CHAPTER 2

Terms of Reference (TOR)

Chapter 2 TERMS OF REFERENCE (TOR)

2.1 Introduction

As part of the EIA study requirement, Terms of Reference (TOR) for the Project is to be prepared and submitted to DOE Putrajaya. TOR was submitted to DOE Putrajaya on 18 July 2018, subsequently TOR review meeting was held on 19 September 2018. Based on feedbacks obtained during the TOR review meeting, TOR (Revision 1) was submitted to DOE on 31 October 2018. The TOR (Revision 1) was endorsed by DOE Putrajaya on 21 November 2018 (DOE's letter reference no. JAS 50/013/901/082 (19)). The TOR endorsement letter and full copy of the TOR document are appended in **Appendix 2.1.1**.

Principally, the TOR contains the following information:

i. Brief information about the Project

ii. EIA study guidelines and approaches

iii. Significant environmental impacts to be studied

iv. Study boundaries

v. Assessment standards

vi. Description of assessment methodologies for water quality, air quality, noise and waste management

vii. Possible mitigation measures

2.2 Key Environmental Components

2.2.1 Water Quality

The thermal treatment or incineration of the healthcare wastes is a dry process. The only possible sources of wastewater are from the truck/ bin cleansing and disinfection activities. The potential scenarios for water pollution will be assessed based on the evaluation of the projected wastewater discharge from the washing bay area.

Initial assessment of wastewater management found that the potential impact on water quality is considered low since the volume of wastewater from the truck/bin cleansing and disinfection activities is low and shall be channelled to IETS for treatment before being discharged to the industrial area drainage system.

2.2.1.1 *Study Boundaries*

In order to gauge surface water quality within the Project area, baseline for water quality will be established for in-situ testing and analysis of grab samples taken at the proposed water monitoring locations as shown in **Table 2.2.1(a)** and **Figure 6.2.5**.

Water quality monitoring will be carried out twice (except for dioxin and furan) to represent dry and wet weathers, where possible. Dioxin and furan will be conducted once–off at upstream and downstream of the site as representative points for future comparison should there be any deposition of such pollutants upon the operation of the new incinerator.

Table 2.2.1(a): Proposed Baseline Water Quality Locations

Station	Approximate Coordinates	Justification
W1	2°16'47.6"N 102°10'50.3"E	To represent the existing water quality at existing drain next to the storm water drain discharge point at the southeast boundary of Project site
W2	2°16'47.3"N 102°10'50.4"E	To represent the existing water quality at existing drain next to the storm water drain discharge point at the west boundary of Project site
W3	2°16'00.9"N 102°10'37.6"E	To represent the existing water quality of Sg Ayer Salak located further downstream of the Project site

2.2.1.2 *Assessment Standards*

Surface water parameters to be tested are listed in **Table 2.2.1(b)** and the tests shall be conducted by SAMM accredited laboratory using appropriate APHA Standard Test Methods. Test results will be discussed in the EIA report with comparison made with the National Water Quality Standards for Malaysia, where relevant.

Table 2.2.1(b): Proposed Water Quality Parameters

Parameters	**Test Method**
Temperature	In-situ, APHA 2550 B
pH value	In-situ, APHA 4500-H+B
Dissolved Oxygen (DO)	In-situ, APHA 2500-O G
Biochemical Oxygen Demand (BOD)	APHA 5210B & 4500-O G
Chemical Oxygen Demand (COD)	APHA 5220 C
Total Suspended Solids (TSS)	APHA 2540 D
Mercury	APHA 3112 B
Cadmium, Lead, Copper, Zinc, Iron, Manganese, Nickel	APHA 3111 B
Total Chromium	APHA 3125 B
Arsenic	APHA 3114 B & C
Tin	In-house Method 0502 based on APHA 3111 D
Boron	APHA 4500-C B
Cyanide	APHA 4500-CN C & D
Phenol	APHA 5530 C
Free Chlorine	In-situ, In-house Method 0501 base on Palintest Comparator
Sulphide	APHA 4500 S2- F
Oil and grease	APHA 5520 B
Turbidity (NTU)	APHA 2130 B
Ammoniacal Nitrogen	APHA 4500-NH_3 C
Total Coliform Count	APHA 9221 B
Faecal Coliform Count	APHA 9221 E
Dioxin and furan	US EPA Method 1613B

2.2.1.3 *Description of Modelling Tools and Assessment Methodologies*

Initial assessment of wastewater management found that the potential impact on water quality is considered low since the volume of wastewater from the truck/bin cleansing and disinfection activities is low and shall be channelled to IETS for treatment before being discharged to the industrial area drainage system.

