



MORBI MUNICIPAL CORPORATION

Request for Proposal (RfP) for Design, Engineering, Procurement and Construction of a Sanitary Landfill Facility (SLF) at Morbi including Comprehensive Operation & Maintenance for a Period of 6 Years

Volume III: Employer's Requirements & Scope of Work

2026

Morbi Municipal Corporation (MRMC)

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Structure of the Bidding Documents

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1	Volume – I	Instruction to Bidders (ITB)
2	Volume – II	Conditions of Contract
3	Volume – III	Employer's Requirements and Scope of Work
4	Volume – IV	Price Bid (BOQ)
5	Volume – V	Drawings

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1 Introduction

- a. This document forms part of the Request for Proposal (RfP) issued by Morbi Municipal Corporation (MRMC) for the Design, Engineering, Procurement and Construction (EPC) of a Sanitary Landfill Facility (SLF) at Morbi, Gujarat, including Comprehensive Operation and Maintenance. This document shall be read in conjunction with all other volumes of the tender documents.
- b. The purpose of this document is to:
 - o Define the technical scope of work and minimum performance requirements of the Project;
 - o Specify the Employer's requirements to be complied with by the Contractor;
 - o Establish the design, construction, testing, commissioning, and O&M obligations of the Contractor under the EPC-cum-O&M contract.
- c. Unless otherwise specified, terms and expressions used in this document shall have the meanings assigned to them in the Conditions of Contract. In case of absence of a definition therein, the meanings assigned under applicable laws, standards, and codes shall apply.
- d. Abbreviations used in this document include, but are not limited to:
 - o SLF – Sanitary Landfill Facility
 - o EPC – Engineering, Procurement and Construction
 - o O&M – Operation and Maintenance
 - o MRMC – Morbi Municipal Corporation
 - o SWM Rules – Solid Waste Management Rules, 2016
 - o CPHEEO – Central Public Health and Environmental Engineering Organization
- e. Words importing the singular shall include the plural and vice versa. Headings are used for convenience only and shall not affect the interpretation of this document.
- f. The Project shall be designed, constructed, operated, and maintained in accordance with:
 - o The Solid Waste Management Rules, 2016, as amended from time to time;
 - o Applicable Central and State environmental laws and regulations;
 - o Relevant CPHEEO Manuals and Guidelines;
 - o Applicable Bureau of Indian Standards (BIS) codes;
 - o Relevant ASTM / ISO / international standards, where Indian Standards are not available;
 - o All approvals, consents, and permits issued by statutory authorities.
- g. In the event of any conflict between standards, the more stringent requirement shall prevail.
- h. This document forms a contractual part of the tender and subsequent agreement. The requirements specified herein are minimum requirements, and the Contractor shall be fully responsible for:

- Detailed design and engineering;
 - Selection of appropriate materials and technologies;
 - Compliance with all statutory and performance requirements;
 - Successful execution and operation of the Project for the entire contract period.
- i. Any information provided by the Employer in other volumes, drawings, or memoranda shall not relieve the Contractor of its responsibility to independently assess site conditions, regulatory requirements, and technical feasibility.

2 Project Overview

2.1 Background

- a. Morbi Municipal Corporation (MRMC) is responsible for the scientific management of municipal solid waste (MSW) generated within its jurisdiction, in accordance with the provisions of the Solid Waste Management (SWM) Rules, 2016, as amended from time to time. Morbi city has experienced rapid urbanization and industrial growth over the past decade, particularly driven by the ceramics and allied manufacturing sectors, resulting in a steady increase in municipal solid waste generation.
- b. MRMC is in the process of establishing an Integrated Municipal Solid Waste Processing Facility comprising a Material Recovery Facility (MRF) and a Compressed Biogas (CBG) Plant, a significant fraction of waste in the form of inert material, processing rejects, non-recyclable residues, street sweepings, drain silt, and other non-biodegradable waste will continue to require final disposal.
- c. In order to ensure long-term environmental compliance, MRMC proposes to develop an engineered Sanitary Landfill Facility (SLF), designed specifically for the scientific disposal of residual and inert waste generated after processing of municipal solid waste.

2.2 Objectives of the Project

The key objectives of the Project are as follows:

- a. To establish an engineered and environmentally secure Sanitary Landfill Facility for the disposal of inert waste, processing rejects, and other non-recoverable municipal solid waste;
- b. To ensure full compliance with the Solid Waste Management Rules, 2016, CPCB guidelines, CPHEEO Manual on Municipal Solid Waste Management, and other applicable statutory requirements;
- c. To provide long-term disposal capacity aligned with projected waste quantities through phased development of landfill cells;
- d. To prevent contamination of soil, groundwater, and surface water through the provision of a composite liner system, leachate collection and management infrastructure, landfill gas venting, and storm water management systems;
- e. To establish safe, efficient, and controlled landfill operations, including waste inspection, placement, compaction, daily and intermediate cover application, and environmental monitoring;

2.3 Project Location and Site Context

- a. The proposed Sanitary Landfill Facility (SLF) shall be developed at Lapper village, located within Morbi Taluka of Morbi District, Gujarat, on land allotted to Morbi Municipal Corporation for municipal solid waste disposal purposes.

2.3.1 Site Location

- a. The Project Site is situated on Survey No. 164, Lalpar village, adjacent to the administrative boundary of Morbi city.
- b. The approximate geographic coordinates of the site are as follows:
 - Latitude: 22°48'05.6" N & Longitude: 70°53'36.9" E

- c. The site is strategically located along National Highway-27, ensuring all-weather access for waste transportation vehicles and construction equipment. The location facilitates efficient haulage from existing and proposed waste processing facilities serving Morbi city.
- d. The Employer reserves the right, prior to commencement of the project and subject to Applicable Laws, to change the location of the Sanitary Landfill Facility due to statutory, legal, or administrative reasons.
- e. In the event of such change, the Contractor shall be required to assess the revised site conditions. Any impact on scope, cost, time, statutory approvals (including Environmental Clearance), or design arising solely due to such change shall be addressed in accordance with the provisions for variation under the Conditions of Contract.
- f. No claim shall be admissible for site change unless such change materially affects the scope or statutory obligations of the Contractor.

2.3.2 Land Ownership and Availability

- a. The land identified for development of the SLF has been formally allotted to the Employer by the competent revenue authority. The site comprises the following parcels:
 - Survey No. 164 Paiki A: approximately 5.27 hectares (Selected for development of SLF under this Tender)
 - Survey No. 164 Paiki B: approximately 2.73 hectares (Proposed to be used for future development of SLF)
- b. Survey No. 164 Paiki A has been identified for development of landfill cell along with essential ancillary infrastructure, while the remaining land may be utilized for future expansion, buffer zones, or associated waste management facilities.
- c. The Contractor shall take possession of the site after award of contract and shall be responsible for securing, fencing, and managing the site during the contract period.



Figure 1: Proposed Site for SLF at Lalpar, Morbi

Figure 2: Measurement sheet of Survey No. 164 paiki allotted to Morbi Municipality

2.3.3 Site Access and Connectivity

- a. The Project Site is accessible through an existing approach road connected to National Highway–27. The approach and internal circulation within the site shall be developed and upgraded by the Contractor as part of the Scope of Work to ensure safe and efficient movement of construction equipment and waste transportation vehicles throughout the construction and O&M phases.

2.3.4 Topography and Physical Characteristics

- a. The site exhibits undulating terrain with local variations in ground levels. Portions of the site have previously been utilized for waste dumping activities.
- b. The Contractor shall undertake all necessary topographical, geotechnical, and hydrogeological investigations required for final design and execution of the landfill facility.

2.3.5 Surrounding Land Use

- a. The surrounding land use in the vicinity of the site includes a mix of industrial, agricultural, and sparsely populated rural areas. No dense residential settlements or environmentally sensitive receptors are located in the immediate vicinity of the proposed landfill footprint.

2.3.6 Site Constraints

- a. The Project Site is intersected by high-tension overhead electricity transmission lines, including 220 kV and 66 kV lines. Statutory right-of-way (RoW) and safety clearances applicable to such transmission lines shall be strictly adhered to in the layout, design, and execution of landfill cells and ancillary facilities.
- b. The Contractor shall incorporate all such constraints into the detailed engineering and shall ensure that no permanent structures, waste placement, or operational activities violate applicable safety and clearance requirements.

2.3.7 Statutory and Environmental Context

- a. The site has been assessed for suitability in accordance with the siting criteria specified under the Solid Waste Management Rules, 2016. The proposed development is subject to obtaining all applicable statutory approvals, including Environmental Clearance (EC) and Consent to Establish / Operate from the State Pollution Control Board. However, the Contractor shall be responsible to comply with statutory requirements and for implementing all environmental safeguards prescribed under applicable approvals during construction and operation.

2.4 Overall Scope of the Contract

- a. The scope of the Contract covers the Design, Engineering, Procurement, Construction, Testing, Commissioning, and Comprehensive Operation and Maintenance of a Sanitary Landfill Facility (SLF) at the Lapper site, Morbi, on a EPC basis, followed by Operation and Maintenance (O&M) for a period of six (6) years.
- b. The Contractor shall be solely responsible for delivering a fully functional, environmentally compliant, and operational SLF, capable of receiving, handling, and disposing of residual and inert municipal solid waste in accordance with the requirements of this RfP and Applicable Laws.

2.4.1 Design and Engineering

- a. The Contractor shall undertake complete detailed design and engineering of the SLF, including but not limited to:
 - Landfill cell layout, geometry, and phased development;
 - Subgrade preparation and ground improvement measures;
 - Composite liner system design;
 - Leachate collection, conveyance, storage, and treatment interface;
 - Landfill gas venting and management systems;
 - Storm water drainage and flood protection systems;
 - Internal roads, utilities, and ancillary infrastructure;
 - Structural, electrical, and mechanical systems required for safe operation.
- b. All designs shall comply with the SWM Rules, 2016, CPHEEO guidelines, applicable BIS standards, and conditions stipulated in statutory approvals.

2.4.2 Procurement

- a. The Contractor shall procure all materials, equipment, plant, machinery, tools, and consumables necessary for execution of the Project, including but not limited to:
 - Geosynthetics and liner materials;
 - Drainage media and piping systems;
 - Pumps, electrical panels, and instrumentation;
 - Construction equipment and vehicles.
- b. All procured items shall conform to the specifications and quality requirements specified in the Contract.

2.4.3 Construction and Installation

- a. The construction scope shall include, inter alia:
 - Site preparation, clearing, grading, and earthworks;
 - Excavation and formation of landfill cells;
 - Installation of liner systems and drainage layers;
 - Construction of leachate management facilities;
 - Development of internal roads, storm water drains, and utilities;
 - Construction of ancillary buildings and facilities;
 - Testing, inspection, and quality control during execution.
- b. The Contractor shall ensure that construction activities are carried out in a safe, environmentally compliant manner without disruption to existing waste management operations.

2.4.4 Testing and Commissioning

- a. The Contractor shall carry out all necessary testing and commissioning activities to demonstrate that the SLF and its associated systems meet the performance requirements specified in the Contract. This shall include:
 - Integrity testing of liner systems;
 - Functional testing of leachate and drainage systems;
 - Verification of environmental protection measures;

2.4.5 Operation and Maintenance (6 Years)

- a. Upon commissioning, the Contractor shall undertake comprehensive O&M of the SLF for a period of six (6) years, including but not limited to:
 - Receipt, inspection, placement, and compaction of waste;
 - Application of daily and intermediate cover;
 - Operation of leachate and gas management systems;
 - Environmental monitoring and reporting;
 - Maintenance of civil, electrical, and mechanical systems;
 - Deployment of trained manpower and supervision;
 - Compliance with all statutory and contractual requirements.

2.4.6 Statutory Compliance and Environmental Clearance

- a. The Contractor shall be solely responsible for obtaining all statutory approvals, consents, permissions, and clearances required for the design, construction, commissioning, operation, and maintenance of the Sanitary Landfill Facility, including environment clearance, Consent to Establish, and Consent to Operate, in accordance with Applicable Laws.

2.5 Contract Type and Duration

2.5.1 Contract Type

- a. The Project shall be implemented under a single, integrated Engineering, Procurement and Construction (EPC) contract, coupled with Comprehensive Operation and Maintenance (O&M) for a defined period, on a turnkey basis.
- b. Under this Contract:
 - The Contractor shall assume full responsibility for design, engineering, procurement, construction, testing, commissioning, and successful operation of the Sanitary Landfill Facility (SLF);
 - The Contract shall be performance-based, with the Contractor obligated to meet all technical, environmental, and operational performance requirements specified in the Tender Documents;
 - The Contractor shall bear full design and construction risk, including adequacy of design, selection of materials and technologies, constructability, and compliance with Applicable Laws.

- The Contract shall be executed as an item-rate EPC contract for the construction phase, based on the Bill of Quantities (BOQ), together with a lump-sum / annual O&M contract for the Operation and Maintenance phase.

2.5.2 Contract Duration

The total duration of the Contract shall comprise the following distinct phases:

Table 1: Contract Duration of the Project

Sn.	Project Phase	Time Period	Remarks
1	Design, Engineering & Environmental Clearance (EC)	12 Months	<p>This phase shall commence from the Date of Award / Date of Commencement as defined in the Conditions of Contract and shall include;</p> <ul style="list-style-type: none"> • Detailed design and engineering; • Appointment of NABET-accredited consultant • Preparation and submission of Form-I and other required documents • Approval of TOR • Environmental Baseline Studies • Preparation of EIA and EMP • Obtaining statutory and other applicable consent / permits / approvals / NOC • Public consultation (if applicable) • Project appraisal • Grant of EC.
2	Construction (including Testing & Commissioning)	12 Months	<p>This phase commence from the date of receipt of Environment Clearance.</p> <p>This phase includes</p> <ul style="list-style-type: none"> • Detailed design and engineering; • Procurement of materials and equipment; • Construction and installation of all Project components; • Testing and commissioning of the SLF.
3	Operation & Maintenance (O&M)	6 Years	<p>O&M phase shall commence from issuance of Provisional Acceptance Certificate.</p> <p>The O&M Phase shall include:</p> <ul style="list-style-type: none"> • Day-to-day operation of the landfill facility; • Maintenance of all civil, electrical, and mechanical systems; • Environmental monitoring and statutory compliance; • Performance reporting and documentation. <p>As per the requirement of the project, the Operation and maintenance period may be extended by the Employer on mutually agreed term and conditions</p>

2.5.3 Defect Liability and Performance Obligations

- a. The Contractor shall be responsible for rectification of defects and non-conformities in accordance with the Defect Liability provisions specified in the Conditions of Contract. Performance obligations during the O&M period shall be governed by the performance standards and key performance indicators (KPIs) defined in the Tender document.

2.6 Interface with Existing / Proposed Facilities

- a. The Contractor shall be solely responsible for identifying, managing, coordinating, and resolving all interfaces between the Works under this project and any existing or proposed facilities, utilities, services, and infrastructure within or adjacent to the Project Site.
- b. The Contractor shall ensure that all such interfaces are duly considered in the design, construction methodology, construction schedule, and Operation and Maintenance plans.

2.6.1 Interface with Existing Waste Management Facilities

- a. Where existing waste handling, disposal, or ancillary operations are ongoing at or near the Project Site, the Contractor shall:
 - Plan and execute the Works in a manner that does not disrupt or obstruct such operations;
 - Provide temporary arrangements, diversions, or protection measures, as required, to ensure continuity of services;
 - Coordinate closely with the Employer or its authorised representatives for sequencing of activities.
 - No additional payment or extension of time shall be admissible on account of such interface requirements.

2.6.2 Interface with Proposed Waste Processing Facilities

- a. The Contractor acknowledges that the Sanitary Landfill Facility is intended to receive residual and inert waste from proposed waste processing facilities, including but not limited to Material Recovery Facilities (MRF) and Compressed Biogas (CBG) Plants.
- b. The Contractor shall ensure that:
 - The SLF design and operational systems are compatible with the quantity and characteristics of such residual waste;
 - Waste acceptance, internal haulage, and disposal operations are adequately coordinated;
 - Flexibility is provided to accommodate variations in waste inflow.

2.6.3 Interface with External Utilities and Services

- a. The Contractor shall be responsible for coordination with all utility providers and external agencies for power supply, water supply, drainage, telecommunications, and any other services required for execution and operation of the Project.
- b. Any relocation, protection, modification, or augmentation of existing utilities required for execution of the Works shall be carried out by the Contractor at its own cost, unless expressly stated otherwise in the Contract.

2.6.4 Design Responsibility at Interfaces

- a. The Contractor shall ensure that all designs adequately address interface conditions, including but not limited to:
 - Structural and geotechnical compatibility;
 - Hydraulic and drainage continuity;
 - Electrical and mechanical integration;
 - Operational safety and environmental protection.
 - The Contractor shall bear full responsibility for any failure, defect, or non-performance arising due to improper interface design or coordination.

2.6.5 Interface during Construction Phase

- a. During construction, the Contractor shall:
 - Maintain safe access for all authorised vehicles and personnel;
 - Implement traffic management and safety measures;
 - Prevent damage to existing facilities and utilities;
 - Restore any disturbed facilities to their original or improved condition.
- b. Any damage caused to existing infrastructure due to the Contractor's activities shall be rectified promptly at the Contractor's cost.

