

EXECUTIVE SUMMARY

1. Introduction

Kotdwar is a city, a municipal corporation and a tehsil in the Pauri Garhwal district of Uttarakhand, India. It is just 101 km from Pauri town, the district headquarter. It is the eighth largest city in Uttarakhand state.

Nagar Nigam Kotdwar under the guidance of Urban Development Directorate, Uttarakhand has planned to upgrade the present system of solid waste management in the city along with establishment of waste processing, resource recovery unit and landfill facility.

The Nagar Nigam has planned to establish a solid waste processing and disposal facility in accordance of the Solid Waste Management Rules, 2016 at the earliest. A Detailed Project Report (DPR) for ISWM in Kotdwar has been prepared by the Uttarakhand Urban Sector Development Agency (UUSDA), Uttarakhand based on Regional Level Concept for Kotdwar through EveryULB Technologies Pvt. Ltd.

The project or activity is covered under category "B" of item 7(i), Common Municipal Solid Waste Management Facility of the schedule to EIA notification 2006 and its subsequent amendments and requires appraisal at state level. However, general condition is applicable due to the presence of Uttar Pradesh-Uttarakhand State border at a distance of 7 m approx. from proposed site. Accordingly, the project requires appraisal at Central level by the EAC.

M/s Ind Tech House Consult, Delhi a QCI-NABET accredited consultancy organization has been engaged by the Nagar Nigam Kotdwar to carry out an Environmental Impact Assessment (EIA) study for the proposed project as per the process defined in the EIA Notification, dated September 14, 2006 and the amendments thereafter.

Application for ToR approval was submitted to EAC on 7th March 2022. The project was examined by the EAC (Infra-2) and TOR was granted vide letter no. F.No.21-35/2022-IA-III dated 10th October.

2. Identification of Project

Presently there is no waste processing or treatment facilities at Kotdwar. All the wastes collected are openly dumped near Paniyali Lakdi Padao which is located 4 km away from town. A manual centralized material recovery facility has been set up at this site.

Kotdwar Nagar Nigam has planned to upgrade the present system to ensure safe collection of waste from sources to the extent possible, transportation of the same either directly or to the secondary storage and subsequent transportation from there for treatment and final disposal of rejects and inert wastes. The system is designed to manage 100 percent of the waste reaching the Municipal stream- daily removal of organic matter to treatment plant for processing and need based removal of inorganic and inert to landfill site and disposal by sanitary methods.

The management plan is designed for handling 80 TPD wastes including recyclable waste [design year upto 2039] generated in the Kotdwar ULB and considers that all wastes are handled at the local

level through centralized model. A land of area 0.998 Ha has been selected for the SWM project at Kanchan Puri, Haldukhatta Malankham, Kotdwar, Uttarakhand.

3. Nature, Size, Location of the Project

Proposed solid waste management facility site is proposed to be set up at Kanchanpuri Haldukhata, Kotdwar, Block- Duggada, Dist. Pauri Garhwal, Uttarakhand. The site is located on south of Haridwar Road near Umraonahgar, Kotdwar and on the West bank of river Malin. The site is easily accessible from Haridwar Road through existing kuchha road [approx. 20 feet wide]. The kuchha road of approx. length 250m will be strengthened by the Nagar Nigam.

Proposed site is an undeveloped forest land [0.998 Ha] transferred to Nagar Nigam Kotdwar with the approval of the Govt. of Uttarakhand. The land has been transferred to Nagar Nigam by Lansdowne Forest Division. Approval for Diversion of Forest Land is also obtained. Projects its coordinates are given below -

Points	Latitude	LONGITUDE
A1	29°45'23.79"N	78°26'14.14"E
A2	29°45'21.73"N	78°26'17.05"E
A3	29°45'24.25"N	78°26'19.35"E
A4	29°45'26.31"N	78°26'16.47"E

Particulars	Details
Nature of the Project	Solid Waste Management Facility
Project Type	New
Components of the proposed facility	The project involves – <ul style="list-style-type: none"> • Processing of organic part of solid waste and production of organic manure through Compost plant. • Landfill for rejects and inert wastes
Size of the Project	80 TPD including recyclable waste [design year 2039] <ol style="list-style-type: none"> 1) Compost Plant – 43.2 ~ 43 TPD [design year upto 2039] 2) Landfill capacity – 11,800 MT [as per present availability of land, now planned for a design period of 5 years]. Within next 1-2 years, the Nagar Nigam shall identify and establish another sanitary landfill site on non-forestry land with life expectancy of 25 years and develop the site within 5 years.
Land Area	0.998 Hectares [waste processing & sanitary landfill]
Project site Location [Composting and landfill facility]	Kanchanpuri, Haldukhatta, Malankham, Kotdwar District - Pauri Garhwal, Uttarakhand
Land Ownership	Nagar Nigam Kotdwar
Nearest Town and Habitation	Proposed site is on the outskirts of Kotdwar city on south.
Nearest Railway Station	Kotdwar Railway station - 8 km on East
Nearest Airport	Dehradun Airport – 53 km on NW
Nearest Highway	NH 119 (8.1 km) SE