Nonetheless, the assessment on water quality shall be further detailed out in the EIA. The evaluation of impacts will be made against established standards and criteria made under the Environmental Quality Act, 1974 and its subsidiary legislation as well as other international accepted criteria.

2.2.1.4 *Possible Mitigation Measures*

Possible mitigation measures or best management practices from similar projects that may be used to address the water quality impacts of this Project are as follows:

- All chemicals, oil and fuels should be stored in a designated and covered area onsite. These areas should be provided with oil traps and also bunded to prevent spillage.
- Trucks and bins washing water to be treated in IETS to comply with Standard B of the Environmental Quality (Industrial Effluents) Regulations 2009 prior discharge to public drain.

2.2.2 Air Quality

Prediction of air quality impact during construction stage is due to fugitive dust and gases emissions from vehicle exhausts and machineries. Potential air quality impact during construction stage is considered low, temporary and insignificant.

During operation stage, air quality impact is one of the main environmental issues expected from the operation of the proposed facility. The prediction of impacts due to air pollutants will be made for point and fugitive dust emissions. Air pollutants are expected from, but not limited to the following sources:

- Emissions of flue gases from combustion via the chimney
- Handling of ash

  Healthcare wastes incineration depending on the capacity, waste feed and combustion conditions of the incineration plant, can emit the following pollutants into the atmosphere:

- Particulate matter
- Heavy metals (i.e. lead, cadmium, arsenic, mercury)
- Acid gases (HCl, SO_2)
- Oxides of nitrogen
- Carbon monoxide
- Organics (VOC, dioxin and furan)

Various other materials present in healthcare wastes, such as pathogens and cytotoxins. No radioactive substances are expected as these are removed before the waste is incinerated.

Particulate matter is emitted as a result of incomplete combustion of organic matter and the entrainment of non-combustible ash due to the turbulent movement of combustion gases. Particulate matter may contain heavy metals, acids and trace organics. Acid gases like HCl and (SO_2) in the exhaust gas are directly related to the chlorine and sulphur content of the waste. Most of the chlorine are from polyvinyl chloride (PVC) waste and other chlorinated compounds wherein during incineration are converted to HCl. Sulphur is also chemically-bound within the waste materials and is oxidised during combustion to form SO_2.

NOx are formed during combustion by i) oxidation of nitrogen chemically bound in waste and ii) reaction between molecular nitrogen and oxygen in combustion air. As for CO, it is a product of incomplete combustion.

Similarly failure to achieve complete combustion of organic materials may result in emissions of a variety of organic compounds such as methane, ethane and other high molecular weight organics (dioxins and furans).

2.2.2.1 *Study Boundaries*

In order to gauge baseline ambient air quality within the Project site and at the identified sensitive receptors, four sampling locations will be established as listed in **Table 2.2.2(a)** and shown in **Figure 6.2.5**. Ambient air monitoring will be carried out twice (except for dioxin and furan) preferably to represent dry weather and wet weather conditions.

Table 2.2.2(a): Proposed Baseline Ambient Air Quality Sampling Locations

Station	Approximate Coordinates	Justification
A1	2°16'48.3"N 102° 10' 51.3"E	To represent the ambient air quality at the north boundary of Project site.
A2	2°16'53.7"N 102°11'15.9"E	To represent the ambient air quality at Taman Tg Minyak Perdana located northeast of Project site.
A3	2°16'36.6"N 102° 10' 25.5"E	To represent the ambient air quality at Kg Ayer Salak located southwest of the Project site.

2.2.2.2 *Assessment Standards*

The test parameters and respective test methods for ambient air quality baseline are tabulated in **Table 2.2.2(b)** Test results obtained will be evaluated against the Malaysia Ambient Air Quality Standard and Arizona Ambient Air Quality Standard.

Table 2.2.2(b): Proposed Test Parameters for Ambient Air Quality

Parameters	Test Methods
$PM_{2.5}$	High Volume Sampler AS/NZS 3580.9.14.2013
PM_{10}	High Volume Sampler AS/NZS 3580.9.6.2003
Sulphur Oxides (as SO_x)	Air Sampling Pump In House Method based on Methods of air sampling and analysis, 3rd Edition, Method 704 A
Nitrogen Oxides (as NO_x)	Air Sampling Pump In House Method based on Methods of air sampling and analysis, 3rd Edition, Method 818A (sampling excluded)

Parameters	Test Methods
CO	*In-situ* using Dositube
HCl	ID 174 SG
HF	ID 110
Lead, Mercury, Cadmium, Chromium, Arsenic, Copper	Extracted from particulate matters filter paper ICPMS
Dioxin and furan	US EPA Method TO-9A

