Executive Summary

E.1. Introduction

M/s. Delhi MSW Solutions Ltd. (DMSWSL) has developed an existing 24 MW RDF based Power Plant within the integrated MSW Management Facility (IMSWMF) at the site notified by Municipal Corporation of Delhi (MCD) for which EC was obtained from MOEFCC with 4000 TPD capacity with minimum 36 MW WTE capacity of 3000 TPD wide EC vide no. F. No.-67/2009-IA.III dt. 8th May 2012. The plant was installed and is operating successfully after obtaining CFE and CFO from Delhi Pollution Control Committee (DPCC) vide letter No. DPCC/PLG/2016/36691 dated 10th Mar 2016 and vide letter no. DPCC/PLG/2017/39391 dated 20th Feb 2017**.** The expansion of the existing WTE project has been recommended by Mayor of Erstwhile North DMC, Hon'ble LG of Delhi for alleviating the mammoth task of MSW of Delhi Now DWSWSL has proposed to expand the capacity of WTE plant from 24 MW to 60 MW in the same premises. The existing IMSWMF has a processing capacity of 4000 TPD.

E.2. Details of project capacity

M/s. Delhi MSW Solutions Ltd. (DMSWSL) has developed the Integrated MSW Management Facility (IMSWMF) at the identified site by Municipal Corporation Delhi (MCD). DMSWSL initially established IMSWMF with the capacity of 4000 TPD and standalone WTE plant of 24 MW with 1200 TPD of RDF as fuel was developed. Now DMSWSL has proposed to utilize the leftover 1800 TPD of RDF by installing another 36 MW WTE Power plant cumulatively 60 MW. The proposed expansion of waste to energy power plant will be located within the existing facility of IMSWMF at Pocket N-1 Sector 5, Bawana Industrial Area, Tehsil Narela, District North West Delhi, Delhi.

E.3. Details of land area breakup

Total plot area of IMSWMF is 100 Acre (40.46 Ha) out of which land (built up area) demarcated for WTE is 17.24 Acre (6.97 Ha). Existing WTE power plant was developed on 8.62 Acre (3.48 Ha) area and total 8.62 Acre (3.48 Ha) is allotted for proposed expansion of WTE plant.

E.4. Water requirement

Total water requirement for existing project is 313 KLD and for the proposed expansion project it is 337 KLD. The same will be sourced from Delhi Jal Board and Industrial Waste Water of adjacent Pragati Power Plant. The wastewater as liquid waste of 105 KLD will be generated which includes cooling tower blow down, boiler blow down and DM regeneration and Leachate. The generated leachate (100 KLD) will be treated in an advanced MVR technology based LTP. Blow down water from ancillary cooling tower, boiler blow down and

WTP Rejects will be collected neutralization tank and neutralized by adding neutralized agents then utilized in the bottom ash quenching and in Air Pollution Control Devices. Thus, facility will achieve zero-liquid discharge (ZLD). Domestic water requirement is 15 KLD which is meet by Municipal Water Supply. The domestic wastewater of 13 KLD will treated in septic tank followed by soak pit /bio toilets.

E.5. Power and fuel requirement

The total power required for operations is approximately 5.4 MW and the same is met from existing WTE Plant of 24 MW capacity. Once the expansion power plant will be fully operational the power requirement will be met from the same plant and excess will be interconnected to sub-station of state grid.

E.6. Required manpower

Total manpower requirement of both existing and proposed WTE site is 475. Total 215 workers are appointed for existing WTE plant and additional 260 workers and technical staff will be required for expansion unit. Most of workers have appointed locally in the existing project. For expansion project also; preference will be given to the local population.

E.7. Baseline environmental status

The baseline data for the project was earlier collected from Sep 2019 to December 2019. Additional baseline data for the proposed expansion project was collected during 23rd Sep 2022 to 22nd Oct 2022. The data is collected with respect to meteorological conditions, air pollution levels, noise levels, water quality, soil quality, land use and socio-economic conditions during the study period. Summary of baseline is tabulated below:

E.7.1. Air quality

The ambient air quality was monitored at 10 locations. The minimum and maximum 98th percentile values of pollutants are shown in **Table 1.**

Table 1: Results of ambient air quality (µg/m^3)

Details	PM_{10}	$PM_{2.5}$	SO_2	NO_x	O_3	CO	NH_3	C_6H_6
Minimum In 98th Percentile	**84.5**	**56.5**	**20.4**	**29.3**	**26.5**	**860**	**29.3**	**0.50**
Maximum In 98th Percentile	**212**	**132**	**28.1**	**38.1**	**40.3**	**1482**	**47.2**	**0.95**
NAAQ Standards 2009	**100**	**60**	**80**	**80**	**100 (8 hourly)**	**2000 (8 hourly)**	**400**	**5 (Annual)**

E.7.2. Ground and surface water quality

Water samples in the study area were collected from 10 ground water and 4 surface water sources respectively. The samples were analyzed for various physical and chemical characteristics, the results of which are given in **Table 2** and **Table 3** respectively.

