Pre- Feasibility Report

Integrated Solid Waste Management, Haryana

For

Karnal Cluster

Wolkem India Limited

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Mewar Industrial Area, Madri,
Udaipur – 313 003, Rajasthan
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WOLKEM INDIA LIMITED
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<th>Title</th>
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</tr>
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1 EXECUTIVE SUMMARY

Karnal Cluster including Gharaunda, Indri, Nilokheri, Nissing, Pundri, and Taraori ULB is generating all kinds of waste, which is becoming a serious health and sanitation hazard for its residents. Apart from MSW waste, Karnal, cluster generates a lot of e-waste (due to a huge corporate sector) as well as bio-medical waste (due to a growing hospital sector). Besides, industrial waste (including sludge etc.) is also generated in large quantities due to growing industrial base. The cluster has an urban area at about 1967 square km. and a resident population of about 420484 in 2017. It generates 243 TPD of Municipal solid waste as per MCS officials every single day. The projected population in 2025 will be 504580 generating 290 TPD municipal waste and in 2035 population will be 605497 generating 414 TPD of municipal waste.

The Municipal Corporation of Karnal (MCK) is the apex body responsible for waste planning and management in the city. As far as its operational role is concerned, MCK is only responsible for waste generated in its municipal area. Waste management in HUDA sectors is undertaken by private contractors, RWAs as well as by permanent employees of HUDA.

The proposed integrated Municipal solid waste processing facility will cater to the needs of Karnal Cluster which comprises of Gharaunda, Indri, Nilokheri, Nissing, Pundri, and Taraori Urban Local Bodies (ULB’s). Estimated MSW generation in Karnal cluster is about 243 TPD. It is expected to reach 414 TPD by 2035. Municipal Corporation Karnal is the designated ULB for Karnal cluster.

Table 1-1: Details of the proposed project

<table>
<thead>
<tr>
<th>S. No.</th>
<th>Information</th>
<th>Details</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Project name</td>
<td>Integrated Solid Waste Management, Karnal cluster, Haryana</td>
</tr>
<tr>
<td>2.</td>
<td>Area</td>
<td>Total Area- 16 acres</td>
</tr>
<tr>
<td></td>
<td><strong>Location of Site</strong></td>
<td></td>
</tr>
<tr>
<td>3.</td>
<td>Villages</td>
<td>Mirgahan</td>
</tr>
<tr>
<td>4.</td>
<td>District</td>
<td>Karnal</td>
</tr>
<tr>
<td>5.</td>
<td>State</td>
<td>Haryana</td>
</tr>
<tr>
<td>6.</td>
<td>Water Requirement and its source</td>
<td>84 KLD</td>
</tr>
<tr>
<td>7.</td>
<td>Power Supply and its source</td>
<td>Construction Phase : D.G set 1x 250</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>---</td>
<td>---</td>
<td>---</td>
</tr>
<tr>
<td>8.</td>
<td>Project Cost</td>
<td>83.47 crore</td>
</tr>
<tr>
<td>9.</td>
<td>Nearest Railway station</td>
<td>Karnal</td>
</tr>
<tr>
<td>10.</td>
<td>Nearest SH/NH</td>
<td>Meerut - Karnal Road</td>
</tr>
<tr>
<td>11.</td>
<td>Nearest Air port</td>
<td>New Delhi</td>
</tr>
</tbody>
</table>

KVA
Operation Phase: 250 KW, State Electricity Board
2 INTRODUCTION AND BACKGROUND

2.1 Identification of Project and Project Proponent

The state of Haryana generates about 4249 Tonnes per day (TPD) of Municipal Solid Waste and this quantity is likely to be more than 7,675 TPD by 2035, assuming the rate of increase of per capita waste generation is in proportion to increase in urban population. Directorate of Urban Local Bodies (DULB), in its endeavor to provide people safe, clean and healthy environment, has proposed to set up cluster based integrated solid waste management facilities in the ULBs of Haryana in Public Private Partnership mode.

Based on factors such as existing treatment plants, free land pockets, optimal waste transport distance 15 cluster based MSW treatment plants have been proposed in Haryana. Karnal cluster comprises of ULBs of Gharaunda, Indri, Nilokheri, Nissing, Pundri, and Taraori. Estimated MSW generation in Karnal Cluster is about 243 TPD. It is expected to reach 414 TPD by 2035.

The proposed integrated Municipal solid waste Processing facility will be set up in 16 acres of new site in Karnal village capacity of 300 TPD.

2.2 Need of Project and its Importance to Region

Karnal is one of Historical Districts of Haryana. It is also known as a city of 'Daanveer Karn'. It is known all over the world for production of Rice, Wheat and Milk. Due to its geographical location, the Karnal district plays an important role in local tourism. Development and habitation in the city is generating all kinds of waste, which is becoming a serious health and sanitation hazard for its residents. Also in Karnal District due to rapid urbanization huge amount of waste is generated every year. So management of waste is of utmost importance. The project seeks to improve and develop a socially and environmentally sustainable system of solid waste management which will reduce the associated environmental and public health risks.

The project intends to create a socially, economically and environmentally viable solid waste management system to develop an environmentally and aesthetically sound MSW dumping site. The major objective is to reduce the solid waste generated in huge quantity and its associated health risks in Cluster.

In this regard, the Municipal Corporation of Karnal the designated ULB for Karnal cluster intends to obtain environmental clearance from the Ministry of Environment,
Forest & Climate Change for Integrated Municipal Solid Waste Processing Facility for Gharaunda, Indri, Nilokheri, Nissing, Pundri, and Taraori ULB’s at Karnal district, Haryana.

2.3 Employment Generation (Direct and Indirect) due to the project

Presently entire waste is being dumped at the site. For construction of processing facility there would be requirement of local semiskilled people and also during operation period there would be requirement of skilled and semi-skilled people. This will lead to generation of employment at local level. Also there would be requirement of unskilled people for door to door collection of waste. All these activities would generate employment. Thus the project shall have positive impact on the society and will enhance the socio-economic condition of all people who would be associated with this project directly or indirectly. Approx. 330 individuals will be benefitted directly and indirectly (supply chain).
3  PROJECT DESCRIPTION

3.1  Type of Project

As per the EIA notification dated 14th September, 2006, as amended till date, the proposed project falls under the Project / Activity: 7 (i)– Common Municipal Solid Waste Management Facility (CMSWMF) under Category A ".

3.2  Site Location and Connectivity

The site is about 8 Km away from the Karnal city Nearer to Murgahan Village at Meerut –Karnal road. There is an existing processing plant and landfill site for MSW. The nearest railway station is Karnal Railway Station. Indira Gandhi International airport is the nearest airport at an aerial distance of 143 km. The location map is shown in figure 3.1.

The coordinate of the proposed project site are given in Table 3-1, and the Google map of the project site is shown in Figure 3-2.

<table>
<thead>
<tr>
<th>Coordinates Points</th>
<th>Latitude</th>
<th>Longitude</th>
</tr>
</thead>
<tbody>
<tr>
<td>A.</td>
<td>29°38'34&quot;N</td>
<td>77°02'51.23&quot;E</td>
</tr>
<tr>
<td>B.</td>
<td>29°38'33.71&quot;N</td>
<td>77°02'50.81&quot;E</td>
</tr>
<tr>
<td>C.</td>
<td>29°38'31.56&quot;N</td>
<td>77°02'50.43&quot;E</td>
</tr>
<tr>
<td>D.</td>
<td>29°38'31.83&quot;N</td>
<td>77°02'48.08&quot;E</td>
</tr>
<tr>
<td>E.</td>
<td>29°38'32.12&quot;N</td>
<td>77°02'45.70&quot;E</td>
</tr>
<tr>
<td>F.</td>
<td>29°38'35.59&quot;N</td>
<td>77°02'47.15&quot;E</td>
</tr>
</tbody>
</table>

Table 3-1: Coordinate of the Project Site
Figure 3-1: Site Location
Figure 3-2: Google Image of the Project Site
Figure 3-3: Project Site
3.3 Details of Alternate Site Considered

As this is new project hence alternative sites were examined and the site at Karnal was finalized based on the easy accessibility, approachability, transportation of waste etc. This alternate land fill site was about 4.6 km away from Uchani village.