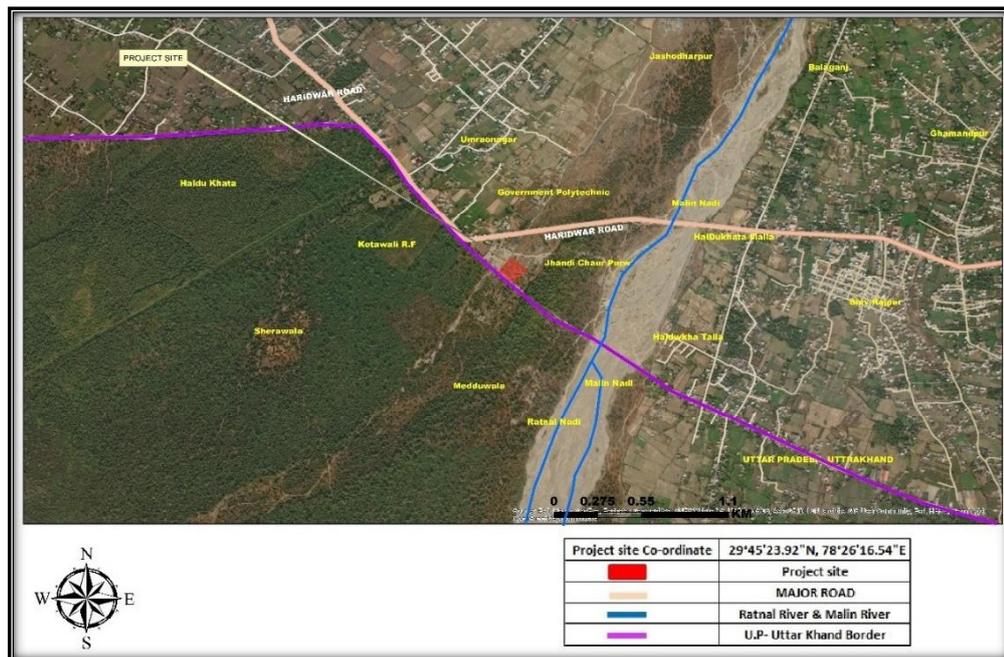
Eco-sensitive areas around the project site: Rajaji National Park is located at an approximate aerial distance of 12.3 km on NW. Certificate from Chief Conservator of Forests regarding this has been obtained.

Site Connectivity: Kotdwar is a gateway city to the Garhwal region and is one of the main entrance points in the state of Uttarakhand. Jolly Grant International Airport, Dehradun is located at around 53 km [aerial distance] on NW. Kotdwar Railway Station is located at a distance of 8 km on East.

By road Kotdwar is 216 km North of Delhi, 120 km South of Dehradun, 208 km West of Nainital, 99 km East of Roorkee and well connected with roads to major destination of Uttarakhand state. Buses to Kotdwar from Delhi are easily available. Kotdwar is well connected with National Highway 119.

Nearest Habitation: Nearby habitation is located at a distance of 150 m on north east of proposed site. The proposed site is located on the outskirts of Kotdwar city on south. Kotdwar town has a population of approx. 175,232 as per Census 2011.

Industries: Sigaddi SIIDCU Industrial Area is located 4.8km NW of project Site and it has non-polluting industries such as Paramount Green, Baluni Engineering Limited, Wipro Limited, SimpexPharma Pvt. Ltd., Print Pack Industries and Kanak Biotech, Akums Health Care Limited, KMC electronics Pvt. Ltd. etc.



LOCATION OF THE PROPOSED SOLIDWASTE MANAGEMENT FACILITY

4. Waste Generation Forecast & Waste Characteristics

To analyze future projection of population and major concentration of population, ward wise data and decadal data were taken during DPR preparation. The population projection in DPR was carried out based on following methods –

