II
3	Black-headed Ibis	*Threskiornis melanocephalus*	R	Near Threatened	Schedule II
4	Black-necked Stork	*Ephippiorhynchus asiaticus*	R	Near Threatened	Schedule II
5	Black-tailed Godwit	*Limosa*	M	Near Threatened	Schedule II
6	Cinereous Vulture	*Aegypius monachus*	M	Near Threatened	Schedule I
7	Common Pochard	*Aythya ferina*	M	Vulnerable	Schedule I
8	Dalmatian Pelican	*Pelecanus crispus*	M	Near Threatened	Schedule II
9	Egyptian Vulture	*Neophron percnopterus*	R	Endangered	Schedule I
10	Eurasian Curlew	*Numenius arquata*	M	Near Threatened	Schedule II
11	Ferruginous Duck	*Aythya nyroca*	M	Near Threatened	Schedule I
12	Great Thick-knee	*Esacus recurvirostris*	R	Near Threatened	Schedule II
13	Greater Spotted Eagle	*Clanga*	R	Vulnerable	Schedule I
14	Himalayan Griffon	*Gyps himalayensis*	M	Near Threatened	Schedule I
15	Imperial Eagle	*Aquila heliaca*	M	Vulnerable	Schedule I

S.N.	Common English Name	Binomial Scientific Name	Migratory/Resident	IUCN Red List - Categories	Wildlife (Protection) Act - Schedules
16	Indian Spotted Eagle	*Clanga hastata*	R	Vulnerable	Schedule I
17	Indian Vulture	*Gyps indicus*	R	Critically Endangered	Schedule I
18	Laggar Falcon	*Falco jugger*	R	Near Threatened	Schedule I
19	Lesser Flamingo	*Phoeniconaias minor*	M	Near Threatened	Schedule II
20	Lesser Florican	Sypheotides indicus	R	Critically Endangered	Schedule I
21	Lesser White-fronted Goose	*Anser erythropus*	M	Vulnerable	Schedule I
22	Macqueen's Bustard (Houbara Bustard)	Chlamydotis macqueenii	M	Vulnerable	Schedule I
23	Oriental Darter	*Anhinga melanogaster*	R	Near Threatened	Schedule II
24	Painted Stork	*Mycteria leucocephala*	R	Near Threatened	Schedule II
25	Pallid Harrier	*Circus macrourus*	M	Near Threatened	Schedule I
26	Red-breasted Goose	*Branta ruficollis*	M	Vulnerable	Schedule I
27	River Tern	*Sterna aurantia*	R	Vulnerable	Schedule I
28	Saker Falcon	Falco cherrug	M	Endangered	Schedule I
29	Sarus Crane	*Antigone antigone*	R	Vulnerable	Schedule I
30	Sociable Lapwing	Vanellus gregarius	M	Vulnerable	Schedule I
31	Steppe Eagle	*Aquila nipalensis*	R	Endangered	Schedule I
32	Tawny Eagle	*Aquila rapax*	R	Vulnerable	Schedule I
33	White-rumped Vulture	*Gyps bengalensis*	R	Critically Endangered	Schedule I

Table 5-35 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	Amur Falcon	*Falco amurensis*	R	Least Concern	Schedule I
2	Barn Owl	*Tyto alba*	R	Least Concern	Schedule I
3	Booted Eagle	*Hieraaetus pennatus*	M	Least Concern	Schedule I
4	Common Buzzard	*Buteo buteo*	R	Least Concern	Schedule I
5	Crested Serpent-Eagle	*Spilornis cheela*	R	Least Concern	Schedule II
6	Eurasian Kestrel	*Falco tinnunculus*	M	Least Concern	Schedule II
7	Eurasian Marsh-Harrier	*Circus aeruginosus*	M	Least Concern	Schedule I

S.N.	Common English Name	Binomial Scientific Name	Migrant (M) / Resident (R)	IUCN Red List - Categories	Wildlife (Protection) Act - Schedules
8	Greater Spotted Eagle	*Clanga clanga*	R	Vulnerable	Schedule I
9	Hen Harrier	*Circus cyaneus*	R	Least Concern	Schedule II
10	Imperial Eagle	*Aquila heliaca*	M	Vulnerable	Schedule I
11	Indian Scops-Owl	*Otus bakkamoena*	R	Least Concern	Schedule II
12	Indian Spotted Eagle	*Clanga hastata*	R	Vulnerable	Schedule I
13	Laggar Falcon	*Falco jugger*	R	Near Threatened	Schedule I
14	Long-legged Buzzard	*Buteo rufinus*	M	Least Concern	Schedule II
15	Montagu's Harrier	*Circus pygargus*	M	Least Concern	Schedule II
16	Mottled Wood-Owl	*Strix ocellata*	R	Least Concern	Schedule II
17	Oriental Honey-buzzard	*Pernis ptilorhynchus*	R	Least Concern	Schedule II
18	Osprey	*Pandion haliaetus*	R	Least Concern	Schedule I
19	Pallid Harrier	*Circus macrourus*	M	Near Threatened	Schedule I
20	Pallid Scops-Owl	*Otus brucei*	R	Least Concern	Schedule II
21	Peregrine Falcon	*Falco peregrinus*	M	Least Concern	Schedule II
22	Red-necked Falcon	*Falco chicquera*	R	Least Concern	Schedule II
23	Rock Eagle-Owl (Indian Eagle-Owl)	*Bubo bengalensis*	R	Least Concern	Schedule I
24	Saker Falcon	*Falco cherrug*	M	Endangered	Schedule I
25	Shikra	*Accipiter badius*	R	Least Concern	Schedule II
26	Short-eared Owl	*Asio flammeus*	R	Least Concern	Schedule I
27	Short-toed Snake-Eagle	*Circaetus gallicus*	R	Least Concern	Schedule I
28	Spotted Owlet	*Athene brama*	R	Least Concern	Schedule II
29	Steppe Eagle	*Aquila nipalensis*	R	Endangered	Schedule I
30	Tawny Eagle	*Aquila rapax*	R	Vulnerable	Schedule I
31	White-eyed Buzzard	*Butastur teesa*	R	Least Concern	Schedule II

Table 5-36 Vultures 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	Cinereous Vulture	*Aegypius monachus*	M	Near Threatened	Schedule I
2	Egyptian Vulture	*Neophron percnopterus*	R	Endangered	Schedule I
3	Eurasian Griffon	*Gyps fulvus*	M	Least Concern	Schedule I
4	Himalayan Griffon	*Gyps himalayensis*	R	Near Threatened	Schedule I
5	Indian Vulture	*Gyps indicus*	R	Critically Endangered	Schedule I
6	White-rumped Vulture	*Gyps bengalensis*	R	Critically Endangered	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 [65](Agriculture lands, river, open scrub, & water bodies), and modified habitats (agricultural lands, & plantations). The distribution of identified habitats within the study area can be seen in ***Table 5-37.*** Photographs of these habitats have been presented in ***Figure 5.32***.

Table 5-37 Area covered by different habitats

Natural Habitat	Area covered		Modified habitat	Area covered	
Landuse	Area (Sqkm)	%	Landuse	Area (Sqkm)	%
River	12.7018	4.05	Agricultural Land	113.9544	36.36
Open Scrub Land	13.0327	4.16	Settlements	151.0156	48.19
Waterboy	4.1845	1.34	Canal	4.346	1.39
Total	29.919	9.55	Roads	11.6219	3.71
			Railway Line	2.5458	0.81
			Total	283.4837	54.09
Total area including Natural and Modified habitats= **313.40 Km2**					

[65] Natural habitats should not be perceived as completely untouched or pristine environments. It is probable that a significant portion of habitats classified as natural has experienced some level of historical or recent human influence. The crucial consideration is the extent of this impact. If, in the assessment of a qualified professional, the habitat predominantly retains the essential features and functions of native ecosystems, it should be acknowledged as a natural habitat, irrespective of any degree of degradation or the existence of invasive alien species, secondary forests, human settlements, or other alterations induced by human activities.

Figure 5-31 Distribution of habitats in the study area

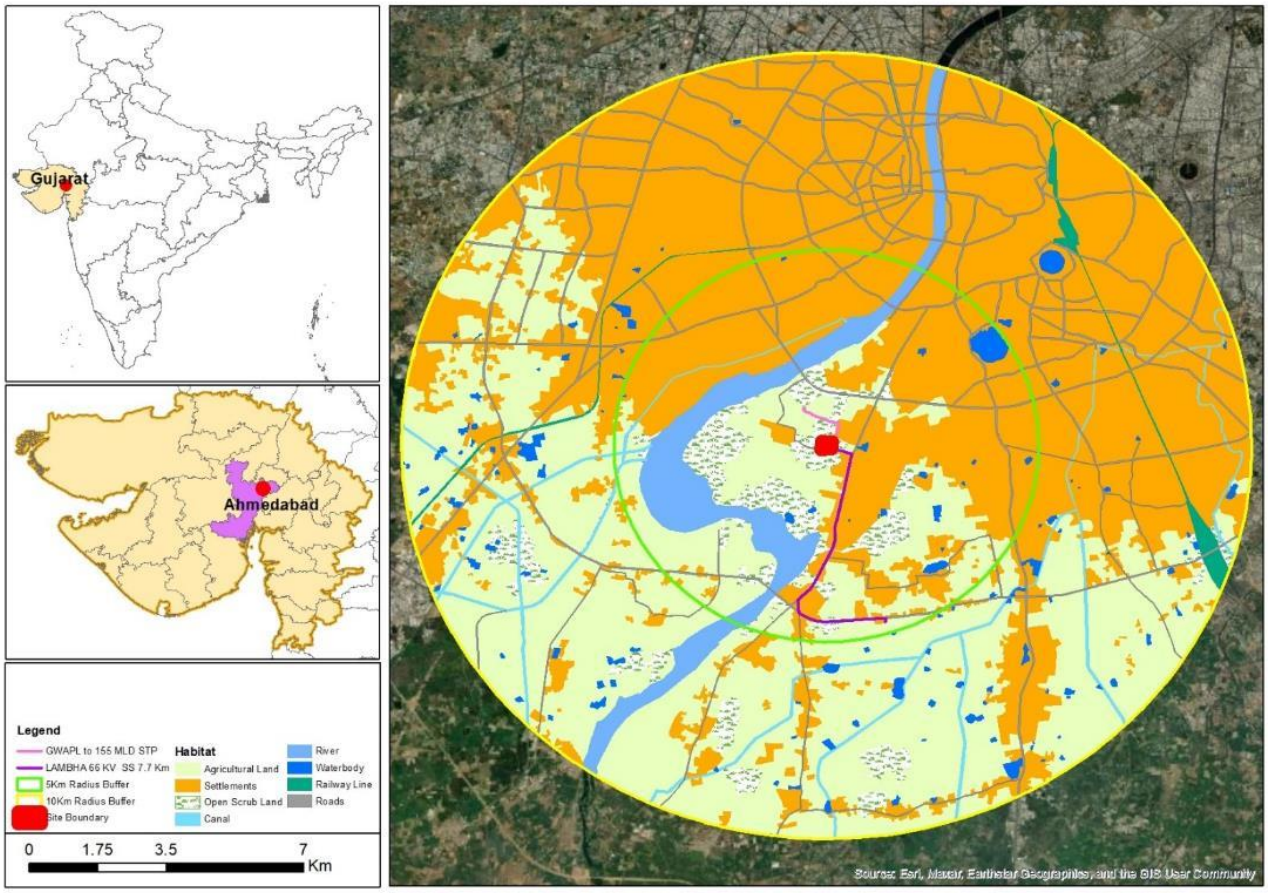


Figure 5-32 Habitats in this Area

Water body	Open Scrub

	
Sabarmati River	Agriculture Land

5.5.3.3 Floral Survey

5.5.3.2.1 Vegetation Profile

As per the available information, the selected location for the project falling in the Semi - Arid – Gujarat Rajputana (4B) Biogeographical Province of India comprises of Deccan Plateau (Malwa Plateau, Gujarat plains and Kathiawar peninsula)[66], the Agro-ecological Region is Hot-Semi-arid eco-region with moderately deep black soils[67] and Gujarat plains and hills region (XII) Agro-Climatic Region[68]. The vegetation of the region may be defined as Northern Tropical thorn forest (6B) according to forest classification of Champion and Seth (1968)[69].

5.5.3.2.2 Floral Diversity

The floral diversity present in the 10 km buffer areas was assessed during the site survey. A total of 79 floral species belonging Thirty-Eight (35) families were observed in the study area. Fabaceae was the most dominating family in the area with Twenty-five (25) species, following Euphorbiaceae, Solanaceae with each five (5) 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 following table.

Table 5-38 Floral diversity of the study area

S.N.	Binomial Scientific Name	Family	Life form	IUCN Red List - Categories
1	*Acacia auriculiformis*	Fabaceae	Tree	Least Concern
2	*Acacia catechu*	Fabaceae	Tree	Least Concern
3	*Acacia farnesiana*	Fabaceae	Tree	Least Concern
4	*Acacia leucophloea (Roxb.) Willd.*	Fabaceae	Tree	Least Concern
5	*Acacia nilotica (L.) Delile*	Fabaceae	Tree	Least Concern
6	*Acacia senegal*	Fabaceae	Tree	Not assessed
7	*Adhatoda vasica*	Lamiaceae	Shrub	Not assessed
8	*Adina cordifolia*	Rubiaceae	Tree	Least Concern

[66] 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
[67] Mandal D.K., Mandal C. and Singh S.K. (2015) Delineating Agro-Ecological Regions. ICAR-NBSSLUP technology, p. 8.
[68] http://iasri.res.in/agridata//12data%5Cchapter1%5Cdb2012tb1_2.pdf
[69] Champion, H. G. and Seth, S. K. (1968). A Revised Survey of Forest Types of India. Govt. of India Press, New Delhi, p. 404.

S.N.	Binomial Scientific Name	Family	Life form	IUCN Red List - Categories
9	*Aerva lanata*	Amaranthaceae	Shrub	Not assessed
10	*Ailanthus excelsa Roxb.*	Simaroubaceae	Tree	Not assessed
11	*Albizia lebbeck (L.) Benth.*	Fabaceae	Tree	Least Concern
12	*Alternanthera philoxeroides (Mart.) Griseb.*	Amaranthaceae	Herb	Not assessed
13	*Alternanthera sessilis (L.) R.Br. ex DC.*	Amaranthaceae	Herb	Least Concern
14	*Azadirachta indica A.Juss.*	Meliaceae	Tree	Least Concern
15	*Barleria prionitis*	Acanthaceae	Shrub	Not assessed
16	*Bombax ceiba*	Bombacaceae	Tree	Least Concern
17	*Butea monosperma (Lam.) Taub.*	Fabaceae	Tree	Least Concern
18	*Butea superba Roxb.*	Fabaceae	Climber / Shrub	Not assessed
19	*Calotropis gigantea (L.) Dryand.*	Apocynaceae	Tree	Not assessed
20	*Calotropis procera (Aiton) Dryand.*	Apocynaceae	Shrub	Least Concern
21	*Capparis decidua (Forssk.) Edgew.*	Capparaceae	Shrub	Least Concern
22	*Carissa spinarum*	Apocynaceae	Shrub	Least Concern
23	*Cassia fistula*	Fabaceae	Tree	Least Concern
24	*Cassia tora*	Fabaceae	Herb	Not assessed
25	*Centella asiatica*	Apiaceae	Herb	Least Concern
26	*Ceratophyllum demersum*	Ceratophyllaceae	Submerged	Not assessed
27	*Chrozophora rottleri (Geiseler) A.Juss. ex Spreng.*	Euphorbiaceae	Herb	Not assessed
28	*Cocos nucifera L.*	Arecaceae	Tree	Not assessed
29	*Cordia dichotoma G.Forst.*	Boraginaceae	Tree	Least Concern
30	*Cymbopogon citratus*	Poaceae	Grass	Not assessed
31	*Dalbergia sissoo DC.*	Fabaceae	Tree	Least Concern
32	*Datura metel*	Solanaceae	Shrub	Least Concern
33	*Datura stramonium*	Solanaceae	Herb	Least Concern
34	*Delonix regia*	Fabaceae	Tree	Not assessed
35	*Digitaria sanguinalis*	Poaceae	Grass	Not assessed
36	*Eichhornia crassipes*	Pontederiaceae	Emergent	Not assessed
37	*Eucalyptus sp.*	Myrtaceae	Tree	Not assessed
38	*Euphorbia caducifolia Haines*	Euphorbiaceae	Tree	Not assessed
39	*Euphorbia hirta L.*	Euphorbiaceae	Herb	Not assessed
40	*Euphorbia tirucalli*	Euphorbiaceae	Shrub	Not assessed
41	*Ficus benghalensis L.*	Moraceae	Tree	Not assessed
42	*Ficus religiosa L.*	Moraceae	Tree	Least Concern
43	*Ficus virens Aiton*	Moraceae	Tree	Least Concern
44	*Gliricidia sepium (Jacq.) Steud.*	Fabaceae	Tree	Least Concern

S.N.	Binomial Scientific Name	Family	Life form	IUCN Red List - Categories
45	*Grewia tiliaefolia*	Tiliaceae	Tree	Not assessed
46	*Hardwickia binata Roxb.*	Fabaceae	Tree	Least Concern
47	*Heliotropium indicum L.*	Boraginaceae	Herb	Not assessed
48	*Hydrilla verticillata*	Hydrocharitaceae	Emergent	Not assessed
49	*Imperata cylindrica*	Poaceae	Grass	Not assessed
50	*Indigofera glabra*	Fabaceae	Herb	Not assessed
51	*Ipomoea carnea*	Convolvulaceae	Shrub	Not assessed
52	*Lantana camara*	Verbenaceae	Shrub	Not assessed
53	*Lemna minor*	Lemnaceae	Emergent	Not assessed
54	*Leucaena leucocephala (Lam.) de Wit*	Fabaceae	Tree	Not assessed
55	*Madhuca longifolia*	Sapotaceae	Tree	Least Concern
56	*Mangifera indica L.*	Anacardiaceae	Tree	Data Deficient
57	*Mimosa pudica*	Fabaceae	Shrub	Least Concern
58	*Moringa oleifera Lam.*	Moringaceae	Tree	Least Concern
59	*Nelumbo nucifera*	Nelumbonaceae	Floating plant	Least Concern
60	*Nymphaea alba*	Nymphaeaceae	Floating plant	Least Concern
61	*Ocimum tenuiflorum*	Lamiaceae	Shrub	Least Concern
62	*Opuntia elatior Mill.*	Cactaceae	Shrub	Least Concern
63	*Parkinsonia aculeata L.*	Fabaceae	Tree	Least Concern
64	*Peltophorum pterocarpum (DC.) K.Heyne*	Fabaceae	Tree	Not assessed
65	*Phoenix sylvestris (L.) Roxb.*	Arecaceae	Tree	Not assessed
66	*Phyllanthus amarus*	Phyllanthaceae	Herb	Least Concern
67	*Pithecellobium dulce (Roxb.) Benth.*	Fabaceae	Tree	Least Concern
68	*Pongamia pinnata (L.) Pierre*	Fabaceae	Tree	Least Concern
69	*Prosopis cineraria (L.) Druce*	Fabaceae	Tree	Least Concern
70	*Prosopis juliflora (Sw.) DC.*	Fabaceae	Tree	Not assessed
71	*Ricinus communis L.*	Euphorbiaceae	Small Tree	Not assessed
72	*Salvadora persica L.*	Salvadoraceae	Tree	Least Concern
73	*Senna auriculata (L.) Roxb.*	Fabaceae	Shrub	Not assessed
74	*Solanum nigrum*	Solanaceae	Herb	Least Concern
75	*Solanum sisymbriifolium Lam.*	Solanaceae	Herb	Not assessed
76	*Solanum virginianum L.*	Solanaceae	Herb	Not assessed
77	*Typha domingensis Pers.*	Typhaceae	Herb	Least Concern
78	*Vallisneria spiralis*	Hydrocharitaceae	Submerged	Not assessed
79	*Ziziphus nummularia (Burm. f.) Wight & Arn.*	Rhamnaceae	Shrub	Not assessed

5.5.3.4 Faunal Survey

1.1.1.2.1 Herpetofauna

As per the literature review[70, 71], local consultation and field survey, 26 species of herpetofauna (reptiles + amphibians) species were reported / observed from the study area. Among them, three (3) are Vulnerable **VL** (Indian Flapshell Turtle *Lissemys punctata,* Indian Roofed Turtle *Pangshura smithii* and Indian Star Tortoise *Geochelone elegans*) and Two (2) is Near Threatened **NT** (Bengal Monitor Lizard *Varanus bengalensis* and Rough-scaled Sand Boa *Eryx* conicus) as per the category of the IUCN Red List (Online Version 2022-2). Among the reported/observed herpetofauna spices totally 12 species falling under the Schedule I category as per the Wildlife (Protection) Act, 1972 - Bengal Monitor Lizard *Varanus bengalensis,* Checkered Keelback *Xenochrophis piscator,* Common Krait *Bungarus caeruleus,* Indian Cobra *Naja,* Indian Flapshell Turtle *Lissemys punctata,* Indian Roofed Turtle *Pangshura smithii,* Indian Star Tortoise *Geochelone elegans,* Oriental Ratsnake *Ptyas mucosa,* Pond Slider *Trachemys scripta* Red Sand Boa Eryx johnii, Russell's Viper *Daboia russelii* and Spiny-tailed Lizard *Saara hardwickii.*

Table 5-39 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 House Gecko	Hemidactylus frenatus	Not assessed	Schedule II	Reported
2	Bengal Monitor Lizard	Varanus bengalensis	Near Threatened	Schedule I	Reported
3	Checkered Keelback	Xenochrophis piscator	Least Concern	Schedule I	Reported
4	Common Dotted Garden Skink	Riopa punctata	Least Concern	Not listed	Reported
5	Common Krait	Bungarus caeruleus	Not assessed	Schedule I	Reported
6	Indian Bullfrog	Hoplobatrachus tigerinus	Least Concern	Schedule II	Reported
7	Indian Chameleon	Chamaeleo zeylanicus	Least Concern	Schedule II	Reported
8	Indian Cobra	Naja	Least Concern	Schedule I	Reported
9	Indian Egg-eater snake	Boiga westermanni	Least Concern	Not listed	Reported
10	Indian Flapshell Turtle	Lissemys punctata	Vulnerable	Schedule I	Reported
11	Indian Roofed Turtle	Pangshura smithii	Vulnerable	Schedule I	Reported
12	Indian Skink	Eutropis carinata	Least Concern	Schedule II	Observed
13	Indian Star Tortoise	Geochelone elegans	Vulnerable	Schedule I	Reported
14	Indus valley Bull-frog	Hoplobatrachus tigerinus	Least Concern	Not listed	Reported
15	Indus valley toad	Bufo stomaticus	Least Concern	Schedule II	Reported
16	Northern House Gecko	Hemidactylus flaviviridis	Least Concern	Not listed	Reported
17	Oriental Garden Lizard	Calotes versicolor	Not assessed	Not listed	Observed
18	Oriental Ratsnake	Ptyas mucosa	Not assessed	Schedule I	Reported
19	Pond Slider	Trachemys scripta	Least Concern	Schedule I	Reported
20	Red Sand Boa	Eryx johnii	Least Concern	Schedule I	Reported
21	Rough-scaled Sand Boa	Eryx conicus	Near Threatened	Not listed	Reported
22	Russell's Viper	Daboia russelii	Least Concern	Schedule I	Reported
23	Sahgal's Termite Hill Gecko	Hemidactylus sahgali,	Least Concern	Not listed	Reported
24	Saw-scaled Vipers	Echis carinatus	Least Concern	Not listed	Reported

[70] https://www.inaturalist.org/places/ahmadabad#taxon=26036 (Accessed on 17 Aug. 2023)
[71] https://www.inaturalist.org/places/ahmadabad#taxon=20978 (Accessed on 17 Aug. 2023)

S.N.	Common English Name	Binomial Scientific Name	IUCN Red List - Categories	Wildlife (Protection) Act - Schedules	Reported / Observed
25	Spiny-headed Fan-throated Lizard	sitana spinaecephalus	Least Concern	Schedule II	Reported
26	Spiny-tailed Lizard	Saara hardwickii	Least Concern	Schedule I	Reported

1.1.1.2.2 Avifauna (Birds)

During the field survey, 67 avifaunal species were observed from the study area, which include one (1) Vulnerable (River Tern *Sterna aurantia*); and three (3) Near Threatened (Black-headed Ibis *Threskiornis melanocephalus*, Painted Stork *Mycteria leucocephala*, Asian Woolly-necked Stork *Ciconia episcopus*) as per IUCN Red List (Online Version 2022-2). Six (06) Schedule I species (as per the Wildlife (Protection) Act, 1972) – Indian Peafowl *Pavo cristatus,* Black Kite *Milvus migrans,* River Tern *Sterna aurantia,* Eurasian Spoonbill *Platalea leucorodia,* Black-winged Kite *Elanus caeruleus* and Brahminy Kite *Haliastur indus* species were also observed in the study area (***Table 5-40***).

Table 5-40 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	Rock dove	Columba livia	R	Least Concern	Schedule II
2	Gray-headed Swamphen	Porphyrio poliocephalus	R	Least Concern	Schedule II
3	Red-wattled Lapwing	Vanellus indicus	R	Least Concern	Schedule II
4	Purple Heron	Ardea purpurea	R	Least Concern	Schedule II
5	White-throated Kingfisher	Halcyon smyrnensis	R	Least Concern	Schedule II
6	Asian Green Bee-eater	Merops orientalis	R	Least Concern	Schedule II
7	Rose-ringed Parakeet	Psittacula krameri	R	Least Concern	Schedule II
8	Black Drongo	Dicrurus macrocercus	R	Least Concern	Schedule II
9	Red-vented Bulbul	Pycnonotus cafer	R	Least Concern	Schedule II
10	Common Myna	Acridotheres tristis	R	Least Concern	Schedule II
11	Intermediate Egret	Ardea intermedia	R	Least Concern	Schedule II
12	Cattle Egret	Bubulcus ibis	R	Least Concern	Schedule II
13	Indian Pond-Heron	Ardeola grayii	R	Least Concern	Schedule II
14	Red-naped Ibis	Pseudibis papillosa	R	Least Concern	Schedule II
15	Jungle Babbler	Argya striata	R	Least Concern	Schedule II
16	Common Babbler	Argya caudata	R	Least Concern	Schedule II
17	Bank Myna	Acridotheres ginginianus	R	Least Concern	Schedule II
18	Oriental Magpie-Robin	Copsychus saularis	R	Least Concern	Schedule II
19	Indian Peafowl	Pavo cristatus	R	Least Concern	Schedule I
20	Gray Francolin	Ortygornis pondicerianus	R	Least Concern	Schedule II
21	Laughing Dove	Spilopelia senegalensis	R	Least Concern	Schedule II
22	Greater Coucal	Centropus sinensis	R	Least Concern	Schedule II

S.N.	Common English Name	Binomial Scientific Name	Migrant (M) / Resident (R)	IUCN Red List - Categories	Wildlife (Protection) Act - Schedules
23	Asian Koel	Eudynamys scolopaceus	R	Least Concern	Schedule II
24	White-breasted Waterhen	Amaurornis phoenicurus	R	Least Concern	Schedule II
25	Black-headed Ibis	Threskiornis melanocephalus	R	Near Threatened	Schedule II
26	White-browed Bulbul	Pycnonotus luteolus	R	Least Concern	Schedule II
27	Indian Robin	Copsychus fulicatus	R	Least Concern	Schedule II
28	Purple-rumped Sunbird	Leptocoma zeylonica	R	Least Concern	Schedule II
29	Purple Sunbird	Cinnyris asiaticus	R	Least Concern	Schedule II
30	Indian Silverbill	Euodice malabarica	R	Least Concern	Schedule II
31	Scaly-breasted Munia	Lonchura punctulata	R	Least Concern	Schedule II
32	House Sparrow	Passer domesticus	R	Least Concern	Schedule II
33	Brahminy Starling	Sturnia pagodarum	R	Least Concern	Schedule II
34	Lesser Whistling-Duck	Dendrocygna javanica	R	Least Concern	Schedule II
35	Knob-billed Duck	Sarkidiornis melanotos	R	Least Concern	Schedule II
36	Eurasian Moorhen	Gallinula chloropus	R	Least Concern	Schedule II
37	Little Egret	Egretta garzetta	R	Least Concern	Schedule II
38	Glossy Ibis	Plegadis falcinellus	R	Least Concern	Schedule II
39	House Crow	Corvus splendens	R	Least Concern	Schedule II
40	Plain Prinia	Prinia inornata	R	Least Concern	Schedule II
41	Baya Weaver	Ploceus philippinus	R	Least Concern	Schedule II
42	Indian Spot-billed Duck	Anas poecilorhyncha	R	Least Concern	Schedule II
43	Ashy Prinia	Prinia socialis	R	Least Concern	Schedule II
44	Common Kingfisher	Alcedo atthis	R	Least Concern	Schedule II
45	Eurasian Collared-Dove	Streptopelia decaocto	R	Least Concern	Schedule II
46	Spotted Dove	Spilopelia chinensis	R	Least Concern	Schedule II
47	Painted Stork	Mycteria leucocephala	R	Near Threatened	Schedule II
48	Gray Heron	Ardea cinerea	R	Least Concern	Schedule II
49	Shikra	Accipiter badius	R	Least Concern	Schedule II
50	Rufous Treepie	Dendrocitta vagabunda	R	Least Concern	Schedule II
51	Indian Gray Hornbill	Ocyceros birostris	R	Least Concern	Schedule II
52	Ashy-crowned Sparrow-Lark	Eremopterix griseus	R	Least Concern	Schedule II
53	Asian Woolly-necked Stork	Ciconia episcopus	R	Near Threatened	Schedule II
54	Yellow-wattled Lapwing	Vanellus malabaricus	R	Least Concern	Schedule II
55	Black Kite	Milvus migrans	R	Least Concern	Schedule I
56	River Tern	Sterna aurantia	R	Vulnerable	Schedule I

S.N.	Common English Name	Binomial Scientific Name	Migrant (M) / Resident (R)	IUCN Red List - Categories	Wildlife (Protection) Act - Schedules
57	Eurasian Spoonbill	Platalea leucorodia	R	Least Concern	Schedule I
58	Indian Cormorant	Phalacrocorax fuscicollis	R	Least Concern	Schedule II
59	Black-winged Kite	Elanus caeruleus	R	Least Concern	Schedule I
60	Rufous-tailed Lark	Ammomanes phoenicura	R	Least Concern	Schedule II
61	Little Grebe	Tachybaptus ruficollis	R	Least Concern	Schedule II
62	Great Cormorant	Phalacrocorax carbo	R	Least Concern	Schedule II
63	Eurasian Hoopoe	Upupa epops	R	Least Concern	Schedule II
64	Indian Roller	Coracias benghalensis	R	Least Concern	Schedule II
65	Red-rumped Swallow	Cecropis daurica	R	Least Concern	Schedule II
66	Gray Wagtail	Motacilla cinerea	R	Least Concern	Schedule II
67	Brahminy Kite	Haliastur indus	R	Least Concern	Schedule I

5.5.3.2.3 Mammals

Based on a comprehensive literature review[72], extensive local consultation, and meticulous field surveys, a total of 19 mammalian species were documented within the study area, and notably none of them are classified as threatened according to the IUCN Red List. However, seven (7) species - Asian palm civet *Paradoxurus hermaphroditus,* Asiatic wild Cat Felis silvestris ornate, Blackbuck *Antilope cervicapra,* Golden Jackal *Canis aureus,* Indian Porcupine *Hystrix indica,* Jungle Cat *Felis chaus* and Small Indian Civet *Viverricula indica*)are listed in Schedule-I as per the Wildlife (Protection) Act, 1972.

Table 5-41 Mammals of reported/Observed from the study area

S.N.	Common English Name	Binomial Scientific Name	IUCN Red List - Categories	Wildlife (Protection) Act - Schedules	Reported or Observed
1	Asian palm civet	*Paradoxurus hermaphroditus*	Least Concern	Schedule I	Reported
2	Asiatic wild Cat	*Felis silvestris ornata*	Least Concern	Schedule I	Reported
3	Bengal Fox (India Fox)	*Vulpes bengalensis*	Least Concern	Schedule II	Reported
4	Blackbuck	*Antilope cervicapra*	Least Concern	Schedule I	Reported
5	Five-striped Palm Squirrel	*Funambulus pennantii*	Least Concern	Schedule II	Observed
6	Golden Jackal	*Canis aureus*	Least Concern	Schedule I	Reported
7	Greater bandicoot rat	*Bandicota indica*	Least Concern	Schedule II	Reported
8	Indian flying fox	*Pteropus giganteus*	Least Concern	Schedule II	Reported
9	Indian Grey Mongoose	*Herpestes edwardsii*	Least Concern	Schedule II	Observed
10	Indian Hare	*Lepus nigricollis*	Least Concern	Schedule II	Observed
11	Indian palm squirrel	*Funambulus palmarum*	Least Concern	Schedule II	Reported
12	Indian Porcupine	*Hystrix indica*	Least Concern	Schedule I	Reported
13	Jungle Cat	*Felis chaus*	Least Concern	Schedule I	Reported

[72] https://www.inaturalist.org/places/ahmadabad#taxon=40151 (Accessed on 17th Aug. 2023)

S.N.	Common English Name	Binomial Scientific Name	IUCN Red List - Categories	Wildlife (Protection) Act - Schedules	Reported or Observed
14	Nilgai	*Boselaphus tragocamelus*	Least Concern	Schedule II	Observed
15	Northern Plains Grey Langur	*Semnopithecus entellus*	Least Concern	Schedule II	Observed
16	Rhesus Monkey	*Macaca mulatta*	Least Concern	Schedule II	Observed
17	Small Indian Civet	*Viverricula indica*	Least Concern	Schedule I	Reported
18	Small Indian Mongoose	*Herpestes javanicus*	Least Concern	Schedule II	Reported
19	Wild Boar	*Sus scrofa*	Least Concern	Schedule II	Observed

5.5.4 Protected and Key Biodiversity Areas

There are no protected areas, Ramsar sites, or designated Important Bird Areas within a 5 km radius of the project location. The closest protected area, the Thol Lake Wildlife Sanctuary, it is a Ramsar site, is situated approximately 22 km away from the project location in the North-west direction. However, the immediate 2.5 km radius of west is the project site comprises a diverse landscape, encompassing agricultural lands, water bodies, *Sabarmati* river, Open Scrub, Grassland, and in ester side of the project has the human settlements.

Thol Lake Wildlife Sanctuary (Ramsar Site)[73, 74]

The Ramsar site spans 699 hectares and designates as Ramsar site in on 5th August 2021, originally constructed in 1912, later in 1988 it is declared as Wildlife Sanctuary. This shallow aquatic expanse, characterized by expanses of open water. The wetland's international significance lies in its role as a crucial wintering ground for over 30 threatened waterbird species, among these are the critically endangered White-rumped Vulture *Gyps bengalensis*, the Sciable Lapwing *Vanellus gregarius*, and the vulnerable Sarus crane *Grus antigone*, Common Pochard Aythya farina), and Lesser White-fronted Goose *Anser erythropus*. On a regular basis, this wetland becomes a habitat for a population of glossy ibis *Plegadis falcinellus* that exceeds 1% of their total population.

The avifauna of the Thol Sanctuary boasts an impressive diversity, encompassing more than 150 distinct species of birds. Among these, approximately 90 species belong to the waterbird category. Notably, the site serves as a significant congregation and nesting ground for the Sarus Crane *Grus antigone* prior to breeding.

Thol Sanctuary also stands as a haven for the remarkable Ruff Philomachus pugnax), drawing one of the largest gatherings of these birds. The spectacle of thousands of Flamingos congregating at the Thol lake is a sight to behold, with estimates occasionally reaching 5,000 to 6,000 individuals. It was also observed in 1983 and identified 70 to 80 Flamingo nests, presumably of the Greater Flamingo species *Phoenicopterus ruber*. The question of whether the Flamingos bred there or simply constructed nests without continuation remains unanswered, mirroring behaviours observed in various other wetland habitats[75].

Thol Sanctuary holds immense importance as a crucial wintering ground for an array of waterfowl. For instance, an approximate count of 62,000 birds was recorded in December 2000, as documented by Singh in 2001.

In addition to its avian inhabitants, the surrounding fields of the Sanctuary provide habitat for notable terrestrial fauna. Among these are the Bluebull *Boselaphus tragocamelus*, Striped Hyena *Hyaena hyaena*, Wolf *Canis lupus*, Golden Jackal *Canis aureus*, and Blackbuck *Antilope cervicapra*.

[73] https://rsis.ramsar.org/ris/2458 (Accessed on 17 Aug. 2023)
[74] https://wiienvis.nic.in/Database/ramsar_wetland_sites_8224.aspx. (Accessed on 04 Aug. 2023)

[75] http://datazone.birdlife.org/site/factsheet/thol-lake-wildlife-sanctuary-iba-india on 19/08/2023

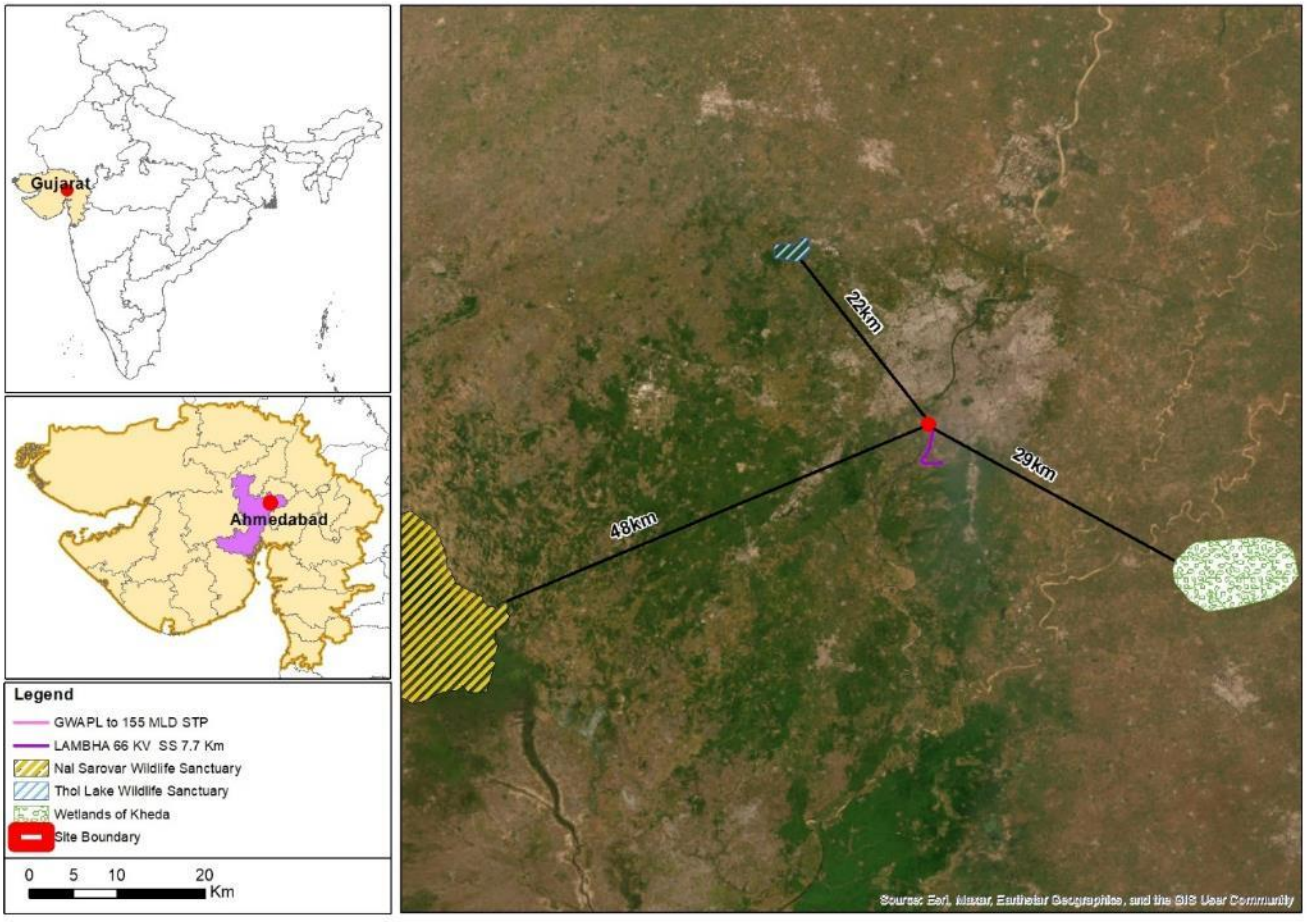
Wetlands of Kheda[76]

Kheda district, situated in western India, covers an area of 719,400 hectares. It is positioned between two significant rivers: the Mahisagar to the east and the Vatrak, a tributary of the Sabarmati River, to the west. The southern border of the district connects to the Gulf of Khambhat. The majority of the district consists of flat terrain, nearly at sea level. However, there are hilly regions in the Kapadvanj and Balasinor tehsils, while the rest of the district mainly comprises plains.

The district is predominantly characterized by canal irrigation, facilitating widespread irrigated farming. Notably, paddy cultivation is a prominent agricultural practice in Kheda district. The temporary wetlands created by paddy fields offer an alternative habitat for the Sarus Crane (Grus antigone), substituting the natural marshland environment. Specific locations like Daloli, Gobrapura, Narda, and Machhial have been identified as significant roosting sites for these cranes.

Key Biodiversity: Regarding avian biodiversity, this site has been designated as an Important Bird Area (IBA)[77] primarily due to its substantial breeding population of the globally endangered Sarus Crane within India. The population of Sarus Cranes in these reservoirs was estimated as follows: 556 individuals in 1989, 618 individuals in 1998, and 959 individuals in 2002.

Figure 5-32 Ecological Sensitivity around the Project site



[76] http://datazone.birdlife.org/site/factsheet/wetlands-of-kheda-iba-india on 19/08/2023.

[77] 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 9

5.5.5 Bird Migration Flyways

India majorly lies in the Central Asian Flyway [78], [79](***Figure 5-33***). 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.

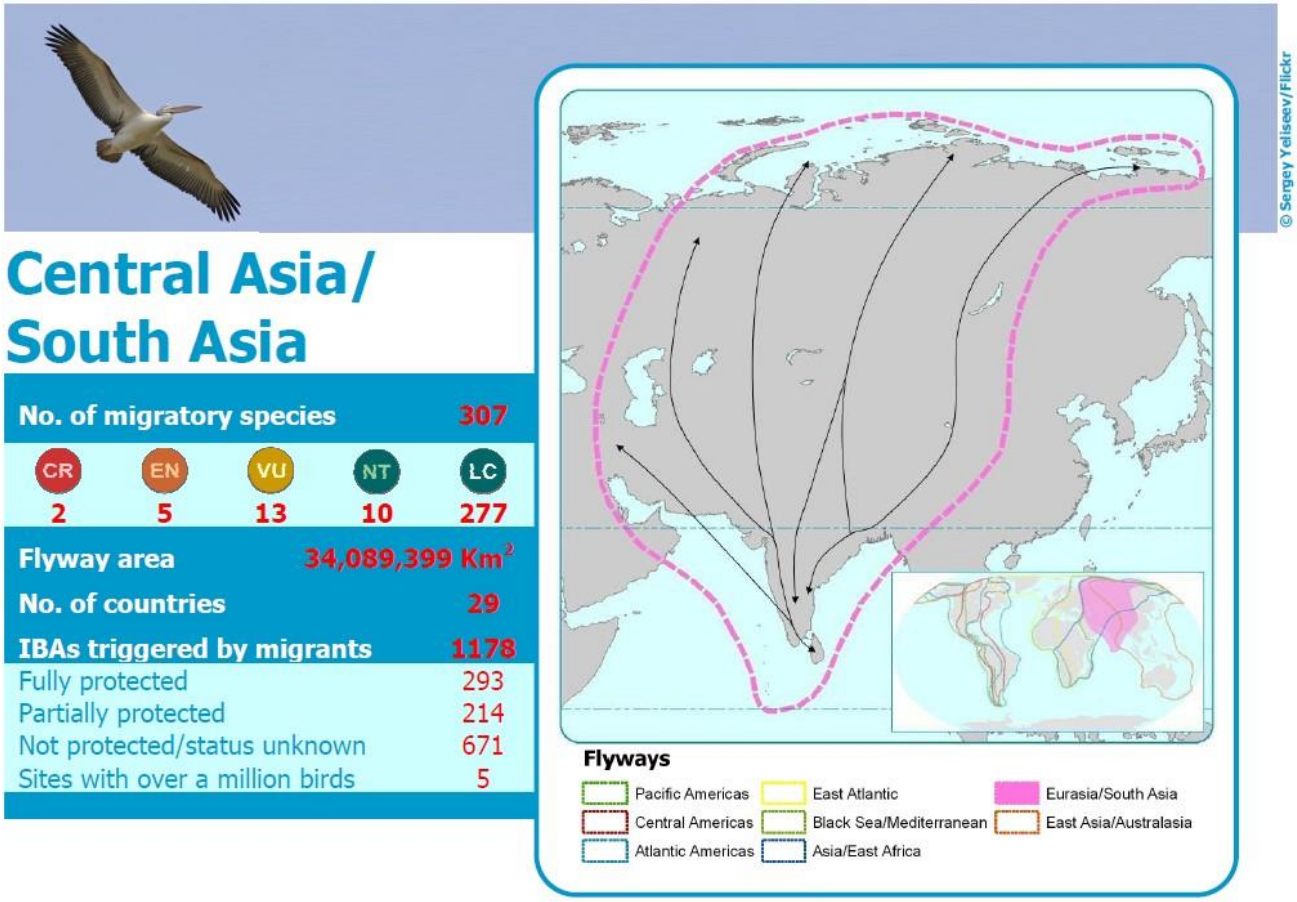
As per the database[80], at least 112 migratory birds including one Endangered **EN** (1) Saker Falcon *Falco cherrugv,* Six (6) Vulnerable **VL** Common Pochard *Aythya ferina,*Imperial Eagle *Aquila heliacal,* Lesser White-fronted Goose *Anser erythropus,* Macqueen's Bustard (Houbara Bustard) *Chlamydotis macqueenii,* Red-breasted Goose *Branta ruficollis,* and Sociable Lapwing *Vanellus gregarius* and seven (7) Near Threatened **NT** (Black-tailed Godwit *Limosa limosa,* Cinereous Vulture *Aegypius monachus,* Dalmatian Pelican *Pelecanus crispus,* Eurasian Curlew *Numenius arquata,* Ferruginous Duck *Aythya nyroca,* Lesser Flamingo *Phoeniconaias minor* and Pallid Harrier *Circus macrourus*) were reported from the region (***Figure 5-33***).

In the region, there are several key congregatory bird species[81, 82], including the Demoiselle Crane, Northern Pintail, Dalmatian Pelican, Black-tailed Godwit, Common Crane, Common Teal, Bar-headed Goose, Common Pochard Eurasian Coot *Fulica atra,* Gadwall *Mareca strepera,* Garganey *Spatula querquedula,* Small Pratincole *Glareola lacteal,* Little Stint *Calidris minuta,* Ruddy Shelduck *Tadorna ferruginea* and Eurasian Wigeon. In order to safeguard these bird populations and minimize the risks of collision and electrocution, certain mitigation measures have been proposed under the section addressing their impact on the biological environment.

[78] http://datazone.birdlife.org/userfiles/file/sowb/flyways/7_Central_Asia_Factsheet.pdf
[79] https://www.cms.int/en/legalinstrument/central-asian-flyway (accessed on 20 Aug. 2023)
[80] https://ebird.org/region/IN-GJ-AH
[81] https://ebird.org/hotspot/L1979634?yr=all&m=&rank=mrec

[82] https://ebird.org/hotspot/L4008340?yr=all&m=&rank=mrec

Figure 5-33 Central Asian Flyway [83]



5.5.6 Critical Habitat Screening

5.5.6.1 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 20-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.

5.5.6.2 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 19***. Based on this exercise, a single species has been identified and screened-in for Critical Habitat Assessment (***Table 5-42***). Although the species has been significantly reported from the EAAA, however, it has no significant records from the area of influence (AoI).

Table 5-42 List of Species Screened in for Critical Habitat Assessment

S.N.	Common English Name	Binomial Scientific Name	CHA Criteria
1	Demoiselle Crane	(*Anthropoides virgo*)	3a

[83] http://datazone.birdlife.org/userfiles/file/sowb/flyways/7_Central_Asia_Factsheet.pdf

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". 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. Considering the nature of the Project and its setting, the stakeholders have been identified and listed in the table given below:

Table 6-1 Stakeholder Group Categorization

Category	Primary Stakeholders	Secondary Stakeholder
Community	• Rag Pickers at the landfill • Opinion holders • Community leaders • 50 kiosks shops which potentially may be impacted due to laying down of underground transmission. • Local Communities living near the plants	Nil
Institutional Stakeholders	• Local Gram Panchayats • Project Investors	• Village Institutions (education and health department) • Political Parties
Government Bodies	• Ahmedabad Municipal Corporation • Regulatory Authorities • District Administration	• State Administration
Other Groups	• Recyclers/recycling entities that buy recyclable waste from rag pickers. • Employees • Contractors and sub-contractors • Contractual workers	• Media • Local NGOs

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.

Table 6-2 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	Based on the information provided by the project and from the secondary source (especially from AMC official website), the waste generated by Ahmedabad City is significantly higher than the waste requirement for the WTE plant. With a waste generation of ~4,000 tonnes per day and a requirement of 1,000 tonnes per day for the project, there is still a substantial amount of waste that needs to be dumped at Ahmedabad landfill site. The waste will continue to be dumped at the landfill area where approximately 1,000 ragpickers are collecting recyclable waste from freshly dumped waste. Given that there is sufficient waste available at the landfill site, it is envisaged that the ragpickers will continue their activities without being economically displaced due to the development of the WTE plant.	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. • 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.	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 shall 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. • 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.	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 or decrease in availability of fresh waste. • If the Project results in changes to waste management practices, it might impact the employment of ragpickers. • 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 might provide access to resources such as education, healthcare, or skill development 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: **Low** • Influence of Project: **Low**
Local bodies including Urban & Gram Panchayats	This stakeholder group is comprised of the lowest level of local self-governance. The ULB /gram panchayats consist of one or more wards /revenue villages and are the lowest level of decision-making bodies for development activities in the wards/ 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 ULB & 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 ULB wards Members/panchayat members can influence the decision-making process 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 wards/ villages by undertaking CSR activities in collaboration with the ULB/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.	The key concerns and expectations of this group from the project are: • Concerns about increased noise from the operation of the waste-to-energy plant. • Concerns about air pollution resulting from the transportation of waste.	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	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:	• 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
		• 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, 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.	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. • 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	• 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. • 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 plant.	
50 kiosks shops which potentially may be impacted due to laying down of underground transmission	During the construction phase, (7.7 kilometre of transmission line) there might be some potential temporary impacts related to access which may cause temporary business disruption of 50 kiosks	The key expectation and concerns of the group includes: • Kiosk shop owners may be concerned about potential disruptions to their daily operations	The laying down of underground transmission lines for a waste-to-energy plant can potentially impact kiosk shops in various ways. Here are potential influences on kiosk shops:	The influence of the waste-to-energy project over kiosk shop owners can encompass various aspects, including economic, social, and operational dimensions. Here are potential influences:	• 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
	owners (0.3 km) sitting along the ROW near the vegetable mandi in Mod Kamod, Ahmedabad. However as informed project may lay the line on the opposite side of the road which may avoid the loss of access and potential business disruption	and sales during the construction phase of laying down the underground transmission for the waste-to-energy plant. • Concerns may arise regarding access to the kiosk shops, as construction activities may limit foot traffic or vehicular access, affecting the visibility and convenience of the shops. • Shop owners may worry about potential damage to their infrastructure (e.g., buildings, signage) during the construction of the underground transmission, affecting the appearance and functionality of their businesses. • Lack of clear communication and information about the project and its timeline may be a concern, leading to uncertainty among kiosk shop owners regarding the potential duration and extent of disruptions. • Kiosk shop owners may expect compensation or support from the waste-to-energy project developer to mitigate potential financial losses during construction and operation phases. • Expectations for clear and transparent communication from the project developer regarding the project timeline, potential disruptions, and any measures taken to minimize the impact on local businesses. • Expectations for the implementation of mitigation measures to minimize disruptions, such as scheduled construction activities during non-peak hours or alternative access routes to the shops. • Expectations for meaningful community engagement, where the concerns and feedback of kiosk shop owners are considered in the planning and execution of the waste-to-energy project.	• The response of kiosk shop owners to the project, whether positive or negative, can influence community perceptions. Gaining support from local businesses can contribute to a more favorable reception of the waste-to-energy facility. • Implementing effective mitigation measures in response to the concerns of kiosk shop owners can positively influence community relations. This might include measures to minimize disruption, provide compensation for losses, or assist in temporary relocations.	• During the construction phase, kiosk shops might experience disruptions due to construction activities. The project's influence will depend on how well disruptions are managed, and whether compensation or support measures are provided. • Kiosk owners may need to make logistical adjustments to accommodate construction needs, such as changes in access routes or temporary relocations. • The project's influence on kiosk owners will be shaped by how well the project engages with the local community. Effective communication and addressing concerns can lead to positive relations. • The implementation of effective mitigation measures, such as compensations for temporary losses or support for relocation, can positively influence the perception of the project. • Clear communication from the project regarding its impact on kiosk shops, timelines, and support mechanisms will influence how kiosk owners perceive and respond to the project. • The project's ability to manage the expectations of kiosk owners, addressing concerns and providing realistic information, will shape their stance toward the project.	
Ahmedabad Municipal Corporation	The Ahmedabad Municipal Corporation (AMC) serves as the local governing body	The Ahmedabad Municipal Corporation (AMC) likely has various concerns and	The Ahmedabad Municipal Corporation (AMC) can have a significant influence on	The influence of the Project on the Ahmedabad Municipal Corporation (AMC)	• 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
	entrusted with the oversight of civic infrastructure and administration in the city of Ahmedabad, Gujarat, India. Positioned as a pivotal local government entity, AMC 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, AMC assumes a central role as the governing authority. This is underscored by the formal agreement issued by AMC, sanctioning the construction and operation of the Project. Notably, AMC 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 AMC's pivotal role in the execution and success of the Project.	expectations from the Project. These considerations can encompass environmental, economic, social, and operational aspects. Here are some common concerns and expectations that AMC 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 • 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 AMC and the Project.	the Project at various stages of its lifecycle. Provided below key aspects of AMC's potential influence on the Project: • AMC 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 AMC. • AMC 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, AMC 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. • AMC can influence community perceptions and support for the project by engaging in transparent communication, addressing concerns, and involving local residents in the decision-making process. • AMC 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 AMC and the project developers depends on the performance, compliance, and mutual satisfaction. AMC's influence is evident in negotiations for contract renewals	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 Ahmedabad by providing an alternative and sustainable method for waste disposal. • Project's environmentally friendly technologies, can positively influence AMC's efforts to mitigate the environmental impact of waste disposal, addressing concerns related to pollution and land use. • The project can enhance AMC'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 employment and skill development. This can positively impact the socio-economic landscape of the community. • Project involves public-private partnerships, it can enhance AMC'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 AMC'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. AMC 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	The key expectations and concerns of the group from the project include:	• The failure of the project to comply with the various rules and regulations	The influence of the project on the stakeholders pertains to the role the project	• Influence of Stakeholder: **Medium**

Relevant Stakeholders	Profile	Concerns and Expectations from the project	Influence of Stakeholder on Project	Influence of Project on Stakeholder	Influence Rating
	authorities including AMC & 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	• Project's compliance to the regulatory requirements; and • Timely disclosure of information and provisioning of updated information throughout the life of the project.	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	will play in the development of the Project in the area	• 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: **Medium** • Influence of Project: **Low**
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 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.	• 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: **Low** • 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
		• Encouraging collaboration between contractors and different project teams enhances overall project performance			
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: **Low** • Influence of Project: **Medium**
Secondary Stakeholders					
Urban/Village level Institutions	This stakeholder group is comprised of health, education institutions and training centres at the wards/village level. The institutions in the immediate vicinity of the project may include the Hospitals, schools anganwadi centres etc	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: **Low** • 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 the project will play in the development of solar energy in the state	• Influence of Stakeholder: **Medium** • 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	The main expectations and concerns of the stakeholder from the project include: • Media may express concerns about the potential environmental impact of the	The influence of the media on the project can be significant, shaping public perception, influencing stakeholders, and	The influence of the project on the stakeholder is likely to be limited. However, provided below the include of the project on the media:	• 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
	important role in generating awareness amongst the community.	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 • 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.	impacting the project's overall success. Here are several potential influences: • Media coverage shapes public perception of the WTE project. Positive coverage can generate support, while negative stories may lead to skepticism 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 . • 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.	• 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 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 Engagement undertaken – Pre-impact assessment

According to the discussions undertaken with 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 Ahmadabad Municipal Corporation.