Few of the perceived impacts of this site are:

The Uchani village land is very small in size (about 3-4 Acres) and spending money to make the site suitable, which will last only for a few years, is not economical.

- Risk of surface water contamination (Karana Lake, 0.87 km from the proposed project site)
- The site is near the main city and adjacent to SH 7 (0.59 Km).

Comparison of both sites:

<table>
<thead>
<tr>
<th>Sr. no</th>
<th>Parameters</th>
<th>Site at Mirgahan Village</th>
<th>Site near Uchani Village</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Land Availability</td>
<td>✓</td>
<td>✓ (lesser than Mirgaham)</td>
</tr>
<tr>
<td>2</td>
<td>Land levelling cost (Cut and fill)</td>
<td>X</td>
<td>✓</td>
</tr>
<tr>
<td>3</td>
<td>Ease of transportation of waste</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>4</td>
<td>Existing dumping site or defunct waste facility</td>
<td>✓</td>
<td>X</td>
</tr>
<tr>
<td>5</td>
<td>Distance from river&gt; 100 meter</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>6</td>
<td>200 meter from a pond</td>
<td>✓</td>
<td>X</td>
</tr>
<tr>
<td>7</td>
<td>200 meter from Highways, Habitations, Public Parks and water supply wells</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>8</td>
<td>20 km away from Airports or Airbase</td>
<td>✓</td>
<td>✓</td>
</tr>
<tr>
<td>9</td>
<td>Hazard prone areas (earthquakes, winds, cyclone)</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>10</td>
<td>No zone of coastal regulation</td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>11</td>
<td>Important bird areas</td>
<td>X</td>
<td>X</td>
</tr>
</tbody>
</table>
3.4 Size and Magnitude of Operation

The proposed project is for design of integrated Municipal solid waste Processing facility of 243 TPD of MSW in an area of 16 Acres for 20 years.

3.5 Project Description with Project Details

➤ Cluster Formation

MSW can be managed through a centralized approach, a decentralized approach or a combination of the two. Waste management services under each approach in turn can be delivered by the ULBs themselves or in association with the private sector or the local community. The Integrated Municipal solid waste processing facility at Karnal will be developed with Centralized approach.

➤ Basis of Cluster Formation

The quantity and composition of MSW generated in the ULB is essential for determining collection, processing and disposal options that could be adopted. They are dependent on the population, demographic details, principal activities in the city/town, income levels and lifestyle of the community. In order to assess the sufficiency of the existing and potential MSW treatment capacity of the State of Haryana, the following step-wise process has been followed:

- Data on current MSW generation from non-industrial (domestic, commercial) and industrial sectors has been collected from ULBs
- Population projections have been made taking population of 2011 as the base figures and considering 3% YoY increase in urban areas (CPHEEO manual, 2015)
- Future MSW generation from domestic, commercial and industrial sectors is estimated using sector specific growth factors
- Treatment capacity of all functioning treatment plants and potential treatment capacity of identified land pockets have been estimated
• The optimal transport distance used to identify the cluster boundary is estimated to be 30 km. In addition, the maximum distance used to define any cluster boundary is 50 km.

➢ Constitution of Karnal Cluster

Karnal cluster consists of Seven ULBs, Municipal Committee Gharaunda, Municipal Committee Indri, Municipal Committee Karnal, Municipal Committee Nilokheri, Municipal Committee Nissing, Municipal Committee Pundri and Municipal Committee Taraori ULBs. The cluster boundary is depicted in the following figure:-

➢ Details of Participating ULBs

The details of the ULBs constituting the Karnal cluster are as follows:

1. Gharaunda

Gharaunda is a city and a municipal committee in Karnal district in the state of Haryana, India. It is situated at a distance of sixty-five miles to the northwest of New Delhi. The municipal area of the town is 4.37 km² and its population is 37,816.

2. Indri

Municipal Council, Fatehabad has been declared as Municipal Council in 2004. The total area of Fatehabad District is 11.4 Sq.km. Total Wards in Fatehabad district is 21 and population projection is 70,777.

3. Karnal

Indri is a city and a municipal committee in Karnal district (National Capital Region) in the Indian state of Haryana. Indri is situated on state highway #7. The Indri city is divided into 13 wards for which elections are held every 5 years and population projection is 17487.

4. Nilokheri

Nilokheri is a town and a municipal committee in Karnal district in the Indian state of Haryana. It has 13 wards. The town is located about 143 km from Delhi on National Highway 1 and is well connected to rail routes as well and population projection is 16400.

5. Nissing

Nissing is a block in Karnal district of Haryana. It is panchayat of Karnal district of Haryana state India and population projection is 17438.
6. Pundri

Pundri is a town and a municipal committee in Kaithal district of the Indian state of Haryana and population projection is 18572.

7. Taraori

Taraori or Tarori or Tarawari, as it is sometimes called in the local dialect, is a city (Municipal committee) in Nilokheri Tehsil of Karnal district in the Indian state of Haryana. This town is situated off NH-1, 16 km north of Karnal and population projection is 25944.

3.5.1 Salient Feature of Project

The proposed project is for design of integrated municipal solid waste Processing facility of 243 TPD of MSW in an area of 16 Acres for 20 years. Project Details are given in Table 3-2.

<table>
<thead>
<tr>
<th>S. No.</th>
<th>Particulars</th>
<th>Details</th>
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</thead>
<tbody>
<tr>
<td>1.</td>
<td>Land Area</td>
<td>16 Acres</td>
</tr>
<tr>
<td>2.</td>
<td>Life Span of Land Fill</td>
<td>20Years</td>
</tr>
<tr>
<td>3.</td>
<td>Power Requirement</td>
<td>250 KW, State Electricity Board</td>
</tr>
<tr>
<td>4.</td>
<td>Proposed Capacity of D.G set in KVA</td>
<td>1x 250 KVA</td>
</tr>
<tr>
<td>5.</td>
<td>Water Requirement</td>
<td>84 KLD</td>
</tr>
<tr>
<td>6.</td>
<td>Total Waste Generation</td>
<td>243 TPD</td>
</tr>
</tbody>
</table>

Environmental Settings of the Area of project are given in Table 3-3.

<table>
<thead>
<tr>
<th>Sr. No.</th>
<th>Area</th>
<th>Place</th>
<th>Distance (km)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Nearest River</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>2.</td>
<td>Nearest Road</td>
<td>Meerut-Karnal Road</td>
<td>-</td>
</tr>
<tr>
<td>3.</td>
<td>Nearest Railway Station</td>
<td>Karnal</td>
<td>9.34 Km</td>
</tr>
<tr>
<td>4.</td>
<td>Nearest Airport</td>
<td>Delhi</td>
<td>148</td>
</tr>
<tr>
<td>5.</td>
<td>Nearest Town</td>
<td>Karnal</td>
<td>7.26 Km</td>
</tr>
</tbody>
</table>
3.5.2 Processing Description

The activities planned in the proposed project include collection, transportation, segregation, treatment & disposal of municipal solid waste in compliance to the MSW Handling Rules.

➤ Primary Collection

Primary collection refers to the process of collecting waste from households, markets, institutions and other commercial establishments and taking the waste to a storage depot/transfer station. Primary collection may be accomplished through the use of containerized push carts/tri-cycles, small mechanized vehicles, compactors and/or tipping vehicles.

