EXECUTIVE SUMMARY

I. Introduction to the Proposed Project

Project Title	**Proposed Waste to Energy Plant at Jeram Integrated Solid Waste Management Centre**, Mukim Jeram, District of Kuala Selangor, Selangor Darul Ehsan.
Project Proponent	Worldwide Holdings Berhad.
Jurisdiction	Majlis Daerah Kuala Selangor (MDKS)
General Location	Located on Jeram ISWMC, Mukim Jeram, District of Kuala Selangor, Selangor Darul Ehsan. • *The general location of the Project is depicted in* ***Figure A.*** • *Geographical location of the proposed Project Site is at a latitude and longitude shown in* ***Figure B.***
Project Area	30.00 acres (12.14 hectares)
WTE Information	• Moving Grate Incinerator • Operating Capacity: 1200 tons per day • Capacity of generating energy: 26.13 MWatt. • Operating Hours: 8,000 hours per year.
Project Background	• The Revised Terms of Reference (TOR) has been submitted to the Department of Environment (DOE) on 8th April 2019 and endorsed by DOE on the 7th May 2019 via its letter [Reference No.: JAS:600-2/13/7 (29)] as appended in **Appendix 1.**
Accessibility	• The proposed development is accessible via Federal Highway (FR2) ⟶ New North Klang Straits Bypass (E30) ⟶ Federal Route 5 (Jalan Kapar) ⟶ Jalan Bukit Kerayong.
Legal Status	• Falls under following item under the **Second Schedule** of the Environmental Quality (Prescribed Activities) (Environmental Impact Assessment Order 2015) made under sub-section 34A (1) of the Environmental Quality Act 1974 [Act 127] (DOE, 2015). **Item 14: Waste Treatment and Disposal** (b) Solid Waste: (iii) Construction of thermal treatment plant. The proposed project is a WTE Plant located next to the existing Jeram Sanitary Landfill.
Zoning Compatibility	• Based on the *Rancangan Tempatan Majlis Daerah Kuala Selangor 2025*, the Project Site has been allocated as area for agriculture. Although the Proposed Project Site is an agriculture landuse, the Selangor Statement Government has acquired the land from KLK Tuan Mee Estate and Majlis Daerah Kuala Selangor is in the process of converting the zoning to Infrastructure and utility landuse (for waste disposal purpose) similar to Jeram Sanitary Landfill (kindly refer to **Appendix 3**: MDKS zoning change letter for the proposed ISWMC)

Current Condition On-Site	• Currently the Project Site is planted with mature oil palms and it is surrounded mainly by other oil palm estates except for existing Jeram Landfill in the western region as well as Bukit Kerayong Palm Oil Mill in the eastern region. There is a Hindu Shrine within southwestern portion of the Project Site. Current condition of the Project Site and surrounding is depicted in ***Figure C***.
Geotechnical Information	• Topography of the Project Site generally characterized as nearly flat terrains with the elevations ranging from GL2.50m to GL4.00m above mean sea level (msl) except a hill lock is located in the middle portion of the Project Site with the elevations ranging from GL5.00m to GL40.00m above msl. • Based on the SI field work and the laboratory test results, the subsoil condition on site can be simplified into three (3) main strata. a) Subsoil Layer 1 (< N ≤ 15) – Very Soft to Stiff CLAY or Sandy SILT and Loose to Medium Dense Silty SAND b) Subsoil Layer 2 (15 < N ≤ 50) – Very Stiff to Hard Sandy SILT and Medium Dense to Dense Silty SAND c) Subsoil Layer 3 (N> 50) – Hard layer of Sandstone Bedrock
Stormwater Management (MSMA Detail)	• The proposed WTE development consists of one (1) phase. • There is one (1) detention pond and concrete drain will be provided by Project Proponent to cater to the stormwater drainage.

Figure A: General Location of the Project Site

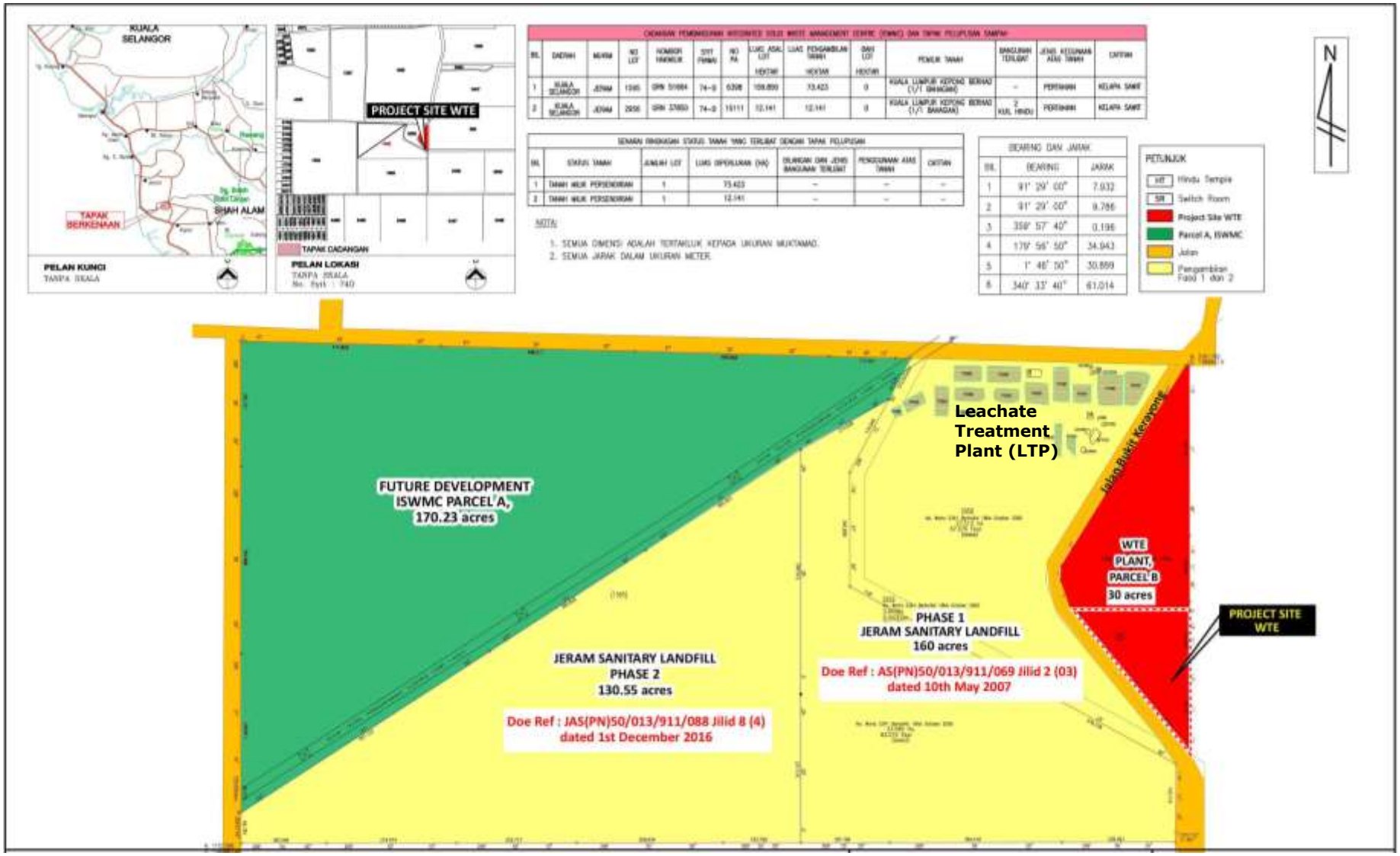


Figure B: Key and Location of the proposed Project Site

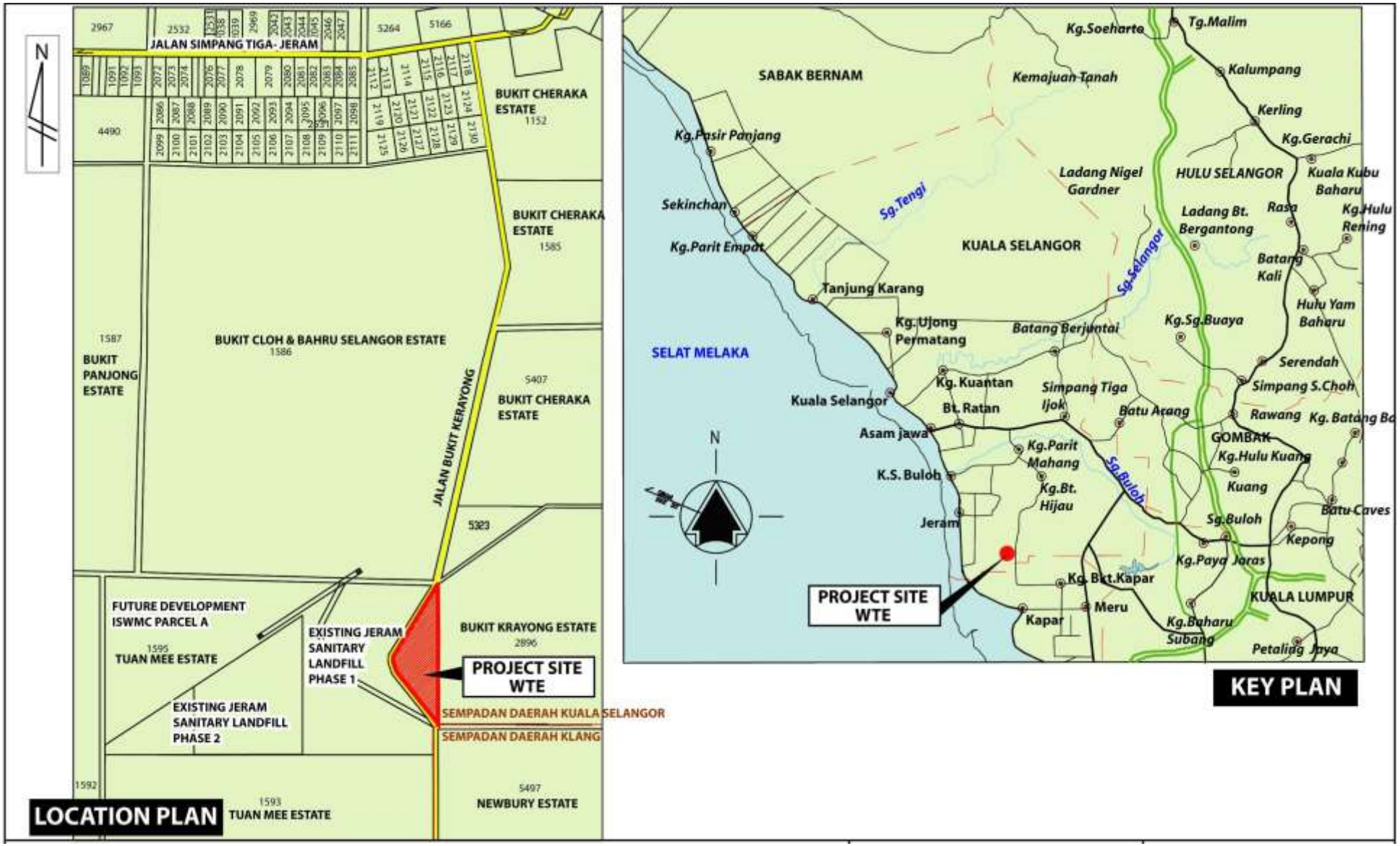
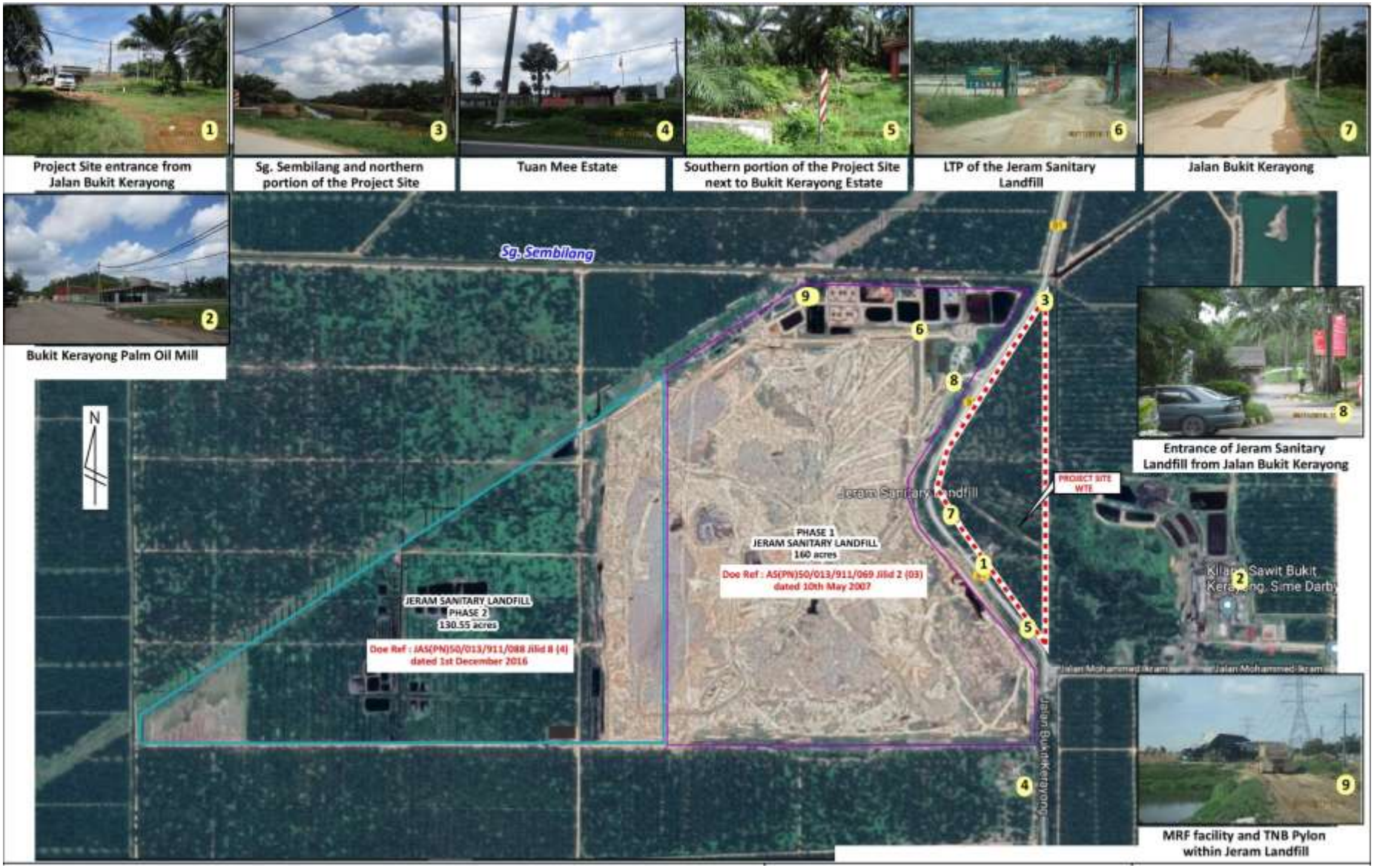


Figure C: Current On-site Condition and Surrounding of project Site



The parties involved in this development are: -.

Land Owner

Unit Perancang Ekonomi Negeri Selangor (UPEN)
Tingkat 3, Bangunan SSAAS,
40503 Shah Alam, Selangor Darul Ehsan.
Tel: 03-55447141/42, Fax: 03-55101264
Attn.: Tuan Dr. Nor Fuad Bin Abdul Hamid

Concession Owner/ Project Proponent

Worldwide Holdings Berhad.
No.1, Worldwide@7, Lot 24,
Jalan Lazuardi 7/29, Section 7,
40000 Shah Alam, Selangor Darul Ehsan.
Tel.: 03-5510 2556; Fax: 03-5510 4448
Attn.: Datin Paduka Norazlina Zakaria (Chief Executive Officer (CEO)

Operations & Maintenance, Project Developer

Worldwide Green Energy Sdn. Bhd.
No.1-9-2, Level 2, Block 1, Worldwide@7, Lot 24, Jalan Lazuardi 7/29,
Section 7, 40000 Shah Alam, Selangor Darul Ehsan.
Tel.: 03-5519 5115; Fax: 03-5519 5045
Attn.: En. Zamri Abdul Rahman (Director)

Strategic Partner

Western Power Clean Energy Sdn. Bhd.
A-3-55, Pusat Komersial Bayu Tasek,
Persiaran Southkey 1, Kata Southkey,
80150 Johor Bahru, Johor.
Tel. : +86-13908098893;
Attn: Ms. Gina Jiang SH (Managing Director)

Environmental Consultant

EUROPASIA ENGINEERING SERVICES SDN. BHD. (239233-K)

No. 63A-2 & 65-2, Petaling Utama Avenue,

Jalan PJS1/50,Taman Petaling Utama,

46150 Petaling Jaya, Selangor Darul Ehsan.

Tel. : 03-7783 3639/40; Fax. : 03-7784 3200

Attn. : **Ms. Geetha P. Kumaran (C0020)**

(EIA Study Team Leader)

Accredited Analytical Laboratory

ENVIRONMENTAL SCIENCE (M) SDN. BHD. (SAMM No.: 076)

Menara ES, No.9, Persiaran Industri,

Bandar Sri Damansara,

52200 Kuala Lumpur.

Tel.: 03-6273 6013 Fax: 03-6275 9325

Attn.: **En. Zulkifil Haji Ahmad** (General Manager)

and

SPECTRUM LABORATORIES SDN. BHD. (SAMM No.: 062)

Lot 14 Jalan Pendamar 27/90,

Seksyen 27, 40000 Shah Alam,

Selangor Darul Ehsan.