6.2 Engagement as part of the Impact assessment – this assignment

As part of EISA process, consultations were carried out with the project team and, contractor staff working at site. These consultations were carried to assess the potential impacts of the project on the different 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 ***Table 6-3***.

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

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 typical activities during different phases of the Project has been summarised below.

Note: *For the project, 95% of the construction activities are already complete. Hence, impacts for the completed construction activities and Pre-construction and mobilization Phase has been scoped out. However, underground laying of Transmission Line as well as Water Pipeline is yet to be undertaken. Hence, 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.	Construction Phase	• Site preparation including fencing, clearing of land, pit filling, levelling and grading. • Labour Engagement • 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 • Construction of Underground Water Pipeline and Transmission Line • Transportation of Construction Machinery for Water pipeline as well as Transmission Line • Site preparation including clearing of land, pit filling, levelling and grading for Underground TL and Water Pipeline
2.	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 waste water management, handling & disposal of hazardous waste. • Regular transportation and disposal of ash generated due to operation of the WTE plant. • 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 ***Section 7.2.1***

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 7-2***.

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 project tehsil falls is an area marked as "semi-critical" in terms of groundwater development, • Approximately 2412 KLD water will be obtained from the STP, of which 1528 KLD treated water and sent to the WTE plant and 7.5 KLD will be fresh water 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. • 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

Sr.No.	Potential Risk/ Impact	Risks Identified
		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) 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 related and respiratory disorders. • Impacts of Accidental Spillage of Stored Chemicals and Untreated Effluents
6	Human-Wildlife Conflicts	• The Plant is surrounded by natural open scrub and modified agricultural habitats. These habitats sustain diverse herpetofauna, avifauna, and mammal populations, as documented in the ecological baseline survey. The presence and movement of these wildlife species within the project compound and along its boundary during the operation phase pose a potential risk of Human-Wildlife conflicts, especially snakes and monitor lizards.
7	Potential business disruption	• It was understood that project involves laying of transmission line and the excavation work for underground transmission line and water pipeline will be done on the govt. land along the existing ROW of Roads and the width of tranches will be max 1 meter. However during the site visit few (~50 nos) squatters /kiosks were observed at vegetable mandi in Mod Kamod. The excavation work might temporarily affect their business due to access restrictions. Further as informed the project may consider the laying of transmission line on the opposite site of the mandi which will avoid any potential impacts. Even If the proposed design could not be changed due technical reasons, then business disruption may last for1 or two days. During such disruption the affected persons can continue their business therefore impacts if any will be negligible.
8	Increased employment and livelihood	• Based on the current understanding, the project is having potential of generating employment both during construction as well as operations stage. Currently 50 staff including subcontracted staff are working for the project. And as informed during operational phase project is likely to employ 120 staff and workers.

7.2.1.1 Scoped out Interactions

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

Table 7-3 Scoped Out Interactions

S.no.	Aspect	Rationale for Scoping Out
1.	Pre-construction and Mobilization activities	95% 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 fallow land. Land which was used by municipality for waste dumping has been allocated to the company, hence change is land use is scoped out.
3.	Impact on Soil- Construction Phase	Since, the time of site visit, the 95% 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 site visit, 95% 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 laying 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.	Collision and Electrocution Risk to the Avifaunal species	Since there are no overhead transmission lines (TL) within the scope of this project, the Collision and Electrocution Risk to the Avifaunal species by TL infrastructure has been scoped out.
9.	Impact on Ragpickers	The operation of the waste-to-energy plant will not result in the economic displacement of ragpickers. Ahmedabad generates approximately 4,000 tons of waste per day, which is significantly higher than the 1,000 tons/day required for the plant's operation. Based on this waste production and the total waste requirement for the project, it is evident that the project will not impact ragpicking activities at the dumpsite. Freshly generated waste will be dumped at the dumpsite even after the project's operation. Ragpickers will continue to collect recyclables from freshly dumped waste and sell them for recycling.

7.2.1.2 Impact Interaction Matrix

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 associated transmission line and towers and water pipeline	√	√	√				√	√					√	√

No interaction	
Potential Interaction	√

7.3 Impact Assessment Methodology

This section assesses the way 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.

Table 7-5 Impact Estimation & Assessment

Criteria	Sub-Classification	Defining Limit
Spread: refers to area of direct influence from the impact of a project activity	Local spread	impact is confirmed within the foot prints and /or within 500m of the 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 1 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

Table 7-6 Impact Significance Criteria

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

Spread	Duration	Intensity	Magnitude
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 7-7.***

The ***probability*** used herein for health and safety incidence are:

- Unexpected

- Possible
- Expected

Table 7-7 The probability of an 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%)

Table 7-8 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	• Species on IUCN Red List as Vulnerable (VU) Near Threatened (NT), or Data Deficient (DD) • Species protected under national legislation	• 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

Receptors	Sub criteria	Low	Medium	High
		IUCN Red List of Threatened Species • Not meeting criteria for medium or high value	• 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	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

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 7-9 Activities & Sources of Impacts

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, rain water 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-Scoped Out (95% of the Civil works for the project are complete)	• 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

Activities	Sources of Pollution
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 remaining 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 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 as well as Interim target-1 values (refer ***Table 5-13 and Table 5-14)***, therefore it can be considered that the project is located in an already degraded airshed for PM10 and PM2.5. The WTE plant is spread across an area of 13 acers 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 located within 500 m of the plant, and since the project is situated in an industrial area the project is surrounded by other industries such as Ahmedabad City Sludge Hygienization plant, Gyaspur landfill site, Warehouses, Torrent Power 400 kV Pirana Substation, Textile Infrastructure etc. within 500-meter radius. Since there are industries situated near the facility, workers working in the area are anticipated to be impacted by air emissions. 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 AMC 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 underground transmission line length is 7.7 km and underground water pipeline is of length 1.71 km and the pre-treatment will be setup at the vacant land within the 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 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 the Project AoI is anticipated to be impacted due to increased emissions.

Proposed Control Measures

- 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 super structures are pre-fabricated. 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.
- Excavated soil at the construction site will be handled adequately and top soil 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 for associated TL and water pipeline 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.

Additional Mitigation Measures

- 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
- 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

	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 95% 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
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 also not be using winching machine[84] for stringing of transmission line as the TL will be laid underground. The winching machine produces a noise level of more than 70 dB (A).

Based on the ambient noise quality monitoring conducted at four locations within study area (refer ***Table 5-15***), N1 & N3 located in an industrial area were found to be within limits as prescribed by CPCB as well as WBG Guideline values, whereas for Leq Day, value of N1 was well within limits as prescribed by CPCB but was exceeding the values as per WBG Guideline. The values for N3 & N4 were exceeding Leq Day and Leq Night limits as prescribed by CPCB as well as WBG guidelines. The exceedance in the noise limits can be attributed to high wind speeds in the region during the months of May and June. Months of May and June are characterized high wind speeds with the highest wind speeds in the month of June.

The construction work for the associated TL and water pipeline is envisaged to increase the existing noise level at the project study area. Since there are no settlements located within 500 m of the associated TL and water pipeline, however workers employed in the various industries located within 500m are anticipated to be impacted from increased noise levels due to their proximity to 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 construction phase will last for a short period of time i.e., 10 months.

[84] The winching machine produces a noise level of more than 70 dB (A)

Impact Magnitude

Impacts on ambient noise quality during construction activities will be for 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 while 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 small. The intensity and frequency have been classified as high and routine respectively as the construction work will be undertaken on 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.

Proposed 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 wastes 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 waste water at site may lead to long term negative impact on soil quality.

Daily general waste of workers in the construction site (organic matter, waste paper, etc.) is 0.74kg/person/day[85]. The number of employees/workers working on the site during construction phase are 89. The daily workload of workers on the project area is about 0.74kg/person/day x 50 person = 65.86 kg/day. The amount of waste generated is not large, however if not collected and managed daily, it increases the chances of degradation and increase 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 top soil 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 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.**

Proposed 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
- 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 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
- 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

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

- 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 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.
- EPC contractor should restore the project site and surrounding area (if used for any temporary structure) to its original condition. GWAPL 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 waste water from workers at the site mainly contains debris, decomposing organic matter, nutrients (N, P) and microorganisms.
- Construction waste water.

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 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 remaining construction activities at the WTE plant is currently water tankers via third party vendors. However, it could not be confirmed at this stage, if the source of water in the tanker is ground water or surface water. With regards to domestic purposes is ground water borewell present within the project site and for drinking water, water campers are being sourced from local vendors.

As per CGWB, the project falls is an area marked as semi-critical as per GWRE 2017 categorization. Furthermore, as per CGWA notification dated 24 September 2020, in semi-critical 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 is present and fresh dumping of the waste is being undertaken in the nearby vicinity. . Based on the ground water quality monitoring results (as presented in ***section 5.3.6.3.1***), 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. Also, there are no residential area within 500m aerial distance 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) for drinking purposes .

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 5-13***) there are multiple dendritic drainage channels located within 10 km of the Project area and within the water pipeline as well as transmission line. A natural perennial water pond is located 570 m (aerial distance) from site towards east direction, Chandola lake is located 4 km (aerial distance) from site towards northeast direction and Kakaria lake is located 6.5 km (aerial distance) from site towards north east direction and Sabarmati river flows at a distance of 2.7 km west from the project site. 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 Rain water is also being used for construction and landscaping activities during the construction phase

Impact Magnitude

Since the associated TL and water pipeline 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. 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

	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 7-10 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 environment • Water environment • Occupational Health & Safety

Aspect	Source	Impact
	• Air emissions from MSW collection and transport include, dust and bio-aerosols, odors, and vehicle emissions	
Bottom Ash & Fly Ash	• Boiler	• Water environment • Air environment • Soil environment • Occupational Health & Safety
Waste generated during the project operations (Hazardous waste, domestic waste, waste water, 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 handling
- Flue gas emission from boiler/furnace due to incineration of waste
- Fugitive fly ash emission from ash handling units and boiler and during ash transportation
- Exhaust emissions from diesel generators used for power back up

During the operation phase of the project, the 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 150-200 Vehicles are anticipated to bring fresh waste to the WTE plant.

Specialized transportation vehicles for the transportation of fresh waste from the garbage stations will be done using 5-10 tonnes trucks with average waste transportation distance of about 40-50km/vehicle. The fresh waste generated by the Ahmedabad city is currently being dumped at the existing dumping site and post operation of the plant, the 1000TPD of 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 (~ 214TPD 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 Table 7-11*** 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, PM_{10}, $PM_{2.5}$, Cadmium +Thorium and their compounds, Scandium+ Arsenic + Lead+ cobalt+ Chromium+ Copper + Manganese+ Nickel+ Vanadium and their compounds. The flue gas emission from the boiler 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 7-11 Technology adopted for Flue Gas Cleaning

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
PM_{10}, $PM_{2.5}$	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

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). GWAPL 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 include H_2S, ammonia, methyl mercaptan. During operation, accumulation of a large amount of waste in the bunker with incoming waste ~ 1000 tonnes per day 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 to account 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. One stack is 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 Hour, taking into account failure of APCD.
6. 99% efficiency of Air Pollution Control Devices (ESP and Bag house filter) has been considered for removal of Particulate Matters
7. For the removal of gases (NO2 and SO2), 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 the Google Earth.

Identification of Source

The under-construction plant is a waste to energy plant, one stack has been considered as the point source for emission. MSW, RDF, segregated waste will be used in boiler. 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}, $PM_{2.5}$, NOx , SO_2 and CO only. Sources of pollutants considered are:

- Process stack – PM10, PM2.5, SO2, NOx, CO
- Road transportation – Fugitive dust

Table 7-12 Details of Boiler

S. No	Parameter	Unit	Value
1.	Capacity	TPH	80
2.	Stack Height	m	62
3.	Stack Diameter	m	3.0
4.	Velocity	m/s	10-15

Table 7-13 Traffic Flow

S. No	Material Type	Vehicle Type	Vehicle Make	Vehicle Model	Loading Capacity in MT	Avg Moving Vehicle / Day
1.	MSW	Compactor (BS IV), diesel based	Tata	LPT 1618	15	70

Table 7-14 Emissions in Normal and Worst-Case Scenario

Emissions in Normal and Worst-Case Scenario				
S.No	Pollutant	Emission rate in Normal Condition (g/s)	Emission Worst Case Condition (g/s)	Emission rate (mg/Nm3)
1.	PM10	0.84	84	10
2.	PM2.5	0.84	84	10
3.	NOx	16.80	33.60	200
4.	SO_2	4.20	8.40	50
5.	CO	4.20	6.30	50
Fugitive Dust Emission				
S. No	Pollutant	Emission rate in Normal Condition (g/s-m2)		
1.	PM10	3.72E-7		
2.	PM2.5	3.72E-8		

Identification of receptors

To identify the impact on receptors in 10 km radius a grid has been taken of 20 km x 20 km in North and East of the site considering center of site as the center of the grid. A total of 41 points on both the sides at an 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 consist of wind direction, wind speed, temperature (in K), mixing height, stability class (urban and rural) and cloud cover. Life of the plant is 25 years, significant changes in the met data in another 25 years is not anticipated.

Analysis of Results

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. Ground Level Concentration (GLC) on sensitive receptors (village settlements) in 10 km radius for all the pollutants was modelled.

The maximum incremental GLC (24 hours averaging period, in normal conditions and 1 hour for worst case scenario) for the PM10, PM2.5, NOx, SOx and CO (8 hours averaging period, in normal conditions) on the baseline conditions will be:

Normal Case (24 hour averaging period)

- PM10 – 0.56 ug/m3
- PM2.5 – 0.52 ug/m3
- NOx – 9.62 ug/m3
- CO- 7.57 ug/m3
- SO_2- 2.35 ug/m3

Worst Case

- PM_{10} –347.33 ug/m3
- $PM_{2.5}$ – 347.33 ug/m3
- NOx – 139.5 ug/m3
- CO- 26.47 ug/m3 (8 hour)
- SO_2- 34.04 ug/m3

Detailed Results for 24 hour averaging period (for PM_{10}, $PM_{2.5}$, 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 sensitive receptors falling within 10 km radius has been presented in ***Table 7-15***.

Referring to the modeling results:

- PM10: Maximum GLC is observed to be 0.563 µg/m3 which is at Project site. With the increase in distance from project site, GLC is getting reduced and by 740 m distance, the concentration is further reduced to less than 0.2 µg/m3.
- PM2.5: Maximum GLC is observed to be 0.528 µg/m3 which is at Project site. With the increase in distance from Project site, GLC is getting reduced and by 720 m distance, the concentration is further reduced to less than 0.2 µg/m3.
- SO2: Maximum GLC is observed to be 2.35 µg/m3 which is at the Project site and highest GLC is falling till the distance of around 280m towards north direction from the plant boundary. With the increase in distance from project site, GLC is getting reduced to 0.8 µg/m3 at a distance beyond 2km.
- NOx: Maximum GLC is observed to be 9.62 µg/m3 which is at Project site. With the increase in distance from Project site, GLC is getting reduced and by 600 m distance, the concentration is further reduced even less than 5.0 µg/m3.
- CO: Maximum GLC is observed to be 7.58 µg/m3 which is at Project site. With the increase in distance from Project site, GLC is getting reduced and by 900 m distance, the concentration is further reduced to less than 2.0 µg/m3.

Table 7-15 Results for Incremental Ground Level Concentrations at the sensitive receptors within 10 km radius for NOx[86]

S.No	Sensitive Receptors	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)	
1	Piplaj	249668	2540910	1.2 Km; SE	4	9	40	NAAQS Permissible Limits for NO_2 (24 Hr) : 80 µg/m³ WBG Ambient Air Quality Standards for NO_2 (WHO Guidelines): 1 year: 40 µg/m³ 1 hour: 200 µg/m³
2	Juhapura	246770	2544494	3.4 Km; NW	2	4	50	
3	Ahmedabad	250710	2547798	6.0 Km; N	1	3	10.653	
4	Narimanpura	243437	2540692	5.5 Km; NW	2	4	30	
5	Visalpur	242379	2536128	8.2 Km; SW	1	2	10.653	
6	Paldi	245075	2534472	8.0 Km; SW	1	2	10.653	
7	Aslali	253449	2535980	7.3 Km; SE	2	5	10.653	
8	Ode	248449	2536178	5.3 Km; S	2	4	30	
9	Sanathal	240670	2542131	8.0 Km; W	2	4	30	
10	Chhipakuva	251505	2544261	3.7 Km; NE	2	4	30	
11	Ghodasar	255262	2542886	6.5 Km; NE	1	3	10.653	
12	Akruti Township	253960	2540869	5.2 Km; SE	2	4	30	
13	Ramnagar	257082	2545235	9.0 Km; NE	1	2	10.653	
14	Shankarpura	254860	2546796	7.8 Km; NE	1	2	10.653	
15	Hindu Colony	250062	2550102	8.5 Km; NE	1	3	10.653	
16	Mumatpura	242880	2547483	8.2 Km; NW	0.9	1	10.653	

Table 7-16 Results for Incremental Ground Level Concentrations at the sensitive receptors within 10 km radius for PM_{10}

S.No	Sensitive Receptors	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)	
1	Piplaj	249668	2540910	1.2 Km; SE	0.2	20	100	NAAQS Permissible Limits (24 Hr) : 100 µg/m³
2	Juhapura	246770	2544494	3.4 Km; NW	0.1	10	100	
3	Ahmedabad	250710	2547798	6.0 Km; N	0.08	6	50	
4	Narimanpura	243437	2540692	5.5 Km; NW	0.1	10	70	
5	Visalpur	242379	2536128	8.2 Km; SW	0.07	6	60	

[86] 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	Sensitive Receptors	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)	
6	Paldi	245075	2534472	8.0 Km; SW	0.07	6	50	**WBG 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)
7	Aslali	253449	2535980	7.3 Km; SE	0.1	10	70	
8	Ode	248449	2536178	5.3 Km; S	0.1	10	70	
9	Sanathal	240670	2542131	8.0 Km; W	0.1	10	70	
10	Chhipakuva	251505	2544261	3.7 Km; NE	0.1	10	90	
11	Ghodasar	255262	2542886	6.5 Km; NE	0.08	6	60	
12	Akruti Township	253960	2540869	5.2 Km; SE	0.1	10	70	
13	Ramnagar	257082	2545235	9.0 Km; NE	0.07	6	50	
14	Shankarpura	254860	2546796	7.8 Km; NE	0.07	6	50	
15	Hindu Colony	250062	2550102	8.5 Km; NE	0.08	8	40	
16	Mumatpura	242880	2547483	8.2 Km; NW	0.04	2.41	50	

Table 7-17 Results for Incremental Ground Level Concentrations at the sensitive receptors within 10 km radius for $PM_{2.5}$

S.No	Sensitive Receptors	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)	
1	Piplaj	249668	2540910	1.2 Km; SE	0.2	20	100	**NAAQS Permissible Limits (24 Hr) :** 60 µg/m³ **WBG Ambient Air Quality Standards (WHO Guidelines): 24 hour values (µg/m³)** 75 (Interim target-1) 50 (Interim target-2) 37.5 (Interim target-3) 25 (guideline)
2	Juhapura	246770	2544494	3.4 Km; NW	0.1	10	100	
3	Ahmedabad	250710	2547798	6.0 Km; N	0.08	6	50	
4	Narimanpura	243437	2540692	5.5 Km; NW	0.1	10	70	
5	Visalpur	242379	2536128	8.2 Km; SW	0.07	6	60	
6	Paldi	245075	2534472	8.0 Km; SW	0.07	6	50	
7	Aslali	253449	2535980	7.3 Km; SE	0.1	10	70	
8	Ode	248449	2536178	5.3 Km; S	0.1	10	70	
9	Sanathal	240670	2542131	8.0 Km; W	0.1	10	70	
10	Chhipakuva	251505	2544261	3.7 Km; NE	0.1	10	90	
11	Ghodasar	255262	2542886	6.5 Km; NE	0.08	6	60	
12	Akruti Township	253960	2540869	5.2 Km; SE	0.1	10	70	
13	Ramnagar	257082	2545235	9.0 Km; NE	0.07	6	50	
14	Shankarpura	254860	2546796	7.8 Km; NE	0.07	6	50	

S.No	Sensitive Receptors	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)	
15	Hindu Colony	250062	2550102	8.5 Km; NE	0.08	8	40	
16	Mumatpura	242880	2547483	8.2 Km; NW	0.04	2.41	50	

Table 7-18 Results for Incremental Ground Level Concentrations at the sensitive receptors within 10 km radius for SO_2

S.No	Sensitive Receptors	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)	
1	Piplaj	249668	2540910	1.2 Km; SE	1	1	10	NAAQS Permissible Limits (24 Hr): 80 µg/m³ WBG Ambient Air Quality Standards (WHO Guidelines): 24 hour values (µg/m³) 125 (Interim target-1) 50 (Interim target-2) 20 (guideline)
2	Juhapura	246770	2544494	3.4 Km; NW	0.5	1	10	
3	Ahmedabad	250710	2547798	6.0 Km; N	0.3	0.7	4	
4	Narimanpura	243437	2540692	5.5 Km; NW	0.5	1	7	
5	Visalpur	242379	2536128	8.2 Km; SW	0.3	0.6	5	
6	Paldi	245075	2534472	8.0 Km; SW	0.3	0.6	5	
7	Aslali	253449	2535980	7.3 Km; SE	0.5	1	5	
8	Ode	248449	2536178	5.3 Km; S	0.5	1	7	
9	Sanathal	240670	2542131	8.0 Km; W	0.3	1	5	
10	Chhipakuva	251505	2544261	3.7 Km; NE	0.5	1	7	
11	Ghodasar	255262	2542886	6.5 Km; NE	0.3	0.7	5	
12	Akruti Township	253960	2540869	5.2 Km; SE	0.3	0.9	8	
13	Ramnagar	257082	2545235	9.0 Km; NE	0.3	0.6	4	
14	Shankarpura	254860	2546796	7.8 Km; NE	0.3	0.6	5	
15	Hindu Colony	250062	2550102	8.5 Km; NE	0.3	0.6	3	
16	Mumatpura	242880	2547483	8.2 Km; NW	0.1	0.152	4	

Table 7-19 Results for Incremental Ground Level Concentrations at the sensitive receptors within 10 km radius for CO

S.No	Sensitive Receptors	X coordinates	Y Coordinates	Distance & Direction	Ground level concentration (µg/m³)			Applicable Standards
					Normal Condition (8 hour)	Worst case Condition (8 hour)	Worst case Condition (1 hour)	
1	Piplaj	249668	2540910	1.2 Km; SE	2	2	8	

S.No	Sensitive Receptors	X coordinates	Y Coordinates	Distance & Direction	Ground level concentration (µg/m³)			Applicable Standards
					Normal Condition (8 hour)	Worst case Condition (8 hour)	Worst case Condition (1 hour)	
2	Juhapura	246770	2544494	3.4 Km; NW	1	1	9	NAAQS Permissible Limits (8 Hr): 2 mg/m³ (2000 µg/m³)
3	Ahmedabad	250710	2547798	6.0 Km; N	1	1	4	
4	Narimanpura	243437	2540692	5.5 Km; NW	1	2	6	
5	Visalpur	242379	2536128	8.2 Km; SW	0.9	1	4	
6	Paldi	245075	2534472	8.0 Km; SW	0.9	1	4	
7	Aslali	253449	2535980	7.3 Km; SE	1	1	5	
8	Ode	248449	2536178	5.3 Km; S	1	2	6	
9	Sanathal	240670	2542131	8.0 Km; W	1	1	6	
10	Chhipakuva	251505	2544261	3.7 Km; NE	1	1	6	
11	Ghodasar	255262	2542886	6.5 Km; NE	0.7	1	4	
12	Akruti Township	253960	2540869	5.2 Km; SE	1	1	6	
13	Ramnagar	257082	2545235	9.0 Km; NE	0.7	1	4	
14	Shankarpura	254860	2546796	7.8 Km; NE	0.7	1	4	
15	Hindu Colony	250062	2550102	8.5 Km; NE	0.9	1	3	
16	Mumatpura	242880	2547483	8.2 Km; NW	0.239	0.5	4	

The ground level concentration (GLC) of various pollutants due to the emission from the waste to energy plant for all the sensitive receptors (settlements) within 10 km radius are well within the National Ambient Air Quality Standards as well as WBG Ambient Air Quality Standards (WHO Guidelines) for normal scenarios for 24 hours values. As confirmed by the GWAPL, 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) and will be installed at the stack to monitor the pollutants.

The impact during normal case scenario will be limited to 10 km radius from the project site. With proper functioning of Air Pollution Control Devices, Incremental ground level concentration has minimal impact. Also, the emissions from the boiler (refer

) 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 7-20***) presents the Resultant Pollution Load in normal working conditions (i.e. all the Air Pollution Control Devices (APCD) devices are fully functional) of the WTE plant. The resultant pollution load for the project study area was calculated w.r.t. 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 (Total Concentration) from ambient air monitoring undertaken for the project indicates that 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 as well as Interim target-1 Also, the ambient air is already degraded for PM10 and PM 2.5 (Refer ***section 5.3.8.1.1***).

The modeling results (refer Table below), indicate that there will be no significant change in the existing ambient air quality parameters due to the project operations. As per modeling results, total 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 66.44 -133.69 µg/m^3, 32.14-75.02µg/m^3, 44.38-51.99 µg/m^3, 12.15-17.11 µg/m^3 and 0.508-0.608 mg /m^3 respectively. Values for PM10 and PM2.5 are exceeding the NAAQS standards, PM10 & PM2.5 values are also exceeding the IFC interim target-2 values. For NO_X, SO_2, and CO the values are well within the NAAQS as well as IFC AAQ standards.

The airshed is already degraded (For PM 10 & PM2.5), the % increase in the pollutant load in ambient air quality lies in the range of 0.42-0.85% and 0.70 - 1.64 % respectively for 24 hours values with APCD devices for PM 10 & PM 2.5. The modelled contribution due to emissions from the project are well within the 25% incremental contribution wrt to IFC AAQ standards for a degraded airshed for PM 10 & PM 2.5, and 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 1.26-1.54%, 15.92-23.98% and 22.70-27.68 % respectively for 24 hours values with APCD devices. The baseline values for CO, SO_2 and NO_x are quite low and well within the limits and the emission by the plant are also well below the standards.

Table 7-20 Resultant Concentration for Pollutants at the Monitoring Locations (Receptors within 3km radius)

SampleLocation	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)	24 Hour (Without APCD)		24 Hour- 1st Highest (With APCD)	24 Hour (without APCD)	24 Hour (1st Highest) With APCD	1 Hour without APCD	24 Hour- 1st Highest (With APCD)	24Hour (without APCD)	
PM_{10}											
AAQ1 Project Premises	133.13	0.56	347.33	Project Site	133.69	480.46	0.56	347.33	0.42	260.90	**NAAQS Permissible Limits (24 Hr) :** 100 µg/m³ **WBG 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 Gyaspur Village	65.88				66.44	413.21			0.85	527.22	
AAQ3 Gyaspur	73.44				74	420.77			0.76	472.94	
AAQ4 Piplaj	67.02				67.58	414.35			0.84	518.25	
$PM_{2.5}$											
AAQ1 Project Premises	74.50	0.52	347.33	Project Site	75.02	421.83	0.87	578.88	0.70	466.21	**NAAQS Permissible Limits (24 Hr):** 60 µg/m³ **WBG 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 Gyaspur Village	32.66				33.18	379.99			1.59	1063.47	
AAQ3 Gyaspur	33.45				33.97	380.78			1.55	1038.36	
AAQ4 Piplaj	31.62				32.14	378.95			1.64	1098.45	
NO_x											

SampleLocation		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)	24 Hour (Without APCD)		24 Hour- 1st Highest (With APCD)	24 Hour (without APCD)	24 Hour (1st Highest) With APCD	1 Hour without APCD	24 Hour- 1st Highest (With APCD)	24Hour (without APCD)	
AAQ1	Project Premises	42.37	9.62	139.5	Project Site	51.99	181.87	12.03	174.38	22.70	329.24	NAAQS Permissible Limits (24 Hr) : 80 µg/m³ WBG Ambient Air Quality Standards (WHO Guidelines): • 1 year: 40 • 1 hour: 200
AAQ2	Gyaspur Village	36.70				46.32	176.2			26.21	380.11	
AAQ3	Gyaspur	34.76				44.38	174.26			27.68	401.32	
AAQ4	Piplaj	36.09				45.71	175.59			26.66	386.53	
						SO2						
AAQ1	Project Premises	14.76	2.35	34.04	Project Site	17.11	48.80	2.938	42.55	15.92	230.62	NAAQS Permissible Limits (24 Hr) : 80 µg/m³ WBG Ambient Air Quality Standards (WHO Guidelines): 24 hour values • 125 (Interim target-1) • 50 (Interim target-2) • 20 (guideline)
AAQ2	Gyaspur Village	9.80				12.15	43.84			23.98	347.35	
AAQ3	Gyaspur	9.80				12.15	43.84			23.98	347.35	
AAQ4	Piplaj	11.00				13.35	45.04			21.36	309.45	
						CO (8 hour)						
			8 hour	1 hour		8 hour	1 hour			8 hour	1 hour	
AAQ1	Project Premises	0.90 mg/m³	7.57 (µg/m³)	26.47274 (µg/m³)	Project Site	0.508	0.526	0.379	1.324	1.514	5.295	NAAQS Permissible Limits (8 Hr): 2 mg/m³ (2000 µg/m³)
AAQ2	Gyaspur Village	0.88 mg/m³	0.00757 (mg/m³)	0.026473 (mg/m³)		0.508	0.526			1.514	5.295	

SampleLocation	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)	24 Hour (Without APCD)		24 Hour- 1st Highest (With APCD)	24 Hour (without APCD)	24 Hour (1st Highest) With APCD	1 Hour without APCD	24 Hour- 1st Highest (With APCD)	24Hour (without APCD)	
Gyaspur AAQ3	0.83 mg/m³				0.608	0.626			1.262	4.412	
Piplaj AAQ4	0.49 mg/m³				0.608	0.626			1.262	4.412	

Proposed Control Measures

- Adequate air pollution control measures such as flue gas cleaning system, 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
- 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) avoids the formation of dioxins and furans
- Use negative pressure in processing buildings to manage odor
- 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
- 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 (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
- 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.
- 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 to 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
- GWAPL will implemented a combination of both ESP and high efficiency of bag filters in series. ESP will acts 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 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

Additional Mitigation Measures

- 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%

- Use extraction system to remove dust from working areas, buildings, and storage vessels, and treat as needed to control particulate emissions
- 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 airshed87.
- 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. GWAPL to discuss with AMC for disposal of ash in line with MoEFCC draft notification no. G.S.R. 285(E) dated 22/04/2021, with previous notification on 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 to Moderate	Small to Substantial

7.4.2.2 Ambient Noise

During the operation phase, noise might be generated due to industrial activities involved in handling, transporting, processing of MSW 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 MSW 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, Cooling Towers, Ancillary equipment including hydraulics, waste pre-processing equipment (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.

Based on the ambient noise quality monitoring conducted at four locations within study area (refer Table 5-15*)*, N1 & N3 located in an industrial area were found to be within limits as prescribed by CPCB as well as WBG Guideline values, whereas for Leq Day, value of N1 was well within limits as prescribed by CPCB but was exceeding the values as per WBG Guideline. The values for N3 & N4 were exceeding Leq Day and Leq Night limits as prescribed by CPCB as well as WBG guidelines. The exceedance in the noise limits can be attributed to high wind speeds in the region during the months of May and June. Months of May and June are characterized high wind speeds with the highest wind speeds in the month of June. Operation of the project may contribute to increasing the noise levels in the project study area.

The project will deploy approximately 60-70 on roll workers during operation phase who will be exposed to the noise emissions along with the workers present within the industrial area and the existing landfill and dumping area. Furthermore, nearest settlements are located at an aerial distance of 750m west from site. There are no permanent residential settlements present within 500m radius of the project. However temporary settlements and structures present within the existing dumping and landfill area may be impacted.

[87] 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).

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 7-21 Inventory of Noise Equipment

S. No	Equipment	Number of Equipment	Noise level dB(A)	
1.	**Boiler fuel feeding**		69.3	58.6
	Boiler fuel bunker	1		
	Orange peel grabber	2		
	Fuel pushing mechanism	-		
	Hydraulic pusher	1		
	Auxiliary burner	2		
	Start-up burner	2		
	Vibro feeder	-		
2.	**Boiler Aux fuel feeding**		69.3	58.6
	Aux fuel silo	-		
	Orange peel grabber	-		
	Drag chain conveyor	-		
	Screw conveyors	-		
	Fuel feeding chutes	-		
3.	**Steam Boiler**	1	73.8	61.3
	Combustion grate	1		
	Furnace and refractory wall	Lot		
	Boiler feed pump	2		
	Safety valves	-		
	Steam drum	1		
	Steam coil Air preheater	-		
	Sec air preheater	-		
	Primary air preheater	-		
	Evaporator	1		
	Superheater	4		
	Attemperator	2		
	Economizer	6		

S. No	Equipment	Number of Equipment	Noise level dB(A)	
	Boiler cleaning system	Lot		
	Blow down tank	1		
4.	**Fans (boiler)**		73.8	61.3
	Primary fan	10		
	Secondary fans	1		
	Flue gas rec fan	1		
	Induced draft fan	2		
5.	**Flue gas cleaning system**	2	73.8	65.3
	Electrostatic precipitator	-		
	Acid control reactor tower	2		
	Dry sorbent injection	2		
	Filter bag house	2		
	Continuous emission monitoring system	1		
	Stack	1		
6.	**Ash Handling System**		73.8	61.3
	Submerged belt conveying system	-		
	Bank zone ash conveying system	-		
	ESP ash conveying system	-		
	Bag filter ash conveying system	-		
	Ash extractor	2		
	Shifting ash conveyor	2		
	Shifting ash add on conveyor	1		
7.	**Stream Turbine**		86.0	82.0
	Generator	1		
	Distributed control system	1		
	SIGMA control system	1		
8.	**Primary Water Treatment Plant**		70.2	63.6
	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		

S. No	Equipment	Number of Equipment	Noise level dB(A)	
	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	1		
	Induced draft cooling tower	-		
	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		

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 7-22 Details of Point Sources

Source ID	X-Coordinate	Y-Coordinate	SPL (dB(A))
Turbine	248684	2541672	89.26
Substation	248646	2541739	71.12
Flue Gas Cleaning System	248649	2541651	74.43
Boiler	248678	2541647	73.02
Fans (Boiler)	248680	2541653	73.02

Source ID	X-Coordinate	Y-Coordinate	SPL (dB(A))
Boiler Fuel Feeding	248702	2541651	69.05
Boiler Aux Fuel Feeding	248709	2541652	69.05
Ash Handling System	248669	2541660	73.02
Condenser Water Cooling System	248694	2541735	75.76
Air Compressor	248694	2541639	70.65
Primary Water Treatment Plant	248881	2541578	71.79
Boiler Water Treatment Plant	248710	2541738	75.76

Table 7-23 Details of Vehicular Movement

Sr. No.	Material Type	Vehicle Type	Vehicle Make	Vehicle Model	Loading Capacity in MT	Avg Moving Vehicle / Day
1	MSW	Compactor	Tata	LPT 1618	15	70

Table 7-24 Boundary Details

Source ID	X1-Coordinate	Y1-Coordinate	X2-Coordinate	Y2-Coordinate	Height
B_001	248895	2541741	248634	2541763	3
B_002	248634	2541763	248612	2541554	3
B_003	248612	2541554	248677	2541548	3
B_004	248677	2541548	248722	2541555	3
B_005	248722	2541555	248796	2541564	3
B_006	248796	2541564	248878	2541560	3
B_007	248878	2541560	248895	2541563	3
B_008	248895	2541563	248911	2541670	3
B_009	248911	2541670	248900	2541682	3
B_010	248900	2541682	248899	2541720	3
B_011	248899	2541720	248895	2541741	3
B_013	248618	2541558	248673	2541552	5
B_014	248673	2541552	248698	2541554	5
B_015	248698	2541554	248730	2541560	5
B_016	248730	2541560	248763	2541563	5
B_017	248763	2541563	248805	2541570	5
B_018	248805	2541570	248857	2541564	5
B_019	248857	2541564	248885	2541564	5
B_020	248885	2541564	248891	2541566	5

Source ID	X1-Coordinate	Y1-Coordinate	X2-Coordinate	Y2-Coordinate	Height
B_021	248891	2541566	248895	2541580	5
B_022	248895	2541580	248899	2541607	5
B_023	248899	2541607	248903	2541636	5
B_024	248903	2541636	248909	2541658	5
B_025	248909	2541658	248909	2541655	5
B_026	248909	2541655	248907	2541651	5

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 7-25 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))
NQ1 (Project Site)	248892	2541720	38	82.78	82.8	0.02
NQ2 (Near Gyaspur Primary School)	247800	2542032	22.9	64.06	64.1	0.04
NQ3 (Near Pirana STP)	249109	2542459	26.1	66.8	66.8	0
NQ4 (Near Piplaj Primary school)	249724	2540661	20.4	67.5	67.5	0

**noise level for traffic flow less than 1000 vehicles / 18 hours is not computable in Dhwani Pro Software*

Table 7-26 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
NQ1 (Project Site)	248892	2541720	38	82.78	82.8	0.02
NQ2 (Near Gyaspur Primary School)	247800	2542032	15	64.06	64.1	0.04
NQ3 (Near Pirana STP)	249109	2542459	17.6	66.8	66.8	0
NQ4 (Near Piplaj Primary	249724	2540661	14.1	67.5	67.5	0

school)

**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)

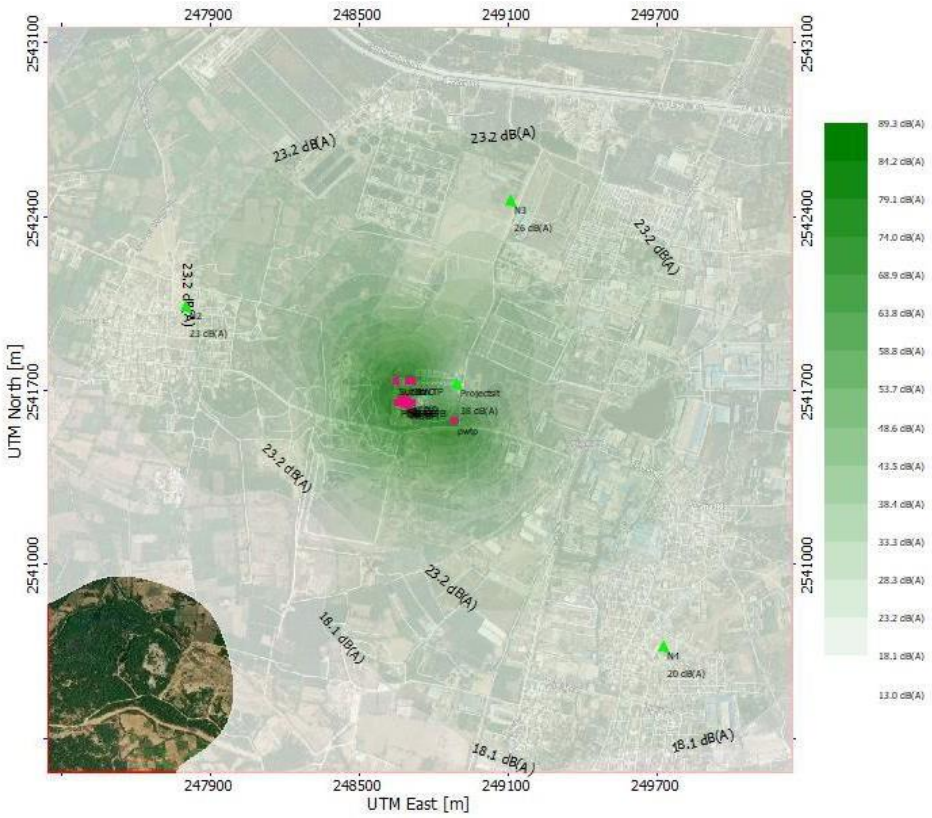


Figure 7-2 Contour Level at Project Site and Surrounding

Figure 7-3 Predicted Noise Level at Receptor with boundary wall (barrier)

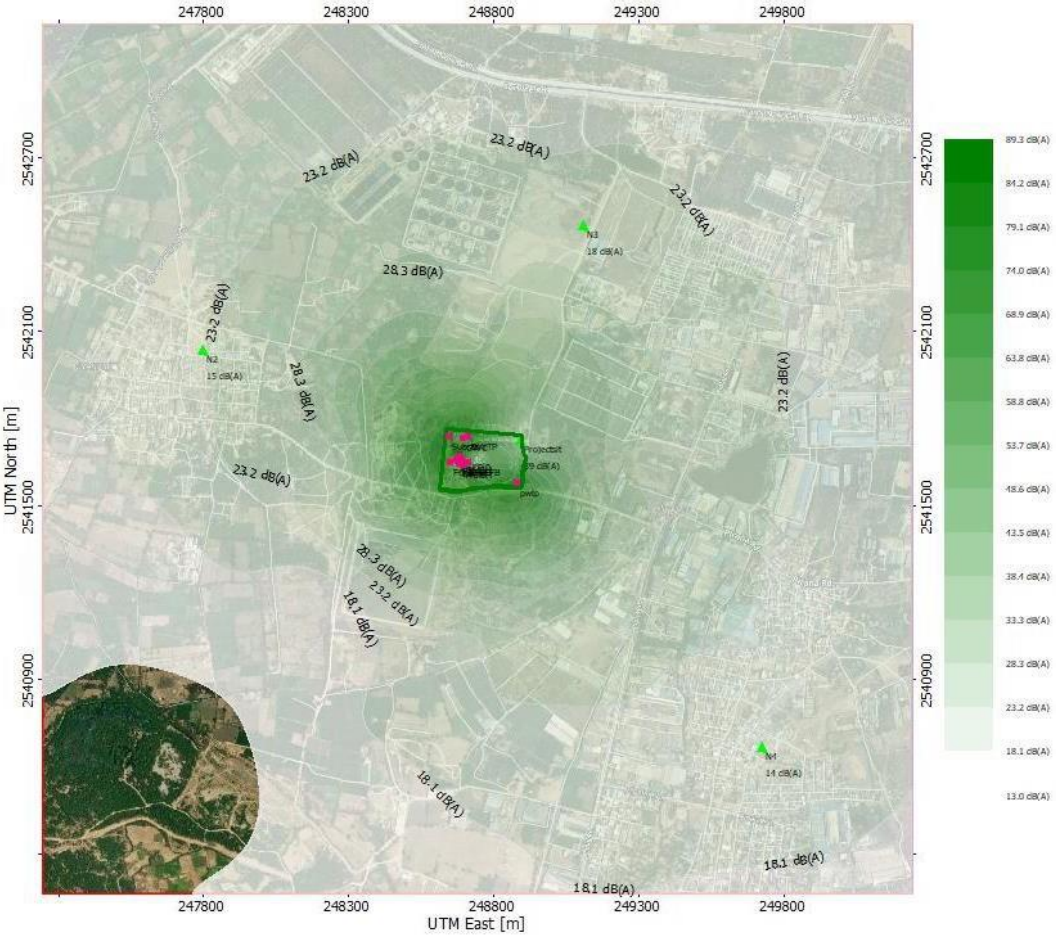
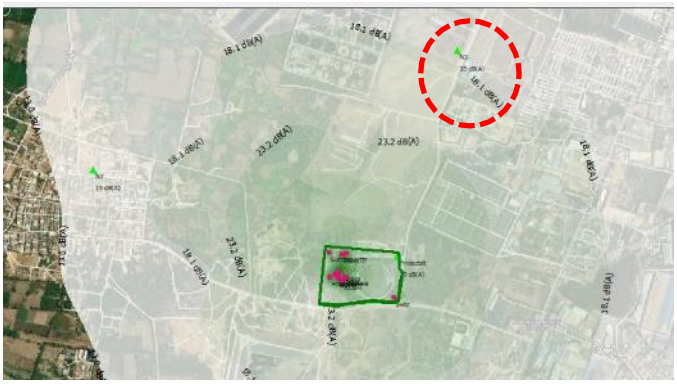


Figure 7-4 Contour Level at different Receptors

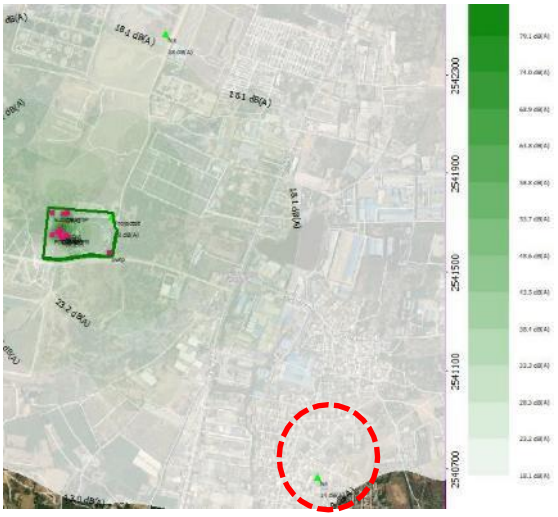
Vicinity of the project site

Near NQ2

Near NQ3



Near NQ4



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[88]

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 exceed 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's will comply to 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 minimise 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 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

	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:

- Fly Ash & Bottom Ash
- 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.

[88] 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) plant. Sludge, used & waste oil slurry, batteries, fly ash, bottom ash etc. are the hazardous waste anticipated due to project operations.

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. The project will be storing the fly ash in the silos, however the bottom ash will be submerged in the water. The bottom ash extractor will be of the water-bath type with bottom ash removal by a hydraulic pusher. The combustion grate will have two bottom ash extractors installed in function of the width of the furnace and grate. At the outlet of each bottom ash extractor, the ashes will drop onto a conveyor system. These conveyors will transport the ashes outside the building to a handling system.

Provision for leachate collection system comprising of two underground leachate collection pit for leachate collection from refuse bunker, feeding hopper and feeding grate and 2 no.s of leachate drying beds. Also, the filtered leachate will also be sent to the boiler.

According to the soil monitoring conducted at 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
- Non-hazardous ash will be provided to cement and fly ash brick manufacturers
- Bottom ash and residuals should be managed based on their classification as hazardous or non-hazardous materials
- Fly ash collected from bag house will contamination 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 wastes 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.
- E-waste generated onsite will 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.
- Battery waste to be disposed via buy back policy with the battery supplier/manufacturer.
- Generated biodegradable waste from the canteen, kitchen, office etc. will be utilized within the plant

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
- GWAPL 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. GWAPL to ensure that the covered trucks are used by AMC to dispose the bottom ash in the nearest sanitary landfill. GWAPL 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)
- 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
- GWAPL to conduct characterization analysis of ash as per IS 3812 covering all the parameters stipulated by BIS to identify any hazardous content before its disposal through AMC trucks. If fly ash is identified as hazardous, it is to be sent to hazardous waste landfill site through authorized vendors and records 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. GWAPL is recommended to obtain chain of custody documents from AMC 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.
- GWAPL 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, GWAPL 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 GWAPL is uncertain that the disposal conducted by AMC is as per the applicable rules, GWAPL will themselves take the responsibility of disposal and will ensure disposal is conducted to the hazardous waste authorized site as per the applicable norms.
- 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/minimise 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, GWAPL 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

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 tower 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 cooling towers 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.
- 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 5-13) there are multiple dendritic drainage channels located within 10 km of the Project area and within the water pipeline as well as transmission line.

According to the water balance diagram (refer ***Figure 2-10***) the daily water requirement for industrial purpose within the WTE plant is approximately 1528 m3/day, the water requirement will be sourced from the STP[89]. The project has received permission for receiving 2 MLD water from the AMC STP. 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. The Pre-treated water i.e. 1528 m3/day will be transported from STP plant to WTE plant and further treated (secondary treatment) on-site prior to be used in the boiler (Refer ***section 2.8.1.2.2***). The project will not use any ground water or surface water sources for project operations.

The project has obtained permission to extract water from the existing borewell within the project premises for domestic and drinking purposes only. As per the categorization, Ahmedabad falls in an area categorized as semi-critical in terms of availability of ground water and the project can abstract 7.5 m3/day water only. Groundwater can only be used for flushing purpose as it is contaminated as per Phase II groundwater quality results.

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 tower 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)

[89] For obtaining water 1528KLD of treated water, 2412KLD needs to be treated at STP and the reject water of 884 KLD will be returned to the STP itself. Currently, the project has received permission for receiving 2 MLD water from the AMC STP, the excess 412 KLD water the project will apply for revision of the permission to receive 2.5 MLD treated water from the STP

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. A pump and piping system will be used to extract the leachate and it will be injected in to the boiler empty pass. Incineration of leachate will be undertaken.
- 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.
- GWAPL has obtained No Objection Certificate from AMC dated to procure secondary treated water from STP for meeting water requirement for industrial purpose. GWAPL has also obtained permission to lay underground pipeline connecting the STP to the Project's pump house.
- 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.
- 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 will be developed to harvest the rainwater and recharge the ground water. Rainwater 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.
- 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
- Sludge generated from the STP should be tested and if found hazardous, should be disposed through authorized hazardous waste recycler. In case sludge is nonhazardous, it should be disposed in landfill after dewatering or used as fertilizer or soil conditioner
- Adequate trainings to be provided to the personnel handling the sludge generated from the STP. The training to be provided by the GWAPL EHS personnel
- 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 and 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 wastewater 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 small.

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

7.4.2.5 Climate Change Impacts

According to Climate Change Department, Government of Gujarat[90], 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.

[90] https://ccd.gujarat.gov.in/

According to the Gujarat State Action Plan on Climate Change (GSAPCC), 2021[91], 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[92].

Note: It should be noted that this is a 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 specific mitigation and adaptation options.

