

EXECUTIVE SUMMARY

E.1 INTRODUCTION

The advent of industrialization, growing urbanization and population, and expanding gross domestic product (GDP) has increased the generation of municipal waste dramatically. The composition and amount of generated waste is a visible expression of civilization and a way to measure the standard of living of society. In fact, the amount of waste generated by households, agriculture, and industries in our country seems gravely linked to population increases and rising GDP. The gigantic amounts of waste that are hauled to dumps and accumulate in heaps and open pits have grown to become a major environmental issue. Landfilling is still the world's most widely used method for managing and treating waste. This practice has detrimental effects on the environment: land degradation, greenhouse gas (GHG) emissions, groundwater pollution, odor, and aesthetics. The landfill dump site has collapsed sometimes due to over dumping of waste. In cases where landfilling is impractical and no space is available, electricity from waste is the preferred option.

The dumping in landfills is an unsustainable method for getting rid of waste and conversion of energy from waste has been found to be suitable means of managing it. Industrialized countries have adopted regulations to divert waste from landfills to recycling, treatment and materials recovery and energy. In addition, economic conditions and regulated markets have stimulated the use of waste as a resource and a source of energy. Waste-to-Energy (WtE) encompasses methods to extract the valuable energy entrapped in waste for the production of electricity and heat. Waste collected in city contains a large amount of biological and recoverable materials. It is therefore a source of renewable energy. As a consequence, energy-from-waste contributes to energy security and diversification, and matches the growing demand for renewable energy in a carbon constrained world.

The objectives of this project are:



1. This project is green initiative for electricity production.
2. To reduce the problem associated with disposal of unprocessed waste as landfill and to meet the objective and goal set for the country under the **Swachh Bharat Mission (SBM)**.
3. To minimize the MSW load going to landfill site through utilizing electricity generation.

The municipal solid waste generated in Delhi is about 1000 MT at the rate of 0.50 kg/capita/day. Out of this, nearly 4,850 MT of waste remains untreated and has to be dumped/processed at some site. The landfill/dumping sites have already exceeded the prescribed limit of height and has severe consequences on environment, health and hygiene. The dumps have attained the height of over 40 meter as opposed to the permissible limit of 20 meter. SDMC has engaged IIT, Delhi for suggesting process of remediation/scientific capping/closure of existing dumpsite of sanitary landfill at Okhla.

South Delhi Municipal Corporation (SDMC) is currently collecting about 4,850 t/d, and NDMC is also collecting 450 t/d of waste in Delhi city which is being managed as follows:

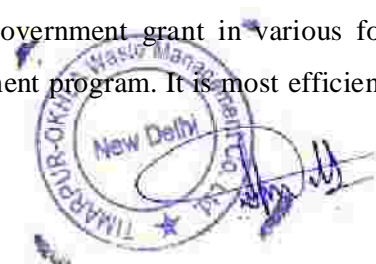
From SDMC -

- Supply of about 1550 t/d to the TOWMCL W t E project
- Supply of about 150 t/d to the Okhla composting plant and
- Supply of 2000 t/d to landfill (This will be diverted to Tehkhand Waste to Energy plant – New Project)
- Balance 1150 TPD to landfill

From NDMC –

Supply of about 450 t/d to the TOWMCL W t E project

The balance waste will be processed in the proposed expansion project. Government of India launched the Swachh Bharat Mission (SBM) in 2014, covering 4041 statutory towns to clean the streets, roads and infrastructure of the country. Hence, The SBM recommends preparation of 'City sanitation plan' and 'State Sanitation Strategy' and highlights the importance of W t E projects as a potential vehicle for addressing the MSW woes in the cities. The Mission talks about subsidizing the W t E projects through the central government grant in various forms. "W t E" plant is one of the most sustainable waste management program. It is most efficient and



environment friendly solution for reducing the burden on landfill and generation of electricity. Hence proposed expansion of TOWMCL will take additional 1000 to 1200 t/d of waste and will generate 24 MW with a view to reduce the problem associated with disposal of unprocessed waste at landfill, thereby complying with the various regulations as well as the objective and goal set for the country under the Swachh Bharat Mission (SBM). The total capacity of the plant after expansion will be 40 MW.

M/s Perfect Enviro Solutions Pvt. Ltd. was earlier awarded the work of conducting EIA studies by TOWMCL. The project was submitted online to MoEF&CC on 19/06/2018 by M/s Perfect Enviro Solutions Pvt. Ltd. After submission, the work of EIA studies has been awarded to M/s Yes Enviro Solutions, Noida by TOWMCL. M/s Yes Enviro Solutions is a QCI approved consultancy for conducting EIA studies for Category 'A' Thermal Power Project (QCI approval dated 13th Oct, 2017). Undertaking of change of Consultant has been attached as **Annexure-XX**. The case was presented for approval of ToR before the Expert Committee on 25/07/2018 by **M/s Yes Enviro Solutions**. The ToR has been issued vide file no. J-13012/09/2018-IA.II(T) dated 20/08/2018 from MoEF&CC.