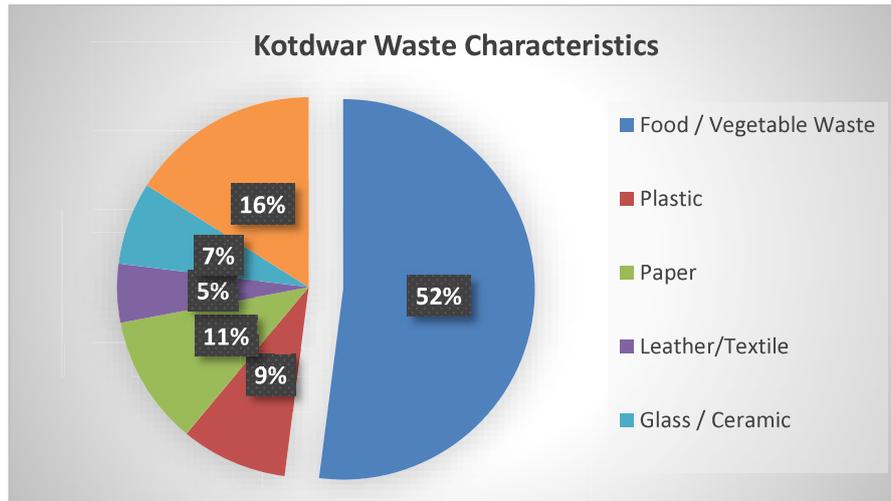
- Arithmetic increase
- Incremental increase method
- Geometric increase

In case of Kotdwar, Arithmetic projection was preferred method due to its old town and saturated population and the same was adapted for the design purpose. The average state growth rate (19.17%) is adopted for the population projection and the design purpose.

Population Projection and Waste Generation in Kotdwar

Horizon Year	Arithmetic increase method	Difference in population 2011	Net Arithmetic Increase	Floating population	PerCapita, gm/day	Daily wastegeneration	Annual wasteGeneration
2011	33035	102565	135600	20340	300	41.3	15070.9
2012	33981	103511	137492	20624	300	41.9	15324.0
2013	34927	104457	139385	20908	300	42.4	15534.9
2014	35874	105404	141277	21192	300	43.0	15745.8
2015	36820	106350	143170	21475	300	43.6	15956.7
2016	37766	107296	145062	21759	300	44.2	16211.8
2017	38712	108242	146955	22043	304	45.4	16609.5
2018	39659	109189	148847	22327	308	46.6	17058.9
2019	40605	110135	150740	22611	313	47.9	17517.7
2020	41551	111081	152632	22895	317	49.1	18035.1
2021	42497	112027	154525	23179	322	50.4	18463.9
2022	43444	112974	156417	23463	326	51.8	18951.6
2023	44390	113920	158310	23746	331	53.1	19449.5
2024	45336	114866	160202	24030	335	54.5	20012.1
2025	46282	115812	162095	24314	340	55.9	20476.0
2026	47228	116759	163987	24598	345	57.4	21005.1
2027	48175	117705	165879	24882	350	58.9	21544.9
2028	49121	118651	167772	25166	355	60.4	22156.2
2029	50067	119597	169664	25450	359	61.9	22657.9
2030	51013	120543	171557	25734	364	63.5	23231.3
2031	51960	121490	173449	26017	370	65.1	23816.4
2032	52906	122436	175342	26301	375	66.7	24480.1
2033	53852	123382	177234	26585	380	68.4	25022.3
2034	54798	124328	179127	26869	385	70.1	25643.6
2035	55745	125275	181019	27153	391	71.8	26277.3
2036	56691	126221	182912	27437	396	73.6	26997.3
2037	57637	127167	184804	27721	402	75.4	27583.1
2038	58583	128113	186697	28004	407	77.2	28255.7
2039	59530	129060	188589	28288	413	79.1	28941.7
2040	60476	130006	190482	28572	419	81.0	29722.4
2041	61422	130952	192374	28856	425	82.9	30355.0

Waste Characteristics –



5. Proposed Waste Management Plan

An integrated solid waste management (ISWM) facility will be established at Kotdwar with redesigning & improving the existing solid waste management system in an environmentally and economically sustainable manner. The project consists of –

- Segregation at source and storage of wastes [3 bin system]
- Primary 3 bins door to door collection system
- Secondary Storage cum mini material recovery facility [Small Transfer Station]
- Secondary Collection & Transportation System
- Centralized Material Recovery Facility at Lakdi Padao
- Sanitary Waste Storage and Processing Plant at Lakdi Padao
- Integrated Solid Waste Management Facility at Kanchan Puri, Kotdwar.

The proposed infrastructure for primary waste collection will cover about 32,600 households under door-to-door collection system, over a five-year period. Simultaneously, door step/kerbside collection to collect solid wastes everyday shall be introduced for non-domestic and other sources. All the generators through community awareness programme, will be sensitized and trained to segregate the wet and dry wastes in separate bins.

(A) Segregation at source and storage of wastes [3 bin system]

- ✓ At the household level MSW should be segregated into wet and dry fractions, at a minimum, and stored in separate containers.
- ✓ Ensure domestic hazardous wastes (e.g. batteries, used CFLs, tube lights, chemical/paint/insecticide containers etc.) are handed over separately at the door step or at special pick-up points specified by the municipal authority or through the relevant retail trade (e.g. for batteries). As long as there are no specific pick-up points/services for collecting such waste, these wastes may be handed over along with the dry waste fraction as an interim solution. Bi-weekly programme & two no. of recycling stations also planned for collection of such waste.