2.6.6 No Claim Clause

- a. The Contractor shall be deemed to have taken into account all interface requirements while preparing its Bid.
- b. No claim for additional cost, compensation, or extension of time shall be entertained on account of interface-related constraints, coordination requirements, or sequencing of works, except where such issues arise solely due to written instructions or omissions attributable to the Employer.

3 Regulatory Requirements & Technical Specifications of SLF

- a. The Sanitary Landfill Facility (SLF) shall be planned, designed, constructed, operated, closed, and maintained in strict compliance with the following:
 - Solid Waste Management Rules, 2016 (as amended),
 - CPHEEO Manual on Municipal Solid Waste Management
 - Applicable advisories, environmental clearance conditions, and statutory approvals
- b. In case of conflict, the provisions of SWM Rules, 2016 and CPHEEO Manual shall prevail.
- c. The Contractor is required to design, engineer, construct, operate and maintain the proposed SLF as per the requirements and specifications mentioned in the SWM Rules, 2016 and CPHEEO Manual

3.1 Specifications for Sanitary Landfills as per the SWM Rules, 2016

The Solid Waste Management (SWM) Rules, 2016, issued by the Ministry of Environment, Forest and Climate Change (MoEF&CC), constitute the primary regulatory instrument governing the scientific management of municipal solid waste across all urban and rural jurisdictions in India. The SWM Rules, 2016, provide detailed engineering, environmental, and management specifications for the planning, design, development, and post-closure care of sanitary landfills. These technical requirements, contained in Schedule I of the Rules, are applicable to all new sanitary landfill facilities and directly inform the engineering design basis of the proposed SLF for Morbi.

3.1.1 Criteria for Site Selection

- a. According to Schedule I of the SWM Rules, 2016, SLF site must be sufficiently distanced from sensitive receptors. Schedule I specifies exclusion distances of at least **100 metres from rivers, 200 metres from ponds, 200 metres from highways, habitations, public parks, and water supply wells, and 20 kilometres from airports and airbases** (with a permissible reduction to 10 km subject to aviation authority clearance).
- b. Landfills are prohibited in floodplains, wetlands, coastal regulation zones, or eco-sensitive areas.
- c. A designated buffer zone must be provided around the landfill boundary, the width of which must be determined in consultation with the State Pollution Control Board.

3.1.2 Criteria for Development of Facilities at the Sanitary Landfill

- a. As per Schedule I of the SWM Rules, 2016, landfill sites must be fenced and equipped with controlled entry gates to prevent unauthorized access.
- b. Internal and approach roads must be paved to avoid dust generation and to ensure safe movement of vehicles.
- c. Facilities for waste inspection, office operations, equipment storage, drinking water, sanitation, fire protection, wash-down areas for vehicles, and site lighting must be provided.
- d. A weighbridge must be installed to record incoming waste quantities, and an inspection area must be available to verify waste characteristics.

3.1.3 Specifications for Landfilling Operations and Closure

- a. Waste placed in the landfill must be compacted in thin layers using heavy machinery to achieve high density.
- b. Daily cover of at least 10 cm of soil or inert material is mandatory to minimize odour, control vectors, and reduce fire risk.
- c. Prior to monsoon, an intermediate cover of 40–65 cm must be applied along with surface grading and drainage channels to prevent infiltration.
- d. Upon completion of a landfill cell, a final cover must be constructed to minimize infiltration and erosion. As per Schedule I, the final cover must include:
 - a 60 cm barrier soil layer (with permeability $< 1 \times 10^{-7}$ cm/s),
 - a 15 cm drainage layer, and
 - a 45 cm vegetative layer to stabilize the surface and limit erosion.

3.1.4 Criteria for Pollution Prevention

- a. A non-permeable composite liner system consisting of 1.5 mm HDPE geomembrane over 90 cm of compacted clay or amended soil (permeability $< 1 \times 10^{-7}$ cm/s) must be installed at the base and walls of the landfill.
- b. The highest groundwater table must be at least 2 metres below the bottom of the clay layer.
- c. A scientifically designed leachate collection, storage, and treatment system is mandatory, ensuring that no untreated leachate is discharged to the environment. Storm water drains must be constructed to prevent mixing of storm water with leachate and to avoid waterlogging or erosion.
- d. The treated leachate shall be recycled or utilized as permitted, otherwise shall be released into the sewerage line, after meeting the standards specified in Schedule- II of the Rule.
- e. **Standards for treated leachates:** The disposal of treated leachates shall meet the following standards, namely:

Table 2: Standards for treated leachates

S. No	Parameter	Standards (Mode of Disposal)		
		Inland surface water	Public sewers	Land disposal
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 °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

S. No	Parameter	Standards (Mode of Disposal)		
		Inland surface water	Public sewers	Land disposal
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 ₆ H ₅ OH) mg/l, max.	1.0	5.0	-

Note: While discharging treated leachates into inland surface waters, quantity of leachates being discharged and the quantity of dilution water available in the receiving water body shall be given due consideration.

3.1.5 Criteria for Water Quality Monitoring

- Baseline groundwater quality data must be established before commissioning of the landfill.
- Groundwater samples must be collected within 50 metres of the landfill boundary during summer, monsoon, and post-monsoon seasons to ensure that leachate infiltration does not contaminate groundwater.
- Usage of groundwater in and around landfill sites for any purpose (including drinking and irrigation) shall be considered only after ensuring its quality.
- The following specifications for drinking water quality shall apply for monitoring purpose:

Table 3: Water quality parameters

S. No.	Parameters	IS 10500:2012, Edition 2.2(2003-09) Desirable limit (mg/l except for pH)
1	Arsenic	0.01
2	Cadmium	0.01
3	Chromium(as Cr ⁶⁺)	0.05
4	Copper	0.05
5	Cyanide	0.05
6	Lead	0.05
7	Mercury	0.001

S. No.	Parameters	IS 10500:2012, Edition 2.2(2003-09) Desirable limit (mg/l except for pH)
8	Nickel	-
9	Nitrate as NO ₃	45.0
10	pH	6.5-8.5
11	Iron	0.3
12	Total hardness (as CaCO ₃)	300.0
13	Chlorides	250
14	Dissolved solids	500
15	Phenolic compounds (as C ₆ H ₅ OH)	0.001
16	Zinc	5.0
17	Sulphate (as SO ₄)	200

3.1.6 Criteria for Ambient Air Quality Monitoring and Gas Management

- A landfill gas management system must be installed to collect, vent, flare, or utilize landfill gas to prevent off-site migration and reduce odour and greenhouse gas emissions.
- Methane concentration must not exceed 25% of the Lower Explosive Limit (LEL).
- Ambient air quality must be monitored regularly in accordance with CPCB standards, and odour control measures must be implemented as necessary.

3.1.7 Criteria for Plantation at Landfill Site

- A vegetative cover comprising drought-resistant, locally suitable, non-edible plant species with shallow root systems must be developed over capped landfill surfaces. Plant roots should not penetrate more than 30 cm into the soil until the landfill stabilizes.
- A peripheral green belt must be developed around the boundary.

3.2 CPHEEO Guidelines on SLF

- The Central Public Health and Environmental Engineering Organization (CPHEEO), under the Ministry of Housing and Urban Affairs, provides the authoritative national engineering, planning, and operational standards for the development of sanitary landfill facilities in India.
- The guidelines presented in the CPHEEO Manual on Municipal Solid Waste Management (Part II) offer a comprehensive framework that expands upon the Solid Waste Management Rules, 2016, by describing in detail the technical, environmental, and administrative requirements for scientifically managed landfill facilities.
- These guidelines cover every major stage of a landfill's lifecycle and emphasize environmental protection, public health safeguards, operational reliability, and engineering integrity.
- The CPHEEO Manual states that sanitary landfills must be designed as engineered, multi-component systems intended to isolate waste from the environment and to prevent contamination of soil, groundwater, and surface water.

- e. The planning and design of sanitary landfills, as described in the CPHEEO Manual, follow a structured approach that begins with detailed investigations of soil, hydrogeology, topography, climate, and land use.
- f. A critical component of CPHEEO guidance is the engineering design of the base liner system. The Manual requires a composite liner that includes a thick layer of compacted clay or amended soil, combined with a high-density polyethylene geomembrane, in order to minimize permeability and prevent leachate infiltration. Above the liner, the Manual requires the placement of a granular drainage layer to facilitate leachate movement toward collection pipes and sumps.

3.2.1 Composite Liner System:

The composition of the base sealing system has to be in compliance with SWM Rules, 2016 and should consist of the following:

- a. Mineral sealing liner: It comprises three layers of clay or equivalent amended soil, at least 30 centimeters (cm) thickness each. In case adequate clay is not found in the vicinity, amended soil mixed with bentonite can be used. The permeability of the mineral sealing must be less than $k_f \leq 1 \times 10^{-7}$ cm per second (cm/s).
- b. Geosynthetic clay liner: In hilly regions, the mineral part of the sealing system can be reinforced by a geosynthetic clay liner, if clay or natural soil for bentonite mixture is not available in sufficient quantity at an acceptable transportation distance.
- c. High-density polyethylene geomembrane: The high-density polyethylene (HDPE) geomembrane should have a standardized thickness of 1.5 millimeter (mm). Only HDPE geomembranes that comply with the requirements of American Society for Testing and Materials (ASTM) or corresponding standards should be used.
- d. Protection layer: A protection layer (of silty soil) should be 20–30 cm thick or, alternatively, a protection layer (geotextile) should be 400 grams per square meter (g/m²) for bottom liner and 200 g/m² for top cover, depending on the landfill height. If the planned height (height + depth) of the landfill is more than 20 m, geotextile should be 800 g/m².
- e. Leachate drainage layer: A leachate drainage layer should be 30 cm thick made of filter gravel, ensuring a permeability greater than 10-2cm/sec.

3.2.2 Leachate Collection System (LCS):

The leachate collection system and its components are to be laid over the HDPE geomembrane. The leachate collection and management system is to be designed to accommodate peak leachate flows, particularly during monsoon seasons, and the Manual describes the need for lined leachate holding ponds or treatment systems. Leachate must be managed in a manner that prevents untreated discharge to water bodies or soil, and the CPHEEO Manual outlines several treatment options depending on the characteristics of the leachate.

- a. Gravel Drainage Layer: The Leachate Collection system (LCS) layer consists of a 30 cm thick gravel drainage layer of 25–50 mm rounded gravel. The slope of the gravel drainage layer follows the minimum slopes required for the leachate collection system and inclines toward the collection point.
- b. LCS Pipes: Drain pipes are made of HDPE and slotted or holed on 2/3 of the pipe circumference. The diameter should be minimum 200 mm for secondary and 250 mm for main leachate pipes. The mentioned diameters should not undercut to allow

controlling by remote camera systems. The wall thickness of pipes has to be calculated under the consideration of the overburden stress due to filling height of waste. Perforated HDPE pipes are embedded in this gravel layer. The networks of HDPE pipes collect the leachate and are connected to a LCS sump(s). Leachate from the sump(s) is to be pumped to the proposed leachate treatment plant for disposal. The specified distance between the secondary drain pipes should be around 40 m. At the end of the secondary leachate collection pipes, access windows for inspection and cleansing of pipes should be installed. The HDPE pipes are connected by welding.

- c. Geotextile Layer: Further protection from clogging in the LCS will be provided by a nonwoven geotextile installed above the entire stone drainage blanket. The geotextiles on top of the stone act as a separator layer between the drainage blanket and the solid waste and also provides additional filtering capacity to help maintain the high permeability of the underlying drainage layer. At no time should vehicles be allowed to pass over the geotextile without a buffer layer in between.
- d. The leachate collection sumps, in some cases, are located within the foot print of the landfill. The actual design configuration should be according to the local site conditions and height and depth of the landfill.
- e. The primary criterion for design of the leachate collection system is that all leachate should be collected and removed from the landfill at a rate sufficient to prevent a hydraulic head greater than 12 inches from occurring at any point over the lining system. The system is designed to remove the accumulation of storm water resulting from a 25-year, 24-hour storm, within 72 hours. Other design criteria include the following:
 - Bottom of the leak detection layer and the leachate collection layer is sloped at a minimum 2%;
 - Granular drainage layer is 1 foot thick with hydraulic conductivity of $>1 \times 10^{-2}$ cm/s;
 - The system must be designed to minimize clogging;
 - The system is located above the seasonally high water table.

3.2.3 Leachate Storage and Treatment

- a. Provide leachate ponds or sumps with HDPE lining for the storage of leachate as per the guidelines
- b. Leachate treatment shall be done through on-site treatment plant, or Co-treatment at STP (subject to feasibility), or Recirculation / evaporation ponds (where permitted)
- c. The type of treatment facilities to be used depends on the leachate characteristics and volume. Typically, treatment may be required (prior to discharge) to reduce the concentration of biodegradable and non-biodegradable organic material, specific hazardous constituents, ammonia and nitrate ions, sulfides, odorous compounds, and suspended solids.
- d. Based on the chemical characteristics of the leachate, treatment may include biological processes (e.g., aeration, activated sludge, nitrification or denitrification); chemical processes (e.g., oxidation, neutralization); and physical processes (e.g., air stripping, activated adsorption, ultrafiltration, etc.).
- e. Under no circumstances shall untreated leachate be discharged into the open environment.

3.2.4 Landfill Gas Management:

- a. Gas management forms another essential component of CPHEEO guidance. The Manual describes the processes by which landfill gas forms within the waste mass, and it mandates the installation of systems capable of venting, collecting, flaring, or utilizing the gas to prevent explosion hazards, odour issues, or uncontrolled emissions. The guidelines note that landfill gas systems must be designed to prevent gas migration outside the landfill boundaries and that monitoring must be carried out regularly to detect, quantify, and manage gas emissions.
 - i. Controlled passive gas venting shall be mandatory for all SLFs
 - ii. Active gas collection, flaring, or energy recovery systems shall be provided where technically and economically feasible
 - iii. Methane concentration shall not exceed 25% of Lower Explosive Limit (LEL)

3.2.5 Waste Placement, Compaction, and Cover:

- b. The CPHEEO Manual places equally strong emphasis on waste placement, compaction, and covering practices. Waste must be placed in thin lifts and compacted using appropriate machinery to achieve the highest practicable density. Daily cover material must be applied to reduce odours, control vectors, and minimize fire hazards. Intermediate cover must be placed before monsoon seasons, and the final cover system applied upon closure must include a barrier soil layer, a drainage layer, and a vegetative layer designed to minimize infiltration and erosion. The design of the final cover is critical in ensuring long-term site stability and environmental protection.
- c. **Compaction:** Waste shall be placed in thin layers (≤ 500 mm). Waste layer shall be compacted to achieve high density.
- d. **Cover System**
 - i. Daily Cover: Minimum 100 mm soil / inert material
 - ii. Intermediate Cover: Minimum 300 to 450 mm
 - iii. Final Cover System:
 - a. 600 mm clay / amended soil ($k \leq 1 \times 10^{-7}$ cm/sec)
 - b. 300 mm drainage layer
 - c. 450 mm vegetative soil layer

3.2.6 Storm water management

- a. Storm water management is treated as a mandatory requirement in landfill design. The Manual states that landfill surfaces must be graded to prevent ponding and that storm water diversion channels or embankments must be constructed to direct clean runoff away from active landfill areas. This requirement is especially important during heavy rainfall periods, during which uncontrolled storm water can increase leachate generation and contribute to slope instability.

3.2.7 SLF infrastructure:

- a. The CPHEEO Manual further outlines the infrastructure that must be included at every sanitary landfill facility. This includes an all-weather access road, internal roads connecting landfill cells, weighbridges for quantifying incoming waste, administrative and control buildings, workshops, vehicle cleaning facilities, and fire protection

systems. The Manual also specifies the need for site security, fencing, lighting, and signage to ensure that landfill operations are conducted safely and in compliance with local regulations.

b. Access Road and Internal Roads

- i. The access road to a sanitary landfill should be 6.5 m wide with two lines, and shall have 20 cm stabilized sub-foundation layer.
- ii. Roads within the site should have 3.0 m width of roadways, and 40–50 cm foundation layer made of broken material or demolition waste.

c. Equipment and Resources:

The Sanitary landfill should be supplied with:

- i. water supply,
- ii. energy,
- iii. communication,
- iv. sewage system,
- v. external lighting, and
- vi. firefighting (external)

d. Waste Inspection Area or Emergency Area: The incoming waste has to be controlled within the entrance area. This area will also be used for parking during bad weather conditions while waste disposal on the landfill site is not possible.

e. Security and Fencing: Site security is among the most important considerations in landfills. The site should be secured to implement a good standard of service. In order to achieve this, the site has to be peripherally fenced and access to the landfill should be limited to one entrance gate, which should be blocked when the site is unattended. The fence will also keep children, unwanted or unorganized scavengers, cattle, and other animals out of the site. It will also protect litter to be blown out of the landfill site.

f. Tyre Cleaning Unit: The tyre cleaning unit consists of concrete and a removable horizontal steel grit. The water of the tire cleaning unit will be discharged by a mobile pump to the leachate collection system. The mud will be excavated by a loader and disposed of at the landfill.

g. Weighbridge and Control Building: The control building should be next to the main entrance gate of the landfill and should have electronic installations inside for control of the weighbridge. The area of the control building should be about 25 m². The weighbridge should be adjacent to the control building.

h. Administration Building: The administration building should include manager's office, offices for manager's secretary and assistants, meeting room, cafeteria, kitchen, toilets and showers, dressing room, resting room and storage.

i. Garage and Workshop: The garage is needed to shelter and to repair all mechanical equipment in the landfill (except landfill compactor and bulldozer). The workshop or repair-center in the garage should be a completely independent unit. Except for the costly or composite parts, the depots of the garage should carry spare parts of vehicles, compactors, and other equipment, according to the service contract signed by the suppliers of the equipment and the municipality.