Table 2: Results of ground water analysis

Parameters	Units	Minimum	Maximum	Drinking water Standards IS: 10500:2012	
				Acceptable	Permissible
pH	-	7.4	8.4	6.5-8.5	No Relaxation
TDS	mg/l	680	2373	500	2000
Chlorides	mg/l	98.3	685	250	1000
Hardness	mg/l	198	886	200	600
Fluorides	mg/l	1.13	1.79	1.0	1.5

Table 3: Results of surface water analysis

Parameters	Units	Min	Max	CPCB water quality criteria as updated on 11th September, 2017				
				A	B	C	D	E
pH	-	7.4	8.5	6.5-8.5		6-9	6.5-8.5	6-8.5
EC	µS/cm	486	1912	-	-	-	-	2250
DO	mg/l	1.5	4.8	6	5	4	4	-
BOD	mg/l	<4	70	2	3	3	-	-
Total coliform	MPN/100ml	920	1600	50	500	5000	-	-

E.7.3. Noise quality

Baseline noise levels have been monitored at 9 locations within the study zone, using a continuous noise measurement device. The day equivalents during the study period ranged between 53.9 to 68.2 dB (A) whereas the night equivalents were in the range 43.9 to 54.6 dB (A). It was observed that the night equivalents were within the AAQ standards in respect of Noise SO 123 (E) dt 14th Feb 2000 for Residential and Commercial area. However, the day equivalents are above the specified standards in some locations.

E.7.4. Traffic study

The traffic survey was carried out on the major district road (MDR) near the project site during site visit (Oct 2022) of the baseline study period. From MDR, we observed that the highest peak was 2171 PCU/hr during 09 to 10 am. It was observed that the existing Level of Service (LOS) is good on both MDR and site access road. The traffic study was compared with previous baseline locations at MDR. Comparing from 2019 to 2022 the traffic volume at MDR was increased from peak hours 1672 to 2171 PCU's per hour due to ongoing urbanization and increase in population. The LOS during 2019 and as well as during 2022 are in "good" (C) performance.

E.7.5. Soil quality

To determine the impact of proposed activity on soil and agricultural productivity soil samples were collected from 9 locations. The results of important parameters are summarized in **Table 4.**

Table 4: Soil quality in the study area

Parameters	Minimum	Maximum	Standard Soil Classification – (Indian Council of Agricultural Research, New Delhi
pH	7.7	8.3	Acidic<6.0, Normal to Saline 6.0-8.5, Tending to become Alkaline 8.6 to 9.0, Alkaline above 9.
EC (µS/cm)	133	537	Normal<1000, Critical for germination 1000-2000, Critical for growing 2000 - 4000, Injurious to most crops>4000
Organic carbon (%)	0.26	1.50	Low < 0.5, Medium 0.5 – 0.75, High > 0.75
Nitrogen (kg/Ha)	107	196	Low below 280, Medium 280-560, High above 560
Phosphorous (kg/Ha)	13	20	Low below 10, Medium 10-25, High above 25
Potassium (kg/Ha)	102	399	Low below 110, Medium 110-280 High above 280

E.7.6. Ecology & Biodiversity

There is no National Parks / Wildlife Sanctuary / Forests / Tiger reserve / Wetlands / Biosphere Reserve/ Tiger Reserves and Elephant corridor etc. present within 10 km radius from project site. The reserve forests (RF) include Bawana RF at 1.5 km (N), Shri Krishna Sultanpur RF at 5.0 km (SW) and Marmurpur PF located 7 km (NE) identified in the study area. There is no forest land present within the project site. No any kind of forest diversion is involved in the project.

There are no perennial water bodies such as rivers and reservoirs, pools, ponds, drains, and canals. Village water tanks and paddy fields are the common aquatic and semi aquatic ecosystems found in the proposed project area.