Tel.: 03-5192 8188 Fax: 03-5191 8188

Attn.: **Mr. Casey Kan**

Civil and Geotechnical Engineering Consultant

NEXUS EC SDN. BHD.

No. 50-3A & 3B, Jalan Bandar 2,

Pusat Bandar Puchong,

47100 Puchong, Selangor Darul Ehsan.

Tel: 03-58824125, 03-58824145, Fax : 03-58824135,

Attn: Ir. Dr. Saravanan Mariappan

Surveyor

Zam Survey Consultant.

No.1, Jalan Restu 2, Desa Restu,

43900 Sepang, Selangor.

Tel: 03-9171 0856; H/P: 019 784 2469

Attn: Sr. Zamri Bin Seman

Traffic Assessment Consultant

RSI Consultant

No. 21C, Jalan BK 5A/2,

Bandar Kinrara, 47100 Puchong,

Selangor Darul Ehsan.

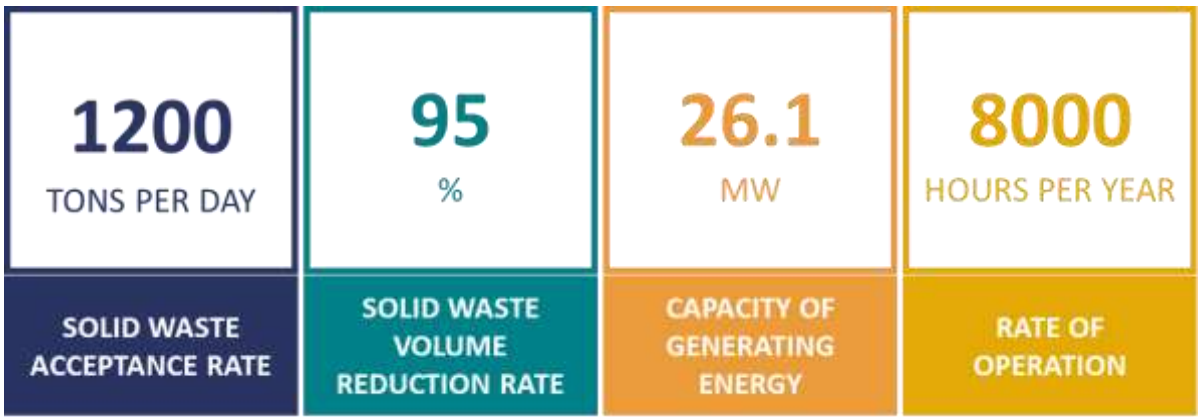
Tel: 03 8076 3360; Fax: 03 8076 3370

Attn.: Ir. Rosli B. Idrus (Director)

II. Proposed Project Description

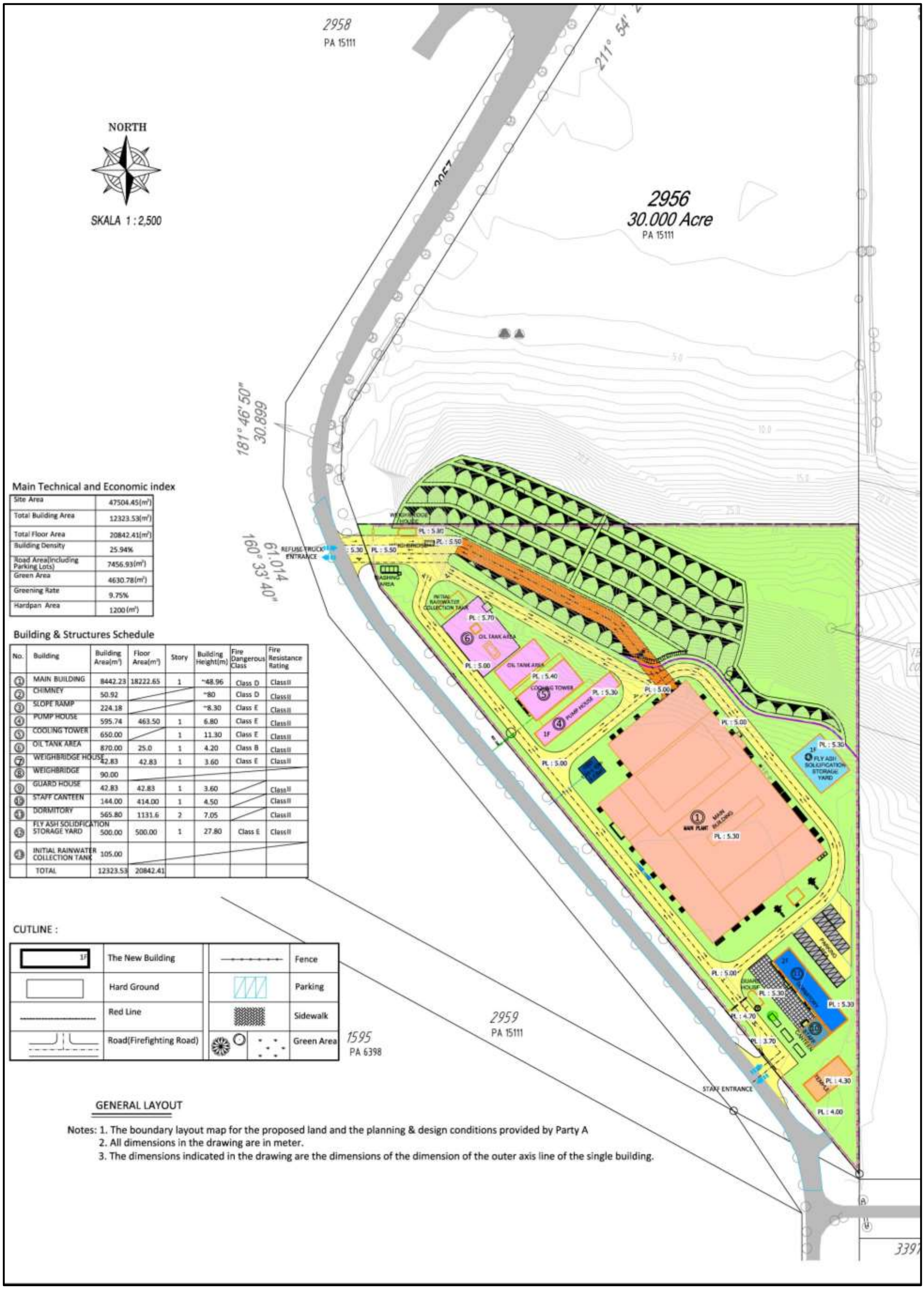
- WTE at Jeram ISWMC is proposed for treatment of municipal solid waste generated from districts particularly in the central region of the country such as Shah Alam, Petaling Jaya, Klang, Ampang Jaya, Selayang, Subang Jaya, and Kuala Selangor. The layout of the Project Site is depicted in **Figure D.**
- The WTE employs a moving grate system based on Keppel Seghers technology from Europe. The boiler for the WTE is obtained from local manufacturers as per requirement in SEDA. The proposed WTE applies the aesthetic aspects of green energy and environmental friendly in plant design. The WTE ensures the control of the pollution technology based on international environment standards as well as in compliance with the Environmental Quality (Clean Air) Regulations 2014. The design basis of the WTE are:

Diagram A: Design Basis of WTE at Jeram ISWMC



Source: Worldwide Holdings Berhad, 2019

Figure D: The layout of the WTE Project Site



Main Technical and Economic index

Site Area	47504.45(m²)
Total Building Area	12323.53(m²)
Total Floor Area	20842.41(m²)
Building Density	25.94%
Road Area(Including Parking Lots)	7456.93(m²)
Green Area	4630.78(m²)
Greening Rate	9.75%
Hardpan Area	1200(m²)

Building & Structures Schedule

No.	Building	Building Area(m²)	Floor Area(m²)	Story	Building Height(m)	Fire Dangerous Class	Fire Resistance Rating
①	MAIN BUILDING	8442.23	18222.65	1	~48.96	Class D	ClassII
②	CHIMNEY	50.92			~80	Class D	ClassII
③	SLOPE RAMP	224.18			~8.30	Class E	ClassII
④	PUMP HOUSE	595.74	463.50	1	6.80	Class E	ClassII
⑤	COOLING TOWER	650.00		1	11.30	Class E	ClassII
⑥	OIL TANK AREA	870.00	25.0	1	4.20	Class B	ClassII
⑦	WEIGHBRIDGE HOUSE	42.83	42.83	1	3.60	Class E	ClassII
⑧	WEIGHBRIDGE	90.00					
⑨	GUARD HOUSE	42.83	42.83	1	3.60		ClassII
⑩	STAFF CANTEEN	144.00	414.00	1	4.50		ClassII
⑪	DORMITORY	565.80	1131.6	2	7.05		ClassII
⑫	FLY ASH SOLIDFICATION STORAGE YARD	500.00	500.00	1	27.80	Class E	ClassII
⑬	INITIAL RAINWATER COLLECTION TANK	105.00					
	TOTAL	12323.53	20842.41				

CUTLINE :

1F	The New Building		Fence
	Hard Ground		Parking
	Red Line		Sidewalk
	Road(Firefighting Road)		Green Area

GENERAL LAYOUT

Notes: 1. The boundary layout map for the proposed land and the planning & design conditions provided by Party A
2. All dimensions in the drawing are in meter.
3. The dimensions indicated in the drawing are the dimensions of the dimension of the outer axis line of the single building.

A. Main Plant Equipment

The main equipment of the project involves waste receiving system, waste feeding system, incinerator/waste heat boiler system, flue gas treatment system, waste heat utilization system, etc.

Table A: List of Main Equipment

No	Equipment Name	Performance Parameters	Unit
1	Road weighbridge	Max. Weighing capacity: 50t	2
2	Refuse Bunker discharge door	Type: electrical Discharge door dimension: 5000x3600 mm	5
3	Bridge-type waste grab crane	Model: double-beam bridge type Lifting capacity: 12.5 t	2
4	Waste grab	Type: electro-hydraulic multi-peel type Transmission mode: hydraulic Garb capacity: 8.0 m^3	3
5	Incinerator/waste heat boiler	Type: mechanical grate incinerator Rated waste treatment capacity: 600 t/d Steam temperature: 400^oC Steam pressure: 4.0 MPa Rated steam quantity: 63.08 t/h Feed water temperature: 130^oC Flue gas exhaust temperature: 200^oC Thermal efficiency: 80%	2
6	Pure condensing type steam turbine	Rated power: 25 MW Rated speed: 3000 rpm Rated inlet steam pressure: 3.8 MPa(a) Rated inlet steam temperature: 395^oC Rated steam entry quantity: 64 t/h	1
7	Generator	Rated power: 30 MW Power factor: 0.8 Rated speed: 3000 rpm Outgoing voltage: 10500 V Excitation mode: brushless excitation	1
8	Reaction tower	Flue gas treatment capacity: ~136000 Nm^3/h Inlet flue gas temperature: 200^oC	2
9	Bag-type dust collector	Flue gas treatment capacity: 136000 Nm^3/h Inlet flue gas temperature: 150^oC Filtering speed: 0.73 m/min Bag-type filter material: PTFE+PTFE overlay film	2

Source: Feasibility Study Report Waste-To-Energy Project at Sanitary Landfill in Mukim Jeram

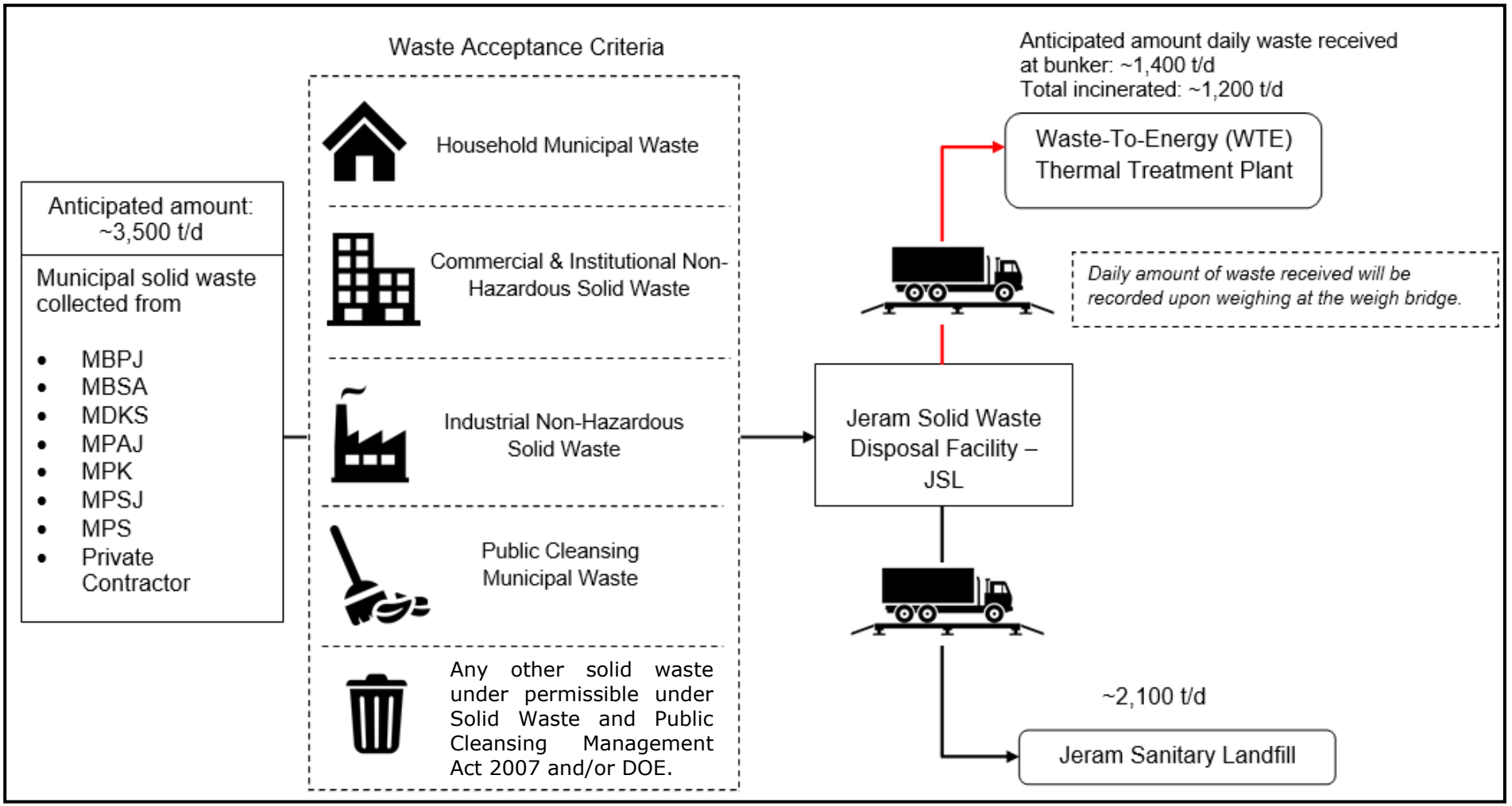
B. Waste Acceptance Criteria

Incoming wastes into the WTE are basically comingle wastes and must go through the weighbridge to measure and record the incoming weight. Since there is no waste separation process will be carried out, all waste will be directed into the bunker for storage prior feeding into the WTE. Operation Process Concept Flow of Waste Management at ISWMC is depicted in **Diagram B**.

Acceptable waste at the WTE should comprise of essentially the municipal waste type and/or similar nature. The waste types shall only be obtained from the following sources and types:

Waste Acceptance Criteria (WAC)	
Waste Source	**Waste Type**
• Household – landed properties, high-rise residential buildings, • Commercial – shops, retail outlets, hotels, resorts, markets, workshops • Institutional wastes – schools, government offices, universities and colleges • Garden wastes – from household, office, landscapes • Public cleansing wastes – from public places, parks, recreational areas	• Municipal waste type comprising of household wastes and waste of similar nature. • Solid wastes (non-hazardous) from commercial and institutional • Solid waste (non-hazardous) from industries • Public cleansing waste – municipal waste type • Any other solid waste permissible under the Solid Waste Act 2007 and/or by DOE

Diagram B: Operation Process Concept Flow of Waste Management at ISWMC



C. WTE Thermal Treatment Process

The wastes in the waste storage bunker are grabbed by the waste crane into the feeding hopper of the incinerator, fall into the feeding grate via the chute, and are then uniformly sent by the feeding grate into the incinerator for burning.