2.2.2.3 *Description of Modelling Tools and Assessment Methodologies*

Based on assessment study requirements, the type of sources and outputs required, the model selected for this assessment will be the USEPA AERMOD Model. In this particular assessment, a 10 km X 10 km (5 km radius) Cartesian grid with 100 m spacing for the nearest 1 km receptors and 200m grid spacing for receptors further than 1 km from the source is used for impact modelling. The surface weather and upper air data used in the AERMOD modelling input will be from the nearest meteorological station. One year of the latest hourly meteorological data consisting of wind speed, wind direction, temperature, stability and mixing height available data will be used in the analysis.

All raw data used in the modelling will be appended in the EIA report. Pollutants to be modelled and assessed are:

i. PM_{10}
ii. $PM_{2.5}$
iii. NO_2
iv. SO_2
v. HCl
vi. arsenic (as As)
vii. cadmium (as Cd)
viii. lead (as Pb)
ix. mercury (as Hg)
x. dioxin and furan

Results of the modelling will be assessed based upon other criteria generally accepted by the DOE for ground level concentrations of air pollutants and also reputable and relevant international standards. The type of air pollution control system used will also be addressed. Based on the result, recommendations to minimise the impact to the surrounding land use or receptor will be formulated.

2.2.2.4 *Possible Mitigation Measures*

Possible mitigation measures or best management practices from similar projects that may be used to address the air quality impacts of this Project are as follows:

- Good housekeeping at site.
- No open burning of any materials on-site is allowed.
- Periodical impact monitoring of air quality at Project boundary and identified sensitive receptor.
- Installation of Continuous Emission Monitoring System (CEMS) shall be conducted to monitor the air emission parameters

More detailed and definite mitigation measures will be discussed in the EIA report.

2.2.3 Waste Management

Waste generated during construction and operation stages of the Project will potentially deteriorates the condition of the surrounding environment if they are not properly managed. Anticipated type of wastes to be generated from the Project is as tabulated in **Table 2.2.3**.

Table 2.2.3: Anticipated Waste from Project

Stage	Category	Type of Waste	Possible Source
Construction Stage	Scheduled Waste	Disposed containers, bags or equipment contaminated with chemicals, pesticides, mineral oil or schedule wastes (SW409)	Construction area, workshop
		Rags or filters contaminated with scheduled waste (SW410)	
		Spent lubrication oil (SW 305)	
		Waste of inks, paints, pigments, lacquer, dye or varnish SW 417	
	Solid Waste	Metal Scrap/ Construction material	Stockpile on site
Operation and Maintenance Stage	Scheduled Waste	Ashes from scheduled waste incinerator (SW 406)	Incinerator
		Spent lubrication oil (SW 305)	Incinerator, workshop
		Spent hydraulic oil (SW 306)	Incinerator, workshop
		Disposed containers, bags or equipment contaminated with chemicals, pesticides, mineral oil or schedule wastes (SW409)	Storage area
		Rags or filters contaminated with scheduled waste (SW410)	Storage area
		Sludges containing one or several metals including chromium, copper, nickle, zinc, lead, cadmium, aluminium, tin, vanadium and beryllium (SW204)	IETS

2.2.3.1 *Study Boundaries*

The study will address wastes generated by the Project.

2.2.3.2 *Assessment Standards*

Impact assessment on waste management based on best management practises as well as latest Acts and Regulations.

2.2.3.3 *Description of modelling tools and assessment methodologies*

Estimation of wastes generation will be attempted using historical data and secondary references. Proposed waste management plans will be evaluated and documented in the EIA report.

2.2.3.4 *Possible Mitigation Measures*

Possible mitigation measures or best management practices from similar projects that may be used to address the noise level of this Project is as follow:

- No open burning of any materials on-site is allowed.
- All workers should be adequately trained in terms of appropriate use, handling and disposal of chemicals and lubricants involved in the operation of the facility.
- To provide appropriate designated and marked storage areas for scheduled wastes.
- All scheduled waste during maintenance works should be handled and disposed off according to the Environmental Quality (Schedule Wastes) Regulations 2005.

More detailed and definite mitigation measures will be discussed in the EIA report.

2.2.4 Noise

The major source of noise from the Project will arise from the operating machineries such as air compressors, feed hopper, exhaust fan and other mechanical systems.

2.2.4.1 *Study Boundaries*

The existing ambient noise levels will be monitored at five proposed monitoring stations as listed in **Table 2.2.4** and shown in **Figure 6.2.5**.