➤ Secondary Storage

Secondary collection includes picking up waste from community bins, waste storage depots or transfer stations and transporting it to waste processing sites or to the final disposal site. It comprises of both activities – secondary storage and secondary transportation.

➤ Transfer Station

The transfer stations have been proposed so as to receive MSW from nearby ULBs coming in smaller vehicles and then transfer the MSW to a larger vehicle for transporting it to the processing facility (in refused compactor / larger transportation vehicle). MSW from the nearby locations are either to be delivered to the transfer stations or directly to the Processing Plant site depending, whichever is nearer. This method of transporting waste in bulk would help in reduction of the overall transportation cost and also substantially reduce the traffic and environmental nuisance associated with a large number of small refuse collection vehicles moving on the road.
Figure 3-4: Methodology for Proposed Waste Collection
3.5.3 MSW Treatment Technologies

This project concept has been developed keeping into considerations the following design criteria, for the design period of 20 years.

1. Compliance to the MSW handling rules (2016) for waste collection, transportation, treatment & disposal; 2. Providing Door to door collection of waste from source in segregated manner with the introduction of 2-bin system (for green waste and dry waste);

3. Introduction of an efficient secondary waste collection & transportation system.

4. Adapting the 4R’s principal of waste minimization through reduction, reuse, recycle and recover.

Hence, proposed a mechanism for recovery of recyclables at the Processing facility and waste reuse through composting of food waste and other green waste

5. Final disposal of only rejects/inerts at the scientifically developed sanitary landfill with an attempt to dispose not more than 25% of the generated waste quantity at the landfill.

The municipal waste received at the site is processed at waste management facility by segregating the waste into recyclable and composting material. After separation of recyclables the compostable material will be diverted to compost plant. The plant is designed to process approx. 243 TPD municipal solid wastes (MSW) on per day basis and is able to process different kind of waste types. MSW processing unit would comprise of the following: Bio methanation plant Composting facility RDF processing facility RDF to power

The plant is designed to process approx. 243 TPD municipal solid waste (MSW) and the entire facility will be able to process different kind of waste types. MSW processing unit would comprise of the following plants:

A. Bio-methanation plant
B. RDF Processing Plant
C. Composting Plant
D. Sanitary Landfill
Figure 3-5: Flow chart for MSW Project
A. Bio-methanation Plant

Bio-methanation is a process by which organic material is microbiologically converted under anaerobic conditions to biogas. Three main physiological groups of microorganisms are involved: fermenting bacteria, organic acid oxidizing bacteria, and methanogenic archaea. Microorganisms degrade organic matter via cascades of biochemical conversions to methane and carbon dioxide. Syntrophic relationships between hydrogen producers (acetogens) and hydrogen scavengers (homoacetogens, hydrogenotrophic methanogens, etc.) are critical to the process. Determination of practical and theoretical methane potential is very important for design for optimal process design, configuration, and effective evaluation of economic feasibility. A wide variety of process applications for bio-methanation of wastewaters, slurries, and solid waste have been developed. They utilize different reactor types (fully mixed, plug-flow, biofilm, UASB, etc.) and process conditions (retention times, loading rates, temperatures, etc.) in order to maximize the energy output from the waste and also to decrease retention time and enhance process stability. Bio-methanation has strong potential for the production of energy from organic residues and wastes. It will help to reduce the use of fossil fuels and thus reduce CO₂ emission.
Segregated green waste

Slurry formation

Bio digester

Biogas storage

Gas scrubbing

Moisture

Impurity removal

Biogas with high % of methane

Effluent

Effluent Treatment Plant

Sludge

Treated water

(To be used in slurry preparation)

Organic manure (slurry)

Dewatering

Biogas (Fuel)

Gas engine (Electricity)

Figure 3-6: Flowchart for Bio-methanation plant
B. RDF Plant

RDF (Refuse Derived Fuel) is a fuel that is normally produced from waste with high calorific value. The larger fractions of MSW, which are separated in the first segregation step, consist of larger burnable waste such as paper, plastic, textiles, coconut shells, rubber etc. The large inert fractions and the recyclable plastic and metals are sorted out manually and the remaining burnable waste is passed on to a mechanical separation unit. Air is added from below and the heavy non-combustible material, such as glass and inert material are separated from the light combustible fractions. Finally, the combustible material is mechanically crushed and chopped into a small fluffy fraction.

In order to produce refuse derived fuels with defined qualities and guaranteed specifications, multi-level processing is required that mainly includes the following stages:

1. Primary shredding
2. Separation of ferrous metal and non-ferrous metal
3. Separation of extraneous material (by e.g. air-steam or ballistic separators)
4. Secondary shredding
5. Pelleting (briquetting)

The RDF processing unit would receive MSW of > 50 mm size and produce RDF through various processes.

(i) The MSW from tipping floor or MSW pit will be conveyed to a trommel screen with 50 -70 mm screen size (depending upon the Physical Characterization of waste). The below 50 mm size will be taken for composting and above 50 mm size will be further conveyed to the main shredder for size reduction. Trommel screens are mechanical segregation devices.

(ii) Shredder The shredder cuts the material to a size of less than 70 mm, (can be adjusted by means of changeable bottom screens). Shredders are programmed in such a manner that in case the un-shreddable material is detected, the shredder will be stopped automatically. The foreign object is also automatically discharged to a dedicated container by means of reversible belt conveyor after the following conveyor. In good quality shredders MIPS (Massive Impact Protection System) protects the knives of the shredder in case of unshreddable material enters the shredder. The shredded material is discharged from the shredder by means of chain/belt conveyor.
(iii) Ballistic Separator The ballistic separator is used to segregate the heavy inert, glass and metal pieces.

![Flowchart for RDF Plant](image)

*Figure 3-7: Flowchart for RDF Plant*
C. Composting Plant

Aerobic composting is the decomposition of organic material by microorganisms to produce humus-like material called compost. It is suitable for the organic fraction of the MSW and agricultural waste such as garden waste, waste from slaughter houses and dairy waste. The compost is most commonly used as soil conditioning. Farmers in India have been using composting for many years to process agricultural waste and cow dung, for the purpose of soil conditioner improvement. The application for MSW has been proven successful and demonstrated in numbers of cities in India. Windrow composting has been found most relevant for large-scale applications in organic solid waste disposal. The compostable fraction mixed with inert material is used for aerobic composting in windrows. The waste is processed for 35 days with regular stir and mixing with bio-culture, which accelerates the degradation.