- j. **Compactor Shed:** The compactor shed should be located next to the disposal area. This building serves as a protection for the landfill compactor and bulldozer from bad weather conditions while they are not in operation.

3.2.8 Environmental Monitoring

- a. The Manual also provides recommendation on the Environmental monitoring system. The Manual suggests landfill operators to install groundwater monitoring wells up gradient and down gradient of the landfill site, and to conduct periodic sampling of groundwater, surface water, leachate, and ambient air. Monitoring is required throughout both the operational and post-closure phases of the facility. Parameters such as methane, carbon dioxide, odour, suspended particulate matter, and ammonia must be monitored to assess the environmental performance of the landfill and to ensure compliance with environmental quality standards.

3.2.9 Closure and post-closure care

- a. The Manual includes detailed guidance on closure and post-closure care. Once a landfill cell or the entire facility reaches capacity, it must be sealed with the final cover system. Thereafter, the site must be monitored for settlement, vegetation growth, leachate levels, gas emissions, and structural stability. Maintenance must continue throughout the post-closure period to ensure that the landfill remains environmentally secure and poses no risks to surrounding communities or natural resources

3.3 MoEF&CC Requirements for Environmental Clearance (EC)

- a. The development of a Sanitary Landfill Facility (SLF) is governed by the regulatory framework established by the Ministry of Environment, Forest and Climate Change (MoEF&CC) under the Environmental Impact Assessment (EIA) Notification, 2006, and its subsequent amendments. As per the Notification, waste management projects, specifically those falling under the category of Common Municipal Solid Waste Management Facilities, are covered under Item 7(i) of the Schedule to the EIA Notification. Such projects require prior Environmental Clearance (EC) from the competent authority before commencement of any construction or operational activity.
- b. Sanitary landfill facilities intended for the disposal of municipal solid waste are categorized as Category B1 projects, which fall under the jurisdiction of the State Environment Impact Assessment Authority (SEIAA) of the respective state, unless they are located within environmentally sensitive zones or meet criteria that elevate them to Category A projects requiring appraisal at the central level. For the proposed SLF in Morbi, the project is expected to be appraised by the Gujarat SEIAA through the State Expert Appraisal Committee (SEAC), subject to verification of site-specific characteristics and compliance with screening requirements.

3.3.1 Process of obtaining EC

- a. Obtaining Environmental Clearance requires the project proponent to undertake a structured environmental appraisal process comprising the following key stages:
 - i. **Submission of Form 1 and Pre-Feasibility Report (PFR):** The initial application for EC must include Form-1 and a Pre-Feasibility Report detailing the nature, location, scale, environmental setting, and preliminary impacts of the proposed SLF. This submission enables the SEAC to conduct a preliminary appraisal and determine the scope of environmental studies required.
 - ii. **Issue of Terms of Reference (ToR) for EIA:** Based on its initial evaluation, the SEAC issues a formal Terms of Reference (ToR) outlining the scope, methodology,

and parameters for conducting the Environmental Impact Assessment (EIA) study. The ToR typically includes requirements related to baseline environmental monitoring, impact prediction, risk assessment, mitigation measures, and preparation of an Environmental Management Plan (EMP).

- iii. **Environmental Impact Assessment (EIA) Study:** In accordance with the approved ToR, a detailed EIA study must be undertaken by a NABET-accredited EIA consultant, covering baseline data collection across three seasons, environmental modelling, impact analysis, risk and hazard assessment, and preparation of an EMP. The EIA identifies potential impacts of the SLF on land, water, air, ecology, socio-economic conditions, and public health, and recommends suitable mitigation and monitoring strategies.
 - iv. **Public Consultation:** For Category B1 projects such as the SLF, a public hearing is generally required, conducted by the Gujarat Pollution Control Board (GPCB). The purpose of the public consultation is to gather feedback from local communities and stakeholders and to integrate their concerns into project planning and impact mitigation.
 - v. **Appraisal by SEAC and Approval by SEIAA:** After submission of the draft and final EIA reports, the SEAC undertakes a detailed appraisal of the project. Upon satisfactory review, the Committee makes a recommendation to the SEIAA, which subsequently issues or denies the Environmental Clearance based on statutory compliance, environmental feasibility, and public interest considerations.
 - vi. **Post-EC Compliance Requirements:** Once EC is granted, the project proponent must adhere to all stipulated conditions, including environmental monitoring, submission of compliance reports at prescribed intervals, implementation of mitigation measures, and reporting of any changes in project scope to the SEIAA and GPCB.
- b. The Environmental Impact Assessment (EIA) shall be prepared separately by an authorized and accredited EIA consultant in accordance with the approved ToR issued by SEAC. The EIA report shall be submitted along with the necessary documentation during the EC application process.
 - c. Compliance with the EC process is a mandatory prerequisite for the commencement of construction and operation of the SLF and forms an integral component of the statutory framework governing waste management infrastructure in India.

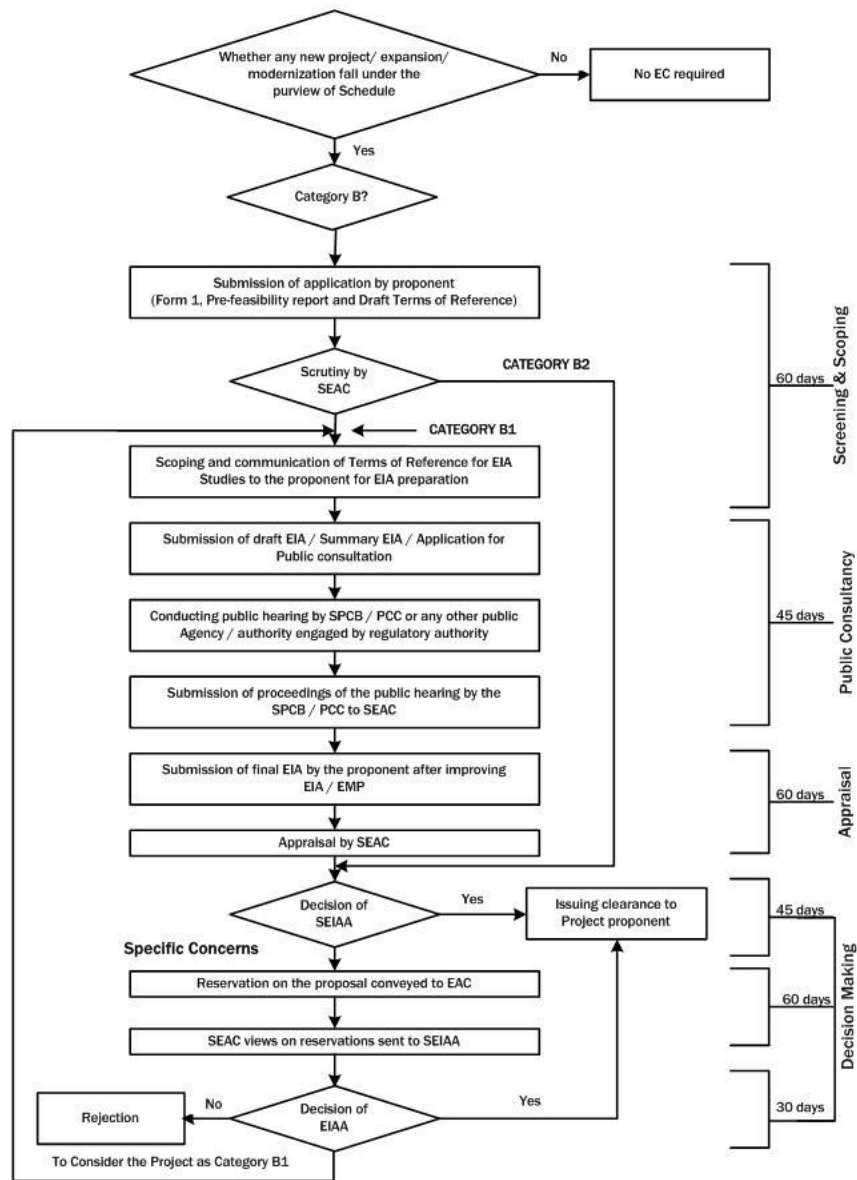


Figure 3: Prior Environmental Clearance Process for Activities Falling Under Category B

4 Employer's Requirements - General

- a. The Employer intends to develop the proposed Sanitary Landfill Facility (SLF) as a scientifically engineered and environmentally compliant forming an integral component of the overall municipal solid waste management system of Morbi city.
- b. The Project shall be implemented on a performance-based EPC-cum-O&M framework, wherein the Contractor shall assume full responsibility for delivering a facility that meets or exceeds the technical, environmental, and operational performance requirements specified in the Tender Documents.

4.1 Design Responsibility and Obligations of the Contractor

4.1.1 Overall Design Responsibility

- a. The Contractor shall have full, sole, and exclusive responsibility for the complete design and engineering of the Sanitary Landfill Facility (SLF) and all associated works under the Contract.
- b. The design prepared by the Contractor shall be fit-for-purpose.
- c. The Contractor shall ensure that the facility is designed such way that it meets all performance requirements specified in the Tender Documents and complies with Applicable Laws, statutory approvals, and regulatory conditions;
- d. The components designed by the contractor shall be safe, durable, operable, and maintainable throughout the Contract Period and design life.

4.1.2 Scope of Design and Engineering

- a. The Contractor's design scope shall include, but not be limited to:
 - i. Detailed engineering of landfill cell, including geometry, phasing, slopes, stability, and settlement considerations;
 - ii. Design of subgrade preparation and ground improvement measures, if required;
 - iii. Design of composite liner systems, including barrier layers, protection layers, and interfaces;
 - iv. Design of leachate collection, conveyance, storage, treatment interface, and monitoring systems;
 - v. Design of landfill gas venting and management systems;
 - vi. Design of storm water drainage, flood protection, and erosion control systems;
 - vii. Design of internal roads, utilities, ancillary buildings, and support infrastructure;
 - viii. Design of electrical, mechanical, and instrumentation systems required for safe and efficient operation.

4.1.3 Compliance with Standards and Approvals

- a. All designs shall:
 - i. Conform to the Solid Waste Management Rules, 2016, Environmental Clearance conditions, CPHEEO guidelines, and applicable BIS / international standards;
 - ii. Be consistent with good engineering practices and current industry standards;
 - iii. Incorporate conditions imposed by statutory authorities and regulatory agencies.

- iv. In case of conflict between standards or requirements, the most stringent requirement shall prevail.

4.1.4 Site Investigations and Data Verification

- a. The Contractor shall be responsible for conducting all necessary topographical, geotechnical, hydrogeological, and environmental investigations required for final design.
- b. The Contractor shall be responsible to carry out underground utility survey and scanning of the roads for utility shifting, if any and shall be required to obtain all required approvals from the relevant authorities as may be required to carry out the utility shifting.
- c. Any data or information provided by the Employer shall be treated as indicative only, and the Contractor shall independently verify such information. No claim shall be entertained on account of differences between indicative data and actual site conditions.

4.1.5 Design Submittals and Reviews

- a. The Contractor shall submit all designs, drawings, calculations, and technical documents to the Employer or its authorized representative for review, in accordance with the Contract.
- b. Review or comments by the Employer shall be limited to general conformity with Employer's Requirements and shall not relieve the Contractor of its design responsibility;
- c. The review by Employers or its authorised representative shall not be construed as approval of design adequacy or fitness for purpose.

4.1.6 Design Coordination with O&M Requirements

- a. The Contractor shall ensure that the design:
 - Facilitates safe, efficient, and compliant operation of the landfill;
 - Minimises long-term operational and maintenance risks;
 - Provides adequate access for monitoring, inspection, and maintenance;
 - Incorporates instrumentation and monitoring systems as required under statutory approvals.

4.2 Minimum Technical and Performance Requirements

- a. The Sanitary Landfill Facility (SLF) to be designed, constructed, commissioned, operated, and maintained by the Contractor shall, at a minimum, comply with the technical, environmental, and operational performance requirements specified in this Section.
- b. The following requirements represent the minimum acceptable standards. The Contractor shall be free to propose enhanced designs, materials, or technologies, provided that such enhancements meet or exceed the minimum performance criteria and comply with Applicable Laws and statutory approvals.
- c. The **SLF** shall be designed for;
 - i. the design capacity and design life specified in the Tender Documents and Environmental Clearance conditions;

- ii. Settlement, long-term stability, and post-closure considerations shall be explicitly incorporated in the design.
- d. The landfill cells shall be designed and constructed to ensure;
 - i. Structural stability under all anticipated loading conditions, including waste load, equipment load, rainfall events, and seismic conditions.
 - ii. Slope stability for interim and final slopes, with appropriate factors of safety.
 - iii. Controlled waste placement, compaction, and covering to minimize voids, settlement, odour, vectors, and fire risk.
- e. The **composite liner system** shall be designed and installed to;
 - i. Prevent migration of leachate into surrounding soil and groundwater.
 - ii. Withstand mechanical stresses due to waste load, settlement, and temperature variations.
 - iii. Maintain long-term integrity throughout the operational life of the landfill.
- f. The Contractor shall ensure that;
 - i. Liner materials meet specified permeability and strength criteria.
 - ii. Quality control and integrity testing are carried out prior to waste placement.
- g. The **leachate collection and management system** shall:
 - i. Effectively collect and convey leachate under all operating conditions;
 - ii. Prevent excessive leachate head buildup over the liner system;
 - iii. Allow safe storage, treatment, recirculation (if permitted), or disposal of leachate in compliance with statutory norms.
 - iv. System performance shall be demonstrated through monitoring and testing during commissioning and operation.
- h. The **landfill gas management system** shall:
 - i. Provide controlled venting or management of landfill gas;
 - ii. Prevent accumulation of gas that could pose safety, odour, or environmental risks;
 - iii. Comply with applicable emission standards and Environmental Clearance conditions.
- i. The **storm water management system** shall:
 - i. Prevent ingress of storm water into active landfill cells;
 - ii. Safely convey runoff away from landfill areas without erosion;
 - iii. Protect liner systems and slopes during extreme rainfall events.
- j. The SLF shall be **designed and operated** to ensure:
 - i. Protection of groundwater, surface water, soil, and air quality;
 - ii. Compliance with environmental monitoring requirements for leachate, groundwater, surface water, and gas;
 - iii. Effective control of odour, litter, vectors, and dust.

- k. During the **Operation and Maintenance period**, the Contractor shall ensure:
- Continuous compliance with statutory and contractual performance standards;
 - Safe and efficient landfill operations, including waste acceptance, placement, compaction, and covering;
 - Maintenance of all civil, mechanical, and electrical systems in good working condition;
 - Timely submission of monitoring data and compliance reports.
- l. Failure to meet any minimum performance requirement shall constitute a material breach of contract, liable for corrective action in accordance with the Tender Conditions.

4.3 Design Life and Capacity Requirements

4.3.1 Design Life

- The Sanitary Landfill Facility (SLF) shall be designed and developed in a manner to ensure optimal utilisation of land, efficient investment of capital, and compliance with environmental and operational requirements throughout the Contract Period.
- The Sanitary Landfill Facility (SLF) shall be designed for a minimum design life of 6 years by optimally using the available land.
- The design shall be compliance with the requirements of the Solid Waste Management Rules, 2016, CPHEEO manual on MSWM, and conditions stipulated in the Environmental Clearance.
- All civil, geotechnical, liner, drainage, and containment systems shall be designed to maintain structural and environmental integrity throughout the design life, accounting for settlement, degradation of materials, and long-term loading conditions.

4.3.2 Design Capacity

- The SLF shall be designed to safely accommodate the projected quantity of residual and inert municipal solid waste generated, including processing rejects from waste processing facilities.

Table 4: Inert Waste Projections & Landfill Volume Requirements

SLF Life	Quantity of MSW (Daily)	Quantity of MSW (Annual)	Quantity of inert waste (20%)	Cumulative quantity of inert waste	Cumulative Volume of Inert Waste (Considering density of 1 Ton / Cu mt)
Year	Ton/day	Ton/year	Ton/year	Ton	Cu mt.
1	287	1,04,788	20,958	20,958	20,958
2	301	1,10,028	22,006	42,963	42,963
3	317	1,15,529	23,106	66,069	66,069
4	332	1,21,305	24,261	90,330	90,330
5	349	1,27,371	25,474	1,15,804	1,15,804
6	366	1,33,739	26,748	1,42,552	1,42,552
7	385	1,40,426	28,085	1,70,637	1,70,637
8	404	1,47,448	29,490	2,00,127	2,00,127

SLF Life	Quantity of MSW (Daily)	Quantity of MSW (Annual)	Quantity of inert waste (20%)	Cumulative quantity of inert waste	Cumulative Volume of Inert Waste (Considering density of 1 Ton / Cu mt)
Year	Ton/day	Ton/year	Ton/year	Ton	Cu mt.
9	424	1,54,820	30,964	2,31,091	2,31,091
10	445	1,62,561	32,512	2,63,603	2,63,603
11	468	1,70,689	34,138	2,97,741	2,97,741
12	491	1,79,223	35,845	3,33,585	3,33,585
13	516	1,88,185	37,637	3,71,222	3,71,222
14	541	1,97,594	39,519	4,10,741	4,10,741
15	568	2,07,473	41,495	4,52,236	4,52,236

- b. The SLF shall be designed to accommodate the inert waste volume of 1,42,552 cubic meter during the life span of 6 years.

