EXECUTIVE SUMMARY

1. Introduction

Municipal Corporation Roorkee under the guidance of Urban Development Directorate, Uttarakhand has planned to upgrade the present system of solid waste management in the Roorkee city and adjoining six other nearby ULBs along with establishment of waste processing, resource recovery unit and centralized landfill facility. This Draft EIA document has been prepared for the proposed Solid Waste Management and Disposal Facility to be developed by the Municipal Corporation Roorkee at Roorkee, District- Haridwar, Uttarakhand.

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.Accordingly, the project will be appraised at State level by the SEAC.

In this regard, M/s Ind Tech House Consult, Delhi a QCI-NABET accredited consultancy organization has been engaged by the Municipal Corporation Roorkee to carry out an Environmental Impact Assessment (EIA) study for the proposed project and to seek prior environmental clearance as per the process defined in the EIA Notification, dated September 14, 2006 and the amendments thereafter.

Application for ToR approval was submitted to SEAC on 1st March 2023 and the project was examined by the SEAC in its 7th meeting held during 30th May 2023. TOR was granted under vide letter no. 275/SEIAA dated 30TH May 2023. Later, application for TOR amendment was made on 22-09-2023 with respect to addition of 60,000 sqm land area in view of the green area requirement at the project premises and the final layout plan of landfill site. Accordingly, Amendmentment of TOR for total plot area of 10,000 sq m was granted by the SEIAA [Reference MOM letter no. 358/SEIAA dated 5th December 2023].

EIA studies have been carried out complying with all conditions of granted TOR and being presented here in the stipulated structure of EIA document as per Appendix III of EIA Notification, 2006.

2. Identification of Project

With rapid urbanization and changing lifestyles, there is an increased generation of solid wastes quantity and like most of the urban areas, Roorkee City is also overwhelmed by discriminating problems related to solid waste management.

Since growth is expected to be moderate, the future generation trends will be governed by population changes and will be mainly from domestic sources. However, considering the contribution to economy by the fast-growing commercial and industrial enterprises, hygienic management of waste will be important for the promotion of economy in a sustainable environment.

Presently Nagar Nigam Roorkee has around 600 Bigha land at Saliyar village near Roorkee, out of which around 25 bigha land is at present utilized for dumping the municipal solid waste without any treatment. Currently waste from Roorkee as well as from Manglore & Jhabrera being dumped on this site, which is approximately 45 TPD.

Nagar Nigam Roorkee has now 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 through 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 sanitary landfill facility.

In this regards, Nagar Nigam Roorkee under guidance of Urban Development Directorate, Uttarakhand had engaged WAPCOS Limited as consultant to prepare the DPR for the proposed solid waste management facility project as per the Swachh Bharat Mission 2014 and Uttarakhand State Solid Waste Management guidelines.