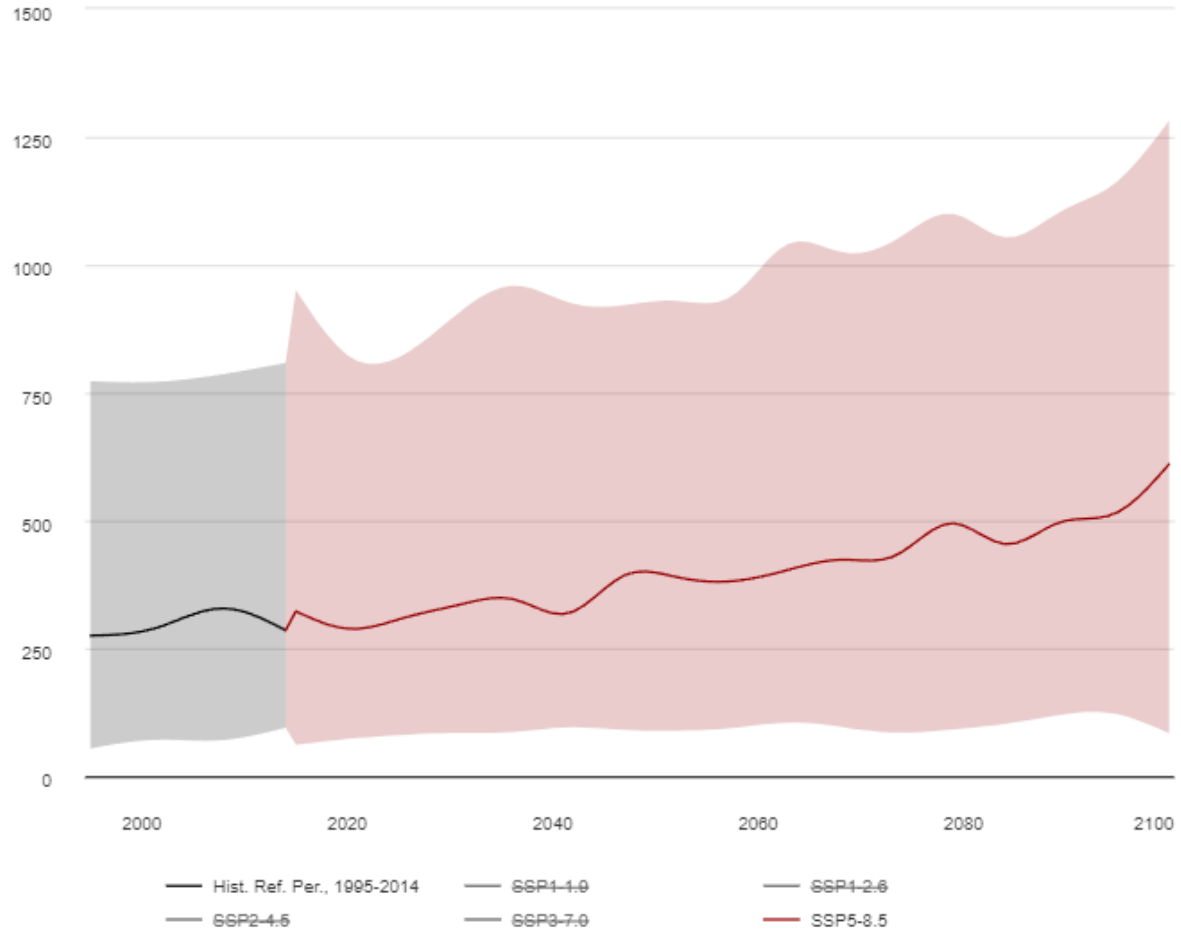
Precipitation

The projection period for precipitation has been considered as 2020-2039. The projected precipitation anomaly for Gujarat has been presented in ***Figure below*** (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.

[91] https://ccd.gujarat.gov.in/Images/Gujarat-State-Action-Plan-on-Climate-Change.pdf
[92] https://climateknowledgeportal.worldbank.org/

Figure 7-5 Mean Projected Precipitation in Gujarat for 2020-2039 (reference period: 1995-2014)

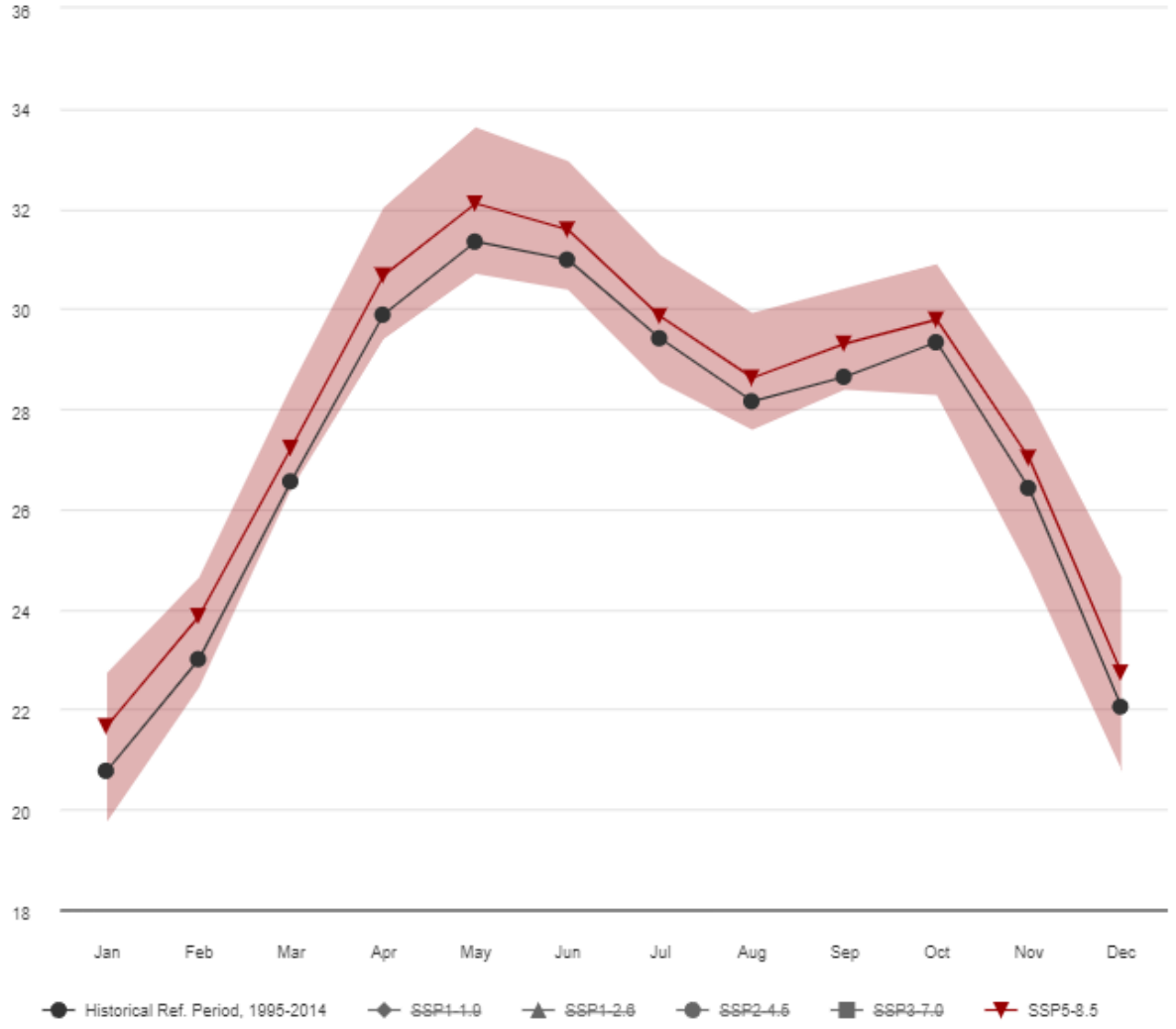


Source: World Bank Climate Change Knowledge Portal

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*** below**.** 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)



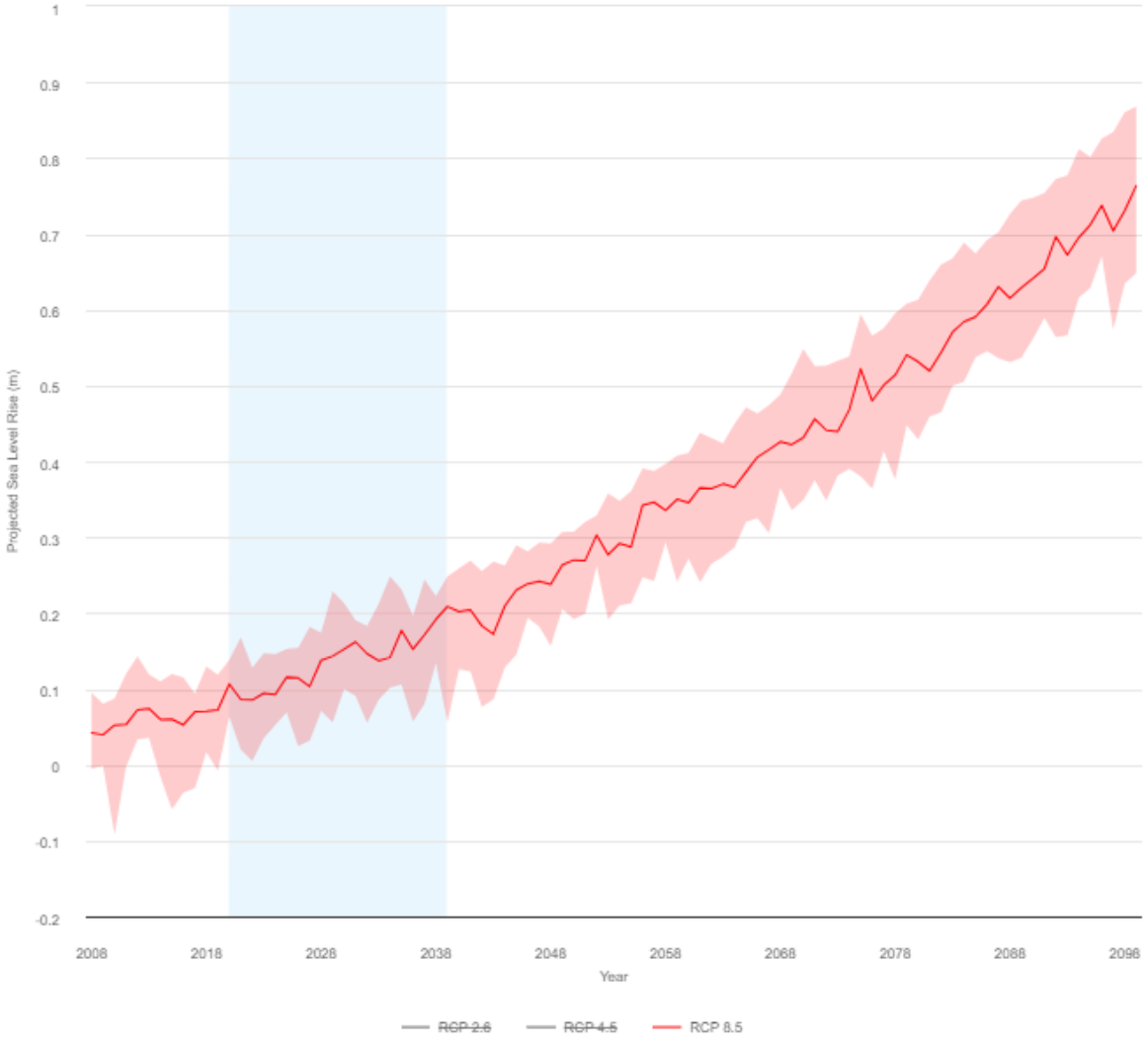
Source: World Bank Climate Change Knowledge Portal

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 below. 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)



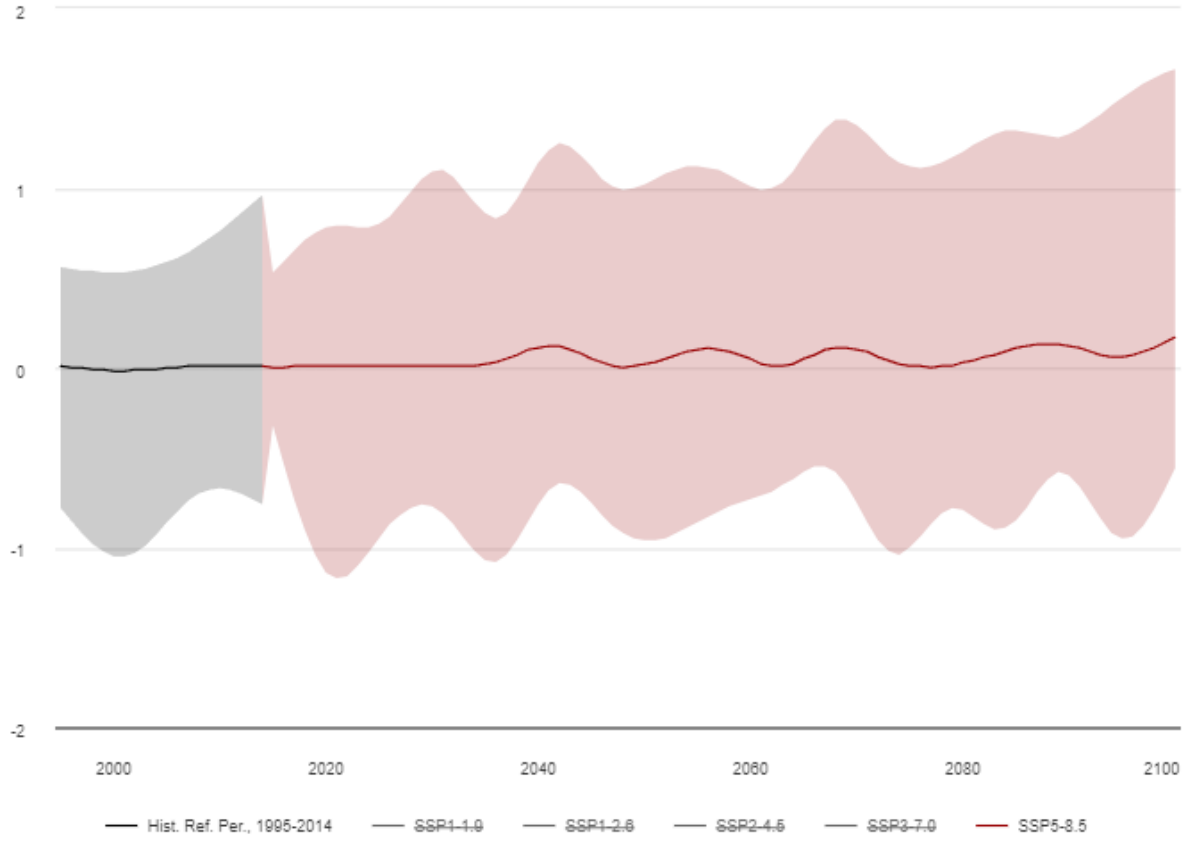
Source: World Bank Climate Change Knowledge Portal

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 below. 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)

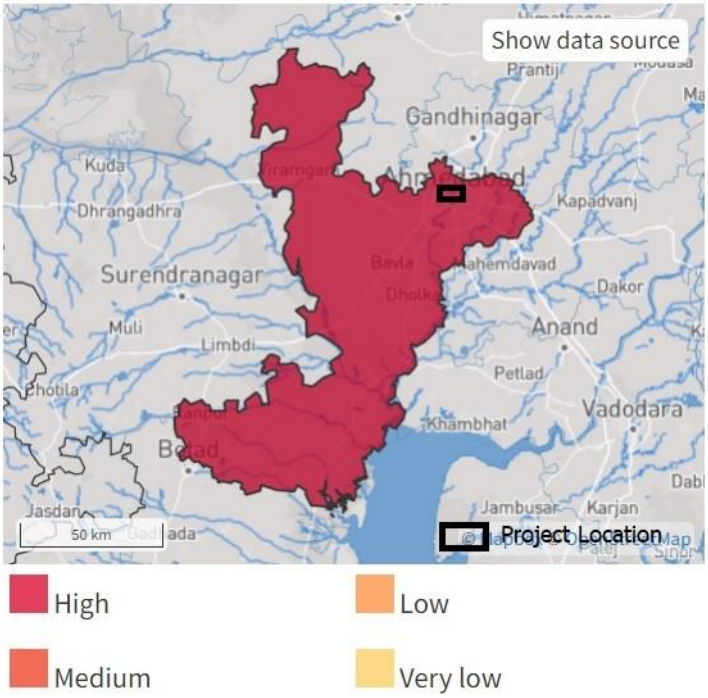


Source: World Bank Climate Change Knowledge Portal

Cyclone

The Cyclone Hazard Map as per Think Hazard 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.

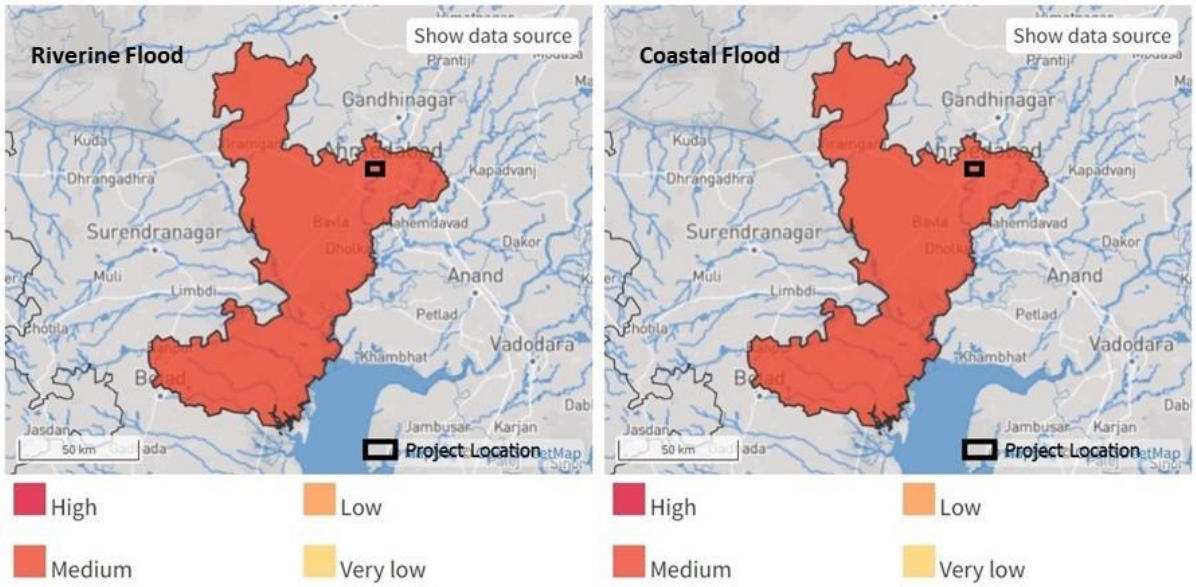
Figure 7-9 Cyclone Hazard Map



Flood

As per the information available in Think Hazard, 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 GWAPL project located in Ahmedabad 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 localised water logging due to

presence of Sabarmati river flowing 2km (aerial distance) from site towards west direction. As per BMTPC also, the project site is located in an area vulnerable to floods. Ahmedabad city has faced intense flood situations in the past due to heavy rainfall. Furthermore, as 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.

Control Measures

- The plant has been designed in a way such that the stormwater flow from the upstream side of the plant is restricted and stormwater collected within the plant will flow through the rainwater harvesting design and utilised in mist make up or groundwater recharge. Therefore, flood like situation in and outside the plant is not expected.
- 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 to the Plant.
- The project design has also 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

Additional Measures

- Undertake detailed flood risk assessments, for the plant location and incorporate the recommendation in the Emergency response plan
- Ensure there is a dedicated, forward-looking budget for mitigating weather-related risks
- Continue to monitor the evolving scientific understanding of climate change hazards and reassess climate change induced risks to specific project elements at regular intervals (e.g., every five years) in the future
- Ensure adequate drainage is developed in and around the plant to avoid water logging and adequate leachate pit is constructed to manage excessive leachate generation during operation phase.

7.5 Impacts on Biological Environment

Upon the site visit, it was observed that the plant is fully established, with the exception of the installation of machines/equipment. The transmission line for this plant will be underground, mitigating potential impacts such as power collisions, habitat destruction, and disturbances. Consequently, the impact during the construction phase is excluded. However, impacts during the operational phase, specifically wildlife conflicts, are thoroughly discussed in the dedicated sections

7.5.1 Operation Phase: Impact Assessment

7.5.1.1 Human-Wildlife Conflicts

The power project surrounded by natural open scrub and modified agricultural habitats. These habitats sustain diverse herpetofauna, avifauna, and mammal populations, as documented in the ecological baseline survey. The presence and movement of these wildlife species within the project compound and along its boundary during the operation phase pose a potential risk of Human-Wildlife conflicts.

As per the baseline, one Schedule I reptiles, Bengal Monitor Lizard *Varanus bengalensis* (Wildlife (Protection) Act, 1972) and mammals, Indian Grey Mongoose *Herpestes edwardsii*, Northern Plains Grey Langur m *Semnopithecus entellus* and Rhesus Monkey *Macaca mulatta*, etc. are capable to climb and thus can enter within the project compound. Beside these species, Common Krait *Bungarus caeruleus*, Indian cobra *Naja*, Oriental Ratsnake *Ptyas mucosa* and Saw-scaled Vipers *Echis carinatus* were also reported from the study area which enter the project premises.

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 (1.1)

Proposed Mitigation Measures

- Frequent checking of the boundary wall to avoid any space for wildlife entrance into project compound..
- Employee Training: Conduct training programs for project personnel to raise awareness about the local wildlife and the importance of respecting their habitats. Employees should be educated on how to handle encounters with wildlife safely and responsibly.
- Emergency Response Protocol: Develop an emergency response protocol to handle any human-wildlife conflicts (especially to handle the Monitor Lizard and Snakes incident) that may arise during the project's operation phase. This should include procedures for safely managing encounters and contacting relevant authorities if needed.
- Good housekeeping practices in the project compound play a crucial role in reducing the attraction of faunal species and mitigating potential human-wildlife conflicts. By implementing effective housekeeping measures, the project can create an environment that is less appealing to wildlife, thereby minimizing their presence within the compound.

By implementing these control measures, the power project can significantly mitigate the potential risk of human-wildlife conflicts, ensuring the safety of both the wildlife and project personnel while minimizing any disruptions to the project's operations.

	Nature of Impact	Spread of Impact	Duration	Intensity	Frequency	Significance of Impact
Without Mitigation Measures	Negative	Local	Permanent	Moderate	-	Substantial
With Mitigation Measures	Negative	Local	Permanent	Low	-	Small-

7.6 Impacts on Socio- Economics

7.6.1 Impact during construction phase

7.6.1.1 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 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 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
- The Project has developed a training calendar and associated training materials and impart trainings at regular intervals to the contractors and workers. The trainings as per the training calendar are provided to all the workers at the WTE plant, workers involved in construction of transmission line and underground water pipeline.
- 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.
- EPC Contractors has a developed 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 are provided to all the workers at the WTE plant, workers involved in construction of transmission line and underground water pipeline
- Project conducts 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.
- GWAPL has aa formal procedure to record near miss, incident, and minor accidents onsite.
- Permit-required for confined spaces are provided with safety measures for venting, monitoring, and rescue operations, to the extent possible..
- Workers engaged in welding works are provided with welder's protective eye shields;
- Electrical and maintenance work are not carried out during poor weather and during lightning strikes;
- Project maintains and obtains check safety method statements from contractors;
- A trained person has been appointed to take charge of the first aid boxes. The location of first aid arrangements are displayed on site;
- The nearest hospital, ambulance, fire station and police station have been identified in the implemented emergency management plan;
- A grievance redressal mechanism in place, to allow for the employees and workers to report any concern or grievance related to work activities.
- GWAPL has a developed a systematic monitoring and auditing mechanism for monitoring the contractors and sub-contractors in terms of resources, child labour and forced labour, health and safety, payment of wages etc.

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 substantial.

Additional Mitigation Measures

- GWAPL 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 14*

- GWAPL to develop and maintain hazard identification and risk assessment (HIRA) for the project and its associated TL and pipeline and communicate the same to the workers. The HIRA register should be update whenever a new hazard is identified at the site.
- 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.
- Monitor health and safety performance and have an operating audit system
- Training of the workers on climbing techniques, and rescue of fall- arrested workers;

	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

7.6.1.2 Temporary Business Disruption & Public Inconvenience

As part of the proposed project the underground transmission line of 7.7 Km and water pipeline 1.71 Km will be constructed for the project. As per the proposed design the alignment of the transmission line and pipeline will be pasting through the existing ROW of the state and national highways and no land acquisition will be done. However, during the construction phase,(7.7 kilometer of transmission line) there might be some potential temporary impacts related to access which may cause temporary business disruption of kiosks owners (0.3 km) vegetable mandi in Mod Kamod, Ahmedabad. However as informed project may lay the line on the opposite side of the road which may avoid the loss of access and potential business disruption. Further as the tranche width is limited to 1 m hence the affected persons can continue their business.

Brief overview of the Kiosks Shops owners

- Kuccha Shop Construction
  - Characterization of Shops: The kiosk owners operate kuccha shops, indicating that the structures are built with materials such as mud, tin sheds or Polly sheets.
- Utilizing National Highway Right-of-Way (RoW):
  - Location Significance: Kiosks situated on the Right-of-Way of the national highway can have strategic significance due to high visibility and potential customer traffic. This location choice may have been influenced by accessibility, visibility to passing vehicles, and the convenience for customers.
- Purchase from Nearby Vegetable Market:
  - Supply Chain Strategy: Kiosk owners adopt a business model involving the purchase of vegetables from a nearby large vegetable market. This indicates a reliance on a broader supply chain for sourcing products to sell in their kiosks.
  - Local Economy Interaction: By sourcing from the nearby market, kiosk owners participate in the local economy, contributing to the livelihoods of larger market vendors and maintaining a connection with regional agricultural activities.

Control Measures Planned for the Project

- The project is meticulously finalizing the route for the transmission line to strategically navigate around areas with existing kiosk shops. In instances where avoidance of these areas proves challenging, the project is actively exploring the feasibility of employing vertical drilling techniques. This approach aims to minimize any potential impact on the operations and structures of the shop owners.

Impact Magnitude

As the laying of water pipeline and transmission will be done locally within the project area with very low spread and the digging of tranches does not require more then 1m linear width of ROW. The duration of the activity will not be more then month and disruption at particular location will not be more than 1 or 2 days. . The intensity of the impact will not result in major changes in the baseline hence the magnitude of the impact is evaluated as **Substantial.** The reasoning of the magnitude of the impact is provided below:

- The construction of the underground transmission line may temporarily disrupt the normal operations of kiosk shops. Excavation and installation activities could limit access or affect visibility, potentially leading to decreased customer footfall.
- Kiosk owners might experience a temporary loss of revenue during the construction phase if customers are deterred by construction activities.
- The construction process might impose restrictions on access routes or parking spaces near the kiosk shops, creating logistical challenges for both owners and customers.

Proposed Mitigation Measures

The following measures should be put in place to ensure that the overall the minimum business disruption and public inconvenience :

- Engage in Transparent Communication with Kiosk Owners
  - Maintain a continuous and transparent communication channels with kiosk owners throughout the project.
  - Establish a dedicated forum for ongoing discussions, addressing concerns promptly, and providing regular updates on project developments.
  - Establish a robust communication plan to keep kiosk owners informed about project milestones and anticipated disruptions.
- Optimize Transmission Line Route to Minimize Impact on Kiosk Structures:
  - Prioritize route optimization to minimize disruption to existing kiosk structures.
  - Seek feedback from kiosk owners during consultation and adjust the route accordingly.
- Deploy Vertical Drilling Techniques to Minimize Surface Disruptions:
  - In cases where route optimization is challenging, employe vertical drilling techniques.
  - Precision in drilling execution is crucial to prevent damage to kiosks.
- Explore Alternative Locations for Affected Kiosk Owners:
  - Assess the feasibility of providing alternative locations for kiosk owners impacted by the transmission line route – if the transmission line route remain unchanged.
  - Furthermore, in the event of any physical damage to the structures of roadside kiosk owners resulting from the installation of the underground transmission line, the project shall fully compensate for the loss or damage to these structures' owner or user at replacement cost[93] or construct the structure as it was earlier to the construction.

	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

7.6.1.3 Impact due to laying down of transmission line

During installation of the underground transmission line (except above mentioned 300 meters – impacting the kiosks shop owners), approximately 80 roadside vendors and kiosks, and permanent shops located near the identified route of the underground transmission line. The installation of transmission line will require temporary closure or shifting of movable roadside vendors and kiosks, and temporary stoppage of access of permanent shops. The closure or stoppage of access will be for a maximum of three (3) days for each 25-meters stretch of the transmission line. Furthermore, a spatial

[93] 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.

assessment of the route has identified specific land categories falling within the Right of Way (RoW) of the transmission line:

Land Use	Area (Acres)
WTE Plant	0.12
Open Scrub Land	1.15
Road Land	32.17
Substation Land	0.30
Total	**33.73**

Impact due to laying down of transmission line

The 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.

Control Measures adopted by the project

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.

Impact Magnitude

- **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.

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 construction.
- 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 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 transmission line, the project shall fully compensate for the loss or damage to these structures' owner or user at replacement cost[94] or construct the structure as it was earlier to the construction.

	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 Impact due to laying down of water pipeline

Based on the site visit to the identified water pipeline route it is expected negligible impact resulting from the impending water pipeline installation. The key rationale behind this assertion lies in the deliberate selection of an area devoid of any economic activities undertaken by individuals, ensuring the uninterrupted flow of access while precluding adverse effects on existing businesses. Furthermore, a spatial assessment of the route has identified specific land categories falling within the water pipeline laying area:

Land Use	Area (Acres)
WTE Plant	0.10
Road Land	0.29
Open Scrub	0.24
STP Plant	0.02
Total	**0.64**

Strategic Location

The chosen site for the water pipeline has been strategically designated in an area where economic activities by individuals are notably absent. Thus, no mitigation measures need to be adopted for the Project.

7.6.2 Impact during Operation Phase

7.6.2.1 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

[94] 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.

- 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, GWAPL 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 in to 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 meter 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.
- 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 of adequate personnel facilities, including washing areas and areas to change clothes before and after work;
- All hot surface area will be well insulated with aluminum cladding on it to eliminate any heat injury to worker.
- 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, GWAPL 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 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	Major
With Mitigation Measures	Negative	Local	Short-Long	Low	Routine	Small Substantial

7.6.2.2 Community Health & Safety

Limited applicability for construction phase. As there are no community settlements within 500 radius of the project and the project is also located within an industrial area. After the construction there will be no potential disturbance to the local community. Also, the civil work for WtE plant is 95% complete, however, laying of underground Transmission lien and water pipeline is yet to be laid. 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.

Possible sources of impacts to community health and safety, considering, mobility of vehicles carrying construction materials and waste during construction and operation phase 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.
- Movement of vehicles, material and commuters via the main access road may be a potential risk for daily commuters and cattle of nearby village.
- Community dissatisfaction,
- Public accessibility and management of emergency situations,
- Outbreak of viral or contagious disease etc.
- Transportation of waste to the project site
- Safety of the workers and road commuters etc.
- General occupational and environmental health issues associated with waste scavenging, Physical, chemical, and biological hazards , Litter, Noise, Dust and odors.

There are no densely populated residential area within the 500 m radius with no residential settlements. Also, the project is located in an area with presence of industries sin the area. 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 centers 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
- 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 labours that are exposed to high noise.
- 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.

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.
- 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.
- 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

7.6.2.3 Impact due to operation and maintenance 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.

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. However, during the maintenance phase, there may be scenarios of digging of RoW and result into temporary access stoppage of roadside vendors and kiosks owners.

Control Measures Planned for the Project

The project will not impose any access stoppage during the operation of the transmission line.

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. 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.

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 transmission line. 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 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.
- Furthermore, in the event of any physical damage to structures of roadside vendors and kiosk owners or any other form of privately owned or used physical structure resulting from the operation of underground transmission line, the project shall fully compensation for the loss or damage to these structures' owners or user at replacement cost or construct the structure as it was earlier to the construction.
- Following the completion of maintenance work, the project shall restore the RoW to its pre-maintenance condition.

	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**

7.6.2.4 Increased Local Employment & Livelihood

As per the available data it was understood that total manpower requirement for the project is nearly 120 persons, which will include both skilled and nonskilled workers.

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 the project duration will be at least for 25 years therefore the duration of impact will be long hence based on the impact assessment matrix the magnitude of the impact is evaluated as **Major**

Proposed Enhancement Measures for the Project

the significance of the impact on economy and employment opportunities during the operation 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	**Permanent**	**Routine**	**High**	**Major**
With Mitigation Measures	Positive	High	Short	Permanent	Routine	**Low**	**Substantial**

7.6.2.5 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 Ahmedabad Municipal Corporation (AMC) 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. Efficient logistics and transportation are vital to maintaining the continuity of waste supply to the plant.

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.

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 Ahmedabad Municipal Corporation (AMC).
   - **Risk of Child Labour:** During site visits, it was noted that the appointment of drivers and helpers by the contractors lacks direct supervision by AMC, 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.

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 AMC to undertake the monitoring, or the project shall undertake the monitoring in support of AMC.
     - 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. 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.
3. 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

7.6.2.6 Impact on Ragpickers at the Ahmedabad Landfill due to Project operation

Based on the information provided by the project and from the secondary source (especially from AMC official website), the waste generated by Ahmedabad City is significantly higher than the waste requirement for the WTE plant. With a waste generation of ~4,000 tonnes per day and a requirement of 1,000 tonnes per day for the project, there is still a substantial amount of waste that needs to be dumped at Ahmedabad landfill site.

The waste will continue to be dumped at the landfill area where approximately 1,000 ragpickers are collecting recyclable waste from freshly dumped waste. Given that there is sufficient waste available at the landfill site, it is envisaged that the ragpickers will continue their activities without being economically displaced due to the development of the WTE plant.

7.6.3 Impact during 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.

Refer to ***Appendix 5*** for compliance status of the contractor in against the applicable labour regulations.

Control Measures in Place

The key considerations covered by the Project's adopted procedure for contractor management[95] are provided below:

- **Contractual Agreement:** As a process, GWAPL 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, GWAPL has prepared a legal and statutory compliance period checklist. The checklist is filled by GWAPL against the compliance status of the appointed contractor. The key acts and their requirements covered by the checklist is outlined below:

Table 7-27 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 Labour (Regulation & Abolition) Rules, 1971	a. Muster Roll b. Attendance Card	a. Wage bill b. Employee of Contractor register c. Employment Card d. Service certificate e. Wage Register f. Wage Slips g. Damage/loss register h. Fine Register	-	c. Labour License d. Service Agreement

95

Sr. No.	Key Acts and associated rules	Acts' Requirements with frequency of auditing			
		Daily	Monthly	Half-yearly	Yearly
			i. Advance Register j. Overtime Register		
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.

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.

Proposed Mitigation Measures

Proposed mitigation measures for 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 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 labour laws and industry best practices. Regularly update contractors on policy changes and provide the necessary support for implementation.

	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 Cumulative Impacts

There are no new projects proposed in immediate proximity of the proposed WTE plant. Nor any other developmental projects are proposed in immediate future. Therefore, no cumulative impacts are anticipated from the operations of the proposed WTE plant.

There will be slight modification in movement of waste carrying trucks which will now be directed to the WTE plant instead of the landfill, no increase in vehicle movement is anticipated. Only limited no. of vehicles transporting - ash generated from the operations will be added which will have insignificant cumulative impact on the traffic movement.

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.

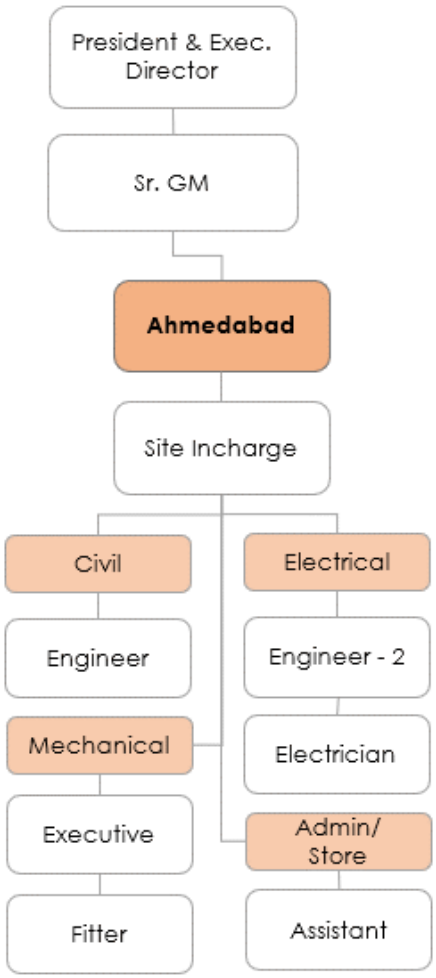
8.1 Organizational Structure

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 Ahmedabad.

At site level, the under-construction project is being monitored by GWAPL'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 (Thambee Engineering Private Limited) who has deployed a dedicated site in-charge for day-to-day construction monitoring at site who is further supported by two teams, where Team 1 comprised of Safety Officer who is responsible for monitoring day to day health and safety aspects at site and Team 2 comprised of Engineer, supervisor, fitters, welders and riggers who are responsible for mechanical work at the project.

Figure 8-1 Organizational Structure- Construction Phase

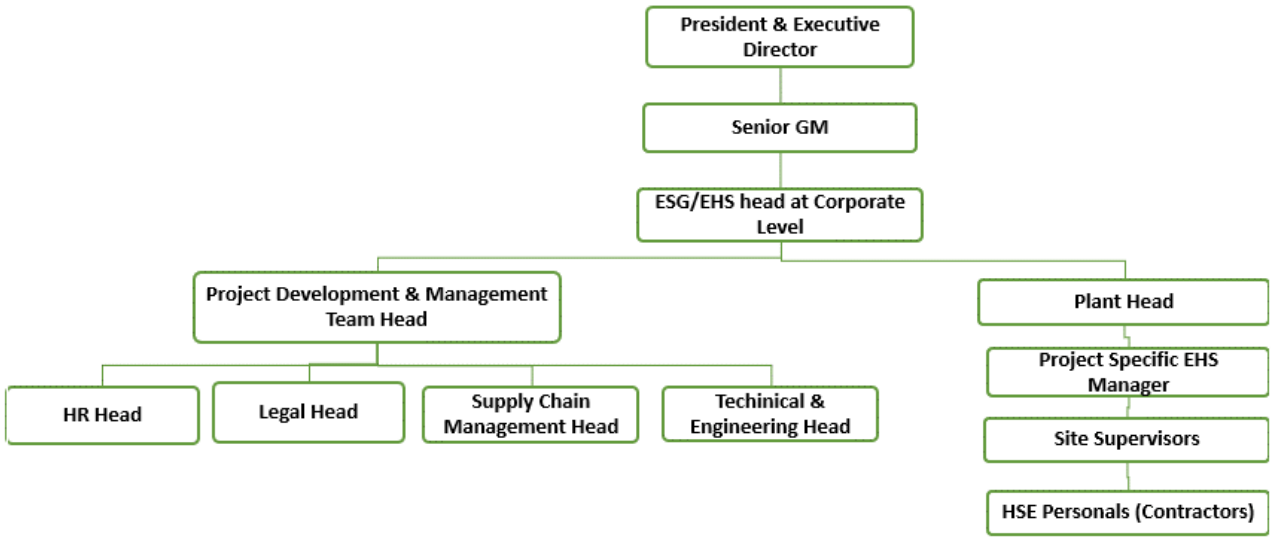


To ensure the efficacy of environmental and social management plan, certain institutional mechanism with well-defined roles and responsibilities is essential for effective implementation of identified mitigation measures both during construction and operation phases. GWAPL will have ultimate responsibility 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. GWAPL 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.

GWAPL 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 (GWAPL). 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 programs. • Providing job specific induction training. • Compliance of regulatory requirements. • Carrying out environmental audits.

Role	Responsibility
	• Identify unsafe acts and conditions and suggest remedies. • Develop safety culture and comply with company's EHS policy and standard requirements. • Encourage and enforce the use of PPE's; • Educate all employees for the use of PPE's and safe practices; • Direct, coordinate and orient the safety activities; • Promulgate the spread of policy, objectives, rules and/or regulations; • Perform a thorough investigation of all accidents and review the recommendations to avoid any repetition; • Monitoring the progress of implementation of ESMP and • Reviewing and updating the ESMP as and when required for its effective implementation
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 and Management Plans

8.2.1 Environment Health & 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 GWAPL 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 Policy

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:

    i. 1st shift – from 08:00 am to 04:00 pm (with a break of half an hour in rotation)
    ii. 2nd shift – from 04:00 pm to 12:00 am (with a break of half an hour in rotation)
    iii. 3rd shift – from 12: 00 am to 08:00 am (with a break of half an hour in rotation)
    iv. 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:

    i. Provident Fund (PF) – as per provisions of the Employees' Provident Fund & Miscellaneous Provisions Act, 1952
    ii. Employees' State Insurance (ESI) – as per provisions of the Employees' State Insurance Act, 1948
    iii. Bonus – As per provisions of the Payment of Bonus Act, 1965
    iv. Gratuity – As per provisions of the payment of Gratuity Act, 1972
    v. 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:

    i. Contractor shall submit necessary legal documents with seven (7) days of appointment and the personnel department will check the documents
    ii. Contractor shall obtain applicable legal licenses and registrations
    iii. Contractor must provide sufficient workers and maintain the workforce for assigned work as per terms and conditions of service agreement.
    iv. Contractor must adhere to the company's 'Prohibition of child labour at workplace' policy.
    v. Contractor must issue gates pass, identity card and attendance card to all the workers deployed, and distribute wages to the workers
    vi. 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
    vii. Contractor must submit the proof of remittance of Employee State Insurance (ESI) and Employee Provident Fund (EPF) every month on time
    viii. 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:

i. No Employee will be retrenched under normal circumstances

ii. 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

iii. The company will follow the rule of 'last person to be employed to be retrenchment first' in that category

iv. The company will give preference to the retrenched employees for re-employment at the time of future recruitment and selection

v. 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:

  i. No employees/contract workers will be compelled or allowed to work at plant for more than 48 hours a week

  ii. All employees/contract workers will be allowed half an hour rest in a day, after continuously working for 5 hours

  iii. Overtime might be needed to handle emergencies, heavy workloads, or other issues. But frequent and excessive overtime work will not be allowed

  iv. 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

  v. The company will advise employees/contract workers to work overtime only when they have to finish urgent work, and up to the stipulated hours

  vi. When employees/contract workers work at 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:

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:

- **Contractual Agreement:** As a process, GWAPL 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, GWAPL has prepared a legal and statutory compliance period checklist. The checklist is filled by GWAPL against the compliance status of the appointed contractor. The key acts and their requirements covered by the checklist is outlined below:

Table 8-1 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 Labour (Regulation & Abolition) Rules, 1971	• Muster Roll • Attendance Card	• Wage bill • Employee of Contractor register • Employment Card • Service certificate • Wage Register • Wage Slips • Damage/loss register • Fine Register • Advance Register • Overtime Register	-	• Labour License • Service Agreement
2.	The Factories Act, 1948 & the Gujarat Factories Rules, 1963	-	• Adult Register • Leave with wage register • Leave Book	-	-
3.	Statutory compliance	-	• PF – Challan • ESI – Challan • Provisional tax – challan	a. LWF - Challan	-
4.	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
5.	The Payment of Gratuity Act, 1972 and the Payment of Gratuity Rules, 1973	-	Nomination form	-	-

Sr. No.	Key Acts and associated rules	Acts' Requirements with frequency of auditing			
		Daily	Monthly	Half-yearly	Yearly
6.	The Employees' Provident Fund & Miscellaneous Provisions Act, 1952	-	Nomination Form	-	-
7.	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 its plant's operations in collaboration with all relevant stakeholders such as the contractors, associated 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 plant / vehicles and property, risk to community health & safety, etc. associated with the construction and operations of a 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 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 GWAPL, 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 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 ***(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 GWAPL 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 plant operations are limited in terms minimal workforce and there are no adverse impact on the general community, as well as their 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
- **Labor Management and Working Conditions including labor camps (Appendix 12**): As per the site conditions (61%) 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 Review and Reporting

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, GWAPL 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 GWAPL (project team) as well as Corporate team (ACEL) and the entire process of inspections and audits/ monitoring will be documented.

GWAPL 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 Indicator

GWAPL 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.

Overarching Themes	Performance Indicators
	• 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 organisation;
- 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.

GWAPL 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, GWAPL will ensure that the conditions stipulated in various permits are complied. The inspections and audits will be done by trained personnel of GWAPL 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 toolbox 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 Environment and Social Management Plan 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 Training & 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
- GWAPL 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	√	√
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 GWAPL 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 Environment and Social Management Plan- Construction Phase

Sr. No.	Environmental/SocialImpact/Issues Resources		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	Supervision responsibility	Reporting Requirements
	Physical Environment								
1.	Air Quality	Particulate, fugitive and vehicular emission	• 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 • 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.	Contractor's EHS representative	EHS Inspection	Monthly	Project EHS representative of GWAPL	EHS Manager at GWAPL	Report from Contractor EHS team to GWAPL EHS team

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	Supervision responsibility	Reporting Requirements
			• Fuel tanks adequately designed to minimize fugitive emissions and welding gas cylinders will be stored in a secluded area within project site						
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						

Sr. No.	Environmental/SocialImpact/Issues Resources		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	Supervision responsibility	Reporting Requirements
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 • 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.						

Sr. No.	Environmental/SocialImpact/Issues Resources	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	Supervision responsibility	Reporting Requirements
		• 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 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)						

Sr. No.	Environmental/SocialImpact/Issues Resources		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	Supervision responsibility	Reporting Requirements
			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. • EPC contractor should restore the project site and surrounding area (if used for any temporary structure) to its original condition. GWAPL 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						

Sr. No.	Environmental/SocialImpact/Issues Resources		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	Supervision responsibility	Reporting Requirements
	Socioeconomics								
5.	Community Health & Safety	Construction 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.	Contractor's EHS representative	Visual Observation and EHS Inspection	Quarterly	Project EHS representative of GWAPL	EHS Manager at GWAPL	Report from Contractor EHS team to GWAPL EHS team

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	Supervision responsibility	Reporting Requirements
			• 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						
6.	Occupational Health & Safety	Electrocution, accident, fire hazard, respiratory and hearing problems while working at site	• GWAPL 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 14*** • GWAPL to develop and maintain hazard identification and risk assessment (HIRA) for the project and its associated TL and pipeline and communicate the same to the workers. The HIRA register should be update whenever a new hazard is identified at the site. • 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. • Monitor health and safety performance and have an operating audit system. • Training of the workers on climbing techniques, and rescue of fall- arrested workers;	Contractor's EHS representative	Visual Observation and EHS Inspection	Quarterly	Project EHS representative of GWAPL	EHS Manager at GWAPL	Report from Contractor EHS team to GWAPL EHS team
7.	Temporary Business Disruption	Temporary Business Disruption & public inconvenience	• **Engage in Transparent Communication with Kiosk Owners** ▪ Maintain a continuous and transparent communication channels with kiosk owners throughout the project. ▪ Establish a dedicated forum for ongoing discussions, addressing concerns	Project Community officer / IR / HR/ EHS officer of contractor	Copy of Notice , Notice boards , signages & Photographs	Biweekly during construction & daily reporting	Project EHS teams	Project in charge	Report from Contractor EHS team to GWAPL EHS team

Sr. No.	Environmental/SocialImpact/Issues Resources	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	Supervision responsibility	Reporting Requirements

promptly, and providing regular updates on project developments.
    - Establish a robust communication plan to keep kiosk owners informed about project milestones and anticipated disruptions.
- **Optimize Transmission Line Route to Minimize Impact on Kiosk Structures:**
    - Prioritize route optimization to minimize disruption to existing kiosk structures.
    - Seek feedback from kiosk owners during consultation and adjust the route accordingly.
- **Deploy Vertical Drilling Techniques to Minimize Surface Disruptions:**
    - In cases where route optimization is challenging, employe vertical drilling techniques.
    - Precision in drilling execution is crucial to prevent damage to kiosks.
- **Explore Alternative Locations for Affected Kiosk Owners:**
    - Assess the feasibility of providing alternative locations for kiosk owners impacted by the transmission line route – if the transmission line route remain unchanged.
    - Furthermore, in the event of any physical damage to the structures of roadside kiosk owners resulting from the installation of the underground transmission line, the project shall fully

Sr. No.	Environmental/SocialImpact/Issues Resources		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	Supervision responsibility	Reporting Requirements
			compensate for the loss or damage to these structures' owner or user at replacement cost[96] or construct the structure as it was earlier to the construction.						
8.	Impact due to laying down of underground transmission line	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. • 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.	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

[96] 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/SocialImpact/Issues Resources		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	Supervision responsibility	Reporting Requirements
			• 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 transmission line, the project shall fully compensation for the loss or damage to these structures' owners or user at replacement cost[97] or construct the structure as it was earlier to the construction.						
9.	Contractor Management	Construction Phase	• 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 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	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

[97] 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/SocialImpact/Issues Resources	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	Supervision responsibility	Reporting Requirements
		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.						

Table 8-6 Environment and Social Management Plan- Operation Phase

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	Supervision responsibility	Reporting Requirements
Physical Environment									
1.	Air Quality	Flue gas emission, dust emission and vehicular emission, particulate matter etc.	• 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% • 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	GWAPL EHS Manager	EHS Inspection	Quarterly	GWAPL Project Head	EHS Head at ACEL	Report from EHS team to Project head and further to corporate team
2.	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. • 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.	GWAPL EHS Manager	EHS Inspection	Quarterly	GWAPL Project Head	EHS Head at ACEL	Report from EHS team to Project head and further to corporate team

Sr. No.	Environmental/Social Impact/Issues Resources	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	Supervision responsibility	Reporting Requirements
		• 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 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..						
3.	Soil Contamination Environment	• Separate remaining ferrous and non-ferrous metals from bottom ash as far as practicably and economically viable, for their recovery • GWAPL 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. GWAPL to ensure that the covered trucks are used by AMC to dispose the bottom ash in the nearest sanitary	GWAPL EHS Manager	EHS Inspection	Quarterly	GWAPL Project Head	EHS Head at ACEL	Report from EHS team to Project head and further to corporate team

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	Supervision responsibility	Reporting Requirements
			landfill. GWAPL 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) • GWAPL to conduct characterization analysis of ash as per IS 3812 covering all the parameters stipulated by BIS to identify any hazardous content before its disposal through AMC trucks. If fly ash is identified as hazardous, it is to be sent to hazardous waste landfill site through authorized vendors and records 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. • GWAPL is recommended to obtain chain of custody documents from AMC 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. • GWAPL 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, GWAPL 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.					

