EIA GUIDELINES

WASTE TREATMENT AND DISPOSAL - SCHEDULED WASTE

Department of Environment
Ministry of Environment and Water, Malaysia

Department of Environment, Malaysia

ISBN 978-983-9795-43-1

Published by:
DEPARTMENT OF ENVIRONMENT
Level 1-4, Podium 2&3
Wisma Sumber Asli
No. 25, Persiaran Perdana, Presint 4
62574 Putrajaya.

Printed by:
OMNITECH PRINT SYSTEMS SDN BHD
102, Jalan SS15/4
47500 Subang Jaya
Selangor Darul Ehsan.
Tel: 03-5880 6633
Email: my.omnitech@gmail.com

ACKNOWLEDGEMENT

The EIA Guidelines for Waste Treatment and Disposal (Scheduled Waste) has been developed to completion with involvement and support from various governmental and private organizations as well as individuals engaged in the scheduled waste management industry.

First and foremost, we would like to express our gratitude to ERE Consulting Group Sdn. Bhd. for their efforts in developing this Guidelines as well as to the DOE Steering Committee for providing guidance and support throughout its development.

The Department of Environment (DOE) would also like to express our gratitude to all the government agencies, both at the Federal and State level, the local authorities, developers, consultants and non-governmental organisations (NGOs) in providing their input and information for the development of this Guidelines.

Relevant information from various other governmental agencies were also made available to the Study Team. We wish to acknowledge the contributions of the DOE Hazardous Substances Division, Ministry of Health, Department of Drainage and Irrigation, PLANMalaysia, Public Works Department and Mineral and Geoscience Department.

We would also like to direct our gratitude to the waste management organizations that have shared their knowledge of scheduled waste treatment and disposal development and operations in Malaysia. These organizations include Kualiti Alam Sdn. Bhd, Trienekens (Sarawak) Sdn. Bhd, Medivest Sdn. Bhd., Clinwaste (M) Sdn. Bhd, Edgenta Mediserve Sdn. Bhd, Tex Cycle Sdn. Bhd, Meriahtek (M) Sdn. Bhd.

Finally, we wish to acknowledge the contributions from all those individuals who have shared their knowledge and experience for the development of the Guidelines.

PREFACE

Waste generation is intricately linked with development and industrialization, and its impacts on the environment is a global issue. While the development of scheduled waste treatment and disposal projects is critical in resolving waste disposal issues, these activities are also associated with environmental and social risks.

As Malaysia transitions into a developed nation, population growth, economic development, and changes in consumer consumption patterns have resulted in a higher complexity of waste and increasing scheduled waste generation. As the Government pursues sustainable solutions, new waste management systems and technologies will be adopted.

Scheduled waste treatment and disposal projects are a prescribed activity under Activity 14(a) of the Environmental Quality (Prescribed Activities) (Environmental Impact Assessment) Order 2015 where Project Proponents are required to conduct an environmental impact assessment (EIA). The EIA is an important assessment tool to ensure that the development of scheduled waste treatment and disposal projects are aligned with the requirements of the Department of Environment (DOE) Malaysia, and meets the requirements of other relevant technical agencies and stakeholders.

This guideline aims to provide Project Proponents and Qualified Persons with relevant information for the preparation of a comprehensive EIA report that meets the goals described above. It takes into cognisance the most recent policy framework, legal requirements, and guidelines from all related technical agencies. The guideline outlines data requirements, assessment tools and standards, and describes potential mitigation measures that may be implemented to reduce environmental and social risks.

In complying with this guideline, it is anticipated the development of scheduled waste treatment and disposal projects shall result in positive economic and social benefits while ensuring that the sustainable development can be achieved and the environment is preserved.

NORLIN BINTI JAAFAR
Director General
Department of Environment

INTRODUCTION

SCOPE OF THE EIA GUIDELINES

1 FIRST SCHEDULE

Activity 14(a)(i)
Construction of recovery plant (off-site).

Activity 14(a)(ii)
Construction of wastewater treatment plant (off-site).

Activity 14(a)(iii)
Construction of storage facility (off-site).

2 SECOND SCHEDULE

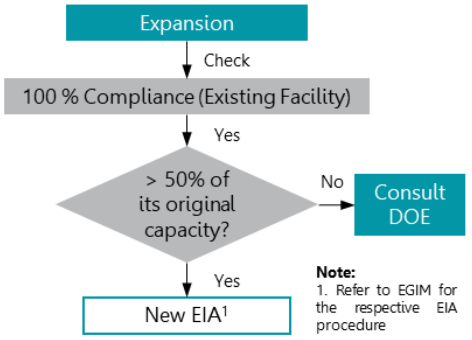
Activity 14(a)(i)
Construction of thermal treatment plant.

Activity 14(a)(ii)
Construction of recovery plant for lead acid battery (off-site).

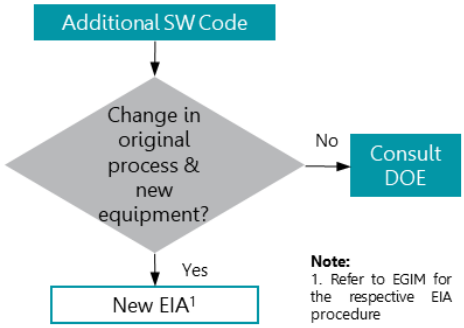
Activity 14(a)(iii)
Construction of recovery plant or treatment facility that generates significant amount of wastewater which is located at the upstream of public water supply (off-site).

Activity 14(a)(iv)
Construction of secure landfill facility.

EIA REPORT REQUIREMENT



Expansion for Scheduled Waste Treatment and Disposal Facilities



Additional Scheduled Waste Code for Recovery Facility (Off-Site)

SUMMARY

TERMS & DEFINITIONS

Scheduled Waste
Any waste falling within the categories of waste listed in the First Schedule in the Environmental Quality (Scheduled Waste) Regulations 2005

Prescribed Premises
As categorised under the Environmental Quality (Prescribed Premises) (Scheduled Wastes Treatment and Disposal Facilities) Order 1989:

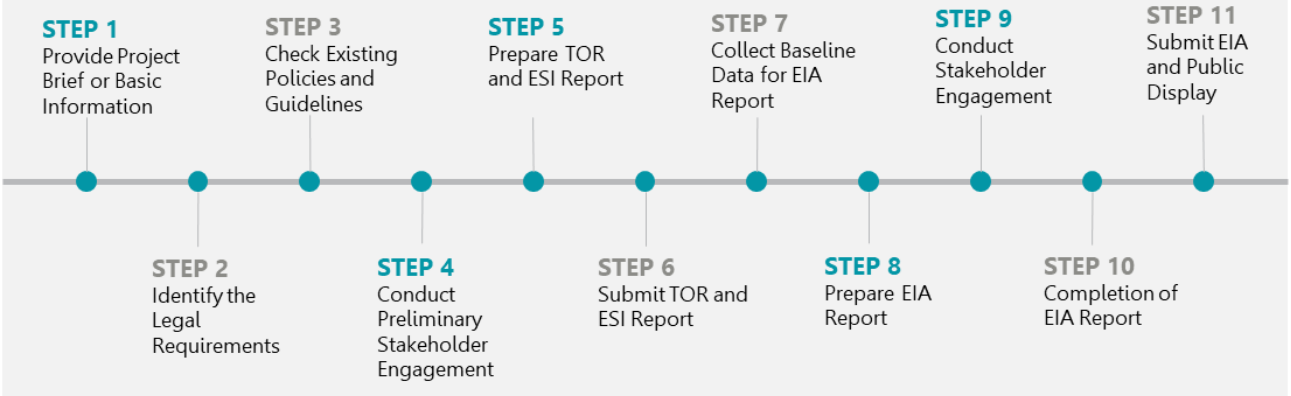
- Off-site storage facilities
- Off-site treatment facilities
- Off-site recovery facilities
- Scheduled waste incinerators
- Land treatment facilities
- Secure landfill

Off-site Recovery Facility
Premises occupied or used for the retrieval of material or product from any scheduled waste which is not produced on those premises

Off-site Treatment Facility
Premises occupied or used for the processing of any scheduled waste which is not produced on those premises

Off-site Storage Facility
Premises occupied or used for the storage, collection or transfer of any scheduled waste which is not produced on those premises

OVERVIEW OF EIA PROCESS



ENVIRONMENTAL PROJECT PLANNING SUMMARY

RELEVANT LEGISLATIONS

- Environmental Quality Act 1974.
- Environmental Quality (Licensing) Regulations 1977.
- Environmental Quality (Prescribed Premises) (Scheduled Wastes Treatment and Disposal Facilities) Order 1989.
- Environmental Quality (Prescribed Premises) (Scheduled Wastes Treatment and Disposal Facilities) Regulations 1989.
- Environmental Quality (Prescribed Conveyance) (Scheduled Wastes) Order 2005.
- Environmental Quality (Scheduled Waste) Regulations 2005.
- Environmental Quality (Industrial Effluent) Regulations 2009.
- Environmental Quality (Clean Air) Regulations 2014.
- Environmental Quality (Prescribed Activities) (Environmental Impact Assessment) Order 2015.
- Customs (Prohibition of Exports) Order 2017.
- Customs (Prohibition of Imports) Order 2017.
- Town and Country Planning Act 1976.

POLICIES AND GUIDELINES

Basel Convention

Import or export of hazardous wastes prohibited before obtaining Written Approval from DOE.

Importation

- Importation of hazardous wastes for final disposal is prohibited.
- Importation of hazardous wastes for the purpose of recovery is prohibited. Licensed recovery facility shall manage, and process hazardous wastes generated and collected in the country.
- Importation of hazardous wastes is allowed only for the purpose of direct reuse or as alternative raw material provided the hazardous waste is not available in the country.

Exportation

- Exportation of hazardous waste for final disposal is prohibited.
- Exportation of hazardous wastes is allowed subject to the following conditions:
  - i. The importing country has better technology which results in higher recovery rate than technology available in Malaysia.
  - ii. No technical capacity and facility to recover the hazardous wastes generated in environmentally sound management.

RELEVANT REQUIREMENTS AT VARIOUS PROJECT IMPLEMENTATION STAGE

1 Pre-Planning	2 Planning & Design	3 Pre-Construction	4 Construction	5 Pre-Operation	6 Operation	7 Pre-Abandonment / Closure	8 Abandonment / Closure
• Feasibility • Site Selection • Technology Selection • Land Status • SI Report	• EIA, SIA, TIA Studies • ESCP • Development Order	• Written Permission • EMP Construction • Written Notification	• Environmental Monitoring • Environmental Audit • Competent Person	• EMP Operation • Stormwater Management Plan • License for Prescribed Premises • License for Prescribed Conveyance	• Written Declaration • Environmental Monitoring • Environmental Reporting • Environmental Audit • Renewal of License	• Abandonment Plan • Closure Plan	• Environmental Monitoring • Environmental Reporting

STAKEHOLDER ENGAGEMENT

RELEVANT STAKEHOLDERS

- DOE
- Project Proponent
- Government Agencies
- Approving Authorities
- Affected Groups
- Interested Groups

ENGAGEMENT METHODS

- Interview
- Questionnaire
- Townhall Meeting
- Forums or Workshops
- Focus Group Discussion

DOCUMENTATION & REPORTING

- Details of the programme
- Attendance list of participants
- Copies of survey forms
- Brief summary of findings from event
- Video or voice recordings

TERMS OF REFERENCE SUMMARY

ENVIRONMENTAL SCOPING

- Gather and analyse information
- Identify significant environmental issues
- Prioritise significant issues for EIA
- Determine approach, methodology and tools for assessment
- Identify potential P2M2s
- Submit TOR and ESI for DOE assessment and endorsement

SITE SUITABILITY ASSESSMENT

Considerations in project alternatives and options:

- Project siting
- Process technology options
- P2M2s technology options
- Project component and design
- Social aspect

STUDY BOUNDARY

- **Zone of study (ZOS):** generally 5-km radial zone from project boundary
- **Zone of impact (ZOI):** vary depending on the size of project, extent shall be determined by the Qualified Person

BASELINE DATA REVIEW

- **Physical:** land use, topography and terrain, geology and hydrogeology
- **Environmental:** surface water quality, groundwater quality, marine water quality
- **Biological:** terrestrial and aquatic flora, terrestrial and aquatic fauna
- **Socio-economic:** demography, public health, development needs and potential
- **Infrastructure and utilities:** Physical communications, points of access and transportation routes

DETERMINATION OF KEY PROJECT ACTIVITIES

Based on four main common activities:

- Pre-construction phase
- Construction phase
- Operation phase
- Abandonment phase

IDENTIFICATION OF SIGNIFICANT IMPACTS AND PRIORITY SETTING

- Key issues are determined based on their importance
- Criteria for determining significance of environmental impacts: magnitude, permanence, reversibility, cumulative effects

RELATED KEY ISSUES

- Air quality & odour
- Noise & vibration
- Soil erosion & sedimentation
- Water quality
- Groundwater quality
- Quantitative risk
- Health risk
- Waste management
- Socio-economic

ESTABLISHMENT OF STUDY REQUIREMENT

- Address identified impacts of the project activities
- Type of study is dependent on the scale and extent of Project Site
- Qualified Person shall provide methodologies, assessment, and expected outputs

SELECTION OF MITIGATION MEASURES

- To be identified based on **Best Available Techniques Economically Achievable (BATs), Best Management Practices (BMPs)** and other options for **P2M2s**
- To be described qualitatively and further detailed in EIA study

STUDY TEAM

- **EIA Study**: Appointment of **Qualified Person** as stipulated in Section 34A(2) of the Environmental Quality Act 1974
- **Pollution Control System Design:** Qualified Consultant must be **Professional Engineer** registered under Section 10(2) of the Registration of Engineers Act 1967 (Revised 2015)
- **Preparation of LD-P2M2:** Registered consultant with **Certified Professional in Erosion and Sediment Control (CPESC) certification**

PREPARATION OF TOR/ESI

To follow format detailed under the Guidance Document for Preparing TOR according to EGIM

BASELINE DATA SUMMARY

BASELINE DATA COLLECTION

Purpose

To provide an overview of the existing environment to determine the suitable approach and methodology for the impact assessment

Primary Source

Field studies (i.e. site survey, aerial photos, SI report, sampling and monitoring activities etc.)

Secondary Source

Desktop studies (i.e. topography map, satellite imagery, local authority, past studies, etc.)