E.2 LEGAL REQUIREMENTS

As per EIA Notification, 2006 & its amendments, all electricity generating units of capacity > 20 MW (using municipal solid non-hazardous waste as fuel) will be treated as Category-A project and will require Environmental Clearance from MoEF&CC. As it is an expansion project, so this project shall abide by all applicable provisions of the Environment Protection Act, 1986 and Rules framed there under. As per the Air (Prevention & Control of Pollution) Act 1981, Water (Prevention & Control of Pollution) Act 1974, Solid Waste Management Rules, 2016, Public Liability Insurance Act, 1991 and Hazardous and Other Wastes (Management and Trans boundary Movement) Rules, 2016, necessary clearances are required to be obtained for expansion project. The project has been granted authorization certificate by DPCC and will obtain yearly Consent for Operation during the operation phase.



E.3 PROJECT DESCRIPTION

The project is located at Compost plant site, near Okhla STP, Timarpur, Okhla, Delhi. The Co-ordinates of the project site are as follows:

1. $28^{\circ}33'14.30''N$ & $77^{\circ}16'50.48''E$
2. $28^{\circ}33'7.81''N$ & $77^{\circ}16'53.10''E$
3. $28^{\circ}33'5.30''N$ & $77^{\circ}16'44.48''E$
4. $28^{\circ}33'13.09''N$ & $77^{\circ}16'41.05''E$
 $28^{\circ}33'14.79''N$ & $77^{\circ}16'45.86''E$
 $28^{\circ}33'13.13''N$ & $77^{\circ}16'46.58''E$

The expansion of W t E project at Timarpur has been planned to address the issue of municipal solid waste of South Delhi Municipal Corporation (SDMC). Further, because of paucity of lands in the city and ever increasing amount of solid waste, it is imperative to process the MSW to the maximum extent possible to minimize dumping at the landfill sites. Hon'ble LG during a meeting on 5.09.2017 directed to increase the capacity of existing WtE plant at Okhla. Even, CEC order dated 13th December, 2017 and Supreme Court order dated 5th Feb, 2018, it has been recommended to increase the capacity of existing WtE units to manage MSW of Delhi. (**Refer Annexure-XVIII**).

The salient features of the project are given in **Table E.1**.

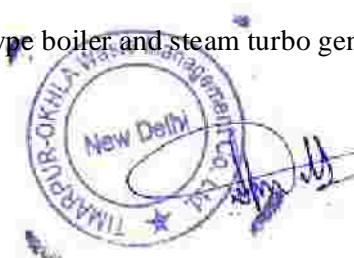


Table No. E.1: Salient Features of the Project

S. No.	Information	Details
1	Project name and Location	Expansion of “Waste to Energy” Power plant from 16 MW to 40 MW located at Okhla, Delhi
2	Capacity	Expansion from 16 MW to 40 MW
3	Name of project Proponent	M/s Timarpur Okhla Waste Management Company Limited
4	General Conditions	Protected Areas- Okhla Bird Sanctuary, Asola Wildlife Sanctuary, Jahapanah City PF, Tilpat forest, Central Ridge RF, City Forest Critically Polluted-Okhla Industrial Area, free from Rehabilitation Government land Interstate Boundary of Delhi-Haryana and Delhi-UP Eco Sensitive Zone: - Aravali ESZ, Okhla ESZ & Asola ESZ.
5	Site Location	
	Village	Okhla
	District	South East Delhi
	State	Delhi
6	Water Requirement	During Construction phase – Treated sewage water from Delhi Jal Board. During operation phase - 1375 KLD including 500 m ³ /d for existing plant from Okhla STP, Delhi Jal Board.
7	Power Supply and its Source	During construction phase-In house power generation
8	Population	Existing-77 (On Roll), 177 (Contract) Expansion-150-During Construction and 13 (Direct) + 24 (Indirect) during operation
9	Project Cost	INR 268.19 crore (Expansion project)
10	Nearest Railway Station	Okhla Railway Station is around 1.45 km in the North West direction.
11	Nearest Metro Station	Sukhdev Vihar Metro Station is around 0.73 km in the NNW direction.

Proposed Fuel: Refuse derived fuel prepared from Municipal Solid Waste.

Technology: Reverse acting reciprocating forwarding grate type boiler and steam turbo generator for power generation (Rankine cycle)

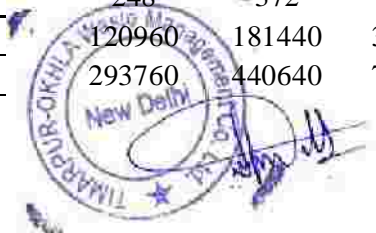


Design capacity of MSW fuel preparation plant: 1950 TPD in existing project & 1200 TPD in proposed expansion i.e 3150 TPD MSW after expansion.