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	Supervision responsibility	Reporting Requirements
			• If GWAPL is uncertain that the disposal conducted by AMC is as per the applicable rules, GWAPL 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/minimise 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 • Records of e-waste and battery waste generated and sent out via authorized agencies to be maintained • 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						

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	Supervision responsibility	Reporting Requirements
			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, GWAPL 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						
4.	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 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	GWAPL EHS Manager	EHS Inspection	Quarterly	GWAPL Project Head	EHS Head at ACEL	Report from EHS team to Project head and further to corporate team

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	Supervision responsibility	Reporting Requirements
			leachate from the Project to avoid contamination of subsurface soil and groundwater. • 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 • Sludge generated from the STP should be tested and if found hazardous, should be disposed through authorized hazardous waste recycler. In case sludge is non-hazardous, it should be disposed in landfill after dewatering or used as fertilizer or soil conditioner • Adequate trainings to be provided to the personnel handling the sludge generated from the STP. The training to be provided by the GWAPL EHS personnel • 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						

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	Supervision responsibility	Reporting Requirements
			• 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 and 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,						
Socioeconomics									
5.	Occupational Health & Safety	Electrocution, accident, fire hazard, respiratory and hearing problems etc. while working at site	• 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	GWAPL EHS Manager	Visual Observation and EHS Inspection	Quarterly	GWAPL Project Head	EHS Head at ACEL	Report from EHS team to Project head and further to corporate team

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	Supervision responsibility	Reporting Requirements
			• Since hazardous waste and material will be generated and present within the project premises, GWAPL 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						

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	Supervision responsibility	Reporting Requirements
			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						

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	Supervision responsibility	Reporting Requirements
			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						
6.	Community Health & Safety	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 • 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. • 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	GWAPL EHS Manager	Visual Observation and EHS Inspection	Quarterly	GWAPL Project Head	EHS Head at ACEL	Report from EHS team to Project head and further to corporate team
7.	Employment & Livelihood	Increased Local Employment & Livelihood	• Project should develop guidelines/policies towards local employment and livelihood opportunity enhancement and include the local employment reporting the annual report .	GWAPL HR / Contractor	Guidelines for local employment , Local Employment Data, Notice /letter for disclosure	Quarterly	GWAPL project level HR	Project in charge / GWAPL HR Head	Quarterly report to from Contractor to project HR/EHS team

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	Supervision responsibility	Reporting Requirements
			• 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,						
8.	Impact due to the operation and maintenance of underground transmission line	Impact Due to operation and maintenance of underground transmission line	• 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 transmission line. This ensures that the normal flow of activities in the community remains unaffected.	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

Sr. No.	Environmental/Social Impact/Issues Resources	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	Supervision responsibility	Reporting Requirements
		• 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. • Furthermore, in the event of any physical damage to structures of roadside vendors and kiosk owners or any other form of privately owned or used physical structure resulting from the operation of underground transmission line, the project shall fully compensation for the loss or damage to these structures' owners or user at replacement cost or construct the structure as it was earlier to the construction. • Following the completion of maintenance work, the project shall restore the RoW to its pre-maintenance condition.						
9.	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 rolls and attendance cards, monthly checks on wage-related	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	Supervision responsibility	Reporting Requirements
			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.						
Biological Environment									
10.	**Access of Wildlife to the Project Compound**	**Human-Wildlife Conflicts**	• Wildlife Barrier Fencing: Install wildlife barrier fencing around the project compound to prevent the entry of mammals capable of climbing. The fencing should be	EHS Manager	Visual Observation and EHS Inspection	Quarterly	Project Head	EHS Head at ACEL	Quarterly Report from Site EHS team to Project head and

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	Supervision responsibility	Reporting Requirements
			designed to be effective against species Rhesus Monkey and Northern Plain Grey Langur. • Monitoring and Surveillance: Set up a regular monitoring and surveillance system to track the movement of wildlife species within the project compound and along its boundary. This will enable early detection and timely response to potential conflicts. • Employee Training: Conduct training programs for project personnel to raise awareness about the local wildlife and the importance of respecting their habitats. Employees should be educated on how to handle encounters with wildlife safely and responsibly. • Emergency Response Protocol: Develop an emergency response protocol to handle any human-wildlife conflicts that may arise during the project's operation phase. This should include procedures for safely managing encounters and contacting relevant authorities if needed. • Public Awareness: Engage with local communities and stakeholders to raise awareness about the presence of diverse wildlife in the area and promote responsible coexistence. Public awareness programs can foster understanding and support for wildlife conservation efforts. • Good housekeeping practices in the project compound play a crucial role in reducing the attraction of faunal species and mitigating potential human-wildlife conflicts. By implementing • effective housekeeping measures, the project can create an environment that is less appealing to wildlife, thereby minimizing their presence within the compound.						further to corporate team
11.	Climate Change	Risk of flooding	• Undertake detailed flood risk assessments, for the plant location and incorporate the recommendation in the Emergency response plan	EHS Manager	Flood Risk Assessment		Project Head	EHS Head at ACEL	Report from Site EHS team to Project head and

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	Supervision responsibility	Reporting Requirements
			• Ensure there is a dedicated, forward-looking budget for mitigating weather-related risks • Continue to monitor the evolving scientific understanding of climate change hazards and reassess climate change induced risks to specific project elements at regular intervals (e.g., every five years) in the future • Ensure adequate drainage is developed in and around the plant to avoid water logging and adequate leachate pit is constructed to manage excessive leachate generation during operation phase.						further to corporate team
12.	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, fugitive dust emission (unpaved roads), noise and soil contamination in case of accidental leakage and road hits/kills	• 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 • 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	GWAPL EHS Manager	EHS inspection	Quarterly	GWAPL Project Head	EHS Head at ACEL	Quarterly Report from EHS team to Project head and further to corporate team

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	Supervision responsibility	Reporting Requirements
			• 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 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	Substantial	Small
	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	Small	Negligible
Social					
Occupational Health & Safety	Short Term	Negative	Construction Phase	Substantial	Substantial-Small
	Long Term	Negative	Operation Phase	Major	Substantial-Small
Community Health & Safety	Short Term	Negative	Construction & Operation Phase	Substantial	Substantial-Small
Business Disruption	Short Term	Negative	Construction Phase	Substantial	Small
Employment & Livelihood	Long Term	Positive	Operation Phase	Substantial	Small
Impact due to laying down of underground transmission line	Short Term	Negative	Construction and operation Phase	Substantial	Small
Ecology					
Human- Wildlife Conflicts	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:

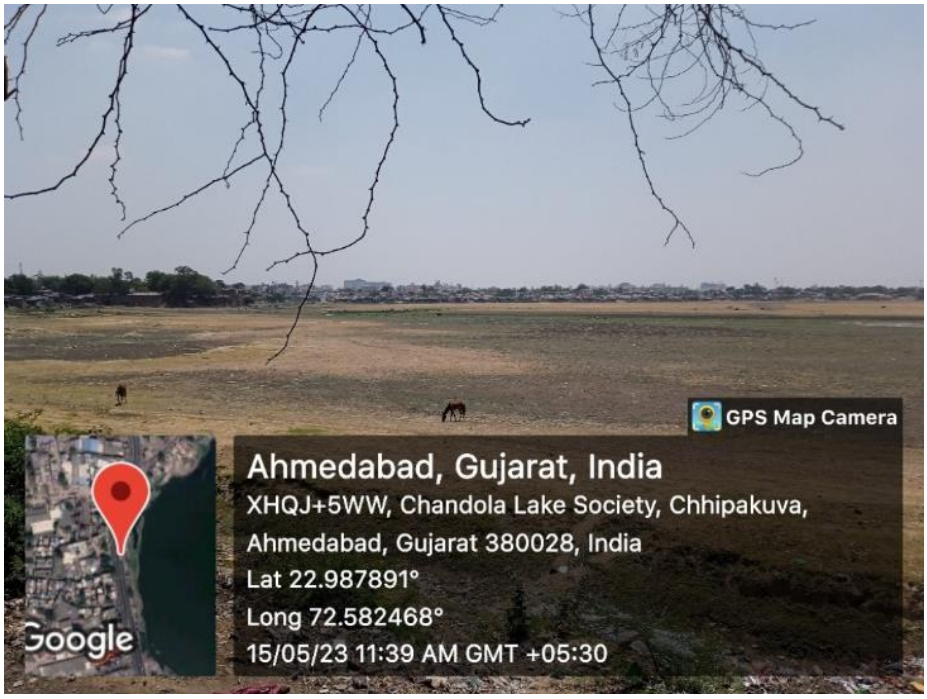
- The construction activities involve air emission, noise emission, water consumption and soil contamination and may impact the Project surrounding area if adequate measures are not implemented. However, the impacts can be minimized and/or avoided by implementing adequate mitigation measures suggested 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 waste to energy plant being constructed by Abellon in Ahmedabad would thus help process approximately 1000 TPD of MSW thereby reducing the quantity of municipal solid waste that would otherwise have collected at the landfill in Ahmedabad and/or dumping area
- The entire route of the underground transmission line is passing through the right of way of existing state roads and building department and these roads are owned by Government of Gujarat, and as informed laying of transmission line does not impact private land. Therefore, no compensation needs to be paid to any of the private landowners.
- However, during the construction phase, (7.7 kilometer of transmission line) there might be some potential temporary impacts related to access which may cause temporary business disruption of 50 kiosks owners (0.3 km) sitting along the ROW near the vegetable mandi in Mod Kamod, Ahmedabad. Further as informed project may lay the line on the opposite side of the road which may avoid the loss of access and potential business disruption. Based on the current design, the installation process may require temporary closure or limited access of these roadside vendors and kiosks owners for a maximum of three (1- 2) day . As the tranche width is ~1 m therefore disruption will be limited hence vendors can continue their routine business with a very minimum disturbance. However, this impact can also be mitigated through implementation of provided mitigation. Thus, the impact also is not categorized as irreversible or unprecedented

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
List of contractors
List of manpower
PF details
Appointment Letter
HR Policy & GRM

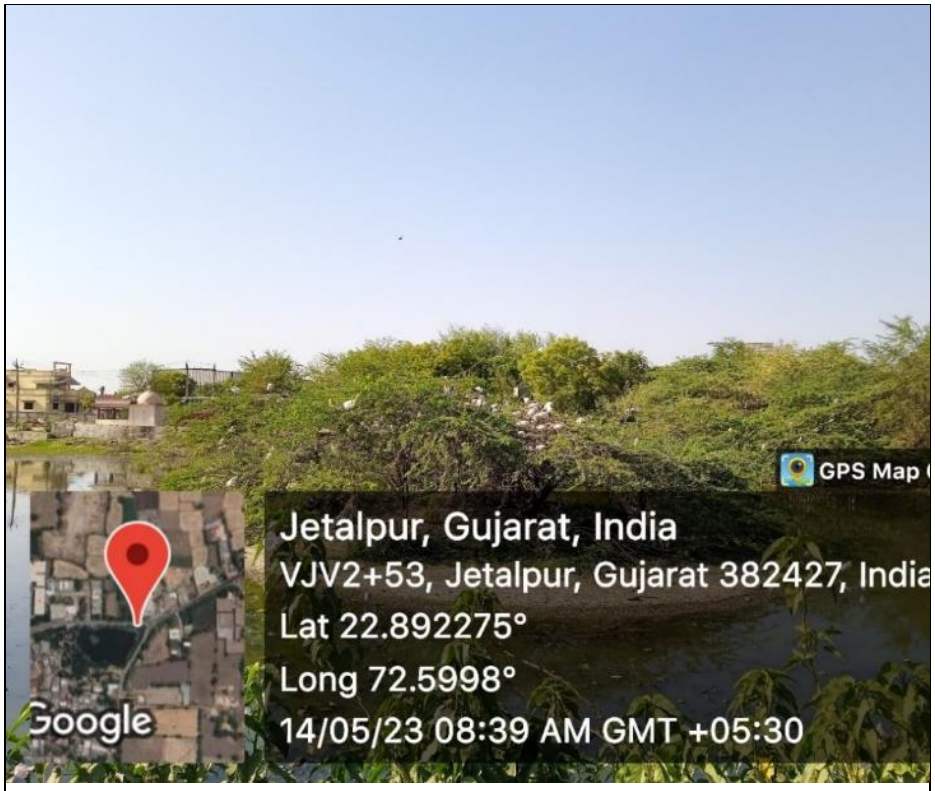
APPENDIX 2: PHOTOLOG

Diverse Habitat Representatives in the Project's Surroundings



Chondola Lake (Dried)

Open scrubland around the project area



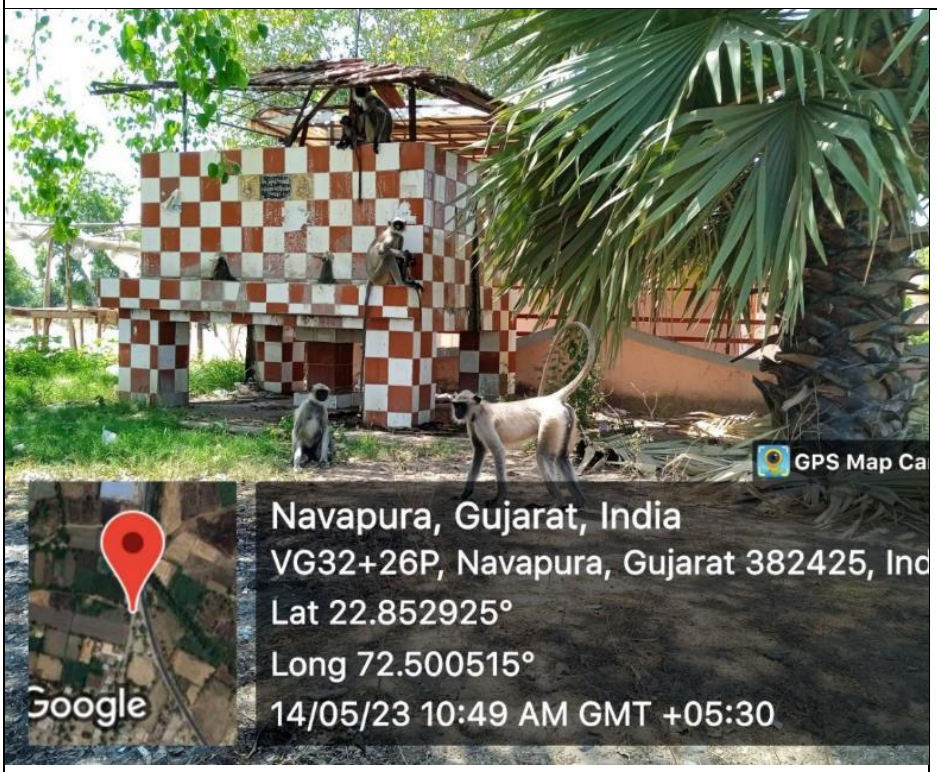
Black-headed ibis nesting on *Prosopis juliflora*

Eutrophicated with *Pontederia crassipes* (formerly *Eichhornia crassipes*)

Prosopis juliflora and Cattle grazing

Fallow Lands

Black-naped Ibis and Black-headed Ibis foraging in agriculure lands



Northern plains gray Langur *Semnopithecus entellus*

APPENDIX 3: DESIGN SPECIFICATION FOR FLUE GAS CLEANING SYSTEM

Semi Wet Reactor Tower

Design Parameters	Unit	Value
No of Reactor Towers	Nos	2
Volume of Each Reactor Tower	Cu.m	370
Dimensions of Reactor Tower	m	5m Dia. X 20m

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 after semi wet reactor Lime Slurry injection through atomizer: In the semi wet reactor	
Material Handled	Lime Slurry	Activated Carbon
Desired Dosing Capacity	518 kg/hr (Lime Powder) 3838 kg / hr (Lime Slurry)	8.3 kg/hr

Filter Bag House

Description	Unit	Value
Total Flue gas flow @ 150 °C	$Am^3/hr.$	2,54,000
No of Bag House	Nos.	2
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 per bag house	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 GWAPL to include measures to handle emergency situations.

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 GWAPL 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 material flammable materials of a gas cylinder, Oil/Diesel storage, Chemical, etc.

- The collision between moving vehicles/toppling Person falls in deep tanks.
- Food poisoning
- Floods
- Bomb Threat
- Earthquake
- Heavy Rains

Plant Emergency Facilities

The List of emergency facilities made available at the 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 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 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 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

<u>General</u>

- 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 safety officer 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 firefighting 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 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 plant and must be unique to each 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
5	Format V	List of chemicals / material safety data sheets
6	Format VI	Spill kit's locations

S.NO	Formats	NAME
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 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 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 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 Safety Officer	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

	Accident Details								Detected Occupational Diseases						Incident /Dangerous Occurrence/ Emergency								
Sr. No.	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

GWAPL 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

GWAPL 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 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

GWAPL 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 GWAPL 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 GWAPL 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 GWAPL. Some of the indicative clauses to be included as part of the Contractor Agreements are suggested below. GWAPL 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);
- Preparation of all relevant plans and other documentation, as identified through the ESMP or other commitments of GWAPL;
- Adherence to E&S management Plan for the site;
- Notice of any incident/accident on site or off-site to GWAPL 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 GWAPL 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, GWAPL 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 GWAPL 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 GWAPL's contractors or through extending the grievance redressal mechanism of the GWAPL

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 GWAPL 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;
- GWAPL 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 GWAPL 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 GWAPL'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 (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;
- GWAPL 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 labor 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

GWAPL 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

GWAPL 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.

GWAPL 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 GWAPL'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. GWAPL 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, GWAPL 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 GWAPL. If significant impacts are occurring or imminent. GWAPL 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. GWAPL 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 GWAPL 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 GWAPL and its contractors (and subcontractors), to achieve this.

Responsibility & Requirement

GWAPL 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 **Additional Measures Recommended**

Activity	Mitigation Measures
	• 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 • 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

Activity	Mitigation Measures
	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 • GWAPL 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. • 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. GWAPL to discuss with AMC 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, GWAPL 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 plant perimeter to assess the effectiveness of the odour control measures being applied.
- In case any complaint regarding odour generated at the 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.

GWAPL will also undertake sampling of odours and conduct odour monitoring in high odorous areas of the 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 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. GWAPL 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. GWAPL will ensure that fly ash will be temporarily collected and stored in the 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, GWAPL 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)
- GWAPL 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 AMC 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.
- GWAPL is recommended to obtain chain of custody documents from AMC 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.
- GWAPL 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, GWAPL 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 GWAPL is uncertain that the disposal conducted by AMC is as per the applicable rules, GWAPL 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

GWAPL 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. 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. 4 Percolation wells are proposed within the Project for recharging 28000 m^3/annum of ground water.

7. Waste Management

Solid waste and hazardous waste will be generated due to 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 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.
7	Oil contaminated rags, Oil Sludge, Oil-Soaked Cotton, Used insulation Material (Glass wool /Mineral Wool), Used Grease	Maintenance activities	

General Procedures

- The same 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 of 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 of 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 of 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 GWAPL’s work to ensure compliance with the Pollution Prevention Plan;
- Plant level EHS Manager will perform regular checks of plant and equipment to identify any exhaust gas leakages/ odour 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 GWAPL’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
- 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 GWAPL at its plants:

- 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 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);
- GWAPL 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

Scope

GWAPL to include the following information in the project specific traffic management plan:

- Traffic Management inside the WTE Plant
- Traffic Management for the transportation of material and movement of staff
- Traffic Management for pedestrian
- 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 from morning to evening hours. Considering the present scenario, where the waste collection vehicles from Ahmedabad city and the waste collection centers are transporting the waste using the same roads to dump the waste at waste dumping/landfill site which is adjacent to the Project so no major increase in traffic due to the project is anticipated.

Following mitigation measures shall be incorporated:

- Proper management of vehicular movement within the site, especially during peak hours;
- Different time slots will be allotted to different waste collection centres. The same will be conveyed to all to prevent any inconvenience to others.
- GWAPL shall ensure adequate lighting is provided within the plant premises
- Stopping/Parking of vehicles in between the roads to be discouraged.
- Pedestrians walk ways to be adequately marked with proper zebra crossings.
- Loading/ unloading area will be located within the plant premises. Entry/ exit of all the vehicles will be made via the entry area designated by GWAPL. 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 plant layout and safe working procedures within the plant premises.
- The movement of heavy, wide or slow-moving loads will be planned at times when traffic volume on the roads concerned is least.
- Appropriate supervision will be provided to control flow of traffic when machinery needs to cross roads.
- Wheel washing on site and road sweeping will be carried out to keep the local highway clear of mud and debris.
- Training and testing of heavy equipment operators and drivers, including vision tests, with records kept of all trainings.
- GWAPL shall dedicate a separate area for staff who will require daily access parking area within the Plant. Dedicated parking area for visitors shall be provided.

Community Safety

- Vehicle route planning and alternative route map will be prepared and explained to the drivers
- 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
- Wheel washing on site and road sweeping will be carried out to keep the local highway clear of mud and debris.
- 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.
- Dedicated pedestrian route will be provided and vehicles will not be allowed to use pedestrian space. In case pedestrian have to use vehicle route safe crossing will be provided.
- Maintaining records of all accidents involving project vehicles and implementing a traffic complaint and corrective action procedure.
- Liaison with the police and other authorities prior to the movement of any abnormal loads or any over dimensioned consignment.
- If road closures are required, diversions will be planned and communicated to the authorities and affected communities in advance. All diversion will be constructed to the specifications of the applicable road authority and will be maintained in good drivable conditions until the completion of the re-instatement work.
- 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.

- A detailed plan for signage around the construction and operation 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.
- 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.
- The project traffic or any project activity will not obstruct the access to neighbouring properties.
- Ambulance and fire services will be consulted regarding road diversions. Road diversions will not increase the response time of these services to local communities.
- Clear road markings like reflective paint and signs should be used to alert pedestrians and vehicle operators to traffic hazards in the plant. Signs may indicate:
    - Entry point
    - Exclusion and safety zones
    - Parking and no parking zones
    - Speed limits
    - Vehicle crossings
- 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

In order to minimise the accident rates and the overall transport fuel consumption, GWAPL will ensure that the vehicle fleet working is maintained according to the manufacturers' specifications. This shall include the compliance of all vehicles with all safety related specifications (such as the fitting of the correct tires, 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 minimise fuel consumption as well ensure safety on road.

GWAPL will ensure the following in respect of vehicle compliance, maintenance, noise and emission standards:

- Regular vehicle inspection to ensure compliance with statutory requirements (PUC, etc.)
- All vehicles shall be maintained so that their noise and emissions do not cause nuisance to workers or local people.
- An up to date database of all vehicles and construction equipment's deployed at the project site will be maintained. The database will contain details about the periodical maintenance, schedule of maintenance, vehicular emission and noise emission testing done as per Indian regulatory requirements, copy of PUC certificates etc.
- New vehicles/equipment purchased 'as new' after contract award shall comply with emission standards in force on the purchase date.
- 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.
- Avoidance of passage through and near settled areas during night time hours.
- Oil and fuel leaks must be addressed within 24 hrs of observation or reporting on any vehicle or construction equipment.
- Vehicle maintenance and management parameters will form a critical component of key performance indictor for the contractor responsible to maintain their vehicles.
- All heavy vehicles like cranes, battery operated trolleys etc. will be provided with reversing siren.
- Provision for dedicated parking area will be made near the project office for parking the private vehicles of construction personnel.
- 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
- Sufficient parking area will be provide within the Plant or sufficient parking space will be provided outside the premises. Parking outside the Plant will be managed by GWAPL and will be ensure that transportation vehicles do not cause inconvenience to the surrounding community.
- 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. GWAPL will ensure that all drivers and driver trainers are suitably trained in accordance with driver training requirements. Drier 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, GWAPL 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:

- Trip Management Plan;
- Daily pre-use vehicle inspection by the driver;
- Safety kit in vehicle;
- Health and Safety Standards and Practices and;
- 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.

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	

S.No.	Safe Practice	Remarks
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	
	Sign Below	
	Drivers Name	
	Drivers Signature	

APPENDIX 8: RESOURCE EFFICIENCY AND CONSERVATION MANAGEMENT PLAN

Scope

GWAPL 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 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. 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 Plant

Responsibility

This plan is to be used by Plant Head in consultation with the department heads to identify:

- Opportunities for maximizing power generation;
- 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?		
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).
   - 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 conducted in past?

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 adhere the given framework for protecting biodiversity in the project area throughout the project lifecycle.

Scope

- This framework outlines a set of strategic actions and measures crucial for the preservation and effective management of biodiversity.
- It encompasses plans aligned with both national and international standards for the protection of biodiversity within the project site location.
- Details the specific control and safeguarding measures to be implemented by Abellon Clean Energy Limited, along with it contractors and subcontractors to achieve this.

Risks and Control Measures

While the operation of Waste to Energy power project may have impact on fauna such as risks of Human-Wildlife Conflicts.

Human-Wildlife Conflicts

- The construction of pre-casted wall will encircle the project compound, effectively deterring climbing mammals.
- Frequent checking of the boundary wall to avoid any space for wildlife entrance into project compound.
- A comprehensive training program will be organized for project personnel, enhancing awareness about local wildlife and imparting skills for safe and responsible wildlife encounters.
- An emergency response protocol will be in place, outlining procedures for handling human-wildlife conflicts during the operational phase.
- Rigorous housekeeping practices will be maintained within the project compound to discourage wildlife presence and minimize potential conflicts. By rigorously implementing these control measures, the power project will substantially curtail the potential risk of human-wildlife conflicts. This approach ensures the safety of both the wildlife and project personnel, while simultaneously mitigating any disruptions to the project's operational efficiency.
-

Trainings

To reduce the possible risks because of Waste to Energy power project during the operational phase following awareness and training will be conducted.

- Comprehensive awareness and training will be provided to project staff, contractors, and laborers regarding the strict enforcement of anti-poaching, trapping, and hunting policies.
- Programs will be conducted to raise awareness and provide guidance on practices to mitigate the risk of human-wildlife conflicts.

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[98]. 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

[98] 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. Their role will be mostly limited to look after the entry and exit to the 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

Sl.noUN - 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 two 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[99]	Develop standard contract agreement	Before entering into contract agreement / renewal	Project in charge / security head/procurement

[99] 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

	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. **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

Security Risk Management Action Plan

Sl.noUN - 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 two 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

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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[100]	Develop standard contract agreement	Before entering into contract agreement / renewal	Project in charge / security head/procurement

[100] 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

	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. **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. **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 GRIEVANCE 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[101]. 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

[101] Grievances and complaints are used interchangeably in the document.

- To structure and manage the handling of comments, responses, and grievances, and allow monitoring of the effectiveness of the mechanism
- 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 facilities. 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 of 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:

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					
Rag Pickers	This stakeholder group includes rag pickers working at AMC land fill site and collection centres. These Rag Pickers are engaged in collection of waste and selling the waste to the respective scarp dealers.	• The expectations and concern of this group from the project: – The Key expectations are to continue the waste collection at AMC 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**

Relevant Stakeholders	Profile	Concerns and Expectations from the project	Influence of Stakeholder on Project	Influence of Project on Stakeholder	Influence Rating
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 in the decision making in the local community	• The expectations and concerns of this group from the project includes: – Receiving benefits from the project in terms of employment and development of infrastructure and the community – Regular updates on the project activities and the opportunities from the same	• 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**
Local bodies including Urban & Gram Panchayats	This stakeholder group is comprised of the lowest level of local self-governance. The ULB /gram panchayats consist of one or more wards /revenue villages and are the lowest level of decision-making bodies for development activities in the wards/ 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 ULB & Gram Panchayat and the local community – Preference to the local community in contractor and employment	• The ULB wards Members/panchayat members can influence the decision-making process 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 wards/ villages by undertaking CSR activities in collaboration with the ULB/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
		opportunities from the project – Regular updates on the project activities and the opportunities from the project			
Regulatory Authorities	This stakeholder group is comprised of the central, state and district level regulatory authorities including AMC & 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 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
			the local community		
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 concerns related to Labor welfare s	• 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
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					
Urban/Village level Institutions	This stakeholder group is comprised of health, education institutions and training centres at the wards/village level. The institutions in the immediate vicinity of the project may include the Hospitals, schools anganwadi centres etc	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	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
		• 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 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	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 the project will play in the development of solar energy in the state	• Influence of Stakeholder: **HIGH** • Influence of Project: **LOW**

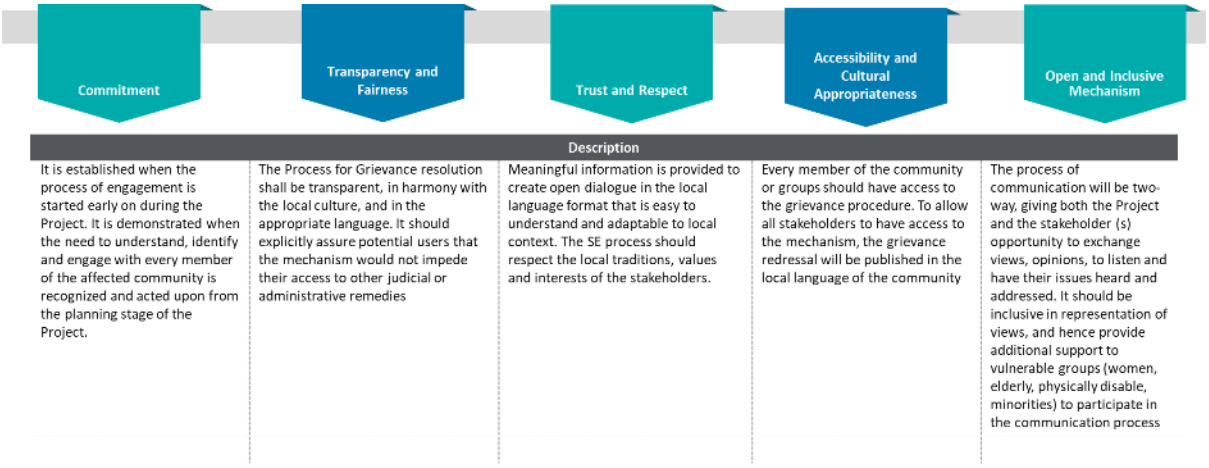
Relevant Stakeholders	Profile	Concerns and Expectations from the project	Influence of Stakeholder on Project	Influence of Project on Stakeholder	Influence Rating
		pertaining to the project activities			
Media	The media, comprising of both print and visual media, has a presence in the district. They 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: **Medium** • 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

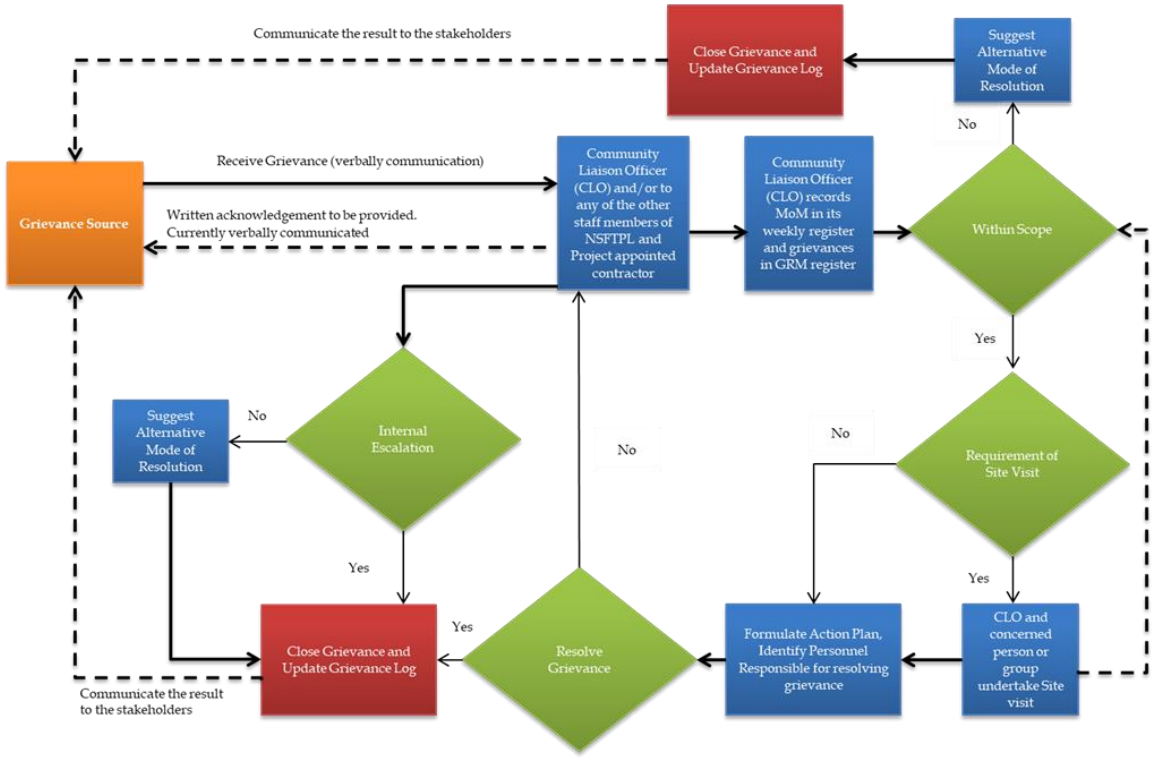
A grievance is a concern or complaint raised by an individual or a group within stakeholders affected by the company's operations. Both concerns and complaints can result from either real or perceived impacts of the company's operations and may be filed in the same manner and handled with the same procedure. 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	

GRIEVANCE REGISTRATION		
Grievance No.:	Date:	
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

Entity	Responsibility
	• 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 • 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

Entity	Responsibility
	• 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 • 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:

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.

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[102], 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 (labor 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
- 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:

[102] https://www.ebrd.com/downloads/about/sustainability/Workers_accomodation.pdf (Accessed on October 13, 2022)

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 • For urinal, usual standards are 1 unit for 15 persons • Standards distance are from 30 to 60 meters from rooms/dormitories
Bathrooms and other Sanitary Facilities	• 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

Standard Parameter	Requirement as well monitoring indicators
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:

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?				

Aspects	Yes	No	Not Applicable (N/A)	Comments
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?				
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?				

Aspects	Yes	No	Not Applicable (N/A)	Comments
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?				
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?				

Aspects	Yes	No	Not Applicable (N/A)	Comments
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?				
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				

Aspects	Yes	No	Not Applicable (N/A)	Comments
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?				
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?				

Aspects	Yes	No	Not Applicable (N/A)	Comments
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?				
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, GWAPL 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 GWAPL 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
Analysis of Sludge	Half Yearly	1 sample

Records

Following records but not limited to the following shall be maintained by GWAPL.

- 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

GWAPL 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 GWAPL 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)			
	Mercury (Hg)			

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) **
	Nickel (as Ni)			
	Arsenic 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
	Oil and grease	10 mg/L		mg/L
	Total suspended solids (TSS)	50 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 **
	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).	3^0C (maximum increase is 3^0C)		^{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
	Heavy Metals, Total	10 mg/L		mg/L
	(list other parameters)*	mg/L		mg/L

Sample Frequency (e.g. quarterly)	Ground Water Quality Parameters	WBG/IFC Permissible limits	Indian Regulatory Limits and Units *	Monitoring results in comparable units **

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. GWAPL 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 center. 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 authorised 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.
- HSE 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. GWAPL 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: GWAPL 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 GWAPL 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.
- GWAPL 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 GWAPL (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 GWAPL 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

C:\Users\Aplinka\Desktop\2) Abellon Clean Energy Limited\4) AHEMEDAB

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	0.56300	ug/m^3	248796.00	2541637.00	62.00	0.00	62.00	02-12-2022, 24
24-HR	2ND	0.53054	ug/m^3	248796.00	2541637.00	62.00	0.00	62.00	10-10-2022, 24
24-HR	3RD	0.50608	ug/m^3	248796.00	2541637.00	62.00	0.00	62.00	01-04-2022, 24
24-HR	4TH	0.49182	ug/m^3	248796.00	2541637.00	62.00	0.00	62.00	06-11-2022, 24
24-HR	5TH	0.44556	ug/m^3	248796.00	2541637.00	62.00	0.00	62.00	09-11-2022, 24
24-HR	6TH	0.44310	ug/m^3	248796.00	2541637.00	62.00	0.00	62.00	05-11-2022, 24
24-HR	7TH	0.44161	ug/m^3	248796.00	2541637.00	62.00	0.00	62.00	04-11-2022, 24
24-HR	8TH	0.42906	ug/m^3	248796.00	2541637.00	62.00	0.00	62.00	12-10-2022, 24
24-HR	9TH	0.41630	ug/m^3	248796.00	2541637.00	62.00	0.00	62.00	07-11-2022, 24
24-HR	10TH	0.40738	ug/m^3	248796.00	2541637.00	62.00	0.00	62.00	08-03-2022, 24
24-HR	11TH	0.39227	ug/m^3	248796.00	2541637.00	62.00	0.00	62.00	12-12-2022, 24
24-HR	12TH	0.37931	ug/m^3	248796.00	2541637.00	62.00	0.00	62.00	09-03-2022, 24
24-HR	13TH	0.37837	ug/m^3	248796.00	2541637.00	62.00	0.00	62.00	14-11-2022, 24
24-HR	14TH	0.37606	ug/m^3	248796.00	2541637.00	62.00	0.00	62.00	07-03-2022, 24
24-HR	15TH	0.37596	ug/m^3	248796.00	2541637.00	62.00	0.00	62.00	07-02-2022, 24
24-HR	16TH	0.37213	ug/m^3	248796.00	2541637.00	62.00	0.00	62.00	02-04-2022, 24
24-HR	17TH	0.36697	ug/m^3	248796.00	2541637.00	62.00	0.00	62.00	01-02-2022, 24
24-HR	18TH	0.36688	ug/m^3	248796.00	2541637.00	62.00	0.00	62.00	20-10-2022, 24
24-HR	19TH	0.36514	ug/m^3	248796.00	2541637.00	62.00	0.00	62.00	05-03-2022, 24
24-HR	20TH	0.36226	ug/m^3	248796.00	2541637.00	62.00	0.00	62.00	25-02-2022, 24
24-HR	21ST	0.35292	ug/m^3	248796.00	2541637.00	62.00	0.00	62.00	24-02-2022, 24
24-HR	22ND	0.34113	ug/m^3	248796.00	2541637.00	62.00	0.00	62.00	17-02-2022, 24
24-HR	23RD	0.33693	ug/m^3	248796.00	2541637.00	62.00	0.00	62.00	14-02-2022, 24
24-HR	24TH	0.33274	ug/m^3	248796.00	2541637.00	62.00	0.00	62.00	10-03-2022, 24
ANNUAL		0.16119	ug/m^3	248796.00	2541637.00	62.00	0.00	62.00	

Result summary of 24 hour averaging period at Worst Condition

Results Summary

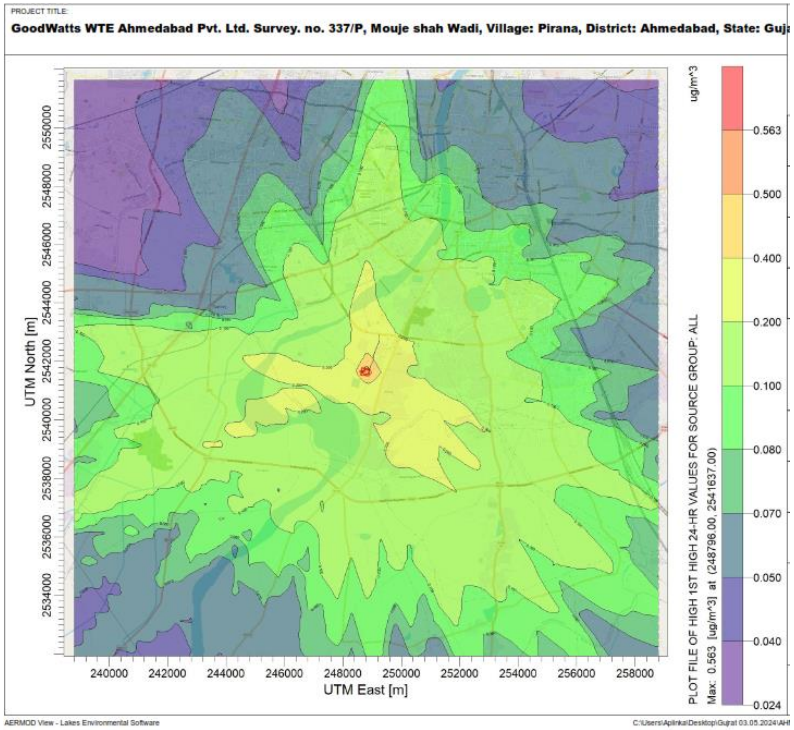
C:\Users\Aplinka\Desktop\2) Abellon Clean Energy Limited\4) AHEMEDAB

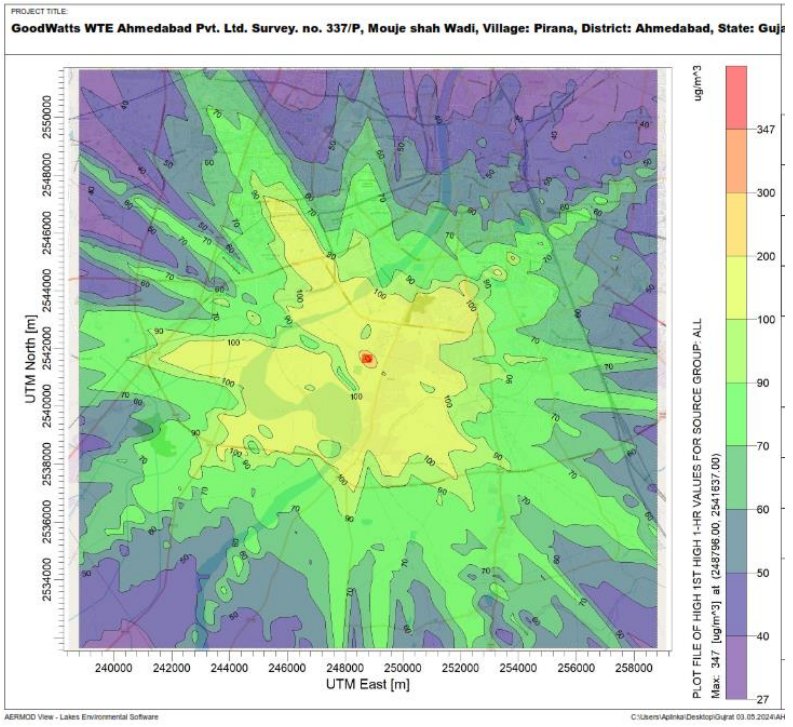
PM10 - Concentration - Source Group: ALL

Averaging Period	Rank	Peak	Units	X (m)	Y (m)	ZELEV (m)	ZFLAG (m)	ZHILL (m)	Peak Date, Start Hour
1-HR	1ST	347.33446	ug/m^3	248796.00	2541637.00	62.00	0.00	62.00	01-04-2022, 14
24-HR	1ST	45.66654	ug/m^3	248796.00	2541637.00	62.00	0.00	62.00	10-10-2022, 24
ANNUAL		8.87421	ug/m^3	249296.00	2541637.00	62.00	0.00	62.00	

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

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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	0.52848	ug/m^3	248796.00	2541637.00	62.00	0.00	62.00	10-10-2022, 24
24-HR	2ND	0.40803	ug/m^3	248796.00	2541637.00	62.00	0.00	62.00	01-04-2022, 24
24-HR	3RD	0.39937	ug/m^3	248796.00	2541637.00	62.00	0.00	62.00	02-12-2022, 24
24-HR	4TH	0.36512	ug/m^3	249296.00	2541637.00	62.00	0.00	62.00	09-06-2022, 24
24-HR	5TH	0.36158	ug/m^3	249296.00	2541637.00	62.00	0.00	62.00	18-07-2022, 24
24-HR	6TH	0.36020	ug/m^3	249296.00	2541637.00	62.00	0.00	62.00	23-09-2022, 24
24-HR	7TH	0.35801	ug/m^3	249296.00	2541637.00	62.00	0.00	62.00	16-05-2022, 24
24-HR	8TH	0.34636	ug/m^3	249296.00	2541637.00	62.00	0.00	62.00	21-05-2022, 24
24-HR	9TH	0.33084	ug/m^3	249296.00	2541637.00	62.00	0.00	62.00	31-05-2022, 24
24-HR	10TH	0.32999	ug/m^3	249296.00	2541637.00	62.00	0.00	62.00	30-07-2022, 24
24-HR	11TH	0.32973	ug/m^3	249296.00	2541637.00	62.00	0.00	62.00	19-07-2022, 24
24-HR	12TH	0.32757	ug/m^3	249296.00	2541637.00	62.00	0.00	62.00	07-06-2022, 24
24-HR	13TH	0.32079	ug/m^3	249296.00	2541637.00	62.00	0.00	62.00	28-07-2022, 24
24-HR	14TH	0.32021	ug/m^3	249296.00	2541637.00	62.00	0.00	62.00	12-07-2022, 24
24-HR	15TH	0.31433	ug/m^3	249296.00	2541637.00	62.00	0.00	62.00	14-05-2022, 24
24-HR	16TH	0.31175	ug/m^3	249296.00	2541637.00	62.00	0.00	62.00	11-07-2022, 24
24-HR	17TH	0.31108	ug/m^3	249296.00	2541637.00	62.00	0.00	62.00	17-05-2022, 24
24-HR	18TH	0.31084	ug/m^3	249296.00	2541637.00	62.00	0.00	62.00	22-05-2022, 24
24-HR	19TH	0.30777	ug/m^3	249296.00	2541637.00	62.00	0.00	62.00	13-07-2022, 24
24-HR	20TH	0.30677	ug/m^3	249296.00	2541637.00	62.00	0.00	62.00	06-06-2022, 24
24-HR	21ST	0.30103	ug/m^3	249296.00	2541637.00	62.00	0.00	62.00	29-07-2022, 24
24-HR	22ND	0.30045	ug/m^3	249296.00	2541637.00	62.00	0.00	62.00	01-05-2022, 24
24-HR	23RD	0.29436	ug/m^3	249296.00	2541637.00	62.00	0.00	62.00	15-05-2022, 24
24-HR	24TH	0.28593	ug/m^3	249296.00	2541637.00	62.00	0.00	62.00	27-05-2022, 24
ANNUAL		0.09775	ug/m^3	249296.00	2541637.00	62.00	0.00	62.00	

Isopleth For Normal Conditions ("First highest") 24 hour concentration

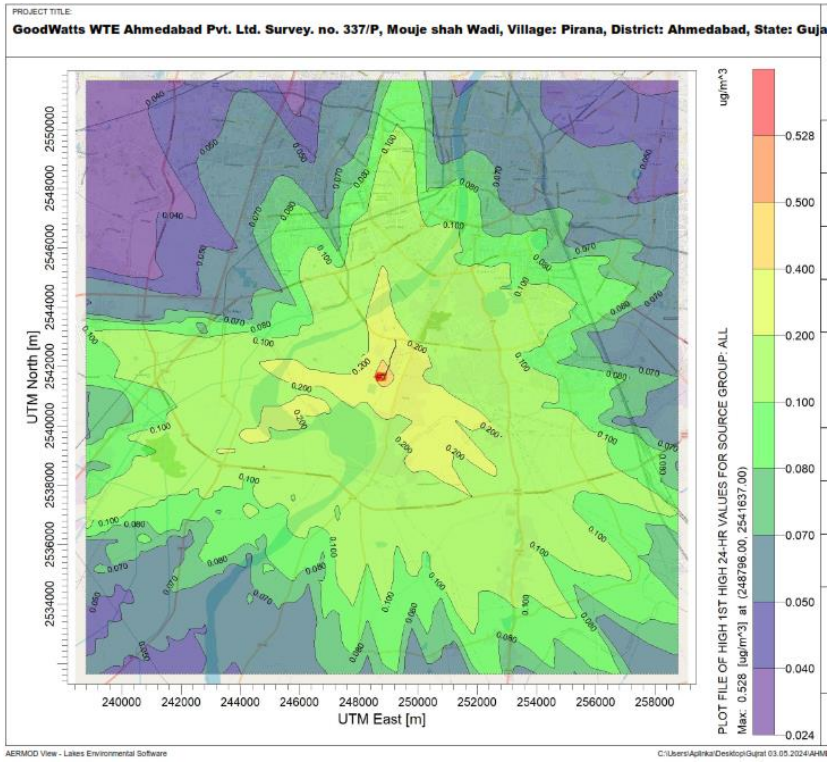
Results Summary

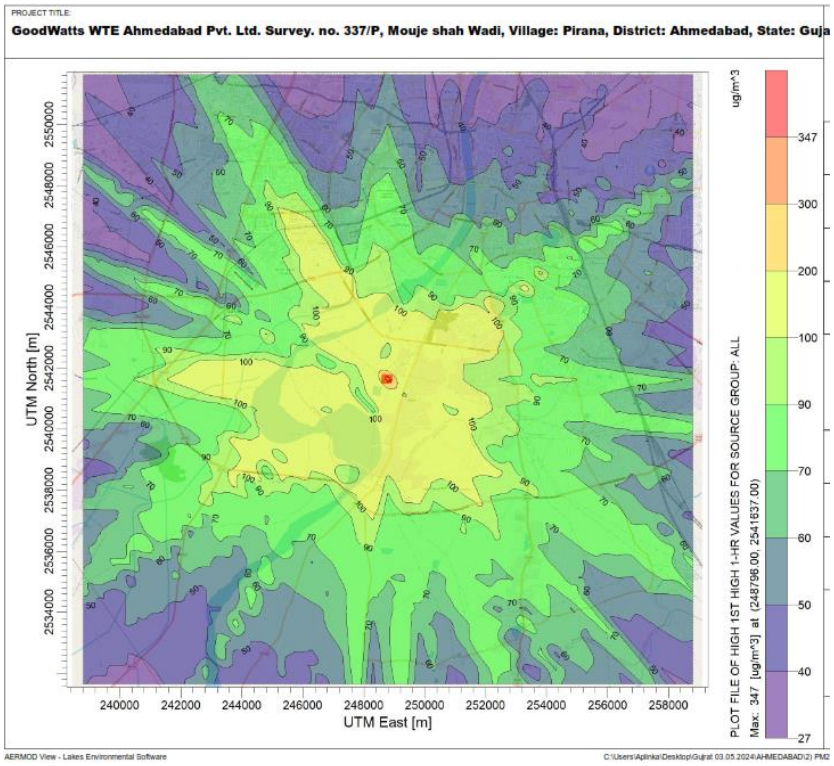
C:\Users\Aplinka\Desktop\2) Abellon Clean Energy Limited\4) AHEMEDAB

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	347.33446	ug/m^3	248796.00	2541637.00	62.00	0.00	62.00	01-04-2022, 14
24-HR	1ST	45.66654	ug/m^3	248796.00	2541637.00	62.00	0.00	62.00	10-10-2022, 24
ANNUAL		8.87421	ug/m^3	249296.00	2541637.00	62.00	0.00	62.00	

Isopleth For Worst Conditions ("First highest") 1 hour concentration





SO2

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\4) AHEMEDAB

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	34.04667	ug/m^3	248796.00	2541637.00	62.00	0.00	62.00	01-04-2022, 14
24-HR	1ST	4.58810	ug/m^3	248796.00	2541637.00	62.00	0.00	62.00	10-10-2022, 24
ANNUAL		0.88796	ug/m^3	249296.00	2541637.00	62.00	0.00	62.00	

Results Summary

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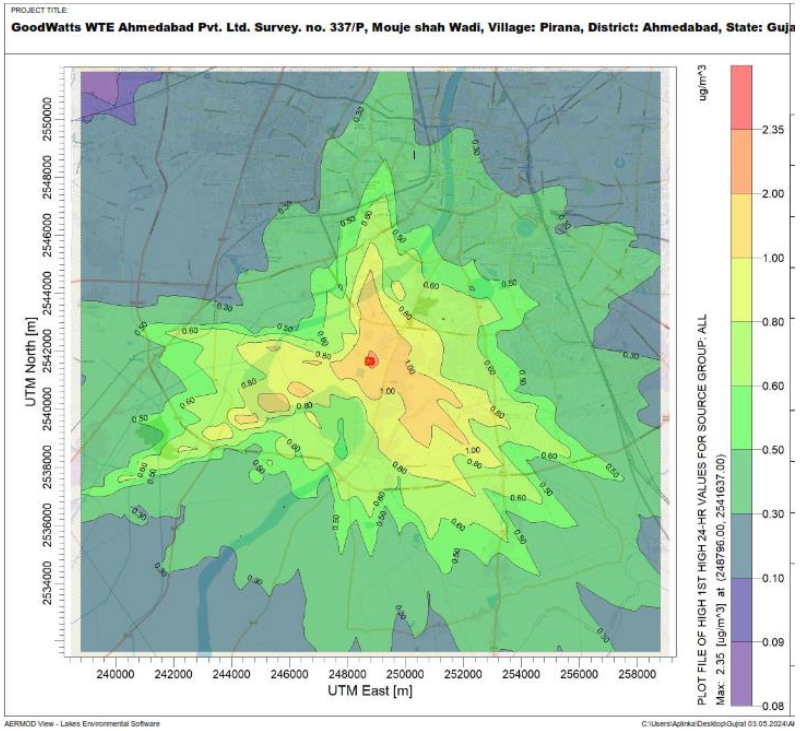
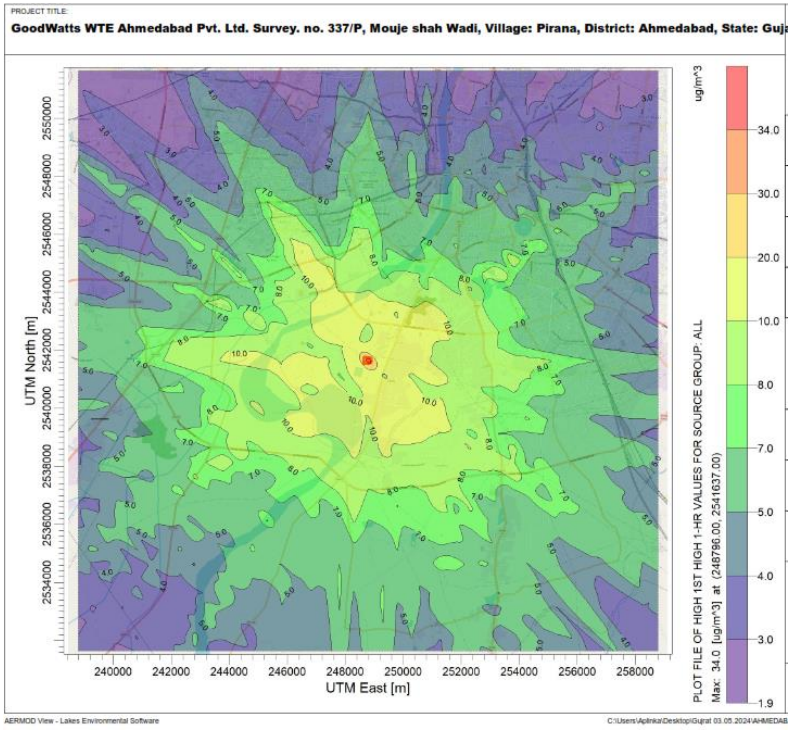
SO2 - Concentration - Source Group: ALL

Averaging Period	Rank	Peak	Units	X (m)	Y (m)	ZELEV (m)	ZFLAG (m)	ZHILL (m)	Peak Date, Start Hour
24-HR	1ST	2.34725	ug/m^3	248796.00	2541637.00	62.00	0.00	62.00	10-10-2022, 24
24-HR	2ND	1.86107	ug/m^3	248796.00	2541637.00	62.00	0.00	62.00	01-04-2022, 24
24-HR	3RD	1.77757	ug/m^3	248796.00	2542137.00	62.00	0.00	62.00	14-06-2022, 24
24-HR	4TH	1.73875	ug/m^3	249296.00	2541637.00	62.00	0.00	62.00	09-06-2022, 24
24-HR	5TH	1.70958	ug/m^3	249296.00	2541637.00	62.00	0.00	62.00	18-07-2022, 24
24-HR	6TH	1.70488	ug/m^3	249296.00	2541637.00	62.00	0.00	62.00	16-05-2022, 24
24-HR	7TH	1.70072	ug/m^3	249296.00	2541637.00	62.00	0.00	62.00	23-09-2022, 24
24-HR	8TH	1.67147	ug/m^3	249296.00	2541637.00	62.00	0.00	62.00	21-05-2022, 24
24-HR	9TH	1.58321	ug/m^3	249296.00	2541637.00	62.00	0.00	62.00	31-05-2022, 24
24-HR	10TH	1.55380	ug/m^3	249296.00	2541637.00	62.00	0.00	62.00	07-06-2022, 24
24-HR	11TH	1.54966	ug/m^3	249296.00	2541637.00	62.00	0.00	62.00	19-07-2022, 24
24-HR	12TH	1.52226	ug/m^3	249296.00	2541637.00	62.00	0.00	62.00	30-07-2022, 24
24-HR	13TH	1.50834	ug/m^3	249296.00	2541637.00	62.00	0.00	62.00	12-07-2022, 24
24-HR	14TH	1.50336	ug/m^3	249296.00	2541637.00	62.00	0.00	62.00	14-05-2022, 24
24-HR	15TH	1.49448	ug/m^3	249296.00	2541637.00	62.00	0.00	62.00	22-05-2022, 24
24-HR	16TH	1.48348	ug/m^3	249296.00	2541637.00	62.00	0.00	62.00	17-05-2022, 24
24-HR	17TH	1.47949	ug/m^3	249296.00	2541637.00	62.00	0.00	62.00	28-07-2022, 24
24-HR	18TH	1.46599	ug/m^3	249296.00	2541637.00	62.00	0.00	62.00	13-07-2022, 24
24-HR	19TH	1.45343	ug/m^3	249296.00	2541637.00	62.00	0.00	62.00	06-06-2022, 24
24-HR	20TH	1.44984	ug/m^3	249296.00	2541637.00	62.00	0.00	62.00	11-07-2022, 24
24-HR	21ST	1.43916	ug/m^3	249296.00	2541637.00	62.00	0.00	62.00	01-05-2022, 24
24-HR	22ND	1.40667	ug/m^3	249296.00	2541637.00	62.00	0.00	62.00	29-07-2022, 24
24-HR	23RD	1.38921	ug/m^3	249296.00	2541637.00	62.00	0.00	62.00	15-05-2022, 24
24-HR	24TH	1.36335	ug/m^3	249296.00	2541637.00	62.00	0.00	62.00	27-05-2022, 24
ANNUAL		0.44915	ug/m^3	249296.00	2541637.00	62.00	0.00	62.00	