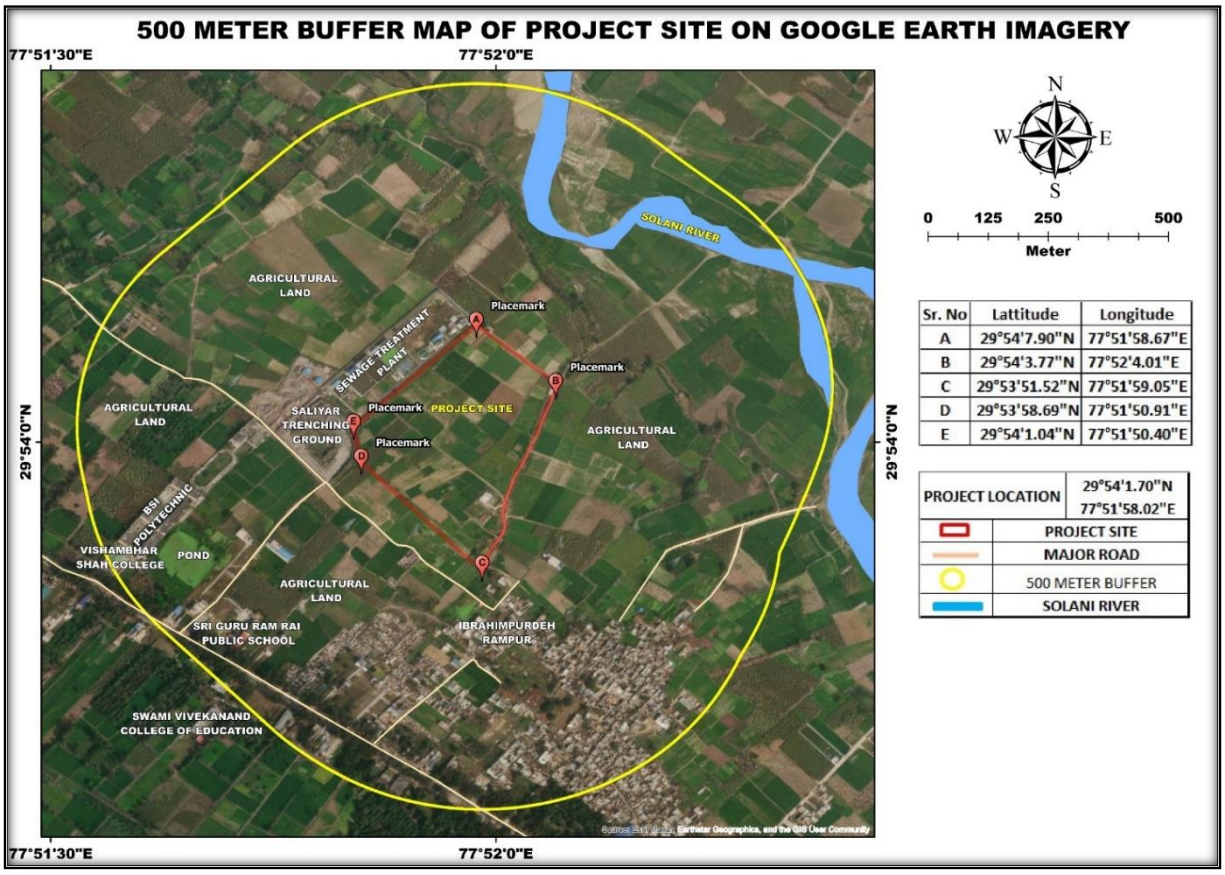
The common facility of organic wastes composting, recovery of recyclables and sanitary landfill for disposal of inert and rejects will be developed based on Regional Landfill Site Concept" for Roorkee Cluster which includes 7 ULBs – Roorkee, Jhabrera, Manglaur, Landhaura, Bhagwanpur, Piran Kaliyar and Laksar.

3. Nature, Size, Location of the Project

Nagar Nigam Roorkee has selected the proposed site at Khasra No. 320, Village Saliyar, Tehsil Roorkee for processing and disposal of solid wastes generated from Roorkee city and cluster towns. The site is located adjacent to the current waste dumping ground at Saliyar.

The facilty has been planned for setting up of organic waste compost plant of capacity **218 TPD** and Landfill facility for inert and rejects designed for twenty years [design year 2042]. Total landfill capacity is estimated as **462324.75 MT**. Project site coordinates are given below –

Sr. No	Latitude	Longitude
A	29°54'7.90" N	77°51'58.67"E
B	29°54'3.77" N	77°52'4.01"E
C	29°53'51.52" N	77°51'59.05"E
D	29°53'58.69" N	77°51'50.91"E
E	29°54'1.04" N	77°51'50.40"E