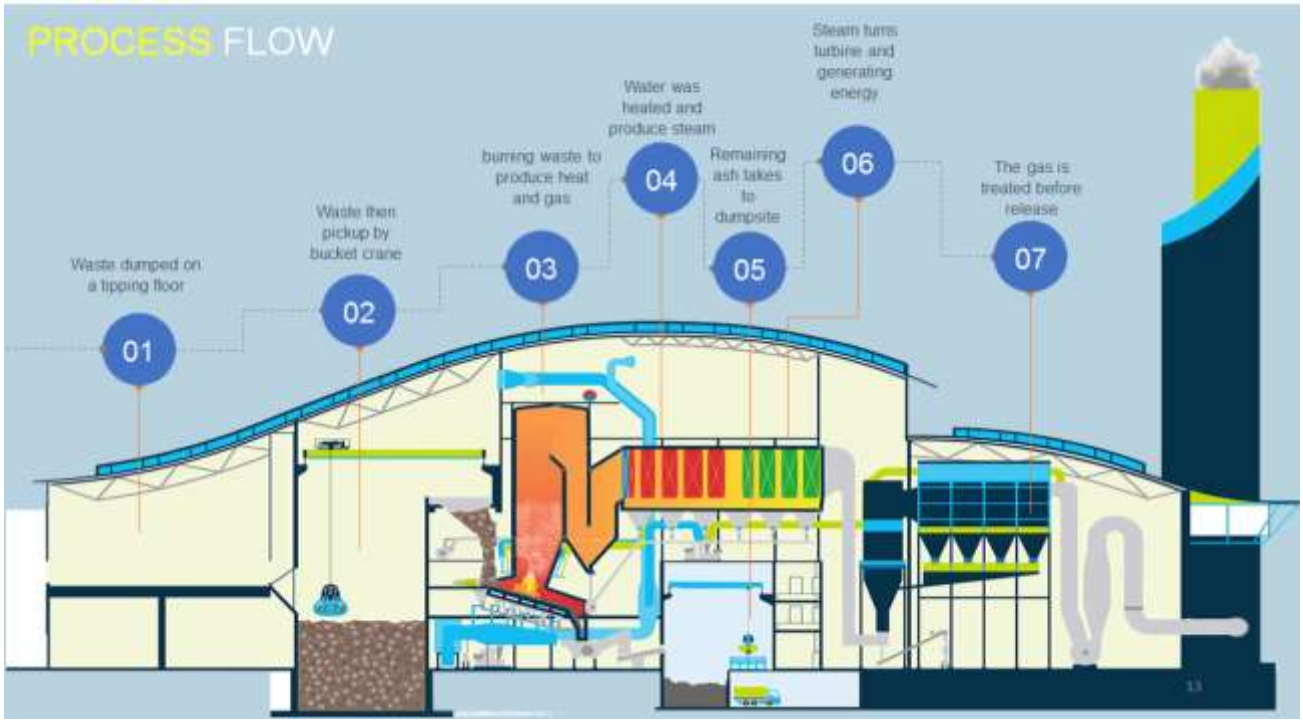
The combustion-supporting air needed by waste combustion includes primary air and secondary air according to different functions. Primary air comes from the waste storage bunker, causes the waste storage bunker to keep negative pressure, and ensures that the odour in the waste storage bunker does not escape outside. After being heated by the steam air preheater, primary air is sent by the primary fan into the incinerator. Secondary air is sucked from the upper part of the boiler room. After being pressurized by the secondary fan, secondary air is sent into the hearth, so that the hearth flue gas generates strong turbulent flow to eliminate chemical incomplete combustion losses and make for burnout of carbon particles in fly ash.

The incinerator is fitted with an ignition burner and an auxiliary burner and uses diesel oil as auxiliary fuel. The ignition burner is used in ignition and warming up. When wastes have a relatively low calorific value and high water ratio, the flue gas temperature at the hearth outlet cannot be kept at over 850^{o}C. Here the auxiliary burner is started to increase hearth temperature and stabilize combustion. During incinerator shutdown, the auxiliary burner must be started before stopping waste feeding until the wastes on the grate are burned out.

Wastes pass through the three areas such as drying, burning and burnout on the grate, the combustible components in wastes are completely burned, and bottom ash falls into the bottom ash extractor. The bottom ash extractor plays a role in water sealing and bottom ash cooling and pushes bottom ash into the bottom ash storage pit. There is a bridge type grab crane above the bottom ash storage pit. The crane can grab the bottom ash in the bottom ash storage pit, and the bottom ash is truck-loaded and transported away, and the part which cannot be utilized is sent to the landfill site as cover soil.

After being cooled by the waste heat boiler, the high temperature flue gas generated by waste combustion enters the flue gas treatment system. Taking water as working medium, the waste heat boiler absorbs the heat quantity in high temperature flue gas and generates 4.0MPa and 400^{o}C steam for power generation by the steam turbine generating unit. The generated electricity is used in this plant, and the surplus electricity is sent to the regional power grid. Generally, the WTE process flow is as shown in **Diagram C**.

Diagram C: General Process Flow of WTE Plant



D. Waste Incinerator

The treatment capacity of each line of waste incinerator is 600 t/d, the annual running time of a single line is 8000 h, its heat load variation range is 60-110%, and its waste treatment capacity variation range is 70-110%. The main parameters of the multi-stage mechanical grate incinerator are as in **Table B**.

Table B: Main Parameters of Mechanical Grate Incinerator

Performance Parameter	Value
Lower calorific value of wastes	Max. 10,100 kJ/kg
	Min. 4,800 kJ/kg
	Design point 8,000 kJ/kg
Required lowest level calorific value enabling stable combustion of wastes without adding auxiliary fuels	5600 kJ/kg
Incinerator number (total scale)	2 units
Annual average water content	≤50%
Annual average ash content	≤25%
Rated treatment capacity of a single incinerator	600 t/d
Max treatment capacity of a single incinerator	660 t/d
Permissible load range of incinerator	70-110%
Annual normal working time of incinerator	8000 h
Retention time of wastes in the incinerator	2 h

Performance Parameter	Value
Retention time in the combustion chamber	2 s
Primary air temperature	~220°C
Secondary air temperature	~25°C
Flue gas temperature in the combustion chamber	>850°C
Excess coefficient of combustion-supporting air	1.9
CO concentration in the flue gas at the combustion chamber outlet	<50 mg/Nm^3
O_2 concentration in the flue gas at the combustion chamber outlet	6-12%
Ignition loss of incineration residue	<3%

Source: Feasibility Study Report Waste-To-Energy Project at Sanitary Landfill in Mukim Jeram

E. Waste Heat Boiler

The heat energy generated by waste incineration generates steam via the waste heat boiler, and steam is converted by the steam turbine generating unit into electric energy. The waste heat boiler is one of the key equipment in the WTE plant. **Table C** below shows the technical parameters of the waste heat boiler.

Table C: Technical Parameters of Waste Heat Boiler

Parameter	Unit	Value
Waste heat boiler number	unit	2
Rated waste treatment capacity	t/d	600
Rated continuous evaporation amount	t/h	63.08
Rated steam outlet pressure	MPa (G)	4.0
Rated steam outlet temperature	°C	400
Working pressure of drum	MPa (G)	4.5
Working temperature of drum	°C	257
Boiler feed water temperature	°C	130
Blowdown rate	%	~2
Flue gas exhaust temperature	°C	190(-5, +10)
Flue gas resistance	Pa	~800
Thermal efficiency of boiler	%	≥80.5

Source: Feasibility Study Report Waste-To-Energy Project at Sanitary Landfill in Mukim Jeram

The project is provided with 1 buried steel oil tank of 20 m^3 in volume, 2 oil supply pumps within one in use and the other for standby (flow rate: 3.6 m^3/h, oil drainage pressure: 2.5 MPa, model: 3Gr42 x 6A).

F. Fuel Consumption and Other Consumables

In the proposed WTE plants, there is no need to pre-treat the waste. The technology uses mass burning method which directly combusts MSW as fuel with minimal processing. Diesel oil is used as auxiliary fuel for start-up and shut down of the incinerator, also to maintain the temperature in the incinerator at 850°C. Other consumables for the WTE process are absorbents and adsorbents used in the flue gas treatment system. **Table D** present amount of fuel and consumables utilised in the WTE plant.

Table D: Fuel Consumption and Other Consumables

Consumables	Quantity (MT/hr)	Utilisation	Storage
Municipal Solid Waste	50.000	Mass burning in incinerator	Waste Bunker
Diesel	50 MT/yr	Auxiliary fuel for start-up, shut down and maintain temperature at set level	Oil Tank Area
20% Ammonia	0.225	In-boiler denitrification	Ammonia Tank Area
Calcium hydroxide	0.600	Absorbent to neutralize acid gases	Calcium Hydroxide Silo
Activated Carbon	0.030	Adsorbent to remove heavy metals and PCDD	Activated Carbon Silo

Source: Feasibility Study Report Waste-To-Energy Project at Sanitary Landfill in Mukim Jeram

G. Waste Heat Utilization

The main equipment includes steam turbine and generator. The auxiliary equipment are made up of condenser, condensate pump, steam seal heater, low pressure heater, deaerator, feed pump, continuous blowdown flash tank, periodic blowdown flash tank, drain tank, drainage steam flasher, ac-dc oil pump, oil tank, oil cooler, air cooler, and temperature-decreased pressure reducer.

Performance parameters of the waste heat utilization system are as in **Table E**. In case of emergency or repair shutdown of the steam turbine generating unit, the WTE is fitted with a steam bypass system.

Table E: Performance Parameters of Waste Heat Utilization System

Parameter	Unit	Value
Steam turbine number (total scale)	-	1
Model		N25-3.9/390
Rated power	MW	25
Rated speed	r/min	3000
Inlet steam pressure	MPa	3.9
Inlet steam temperature	°C	390
Inlet steam flowrate	t/h	122.368
Exhaust steam pressure	MPa(a)	0.007 (absolute)
Generator number (total scale)	-	1
Rated power	MW	30
Rated voltage	kV	10.5
Power factor		0.8
Rated speed	r/min	3000
Generator cooling mode		Water cooling

Source: Feasibility Study Report Waste-To-Energy Project at Sanitary Landfill in Mukim Jeram

H. Power Generation

At the Maximum continuous rating (MCR) point of the incinerator, the average daily municipal solid waste treatment capacity is 1200 t/d, and the lower calorific value of wastes into the incinerator is 8000 kJ/kg. By calculation as per the treatment capacity, the annual municipal solid waste treatment capacity is about 511,000 t/a.

By estimation as per 4.683 kg/kWh steam loss rate, the generated output of the generating unit is 26.13 MW. By calculation according to 511,000 ton waste annually quantity into the plant, the annual energy output is 20903 x 10^4 kWh per year. If the auxiliary power ratio is taken as 13%, the annual on-grid energy is 18185 x 10^4 kWh per year. The on-grid energy converted per ton of municipal solid wastes is 355.88 kWh/t.

The on-grid electric energy is boosted by a 40MVA and 35±2×2.5%/10.5kV main transformer to 33kV. The 33kV system uses the winding transformer bank connection mode, and it is planned to connect one-circuit 33kV line into the PMU Bukit Kapar 132/33kV. The distance from project site to the PMU Bukit Kapar is approximately 8 km.

I. Flue Gas Treatment System

The flue gas generated during municipal solid waste incineration contains large amount of pollutants, which mainly include the following:

- **Products of incomplete combustion**: By-products generated by poor combustion, including CO, carbon black, hydrocarbon, alkene, ketone, alcohol, organic acid, polymer, etc.
- **Dust**: inert metal salt in wastes, metal oxide or products of incomplete combustion, etc.
- **Acid gas**: including HCl, hydrogen halide (fluorine, bromine, iodine, etc.), sulfur oxides (SO_2 and SO_3), nitric oxides (NOx), PO_5, and H_3PO_4.
- **Heavy metals**: including Pb, Cr, Hg, Ar, etc., oxide, chloride, etc.
- **Dioxin**: Polychlorinated dibenzo-para-dioxins (PCDD) / polychlorinated dibenzofurans (PCDFs)

According to the analysis of elements in treated wastes, the emission of flue gas from each incinerator is about 136,000 Nm^3/h with emission quality as **Table F**.

Table F: Flue Gas Emission Quality Before Treatment

Parameter	Unit	Value
Flue gas emission	Nm^3/h	136000
Flue gas temperature	^oC	190
CO_2	%	~7.5
PM	mg/Nm^3	~10000
HF	mg/Nm^3	~50
SOx	mg/Nm^3	~600
HCl	mg/Nm^3	500 – 750
CO	mg/Nm^3	~50
NOx	mg/Nm^3	~400
Hg	mg/Nm^3	~5
Cd	mg/Nm^3	~1
Pb+As+Sb+Cu	mg/Nm^3	~50
PCDD	$ng.TEQ/Nm^3$	~5

Source: Feasibility Study Report Waste-To-Energy Project at Sanitary Landfill in Mukim Jeram

The treated flue gas emission of the Project is anticipated better than as required by EU2000/76/EC standard and comply to the limits stipulated in Environmental Quality (Clean Air) Regulations 2014 as determined in **Table G**. **Table H** shows the removal efficiency of the Flue Gas Treatment System. **Diagram D** shows the schematic of flue gas

treatment system.

Table G: Requirement of Emission Index

Pollutant	Unit	EU2000/76/EC		Environmental Quality (Clean Air) Regulations 2014	Engineering Objective
		Daily Average	Half-hourly average		
Total PM	mg/Nm^3	10	30	100*	10
NMVOC	mg/Nm^3	10	10	10	100
Smoke	mg/Nm^3	10	30	-	10
HCl	mg/Nm^3	10	60	40*	9
HF	mg/Nm^3	1	4	1*	1
SOx	mg/Nm^3	50	200	50*	45
NOx	mg/Nm^3	200	400	200*	180
TOC	mg/Nm^3	10	20	10*	10
CO	mg/Nm^3	50	100	50*	50
Hg	mg/Nm^3	0.05	0.05	0.05	0.05
Cd	mg/Nm^3	-	-	-	0.1
Cd+Tl		0.05	0.05	0.05	0.05
Pb	mg/Nm^3	-	-	-	0.5
Other Heavy Metals		0.5	0.5	0.5	0.5
PCDD	ngTEQ/Nm^3	0.1	0.1	0.1	0.1

Note:

(1)various standard limit values specified in the table are converted by taking the dry flue gas containing 11% O_2 under normal state as the reference.

*(2)*Averaging time for continuous monitoring is 30 minutes.*

Table H: Removal Efficiency of Flue Gas Treatment System

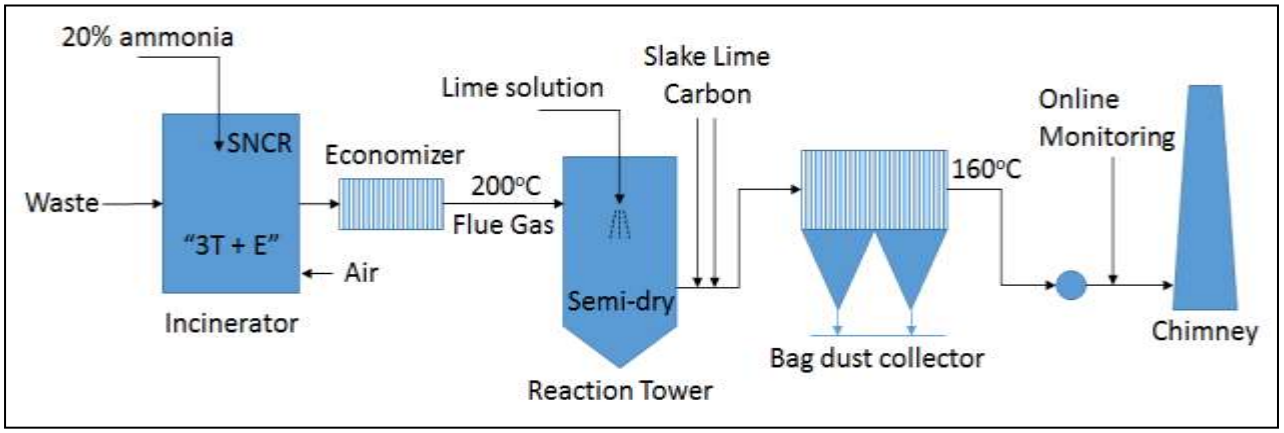
Parameter	Unit	Concentration		Removal Efficiency
		Before Treatment	After Treatment*	
PM	mg/Nm^3	~10000	100	99%
HF	mg/Nm^3	~50	1	98%
SOx	mg/Nm^3	~600	50	92%
HCl	mg/Nm^3	500 – 750	40	95%
CO	mg/Nm^3	~50	50	-
NOx	mg/Nm^3	~400	200	50%
Hg	mg/Nm^3	~5	0.05	99%
Cd	mg/Nm^3	~1	-	-
Pb+As+Sb+Cu	mg/Nm^3	~50	0.5	99%
PCDD	ng.TEQ/Nm^3	~5	0.1	98%

Note:

**As stipulated in Environmental Quality (Clean Air) Regulations 2014*

The Project employs "SNCR (in-furnace) + semi-dry process + dry process + activated carbon injection + bag type dust collector" in the flue gas treatment system to ensure full compliance of the emission standard. The flue gas treatment process has extensive applicability in international waste-to-energy plants.