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\4) AHEMEDAB

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	139.50018	ug/m^3	248796.00	2541637.00	62.00	0.00	62.00	01-04-2022, 14
24-HR	1ST	18.74383	ug/m^3	248796.00	2541637.00	62.00	0.00	62.00	10-10-2022, 24
ANNUAL		3.59573	ug/m^3	249296.00	2541637.00	62.00	0.00	62.00	

Results Summary

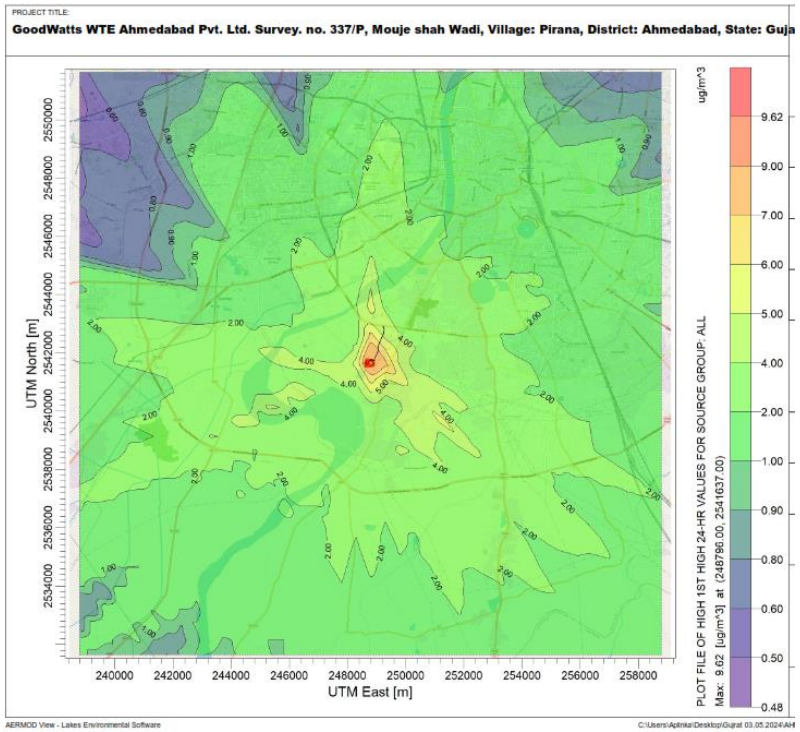
C:\Users\Aplinka\Desktop\2) Abellon Clean Energy Limited\4) AHEMEDAB

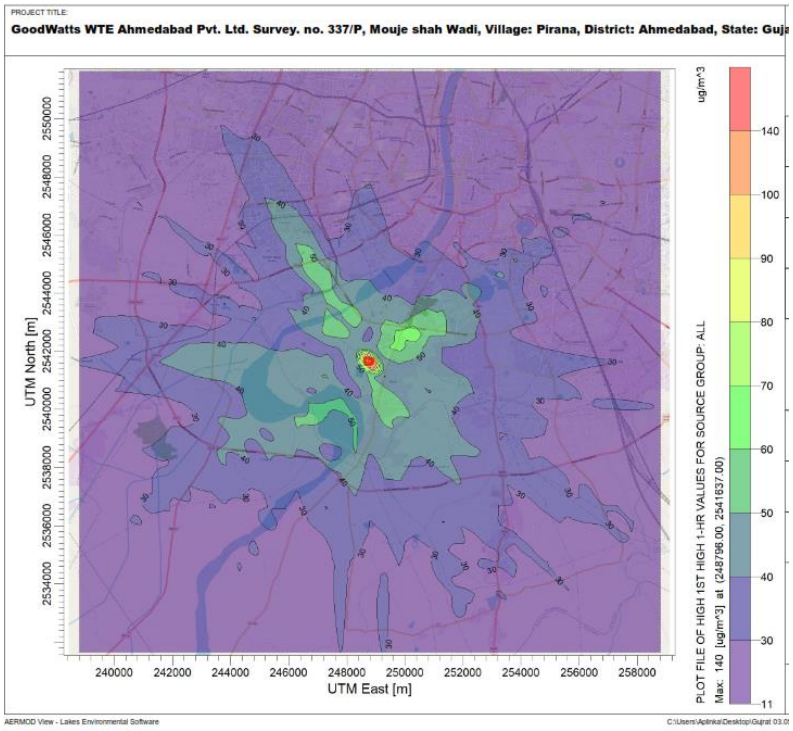
NOX - Concentration - Source Group: ALL

Averaging Period	Rank	Peak	Units	X (m)	Y (m)	ZELEV (m)	ZFLAG (m)	ZHILL (m)	Peak Date, Start Hour
24-HR	1ST	9.62498	ug/m^3	248796.00	2541637.00	62.00	0.00	62.00	10-10-2022, 24
24-HR	2ND	7.60429	ug/m^3	248796.00	2541637.00	62.00	0.00	62.00	01-04-2022, 24
24-HR	3RD	7.20899	ug/m^3	248796.00	2541637.00	62.00	0.00	62.00	02-12-2022, 24
24-HR	4TH	7.01375	ug/m^3	249296.00	2541637.00	62.00	0.00	62.00	09-06-2022, 24
24-HR	5TH	6.91138	ug/m^3	249296.00	2541637.00	62.00	0.00	62.00	18-07-2022, 24
24-HR	6TH	6.87872	ug/m^3	249296.00	2541637.00	62.00	0.00	62.00	16-05-2022, 24
24-HR	7TH	6.86796	ug/m^3	249296.00	2541637.00	62.00	0.00	62.00	23-09-2022, 24
24-HR	8TH	6.72302	ug/m^3	249296.00	2541637.00	62.00	0.00	62.00	21-05-2022, 24
24-HR	9TH	6.37988	ug/m^3	249296.00	2541637.00	62.00	0.00	62.00	31-05-2022, 24
24-HR	10TH	6.26660	ug/m^3	249296.00	2541637.00	62.00	0.00	62.00	07-06-2022, 24
24-HR	11TH	6.25789	ug/m^3	249296.00	2541637.00	62.00	0.00	62.00	19-07-2022, 24
24-HR	12TH	6.16342	ug/m^3	249296.00	2541637.00	62.00	0.00	62.00	30-07-2022, 24
24-HR	13TH	6.08374	ug/m^3	249296.00	2541637.00	62.00	0.00	62.00	12-07-2022, 24
24-HR	14TH	6.06190	ug/m^3	249296.00	2541637.00	62.00	0.00	62.00	14-05-2022, 24
24-HR	15TH	6.01495	ug/m^3	249296.00	2541637.00	62.00	0.00	62.00	22-05-2022, 24
24-HR	16TH	5.99790	ug/m^3	249296.00	2541637.00	62.00	0.00	62.00	28-07-2022, 24
24-HR	17TH	5.98775	ug/m^3	249296.00	2541637.00	62.00	0.00	62.00	17-05-2022, 24
24-HR	18TH	5.92402	ug/m^3	249296.00	2541637.00	62.00	0.00	62.00	13-07-2022, 24
24-HR	19TH	5.86516	ug/m^3	249296.00	2541637.00	62.00	0.00	62.00	06-06-2022, 24
24-HR	20TH	5.86247	ug/m^3	249296.00	2541637.00	62.00	0.00	62.00	11-07-2022, 24
24-HR	21ST	5.79853	ug/m^3	249296.00	2541637.00	62.00	0.00	62.00	01-05-2022, 24
24-HR	22ND	5.69369	ug/m^3	249296.00	2541637.00	62.00	0.00	62.00	29-07-2022, 24
24-HR	23RD	5.60563	ug/m^3	249296.00	2541637.00	62.00	0.00	62.00	15-05-2022, 24
24-HR	24TH	5.49027	ug/m^3	249296.00	2541637.00	62.00	0.00	62.00	27-05-2022, 24
ANNUAL		1.82228	ug/m^3	249296.00	2541637.00	62.00	0.00	62.00	

Isopleth For Normal Conditions (“First highest”) 24 hour concentration

Isopleth For Worst Conditions (“First highest”) 1 hour concentration





CO

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\4) AHEMEDAB

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	26.47274	ug/m^3	248796.00	2541637.00	62.00	0.00	62.00	01-04-2022, 14
8-HR	1ST	10.95999	ug/m^3	248796.00	2541637.00	62.00	0.00	62.00	10-10-2022, 16
ANNUAL		0.69992	ug/m^3	249296.00	2541637.00	62.00	0.00	62.00	

Results Summary

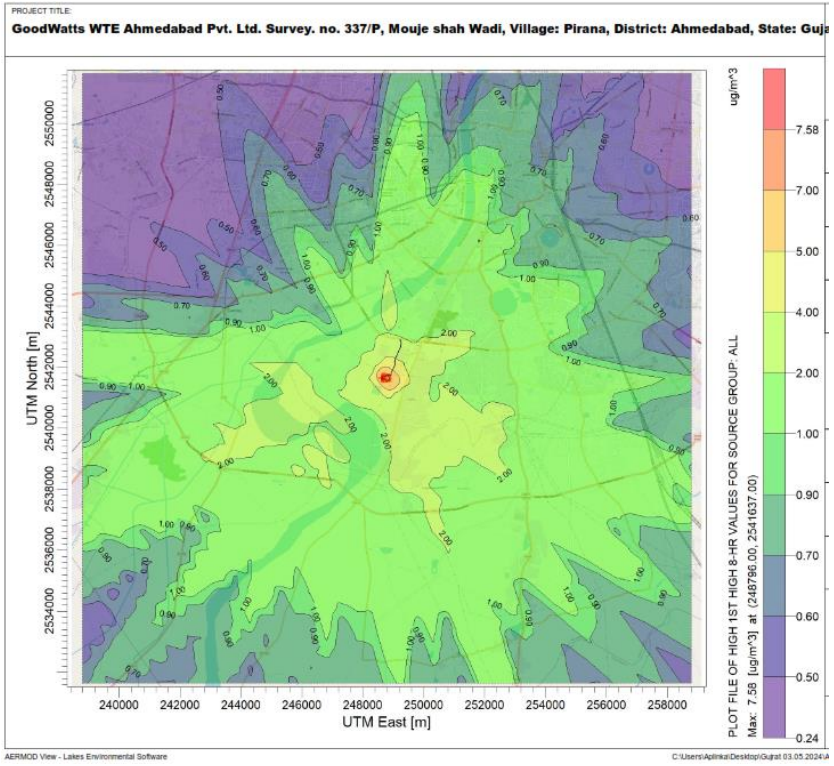
C:\Users\Aplinka\Desktop\2) Abellon Clean Energy Limited\4) AHEMEDAB

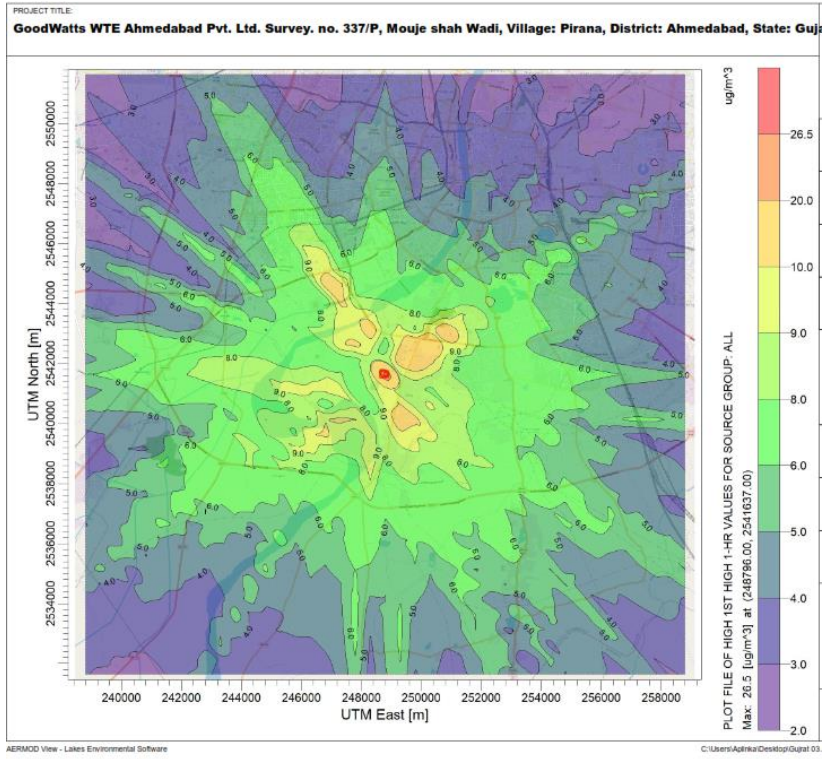
CO - Concentration - Source Group: ALL

Averaging Period	Rank	Peak	Units	X (m)	Y (m)	ZELEV (m)	ZFLAG (m)	ZHILL (m)	Peak Date, Start Hour
8-HR	1ST	7.57502	ug/m^3	248796.00	2541637.00	62.00	0.00	62.00	10-10-2022, 16
8-HR	2ND	5.86513	ug/m^3	248796.00	2541637.00	62.00	0.00	62.00	01-04-2022, 16
8-HR	3RD	5.70657	ug/m^3	248796.00	2541637.00	62.00	0.00	62.00	02-12-2022, 16
8-HR	4TH	4.58108	ug/m^3	248796.00	2541637.00	62.00	0.00	62.00	05-11-2022, 16
8-HR	5TH	4.41064	ug/m^3	248796.00	2541637.00	62.00	0.00	62.00	04-11-2022, 16
8-HR	6TH	3.94841	ug/m^3	248796.00	2542137.00	62.00	0.00	62.00	07-07-2022, 16
8-HR	7TH	3.86131	ug/m^3	249296.00	2541637.00	62.00	0.00	62.00	26-05-2022, 16
8-HR	8TH	3.82186	ug/m^3	249296.00	2541637.00	62.00	0.00	62.00	21-05-2022, 16
ANNUAL		0.47824	ug/m^3	249296.00	2541637.00	62.00	0.00	62.00	

Isopleth For Normal Conditions (“First highest”) 24 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 GWAPL 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;
- 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.

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 Liaoning 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 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: GWAPL 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: GWAPL 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: AVIFAUNA 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	Alexandrine Parakeet	*Psittacula eupatria*	R	Near Threatened	Schedule IV
2	Alpine Swift	*Apus melba*	R	Least Concern	Schedule IV
3	Amur Falcon	*Falco amurensis*	R	Least Concern	Schedule I
4	Ashy Drongo	*Dicrurus leucophaeus*	R	Least Concern	Schedule IV
5	Ashy Prinia	*Prinia socialis*	R	Least Concern	Schedule IV
6	Ashy-crowned Sparrow-Lark	*Eremopterix griseus*	R	Least Concern	Schedule IV
7	Asian Brown Flycatcher	*Muscicapa dauurica*	R	Least Concern	Schedule IV
8	Asian Desert Warbler	*Curruca nana*	R	Least Concern	Schedule IV
9	Asian Green Bee-eater	*Merops orientalis*	R	Least Concern	Schedule IV
10	Asian Koel	*Eudynamys scolopaceus*	R	Least Concern	Schedule IV
11	Asian Openbill	*Anastomus oscitans*	R	Least Concern	Schedule IV
12	Asian Palm Swift	*Cypsiurus balasiensis*	R	Least Concern	Schedule IV
13	Asian Woolly-necked Stork	*Ciconia episcopus*	R	Near Threatened	Schedule IV
14	Baillon's Crake	*Zapornia pusilla*	M	Least Concern	Schedule IV
15	Bank Myna	*Acridotheres ginginianus*	R	Least Concern	Schedule IV
16	Bank Swallow	*Riparia riparia*	M	Least Concern	Schedule IV
17	Bar-headed Goose	*Anser indicus*	M	Least Concern	Schedule IV
18	Barn Owl	*Tyto alba*	R	Least Concern	Schedule I
19	Barn Swallow	*Hirundo rustica*	R	Least Concern	Schedule IV
20	Barred Buttonquail	*Turnix suscitator*	R	Least Concern	Schedule IV
21	Baya Weaver	*Ploceus philippinus*	R	Least Concern	Schedule IV
22	Bay-backed Shrike	*Lanius vittatus*	R	Least Concern	Not Listed
23	Bimaculated Lark	*Melanocorypha bimaculata*	R	Least Concern	Schedule IV
24	Black Bittern	*Ixobrychus flavicollis*	R	Least Concern	Schedule IV
25	Black Drongo	*Dicrurus macrocercus*	R	Least Concern	Schedule IV
26	Black Kite	*Milvus migrans*	R	Least Concern	Schedule I
27	Black Redstart	*Phoenicurus ochruros*	R	Least Concern	Schedule IV
28	Black Stork	*Ciconia nigra*	R	Least Concern	Schedule IV
29	Black-bellied Plover	*Pluvialis squatarola*	R	Least Concern	Schedule IV
30	Black-breasted Weaver	*Ploceus benghalensis*	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
31	Black-capped Kingfisher	*Halcyon pileata*	R	Least Concern	Schedule IV
32	Black-crowned Night-Heron	*Nycticorax nycticorax*	R	Least Concern	Schedule IV
33	Black-headed Bunting	*Emberiza melanocephala*	M	Least Concern	Schedule IV
34	Black-headed Cuckooshrike	*Lalage melanoptera*	R	Least Concern	Schedule IV
35	Black-headed Gull	*Chroicocephalus ridibundus*	M	Least Concern	Schedule IV
36	Black-headed Ibis	*Threskiornis melanocephalus*	R	Near Threatened	Schedule IV
37	Black-naped Monarch	*Hypothymis azurea*	M	Least Concern	Schedule IV
38	Black-necked Stork	*Ephippiorhynchus asiaticus*	R	Near Threatened	Schedule IV
39	Black-rumped Flameback	*Dinopium benghalense*	R	Least Concern	Schedule IV
40	Black-tailed Godwit	*Limosa limosa*	M	Near Threatened	Schedule IV
41	Black-winged Kite	*Elanus caeruleus*	R	Least Concern	Schedule IV
42	Black-winged Stilt	*Himantopus himantopus*	R	Least Concern	Schedule IV
43	Blue Rock-Thrush	*Monticola solitarius*	M	Least Concern	Schedule IV
44	Blue-cheeked Bee-eater	*Merops persicus*	R	Least Concern	Not Listed
45	Blue-tailed Bee-eater	*Merops philippinus*	M	Least Concern	Schedule IV
46	Bluethroat	*Luscinia svecica*	M	Least Concern	Schedule IV
47	Blyth's Pipit	*Anthus godlewskii*	M	Least Concern	Schedule IV
48	Blyth's Reed Warbler	*Acrocephalus dumetorum*	M	Least Concern	Schedule IV
49	Bonelli's Eagle	*Aquila fasciata*	R	Least Concern	Schedule I
50	Booted Eagle	*Hieraaetus pennatus*	M	Least Concern	Schedule I
51	Booted WarblerI	*duna caligata*	R	Least Concern	Schedule IV
52	Brahminy Kite	*Haliastur indus*	R	Least Concern	Schedule I
53	Brahminy Starling	*Sturnia pagodarum*	R	Least Concern	Schedule IV
54	Bridled Tern	*Onychoprion anaethetus*	R	Least Concern	Schedule IV
55	Bronze-winged Jacana	*Metopidius indicus*	R	Least Concern	Schedule IV
56	Brown Boobook	*Ninox scutulata*	M	Least Concern	Schedule IV
57	Brown Crake	*Zapornia akool*	R	Least Concern	Schedule IV
58	Brown Noddy	*Anous stolidus*	R	Least Concern	Schedule IV
59	Brown Rock Chat	*Oenanthe fusca*	R	Least Concern	Schedule IV
60	Brown Shrike	*Lanius cristatus*	R	Least Concern	Schedule IV
61	Brown-breasted Flycatcher	*Muscicapa muttui*	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
62	Brown-capped Pygmy Woodpecker	*Yungipicus nanus*	R	Least Concern	Schedule IV
63	Brown-headed Gull	*Chroicocephalus brunnicephalus*	M	Least Concern	Schedule IV
64	Caspian Tern	*Hydroprogne caspia*	M	Least Concern	Schedule IV
65	Cattle Egret	*Bubulcus ibis*	R	Least Concern	Schedule IV
66	Chestnut-bellied Sandgrouse	*Pterocles exustus*	R	Least Concern	Schedule IV
67	Cinereous Vulture	*Aegypius monachus*	M	Near Threatened	Schedule I
68	Cinnamon Bittern	*Ixobrychus cinnamomeus*	R	Least Concern	Schedule IV
69	Citrine Wagtail	*Motacilla citreola*	M	Least Concern	Schedule IV
70	Clamorous Reed Warbler	*Acrocephalus stentoreus*	R	Least Concern	Schedule IV
71	Collared Pratincole	*Glareola pratincola*	M	Least Concern	Schedule IV
72	Common Babbler	*Argya caudata*	R	Least Concern	Schedule IV
73	Common Buzzard	*Buteo*	R	Least Concern	Schedule I
74	Common Chiffchaff	*Phylloscopus collybita*	M	Least Concern	Schedule IV
75	Common Crane	*Grus grus*	M	Least Concern	Schedule I
76	Common Cuckoo	*Cuculus canorus*	R	Least Concern	Schedule IV
77	Common Grasshopper Warbler	*Locustella naevia*	R	Least Concern	Schedule IV
78	Common Greenshank	*Tringa nebularia*	M	Least Concern	Schedule IV
79	Common Hawk-Cuckoo	*Hierococcyx varius*	R	Least Concern	Schedule IV
80	Common Iora	*Aegithina tiphia*	R	Least Concern	Schedule IV
81	Common Kingfisher	*Alcedo atthis*	R	Least Concern	Schedule IV
82	Common Myna	*Acridotheres tristis*	R	Least Concern	Schedule IV
83	Common Pochard	*Aythya ferina*	M	Vulnerable	Schedule I
84	Common Quail	*Coturnix coturnix*	R	Least Concern	Schedule IV
85	Common Redshank	*Tringa totanus*	M	Least Concern	Schedule IV
86	Common Redstart	*Phoenicurus phoenicurus*	R	Least Concern	Schedule IV
87	Common Ringed Plover	*Charadrius hiaticula*	R	Least Concern	Schedule IV
88	Common Rosefinch	*Carpodacus erythrinus*	M	Least Concern	Schedule IV
89	Common Sandpiper	*Actitis hypoleucos*	R	Least Concern	Schedule IV
90	Common Shelduck	*Tadorna tadorna*	R	Least Concern	Schedule IV
91	Common Snipe	*Gallinago gallinago*	R	Least Concern	Schedule IV
92	Common Tailorbird	*Orthotomus sutorius*	R	Least Concern	Schedule IV

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93	Common Tern	*Sterna hirundo*	R	Least Concern	Schedule IV
94	Common Woodshrike	*Tephrodornis pondicerianus*	R	Least Concern	Schedule IV
95	Coppersmith Barbet	*Psilopogon haemacephalus*	R	Least Concern	Schedule IV
96	Cotton Pygmy-Goose	*Nettapus coromandelianus*	R	Least Concern	Schedule I
97	Crab-Plover	*Dromas ardeola*	R	Least Concern	Schedule IV
98	Crested Lark	*Galerida cristata*	R	Least Concern	Schedule IV
99	Crested Serpent-Eagle	*Spilornis cheela*	R	Least Concern	Schedule IV
100	Curlew Sandpiper	*Calidris ferruginea*	R	Least Concern	Schedule IV
101	Dalmatian Pelican	*Pelecanus crispus*	M	Near Threatened	Schedule IV
102	Delicate Prinia	*Prinia lepida*	R	Least Concern	Schedule IV
103	Demoiselle Crane	*Anthropoides virgo*	M	Least Concern	Schedule I
104	Desert Wheatear	*Oenanthe deserti*	M	Least Concern	Schedule IV
105	Dunlin	*Calidris alpina*	M	Least Concern	Schedule IV
106	Dusky Crag-Martin	*Ptyonoprogne concolor*	R	Least Concern	Schedule IV
107	Eastern Orphean Warbler	*Curruca crassirostris*	M	Least Concern	Schedule IV
108	Egyptian Vulture	*Neophron percnopterus*	R	Endangered	Schedule I
109	Eurasian Collared-Dove	*Streptopelia decaocto*	R	Least Concern	Schedule IV
110	Eurasian Cootx	*Fulica atra*	R	Least Concern	Schedule IV
111	Eurasian Curlew	*Numenius arquata*	M	Near Threatened	Schedule IV
112	Eurasian Griffon	*Gyps fulvus*	M	Least Concern	Schedule I
113	Eurasian Hobby	*Falco subbuteo*	M	Least Concern	Schedule IV
114	Eurasian Hoopoe	*Upupa epops*	R	Least Concern	Schedule IV
115	Eurasian Kestrel	*Falco tinnunculus*	M	Least Concern	Schedule IV
116	Eurasian Marsh-Harrier	*Circus aeruginosus*	M	Least Concern	Schedule I
117	Eurasian Moorhen	*Gallinula chloropus*	R	Least Concern	Schedule I
118	Eurasian Nightjar	*Caprimulgus europaeus*	R	Least Concern	Schedule IV
119	Eurasian Sparrowhawk	*Accipiter nisus*	M	Least Concern	Schedule I
120	Eurasian Spoonbill	*Platalea leucorodia*	R	Least Concern	Schedule I
121	Eurasian Wigeon	*Mareca penelope*	M	Least Concern	Schedule I
122	Eurasian Wryneck	*Jynx torquilla*	M	Least Concern	Schedule IV
123	European Roller	*Coracias garrulus*	M	Least Concern	Schedule IV
124	European Starling	*Sturnus vulgaris*	M	Least Concern	Schedule IV
125	Falcated Duck	*Mareca falcata*	R	Least Concern	Schedule IV

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126	Ferruginous Duck	*Aythya nyroca*	M	Near Threatened	Schedule I
127	Gadwall	*Mareca strepera*	M	Least Concern	Schedule IV
128	Garganey	*Spatula querquedula*	M	Least Concern	Schedule IV
129	Glossy Ibis	*Plegadis falcinellus*	R	Least Concern	Schedule IV
130	Gray Francolin	*Ortygornis pondicerianus*	R	Least Concern	Schedule IV
131	Gray Heron	*Ardea cinerea*	R	Least Concern	Schedule IV
132	Gray Wagtail	*Motacilla cinerea*	R	Least Concern	Schedule IV
133	Gray-bellied Cuckoo	*Cacomantis passerinus*	R	Least Concern	Schedule IV
134	Gray-breasted Prinia	*Prinia hodgsonii*	R	Least Concern	Schedule IV
135	Gray-headed Canary-Flycatcher	*Culicicapa ceylonensis*	R	Least Concern	Schedule IV
136	Gray-headed Swamphen	*Porphyrio poliocephalus*	R	Least Concern	Schedule IV
137	Graylag Goose	*Anser anser*	M	Least Concern	Schedule IV
138	Gray-necked Bunting	*Emberiza buchanani*	M	Least Concern	Schedule IV
139	Great Cormorant	*Phalacrocorax carbo*	R	Least Concern	Schedule IV
140	Great Crested Grebe	*Podiceps cristatus*	M	Least Concern	Schedule IV
141	Great Egret	*Ardea alba*	R	Least Concern	Schedule IV
142	Great Gray Shrike	*Lanius excubitor*	R	Least Concern	Schedule IV
143	Great Thick-knee	*Esacus recurvirostris*	R	Near Threatened	Schedule IV
144	Great White Pelican	*Pelecanus onocrotalus*	M	Least Concern	Schedule IV
145	Greater Coucal	*Centropus sinensis*	R	Least Concern	Schedule IV
146	Greater Flamingo	*Phoenicopterus roseus*	M	Least Concern	Schedule IV
147	Greater Painted-Snipe	*Rostratula benghalensis*	R	Least Concern	Schedule IV
148	Greater Sand-Plover	*Charadrius leschenaultii*	R	Least Concern	Schedule IV
149	Greater Short-toed Lark	*Calandrella brachydactyla*	M	Least Concern	Schedule IV
150	Greater Spotted Eagle	*Clanga*	R	Vulnerable	Schedule I
151	Greater White-fronted Goose	*Anser albifrons*	M	Least Concern	Schedule IV
152	Green Sandpiper	*Tringa ochropus*	M	Least Concern	Schedule IV
153	Green Warbler	*Phylloscopus nitidus*	M	Least Concern	Schedule IV
154	Greenish Warbler	*Phylloscopus trochiloides*	M	Least Concern	Schedule IV
155	Green-winged Teal	*Anas crecca*	M	Least Concern	Schedule IV
156	Gray-throated Martin	*Riparia chinensis*	M	Least Concern	Schedule IV
157	Gull-billed Tern	*Gelochelidon nilotica*	M	Least Concern	Schedule I
158	Hair-crested Drongo	*Dicrurus hottentottus*	R	Least Concern	Schedule IV

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159	Hen Harrier	*Circus cyaneus*	R	Least Concern	Schedule IV
160	Himalayan Griffon	*Gyps himalayensis*	R	Least Concern	Schedule IV
161	House Crow	*Corvus splendens*	R	Least Concern	Schedule IV
162	House Sparrow	*Passer domesticus*	R	Least Concern	Schedule IV
163	Hume's Lark	*Calandrella acutirostris*	R	Least Concern	Schedule IV
164	Hume's Warbler	*Phylloscopus humei*	R	Least Concern	Schedule IV
165	Imperial Eagle	*Aquila heliaca*	M	Vulnerable	Schedule I
166	Indian Bushlark	*Mirafra erythroptera*	M	Least Concern	Schedule IV
167	Indian Cormorant	*Phalacrocorax fuscicollis*	R	Least Concern	Schedule IV
168	Indian Courser	*Cursorius coromandelicus*	R	Least Concern	Schedule IV
169	Indian Golden Oriole	*Oriolus kundoo*	R	Least Concern	Schedule IV
170	Indian Gray Hornbill	*Ocyceros birostris*	R	Least Concern	Schedule IV
171	Indian Nightjar	*Caprimulgus asiaticus*	R	Least Concern	Schedule IV
172	Indian Paradise-Flycatcher	*Terpsiphone paradisi*	R	Least Concern	Schedule IV
173	Indian Peafowl	*Pavo cristatus*	R	Least Concern	Schedule I
174	Indian Pied Starling	*Gracupica contra*	R	Least Concern	Schedule IV
175	Indian Pitta	*Pitta brachyura*	M	Least Concern	Schedule IV
176	Indian Pond-Heron	*Ardeola grayii*	R	Least Concern	Schedule IV
177	Indian Robin	*Copsychus fulicatus*	R	Least Concern	Schedule IV
178	Indian Roller	*Coracias benghalensis*	R	Least Concern	Schedule IV
179	Indian Scops-Owl	*Otus bakkamoena*	R	Least Concern	Schedule IV
180	Indian Silverbill	*Euodice malabarica*	R	Least Concern	Schedule IV
181	Indian Skimmer	*Rynchops albicollis*	R	Least Concern	Schedule IV
182	Indian Spot-billed Duck	*Anas poecilorhyncha*	R	Least Concern	Schedule IV
183	Indian Spotted Eagle	*Clanga hastata*	R	Vulnerable	Schedule I
184	Indian Thick-knee	*Burhinus indicus*	R	Least Concern	Schedule IV
185	Indian Vulture	*Gyps indicus*	R	Critically Endangered	Schedule I
186	Indian White-eye	*Zosterops palpebrosus*	R	Least Concern	Schedule IV
187	Intermediate Egret	*Ardea intermedia*	R	Least Concern	Schedule IV
188	Isabelline Shrike	*Lanius isabellinus*	M	Least Concern	Schedule IV
189	Isabelline Wheatear	*Oenanthe isabellina*	M	Least Concern	Schedule IV
190	Jack Snipe	*Lymnocryptes minimus*	R	Least Concern	Schedule IV
191	Jungle Babbler	*Argya striata*	R	Least Concern	Schedule IV
192	Jungle Prinia	*Prinia sylvatica*	R	Least Concern	Schedule IV

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193	Kentish Plover	*Charadrius alexandrinus*	M	Least Concern	Schedule II
194	Knob-billed Duck	*Sarkidiornis melanotos*	R	Least Concern	Schedule IV
195	Laggar Falcon	*Falco jugger*	R	Near Threatened	Schedule I
196	Large Cuckooshrike	*Coracina macei*	R	Least Concern	Schedule IV
197	Large Gray Babbler	*Argya malcolmi*	R	Least Concern	Schedule IV
198	Large-billed Crow	*Corvus macrorhynchos*	R	Least Concern	Schedule IV
199	Large-billed Leaf Warbler	*Phylloscopus magnirostris*	R	Least Concern	Schedule IV
200	Laughing Dove	*Spilopelia senegalensis*	R	Least Concern	Schedule IV
201	Lesser Black-backed Gull	*Larus fuscus*	R	Least Concern	Schedule IV
202	Lesser Flamingo	*Phoeniconaias minor*	M	Near Threatened	Schedule IV
203	Lesser Florican	*Sypheotides indicus*	M	Critically Endangered	Schedule I
204	Lesser Sand-Plover	*Charadrius mongolus*	M	Least Concern	Schedule IV
205	Lesser Whistling-Duck	*Dendrocygna javanica*	R	Least Concern	Schedule IV
206	Lesser White-fronted Goose	*Anser erythropus*	M	Vulnerable	Schedule I
207	Lesser Whitethroat	*Curruca curruca*	M	Least Concern	Schedule IV
208	Little Bittern	*Ixobrychus minutus*	R	Least Concern	Schedule IV
209	Little Cormorant	*Microcarbo niger*	R	Least Concern	Schedule IV
210	Little Crake	*Zapornia parva*	R	Least Concern	Schedule IV
211	Little Egret	*Egretta garzetta*	R	Least Concern	Schedule IV
212	Little Grebe	*Tachybaptus ruficollis*	R	Least Concern	Schedule IV
213	Little Ringed Plover	*Charadrius dubius*	M	Least Concern	Schedule IV
214	Little Stint	*Calidris minuta*	M	Least Concern	Schedule IV
215	Little Swift	*Apus affinis*	R	Least Concern	Schedule IV
216	Little Tern	*Sternula albifrons*	R	Least Concern	Schedule IV
217	Long-billed Pipit	*Anthus similis*	M	Least Concern	Schedule IV
218	Long-legged Buzzard	*Buteo rufinus*	M	Least Concern	Schedule IV
219	Long-tailed Shrike	*Lanius schach*	R	Least Concern	Schedule IV
220	Macqueen's Bustard	*Chlamydotis macqueenii*	M	Vulnerable	Schedule I
221	Mallard	*Anas platyrhynchos*	M	Least Concern	Schedule IV
222	Marbled Teal	*Marmaronetta angustirostris*	R	Least Concern	Schedule IV
223	Marsh Sandpiper	*Tringa stagnatilis*	M	Least Concern	Schedule IV
224	Merlin	*Falco columbarius*	R	Least Concern	Schedule IV

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225	Montagu's Harrier	*Circus pygargus*	M	Least Concern	Schedule IV
226	Mottled Wood-Owl	*Strix ocellata*	R	Least Concern	Schedule IV
227	Moustached Warbler	*Acrocephalus melanopogon*	R	Least Concern	Schedule IV
228	Namaqua Dove	*Oena capensis*	M	Least Concern	Schedule II
229	Northern Pintail	*Anas acuta*	M	Least Concern	Schedule IV
230	Northern Shoveler	*Spatula clypeata*	M	Least Concern	Schedule IV
231	Orange-headed Thrush	*Geokichla citrina*	M	Least Concern	Schedule IV
232	Oriental Darter	*Anhinga melanogaster*	R	Near Threatened	Schedule IV
233	Oriental Honey-buzzard	*Pernis ptilorhynchus*	R	Least Concern	Schedule IV
234	Oriental Magpie-Robin	*Copsychus saularis*	R	Least Concern	Schedule IV
235	Oriental Pratincole	*Glareola maldivarum*	M	Least Concern	Schedule IV
236	Oriental Skylark	*Alauda gulgula*	R	Least Concern	Schedule IV
237	Osprey	*Pandion haliaetus*	R	Least Concern	Schedule I
238	Pacific Golden-Plover	*Pluvialis fulva*	M	Least Concern	Schedule IV
239	Paddyfield Pipit	*Anthus rufulus*	R	Least Concern	Schedule IV
240	Paddyfield Warbler	*Acrocephalus agricola*	M	Least Concern	Schedule IV
241	Painted Stork	*Mycteria leucocephala*	R	Near Threatened	Schedule IV
242	Pale Sand Martin	*Riparia diluta*	M	Least Concern	Schedule IV
243	Pale-billed Flowerpecker	*Dicaeum erythrorhynchos*	R	Least Concern	Schedule IV
244	Pallas's Gull	*Ichthyaetus ichthyaetus*	M	Least Concern	Schedule IV
245	Pallid Harrier	*Circus macrourus*	M	Near Threatened	Schedule I
246	Pallid Scops-Owl	*Otus brucei*	R	Least Concern	Schedule IV
247	Parasitic Jaeger	*Stercorarius parasiticus*	R	Least Concern	Schedule IV
248	Peregrine Falcon	*Falco peregrinus*	M	Least Concern	Schedule IV
249	Pheasant-tailed Jacana	*Hydrophasianus chirurgus*	R	Least Concern	Schedule IV
250	Pied Avocet	*Recurvirostra avosetta*	M	Least Concern	Schedule IV
251	Pied Bushchat	*Saxicola caprata*	R	Least Concern	Schedule IV
252	Pied Cuckoo	*Clamator jacobinus*	R	Least Concern	Schedule IV
253	Pied Kingfisher	*Ceryle rudis*	R	Least Concern	Schedule IV
254	Pin-tailed Snipe	*Gallinago stenura*	R	Least Concern	Schedule IV
255	Plain Prinia	*Prinia inornata*	R	Least Concern	Schedule IV
256	Plum-headed Parakeet	*Psittacula cyanocephala*	R	Least Concern	Schedule IV

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257	Purple Heron	*Ardea purpurea*	R	Least Concern	Schedule IV
258	Purple Sunbird	*Cinnyris asiaticus*	R	Least Concern	Schedule IV
259	Purple-rumped Sunbird	*Leptocoma zeylonica*	R	Least Concern	Schedule IV
260	Rain Quail	*Coturnix coromandelica*	R	Least Concern	Schedule IV
261	Red Avadavat	*Amandava amandava*	R	Least Concern	Schedule IV
262	Red Collared-Dove	*Streptopelia tranquebarica*	R	Least Concern	Schedule IV
263	Red Phalarope	*Phalaropus fulicarius*	R	Least Concern	Schedule IV
264	Red-backed Shrike	*Lanius collurio*	R	Least Concern	Schedule IV
265	Red-breasted Flycatcher	*Ficedula parva*	R	Least Concern	Schedule IV
266	Red-breasted Goose	*Branta ruficollis*	M	Vulnerable	Schedule I
267	Red-crested Pochard	*Netta rufina*	M	Least Concern	Schedule IV
268	Red-headed Bunting	*Emberiza bruniceps*	M	Least Concern	Schedule IV
269	Red-naped Ibis	*Pseudibis papillosa*	R	Least Concern	Schedule IV
270	Red-necked Falcon	*Falco chicquera*	R	Least Concern	Schedule IV
271	Red-necked Phalarope	*Phalaropus lobatus*	R	Least Concern	Schedule IV
272	Red-rumped Swallow	*Cecropis daurica*	R	Least Concern	Schedule IV
273	Red-tailed Shrike	*Lanius phoenicuroides*	R	Least Concern	Schedule IV
274	Red-vented Bulbul	*Pycnonotus cafer*	R	Least Concern	Schedule IV
275	Red-wattled Lapwing	*Vanellus indicus*	R	Least Concern	Schedule IV
276	River Tern	*Sterna aurantia*	R	Vulnerable	Schedule I
277	Rock Bush-Quail	*Perdicula argoondah*	R	Least Concern	Schedule IV
278	Rock Eagle-Owl	*Bubo bengalensis*	R	Least Concern	Schedule I
279	Rock Pigeon	*Columba livia*	R	Least Concern	Schedule IV
280	Rose-ringed Parakeet	*Psittacula krameri*	R	Least Concern	Schedule IV
281	Rosy Starling	*Pastor roseus*	M	Least Concern	Schedule IV
282	Ruddy Shelduck	*Tadorna ferruginea*	M	Least Concern	Schedule IV
283	Ruddy Turnstone	*Arenaria interpres*	R	Least Concern	Schedule IV
284	Ruddy-breasted Crake	*Zapornia fusca*	R	Least Concern	Schedule IV
285	Ruff	*Calidris pugnax*	M	Least Concern	Schedule IV
286	Rufous Treepie	*Dendrocitta vagabunda*	R	Least Concern	Schedule IV
287	Rufous-fronted Prinia	*Prinia buchanani*	R	Least Concern	Schedule IV
288	Rufous-tailed Lark	*Ammomanes phoenicura*	R	Least Concern	Schedule IV
289	Rufous-tailed Scrub-Robin	*Cercotrichas galactotes*	R	Least Concern	Schedule IV

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290	Rusty-tailed Flycatcher	*Ficedula ruficauda*	R	Least Concern	Schedule IV
291	Saker Falcon	*Falco cherrug*	M	Endangered	Schedule I
292	Sand Lark	*Calandrella raytal*	R	Least Concern	Schedule II
293	Sarus Crane	*Antigone antigone*	R	Vulnerable	Schedule I
294	Savanna Nightjar	*Caprimulgus affinis*	R	Least Concern	Schedule IV
295	Scaly-breasted Munia	*Lonchura punctulata*	R	Least Concern	Schedule IV
296	Shikra	*Accipiter badius*	R	Least Concern	Schedule IV
297	Short-eared Owl	*Asio flammeus*	R	Least Concern	Schedule I
298	Short-toed Snake-Eagle	*Circaetus gallicus*	R	Least Concern	Schedule I
299	Siberian Stonechat	*Saxicola maurus*	M	Least Concern	Schedule IV
300	Singing Bushlark	*Mirafra cantillans*	R	Least Concern	Schedule II
301	Sirkeer Malkoha	*Taccocua leschenaultii*	R	Least Concern	Schedule IV
302	Slender-billed Gull	*Chroicocephalus genei*	M	Least Concern	Schedule IV
303	Small Buttonquail	*Turnix sylvaticus*	R	Least Concern	Schedule IV
304	Small Minivet	*Pericrocotus cinnamomeus*	R	Least Concern	Schedule IV
305	Small Pratincole	*Glareola lactea*	M	Least Concern	Schedule IV
306	Sociable Lapwing	*Vanellus gregarius*	M	Vulnerable	Schedule I
307	Sooty Tern	*Onychoprion fuscatus*	R	Least Concern	Schedule IV
308	Spot-breasted Fantail	*Rhipidura albogularis*	R	Least Concern	Schedule IV
309	Spotted Crake	*Porzana porzana*	R	Least Concern	Schedule IV
310	Spotted Dove	*Spilopelia chinensis*	R	Least Concern	Schedule IV
311	Spotted Flycatcher	*Muscicapa striata*	R	Least Concern	Schedule IV
312	Spotted Owlet	*Athene brama*	R	Least Concern	Schedule IV
313	Spotted Redshank	*Tringa erythropus*	M	Least Concern	Schedule IV
314	Steppe Eagle	*Aquila nipalensis*	R	Endangered	Schedule I
315	Streak-throated Swallow	*Petrochelidon fluvicola*	R	Least Concern	Schedule IV
316	Striated Heron	*Butorides striata*	R	Least Concern	Schedule IV
317	Striolated Bunting	*Emberiza striolata*	R	Least Concern	Schedule IV
318	Sulphur-bellied Warbler	*Phylloscopus griseolus*	R	Least Concern	Schedule IV
319	Sykes's Nightjar	*Caprimulgus mahrattensis*	M	Least Concern	Schedule IV
320	Sykes's Warbler	*Iduna rama*	R	Least Concern	Schedule IV
321	Taiga Flycatcher	*Ficedula albicilla*	M	Least Concern	Schedule IV
322	Tawny Eagle	*Aquila rapax*	R	Vulnerable	Schedule I

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323	Tawny Lark	*Galerida deva*	R	Least Concern	Schedule IV
324	Tawny Pipit	*Anthus campestris*	R	Least Concern	Schedule IV
325	Tawny-bellied Babbler	*Dumetia hyperythra*	R	Least Concern	Schedule IV
326	Temminck's Stint	*Calidris temminckii*	M	Least Concern	Schedule IV
327	Terek Sandpiper	*Xenus cinereus*	R	Least Concern	Schedule IV
328	Thick-billed Flowerpecker	*Dicaeum agile*	R	Least Concern	Schedule IV
329	Tickell's Blue Flycatcher	*Cyornis tickelliae*	R	Least Concern	Schedule IV
330	Tickell's Leaf Warbler	*Phylloscopus affinis*	R	Least Concern	Schedule IV
331	Tree Pipit	*Anthus trivialis*	R	Least Concern	Schedule IV
332	Tricolored Munia	*Lonchura malacca*	R	Least Concern	Schedule IV
333	Tufted Duck	*Aythya fuligula*	M	Least Concern	Schedule IV
334	Ultramarine Flycatcher	*Ficedula superciliaris*	M	Least Concern	Schedule IV
335	Variable Wheatear	*Oenanthe picata*	M	Least Concern	Schedule IV
336	Water Rail	*Rallus aquaticus*	R	Least Concern	Schedule IV
337	Watercock	*Gallicrex cinerea*	R	Least Concern	Schedule IV
338	Western Crowned Warbler	*Phylloscopus occipitalis*	M	Least Concern	Schedule IV
339	Western Reef-Heron	*Egretta gularis*	M	Least Concern	Schedule IV
340	Western Yellow Wagtail	*Saxicola maurus*	M	Least Concern	Schedule IV
341	Whimbrel	*Numenius phaeopus*	R	Least Concern	Schedule IV
342	Whiskered Tern	*Chlidonias hybrida*	M	Least Concern	Schedule IV
343	White Stork	*Ciconia ciconia*	R	Least Concern	Schedule IV
344	White Wagtail	*Motacilla alba*	R	Least Concern	Schedule IV
345	White-bellied Drongo	*Dicrurus caerulescens*	R	Least Concern	Schedule IV
346	White-bellied Minivet	*Pericrocotus erythropygius*	R	Least Concern	Schedule IV
347	White-breasted Waterhen	*Amaurornis phoenicurus*	R	Least Concern	Schedule IV
348	White-browed Bulbul	*Pycnonotus luteolus*	R	Least Concern	Schedule IV
349	White-browed Bushchat	*Saxicola macrorhynchus*	R	Least Concern	Schedule IV
350	White-browed Fantail	*Rhipidura aureola*	R	Least Concern	Schedule IV
351	White-browed Wagtail	*Motacilla maderaspatensis*	R	Least Concern	Schedule IV
352	White-eared Bulbul	*Pycnonotus leucotis*	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
353	White-eyed Buzzard	*Butastur teesa*	R	Least Concern	Schedule IV
354	White-rumped Vulture	*Gyps bengalensis*	R	Critically Endangered	Schedule I
355	White-tailed Lapwing	*Vanellus leucurus*	M	Least Concern	Schedule IV
356	White-throated Kingfisher	*Halcyon smyrnensis*	R	Least Concern	Schedule IV
357	White-winged Tern	*Chlidonias leucopterus*	R	Least Concern	Schedule IV
358	Wire-tailed Swallow	*Hirundo smithii*	R	Least Concern	Schedule IV
359	Wood Sandpiper	*Tringa glareola*	M	Least Concern	Schedule IV
360	Yellow Bittern	*Ixobrychus sinensis*	R	Least Concern	Schedule IV
361	Yellow-crowned Woodpecker	*Leiopicus mahrattensis*	R	Least Concern	Schedule IV
362	Yellow-eyed Babbler	*Chrysomma sinense*	R	Least Concern	Schedule IV
363	Yellow-footed Green-Pigeon	*Treron phoenicopterus*	R	Least Concern	Schedule IV
364	Yellow-throated Sparrow	*Gymnoris xanthocollis*	M	Least Concern	Schedule IV
365	Yellow-wattled Lapwing	*Vanellus malabaricus*	R	Least Concern	Schedule IV
366	Zitting Cisticola	*Cisticola juncidis*	R	Least Concern	Schedule IV

APPENDIX 18: STATUS OF APPLICABLE 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 Establish (CTE) 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 03.06.2019 valid till 15.01.2026.	nil
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 etc. 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*** GWAPL has obtained No Objection Certificate (NOC) from CGWA on 07.02.2022 valid up to 06.02.2025. 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, Ahmedabad Municipal Corporation	***Applicable during operation Phase*** The Project will apply for fire NOC or necessary approval (as applicable) for the project prior to start of operation phase	The Project should ensure to obtain necessary approvals/fire NOC (as applicable) prior to operation phase.