BASELINE MONITORING AND ANALYSIS

Samples collected must be analysed by a SAMM accredited laboratory
Laboratory report or COA shall be included in the EIA as appendix

Air Quality

Parameters and criteria as referred in Malaysia Ambient Air Quality Standards (MAAQS) 2013

Odour

Parameters may include perceived odour (DT) and odour concentration (ou/m^3)

Noise

Parameters and criteria as referred in the Guidelines for Environmental Noise Limits and Control, Third Edition 2019

Vibration

Parameters and criteria as referred in the Planning Guidelines for Vibration Limits and Control in the Environment Second Edition 2007

Surface Water Quality

Parameters and criteria as referred in the National Water Quality Standards (NWQS)

Marine Water Quality

Parameters and criteria as referred in the Malaysian Marine Water Quality Standards (MMWQS)

Groundwater Quality

Parameters and criteria as referred in Malaysia Groundwater Quality Standards for Conventional Raw Water Treatment (Drinking Water)

Note:
Parameters for baseline monitoring shall be dependent on the project needs as described in the TOR and ESI

GOOD PRACTICES FOR SAMPLING

Water Quality

- ✓ Sites must be easily and safely accessed under all weather conditions
- ✓ Sampling depth is measured from the water surface to the middle of the sampler
- ✓ A bottle that is to be used for transport or storage of the sample should be rinsed three times with portions of the sample before being filled. This does not apply, however, if the storage/transport bottle already contains a preservative chemical
- ✓ A small air space should be left in the sample bottle to allow the sample to be mixed before analysis

Air Quality

- ✓ Identify location of potential on-site emission sources, as identified from the review of site background information or from preliminary on-site inspections
- ✓ Sampling station location should be representative of the area selected
- ✓ Identify potential off-site emission sources located upwind of the sampling location(s). Study local wind patterns to determine the location of off-site sources.
- ✓ As a general rule, the distance away from the obstruction should be 10 times the height of the obstruction

Noise & Vibration

- ✓ The sound level meter may be hand held for spot readings, but for extended monitoring shall be mounted onto a tripod A noise reading should always be taken at least 1.2–1.5 metre above the ground)
- ✓ Measurement location shall be at least 3.5 m away from walls, buildings or other sound reflecting structures
- ✓ Measurements cannot normally be made if the wind speed exceeds 5 m/s at the microphone position.
- ✓ Relevant standards for noise measurement include ISO 1996-1:2016, BS 5228-1:2009

Groundwater Quality

- ✓ Always sample from the anticipated cleanest, i.e., least contaminated location, to the most contaminated location
- ✓ Sample containers for samples suspected of containing high concentrations of contaminants shall be stored separately
- ✓ Purged water should be monitored for pH, specific conductance and turbidity and volume recorded
- ✓ All samples requiring preservation must be preserved as soon as practically possible, ideally immediately at the time of sample collection

EVALUATION OF IMPACTS SUMMARY

SOIL EROSION & SEDIMENTATION

Typical Input
- Rainfall erosivity factor
- Soil erodibility factor
- Slope length and degree factor
- Land-cover management factor
- Conservation practice factor
- Runoff volume
- Peak discharge

Impact Assessment
- RUSLE, MUSLE
- Manual calculation or aid of software

Output
- Annual soil erosion rate
- Sediment yield
- Potential soil erosion risk map
- Impact significance evaluation

WATER QUALITY

Typical Input
- Flowrate of water bodies and flowrate of pollutant
- Pollutant Water Quality Data
- River water quality
- Marine water quality

Impact Assessment
- Mathematical models
- Simple mass balance models

Output
- Graph of concentration of pollutants over spatial for normal scenario and worst scenario

Evaluation Criteria
- Environmental Quality (Sewage) Regulations 2009
- Environmental Quality (Industrial Effluent) Regulations 2009
- NWQS/MMWQS

GROUNDWATER QUALITY

Typical Input
- Topography
- Pollutant Water Quality Data
- Groundwater Level
- Rainfall data
- Hydraulic conductivity
- Geology
- Pumping rate
- Well yield

Impact Assessment
- Mathematical models

Output
- Contaminant transport maps
- Geophysics plot (if necessary)

Evaluation Criteria
- Groundwater Quality Standards for Conventional Raw Water Treatment (Drinking Water)

AIR QUALITY & ODOUR

Typical Input
- Source data
- Meteorological data
- Terrain data
- Building data
- Sensitive receptors

Impact Assessment
- Air Dispersion Modelling Software

Output
- MAIC
- GLC
- Dispersion contours
- Impact significance evaluation

Evaluation Criteria
- Environmental Quality (Clean Air) Regulations 2014
- MAAQS 2013
- AAQC 2003
- IAQM, 2018

NOISE

Typical Input
- Sound power level, sound pressure level
- Source classification and mobile sources
- Existing background noise and existing noise sources
- Type of noise
- Propagation factors
- Directionality
- Ground effect
- Location and height of source
- Total attenuation from factors

Impact Assessment
- Calculation of increased noise level for worse case scenario

Output
- Absolute numerical noise limit
- Change in noise levels relative to an existing baseline level

Evaluation Criteria
- Guidelines for Environmental Noise Limits and Control 3rd Edition 2019

WASTE

Typical Input
- Incoming waste information
- Source of waste
- Waste generation rate
- Number of workers

Impact Assessment
- Estimation of total amount of waste

Output
- Weight of estimated waste generated
- Volume of estimated waste
- Impact significance evaluation

QUANTITATIVE RISK

Typical Input
- Hazardous substance data
- Equipment specifications
- Possible accident scenario
- Failure frequency data
- Meteorological data

Impact Assessment
- Consequence modelling software for normal case and worst-case

Output
- Individual risk
- Societal risk
- Individual risk contours
- F-N Curve
- Impact significance evaluation

Evaluation Criteria (Individual Risk)
- Industry: 1 x 10^{-5} fatalities/person/year
- Public: 1 x 10^{-6} fatalities/person/year

HEALTH

Typical Input
- Community health data
- Local health statistics
- Air quality assessment result
- Water quality assessment result
- Groundwater quality assessment result

Impact Assessment
- HRA using qualitative and quantitative risk assessments

Output
- Health risk calculation at certain level of exposure
- Impact significance evaluation

Evaluation Criteria (Public Health)
- Non-carcinogenic: Hazard quotient (HQ) < 1
- Carcinogenic risk: Generally acceptable risk (10^{-4} to 10^{-6})

SOCIO-ECONOMIC

Typical Input
- Details of demographics
- Local economic profile
- Feedback from stakeholders engagement

Impact Assessment
- Social impact matrix

Output
- Risk matrix with socio economic concerns and the magnitude of impact

Evaluation Criteria
- Manual for SIA for Project Development 2nd Edition 2018

VIBRATION

Typical Input
- Reference PPV from reliable publication
- Distance from equipment / activities to receiver
- Attenuation rate of the ground

Impact Assessment
- Equation for prediction of vibration level

Output
- Prediction of PPV
- Damage risk in structural damage
- Level of human annoyance

Evaluation Criteria
- The Planning Guidelines for Vibration Limits and Control in the Environment 2nd Edition 2007

MITIGATION MEASURES SUMMARY

PURPOSE

- Avoid negative impacts by selecting alternatives to implement preventive measures
- Adopt relevant mitigation measures and BMPs to minimize impacts when an impact cannot be avoided
- Enhance and amplify the beneficial impacts
- Ensure residual impacts are kept within acceptable levels

PRINCIPLES OF ADOPTION OF P2M2

Need and extent of P2M2s shall correspond to the significance of the predicted impact

Priority shall be given to control at source rather than to rectifying impacts

Proposed P2M2 should be **project-specific** and designed for site conditions

Adequate explanation on the design and function of P2M2s should be include in EIA

Project Proponent is encouraged to use **new technology** provided it is proven effective

P2M2s require regular **inspection, maintenance and rehabilitation**

Effectiveness of P2M2s shall be documented through **monitoring programme**

Qualified Person should propose **BMPs** based on the findings of the EIA

APPROACHES TOWARDS P2M2 ADOPTION

Key P2M2s that are applicable include:

- Air Pollution Control
- Water Pollution Control
- Noise and Vibration Control
- Erosion and Sediment Control
- Scheduled Waste Management

Other mitigation measures:

- Safety and Health
- Traffic

LAND-DISTURBING POLLUTION PREVENTION AND MITIGATION MEASURES (LD-P2M2)

Project Activity and Implementation

- Phasing plan
- Project implementation schedule
- Description of construction activities
- Construction schedule
- Construction method statements

Information and Analysis on Project Development

- Selected weather and rainfall data
- Site runoff velocity and flow rates
- Description of site soil and geological characteristics
- Description of adjacent affected areas by land disturbance
- List of waterways
- List of P2M2s proposed
- Access roads and project components outside boundary
- Earthworks cut and fill volume
- Availability of rocks materials
- Biomass ,solid and hazardous waste management
- Spill prevention and control plan
- Soil loss prediction
- Calculation for sediment traps/basins and runoff flows

Map of Site Plan with Existing Conditions

- Topographic survey map
- Geological terrain map
- Erosion risk map
- Landuse map
- Site development plan map

ENVIRONMENTAL MANAGEMENT PLAN SUMMARY

EMP FRAMEWORK

- Monitoring of water quality of receiving water body by Accredited Lab
- Monitoring of TSS and Turbidity at inlets and outlets of sediment structures
- Monitoring of leachate discharge
- In-situ monitoring of TSS and Turbidity after rain event
- Monitoring of air, noise and vibration qualities depending on receptor sensitivity
- Planning, construction and maintenance of LD-P2M2 on site
- P2M2 notification and implementation
- Identification of need of competent persons to undertake specific task on site
- Description and implementation details of EMT
- Any other green initiatives undertaken
- Clear documentation on any transfer of ownership or proponent of approved EIA
- Allocation and reporting of sufficient resources to undertake project activities
- Temporary / permanent abandonment / project closure plan details for all phases
- Implementation of 5S concept in good housekeeping practices

AUDIT PROGRAMME

Pre-Audit

- ✓ Preparation of pre-audit checklist and information request to the auditee
- ✓ Submission of notification of audit to DOE and auditee

On-Site Audit

- ✓ Briefing to auditee by Lead Auditor
- ✓ Include documentation review, site inspection, interviews with relevant personnel
- ✓ Auditee briefed at Closing Meeting
- ✓ On-site Audit Summary submitted to state DOE

Post Audit

- ✓ Lead Auditor shall submit an Audit Report to DOE within 14 calendar days after site audit
- ✓ Auditee shall develop a Corrective Action Plan for any non-compliances which shall be submitted to DOE within 21 calendar days after site audit

SELF-REGULATION

7 ENVIRONMENTAL MAINSTREAMING TOOLS

- Environmental Policy
- Environmental Facility
- Environmental Budget
- Environmental Monitoring Committee
- Environmental Competency
- Environmental Reporting and Communication
- Environmental Transparency

ABANDONMENT PLAN

- ✓ Project abandonment can occur during the construction stage or operation stage of the Project due to unforeseen circumstances.
- ✓ The Project Proponent must submit a project abandonment plan to the DOE prior to the abandonment of the Project
- ✓ In essence, the project abandonment plan shall address the environmental issues arise from the decommissioning including demolition and dismantling activities

EMERGENCY RESPONSE PLAN

- ✓ Clear, written policies that designate a chain of command, listing names and job titles of the people (or departments) who are responsible for making decisions, monitoring response actions and recovering back to normal operations; Indicate arrangements that should be put in place with the local emergency authorities before facility start up

REPORTING AND REVIEW SUMMARY

EIA REPORT

Data Deliverables

- All relevant data collected during the EIA Study shall be make available
- Sampling results, modelling databases, baseline data, metadata

Conclusion to the EIA Report

- When concluding the EIA Report, the Qualified Person should provide fair and unbiased conclusion of the EIA study based on the expert opinion of the impact assessment for the purpose of informed decision-making.

EIA REPORT SUBMISSION AND REVIEW PROCESS

Components	First Schedule Activities	Second Schedule Activities
Submission of Report	• DOE State	• DOE HQ
TOR/ESI Report Submission	• Three (3) hardcopies and one (1) softcopy in PDF format via email • Distribution of softcopy (CD) to agencies/AI/NGO for comments	• Three (3) hardcopies and one (1) softcopy in PDF format via email • Distribution of softcopy (CD) to agencies/AI/NGO for comments
EIA Report Submission	• Three (3) hardcopies and one (1) softcopy (CD) to DOE State • One (1) softcopy (CD) to DOE HQ • Distribution of softcopy (CD) to agencies/AI/NGO for comments	• Three (3) hardcopies and one (1) softcopy (CD) to DOE HQ • One (1) hardcopy to DOE State • Distribution of softcopy (CD) to agencies/AI/NGO for comments
Review Timeline	• Twenty-five (25) working days (5 weeks)	• Sixty (60) working days (12 weeks)
Public Participation in EIA Study	• Required	• Required
Public Display of EIA Report	• Not required	• Required
Advertisement of EIA Report	• Not required	• Online advertisement in two (2) major newspapers for three (3) consecutive days

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LIST OF APPENDICES

LIST OF ABBREVIATIONS

ADMS	Air Dispersion Modelling Software
ALARP	As Low as Reasonably Practicable
APCS	Air Pollution Control System
ASR	Air Sensitive Receptors
BACT	Best Available Control Technology
BAT	Best Available Techniques
BMP	Best Management Practices
BOD	Biochemical Oxygen Demand
BS	British Standard
CePSO	Certified Environmental Professional in Scrubber Operation
CePSTPO	Certified Environmental Professional in Sewage Treatment Plant Operation
CePSWaM	Certified Environmental Professional in Scheduled Waste Management
CESSWI	Certified Erosion, Sediment and Storm Water Inspector
CISEC	Certified Inspection of Sediment and Erosion Control
CM	Compliance Monitoring
COA	Conditions of Approval (DOE)
COA	Certificate of Analysis
COD	Chemical Oxygen Demand

CPESC	Certified Professional in Erosion and Sediment Control
DID	Department of Drainage and Irrigation
DO	Dissolved Oxygen
DOE	Department of Environment
DOF	Department of Fisheries
DOSH	Department of Occupational Safety and Health
DOSM	Department of Statistics Malaysia
DWNP	Department of Wildlife and National Parks
EB	Environmental Budgeting
EC	Environmental Competency
EESIM	Environmental Essentials for Siting of Industries in Malaysia
EF	Environmental Facility
EGIM	Environmental Impact Assessment Guideline
EIA	Environmental Impact Assessment
EMC	Environmental Monitoring Committee
EMP	Environmental Management Plan
EMR	Environmental Monitoring Reports
EMT	Environmental Management Team
EMT	Environmental Mainstreaming Tools
EP	Environmental Policy
EPMC	Environmental Performance Monitoring Committee
ERC	Environmental Reporting and Communication
ERCMC	Environmental Regulatory Compliance Monitoring Committee
ESCP	Erosion and Sedimentation Control Plan
ESI	Environmental Scoping Information
ET	Environmental Transparency
FDPM	Forestry Department of Peninsular Malaysia
GA	Government Agencies
GLC	Ground Level Concentration
GPS	Global Positioning Systems
HIA	Health Impact Assessment
HQ	Hazard Quotient
HRA	Health Risk Assessment
IM	Impact Monitoring
IS	Indian Standard
ISO	International Organization for Standardization
IWK	Indah Water Konsortium
JAKOA	Jabatan Kemajuan Orang Asli
JMG	Jabatan Mineral dan Geosains
JUPEM	Jabatan Ukur dan Pemetaan Malaysia
LCR	Lifetime Cancer Risk

LUAS	Lembaga Urus Air Selangor
MAIC	Maximum Average Incremental Values
MLSS	Mixed Liquor Suspended Solids
MOH	Ministry of Health
MUSLE	Modified Universal Soil Loss Equation
NGO	Non-Governmental Organisations
P2M2	Pollution Prevention and Mitigation Measures
PLANMalaysia	Department of Town and Country Planning
PM	Performance Monitoring
PTG	Pejabat Tanah dan Galian
PWD	Public Works Department
QRA	Quantitative Risk Assessment
RUSLE	Revised Universal Soil Loss Equation
SAMM	Skim Akreditasi Makmal Malaysia
SI	Soil Investigation
SIRIM	Standard and Industrial Research Institute of Malaysia
SLM	Sound Level Meter
SPA	State Planning Authority
SR	Self-Regulation
SSA	Site Suitability Assessment
STS	Sewage Treatment System
TELOS	Technical, Economic, Legal, Operational and Scheduling
TIA	Traffic Impact Assessment
TNB	Tenaga Nasional Berhad
TOR	Terms of Reference
TSS	Total Suspended Solids
UNEP	United Nations Environment Programme
USEPA	United States Environmental Protection Agency
WGR	Waste Generation Rates
WRF	Weather Research and Forecasting
ZOI	Zone of Impact
ZOS	Zone of Study

LIST OF FIGURES

LIST OF TABLES

EIA GUIDELINES

Waste Treatment & Disposal – Scheduled Waste

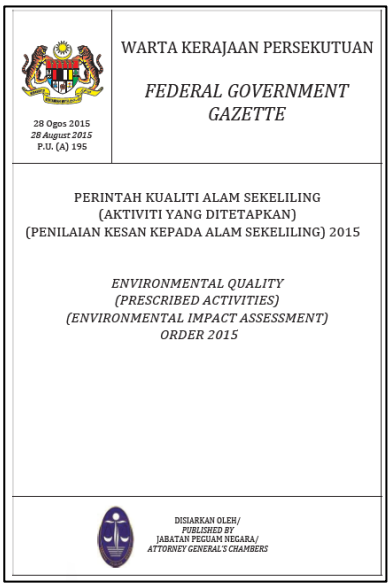
1 INTRODUCTION

CHAPTER 1

INTRODUCTION

1.1 INTRODUCTION

The **"Environmental Impact Assessment (EIA) Guidelines for the Waste Treatment and Disposal – Scheduled Waste"** (hereinafter referred to as the 'Guidelines') is newly issued to align with the latest amendments in the Environmental Quality (Prescribed Activities) (Environmental Impact Assessment) Order 2015, of the Environmental Quality Act 1974 (Act 127).


WARTA KERAJAAN PERSEKUTUAN

FEDERAL GOVERNMENT GAZETTE

28 Ogos 2015
28 August 2015
P.U. (A) 195

PERINTAH KUALITI ALAM SEKELILING
(AKTIVITI YANG DITETAPKAN)
(PENILAIAN KESAN KEPADA ALAM SEKELILING) 2015

ENVIRONMENTAL QUALITY
(PRESCRIBED ACTIVITIES)
(ENVIRONMENTAL IMPACT ASSESSMENT)
ORDER 2015

DISIARKAN OLEH/
PUBLISHED BY
JABATAN PEGUAM NEGARA/
ATTORNEY GENERAL'S CHAMBERS

The amended Environmental Quality (Prescribed Activities) (Environmental Impact Assessment) Order 2015 was gazette on 28 August 2015 with a revised list of Prescribed Activities. The Prescribed Activities are now divided into the First Schedule (21 Prescribed Activities) and the Second Schedule (17 Prescribed Activities).