Particulars	Details
Nature of the Project	Solid Waste Management Facility
New/Expansion	New
Components of the proposed facility	The project involves – • Processing of organic part of solid waste and production of organic manure through Compost plant. • Recovery of Recyclable Wastes • Landfill for rejects and inert wastes
Size of the Project	**1) Compost Plant** – 218 TPD [design year upto 2042] **2) Landfill capacity – 462324.75 MT** [for twenty years; design year 2042]
Land Area	10 Hectares [waste processing & sanitary landfill]
Project site Location	Village Saliyar, Roorkee, Dist.-Haridwar, Uttarakhand
Land Ownership	Proposed project site [approx. 10 Ha] is an undeveloped vacant land in possession of the Nagar Nigam Roorkee. Adjacent land on south west and west is presently used for open dumping of solid wastes and common Sewage treatment Plant. As per land revenue records, the proposed site of area 10 Ha is earmarked for Municipal Solid Waste Management.
Nearest Town and Habitation	Roorkee Main Town is situated at an aerial distance of 2.2 Km on SE.
Nearest Railway Station	Roorkee Rly Station is situated at an aerial distance of 5.2 Km on SE

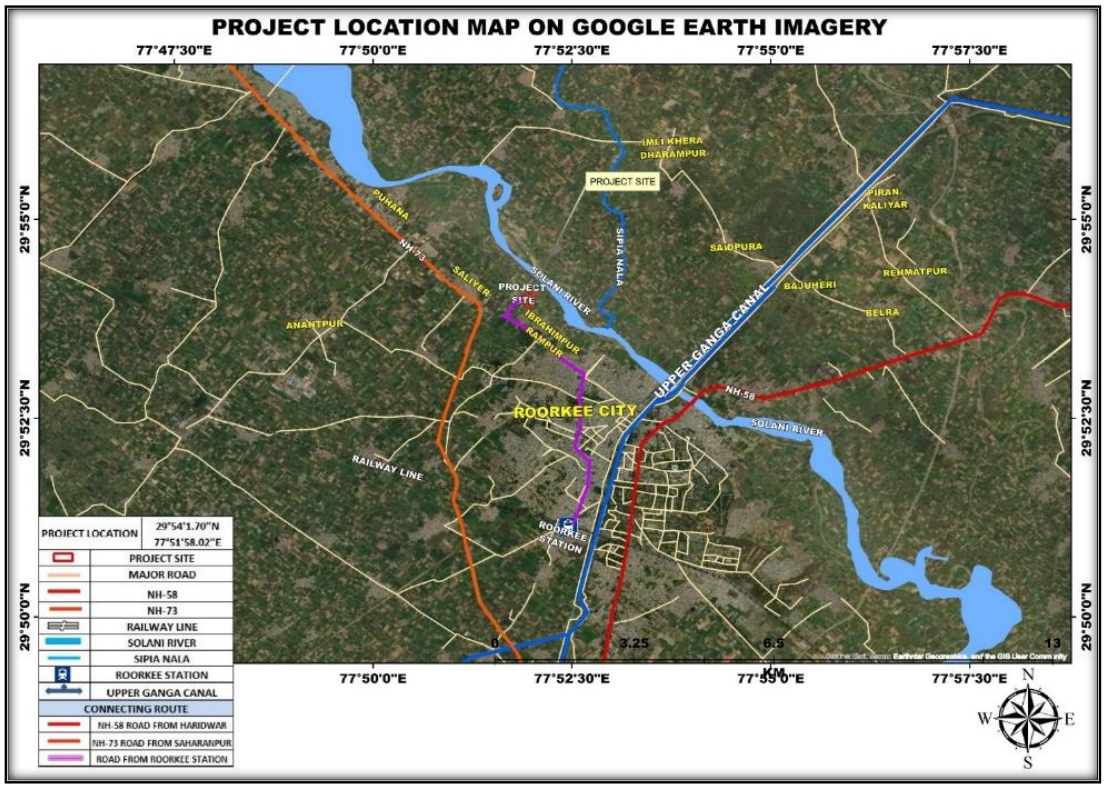
Nearest Airport	Jolly Grant Airport, Dehradun is situated at an aerial distance of 44.3 Km on NE. Heliport, Roorkee Cantt. is situated at an aerial distance of 5.57 Km on SE direction.