S. No	Applicable Policies and Regulations	Institution Responsible	Applicability/Coverage	Recommendation
6.	Forest Clearance under The Forest (Conservation) Act, 1980 Wildlife Clearance under the Wildlife (Protection)Act, 1972	MoEF&CC and NBWL	***Not Applicable*** Since there are no protected areas such as national parks, wildlife sanctuaries, biosphere reserved within 10 km of the project area. Forest clearance and wildlife clearance is not applicable to the project.	Nil
7.	Building and other construction worker (BOCW) registration	Assistant Labour Commissioner Officer	**Applicable** GWAPL has obtained BOCW registration with registration number DDISH/AHD/BOCW/415/2019 dated 05.09.2019. The completion date provided in the registration was 31.12.2021. however, the construction work of the WTE plant has not been completed yet. Thus, it is required to update the registration with update the completion date of construction work of the Project.	Project shall update the BOCW registration with updated construction work completion date.
8.	Principle Employers' Registration as per the section 7 of the contract labour (regulation and abolition) Act, 1970	Assistant Labour Commissioner Office	**Applicable** GWAPL has obtained the principal employer license with the registration number AHD/2019/CLRA/175. The license has covered only security service providing agency named M/s Golden Crown Security and Allied Services. However, the license does not cover M/s Tambe Engineering Private Limited (TEPL). TEPL is engaged in installing of boiler and other construction work	GWAPL shall update the license to involve TEPL as part of the principal labour license.
9.	Contract Labour License under the Contract Labour (Regulation & Abolition) Act 1970	Assistant Labour Commissioner Office	**Not Applicable** M/S Tambe Engineering Private Limited has employed 35 workers which is less than required applicability of the Act in Gujarat – Gujarat government has amended the Act on July 20, 2020, to increase the applicability threshold to 50 or more workers. **Not Applicable on Golden Crown Security Allied Services** The number of security personnel employed (which is 15) 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.	
10.	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 demonstrated 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	Nil

<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>monitoring and maintaining such practice to ensure ongoing compliance with applicable laws and regulations related to labour and child protection.</td><td></td></tr>
<tr><td>11.</td><td>The Bonded Labour System (Abolition) Act, 1976</td><td>Labour Commissioner Office</td><td>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 mean 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 bonded 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.</td><td>Nil</td></tr>
<tr><td>12.</td><td>The Minimum Wages Act, 1948</td><td>Labour Commissioned Office</td><td>Applicable
It has been conformed through consultation and a review of the wage register that all workers and security personnel at the project are receiving wages over and above 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>Mechanical work</td><td>18,000/month and 692/day</td><td>Skilled</td><td>474</td></tr>
<tr><td>Workers 2</td><td>Mechanical work</td><td>20,000/ month and 769/day</td><td>Skilled</td><td>474</td></tr>
<tr><td>Workers 3</td><td>Security personnel</td><td>15,000/month and 615/day</td><td>Skilled</td><td>474</td></tr>
</table></td><td>Nil</td></tr>
</table>

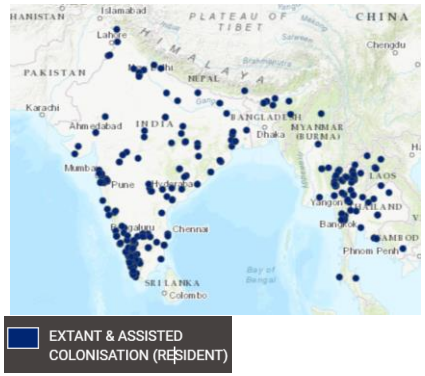
[103] https://col.gujarat.gov.in/Portal/News/998_3_minimum_wages_46_Schedule_Employment_27.03.2023.pdf (Accessed on May 27, 2023)

<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>13.</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 agency has obtained the PSARA license vide license number 19083828 and is valid till 19.08.2024</td><td>Nil</td></tr>
<tr><td>14.</td><td>Registration under the Employees' Provident Fund and Miscellaneous Provisions Act, 1952</td><td>Employees' Provident Fund Organisation</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>Tambe Engineering Private Limited</td><td>The Act is applicable on the contractor</td><td>The contractor has obtained the PF registration vide establishment code DSSHD195570300. Further, based on the consultation with workers and review of PF deposit message on workers' mobile, it is confirmed that the contractor has obtained the PF registration and all the workers are receiving benefits as per the Act.</td></tr><tr><td>Golden Crown Security Allied Services</td><td>The Act is applicable on the contractor</td><td>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.</td></tr></table></td><td>Nil</td></tr>
<tr><td>15.</td><td>Registration under the Employees' State Insurance Act, 1948</td><td>Employee State Insurance Organisation</td><td>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</td><td>Nil</td></tr>
</table>

S. No	Applicable Policies and Regulations	Institution Responsible	Applicability/Coverage	Recommendation
			letter no. T.11/13/03/2015 Rev.II date 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 19: CRITICAL HABITAT SCREENING

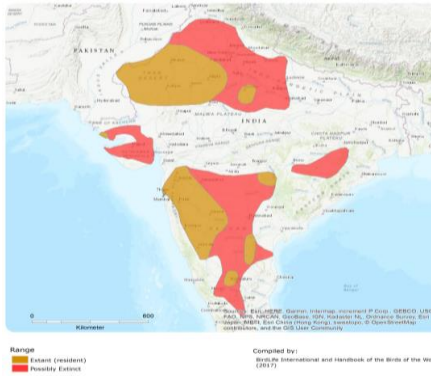
Appendix 19: Critical Habitat Screening (Ahmadabad Site)

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
Plants					
1	Teak (*Tectona grandis*)  https://www.iucnredlist.org/species/62019830/62019832#geographic-range	**IUCN:** Endangered **IWP:** Schedule I **Restricted range:** No **Migratory:** NA	1 a, c	Tectona grandis is native to India, Myanmar, Lao PDR and Thailand. It is estimated that only 27.9 million ha of natural teak-containing forest remains. In parts of the species range decline in natural teak forests has been substantial and rapid. This is caused by excessive harvesting, encroachment for agricultural land and other developments, overgrazing, and forest fires. The species have been experiencing harvest pressure over the last few centuries, with particularly high demand in the 1950s and 60s. Consequently, over the last fifty years teak forest (forest in which teak is dominant) has 'drastically declined[3] and many mature, seed producing individuals were removed. In India, teak-bearing forests can be found in regions with annual precipitation of 800–2500 mm. Dry and moist deciduous woods can be found below 24° N latitude. The main states in India where teak is grown include Kerala, Tamil Nadu, Karnataka, Orissa, Andhra Pradesh, Chattisgarh, Maharashtra, Gujarat, Madhya Pradesh, Rajasthan, Uttar Pradesh and Manipur[4, 5]. Previous study cleared that the environment in south Gujarat is more conducive for teak cultivation. In south Gujarat, trees with girths greater than 120 cm are fairly common. But in Saurashtra-Kutch and central Gujarat, no trees larger than 120 cm in diameter have been reported[6]. As per the report of forest survey of India (for Gujarat State)[7], no natural population of the species is available from the Ahmedabad city as well as in the project's EAAA, only few agroforestry plantations are available.	Screened Out
Herpetofauna					
2	Indian Softshell Turtle (*Nilssonia gangetica*)	**IUCN:** Endangered **IWP:** Schedule I **Restricted range:** No	1 a, c	Indian Softshell Turtle occurs throughout the northern plains of the Indian Subcontinent, in the Indus, Ganga, Narmada and Mahanadi basins[8]	Screened out

[1] IUCN RedList - Online Version 2022-2
[2] Indian Wildlife (Protection) Act. 1972
[3] Fofana, I.J., Ofori, D., Poitel, M. and Verhaegen, D. 2009. Diversity and genetic structure of teak (Tectona grandis Lf) in its natural range using DNA microsatellite markers. New Forests 37(2): 175-195.
[4] Tewari, D. N. (1992). A monograph on teak (Tectona grandis Linn. f.) (pp. iii+-479).
[5] Nyi Nyi Kyaw, N. N. K. (2004). En route towards sustainable development of Myanmar natural teak forests.
[6] Singh, H. S. (2013). Tree wealth in the non-forest areas of Gujarat. Social Forestry, Forest Department.
[7] https://fsi.nic.in/isfr19/vol2/isfr-2019-vol-ii-gujarat.pdf
[8] www.iucnredlist.org/species/pdf/2930943

		 https://www.iucnredlist.org/species/39618/2930943	**Migratory:** No	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[9] 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[10]. 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.[11] Although the species distribution map includes its presence in few coastal states 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[12, 13, 14], the species is available in the Gujarat, but no records are available from the Ahmedabad city specifically project's EAAA. The nearest reported location is wetlands of Kheda[15], where 2 individuals of the species were reported during Jun. 2020.	
Birds					
3	Great Indian Bustard (*Ardeotis nigriceps*)	**IUCN:** Critically Endangered **IWP:** Schedule I **Restricted range:** Yes **Migratory:** No	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 undulating terrain. These birds congregate in traditional less disturbed grassland patches to breed during mid-summer and monsoon[16] 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[17]) are present in Gujarat, Maharashtra, Andhra Pradesh, and Karnataka states of India.	Screened Out

[9] 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.
[10] 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.
[11] https://wildlifesos.org/anti-poaching/introducing-the-indian-softshell-turtle/
[12] https://www.inaturalist.org/observations?place_id=any&subview=map&taxon_id=73648
[13] https://www.gbif.org/species/2442542
[14] https://indiabiodiversity.org/species/show/238650
[15] https://www.inaturalist.org/observations/61499736
[16] 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.
[17] Patil, P. 2011. Joint meeting to discuss conservation of Great Indian Bustard sanctuary. Protected Area Update 17(3): 13.

	 https://www.iucnredlist.org/species/22691932/134188105			In India, their population is confined mostly to Rajasthan and Gujarat. Small population occur in Maharashtra, Karnataka and Andhra Pradesh[18]. However, the species has not been found surrounding of Ahmedabad[19]. Historically the species was present throughout the Kachchh and Saurashtra, but now only restricted in the Kutch Bustard Wildlife Sanctuary and Chhari Dhand[20], and there are no recent records of the species from the Ahmedabad and surrounding area[21, 22].	
4	Lesser Florican (*Sypheotides indicus*)	**IUCN:** Critically Endangered **IWP:** Schedule I **Restricted range:** No **Migratory:** Yes	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[23]. 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)[24]. 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[25]. Breeding coincides with the south-west monsoon, May-September, with birds congregating in north-central and west India for	Screened Out

[18] 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.

[19] https://ebird.org/region/IN-GJ-AH

[20] 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

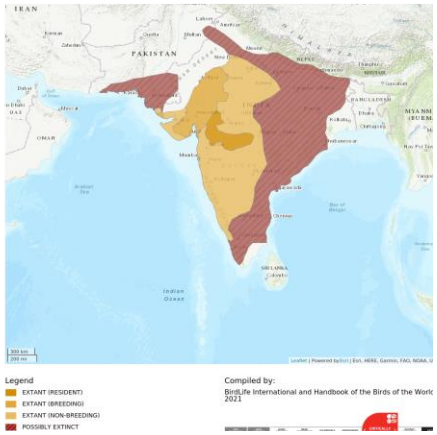
[21] https://www.inaturalist.org/observations?place_id=any&subview=map&taxon_id=114

[22] https://ebird.org/species/indbus1

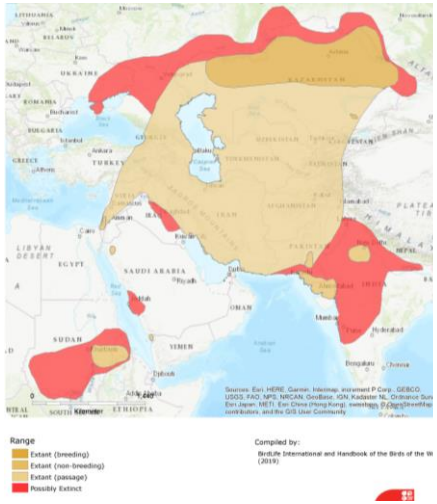
[23] BirdLife International. 2021. Sypheotides indicus. The IUCN Red List of Threatened Species 2021: e.T22692024A199959007

[24] 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.

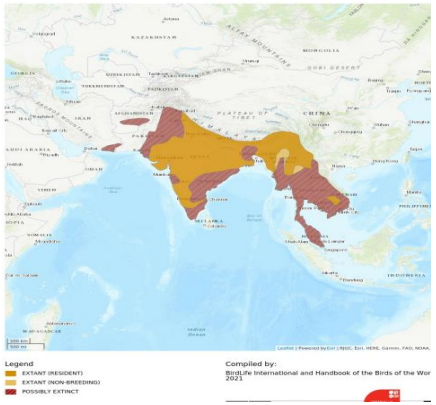
[25] Dutta, S., Narwade, S., Bipin, C. M., Gadhavi, D., Uddin, M., et. al. 2018. Status of the Lesser Florican Sypheotides indicus and implications for its conservation. Dehradun: Wildlife Institute of India.

	 https://www.iucnredlist.org/species/22692024/199959007			males to perform extraordinary leaping aerial displays. Sufficient grass cover is particularly important during the breeding season. 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[26] As per the Important Bird and Biodiversity Areas in India: Priority Sites for Conservation (Revised and updated Edition - 2016) [27], 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. All the above-mentioned areas are away from the Ahmedabad. However, there are undisclosed location records from Bagodara town[28] which is around 50 km away from the project location. The absence of suitable habitat, increased level of human activities and lack of recent records indicates unlikelihood of this species in EAAA.	
5	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[29], 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[30], 30 at Great Rann of Kutch in November 2008 and 2012[31]. Surveys in 2006 in Kazakhstan estimated 376 breeding pairs in an area of 145,000 km2. Extrapolating this population density across the breeding range yields a possible total population size of 5,600 breeding pairs, i.e. 11,200 mature individuals, roughly equivalent to 16,000-17,000 individuals in total[32].	Screened Out

[26] https://ebird.org/region/IN-GJ-JA
[27] 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
[28] https://ebird.org/map/lesflo2?neg=true&env.minX=&env.minY=&env.maxX=&env.maxY=&zh=false&gp=false&ev=Z&excludeExX=false&excludeExAll=false&mr=1-12&bmo=1&emo=12&yr=all&byr=1900&eyr=2024
[29] Kamp, J.; Koshkin, M. A.; Sheldon, R. D. 2010. Historic breeding of Sociable Lapwing (Vanellus gregarius) in Xinjiang. Chinese Birds 1(1): 70-73.
[30] Deomurari, A. 2007. Western India: Gujarat Kutch Birding and Wildlife Tour, November 2007.
[31] Sheldon, R. 2013. The Sociable Lapwing - Interim short report to the BirdLife International Preventing Extinctions Programme. BirdLife International Preventing Extinctions Programme.
[32] https://www.iucnredlist.org/species/22694053/155545788#population

	 https://www.iucnredlist.org/species/22694053/155545788			Sociable lapwing uses dry wastelands, cultivated, ploughed and stubble fields[33]. It winters in Sudan, Eritrea, Israel, Arabian Peninsula, Pakistan and India, possibly also in Iraq and Iran[34]. As per the Important Bird and Biodiversity Areas in India: Priority Sites for Conservation (Revised and updated Edition - 2016) [35], the species is reported from Flamingo City and Naliya Grassland (Wildlife Kutch Bustard Sanctuary). Both the IBAs are located in the Kutch region, and also there is record of the species from the Saurashtra region[36]. Last time, a solitary observation of the species was reported from the Medra area (beyond the EAAA) in 2015[37]. However, there is less likelihood of meeting threshold i.e.160-170 individuals (≥1 percent of the global population) for the EAAA.	
6	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[38]. 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[39]. 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[40]. Declines in the major part of the population throughout the Indian Subcontinent probably	Screened Out

[33] https://www.iucnredlist.org/species/22694053/155545788#habitat-ecology
[34] https://birdsoftheworld.org/bow/species/soclap1/cur/introduction?login
[35] 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
[36] https://www.inaturalist.org/observations?place_id=any&subview=map&taxon_id=4858
[37] https://www.inaturalist.org/observations/1505374
[38] BirdLife International. 2001. Threatened birds of Asia: the BirdLife International Red Data Book. BirdLife International, Cambridge, U.K.
[39] BirdLife International. 2021. Gyps bengalensis. The IUCN Red List of Threatened Species 2021: e.T22695194A204618615
[40] BirdLife International. 2021. Gyps bengalensis. The IUCN Red List of Threatened Species 2021: e.T22695194A204618615

	 https://www.iucnredlist.org/species/22695194/204618615			began in the 1990s and were very rapid, resulting in an overall population decline of greater than 99% over a 10-15 year period. 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)[41]. As per the available secondary information, also the species has been reported from the surroundings of Ahmedabad area[42]. Based on available secondary information extracted from eBird Database[43], maximum 250 individuals were reported from Dabhla Panjarapole Dumping Site[44] in year 2008, after that no such large number were reported from the surroundings of the Ahmedabad.In recent years, the maximum 5 individuals reported form Glade One[45] (Khicha and Devati), therefore, it is less likely to meet the threshold i.e. 40-60 (≥1 percent of the global population[46]) for the EAAA.	
7	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[47]. 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[48] 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[49]	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-AH

[43] https://ebird.org/map/whrvul1?neg=true&env.minX=&env.minY=&env.maxX=&env.maxY=&zh=false&gp=false&ev=Z&excludeExX=false&excludeExAll=false&mr=1-12&bmo=1&emo=12&yr=all&byr=1900&eyr=2024

[44] https://ebird.org/checklist/S86778092

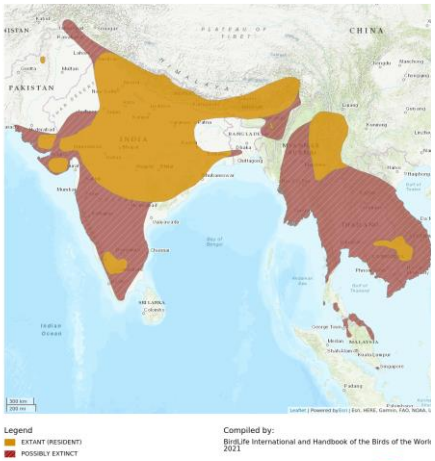
[45] https://ebird.org/checklist/S51371438

[46] https://www.iucnredlist.org/species/22696027/203868747#population

[47] 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.

[48] BirdLife International. 2021. Sarcogyps calvus. The IUCN Red List of Threatened Species 2021: e.T22695254A205031246

[49] https://ebird.org/region/IN-GJ-JA

	 https://www.iucnredlist.org/species/22695254/205031246			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 Sanctuary & Nanda Island and Nikol-Samadhiyala-Malan Wetlands Complex[50]. In Saurashtra region, the species has stray records from Junagarh, Gir Somnath, Amreli and Bhavnagar districts[51]; however, there is no record of the species from the Ahmedabad and surrounding area and the project site also comes under the area where the species has been possibly extinct i.e. not recorded since long time[52, 53].	
8	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[54]. Prakash et al. (2019)[55] estimated the population to be c.12,000 individuals based on road transects carried out in 2015. This roughly equates to 8,000 mature individuals. It is placed in the band 5,000-15,000 mature individuals[56]. 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)[57].	Screened Out

[50] 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

[51] https://ebird.org/species/rehvul1

[52] https://ebird.org/region/IN-GJ-AH

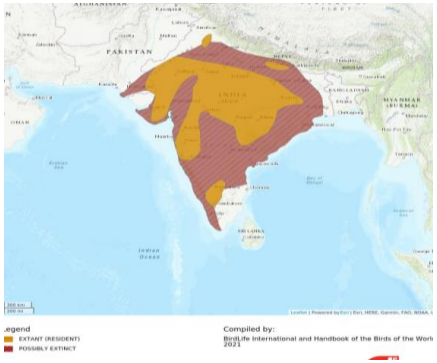
[53]https://www.iucnredlist.org/species/22695254/205031246#geographic-range

[54] BirdLife International. 2021. Gyps indicus. The IUCN Red List of Threatened Species 2021: e.T22729731A204672586

[55] Prakash, V., Bishwakarma, M.C., Chaudhary, A., Cuthbert, R., Dave, R., Kulkarni, M., Kumar, S., Paudel, K., Ranade, S., Shringarpure, R. and Green, R.E. 2012a. The Population Decline of Gyps Vultures in India and Nepal Has Slowed since Veterinary Use of Diclofenac was Banned. PLoS One 7(11).

[56] https://www.iucnredlist.org/species/22729731/204672586#population

[57] 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			Although 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)[58]. Based on available secondary information extracted from eBird Database[59] (which reports maximum 12 individuals from Dabla Panjarapole Dumping Site[60] in year 2008). However, in recent years, the maximum 2 individuals reported form Dabhla Chokdi[61], therefore, it is unlikely to meet the threshold i.e. 50-150 (≥1 percent of the global population[62]) for the EAAA.	
9	Indian Skimmer (*Rynchops albicollis*)	**IUCN:** Endangered **IWP:** Schedule I **Restricted range:** No **Migratory:** Yes	1 a, c	Indian Skimmer was formerly widely distributed across the Indian Subcontinent, but now almost completely restricted to India as a breeding bird, with only occasional breeding in western Bangladesh[63]. The recent population decline has been accompanied by a range contraction and there are no recent confirmed breeding records from Pakistan or Myanmar[64]. The population is estimated at 2,450-2,900 mature individuals, based on the compilation of counts and expert estimates from across the species's range. In India, most observations during the non-breeding season are of few birds but larger congregations are also known from a handful of key sites, ca. 150 from Jamnagar in Gujarat[65], ca. 100-300 from Yamuna & Ganges rivers[66], while on the east coast between 200 - 400 have been recorded at Satkosia on the River Mahanadi in Odisha[67] and around 120 at Coringa Wildlife Sanctuary and Kakinada in Andhra Pradesh[68]. It occurs primarily on larger, sandy, lowland rivers, around lakes and adjacent marshes and, in the nonbreeding season, estuaries and coasts. It breeds colonially on large,	Screened out

[58] 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

[59] https://ebird.org/region/IN-GJ-AH

[60] https://ebird.org/checklist/S86778092

[61] https://ebird.org/checklist/S92978851

[62] https://www.iucnredlist.org/species/22696027/203868747#population

[63] Kabir, M. T., Chowdhury, S. U., Tareq, O., Alam, A. B. M. S., Ahmed, S., Shahadat, O. & Foysal, M. 2016. New breeding records of riverine birds in Bangladesh. BirdingASIA 26: 39-42.

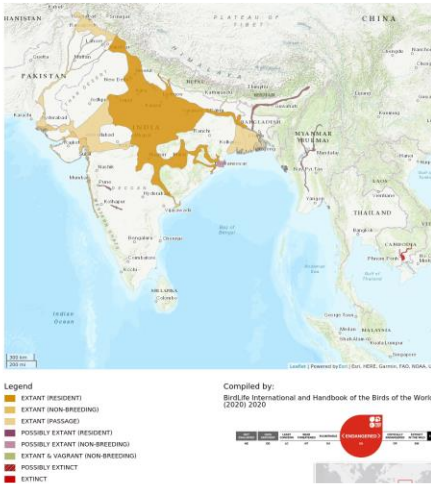
[64] BirdLife International. 2020. Rynchops albicollis. The IUCN Red List of Threatened Species 2020: e.T22694268A178970109.

[65] eBird. 2020. eBird: An online database of bird distribution and abundance [web application]. Ithaca, NY, USA Available at: http://www.ebird.org

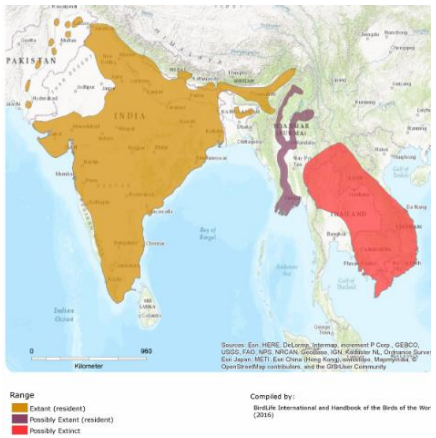
[66] Shaikh, P.A. 2020. Status and distribution of Indian Skimmer Rynchops albicollis in India, with focus on breeding population in the National Chambal Sanctuary, India. Final Report submitted to BirdLife International.

[67] Debata, S. 2019. Impact of cyclone Fani on the breeding success of sandbar-nesting birds along the Mahanadi River in Odisha, India. Journal of Threatened Taxa 11(14): 14895–14898.

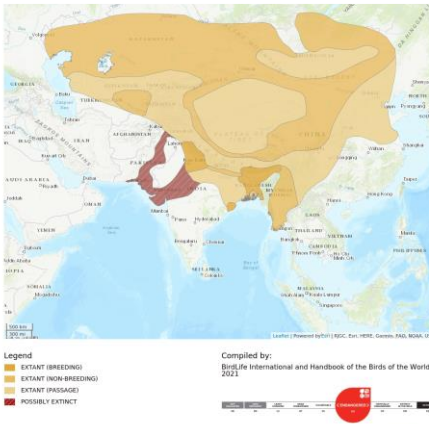
[68] Wetlands International South Asia. 2020. Asian Waterbird Census: Results for Coordinated January Counts for India 2006-2015. Wetlands International New Delhi, India.

	 https://www.iucnredlist.org/species/22694268/178970109			exposed sand-bars and islands, requiring water levels to drop sufficiently to expose the islands and not threaten flooding the nest but not to drop so far as to allow land-based predators access to the colonies[69, 70, 71]. The population is estimated at 2,450-2,900 mature individuals, based on the compilation of counts and expert estimates from across the species's range (Chowdhury et al. 2020, Shaikh 2020, S.U. Chowdhury, D.K. Das, S. Debata, S. Mohsanin, T. Munkur, P. Shaikh, C Zöckler in litt. 2020). Much of the research into the status of the species was collated during the Riverine birds of the Central Asian Flyway workshop in November 2019. The Important Bird and Biodiversity Areas in India: Priority Sites for Conservation (Revised and updated Edition - 2016)[72], reports the presence of Indian Skimmer in Banni Grassland & Chhari Dhand, Flamingo City, Gir National Park and Wildlife Sanctuary, Khijadia Bird Sanctuary, Marine National Park and Wildlife Sanctuary, Nalsarovar Wildlife Sanctuary, Salt Pans of Bhavnagar, Thol Lake Bird Sanctuary, Wetlands of Kheda, Wild Ass Wildlife Sanctuary & Nanda Island, and Bhaskarapra wetland. The species has a presence in the surroundings of Ahmedabad[73], however based on available secondary information extracted from eBird Database[74], no record of the species is available from the Ahmedabad City and its surroundings, the nearest solitary record was from the Nal Sarovar Chowkdi, Kitli[75] which is located >50 km from the project site. Thus, it is unlikely to meet the threshold i.e. 24-29 (≥1 percent of the global population[76]) for the EAAA.	
10	Black-bellied Tern (*Sterna acuticauda*)	**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[77].	Screened Out

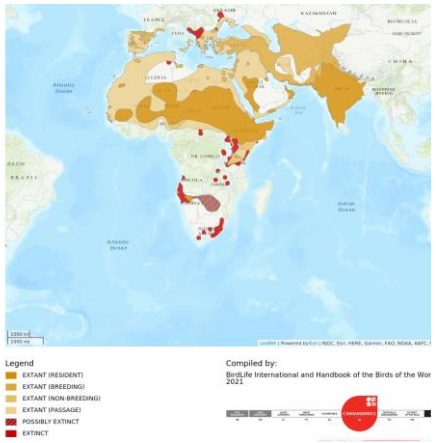
[69] Debata, S. 2019. Impact of cyclone Fani on the breeding success of sandbar-nesting birds along the Mahanadi River in Odisha, India. Journal of Threatened Taxa 11(14): 14895–14898.
[70] Shaikh, P.A. & Mendis, A. 2019. Status and distribution of Indian Skimmer Rynchops albicollis breeding population in the National Chambal Sanctuary, India. Progress Report submitted to BirdLife International.
[71] Shaikh, P.A. 2020. Status and distribution of Indian Skimmer Rynchops albicollis in India, with focus on breeding population in the National Chambal Sanctuary, India. Final Report submitted to BirdLife International.
[72] 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
[73] https://ebird.org/region/IN-GJ-AH
[74]https://ebird.org/map/indski1?neg=true&env.minX=69.93180978917633&env.minY=21.76390156327669&env.maxX=75.55680978917633&env.maxY=24.015673500112655&zh=true&gp=false&ev=Z&excludeExX=false&excludeExAll=false&mr=1-12&bmo=1&emo=12&yr=all&byr=1900&eyr=2024
[75] https://ebird.org/checklist/S150025731
[76] https://www.iucnredlist.org/species/22696027/203868747#population
[77] https://www.iucnredlist.org/species/22694711/207933556

	 https://www.iucnredlist.org/species/22694711/207933556			Overall, and acknowledging some uncertainty, the global population is estimated to number 800-1,600 mature individuals, with a best estimate in the range of 900-1,100[78]. 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) [79], 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 has a presence in the surroundings of Ahmedabad[80], however based on available secondary information extracted from eBird Database[81] (which reports maximum 1 (one) individuals from Gandhinagar[82]), it is unlikely to meet the threshold i.e. 9-11 (≥1 percent of the global population[83]) for the EAAA.	
11	Pallas's Fish-eagle (*Haliaeetus leucoryphus*)	**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)[84]. 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[85]. 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-	Screened Out

[78] https://www.iucnredlist.org/species/22694711/207933556#population
[79] 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
[80] https://ebird.org/region/IN-GJ-AH
[81]https://ebird.org/map/blbter1?neg=true&env.minX=69.93180978917633&env.minY=21.76390156327669&env.maxX=75.55680978917633&env.maxY=24.015673500112655&zh=true&gp=false&ev=Z&excludeExX=false&excludeExAll=false&mr=1-12&bmo=1&emo=12&yr=all&byr=1900&eyr=2024
[82] https://ebird.org/checklist/S60939785
[83] https://www.iucnredlist.org/species/22694711/207933556#population
[84] BirdLife International. 2021. Haliaeetus leucoryphus. The IUCN Red List of Threatened Species 2021: e.T22695130A199521572
[85] 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.

	 https://www.iucnredlist.org/species/22695130/199521572			February in northern India and Myanmar[86] and in Bangladesh it returns to nest sites in late August[87]. Although the species was historically reported from Khijadia Bird Sanctuary and Nalsarovar Wildlife Sanctuary[88]; however, the species has not been reported from Gujrat since long time[89, 90] 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)[91].	
12	Egyptian Vulture (*Neophron percnopterus*)	**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[92]. 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,	Screened Out

[86] BirdLife International. 2001. Threatened birds of Asia: the BirdLife International Red Data Book. BirdLife International, Cambridge, U.K.
[87] Sourav, M.S.H., Ahmed, B. & Thompson, P. 2011. Pallas's Fish Eagle Haliaeetus leucoryphus in Bangladesh. BirdingASIA 16: 101-105.
[88] 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
[89] 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
[90] https://www.inaturalist.org/observations?place_id=any&subview=map&taxon_id=5312
[91] https://www.iucnredlist.org/species/22695130/199521572
[92] BirdLife International. 2021. Neophron percnopterus. The IUCN Red List of Threatened Species 2021: e.T22695180A205187871

	 https://www.iucnredlist.org/species/22695180/205187871			organic waste, insects, young vertebrates, eggs and even faeces[93, 94, 95]. 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[96]. 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 also from the surroundings of Jamnagar area[97] As per the Important Bird and Biodiversity Areas in India: Priority Sites for Conservation (Revised and updated Edition – 2016) [98], 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 Ahmedabad[99], however based on available secondary information extracted from eBird Database[100] (which reports maximum 100 individuals from Dabhla Chokdi[101]), it is less likely to meet the threshold i.e. 186-540 (≥1 percent of the global population[102]) for the EAAA.	
13	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[103]. The global population of the species has been estimated below 37,000 (26,014-36,731) pairs[104].	Screened Out

[93] 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.

[94] 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.

[95] 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).

[96] 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.

[97] https://ebird.org/region/IN-GJ-JA

[98] 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 Chttps://ebird.org/region/IN-GJ-AHonservation Network, Royal Society for the Protection of Birds and BirdLife International (U.K.). Pp. 1992 + xii

[99] https://ebird.org/region/IN-GJ-AH

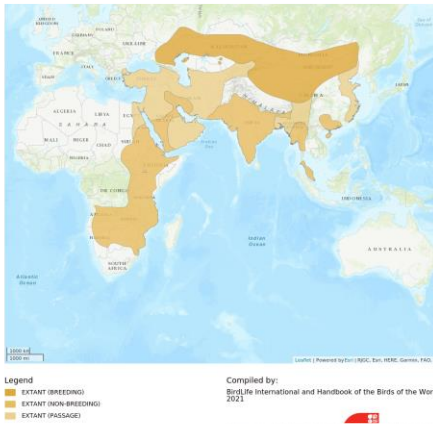
[100]https://ebird.org/map/egyvul1?neg=true&env.minX=71.41499911656642&env.minY=22.401923305537444&env.maxX=74.22749911656642&env.maxY=23.527261360491 39&zh=true&gp=false&ev=Z&excludeExX=false&excludeExAll=false&mr=1-12&bmo=1&emo=12&yr=all&byr=1900&eyr=2024

[101] https://ebird.org/checklist/S101136844

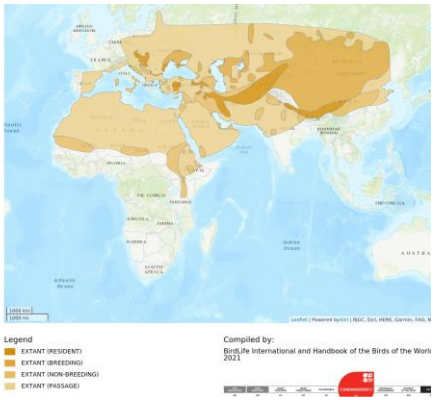
[102] https://www.iucnredlist.org/species/22696027/203868747#population

[103] 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.

[104] 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.

	 https://www.iucnredlist.org/species/22696038/205452572			It inhabits areas of steppe and semi-desert and is recorded breeding up to 2,300 m in mountainous regions[105]. It feeds mainly on small mammals on its breeding grounds, with susliks forming the vast majority of its diet in some areas[106]. 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 also from the surroundings of Ahmedabad[107]. Undoubtedly the species has a presence in the surroundings of Ahmedabad[108], however based on available secondary information extracted from eBird Database[109] (which reports maximum 4 individuals from the Shypram, Safal Parisar Rd, Ahmedabad, [110]), it is less likely to meet the threshold i.e. 370 (≥1 percent of the global population[111]) for the EAAA.	
14	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[112]. 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[113]. 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.	Screened Out

[105] 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.
[106] BirdLife International. 2021. Aquila nipalensis. The IUCN Red List of Threatened Species 2021: e.T22696038A205452572
[107] https://ebird.org/region/IN-GJ-AH
[108] https://ebird.org/region/IN-GJ-AH
[109]
[110] https://ebird.org/checklist/S123851452
[111] https://www.iucnredlist.org/species/22696027/203868747#population
[112] BirdLife International. 2021. Falco cherrug. The IUCN Red List of Threatened Species 2021: e.T22696495A204182473
[113] 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.

	 https://www.iucnredlist.org/species/22696495/204182473			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[114]. All the above mentioned IBAs are located away from the Ahmedabad area and the available secondary data[115, 116] also supports the unlikelihood of this species in the EAAA.	
15	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[117]. 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[118]. 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[119]. Sometimes it also breeds on saline, brackish and soda lakes and occasionally even in sheltered coastal bays[120]. 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 also from the surroundings of Ahmedabad [121].	Screened Out

[114] 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

[115] https://ebird.org/map/sakfal1?neg=true&env.minX=58.938673787510844&env.minY=18.67141536387653&env.maxX=81.43867378751085&env.maxY=27.64867577168789&zh=true&gp=true&ev=Z&excludeExX=false&excludeExAll=false&mr=1-12&bmo=1&emo=12&yr=all&byr=1900&eyr=2024

[116] https://www.inaturalist.org/observations?place_id=any&subview=map&taxon_id=4691

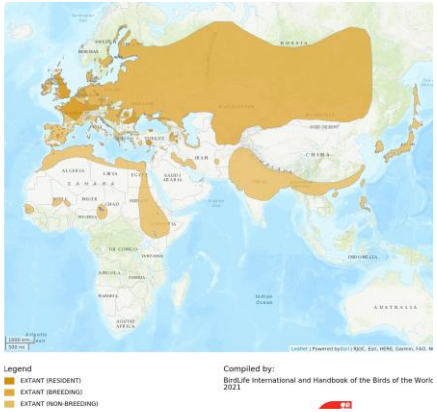
[117] Carboneras, C. and Kirwan, G.M. 2014. Common Pochard (Aythya ferina). In: J. del Hoyo, A. Elliott, J. Sargatal, D.A. Christie and E. de Juana (eds), Handbook of the Birds of the World Alive, Lynx Edicions, Barcelona.

[118] https://www.iucnredlist.org/species/22680358/205288455#population

[119] BirdLife International. 2021. Aythya ferina. The IUCN Red List of Threatened Species 2021: e.T22680358A205288455

[120] Kear, J. 2005. Ducks, geese and swans volume 2: species accounts (Cairina to Mergus). Oxford University Press, Oxford, U.K.

[121] https://ebird.org/region/IN-GJ-AH

	 https://www.iucnredlist.org/species/22680358/205288455		Undoubtedly the species has a presence in the surroundings of Ahmedabad [122], however based on available secondary information extracted from eBird Database[123] (which reports maximum 95 individuals from Vasai, Ahmedabad[124]), it is less likely to meet the threshold i.e. 11,400-11,800 (≥1 percent of the global population[125]) for the EAAA.
16	Black-capped Kingfisher (*Halcyon pileata*) 	**IUCN:** Vulnerable **IWP:** Not listed **Restricted range:** No **Migratory:** Yes	The species breeds from Korea, east, central & southern China (from Liaoning to east Gansu and south to Hainan) and northern Indochina. It winters south to India, Sri Lanka, Myanmar, Indochina, Malay Peninsula, Andaman and Nicobar Is, Greater Sundas, Sulawesi and southern Philippines[126]. Data from South Korea, Hong Kong and Singapore indicate this species has declined rapidly over the past three generations (12.3 years) while data from India indicate it may be declining there too[127]. The global population size has not been quantified, but the species is reported to be locally frequent and common to uncommon[128] . Given its extensive range and reports that the species is locally common, the population size is not thought to approach 10,000 individuals[129]. The species occurs mainly in lowlands up to 1,525m. In temperate regions it is found in deciduous forest near to water. In the tropics and subtropics it is found in coastal mangroves and wooded seashores, but also inland across creeks, lagoons, estuaries, rice fields, open

[122] https://ebird.org/region/IN-GJ-AH

[123]https://ebird.org/map/compoc?neg=true&env.minX=69.66819455015631&env.minY=22.361188725966464&env.maxX=70.37131955015631&env.maxY=22.643481666625686&zh=true&gp=true&ev= https://ebird.org/checklist/S103330649Z&excludeExX=false&excludeExAll=false&mr=1-12&bmo=1&emo=12&yr=all&byr=1900&eyr=2024

[124] https://ebird.org/checklist/S103330649

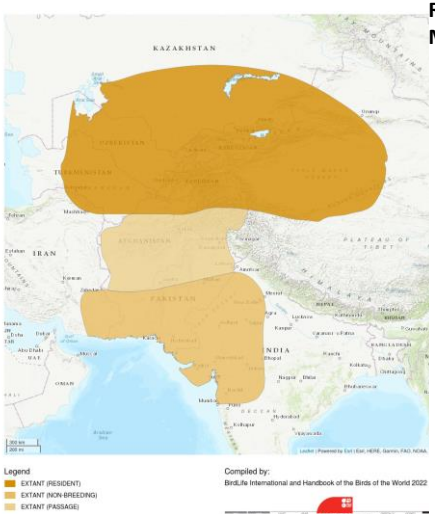
[125] https://www.iucnredlist.org/species/22696027/203868747#population

[126] Woodall, P.F., Kirwan, G.M. 2020. Black-capped Kingfisher (Halcyon pileata), version 1.0. Ithaca, NY, USA. Cornell Lab of Ornithology. Available at: https://doi.org/10.2173/bow.blckin1.01.

[127] Bird, J.P., Martin, R., Akçakaya, H.R., Gilroy, J., Burfield, I.J., Garnett, S.G., Symes, A., Taylor, J., Şekercioğlu, Ç.H. and Butchart, S.H.M. 2020. Generation lengths of the world's birds and their implications for extinction risk. Conservation Biology 34(5): 1252-1261.

[128] del Hoyo, J.; Elliott, A.; Sargatal, J. 2001. Handbook of the Birds of the World, vol. 6: Mousebirds to Hornbills. Lynx Edicions, Barcelona, Spain.

[129] BirdLife International (2024) Species factsheet: Halcyon pileata.

	 https://www.iucnredlist.org/species/22683249/212490546			cultivated land, Nipa palm groves, willow jungle, forest clearings, streams in bamboo-forest and in gardens. They feed on insects and occasionally frogs and reptiles in inland habitats, but mainly on fish and crabs in coastal habitats[130].The species has a presence in the surroundings of Ahmedabad[131], however based on available secondary information extracted from eBird Database [132] the recorded location is 28 km away from the project location[133]. Therefore, it is less likely to meet the threshold i.e. 100 (≥1 percent of the approximate global population) 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[134]. 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[135]. The population size is preliminarily suspected to fall into the band 10,000-19,999 mature individuals[136]. 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[137]. It may also occur on mountain valleys close to water sources[138]. In winter, it occurs in open areas with scattered trees, 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[139].	Screened Out

[130] Woodall, P.F., Kirwan, G.M. 2020. Black-capped Kingfisher (Halcyon pileata), version 1.0. Ithaca, NY, USA. Cornell Lab of Ornithology. Available at: https://doi.org/10.2173/bow.blckin1.01.
[131] https://ebird.org/region/IN-GJ-AH
[132] https://ebird.org/map/blckin1?neg=true&env.minX=71.94446385091985&env.minY=22.991588042930825&env.maxX=72.64758885091985&env.maxY=23.272578613826855&zh=true&gp=true&ev=Z&excludeExX=false&excludeExAll=false&mr=1-12&bmo=1&emo=12&yr=all&byr=1900&eyr=2024
[133] https://ebird.org/checklist/S49828685
[134] BirdLife International. 2001. Threatened birds of Asia: the BirdLife International Red Data Book. BirdLife International, Cambridge, U.K.
[135] BirdLife International. 2022. Columba eversmanni. The IUCN Red List of Threatened Species 2022: e.T22690097A217014626
[136] 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.
[137] BirdLife International. 2022. Columba eversmanni. The IUCN Red List of Threatened Species 2022:e.T22690097A217014626
[138] 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.
[139] BirdLife International. 2022. Columba eversmanni. The IUCN Red List of Threatened Species 2022:e.T22690097A217014626

	https://www.iucnredlist.org/species/22690097/217014626			Last time, the species was recorded from Little Rann of Kachchh in 2005[140], after that there is no record of this migratory species from the Gujarat state [141, 142, 143].	
18	Greater Spotted Eagle (*Clanga clanga*)  https://www.iucnredlist.org/species/22696027/203868747	**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[144]; and potentially in tiny numbers in Pakistan and north-west India[145]. Global population of the species, provisionally placed in the band 2,500-9,999 mature individuals[146]. 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[147]. It feeds on unretrieved quarry, small mammals, waterbirds, frogs and snakes, hunting over swamps, and wet meadows[148]. The Important Bird and Biodiversity Areas in India: Priority Sites for Conservation (Revised and updated Edition - 2016)[149], reports the presence of the species in Banni Grassland & Chhari Dhand, Bhal Area, Flamingo City, Gir National Park and Wildlife 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 Ahmedabad[150], however based on available secondary information extracted from eBird Database[151] (which reports	Screened Out

[140] https://ebird.org/hotspot/L3315807

[141] 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

[142] https://ebird.org/map/pabpig1?neg=true&env.minX=68.93208043728741&env.minY=22.06850727071084&env.maxX=71.74458043728741&env.maxY=23.196590010623925&zh=true&gp=true&ev=Z&excludeExX=false&excludeExAll=false&mr=1-12&bmo=1&emo=12&yr=all&byr=1900&eyr=2024

[143] https://www.inaturalist.org/observations?place_id=any&subview=map&taxon_id=3015

[144] Meyburg, B.-U.; Haraszthy, L.; Strazds, M.; Schäffer, N. 1999. European species action plan for Greater Spotted Eagle (Aquila clanga).

[145] BirdLife International. 2001. Threatened birds of Asia: the BirdLife International Red Data Book. BirdLife International, Cambridge, U.K.

[146] BirdLife International (2024) Species factsheet: Clanga clanga.

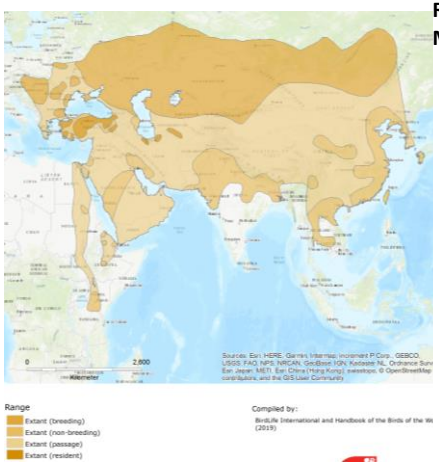
[147] Maciorowski, G., Galanaki, A., Kominos, T., Dretakis, M. and Mirski, P. 2019. The importance of wetlands for the Greater Spotted Eagle Clanga clanga wintering in the Mediterranean Basin. Bird Conservation International 29: 115-123.

[148] Lõhmus A, Väli Ü. 2001. Interbreeding of the Greater Aquila clanga and Lesser Spotted Eagle A. pomarina. Acta Ornithoecologica 4: 377–384.

[149] 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

[150] https://ebird.org/region/IN-GJ-AH

[151] https://ebird.org/map/grseag1?neg=true&env.minX=71.72502382209156&env.minY=22.95985568166172&env.maxX=73.13127382209156&env.maxY=23.52137873538446&zh=true&gp=true&ev=Z&exclu https://ebird.org/india/checklist/S122351839deExX=false&excludeExAll=false&mr=1-12&bmo=1&emo=12&yr=all&byr=1900&eyr=2024

				maximum 7 individuals from Kalol[152]), it is less likely to meet the threshold i.e. 25-99 (≥1 percent of the global population[153]) for the EAAA.	
19	Eastern Imperial Eagle (*Aquila heliaca*)  https://www.iucnredlist.org/species/22696048/155464885	**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[154]. 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)[155]. In Europe, the breeding population was estimated to number 1,300-1,900 breeding pairs, equating to 2,500-3,800 mature individuals. Recent population estimates from Russia and Kazakhstan suggest the global population may exceed 10,000 mature individuals, but in light of criticism of these estimates the population is precautionarily retained in the band 2,500-9,999 mature individuals here. This equates to 3,750-14,999 individuals in total, rounded here to 3,500-15,000 individuals[156]. 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[157]. 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[158]. Undoubtedly the species has a presence in the surroundings of Ahmedabad[159], however based on available secondary information extracted from eBird Database[160] (which reports a single individual from various places, the nearest recorded location is Jatalpur [161]), it is	Screened Out

[152]

[153] https://www.iucnredlist.org/species/22696027/203868747#population

[154] 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.

[155] BirdLife International. 2019. Aquila heliaca (amended version of 2017 assessment). The IUCN Red List of Threatened Species 2019: e.T22696048A155464885

[156] https://www.iucnredlist.org/species/22696048/155464885#population

[157] BirdLife International. 2019. Aquila heliaca (amended version of 2017 assessment). The IUCN Red List of Threatened Species 2019: e.T22696048A155464885

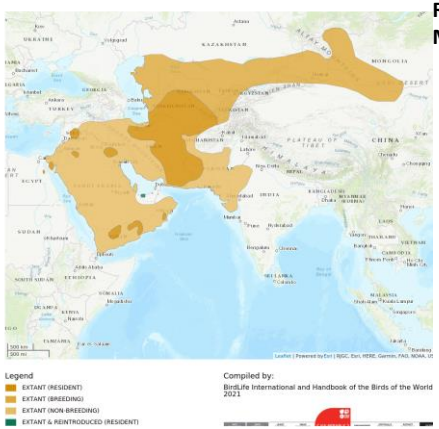
[158] Rahmani, A.R., Islam, M.Z. and Kasambe, R.M. (2016) Important Bird and Biodiversity Areas in India: Priority Sites for Conservation (Revised and updated). Bombay Natural History Society, Indian Bird Conservation Network, Royal Society for the Protection of Birds and BirdLife International (U.K.).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

[159] https://ebird.org/region/IN-GJ-AH

[160]

https://ebird.org/map/impeag1?neg=true&env.minX=72.36253965791883&env.minY=23.07747536415471&env.maxX=72.45043028291883&env.maxY=23.11260892596751&zh=true&gp=true&ev=Z&excludeExX=false&excludeExAll=false&mr=1-12&bmo=1&emo=12&yr=all&byr=1900&eyr=2024

[161] https://ebird.org/checklist/S162047944

				less likely to meet the threshold i.e. 25-99 (≥1 percent of the global population[162]) for the EAAA.	
20	Asian Houbara (*Chlamydotis macqueenii*)  https://www.iucnredlist.org/species/22733562/205364424	**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 [163]. This species inhabits open, arid and sparsely vegetated steppe and semi-desert[164,165]. It favours scattered shrubby vegetation, typically comprising xerophytic or halophytic plants[166]. The distribution map of the species covers majorly Gujrat and Rajasthan states of India. In Gujrat[167], 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 Island, and Gosabara (Mokarsar) Wetland Complex. All the above mentioned IBAs are away from the Ahmedabad area. A single captive record of the species is available from the Gujarat University[168], other than it there is no record of the species from the Ahmedabad and surrounding areas[169, 170], specifically project's EAAA.	Screened Out
21	Marbled Teal (*Marmaronetta angustirostris*)	**IUCN:** Near Threatened **IWP:** Schedule I **Restricted range:** No	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)[171, 172]; Israel, Jordan, Syria, wintering south to	Screened Out

[162] https://www.iucnredlist.org/species/22696048/155464885#population
[163] BirdLife International. 2021. Chlamydotis macqueenii. The IUCN Red List of Threatened Species 2021: e.T22733562A205364424
[164] 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.
[165] 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.
[166] 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.
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[168] https://ebird.org/checklist/S128841797
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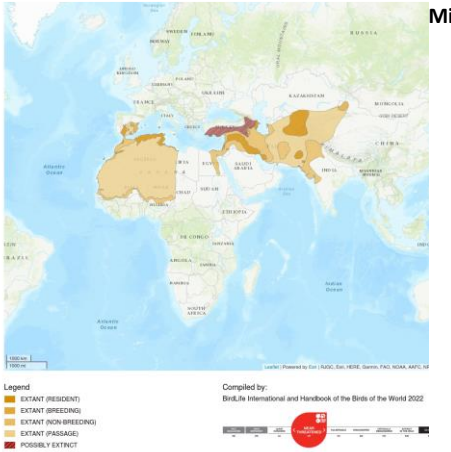

https://www.iucnredlist.org/species/22680339/205917761

Migratory: Yes

Egypt) and western and southern Asia (Azerbaijan, Armenia, Russia (where it is on the verge of extinction) [173]; Turkmenistan, Uzbekistan, Tajikistan, Kazakhstan, Iraq, Iran, Afghanistan, Pakistan, India and extreme northwest China, wintering in Iran, Pakistan and north-west India[174].

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[175].

It is adapted to temporary, unpredictable, Mediterranean-type wetlands[176, 177]; and breeds in fairly dry, steppe-like areas on shallow freshwater, brackish or alkaline ponds with well vegetated shorelines, rich emergent and submergent vegetation[178, 179, 180]; delta marshes where receding waters leave behind large areas of shallow water with abundant sedges and bulrushes[181]; slow rivers and saline coastal lagoons, & man-made wetlands including fish-rearing ponds, small reservoirs and sewage farms[182, 183]. 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[184].

Banni Grassland and Chhari Dhand, and Nalsarovar Wildlife Sanctuary are the possible habitats for this migratory species in Gujarat[185]. Both the above mentioned IBAs are away from the Ahmedabad area and the available secondary data[186, 187] also supports the unlikelihood of this species in the EAAA.

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[183] BirdLife International. 2022. Marmaronetta angustirostris. The IUCN Red List of Threatened Species 2022: e.T22680339A205917761
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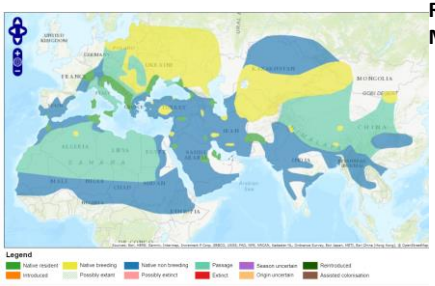
[186] https://ebird.org/map/martea1?neg=true&env.minX=67.40442207752098&env.minY=21.372533692932727&env.maxX=73.02942207752098&env.maxY=23.630695707649686&zh=true&gp=true&ev=Z&excludeExX=false&excludeExAll=false&mr=1-12&bmo=1&emo=12&yr=all&byr=1900&eyr=2024
[187] https://www.inaturalist.org/observations?place_id=any&subview=map&taxon_id=7139

22	Ferruginous Duck (*Aythya nyroca*)  https://datazone.birdlife.org/species/factsheet/ferruginous-duck-aythya-nyroca/distribution	**IUCN:** Near Threatened **IWP:** Schedule II **Restricted range:** No **Migratory:** Yes	This species breeds principally in south-western Asia (east to China and south to Pakistan and India), central and eastern Europe, and north Africa[188]. The wintering range overlaps with the breeding range and extends to the Middle East, north-east and West Africa and South-East Asia[189]. The most recent population estimates as collated by Wetlands International are as follows: 5,700-6,300 individuals in the western Mediterranean and in North and West Africa; 50,000-82,000 individuals in Eastern Europe and the eastern Mediterranean and Sahelian Africa; 25,000-50,000 individuals in western and south-west Asia as well as in north-east Africa, and 100,000 individuals elsewhere in Asia giving a total of c.180,000–240,000 individuals [190, 191, 192]. Undoubtedly the species has a presence in the surroundings of Ahmedabad[193], however based on available secondary information extracted from eBird Database[194] (which reports maximum 10 individuals from Dandi road, Bhera[195]), it is less likely to meet the threshold i.e. 25-99 (≥1 percent of the global population[196]) for the EAAA.	
23	Black-tailed Godwit (*Limosa limosa*)	**IUCN:** Near Threatened 3a **IWP:** Schedule IV **Restricted range:** No **Migratory:** Yes	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[197]. The global population is estimated at 614,000-809,000 individuals[198]. 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[199].	Screened Out

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[189] Vinicombe, K. E. 2000. Identification of Ferruginous Duck and its status in Britain and Ireland. British Birds 93: 4-21.
[190] Wetlands International. 2017a. Waterbird Population Estimates. Retrieved from wpe.wetlands.org on Tuesday 23 May 2017. Updated from the AEWA Conservation Status Review 6.
[191] Wetlands International. 2017b. Waterbird Population Estimates. Retrieved from wpe.wetlands.org on Tuesday 23 May 2017. Current data from http://wpe.wetlands.org/search?form%5Bspecies%5D=ferruginous+duck&form%5Bpopulation%5D=&form%5Bpublication%5D=5.
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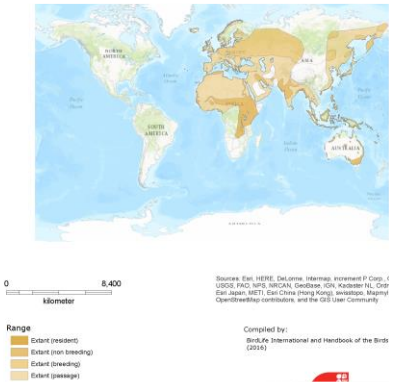
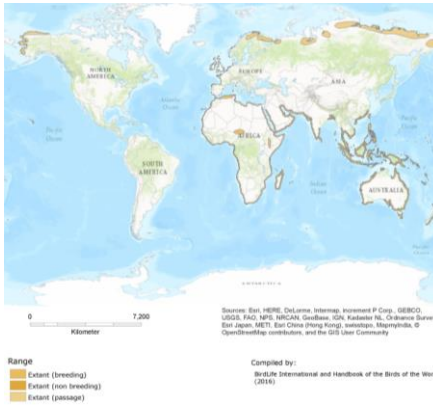
[193] https://ebird.org/region/IN-GJ-AH
[194]https://ebird.org/map/impeag1?neg=true&env.minX=72.36253965791883&env.minY=23.07747536415471&env.maxX=72.45043028291883&env.maxY=23.11260892596751&zh=true&gp=true&ev=Z&excludeExX=false&excludeExAll=false&mr=1-12&bmo=1&emo=12&yr=all&byr=1900&eyr=2024
[195] https://ebird.org/checklist/S84520960
[196] https://www.iucnredlist.org/species/22696048/155464885#population
[197] 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.
[198] https://www.iucnredlist.org/species/22693150/111611637#population
[199] BirdLife International. 2017. Limosa limosa. The IUCN Red List of Threatened Species 2017: e.T22693150A111611637

	 https://www.iucnredlist.org/species/22693150/111611637		Undoubtedly the species has a presence in the surroundings of Ahmedabad[200], however based on available secondary information extracted from eBird Database[201] (which reports maximum 2000 individuals from Changodar Area [202]), it is less likely to meet the threshold i.e. 6,140-8,090 (≥1 percent of the global population) for the EAAA.	
24	Bar-tailed Godwit (*Limosa lapponica*)	**IUCN:** Near Threatened 3a **IWP:** Schedule IV **Restricted range:** No **Migratory:** Yes	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[203]. 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 winter in intertidal areas along muddy coastlines, estuaries, inlets, mangrove-fringed lagoons and sheltered bays with tidal mudflats or sandbars[204]. The species has no presence in the surroundings of Ahmedabad,[205] however based on available secondary information extracted from eBird Database, reported from Nalsarovar area[206] which is more than 50 km from project location. Hence. unlikelihood of this species in the EAAA.	Screened Out

[200] https://ebird.org/region/IN-GJ-AH
[201]https://ebird.org/map/bktgod?neg=true&env.minX=72.48002351597677&env.minY=22.75650071933459&env.maxX=72.65580476597677&env.maxY=22.826925486645383&zh=true&gp=true&ev=Z&excludeExX=false&excludeExAll=false&mr=1-12&bmo=1&emo=12&yr=all&byr=1900&eyr=2024
[202] https://ebird.org/checklist/S33364967
[203] https://www.iucnredlist.org/species/22693158/111221714#population
[204] BirdLife International. 2017. Limosa lapponica. The IUCN Red List of Threatened Species 2017: e.T22693158A111221714
[205] https://ebird.org/map/batgod?neg=true&env.minX=&env.minY=&env.maxX=&env.maxY=&zh=false&gp=true&ev=Z&excludeExX=false&excludeExAll=false&mr=1-12&bmo=1&emo=12&yr=all&byr=1900&eyr=2024
[206] https://ebird.org/map/batgod?neg=true&env.minX=&env.minY=&env.maxX=&env.maxY=&zh=false&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/22693158/111221714

25	Eurasian Curlew (*Numenius arquata*)	**IUCN:** Near Threatened 3a **IWP:** Schedule II **Restricted range:** No **Migratory:** Yes	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 Mediterranean, Africa, the Middle East, the Indian Subcontinent, South-East Asia, Japan and the Sundas[207]. 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[208]. 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[209], and non-intensive farmland in river valleys[210]. During the winter the species frequents inland lakes & rivers, muddy coasts, bays & estuaries, wet grassland & arable fields[211], tidal mudflats & sandflats[212], rocky & sandy beaches with many pools, muddy shores of coastal lagoons, mangroves, saltmarshes[213, 214], and coastal meadows & pasture[215].	Screened Out

[207] BirdLife International. 2017. Numenius arquata. The IUCN Red List of Threatened Species 2017: e.T22693190A117917038
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[210] Hayman, P.; Marchant, J.; Prater, A. J. 1986. Shorebirds. Croom Helm, London.
[211] 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.
[212] Snow, D.W. and Perrins, C.M. 1998. The Birds of the Western Palearctic, Volume 1: Non-Passerines. Oxford University Press, Oxford.
[213] Johnsgard, P. A. 1981. The plovers, sandpipers and snipes of the world. University of Nebraska Press, Lincoln, U.S.A. and London.
[214] Snow, D.W. and Perrins, C.M. 1998. The Birds of the Western Palearctic, Volume 1: Non-Passerines. Oxford University Press, Oxford.
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	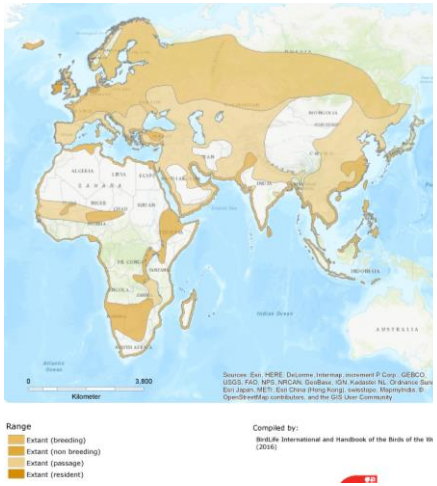 https://www.iucnredlist.org/species/22693190/117917038	Banni Grassland and Chhari Dhand, Bhal Area, Charakla Saltworks, Gir National Park and Wildlife Sanctuary, Khijadia Bird Sanctuary, Marine National Park and Wildlife Sanctuary, Nalsarovar Wildlife Sanctuary, Salt Pans of Bhavnagar, Velavadar National Park, Wetlands of Kheda, Wild Ass Wildlife Sanctuary & Nanda, and Gosabara (Mokarsar) Wetland Complex are the possible habitats for this migratory species in Gujarat[216]. The species has clear presence in the surroundings of Ahmedabad,[217]. Based on available secondary information extracted from eBird Database[218], maximum 21 individuals reported from Navagam Matar Rd [219]. Hence, it is less likely to meet the threshold i.e. 8,350- 13,100 (≥1 percent of the global population) for the EAAA.
26	Curlew Sandpiper (*Calidris ferruginea*)	The species breeds across Arctic Siberia from the Chosa Bay to Kolyuchinskaya Gulf (north Chukotskiy Peninsula) (Russia)[220], and winters from sub-Saharan Africa through the Middle East and south and south-east Asia to Australasia. In the western Palearctic the species follows three migratory routes: down western European coasts to West Africa; across eastern Europe via the Black Sea and Tunisia to West Africa (following the coast of North Africa or via Mali); and via the Black Sea and Caspian Sea and across the Middle East and Rift Valley lakes to southern and eastern Africa. On return migration few birds use the western European flyway, instead moving up via Tunisia and Sivash (north Crimea). Birds that move south through Sivash winter in east, central and southern Africa and probably migrate north via the Caspian Sea. Birds also move across Siberia to India, continuing down through south-east Asia to Australia but many birds winter in southern India and Sri Lanka, they may also move overland to east Asia and via the coast of China to Australia[221].