- ✓ Diapers and sanitary napkins should be wrapped securely before being put in the separate bin meant for it, for the protection of the waste handlers and should be marked with a “Red Cross” to enable further segregation and disposal.
- ✓ All the waste generators through community awareness programme and behaviour change campaigns, will be sensitized and trained to segregate their waste into 3 bin system ie. Wet, dry and sanitary waste.

HOUSEHOLD STORAGE:

At the household level dry waste and wet waste should be stored in separate garbage bins – wet wastes in green covered bin and dry wastes in covered blue bin. . A container of 15 lit capacity with paddle for a family of five members would be adequate as collection will take place on daily basis.

COMMERCIAL STORAGE:

- ✓ Shops, commercial establishments and businesses will store segregated waste onsite. Designated auto tippers will collect at fixed time on daily basis. Vegetable and flower market waste generators would be instructed to deposit their waste in conveniently located large green bins.
- ✓ Typically, four wheeled, HDPE, injection molded, international standard, UV tested bins or metal bins of 60L capacity to be used.

PUBLIC PLACES:

- ✓ With a view to achieve clean streets and public places, litter bins will be provided along the important roads of the city, markets, public places, tourist spots, bus and railway stations, etc. The distance ranging of 20m to 50 m depending on the local condition.

(B) Collection & Transportation System

Collection of wet and dry waste separately enhances the potential of efficient and cost effective treatment of such wastes and ensure optimum advantage from the recyclable material fed into the system. Waste collection services are divided into primary and secondary 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 or directly to the disposal site.

(C) Secondary Storage Cum Mini Material Recovery Facility (Mini Transfer Stations)

Kotdwar city is distributed over 52 sq.km area with end to end distance of around 17 km hence to increase efficiency of D2D collection system (more number of trips/ shift), two secondary collection cum minim MRF centres has been proposed. In this centre segregated wet waste is transported to proposed integrated solid waste management facility at Kanchanpuri and Segregated dry and sanitary waste is transported to centralized MRF.

SN	Name	Location	Coordinates
1	Secondary collection cum Mini MRF	Simmal Chor, Kotdwar	29°45'0.28"N/

	centre-1		78°29'10.74"E
2	Secondary Collection cum Mini MRF Centre-2	Near Library, Kotdwar	29°44'35.22"N/ 78°31'5.19"E

- ✓ Recycling centre is also planned with separate bins for electronic waste at main tourist spots and at strategic commercial locations. One such centre will be set up near Nagar Nigam office, remaining one can be set up after due discussions with all the stake holders.

(D) Centralized Material Recovery Facility

Kotdwar nagar nigam has already established centralized material recovery facility at Lakdi Padao which is manually operating and equipped with baling machine. This facility has been proposed for upgradation into semi mechanized MRF facility where all the dry waste from the city will be processed centrally.

SN	Name	Location	Coordinates
1	Centralized Material Recovery Facility	Lakdi Padao	29°44'28.50"N/ 78°31'36.47"E

(E) Sanitary waste storage & processing plant, Lakdi Padao

As per provisions of the Solid Waste Management Rules 2016, Kotdwar Nagar Nigam has initiated 3 bins D2D collection system. Sanitary waste like diapers and sanitary napkin waste will be collected separately and transported to centralized sanitary waste storage and processing facility proposed at Lakdi padao near centralized MRF facility.

SN	Name	Location	Coordinates
1	Sanitary waste storage & processing facility	Lakdi Padao	29°44'29.76"N/ 78°31'36.56"E



(F) Proposed Wastes Processing and Disposal Facility

The proposed facility will have following components –

- 1) **Processing of Organic Waste through Compost Plant**
- 2) **Processing of Recyclable Materials from Mixed Dry Wastes**
- 3) **Sanitary Landfill for Rejects from processing and Inerts Wates**

- The primary segregated waste will be bought into tipping area and further segregated into various recycling streams (into 12 types) which will be in turn sold to nearest “Recyclers / local Kabadiwala” weekly.
- Conveyor belt with trommel system will be given of capacity 80 TPD to cater to pre-compost conversion to take out the minor size inorganic items and for easy sorting into various recycling streams. Containers will be provided to store the segregated inorganic materials to be further sold to local recyclers. The selling can be done week wise in a designated day and ULB should register the Kabadiwalas/ rag pickers for including them in the disposal of these inorganic / recyclable items.
- Step wise landfill will be provided to inert and reject wastes. The ULB will acquire additional land to cater the 30 year design period.