Design Capacity of Waste to Energy plant: 16 MW existing project to 40 MW after expansion of the project. The material inventory of the project is given in **Table E.2.**

Table No. E.2: Material Inventory of the Project

	Monthly Consumption (kg)	Per MW Consumption (kg)	For 16 MW (kg)	For 24 MW (kg)	Total For 40 MW (kg)
Antiscalant	186	9.3	148.8	223.2	372
Caustic Flakes	3456	172.8	2764.8	4147.2	6912
Citric Acid	17	0.85	13.6	20.4	34
Ethylene Diamine Tetra Acetic Acid	17	0.85	13.6	20.4	34
Ferric Chloride	248	12.4	198.4	297.6	496
Sulphuric Acid	465	23.25	372	558	930
Polyelectrolyte	45	2.25	36	54	90
Hydrazine	24	1.2	19.2	28.8	48
Hypochlorite	2356	117.8	1884.8	2827.2	4712
Hydrochloric Acid	3755	187.75	3004	4506	7510
Sodium Meta Bisulphate	100	5	80	120	200
Suchem RO 785	31	1.55	24.8	37.2	62
Volatile Amine	320	16	256	384	640
Suchem CM 361M	52.7	2.635	42.16	63.24	105.4
Suchem CM 391	30	1.5	24	36	60
Suchem CM 393	30	1.5	24	36	60
Suchem CM 410	43	2.15	34.4	51.6	86
Suchem CM 421	158	7.9	126.4	189.6	316
Suchem RO 780	17	0.85	13.6	20.4	34
Suchem RO 781	17	0.85	13.6	20.4	34
Suchem RO 785	32	1.6	25.6	38.4	64
Nitric Acid	1550	77.5	1240	1860	3100
Bleaching Powder	310	15.5	248	372	620
Molasses	310	15.5	248	372	620
Activated Carbon	151200	7560	120960	181440	302400
Lime	367200	18360	293760	440640	734400



E.3.1 Connectivity

Nearest NH-2 is at the distance of 0.41 km in WSW direction from the project site. Nearest railway station is Okhla Railway Station at a distance of 1.45 km in NW direction. Nearest Metro station is Sukhdev Vihar Metro Station at the distance of 0.73 km in NNW direction. Nearest Airport is Indira Gandhi International Airport- approx. 17.48 km in W direction.

E.3.2 Land Requirement

The land required for the project is in possession of _____ ct proponent. The breakup of land for various purposes for existing and expansion project is given in **Table no. E.3.**

Table No. E.3: Breakup of Land Requirement

S. No.	Particulars (Land Use)	Existing Area Details (sq.m)	Proposed Area Details (sq.m)	Total Details (sq.m)
1	Plant Area	24444.00	6000.00 (Demarcated land parcel for expansion)	30444
2	Road Area/Parking Area	9720	-	9720
3	Green Area	12000	-	12000
4	Office and Utilities	8538.86	-	8538.86
5	Area Demarcated for future expansion	6000.00	-	
Total Plot Area		60702.86	-	60702.86

The CEA norm for land requirement for main plant of thermal power project using indigenous coal recommends 0.52 Acre/MW. CEA has not prescribed norm for land requirement for WtE project. Total land including existing project is 15 acres. In this project, the land requirement (including office building and canteen) for 40 MW comes to 0.37Acres/MW which is less than CEA norm for coal based plant. However, requirement of additional land for the develop of green belt has been referred to SDMC to meet TOR requirement.



E.4 ENVIRONMENTAL SETTING OF THE STUDY AREA

The study area has been classified into core zone and buffer zone comprising the project site and the area within a radius of 10 km from the project site, respectively. The study has been done during March, 2018 to May, 2018.

The nearest river is Yamuna, which is 1.62 km in E direction from the project site. Okhla Bird Sanctuary, Jahapanah City PF, Asola Wildlife Sanctuary, Tilpat forest, Central Ridge RF, City Forest Hauzrani are 1.62 km, E; 4 km, SW; 5.68 km, SSW; 9.74 km, SSE; 10.81 km, NW; 7.42 km, WSW direction respectively.

E.4.1 Climate

The climate of NCT Delhi is mainly influenced by its inland position and the prevalence of air of the continental type during the major part of the year. Extreme dryness with the intensely hot summer and cold winter are the characteristics of the climate. Only during the three-monsoon months July, August, and September does air of oceanic origin penetrate to this state and causes increased humidity, cloudiness and precipitation. The year can broadly be divided into four seasons. The cold season starts in late November and extends up to the beginning of March. This is followed by the hot season, which lasts till about the end of June when the monsoon arrives over the state. The monsoon continues to the last week of September. The two post monsoon months October and November constitute a transition period from the monsoon to winter condition.