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[217] https://ebird.org/map/batgod?neg=true&env.minX=&env.minY=&env.maxX=&env.maxY=&zh=false&gp=true&ev=Z&excludeExX=false&excludeExAll=false&mr=1-12&bmo=1&emo=12&yr=all&byr=1900&eyr=2024

[218]https://ebird.org/map/eurcur?neg=true&env.minX=71.07335542788826&env.minY=22.536362301112465&env.maxX=73.88585542788826&env.maxY=23.660582999722394&zh=true&gp=true&ev=Z&excludeExX=false&excludeExAll=false&mr=1-12&bmo=1&emo=12&yr=all&byr=1900&eyr=2024

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[221] Van Gils, J. and Wiersma, P. 1996. Curlew Sandpiper (Calidris ferruginea). 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.

	 https://www.iucnredlist.org/species/22693431/110631069		The global population is estimated to number c.1,085,000-1,285,000 individuals The minimum European population in winter is estimated at 1,000-1,800 individuals, which equates to 690-1,200 mature individuals[222]. The population wintering in West Africa is estimated at 350,000-450,000 individuals[223]. The East Asian-Australasian Flyway population has been estimated at 90,000 individuals[224]. This species breeds on slightly elevated areas in the lowlands of the high Arctic especially on southward-facing slopes, as well as along the coast and islands of the Arctic Ocean[225], [226]. It shows a preference for open tundra with marshy, boggy depressions and pools. Snow and from melting permafrost and snow[227],[228]. The nest is a cup positioned on the margins of marshes or pools, on the slopes of hummock tundra, or on dry patches in Polygonum tundra. In the winter the species chiefly occurs on coastal brackish lagoons, tidal mud- and sand-flats, estuaries, saltmarshes (de, exposed coral, rocky shores and tidewrack on sandy beaches and also inland on the muddy edges of marshes, large rivers and lakes (both saline and freshwater), irrigated land, flooded areas dams[229] and saltpans [230,231]. The species has presence in the surroundings of Ahmedabad,[232] however based on available secondary information extracted from eBird Database[233], reported from Vadala, Govindpura[234], which is more than 25 km from project location. Hence. unlikelihood of this species in the EAAA.	
27	Eurasian Oystercatcher (*Haematopus ostralegus*)	**IUCN:** Near Threatened 3a **IWP:** Schedule II **Restricted range:** No **Migratory:** Yes	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,	Screened Out

[222] Wetlands International. 2015. Waterbird Population Estimates. Available at: wpe.wetlands.org. (Accessed: 17/09/2015).
[223] van Roomen M., Nagy S., Foppen R., Dodman T., Citegetse G. and Ndiaye A. 2015. Status of coastal waterbird populations in the East Atlantic Flyway. With special attention to flyway populations making use of the Wadden Sea. Programme Rich Wadden Sea, Leeuwarden, The Netherlands, Sovon, Nijmegen, The Netherlands, Wetlands International, Wageningen, The Netherlands, BirdLife International, Cambridge, United Kingdom &, Common Wadden Sea Secretariat, Wilhelmshaven, Germany.
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[226] 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.
[227] Snow, D.W. and Perrins, C.M. 1998. The Birds of the Western Palearctic, Volume 1: Non-Passerines. Oxford University Press, Oxford.
[228] Van Gils, J. and Wiersma, P. 1996. Curlew Sandpiper (Calidris ferruginea). 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.
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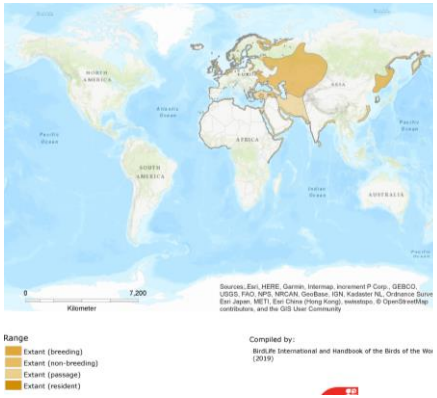
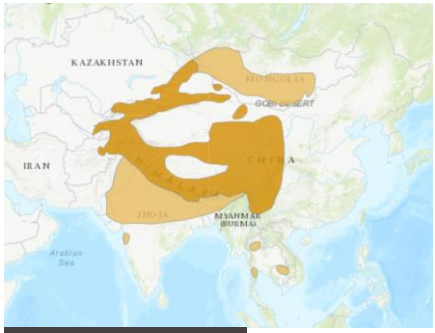
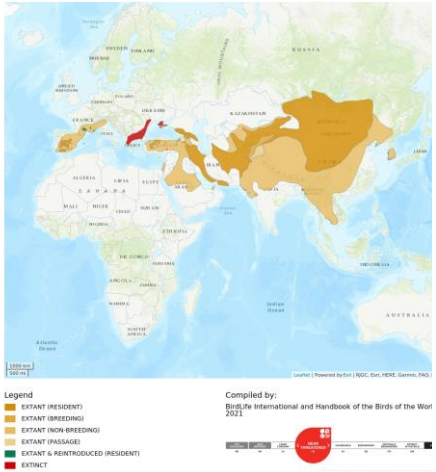
[233]https://ebird.org/map/cursan?neg=true&env.minX=72.21808521993916&env.minY=22.66444058687397&env.maxX=72.92121021993916&env.maxY=22.946111268821298&zh=true&gp=true&ev=Z&excludeExX=false&excludeExAll=false&mr=1-12&bmo=1&emo=12&yr=all&byr=1900&eyr=2024
[234] https://ebird.org/india/checklist/S92588407

	 https://www.iucnredlist.org/species/22693613/154998347	Caspian and Aral Seas, and east to western Siberia, and winters on coasts from East Africa through Arabia to India[235]. 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)[236]. 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[237, 238]. Outside of the breeding season the species is chiefly coastal, frequenting estuarine mudflats, saltmarshes & sandy & rocky shores[239]. The species has no presence in the surroundings of Ahmedabad,[240] however based on available secondary information extracted from eBird Database[241], reported from Little Rann of Kachchh area[242], which is more than 130 km away from project location. Hence. unlikelihood of this species in the EAAA.
28	Himalayan Griffon (*Gyps himalayensis*)	This species is distributed from western China, Kazakhstan, Uzbekistan, Kyrgyzstan, Tajikistan, Afghanistan and Pakistan, east through the Himalayan range in India, Nepal and Bhutan, to central China and Mongolia. The species is regarded as common in the Qinghai-Tibetan Plateau, China, with wintering populations also found in Yunnan province[243, 244]. Ferguson-Lees and Christie (2001)[245] suggest that a six-figure population would be realistic. The population in the Tibetan Plateau, which consists of c.80% of the breeding population, has been estimated at c.230,000 individuals, equating to c.153,000 mature individuals[246]. Assuming a similar density across the rest of the species's range, a very preliminary estimate

[235] BirdLife International. 2019. Haematopus ostralegus. The IUCN Red List of Threatened Species 2019: e.T22693613A154998347
[236] Wetlands International. 2019. Waterbird Population Estimates. Available at: wpe.wetlands.org.
[237] Hayman, P.; Marchant, J.; Prater, A. J. 1986. Shorebirds. Croom Helm, London.
[238] del Hoyo, J.; Elliott, A.; Sargatal, J. 1996. Handbook of the Birds of the World, vol. 3: Hoatzin to Auks. Lynx Edicions, Barcelona, Spain.
[239] del Hoyo, J.; Elliott, A.; Sargatal, J. 1996. Handbook of the Birds of the World, vol. 3: Hoatzin to Auks. Lynx Edicions, Barcelona, Spain.
[240] https://ebird.org/map/batgod?neg=true&env.minX=&env.minY=&env.maxX=&env.maxY=&zh=false&gp=true&ev=Z&excludeExX=false&excludeExAll=false&mr=1-12&bmo=1&emo=12&yr=all&byr=1900&eyr=2024
[241] https://ebird.org/map/euroys1?neg=true&env.minX=72.57539866746963&env.minY=22.732415636648902&env.maxX=72.66328929246963&env.maxY=22.767638778104313&zh=true&gp=true&ev=Z&excludeExX=false&excludeExAll=false&mr=1-12&bmo=1&emo=12&yr=all&byr=1900&eyr=2024
[242] https://ebird.org/checklist/S153685633
[243] Lu, X., Ke, D., Zeng, X., Gong, G. & Ci, R. 2009. Status, Ecology, and Conservation of the Himalayan Griffon Gyps himalayensis (Aves, Accipitridae) in the Tibetan Plateau. Ambio 38(3): 166-173.
[244] BirdLife International. 2021. Gyps himalayensis. The IUCN Red List of Threatened Species 2021: e.T22695215A204643889.
[245] Ferguson-Lees, J. and Christie, D.A. 2001. Raptors of the world. Christopher Helm, London.
[246] Lu, X., Ke, D., Zeng, X., Gong, G. & Ci, R. 2009. Status, Ecology, and Conservation of the Himalayan Griffon Gyps himalayensis (Aves, Accipitridae) in the Tibetan Plateau. Ambio 38(3): 166-173.

	 https://www.iucnredlist.org/species/22695215/204643889		of global population is therefore c.290,000[247]. It is placed in the band for 100,000-499,999 individuals, assumed to equate to c.66,000-334,000 mature individuals. The species inhabits mountainous areas, mostly at 1,200-5,500 m[248], but has been recorded up to 6,000 m[249]. In winter it moves lower down, with juveniles wandering into the plains. It feeds on carrion[250] and regularly visits carcass dumps in South and South-East Asia[251]. As per the Important Bird and Biodiversity Areas in India: Priority Sites for Conservation (Revised and updated Edition - 2016)[252], 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 Ahmedabad and the available secondary data[253, 254] also indicates unlikelihood of this species in Ahmedabad and surrounding area.	
29	Cinereous Vulture (*Aegypius monachus*)	**IUCN:** Near Threatened 3a **IWP:** Schedule I **Restricted range:** No **Migratory:** Yes	Cinereous Vulture breeds in Spain, Bulgaria, Greece, Turkey, Armenia, Azerbaijan, Georgia, Ukraine, Russia, Uzbekistan, Kazakhstan, Tajikistan, Turkmenistan, Kyrgyzstan, Iran, Afghanistan, north India, northern Pakistan[255], Mongolia and mainland China, with a small reintroduced population in France[256, 257]. 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[258]. 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	Screened Out

[247] Lu, X., Ke, D., Zeng, X., Gong, G. & Ci, R. 2009. Status, Ecology, and Conservation of the Himalayan Griffon Gyps himalayensis (Aves, Accipitridae) in the Tibetan Plateau. Ambio 38(3): 166-173.
[248] BirdLife International. 2021. Gyps himalayensis. The IUCN Red List of Threatened Species 2021: e.T22695215A204643889.
[249] Ferguson-Lees, J. and Christie, D.A. 2001. Raptors of the world. Christopher Helm, London.
[250] 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.
[251] BirdLife International. 2021. Gyps himalayensis. The IUCN Red List of Threatened Species 2021: e.T22695215A204643889.
[252] 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
[253]https://ebird.org/map/himgri1?neg=true&env.minX=70.31359873222792&env.minY=22.64126298701009&env.maxX=73.12609873222792&env.maxY=23.764607583713353&zh=true&gp=true&ev=Z&excludeExX=false&excludeExAll=false&mr=1-12&bmo=1&emo=12&yr=all&byr=1900&eyr=2024
[254] https://www.inaturalist.org/observations?place_id=any&subview=map&taxon_id=5367
[255] BirdLife International. 2021. Aegypius monachus. The IUCN Red List of Threatened Species 2021: e.T22695231A154915043
[256] 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.
[257] Heredia, B.; Yarar, M.; Parr, S. J. 1997. A baseline survey of Cinereous Vultures Aegypius monachus in Western Turkey.
[258] BirdLife International. 2021. Aegypius monachus. The IUCN Red List of Threatened Species 2021: e.T22695231A154915043

	 https://www.iucnredlist.org/species/22695231/154915043			Europe and 5,500-8,000 pairs in Asia[259]. The population in Korea has been estimated at c.50-10,000 wintering individuals[260]. 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[261]. 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 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)[262], 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, and Kheda[263]. All the above-mentioned areas are away from the Ahmedabad and the available secondary data[264, 265] also indicates unlikelihood of this species Ahmedabad and surrounding area.
30	Pallid Harrier (*Circus macrourus*)	**IUCN:** Near Threatened **IWP:** Schedule I **Restricted range:** No **Migratory:**Yes	This species breeds primarily in the steppes of Asiatic Russia, Kazakhstan and north-west China. Small populations breed in Azerbaijan, Romania, Turkey and Ukraine, however recent survey data suggest that these populations have almost disappeared[266]. A minority winter in south-east and central Europe, north Africa and the Middle East but most migrate to the Afrotropics and the Indian subcontinent[267],[268]. The global population is estimated at 9,000-15,000 pairs[269], equating to 18,000-30,000 mature individuals. The European population is estimated at 1,000-2,200 breeding pairs, which roughly equates to 2,000-4,400 mature individuals [270].	Screened Out

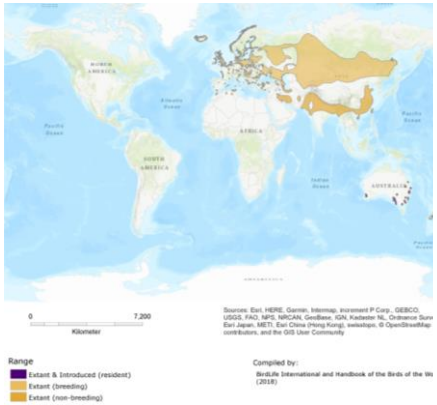
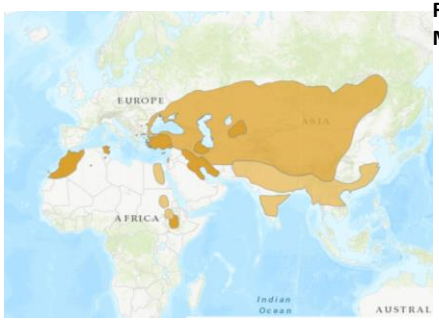
[259] BirdLife International. 2021. Aegypius monachus. The IUCN Red List of Threatened Species 2021: e.T22695231A154915043
[260] Brazil, M. 2009. Birds of East Asia: eastern China, Taiwan, Korea, Japan, eastern Russia. Christopher Helm, London.
[261] Thiollay, J.-M. 1994. Family Accipitridae (Hawks and Eagles). In: del Hoyo, J.; Elliott, A.; Sargatal, J. (ed.), Handbook of the birds of the world, pp. 52-205. Lynx Edicions, Barcelona, Spain.
[262] 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
[263] https://ebird.org/india/checklist/S125153922
[264]https://ebird.org/map/cinvul1?neg=true&env.minX=59.27471492461777&env.minY=19.05366498639926&env.maxX=81.77471492461777&env.maxY=28.005905832244554&zh=true&gp=true&ev=Z&excludeExX=false&excludeExAll=false&mr=1-12&bmo=1&emo=12&yr=all&byr=1900&eyr=2024
[265] https://www.inaturalist.org/observations?place_id=any&subview=map&taxon_id=5382
[266] 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.
[267] 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.
[268] Corso A. & Cardelli C. 2004. The migration of Pallid Harrier across the central Mediterranean with particular reference to the Strait of Messina. British Birds 97: 238-246.
[269] Galushin, V.; Clarke, R.; Davygora, A. 2003. International Action Plan for the Pallid Harrier (Circus macrourus).
[270] BirdLife International. In prep. European Red List of Birds. Deliverable to the Europesan Commission (DG Environment) in 2021 under Service Contract ENV.D.3/SER/2018/0018.

	 https://www.iucnredlist.org/es/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[271], [272]. The species has also been found to breed in agricultural areas, at least when agriculture is non-intensive[273].The species is migratory, with most birds wintering in sub-Saharan Africa or south-east Asia. They leave their breeding grounds between August and November and return in March and April[274].Birds migrate on a broad front, with only minor concentrations at bottleneck sites[275]. As per the eBird data, the species is reported in the surroundings of Ahmadabad[276]. Based on available secondary information extracted from eBird Database[277] (which reports maximum one (1) individuals from the Sanand, it is less likely to meet the threshold i.e. 180-300 (≥1 percent of the global population) for the EAAA.	
31	Dalmatian Pelican (*Pelecanus crispus*)	**IUCN:** Near Threatened 3a **IWP:** Schedule II **Restricted range:** No **Migratory:** Yes	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[278, 279]. 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[280], 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-	Screened Out

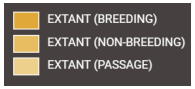
[271] Snow, D.W. and Perrins, C.M. 1998. The Birds of the Western Palearctic, Volume 1: Non-Passerines. Oxford University Press, Oxford.
[272] Galushin, V.; Clarke, R.; Davygora, A. 2003. International Action Plan for the Pallid Harrier (Circus macrourus).
[273] Terraube, J.; Arroyo, B. E.; Mougeot, 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.
[274] 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.
[275] Ferguson-Lees, J. and Christie, D.A. 2001. Raptors of the world. Christopher Helm, London.
[276] https://ebird.org/region/IN-GJ-AH
[277]https://ebird.org/map/palhar1?neg=true&env.minX=68.21205520629884&env.minY=21.91732804948867&env.maxX=71.02455520629884&env.maxY=23.04664287063698&zh=true&gp=true&ev=Z&excludeExX=false&excludeExAll=false&mr=1-12&bmo=1&emo=12&yr=all&byr=1900&eyr=2024
[278] 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.
[279] BirdLife International. 2015. European Red List of Birds. Office for Official Publications of the European Communities, Luxembourg.
[280] 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.

	 https://www.iucnredlist.org/species/22697599/122838534			9,300 mature individuals[281]. However, the total global population (mature individuals) has been estimated as 11400-13400[282]. It occurs mainly at inland, freshwater wetlands but also at coastal lagoons, river deltas & estuaries[283, 284, 285, 286], small islands in freshwater lakes[287] or in dense aquatic vegetation[288], and often in hilly terrain[289]. On migration, large lakes form important stop-over sites[290]. It typically winters on *Jheels* and lagoons in India, and ice-free lakes in Europe[291]. It sometimes fishes inshore along sheltered coasts[292]. 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[293]. Undoubtedly the species has a presence in the surroundings of Ahmedabad[294], however based on available secondary information extracted from eBird Database[295] (which reports maximum 50 individuals from Vasna Chacharavadi[296]), therefore, it is lesslikely to meet the threshold i.e. 114-134 (≥1 percent of the global population) for the EAAA.	
32	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.	Screened Out

[281] BirdLife International. 2018. Pelecanus crispus (amended version of 2017 assessment). The IUCN Red List of Threatened Species 2018: e.T22697599A122838534
[282] https://www.iucnredlist.org/species/22697599/122838534#population
[283] 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.
[284] 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.
[285] Crivelli, A. J.; Catsadorakis, G.; Hatzilacou, D.; Nazirides, T. 1997. Pelicanus crispus Dalmatian Pelican. Birds of the Western Palearctic Update 1(3): 149-153.
[286] 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.
[287] 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.
[288] 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.
[289] Nelson, J. B. 2005. Pelicans, cormorants and their relatives. Pelecanidae, Sulidae, Phalacrocoracidae, Anhingidae, Fregatidae, Phaethontidae. Oxford University Press, Oxford, U.K.
[290] Nelson, J. B. 2005. Pelicans, cormorants and their relatives. Pelecanidae, Sulidae, Phalacrocoracidae, Anhingidae, Fregatidae, Phaethontidae. Oxford University Press, Oxford, U.K.
[291] 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.
[292] 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.
[293] 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
[294] https://ebird.org/region/IN-GJ-AH
[295] https://ebird.org/map/dalpel1?neg=true&env.minX=71.82110612442114&env.minY=22.413075314596426&env.maxX=73.22735612442114&env.maxY=22.97686934142236&zh=true&gp=true&ev=Z&excludeExX=false&excludeExAll=false&mr=1-12&bmo=1&emo=12&yr=all&byr=1900&eyr=2024
[296] https://ebird.org/checklist/S52426417

	 https://www.iucnredlist.org/species/22679889/131907747		The global population is estimated to number c. 1,000,000-1,100,000 individuals[297]. During the breeding season the species inhabits wetlands surrounded by fringing vegetation in open grassland[298], sedge or heather moorland[299], arctic tundra, steppe or semi-desert from sea-level up to 2,300 m[300]. In the winter the species inhabits lowland farmland in open country, swamps, lakes, reservoirs, coastal lagoons, and estuaries[301, 302]. Indeed, the species has a presence in the surroundings of Ahmedabad [303], however based on available secondary information extracted from eBird Database[304](which reports maximum 740 individuals from Changodar area[305] followed by 200 individuals from Jayantilal Park[306]), it is less likely to meet the threshold i.e. 10,000-11,000 (≥1 percent of the global population) for the EAAA.
33	Ruddy Shelduck (*Tadorna ferruginea*) 	**IUCN:** Least Concern **IWP:** Schedule II **Restricted range:** No **Migratory:** Yes	The Ruddy Shelduck, with a vast native range spanning from Algeria to Vietnam, exhibits diverse residency patterns. Breeding grounds extend from Afghanistan to Western Sahara, including regions like Mongolia and Spain's Canary Islands. Non-breeding areas include Bhutan and Italy, while passage occurs in Denmark. Notably, Turkmenistan reports extinction. Vagrant occurrences vary, with resident sightings in North Macedonia, breeding in Czechia and Germany, and non-breeding in Bahrain and Lebanon. Seasonal patterns are uncertain in Belarus and Montenegro. Additionally, vagrant sightings occur in numerous countries including Japan, Portugal, and Yemen, demonstrating the species' wide-ranging distribution and occasional wanderings[307]. The global population is estimated to number c.170,000-220,000 individuals (Wetlands International 2015). The European population is estimated at 17,000-26,500 pairs, which equates to 33,900-53,100 mature individuals[308].

[297] Wetlands International. 2015. Waterbird Population Estimates. Available at: wpe.wetlands.org.
[298] 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.
[299] Johnsgard, P.A. 1978. Ducks, geese and swans of the World. University of Nebraska Press, Lincoln and London.
[300] Snow, D.W.; Perrins, C.M. 1998. The Birds of the Western Palearctic, Volume 1: Non-Passerines. Oxford University Press, Oxford.
[301] 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.
[302] Madge, S.; Burn, H. 1988. Wildfowl. Christopher Helm, London.
[303] https://ebird.org/region/IN-GJ-AH
[304] https://ebird.org/map/gragoo?neg=true&env.minX=&env.minY=&env.maxX=&env.maxY=&zh=false&gp=true&ev=Z&excludeExX=false&excludeExAll=false&mr=1-12&bmo=1&emo=12&yr=all&byr=1900&eyr=2024
[305] https://ebird.org/checklist/S51144451
[306] https://ebird.org/checklist/S98114960
[307] https://www.iucnredlist.org/species/22680003/86011049#geographic-range
[308] BirdLife International. 2015. European Red List of Birds. Office for Official Publications of the European Communities, Luxembourg.

	 https://www.iucnredlist.org/species/22680003/86011049			Habitat Breeding This species frequents the shores of inland freshwater, saline and brackish lakes and rivers in open country, particularly those in open steppe, upland plateau and mountainous regions (reaching up to 5,000 m in Himalayas)[309], [310], [311], [312], [313]. However, it is less dependent upon large water bodies for resting and feeding than most other Anatidae, and often occurs a considerable distance from water during the breeding season[314]. Non-breeding In the non-breeding season this species prefers streams, slow-flowing rivers, freshwater pools, flooded grasslands, marshes and brackish or saline lakes in lowland regions, and is also found on artificial reservoirs [315], [316], [317], [318], [319] in the vicinity of agricultural lands (Uzbekistan)[320]. It avoids coastal waters and tall, dense vegetation or emergent and floating aquatic plants[321]. The species has clear presence in the surroundings of Ahmedabad[322], based on available secondary information extracted from eBird Database, the maximum around 443 individuals reported from Sahwadi Sewage[323] in year 1991, whilethe recent records shows maximum 35 individuals from Bavla Old Mill OBI[324]. Therefore is less likely to meet the threshold i.e. 1,700-2,200 (≥1 percent of the global population) for the EAAA.	
34	Gadwall (*Mareca strepera*)	**IUCN:** Least Concern **IWP:** Schedule IV **Restricted range:** No **Migratory:** Yes	3a	Gadwall has an extremely wide distribution across the Palearctic and Nearctic regions. The global population is estimated to number c. 4,300,000-4,900,000 individuals[325]. The species inhabits highly productive & eutrophic freshwater marsha or lakes, open lowland grassland, shallow, standing or slow-flowing waters with abundant emergent vegetation, and grass-covered islands[326]. It may also be found on permanent, shallow,	Screened Out

[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] Brown, L.H., Urban, E.K. and Newman, K. 1982. The Birds of Africa, Volume I. Academic Press, London.
[312] 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.
[313] Quan, R. C.; Wen, X.; Tang, X.; Peng, G. H.; Huang, T. F. 2001. Habitat use by wintering Ruddy Shelduck at Lashihai Lake, Lijiang, China. Waterbirds 24(3): 402-406.
[314] Scott, D. A.; Rose, P. M. 1996. Atlas of Anatidae populations in Africa and western Eurasia. Wetlands International, Wageningen, Netherlands.
[315] 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.
[316] Johnsgard, P.A. 1978. Ducks, geese and swans of the World. University of Nebraska Press, Lincoln and London.
[317] Brown, L.H., Urban, E.K. and Newman, K. 1982. The Birds of Africa, Volume I. Academic Press, London.
[318] 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.
[319] Quan, R. C.; Wen, X.; Tang, X.; Peng, G. H.; Huang, T. F. 2001. Habitat use by wintering Ruddy Shelduck at Lashihai Lake, Lijiang, China. Waterbirds 24(3): 402-406.
[320] Kreuzberg-Mukhina, E. A. 2006. The effect of habitat change on the distribution of waterbirds in Uzbekistan and the possible implications of climate change. In: Boere, G.; Galbraith, C., Stroud, D (ed.), Waterbirds around the world, pp. 277-282. The Stationary Office, Edinburgh, UK.
[321] Madge, S.; Burn, H. 1988. Wildfowl. Christopher Helm, London.
[322]https://ebird.org/map/rudshe?neg=true&env.minX=61.24837099397675&env.minY=16.45282245557036&env.maxX=83.74837099397675&env.maxY=25.568096875255485&zh=true&gp=true&ev=Z&excludeExX=false&excludeExAll=false&mr=1-12&bmo=1&emo=12&yr=all&byr=1900&eyr=2024
[323] https://ebird.org/india/checklist/S75812239
[324] https://ebird.org/checklist/S153992161
[325] Wetlands International. 2015. Waterbird Population Estimates. Available at: wpe.wetlands.org.
[326] 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/22680149/86020572			slightly alkaline marshes, as well as on oxbow lakes, channels, reservoirs, and gravel-pits[327]. Although the Important Bird and Biodiversity Areas in India: Priority Sites for Conservation (Revised and updated Edition - 2016)[328] reports the species from Salt Pans of Bhavnagar. However, the species has been reported throughout the state (Gujarat)[329]. Indeed, the species has a presence in the surroundings of Ahmedabad [330], however based on available secondary information extracted from eBird Database[331] (which reports maximum 200 individuals from Vansa Barrage[332]), it is less likely to meet the threshold i.e. 43,000-49,000 (≥1 percent of the global population) for the EAAA.	
35	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[333]. This species breeds in lowland freshwater marshes, slow-flowing large rivers[334] and shallow lakes and lagoons with ample submerged, floating and emerging vegetation[335]. Ideal wetland habitats for this species are those surrounded by sparse open forest, 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 [336, 337].	Screened Out

[327] BirdLife International. 2016. Mareca strepera. The IUCN Red List of Threatened Species 2016: e.T22680149A86020572

[328] 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

[329] https://ebird.org/map/gadwal?neg=true&env.minX=64.1924152412128&env.minY=19.18638948676505&env.maxX=75.4424152412128&env.maxY=23.734789838523643&zh=true&gp=true&ev=Z&excludeExX=false&excludeExAll=false&mr=1-12&bmo=1&emo=12&yr=all&byr=1900&eyr=2024

[330] https://ebird.org/region/IN-GJ-AH

[331] https://ebird.org/map/gadwal?neg=true&env.minX=72.31891995429757&env.minY=23.007072106736192&env.maxX=72.67048245429757&env.maxY=23.147624808977064&zh=true&gp=true&ev=Z&excludeExX=false&excludeExAll=false&mr=1-12&bmo=1&emo=12&yr=all&byr=1900&eyr=2024

[332] https://ebird.org/checklist/S101522321

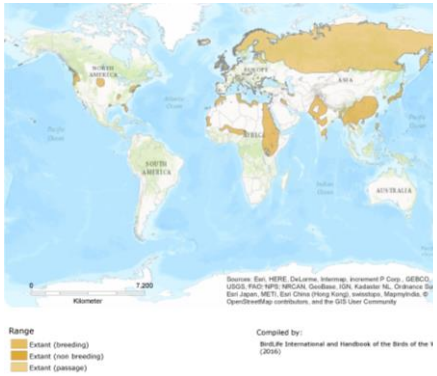
[333] Wetlands International. 2015. Waterbird Population Estimates. Available at: wpe.wetlands.org.

[334] Kretchmar, A. V. 1994. Eurasian wigeon (Anas penelope) in north-eastern Asia. Zoologichesky Zhurnal 73(5): 68-79.

[335] Kear, J. 2005. Ducks, geese and swans volume 2: species accounts (Cairina to Mergus). Oxford University Press, Oxford, U.K.

[336] 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.

[337] 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			Nalsarovar Wildlife Sanctuary, and Salt Pans of Bhavnagar are the possible habitats for this migratory species in Gujarat[338]. Indeed, the species has a presence in the surroundings of Ahmedabad[339] ,however based on available secondary information extracted from eBird Database [340](which reports maximum 200 individuals from Dandi road, Bherai[341], followed by 100 individuals form Vasai Irrigation Tank [342]), it is less likely to meet the threshold i.e. 28,000-33,000 (≥1 percent of the global population) for the EAAA.	
36	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[343]. The global population is estimated to number > c. 19,000,000 individuals[344], while the European population is estimated at 2,850,000-4,610,000 pairs[345]. Habitats commonly frequented include flooded swampy woodlands, seasonal flood lands[346], wet grassy swamps and meadows, oxbow lakes[347], open waters with mudflats, banks or spits, irrigation networks, reservoirs, ornamental waters[348, 349], canals and sewage farms[350].	Screened Out

[338] 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

[339] https://ebird.org/region/IN-GJ-AH

[340]https://ebird.org/map/eurwig?neg=true&env.minX=72.44054733505607&env.minY=22.84152000760717&env.maxX=72.61632858505607&env.maxY=22.911900798420387&zh=true&gp=true&ev=Z&excludeExX=false&excludeExAll=false&mr=1-12&bmo=1&emo=12&yr=all&byr=1900&eyr=2024

[341] https://ebird.org/checklist/S84520960

[342]https://ebird.org/india/checklist/S75769631

[343] https://indianbirds.thedynamicnature.com/2015/03/mallard-anas-platyrhynchos.html

[344] Wetlands International. 2015. Waterbird Population Estimates. Available at: wpe.wetlands.org.

[345] BirdLife International. 2015. European Red List of Birds. Office for Official Publications of the European Communities, Luxembourg.

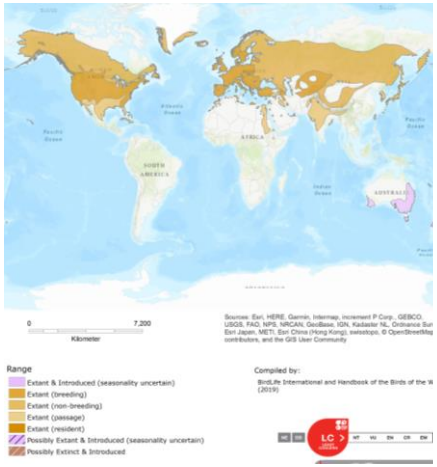
[346] Snow, D.W.; Perrins, C.M. 1998. The Birds of the Western Palearctic, Volume 1: Non-Passerines. Oxford University Press, Oxford.

[347] 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.

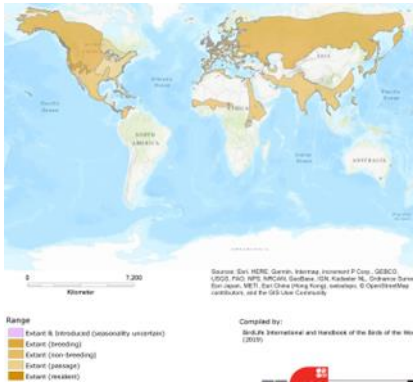
[348] del Hoyo, J.; Elliot, A.; Sargatal, J. 1992. Handbook of the Birds of the World, Vol. 1: Ostrich to Ducks. Lynx Edicions, Barcelona, Spain.

[349] Scott, D. A.; Rose, P. M. 1996. Atlas of Anatidae populations in Africa and western Eurasia. Wetlands International, Wageningen, Netherlands.

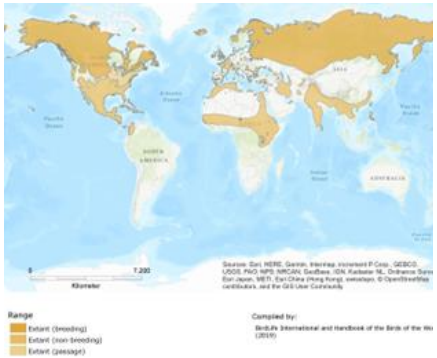
[350] Snow, D.W.; Perrins, C.M. 1998. The Birds of the Western Palearctic, Volume 1: Non-Passerines. Oxford University Press, Oxford.

	 https://www.iucnredlist.org/species/22680186/155457360			During the winter the species may also be found in saline habitats along the coast[351] where water is shallow, fairly sheltered and within site of land i.e. brackish lagoons, brackish estuaries and bays[352, 353]. Undoubtedly the species has a presence in the surroundings of Ahmedabad[354], however based on available secondary information extracted from eBird Database[355](which reports maximum 10 individuals Ambawadi[356] followed by 5 individuals from Vizol[357]), it is less likely to meet the threshold i.e. 1,90,000 (≥1 percent of the global population) for the EAAA.	
37	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. The global population is estimated to number 6,500,000-7,000,000 individuals[358]; while the European population is estimated at 170,000-233,000 pairs[359]. 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)[360],	Screened Out

[351] Madge, S.; Burn, H. 1988. Wildfowl. Christopher Helm, London.
[352] Snow, D.W.; Perrins, C.M. 1998. The Birds of the Western Palearctic, Volume 1: Non-Passerines. Oxford University Press, Oxford.
[353] del Hoyo, J.; Elliot, A.; Sargatal, J. 1992. Handbook of the Birds of the World, Vol. 1: Ostrich to Ducks. Lynx Edicions, Barcelona, Spain.
[354] https://ebird.org/region/IN-GJ-AH
[355]https://ebird.org/map/mallar3?neg=true&env.minX=71.14413601160979&env.minY=22.65327118536644&env.maxX=73.95663601160979&env.maxY=23.776515255619955&zh=true&gp=true&ev=Z&excludeExX=false&excludeExAll=false&mr=1-12&bmo=1&emo=12&yr=all&byr=1900&eyr=2024
[356] https://ebird.org/checklist/S161803651
[357] https://ebird.org/checklist/S156995605
[358] Wetlands International. 2015. Waterbird Population Estimates. Available at: wpe.wetlands.org.
[359] BirdLife International. 2015. European Red List of Birds. Office for Official Publications of the European Communities, Luxembourg.
[360] Johnsgard, P.A. 1978. Ducks, geese and swans of the World. University of Nebraska Press, Lincoln and London.

	 https://www.iucnredlist.org/species/22680247/153875944			[361, 362, 363], oxbow lakes, channels and swamps[364, 365, 366, 367, 368, 369], artificial waters bordered by lush grassland such as sewage farms, rice-fields and fish ponds[370, 371, 372]. In the winter it can be found on coastal brackish lagoons, tidal mudflats, 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)[373, 374, 375, 376, 377]. Undoubtedly the species has a presence in the surroundings of Ahmedabad[378], however based on available secondary information extracted from eBird Database[379] (which historically reports maximum 1710 individuals from Vasai village Tank[380] in 1990 and in recent years 500 individuals from Vasna Barriage East[381]), it is less likely to meet the threshold i.e. 65,000-70,000 (≥1 percent of the global population) for the EAAA.	
38	Northern Pintail (*Anas acuta*)	**IUCN:** Least Concern **IWP:** Schedule IV **Restricted range:** No **Migratory:** Yes	3a	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.	Screened Out

[361] Brown, L.H.; Urban, E.K.; Newman, K. 1982. The Birds of Africa, Volume I. Academic Press, London.
[362] del Hoyo, J.; Elliot, A.; Sargatal, J. 1992. Handbook of the Birds of the World, Vol. 1: Ostrich to Ducks. Lynx Edicions, Barcelona, Spain.
[363] Snow, D.W.; Perrins, C.M. 1998. The Birds of the Western Palearctic, Volume 1: Non-Passerines. Oxford University Press, Oxford.
[364] Johnsgard, P.A. 1978. Ducks, geese and swans of the World. University of Nebraska Press, Lincoln and London.
[365] Brown, L.H.; Urban, E.K.; Newman, K. 1982. The Birds of Africa, Volume I. Academic Press, London.
[366] 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.
[367] Madge, S.; Burn, H. 1988. Wildfowl. Christopher Helm, London.
[368] del Hoyo, J.; Elliot, A.; Sargatal, J. 1992. Handbook of the Birds of the World, Vol. 1: Ostrich to Ducks. Lynx Edicions, Barcelona, Spain.
[369] Kear, J. 2005. Ducks, geese and swans volume 2: species accounts (Cairina to Mergus). Oxford University Press, Oxford, U.K.
[370] Snow, D.W.; Perrins, C.M. 1998. The Birds of the Western Palearctic, Volume 1: Non-Passerines. Oxford University Press, Oxford.
[371] Kear, J. 2005. Ducks, geese and swans volume 2: species accounts (Cairina to Mergus). Oxford University Press, Oxford, U.K.
[372] 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.
[373] Johnsgard, P.A. 1978. Ducks, geese and swans of the World. University of Nebraska Press, Lincoln and London.
[374] Madge, S.; Burn, H. 1988. Wildfowl. Christopher Helm, London.
[375] del Hoyo, J.; Elliot, A.; Sargatal, J. 1992. Handbook of the Birds of the World, Vol. 1: Ostrich to Ducks. Lynx Edicions, Barcelona, Spain.
[376] Snow, D.W.; Perrins, C.M. 1998. The Birds of the Western Palearctic, Volume 1: Non-Passerines. Oxford University Press, Oxford.
[377] Kear, J. 2005. Ducks, geese and swans volume 2: species accounts (Cairina to Mergus). Oxford University Press, Oxford, U.K.
[378] https://ebird.org/region/IN-GJ-AH
[379]https://ebird.org/map/norsho?neg=true&env.minX=71.81016821019016&env.minY=22.735082564929463&env.maxX=73.21641821019016&env.maxY=23.297545344693763&zh=true&gp=true&ev=Z&excludeExX=false&excludeExAll=false&mr=1-12&bmo=1&emo=12&yr=all&byr=1900&eyr=2024
[380] https://ebird.org/india/checklist/S75771032
[381] https://ebird.org/india/checklist/S82558616



https://www.iucnredlist.org/species/22680301/153882797

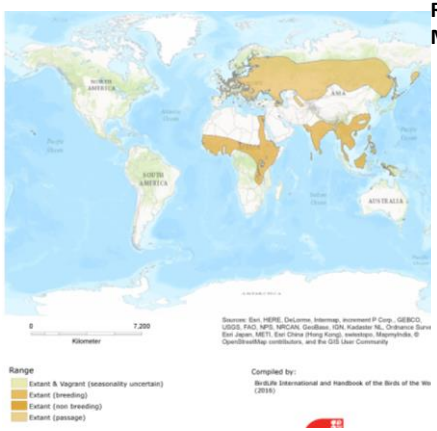
The population is estimated to number 7,100,000-7,200,000 individuals[382]; while the European population is estimated at 210,000-269,000 pairs[383].

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 vegetation and wetlands interspersed with brushy thickets or copses[384, 385, 386, 387, 388, 389]. 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[390, 391, 392, 393, 394, 395, 396].

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)[397].

Undoubtedly the species has a presence in the surroundings of Ahmedabad[398], however based on available secondary information extracted from eBird Database[399] (which reports maximum 250 individuals from Changodar Area [400] and 250 another place Daskroi, Ahmedabad[401]), it is less likely to meet the threshold i.e. 71,000-72,000 (≥1 percent of the global population) for the EAAA.