Diagram D: Schematic of Flue Gas Treatment System



Source: Feasibility Study Report Waste-To-Energy Project at Sanitary Landfill in Mukim Jeram

J. Online Monitoring System

Continuous Emission Monitoring System (CEMS) is provided to continuously monitor and record selected gas parameters to monitor the imminent breach of emission limit and is interlocked with the control system to adjust various processes parameters to avoid such exceedance. Also, alarms will be activated to terminate waste feed in the event of an emission concentration exceedance. Online flue gas sample detectors and analyzers for NMVOC as TOC, SO_2, NOx, HCl, HF, CO, Total PM and flue gas flowmeters etc. as required in the Environmental Quality (Clean Air) Regulations 2014 are installed and the monitoring information is all transmitted to the central control room via sensors and displayed on the computer. Other parameters such as Hg, Pb, Cd, Dioxin & Furan will be manual periodic monitoring. The CEMS is provided with software to allow remote online monitoring of all emission parameters by the Department of Environment.

In addition, the online flue gas monitoring result is announced to the public. A real time air quality public display on the LED screen is to be set up at the WTE Plant (refer to **Diagram E**). The system's monitoring parameters to be displayed include Total PM, SO_2, NOx, HCl, HF, CO, CO_2, O_2, H_2O, NH_3, dust, flue gas flow rate, flue gas temperature etc. This exercise promotes environmental transparency, one of the Environmental Mainstreaming Tools formulated by DOE for Self-Regulation.

Diagram E: Air Quality Control and Compliance Standard for WTE Plant

Gas emission mitigation measures that comply with DOE Malaysia and International Standards.

Parameter	Unit	EU2000/76/EC (Daily Average)	EQ (Clean Air) Regulation 2014	Guaranteed value (Daily Average)	
PM	Mg/Nm3	10	100	10	
NMVOC	Mg/Nm3	10	10	10	
CO	Mg/Nm3	50	50	50	
NOx	Mg/Nm3	200	200	200	→ Online Monitoring
SO2	Mg/Nm3	50	50	50	
HCl	Mg/Nm3	10	40	10	
Hg	Mg/Nm3	0.05	0.05	0.05	
Cd	Mg/Nm3	0.05	0.05	0.05	→ Manual Periodic Monitoring
Pb	Mg/Nm3	0.5	0.5	0.5	
HF	Mg/Nm3	1	1	1	→ Online Monitoring
*Dioxin & Furan	Ng/Nm3	0.1	0.1	0.1	→ Manual Periodic Monitoring

Air quality monitoring display 'real-time' on the LED screen at WTE plant.

Sample that will be implemented

Heavy metals and dioxin & furan are monitored manual periodic.

K. Mass Balance

The process schematic diagram is presented in **Diagram F**. **Table I** shows the mass balance for the WTE Plant.

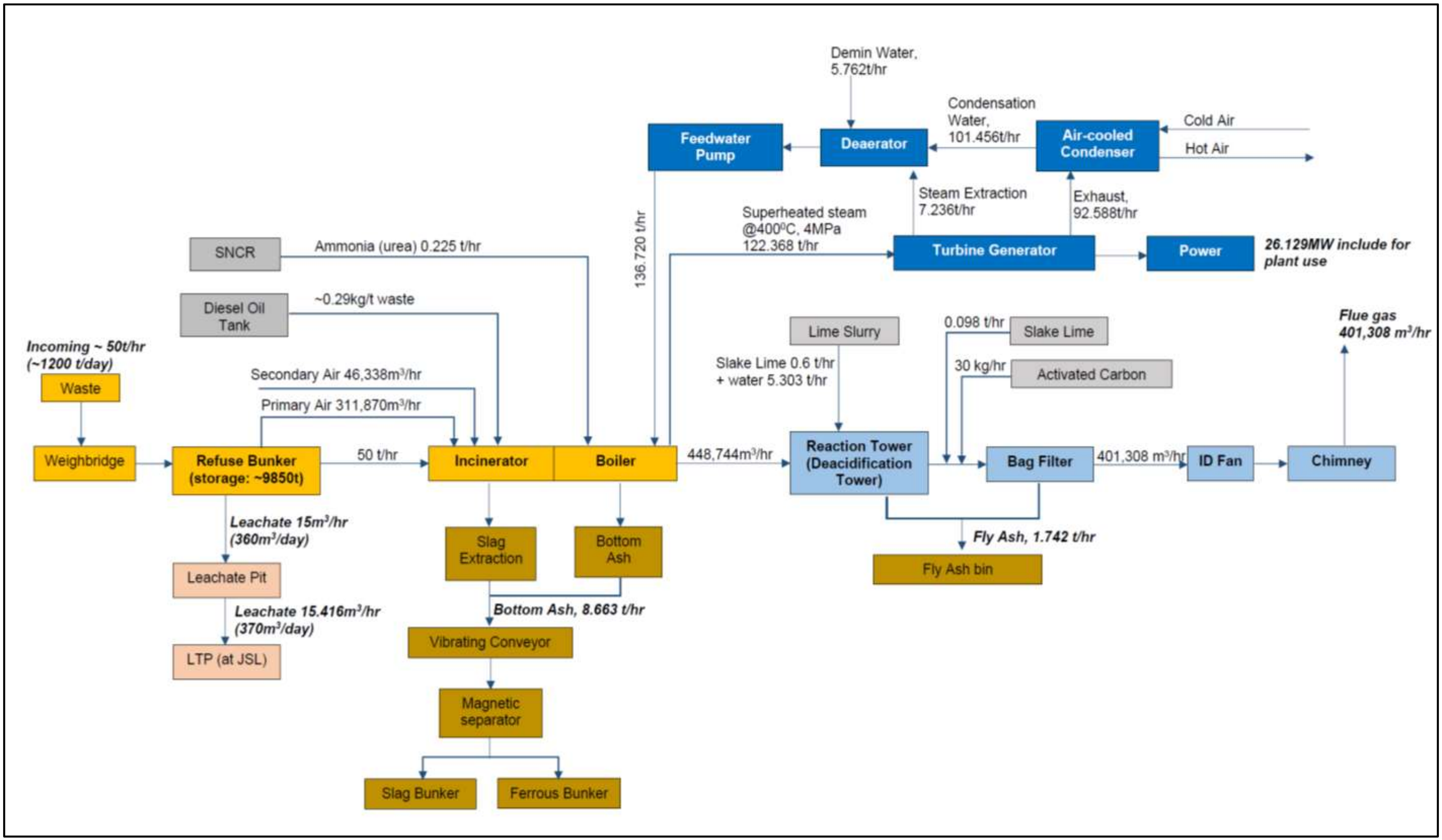
Table I: Mass Balance for WTE Plant

Process	Input (A)		Qty (t/h)	Output (B)		Qty (t/h)
Incinerator + Boiler	1	Fuel into the furnace	50.000	6	Flue gas (boiler outlet)	322.440
	2	Primary air	223.299	19	Bottom ash (wet)	10.395
	3	Secondary air	55.825			
	4	Ammonia	0.225			
	5	Sewage spray back	0			
	18	Cooling water	3.486			
	Subtotal		**332.835**	**Subtotal**		**332.835**
Deacidification Tower	6	Flue gas (boiler outlet)	322.440	16	Flue gas (bag filter outlet)	326.729
	7	Slake lime	0.600	20	Fly ash	1.742
	7	Water	5.303			
	8	Activated carbon	0.03			
	9	Slake lime	0.098			
	Subtotal		**328.471**	**Subtotal**		**328.471**
Ash Stabilization	20	Fly ash	1.742	22	Fly ash stabilized	2.387
	21	Cement	0.261			
	21	Agent	0.035			
	21	Water	0.348			
	Subtotal		**2.387**	**Subtotal**		**2.387**
	TOTAL INPUT (A)		**339.51**	**TOTAL OUTPUT (B)**		**339.51**

Source: Feasibility Study Report Waste-To-Energy Project at Sanitary Landfill in Mukim Jeram

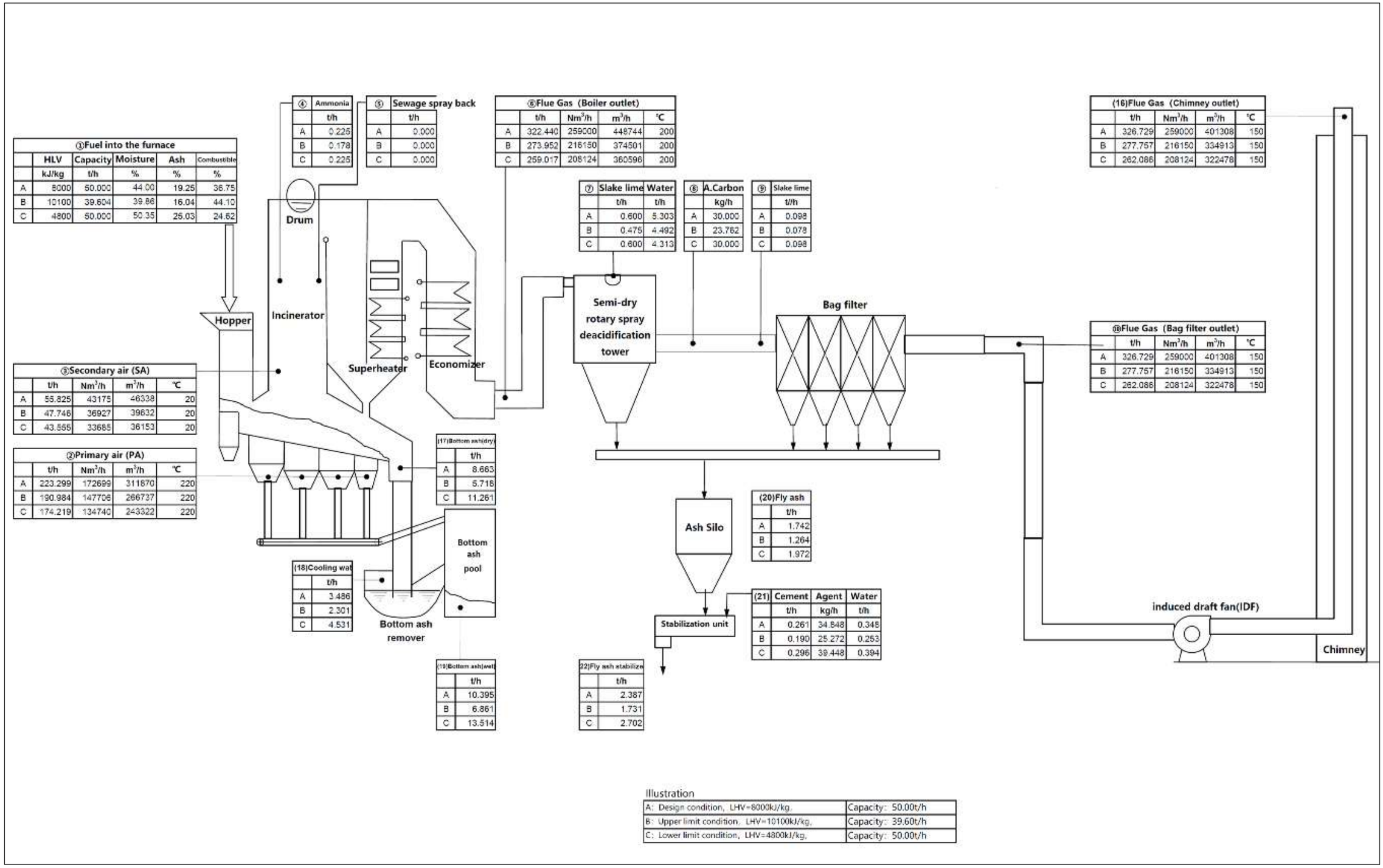
The mass balance and heat balance are shown in **Diagram G** and **Diagram H** respectively.

Diagram F: Waste Mass Flow and WTE Outputs



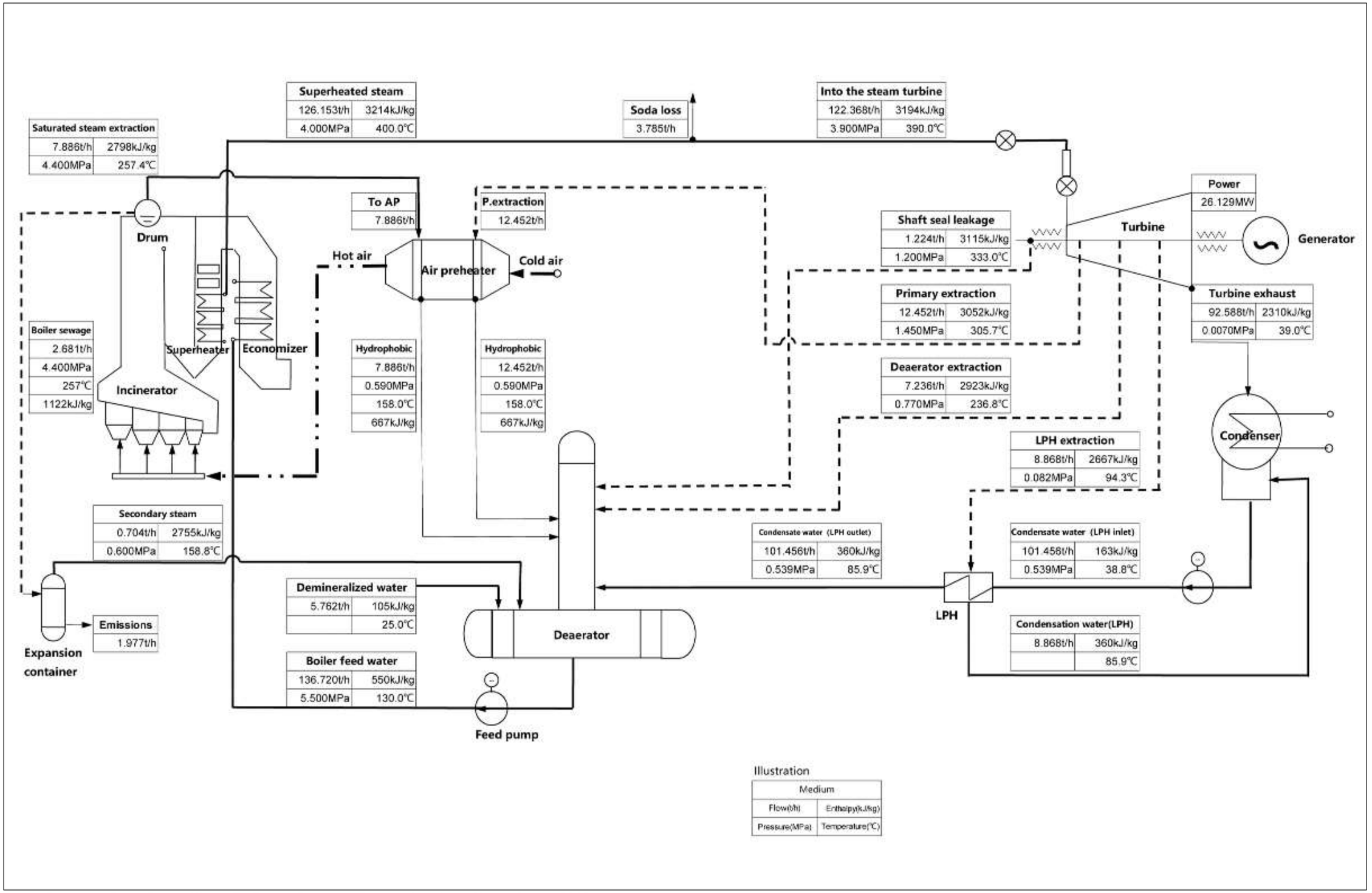
Source: Feasibility Study Report Waste-To-Energy Project at Sanitary Landfill in Mukim Jeram, 2019

Diagram G: Mass Balance Diagram



Source: Feasibility Study Report Waste-To-Energy Project at Sanitary Landfill in Mukim Jeram, 2019