PROCESSING OF ORGANIC WASTE- CAPACITY 43.2 ~ 43 TPD [PLANNED UPTO DESIGN YEAR 2039].

Windrow Composting Process–

- The windrow composting process involves placing the waste into long heaps of trapezoidal shapes known as windrows with base width of 5 to 6 m, top width 2 to 3 m and height 2 to 3 m. The windrows will be placed on a covered concrete platform.

- Cow dung culture or efficient microbial culture is sprayed on the windrows to control the odour and flies. The temperature inside the window increases rapidly due to bacterial action which eradicates pathogens and weed seeds.
- Waste is turned from one windrows to other twice a week to provide aeration for enhancing the decomposition process. The process will continue over 4 weeks and the material after windrow process will be stored under shelter for a period of one week for stabilization.
- The stabilized material will be screened for extracting organic manure.
- Further to enrich the compost quality, organic additives like neem cake, rock phosphate decomposed poultry litter and micronutrients like zinc and boron will be added and the final compost product will be packed and stored for marketing.

The main component for the above process are as follows:

- ✓ Covered aerobic compost yard
- ✓ Compost processing shed with finishing and storage area
- ✓ Reject storage area
- ✓ Laboratory
- ✓ Leachate drain and Leachate collection tank for recycling
- ✓ Slurry tank for cowdung EM culture
- ✓ Electro mechanical equipment comprising trommels, conveyors, sieves, weighing and bagging machines

PROCESSING OF INORGANIC WASTE

After the Initial weighing, the collection vehicle transport their loads to the receiving "(tipping area) for temporary storage and initial processing. Main parts of the unit are -

- ✓ Feeder Conveyor (feeding compartment)
- ✓ Hand Sorting
- ✓ Primary separation unit (first trommel 75 mm)
- ✓ First reject belt
- ✓ Second Trommel unit (25 mm)
- ✓ Second rejection belt
- ✓ Magnetic separator
- ✓ Air separator
- ✓ Baler

SANITARY LANDFILL

Total Capacity proposed at present is 11,800 MT. As per present availability of land, now the landfill has been planned for a design period of 5 years. Within next 1-2 years, the Nagar Nigam shall identify and establish another sanitary landfill site on non-forestry land with life expectancy of 25 years and develop the site within 5 years.

Waste categories to be disposed in sanitary landfill -

- ✓ Waste that is by its nature or through pre-treatment non-biodegradable and inert;
- ✓ Pre-processing and post-processing rejects from waste processing sites;
- ✓ Non-hazardous waste not being processed or recycled.

The proposed landfill will be operated in phases to allow progressive use of the area such that at any given time a part of the site would have a final cover, a part being actively filled, a part being prepared to receive waste and a part undisturbed. A 'phase' consists of cells, lifts, daily cover, intermediate cover, liner and leachate collection facility, gas control facility and final cover over the sub-area. The term 'cell' is used to describe the volume of material placed in a landfill during one operating period, usually one day. A cell includes the solid waste deposited and the daily cover material surrounding it.

6. Landfill closure plan:

At the end of life of the proposed sanitary landfill, it will be properly capped, closed as per the provisions of the Solid Waste Management Rules and green cover will be established. The land will be returned to the Forest Department.

Phase closure: After the last set of cells of a phase are placed (on the highest lift), the final cover is constructed. If another phase is to be placed over the just completed phase, an intermediate cover is provided. However, if the completed phase has reached final height of the landfill, then final cover system and surface water drainage system are provided.

7. Post Closure Stabilisation, Operation & Care

If the landfill cover is intended to be used for a specific purpose e.g. park or golf course or vehicle parking area, then the cover shall be stabilized to achieve the end use. However, if no specific end – use is envisaged, then long – term vegetative stabilization will be undertaken to return the land to its original and natural vegetative landform.

8. Requirement of Water, Power and Manpower

WATER REQUIREMENT

Construction Phase- During construction phase, approximate water requirement will be 2.5 KLD.

Operational Phase–Water is required for different components of MSW management facility like for compost plant, general purposes like drinking, wash water, cleaning, green area etc. Water is required for maintaining the required level of moisture in the composting garbage during summer when moisture is low.

As estimated, fresh water requirement will be approx. 11 KLD for the proposed project and will be met through onsite bore-well.

- Domestic consumption – 1 KLD [@45 lit/person].
- Washing/water sprinkling/green area demand – 10 KLD

POWER REQUIREMENT

Power demand for the project during operation phase [approx. 200 KVA] will be sourced from local electricity distribution authority. One DG Set of 150 KVA will be provided at site as back up during power failure.

MANPOWER REQUIREMENT

During peak construction phase approx. 50 workers (skilled & semi-skilled workers) will be hired, mostly from local areas.