E.7.7. Socioeconomic Study

The study area comprises Narela Tehsil of North West Delhi (NCT Delhi) covering majority of the study area and a part of Sonipat Tehsil of Haryana, consisting of 6,74,439 and 44,184 population as per Census of India, respectively. Output of the study is given below:

- Men and women in Narela Tehsil of North West Delhi (NCT Delhi) constitute about 54.2% and 45.8% in the study area respectively. Whereas, the gender diversity, as percentage of men and women in the parts of Sonipat Tehsil of Haryana accounted to be about 54.9% and 45.1% respectively.

- Average family size in the study area is 5 persons per household.
- Male and female constitute 54.2% and 45.8% respectively and number of females per 1000 males is low at 846.
- Average density of population of the study area is 272 persons per km^2.
- The Socio-Economic study observed that 20.7% of total population in the study area which includes Narela Tehsil of North West Delhi (NCT Delhi) belongs to Scheduled Caste (SC) category. Whereas, a part of Sonipat Tehsil which is coming within the study area evidences 20.9% of total population belongs to Scheduled Caste category.
- The analysis of the literacy levels in selected villages of Narela Tehsil of North West Delhi (NCT Delhi) reveals an average literacy rate of 69.5% as per available census data. However, the male literacy rate of the study area is 58.7%, whereas the literacy rate among women is estimated to be as low as 41%. Literacy levels in selected villages of Sonipat Tehsil of Haryana indicate an average rate of about 69.4% as per census 2011 data. The male literacy rate of the selected villages is 60%, and the literacy rate among women is estimated to be around 40%.
- Well-developed medical and health care center, which includes both private and government facilities, are available in the study area.
- Study area accounted for 29 % of the main working class of the total population. Whereas, marginal workers and non-workers constitute 2% and 69% of the total population, respectively. However, the selected villages of Sonipat Tehsil within a 5-10km radius have 28% of the total population's main workers, followed by marginal workers and non-workers, who account for 6% and 65% of the total population, respectively.

E.7.8. Anticipated impacts

The impacts due to project on the environment are classified into two phases and the possible impacts are assessed.

- During Construction phase
- During Operation phase

The impact of the above activities would be temporary and will be confined within the project boundary.

E.7.9. Impacts during Construction phase

Construction phase works include site clearance, site formation, building works, infrastructure provision and other infrastructure activities. However, this project is

expansion of existing WTE plant, the impact during construction phase is not much envisaged.

E.7.10. Impacts during Operation phase

E.7.10.1 Impact on air quality

The proposed project is expansion of existing waste to energy power plant and the major source of pollution would be the emissions from the stack. The main raw materials required for the project is Refused Derived Fuel (RDF) for producing the energy by combustion/incineration. The important air pollutants generated from the power plant are particulate matter (PM), sulfur di-oxide (SO_2), oxides of nitrogen (NOx), dioxins and furans (PCDDs & PCDFs). High Speed Diesel (HSD) is used for DG set and Light Diesel Oil (LDO) is used only for power plant start-up activity, heat transfer furnace. The major air pollutants generated from the proposed operation are:

- Dust particulates in flue gas from chimney
- SO2, NOx, dioxins and furans in flue gas
- Fly ash dust particles from ash silos and ash disposal areas

To estimate the ground level concentration of air pollutants released from 60 m height of the stack provided for the power plant, a study state dispersion model based on Gaussian Plume (AERMOD Version 7.0.3) software is used to calculate the concentrations for PM, SO2 and NOx.

E.7.10.2. The proposed mitigation measures

- Bag filter with an efficiency of more than 99.5% to limit PM in outlet to less 30 mg/Nm^3.
- To minimize the SO_2 and NOx emissions a semidry flue gas cleaning system consist of spray reactor with lime slurry and activated carbon is used.
- The chimney is selected considering sulphur dioxide emissions and to meet central pollution control board norms. The height of chimney has been selected as 65 m for the power plant.
- To control NOx emission from the power plant boiler over fire air system and low NOx burners is used.
- Semi dry type gas cleaning system is envisaged for this plant. The acid gas emissions are controlled by dozing lime slurry into the gas steam.
- The furnace and the flue gas residence time (minimum 2 seconds with a minimum flue gas temperature of 950°C) in the furnace are designed such that, the dioxins and furans (PCDDs & PCDFs) emissions are mitigated.
- The flue gas is further treated with activated carbon which ensures the PCDDs & PCDFs are limited to less than 0.1 ng/TEQ/Nm^3 of flue gas.
- Semi-dry type gas cleaning system with lime dozing is envisaged for reduction of acid gases and activated carbon injection is envisaged for reducing the dioxins/ furans and

heavy metal emissions.