Eco-sensitive areas around the project site: Not within 15 KM radius

Site Connectivity: Roorkee is a city and a municipal corporation in the Haridwar district of the state Uttarakhand, India. It is just 36 km from Haridwar city. The site is well connected via road network and existing road network is adequate. It is located on East of NH 344 and approached from NH 344 through existing road of approx. 5m width.

Nearest Habitation: Nearest habitation in village Ibrahimpurdeh is located at an aerial distance of 40m on South East corner from the boundary of the proposed site.

Shri Guru Ram Rai Public School is situated at aerial distance of 400m on SW. Bishamber Sahai Institute of Technology is situated at aerial distance of 300m on SW.



Location of the Proposed Solid Waste Management Facility

4. Waste Generation Forecast & Waste Characteristics

In the DPR, the population of Roorkee city under Roorkee Nagar Nigam has been taken as 182515 [as per census 2011]. It was found that in Roorkee average domestic solid waste generation is approx. 0.45 kg/capita/day.

Population Projection and Waste Generation in Roorkee & Cluster ULBs

Population projection by Geometrical Progression Method was preferred method.

Year	Roorkee (MB)	Waste Generation in MT/day	Jhabrera (NP)	Waste Generation in MT/day	Manglaur (MB)	Waste Generation in MT/day	Landhaura (NP)	Waste Generation in MT/day	Bhagwanpur (CT)	Waste Generation in MT/day	Piran Kaliyar (CT)	Waste Generation in MT/day	Laksar (NP)	Waste Generation in MT/day	Total Population	Total Waste Generation MT/Day	Say	Volume of Waste @.480Kg/cum
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19
2019	260173	176.92	13461	4.04	64163	18.93	22473	6.74	17636	5.29	49956	14.99	24842	7.45	422704	234.36	235.00	489.58
2020	265741	182.74	13776	4.13	65719	19.39	23047	6.91	18105	5.43	50486	15.15	25257	7.58	435131	241.33	242.00	504.17
2021	272591	188.76	14098	4.23	67312	19.86	23635	7.09	18586	5.58	51031	15.31	25678	7.70	447932	248.53	249.00	518.75
2022	286733	194.98	14429	4.33	68945	20.34	24238	7.27	19080	5.72	51590	15.48	26107	7.83	461122	255.95	256.00	533.33
2023	296175	201.40	14767	4.43	70617	20.83	24857	7.46	19587	5.88	52164	15.65	26543	7.96	474710	263.61	264.00	550.00
2024	305929	208.03	15113	4.53	72329	21.34	25491	7.65	20108	6.03	52753	15.83	26985	8.10	488709	271.50	272.00	566.67
2025	316003	214.88	15466	4.64	74083	21.85	26142	7.84	20642	6.19	53358	16.01	27436	8.23	503130	279.65	280.00	583.33
2026	326410	221.96	15829	4.75	75879	22.38	26809	8.04	21191	6.36	53979	16.19	27895	8.37	517992	288.05	289.00	602.08
2027	337158	229.27	16199	4.86	77719	22.93	27493	8.25	21754	6.53	54616	16.38	28360	8.51	533299	296.72	297.00	618.75
2028	348261	236.82	16578	4.97	79604	23.48	28195	8.46	22333	6.70	55271	16.58	28834	8.65	549076	305.66	306.00	637.50
2029	359730	244.62	16967	5.09	81534	24.05	28914	8.67	22926	6.88	55942	16.78	29315	8.79	565328	314.89	315.00	656.25
2030	371577	252.67	17364	5.21	83512	24.64	29652	8.90	23536	7.06	56632	16.99	29804	8.94	582077	324.40	325.00	677.08
2031	383813	260.99	17770	5.33	85537	25.23	30409	9.12	24162	7.25	57340	17.20	30302	9.09	599333	334.22	335.00	697.92
2032	396452	269.59	18186	5.46	87611	25.85	31185	9.36	24804	7.44	58067	17.42	30808	9.24	617113	344.35	345.00	718.75
2033	409508	278.47	18612	5.58	89735	26.47	31981	9.59	25463	7.64	58813	17.64	31322	9.40	635434	354.79	355.00	739.58
2034	422993	287.64	19048	5.71	91911	27.11	32797	9.84	26140	7.84	59579	17.87	31845	9.55	654313	365.57	366.00	762.50
2035	436923	297.11	19494	5.85	94140	27.77	33634	10.09	26835	8.05	60365	18.11	32377	9.71	673768	376.69	377.00	785.42
2036	451311	306.89	19950	5.99	96423	28.44	34492	10.35	27548	8.26	61173	18.35	32917	9.88	693814	388.16	389.00	810.42
2037	466173	317.00	20417	6.13	98761	29.13	35373	10.61	28281	8.48	62001	18.60	33467	10.04	714473	399.99	400.00	833.33
2038	481525	327.44	20896	6.27	101156	29.84	36276	10.88	29033	8.71	62852	18.86	34026	10.21	735764	412.20	413.00	860.42
2039	497383	338.22	21385	6.42	103609	30.56	37201	11.16	29804	8.94	63725	19.12	34594	10.38	757701	424.80	425.00	885.42
2040	513762	349.36	21885	6.57	106122	31.31	38151	11.45	30597	9.18	64622	19.39	35171	10.55	780310	437.79	438.00	912.50
2041	530681	360.86	22398	6.72	108695	32.07	39124	11.74	31410	9.42	65542	19.66	35758	10.73	803608	451.20	452.00	941.67
2042	548156	372.75	22922	6.88	111331	32.84	40123	12.04	32245	9.67	66487	19.95	36355	10.91	827619	465.03	466.00	970.83