Operational manpower requirement for the solid waste management facility [composting and landfill] is estimated as 25. No Housing facilities or colony will be provided. The workers shall be employed from nearby areas.

9. Proposed Project Cost

The overall estimated project cost for collection, transportation, processing and disposal of wastes at Kotdwar is INR 1369.951 lakh.

10. Baseline Environmental Status

Field investigations were undertaken for collecting the existing baseline environment for air, water, noise, soil, ecological and socio-economic conditions. A study area of 10 Km radius from the project site was identified to establish the present environmental conditions for the above environmental components. Field data generation was done during summer season from March 2022 to May 2022.

Metrological data has been collected from the IMD station at Najibabad and pre dominant wind direction recorded is from West (W) followed by East (E).

Ambient Air Quality

Ambient air quality monitoring stations were set up for 6 different locations. The locations were selected in downwind, cross wind and up wind of the proposed project. The common air pollutants namely Particulate matter (PM₁₀ & PM_{2.5}), Sulphur dioxide (SO₂), the oxides of nitrogen (NO_x), Methane (CH₄), Hydrogen sulfide (H₂S) were sampled and results were averaged to 24 hours to meet the requirements of the MoEF&CC and compared with the standards stipulated by CPCB.

- PM₁₀ concentration in the study area varied from 53 to 92 µg/m³
- PM_{2.5} concentrations in the study area varied from 34 to 49 µg/m³
- SO₂ concentration in the study area varied from <6.0 to 9.2 µg/m³
- NO₂ concentration in the study area varied from 8.3 to 14.2 µg/m³
- H₂S concentration in the study area was observed to be <1.0 µg/m³
- CH₄ concentration in the study area was observed to be <0.1 µg/m³

From the baseline monitoring result, it is observed that the monitored parameters (PM₁₀, PM_{2.5}, SO₂, NO₂,) are within the permissible limits as per NAAQS, 2009 during the study period.

Water Quality

In order to depict the baseline groundwater quality, samples from bore-well/tube-well and pond/canal were collected from 6 nearby locations, and analyzed for basic physico-chemical parameters (pH, conductivity, TDS, TSS, alkalinity/acidity, Total Hardness (Permanent & Temporary Hardness), sulphate, chloride, nitrate, phosphate, fluoride, calcium, magnesium, iron, manganese, copper, zinc, toxic metals (As, Ni, Pb, Hg, Cr, Cd) and coliform count. One grab sample was taken from each location for analysis during the study period. The groundwater quality of villages around the study area is fit for drinking. Analysis results of ground water reveal the following: -

- pH varies from to 7.02 to 7.07
- Total Dissolved Solids varies from 230 to 262 mg/l.
- Total Hardness varies from 128 to 136 mg/l.
- Calcium varies from 22.4 to 25.6 mg/l
- Magnesium varies from 15 to 18 mg/l
- Chloride varies from 22 to 34 mg/l
- Fluoride varies was found to be <0.1 mg/l
- Nitrates varies found to be <0.1 mg/
- Sulphates varies from 7.6 to 9.6 mg/l
- Toxic Metals: <0.01 mg/l
- Total Coliform: <2
- E-Coli: Absent

The above parameters indicate that the ground water of the study area is well within the permissible limit as per IS 10500: 2012

Observation on Surface water quality:

The surface water quality of the streams is fit for drinking after conventional treatment. Analysis results of surface water reveal the following: -

- pH varies from to 7.78 to 7.95
- Dissolved Oxygen varies from 5.8 to 6.1 mg/l.
- BOD varies from 1.6 to 2.4 mg/l
- COD varies from 10 to 28 mg/l
- Total Dissolved Solids varies from 182 to 312 mg/l.
- Total coliform varies from 23 to 50 MPN/100 mg/l

The above parameters indicate that the surface water of the study area falls under class-B (Outdoor bathing (Organised)) as per CPCB water Quality criteria.

Ambient Noise

Baseline Ambient noise level monitoring was carried out at 8 locations around the locations where human habitations are present. Day time noise level (6 am to 10 pm) was found between 48.56 to 50.48 dB(A). Night-time (10 pm to 6 am) noise levels were found between 39.08 to 40.86 dB (A). The

noise level was meeting the national standards in project site. However, in all other locations it is exceeding marginally.

Soil Quality

The physical, chemical properties and important heavy metals concentrations were determined in 8 soil samples collected from the fields close to the location where hand pump water was taken for analysis. Soils of study area are sandy loam by nature. Specific Conductivity and pH are in normal range. Organic matter content is sufficient. The concentration of Nitrogen, Phosphorus and Potassium were medium. The soils of study area are fit for cultivation. The soil is sandy clay in nature.