Table 2.2.4: Proposed Baseline Noise Measurement Locations

Station	Approximate Coordinates	Justification
N1	2°16'48.1"N 102°10'51.9"E	To represent the ambient noise level at the northeast boundary of the Project
N2	2°16'46.2"N 102°10'50.7"E	To represent the ambient noise level at the west boundary of the Project site.
N3	2°16'44.7"N 102°10'52.9"E	To represent the ambient noise level at the south boundary of the Project site.
N4	2°16'53.7"N 102°11'15.9"E	To represent the noise level at Taman Tg Minyak Perdana located northeast of Project site.

2.2.4.2 *Assessment Standards*

Noise measurements will be conducted once at the monitoring station using a calibrated sound level meter and continuously over 24 hours period to represent 15 hours (7 am to 10 pm) day time and 9 hours (10 pm to 7 am) night time. Measurement parameters shall include L_{eq}, L_{max}, L_{min}, L_{10} and L_{90}. Extraneous and significant noise contributors observed during the monitoring sessions will be recorded. Measured results will be evaluated against the Planning Guidelines for Environmental Noise Limits and Control (**Appendix 3** of the ESI) and discussed in the EIA report.

2.2.4.3 *Description of Modelling Tools and Assessment Methodologies*

Noise levels at a distance from source can be predicted based on the approach that noise emanating from a source will attenuate naturally as it propagates over free air. This is due to wave divergence, which results in dissipation of sound energy. The attenuation of noise can be estimated based on information related to sound power level of the source and the distance over which the sound travels. Therefore, the propagation of a noise source measured at 1m away can be shown to behave to the following formula:

$L = L_0 - 20\ log_d$ (Point source)

$L = L_0 - 10log_d$ (Line source)

Where,

L = Noise Level at d metres away from the source
L_0 = Noise Level measured at 1 meter away from the source
d = Distance from the point source in meters

2.2.4.4 *Possible Mitigation Measures*

Possible mitigation measures or best management practices from similar projects that may be used to address the noise level of this Project are as follows:

- Establish periodical maintenance schedule for all motorised machineries and equipment as preventive measure to minimise emission of loud noise. Attention shall be given to efficiency of mufflers to reduce noise problems.

- Enclosure or other type of acoustic measures shall be applied on equipment which contribute to noise levels higher than 85 dB (A).

More detailed and definite mitigation measures will be discussed in the EIA report.

2.2.5 Health Impact Assessment

The Health impact assessment (HIA) component will investigate potential public health impacts from primary environmental influences such as air quality and water quality, on the population residing in the vicinity of the proposed Project especially during the construction and operation stages The HIA methodology will be based on the Guidance Document on HIA in EIA issued by the Department of Environment as well as the US EPA's Human Health Risk Assessment Protocol.

2.2.5.1 *Study Boundaries*

The study boundary for HIA is 5 km radius from the Project.

2.2.5.2 *Assessment Standards*

For acute health risk, exposure concentration or dose will be compared with the Malaysia Ambient Air Quality Standard and Arizona Ambient Air Quality Standard and discussed in the EIA report. For prediction of health impact, the reference concentration (RfC) will be referred to the US EPA Integrated Risk Information System.

2.2.5.3 *Description of Modelling Tools and Assessment Methodologies*

The Health impact assessment (HIA) component will investigate potential public health impacts from primary environmental influences such as air quality and water quality, on the population residing in the vicinity of the proposed Project especially during the construction and operation stages The HIA methodology will be based on the Guidance Document on HIA in EIA issued by the Department of Environment as well as the US EPA's Human Health Risk Assessment Protocol.

It is anticipated that main environmental influences from the proposed Project will be the changes to ambient air quality. The air pollutants that will be modelled for their health effects are:

i.	PM_{10}	ii.	NO_2	iii.	SO_2
iv.	HCl	v.	arsenic (as As)	vi.	cadmium (as Cd)
vii.	lead (as Pb)	viii.	mercury (as Hg)	ix.	dioxins and furans

A description of the existing public health status will be attempted. This will involve describing the present health status of the population residing in the vicinity of the proposed Project. It will involve both primary and secondary data collection. Primary data on community health status will be obtained through a health questionnaire survey of the residents within the proposed project's zone of impact. Secondary data on disease morbidity will be requested from the nearest government hospital and health clinic to the proposed project site.