Diagram H: Energy Balance Diagram

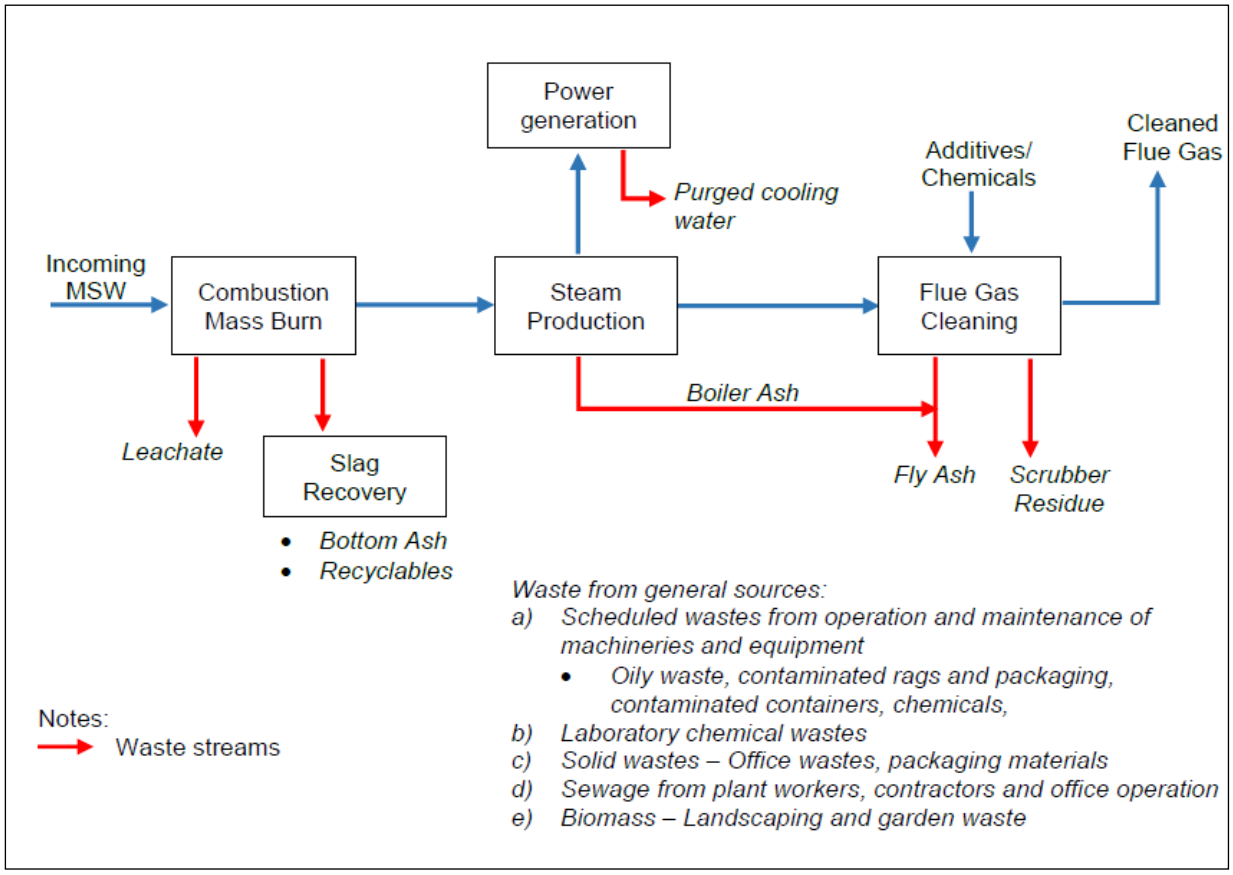


Source: Feasibility Study Report Waste-To-Energy Project at Sanitary Landfill in Mukim Jeram, 2019

L. Waste Generation and Management

The waste generated from the incineration of municipal solid waste comprises mainly of bottom ash and fly ash. **Diagram I** show the general waste streams from the WTE operation.

Diagram I: General Waste Streams from the WTE Operation



Source: Feasibility Study Report Waste-To-Energy Project at Sanitary Landfill in Mukim Jeram

L1. Solid Waste (Non-Scheduled Waste)

Solid waste from the Project operation are domestic waste generated mainly from administrative office activities (i.e. paper, food packaging etc.). **Table J** shows solid waste generated and its estimated amount.

Table J: Solid Waste Generation

Solid Waste	Estimated Quantity (MT/d)	Disposal/Management Method
Administrative & Domestic waste • Food waste and packaging • Empty bottles and cans • Papers	0.08 [Calculated based on 1kg/person/day]	Dispose to Jeram Sanitary Landfill

L2. Scheduled Waste

Scheduled wastes for the WTE mainly include the bottom ash (SW 104) from the waste incinerator and the fly ash (SW 104) captured by flue gas treatment equipment such as bag type dust collectors etc.

Bottom Ash (SW 104)

By calculation according to the unit's annual running time of 8000 h under rated operating conditions, the bottom ash quantity is shown in the following table:

Unit Capacity	Hourly bottom ash quantity (t/h)	Daily bottom ash quantity (t/d)	Annual bottom ash quantity (t/a)
1 x 600 t/d grate incineration boiler	5.2	124.74	36424
2 x 600 t/d grate incineration boiler	10.4	249.48	72848

Fly Ash (SW 104)

The management of fly ash depends on the TCLP and TTLC analysis to be conducted to determine its treatment whether the fly ash after solidification can be disposed at landfill or to be sold to brick factory post obtaining Special Management approval from DOE. The project uses the cement-stabilizer solidification technology for fly ash solidification prior to disposal at the solid waste landfill. The following table shows the discharge quantity of the two sets of flue gas treatment systems under rated operating conditions:

Unit Capacity	Hourly ash quantity (t/h)	Daily ash quantity (t/d)	Annual ash quantity (t/a)
1 x 600 t/d grate incineration boiler	0.87	20.91	6105
2 x 600 t/d grate incineration boiler	1.74	41.82	12211

M. Utility Consumption

The utility consumption per ton of treated solid wastes are as below:

Power Consumption	~53.18 kWh/t waste
Water Consumption	~2.412 m^3/t waste
Light Diesel Oil Consumption	~0.29 kg/t waste

M. Leachate and Waste Water Treatment

Leachate and waste water from the waste-to-energy plant are basically grouped into 2 categories with differing treatment objectives, approaches and methodologies, that is Treatment of Low Concentration Discharges (Treatment Stream A) and Treatment of High Concentration Organic Discharges Containing Heavy Metals (Treatment Stream B)

M1. Treatment of Low Concentration Discharges (Treatment Stream A)

Source, treatment and re-use of low concentration discharges and flowchart for stream A is depicted in **Diagram J** and **Diagram K**. The sources and maximum flowrate of the low concentration discharges (Treatment Stream A) are tabulated in **Table K** and the combined design parameters and concentrations are tabulated in **Table L.**

Table K: Source and Quantity of Waste Water for Treatment Stream A

NO	SOURCES	MAXIMUM FLOWRATE (M^3/DAY)
1.	Used backwash water from demineralization plant	22.5
2.	Wash water from workshop cleaning and washing	10
3.	Wash water from truck approach ramp	5
4.	Wash water from weighbridge area	5
5.	Domestic sewage	14.8
6.	Initial rainfall run-off	5
	Total Quantity of Wastewater for Stream A	62.3

Source: Feasibility Study Report Waste-To-Energy Project at Sanitary Landfill in Mukim Jeram

Table L: Combined Design Parameters and Concentration

NO	DESIGN PARAMETERS	UNIT	COMBINED STREAM	DESIGN BASIS
1.	Flow rate	M^3/Day	62.3	72
2.	BOD	mg/l	106.3	200
3.	COD	mg/l	160.9	350
4.	Suspended Solids	mg/l	143.8	250
5.	NH3-N	mg/l	7.1	35
6.	Total Phosphorus	mg/l		5
7.	pH			6 - 9

Source: Feasibility Study Report Waste-To-Energy Project at Sanitary Landfill in Mukim Jeram

The design treated water quality is tabulated in **Table M.**

Table M: DESIGN TREATED WATER QUALITY

NO	DESIGN PARAMETERS	UNIT	DESIGN TREATED WATER QUALITY (RECYCLED WATER QUALITY)	ACCEPTABLE CONDITIONS FOR DISCHARGE
1.	Flow rate	M^3/Day	72	
2.	BOD	mg/l	10 (MAX)	20 (MAX)
3.	COD	mg/l	60 (MAX)	400 (MAX)
4.	Suspended Solids	mg/l	10 (MAX)	50 (MAX)
5.	NH3-N	mg/l	5 (MAX)	5 (MAX)
6.	Total Phosphorus	mg/l	NA	NA
7.	pH		6.5 - 8.5	6.0 - 9.0

Source: Feasibility Study Report Waste-To-Energy Project at Sanitary Landfill in Mukim Jeram

The treated waste water of 62.3 m^3 per day shall then be used as water for flue gas treatment and slurry preparation. Please refer to **Diagram L:** Schematic Diagram of the Water Supply System in the Plant Area and **Diagram M:** Water balance Diagram.