E.4.2 Ambient Air Quality

One season monitoring was done to assess the ambient air quality. Monitoring was carried out at 12 stations during March, 2018 to May, 2018. IS – 5182 part 14, 2000 was followed as guideline for selection of ambient air monitoring stations. As per guidelines one location in upwind direction and another location in downwind direction of predominant wind direction is considered. The location of air quality monitoring stations are chosen, so as to satisfy that they are representative of the area. The details of monitoring locations are given in **Table E.4**

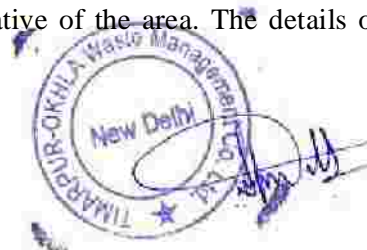


Table No. E.4: Location of Air Quality Monitoring Stations

Sampling Points	Location	Dist. From center of site (km)	Direction
AAQMS1	Project Site	0.00	-
AAQMS2	Sarita Vihar	2.86 km	SSE
AAQMS3	Sukhdev Vihar	0.47 km	NW
AAQMS4	Haji Colony	0.33 km	ENE
AAQMS5	Okhla Phase-III	1.24 km	WSW
AAQMS6	Jasola-Okhla	0.96 km	ESE
AAQMS7	Near Okhla Bird Sanctuary	1.69 km	E
AAQMS8	Near Asola Wildlife Sanctuary	5.60 km	S
AAQMS9	Okhla Phase-II	1.75 km	S SW
AAQMS10	Zakir Nagar	1.25 km	N
AAQMS11	New Friends Colony	1.42 km	NNW
AAQMS12	Shyam Nagar	0.80 km	SW

The study area represents industrial, residential and eco sensitive areas. 12 AAQM stations were selected in and around project site covering upwind, downwind and crosswind directions and PM_{2.5}, PM₁₀, SO₂, NO₂, CO and Hg were estimated in the ambient air. The methodology for sampling and analysis is adopted as per Central Pollution Control Board norms. The 98 percentile of PM_{2.5} ³ (Jasola-Okhla) to ³ (Sarita Vihar), PM₁₀ ³ (Jasola- ³ (Okhla Phase-II), SO₂ ³ (Okhla Phase- ³ (Near Okhla Bird Sanctu ³ (Okhla Phase-II), CO concentration varies from ³ (Near Okhla Bird Sanctuary) to 2292.9 ³ (Project Site) and Hg was below detectable limit in the study area.

E.4.3 Noise Environment

Noise levels were recorded during the day and night time to compute the equivalent noise levels. The noise level was recorded for 24 hours at an interval of 1 hour once during the study period at each monitoring location. Details of monitoring locations are given in **Table no. E.5.**

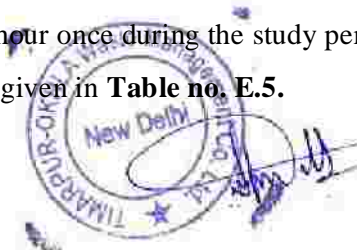


Table no. E.5:- Noise sampling locations

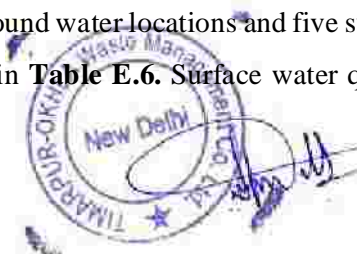
Sampling Points	Location	Dist. From center of site (km)	Direction
NQ1	Project Site	0.00	-
NQ2	Sarita Vihar	2.86 km	SSE
NQ3	Sukhdev Vihar	0.63 km	NNW
NQ4	Haji Colony	0.33 km	ENE
NQ5	Okhla Phase-III	1.24 km	WSW
NQ6	Jasola-Okhla	1.00 km	ESE
NQ7	Near Okhla Bird Sanctuary	1.87 km	E
NQ8	Near Asola	5.71 km	S
NQ9	Okhla Phase-II	1.88 km	S

Noise levels were measured at 9 locations near residential areas, high way, commercial areas and near ESZ located within 10 km radius in and around the proposed plant area. The measured, $L_{eq(day)}$ values ranged from 55.88 dB(A) (Project site) to 62.16 dB(A) (Sarita Vihar), $L_{eq(night)}$ values ranged from 46.45 dB(A) (Project site) to 54.41 dB(A) (Okhla phase-II). Noise levels at project site, Okhla phase III, Jasola-Okhla and Okhla phase II are within Industrial standard limits but noise levels at Sarita Vihar, Sukhdev Vihar, Haji Colony are slightly exceeding the residential standard limits. Noise levels near Okhla Bird Sanctuary and near Asola Wildlife Sanctuary are also exceeding the silence Zone standard limits.

E.4.4 Water Environment

The total water requirement for the project during operation will be 1375 KLD including 500 m³/d for existing plant. The source of water is Okhla Sewage Treatment Plant, located adjacent to the project site. The treated sewage water will be transported to the site through pipeline.