In the context of these Guidelines, the prescribed activities are classified under Activity 14(a) - Waste Treatment and Disposal (Scheduled Waste) with a total of 7 prescribed activities. EIA report is required for the prescribed activities specified in the Environmental Quality (Prescribed Activities) (Environmental Impact Assessment) Order 2015 as stipulated in Section 34A of the Environmental Quality Act (EQA) 1974.

The Department of Environment (DOE) has rationalised the EIA process to make it more reflective of the scope, functions and visions of the Department in line with its Environment Strategic Plan, with a focus on Environmental Mainstreaming Tools (EMT) to achieve Self-Regulation (SR).

The Guidelines shall be read and referred to together with the Environmental Impact Assessment Guideline in Malaysia (EGIM) published by the DOE. Compliance with the requirements set out in the Guidelines and the EGIM will fulfil the obligations of the Project Proponent as stated under Section 34A (2C) of the EQA 1974.

1.2 OBJECTIVES OF THE EIA GUIDELINES

1.3 SCOPE OF THE EIA GUIDELINES

The scope of the guidelines covers 7 prescribed activities under Activity 14(a) - Waste Treatment and Disposal (Scheduled Waste) of the Environmental Quality (Prescribed Activities) (Environmental Impact Assessment) Order 2015. There are 3 prescribed activities under the First Schedule and 4 prescribed activities under the Second Schedule. **Figure 1-1** illustrates the relationships between these prescribed activities.

SCOPE OF THE EIA GUIDELINES

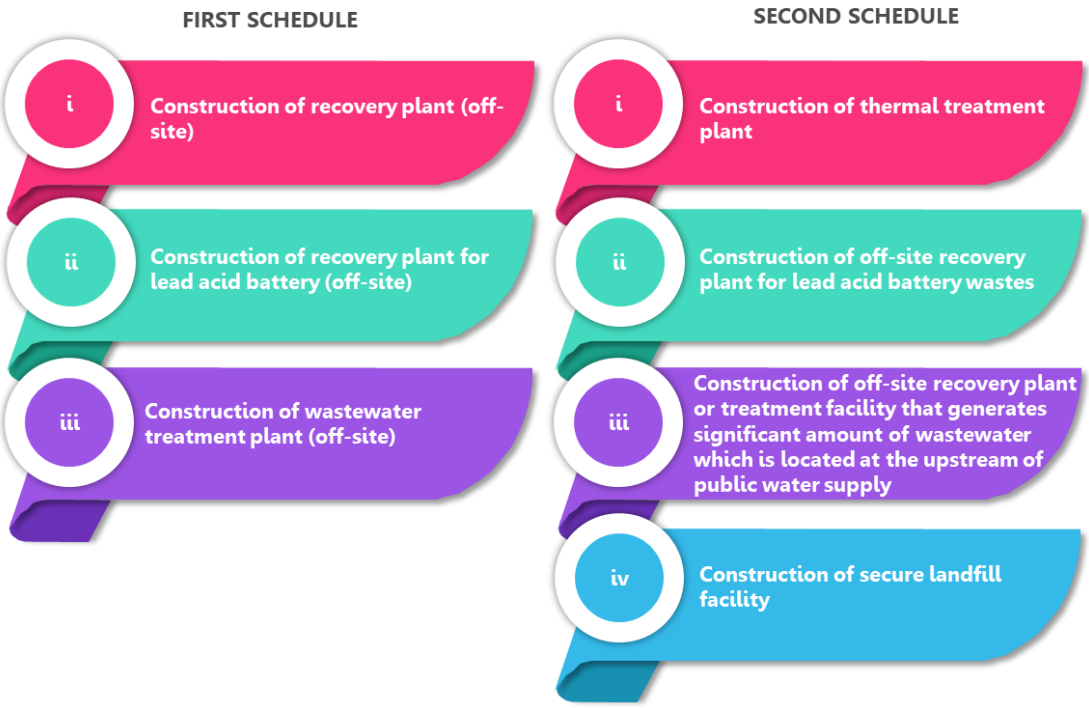
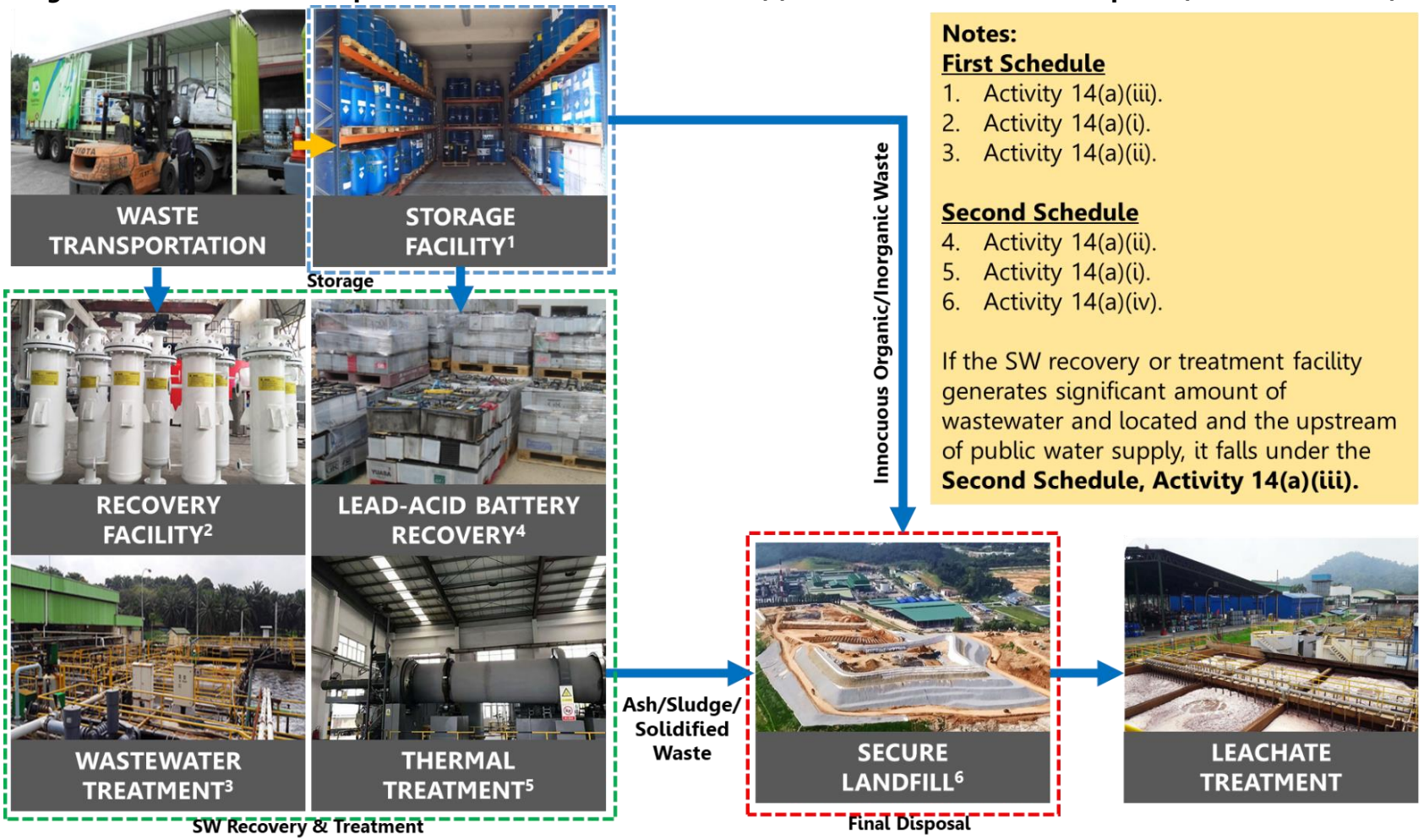


Figure 1-1 Relationship between Prescribed Activities 14(a) – Waste Treatment and Disposal (Scheduled Waste)



Note: Innocuous means harmless or non-dangerous.

1.4 TERMS AND DEFINITIONS

1.4.1 Scheduled Waste

In the Environmental Quality (Scheduled Waste) Regulations 2005, scheduled waste is defined as any waste falling within the categories of waste listed in the First Schedule. There are 77 code of scheduled wastes listed under the First Schedule of the Environmental Quality (Scheduled Wastes) Regulations 2005. These scheduled wastes are grouped into 5 specific SW code based on their characteristics. Each SW code has several sub-categories. For example, under SW 1 code there are 10 sub-categories from SW 101 to SW 110.

SW 1	SW 2	SW 3	SW 4	SW 5
• **Metal** and metal bearing wastes	• Wastes containing principally **inorganic** constituents which may contain metals and organic materials	• Wastes containing principally **organic** constituents which may contain metals and inorganic materials	• Wastes which may contain either **organic** or **inorganic** constituents	• Other wastes
10	**7**	**27**	**32**	**1**

There are 5 main hazardous characteristics that scheduled wastes pose as shown below.

1.4.2 Prescribed Premises

Six types of facilities categorised as prescribed premises under the Environmental Quality (Prescribed Premises) (Scheduled Wastes Treatment and Disposal Facilities) Order 1989. The following prescribed premises shall be licensed by the DOE prior to the operation:

a) Off-site storage facilities;
b) Off-site treatment facilities;
c) Off-site recovery facilities;
d) Scheduled waste incinerators;
e) Land treatment facilities; and
f) Secure landfill.

1.4.3 Prescribed Conveyance

In the Environmental Quality (Prescribed Conveyance) (Scheduled Waste) Order 2005, the prescribed conveyance is defined as any vehicles or ship or any description which is:

a) Propelled by a mechanism contained within itself;
b) Constructed or adapted to be used on land or water; and
c) Used for the movement, transfer, placement or deposit of scheduled wastes.

1.4.4 Relevant Terms and Definitions

Definitions of relevant terms for each prescribed activity are tabulated in **Table 1-1** and **Table 1-2**. Most of the terms are defined or interpreted based on the Environmental Quality Act 1974 and its regulations.

Table 1-1 Relevant Terms for Activity 14(a) under First Schedule

First Schedule
Activity 14(a)(i) - Construction of recovery plant (off-site)
Off-site recovery facility: Premises occupied or used for the retrieval of material or product from any scheduled waste which is not produced on those premises[1].
Activity 14(a)(ii) - Construction of wastewater treatment plant (off-site)
Off-site treatment facility: Premises occupied or used for the processing of any scheduled waste which is not produced on those premises[1].

First Schedule
Industrial effluent treatment system: Any facility including the effluent collection system, designed and constructed for the purpose of reducing the potential of the industrial effluent or mixed effluent to cause pollution[2].
Wastewater treatment plant: An industrial facility where a combination of mechanical, physical, chemical and biological processes is used to achieve pollutants removal from the incoming wastewater[3].
Activity 14(a)(iii) - Construction of storage facility (off-site)
Off-site storage facility: Premises occupied or used for the storage, collection or transfer of any scheduled waste which is not produced on those premises[1].

Sources:

1. Environmental Quality (Prescribed Premises) (Scheduled Waste Treatment and Disposal Facilities) Order 1989.
2. Environmental Quality (Industrial Effluent) Regulations 2009.
3. R. Hreiz *et al.* / Chemical Engineering Journal 281 (2015) 900–920.

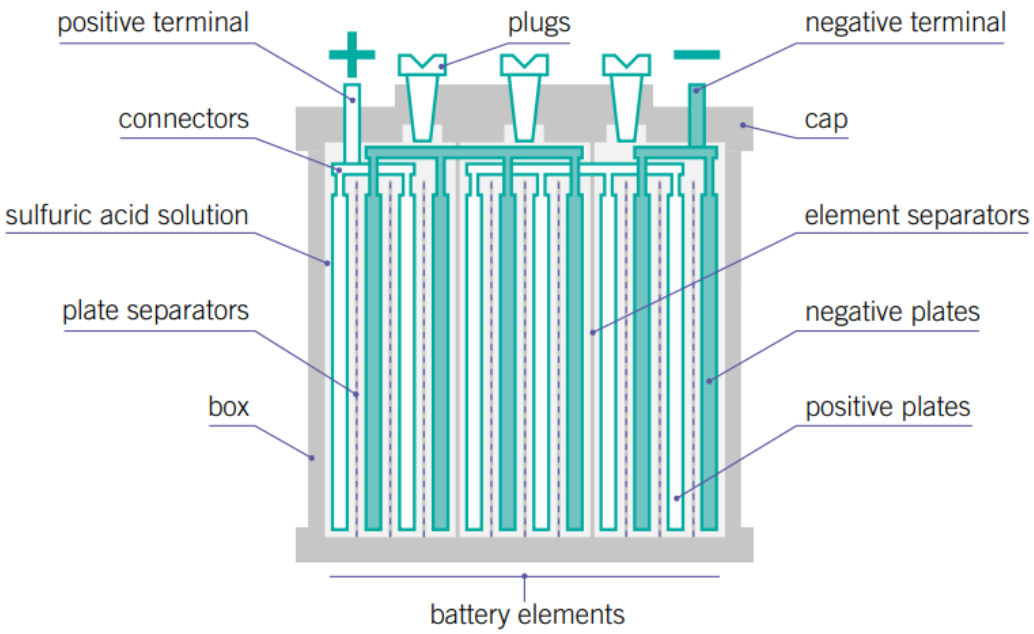
Table 1-2 Relevant Terms for Activity 14(a) under Second Schedule

Second Schedule
Activity 14(a)(i) - Construction of thermal treatment plant
Incinerator: Any device, apparatus, equipment or structure used for destroying, reducing or salvaging or waste heat recovery by fire or by burning any material or substance including refuse, rubbish, garbage, agricultural waste, trade waste, debris or scrap or a facility for cremating animal remains[1]. **Scheduled waste incinerator:** Premises occupied or used for the thermal destruction of any scheduled waste[2].
Activity 14(a)(ii) Construction of recovery plant for lead acid battery (off-site)
Off-site recovery facility: Premises occupied or used for the retrieval of material or product from any scheduled waste which is not produced on those premises[2]. **Battery:** An electrochemical apparatus which provides electrical energy through the controlled use of chemical reactions. Some batteries use reversible chemical reactions and can be recharged, such as the lead-acid batteries, while others use non-reversible reactions and have just one useful lifetime[3].

Second Schedule

Lead Acid Battery:

A lead-acid battery is made up of the following components, enclosed within a plastic or ebonite box or casing as follows[4]:



Typical Diagram for Components and Structure of a Lead-Acid Battery

Positive and negative terminals:

Made of lead and where the external electricity consumer devices are connected[3].

Plugs:

One for each battery element, where distillate or deionized water can be replaced whenever needed and also to provide an escape route for gases formed in the cells[3].

Connectors:

Made of lead, that make electrical contact between plates of same polarity and also make electrical contact between separated elements[3].

Cap and box:

Originally made of ebonite, but now more commonly made from either polypropylene or co-polymer[3].

Sulfuric acid solution:

The electrolyte of the battery[3].

Element separators:

Usually a part of the box and made of the same material, provide chemical and electrical isolation between the electrical elements. They are connected in a serial layout in order to increase the final voltage of the battery[3].

Second Schedule
Plate separators: Made of PVC or other porous materials, avoid physical contact between two contiguous plates but, at the same time, allowing free movement of ions in the electrolyte solution[3]. **Negative plates:** Constituted by a metallic lead grid covered by a lead dioxide (PbO_2) paste[3]. **Positive plates:** Constituted by metallic lead plates[3]. **Battery element:** A series of negative and positive plates, placed consecutively and isolated between each other with plate separators. Plates of same polarity are electrically connected[3].
Activity 14(a)(iii) - Construction of recovery plant or treatment facility that generates significant amount of wastewater which is located at the upstream of public water supply (off-site)
Off-site recovery facility: Premises occupied or used for the retrieval of material or product from any scheduled waste which is not produced on those premises[1]. **Off-site treatment facility:** Premises occupied or used for the processing of any scheduled waste which is not produced on those premises[1]. **Wastewater treatment plant:** An industrial facility where a combination of mechanical, physical, chemical and biological processes is used to achieve pollutants removal from the incoming wastewater[2]. **Public water supply:** The public water supply intakes specified in the Sixth Schedule of the Environmental Quality (Industrial Effluent) Regulations 2009.
Activity 14(a)(iv) - Construction of secure landfill facility
Secure landfill: Premises occupied or used for the disposal of any scheduled waste on land[2].

Sources:

1. Environmental Quality (Clean Air) Regulations 2014.
2. Environmental Quality (Prescribed Premises) (Scheduled Waste Treatment and Disposal Facilities) Order 1989.
3. Technical guidelines for the environmentally sound management of waste lead-acid batteries 2003 by UNEP.
4. Recycling used lead-acid batteries: health considerations 2017 by WHO.