Year	Roorkee (MB)	Waste Generation in MT/day	Jhabrera (NP)	Waste Generation in MT/day	Manglaur (MB)	Waste Generation in MT/day	Landhaura (NP)	Waste Generation in MT/day	Bhagwanpur (CT)	Waste Generation in MT/day	Piran Kaliyar (CT)	Waste Generation in MT/day	Laksar (NP)	Waste Generation in MT/day	Total Population	Total Waste Generation MT/Day	Say	Volume of Waste @480Kg/cum
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19
	566209	385.02	23459	7.04	114031	33.64	41147	12.34	33102	9.93	67457	20.24	36962	11.09	852367	479.30	480.00	1000.00
	584854	397.70	24008	7.20	116796	34.45	42197	12.66	33982	10.19	68453	20.54	37579	11.27	877869	494.02	495.00	1031.25
2045	604113	410.80	24570	7.37	119628	35.29	43274	12.98	34885	10.47	69475	20.84	38207	11.46	904152	509.21	510.00	1062.50
2046	624008	424.33	25146	7.54	122529	36.15	44378	13.31	35813	10.74	70524	21.16	38845	11.65	931243	524.88	525.00	1093.75
2047	644557	438.30	25734	7.72	125500	37.02	45511	13.65	36765	11.03	71602	21.48	39493	11.85	959162	541.05	542.00	1129.17
2048	665784	452.73	26337	7.90	128543	37.92	46672	14.00	37742	11.32	72707	21.81	40153	12.05	987938	557.74	558.00	1162.50
2049	687709	467.63	26953	8.09	131661	38.84	47863	14.36	38746	11.62	73843	22.15	40822	12.25	1017598	574.95	575.00	1197.92
2050	710356	483.04	27585	8.28	134853	39.78	49085	14.73	39776	11.93	75008	22.50	41504	12.45	1048167	592.71	593.00	1235.42
2051	733748	498.95	28230	8.47	138123	40.75	50338	15.10	40833	12.25	76205	22.86	42197	12.66	1079674	611.04	612.00	1275.00

5. Proposed Waste Management Plan

The whole project of solid waste management consists of:

- Primary Storage & Collection
- Secondary Waste Collection & Transportation
- Secondary Storage for cluster towns
- Decentralised Segregation for resource recovery
- Integrated Solid Waste Management Facility at Saliyar, Roorkee [Composting and Sanitary Landfill Facility].