Elements of composting facility:

a) Yard Management System: The < 50 mm fraction of MSW screened in the trommel of pre-processing section is conveyed to the designated areas of compost pad for windrow preparation. In windrow type aerobic composting system, the fresh MSW is stacked in the form of trapezoidal heaps called 'windrows' with sufficient quantity of decomposing microbial cultures, will be inoculated at this point with sprayer to reduce odour and repel vectors. Moisture will also be supplemented at required levels before windrow preparation. The thoroughly mixed waste is then made to windrows of convenient dimensions and kept for the biologic decomposition. The windrows are periodically turned (normally once a week) using hydraulic excavators to provide proper aeration and temperature control. The composting heap is stabilized in about 6 weeks, when it is shifter to the screening plant for removal of the inert and non-composted matter. Inside temperature of the windrow may go up to 65°C.

b) Coarse segregation system: Stabilized material from monsoon shed is then fed to the 'coarse segregation section' using a Skid Steer Loader for intermediate screening. Two stage screening system is adopted to achieve maximum screening efficiency using trommel of different hole sizes. Cascading action inside the trommel ensures better screening of the lumpy and highly heterogeneous municipal solid waste. These days equipment in this section are hydraulically driven to ensure greater safety against breakdowns and to lower power consumption. Hydraulic drive also introduces features like on-load starting, centralized control etc. PLC based controls allows automatic shutdown in case of any emergency. Screened material coming out
of this section is uniform in texture and contains semi-stabilized organic compost. This material needs further stabilization so it is transferred to the curing section.

c) **Curing system:** Material coming out of the coarse segregation section is stored in curing section for 15 days for further stabilization and moisture control. Some additives, such as, as rock phosphate may be added at this stage to improve quality of final product. Curing area can hold up to 20 days of material coming to the curing section on daily basis.

d) **Refinement system:** As per compost quality norms nationally (FCO) and internationally, the compost should be below 4 mm average particle size and it should not contain impurities such as glass, plastic, other inert material etc. which spoils the overall appearance and creates suspicion in the mind of the end user about quality of the final product. This section consists of a trommel screen 4 mm. which contains the hole size of 4mm. The screened material coming out of the trommel screen is sent to the gravity separator which removes heavy impurities such as glass, metals, sand, silica etc. from the organic manure. The magnetic separator in the production line will take care of all kinds of ferrous impurities in the compost. Organic Manure free from major impurities is passed through a liquid add mixer where quality enhancer in powder or liquid form is added. High quality organic manure is then passed through the packing spout and final packing of the product takes place.

e) **Packing and Storage System:** The mechanized packing section can do the bagging, weighment and stitching of 50 kg bags and finally stacked in the finished product store by using a stacking conveyor.

f) **Leachate, litter and Odour Management System:** During composting some dark coloured thick fluid may get generated. This fluid is known as ‘leachate’. It should not get percolated in the soil or else it will pollute the ground water. To avoid this, proper concreting of the 'compost pad' is done and a peripheral drain is provided to collect the leachate generated during the process. The leachate so collected has to be suitably treated or recycled over the windrows. The air-borne litter is controlled by providing a high wire mesh. A green belt is provided around the plant.

**D. Landfill**

The waste going to the landfill is restricted to certain inert material and other unusable waste and will stand for less than 8 percent of the incoming waste. Compactors will be used to arrange the waste in thin layers and to achieve high density of the waste. To minimize the run off to the ground water, the sanitary landfill will have a sealing system consisting of sheets made of plastic material and soil layer with low permeability. The
site will be provided with a leachate collection and removal system, which will be explained in the next section. Sand, silt and soil, which are separated during the segregation steps, are going to be used as earth cover to prevent infiltration. A cover of 10 cm is provided daily and an intermediate cover of 40-64 cm during monsoon.

Deposition of waste in conical heaps over the landfill site and spreading these heaps using a tracked bull dozer is a low cost and easy option. The lower levels of waste are permanently saturated and free flow of water into and out of the dumped waste will lead to the migration of leachate into the surrounding surface and sub-surface water and thereby contaminating the ground water aquifers.

The other major issue of simple deposition waste will be the formation of anaerobic conditions at the site as the waste deposition thickness increases, giving rise to the generation of landfill gas and thereby creating serious safety concerns in the immediate project influence area.

**Leachate Generation and Treatment**

Water that percolates through the placed solid waste is known as leachate. During its progress through the waste, the water entrains suspended solids, extracts soluble constituents of the waste and soluble products of the waste degradation process. The composition of leachate depends up on the stage of waste degradation and the types of waste within the landfill. The main components of leachate will comprise:

- Major elements and ions including calcium, magnesium, iron, potassium, sodium, ammonia, carbonates, sulphates, chlorides, etc.
- Trace metals including manganese, chromium, nickel, lead, cadmium, etc.
- Organic compounds including phenols, Poly aromatic hydrocarbons, etc.
- Microbiological components

The quantity of leachate generated will depend on the annual precipitation rates and active area of the landfill. This requires preparation of complete water balance of the landfill site, in accordance with the development phases of the project. It is now too early to anticipate a detailed phasing of the landfill site and hence it is assumed that an area equivalent to the total waste generated in a year would be the active area for the landfill site in the particular year.

However, it is to be noted that the leachate generation trends vary drastically depending upon the quantity of waste deposited every day and the actual quantity shall be estimated by considering the cumulative quantity of waste deposited in the landfill. The quantity estimated here will just give an idea for the area requirements of leachate treatment.
Landfill Gas Generation, Control and Management

Landfill gas is generated due to the degradation of the organic matter in the wastes. Since the landfill material will be basically inert, the landfill gas generation will be minimal. However, a minor portion of un-composted material may also go to the landfill and therefore adequate gas ventilation system has to be provided as a part of the design.

Storm Water Control and Management

The drains of storm water from the active landfill area and processing plant area, adequate drainage facilities are recommended for landfill area. As a part of this, drainage arrangements in each phase of the landfill will have to be constructed and drain towards the existing ravine side of the disposal site. Temporary and permanent drainage ditches would be installed in waste reception area, topsoil storage plant, haul roads, floor preparation areas and waste placement areas.

Clean and contaminated waters will be segregated and discharged to the nearby water body and treatment facility respectively.

Buffer Zones

A vegetative cover will have to be provided as buffer zone between the landfill site and the nearby localities. In addition to the buffer zone, a compound wall/rigid fencing all around the landfill site to a height of 3 m or as suitable, shall also to be constructed, to totally seclude the site from outside activities.

The proposed vegetative cover shall comprise trees and shrubs that improve the visual and aesthetic appearance of the site. In addition the waste reception area, administrative area and segregation areas shall also be provided with vegetative cover to the extent possible.

3.5.4 Proposed Site Infrastructure

In addition to the landfill area, the site shall be provided with the following infrastructure:

A. Waste reception facilities
B. Haul roads
C. Weigh bridge
D. Site Utility Office
E. Top soil storage
F. Support services such as electricity, water supply telephones etc.
G. Site Staff
H. Vehicles and equipment
I. Vehicle and equipment maintenance workshops and

A. Waste Reception Facilities

The waste reception facilities shall comprise of the following:-

- An approach road to permit two way traffic, metalled and of adequate length to permit the queuing of vehicles
- Site notice board displaying license conditions, hours of operation and site regulations
- Secure and lockable gates at the entrance to the site.
- Cattle grid at the entrance to the waste reception area
- A weigh bridge of 20 ton capacity capable of weighing 20 -25 vehicles per hour
- Weigh booking office with all amenities and preferably computer logging facilities.
- By pass lane for non-waste vehicles and emergency services
- Site administration office for site management with all support services
- Amenity block with dining room, toilets and washing facilities
- Small testing laboratory with first aid facilities
- Designated car park area
- Adequate store room
- Work shop for the first line on-site maintenance with all spares and support services
- Adequate site lighting covering all traffic routes.

B. Haul Roads

The entire stretch of access road shall be upgraded / paved to a minimum of 8 m width (for two way traffic). All the primary haul roads from the public high way to the waste reception area and the landfill operational area shall be treated as permanent roads and should be constructed as per the standards.

The secondary arterial roads and temporary roads within the site can be of lesser standards, as the locations of these roads will be changing, following the landfill development.
C. Weigh Bridge: The weighbridge operator should have a clear view of the plate and ensure the vehicle being weighed is positioned on the plate. Weighbridge operators should be aware that persons requiring a weighing may deliberately leave a wheel over the edge of the plate to reduce the weight shown.