- The RDF storage has been envisaged in a completely closed shed in the tipping / storage area. This measure will reduce the dust nuisance in the power plant area. Also the forced draught fan takes suction from the storage pit there by maintaining slightly negative pressure in the RDF storage pit. This will eliminate odour in the RDF storage pit area.
- As RDF will be stored in a covered shed, no bird menace is envisaged. Arrangement will be made for suitable spray on the RDF to overcome the nuisance of bird menace, mosquito and fly nuisance and odour.
- Internal roads are concreted / asphalted to reduce fugitive emissions
- Greenbelt will be provided around the power plant, along the internal roads and along the plant boundary and wherever required.

E.7.10.3. Impact on water quality and Management

Total water requirement for existing project is 313 KLD. Total water requirement for the proposed expansion project is 337 KLD. The same will be sourced from Delhi Jal Board and recycled Industrial Waste Water of adjacent Pragati Power Plant. The wastewater as liquid waste of 105 KLD will be generated which includes cooling tower blow down, boiler blow down and DM regeneration and Leachate. The generated leachate (100 KLD) will be treated in the existing LTP, blow down water from ancillary cooling tower, boiler blow down and WTP Rejects will be collected neutralization tank and nutralised by adding neutralized agents then utilized in the bottom ash quenching and in Air Pollution Control Devices. Thus, facility will achieve the zero-liquid discharge (ZLD). Domestic water requirement is 15 KLD which is meet by Municipal Water Supply. The domestic wastewater of 13 KLD will treated in septic tank followed by soak pit /bio toilets.

E.7.10.4. Impact on noise levels

Any activity in general, consists of several sources of noise pollution. The different sources of noise pollution are mentioned below:

- Boiler feed pumps
- Turbo generator
- Cooling tower
- Diesel generator
- Frequent vehicular movement

E.7.10.5. The proposed mitigation measures are

- Noise level specification of various equipment as per the Occupational Safety and Health Association (OSHA) standards.
- Providing suitable enclosures (adequate insulation) to minimize the impact of high noise generating sources.
- Employees will be provided with PPE like ear plugs, helmets, safety shoes etc.

- Development of greenbelt all along the boundary and along the roads within the project site.

E.8. Environmental monitoring plan

The main spirit of environmental monitoring plan is aimed such that there is not much of time lack between commencements of damage to environment mitigation measures to various environmental parameters that are being affected. Environmental monitoring program has been prepared for assessing the efficiency of implementation of Environment Management Plan and details of the same are given in **Table 5.**

Table 5: Environmental monitoring plan during operational phase

S. No	Potential Impact	Detailed actions to be followed as per EMP	Parameters/Points to be monitored	Frequency of Monitoring
1.	Air Emissions	Stack emissions from boiler	Stack emissions from boiler for PM_{10}, HCl, SO_2, NO_x, CO, TOC, HF, Total dioxins & furans, Cd+Th+ their compounds, Hg & its compounds, heavy metals (Sb+As+Pb+Cr+Co+Cu +Mn+Ni+V+ their compounds),	As per CFE conditions/Emission standards as per SWM rules 2016 / once in month for regular parameters.
		DG sets, etc.	DG sets for PM, SO2 & NOx	As per MOEFCC/CPCB guidelines once in a Month.
		AAQ shall be monitored within the project premises and nearby habitations (minimum 3 places). All vehicles shall have Pollution Under Control (PUC) certificate.	PM, SO_2, NO_x VOC etc.) Vehicle logbooks shall be maintained. Greenbelt will be developed for minimizing dust propagation	
		Meteorological data	Wind speed, direction, temperature, relative humidity and rainfall.	As per CFE condition
2.	Noise	Noise generated during operation of boiler, cooling towers, DG sets etc. shall be monitored	Spot Noise Level will be recorded and shall meet the limits set by relevant legislation	Periodic during operation phase. As per CFE condition
3.	Wastewater Discharge	Wastewater must be treated and must Comply to wastewater discharge standards and achieve zero	pH, TSS, TDS, BOD, COD, Oil & Grease and other parameters as mentioned in the CFE	Daily at regular intervals and Once in a month by third party