Ecological Environment

Forest Block in Study Area: There are fifteen [15] reserve forests in 10 km of the study area and there are no wildlife sanctuaries, national parks, Biosphere reserves or migratory corridor of any sensitive species in the study area. Details of Forest block within 10 Km area are provided below-

TABLE 3.6 (C): DETAILS OF FOREST BLOCK WITHIN 10 KM AREA

S.No	Forest	Distance & Direction
1	Giwain RF	9.1 km NE
2	Sukhrao RF	7.9 km NE
3	Sattikhal RF	8.7 km NE
4	Gwalgarh RF	8.5 km NE
5	Laldhang RF -	5.5 km NW
6	Kotdwara RF	3.6kmN
7	Kotawali RF	20 m SW
8	Girdawa Sahanpur RF -	6.1 km SW
9	Kauriya RF	2.0 km SE
10	Mohanwali RF	8.6 km S
11	North Kothari RF	9.6 km SE
12	South Kothari RF	9.7 Km SE
13	Paniyal RF	7.7 Km NE
14	Sukharao Kham RF	5.2 Km NE
15	Malinkham RF	1.6 Km NE

The biological environment in the surrounding of the study area is dominated by grasses with tree, herbs & Shrub species, All the species reported from core zone are common and generally found in wide variety of habitat of the study area. No endemic/endangered sp. were recorded from core area of the project site. Apart from that there is no Biosphere reserve, National Park, Wildlife sanctuary, Tiger Reserve or Elephant reserve are reported within 10 Km radius of project site and project area is also devoid of any breeding and nesting ground of any faunal species. So it can be stated that proposed project and associated activities will not influence biodiversity of the area.

Socio – Economic Environment

Total population of the study area is 163967 persons. Out of which 81239 are male and 82728 are female. SC total population is 21899 out of which 11172 are male and 10727 are female.

Literacy Rate is the amount of people in a country with the ability to read and write. The analysis of the literacy levels is done in the study area. Literacy in any region is key for socio-economic progress and the Indian literacy rate grew to 79.63% in 2011.

11. Anticipated Environmental Impacts and Mitigation Measures

Matrix methodology has been adopted for the impact assessment of this project. This method incorporates a list of impacting activities and their likely environmental impacts, presented in a matrix format.

S.No	Aspects	Environmental Attribute					
		Air	Noise	Water	Land & soil	Ecology and Bio-diversity	Socio Economics
Construction Phase							
1	Land procurement				√		
2	Clearance of Vegetation	√		√	√	√	
3	Excavation work (Cutting, filling & Levelling)	√	√	√	√	√	√
4	Site development, foundation work and various Civil constructions. Endowment of structure required for various project activities proposed	√	√	√			√
5	Vehicle movement for Raw material transportation and unloading and removal of unwanted material from site	√	√			√	
6	Storage, handling and disposal of solid waste	√	√	√	√		
7	Wastewater generation & disposal			√		√	
8	Landscaping & Greenbelt development	√	√		√	√	
Operational Phase							
1	Vehicle movement	√	√			√	
2	Storage, handling and disposal of solid waste	√	√	√	√		
3	Water consumption			√			
4	Wastewater generation & disposal			√	√		
5	DG Operation	√	√		√	√	

Impacts during Construction Phase

Construction phase works include site clearance, site formation, excavation, material handling, building works, infrastructure provision and any other infrastructure activities. The impacts will be mainly on air quality, water quality and soil quality. The impacts due to construction activities are short term and limited to the construction phase only.

Impacts during Operation Phase

Air Environment -During operational phase, air pollutants will be emitted mainly from the stack of the DG sets. Some foul gases will also generate from Compost plant and landfill site. The setting up and operation of the proposed project will not cause any intolerable impact on the ambient air quality as the DG will run during power failure only. Also stack of adequate height will be provided for DG set. Regular water sprinkling will be carried out. Controlled passive gas venting system will be provided at the landfill.

Noise Environment -The operation phase involves machinery and equipment which would generate noise substantially. Intermittent source of noise shall be movement of vehicles used during the operation activities. Proper enclosures and noise shields will be used for reduction in noise levels. Also, since the project site is sufficiently away from habitation, there will not be any significant increase in the impact of the noise generated from the site. However, impact due to noise pollution can be minimized by ensuring that no noise generating activity is carried out during night hours.

Water Environment -The total water requirement of the project will be fulfilled through onsite ground water abstraction.

The possible source of the ground water contamination will be leachate discharge from landfill site and compost plant. The leaching can be controlled by construction of impervious layer in landfill site and compost plant. The impacts on ground water will be negligible due to the appropriate planning of the plant design. A final cover system at the top of the landfill to enhance surface drainage, prevent water infiltration and also to support surface vegetation.