1.5 SCOPE OF THE PRESCRIBED ACTIVITIES

The scope of the prescribed activities under Activity 14(a) of the Environmental Quality (Prescribed Activities) (Environmental Impact Assessment) Order 2015 are as tabulated in **Table 1-3** and **Table 1-4**.

Table 1-3 Scope of Activity 14(a) under the First Schedule

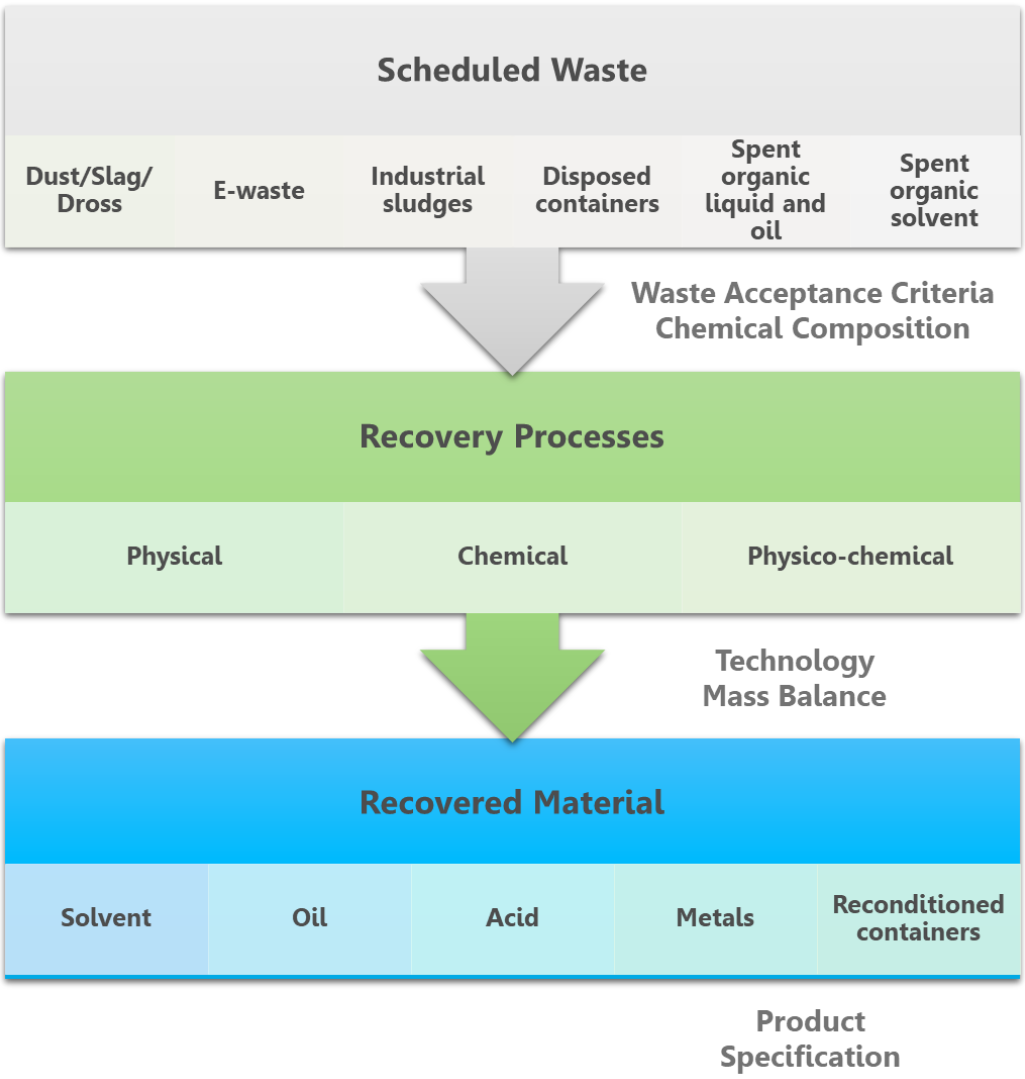
First Schedule

Activity 14(a)(i) - Construction of recovery plant (off-site)

Scope of Activity (*Off-site for all sizes*):

- **Construction and operation of an off-site recovery plant** used to recover material from scheduled waste for reuse and is saleable for economic benefits using physical or chemical processes or a combination of both processes.

- **Energy recovery** from scheduled waste is classified under Schedule 2, Activity 14(a)(i) – Construction of thermal treatment plant.



First Schedule

- Examples of physical and chemical processes are as follows[1]:

Physical Separation	Component Separation	Chemical Transformation
• Gravity settling • Filtration • Flotation • Flocculation • Centrifugation	• Distillation • Evaporation • Ion Exchange • Ultrafiltration • Reverse Osmosis • Electrolysis • Carbon/resin absorption • Solvent extraction	• Precipitation • Electrodialysis • Chlorinolysis • Reduction • Chemical dechlorination • Thermal oxidation

Activity 14(a)(ii) - Construction of wastewater treatment plant (off-site)

Scope of Activity (*Off-site for all sizes*):

- **Construction and operation of an off-site wastewater treatment plant** used to treat wastewater usually industrial discharges containing scheduled waste to levels stipulated in the regulations[2]. Wastewater can be treated using mechanical, physical, chemical, biological process or combination of these processes.

- Typical types of scheduled wastes to be treated are aqueous – acidic & caustic, oily wastes from oil tankers, solvents, sludge and other wastes requiring specialized handling or treatment.

Activity 14(a)(iii) - Construction of storage facility (off-site)

Scope of Activity (*Off-site for all sizes*):

- **Construction and operation of an off-site storage facility** used as off-site storage for scheduled wastes before they are sorted and designated for treatment or disposal at specialized facilities. The wastes may take the form of solid, liquid or sludge that require separate storage facilities before pre-treatment.

Notes:

1. Any companies that intend to construct this facility must have a recovery or treatment facility under the same company (e.g. Company ABC has off-site storage at Pasir Gudang for temporary scheduled waste storage before transferring the scheduled waste at its recovery or treatment facility in Seremban). The DOE will not consider the application if the company does not have the intention to further recover or treat the scheduled wastes.
2. Off-site storage facility provided by the Port Authority to ensure that the hazardous wastes falling within the scope of MARPOL Convention, once off-loaded from a ship are managed in an environmentally sound manner is also covered in this scope of activity. The Port Authority also must have either an on-site or off-site recovery or treatment facility for the DOE to consider the application.
3. DOE shall be referred for policy approval for cases other than Item No. 1 & 2 mentioned above.

Sources:

1. Technologies and Management Strategies for Hazardous Waste Control.
2. Environmental Quality (Industrial Effluent) Regulations 2009.

Table 1-4 Scope of Activity 14(a) under the Second Schedule

Second Schedule

Activity 14(a)(i) - Construction of thermal treatment plant

Scope of Activity (A*ll sizes*):

- **Construction and operation of a thermal treatment plant** used to treat scheduled waste through thermal destruction processes such as pyrolysis (non-oxidative thermal decomposition), gasification (partial oxidation) and incineration (full oxidative combustion).

- There are **2 objectives** of the thermal treatment plant as follows:
  - ✓ To **reduce the volume and hazardous characteristics** of the scheduled waste while capturing or destroying potentially harmful substances that may be released during the incineration process.
  - ✓ To enable **recovery of the energy** (waste-to-energy), mineral or chemical content of scheduled waste.

- A typical waste incineration plant will include the following operations:
  - ✓ Incoming waste reception.
  - ✓ Storage of waste and raw materials.
  - ✓ Pre-treatment of waste (where required, on site or off site).
  - ✓ Loading of waste into the process.
  - ✓ Thermal treatment of the waste.
  - ✓ Energy recovery (e.g. boiler) and conversion.
  - ✓ Flue-gas cleaning (FGC).
  - ✓ Flue-gas cleaning residue management.
  - ✓ Flue-gas discharge.
  - ✓ Emissions monitoring and control.
  - ✓ Wastewater control and treatment (e.g. from site drainage, flue-gas cleaning, storage).
  - ✓ Ash/bottom ash management and treatment (arising from the combustion stage).
  - ✓ Solid residue discharge/disposal.

- Examples of **incineration technologies** are as follows[1]:

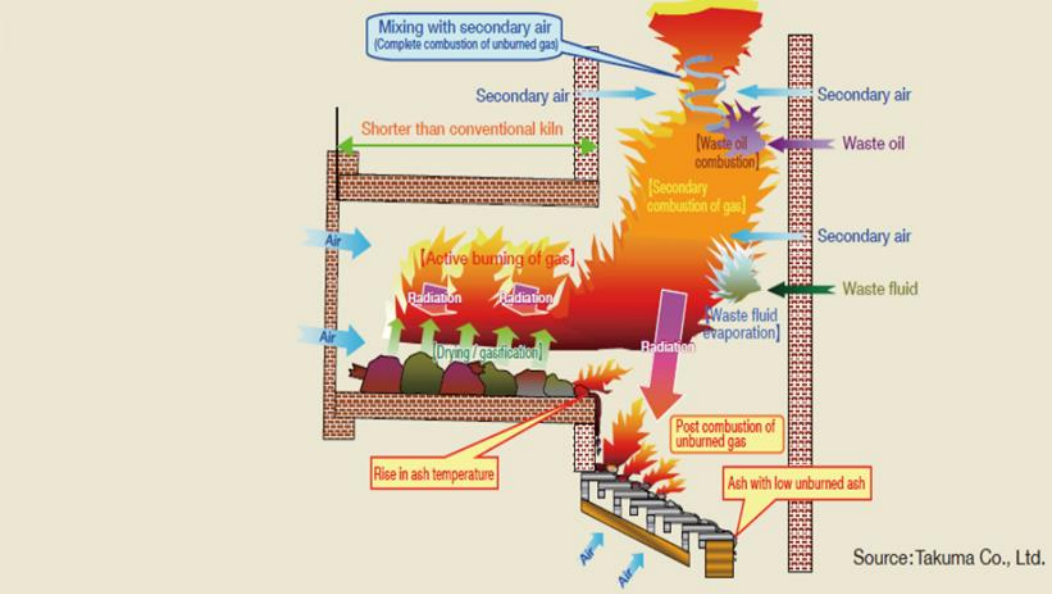
Grate Incinerators	Rotary Kilns	Fluidised Bed	Plasma Technologies
• Reciprocating • Travelling • Rocking • Roller • Water cooled • Grate plus rotary kiln • Step-hearth • Static hearth • Static furnace	• Conventional rotary kiln • Rotary kiln stoker	• Bubbling • Circulating • Rotating	• Argon plasma arc • Inductively coupled radio frequency plasma • Alternating current plasma • Microwave plasma • Nitrogen plasma arc

Notes:

1. Microwave plasma technology is different from the microwave technology for clinical waste (SW 404) treatment.
2. Microwave plasma technology reaction temperature is around 1000–1300°C[2] while microwave technology for clinical waste treatment is around 100°C[3].
3. Microwave technology for the clinical waste treatment can only be used for pre-treatment and is not covered under this prescribed activity. No EIA is required for this activity.

Second Schedule

- Rotary kiln stoker (as illustrated below[4]) is the most preferred technology:



Typical Diagram for Combustion System of Rotary Kiln with Post Diagram Burning Stoker Furnace

- Typical reaction conditions and products from pyrolysis, gasification and incineration processes[1]:

Parameter	Pyrolysis	Gasification	Combustion (normally called as incineration process)
Reaction temperature (°C)	250 – 700	500 – 1600	800 - 1450
Pressure (bar)	1	1 – 45	1
Atmosphere	Inert/nitrogen	Gasification agent: O_2, H_2O	Air
Stoichiometric ratio (n)	0	<1	>1
Main products from the process:			
Gas phase:	H_2, CO, H_2O, N_2 and hydrocarbons	H_2, CO, CO2, CH_4, H_2O and N_2	CO_2, H_2O, O_2 and N_2
Solid phase:	Ash, coke	Ash, slag	Ash, slag
Liquid phase:	Pyrolysis oil and water	-	-

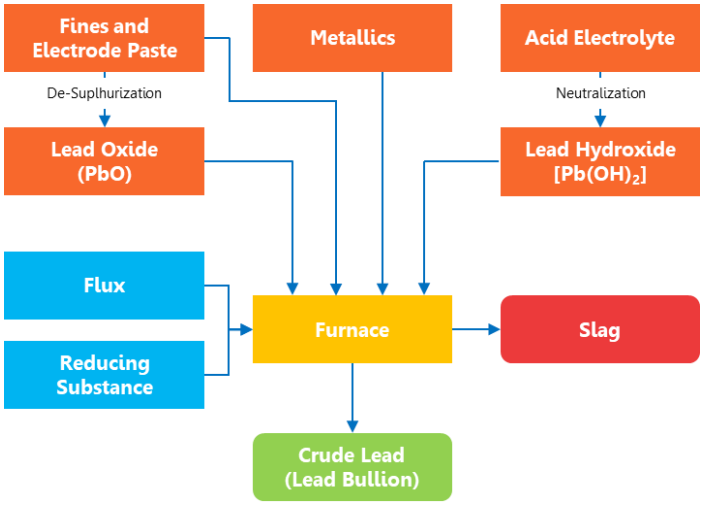
Second Schedule

Activity 14(a)(ii) Construction of recovery plant for lead acid battery (off-site)

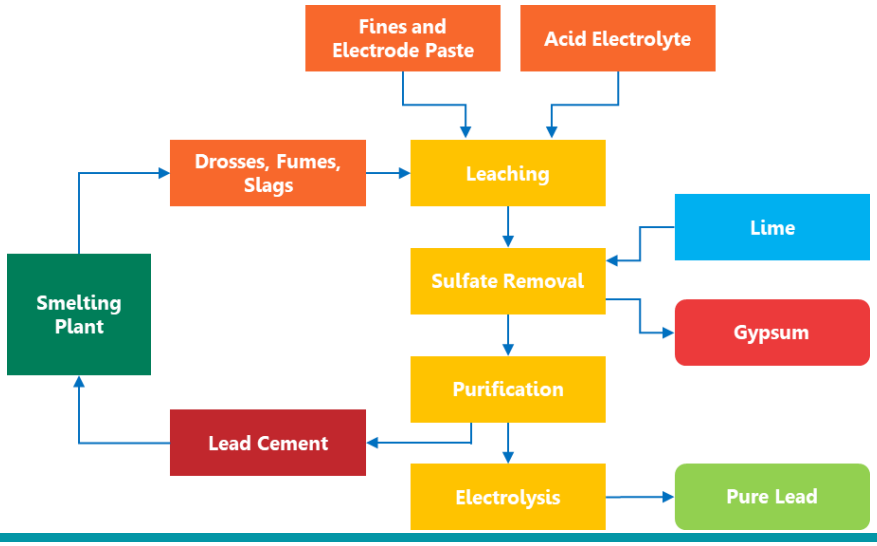
Scope of Activity (*Off-site for all sizes*):

- **Construction and operation of an off-site recovery plant for lead acid battery wastes** used to recover material from lead acid battery wastes for reuse and is saleable for economic benefits by means of pyrometallurgical or hydrometallurgical methods.

- Example of a lead smelting process diagram **(pyrometallurgical method)**[5]:



- Example of an electrolytic lead process diagram **(hydrometallurgical method)**[5]:



Second Schedule

Activity 14(a)(iii) - Construction of recovery plant or treatment facility that generates significant amount of wastewater which is located at the upstream of public water supply (off-site)

Scope of Activity (*Off-site & significant amount & located upstream of public water supply*):

- **A significant amount of wastewater** can be defined in three ways:

  - ✓ **Quantity[6]:** Wastewater discharge from the off-site recovery plant or treatment facility which is equal or more than 60 m^3/day; or
  - ✓ **Loading[6,7]:** Discharge of BOD at 20°C or suspended solids or both to inland waters exceed the specified maximum permissible loads either generally or specifically the body of waters concerned; or
  - ✓ **Quality[6]:** Wastewater discharge from the off-site recovery plant or treatment facility which contains the following contaminants:

Oil & Grease	Cd	Cr^{6+}	Cr^{3+}	As	CN^-	Pb	Cu	Mg	Ni	Sn

- **Located at upstream of public water supply** means the wastewater is discharged at the areas upstream of the public water supply intakes specified:

  - ✓ In the Sixth Schedule of the Environmental Quality (Industrial Effluent) Regulations 2009; or
  - ✓ By the State Water Authority (e.g. Lembaga Urus Air Selangor, etc.).

Notes:

1. This activity is unfavourable and not recommended by the DOE. One of the site selection criteria is the facility should preferably be located downstream of water intake points. If this cannot be avoided, the recycling of the treated effluent is highly recommended to achieve "zero discharge" or "minimal discharge".
2. The Qualified Person shall engage with the State Water Authority to identify the location of public water intake points that may not be included in the Sixth Schedule of the Environmental Quality (Industrial Effluent) Regulations 2009.