D. Site Utility Office

Security to the whole of landfill area shall be provided for all 24 hours the day. A compound wall all around the site shall be constructed to provide integrity to the site and also serve as noise barrier to the adjoining areas. The wall can be of masonry or any other suitable material / rigid fence. As unauthorized access to the site may pose significant health and safety risks, warning notices and access control shall be provided at the following locations of the site:

- Plant and equipment compounds
- Waste receipt point
- Leachate and Land fill gas collection and treatment locations and
- Parts of site undergoing construction Vehicles and Equipment

E. Top soil storage: Soil erosion removes the top soil that is necessary for organic matter, nutrients, micro-organisms that are requires for plants to grow and shine. Soil conservation is one such step that protects the soil from being washed away. The soil then ends up in aquatic resources bringing in pesticides and fertilizers used on agricultural land. Healthy soil is important for plants to grow and flourish. Taking necessary steps to conserve the soil is part of environmentally friendly lifestyle. There are several ways to conserve soil that can be done through agricultural practices or measures you take at home

F. Support services such as electricity, water supply telephones etc.: The entire area of waste reception area and landfill site shall be provided with electricity and backup generators, potable water supply, communication facilities such as phones and efficient surface water drainage. The exact requirements of all these facilities shall be worked out during the detailed engineering phase of the project, before execution

G. Site Staff

Adequate manpower is required to ensure that the site is constructed and operated successfully. The staff employed shall be sufficiently qualified, trained,
competent and adequately supervised, to ensure efficient functioning of the plant.

The type of staff requirement anticipated for the study is presented below.

- Site manager supervising all aspects of construction and operation
- Supervisors overseeing the landfill operations and maintenance
- Resident engineers supervising landfill construction
- Unit Cashiers
- Clerk / Typists
- Weigh bridge clerks
- Stores in-charges
- Vehicle drivers
- Vehicle fitters and mechanics
- Electricians
- Lab technicians
- Environmental monitoring technicians
- Medical and first aid personnel
- Security guards and
- General labour

H. Vehicles and Equipment

The vehicle and equipment envisaged for the plant operations are as listed below. The number of pumps required shall be estimated as per the pumping needs of the facility operator.

- Weigh Bridge
- Tracked Bulldozer
- Tracked Loading Shovel
- Tracked Backhoe / loader
- Grader
- Compactor
- Dump Truck
- Tractor and Bowser / Sweeper
- Van / Pick up
- Pumps

In addition to the above, adequate firefighting equipment shall also be installed to meet the unforeseen fire accident
I. Vehicle and Equipment Maintenance and Spares

In keeping with good working practice, regular machinery inspections shall be undertaken on weekly basis and preventive maintenance should be practiced. Workshop facilities will be provided on site, for routine maintenance and servicing as required. Sufficient holding of spare parts should be maintained, to keep each landfill facility operational on a continuous basis.

3.5.5 Containment of Potential Pollutants

Containment measures such as double liners at the bottom and lateral sides of the landfill, and surface capping after the land filling is completed, are required to control the pollutants and mitigate subsequent impacts on environment.

I. Basal and Lateral Containment

The basal and lateral containment at the site shall be provided by using in situ natural soils and geological strata of permeability less than $1 \times 10^{-9}$ m/sec. detailed geo-technical investigations, by excavating top soil should be carried out to assess the permeability of the soil. The site preparation and construction of liner will comprise of

a. Site clearance.
b. Grading and dozing of the floor at foundation level to provide suitable slope for gravity drainage of leachate.
c. Placement and compaction of excavated clay in minimum of four lifts of 250 mm thick with clay placed at or within $+4\%$ of optimum moisture content.
d. Within each major phase the mineral liner will be laid, as to be continuous at foundation level and will form as the primary containment layer.

If the geo-technical investigations conclude soil permeability, not suitable for liners, clay either has to be imported or in situ sandy materials, has to be improved though addition of bentonite under controlled application rates.

II. Surface Capping

To minimize the ingress of water into the site after completion, it is proposed to form an engineered capping layer. This will comprise a multilayer system comprising:

a. A protective layer of graded fine granular material of 100 mm thick and free from objects larger than 10 mm size, placed above the gas drainage layer
over the last lift of waste
b. Sealing layer with a maximum permeability and an equivalent layer of clay
   1m thick with a permeability of $1 \times 10^{-9}$ m/sec and
c. A second protective layer with same specifications as mentioned above, placed above the sealing layer

III. Ground and Surface Water Interception and Drainage

Conventional dewatering measures shall be employed within the landfill area to discharge and maintain groundwater levels below landfill foundation level. This will be ensured through

a. Pumping from perimeter trench drains installed on the bunds or from sumps installed below the landfill foundation level for areas undergoing preparation
b. Installation of temporary or permanent surface water interception drainage ditches to carry peak rainfall runoff and prevent flooding of landfill site

data. The submersible pumps or adductor pumps should be used to remove leachate from the sumps and the collection chambers should be linked by permanent pipe work to the treatment plant.
g. The precise methods and degree of treatment shall accommodate the
fluctuations in leachate generation. However the following steps shall be followed to meet the standards prescribed by the ministry.

- Balancing of leachate flows and volumes
- Redistribution and recirculation of leachate to dry absorptive waste to reduce volume and to enhance the rates of stabilization
- Aerobic processing through lagoons

V. Landfill Gas and Management

The primary measures to restrict the uncontrolled migration of landfill gas from the site will comprise,

- Low permeability containment layers and systems installed on the base and side walls
- Permeable gas drainage blanket of 0.3 m thickness laid beneath the capping layer and
- Vertical gas chimneys vents and extraction wells

The gas drainage blanket will be formed of a layer of fines free, graded granular fill overlain by a layer of fine sand 100 mm thick and provide protection to the capping layer. Chimneys, vents and extractions wells shall be constructed by drilling from the surface of the capping layer. The extraction wells will have an outer diameter of 0.3 m to 1 m and a HDPE well pipe of 0.1 to 0.15 m within well body.

VI. Surface Restoration

The landfill will be brought up to its pre-settlement level in stages and capped off in a program of progressive restoration, to limit the ingress of water into the site and to facilitate the control of landfill gas. The capping will be a composite structure comprising of four layers of an engineered seal designed to prevent water ingress and egress of landfill gas and an agricultural cap comprising of subsoil drainage layer.

A suitable vegetative cover will have to be established on the closed site to ensure slow surface runoff, promote evapo-transpiration of rainfall, retain moisture in the cap and enhance the formation of a soil structure in the agriculture soil.
3.6 Availability of Water Resources/ Power, Energy Requirement and Source

3.6.1 Water Balance

The source of water supply is Municipal Corporation/Nagar Nigam Karnal (Fresh/Treated waste water). During construction phase, water requirement will be 6-8 KLD and during operation phase total water requirement will be 84 KLD.

Water balance during operation phase is given in figure 3.8.

<table>
<thead>
<tr>
<th>Sr. No.</th>
<th>Description</th>
<th>Fresh Water Requirement (KLD)</th>
<th>Treated Water (KLD)</th>
<th>Total Water Requirement (KLD)</th>
<th>Waste Water Generation (KLD)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Employees (390) 45 LPD/per Employee</td>
<td>17.5</td>
<td>-</td>
<td>17.5</td>
<td>9</td>
</tr>
<tr>
<td>2.</td>
<td>Tier Washing</td>
<td>-</td>
<td>2.5</td>
<td>2.5</td>
<td>2.5</td>
</tr>
<tr>
<td>3.</td>
<td>Dust Suppression</td>
<td>-</td>
<td>5</td>
<td>5</td>
<td>-</td>
</tr>
<tr>
<td>4.</td>
<td>Green Belt Development</td>
<td>-</td>
<td>9</td>
<td>9</td>
<td>-</td>
</tr>
<tr>
<td>5.</td>
<td>Process Water</td>
<td>-</td>
<td>50</td>
<td>50</td>
<td>38</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td></td>
<td>-</td>
<td>66.5</td>
<td>84</td>
<td>49.5</td>
</tr>
</tbody>
</table>
3.6.2 Power Requirement

Power will be sourced from 1 DG sets of 250 KVA during construction phase. Afterwards required power 250 KW will be supply from state electricity board cater to the needs of the MSW processing facility, also 1 D.G set of 250 KVA capacity will be kept on standby.
3.7 Quantity of Waste to be generated

The details about the population and waste generation for Proposed Cluster are given in Table 3.7.