The proposed infrastructure for primary waste collection will cover 100 % 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.

All wastes will be brought into tipping area and further segregated into various recycling streams which will be sold to local recyclers [kabadiwalas] weekly basis. Organic wastes will be turned into

compost by using windrow composting method. The design duration is taken as 30 – 35 days and aerator if used will ensure the same even if the conditions are in lower temperature during winter days. Stepwise landfill will be provided for inert wastes disposal.

The efficiency of the proposed Waste Management Plan will be driven by the separation of waste at the primary collection level. A prolonged campaign will be required with adequate budgetary provisions to impress the citizens that source segregation will provide them a healthy environment and a better lifestyle.

Municipal Corporation Roorkee aims to be cleanest, hygienic and free of any unwanted littering in the city and want to create clean and hygienic place for its residents. It is already trying to reach 100% door to door collection in all of its wards.

- ✓ Source segregation is key aspect and 3 color coded [wet, dry and sanitary wastes] dustbins will be provided to each household on one time basis. Commercial shops will also be encouraged to adopt the practice of segregation.
- ✓ Waste from households and commercial places will be collected by the pushcart/tricycle, auto tippers & pickup vehicles. Very few collection points will be made in the city so that the primary collected waste can be directly unloaded into the auto tippers and further transported to the processing site.
- ✓ The waste will be further segregated at the processing site into various material streams. The wet waste will be shredded and sent to compost yard for making compost.
- ✓ Dry waste will be segregated in different material types like plastic, paper, glass etc. Materials like plastic bottles, hard papers are sent to compactor machine for volume reduction & further to shredder for shredding the plastic caps and hard plastics. This process increases the selling price of the plastics and due to presence of huge industrial area the ULB will be able to sell the same. Segregated and processed inorganic waste will be sold to various recyclers/vendors.
- ✓ Compost processing rejects, inert materials and non-recyclable materials will be disposed to the proposed sanitary landfill facility at the site.
- ✓ Presegregated wastes from cluster towns after manual recovery of recyclable wastes will be received by the proposed common facility for final recovery of resources and disposal to landfill.

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 462,324.75 MT. As per present availability of land, now the landfill has been planned for a design period of 20 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 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 povisions 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 Stabilization, 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

A) Water Requirement

Construction Phase- During construction phase, approximate water requirement will be 4.5 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. 80 KLD for the proposed project and will be sourced through onsite bore-well.

- Domestic consumption – 2.225 KLD [@45 lit/person] ~ 2.5 KLD
- Washing/water sprinkling/green area demand – 77.5 KLD

B) Power requirement

Power demand for the project during operation phase [approx. 140 KW] will be sourced from local electricity distribution authority. One DG Set of 90 KW~110 kVA will be provided at site as back up during power cut.

C) Manpower requirement

During peak construction phase approx. 100 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 50. No Housing facilities or colony will be provided. The workers shall be employed from nearby areas.

9. Proposed Project Cost

Overall estimated project cost for collection, transportation, processing and disposal of wastes at Roorkee is INR 4560.796 lakh. Out of the same, estimated cost for development of proposed common solid waste processing and disposal facility is INR 2397.77 lakh.

10. Baseline Environmental Status

Field investigations were undertaken for collecting the existing baseline data with respect to air, water, noise, soil, ecology and socio-economy. A study area of 10 Km radius around the project site was considered to establish the present baseline scenario for the above environmental components. Field data generation was done during winter season from December 2022 to February 2023.

Metrological data has been collected from the IMD station at Roorkee and pre dominant wind direction recorded is North West in winter season.