Activity 14(a)(iv) - Construction of secure landfill facility

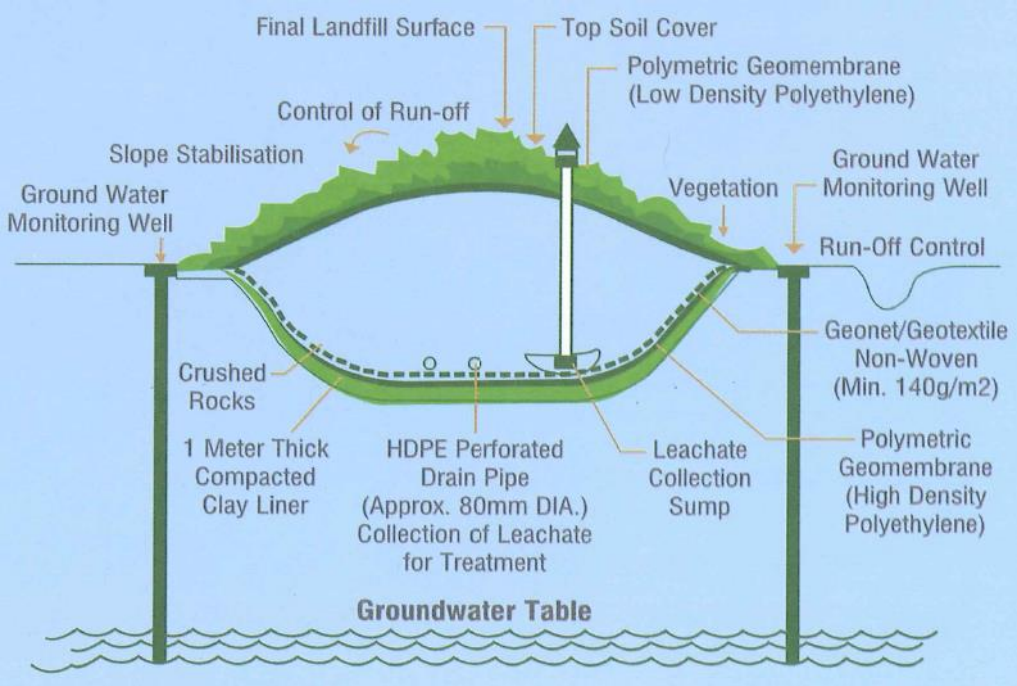
Scope of Activity *(On-site or off-site for all sizes)*:

- **Construction and operation of a secure landfill** on any land used for the depository of scheduled waste listed in the First Schedule of the Environmental Quality (Scheduled Waste) Regulations 2005.

- **Radioactive materials** are not covered in this activity and administered under the Atomic Energy Licensing Act 1984.

Second Schedule

- There are several critical elements in a secure landfill as follows[8]:
  - ✓ Compacted clay liner.
  - ✓ Polymetric geomembrane (HDPE).
  - ✓ Geonet/geotextile (non-woven).
  - ✓ Crushed rocks.
  - ✓ Leachate collection system.
  - ✓ Surface run-off control.
  - ✓ Groundwater monitoring well.



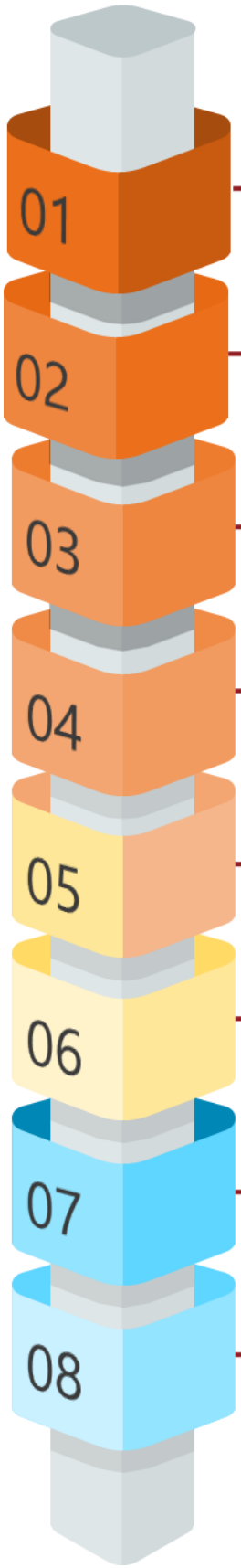
Note:

1. At the point of the publication of this guideline, there is no guideline for secure landfill design and operating requirements published in Malaysia. Therefore, other references such as the Requirements for Hazardous Waste Landfill Design, Construction and Closure (1989) published by USEPA can be referred to.

Sources:

1. Best Available Techniques Guidance Document on Waste Incinerator published by the DOE.
2. https://bhrc.wa.gov.au/wp-content/uploads/sites/166/2015/07/Appendix-4B-Parker-Range-Resource-Singapore-Presentation-Waste-to-Energy.pdf
3. https://www.malsparo.com/treat2.htm#:~:text=Microwave%20radiation%20is%20used%20to,source%20to%20treat%20medical%20waste.&text=Microwave%20disinfection%20works%20only%20when,solid%20components%20of%20the%20waste.
4. Takuma Co. Ltd.
5. Technical Guidelines for the Environmentally Sound Management of Waste Lead-acid Batteries.
6. Adapted from the First Schedule of the Environmental Quality (Industrial Effluent) Regulations 2009.
7. Adapted from Section 51(ee) of the Environmental Quality Act 1974.
8. Kualiti Alam, 2016.

1.6 STRUCTURE OF THE EIA GUIDELINES



INTRODUCTION
Provides the general overview of the guidelines including the scope and definition of activities covered as well as the environmental assessment process.

ENVIRONMENTAL PROJECT PLANNING
Provides the bird's-eye-view on all the relevant legal requirements and policies involve throughout the entire lifecycle of the Activity 14(a) projects.

TERMS OF REFERENCE (TOR)
Provides guidance for the preparation of TOR/ESI from the screening and scoping exercises. Impacts to be addressed and how to assess the impacts in the EIA study are outlined in this chapter.

BASELINE DATA
Provides guidance for the baseline data collection and analysis for the EIA study. This chapter not only focuses on the primary data collection but also the secondary data collection.

EVALUATION OF IMPACTS
Provides guidance for the evaluation of impacts which covers the typical input, appropriate methods and tools, intended output and the evaluation criteria for impact assessment.

MITIGATION MEASURES
Provides guidance on the selection of suitable mitigation measures to minimise the environmental impacts as well as residual impacts identified in the EIA Study.

ENVIRONMENTAL MANAGEMENT PLAN (EMP)
Provides guidance on the formulation of the Environmental Management Plan (EMP) with the incorporation of Guided Self-Regulation (GSR) element.

REPORTING AND REVIEW
Provides guidance on the preparation of the EIA report including the submission and approval process in line with the EIA Guidelines in Malaysia 2016 published by DOE.

1.7 EIA REPORT REQUIREMENT

EIA report is required for the prescribed activities specified in the Environmental Quality (Prescribed Activities) (Environmental Impact Assessment) Order 2015 including Activity 14(a) as stipulated in Section 34A of the Environmental Quality Act (EQA) 1974. Any person intending to carry out any prescribed activity shall appoint a qualified person to conduct an EIA and to submit a report thereof to the Director General in the manner as the Director General may prescribe.

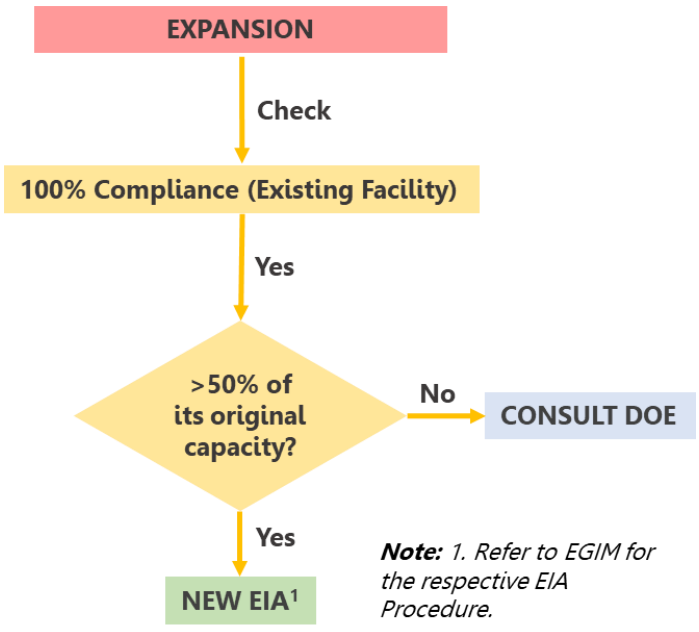
EIA report requirements for the case of expansion of scheduled waste treatment and disposal facility and the additional scheduled waste code for recovery facility (off-site) depends on several conditions as described below.

[**Note:** The Project Proponent or the Qualified Person must always consult with the DOE for the final decision whether or not the EIA report is required. The conditions stated below are of the typical case but may change depending on a case-by-case basis.]

1.7.1 Expansion for Scheduled Waste Treatment & Disposal Facilities

Before the Project Proponent can proceed with the expansion, they need to make sure that the existing facility complies 100% with all the conditions imposed by the DOE. Any non-compliances (if any) need to be rectified before the expansion. After that, the Project Proponent shall confirm on the expansion capacity and compare with the existing capacity. If the expansion is 50% more than the existing capacity, a new EIA report shall be prepared and submitted to the DOE. If the expansion capacity is less than 50%, consultation with the DOE shall be conducted to determine the need for the EIA Study. **Figure 1-2** shows the flowchart for the expansion activity.

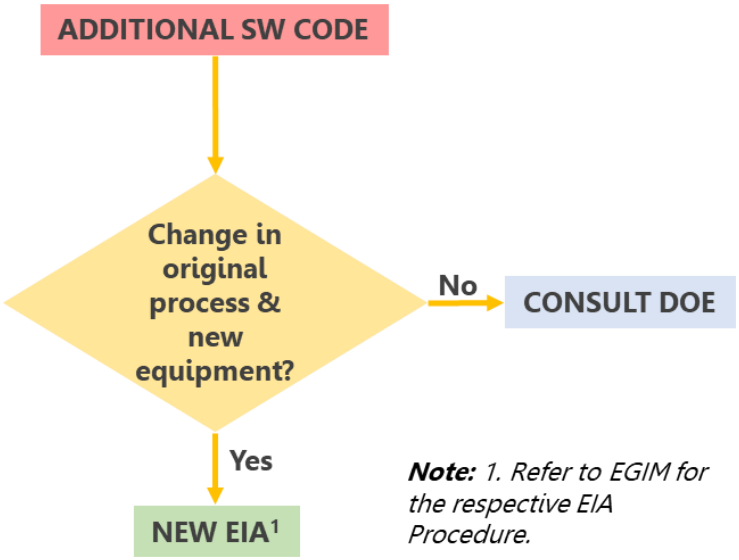
Figure 1-2 Flowchart for the Expansion Activity of the Scheduled Waste Treatment and Disposal Facilities



1.7.2 Additional Scheduled Waste Code for Recovery Facility (Off-Site)

The basic principle in determining the requirement for an EIA report for the additional scheduled waste code for a recovery facility (off-site) depends on the processes and equipment involved. If the additional scheduled waste code results in the changes to the existing process and equipment, the Project Proponent shall submit a new EIA report. Otherwise, consultation with the DOE shall be conducted to determine the requirements to be complied with. **Figure 1-3** shows the flowchart for the additional scheduled waste code activity.

Figure 1-3 Flowchart for the Additional Scheduled Waste Code for Recovery Facility (Off-Site)



1.8 OVERVIEW OF THE EIA PROCESS

An EIA is a study to identify, predict, evaluate and communicate both the adverse and beneficial impacts of a proposed project on the environment. It also specifies any pollution prevention and mitigation measures (P2M2s) that are required to minimise significant environmental impacts throughout the project cycle.

Table 1-5 below shows the step-by-step guide of the EIA process. Relevant chapters to be referred to in the guidelines are given in the reference column.

Table 1-5 Step-by-Step Guide for the Environmental Impact Assessment Process

	Step	Description	Reference
STEP 1	Provide Project Brief or Basic Information	• The Project Proponent must provide the basic information to enable the Qualified Person to understand the scope of the project and carry out the screening process. • The requirement for the EIA study will be determined and if required, the project will be classified under the First Schedule or Second Schedule.	• Chapter 1 of the Guidelines.
STEP 2	Identify the Legal Requirements	• The Qualified Person shall identify all legal requirements relevant to the project based on the information provided by the Project Proponent.	• Chapter 2 of the Guidelines.
STEP 3	Check Existing Policies and Guidelines	• The Project Proponent is required to clear all policy and administrative matters related to the project before submitting the EIA report to the DOE.	• Chapter 2 of the Guidelines.
STEP 4	Conduct Preliminary Stakeholder Engagement	• The Project Proponent and the Qualified Person should engage with the DOE and the relevant GAs to determine the requirements to be included in the TOR report. • The Qualified Person can also engage with other relevant stakeholders to obtain site information and data for the scoping.	• Chapter 2 of the Guidelines.
STEP 5	Prepare TOR and ESI Report	• ESI and TOR must be prepared before the preparation of the EIA report. • The Qualified Person shall obtain secondary data to assist in the Environmental Scoping. • At this point in time, qualitative data is sufficient for scoping of significant impacts for the TOR. • Relevant information required for the TOR includes: ✓ Site Suitability Assessment (SSA). ✓ Determination of the study boundary. ✓ Overview of baseline data. ✓ Identification of key project activities. ✓ Identification of significant impacts and priority setting. ✓ Selection of mitigation measures.	• Chapter 3 of the Guidelines.

	Step	Description	Reference
STEP 6	Submit TOR and ESI Report	• The Qualified Person shall review all data obtained during scoping to prepare the TOR report based on DOE requirements in the EGIM.	• Chapter 3 of the Guidelines.
STEP 7	Collect Baseline Data for EIA Report	• Baseline data collection shall be carried out after the TOR endorsement to obtain detailed information of the existing environment on the project site and its surroundings.	• Chapter 4 of the Guidelines.
STEP 8	Prepare EIA Report	• The major studies and components of the EIA report shall cover the following: ✓ Identify and predict significant environmental issues and impacts. ✓ Assess and evaluate the significant environmental issues and impacts. ✓ Identify suitable P2M2s. ✓ Provide the Environmental Management Plan (EMP) framework. ✓ Conclude the EIA study findings. • Process description shall cover the following (refer to **Appendix A** for more detail): ✓ Project Location ✓ Project Components ✓ Type of Scheduled Waste ✓ Waste Acceptance Criteria (WAC) ✓ Process Technology ✓ Detailed Design for Pollution Control System ✓ Mass Balance Calculation ✓ Project Activities ✓ Infrastructure, Utilities and Amenities Requirement ✓ Project Implementation Schedule	• Chapter 5,6 & 7 of the Guidelines.

	Step	Description	Reference
STEP 9	Conduct Stakeholder Engagement	• The Project Proponent and Qualified Person are recommended to engage with the relevant stakeholders particularly to those affected by the project. • The engagement aims to seek their thoughts and feedback. • Key points for the engagement are as follows: ✓ Project background. ✓ Potential environmental issues. ✓ Proposed P2M2s. • All findings from the engagement shall be incorporated and addressed in the EIA report when necessary.	• Chapter 2 of the Guidelines.
STEP 10	Completion of EIA Report	• The results of assessments and studies required by other GAs have to be incorporated into the EIA report but not necessary to append the individual reports. • The EIA report shall be prepared according to the EGIM.	• Chapter 8 of the Guidelines.
STEP 11	Submit EIA and Public Display	• The EIA report shall be submitted to DOE State or DOE HQ for review. • The Qualified Person shall note the differences in requirements for a First Schedule and Second Schedule EIA and follow the required procedures. • Second Schedule EIA requires a public display of the EIA report. • The public can provide their comments and feedback within the review period to DOE HQ during the public display.	• Chapter 8 of this Guidelines.

EIA GUIDELINES

Waste Treatment & Disposal – Scheduled Waste

2 ENVIRONMENTAL PROJECT PLANNING

CHAPTER 2

ENVIRONMENTAL PROJECT PLANNING

2.1 INTRODUCTION

EIA is an integral part of the overall integrated project planning, which can provide benefits and value to any project. It is a tool to evaluate the potential impacts arising from a proposed project based on the physicochemical, ecological and human components of the environment.

It identifies the key areas of environmental concerns for consideration during the project planning stage and provides a means to decide on the types of mitigation measures to avert or minimise the adverse impacts at an early stage. A summary of the EIA process is shown in EGIM.