The water quality near the site and other locations within the 10 km impact zone was monitored during the study period. Water quality was monitored at six ground water locations and five surface water locations. The details of sampling locations are given in **Table E.6**. Surface water quality



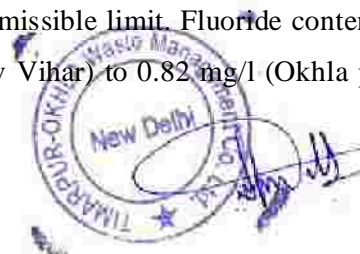
was analyzed for parameters as mentioned in the 'Methods of Monitoring & Analysis published by CPCB and it was rated according to the CPCB Water Quality Criteria against A, B, C, D, & E class of water based on parameters identified in the criteria. The water quality in the impact zone was assessed through physico-chemical and bacteriological analysis of ground and surface water samples. The results have been compared with the drinking water quality standards specified in IS: 10500: 2012.

Table No. E.6: Location of Water Sampling

Monitor	Location	Dist. From center of site (km)	Direction
GW1	Project Site	0	-
GW2	Sarita Vihar	2.86 km	SSE
GW3	Sukhdev Vihar	0.63 km	NNW
GW4	Haji Colony	0.33 km	ENE
GW5	Okhla Phase-III	1.24 km	WSW
GW6	Jasola-Okhla	1.0 km	ESE
SWQ1	Upstream Yamuna	2.36 km	NE
SWQ2	Centre Yamuna	2.23 km	E
SWQ3	Downstream Yamuna	2.96 km	ESE
SWQ4	Agra Canal	1.31 km	E
SWQ5	Sanjay Lake	7.03 km	NE

E.4.4.1 Ground Water Quality

The ground water quality data of six monitoring locations are given at **Table no. 3.10**. The pH ranges from 7.19 (Sukhdev Vihar) to 7.38 (Haji Colony). Turbidity of all ground water meets the permissible limits of 10 NTU. TDS value was found between 629 mg/l (Haji Colony) to 1074 mg/l (Okhla phase-III). Alkalinity ranged from 198 mg/l (Haji Colony) to 295 mg/l (Sukhdev Vihar). Total hardness ranged from 324 mg/l (Haji Colony) to 550 mg/l (Sarita Vihar). The chloride value of all the samples were recorded from 162.22 mg/l (Project site) to 258.78mg/l (Okhla phase-III). Sulphate content in the ground water sample ranged from 82.1mg/l (Haji Colony) to 142.8 mg/l (Okhla phase-III) and all were well within the desirable permissible limit. Fluoride content was found to be within desirable limit (from 0.49 mg/l (Sukhdev Vihar) to 0.82 mg/l (Okhla phase-



III) in all the water samples. Zinc content from 0.38 mg/l (Project site) to 0.84 mg/l (Okhla phase-III) in all ground water samples were found within the desirable limit (*i.e.* 5 mg/l). Iron content in all the sampling locations was found from 0.042 mg/l (Sarita Vihar) to 0.326 mg/l (Sukhdev Vihar) is well within the desired limit. Other parameters like heavy metals values are given below: Hg at all location founds to be <0.001 mg/l, Cd at all location <0.002 mg/l, Se at all locations <0.01 mg/l, As <0.01 mg/l at all locations, Pb at all locations found to be <0.01 mg/l & CN at all locations <0.05 mg/l.

E.4.4.2 Surface Water Quality

The surface water quality of five monitoring locations are given in **Table 3.11**. Monitored data of surface water pertaining to all the locations reveal that pH values ranged from 7.50 to 7.68, DO values were observed to be varying from <0.1 to 3.6 mg/l, COD values were observed from 108 to 302 mg/l, BOD values were observed 22.6 to 48 mg/l. TDS values was observed in the range of 396 mg/l to 924 mg/l. Bacteriological examination of surface water indicates the presence of high total coliform, which may be due to human activities observed during the study period. The results of the parameters have been compared with the water quality criteria of CPCB. It is evident from the data that the water quality of Yamuna at all locations are falling under below E.

E.4.5. Land Environment

The land use/ land cover map has been prepared based on toposheet of Survey of India as well as Master plan of Delhi 2021, Faridabad 2021 and Noida Master Plan 2031 with respect to major land use categories and results are presented in **Table no. E.7 & E.8** respectively.

Table No. E.7:-Landuse pattern based on Toposheet

S. No.	Landuse Class	Area (Ha)	%
1	Settlement	7685.96	23.72
2	Water Bodies	224.3	0.69
3	River	587.25	1.81



4	Dry Channel	230.94	0.71
5	Vegetation	24.71	0.08
6	Forest/WLS	1228.43	3.79
7	Open Land	2067.50	6.38
8	Open Scrub	2675.03	8.26
9	Agricultural Land	17673.85	54.55
	Total	32397.97	100