A leachate collection and control facility will be established to collect leachate from within and from the base of the Sanitary Landfill and then recirculate/ treat the leachate in composting facility. Remaining, if any will be treated and reused in green area or dust suppression.

Separate drainage system will be designed for management of storm water run off. Storm water will be collected and reused in composting, vehicle washing during monsoon season.

Land Environment - The project site is part of forest land and construction of MSW management facility will change the land use. Green Cover of land will be enhanced leading to ecological and enhanced aesthetical impact which will also act as pollution barrier. The entire operational area shall be well paved and thus there will be no leaching of any substances in case of spills.

Biological Environment - Major impacts on terrestrial ecology due to air, water and noise pollution caused by site activities, vehicular movement, wastewater and waste handling. The project operations will be carried out in a systematic manner as to minimize any disturbance of Ecological

and biodiversity of the area. Development of a plantation with varied variety of trees and shrubs would have a positive impact.

Socio-Economic Environment - The improvement in the social condition of the surrounding will be observed soon after the implementation of the integrated municipal waste-processing complex.

- Improvement in the social condition through Employment
- Improvement in the state of living standards of the waste-pickers and their family.

Social acceptance of the MSW management facility will be the major issue because of aesthetic sense and foul smell in surrounding areas. But the project proponent will take care of these issues and implement adequate mitigation measures to maintain the aesthetic sense of the area.

12. Site Selection and Alternative Site Analysis

One of the major constraints in identifying sanitary landfill site was its availability in near vicinity of project city as otherwise proposing a site far away from the city would increase the Operation and Maintenance cost for the improved MSW management system. Kotdwar Nagar Nigam has identified 3 alternative sites including the proposed site at Kanchanpuri. The selection of landfill site was carried out based upon various selection criteria as per the MSW manual and finally the site at Kanchanpuri was selected.

13. Environmental Monitoring Plan

Arrangements will be made for regular site inspections by in house audit team and the independent engineer. Regular risk assessments of the operational procedure will be under taken to continue safe and efficient operations. An environmental monitoring plan is suggested to monitor environmental parameters during designing phase, construction phase and operation phase of the project. Following attributes are proposed to be regularly monitored during operation phase based on the environmental concern:

- Monitoring of Point Source emissions [stack emission]
- Monitoring of ambient air quality at plant boundary and nearby area.
- Work zone air quality monitoring*
- Groundwater quality near project site.
- Fresh water, wastewater quality & quantity
- Soil quality at project site
- Ambient Noise levels monitoring near various units and at project boundary
- Green belt plantation, maintenance, development of other forms of greenery like lawns, gardens, etc. within the site and outside area.

14. Environment Management Plan

For the effective and consistent functioning of the project, an Environmental Management Cell (EMC) will be established for the project. The Environmental Management Plan (EMP) is required to ensure a sustainable development of the plant area and the surrounding areas of the plant. Total estimated capital investment for the proposed facility is 1369.951 lakh INR. The environmental

management plan capital cost has been allocated as INR 62.11.lakh and annual recurring expenditure during the stage of operation is estimated as INR 10.44 lakhs.

15. Green Belt Development

An area of approx. 1965 sqm [33.5%] has been earmarked for development of greenbelt along the boundary, roads, and in open places available inside the facility. As planned, a 3 – 5 m wide green belt shall be developed around the plant boundary which will consist of hardy, locally available plant species.

16. Occupational Safety and Health Management

Safe working environment is essential for proper operation of the landfill site and due safety in work would be taken by all concerned. The following guidelines will be followed to cover safety and health aspects within the landfill to prevent and reduce accidents and occupational diseases among workers. The following points recommended on safety aspects will be implemented by the authorities:

- Providing workers with appropriate protective clothing, gloves, respiratory face masks and slip-resistant shoes for waste transport workers and hard-soled safety shoes for all workers.
- The workplace shall be equipped with fire detectors, alarm systems and fire-fighting equipment. The equipment shall be periodically inspected and maintained in good working condition.
- Providing adequate personnel facilities, including washing areas and areas to change clothes before and after work.
- All the employees shall be required to undergo a medical check-up before joining the facility.
- First aid facilities required to attend immediately for meeting emergency situations shall be made available at the facility.

17. Project Benefits

The contribution of the proposed project on local social infrastructure is expected to be significant. This Project will provide a significant amount of direct and indirect employment opportunities to the local people. From the proposed project the major benefits, include improving the degraded environment by establishing an Integrated Solid Waste Management Facilities. Also, a number of recyclable materials, for example paper, glass, plastic, rubber, ferrous and non-ferrous metals present in the MSW are suitable for recovery and reuse which will be beneficial for environment by conserving resources. This will also improve ecomic condition of rag pickers and recycling units.