2.2 WASTE MANAGEMENT CONCEPT

Malaysia had adopted the cradle-to-grave method previously. This method begins from the extraction of the raw materials, the manufacturing process, followed by the use of products and finally the disposal of the products. Priority is given to the disposal rather than resource recovery. It has given rise to the environmental problems such as illegal dumping.

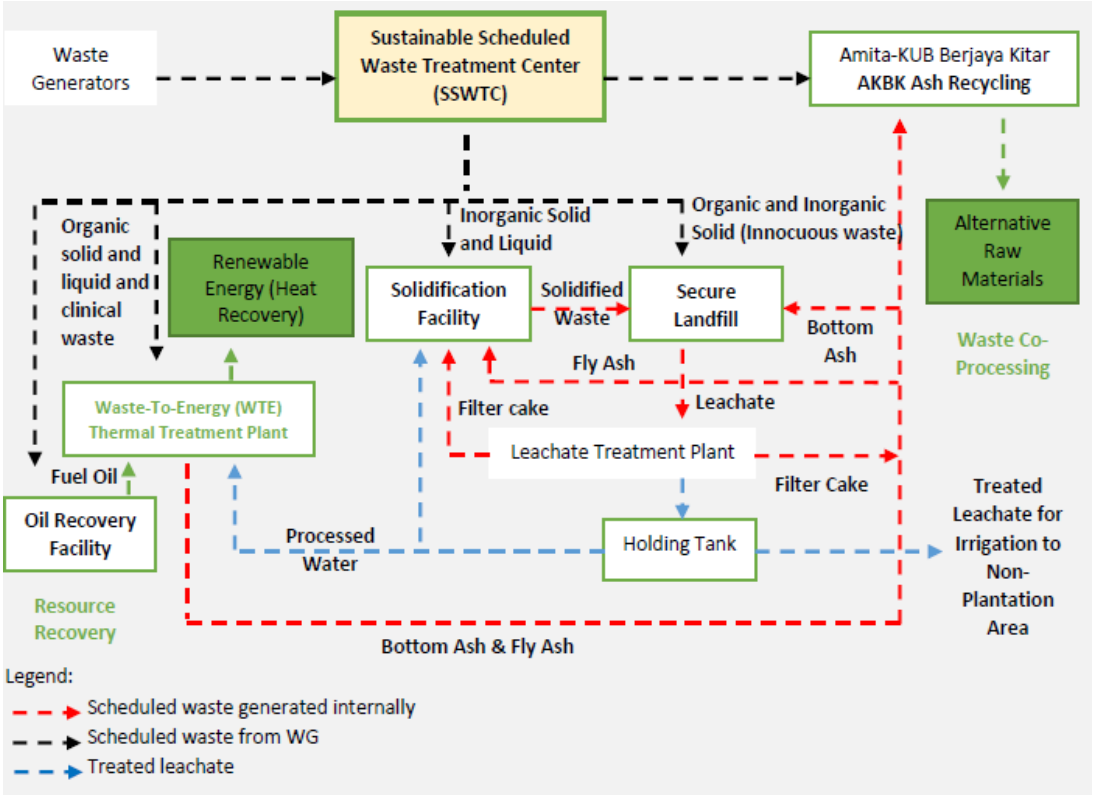
In recent years, emphasis has been given to cleaner production techniques and zero discharge engineering which aim to shift from cradle-to-grave concept to cradle-to-cradle concept. This concept will minimise the generation of waste either by reducing, re-using, recycling or recovering the waste into different products. Many of the scheduled waste treatment and disposal facilities have embraced this concept. It can be seen from the increasing development of the Integrated Scheduled Waste Management Facility which is more sustainable.

Figure 2-1 shows the example of the Integrated Scheduled Waste Management Facility. Main components of this facility are as follows:

- Waste to Energy Thermal Treatment Plant.
- Recycling Plant for Production of Alternative Raw Material and Fuel.
- Secure Landfill.
- Solidification Plant.
- Physical and Chemical Treatment Plant.
- Effluent Treatment Plant.
- Leachate Treatment Plant.

It is important to note that the DOE, product producers, generators and scheduled waste licensed premises need to play a critical role in ensuring that scheduled wastes are prevented, minimized, collected and treated properly in accordance to the waste hierarchy or ''cradle-to-cradle'' concept. Converting to this concept will protect the natural resources and reduce the scheduled waste generation in Malaysia.

Figure 2-1 Example of the Integrated Scheduled Waste Management Facility

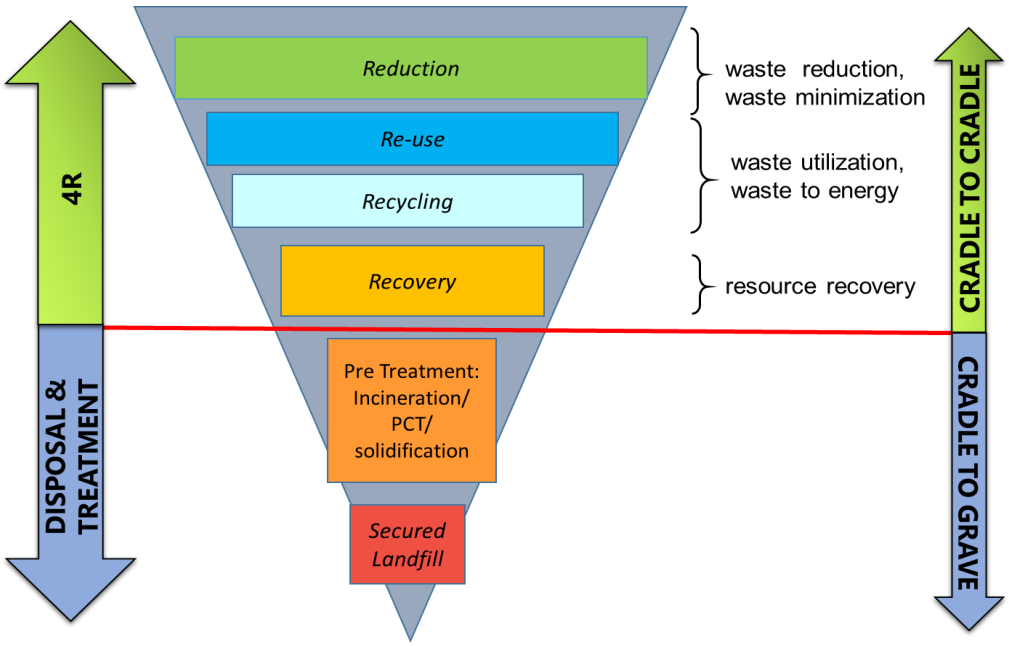


Source: EIA Report for Proposed Development of Sustainable Scheduled Waste Treatment Center (SSWTC) at PT1682 Bukit Tagar Sanitary Landfill, Mukim Sungai Tinggi, Daerah Hulu Selangor, Selangor Darul Ehsan.

Based on the waste management hierarchy **(Figure 2-2)**, treatment (i.e. physical and chemical treatment) and disposal are the least favoured options. Scheduled wastes are preferred to be reduced, reused, recycled and recovered. Some examples of the applications of 4R for scheduled wastes are as follows:

- Solvent and chemical recycling.
- Scheduled waste recycling into Alternative Raw Material (ARM) and Alternative Fuel (AF).
- Wastewater recycling.
- Energy recovery from thermal treatment plant.
- Metal recovery.
- Volatile compound recovery.
- Co-processing.

Figure 2-2 Waste Management Hierarchy



2.3 RELEVANT LEGISLATIONS

The EQA 1974 (Act 127) and the Environmental Quality (Scheduled Waste) Regulations 2005 are the two main legal instruments that governing the scheduled waste management in Malaysia. There are also other key legislations governing the scheduled waste activities as tabulated in **Table 2-1**.

Table 2-1 Key Legislations Governing the Scheduled Waste Activities

Legislations	Details
Environmental Quality Act 1974	It regulates the development of **scheduled waste management facilities** under the following sections: • **Section 11** – Licenses. • **Section 12** – Power to attach conditions to license. • **Section 13** – Duration and renewal of licenses. • **Section 14** – Transfer of licenses. • **Section 15** – Register of licenses. • **Section 16** – Licensee to comply with license. • **Section 17** – License fees. • **Section 18** – Prescribed premises to be licensed. • **Section 21** – Power to specify conditions of emission, discharge, etc. • **Section 34A** – Report on impact on environment resulting from prescribed activities. • **Section 34B** – Prohibition against placing, deposit, etc. of scheduled wastes. • **Section 49A** – Competent person.

Legislations	Details
Environmental Quality (Licensing) Regulations 1977	These regulations contain the **form of application** for license.
Environmental Quality (Prescribed Premises) (Scheduled Wastes Treatment and Disposal Facilities) Order 1989	This order specifies the **prescribed premises** to be licensed to exercise the powers conferred by Section 18 of the Environmental Quality Act 1974.
Environmental Quality (Prescribed Premises) (Scheduled Wastes Treatment and Disposal Facilities) Regulations 1989	These regulations support and set procedures for **licensing for prescribed premises** under the Environmental Quality (Prescribed Premises) (Scheduled Wastes Treatment and Disposal Facilities) Order 1989.
Environmental Quality (Prescribed Conveyance) (Scheduled Wastes) Order 2005	This order defines the **prescribed conveyance** to exercise the powers conferred by subsection 18(1A) of the Environmental Quality Act 1974.
Environmental Quality (Scheduled Waste) Regulations 2005	These regulations specify the **management of scheduled waste** from generation to final disposal. It classifies the most common hazardous waste generated in Malaysia.
Environmental Quality (Industrial Effluent) Regulations 2009	These regulations are currently used to regulate the discharge limits of the **industrial effluent treatment systems** to treat industrial effluent from a scheduled waste management facility (i.e. treatment or recovery facility).
Environmental Quality (Clean Air) Regulations 2014	These regulations incorporated the previous Environmental Quality (Dioxin and Furan) Regulations 2014. In these regulations, heat and power generation and **waste incinerators** in all sizes are among the activities subject to the Best Available Techniques Economically Achievable (BAT). Air pollutant emission concentration limits for these activities are stipulated in these regulations.
Environmental Quality (Prescribed Activities) (Environmental Impact Assessment) Order 2015	This order specifies the **prescribed activities** to exercise the powers conferred by subsection 34A(1) of the Environmental Quality Act 1974. Scheduled waste prescribed activities are listed under **Activity 14(a)** of the First Schedule and Second Schedule. This order also applies to Sabah and Sarawak.
Customs (Prohibition of Exports) Order 2017	This order facilitates the Basel Convention on the Control of Transboundary Movement of Hazardous Wastes and their Disposal. It specifies the goods which are **prohibited for export** except in the manner provided. Toxic and or hazardous wastes are listed in **Item No. 31** under the Third Schedule, Part 1.

Legislations	Details
Customs (Prohibition of Imports) Order 2017	This order facilitates the Basel Convention on the Control of Transboundary Movement of Hazardous Wastes and their Disposal. It specifies the goods which are **prohibited to be imported** into Malaysia except in the manner provided. Toxic and or hazardous wastes are listed in **Item No. 54** under the Third Schedule, Part 1.
Town and Country Planning Act 1976	Subsection 20B(1) of the act explains the duty to seek advice on any construction of major national infrastructure including **toxic waste disposal sites** and other infrastructure of national interest determined by the Council. **Social Impact Assessment (SIA)** requirement is required under Subsection 20B(2) of the act. This act applies only to Peninsular Malaysia and the Federal Territory of Labuan.

Note: The list is not exhaustive and not all the above may be relevant to the project. It is the responsibility of the Project Proponent and the Qualified Person to determine the relevant legislation required for the environmental assessment and compliance.

2.4 POLICIES AND GUIDELINES COMPLIANCE

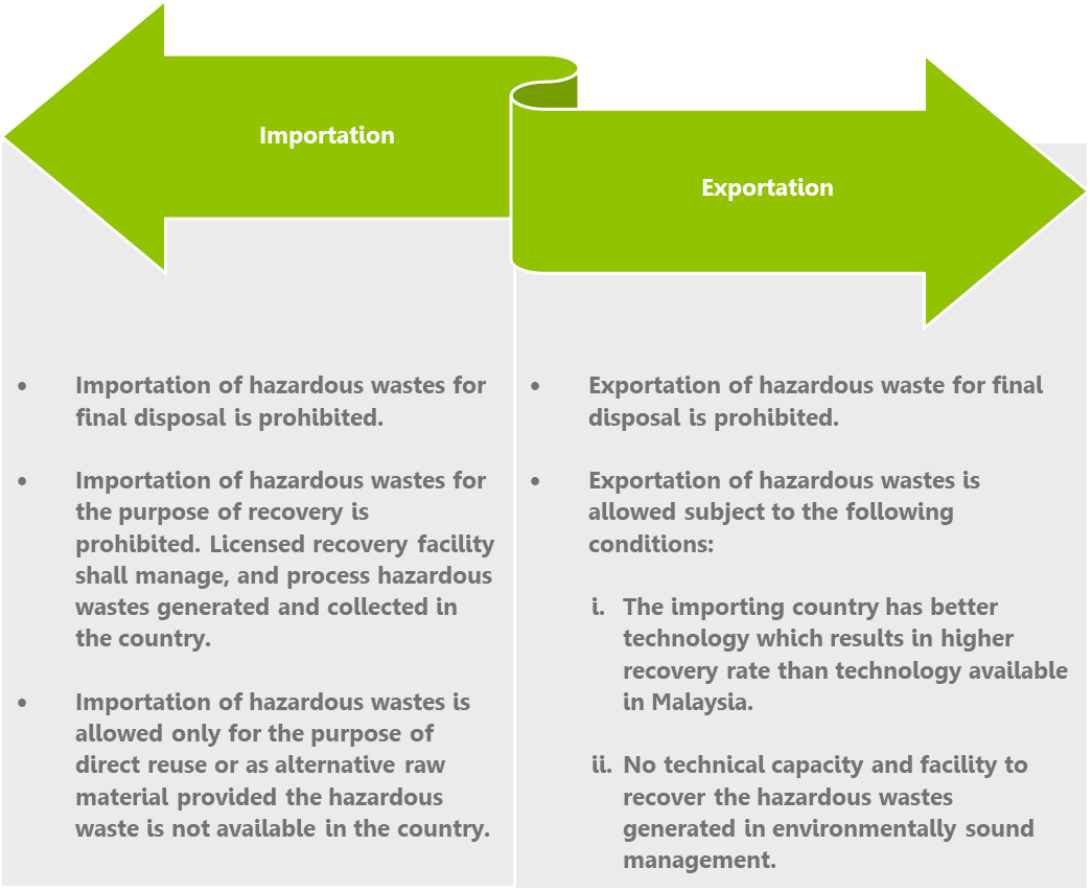
The Environmental Quality Act 1974 has been the pillar for all the policies established regarding the scheduled waste management in Malaysia. The Environmental Quality (Scheduled Waste) Regulations 2005 specify all the requirements needed for the management of scheduled waste from generation to final disposal. Scheduled waste management is under the purview of the DOE which is an agency that acts as a regulator and policy maker. Recognising the threat which may pose from the scheduled waste, the DOE have formulated several policies to ensure scheduled waste is managed in environmentally sound manner to protect human health and the environment.

It is important to note that, these policies are not rigid but rather dynamic and will be revised from time to time. Factors like technological advancement, supply and demand among others can affect the policies that have been formulated. Therefore, it is important for the Project Proponent or the Qualified Person to engage with the DOE during the planning stage to make sure the proposed project is in line with their current policies. Some of the policies that are deemed relevant are described below.

2.4.1 Basel Convention

Malaysia has ratified the Basel Convention on the Control of Transboundary Movement of Hazardous Waste and their Disposal. Section 34B of the Environmental Quality Act 1974 is a provision that governing the importation and the exportation of scheduled waste.

Under this provision, any importation and exportation of scheduled wastes is restricted and written approval from Director General of DOE shall be obtained prior to the movement. Director General of DOE is the Focal Point and Competent Authority to the Basel Convention in Malaysia. In implementing the Convention, Malaysia has adopted the principles and basic obligations stated under the provision of Basel Convention to established policies on the importation and exportation of scheduled wastes.



2.4.2 Sludges Not Categorised as Scheduled Wastes

The DOE has classified other types of sludges that are not regulated under the Environmental Quality (Scheduled Waste) Regulations 2005. Disposal of the sludges from the industries shown below is regulated under their respective regulations.