Ambient Air Quality

Ambient air quality monitoring stations were set up for 6 different locations selected in downwind, cross wind and up wind of the proposed project site. The common air pollutants namely Particulate matter (PM10 & PM2.5), Sulphur dioxide (SO2), the oxides of nitrogen (NOX), Methane (CH4), Hydrogen sulfide (H2S) were sampled and results were averaged to 24 hours and compared with the NAAQ standards stipulated by CPCB.

- PM_{10} concentration in the study area varied from 78 to 132 µg/m^3
- $PM_{2.5}$ concentrations in the study area varied from 49 to 77 µg/m^3
- SO_2 concentration in the study area varied from 6.1 to 8.59 µg/m^3
- NO_2 concentration in the study area varied from 10.28 to 16.41 µg/m^3
- CO concentration in the study area was observed to be 0.65 to 1.02 µg/m^3

All the Parameters except PM10 & PM2.5 are found to be well within the standards as per NAAQS.

Water Quality

Grab samples of groundwater from bore-well/tube-well and pond/canal were collected from 6 nearby locations and analyzed for basic physico-chemical parameters and coliform count. 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 7.38 to 7.46
- Total Dissolved Solids varies from 490 to 528 mg/l.
- Total Hardness varies from 276 to 284 mg/l.
- Calcium varies from 48 to 53 mg/l
- Magnesium varies from 37 to 38 mg/l
- Chloride varies from 56 to 65.51 mg/l
- Fluoride varies was found to be <0.1 mg/l to 0.12 mg/l
- Nitrates varies from 4.62 to 5.2 mg/l
- Sulphates varies from 32.2 to 38.5 mg/l
- Toxic Metals: <0.01 mg/l
- Total Coliform: <2
- E-Coli: Absent

The above results indicate that the ground water of the study area is well within the Acceptable limit as per IS 10500: 2012. However, Total Hardness, Total dissolved Solids, Magnesium and Total Alkalinity are within the permissible Limits.

Surface water quality:

Analysis results of surface water reveal the following: -

- pH varies from to 7.02 to 7.24
- Dissolved Oxygen varies from 4.1 to 6.3 mg/l.
- BOD varies from 2.9 to 6.5 mg/l
- COD varies from 18 to 46 mg/l
- Total Dissolved Solids varies from 204 to 280 mg/l.
- Total coliform: Absent

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

Ambient Noise

Day time noise level (6 am to 10 pm) was found between 52.2 to 53.8 dB(A). Night-time (10 pm to 6 am) noise levels were found between 41.1 to 42.6 dB (A). Ambient Noise level in the study area is complying with the prescribed national standards.

Soil Quality

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

There are four [4] reserve forests in 10 km of the study area Details of Forest block within 10 Km area are provided below-

DETAILS OF FOREST BLOCK WITHIN 10 KM AREA

S.No	Forest	Distance & Direction
1	Sakrauda RF	12.11 Km NE
2	Hazara RF	14.4 Km NW
3	Papri RF	14.6 Km NE
4	Dholakhand RF	9.7 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 as per Census 2011 is 590,812 persons. Out of which 313,270 are male and 277, 542 are female. SC total population is 110,464 out of which 58,649 are male and 51,815 are female.

11. Anticipated Environmental Impacts and Mitigation Measures

Matrix has been prepared 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 construction material transportation, unloading and removal of waste material from site	√	√			√	
6	Storage, handling and disposal of solid waste	√	√	√	√		
7	Wastewater generation & disposal			√		√	

S. No	Aspects	Environmental Attribute					
		Air	Noise	Water	Land & soil	Ecology and Bio-diversity	Socio Economics
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 this phase, the sources of fugitive dust are due to movement of garbage laden vehicle to and fro to the processing site. The unloading of garbage trucks and tractors release suspended particulates in the air. Further; the operation of wheel loader during levelling operations (of the dumped solid waste) creates fugitive particulates. Emissions from the vehicles used for transportation of daily garbage will also contribute to the ambient air pollution. Some foul gases may also generate from Compost plant and landfill site.