5 Detailed Scope of Work

5.1 General

- a. The Scope of Work under this Tender shall include all activities, services, works, and obligations necessary for the successful design, engineering, procurement, construction, testing, commissioning, and comprehensive operation and maintenance of the Sanitary Landfill Facility (SLF) at Lalpar site, Morbi, on turnkey EPC basis with O&M.
- b. The Scope of Work of the Contractor shall be interpreted as inclusive, complete, and comprehensive, and shall cover all items and activities required to deliver a fully functional, compliant, and operational SLF, whether or not explicitly mentioned in the Tender Documents.
- c. The description of the Works provided in the Tender Documents, including drawings, specifications, and schedules, is intended to define the scope and performance requirements of the Project. The Contractor shall be deemed to have fully examined, understood, and satisfied itself as to the nature, extent, complexity, and requirements of the Works prior to submission of its Bid.
- d. The Contractor shall be solely and fully responsible for verifying all information contained in the Tender Documents and for assessing all conditions, obligations, and requirements that may affect execution of the Works. No claim for additional cost or extension of time shall be admissible on account of any misunderstanding, misinterpretation, or underestimation of the extent or nature of the Works.

5.1.1 Turnkey Responsibility

- e. The Contractor shall assume single-point responsibility for the entire Project, including but not limited to:
 - Detailed design and engineering;
 - Procurement of all materials, equipment, and services;
 - Construction and installation of all Project components;
 - Testing and commissioning;
 - Obtaining statutory approvals, including Environmental Clearance;
 - Comprehensive Operation and Maintenance for six (6) years.
- f. The Contractor shall deliver the Project in accordance with the performance requirements, timelines, and quality standards specified in the Contract.

5.1.2 Compliance with Applicable Laws and Standards

- a. All Works shall be executed in strict compliance with:
 - Solid Waste Management Rules, 2016 and subsequent amendments;
 - Environmental Clearance conditions and other statutory approvals;
 - CPHEEO manuals and guidelines;
 - Applicable BIS codes and recognised international standards;
 - Directions issued by regulatory authorities from time to time.

5.1.3 Coordination and Interface Management

- a. The Contractor shall be responsible for coordination with all the stakeholders including the following;
 - The Employer and its authorised representatives;
 - Project management Consultants & Third party inspection agencies appointed by the Employer.
 - Statutory and regulatory authorities;
 - Utility agencies and service providers;
 - Existing and proposed waste management facilities.
- b. All interface risks shall be borne by the Contractor unless expressly stated otherwise in the Contract.

5.1.4 Site Conditions and Data Verification

- a. The Contractor shall be responsible to inspect the Project Site thoroughly, the ground conditions, access to the site, the availability of utilities like water, sewer and power. The Contractor shall be required to understand the site constraints and assess the site in environmental context.
- b. Any data or information provided by the Employer shall be treated as indicative only. No claim shall be entertained on account of differences between such data and actual site conditions.

5.1.5 Health, Safety, and Environmental Protection

- a. The Contractor shall be fully responsible for the safety of its personnel, equipment, and third parties.
- b. The Contractor shall be fully responsible for environmental, health and safety (EHS) measures.
- c. The contractor shall prevent of pollution, accidents, and environmental damage during execution and operation of the Works.

5.1.6 Inclusivity of Scope

- a. All works specified in the Tender documents shall be deemed to include the provision of all labour, supervision, materials, tools, plant, equipment, temporary works, utilities, traffic management, safety arrangements, transport, handling, storage, testing, and all other inputs and services whatsoever necessary for the satisfactory, safe, and complete execution of the Works in accordance with the Tender Documents.
- b. The Contractor shall execute the Works to the satisfaction of the Employer or its authorised representative, and no additional payment shall be made for any item, activity, or service which is reasonably required for completion of the Works, whether or not such item is specifically mentioned in the Tender Documents. All such requirements shall be deemed to be included in the Scope of Work and the Contract Price.

5.2 Project Execution Plan (PEP)

- a. The Contractor shall prepare and submit, within seven (7) days from the Date of Work Order, a comprehensive Project Execution Plan (PEP) for review and approval by the Employer or its authorised representative.

- b. The PEP shall include, at a minimum, a detailed baseline construction programme (Gantt chart) identifying activities, durations, sequencing, milestones, and the critical path; a Resource Deployment Plan covering manpower, plant, equipment, and key materials; and a Project Organisation Structure detailing the proposed project team with defined roles, responsibilities, and reporting lines, including key site personnel and subcontractors.
- c. The baseline programme shall be prepared using recognised project management software and shall be consistent with the milestone requirements specified in the Tender. The Contractor shall update the programme monthly, reflecting actual progress, forecasts, risks, and recovery measures, and shall clearly identify any deviations from the baseline.
- d. The level of information and detail that is to be included in the Baseline program, that it shall be sufficient to accurately define the Contractor's intentions and sequence of works. The program shall show every significant activity required for the completion of the Contract that include but not limited to the following:
 - key dates, milestones, interface and handover dates, phased completion and completion of Whole of the Works
 - Contractor's design including dates for submission to and acceptance by the Engineer
 - procurement of major equipment and material, in particular long lead items and the delivery to site
 - all on-site works, including preliminary and Temporary Works by the Contractor, his sub-contractors and suppliers
 - any off-site work such as the production and/or fabrication of any components or materials
 - the different stages of traffic diversion and specific requirements with regard to traffic aspects as given in this Specification
 - interface with Utility Agencies and work done by Utility Agencies or the Contractor for diversion
 - interface with other contracts/contractors; and
 - any outside influence which will or may affect the progress of Works
- e. Approval of the PEP by the Employer shall be for general conformity only and shall not relieve the Contractor of its obligations or responsibilities under the Contract. Any delay arising due to incomplete, inaccurate, or non-compliant submissions of the PEP or its updates shall be the sole responsibility of the Contractor and shall not entitle the Contractor to any extension of time or additional cost.

5.3 Obtaining Statutory Compliance and Environmental Clearance

- a. The Contractor shall be solely responsible for ensuring full compliance with all Applicable Laws, statutory requirements, approvals, consents, permissions, and clearances necessary for the design, construction, commissioning, operation, and maintenance of the Sanitary Landfill Facility (SLF) for the entire Contract Period.
- b. Without limitation, the Scope of Work of the Contractor shall expressly include the following statutory and regulatory obligations:

- c. The Contractor shall appoint a NABET-accredited environmental consultant for preparation of the Environmental Impact Assessment (EIA) Report, Environmental Management Plan (EMP), and all related studies, strictly in accordance with the provisions of the EIA Notification, 2006, as amended from time to time, and guidelines issued by the Ministry of Environment, Forest and Climate Change (MoEF&CC);
- d. The Contractor shall be responsible for preparation, submission, follow-up, and successful obtaining of Environmental Clearance (EC) from the competent authority, including conduct of baseline environmental monitoring, public consultation (where applicable), appraisal meetings, and compliance to all conditions stipulated in the EC.
- e. The Contractor shall be responsible for conducting all required studies including Environmental Impact Assessment (EIA) or any other studies as may be mandated by the competent authority;
- f. The Contractor shall be responsible for preparation of reports and documents such as application, form-1, conceptual plans, or any other documents as may be mandated by the competent authority;
- g. The Contractor shall further be responsible for obtaining Consent to Establish (CTE) and Consent to Operate (CTO) from the State Pollution Control Board and for ensuring continuous compliance with all conditions stipulated therein during construction and operation of the facility;
- h. The Contractor shall coordinate with all statutory authorities, prepare and submit required documentation, reports, and returns, and implement all environmental safeguards, mitigation measures, and monitoring programmes prescribed under statutory approvals;
- i. The Contractor shall further be responsible for liaison, coordination, and follow-up with all statutory authorities at Central, State, and local levels for securing and maintaining such approvals;
- j. Implementation of all environmental safeguards, mitigation measures, monitoring programs, and reporting obligations prescribed under the Environmental Clearance and other statutory approvals during construction and operation of the facility.
- k. The Contractor shall ensure that all statutory approvals are obtained within the timelines necessary for completion of the Project, and no claim for extension of time or additional cost shall be admissible on account of delays or non-availability of such approvals, unless such delays are solely attributable to the applicable Authority.
- l. Any delay, rejection, or requirement for revision arising due to deficiencies in submissions, studies, or compliance shall be the sole responsibility of the Contractor, and no claim for extension of time or additional cost shall be admissible on this account, except where such delay is demonstrably attributable to the Employer.
- m. Obtaining and maintaining statutory approvals and Environmental Clearance shall be deemed to be an integral and inseparable part of the Scope of Work under this Contract.

5.4 Design & Engineering

5.4.1 Landfill Components

- a. The Contractor shall be fully responsible for carrying out complete, detailed design and engineering of the Sanitary Landfill Facility (SLF) and all associated works under the

Contract, in accordance with the Employer's Requirements, Applicable Laws, and good engineering practice.

- b. All design and engineering activities shall be undertaken with due consideration to constructability, operational efficiency, environmental protection, safety, durability, and long-term performance of the facility over its design life and the six (6) year Operation and Maintenance period.
- c. The design shall comply with the Solid Waste Management Rules, 2016, CPHEEO guidelines, Environmental Clearance conditions, and applicable BIS / recognised international standards.
- d. The Contractor shall design **landfill cell** to ensure adequate containment and environmental protection, stability of subgrade, interim slopes, and final slopes under static and seismic conditions, and safe access and operational efficiency.
- e. The Contractor shall design a **composite liner system** comprising appropriate barrier layers, drainage layers, protection layers, and interfaces to prevent migration of leachate into soil and groundwater. The design shall address material properties and specifications, interface friction and anchorage, leachate head control, and long-term integrity under waste loading and settlement.
- f. The Contractor shall design a **comprehensive leachate management system**, including leachate collection pipes and drainage layers, sumps, pumping arrangements, and conveyance systems, storage and treatment / disposal interface, as applicable, and monitoring and control provisions. The system shall be capable of functioning effectively under peak leachate generation conditions.
- g. The Contractor shall design **landfill gas management systems** to allow passive venting of landfill gas, prevent accumulation of explosive or odorous gases, comply with statutory and Environmental Clearance requirements.
- h. The Contractor shall design **storm water management systems** to prevent ingress of storm water into active landfill cell, safely convey runoff away from landfill areas and prevent erosion, flooding, and slope instability.
- i. The design scope shall include the following components required for safe and efficient operation of the proposed SLF
 - Landfill cell with composite liner system
 - Internal roads and approach road,
 - Storm water drain,
 - Weighbridge with weighbridge cabin,
 - Admin building with toilet block including electric, plumbing, furniture work
 - Retaining wall on the periphery as per requirement,
 - Automatic vehicle wheel washing system with ETP,
 - Engineering store,
 - Leachate management consisting of leachate collection network, leachate collection well, leachate collection tank, leachate treatment unit, leachate pump.
 - Material inspection shed
 - Underground tank for fresh water with water pump

- electrical systems,
- mechanical equipment,
- boundary fence,
- green belt area, and other ancillary facilities.

5.4.2 Design Submittals and Approval Process

- a. The Contractor shall submit all design documents, drawings, calculations, and reports to the Employer or its authorised representative for review, in accordance with the agreed submission schedule.
- b. Review or comments by the Employer shall be for general conformity only and shall not relieve the Contractor of its responsibility for design adequacy, performance, or compliance.

5.4.3 Design Changes and Optimisation

- a. The Contractor may propose design optimisations or improvements, provided such changes meet or exceed the minimum performance requirements, do not adversely affect statutory compliance or safety, and are approved by the Employer in writing prior to implementation.

5.4.4 As-Built Drawings and Documentation

- a. Upon completion of construction, the Contractor shall submit as-built drawings, design documentation, and operation manuals reflecting the actual executed Works.

5.5 Procurement

5.5.1 General

- a. The Contractor shall be fully responsible for the procurement, supply, inspection, transportation, storage, handling, installation, and commissioning of all materials, equipment, plant, machinery, vehicles, tools, consumables, spare parts, and services required for the execution of the Works and for comprehensive Operation and Maintenance of the Sanitary Landfill Facility for a period of six (6) years.
- b. All procurement activities shall be carried out on a turnkey basis, and the Contract Price shall be deemed to include all costs associated with procurement unless expressly stated otherwise in the Contract.

5.5.2 Scope of Procurement

The scope of procurement shall include, but not be limited to, the following categories:

a. Civil Works Materials

- Earthwork materials, aggregates, concrete, reinforcement steel
- Geosynthetics, liners, drainage media, pipes, fittings
- Pre-engineered building components and structural steel

b. Mechanical Equipment

- Leachate pumps and associated accessories
- Weighbridge systems
- Leachate treatment and handling systems

- Wheel washing systems with ETP
- Valves, piping, fittings, and mechanical auxiliaries

c. Electrical Equipment and Systems

- Transformers, cabling, panels, MCCs
- Lighting systems, lightning arrestors, earthing
- DG sets and emergency power systems

d. Vehicles and Machinery

- One bulldozer, excavator and backhoe loaders each
- One water tankers and leachate tankers each
- One Tractors and trailer each

e. Fire Safety and Safety Systems

- Fire fighting systems and equipment
- Alarm and detection systems
- Safety and emergency response equipment

f. Utilities and Support Systems

- Power supply (including temporary power supply), water supply and wastewater systems
- Pumps, tanks, plumbing accessories

g. Miscellaneous and O&M Support Items

- Furniture, IT systems, CCTV, Digital dashboard for monitoring, signage
- PPE, toolkits, consumables and spares

5.5.3 Quality, Standards, and Compliance

- a. All procured items shall be new, unused, and of proven quality,
- b. All procured items shall conform to the specifications and performance requirements of the Tender Documents,
- c. The items shall be in compliance with applicable BIS standards or recognized international standards where BIS standards are not available;
- d. All items shall meet the conditions stipulated in the Environmental Clearance, CTE, and CTO, where applicable.
- e. In the event of any conflict, the most stringent requirement shall prevail.

5.5.4 Approved Makes, Vendors, and Sub-suppliers

- c. The Contractor shall submit a list of proposed manufacturers, suppliers, and makes for review prior to procurement.
- d. Approval by the Employer shall be limited to general conformity and shall not relieve the Contractor of responsibility for quality, performance, warranty, or statutory compliance of the procured items.

5.5.5 Inspection, Testing, and Acceptance

- a. The Contractor shall establish and implement a procurement inspection and testing regime, including factory inspection and testing, where applicable, pre-dispatch inspection, and On-site inspection upon delivery.
- b. The Employer or its authorised representative shall have the right to inspect materials and equipment at any stage.

5.5.6 Storage, Handling, and Protection

- a. The Contractor shall be responsible for proper storage and protection of all materials and equipment, prevention of damage, deterioration, contamination, or theft and compliance with manufacturer's handling and storage requirements.
- b. Any item damaged due to improper storage or handling shall be replaced at the Contractor's cost.

5.5.7 Procurement for O&M Period

- a. The Contractor shall ensure procurement and availability of mandatory spare parts and consumables, replacement components required for uninterrupted operation during the six (6) year O&M period.
- b. All such procurement shall be deemed included in the Contract Price.

5.5.8 Statutory, Environmental, and Safety Compliance

- a. All procurement activities shall comply with applicable labour, safety, and environmental laws, transportation and storage regulations, Environmental Clearance conditions related to material usage and disposal.

5.5.9 No-Claim and Risk Allocation

- a. The Contractor shall be deemed to have considered all procurement-related risks, including price escalation, supply-chain disruptions, and vendor availability, while submitting the Bid.
- b. No claim for additional cost or extension of time shall be admissible on account of procurement delays, price variations, changes in source, or non-availability of materials, except as expressly permitted under the Conditions of Contract.

5.6 Site Clearance and Preparation

- a. The Project Site shall be handed over to the Contractor on an "as-is, where-is" basis. The Contractor shall be fully responsible for clearing, cleaning, grading, levelling, and preparing the Site to make it suitable for execution of the Works, including removal of vegetation, debris, waste materials, and any other surface obstructions encountered within the Site.
- b. The Contractor shall also be responsible for safe handling and lawful disposal of all cleared materials in accordance with Applicable Laws and Environmental Clearance conditions.
- c. No additional payment or extension of time shall be admissible on account of site clearance, preparation, or surface obstructions, which shall be deemed to be included in the Scope of Work and Contract Price.