Table no. E.8: Landuse based on Master plan Delhi 2021, Faridabad 2021 and Noida

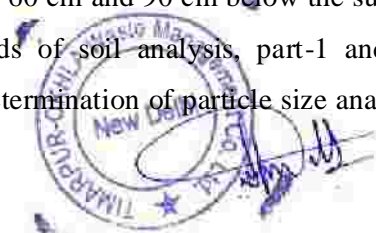
Master Plan 2031

S. No	Landuse Class	Area (Ha)	Percentage
1.	Commercial	1003.97	3.1
2.	Public & Semipublic Facilities	3029.98	9.4
3.	Green Area/ Agricultural Land	901.27	2.8
4.	Industrial	1578.8	4.9
5.	Recreational	4560.76	14.1
6.	Residential	11675.15	36.0
7.	Airport/Terminal	355.9	1.1
8.	Utility	512.72	1.6
9.	River	1001.09	3.1
10.	WLS	548.2	1.7
11.	Village	895.74	2.8
12.	Government Area	455.11	1.4
13.	Urbanisable Area	5879.28	18.1
	Total	32397.97	100.0

E.4.5.1. Soil Characteristics

For studying soil profile of the region, 9 sampling locations were selected to assess the existing soil conditions in and around the project area representing various land use conditions **Table E.9**.

The physical, chemical and heavy metal concentrations were determined. At each location, soil sample was collected from three different depths viz. 30 cm, 60 cm and 90 cm below the surface and homogenized. This is in line with IS: 2720. Methods of soil analysis, part-1 and the International Pipette Method (Black, 1964) is adopted for determination of particle size analysis.



The textural diagram was generated using “SEE Soil Cla 2.0 version based on United States Department of Agriculture (USDA) classification of soils. Physical parameters such as bulk density, porosity and water holding capacity were determined by following KR Box Method (Keen and Raczkowski, 1921).

Table No. E.9: Location of Soil Sampling

Monitor	Location	Dist. From center of site (km)	Direction
SQ1	Project Site	0.00	-
SQ2	Sarita Vihar	2.86 km	SSE
SQ3	Sukhdev Vihar	0.63 km	NNW
SQ4	Haji Colony	0.33 km	ENE
SQ5	Okhla Phase-III	1.24 km	WSW
SQ6	Jasola-Okhla	1.00 Km	ESE
SQ7	Near Okhla Bird Sanctuary	1.87 Km	E
SQ8	Near Asola WL Sanctuary	5.71 km	S
SQ9	Okhla Phase-II	1.88 km	S

Results of analysis show that the texture of soil at all locations is Sandy Clay Loam. The value of pH ranges from 7.2 to 7.5 indicating that all samples are little alkaline. The average concentration of Nitrogen, Phosphorus and Potassium in the soil samples varies from 365.3 kg/ha (Okhla Phase-II) to 634.5 kg/ha (near Asola Wildlife Sanctuary); 32.9 kg/ha (Okhla Phase-II) to 56.7 kg/ha (near Asola Wildlife Sanctuary) and 8.12 kg/ha (Sukhdev Vihar) to 29.4 kg/ha (near Asola Wildlife Sanctuary) respectively. Electrical Conductivity (EC) of soil ranged from 543 ($\mu\text{mhos/cm}$) (near Asola Wildlife Sanctuary) to 798 ($\mu\text{mhos/cm}$) (project site), in case of very slight saline nature of soil. Soil having EC ($\mu\text{mhos/cm}$) above 1210 to 1600 are considered to be saline soil, no Soil sample come under such category. For soil having EC ($\mu\text{mhos/cm}$) between 810 - 1200 are considered to be moderately saline, only one soil sample i.e. SQ7 having 843 ($\mu\text{mhos/cm}$) (near Okhla Bird Sanctuary) is falling in this category. Rest soil samples i.e. SQ1, SQ2, SQ3, SQ4, SQ5, SQ6, SQ8 and SQ9 come under slightly Saline category.

Test reports are enclosed as **Annexure-XIII**.



E.4.6. Biological Environment

An ecological survey of the study area was conducted particularly with reference to the listing of species and assessment of the existing baseline ecological (Terrestrial and Aquatic ecosystem) conditions in the study area. Detailed are given in chapter 3 of EIA report. Ecological sensitive areas are Okhla Bird Sanctuary, Jahapanah City PF, Asola Wildlife Sanctuary, Tilpat forest, Central Ridge RF, City Forest Hauzrani in the study area.

E.5 IMPACT ASSESSMENT AND MITIGATION

The impact of the project on different component of environment has been assessed and mitigative measures have been suggested. The details are given in the EIA report.

E.5.1 Land Environment & topography

The topographical survey of the “W t E” project has already been carried out during construction of existing unit. The terrain of the site is flat land. Contour level of the site varies from 212 msl to 214 msl.

The land use is already industrial which will not be changed. During the operation phase of the project, the land may get polluted/ contaminated from ttering of various kinds of municipal wastes, leakage of leachates and due to fly ash or bottom ash.

To ensure against any chances of soil pollution, it is imperative to establish a well-planned solid waste collection, storage and segregation system at si e as being practiced for the existing project. Only covered trucks will be allowed to enter the premises for unloading of materials. Good housing keeping will help to control contamination of soil as in existing project.