Only point source of air pollutants will be the stack of the DG set operated during power cut only. The same 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.

Mitigation Measures: Regular water sprinkling will be carried out at the site. Controlled passive gas venting system will be provided at the landfill. Covering the landfill wastes with daily and intermediate covers of soil on a regular basis will be done. Adequate green area will be provided at site to act as a barrier both for noise and dust particulates. Spray of herbal sanitizers and inoculums on the wastes will be done to remove odour during composting. The compost facilities, roads, equipment and the surrounding area shall also be cleaned regularly to remove the odour generating wastes. The processed compost is stored in sheds so as to avoid attraction to birds and runoff due to rain or windblown entrainment of particles.

Noise Environment - The operation phase involves machinery and equipment which would generate noise substantially. Intermittent source of noise shall be due to movement of vehicles used during the operation activities.

Mitigation measures: DG set will be installed with inbuilt acoustic enclosure and Anti vibration mount (AVM) pads. Adequate parking, road signage and traffic management will be made to avoid traffic congestion & noise.

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 fresh water requirement of the project will be fulfilled through onsite ground water abstraction with prior approval from the concerned authority. Domestic wastewater will be disposed through onsite septic tank and soak pit.

Possible source of 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 facility design. A final cover system will be done at the top of the landfill to enhance surface drainage, prevent water infiltration and also to support surface vegetation.

A leachate collection facility will be established to collect leachate from within and from the base of the Sanitary Landfill and then recirculate the leachate in composting facility. Remaining, if any will be evaporated.

Separate drainage systems are proposed for storm water to avoid run off contamination as well as any contamination of surface water sources. Hence, No negative impacts on water bodies/rivers/ ponds have been anticipated.

Land Environment - As per land records, the project site is earmarked for solid waste management. Therefore, the proposed project will not change the landuse of the site.

Green area of approx. 37,350 m^2 will be developed in compliance with MoEF&CC requirement. This will have improved ecological and enhanced aesthetic impact and will also act as pollution barrier. Entire operational area shall be well paved.

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 planation 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 Solid Waste Management Facility.

- 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 solid waste 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

No alternative site examined. The proposed site is located beside the existing waste dumping site of Roorkee and the land is owned by the Nagar Nigam Roorkee. The site is already earmarked for solid waste management. Also, the site is quite far away from main Roorkee City and majorly complies with the siting criteria for setting up of Common Solid Waste Management Facility except habitation in the buffer zone. However, with proper planning of the landfill facility at the furthest corner of the site, the buffer distance between the core landfill facility and nearest habitation on SE ditecrion of the site will be kept more than 200 m.

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 common facility including sanitary landfill is INR 2397.77 lakh. The environmental management plan capital cost has been allocated as INR 96 .lakh and annual recurring expenditure during the stage of operation is estimated as INR 11.6 lakhs. CER amount to be fianlised after the Public Hearing.

15. Green Belt Development

An area of approx. 37,350 sqm [37.35%] has been earmarked for development of greenbelt along the boundary, roads and in open places available inside the facility. As planned, 3-5 m wide green belt shall be developed along 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 maintained. Below mentioned guidelines will be followed to cover safety and health aspects at the site 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. Legacy Waste Management

The legacy waste collected over the past several decades at the dumping site is located at Village Saliyar adjacent to the proposed project site. As estimated by the Nagar Nigam Roorkee approximately 1.3 lakh MT (1.63 lakh cum) waste is dumped there over 14000 sqm area. Bio-mining and Bioremediation will be adopted to clear the above legacy wastes for which necessary action has already been initiated by the Nagar Nigam Roorkee and work order has been issued to the successful bidder.

18. Project Benefits

The contribution of the proposed project on local social infrastructure is expected to be significant. From the proposed project the major benefits, include improving the degraded environment by establishing an integrated solid waste management facility. 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 Project will provide a significant amount of direct and indirect employment opportunities to the local people. This will also improve economic condition of rag pickers and recycling units.