5.7 Tree Cutting, Permissions, and Compensatory Plantation

- a. Where removal or cutting of trees within the Project Site is required for execution of the Works, the Contractor shall be responsible for identification, marking, and obtaining prior permissions from the competent authority in accordance with Applicable Laws and statutory requirements.
- b. The Contractor shall carry out tree cutting only after receipt of written approval from the competent authority and in strict compliance with the conditions stipulated therein. The Contractor shall also be responsible for compensatory plantation, transplantation (if applicable), and any other environmental mitigation measures mandated by the approving authority.
- c. All costs associated with tree cutting, statutory permissions, compensatory plantation, survival maintenance, fees, and compliance shall be deemed to be included in the Scope of Work and Contract Price. No claim for additional cost or extension of time shall be admissible on account of tree cutting or related statutory compliances, except where delays are demonstrably attributable to the Employer.

5.8 Shifting / Diversion of Existing Utilities

- a. Any existing underground or overhead utilities, including but not limited to water supply lines, sewer lines, storm water drains, electrical cables, communication cables, pipelines, or any other services encountered within or affecting the Project Site, which obstruct or interfere with execution of the Works, shall be identified, protected, shifted, diverted, or relocated by the Contractor as required for execution of the Project.
- b. Where such existing utilities are not required to be shifted or diverted, the Contractor shall be fully responsible for their support, protection, safeguarding, and continuous integrity during execution of the Works. The Contractor shall take all necessary measures, including temporary supports, protective coverings, barricading, monitoring, and safety precautions, to ensure that such services remain undamaged, operational, and uninterrupted.
- c. The Contractor shall coordinate with concerned utility agencies, obtain necessary permissions, and carry out all shifting, diversion, protection, and restoration works in accordance with Applicable Laws, approved procedures, and directions of the concerned authorities. The Contractor shall ensure continuity of essential services during such activities and shall be responsible for repair, restoration, or replacement of any utility damaged due to its acts or omissions, at its own cost.
- d. All costs, risks, and responsibilities associated with identification, protection, support, shifting, diversion, restoration, coordination, and compliance relating to existing utilities shall be deemed to be included in the Scope of Work and Contract Price.
- e. No claim for additional cost or extension of time shall be admissible on account of existing utilities, whether shifted or not.

5.9 Reinstatement and Making Good of Damages

- a. The Contractor shall be responsible for making good, repairing, and reinstating, to the satisfaction of the Employer or its authorised representative, all works, structures, services, and surfaces affected, disturbed, or damaged during execution of the Works.
- b. Such works shall include, but not be limited to, roads, pavements, drains, concrete slabs, gratings, kerbs, turfing, landscaping, railings, fencing, boundary walls, utilities,

and other infrastructure, whether within or outside the Project Site, which are affected as a result of the Contractor's activities.

- c. All reinstatement and making good works shall be carried out promptly and to a standard equal to or better than the original condition, using materials and workmanship approved by the Employer.
- d. All costs associated with such reinstatement and making good shall be borne solely by the Contractor and shall be deemed to be included in the Contract Price. No claim for additional payment or extension of time shall be admissible on this account.

5.10 Utilities for Construction, Testing, Commissioning and O&M

- a. The Contractor shall be solely responsible for arranging, providing, and bearing the full cost of electric power, water, fuel, and all other utilities required for the execution of the Works during the construction, testing, commissioning, and the entire six (6) year Operation and Maintenance period of the Sanitary Landfill Facility.
- b. The Contractor shall make its own arrangements for temporary and permanent utility connections, including payment of all application fees, deposits, consumption charges, taxes, and statutory levies. The Employer shall not be liable to provide any utility connection or to bear any utility-related cost unless expressly stated otherwise in the Contract.
- c. Any interruption, inadequacy, or non-availability of utilities shall not constitute grounds for extension of time or additional payment.

5.11 Construction & Installation

5.11.1 General

- a. The Contractor shall be fully responsible for the execution, construction, installation, testing support, and completion of all civil, structural, mechanical, electrical, and allied works required for development of the Sanitary Landfill Facility (SLF), in accordance with the Tender Documents, Applicable Laws, and approved designs.
- b. All construction and installation activities shall be carried out on a turnkey basis, ensuring delivery of a safe, compliant, and operational facility ready for commissioning and subsequent Operation and Maintenance.
- c. All construction and installation works shall be carried out as per designs & drawings, technical specification/ catalogue approved by the Employer or its authorised representative.

5.11.2 Setting Out, Site Levels, and Survey Responsibility

- a. The Contractor shall be responsible for taking all levels, carrying out setting out, and establishing survey controls and benchmarks for the whole of the Works.
- b. Any information regarding existing ground levels or site conditions shown on the Drawings or included in the Tender Documents is provided in good faith for general guidance only, and the accuracy of such information is not guaranteed. The Contractor shall be deemed to have inspected the Site and shall carry out such independent field surveys and measurements as may be necessary to ascertain the full extent, nature, and requirements of the Works.
- c. The Contractor shall remain fully responsible for the accuracy of all setting out, levels, alignments, gradients, and dimensions of the Works, and no claim for additional cost

or extension of time shall be admissible on account of any discrepancy between the information provided in the Contract Documents and actual site conditions.

5.11.3 Site Preparation Works

- a. The Contractor shall undertake all site preparation and enabling works necessary to facilitate execution of the Project.
- b. This shall include mobilisation and demobilisation of manpower, plant, and machinery; clearing, grading, levelling, and preparation of the site; and execution of all temporary works required for construction.
- c. Temporary access roads, utilities, construction facilities, and site offices shall be provided and maintained by the Contractor as required.
- d. The Contractor shall also be responsible for setting out the Works, establishing survey controls and benchmarks, and implementing all construction-stage environmental protection and safety measures in accordance with the Contract and Applicable Laws.

5.11.4 Landfill Cell Construction Works

- a. The Contractor shall execute all works related to landfill cell development in accordance with approved designs and sequencing plans.
- b. This shall include excavation and formation of landfill cells, preparation and compaction of subgrade, and construction and installation of base liner and side liner systems along with all associated protection layers and drainage layers.
- c. The scope shall further include construction of leachate collection sumps, wells, trenches, and installation of the leachate collection network and landfill gas venting infrastructure. All slope protection works, berms, and stability measures shall be executed to ensure long-term structural integrity and environmental safety of the landfill.

5.11.5 Civil and Structural Works

- a. The Contractor shall carry out all civil and structural works necessary for development of the SLF.
- b. These works shall include construction of RCC internal roads and approach roads, storm water drainage systems, retaining walls, embankments, and erosion control measures.
- c. Buildings and structures such as the administrative building, security cabin, engineering store, and material inspection sheds, including both civil and PEB components, shall be constructed and completed in all respects.
- d. The scope shall also include construction of fresh water underground tanks, leachate collection tanks, weighbridge cabin and foundation, vehicle repairing ramp, ancillary structures, and installation of boundary fencing and site security infrastructure.

5.11.6 Installation of Mechanical Systems

- a. The Contractor shall install, test, and integrate all mechanical systems required for operation of the SLF.
- b. This shall include installation of submersible leachate pumps with associated piping, valves, and accessories; leachate treatment and handling systems; weighbridge systems and related mechanical components; automatic wheel washing systems with

top wash and integrated effluent treatment facilities; and landfill gas venting and collection systems.

- c. All mechanical installations shall be tested and commissioned in accordance with approved procedures and manufacturer recommendations.

5.11.7 Installation of Electrical Systems

- a. The Contractor shall execute installation and integration of all electrical systems required for the Project.
- b. This shall include power supply arrangements, transformers, cabling, electrical panels, motor control centres, and control systems. Plant lighting, lightning protection systems, earthing systems, and emergency power supply through DG sets shall be provided, installed, tested, and commissioned in accordance with applicable standards and safety requirements.

5.11.8 Utilities and Ancillary Works

- a. The Contractor shall provide, install, and commission all utility systems required for construction and operation of the SLF.
- b. These shall include water supply systems with storage and distribution arrangements, wastewater disposal systems for buildings and facilities, plumbing, drainage, sanitation systems, and complete fire safety infrastructure along with associated installations.

5.11.9 Vehicles and Machinery

- a. The Contractor shall deploy, commission, operate, and maintain all vehicles and machinery required for landfill construction and operations, including those specified in the Tender Documents.
- b. All such vehicles and machinery shall be suitable for landfill operations and maintained in safe and serviceable condition.

5.11.10 Construction Safety

- a. The Contractor shall manage all construction activities in accordance with approved and / or standard methodologies.
- b. The Contractor shall be fully responsible for safety of personnel, equipment, and third parties, and shall implement all measures necessary to prevent accidents, environmental pollution, and damage to property.
- c. Where construction activities are required to be carried out alongside ongoing site operations, the Contractor shall ensure effective coordination so as to avoid disruption and maintain safety at all times.

5.11.11 Quality Control and Documentation

- a. The Contractor shall implement a comprehensive Quality Assurance and Quality Control (QA/QC) system covering all stages of construction and installation.
- b. Inspections, testing, and verification shall be carried out at appropriate stages to ensure compliance with approved designs, specifications, and standards.
- c. Complete records of construction activities, inspection results, and test reports shall be maintained and submitted to the Employer or its authorised representative as required under the Contract.

5.11.12 No-Omission and No-Claim Clause

- a. The Contractor shall be deemed to have included in the Contract Price all construction and installation works necessary for successful completion of the Project.
- b. No claim for additional cost or extension of time shall be admissible on account of omission of any item required for functionality, safety, performance, or statutory compliance of the facility.

5.12 Testing, Commissioning & Acceptance

5.12.1 General

- a. The Contractor shall be responsible for carrying out all testing, pre-commissioning, commissioning, and performance verification activities necessary to demonstrate that the Sanitary Landfill Facility (SLF) and all associated systems comply with the Tender Documents, Applicable Laws, and statutory approvals.
- b. Testing and commissioning shall be conducted in a systematic, documented, and verifiable manner, in accordance with approved procedures and schedules.

5.12.2 Pre-Commissioning Tests

- a. Prior to commissioning, the Contractor shall perform all pre-commissioning tests and inspections, including but not limited to:
 - Inspection and testing of civil and structural works for dimensional accuracy, workmanship, and completeness;
 - Integrity testing of liner systems, including seams and interfaces;
 - Testing of leachate collection pipes, sumps, and pumps;
 - Electrical testing of panels, cabling, earthing, and safety systems;
 - Mechanical testing of pumps, wheel washing systems, weighbridge, and ancillary equipment;
 - Verification of fire safety systems and emergency arrangements.
- b. All pre-commissioning tests shall be completed and documented prior to commencement of commissioning.

5.12.3 Commissioning

- a. Commissioning shall include integrated testing and operational trials of all systems under actual or simulated operating conditions, including:
 - Functional testing of leachate collection, conveyance, and treatment systems;
 - Operational testing of landfill gas venting systems;
 - Trial operation of weighbridge, wheel washing system, and vehicle circulation;
 - Verification of storm water management and drainage performance;
 - Testing of utilities, electrical systems, and emergency power supply;
 - Demonstration of safe and effective landfill operational procedures.
- b. Commissioning activities shall be carried out in the presence of the Employer or its authorised representative, where required.

5.12.4 Performance Demonstration

- a. The Contractor shall demonstrate that the SLF meets the minimum technical and performance requirements specified in the Contract, including:
 - Environmental protection measures;
 - Functional reliability of systems;
 - Operational safety;
 - Compliance with Environmental Clearance, CTE, and CTO conditions.
- b. Any deficiencies identified during commissioning shall be rectified by the Contractor prior to acceptance.

5.12.5 Provisional Acceptance

- a. Upon successful completion of testing and commissioning, and upon demonstration of compliance with Tender requirements, the Employer shall issue a Provisional Acceptance Certificate (PAC).
- b. The date of issuance of the PAC shall mark the commencement of the six (6) year Operation and Maintenance period and serve as the reference date for performance obligations during O&M.

5.12.6 Defects and Rectification

- a. Any defects, deficiencies, or non-conformities identified during testing, commissioning, or within the period leading up to Provisional Acceptance shall be rectified by the Contractor at its own cost and risk, without entitlement to additional payment or extension of time.

5.12.7 Final Acceptance

- a. Upon successful completion of the O&M period, fulfilment of all contractual obligations, and rectification of any outstanding defects, the Employer shall issue a Final Acceptance Certificate (FAC) in accordance with the Conditions of Contract.

5.12.8 Documentation and Records

- a. The Contractor shall submit complete documentation, including:
 - Test reports and certificates;
 - As-built drawings;
 - Operation and Maintenance manuals.
 - Any other document required by the Employer or its authorised representatives
- b. Acceptance shall be conditional upon submission and approval of all required documentation.

5.12.9 No-Claim Clause

- a. The Contractor shall be deemed to have included in the Contract Price all costs associated with testing, commissioning, re-testing, and acceptance activities.
- b. No claim for additional cost or extension of time shall be admissible on account of testing or commissioning requirements, repetition of tests, or rectification of deficiencies.

5.13 Operation & Maintenance (6 Years)

5.13.1 General

- a. The Contractor shall undertake comprehensive Operation and Maintenance (O&M) of the Sanitary Landfill Facility (SLF) for a period of six (6) years, commencing from the date of issuance of the Provisional Acceptance Certificate (PAC).
- b. The O&M scope shall include all activities, services, manpower, equipment, consumables, spares, monitoring, and reporting necessary to ensure continuous, safe, and compliant operation of the SLF in accordance with the Tender Documents, Environmental Clearance, Consents, and Applicable Laws.

5.13.2 Operational Responsibilities

- a. During the O&M Period, the Contractor shall be responsible for, inter alia:
 - Receipt, inspection, and acceptance of residual and inert municipal solid waste;
 - Proper placement, spreading, and compaction of waste in landfill cells;
 - Application of daily and intermediate cover material as per requirement;
 - Safe management of active and inactive landfill area;
 - Housekeeping, dust suppression, litter control, and odour management;
 - Traffic management within the landfill premises.

5.13.3 Leachate Management Operations

- a. The Contractor shall operate and maintain all leachate management systems, including:
 - Continuous operation of leachate collection wells, sumps, and pumps;
 - Monitoring of leachate generation and leachate head over liner systems;
 - Operation of leachate treatment and/or disposal systems as approved;
 - Safe handling, storage, transport, and disposal of treated or untreated leachate in compliance with the Tender conditions, statutory norms and Employer's instructions from time to time.

5.13.4 Landfill Gas Management

- a. The Contractor shall ensure:
 - Effective operation of landfill gas venting systems;
 - Prevention of gas accumulation, fire hazards, or explosion risks;
 - Monitoring and control of odour and emissions;
 - Compliance with Environmental Clearance conditions related to gas management.

5.13.5 Maintenance of Civil, Mechanical, and Electrical Systems

- a. The Contractor shall carry out preventive, routine, and corrective maintenance of all Project components, including:
 - Landfill cells, slopes, roads, and drainage systems;
 - Liner systems and protective layers (as accessible);

- Mechanical equipment such as pumps, wheel washing systems, and weighbridge;
 - Electrical systems, panels, lighting, DG sets, and earthing;
 - Buildings, utilities, fencing, and ancillary facilities.
- b. All maintenance activities shall be carried out to ensure uninterrupted and safe operations.

5.13.6 Environmental Monitoring and Compliance

- a. The Contractor shall undertake environmental monitoring in accordance with the Environmental Clearance, CTE, CTO, and Applicable Laws, including:
- Groundwater monitoring through piezometer wells;
 - Surface water monitoring, if applicable;
 - Leachate quality monitoring;
 - Ambient air quality and landfill gas monitoring;
 - Noise monitoring.
- b. The Contractor shall submit monitoring reports to statutory authorities and the Employer at prescribed intervals.

5.13.7 Manpower and Supervision

- a. The Contractor shall deploy adequate, trained, and qualified manpower for operation and maintenance of the SLF, including supervisory and safety personnel.

S/N	Description	Nos.
1	Landfill manager	1
2	Engineer	1
3	Weighbridge operator	1
4	Watchman	2
5	Foreman	1
6	Machine drivers	3
7	Spotter	1
8	Unskilled worker	5
	Total	15

- b. All personnel shall be trained in:
- Safe landfill operations;
 - Environmental compliance;
 - Emergency response and fire safety;
 - Use of personal protective equipment (PPE).

5.13.8 Health, Safety, and Emergency Management

- a. The Contractor shall implement comprehensive health, safety, and emergency response measures, including:
- Fire prevention and fire fighting arrangements;
 - Emergency response procedures;

- Accident prevention and reporting systems;
- Provision and enforcement of PPE usage.

5.13.9 Record Keeping and Reporting

- a. The Contractor shall maintain complete and accurate records, including:
 - Daily waste receipt and disposal logs;
 - Equipment operation and maintenance records;
 - Environmental monitoring data;
 - Incident and non-compliance reports.
- b. Monthly O&M reports shall be submitted to the Employer in the format approved by the Employer or its authorized representative.