<table>
<thead>
<tr>
<th>ULBs</th>
<th>Area of the ULB Sq.Km</th>
<th>Population projection for 2015</th>
<th>Waste generation in 2017 (tons per day)</th>
<th>Population Projection for 2025</th>
<th>Estimated waste generation in 2025</th>
<th>Population projection for 2035</th>
<th>Estimated waste generation in 2035 (Tons per day)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gharaunda</td>
<td>1967</td>
<td>420484</td>
<td>243</td>
<td>504580</td>
<td>290</td>
<td>605497</td>
<td>414</td>
</tr>
<tr>
<td>Indri</td>
<td></td>
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<tr>
<td>Karnal</td>
<td></td>
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<tr>
<td>Nilokheri</td>
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</tr>
<tr>
<td>Nissing</td>
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<td>Pundri</td>
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<td></td>
<td></td>
</tr>
<tr>
<td>Taraori</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

3.7.1 Leachate/Effluent/Sewage Generation

During operation phase Leachate generation will be 25-30 KLD. Leachate will be collected in leachate collection pit and treated in treatment plant and effluent will be generated to the tune will be treated in Effluent treatment plant. During construction phase 1.9 KLD of sewage will be generated which will be disposed-off through soak pit.

3.7.2 Hazardous Waste Generation

Only used oil (category 5.1) will be generated and collected and will be handed over to authorized recyclers. 300 liter/year used oil will be generated.
4 SITE ANALYSIS

4.1 Connectivity

The Project site is about 8 Km away from the Karnal city at Meerut-Karnal road which will cater to the need of transportation of MSW treatment & Disposal facility to the integrated solid waste management site.

Nearest airport from project site is Indira Gandhi International Airport, New Delhi situated at an aerial distance of 148.0 km. The site is landlocked and away from sea or waterways.

4.2 Land form, Land Use and Land Ownership

Currently land-use of the site is agricultural and belongs to the Municipal Corporation of Karnal. The application for conversion of land use from agriculture to industrial is in process.

4.3 Topography along with Map

Karnal is a city located in the NCR (National Capital Region) and the headquarters of Karnal District in the Indian state of Haryana. It is one of the Counter-Magnet cities.

Karnal has been ranked 65th (1st in Haryana) among 434 cities in the list of cleanest cities of India under Swachh Survekshan 2017.

The area represents almost an alluvial plain without any conspicuous topographical features and forms a part of the vast Indo-Gangetic plain. The elevation of the area above mean sea level ranges from 256 m AMSL in the north to 245 m AMSL in the south with an average elevation of 240 m AMSL. The general slope of the area is southwards. In the north western part of the district the land slopes south west wards. There are many topographical depressions in the area of which the most pronounced is at Daha, south of Karnal.

The topographic map of the study area is given in Fig. No. 4.1.
4.4 Existing Land Use Pattern

The existing land is vacant and will be developed as Integrated Municipal solid waste processing facility with the combination of following technologies:

A. Bio-methanation plant
B. RDF Processing Plant
C. Composting Plant
D. Sanitary Landfill

Figure 4-1: Topographical Map
4.5 Existing Infrastructure

4.5.1 Environment Sensitivity

Table 4-1: Environment Setting of the Study Area

<table>
<thead>
<tr>
<th>S.No.</th>
<th>Particulars</th>
<th>Details</th>
</tr>
</thead>
<tbody>
<tr>
<td>A.</td>
<td>Nature of the Project</td>
<td>Integrated Municipal Solid Waste Processing Facility</td>
</tr>
<tr>
<td>B.</td>
<td>Size of the Project</td>
<td></td>
</tr>
<tr>
<td>1.</td>
<td>Expected Waste Quantity</td>
<td>243</td>
</tr>
<tr>
<td>C.</td>
<td>Location Details</td>
<td></td>
</tr>
<tr>
<td>1.</td>
<td>Village</td>
<td>Mirgahan</td>
</tr>
<tr>
<td>2.</td>
<td>Tehsil</td>
<td>Karnal</td>
</tr>
<tr>
<td>3.</td>
<td>District</td>
<td>Karnal</td>
</tr>
<tr>
<td>4.</td>
<td>State</td>
<td>Haryana</td>
</tr>
<tr>
<td>5.</td>
<td>Latitude &amp; Longitude</td>
<td>Coordinates Points</td>
</tr>
<tr>
<td></td>
<td></td>
<td>A.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>B.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>C.</td>
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<td></td>
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<td>D.</td>
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<td></td>
<td></td>
<td>E.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>F.</td>
</tr>
<tr>
<td>6.</td>
<td>Toposheet No.</td>
<td></td>
</tr>
<tr>
<td>D.</td>
<td>Environmental Settings of the Area</td>
<td></td>
</tr>
<tr>
<td>1.</td>
<td>Ecological Sensitive Areas</td>
<td>No</td>
</tr>
<tr>
<td>2.</td>
<td>River / water body</td>
<td>River/ water body</td>
</tr>
<tr>
<td></td>
<td></td>
<td>-</td>
</tr>
<tr>
<td>3.</td>
<td>Nearest Town / City</td>
<td>Karnal</td>
</tr>
<tr>
<td>4.</td>
<td>Nearest Railway Station</td>
<td>Karnal Railway Station</td>
</tr>
<tr>
<td>5.</td>
<td>Nearest Airport</td>
<td>Delhi</td>
</tr>
<tr>
<td>6.</td>
<td>State Boundary</td>
<td>6.65 Km Uttar Pradesh – Haryana State Boundary</td>
</tr>
<tr>
<td>7.</td>
<td>Seismic Zone</td>
<td>Zone – III</td>
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<td>D.</td>
<td>Cost Details</td>
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<tr>
<td>1.</td>
<td>Total Project Cost</td>
<td>83.47 crore</td>
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<tr>
<td>E.</td>
<td>Requirements of the Project</td>
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<tr>
<td>1.</td>
<td>Water Requirement</td>
<td>84 KLD</td>
</tr>
<tr>
<td>3.</td>
<td>Man Power Requirement (Skilled and unskilled persons)</td>
<td>Approx. 330</td>
</tr>
</tbody>
</table>
4.6 Climate Data from Secondary Source

The climate in the region shows broadly four seasonal variations, namely:

Winter: December - February
Summer: March – May
Monsoon: June - September
Post-monsoon: October – November

Information presented in subsequent paragraphs is from the Indian Meteorological Department (IMD), Long Term Climatological Tables, 1971 -2000. These tables give useful information about a region’s weather, since they are collected over a 30-year period. The temperature of the district is found to be varying between 2.5°C to 43.7°C, the annually 1st predominant winds are observed to be NW and average annual rainfall observed to be 963.3 mm.

4.7 Social Infrastructure

Health

Karnal District is served by number of private and Government hospitals and they provide specialized Clinical service to the Urban as well as Rural population who so ever are able to afford.

Fire and Emergency

Fire Brigade in Karnal is equipped with high technique and advance feature to tackle all kind of problem during the time of panic. Fire fighter is centrally placed in the city placed to reach every area within seconds to control the situation.
5 ENVIRONMENTAL MITIGATION MEASURES

In consideration to the prevailing site features and the proposed Integrated Municipal Solid Waste Management Facilities, outlined in earlier Chapters, it is necessary to ensure that the proposed plant and facilities would be adequately designed with necessary environment protection measures. This Chapter accordingly outlines the environment protection measures for the proposed Integrated Municipal Solid Waste management at Karnal site comprising of Compost Plant and Sanitary Landfill. During project implementation period special emphasis would be made on measures to minimize leachate/ effluent generation and dust control at source. The sources and types of pollution with broad level mitigation measures is outlined in the following sections.