For the utilization of fly ash an automatic Brick/ int locking paver plant is already in operation at site for existing project. The production capacity of the brick plant will be enhanced, if required. The quenched bottom ash will be lead to bottom ash processing plant which is similar to C&D plant. The process involves segregation, size reduction and screening for fine recovery. This will



reduce the amount of inert bottom ash to landfill. After the processing which are not recyclable will be sent to sanitary land fill.

E.5.2 Air Environment

The baseline condition of air with respect to particulate parameter is already worst in the city of Delhi. Emission modelling results show that increment due due to proposed project is insignificant. Installation of air pollution control devices for particulate matter and gaseous pollutants will limit the stack emission within standards prescribed in MSW Notification, 2016.

For effective odour control, bioinoculum comprising of consortium of microorganism called EM culture will be mixed with the raw MSW for odour control.

In addition, the MSW storage pit will be kept in enclosed negative pressure with the airflow being routed through the boiler which prevents unpleasant odours from escaping into the atmosphere. Along with these a special fragrance liquid will be sprayed through a foggy nozzle for reducing odour. Further, flowering plants having fragrance have already been raised in the plantation programme of existing project site which also help in improving odourous condition.

E.5.3 Water Environment

No ground water will be abstracted for operation of the plant. STP treated water from DJB is being utilized for existing project and same will be utilized for expansion project also.

Treated STP water will be utilized during both construction and operation phase.

Hazardous materials will be stored under handover to authorized recyclers, similar to existing project.

All the drains will be properly cemented to avoid contamination of ground water as adopted in case of existing water.

The project will be designed based on zero discharge concept. The wastewater will be reutilized in the plant premises after adequate treatment and there will be no effluent discharge from the plant. All the effluents from various sections will be brought to common collection pit for treatment. The treatment will involve pH correction and sedimentation.

E.5.4 Noise Environment



All the noise generating equipment of the plant will be designed with noise level of 90 dBA. Proper acoustic enclosures will be provided to the equipments generating high noise level. Necessary PPE's, ear plug/ear muff will be provided to the workers in high noise area.

E.5.5 Biological Environment

Greenbelt has already been developed at existing plant. As per TOR points to meet 33% plantation criteria, layout has been planned in a way that no tree cutting will be done. Additional sapling (60 No.) will be planted following the Miyawaki plantation method along with existing green belt which will increase the density of trees in the greenbelt. For more plantation request for additional parcel land has been attached as **Annexure- III**.

Local species with aesthetic appeal will be planted that will attract local bird and insect species during additional plantation. All the open spaces in the plant premises will be landscaped and brought under green cover.

E.5.6 Socio Economic

The expansion of the project would create additional employment opportunities during construction and operation. Overall benefit and impact are summarized below:

1. Reduction in ever increasing volume of Municipal Waste at Okhla Landfill Site.
2. Reduction in associated costs of wastes going to Landfill.
3. Alternate uses of land
4. Impact on aesthetic beauty of the area
5. Employment opportunities for job seekers
6. Impact on health
7. Impact on demographic scenario of the project area.
8. Increase in availability of power.
9. Increase in revenue to the DISCOMs as well as to the local body

E.6 ENVIRONMENTAL MONITORING PROGRAM



Environmental monitoring is important in terms of evaluating the performance of pollution control equipments installed in the project during operation. sampling and analysis of the environmental attributes will be as per the guidelines of CPCB. Following attributes will be covered in the environmental monitoring as per stipulation of DPCC:

1. Stack Emission
2. Ambient Air quality
3. Water and wastewater quality;
4. Noise levels;
5. Occupational Health Survey

E.7. RISK ASSESSMENT AND DISASTER MANAGEMENT STUDIES

Risk in general is defined as a measure of potential economic loss or human injury in terms of the probability of the loss or injury occurring and magnitude of the loss or injury if it occurs. Risk thus comprises of two variables; magnitude of consequences and the probability of occurrence. Few hazards and mitigation measures are mentioned below:-

E.7.1 Vehicular movement hazard

The vehicles have the potential to meet with an accident during the transit due to various reasons road condition, bad weather, drunk – driver, overloading, vehicle condition during construction and operation.

Mitigation measure

All the vehicles used during project construction and MSW waste collection during operation shall be of good quality and shall be maintained by the trained drivers lead by supervisors as practiced for existing project.

The GPS system installation will support the facility to track the movement of the vehicle and drivers, which is existing in the present project also.



E.7.2 Health Hazards of employees / workman engaged at the MSW site

The employees/ workman may get ill frequently and may cause accidents.

Mitigation measure

All the employees shall be trained and provided with adequate PPE to protect from the health hazards as in existing project

Separate care will be taken for the workmen employed for the work, similar to existing project.

E.7.3. Biological Hazards

As the composition of MSW will be uncertain and in all likelihood there is possibility of the vector / bacterial diseases.