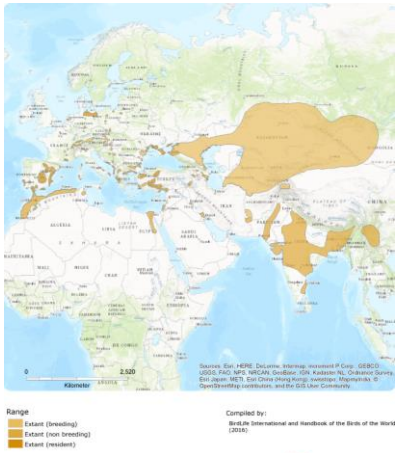
[382] Wetlands International. 2006. Waterbird Population Estimates – Fourth Edition. Wageningen, The Netherlands.
[383] BirdLife International. 2015. European Red List of Birds. Office for Official Publications of the European Communities, Luxembourg.
[384] Johnsgard, P.A. 1978. Ducks, geese and swans of the World. University of Nebraska Press, Lincoln and London.
[385] Madge, S.; Burn, H. 1988. Wildfowl. Christopher Helm, London.
[386] del Hoyo, J.; Elliot, A.; Sargatal, J. 1992. Handbook of the Birds of the World, Vol. 1: Ostrich to Ducks. Lynx Edicions, Barcelona, Spain.
[387] Snow, D.W.; Perrins, C.M. 1998. The Birds of the Western Palearctic, Volume 1: Non-Passerines. Oxford University Press, Oxford.
[388] 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.
[389] Kear, J. 2005. Ducks, geese and swans volume 2: species accounts (Cairina to Mergus). Oxford University Press, Oxford, U.K.
[390] Johnsgard, P.A. 1978. Ducks, geese and swans of the World. University of Nebraska Press, Lincoln and London.
[391] Brown, L.H.; Urban, E.K.; Newman, K. 1982. The Birds of Africa, Volume I. Academic Press, London.
[392] Madge, S.; Burn, H. 1988. Wildfowl. Christopher Helm, London.
[393] del Hoyo, J.; Elliot, A.; Sargatal, J. 1992. Handbook of the Birds of the World, Vol. 1: Ostrich to Ducks. Lynx Edicions, Barcelona, Spain.
[394] Scott, D. A.; Rose, P. M. 1996. Atlas of Anatidae populations in Africa and western Eurasia. Wetlands International, Wageningen, Netherlands.
[395] 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.
[396] Snow, D.W.; Perrins, C.M. 1998. The Birds of the Western Palearctic, Volume 1: Non-Passerines. Oxford University Press, Oxford.
[397] 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
[398] https://ebird.org/region/IN-GJ-AH
[399]https://ebird.org/map/norpin?neg=true&env.minX=72.13034626563068&env.minY=22.85712517482893&env.maxX=72.83347126563068&env.maxY=23.13839638894954&zh=true&gp=true&ev=Z&excludeExX=false&excludeExAll=false&mr=1-12&bmo=1&emo=12&yr=all&byr=1900&eyr=2024
[400] https://ebird.org/checklist/S51144451
[401] https://ebird.org/checklist/S97735464

39	Garganey (*Spatula querquedula*)  https://www.iucnredlist.org/species/22680313/86016410	**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[402]. The global population is estimated to number c. 2,600,000-2,800,000 individuals[403]. 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 (Cramp and Simmons 1977, Johnsgard 1978, de Hoyo. 1992, Green 1998, Schricke 2001). During nonbreeding season the species shows a preference for large freshwater or occasionally brackish lakes, again with abundant floating, emergent and fringing vegetation (Kear 2005b), also shallow flood plains, shallow dams, pans and sewage ponds (in South Africa) (Hockey et al. 2005). The species also frequents coastal saltmarshes and lagoons on passage (de Hoyo. 1992) and may spend the day resting on marine inshore waters when migrating (Madge and Burn 1988). Although the Important Bird and Biodiversity Areas in India: Priority Sites for Conservation (Revised and updated Edition - 2016)[404] reports the species from Salt Pans of Bhavnagar. However, the species has been reported throughout the state (Gujarat)[405]. Indeed, the species has a presence in the surroundings of Ahmedabad[406], however based on available secondary information extracted from eBird Database[407] (which reports maximum 500 individuals from Dandi road, Bherai[408], followed by 239 individuals from Chachaadi [409]), it is less likely to meet the threshold i.e. 26,000-28,000 (≥1 percent of the global population) for the EAAA.	Screened Out
40	Common Teal (*Anas crecca*)	**IUCN:** Least Concern **IWP:** Schedule IV **Restricted range:** No **Migratory:** Yes	3a	Common Teal migrates from Europe & formal USSR and winter in coasts of Northern Africa, East Africa, Central Asia, Indian Subcontinent, & Eastern Asia[410].	Screened Out

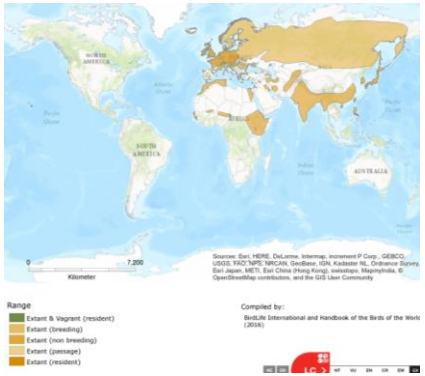
[402] https://indianbirds.thedynamicnature.com/2015/03/garganey-spatula-querquedula.html#google_vignette
[403] Wetlands International. 2015. Waterbird Population Estimates. Available at: wpe.wetlands.org.
[404] Rahmani, A.R., Islam, M.Z. and Kasambe, R.M. (2016) Important Bird and Biodiversity Areas 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
[405]https://ebird.org/map/gargan?neg=true&env.minX=57.44641875687685&env.minY=17.108674891385363&env.maxX=79.94641875687685&env.maxY=26.184438205735823&zh=true&gp=true&ev=Z&excludeExX=false&excludeExAll=false&mr=1-12&bmo=1&emo=12&yr=all&byr=1900&eyr=2024
[406] https://ebird.org/region/IN-GJ-AH
[407]https://ebird.org/map/gargan?neg=true&env.minX=72.50543719143535&env.minY=22.975555897545384&env.maxX=72.61530047268535&env.maxY=23.01071605098308&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/S84520960
[409] https://ebird.org/checklist/S52083779
[410] BirdLife International. 2020. Anas crecca. The IUCN Red List of Threatened Species 2020: e.T22680321A181692388

	 https://www.iucnredlist.org/species/22680321/181692388			The global population is estimated at c. 2,800,000 mature individuals[411, 412]. The European population is estimated at 557,000-915,000 pairs, which equates to 1,110,000-1,830,000 mature individuals[413]. Its habitats include Forest, Shrubland, Wetlands (inland), Marine Intertidal, Marine Coastal/Supratidal, Artificial/Terrestrial, Artificial/Aquatic & Marine[414]. Definitely, the species has a presence in the surroundings of Ahmedabad[415], however based on available secondary information extracted from eBird Database[416] (which reports maximum 740 individuals from Changodar [417] and followed by 700 individuals from Dandi road, Bherai[418]), it is less likely to meet the threshold i.e. 28,000 (≥1 percent of the global population) for the EAAA.	
41	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[419, 420]. The species inhabits inland deep fresh or brackish[421] reed-fringed lakes, rivers, or saline and alkaline lagoons[422] in open country[423], also occurring (less often) on estuaries, river deltas and other sheltered coastal habitats[424] on passage[425] or during the winter[426].	Screened Out

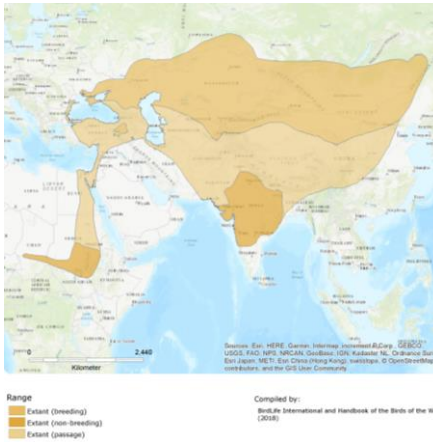
[411] Partners in Flight. 2019. Avian Conservation Assessment Database, version 2019. Available at: http://pif.birdconservancy.org/ACAD.
[412] Wetlands International. 2020. Waterbird Population Estimates. Available at: wpe.wetlands.org.
[413] BirdLife International. 2015. European Red List of Birds. Office for Official Publications of the European Communities, Luxembourg.
[414] BirdLife International. 2020. Anas crecca. The IUCN Red List of Threatened Species 2020: e.T22680321A181692388
[415] https://ebird.org/region/IN-GJ-AH8
[416]https://ebird.org/map/gnwtea?neg=true&env.minX=72.16764450073242&env.minY=22.7787741345633&env.maxX=72.51920700073242&env.maxY=22.91956421307293&zh=true&gp=true&ev=Z&excludeExX=false&excludeExAll=false&mr=1-12&bmo=1&emo=12&yr=all&byr=1900&eyr=2024
[417] https://ebird.org/checklist/S51144451
[418] https://ebird.org/checklist/S84520960
[419] Wetlands International. 2015. Waterbird Population Estimates. Available at: wpe.wetlands.org.
[420] https://www.iucnredlist.org/species/22680348/86012189
[421] del Hoyo, J.; Elliot, A.; Sargatal, J. 1992. Handbook of the Birds of the World, Vol. 1: Ostrich to Ducks. Lynx Edicions, Barcelona, Spain.
[422] Kear, J. 2005. Ducks, geese and swans volume 2: species accounts (Cairina to Mergus). Oxford University Press, Oxford, U.K.
[423] del Hoyo, J.; Elliot, A.; Sargatal, J. 1992. Handbook of the Birds of the World, Vol. 1: Ostrich to Ducks. Lynx Edicions, Barcelona, Spain.
[424] del Hoyo, J.; Elliot, A.; Sargatal, J. 1992. Handbook of the Birds of the World, Vol. 1: Ostrich to Ducks. Lynx Edicions, Barcelona, Spain.
[425] Madge, S.; Burn, H. 1988. Wildfowl. Christopher Helm, London.
[426] 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 Ahmedabad[427] , however based on available secondary information extracted from eBird Database[428] (which reports maximum 6 individuals from the Giramtha[429]), it is less likely to meet the threshold i.e. 4200-6000 (≥1 percent of the global population) for the EAAA.	
42	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[430]. The global population is estimated to number c. 2,600,000-2,900,000 individuals[431]. 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[432, 433]. It is common on large, freshwater lakes, ponds, reservoirs, gravel-pits and quiet stretches of wide slow-flowing rivers during this season[434, 435]. 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	Screened Out

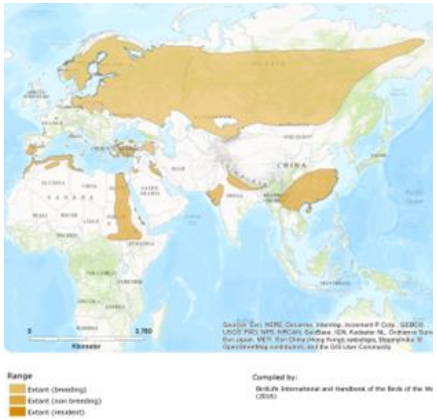
[427] https://ebird.org/map/recpoc?neg=true&env.minX=&env.minY=&env.maxX=&env.maxY=&zh=false&gp=false&ev=Z&excludeExX=false&excludeExAll=false&mr=1-12&bmo=1&emo=12&yr=all&byr=1900&eyr=2024
[428] https://ebird.org/map/recpoc?neg=true&env.minX=&env.minY=&env.maxX=&env.maxY=&zh=false&gp=false&ev=Z&excludeExX=false&excludeExAll=false&mr=1-12&bmo=1&emo=12&yr=all&byr=1900&eyr=2024
[429] https://ebird.org/checklist/S81855123
[430] https://www.brickfieldspark.org/data/ducktufted.htm
[431] Wetlands International. 2015. Waterbird Population Estimates. Available at: wpe.wetlands.org.
[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] Kear, J. 2005. Ducks, geese and swans volume 2: species accounts (Cairina to Mergus). Oxford University Press, Oxford, U.K.
[434] del Hoyo, J.; Elliot, A.; Sargatal, J. 1992. Handbook of the Birds of the World, vol. 1: Ostrich to Ducks. Lynx Edicions, Barcelona, Spain.
[435] 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			and estuaries although it avoids strong wave action and very exposed maritime conditions unless all inland freshwaters become frozen[436, 437, 438, 439, 440]. Indeed, the species has a presence in the surroundings of Ahmedabad[441] however based on available secondary information extracted from eBird Database[442] (which reports maximum 33 individuals from the Kheda [443] and followed by 30 individuals from Vasai[444]), it is less likely to meet the threshold i.e. 26,000-29,000 (≥1 percent of the global population) for the EAAA.	
43	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)[445]. The global population is estimated to number c. 230,000-261,000 individuals[446]. 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[447, 448, 449, 450]. In India a wider range of habitat types are used, including marshes, freshwater lakes, rivers[451], cultivated fields and rice stubble[452], sandy riverbeds, the flat	Screened In

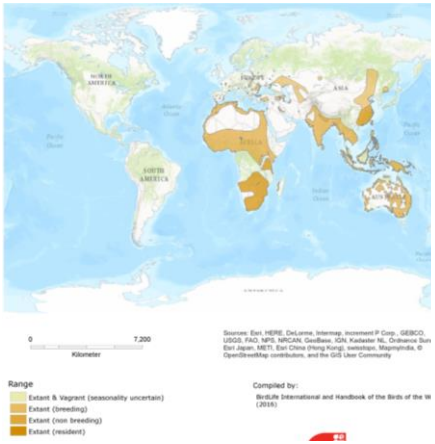
[436] Madge, S.; Burn, H. 1988. Wildfowl. Christopher Helm, London.
[437] del Hoyo, J.; Elliot, A.; Sargatal, J. 1992. Handbook of the Birds of the World, vol. 1: Ostrich to Ducks. Lynx Edicions, Barcelona, Spain.
[438] Scott, D. A.; Rose, P. M. 1996. Atlas of Anatidae populations in Africa and western Eurasia. Wetlands International, Wageningen, Netherlands.
[439] Snow, D.W.; Perrins, C.M. 1998. The Birds of the Western Palearctic, Volume 1: Non-Passerines. Oxford University Press, Oxford.
[440] Kear, J. 2005. Ducks, geese and swans volume 2: species accounts (Cairina to Mergus). Oxford University Press, Oxford, U.K.
[441] https://ebird.org/region/IN-GJ-AH
[442]https://ebird.org/map/tufduc?neg=true&env.minX=71.86035075274938&env.minY=22.67941075997896&env.maxX=73.26660075274938&env.maxY=23.242104962465366&zh=true&gp=false&ev=Z&excludeExX=false&excludeExAll=false&mr=1-12&bmo=1&emo=12&yr=all&byr=1900&eyr=2024
[443] https://ebird.org/checklist/S77616577
[444] https://ebird.org/checklist/S81855881
[445] https://birdcount.in/migration-map/demcra1/
[446] Wetlands International. 2015. Waterbird Population Estimates. Available at: wpe.wetlands.org.
[447] Johnsgard, P. A. 1983. Cranes of the world. Croom Helm, London.
[448] Ellis, D.H., Gee, G.F. and Mirande, C.M. 1996. Cranes: their biology, husbandary, and conservation. Gazelle Books, Lancaster, U.K.
[449] del Hoyo, J.; Elliott, A.; Sargatal, J. 1996. Handbook of the Birds of the World, vol. 3: Hoatzin to Auks. Lynx Edicions, Barcelona, Spain.
[450] 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.
[451] Urban, E.K.; Fry, C.H.; Keith, S. 1986. The Birds of Africa, Volume II. Academic Press, London.
[452] del Hoyo, J.; Elliott, A.; Sargatal, J. 1996. Handbook of the Birds of the World, vol. 3: Hoatzin to Auks. Lynx Edicions, Barcelona, Spain.

	 https://www.iucnredlist.org/species/22692081/131927771			and open margins of seasonal pans and farm ponds[453], and hot desert (if water is readily available) [454, 455]. 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[456]. Indeed, the species has a presence in the surroundings of Ahmedabad[457], however based on available secondary information extracted from eBird Database[458](which reports maximum 3000 individuals from Sanand area in 2023[459] followed by 900 from Vasai wetland[460]), it is likely to meet the threshold i.e. 2300-2610 (≥1 percent of the global population) for the EAAA.	
44	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 passible 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[461]. The non-breeding wintering and migration habitats of the species include flood land, swampy meadows, shallow sheltered bays, rice paddies, pastures and savannah-like areas	Screened Out

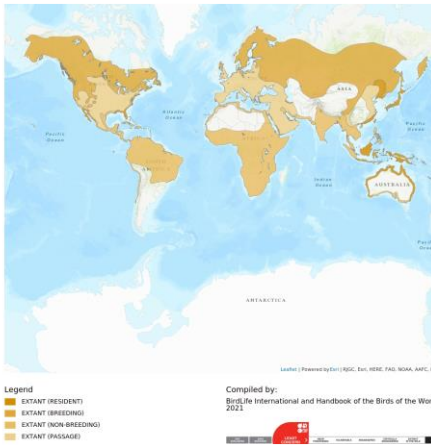
[453] Johnsgard, P. A. 1983. Cranes of the world. Croom Helm, London.
[454] Ellis, D.H., Gee, G.F. and Mirande, C.M. 1996. Cranes: their biology, husbandary, and conservation. Gazelle Books, Lancaster, U.K.
[455] Meine, C. D. and Archibald, G. W. 1996. The cranes - status survey and conservation action plan. International Union for Conservation of Nature and Natural Resources, Gland, Switzerland, and Cambridge, U.K.
[456] 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
[457] https://ebird.org/region/IN-GJ-AH
[458]https://ebird.org/map/demcra1?neg=true&env.minX=72.62016450066086&env.minY=22.746813785736713&env.maxX=72.63115082878586&env.maxY=22.751216711111939&zh=true&gp=false&ev=Z&excludeExX=false&excludeExAll=false&mr=1-12&bmo=1&emo=12&yr=all&byr=1900&eyr=2024
[459] https://ebird.org/checklist/S125990096
[460] https://ebird.org/checklist/S160839665
[461] https://www.iucnredlist.org/species/22692146/86219168#population

	 https://www.iucnredlist.org/species/22692146/86219168			(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[462]. Definitely, the species has a presence in the surroundings of Jamnagar[463, 464], however based on available secondary information extracted from eBird Database[465] (which reports maximum 700 individuals from Vasai [466] and followed by 500 from Timba[467]), it is less likely to meet the threshold i.e. 4,910-5,030 (≥1 percent of the global population) for the EAAA.	
45	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[468]. The global population is estimated to number c. 300,000-1,500,000 individuals[469, 470]. 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[471]. 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-fields[472, 473]. It also	Screened Out

[462] BirdLife International. 2016. Grus grus. The IUCN Red List of Threatened Species 2016: e.T22692146A86219168
[463] https://ebird.org/barchart?r=IN-GJ-JA&yr=all&m=
[464] https://www.inaturalist.org/observations?place_id=32154&subview=map&view=species&iconic_taxa=Aves
[465]https://ebird.org/map/comcra?neg=true&env.minX=69.89330673217775&env.minY=22.454821727634865&env.maxX=70.24486923217775&env.maxY=22.59594480929902&zh=true&gp=true&ev=Z&excludeExX=false&excludeExAll=false&mr=1-12&bmo=1&emo=12&yr=all&byr=1900&eyr=2024
[466] https://ebird.org/india/checklist/S97438024
[467] https://ebird.org/india/checklist/S102047201
[468] https://indianbirds.in/pdfs/IB_17_1_Ranade_WhiskeredTern.pdf
[469] Wetlands International. 2015. Waterbird Population Estimates. Available at: wpe.wetlands.org.
[470] https://www.iucnredlist.org/species/22694764/111750380
[471] Richards, A. 1990. Seabirds of the northern hemisphere. Dragon's World Ltd, Limpsfield, U.K.
[472] 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.
[473] 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/22694764/111750380			occurs along the coast on estuaries, coastal lagoons, creeks in mangrove swamps[474] and tidal mudflats[475]. Definitely, the species has a presence in the surroundings ofAhmedabad[476] , however based on available secondary information extracted from eBird Database[477] (which reports maximum 60 individuals from Abarmati Ashram[478] and followed by 50 individuals from the Parulben No Bagicho[479]), it is less likely to meet the threshold i.e. 3,000-15,000 (≥1 percent of the global population) for the EAAA.	
46	Osprey (*Pandion haliaetus*)	**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[480]. 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[481]. 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[482].	Screened Out

[474] Snow, D.W.; Perrins, C.M. 1998. The Birds of the Western Palearctic, Volume 1: Non-Passerines. Oxford University Press, Oxford.
[475] 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.
[476] https://ebird.org/region/IN-GJ-AH
[477] https://ebird.org/map/whiter2?neg=true&env.minX=72.3682716476092&env.minY=22.804905592647614&env.maxX=72.7198341476092&env.maxY=22.94566861361582&zh=true&gp=false&ev=Z&excludeExX=false&excludeExAll=false&mr=1-12&bmo=1&emo=12&yr=all&byr=1900&eyr=2024
[478] https://ebird.org/checklist/S156552411
[479] https://ebird.org/checklist/S51374798
[480] https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4650845
[481] https://archive.org/details/audubonsocietyfi0000bull/page/469
[482] BirdLife International. 2021. Pandion haliaetus. The IUCN Red List of Threatened Species 2021: e.T22694938A206628879

	 https://www.iucnredlist.org/species/22694938/206628879			It inhabits the areas around shallow waters, being sufficiently tolerant of human settlement to persist in suburban and sometimes urban environments[483]. Due to the presence of suitable habitats in the surroundings of Jamnagar, and historical records of the species from the same area, there is a likelihood of the presence of this migratory species in the EAAA. Undoubtedly the species has a presence in the surroundings of Ahmedabad[484], however based on available secondary information extracted from eBird Database[485] (which reports maximum 2 individuals from the Meldi Mata Temple[486]), it is less likely to meet the threshold i.e. 96-136 (≥1 percent of the global population) for the EAAA.	
47	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[487]. The European population is estimated at 34,800-44,700 pairs, which equates to 69,600-89,400 mature individuals[488]. 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[489]. Although the Important Bird and Biodiversity Areas in India: Priority Sites for Conservation (Revised and updated Edition - 2016)[490] reports the species fsrom Nikol-Samadhiyala-	Screened Out

[483] del Hoyo, J.; Elliot, A.; Sargatal, J. 1992. Handbook of the Birds of the World, Vol. 1: Ostrich to Ducks. Lynx Edicions, Barcelona, Spain.

[484] h
https://ebird.org/map/osprey?neg=true&env.minX=72.4826531705685&env.minY=22.761932018793924&env.maxX=72.6584344205685&env.maxY=22.832353981379796&zh=true&gp=false&ev=Z&excludeExX=false&excludeExAll=false&mr=1-12&bmo=1&emo=12&yr=all&byr=1900&eyr=2024ttps://ebird.org/region/IN-GJ-AH

[485]

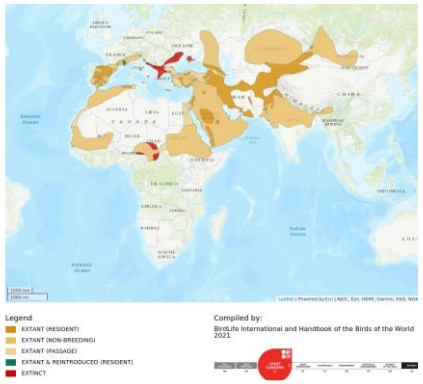
[486] https://ebird.org/checklist/S161987795

[487] https://animalia.bio/griffon-vulture?letter=v#distribution

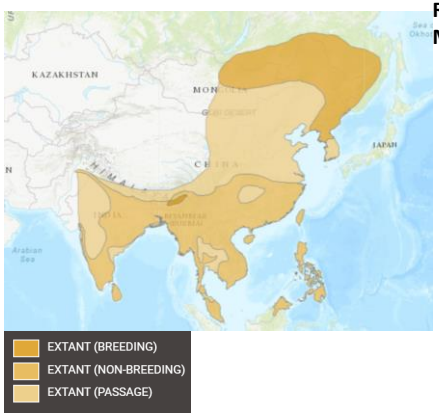
[488] BirdLife International. In prep. European Red List of Birds. Deliverable to the European Commission (DG Environment) in 2021 under Service Contract ENV.D.3/SER/2018/0018.

[489] 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.

[490] 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/22695219/157719127			Malan Wetlands Complex. However, the species has been reported from throughout the state (Gujarat)[491]. Definitely, the species has a presence in the surroundings of Ahmedabad[492] , however based on available secondary information extracted from eBird Database[493] the species has only 2 reports (with single individual) from Kodiyar[494] in Dec. 2009 and another is from Dabla Chokdi Gandhinagar [495] in Jan 2022. Thus, it is less likely to meet the threshold i.e. 800-9,000 (≥1 percent of the global population) for the EAAA.	
48	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[496]. In Europe, the breeding population is estimated to number 151,000-243,000 breeding females, which equates to 303,000-485,000 mature individuals[497]. 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. 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[498].	Screened Out

491
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
492 https://ebird.org/region/IN-GJ-AH
493 https://ebird.org/map/eurgri1?neg=true&env.minX=&env.minY=&env.maxX=&env.maxY=&zh=false&gp=false&ev=Z&excludeExX=false&excludeExAll=false&mr=1-12&bmo=1&emo=12&yr=all&byr=1900&eyr=2024
494 https://ebird.org/checklist/S80007759
495 https://ebird.org/checklist/S100500060
496 https://animalia.bio/western-marsh-harrier#distribution
497 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.
498 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/22695344/203357709		Definitely, the species has a presence in the surroundings of Ahmedavad[499] , however based on available secondary information extracted from eBird Database[500](which reports maximum 6 individuals from the Meldi Mata Temple[501] in Feb 2024), it is less likely to meet the threshold i.e. 6,000 – 11,000 (≥1 percent of the global population) for the EAAA.	
49	Pied Harrier (Circus melanoleucos) 	**IUCN:** Least Concern **IWP:** Schedule I **Restricted range:** No **Migratory:** Yes	The Pallid Harrier's geographic range encompasses various regions across Asia. Breeding occurs primarily in the Eastern Asian Russia, while non-breeding populations are found in places like Hong Kong, Indonesia, and the Philippines. Passage through Korea, Republic of, is noted during migration. Resident populations are established in Bangladesh, India, and China, among others. Vagrant sightings extend to Japan and Brunei Darussalam during non-breeding periods. This distribution highlights the species' adaptability to diverse habitats and its capacity for seasonal movements across vast areas of Asia[502]. The global population is estimated at 9,000-15,000 pairs[503], equating to 18,000-30,000 mature individuals. The European population is estimated at 1,000-2,200 breeding pairs, which roughly equates to 2,000-4,400 mature individuals[504]. The Pallid Harrier is a terrestrial bird primarily found in shrublands, grasslands, and wetlands, both during breeding and residency. It frequents temperate shrublands and grasslands, utilizing inland wetlands such as marshes and freshwater lakes during the breeding season. Additionally, it thrives in artificial or terrestrial habitats like arable lands. With a full migratory pattern, it congregates and disperses, likely due to habitat and seasonal resource availability. Despite its continuing decline in some areas, the extent and	Screened Out

[499] https://ebird.org/region/IN-GJ-AH

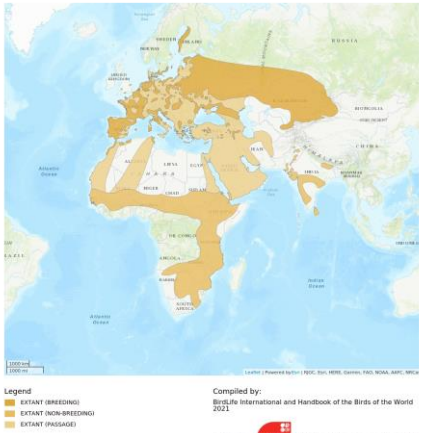
[500] https://ebird.org/map/wemhar1?neg=true&env.minX=71.7396365012995&env.minY=22.608418738043678&env.maxX=73.1458865012995&env.maxY=23.171407282129664&zh=true&gp=false&ev=Z&excludeExX=false&excludeExAll=false&mr=1-12&bmo=1&emo=12&yr=all&byr=1900&eyr=2024

[501] https://ebird.org/checklist/S161987795

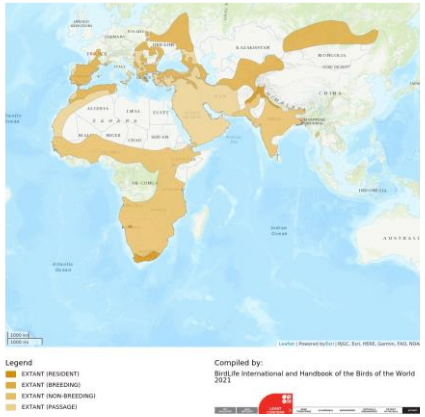
[502] https://www.iucnredlist.org/species/22695402/203542370#geographic-range

[503] Galushin, V.; Clarke, R.; Davygora, A. 2003. International Action Plan for the Pallid Harrier (Circus macrourus).

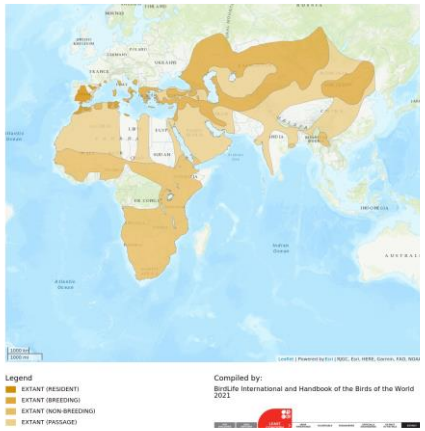
[504] BirdLife International. In prep.. European Red List of Birds. Deliverable to the European Commission (DG Environment) in 2021 under Service Contract ENV.D.3/SER/2018/0018.

	https://www.iucnredlist.org/species/22695402/203542370			quality of its habitat are yet to be fully understood. This species plays a crucial role in maintaining the ecological balance of its diverse habitats[505]. The species has clear presence in the surroundings of Ahmedabad[506], based on available secondary information extracted from eBird Database, the maximum 2 individuals reported from Nirma University[507]. Therefore is less likely to meet the threshold i.e 180-300 (≥1 percent of the global population) for the EAAAs.	
50	Montagu's Harrier (*Circus pygargus*)  https://www.iucnredlist.org/species/22695405/201058261	**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[508]. The European population is estimated at 69,700-110,000 breeding females, which equates to 139,000- 219,000 mature individuals[509]. 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[510]. 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[511]. The Important Bird and Biodiversity Areas in India: Priority Sites for Conservation (Revised and updated Edition - 2016)[512] reports the species from Velavadar National Park only; though, the species has been reported from throughout the state (Gujarat)[513]. Indeed, the species has a presence in the surroundings of Ahmedabad[514], however based on available secondary information extracted from eBird Database[515] (which reports	Screened Out

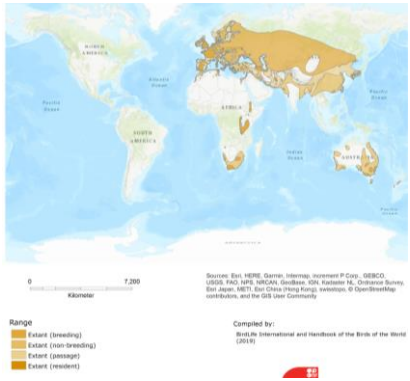
[505] https://www.iucnredlist.org/species/22695402/203542370#habitat-ecology
[506] https://ebird.org/region/IN-GJ-AH
[507] https://ebird.org/checklist/S158138546
[508] https://www.iucn.it/documenti/flora.fauna.italia/3-uccelli-2/files/Falconiformes/albanella_minore/albanella_minore_gb.htm
[509] BirdLife 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.
[510] https://www.iucnredlist.org/species/22695405/201058261#population
[511] 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.
[512] 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
[513] https://ebird.org/map/monhar1?neg=true&env.minX=71.52023352987499&env.minY=21.721360693376052&env.maxX=74.33273352987499&env.maxY=22.852261049495716&zh=true&gp=true&ev=Z&excludeExX=false&excludeExAll=false&mr=1-12&bmo=1&emo=12&yr=all&byr=1900&eyr=2024
[514] https://ebird.org/region/IN-GJ-AH
[515] https://ebird.org/map/monhar1?neg=true&env.minX=72.36056303528446&env.minY=22.897240027960425&env.maxX=72.53634428528446&env.maxY=22.967591913411 81&zh=true&gp=false&ev=Z&excludeExX=false&excludeExAll=false&mr=1-12&bmo=1&emo=12&yr=all&byr=1900&eyr=2024

				maximum 3 individuals from Sanand[516] in 2023 and 3 individuals from Gyaspur[517] in 2023), it is less likely to meet the threshold i.e. 3,000 – 5,500 (≥1 percent of the global population) for the EAAA.	
51	Booted Eagle (*Hieraaetus pennatus*)  https://www.iucnredlist.org/species/22696092/206456835	**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[518]. 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[519]. It is a species of open woodland, preferring patches of forest interspersed with open areas; it is recorded up to 3,000 m[520]. Definitely, the species has a presence in the surroundings of Ahmedabad[521], however based on available secondary information extracted from eBird Database[522](which reports maximum 2 individuals from Sanjay Manga Lake[523] in Feb 2024, 2 individuals from Sanand[524] in Feb 2024 and 2 from Vasna Barrage[525] in Nov 2020) it is less likely to meet the threshold i.e. 1,500-1,950 (≥1 percent of the global population) for the EAAA.	Screened Out
52	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[526].	Screened Out

[516] https://ebird.org/checklist/S125990096
[517] https://ebird.org/checklist/S157126128
[518] https://web.archive.org/web/20160327005804/http://www.biodiversityexplorer.org/birds/accipitridae/aquila_pennatus.htm
[519] https://www.iucnredlist.org/species/22696092/206456835#population
[520] 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.
[521] https://ebird.org/region/IN-GJ-AH
[522]https://ebird.org/map/booeag1?neg=true&env.minX=72.36056303528446&env.minY=22.897240027960425&env.maxX=72.53634428528446&env.maxY=22.96759191341181&zh=true&gp=false&ev=Z&excludeExX=false&excludeExAll=false&mr=1-12&bmo=1&emo=12&yr=all&byr=1900&eyr=2024
[523] https://ebird.org/checklist/S160996158
[524] https://ebird.org/checklist/S161664174
[525] https://ebird.org/checklist/S153575162
[526] https://www.iucnredlist.org/species/22696357/205768513#geographic-range

	 https://www.iucnredlist.org/species/22696357/205768513		The European population is estimated at 32,900-42,600 pairs, which equates to 65,800-85,200 mature individuals[527]. The population in China has been estimated at c.100-10,000 breeding pairs and c.50-1,000 individuals on migration[528]. The population in Kazakhstan has been estimated at 5,000-10,000 pairs[529]. The population in North Africa is estimated to be at least 2,500-3,000 breeding pairs[530]. The global population is therefore roughly estimated at 80,000-134,000 mature individuals[531]. 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 mainly migratory, with most breeders overwintering in sub-Saharan Africa, although some travel to parts of north-west Africa, southern Europe and southern Asia[532]. Although the global distribution map of the species includes Ahmedabad[533] however based on available secondary information[534, 535], the species has not been reported from the Ahmedabad and surrounding areas.
53	Common Kestrel (Falco tinnunculus)	**IUCN:** Least Concern **IWP:** Schedule II **Restricted range:** No **Migratory:** Yes	The Common Kestrel has a vast native range, spanning from Algeria to Zimbabwe, including European countries like Austria, France, and Sweden. It breeds extensively across Europe, Asia, and parts of Africa, from Afghanistan to Vietnam and even the Faroe Islands. Non-breeding populations are observed in places like Guam and the Canary Islands, with Macao's seasonality uncertain. Vagrant sightings stretch to locations such as Bermuda, Brazil, and Canada, showcasing the species' adaptability and occasional wanderings. Its distribution underscores its ability to thrive in diverse habitats across continents, from urban environments to open countryside[536]. The Common Kestrel's habitat ecology is diverse, spanning terrestrial ecosystems. It inhabits forests, shrublands, and grasslands, utilizing wetlands and coastal areas. Additionally, it thrives in artificial and terrestrial environments. This adaptable bird of prey demonstrates remarkable versatility in its choice of habitats, from dense woodlands to

[527] 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.
[528] Brazil, M. 2009. Birds of East Asia: eastern China, Taiwan, Korea, Japan, eastern Russia. Christopher Helm, London.
[529] 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.
[530] 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 .
[531] https://www.iucnredlist.org/species/22696357/205768513#population
[532] https://www.iucnredlist.org/species/22696357/205768513#habitat-ecology
[533] https://www.iucnredlist.org/species/22696357/205768513
[534]https://ebird.org/map/leskes1?neg=true&env.minX=71.7839919941202&env.minY=22.646354928670977&env.maxX=73.1902419941202&env.maxY=23.209186291507653&zh=true&gp=false&ev=Z&excludeExX=false&excludeExAll=false&mr=1-12&bmo=1&emo=12&yr=all&byr=1900&eyr=2024
[535] https://www.inaturalist.org/observations?place_id=any&subview=map&taxon_id=59845
[536] https://www.iucnredlist.org/species/22696362/206316110#geographic-range

	 https://www.iucnredlist.org/species/22696362/206316110			open grassy plains and coastal regions. Such adaptability enables the Common Kestrel to maintain a widespread distribution across various landscapes, demonstrating its ability to thrive in a range of environmental conditions[537]. The European population is estimated at 411,000-631,000 pairs, which equates to 823,000-1,270,000 mature individuals. Europe forms approximately 19% of the global range, so a very preliminary estimate of the global population size is 4,330,000-6,680,000 mature individuals, although further validation of this estimate is needed. It is therefore placed in the band 4,300,000-6,700,000 mature individuals[538]. The species has clear presence in the surroundings of Ahmedabad[539] based on available secondary information extracted from eBird Database, the maximum 2 individuals reported from Jayanti Lal Park[540]. Therefore, it is less likely to meet the threshold i.e 43,000-67,000 (≥1 percent of the global population) for the EAAAs.	
54	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[541]. The global population is estimated to number c. 915,000-1,400,000 individuals[542]. 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 of open water[543, 544]. 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)[545]. The species overwinters on large exposed ice-free lakes and reservoirs, moving to sheltered	Screened Outs

[537] https://www.iucnredlist.org/species/22696362/206316110#habitat-ecology s
[538] BirdLife International (2024) Species factsheet: Falco tinnunculus. Downloaded from https://datazone.birdlife.org/species/factsheet/common-kestrel-falco-tinnunculus on 10/04/2024.
[539]https://ebird.org/map/eurkes?neg=true&env.minX=71.16929626464842&env.minY=22.46376480279222&env.maxX=73.98179626464842&env.maxY=23.58858963708374&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://ebird.org/checklist/S120296058
[541] del Hoyo, J.; Elliot, A.; Sargatal, J. 1992. Handbook of the Birds of the World, Vol. 1: Ostrich to Ducks. Lynx Edicions, Barcelona, Spain.
[542] Wetlands International. 2015. Waterbird Population Estimates. Available at: wpe.wetlands.org.
[543] del Hoyo, J.; Elliot, A.; Sargatal, J. 1992. Handbook of the Birds of the World, Vol. 1: Ostrich to Ducks. Lynx Edicions, Barcelona, Spain.
[544] Snow, D.W.; Perrins, C.M. 1998. The Birds of the Western Palearctic, Volume 1: Non-Passerines. Oxford University Press, Oxford.
[545] 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/22696602/154250080			coastal inshore waters less than 10 m deep, such as brackish estuaries, deltas, tidal channels and tidal lagoons during cold spells[546, 547, 548]. The Important Bird and Biodiversity Areas in India: Priority Sites for Conservation (Revised and updated Edition - 2016)[549] reports the species from Charakla Saltworks, Khijadiya Bird Sanctuary, and Gosabara Wetland. Definitely, the species has a presence in the surroundings of Ahmedabad[550], however based on available secondary information extracted from eBird Database[551] (which reports from two places, maximum with 2 individuals from Adroda[552] in Nov 2023 and 1 from Shela[553], in Dec 2021), it is less likely to meet the threshold i.e. 9,150-14,000 (≥1 percent of the global population) for the EAAA.	
55	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[554]. 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 entering alkaline or saline lakes[555, 556]. It nests and roosts nests in large dense colonies on sandbanks, mudflats, islands or boggy, open shores[557, 558].	Screened Out

[546] del Hoyo, J.; Elliot, A.; Sargatal, J. 1992. Handbook of the Birds of the World, Vol. 1: Ostrich to Ducks. Lynx Edicions, Barcelona, Spain.
[547] Snow, D.W.; Perrins, C.M. 1998. The Birds of the Western Palearctic, Volume 1: Non-Passerines. Oxford University Press, Oxford.
[548] Fjeldså, J. 2004. The grebes. Oxford University Press, Oxford, U.K.
[549] 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
[550] https://ebird.org/region/IN-GJ-AH
[551] https://ebird.org/map/grcgre1?neg=true&env.minX=72.53060913085938&env.minY=23.047769557469202&env.maxX=72.70639038085938&env.maxY=23.118043021768717&zh=true&gp=false&ev=Z&excludeExX=false&excludeExAll=false&mr=1-12&bmo=1&emo=12&yr=all&byr=1900&eyr=2024
[552] https://ebird.org/checklist/S153568703
[553] https://ebird.org/checklist/S98982975
[554] https://www.iucnredlist.org/species/22697360/155527405#population
[555] 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.
[556] BirdLife International. 2019. Phoenicopterus roseus (amended version of 2018 assessment). The IUCN Red List of Threatened Species 2019: e.T22697360A155527405
[557] Brown, L.H.; Urban, E.K.; Newman, K. 1982. The Birds of Africa, Volume I. Academic Press, London.
[558] 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/22697360/155527405			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[559]. Indeed, the species has a presence in the surroundings of Ahmedabad[560] however based on available secondary information extracted from eBird Database[561] (which reports maximum 500 individuals from Meldi Mata Temple[562] and followed by 360 from Bherai[563]), it is less likely to meet the threshold i.e. 5,500-6,800 (≥1 percent of the global population) for the EAAA.	
56	Great White Pelican (*Pelecanus onocrotalus*)	**IUCN:** Least Concern **IWP:** Schedule IV **Restricted range:** No **Migratory:** Yes	3a	Great White Pelican is widely distributed in Africa and parts of Eurasia. The species is nomadic, moving vast distances in response to environmental conditions[564]. The global population of the species is estimated at 265,000-295,000 individuals[565]. The species is associated with relatively large, warm, shallow fresh, brackish, alkaline or saline lakes, lagoons, marshes, broad rivers, deltas, estuaries and coasts of landlocked	Screened Out

[559] 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

[560] https://ebird.org/region/IN-GJ-AH

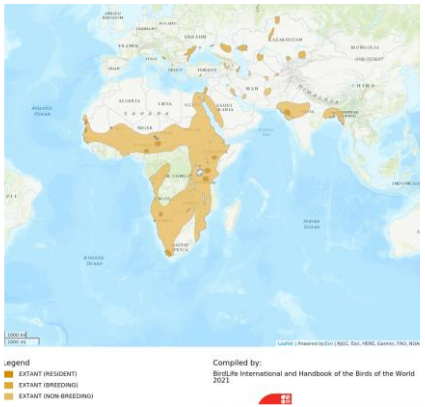
[561] https://ebird.org/map/grefla3?neg=true&env.minX=72.2758388519287&env.minY=22.82664281579352&env.maxX=72.2978115081787&env.maxY=22.835443371249838&zh=true&gp=false&ev=Z&excludeExX=false&excludeExAll=false&mr=1-12&bmo=1&emo=12&yr=all&byr=1900&eyr=2024

[562] https://ebird.org/checklist/S164161901

[563] https://ebird.org/checklist/S90966599

[564] http://speciesstatus.sanbi.org/assessment/last-assessment/3118/

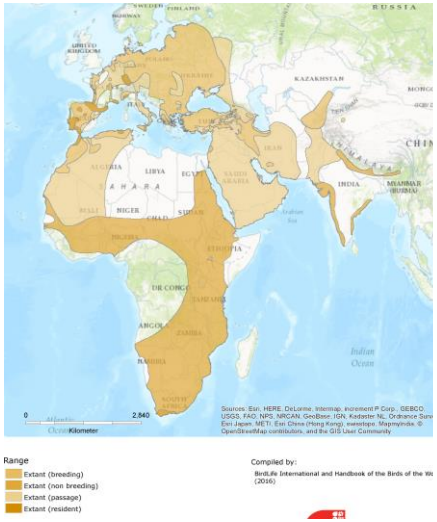
[565] Wetlands International. 2015. Waterbird Population Estimates. Available at: wpe.wetlands.org.

	 https://www.iucnredlist.org/species/22697590/177120498			seas[566, 567, 568]. The species requires secure areas of extensive reedbeds, wet swamps, mudflats and sandbanks or gravel and rocky substrates for nesting[569, 570, 571, 572]. The Important Bird and Biodiversity Areas in India: Priority Sites for Conservation (Revised and updated Edition - 2016)[573] reports the species from Kaj Lake, Khijadiya Bird Sanctuary, Marine National Park & Wildlife Sanctuary, Salt Pans of Bhavnagar, Wild Ass Wildlife Sanctuary & Nanda Island. Definitely, the species has a presence in the surroundings of Ahmedabad[574] , however based on available secondary information extracted from eBird Database[575] (which reports maximum 100 individuals from Palodia[576] in March 2022 and followed by 58 individuals from Changodar area[577] in 2017), it is less likely to meet the threshold i.e. 9,150-14,000 (≥1 percent of the global population) for the EAAA.	
57	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[578]. The global population is estimated to number c.24,000-44,000 individuals[579]. The species inhabits old, undisturbed, open forests - from sea-level up to mountainous regions (e.g. 2,000-2,500 m in altitude)[580 , 581, 582].	Screened Out

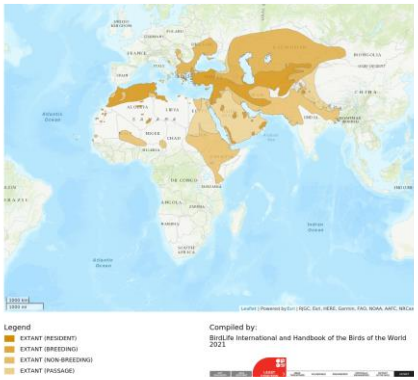
[566] del Hoyo, J., Elliot, A. and Sargatal, J. 1992. Handbook of the Birds of the World, Vol. 1: Ostrich to Ducks. Lynx Edicions, Barcelona, Spain.
[567] Johnsgard, P. A. 1993. Cormorants, darters, and pelicans of the world. Smithsonian Institution Press, Washington.
[568] Snow, D.W. and Perrins, C.M. 1998. The Birds of the Western Palearctic, Volume 1: Non-Passerines. Oxford University Press, Oxford.
[569] 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.
[570] Johnsgard, P. A. 1993. Cormorants, darters, and pelicans of the world. Smithsonian Institution Press, Washington.
[571] Snow, D.W. and Perrins, C.M. 1998. The Birds of the Western Palearctic, Volume 1: Non-Passerines. Oxford University Press, Oxford.
[572] Nelson, J. B. 2005. Pelicans, cormorants and their relatives. Pelecanidae, Sulidae, Phalacrocoracidae, Anhingidae, Fregatidae, Phaethontidae. Oxford University Press, Oxford, U.K.
[573] 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
[574] https://ebird.org/region/IN-GJ-AH
[575] https://ebird.org/map/grwpel1?neg=true&env.minX=72.55370770738342&env.minY=22.766732122480054&env.maxX=72.64159833238342&env.maxY=22.801946412295916&zh=true&gp=false&ev=Z&excludeExX=false&excludeExAll=false&mr=1-12&bmo=1&emo=12&yr=all&byr=1900&eyr=2024
[576] https://ebird.org/checklist/S104979859
[577] https://ebird.org/checklist/S33364967
[578] BirdLife International. 2017. Ciconia nigra. The IUCN Red List of Threatened Species 2017: e.T22697669A111747857
[579] BirdLife International. 2017. Ciconia nigra. The IUCN Red List of Threatened Species 2017: e.T22697669A111747857
[580] Hancock, J. A.; Kushlan, J. A.; Kahl, M. P. 1992. Storks, ibises and spoonbills of the world. Academic Press, London.
[581] 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.
[582] 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[583], swampy patches[584], damp meadows[585], flood-plains, pools in dry riverbeds[586], especially where there are stands of reeds or long grass[587]. The species has presence in the surroundings of Ahmedabad[588] , however based on available secondary information extracted from eBird Database[589] (which reports one report with maximum 8 individuals from Thol Bird Sanctuary[590] which is outside the EAAA), it is less likely to meet the threshold i.e. 20-25 (≥1 percent of the global population) for the EAAA.	
58	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[591]. The global population size is estimated at 700,000-704,000 individuals[592, 593]. 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	Screened Out

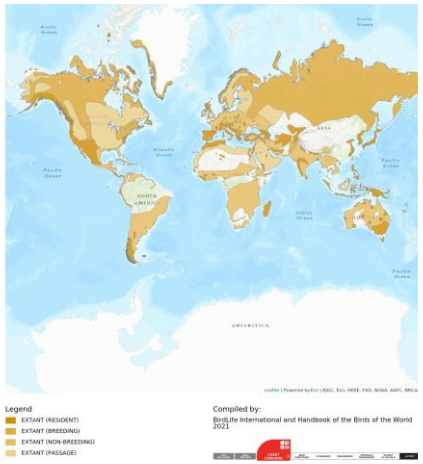
[583] del Hoyo, J., Elliot, A. and Sargatal, J. 1992. Handbook of the Birds of the World, Vol. 1: Ostrich to Ducks. Lynx Edicions, Barcelona, Spain.
[584] Snow, D.W. and Perrins, C.M. 1998. The Birds of the Western Palearctic, Volume 1: Non-Passerines. Oxford University Press, Oxford.
[585] Hancock, J. A.; Kushlan, J. A.; Kahl, M. P. 1992. Storks, ibises and spoonbills of the world. Academic Press, London.
[586] 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.
[587] Brown, L.H., Urban, E.K. and Newman, K. 1982. The Birds of Africa, Volume I. Academic Press, London.
[588] https://ebird.org/region/IN-GJ-AH
[589] https://ebird.org/map/blasto1?neg=true&env.minX=72.24681082891776&env.minY=22.988937171907523&env.maxX=72.59837332891776&env.maxY=23.129508811733263&zh=true&gp=false&ev=Z&excludeExX=false&excludeExAll=false&mr=1-12&bmo=1&emo=12&yr=all&byr=1900&eyr=2024
[590] https://ebird.org/checklist/S40023541
[591] https://animalia.bio/white-stork
[592] Wetlands International. 2015. Waterbird Population Estimates. Available at: wpe.wetlands.org.
[593] https://www.iucnredlist.org/species/22697691/86248677

	 https://www.iucnredlist.org/species/22697691/86248677			there are scattered trees for roosting[594, 595, 596]. During the winter the species shows a preference for drier habitats such as grasslands, steppe, savanna and cultivated fields, often gathering near lakes, ponds, pools, slow-flowing streams, ditches or rivers[597, 598]. Bhal Area and Velavadar National Park are the possible habitats for this migratory species in Gujarat[599]. Definitely, the species has a presence in the surroundings of Ahmedabad[600], however based on available secondary information extracted from eBird Database[601] (which reports maximum 4 individuals from the Ahmedabad International Airport[602] in 2010, and followed by 3 individual from Ellisbridge[603] in Dec 2023) , it is unlikely to meet the threshold i.e. 7,000-7,040 (≥1 percent of the global population) for the EAAA.	
59	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[604]. The European population is estimated at 13,800-22,900 pairs, which equates to 27,600-45,800 mature individuals (BirdLife International in prep.). 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.	Screened Out

[594] Hancock, J. A.; Kushlan, J. A.; Kahl, M. P. 1992. Storks, ibises and spoonbills of the world. Academic Press, London.
[595] del Hoyo, J.; Elliot, A.; Sargatal, J. 1992. Handbook of the Birds of the World, vol. 1: Ostrich to Ducks. Lynx Edicions, Barcelona, Spain.
[596] Snow, D.W.; Perrins, C.M. 1998. The Birds of the Western Palearctic, Volume 1: Non-Passerines. Oxford University Press, Oxford.
[597] Hancock, J. A.; Kushlan, J. A.; Kahl, M. P. 1992. Storks, ibises and spoonbills of the world. Academic Press, London.
[598] del Hoyo, J.; Elliot, A.; Sargatal, J. 1992. Handbook of the Birds of the World, vol. 1: Ostrich to Ducks. Lynx Edicions, Barcelona, Spain.
[599] 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
[600] https://ebird.org/region/IN-GJ-AH
[601] https://ebird.org/map/whisto1?neg=true&env.minX=72.50905460777938&env.minY=22.839829775642926&env.maxX=72.59694523277938&env.maxY=22.875025168461892&zh=true&gp=false&ev=Z&excludeExX=false&excludeExAll=false&mr=1-12&bmo=1&emo=12&yr=all&byr=1900&eyr=2024
[602] https://ebird.org/checklist/S7183627
[603] https://ebird.org/checklist/S156981902
[604] https://www.thainationalparks.com/species/long-legged-buzzard

	 https://www.iucnredlist.org/species/22736562/202674118			It is a species of open areas, particularly steppe and semi-desert, and has been recorded up to 3,500 m[605]. Indeed, the species has a presence in the surroundings of Ahmedabad[606] however based on available secondary information extracted from eBird Database[607] (which reports various observations maximum with 2 individuals from Wadala[608] and solitarily Sabarmati riverfront[609]), it is less likely to meet the threshold i.e. 1,000 to 4,999 (≥1 percent of the global population) for the EAAA.	
60	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[610]. The European population is estimated at 16,100-31,100 pairs, which equates to 32,200-62,100 mature individuals[611]. 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[612]. It inhabits an extreme variety of habitats, tolerating wet and dry, hot and cool climates, from sea level up to c.4,000 m[613]. Undoubtedly the species has a presence in the surroundings of Ahmadabad[614], however based on available secondary information extracted from eBird Database[615](which reports	Screened Out

[605] 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.
[606] https://ebird.org/region/IN-GJ-AH
[607] https://ebird.org/map/lolbuz1?neg=true&env.minX=70.85815089535666&env.minY=22.244803363445282&env.maxX=73.67065089535666&env.maxY=23.37143952671165&zh=true&gp=false&ev=Z&excludeExX=false&excludeExAll=false&mr=1-12&bmo=1&emo=12&yr=all&byr=1900&eyr=2024
[608] https://ebird.org/checklist/S41922091
[609] https://ebird.org/checklist/S154835085
[610] https://www.allaboutbirds.org/guide/Peregrine_Falcon/overview
[611] 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.
[612] https://www.iucnredlist.org/species/45354964/206217909#population
[613] 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.
[614] https://ebird.org/region/IN-GJ-AH
[615]https://ebird.org/map/perfal?neg=true&env.minX=72.48213291168211&env.minY=22.846522225360143&env.maxX=72.57002353668211&env.maxY=22.881715885204233&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/45354964/206217909			maximum 1 individuals from Barej[616]), it is less likely to meet the threshold i.e. 1,000-4,999 (≥1 percent of the global population) for the EAAA.	
	Mammal				
61	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[617]. 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 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[618]. 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 Ahmedabad city and specifically the Project's EAAA[619,620, 621]. The nearest known record of the species is from Chhala town (>40 km from the project location and on the other side of city) during Oct. 2017[622].	Screened Out

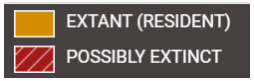
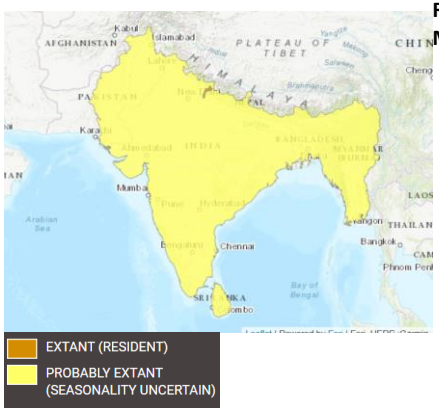
[616] https://ebird.org/checklist/S157668729
[617] Mahmood, T., Challender, D., Khatiwada, A., Andleeb, S., Perera, P., Trageser, S., Ghose, A. & Mohapatra, R. 2019. Manis crassicaudata. The IUCN Red List of Threatened Species 2019: e.T12761A123583998
[618] https://www.wwfindia.org/about_wwf/priority_species/threatened_species/indian_pangolin/
[619] https://www.inaturalist.org/observations?place_id=any&subview=map&taxon_id=43362
[620] https://indiabiodiversity.org/species/show/257364
[621] https://www.gbif.org/species/5219633
[622] https://www.inaturalist.org/observations/200736859

https://www.iucnredlist.org/species/12761/123583998

Other Fauna (Fishes)

62	Wallago (*Wallago attu*) 	**IUCN:** Vulnerable **IWP:** Not listed **Restricted range:** No **Migratory:** NA	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 km2, based on a minimum convex polygon calculated from georeferenced records in GBIF (2019) and the literature[623],[624]. 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, for example with a recorded decline of 26.7% over four decades in southern West Bengal from 1960 to 2000[625]. In another study in northeastern Sunderbans, the species is known to have declined by 99% in four years (1997-2001)[626] , and studies in southern India[627]. indicates that the exploitation rate was greater than where the stock is reduced to half its virgin biomass. 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.	Screened out

[623] Bleeker, P. 1858. De visschen van den Indischen Archipel. Beschreven en toegelicht. Siluri. Acta Societatis Regiae Scientiarum Indo-Neêrlandicae 4: i-xii+1-470.
[624] 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.
[625] 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.
[626] Patra, M. K., Acharjee, S. K. and Chakraborty, S. K. 2005. Conservation categories of siluroid fishes in North-East Sundarbans, India. Biodiversity and Conservation 14: 1863–1876.
[627] Thella, R., Dahanukar, N., Eldho, P.S., Ali, A. and Raghavan, R. 2018. Population dynamics of Wallago attu (Bloch and Schneider 1801) (Osteichthyes, Siluridae) in three small rivers of southern India. Asian Fisheries Science 31: 172–178.

	 https://www.iucnredlist.org/species/166468/174784999		The Wallago attu catfish 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 predatory of the local catfish which thrives well in rivers and tanks, especially in jheels with grassy margins. In order to have other fish species in tanks and reservoirs, this fish needs to be eliminated. 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[628]. The species has been reported from Dekavada and Nathpura areas of Ahmedabad[629], which are about 60 km away from the project location.	
63	Indian Butter Catfish (*Ompok bimaculatus*)  https://www.iucnredlist.org/species/166616/174788267	**IUCN:** Near Threatened **IWP:** Not listed **Restricted range:** No **Migratory:** NA	*Ompok bimaculatus* is widely distributed in Pakistan, India, Sri Lanka, Bangladesh and Myanmar[630]. However, given the uncertainties surrounding the identity of this species, it is possible that its range is more geographically circumscribed. This species is relatively abundant throughout its distribution. No empirical data on declines in its entire range is available, although Mishra et al. (2009)[631] 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%[632]. 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. Inhabits plains and submontane regions, and is found in rivers, lakes, tanks and ponds[633]. Although, the species has a presence in the Gujarat State[634, 635], intensely from Narmada River & tributary[636]; however, no record of the species is available from the Ahmadabad area[637, 638, 639], specifically from the project's EAAA.	Screened out

[628] https://www.iucnredlist.org/species/166468/174784999#habitat-ecology
[629] https://www.inaturalist.org/observations/82644986
[630] Ng, H.H. and R.K. Hadiaty. 2009. Ompok brevirictus, new catfish (Teleostei: Siluridae) from Sumatra. Zootaxa 2232: 50-60.
[631] 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.
[632] 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.
[633] https://www.iucnredlist.org/species/166616/174788267#habitat-ecology
[634] https://www.gbif.org/species/2337651
[635] https://indiabiodiversity.org/species/show/232938
[636] 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.
[637] https://www.gbif.org/species/2337651
[638] https://indiabiodiversity.org/species/show/232938
[639] https://www.inaturalist.org/observations?place_id=any&subview=map&taxon_id=107557

64	Shortfin Eel (*Anguilla bicolor*)  https://www.iucnredlist.org/species/166894/176494582	**IUCN:** Near Threatened **IWP:** Not listed **Restricted range:** No **Migratory:** NA	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 (EPAA 2002)), it is widespread in the tropical Indian Ocean (Seychelles, Madagascar and Mascarenes), east to India, Sri Lanka, Bangladesh, Myanmar. It is found across to northwestern Australia but known only from streams in the Kimberley regions of northwestern Western Australia and Kakadu National Park in the Northern Territory[640]. 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[641]. 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[642]. Although, the species has a presence in the Gujarat State[643]; however, no record of the species is available from the Ahmadabad, specifically from the project's EAAA[644, 645, 646].	Screened out

[640] Allen, G.R., Midgley, S.H. and Allen, M. 2002. Field guide to the Freshwater Fishes of Australia. Western Australian Museum, Perth.
[641] https://www.iucnredlist.org/species/166894/176494582#population
[642] https://www.iucnredlist.org/species/166894/176494582#habitat-ecology
[643] https://www.entomoljournal.com/archives/2020/vol8issue5/PartQ/8-4-538-214.pdf
[644] https://www.gbif.org/species/5712355
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