5.1 Air Pollution Control Measures

Air environment including Ambient Air Quality and odour generation due to the proposed project during construction and operational phases would be accounted. The principal sources of air pollution are construction activities, truck movement with construction materials and municipal solid waste, loading and unloading of materials, vehicular exhaust.

The impact is generally confined to the project area and is expected to be negligible outside the project site boundaries. The pollutants their sources and mitigation measures to be adopted are presented in Table 5-1.

5.2 Water Pollution Control Measures

The water demand for the project which would be in the range of 84 KLD. No surface water would be tapped. The source of water would be the Municipality / Nagar Palika.

The main wastewater generation sources during construction phases would be equipment washed water and other surface run-off with suspended solids loading and sewage from temporary sanitary facilities with BOD loading.

During construction activity the surface run-off would be diverted to working pit to arrest the suspended solids if any and the settled water would be reused for construction purposes, and for sprinkling on roads to control the dust emission, etc.

During operation phase, the wastewater would be from drinking and sanitary use, leachate from compost plant and secured land fill area. The domestic wastewater would
be treated in septic tank followed by Soak pit. Maximum leachate generation from the operating cell of landfill pit and other areas including compost pads would be in the tune of 6 cum/hr.

Leachate generated at various places in the plant would be collected in a pond and properly treated in an ETP of capacity of about 2 cum/hr. The treated leachate would be sprayed on windrow to maintain suitable temperature and moisture. Leachate generated during precipitation period would be stored in evaporation pond.

Based on the rainfall intensity of the plant area, separate storm water drainage system would be properly designed. Storm water would be collected in a centralized pit to arrest the silt particulates and clear water would be used locally for landscaping and fountains. Surplus water would be released into public drains or adjacent nala. The pollutants their sources and mitigation measures to be adopted are presented in Table 5-1.

### 5.3 Solid Waste Disposal

During the construction phase, the solid waste would be different types of raw materials such as coarse aggregate, fines aggregate, bricks, steel etc. being used during construction stage. The solid waste generated during this period would be predominantly inert in nature.

During operation phase no solid waste would be generated as such except ETP sludge or particulates settled in evaporation ponds of nominal quantity. Appropriate management of solid rejects from different processing activity would be undertaken. Sanitary landfilling would be adopted for rejects generated from processing, ETP sludge and evaporation pond settled particulates. The total generation of solid waste would be in the range of 8-10 TPD. The pollutants, their sources and mitigation measures to be adopted are presented in Table 5-1.
### Table 5-1: Environmental Mitigation Measures

<table>
<thead>
<tr>
<th>S.No</th>
<th>Pollution Source</th>
<th>Pollution Emitted</th>
<th>Mitigation Measures</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
| 1.   | Construction activities | SO2, NOX, Particulates, Odour etc. | • Dust suppression by water sprinkling.  
• Bitumen covered internal roads.  
• Wheel Washing Bay at the entry point.  
• Vehicles carrying of construction materials and waste to be covered with tarpaulin / plastic sheet.  
• Proper ventilation and moisture in the compost plant and windrow area to be maintained and herbal insecticides to be sprayed around odour generation areas at regular intervals.  
• Secured landfill except the current waste handling area rest to be covered by polyethylene sheets  
• Green belt would be provided along the internal roads and plant boundary |
| 2.   | Vehicular Movement |                           |                                                                                                                                                   |
| 3.   | Loading and unloading of Trucks |                           |                                                                                                                                                   |
| 4.   | DG Set |                           |                                                                                                                                                   |
| 5.   | Processing of waste |                           |                                                                                                                                                   |
|      | Domestic Waste | Suspended Solids, BOD etc. | • Septic Tank/Soak Pit.  
• ETP for recycling.  
• Impermeable liner in the landfill pit.  
• Storm water drainage system for recycling |
| 6.   | Leachate from Windrow Compost Plant |                           |                                                                                                                                                   |
| 7.   | Leachate from landfill |                           |                                                                                                                                                   |
| 8.   | Construction | Construction materials e.g. coarse aggregate, fines aggregate, bricks, steel etc. | • Recycled or used for filing/ levelling of low-lying areas within the site or transported outside. |
| 9.   | ETP sludge or evaporation pond | ETP sludge or evaporation pond settled particulates | • Sanitary Landfilling |

**Solid Waste Management**

- Recycled or used for filing/ levelling of low-lying areas within the site or transported outside.
5.4 Noise

Noise pollution would be resulted from transportation and during construction phase. To reduce noise pollution, high-grade machinery would be used. There would not be any major noise-causing activity during operational phase. DG set operation would have proper in-built noise control measures.

5.5 Ecology of the Area

Site clearing or operational activities would not impact the ecology of the area adversely, since there are no known rare, endangered or ecologically significant animal and plant species in the area. There is no wildlife sanctuary located within 10km radius of the project site. In fact the scientific processing and landfilling would have a beneficial impact on the surrounding terrestrial and aquatic ecology.

5.6 Green Belt Development

In order to arrest wind borne fugitive dusts around the plant boundary with about 3-5 m wide green coverage based on locally available plant species. An area of 10-12% would be earmarked for development of greenbelt/greenery along the boundary, roads, and in open places available. The green belt developed would help to capture the fugitive emissions, attenuate the noise generation and improve the aesthetics. All open spaces, where tree plantation may not be possible, would be covered with shrubs and grass to prevent erosion of topsoil. Apart from green belt all around the site, also on the top of capped landfills greenery would be developed.

5.7 Environmental Monitoring

Monitoring for air quality parameters as per NAAQS 2009 and surface water quality would be carried out on a six monthly basis. The ground water quality monitoring carried out quarterly once. Programs would be conducted on a regular basis for monitoring safety and health protection of workers with specific reference to improving rag pickers quality of life, health concerns, etc.
6 PLANNING BRIEF

6.1 Planning Concept

The project is an Integrated Municipal solid waste processing facility. As this is a fresh site basic facilities of infrastructure like admin building, processing area, Laboratory, Leachate treatment system Landfill vehicle parking, Staff vehicle parking, Panel room, Weigh bridge with cabin, Circulation area, internal roads etc. will be developed at the site. Transportation of Solid waste will be carried out through existing road network around the site.

6.2 Assessment of Infrastructure Demand (Physical &Social)

Key infrastructure such as hospitals, schools, bank, places of worship and social/community facilities such as park, market, playground etc. education, health care and community development are available in Karnal. Internal roads, canteen, office, laboratory and parking facilities will be provided at the site. Temporary shelters will be provided to workers.

6.3 Amenities/ Facilities

Basic Amenities like public transport, water supply, telecommunications, educational institutions, hospitals etc. are available in Karnal.

The following facilities/amenities will be extended by the proposed project:

- Arrangements for safe and healthy working conditions & temporary rest shelters
- Provision of drinking water
- Provision of PPE
- First-aid facilities and health check-up camps for the workers
- Conducting medical camps for workers and nearby villagers at regular interval
- Provision of firefighting system
6.4 Green Belt

Around 33% of the total project area i.e. 5.28 acres (16 acres) of land will be developed as green belt. The green belt will be developed considering the native species and CPCB guidelines will be followed.

6.5 Connectivity (Road/Rail/Waterways)

The proposed Integrated MSW processing unit is well connected to Road/Highways for transportation of MSW.