Diagram J: Source, Treatment and Re-Use of Low Concentration Discharges

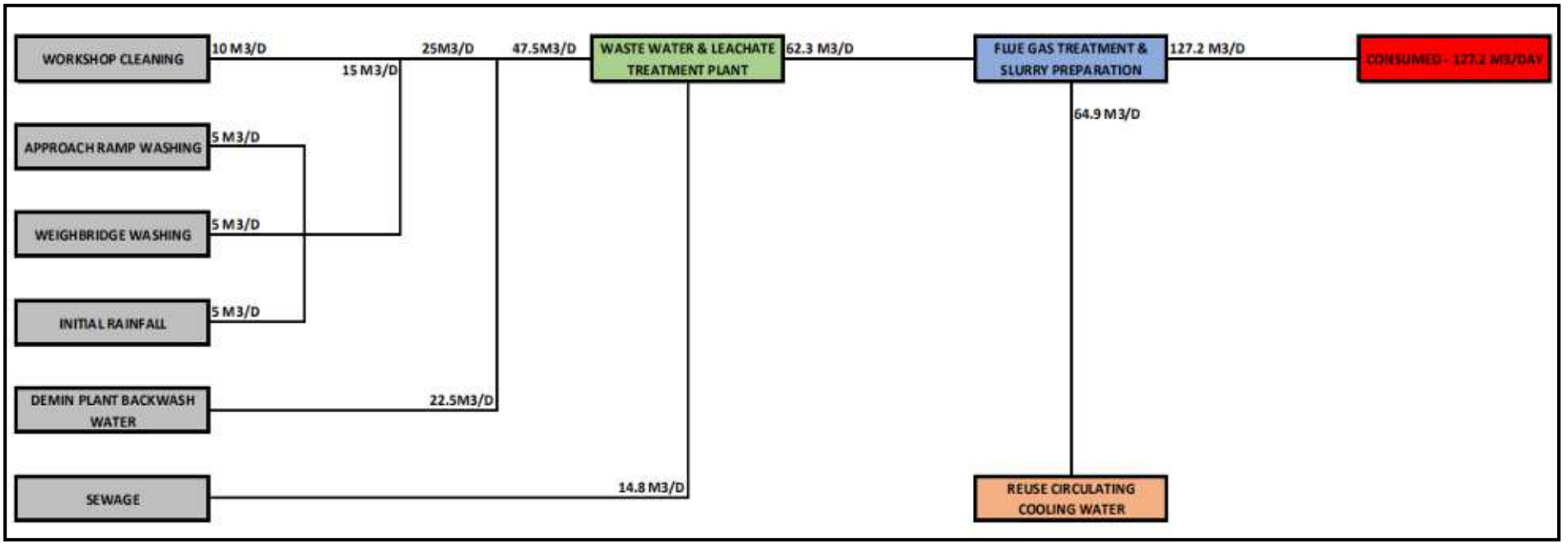


Diagram K: Flow Chart For Treatment Stream A

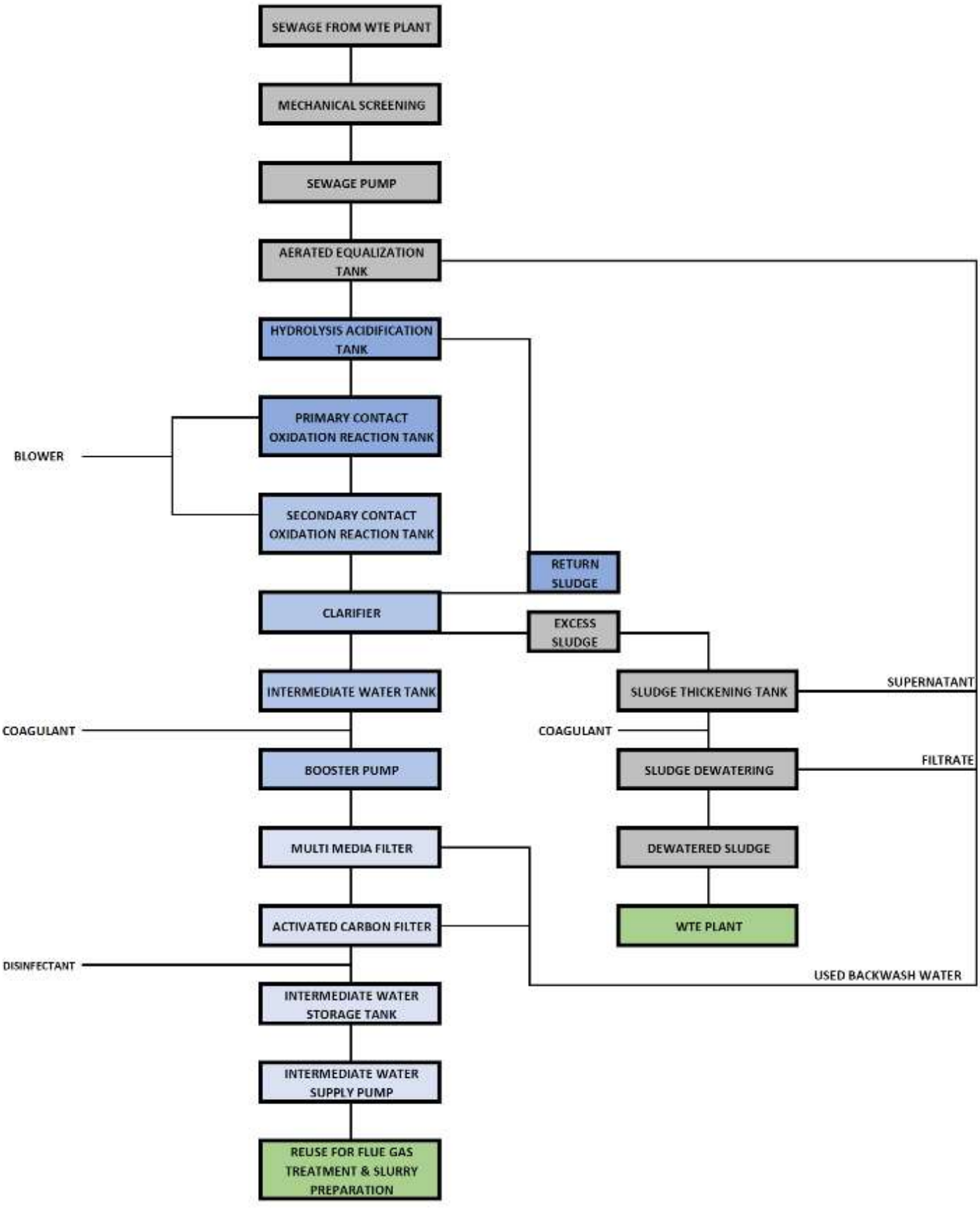


Diagram L: Schematic Diagram of the Water Supply System in the Plant Area

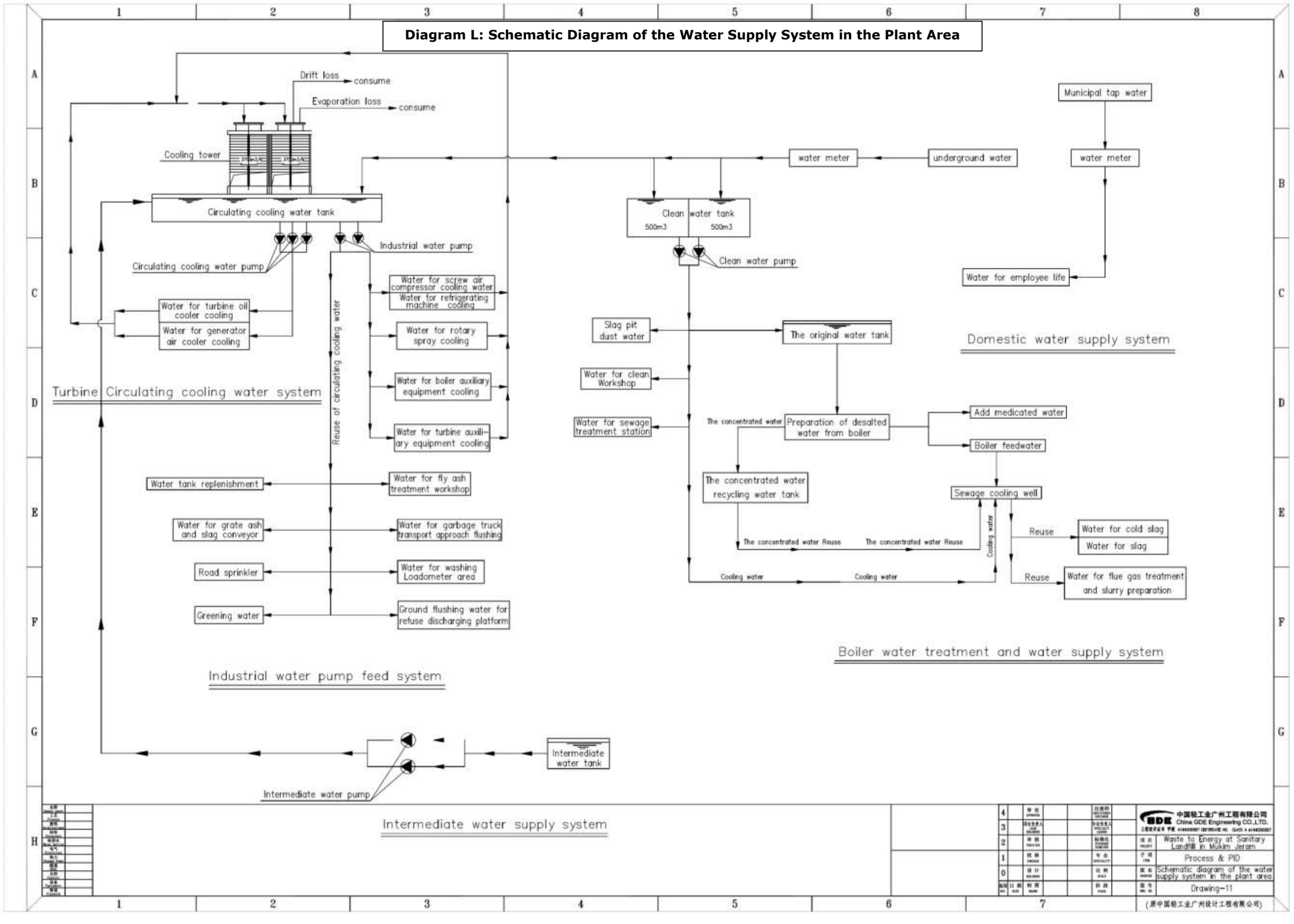
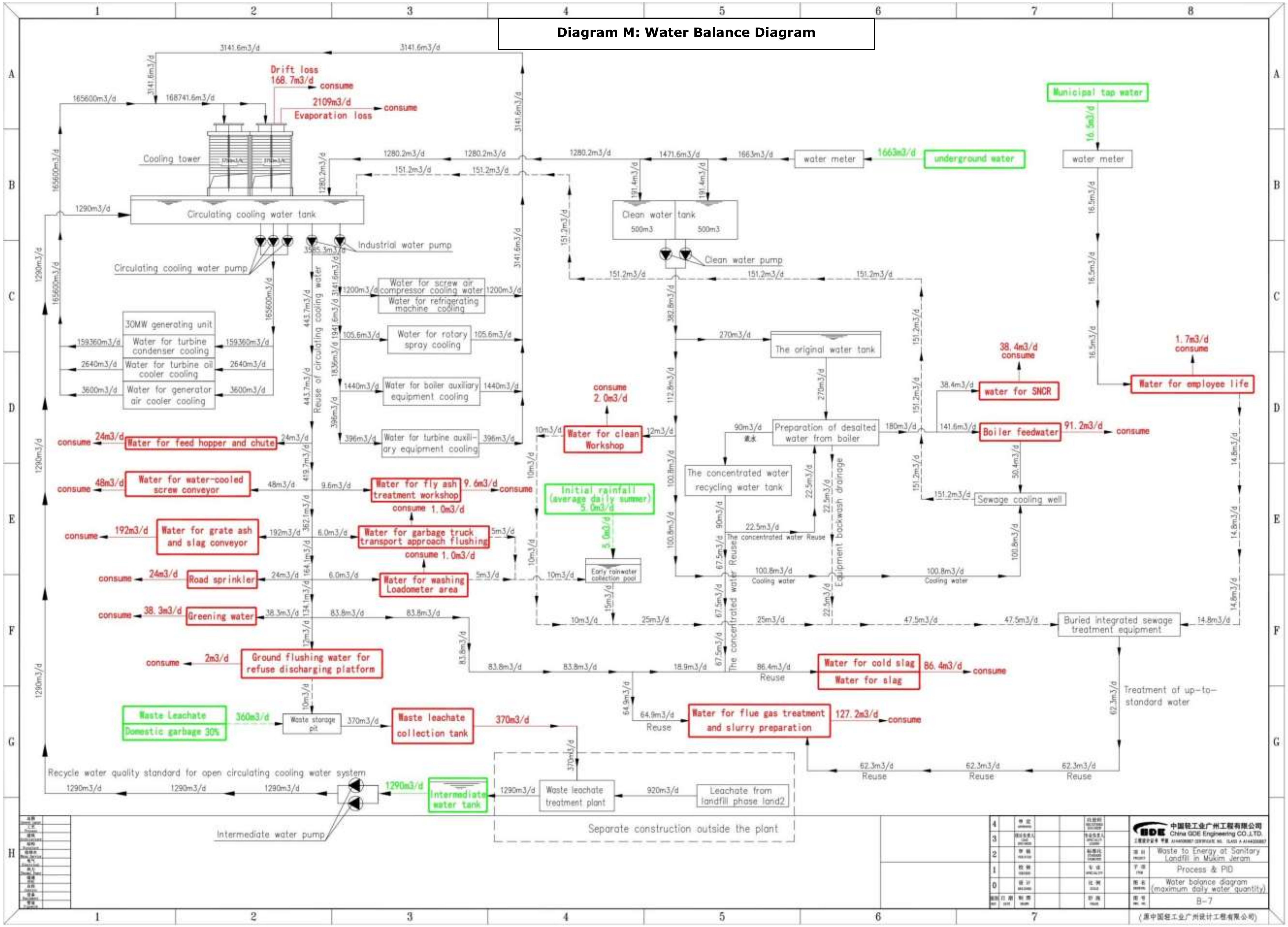


Diagram M: Water Balance Diagram



M2. Treatment of High Concentration Organic Discharges Containing Heavy Metals (Treatment Stream B)

The source and quantity for this high concentration waste stream is:

- Leachate and
- Washed water from waste unloading area

The combined design parameters and concentrations for this high concentration waste stream (Treatment Stream B) are tabulated in **Table N** as follows:

Table N: Design Parameters and Concentrations for Treatment Stream B

NO	PARAMETERS	UNIT	AMOUNT
1.	BOD	mg/l	30,000
2.	COD	mg/l	50,000
3.	Suspended Solids	mg/l	10,000
4.	NH3-N	mg/l	2,000
5.	Total Phosphorus	mg/l	3
6	Chroma		10,000
7.	pH		4 - 8
8.	Flow Rate	M^3/Day	370

Source: Feasibility Study Report Waste-To-Energy Project at Sanitary Landfill in Mukim Jeram

The design treated water quality is tabulated in **Table O.**

Table O: DESIGN TREATED WATER QUALITY

NO	DESIGN PARAMETERS	UNIT	DESIGN TREATED WATER QUALITY (RECYCLED WATER QUALITY)	ACCEPTABLE CONDITIONS FOR DISCHARGE
1.	Flow rate	M^3/Day	370	
2.	BOD	mg/l	10 (MAX)	20 (MAX)
3.	COD	mg/l	60 (MAX)	400 (MAX)
4.	Suspended Solids	mg/l	10 (MAX)	50 (MAX)
5.	NH3-N	mg/l	5 (MAX)	5 (MAX)
6.	Total Phosphorus	mg/l	1 (MAX)	NA
7.	Chroma		30 (MAX)	NA
8.	pH		6.0 - 9.0	6.0 - 9.0

Source: Feasibility Study Report Waste-To-Energy Project at Sanitary Landfill in Mukim Jeram

The treated leachate of 370 m^3 per day shall then be combined with the treated leachate from the existing leachate treatment system of Jeram sanitary landfill with a flowrate of 920 m^3 per day and recycled back to the WTE for use as make up water for circulating cooling water tank. Please refer to **Diagram M:** Water balance and as shown in the following **Diagram N** and **Diagram O**.

M3. Recycling of Treated Waste Water and Leachate

The maximum, average and minimum daily water consumption in the plant is tabulated in the following **Table P**.

Table P: Total Water Consumed

NO	WATER CONSUMPTION	MAXIMUM WATER DEMAND (m^3/day)	AVERAGE WATER DEMAND (m^3/day)	MINIMUM WATER DEMAND (m^3/day)
1.	Drift loss	168.7	163.1	157.5
2.	Evaporation loss	2,109	2,039	1,968.3
3.	Water for feed hopper & chute	24	24	24
4.	Water for water cooled screw conveyor	48	48	48
5.	Water for grate ash and slag conveyor	192	192	192
6.	Water for road cleaning	24	24	24
7.	Water for landscaping	38.3	38.3	38.3
8.	Water for tipping platform cleaning	2	2	2
9.	Water for weighbridge cleaning	1	1	1
10.	Water for garbage truck flushing	6	6	6
11.	Water for fly ash treatment workshop	9.6	9.6	9.6
12.	Water for workshop cleaning	2	2	2
13.	Water for flue gas treatment and slurry preparation	127.2	127.2	127.2
14.	Water for cold slag	86.4	86.4	86.4
15.	Boiler feedwater	91.2	91.2	91.2
16.	Water for SNCR	38.4	38.4	38.4
17.	Potable water	1.7	1.7	1.7
	Total Water Consumed	2,969.5	2,893.9	2,817.6

Source: Feasibility Study Report Waste-To-Energy Project at Sanitary Landfill in Mukim Jeram

Diagram N: Source, Treatment and Re-Use of High Concentration Discharges

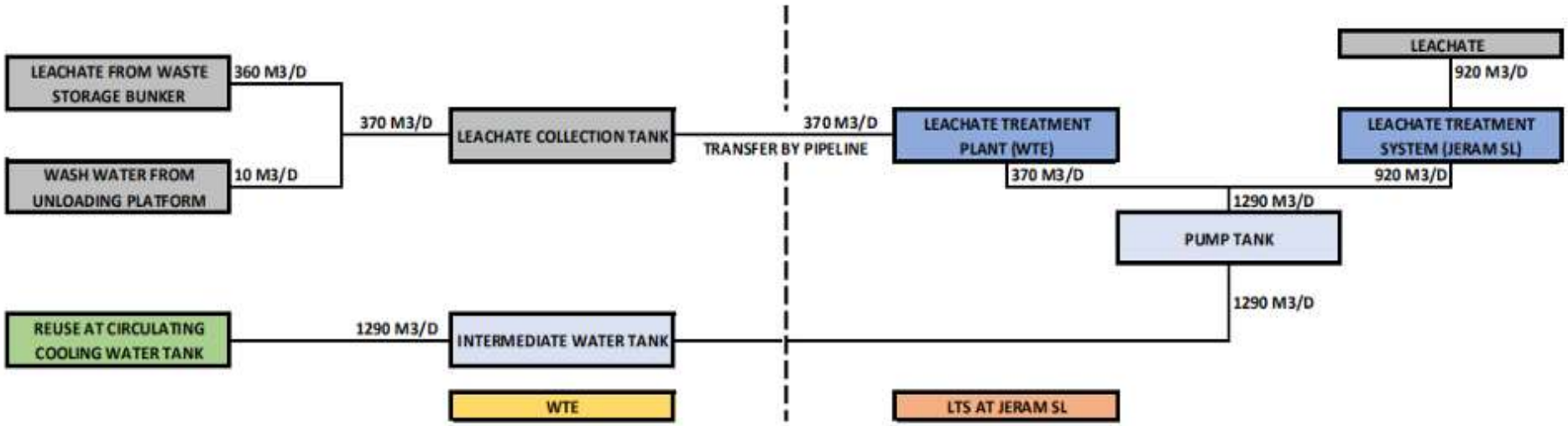
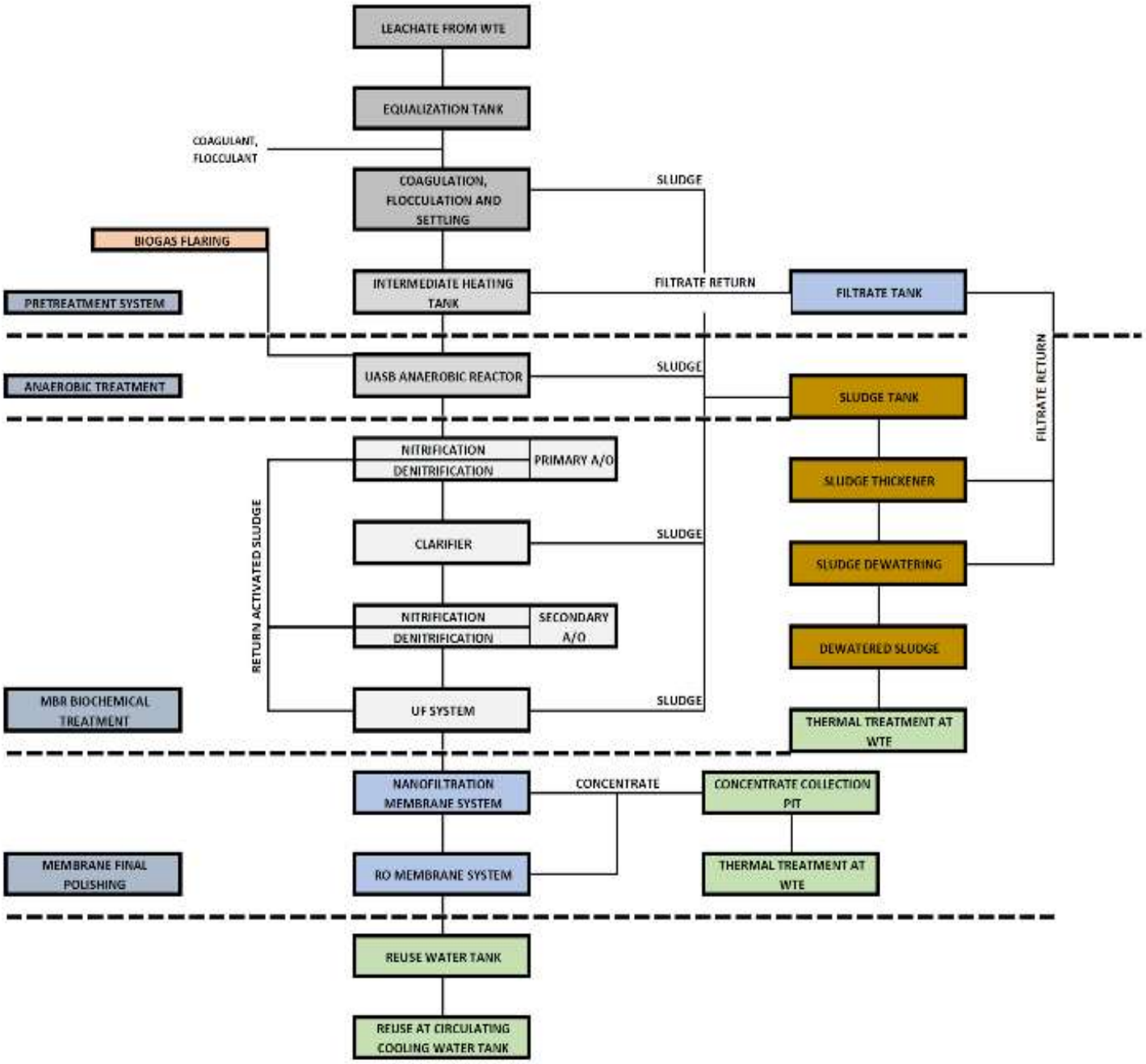


Diagram O: Flowchart For Treatment Stream B



The maximum, average and minimum daily water supply to the plant is tabulated in the following **Table Q**.

Table Q: Total Water Supplied

NO	WATER SUPPLY TO PLANT	MAXIMUM WATER SUPPLY (m^3/day)	AVERAGE WATER SUPPLY (m^3/day)	MINIMUM WATER SUPPLY (m^3/day)
1.	Municipal tap water	16.5	16.5	16.5
2.	Ground water	1,663	1,587.4	1,511.1
3.	Recycled from Leachate Treatment System	1,290	1,290	1,290
	Total Water Supplied	2,969.5	2,893.9	2,817.6

It was noted that even though there are three scenarios of maximum, average and minimum water consumption and as well as water supply to the plant, the amount of recycled leachate that shall be re-used remains constant under these 3 scenarios that is 1,290 m^3 per day. The recycled leachate for re-use is contributed from the following streams as tabulated in **Table R** below.