Sludge from Pulp and Paper Industry[1]

Written permission must be obtained from the DOE State Office as stipulated under Regulation 23, Environment Quality (Industrial Effluent) Regulations 2009

Sludge from Agro-Based Industries[2]

Written permission must be obtained from the DOE State Office as stipulated under Regulation 23, Environment Quality (Industrial Effluent) Regulations 2009

Sludge from Sewage Treatment Plants

Written permission must be obtained for the disposal of such sludge from the DOE State Office as stipulated under the Regulation 15 of the Environmental Quality (Sewage) Regulations 2009

Sludge from Crude Palm Oil Mills

Written permission must be obtained for the disposal of such sludge from the DOE State Office as stipulated under the Environmental Quality (Prescribed Premises) (Crude Palm Oil) Regulations 1977

Sludge from the Raw Natural Rubber Plant

Written permission must be obtained for the disposal of such sludge from the DOE State Office as stipulated under the Environmental Quality (Prescribed Premises) (Raw Natural Rubber) Regulations 1978

Notes:

1. Production processes only use virgin pulp, without waste printed paper.
2. Sludge containing organic matters from agro-based industry and does not contain pollutants exceeding the limits for the parameters listed in the Guidelines for the Application of Special Waste management of Scheduled Waste as below:
   a) Animal slaughtering industry.
   b) Food industry where the main raw materials are from agriculture and animal products. For example:
      - Industry processing agricultural and livestock product.
      - Industry producing beverages.
      - Industry producing food products such as chocolate, biscuit, nuts, noodles and other food products.
3. The list is not exhaustive and may be added/changed by the DOE. It is the responsibility of the Project Proponent and the Qualified Person engage with the DOE to obtain the latest policies and guidelines.

2.4.3 Special Management of Scheduled Waste

A waste generator may apply to the Director General of DOE to exclude the scheduled wastes generated from their particular facility or process from being treated, disposed of or recovered at the prescribed premises. This provision is specified under Regulation 7 (1), Environmental Quality (Scheduled Waste) Regulation 2005.

In order for the application to be considered, scheduled waste generators shall demonstrate that the waste meet all the criteria set in the Guidelines for the Application of Special Management of Scheduled Waste published by the DOE. In general, the waste shall not exhibit any of the hazardous characteristics described in **Chapter 1.4.1** and has been proven by scientific studies or tests on its toxicity and carcinogenicity and does not pose hazardous effects on human or other life forms as defined in the above-mentioned guidelines.

2.4.4 Co-Processing of Scheduled Waste in Cement Industry

Certain types of scheduled waste can be co-processed as alternative raw material or alternative fuel or additives in the cement plant. **Table 2-2** shows the examples of scheduled wastes that have been approved by the DOE to be co-processed in the cement plant. The lists are not exhaustive and can be reviewed by the DOE on a case-by-case basis.

Scheduled wastes need to be tested and should fulfil the Waste Acceptance Criteria (WAC) set by the cement plant or at least the minimum WAC specified in the Guidelines on Environmentally Sound Co-Processing of Scheduled Waste in Cement Industry in Malaysia (First Edition 2015). This is to verify the suitability of the scheduled wastes before they can be used as alternative raw material, alternative fuel and additives in the cement plant.

Not all scheduled wastes can be co-processed in the cement plant. **Figure 2-3** shows the list of scheduled wastes that are <u>not allowed</u> to be co-processed in the cement plant. These wastes are not recommended to be utilised due to the following reasons:

- Health and safety concerns;
- Potentially negative impacts on kiln operation;
- Clinker quality;
- Air emissions; and
- When a preferable alternative waste management option is available.

Table 2-2 Examples of Scheduled Waste Approved for Co-Processing in Cement Plant

Purpose of Co-Processing	Scheduled Waste Code*	Type of Waste
Alternative raw material	SW 104	• Used copper slag • Used garnets • Spent pot linings
	SW 204	• Sludges containing one or several metals including chromium, copper, nickel, zinc, lead, cadmium, aluminium, tin, vanadium and beryllium
	SW 207	• Sludges containing fluoride
Cement additive	SW 104 SW 205	• Fly ash from coal-based power plant • Flue Gas Desulfurization (FGD) gypsum from power plant (i.e. not necessary be coal based) • Gypsum from chemical plant

Note: * Scheduled Waste Code under the First Schedule of the Environmental Quality (Scheduled Waste) Regulations 2005.

Figure 2-3 Scheduled Wastes That Are Not Allowed to be Co-Processed in the Cement Plant

2.4.5 Waste Acceptance Criteria

Waste Receivers (WR) need to develop the waste acceptance criteria (WAC) based on the process technology used in their treatment and disposal facilities. **Figure 2-4** shows that each treatment and disposal method have their specific WAC. Several important elements that should be considered in developing WAC including (but not limited to):

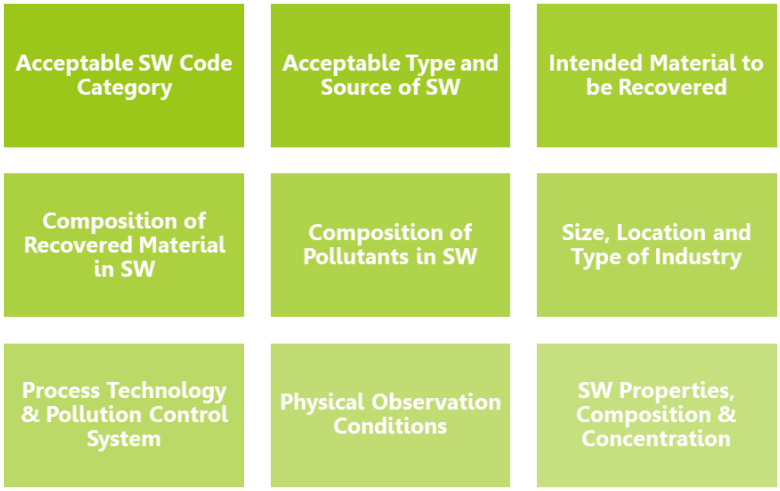
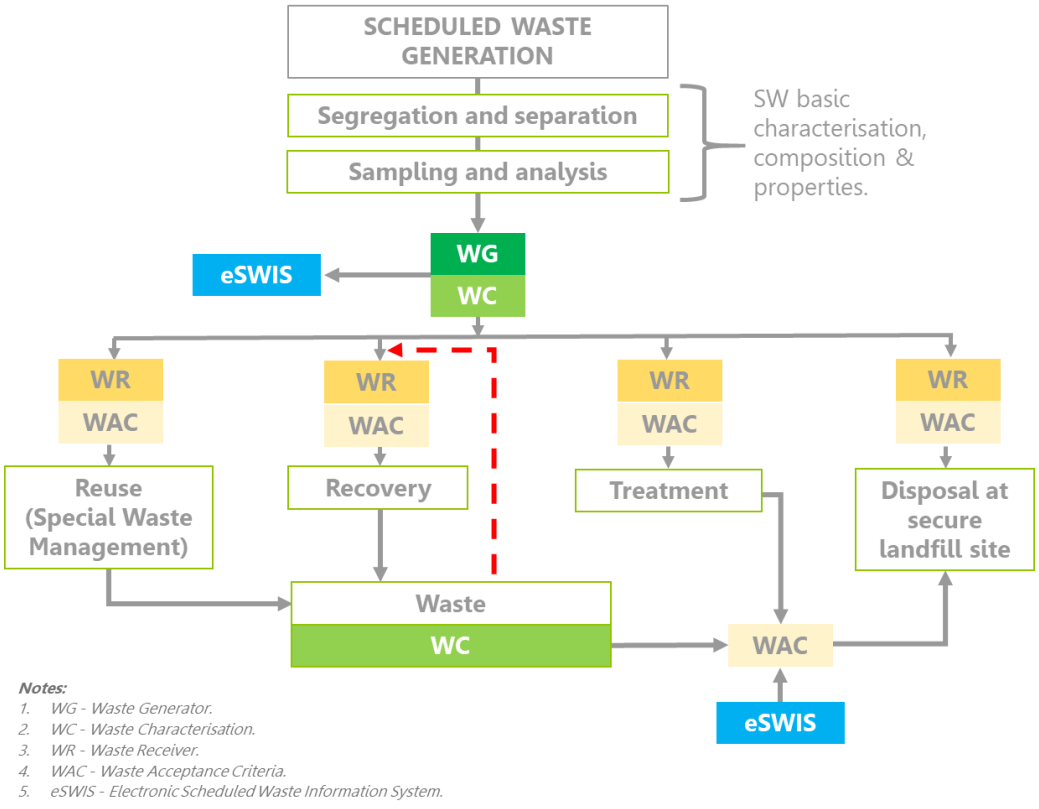


Figure 2-4 Relationship between WAC and the Treatment and Disposal Methods



Examples of WAC that have been developed for the disposal at secure landfill and recovery facility are shown in **Table 2-3** and **Table 2-4**. Only scheduled wastes that have passed the WAC can be further processed at the recovery/treatment facility or disposed at the secure landfill. Guidance for the WAC can be referred in the *Dokumen Panduan e-SWIS - Modul Kriteria Penerimaan Buangan (Waste Acceptance Criteria) Edisi Pertama 2016 published by the DOE*.

Table 2-3 Example of WAC for Disposal at Secure Landfill

Parameter	Unit	Limit
Total solids	%	>20
pH slurry	-	5.5 – 12
Total Organic Carbon (TOC)	%	<10
Oil & Grease (O&G)	mg/l	1000
Chloride, Cl	%	2
Cyanide, CN	mg/l	0.5
Toxicity Characteristic Leaching Procedure (TCLP) test		
Arsenic (As)	mg/l	5
Barium (Ba)	mg/l	100
Boron (B)	mg/l	400
Cadmium (Cd)	mg/l	1
Chromium (Cr)	mg/l	5
Copper (Cu)	mg/l	100
Lead (Pb)	mg/l	5
Mercury (Hg)	mg/l	0.2
Nickel (Ni)	mg/l	100
Selenium (Se)	mg/l	1
Silver (Ag)	mg/l	5
Tin (St)	mg/l	100
Zinc (Zn)	mg/l	100

Table 2-4 Example of WAC for Recovery Facility

Parameter	Unit	Limit
Waste Oil Recovery		
Arsenic (As)	ppm	Maximum 5 ppm
Cadmium (Cd)	ppm	<2
Chromium (Cr)	ppm	<10
Lead (Pb)	ppm	<100
Total halogen (chlorine)	ppm	<1000
Flash point	^{o}C	>37.7
Appearance	-	Clear and bright
Spent Catalyst Containing Gold, Silver and Palladium		
Gold (Au)	%	≥0.05
Silver (Ag)	%	≥2.5
Palladium (Pd)	%	≥0.005
Scheduled Waste Containing Alloy and Welding Alloy		
Welding dross	%	>15%

2.4.6 Standard and Specification of Recovered Scheduled Waste

2.4.6.1 Percentage of Recoverable of Metals from Metal Hydroxide Sludge and Spent Catalyst

The DOE has set the percentage of recoverable of metals from metal hydroxide sludge and spent catalyst. **Table 2-5** shows the specifications to comply.

Table 2-5 Percentage of Recoverables of Metals from Metal Hydroxide Sludge and Spent Catalyst

Type of Scheduled Waste	Recovered Metals	Minimum Percentage (based on dry weight)
Metal hydroxide sludge	Copper (Cu)	10
	Gold (Au)	0.05
	Nickel (Ni)	5
	Silver (Ag)	2.5
	Zinc (Zn)	20
Spent catalyst	Chromium oxide	10
	Cobalt (Co)	20
	Copper compound	10
	Nickel oxide	10
	Nickel (Ni)	8
	Palladium (Pd)	1.0
	Platinum (Pt)	0.2
	Zinc oxide (ZnO)	10

2.4.6.2 Standard and Specification of Recovered Waste Oil

The DOE has published Guidelines on Standard and Specification of Recovered Waste Oil in Malaysia (First Edition 2010). There are several waste oils specified in the First Schedule of the Environmental Quality (Scheduled Waste) Regulations 2005 that still have economic values and can be recovered. For the recovered, recycled, or reconstituted processes of waste oil to be considered as non-scheduled waste, it must meet the allowable level of contaminant and specification of recovered waste oil as described in **Table 2-6**.

Table 2-6 Standard and Specification of Recovered Waste Oil

Parameters/Constituents	Allowable Level
Arsenic	5 ppm maximum
Cadmium	2 ppm maximum
Chromium	10 ppm maximum
Lead	100 ppm maximum
Total Halogen (as Chlorine)	1000 ppm maximum
Flash point	37.7°C or higher
Appearance	The recovered waste oils must have a clear and bright appearance

Parameters/Constituents	Allowable Level
Poly-aromatic hydrocarbons (PAHs)	
Benzo(a)pyrene	10 mg/1 kg oil (10 ppm) maximum
Dibenz(ah)anthracene	10 mg/1 kg oil (10 ppm) maximum
Benz(a)anthracene	100 mg/1 kg oil (100 ppm) maximum
Benzo(b)fluoranthene	100 mg/1 kg oil (100 ppm) maximum
Benzo(k)fluoranthene	100 mg/1 kg oil (100 ppm) maximum
Chrysene	100 mg/1 kg oil (100 ppm) maximum
Indeno(123-cd)pyrene	100 mg/1 kg oil (100 ppm) maximum

2.4.7 Process Technology

2.4.7.1 Process Technology Options

There are several options that should be considered in managing the scheduled wastes (**Figure 2-5**). Among the options are as follows:

- Reuse of scheduled wastes as Alternative Raw Material (ARM).
- Recovery of scheduled wastes.
- Treatment of scheduled wastes.
- Disposal of scheduled wastes at secure landfill.

Figure 2-6 summarises the types of process technologies to treat and dispose the scheduled wastes.

Figure 2-5 Flowchart of Scheduled Waste Management Process Technology Options for Various Types of Scheduled Wastes

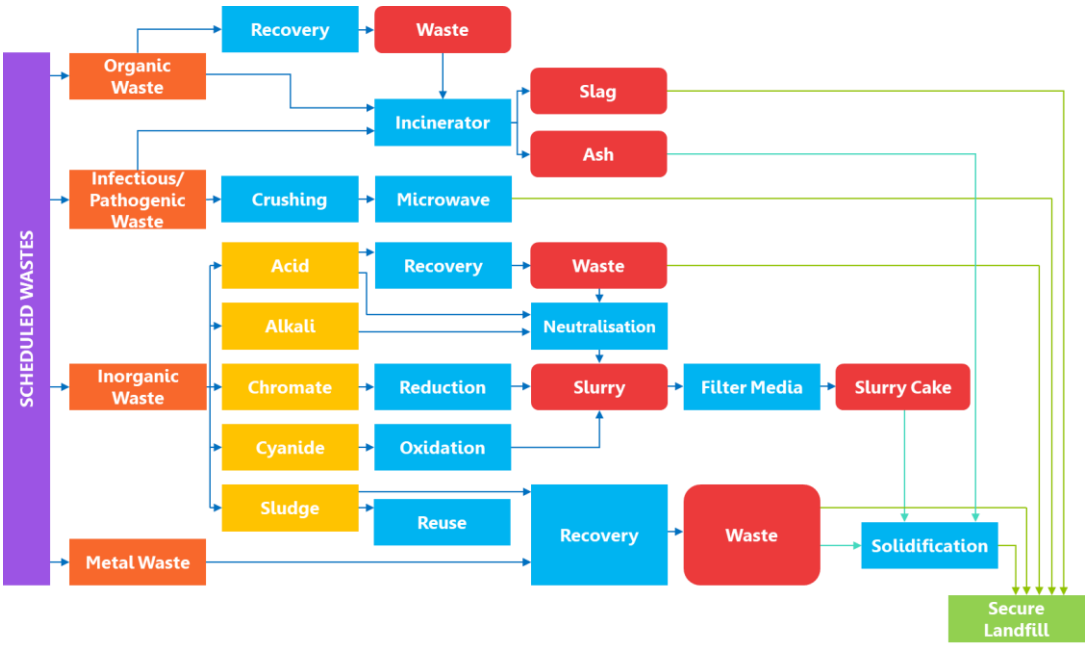
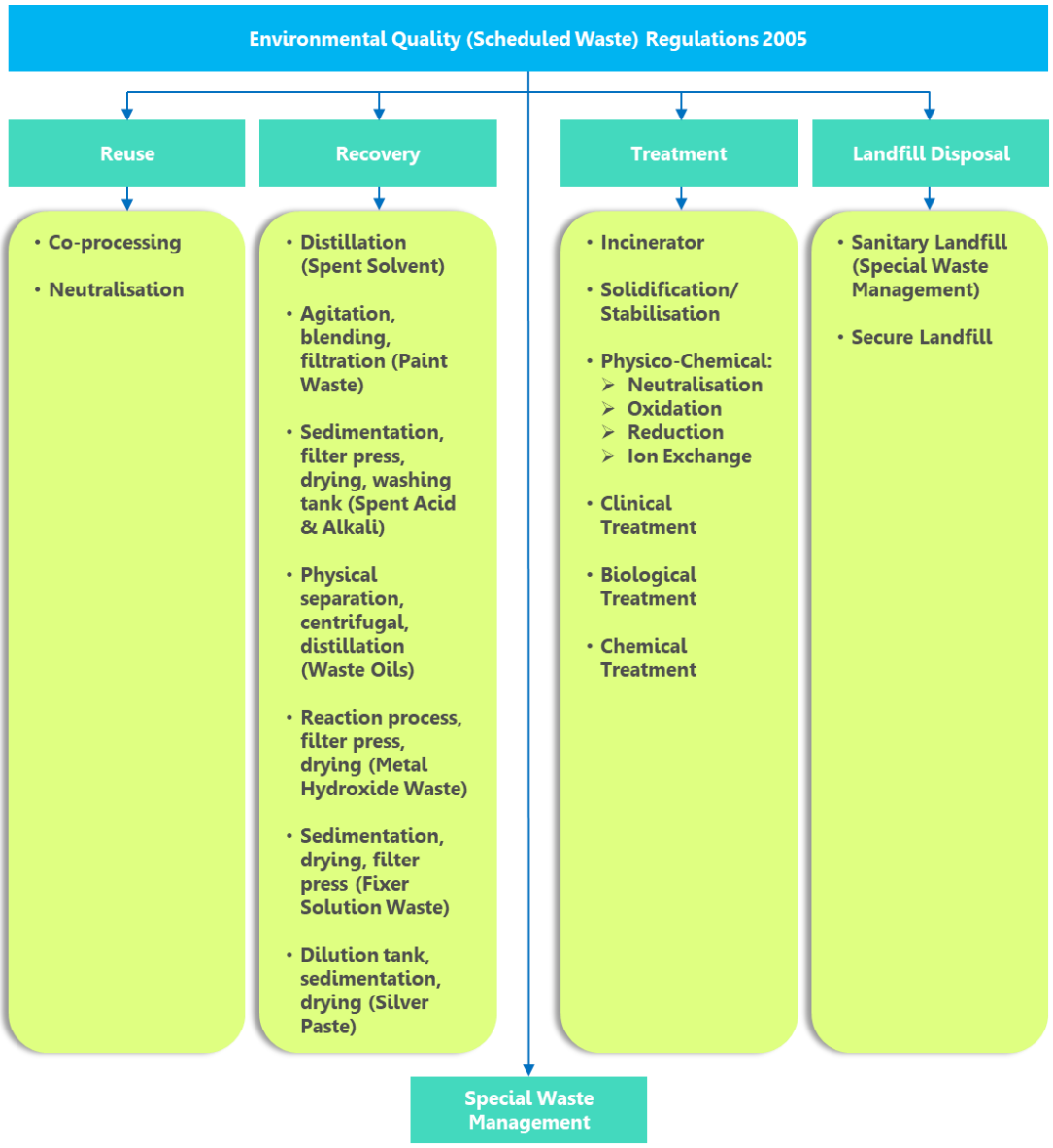