5.13.10 Monitoring Dashboard and Digital Reporting System

- a. During the Operation and Maintenance period, the Contractor shall design, develop, implement, and maintain a digital monitoring dashboard for the Sanitary Landfill Facility, accessible to the Employer or its authorised representatives, for the purpose of monitoring operational performance and compliance.
- b. The dashboard shall, at a minimum, display key operational and compliance data, including but not limited to waste quantities received (weighbridge data), operational status of the facility, CCTV feeds or snapshots (where provided), and other relevant performance indicators as required by the Employer.
- c. The dashboard shall be updated on a real-time or near-real-time basis, as technically feasible, and shall be capable of generating periodic reports in formats approved by the Employer.
- d. All costs associated with development, hosting, operation, maintenance, data integration, and user access of the monitoring dashboard during the O&M period shall be deemed to be included in the Scope of Work and Contract Price.
- e. All data generated through the dashboard shall remain the property of the Employer, and the Contractor shall ensure data security, integrity, and availability throughout the Contract Period.

5.13.11 Performance Standards and Compliance

- a. The Contractor shall operate the SLF in compliance with the performance standards and KPIs specified in the Tender documents.
- b. Failure to meet performance requirements or statutory obligations during the O&M period shall attract penalties and corrective actions as specified in the Conditions of Contract.

5.13.12 No-Claim Provision

- a. The Contractor shall be deemed to have included in the Contract Price all costs associated with operation and maintenance for the six (6) year O&M period.
- b. No claim for additional cost or extension of time shall be admissible on account of operational difficulties, increased maintenance requirements, or changes in waste characteristics.

5.14 Regional / Cluster-Based MSWM Coordination

- a. The Employer may, at its discretion and in accordance with Applicable Laws, decide to collaborate with nearby Municipalities, or Gram Panchayats for implementation of regional or cluster-based municipal solid waste management arrangements, including utilization of the Sanitary Landfill Facility developed under this Tender.
- b. In such event, the Contractor shall extend technical and operational support to the Employer, including providing inputs related to landfill operations, waste acceptance protocols, capacity utilization, and compliance requirements, as may be reasonably required for effective implementation of such arrangements.
- c. The Contractor shall comply with and implement operational directions issued by the Employer pursuant to such regional coordination, provided that such directions are consistent with the Contract, Environmental Clearance, and Applicable Laws.
- d. The Contractor shall ensure that only authorized residual and inert waste (i.e. rejects from approved solid waste processing facilities) is received and disposed of at the landfill site from all participating local bodies, strictly in accordance with the Solid Waste Management Rules, 2016, Environmental Clearance conditions, and waste acceptance procedures approved by the Employer.

5.15 Essential Services and Emergency Support

- a. The services to be provided by the Contractor under this Tender shall be treated as essential public services. Accordingly, the Contractor shall ensure uninterrupted performance of its obligations and shall deploy necessary manpower, equipment, and resources to maintain continuity of services.
- b. In the event of emergencies, exigencies, or unforeseen situations, including but not limited to natural disasters, fire incidents, public health emergencies, or situations affecting continuity of municipal solid waste management services, the Contractor shall extend reasonable operational support and cooperation to the Employer in coordination with other contractors engaged by the Employer or other agencies.
- c. Such support shall be limited to activities necessary to ensure public safety, environmental protection, and continuity of essential waste management services, and shall be carried out in accordance with Applicable Laws, safety requirements, and directions of the Employer.

5.16 Temporary Equipment and Manpower Support

- a. In exceptional circumstances such as cleanliness drives, emergency response, or coordinated municipal initiatives, the Contractor shall, on written request of the employer, extend temporary support by deploying available vehicles, specialized movable equipment, or manpower.

6 Performance Standards & Key Performance Indicators (KPIs)

6.1 General

- a. This Section specifies the minimum performance standards and Key Performance Indicators (KPIs) applicable to the design, construction, commissioning, and six (6) year Operation and Maintenance (O&M) of the Sanitary Landfill Facility (SLF).
- b. The KPIs defined herein shall serve as the basis for monitoring, evaluation, and enforcement of performance obligations of the Contractor during the Contract Period, particularly during the O&M phase.
- c. Compliance with these performance standards is mandatory and shall be read in conjunction with applicable Laws and statutory approvals, Environmental Clearance (EC), Consent to Establish (CTE), and Consent to Operate (CTO) and Conditions of Contract.

6.2 Applicability of Performance Standards

- a. Performance standards and KPIs shall apply from:
 - The date of commencement of construction (where relevant); and
 - The date of issuance of the Provisional Acceptance Certificate (PAC) for all O&M-related KPIs.
- b. KPIs shall be applicable on a continuous basis during the O&M Period, unless otherwise specified.
- c. Failure to meet any KPI shall constitute non-compliance, subject to corrective action and remedies as specified in the Conditions of Contract.

6.3 Key Performance Indicators (KPIs)

The performance standards and KPIs are mentioned in the following table:

Table 5: Performance Standards and Key Performance Indicators (KPIs)

Sn.	KPI Category	Performance Area	KPI / Performance Standard	Measurement Method	Frequency
1	Operations KPIs	Weighbridge operation	100% waste disposed in landfill should be weighed and recorded	Weighbridge logs	Continuous
2	Environmental Compliance KPIs	Leachate containment	No uncontrolled leachate should be discharge outside designated system	Site inspection, records	Continuous
4	Environmental Compliance KPIs	Odour control	No persistent odour nuisance beyond site boundary	Complaints / inspection	Continuous
5	Health and Safety KPIs	Fatal accidents	Zero fatal accidents attributable to negligence of the Contractor	Incident reports	Continuous

Sn.	KPI Category	Performance Area	KPI / Performance Standard	Measurement Method	Frequency
6	Operations KPIs	Waste acceptance	100% waste should be disposed only in the landfill cells	Daily logs	Daily
7	Operations KPIs	Waste compaction	Waste compacted as per approved operating procedure	Inspection / records	Daily
8	Operations KPIs	Daily cover	Daily cover applied on active landfill face	Inspection	Daily
9	Operations KPIs	House-keeping	Clean entire site, no litter dispersion	Inspection	Daily
10	Operations KPIs	Dust control	Dust levels within acceptable limits	Visual / monitoring	Daily
11	Health and Safety KPIs	PPE compliance	100% PPE usage by operational staff	Inspection	Daily
12	Reporting and Documentation KPIs	Daily records	Daily waste, equipment & operations records maintained	Logbooks	Daily
13	Environmental Compliance KPIs	Landfill gas management	Effective venting of gases generated in the landfill. No unsafe accumulation of gas should happen.	Site inspection, incident records	Monthly
14	Maintenance KPIs	Landfill slopes	No visible instability, slips, or erosion	Inspection	Monthly
15	Maintenance KPIs	Equipment availability	≥ 95% availability of critical equipment	Maintenance records	Monthly
16	Reporting and Documentation KPIs	O&M reports	Monthly O&M reports submitted	Report review	Monthly
17	Reporting and Documentation KPIs	Data accuracy	No falsification or material errors in reports	Audit	Periodic
18	Environmental Compliance KPIs	Leachate head	Leachate head over liner within approved design / EC limits	Monitoring wells / logs	Quarterly
19	Environmental Compliance KPIs	Leachate quality	Compliance with GPCB / EC discharge norms	Lab test reports	Quarterly
20	Environmental Compliance KPIs	Groundwater protection	No statistically significant deterioration in groundwater quality attributable to landfill	Piezometer monitoring	Quarterly

Sn.	KPI Category	Performance Area	KPI / Performance Standard	Measurement Method	Frequency
21	Environmental Compliance KPIs	Surface water protection	No contamination of nearby surface water bodies	Sampling & analysis	Quarterly
22	Maintenance KPIs	Roads & drains	Roads and drains maintained in serviceable condition	Inspection	Quarterly
23	Maintenance KPIs	Leachate systems	Pumps, sumps, and pipelines functional	Maintenance logs	Quarterly
24	Maintenance KPIs	Electrical systems	Power supply, lighting, DG sets functional	Logs / inspection	Quarterly
25	Maintenance KPIs	Fire safety systems	Firefighting systems operational	Inspection	Quarterly
26	Reporting and Documentation KPIs	Environmental reports	Monitoring reports submitted within stipulated timelines	Submission records	Quarterly
27	Operations KPIs	Intermediate cover	Intermediate cover applied as per approved schedule	Inspection	Prior to Monsoon
28	Health and Safety KPIs	Safety incidents	All incidents reported and investigated	Records	As occurred
29	Reporting and Documentation KPIs	Statutory compliance	Timely submission to SPCB / authorities	Acknowledgements	As required
30	Environmental Compliance KPIs	Storm water control	No storm water ingress into active landfill cells	Inspection during rains	Event-based

6.4 Monitoring, Measurement, and Verification

- Performance shall be monitored through review of records and reports, site inspections and audits, and environmental monitoring data.
- The Employer or its authorized representative shall have the right to inspect the facility at any time, verify performance data and direct corrective actions in case of non-compliance.

6.5 Corrective Actions and Non-Compliance

- In case of failure to meet any performance standard or KPI, the Contractor shall immediately identify the cause of non-compliance and implement corrective measures within the time frame directed by the Employer and
- The Contractor shall ensure to prevent recurrence of such non-compliance in future.
- Persistent or repeated non-compliance shall attract remedies, including penalties, as specified in the Conditions of Contract (SCC).

6.6 No-Claim Provision

- a. The Contractor shall be deemed to have considered all performance standards and KPIs while submitting the Bid.
- b. No claim for additional cost or extension of time shall be admissible on account of compliance with performance standards, monitoring requirements, or corrective actions.

7 Environmental, Health & Safety (EHS) Requirements

7.1 General

- a. The Contractor shall be fully responsible for ensuring protection of the environment and safeguarding the health and safety of all personnel, the public, and the surrounding environment during the design, construction, testing, commissioning, and the entire six (6) year Operation and Maintenance period of the Sanitary Landfill Facility (SLF).
- b. The Contractor shall implement all necessary measures to prevent adverse environmental impacts and occupational hazards arising from the execution and operation of the Project.
- c. All activities under the Contract shall be carried out in full compliance with applicable environmental laws, labour laws, occupational health and safety regulations, and the conditions stipulated in the Environmental Clearance, Consent to Establish, and Consent to Operate issued by statutory authorities.
- d. The EHS obligations shall apply to the Contractor, its subcontractors, suppliers, and any other persons engaged at the Project Site.

7.2 Noise Control during Construction

- a. The Contractor shall take all necessary measures to control and minimize noise arising from construction activities and operation of construction plant and equipment, in accordance with the Environment (Protection) Act, 1986, the Noise Pollution (Regulation and Control) Rules, 2000, as amended, and other Applicable Laws.
- b. Noise levels at the construction site and at the site boundary shall be maintained within the permissible limits prescribed by statutory authorities. All construction plant, machinery, and equipment shall be properly maintained and, where appropriate, fitted with approved mufflers, silencers, or acoustic enclosures to reduce noise emissions. Equipment generating excessive noise shall not be permitted to operate, and the Employer or its authorized representative shall have the right to instruct the Contractor to shut down or remove any equipment that does not comply with noise control requirements.
- c. Construction methods and equipment shall be selected and operated in a manner that minimizes noise generation. Percussive methods for breaking concrete shall be avoided, and noise-reducing systems and equipment, such as hydraulic or electrically operated drills and breakers, shall be used wherever practicable. All construction plant shall be maintained in good working condition to prevent noise due to vibration, wear, or mechanical defects.
- d. Noisy construction activities and plant shall be located as far as practicable from occupied buildings and sensitive receptors. Temporary noise barriers, acoustic screens, site huts, or other suitable noise attenuation measures shall be provided wherever necessary to mitigate noise impacts. Care shall be exercised during loading and unloading of materials, movement of vehicles, dismantling of temporary works, and handling of materials to minimize impact noise.
- e. The Contractor shall ensure that access arrangements and construction logistics are planned so as to cause minimum disturbance to nearby residents and occupied premises. Construction activities during night hours or beyond normal working hours

shall be undertaken only with prior written approval of the Employer and in compliance with statutory restrictions.

- f. The Contractor shall provide all necessary instruments, qualified personnel, and arrangements for measurement and monitoring of noise levels, as and when required by the Employer or statutory authorities. Noise monitoring reports, including analysis and compliance status, shall be submitted to the Employer within the timeframe specified.
- g. No construction activity shall be carried out in a manner that causes public nuisance, except in cases where work is essential to safeguard life, property, or safety of the Works, in which event the Contractor shall immediately inform the Employer and take all reasonable mitigation measures.

7.3 Environmental Protection

- h. The Contractor shall adopt a proactive approach to environmental management, ensuring that the design and operation of the SLF prevent contamination of land, soil, groundwater, and surface water.
- i. Particular emphasis shall be placed on effective containment and management of leachate, protection of liner systems, and prevention of uncontrolled discharges.
- j. Groundwater quality shall be monitored regularly through designated piezometer wells, and any deviation from baseline conditions attributable to landfill operations shall be promptly investigated and mitigated by the Contractor at its own cost.
- k. Storm water shall be managed in a manner that prevents ingress into active landfill cells and avoids erosion, flooding, or slope instability. Surface runoff shall be safely conveyed away from landfill areas without causing environmental degradation.
- l. The Contractor shall ensure that only authorized waste streams are accepted and disposed of in designated landfill cells and that practices such as open burning, unauthorized dumping, or scavenging are strictly prohibited.
- m. The Contractor shall control dust during construction and operation, manage landfill gas effectively, and prevent odour nuisance beyond the site boundary.
- n. All emissions shall comply with applicable ambient air quality standards and regulatory requirements.

7.4 Occupational Health and Safety

- a. The Contractor shall provide and maintain a safe and healthy working environment for all personnel deployed at the Project Site. Adequate safety measures shall be implemented to prevent accidents, injuries, and occupational illnesses.
- b. All plant, machinery, vehicles, and equipment shall be maintained in safe operating condition and shall be operated only by trained and authorized personnel.
- c. Appropriate personal protective equipment (PPE) shall be provided to all workers and visitors, and its use shall be mandatory.
- d. The Contractor shall ensure that personnel are adequately trained through induction programs and periodic safety training sessions.

7.5 Fire Safety and Emergency Preparedness

- a. The Contractor shall implement comprehensive fire prevention and emergency preparedness measures suitable for landfill operations.
- b. Fire detection and firefighting systems shall be installed, maintained, and kept operational at all times.
- c. Open burning of waste shall be strictly prohibited.
- d. An Emergency Response Plan shall be prepared, implemented, and periodically updated to address potential incidents such as fires, gas-related hazards, leachate spills, medical emergencies, and natural disasters.

7.6 Environmental Monitoring Program and Responsibility

- a. The Contractor shall implement a comprehensive Environmental Monitoring Program (EMP) during the construction and operation phases of the Project, strictly in accordance with the Environmental Clearance (EC), approved EIA/EMP, Consent to Establish (CTE), Consent to Operate (CTO), and Applicable Laws.
- b. The Environmental Monitoring Program shall include, but not be limited to, monitoring of air quality, water quality (surface and groundwater), noise levels, soil quality, plantation and green belt development, haul road conditions, and borrow area management, at locations, frequencies, and parameters as prescribed under statutory approvals.
- c. The Contractor shall be solely responsible for implementation of the EMP, engagement of approved laboratories, monitoring, record keeping, and submission of reports to the Employer and statutory authorities.
- d. The Employer or its authorized representative shall have the right to supervise, review, and direct corrective actions based on monitoring results.
- e. Any modification to the Environmental Monitoring Program arising from statutory directions shall be automatically applicable under the Contract without additional cost or time implications.

7.7 Incident Reporting and Corrective Action

- a. Any environmental incident, accident, safety violation, or near-miss occurring at the Project Site shall be reported immediately to the Employer and relevant authorities, as applicable.
- b. The Contractor shall investigate the root causes of such incidents and implement corrective and preventive measures to avoid recurrence.
- c. The Contractor shall cooperate fully with any investigation carried out by statutory authorities.

7.8 Audits, Inspections, and Compliance

- a. The Employer or its authorized representative shall have the right to carry out EHS inspections and audits at any time during the Contract Period.
- b. The Contractor shall provide full cooperation and access to records, personnel, and facilities.
- c. Any non-compliance identified during inspections or audits shall be rectified by the Contractor within the timeframe specified by the Employer.

- d. Failure to comply with EHS requirements shall be treated as material non-performance and shall attract corrective actions, penalties, or other remedies as specified in the Conditions of Contract.

7.9 No-Claim Provision

- a. The Contractor shall be deemed to have included in the Contract Price all costs associated with compliance with environmental, health, and safety requirements.
- b. No claim for additional cost or extension of time shall be admissible on account of implementation of EHS measures or compliance with statutory and contractual obligations.

8 Quality Assurance & Quality Control (QA/QC)

8.1 General

- a. The Contractor shall establish, implement, and maintain a comprehensive Quality Assurance and Quality Control (QA/QC) system for all activities associated with the design, procurement, construction, testing, commissioning, and six (6) year Operation and Maintenance of the Sanitary Landfill Facility (SLF).
- b. The QA/QC system shall ensure that all works, materials, equipment, and services conform to the requirements mentioned in the Tender Documents, Applicable Laws, statutory approvals, and recognized engineering standards.
- c. Quality shall be an integral part of the Project execution and shall not be treated as an activity limited to inspection alone. The Contractor shall be responsible for achieving quality through proper planning, trained personnel, approved procedures, and continuous monitoring.