Table R: Contribution Streams for Recycled Leachate

NO	CONTRIBUTION STREAMS	QUANTITY FOR RECYCLING (m^3/day)	PERCENTAGE OF LTS TREATMENT CAPACITY
1.	Existing Jeram Sanitary Landfill LTP	920	100%
2.	Proposed LTP for WTE	370	100%
	Total Recycled Water	1,290	

Hence, there is 100% re-use of the treated and recycled leachate to the WTE. The recycled water is required to meet the following water quality for acceptance as re-use water. The recycled water quality is also compared to the Environmental Quality (Control of Pollution from Solid Waste Transfer Station and Landfill) Regulations 2009, Acceptable Conditions for Discharge of Leachate.

Table S: Recycled Water Quality

NO	PARAMETERS	UNIT	MAX CONCENTRATION	LEACHATE DISCHARGE STANDARDS*
1.	pH		6.5 - 8.5	6.0 - 9.0
2.	Suspended Solids	mg/l	N.A	50
3.	Turbidity	NTU	5	NA
4.	Chroma (the degree of colorfulness)	degree	30	NA
5.	BOD	mg/l	10	20
6.	COD	mg/l	60	400
7.	Total Iron	mg/l	0.3	5
8.	Manganese	mg/l	0.1	0.2
9.	Chloride	mg/l	250	NA
10.	Silicate	mg/l	50	NA
11.	Total Hardness (as CaCO3)	mg/l	450	NA
12.	Total Alkalinity (as CaCO3)	mg/l	350	NA
13.	Sulphate	mg/l	250	NA
14.	Ammoniacal Nitrogen	mg/l	10	5
15.	Total Phosphorus	mg/l	1	NA
16.	Total Dissolved Solids	mg/l	1,000	NA
17.	Total Petroleum Hydrocarbon	mg/l	1	NA
18.	Anionic Surfactant	mg/l	0.5	NA
19.	Residual Chlorine	mg/l	0.05	NA
20.	Coliform Bacteria	/L	2,000	NA

Source: Feasibility Study Report Waste-To-Energy Project at Sanitary Landfill in Mukim Jeram
****means Second Schedule (Regulation 13) of Environmental Quality (Control of Pollution from Solid Waste Transfer Station and Landfill) reg. 2009: Acceptable Conditions for discharge of Leachate.***

H. Development Schedule

It is estimated that the proposed WTE development will be carried out for duration of approximately 51 months i.e., from Quarter 3/2019 until Quarter 4/2023. The development schedule as actual construction works are subjected to the authority's approval.

Table T: Proposed Project Development Schedule

Pre-Development Stage	**Timeline**
EIA / SIA Award	October 2019 (1 month)
Feasibility Study Finalise	October 2019 (1 month)
Joint Development Agreement (JDA) Signing	October 2019 (1 month)
Shareholder Agreement SHA) Finalise	November 2019 (1 month)
Special Purpose Vehicle (SPV) Formalize	November 2019 (1 month)
SEDA Application Completed	November 2019 (1 month)
Master Agreement	Quarter 1 2020 (3 month)
ST License provisional	Quarter 2 2020 (3 month)
Parcel B land acquire	Quarter 1 2020 (3 months)
Renewable Energy Power Purchase Agreement (REPPA)	Quarter 2 2020 (3 months)
Suruhanjaya Tenaga (ST) License Permanent	Quarter 2 2020 (3 months)
EPCC Award	Quarter 2 2020 (3 months)
PBT Agreement Sign	Quarter 1 2020 (3 months)
EIA complete	Quarter 2 2020 (3 months)
Financial close	Quarter 3 2020 (3 months)
Construction Stage	Quarter 4 2020 to Quarter 1 2023 (30 months)
Testing and Commissioning Stage	Quarter 2 2023 to Quarter 3 2023 (6 months)
Operations and Maintenance Stage for defect & liability period	Quarter 4 2023 (3 months)

Source: Worldwide Holdings Bhd, 2019

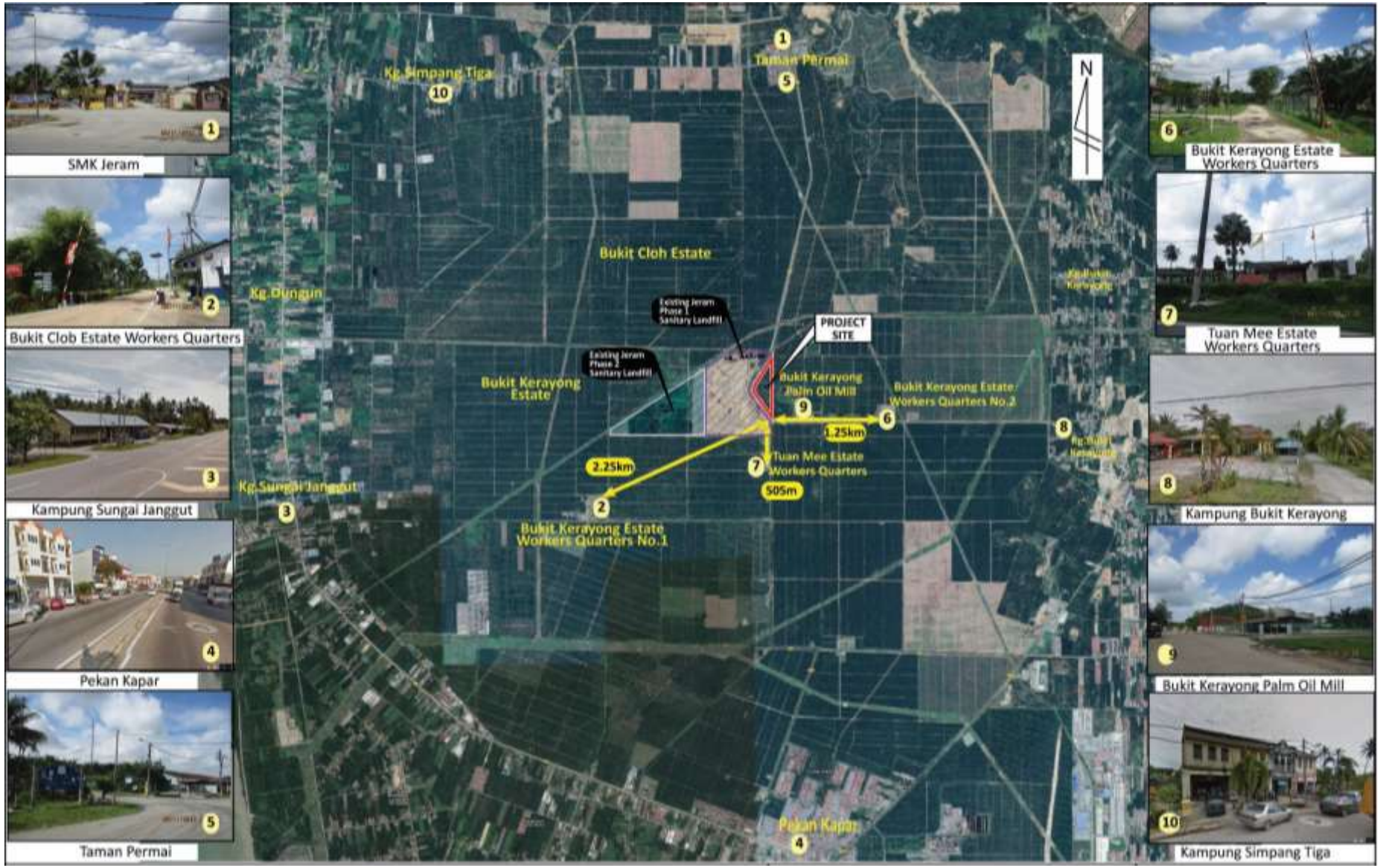
III. Existing Environment

PHYSICAL ENVIRONMENT	
Topography	i. Generally characterised as nearly flat terrains with the elevations ranging from GL2.50m to GL4.00m above mean sea level (msl) except a hill lock is located in the middle portion of the Project Site with the elevations ranging from GL5.00m to GL40.00m above msl. • The highest point - approximately GL40.18m (lies at hill lock in eastern boundary of the Project Site) • The lowest point - approximately GL2.26m (at the northern boundary of the Project Site).
Hydrology	i. The Project Site lies within a low-lying flat terrain which is drained by earth drains and man-made canals. ii. The earth drains from the proposed Project Site flows westerly into an excavated canal along Jalan Bukit Kerayong and subsequently northly into a channelized Sg. Sembilang which will flow westerly and eventually into the Straits of Melaka. iii. There is no water intake point located at the downstream of Project Site and Sg. Sembilang.
Geological	i. Based on the Geological Map of Peninsular Malaysia (9th Edition, 2014), the Project Site is underlain by Bedrock of the area is Kenny Hill Formation and alluvium. ii. Based on the soil investigation (SI) carried out by Messrs. Pantas Drilling Sdn. Bhd. from 2nd April 2019 until on 26th April 2019, there are five (5) nos. of deep boreholes (i.e. BH1 to BH5) and nine (9) nos. of monitoring wells with three (3) different depths and one (1) no. of water well drilled within the Project Site. iii. General, the subsoil condition on site can be simplified into three (3) main strata. • Subsoil Layer 1 (< N ≤ 15) – Very Soft to Stiff CLAY or Sandy SILT and Loose to Medium Dense Silty SAND; • Subsoil Layer 2 (15 < N ≤ 50) – Very Stiff to Hard Sandy SILT and Medium Dense to Dense Silty SAND; • Subsoil Layer 3 (N> 50) – Hard layer of Sandstone Bedrock.
Soil	According to the Reconnaissance Soil Map of Peninsular Malaysia (*Pindaan* 2002): - i. The soil within the Project Site is classified as marine alluvium soil of Selangor-Kangkung Association.

Cont....'

PHYSICAL ENVIRONMENT	
Hydrogeology/ Groundwater	i. With reference to the Hydrogeological Map of Selangor and Kuala Lumpur Federal Territory (2008), the entire Project Site is located on very high potential aquifer regime of this region. ii. The nearest tube wells are located near Meru Town which is approximately 10km southeast from the proposed Project Site, could be correlated to the groundwater volume. These active tube wells indicate that the groundwater could yield between >20.0 meter^3/hour.
Landuse	i. Agricultural areas are the prevalent land use, with a total area of 18,275.49 acres (84.05% of the impact area). The main cultivated crops in the vicinity of the Project Site are rubber and oil palm which cover approximately 359.95 acres (1.66%) and 16,780.15 acres (77.17%) of the impact area respectively. ii. The settlements & associated non-agricultural areas are the second predominant landuse in the impact area with a total of 2,277.89 acres or 10.48%. These urbanized areas are usually in the form of townships and settlements/ villages areas in the vicinity to the Project Site i.e. Taman Permai as well as Taman Pekerti and Kg. Kapar though a bit far off from the Project Site but still within the zone of impact. iii. Forest area determines the landscape of the total impact area which consists of idle scrubs. This component covers about 37.67 acres or 0.17%. Other component within the zone of impact is cleared land and water body which makes up to about 1,152.65 acres out of the total impact area. iv. The Project Site covers approximately 0.138% of the total impact area which is currently oil palm estate. Immediate receptors to the Proposed Project as shown in **Figure E.**

Figure E: Immediate receptors to the Proposed Project



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PHYSICAL ENVIRONMENT

Baseline Sampling
- River water

i. Water sampling session was conducted on 16th May 2019 (W5 & W6) representing two monitoring sessions i.e., morning and evening.
ii. Existing water quality sampling (W1 to W5 – along the Sg. Sembilang) for JSL1 and JSL2 during March 2019 to November 2019 was used as secondary data for the study.
iii. All sampling points generally fall under Class II to Class IV of the National Water Quality Standards (NWQS) for Malaysia as shown in **Table V**. Generally, the water quality is clean (Class II), slightly polluted (Class III) and polluted (Class IV) for all water sampling points.

Table V: Water Sampling Points

Date	Sampling Points (WQI Index)						
	W1	W1A	W2	W3	W4	W5	W6
20/3/2019	37 Class IV	42 Class IV	48 Class IV	-	-	-	-
24/4/2019	67 Class III	68 Class III	68 Class II	-	-	-	-
16/5/2019 (am)	-	-	-	-	-	61 Class III	ND
16/5/2019 (pm)	-	-	-	-	-	51 Class IV	ND
29/5/2019	65 Class III	62 Class III	63 Class III	-	-	-	-
26/6/2019	79 Class II	78 Class II	77 Class II	45 Class IV	46 Class IV	49 Class IV	-
15/7/2019	76 Class III	66 Class III	70 Class III	78 Class III	53 Class III	58 Class III	-
28/8/2019	80 Class II	76 Class III	81 Class II	70 Class III	63 Class III	61 Class III	-
30/9/2019	77 Class II	79 Class II	77 Class II	74 Class III	52 Class IV	51 Class IV	-
23/10/2019	70 Class III	68 Class III	73 Class III	75 Class III	47 Class IV	67 Class III	-
27/11/2019	77 Class II	79 Class II	77 Class II	74 Class III	52 Class IV	51 Class IV	-

Source: Europasia Engineering Services Sdn. Bhd, 2019
ND – No Discharge during the sampling

Groundwater

i. The baseline groundwater sampling has been carried out at WTE-GW1, WTE-GW2 and WTE-GW3 on 16th May 2019.
ii. Existing groundwater quality sampling (JSL1-GW1, JSL1-GW2, JSL-GW4 and JSL2-GW4) at JSL1 and JSL2 during March 2019 to September 2019 was used as secondary data for the study.
iii. Sulphate, Manganese, Iron and Hardness ($CACO_3$) were exceeded the MOH Acceptable Value for Recommended Raw Water Quality of National Drinking Water Quality Standards, 2004 and DOE National Groundwater Quality Standard for Industry at all three (3) points, i.e., WTE-GW1, WTE-GW2 and WTE-GW3. In addition, Chloride was recorded 265 mg/L at WTE-GW2 which exceeded the DOE National Groundwater Quality Standard for Industry limit of 100mg/L and MOH compliance limit of 250 mg/L.

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PHYSICAL ENVIRONMENT

Baseline Sampling

- Air Quality

i. Air quality assessment was carried out from the 18th to 23th March 2019. Sampling point location is as depicted in **Table W**.
ii. From the results obtained for the baseline, all parameters are within the respective limits stated in the Malaysia Ambient Air Quality Standard IT-2 (2018). There is no limit for TSP, HCl, HF, heavy metals, volatile organic compounds, dioxin and furan in the existing Malaysia Ambient Air Quality Standard.
iii. Hydrogen chloride (HCl) was found in air samples collected at locations WTE-A1, WTE-A3 and WTE-A4 while hydrogen fluoride (HF) was also recorded at location WTE-A3.Dioxin and furan measurement conducted at all locations shows that the total I-TEQ at minimum concentration was less than 0.000001 ng/Nm^3 to the maximum concentration of 0.000080 ng/Nm^3.

Table W: Sampling Point for Air

Sampling Location	Location	Description
WTE-A1	N 3º11' 18.09" E 101º 22' 5.208"]	At an open space, within the proposed project site area.
WTE-A2	N 3º 10' 51.714" E 101º 22' 9.282"]	At an open space, near to office Tuan Mee Estate workers quarters.
WTE-A3	N 3º 11' 10.182" E 101º 22' 53.076"]	At an open space, at Bukit Kerayong Estate workers quarters No.2.
WTE-A4	N 3º 13' 32.832" E 101º 22' 15.546"]	At an open space, in between Taman Permai and SMK Jeram, near Jalan 1.
WTE-A5	N 3º 10' 30.84" E 101º 21' 1.542"]	At an open space, at Bukit Kerayong Estate workers quarters No.1.

Source: Europasia Engineering Services Sdn. Bhd, 2019

- Noise Quality

i. Noise levels at the designated sampling sites, i.e. WTE-N1 to WTE-N3 (same location with the air quality assessment) were determined from 7:00 a.m. to 10:00 p.m. for day-time and 10:00 p.m. to 7:00 a.m. for night-time.
ii. The result analysis shows that existing noise level at all sampling locations for both sessions within the permissible limits (i.e., day-time & night-time) except for WTE-N1 during night-time.
iii. High noise level is most probably attributed to the noise from the vehicle's movement along the main road, i.e., Jalan Bukit Kerayong.