Mitigation measure

At the existing project, all the employees are trained and provided with adequate PPE to protect from the health hazards and same will be followed in expansion project too.

Also, periodical medical check-up shall be conducted to ensure good health and also early detection of any ailments.

E.7.4. Hazards during Storage of MSW at Site

E.7.4.1 Fire

The problem of fire can arise dry matter loss can result from heat generation, which in turn is related to moisture content.

Mitigation measure

Safeguards include maintaining dry storage conditions and minimization of inventory levels to give relatively short storage times.

A storage fire risk assessment should consider factors such as size/area of storage, occupancy and escape routes. As well as active fire alarm systems, detection of hot spots and monitoring of carbon monoxide levels are also employed.

Proper emergency management plan has already been made for existing project. The same will



be adopted for expansion project. Periodical mock drill are conducted to check the effectiveness of preparedness and controls.

Adequate fire fighting system will be provided for expansion project as elaborated in the EIA report.

E.7.4.4 Electrical Hazards during power generation

Electrical shock may occur to workers and employees during construction and operation of the project.

Mitigation measure

The safe design and construction practices will be practiced and followed during the entire phase of construction and operation.

All the workman shall be trained and provided with appropriate PPE while performing electric related jobs.

E.7.5. Boiler hazards

LDO is used widely as a heating fuel in boilers and care is essential in preventing explosive pockets particularly during start-up and shutdown. A study of 100 explosions indicated that about a little less than 50% occurred during lighting off period, 40% during operation and about 10% during re-lighting following burner flame extinguishments. No explosions were reported while furnace box temperature was above 760°C. A number of explosions occurred during warming up phase. Lighting of explosions was mostly in multi burner furnaces where operators failed to close all individual main burner gas cocks and to establish reliable pilot flames at all burners before opening the main furnace gas valve.

Mitigation measure

The impact of boiler explosion will not go beyond 260 m from the project site.

E.8 DISASTER MANAGEMENT PLAN



A Disaster Management Plan has been suggested for implementation during emergency situation.

E.9 PROJECT BENEFITS

The proposed expansion project has been planned to manage the MSW of South Delhi and convert the waste to Energy. Waste-to-Energy (W t E) projects are considered one of the most economical and environment friendly solutions for tackling the problem of municipal waste. This will reduce the air, water and soil contamination and odor also. This will improve the quality of life of society and will provide safe & hygienic surroundings. Development of project will provide employment opportunity to local unskilled and semiskilled people during both construction & operation phase. Indirect employment will also be generated during construction phase of project.

E.9.1 Corporate Social Responsibility (CSR) Policy of Jindal SAW Ltd.

The proposed project will be implemented by Timarpur Okhla Waste Management Company Limited., a subsidiary of Jindal Saw Ltd. The Jindal Saw is having a Corporate Social Responsibility Policy and same will be adopted by Timarpur Okhla Waste Management Company Limited. Corporate Social Responsibility is strongly connected with the principles of sustainability. Therefore, it is the core corporate responsibility of Jindal SAW Ltd. to practice its corporate values through its commitment to grow in a socially and environmentally responsible way. The company is committed to undertake activities such as free medical checkup camps for nearby local population, providing organic manure to local farmers to increase yield of crops, Vocational training (Skill Development) to women, local villagers & ragpickers on Developing packaging & other products from recyclables/ reusable, Books/Stationary distribution in nearby schools, plantation of Medicinal and Fragrance Trees in nearby localities and surrounding areas.

E.10 ENVIRONMENTAL MANAGEMENT PLAN



An Environment Management Group (EMG) has already been setup for existing project which has responsibility for managing following activities related to environmental function existing.

- Co-ordinate and manage the EMP implementation during construction and operation phase.
- Manage and co-ordinate environmental monitoring and pollution control system operation.
- Co-ordination with government agencies in relation to environmental management activities
- Implement and monitor greenbelt development and plantation activities.
- Safety officer will ensure safe working practices in all the sections of the plant.

This EMG will be further strengthen for the expansion project. A well-defined Environmental Monitoring Program is being implemented with trained and qualified staff and same will follow at the time of operation of expansion project.

For environmental protection measures, proponent has allocated Total **Rs. 59.25 (23.7 Existing +35.55 Expansion)** Crores as capital cost and **Rs. 12.13 (4.88 Existing + 7.25 Expansion)** crores as recurring cost for the expansion of the project.

E.11 CONCLUSION

“W t E” is an important part of integrated solid waste management system.

By means of adopting modern and efficient technology, effective implementation of EMP and by implementation of industrial best practices, the major impacts on Air, water, land and noise will be reduced to negligible levels.

The proposed expansion of Waste to Energy plant is likely to generate direct and indirect employment opportunities for both unskilled and semi-skilled workers living in the area.

This “W t E” project will reduce the problem associated with the disposal of unprocessed waste as landfill and meet the objective and goal set for the country under the Swachh Bharat Mission (SBM).