8.2 Control of Design Quality

- a. The Contractor shall ensure that all design and engineering activities are carried out as per Good Engineering Practice.
- b. Design inputs, assumptions, calculations, and outputs shall be properly reviewed and verified prior to issue for construction.
- c. Any changes to approved designs shall be subject to documented review and approval procedures.
- d. Review or comments by the Employer or its authorized representative shall not relieve the Contractor of responsibility for design adequacy or fitness for purpose.

8.3 Quality Control of Materials and Equipment

- a. The Contractor shall ensure that all materials and equipment procured for the Project conform to specified standards and approved designs.
- b. Materials and equipment shall be subject to inspection and testing at manufacturing facilities, prior to dispatch, and upon receipt at site, as applicable.
- c. Materials found to be non-conforming shall be rejected and removed from site.
- d. Replacement of rejected materials shall be carried out by the Contractor at its own cost and without impact on the Project schedule.

8.4 Construction Quality Control

- a. The Contractor shall implement quality control measures during construction to ensure that all works are executed in accordance with approved drawings, specifications, and procedures.
- b. Inspection and testing shall be carried out at appropriate stages to verify workmanship, dimensional accuracy, and material performance.
- c. Records of inspections, tests, and approvals shall be maintained systematically and made available to the Employer or its authorized representatives or the regulatory authorities upon request.
- d. Any non-conformity identified during construction shall be promptly rectified, and preventive measures shall be implemented to avoid recurrence.

8.5 Testing and Verification

- a. All tests required under the Contract, including laboratory tests, field tests, and performance tests, shall be carried out by NABL approved laboratories.
- b. Test results shall be documented and submitted to the Employer as part of the quality records.
- c. Where test results indicate non-compliance, the Contractor shall investigate the cause and carry out corrective measures, including rework or replacement, as necessary.

8.6 Quality Control during Operation and Maintenance

- a. During the O&M period, the Contractor shall continue to implement quality control measures to ensure reliable and compliant operation of the SLF.
- b. Preventive maintenance schedules shall be followed, and performance of equipment and systems shall be monitored and recorded.
- c. Any deterioration in performance or condition of assets shall be promptly addressed to maintain compliance with performance standards and KPIs specified in the Contract.

8.7 Documentation and Records

- a. The Contractor shall maintain comprehensive quality documentation, including quality plans, inspection and test records, non-conformance reports, corrective action records, as-built drawings, and operation manuals.
- b. All records shall be retained for the duration of the Contract and made available to the Employer or regulatory authorities upon request.

8.8 Audits and Continuous Improvement

- a. The Employer or its authorized representative shall have the right to conduct quality audits at any time.
- b. The Contractor shall cooperate fully with such audits and shall implement corrective and preventive actions arising from audit findings within the specified timeframe.

8.9 No-Claim Provision

- a. The Contractor shall be deemed to have included in the Contract Price all costs associated with implementation of the QA/QC system, inspections, testing, documentation, and corrective actions.
- b. No claim for additional cost or extension of time shall be admissible on account of quality control requirements or rectification of non-conforming work.

9 Documentation & Reporting Requirements

9.1 General

- a. The Contractor shall be responsible for preparation, maintenance, submission, and safe custody of all documents, records, drawings, reports, and data required in the Tender documents during the design, construction, testing, commissioning, and six (6) year Operation and Maintenance period of the Sanitary Landfill Facility (SLF).
- b. All submissions required to be made by the Contractor under this Project shall be prepared and submitted strictly in accordance with the Submission Schedule prescribed in the Tender Documents.
- c. Documentation and reporting shall be treated as an integral contractual obligation, essential for demonstrating compliance with technical requirements, statutory approvals, performance standards, and contractual deliverables.
- d. All documents shall be prepared in English or Gujarati only, in formats approved by the Employer, and shall be submitted both in hard copy and electronic form, unless specified otherwise.

9.2 Design and Engineering Documentation

- a. During the design and engineering phase, the Contractor shall prepare and submit all detailed engineering drawings, design calculations and technical specifications as per the submission schedule.
- b. All design & engineering documents shall be reviewed and approved prior to issue for construction. Document revisions shall be clearly identified, recorded, and traceable.

9.3 Site Responsibility Chart

- a. The Contractor shall, before the commencement of Construction, submit a Site Responsibility Chart for approval of the Employer or its authorized representative.
- b. The Site Responsibility Chart shall clearly define the roles, functions, and responsibilities of all key personnel to be deployed at site, including the Project Manager, construction managers, engineers, supervisors, safety officers, quality personnel, and workmen, as well as the roles and responsibilities of all subcontractors engaged in execution of the Works.
- c. The Contractor shall ensure that the Site Responsibility Chart remains updated at all times and reflects any changes in personnel during the Contract Period. No major change in key site personnel shall be made without prior intimation to the Employer.

9.4 Construction Stage Documentation

- a. During construction, the Contractor shall maintain comprehensive records covering execution of the Works. These shall include daily progress reports, monthly progress reports, inspection report, test records, quality control documentation, material test reports, method statements, and records of statutory inspections.
- b. Such reports / document shall be kept at the site and produced it whenever required.
- c. Construction-stage documentation shall accurately reflect the status of works and shall be updated on a regular basis to enable effective monitoring by the Employer.

9.5 Testing, Commissioning, and Acceptance Records

- a. The Contractor shall prepare and submit complete documentation relating to testing, pre-commissioning, commissioning, and performance verification activities. This shall include test procedures, test results, commissioning reports, compliance statements, and certification records required for Provisional Acceptance and Final Acceptance.
- b. Acceptance of the Works shall be subject to submission and approval of all required commissioning and performance documentation.

9.6 Operation and Maintenance Documentation

- a. During the O&M period, the Contractor shall maintain detailed operational and maintenance records, including daily waste receipt and disposal logs, equipment operation logs, preventive and corrective maintenance records, manpower deployment records, and consumable usage records.
- b. The Contractor shall also prepare and submit periodic O&M reports (as mentioned in the Submission Schedule) summarizing operational performance, compliance status, incidents, corrective actions, and observations, at intervals specified by the Employer.

9.7 Environmental and Statutory Reporting

- a. The Contractor shall prepare and submit all environmental monitoring reports, compliance statements, and statutory returns required under the Environmental Clearance, Consent to Establish, Consent to Operate, and Applicable Laws.
- b. All submissions to statutory authorities shall be made within prescribed timelines, with copies provided to the Employer. Any non-compliance or adverse observation by regulatory authorities shall be promptly reported to the Employer along with corrective action taken.

9.8 As-Built Drawings and Final Documentation

- a. Upon completion of construction and prior to Provisional Acceptance, the Contractor shall submit complete as-built drawings reflecting the Works as executed, including all deviations from approved designs.
- b. The Contractor shall also submit Operation and Maintenance Manuals, equipment warranties, spares lists, and other final documentation required for effective long-term operation of the facility.

9.9 Record Retention and Access

- a. All documents and records related to the Project shall be retained by the Contractor for the entire duration of the Contract and for any additional period required under Applicable Laws.
- b. The Employer or its authorized representatives shall have the right to access, inspect, and copy such records at any time for the purposes of audit, compliance verification, or dispute resolution.

9.10 Accuracy and Accountability

- a. The Contractor shall be solely responsible for the accuracy, completeness, and authenticity of all documents and reports submitted under the Contract.
- b. Submission of misleading, incorrect, or falsified information shall be treated as a material breach of contract.

9.11 No-Claim Provision

- a. The Contractor shall be deemed to have included in the Contract Price all costs associated with preparation, submission, storage, and management of documentation and reports.
- b. No claim for additional cost or extension of time shall be admissible on account of documentation or reporting requirements.

Appendix 1: Project Milestones

Design & Engineering and Environmental Clearance (EC) processes shall run simultaneously. Any change or recommendations proposed by the competent authority shall be incorporated in design by the Contractor.

Part A – Milestones during Design and Engineering Stage

Table 6: Design and Engineering Stage Milestones

Milestone No.	Milestone Description	Completion Timeline (T = Date of Work Order)	Role
Milestone A.1.	Issue of Work Order / Commencement of Contract	T	Employer
Milestone A.2.	Submission of Project Execution Plan	T + 1 week	Contractor
Milestone A.3.	Completion of Topographical, Geotechnical, and Hydrogeological Investigations and submission of reports thereof	T + 2 weeks	Contractor
Milestone A.4.	Preparation and submission of Landfill Cell Design Calculations SLF Layout with landfill cell and supporting infrastructure and Liner System Drawings	T + 3 weeks	Contractor
Milestone A.5.	Preparation and submission of civil & structure drawings for approval	T + 5 weeks	Contractor
Milestone A.6.	Preparation and submission of MEP drawings for approval	T + 6 weeks	Contractor

Part B: Milestones during Environmental Clearance (EC) Stage

Table 7: Environment Clearance (EC) Stage Milestones

Milestone No.	Milestone Description	Activity Duration	Completion Timeline (T = Date of Work Order)	Role
Milestone B.1.	Issue of Work Order & Commencement of Contract	-	T	Employer
Milestone B.2.	Appointment and submission of details	2 Weeks from Work order date	T + 2 weeks	Contractor

Milestone No.	Milestone Description	Activity Duration	Completion Timeline (T = Date of Work Order)	Role
	of NABET-accredited EIA Consultant			
Milestone B.3.	Submission of Form - 1	2 Weeks from Work order date	T + 4 weeks	Contractor (through its appointed EIA Consultant)
Milestone B.4.	Approval of TOR	6 weeks from the submission of TOR	T + 10 weeks	Concerned Authority
Milestone B.5.	Commencement of Environmental Baseline Monitoring (EBM)	2 weeks from the approval of TOR (excluding monsoon) *	T + 12 weeks (excluding monsoon) *	Contractor (through its appointed EIA Consultant)
Milestone B.6.	Submission of Environmental Baseline Monitoring (EBM) Report	12 weeks from commencement of EBM (excluding monsoon) *	T + 24 weeks (excluding monsoon) *	Contractor (through its appointed EIA Consultant)
Milestone B.7.	Submission of Draft (Draft) EIA report for review by Employer	14 weeks from commencement of EBM	T + 26 weeks	Contractor (through its appointed EIA Consultant)
Milestone B.8.	Review of Draft (Draft) EIA by Employer	2 weeks from the submission of Draft (Draft) EIA report	T + 28 weeks	Employer
Milestone B.9.	Submission of Draft (Final) EIA report after incorporating comments for Public Hearing; and, Submission of Executive Summary of EIA for Public Hearing in English and Gujarat language.	1 week from the receipt of comments from Employer	T+ 29 weeks	Contractor (through its appointed EIA Consultant)
Milestone B.10.	Conduct public hearing by regulatory authority	8 weeks from submission of draft EIA report	T+ 37 weeks	Concerned Authority
Milestone B.11.	Submission of Final (Draft) EIA report by incorporating Public Hearing Proceedings	2 weeks from the issuance of public hearing proceedings	T + 39 weeks	Contractor (through its appointed

Milestone No.	Milestone Description	Activity Duration	Completion Timeline (T = Date of Work Order)	Role
	for review by Employer			EIA Consultant)
Milestone B.12.	Review of Final (Draft) EIA report by Employer	2 weeks from the submission Final (Draft) EIA report	T + 41 weeks	Employer
Milestone B.13.	Submission of Final (Final) EIA report after incorporating comments from Employer	1 week from the receipt of comments from Employer	42 weeks	Contractor (through its appointed EIA Consultant)
Milestone B.14.	Grant of EC	8 weeks from submission of Final (Final) EIA report	50 weeks	Concerned Authority

(* In case if baseline monitoring activity is not allowed to be executed during monsoon season, the timelines shall be extended for such period.)

Part C: Milestone during Construction Stage

Table 8: Construction Stage Milestones

Milestone No.	Milestone Description	Completion Timeline (E = Grant of EC)	Role
Milestone C.1.	Grant of EC	E	Concerned Authority
Milestone C.2.	Site clearing, approach road, and boundary fence	E+ 1 month	Contractor
Milestone C.3.	Landfill Cell Excavation	E + 3 months	Contractor
Milestone C.4.	Construction of Retaining wall	E + 5 months	Contractor
Milestone C.5.	Completion of landfill Cell including Composite Base line & Side Liner System Installation, Leachate Collection System & Gas Venting Infrastructure	E + 7 months	Contractor
Milestone C.6.	Completion of Internal Roads, Storm water Drains, Admin building, toilet block, water supply, waste water disposal, water tanks, inspection shed, leachate collection	E + 10 months	Contractor

	tank, weighbridge cabin, and other Civil Infrastructure.		
Milestone C.7.	Completion of all Mechanical & Electrical Installations including admin building plumbing and electric work	E + 11 months	Contractor
Milestone C.8.	Installation of Ancillary Facilities like Weighbridge, Wheel Wash system, leachate treatment facility, and Admin building furniture	E + 12 months	Contractor
Milestone C.9.	Completion of plantation in green belt area Testing, Commissioning & Performance Verification Issuance of Provisional Acceptance Certificate (PAC) Commencement of Operation & Maintenance (6 years)	E + 12 months	Contractor
Milestone C.10.	Procurement of O&M Vehicles and Machinery	E + 12 Months	Contractor

Note:

Notwithstanding anything contained elsewhere in the Tender document, Morbi Municipal Corporation (MRMC) reserves the unconditional right, at its sole discretion, upon receipt of Environmental Clearance (EC) for the Sanitary Landfill Facility (SLF), to suspend, hold in abeyance, reduce the scope of, or terminate this Agreement, in whole or in part, by giving written notice to the Contractor.

In such event, the Contractor shall be entitled only to payment for the services satisfactorily performed and accepted by MRMC up to the effective date of suspension or termination. The Contractor shall not be entitled to any claim for loss of profit, anticipated revenue, consequential damages, compensation for unperformed services, or any other costs arising out of such suspension or termination.

Upon receipt of the notice of suspension or termination, the Consultant shall immediately discontinue the affected services and submit all reports, drawings, studies, data, documents and other deliverables prepared up to the date of suspension or termination to MRMC.

Appendix 2: Submission Schedule

All submissions shall be made in the formats approved by the Employer. Review, comments, or acceptance of any submission by the Employer shall be for general conformity only and shall not relieve the Contractor of its responsibilities under the Contract. Delays arising due to incomplete, incorrect, or non-compliant submissions shall be solely attributable to the Contractor and shall not entitle the Contractor to any extension of time or additional payment.

Table 9: Submission Schedule

Sn.	Submission	Timeline
1.	Project Execution Plan including detailed Gantt chart (baseline schedule), Resource Deployment Plan, and proposed project team with roles and responsibilities.	Within 01 week from Work Order
2.	Environment, Health and Safety (EHS) Plan	Within 02 weeks from Work Order
3.	Topographical, Geotechnical, and Hydrogeological Survey Report	Within 02 weeks from Work Order
4.	Appointment of NABET-accredited EIA Consultant	Within 02 weeks from Work Order
5.	Design Basis Report and Landfill Cell Design Calculations	Within 03 weeks from Work Order
6.	SLF Layout with landfill cell and supporting infrastructure and Liner System Drawings	Within 03 weeks from Work Order
7.	Drawings - Civil & Structural	Within 05 weeks from Work Order
8.	Drawings - Mechanical, Electrical & Plumbing (MEP)	Within 06 weeks from Work Order
9.	Revised Drawings - Civil & Structural (If required)	Before commencement of construction of the structure
10.	Revised Drawings - Mechanical, Electrical & Plumbing (MEP) (If required)	Before procurement of the component
11.	Design & Drawing Review Comments Compliance Report	Within 7 days of comments
12.	Draft EIA / EMP Report	As mentioned in the Project Milestones
13.	Final EIA / EMP Report (post-public consultation)	As mentioned in the Project Milestones
14.	Environmental Clearance (EC)	Within 12 months of work order
15.	Consent to Establish (CTE)	Prior to commencement of construction

Sn.	Submission	Timeline
16.	Method Statements for Major Activities	Prior to activity
17.	Material Test Certificates & Inspection Reports	Prior to activity
18.	Monthly Construction Progress Reports	Monthly
19.	Commissioning & Performance Test Reports	As mentioned in the Project Milestones
20.	Compliance Statement for Provisional Acceptance	Prior to issuance of Provisional Acceptance Certificate (PAC)
21.	All As-Built Drawings (All Disciplines)	Prior to issuance of Provisional Acceptance Certificate (PAC)
22.	O&M Manual / SOP	Prior to commencement of operations
23.	Consent to Operate (CTO)	Prior to commencement of operations
24.	Preventive Maintenance Schedule	Prior to commencement of operations
25.	Resource Deployment Plan (O&M) including manpower and machineries	Prior to commencement of operations
26.	Monitoring Dashboard – Live Access	Prior to commencement of operations
27.	Daily Operational Logs	Maintained daily, submitted monthly
28.	Monthly O&M Performance Reports including KPI Compliance Reports	Monthly
29.	Environmental Monitoring Reports	Quarterly / As required
30.	Asset Register & Inventory	Prior to issuance of Final Acceptance Certificate (FAC)
31.	Any other submission as instructed by the Employer	As per the instructions

Appendix 3: Geo-Technical Investigation Report

**FINAL REPORT
SOIL INVESTIGATION, TOPOGRAPHY AND
GROUND WATER INVESTIGATION FOR
COMPONENTS OF THE SANITARY LANDFILL
AT MORBI. TAL & DIST : MORBI. STATE : GUJARAT.**

**JOB NO.: MK/24/02-2026
MONTH & YEAR: FEBRUARY – 2026**

**FORWARDED TO,
GUJARAT ENERGY RESEARCH AND
MANAGEMENT INSTITUTE.,
GANDHINAGAR.**

**M K SOIL TESTING LABORATORY
PRIVATE LIMITED.
SURVEY NO. 4/4, BHARTI HOUSE,
NEAR CHANCHALBAUG PARTY PLOT,
OPPOSITE JHANVI BUNGALOWS, BODAKDEV,
AHMEDABAD – 380 054,
PHONE NO.: +91-79-2970-2174 / 75, 9624097903**

Job No.: MK/24/02-26

M K Soil Testing Laboratory Private Limited, Ahmedabad-54

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Job No.: MK/24/02-26

M K Soil Testing Laboratory Private Limited, Ahmedabad-54

1.0 INTRODUCTION:

Gujarat Energy Research And Management Institute., Gandhinagar Proposes Soil investigation, topography and ground water investigation for components of the Sanitary landfill at Morbi. Tal & Dist : Morbi. State : Gujarat.