- Odour

i. A baseline odour sampling and determination was carried out on 15th and 16th April 2019 (Monday and Tuesday) by SOx NOx Asia Sdn. Bhd.
ii. It could be observed that the unpleasant residual landfill smell at the identified sensitive receptors was occasionally perceived faintly (<2 D/T) at Bukit Kerayong Estate Worker Quarters No. 2 (O3) and Bukit Kerayong Estate Worker Quarters No. 1 (O5).

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BIOLOGICAL ENVIRONMENT	
▪ The proposed project site itself is an oil palm estate located within part of Tuan Mee Estate. ▪ Landuse and site survey revealed that there are no protected areas such as forest reserve, wildlife reserve, wetland, water catchment and river reserve within the Project Site itself. ▪ Based on Local Plan of Majlis Daerah Kuala Selangor 2025, the Proposed Project Site itself is not located within any Proposed Environmental Sensitive Areas (ESA). ▪ The Proposed Project Site does not fall within the 55 Important Birds and Biodiversity Area (IBA) in Malaysia (www.birdlife.org) and it is located approximately 7km west to the Important Birds Area (IBA) of North-Central Selangor Coast (MY011).	
Flora	i. The most dominant trees in the Project Site are oil palms (mature & young plantings) and shrubs.
Fauna	i. Very much adversely affected due to currently ongoing surrounding development activities nearby which does not provide a suitable habitat for wildlife. ii. Long-tailed Macaques, stray cows and Monitor Lizards are common animals within the Project Site and Jeram area.
Aquatic Species	i. A total of 39 fish individuals from four (4) species was caught at the Study area, i.e. Puyu (*Anabas testudineus*), Haruan (*Channa striata*), Keli Bunga (*Clarias macrocephalus*) and Sepat Ronggeng (*Trichopodus trichopterus*). ii. The food tainting assessment carried out indicated that most of the parameters analysed in fish muscle were found to be within the permissible limits stated by the Food and Agriculture Organization and World Health Organization as well as Malaysian Food Act 1983 and Food Regulations 1985. iii. Only lead (Pb) level at S2 (1.77 mg/kg) was higher than the permitted limit of 1.5 mg/kg by Food and Agriculture Organization and World Health Organization (FAO/WHO, 2004).

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SOCIO-ECONOMIC AND HUMAN ENVIRONMENT

- Based on the direction from PLANMalaysia@ Selangor as per letter dated 19 December 2018 (Ref: JPBD.Sel./04/06/00125 Vol.2 (4)) which states that the Department agrees a **Social Impact Assessment (SIA) Study is not required** as:
  - The development of a Waste To Energy (WTE) Plant Project is part of the component facility of the Jeram Integrated Solid Waste Management Centre (ISWMC) which is developed on land owned by the Selangor State Government.
  - An SIA study had been carried out in 2015 as part of the EIA (for the main component of the facility) and approved in 2016. The SIA study included socio-economic issues which had arisen, mainly related to transportation of solid waste.
  - The WTE facility involves closed processes.

- The deliverables from this study comprises of the Social Impact Assessment (SIA) analysis and report which identifies expected impacts (plus as have been carried out in previous SEIA) on the communities within the ZOI, and mitigation measures necessary to address those impacts and status of action undertaken resulting of suggested measures from previous detailed SEIA study. In this present study, a statement of accountability or "aku janji" in the form of a Social Impact Assessment (SIA) from the proponent is sought after.
- This SIA will be a brief summary of the perceived accountability – which may also take the form of a special focused CSR activity - by WHB or its subsidiary Worldwide Landfill Sdn Bhd on matters having persistent impacts on communities within the ZOI. Collective mitigation measures, as outlined in the previous SEIA study (and how far these have since been acted upon) and current study's mitigation measures; and a mutual wholehearted effort to eradicate and / or minimise the woes facing communities, roads users as well as waste disposal transport operators, not only can be genuinely undertaken but also must be seen to be implemented and enforced.

PUBLIC HEALTH ENVIRONMENT

- Morbidity statistics on diseases related to the environment were obtained from Klinik Kesihatan Jeram for a period of 1 year from January to December 2018. Eye and respiratory diseases as represented by conjunctivitis, asthma and tuberculosis made up 0.7% and 5.2% of all adult and children cases, respectively. Cardiovascular diseases as represented only by hypertension made up 3.3% of all adult cases.
- Only food poisoning cases were reported at the clinic and these cases made up only 0.08% of all adult cases.
- Dengue fever cases were reported, and they made up only 0.2% and 0.7% of all adult and children cases.
- The skin disease cases made up only 0.2% and 1.2% of all adult and children cases, respectively. The most common skin disease reported was urticaria.
- The following morbidity statistics are regarding diseases related to the environment which were obtained from Hospital Tengku Ampuan Rahimah for a period of one year, from July 2017 to June 2018.
- Eye and respiratory diseases as represented by conjunctivitis, upper respiratory tract infections, influenza, asthma, tuberculosis, pneumonia, chronic bronchitis, emphysema and lung cancer made up 17.9% and 39.0% of all adults and children cases, respectively. Cardiovascular diseases as represented by hypertension, heart failure, ischemic heart disease and cerebrovascular accident/stroke made up of 20.3% and 0.5% of all adult and children cases, respectively.

▪ The water pollution related diseases as represented by dysenteries, typhoid and paratyphoid, hepatitis A, acute poliomyelitis and food poisoning made up 1.0% and 2.3% of all adult and children cases, respectively. ▪ These animal vector and reservoir related disease cases made up of 2.4% and 2.2% of all adult and children cases, respectively. ▪ These skin diseases made up of 4.0% and 4.8% of all adults and children cases, respectively. ▪ The prevalence rates of selected communicable diseases in Daerah Kuala Selangor in 2018, in comparison with the prevalence of these diseases in Malaysia in 2017. The prevalence rates for typhoid, hepatitis A, dysentry, food poisoning, dengue fever and leptospirosis in the district were higher than that of the nation. This means that foodborne diseases were a problem in the district while the higher prevalence of dengue fever and leptospirosis are a concern as they are problematic communicable diseases in Malaysia
TRAFFIC
▪ The proposed development is accessible via Federal Highway (FR2) and New North Klang Straits Bypass (E30) and exit at Federal Route 5 (Jalan Kapar). From FR5, it will link to Jalan Bukit Kerayong until reach the Jeram Sanitary Landfill and the proposed site located on the right bound.

IV. Significant Environmental Impacts & Proposed Mitigating Measures

The key environmental issues are those related to activities during the site clearing, construction phase and operational phase. All the impacts that are likely to be generated by the proposed Project together with the proposed mitigation measures are summarized in **Table N.**

V. Environmental Management Plan (EMP) and Emergency Response Plan (ERP) Framework

Apart from the recommendation of mitigating measures, this report also emphasizes on the formulation and implementation of an environmental management plan (EMP). This plan involves the participation of the Project developer, local authorities and consultants. The outline of the EMP relies on a collective effort from all the various group involved regardless of their level of involvement in the hierarchy. The management schemes and monitoring program proposed for the proposed Project at operational levels are: -

- Supervision, field training and maintenance program for pollution control structures;
- On-site implementation of land disturbing-pollution prevention measures;
- Planning of a progress of works on site;
- Provision of safety measure along with an emergency response plan;

- Implementation of a properly documented traffic management scheme to ensure safety within the site;
- Water, groundwater, air and noise quality monitoring to evaluate the effectiveness of the proposed mitigation measures implemented on-site;
- Water, groundwater, air and noise quality need to be analyzed by a laboratory accredited by Jabatan Piawaian (Standard) Malaysia.
- Monitoring program for air and leachate effluent quality is deemed essential during operational phase to safeguards against the potential of unexpected emissions and effluent discharge.

Environmental Management System

The key advantages of implementing an environmental management system are that it provides a disciplined approach to environmental management and ensures that issues that may impact on the environment are identified and addressed.

An environmental management system should also include a plan for shutdown or closure of the facility involved. There should be a plan in place for remediation of buildings and soils and for financial assurance that a proper shutdown will occur in the event that such shutdown or closure proves necessary.

Emergency Response Plan

An action plan is proposed and workers trained, to respond to emergencies or accidents, including proper use of personal protection equipment. Emergencies may occur on site at the facility or off-site during transportation. Based on the hazards identified above, a proposed Emergency Response Plan (ERP) should be prepared prior to the operations of the plant.

Quantitative Risk Assessment

It is noted that the risks have been assessed on a conservative basis, both in terms of consequences (e.g. use of the maximum inventories of hazardous substances in vessels, worst case process conditions, releases are modelled based on initial maximum (rather than average) release rates, no account taken of site drainage/ emergency spill containment systems to limit the spread of liquid releases etc. using published computer models that are inherently conservative), and frequency – i.e. no account has been taken of project site safety systems (e.g. isolation valves, detectors), operator intervention to prevent or minimise releases and no credit has been taken to account for the site Safety Management System.

A worst-case scenario (WCS) is a scenario with furthest consequence distance, while worst case credible scenario (WCCS) is a credible scenario (with event frequencies > 1×10^{-6} per year) with furthest consequence distance.

- The WCS and WCCS for fire event is jet fire due to catastrophic leak (rupture) of pipeline from the Diesel Tank to Incinerator containing Diesel. The pipeline operates at 33^{o}C and 16barg pressure. The overpressure contours for the WCS and WCCS show that the hazard zone of 37.5 kW/m^2 thermal radiation level will reach up to 44.45 m while the 12.5 kW/m^2 and 4 kW/m^2 thermal radiation levels will extend up to 54.89 m and 71.18 m each.
- The WCS and WCCS for explosion event is explosion due to catastrophic leak (rupture) of Incinerator containing Diesel. The Incinerator operates at 220^{o}C and atmospheric pressure. The overpressure contours for the WCS and WCCS show that the hazard zone of 0.21 bar overpressure level will reach up to 65.23 m while the 0.021 bar overpressure level will extend up to 325.62 m.

However, mitigating measures are necessary to ensure that the plant will operate safely such as the implementation and practice of an emergency plan for the site covering incidents related to handling, storage and process of hazardous materials. These also include the firefighting system and safety control system.

VI. Study Findings

The report has assessed the three (3) main facets of environmental entities i.e. physical, biological and socio-economics of the human settlements with the integration of the proposed WTE Plant. Studies were carried out within the project site itself and its surrounding areas.

The existing biological environment at the Project Site is limited to the flora and fauna composition of an oil palm estate in Peninsular Malaysia. Based on Local Plan of Majlis Daerah Kuala Selangor 2025, the Proposed Project Site itself is not located within any Proposed Environmental Sensitive Areas (ESA). Majority part of the biological environment will be lost during site clearing and construction activities. However, this can be mitigated via the various practical and cost-effective remedial measures recommended in this report to minimize adverse environmental impacts.

Project Development activities must take into the considerations of the nearest receptors which is the Tuan Mee Estate Workers Quarters and Bukit Kerayong Estate Workers

Quarters No.2, located at the 505m southern and 1.25km eastern region to ensure there are minimal disruptors to their well-being. In terms of socio-economics and human settlements within the project site, there was no human settlement observed within the project site except a Hindu Shrine which will be relocated to the southern portion of the Project Site. Therefore, no socio-economics activity that shall be affected by this proposed development within the site.

In reviewing the proposed Project and its' anticipated integration with the existing environment of the Project Site, the main concerns are the process employed, the potential contamination (i.e. water, air and noise pollution) on the physical environmental and aspects of health and safety upon human during the operation phases of the proposed WTE Plant.

During the earthwork stage, earthworks will only be carried out at the Project Site for one (1) Phase and the Project Site should not commence without the implementation of the LD-P2M2 control. The appointed contractor should strictly adhere to the approved earthworks engineering plan and LD-P2M2 during the construction phase. In addition, based on the assessment carried out, it is recommended that the proposal of one (1) sediment basin for the development must be carried out in order to ensure that the surface run off is at a manageable level to ensure compliance to limits on surface quality control. Erosion control measures must be instituted as per the recommendations of the Land Disturbing Pollution Prevention and Mitigation Measures (LDP2M2).

During the operational phase, the total municipal solid wastes (MSW) to be processed in the WTE will amount to 1,200 tonnes/days. The total daily incoming flow rate of the waste leachate (360m^3/d) + ground flushing water for refuse discharge platform (10m^3/d) for WTE development is 370 m^3/day. The main characteristic of the leachate effluent is the organic pollutants of COD, BOD_5 NH_3-N, Total Nitrogen, Total Phosphorus as well as Total Suspended Solids (TSS).

The leachate from WTE Jeram will be pumped to the existing Leachate Treatment Plant at Jeram Sanitary Landfill for treatment before it is treated for reuse in the WTE Plant. The Jeram Sanitary Landfill and WTE Plant LTP treated water are 100% reused and under normal conditions, there are no discharge to Sg. Sembilang. In the event WTE Plant is not in operation (for example during maintenance period), the Jeram Sanitary Landfill LTP treated effluent will be discharge into Sg. Sembilang. The treated effluent shall comply to the minimum Acceptable Conditions for Discharge of Leachate, Second Schedule (Regulation 13) of the Environmental Quality (Control Pollution from Solid Waste Transfer

Station and Landfill) Regulation 2009 and also committed parameters limits under Waste Load Allocation (WLA), DEIA study 2016.

For groundwater assessment, it predicted a local effect due to the construction of the WTE. Changes in the pressure head in the layer 4 and 5 will not give a significant impact the groundwater system in the area. The groundwater flow in the site area and the surrounding area is remained the as is in the existing environment. The contaminant transport model indicates that contaminant leakage in the WTE will not intrude into the aquifer layer. The contaminant remains static in the simulated area. There is no indication the contaminants will interact with both river water of Sungai Sembilang, Sungai Tambak Jawa and pumping well.

In terms of scheduled wastes, there will be sludge generation from the Leachate Treatment Plant (LTP) in the existing Jeram Sanitary Landfill and the sludge from LTP is classified as scheduled waste SW204. The Project Proponent has already obtained approval of special management of scheduled waste from DOE Malaysia to dispose Sludge (SW204) of the LTP to the existing Jeram Sanitary Landfill since its operation in Year 2010.

In terms of Air Pollution control, the WTE Plant employs "SNCR (in-furnace) + semi-dry process + dry process + activated carbon injection + bag type dust collector" in the flue gas treatment system. The emission concentrations shall comply with Third Schedule [Regulation 13]: Limit Values and Technical Standards (By Activity or Industry): K. Waste Incinerators In All Sizes of Environmental Quality (Clean Air) Regulations 2014 (CAR 2014). The Project Proponent will also apply a special management of scheduled waste from DOE Malaysia for fly ash and bottom ash generated during the WTE operational stage.

During Normal Operation, the calculated Ground Level Concentration (GLCs) for identified criteria air pollutants at the identified off-site ASRs i.e. **ASR1**, **ASR2**, **ASR3** and **ASR4** met the Malaysian Ambient Air Quality Standards 2013 at 2020 and the adopted Ontario's Ambient Air Quality Criteria. Further assessment on the contribution based on 25% threshold of the adopted IFC standard indicates that the predicted MAICs for the MAAQS 2013 criteria pollutants were within the calculated thresholds.

During Abnormal Situation, the predicted 1-hour averaging time for identified air pollutants is assessed to have significant impact to the surrounding areas. Nevertheless, all the predicted MAICs were below the adopted Acute Exposure Guideline Level-1 (Non-disabling) values for the prescribed air pollutants.

For the assessment of Stack Height at 80 m and 100 m, it could be observed that there is a significant reduction i.e. more than 20% (Rule of thumb) of the identified air pollutants highest MAICs and reduction of concentrations at the existing hill towards the northeast of the Project Site (located more than 3 km).

For Health Impact Assessment of all the air pollutants identified, only Cd and dioxins and furans (as 2,3,7,8-TCDD) are carcinogens. Using the published inhalation URF, the LCR from a lifetime exposure of 40 years to these carcinogens were estimated for their highest 24-hour incremental concentrations under controlled Project operational phase at Bukit Kerayong Worker Quarters No. 2 (ASR2), the total Lifetime cancer risk (LCR) for both carcinogenic air pollutants at 80 m and 100 m stack height is 1.1×10^{-6} and 1.0×10^{-6}, respectively. Therefore, the LCR is deemed as acceptable.

The project proponent shall be responsible for all aspects related to the development of the project including the environmental planning of the project and its associated cost. The major roles and responsibilities of the proponent shall be the following:

- Allocating sufficient funds for implementation of Environmental Management Plan (EMP) including temporary pollution prevention and mitigation measures (P2M2)
- Ensuring the EMP including temporary and permanent pollution prevention and mitigation measures (P2M2) are implemented and maintained.
- Appointing an Environmental Officer during construction stage
- Appointing competent personnel for the WTE plant during operation stage

Based on the findings of the study and the deliberations put forth in mitigating any identified impacts, it can concluded that the proposed WTE Plant development can be carried out within the context of a carefully planned and managed project that will be ultimately beneficial to contribute towards the social acceptability, waste management and job opportunity to the Kuala Selangor, Selangor.