6.6 Drinking Water Management

During operational phase the water for domestic purpose to the tune of 17.5 KLD will be sourced from Ground water/Municipal water supply. Water requirement for other than domestic purposes i.e. 66.5 KLD will be sourced from treated waste water by Municipal co-operation, Karnal. During construction phase 6-8 KLD water will be required will be supplied by Municipal Corporation of Karnal.

6.7 Solid and Industrial Waste Management

The solid waste from Karnal will consists of three main constituents i.e. compostable, recyclable and miscellaneous. Compostable and recyclable wastes are very valuable so far as the composting is concerned, while the miscellaneous waste will be disposed-off into landfill. The municipal solid wastes generated during operation phase will consist of papers, cartons, Thermocol, plastics, polythene bags, Glass, etc. Solid waste will be generated from households, restaurants, and markets located in Karnal. The quantity of solid wastes generated will be approximately 243 ton/day in 2017 and it will reach upto 414 ton/day by year 2035. Life of landfill will be twenty years. Biodegradable waste will be treated at camp site. The recyclable waste will be sold to recyclers.

6.8 Hazardous Waste Generation

Generated Spent oil from D.G sets (category 5.1) will be collected and handed over to authorized recyclers. Approximately 300 liter/year used oil will be generated.
6.9 **Power Requirement and Supply Source**

1 D.G set of 250 KVA will be utilized for power during construction phase. During operation phase 250 KW power will be taken from of State Electricity Board and for emergency 1 D.G set of 250 KVA will be utilized as backup.

6.10 **Resettlement and Rehabilitation Plan**

Not applicable as this is an existing site and the ownership of the land is with Municipal Corporation Karnal.
7 PROJECT SCHEDULE AND COST

7.1 Project Cost

Total capital cost is INR 83.47 Crores and operation and maintenance cost is proposed to be 6% of Capital Cost i.e. approximately 5.0 Crores.

7.2 Likely Date of Start of Construction

The construction work will begin after obtaining statutory clearance from Ministry of Environment Forest and Climate Change and Consent from State Pollution Control Board.

7.1 EMP Budget

<table>
<thead>
<tr>
<th>S. No.</th>
<th>Particulars</th>
<th>Capital cost in lacs</th>
<th>Budget in lacs (per Year)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Environmental Pollution control (Air, water, Soil, Noise etc.)</td>
<td>10.0</td>
<td>0.50</td>
</tr>
<tr>
<td>2</td>
<td>Environment Monitoring</td>
<td>-</td>
<td>1.2</td>
</tr>
<tr>
<td>3</td>
<td>Occupation</td>
<td>2.0</td>
<td>0.50</td>
</tr>
<tr>
<td>4</td>
<td>Green Belt</td>
<td>2.0</td>
<td>0.50</td>
</tr>
<tr>
<td></td>
<td><strong>Total</strong></td>
<td><strong>14.00</strong></td>
<td><strong>2.7</strong></td>
</tr>
</tbody>
</table>

7.2 Budgetary Break up for Labour

<table>
<thead>
<tr>
<th>S. No.</th>
<th>Activity</th>
<th>Budget in lacs/Year</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Safe Drinking Water</td>
<td>0.50</td>
</tr>
<tr>
<td>2.</td>
<td>Urinal, Latrine and Bathrooms</td>
<td>1.00</td>
</tr>
<tr>
<td>3.</td>
<td>PPE and Safety equipment will be Provided</td>
<td>0.20</td>
</tr>
<tr>
<td>4.</td>
<td>First Aid facility</td>
<td>0.20</td>
</tr>
<tr>
<td>5.</td>
<td>Regular Health checkup and provision of medicine</td>
<td>0.25</td>
</tr>
<tr>
<td>6.</td>
<td>Educational and awareness programme for safety measures &amp; Recreational program</td>
<td>0.30</td>
</tr>
<tr>
<td></td>
<td><strong>Total</strong></td>
<td><strong>2.45</strong></td>
</tr>
</tbody>
</table>
7.3 Budget for CSR Activities

*Table 7-3: Budgetary for CSR Activities*

<table>
<thead>
<tr>
<th>S. No.</th>
<th>Activity</th>
<th>Capital cost in lacs/Year</th>
<th>Recurring Cost in Lacs</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Education welfare: scholarship for students in nearby govt. school</td>
<td>4.0</td>
<td>1.5</td>
</tr>
<tr>
<td>2.</td>
<td>Medical/ Health Camp: organize health check-up camps</td>
<td>2.0</td>
<td>0.6</td>
</tr>
<tr>
<td>3.</td>
<td>Area development: provide assistance to nearby village panchayat for area development.</td>
<td>5.0</td>
<td>--</td>
</tr>
<tr>
<td></td>
<td><strong>Total</strong></td>
<td><strong>11.0</strong></td>
<td><strong>2.1</strong></td>
</tr>
</tbody>
</table>
8 ANALYSIS OF PROPOSAL (RECOMMENDATION)

8.1 Social Benefits Better living Conditions

No open dumping will be carried out. This will reduce the chances of air, water & soil contamination and also will reduce emission odour. This will improve the living standard of society & will provide safe & hygienic surroundings.

Improved Health Conditions

Efficient waste collection & disposal of waste will made the living & health condition in the area better. Littering waste creates nuisance due to unpleasant view and emission of mal odour. It also provides ground for breeding of mosquitoes & disease causing pathogens. Solid waste management project will ensure timely collection of waste, efficient treatment & disposal in scientific & environment friendly manner. This will reduce the chances of spread of diseases. Project will improve the health condition of the area

Enhancement of Aesthetic Value of Area

Cattles & other stray animals roam around the existing open dump site. This creates disturbance to society. Scavenging birds hover above the open dump site which may pose significant threat to aircrafts. Open dumping of waste also creates an unpleasant view and leads to emission of mal odour.

A scientific technology of waste management is developed. This will reduce bird menace. An entry gate & wired fence will be provided around the project site to prevent entry of stray animals & cattle. A thick green belt will also be developed around project site. The project will lead to improvement in aesthetic value of the area.

Direct & Indirect Employment Opportunities

Development of project will provide employment opportunity to local skilled, unskilled & semi-skilled people during both construction & operation phase.

Indirect employment may also generate during construction phase of project. Tea stalls, and food joints may come up around project site for workers.
8.2 Economic Benefits Revenue from Waste

Waste-to-energy facilities are economically sound investments that provide multiple financial and environmental benefits to the communities that utilize them. Waste is material that is being rejected as it has no use for the people. Project comprises of collection of waste, waste processing & safe disposal. From waste following products will be recovered, which can generate revenue:

1) Recyclables
2) Inert waste as filler material.

Improved Economic Status

Project will generate both direct & indirect employment. Local people will be preferred for giving employment. This will improve economic status of the area. Emigration of local people to other parts of state/country due to unavailability of employment will be reduced.

The Economic Development Benefits of Waste-to-Energy Facilities

- Over the lifespan of a waste-to-energy facility, communities can expect to pay less for MSW disposal than at a regional landfill.
- Monies spent on waste-to-energy facilities remain within the communities, while 90 percent of the monies spent on landfills will be transferred out of the local economy.
- Waste-to-energy facility construction generates high-paying jobs that cannot be outsourced.
- Waste-to-energy facilities generate significant amounts of baseload renewable energy which can be sold to the local power grid.

8.3 Environmental Benefits

Prevention of Air, Water & Soil Contamination

No open dumping of waste will be carried out, which leads to soil, water & air pollution. Also littering waste is ground for breeding mosquitoes, which become agents of various deadly diseases.
This project involves scientific management of waste which will prevent environmental pollution & spread of disease.

**Development of Green Belt**

Green belt developed along with lawns & green buffer at site. This will help in attenuating dust & noise level at site.