1.1. Scope of Work:

The purpose of the investigations was to determine the sub soil stratification, geotechnical information & safe bearing capacity of the subsoil strata, so as to provide information that will assist the structural engineers in the design of the foundations and the relevant works.

The Job was carried out vide your work order no. GERMI / PRM / 2025 / Nov / 184 dated 24.11.2025 under the guidance and supervision of soil personnel of M K Soil Testing Laboratory Private Limited and client's engineer.

2.0 FIELD WORK:**2.1 Boring:**

One borehole having 150mm diameter was drilled with rotary drilling method upto 15.0m depth below Existing ground level (EGL). The work was in general carried out in accordance with IS: 1892 – 1979. The borehole is shown in location plan in drawing part of report.

Table No. 1 Location Details

Test location	Termination depth below EGL (m)	Ground water table below EGL (m)
BH-1	15.0	Not met with

2.1.1 Disturbed Samples

Disturbed representative samples were collected, logged, labelled and placed in polythene bags. Core samples are collected wherever rock was encountered. As the rock encountered is highly fractured sufficient core samples were not collected during drilling work.

2.1.2 Undisturbed Samples

Undisturbed soil samples are not collected in 100 mm diameter thin walled samplers (Shelby tube) due to weathered rock from shallow depth.

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2.2 Standard Penetration Test

The standard penetration tests are conducted in bore as per IS: 2131: 1981 (Reaffirmed 1987). The split spoon sampler resting on the bottom of bore hole is allowed to sink under its own weight, then the split spoon sampler is seated 15cm with the blows of hammer falling through 750mm. The driving assembly consists of a driving head and a 63.5 kg weight. It is ensured that the energy of the falling weight is not reduced by friction between the drive weight and the guides or between ropes. The rods to which the sampler is attached for driving are straight, tightly coupled and straight in alignment. Thereafter the split spoon sampler is further driven by 30cm. The number of blows required to drive each 15cm penetration is recorded. The first 15cm of drive considered as seating drive. The total blows required for the second and third 15cm penetration is termed as a penetration resistance - N value.

As per standard reference books, (Reference: Foundation analysis and design 5th Edition by Joseph Bowles, Para : 3.7). The boring log shows Refusal and the test is halted :

"If the no. of blows exceeds 50 before desired penetration is achieved, it is reported as N- value >50 (refusal) with the actual penetration achieved".

2.3 Drilling in Rocks:

When rock was encountered core barrel and Nx size TC/Diamond bits are used for drilling and recovering rock cores. Recovered rock cores were numbered serially and preserved in wooden core boxes. Rock core recovery and Rock Quality Designation (RQD) were computed for every run length drilled. Detailed core logs of boreholes were prepared by geologist at site.

Scale Of Weathering Grades Of Rock Mass (As per IS : 4464: 2024)

Terms	Description	Grade
Fresh	No visible sign of rock material weathering, perhaps slight discoloration on major discontinuity surfaces.	W1
Slightly Weathered rock	Discoloration indicates weathering of rock material and discontinuity surfaces. All the rock material may be discolored by weathering.	W2
Moderately Weathered rock	Less than half of the rock material is decomposed or disintegrated to a soil. Fresh or discolored rock is present either as a continuous framework or as core stones.	W3
Highly Weathered rock	More than half of the rock material is decomposed or disintegrated to a soil. Fresh or discolored rock is present either as a discontinuous framework or as core stones	W4
Completely Weathered rock	All rock material is decomposed and / or disintegrated to soil. The original mass structure is still largely intact.	W5

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Classification of Rock as per RQD

RQD Classification	RQD (%)
Excellent	90 to 100
Good	75 to 90
Fair	50 to 75
Poor	25 to 50
Very Poor	00 to 25

Classification of Rock as per Compressive Strength

Rock Strength	Compressive Strength (Kg/cm ²)
Extremely weak	< 20
Very Weak	20 to 100
Weak	101 to 250
Average	251 to 500
Strong	501 to 1000
Very Strong	1001 to 2500
Extremely Strong	> 2500

3.0 LABORATORY WORK :

The laboratory tests on Rock samples were started immediately after the receipt of the same in the laboratory as per approved list given by client. All laboratory tests are carried out as per the respective Indian Standards. The results of the laboratory tests were performed on various soil/rock samples are presented in the form of Table No. 3 and drawing part end of report.

4.0 SUB SOIL STRATIFICATION:

Field and laboratory test data reveal the general stratification as under:

Table – 2**Soil Stratification of boreholes**

BH No	Depth (m)	Stratification	CR & RQD (%)
BH-1	0.0-3.0	Filled up material	-
	3.0-15.0	Grayish weathered rock	CR : 56.0-90.0% RQD : 35.0-52.0%

* 3 *

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5.0 TYPICAL CALCULATION OF SAFE BEARING CAPACITY (ROCK LAYER):

In general Rock mass rating (RMR) method for estimation of SBC in rock is used for good quality rock. SBC is estimated based on RMR and core strength as below :

5.1 Bearing Capacity (Based on RMR)**Obtaining RMR**

Sr. No.	Description	Condition	Rating as per IS 13365 (part 1)
1.	Strength or intact rock material	Average	4
2.	Rock Quality Designation	Poor	8
3.	Spacing of Discontinuities	Close	8
4.	Condition of Discontinuity	Considering 5mm to 1-5mm thick gauge	5
5.	Ground Water Condition	Considering Damp	10
6.	Orientation of discontinuity	Considering fair	-7
RMR			28

RMR value obtained is 28 for which as per IS: 12070-1987 the safe bearing capacity is obtained as 80.0 t/m² without exceeding total settlement 12mm.

5.2 Safe Bearing pressure based on Core Strength (IS: 12070) :

This method is applicable for rock mass with closed discontinuities at moderately close spacing (0.3m to 1m)

The safe bearing pressure is given by

$$q_s = q_c \times N_j$$

q_s = Gross safe bearing pressure

q_c = Average uniaxial compressive strength of rock core.

= Considering minimum compressive strength in the upper layer = 285.5 kg/cm².

N_j = Empirical co-efficient depending on spacing of discontinuities.

= 0.1 for spacing of discontinuity 30cm to 100cm.

$$q_s = 285.5 \times 0.1 = 28.55 \text{ kg/cm}^2 = 28.55 \text{ t/m}^2 \text{ say } 28.5 \text{ t/m}^2.$$

Applying factor as per Clause 9.0,

Factor for submerged condition and cavities : not applicable

Factor for Slope fair orientation of continuous joints in the slope : 1/2

Hence $q_s = 28.5 \times 1/2 = 14.25 \text{ t/m}^2$.

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6.0 SUMMARY:**Bearing Capacity Based on Rock Mass Rating (RMR)**

Borehole Location	Strata	Depth with minimum 0.50m embedment in rock (m.)	RMR Value	Net SBC as per RMR (t/m ²)	Recommended Net SBC (t/m ²)
BH-1	Weathered rock	3.5	28	80	45
		4.5	28	80	65
		5.5	28	80	65

Note : This recommended safe bearing capacity is on rock given in the above table are applicable for all size of foundations isolated foundation, strip footings and raft foundation. It also considers maximum permissible settlement of 12mm as per IS: 13063:1991.

6.1 General Recommendation for Foundation on rock:

This recommended safe bearing capacity on rock given in the above table is applicable for all size of foundations isolated foundation, strip footings and raft foundation. It also considers maximum permissible settlement of 12mm as per IS: 13063:1991. Also there is no significant effect of size for foundation resting on rock or compact soil strata having penetration as refusal.

The above bearing capacity values are based on boreholes data of rock obtained during investigation. Sufficient care shall be taken to remove loosened pieces of rock from foundation, washing and air jetting has been done, so that foundation rests on practically undisturbed rock mass.

If at the time of actual excavation major cavities are found, the depth of foundation shall be taken to a level such that 80% rock area is available. It must be ensured that any part of footing / raft does not overhang. If loose pockets of disintegrated rock are found at few places same shall be cleaned and backfilled with lean concrete.

If deep observation pits or existing pits are encountered the same shall be backfilled by lean concrete upto the foundation level. Due attention shall be paid to problems of foundation on rock slopes and necessary remedial measures shall be taken.

Excavations through rock may be cut nearly vertical. Wedges of soft disintegrated rock should be removed for safety purpose. During the dry season with no surficial flow, even steeper slopes may remain stable. The engineer should monitor the slopes to ensure stability. If excessive sloughing or caving occurs, the slopes may be flattened to ensure stability.

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6.2 Foundation Level Preparation

The exposed foundation bearing surface should be compacted properly using light manual rammers / rollers. The surface should then be protected from disturbances due to construction activities so that the foundations may bear on the natural undisturbed ground. For all shallow foundations, we recommend the placement of a 75 to 100mm thick "bedding layer" of lean concrete to facilitate placement of reinforcing steel and to protect the soils from disturbance.

For foundations resting on rock all loose, weathered or fragmented rock should be removed so that foundations may bear on the firm rock. The foundation should be seated at least 0.5m into the rock formation.

Also there is possibility of undulation in bed rock levels. In such condition for open foundation adjacent by each other the level difference shall be adjusted by provision of lean concrete layer below the footing wherever required.

6.3 Variability in Subsurface Conditions

Surface conditions encountered during construction may vary somewhat from the conditions encountered during the site investigation. However it required to check and verified during execution of work.

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7.0 CONCLUSIONS AND RECOMMENDATION:

1. Soil Investigation work for proposed Soil investigation, topography and ground water investigation for components of the Sanitary landfill at Morbi is in general found to consists of by filled up material followed by weathered basalt rock upto termination depth below EGL.
2. The bearing capacity of foundations with minimum 0.50m embedment in weathered rock is given vide para 6.0 in tabular form. General recommendations for foundation on weathered rock are given vide para – 6.1 to 6.3 of report.
3. The results of the laboratory tests are incorporated in the form of tables at the later part of the report.

For, M K SOIL TESTING LABORATORY PRIVATE LIMITED



Site Incharge
(Hardik Ashara)



Lab Incharge
(Drashti Sheth)



Authorized Signatory
(Parag Dave)

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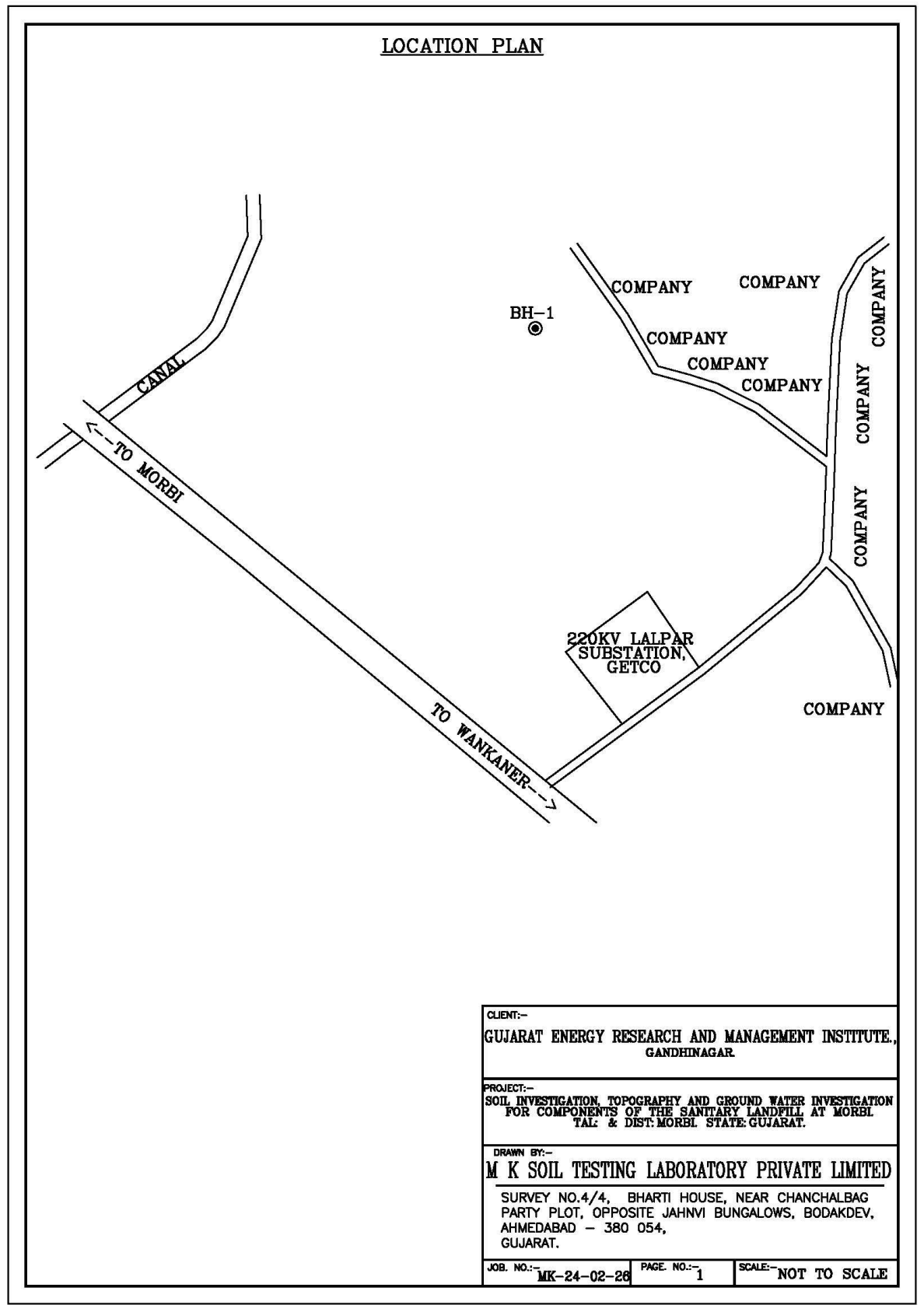
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ABBREVIATIONS

DS	Disturbed Soil Sample
CS	Core sample
SBC	Safe Bearing Capacity
SPT	Standard penetration test
REF	Refusal
NP	Non-Plastic
LL	Liquid Limit
PL	Plastic Limits
PI	Plasticity Index
RMR	Rock Mass Rating
CR	Core Recovery
RQD	Rock Quality Designation
FS	Filled up material
WR	weathered rock
BH	Borehole




PROJECT: SOIL INVESTIGATION, TOPOGRAPHY AND GROUND WATER INVESTIGATION
FOR COMPONENTS OF THE SANITARY LANDFILL AT MORBI.
TAL: & DIST: MORBI. STATE: GUJARAT.

CLIENT: GUJARAT ENERGY RESEARCH AND MANAGEMENT INSTITUTE., GANDHINAGAR.

METHOD OF BORING	ROTARY
DIA. OF BORE	150MM
BORE HOLE NO.	BH-1

G.W.T. BELOW EXISTING G.L. (m)	NOT MET WITH
TERMINATION DEPTH (m)	15.00
JOB NO.	MK-24-02-26

BORELOG

DEPTH (m)	TYPE OF SAMPLE	SPT - NO. OF BLOWS			SPT: N-VALUE	SOIL CLASSIFICATION	LEGEND	VISUAL DESCRIPTION	DEPTH IN (m)	LAYER THICKNESS (m)	CORE RECOVERY & R.Q.D. IN ROCK
		0-15cm	15-30cm	30-45cm							
0.00	DS	-	-	-	-	WR		GRAYISH COLOUR WEATHERED ROCK OBTAINED IN BOULDER FORM	15.00	15.00	CR=80% RQD=35% CR=84% RQD=40% CR=84% RQD=42% CR=90% RQD=45% CR=81% RQD=40% CR=80% RQD=48% CR=86% RQD=52% CR=88% RQD=45%
1.00	CS	-	-	-	-						
2.00	CS	-	-	-	-						
3.00	CS	-	-	-	-						
4.50	CS	-	-	-	-						
6.00	CS	-	-	-	-						
7.50	CS	-	-	-	-						
9.00	CS	-	-	-	-						
10.50	CS	-	-	-	-						
12.00	CS	-	-	-	-						
13.50	CS	-	-	-	-						
15.00	CS	-	-	-	-						

P - 2