		liquid discharge.		
4.	Solid waste/ Haz. waste	During operational phase, waste should be handled according to the waste management plan as per Hazardous and other waste (Management and Transboundary Movement) Rules, 2016 its amendments till date. Solid waste should handle as per SWM rules, 2016	Logbook shall be maintained to record the amounts of wastes generated, transportation routes and final reuse/disposal. Solid and Hazardous waste quantities and destination (final disposal) will be documented and kept to ensure proper handling and disposal.	Periodically and as per CFE condition
5.	Ground Water Quality and Water Levels	Ground water quality and ground water levels must be monitored. Ground water monitoring during operation phase shall form part of the continuous QA/QC procedures for the plant subject to ongoing inspection.	Comprehensive monitoring of ground water quality and ground water levels as per IS 10500-2012 (important major, minor ions, heavy metals)	Periodically or once in a year
6.	Flora and fauna	Vegetation, Greenbelt/ Green cover development	Number and type of plant species will be recorded	Once a year
7.	Soil quality	Checking & Maintenance of good soil quality around	Soil quality will be analysed for Physico-chemical parameters and presence of metals.	Every quarter
8.	Health Conditions Accidents	A baseline health check-up of all employees and migrant labour shall be carried out. The	Follow-up medical Check-up shall be carried out and results must be documented. Safety records and	Regular check-up as per factories act.

		Emergency Response Plan will be monitored and tested frequently to ensure its effective in the event of an emergency.	monitoring of plant safety rules.	

E.9. Risk analysis

The principal objective of the risk assessment study is to identify and quantify the major hazards and the risk associated with various operations of the project, which may lead to emergency consequences (disasters) affecting the public safety and health. All necessary measures to minimize the risk due to the project are taken viz, Fire & safety control measures, Emergency preparedness plan, Disaster Management plan, etc.

E.10. Project benefits

The contribution of the power plant on local social infrastructure is expected to be significant. The proposed expansion of power plant will stimulate the growth of industrial and commercial activities in and around the district, by improving the availability of the power. This project will provide a significant amount of direct and indirect employment opportunities to the local people with different skills and trades.

The physical infrastructure and socio-economic status of the surrounding areas will be benefited as follows:

- Road transport facilities which improve accessibility
- Improvement in education, housing, and banking facilities
- Improvement in postal & communication services
- Recreation facilities
- Improvement in power supply, water supply and sanitation
- Improvement in economic conditions
- Proper training to the local people will be given to improve the employment potential within the plant
- Increase in revenue to the state in the form of taxes and duties from the development of local businesses
- Local markets with food and non-food commodities will be improved due to the increase inflow of human residents within the district.
- Waste to Energy facilities provide a safe, technologically advanced means of waste disposal that reduces greenhouse gases, generates clean energy and recycles metal.
- Waste to Energy facilities will save space and significantly reduce landfill volume.
- In terms of CO_2 emissions, waste to energy saves one ton of CO_2 per ton of waste, when compared to landfills that do recover their landfill gases, it saves about half a ton of CO_2 per ton of waste.

E.11. Cost estimate of 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. The EMP will be integrated in all the major activities of the project, with clearly defined policies, to ensure that the ecological balance of the area is maintained and the adverse effects are minimized. EMP requires multidisciplinary approach with mitigation, management, monitoring and institutional measures to be taken during implementation and operation, to eliminate adverse environmental impacts or reduce them to acceptable levels. In order to ensure sustainable development in the study area, it needs to be an all-encompassing plan for which the plant authorities, government, regulating agencies, and the population of the study area need to extend their cooperation and contribution.

The mitigation measures are planned for construction and operation phases and the overall management plan helps to improve the supportive capacity of the receiving bodies. The EMP aims to control pollution at the source level to the possible extent with the available and affordable technology followed by the standard treatments before getting discharged. The recommended mitigation measures will synchronize the economic development of the study area with the environmental protection of the region.

The budget proposed for implementation of EMP measures in operation phase is Rs. 134.5 Crores is capital cost and Rs. 20.5 crores /annum is recurring cost.

E.12. Conclusions

The municipal solid waste generation is increasing day by day with the increase in the urban population and thereby causing the need for sustainable management or disposal of the generated solid waste. The waste to energy plant is now a more sustainable option for solid waste management as there is a shortage of land area for scientific landfill and also the demand for electricity has been steadily increasing. Expansion of power plant in this area will benefit the society by providing better infrastructural, educational and medical facilities in the area also improvement in indirect employment and economic growth of the area. The project provides job opportunities to around 260 persons will get direct employment and around 150 people will get indirect employment.