To assess the public health risk of the proposed Project a health risk assessment (HRA) methodology will be employed. The HRA will describe the public health impacts and risks on the population residing within the zone of impact of the proposed Project during its construction and operational phases. It will employ the health risk assessment (HRA) approach adopted in the Guidance Document which comprises the six basic steps of issues identification, hazard identification, dose-response assessment, exposure assessment, risk characterization and uncertainty analysis. Data input into the HRA process will be sourced from the health survey, air quality modelling outputs, water quality modelling outputs, published epidemiological studies on health effects of air and water pollutants, and exposure parameters database from the US EPA or ATSDR. The specific areas which will be encompassed as part of this HIA will include, but will not be limited to:

- Assessment of public health risks (both acute and chronic) associated with the proposed emission of air pollutants from the Project during testing and commissioning and full operation. Assessment and impact projection will be in consideration of any other accumulating sources nearby the proposed Project site;

- Assessment of public health risks (both acute and chronic) associated with any other activities which at this stage of the assessment are not foreseen.

Based on the outcomes of the HRA process, appropriate mitigation and control measures will be proposed to minimize the environmental health impacts on the impacted community.

Residual environmental health impacts on the impacted community, if any, will be identified and adequately described. A proper environmental monitoring and auditing program will be proposed for the residual impacts identified, if necessary.

2.2.5.4 *Possible Mitigation Measures*

Possible mitigation measures or best management practices from similar projects that may be used to address the air quality impacts of this Project are as follow:

- No open burning of any materials on-site is allowed.
- Periodical impact monitoring of air quality at Project boundary and identified sensitive receptor.
- Installation of proper air pollution control equipment.
- Installation of Continuous Emission Monitoring System (CEMS) shall be conducted to monitor the air emission parameters.

2.2.6 Quantitative Risk Assessment

Quantitative Risk Assessment (QRA) is the application of methodology to produce a numerical representation of the frequency and extent of a specified level of exposure or harm, to specified people or the environment, due to the operation of the Project.

2.2.6.1 *Study Boundaries*

The study boundary for QRA is 5 km radius from the Project.

2.2.6.2 *Assessment Standards*

Risk Assessment criteria:

1×10^{-6} fatalities / person per year Individual Risk (IR) contour should not encompass involuntary recipients of industrial risks such as residential areas, schools, hospitals and places of continuous occupancy.

1×10^{-5} fatalities / person per year Individual Risk (IR) contour should not extend beyond industrial developments.

2.2.6.3 *Description of Modelling Tools and Assessment Methodologies*

The principal stages of this risk assessment are briefly described as follows:

- **Data Collection** - Information is collected and documented covering the following areas:
  - Description: the layout of the plant and proposed process.
  - Surrounding environment: the topography, meteorology, population distribution, possible ignition sources within or surrounding the proposed Project site.
  - Safety measures: the measures available to prevent and/or mitigate possible accidents.

- **Hazard Identification -** All potential hazards resulting from the failures of handling and storage of the hazardous substances are identified. The identification process uses a mixture of experience from previous QRA's.

- **Frequency Analysis -** All event outcome frequencies will be calculated based on generic data of failure rates / leak frequencies applicable for each relevant industry.

- **Consequence Modelling -** The consequences of each event are determined by established modelling programs such as CIRRUS. The consequences are expressed as distance to levels, which can cause fatalities.

- **Risk Presentation -** The frequencies and the consequences of each event are combined to produce overall measures of risk.

- **Major Risk Contributors -** The risk generated by each accident scenario is ranked in terms of initiating source and consequence type (i.e. explosion, jet fire, pool fire, etc.).

In examining the operations of the Project, all potential hazards arising from the Project's equipment failure will be identified. For this purpose, information on the Project layout will be used for the identification of hazards. The possible hazardous scenarios that shall be evaluated are pool fires and its possible impact towards the surrounding.

The results shall be presented in a risk contour plot representing the overall risk arising from accidents which could result in fatalities on-site and off-site. The final stage of this assessment is to compare the public risk level arising from the operation of the Project with commonly acceptable risk levels. Risk reduction measures and the effects of the mitigating measures will also be discussed to enhance the safety of the plant.

2.2.6.4 *Possible Mitigation Measures*

Possible mitigation measures or best management practices from similar projects that may be used to address the noise level of this Project is as follow:

- Review and update the Emergency Response Plan (ERP) for the operation of the Project.

- Enforce safety procedures to ensure authorised access only to the facility and further restrictions are in place for limiting storage area access to approved persons only.

- Perform regular emergency response drills (including desktop exercises), as well as feedback and review sessions.

- Conduct routine inspections of fire safety requirements (fire blankets, fire extinguishers, smoke detectors, sprinklers, emergency lighting and fire-rated doors etc.

More detailed and definite mitigation measures will be discussed in the EIA report.