Figure 2-6 Types of Process Technologies for Scheduled Waste Management

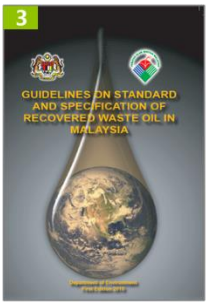


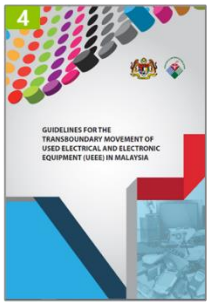
2.4.7.2 Carbonator

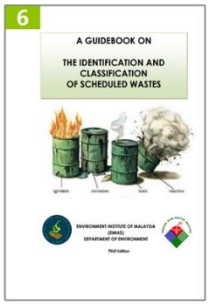
The DOE has set a rule for the usage of technology particularly the carbonator or carbonizer at the off-site scheduled waste recovery facility. The installation of a carbonator or carbonizer is strictly for the pre-treatment process only as certain material like metal oxides will not be destroyed. Further treatment process is needed to extract metals or other valuable materials.

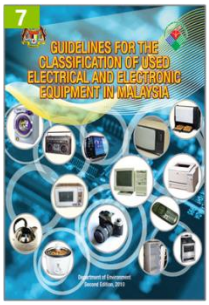
2.5 GUIDELINES AND GUIDANCE DOCUMENT

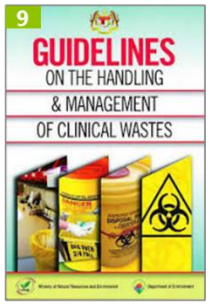
The EIA report shall refer to the relevant guidelines and guidance documents issued by the DOE and other Government Agencies (GAs) on environment-related systems and management. Besides that, other documents and notices issued from time to time, related to the EIA process and procedures shall be referred too. The lists of relevant guidelines or guidance documents published by the DOE are shown below.

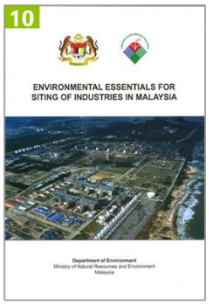


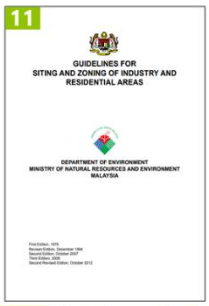


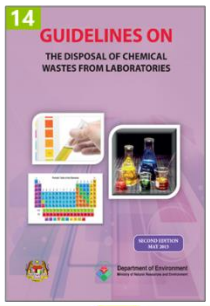












1	Kod Amalan Pelabelan Buangan Terjadual, Penggunaan Label dan Bekas Penstoran Buangan Terjadual di bawah Peraturan-Peraturan Kualiti Alam Sekeliling (Buangan Terjadual) 2005, Edisi Pertama, 25 Mei 2015	6	A Guidebook on the Identification and Classification of Scheduled Wastes, First Edition, October 2015	11	Guidelines for Siting and Zoning of Industry and Residential Areas, Second Revised Edition, October 2012
2	Panduan Permohonan Lesen Bagi Menduduki Dan Menggunakan Premis yang Ditetapkan. (Kemudahan Pengolahan dan Pelupusan Buangan Terjadual), Edisi Ketiga, 2007	7	Guidelines for the Classification of Used Electrical and Electronic Equipment in Malaysia, Second Edition, 2010	12	Environmental Impact Assessment Guideline in Malaysia, 2016
3	Guidelines on Standard and Specification of Recovered Waste Oil in Malaysia, First Edition 2010	8	Guidelines for Packaging, Labelling and Storage of Scheduled Waste in Malaysia, January 2014	13	Best Available Techniques Guidance Document on Waste Incinerator published by the DOE, 2014
4	Guidelines for the Transboundary Movement of Used Electrical and Electronic Equipment (UEEE) in Malaysia	9	Guidelines on the Handling and Management of Clinical Wastes in Malaysia, Third Edition, 2010	14	Guidelines on the Disposal of Chemical Waste from Laboratories
5	Guidelines on Environmentally Sound Co-Processing of Scheduled Waste in Cement Industry in Malaysia, First Edition, 25th May 2015	10	Environmental Essentials for Siting of Industries in Malaysia, October 2017	15	Guidelines for The Application of Special Management of Scheduled Waste

2.6 INTEGRATION OF ENVIRONMENTAL COMPLIANCE INTO PROJECT PLANNING

It is important for the Project Proponent to aware of all the legal requirements on the environment and other associated requirements that could be one of the pre-requisites for the EIA approval. Environmental compliance is not all about fulfilling the requirements from the DOE and other Government Agencies (GAs) for the EIA study but needs to be seen at a bigger perspective throughout the entire cycle of the project. **Figure 2-7** shows the summary relevant requirements at various project implementation stage.

A typical project cycle involves many phases and requires inputs from various technical specialists and consultants to provide for submissions and applications to the various approving authorities as shown in **Table 2-7**.

The benefits of knowing or taking into consideration these requirements at the early development of the project are:

- Avoid any legal implications by the relevant authorities.
- Allow the Project Proponent to allocate sufficient budget to safeguard the environment (not only focusing on the EIA study).

Figure 2-7 Summary of Relevant Requirements at Various Project Implementation Stage

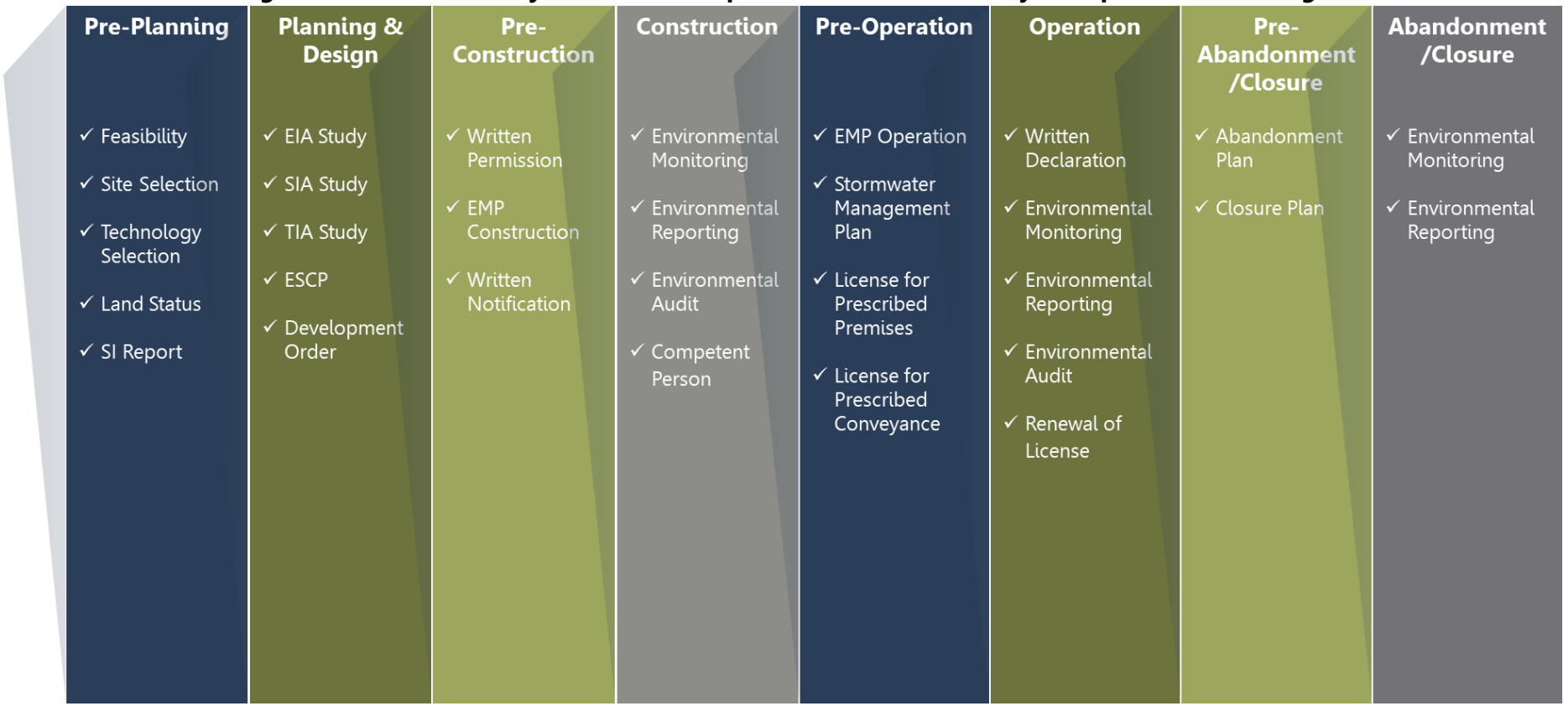


Table 2-7 List of Relevant Requirements at Various Project Implementation Stage

Project Stage	Requirement	Detail	Legal Provision
Pre-Planning	Feasibility Study	• Assessment on TELOS – Technical, Economic, Legal, Operational and Scheduling.	-
	Site Selection	• Site suitability assessment.	-
	Technology Selection	• Create a technology shortlist.	-
	Soil Investigation (SI)	• Nature and characteristics of sub-soil below the ground level.	• Geological Survey Act 1974 (act 129).
	Land Status	• Compatibility of the land.	• National Land Code 1965 (Act 56).
Planning & Design	**Department of Environment (DOE)**		
	Environmental Impact Assessment (EIA)	• TOR and ESI. • Statement of need. • Project options. • Project description. • Existing environment. • Evaluation of impacts. • Mitigation measures. • Environmental Management Plan (EMP).	• Section 34A of the Environmental Quality Act (EQA) 1974. • Environmental Quality (Prescribed Activities) (Environmental Impact Assessment) Order 2015. • Environmental Quality (Scheduled Waste) Regulations 2005. • Environmental Quality (Industrial Effluent) Regulations 2009. • Environmental Quality (Sewage) Regulations 2009.

Project Stage	Requirement	Detail	Legal Provision
			• Environmental Quality (Clean Air) Regulations 2014.
	Department of Environment (DOE)/Ministry of Health (MOH)		
	Health Impact Assessment (HIA) - to be integrated in the EIA report	• Screening • Scoping • Description of existing public health status • Health Risk Assessment (HRA)	• Environmental Quality Act 1974.
	Department of Mineral and Geoscience (JMG)		
	Geological & Hydrogeological Assessment Report – to be integrated in the EIA report	• Subsurface geological profile: drilling/geophysical survey. • Permeability test results. • Construction materials – clay liner, clay blanket & filter sand. • Detailed groundwater regime. • Expected leachate movement and mitigative measures. • Potential groundwater, soil and rock pollution and mitigative measures. • Proposed groundwater monitoring network. • Flood prone area.	• Geological Survey Act 1974 (act 129). • Geological Survey (Notification of Development of Wells and Excavations) Regulations 2013.
	PLANMalaysia		
	Social Impact Assessment (SIA) – Not applicable in Sabah & Sarawak	• Screening. • Scoping. • Baseline study. • Impact projection and evaluation. • Mitigation. • Social Impact Management Plan (SIMP).	• Section 20B of the Town and Country Planning Act 1976 [Act 172]. • Section 21A of the Town and Country Planning Act 1976 [Act 172].
	National Physical Planning Council (MPFN)		
	Seek for MPFN advice for Second Schedule,	• Technical reports.	• Sub-Section 22(2A) of the Town and Country

Project Stage	Requirement	Detail	Legal Provision
	Activity 14(a)(iv) – Secure landfill facility (Not applicable in Sabah & Sarawak)		Planning Act 1976 [Act 172].
	Department of Irrigation and Drainage (DID)		
	Erosion and Sedimentation Control Plan (ESCP)	• Annual soil erosion rate. • Sediment yield. • Proposed erosion and sedimentation control measures. • Inspection and maintenance.	• Section 70 of the Street, Drainage and Building Act 1974 [Act 133]. • Section 70A of the Street, Drainage and Building Act 1974 [Act 133].
	Public Works Department (PWD)/Local Authority (LA)		
	Traffic Impact Assessment (TIA) – required if PWD road (Federal/State road) is involved	• Road & junction characteristics. • Traffic count survey. • Existing traffic condition evaluation. • Traffic forecast. • Impact assessment. • Mitigation measures.	• Section 85 of the Road Transport Act 1987 [Act 333]. • Section 21 of the Town and Country Planning Act 1976 [Act 172].
	Local Authority (LA)		
	Development Order (Kebenaran Merancang)	• Approvals of various submissions to the technical agencies: ✓ EIA report – DOE. ✓ ESCP report – DID. ✓ TIA report – PWD. ✓ SIA report – PLANMalaysia. ✓ Geotechnical report (if required). ✓ TNB. ✓ IWK. ✓ BOMBA.	• Section 21 of the Town and Country Planning Act 1976 [Act 172].

Project Stage	Requirement	Detail	Legal Provision
		✓ DOSH. ✓ PTG. ✓ Various departments under Local Authority. ✓ Others.	
Pre-Construction	**Department of Environment (DOE)**		
	Written Permission	• <u>Prescribed premises:</u> ✓ Form AS 11- Application for Written Permission Under Section 19, Environmental Quality Act, 1974, To Set Up Off Site Schedule Waste Recovery Facilities. ✓ Form AS 13 - Application for Setting-Up Off Site Storage Facilities/Transportation. • <u>Prescribed conveyance:</u> ✓ Form AS 11(a) - Application for Written Permission Under Section 19, Environmental Quality Act, 1974, For Setting Up Transport Vehicle as Prescribed Conveyance. ✓ Form AS. PBT.2005 - Application for Written Permission Under Section 19, Environmental Quality Act, 1974, For Setting Up Vehicle or Ship as Prescribed Conveyance.	• Section 19 of the EQA 1974.
	Environmental Management Plan (EMP) for Construction	• Company's environmental policy. • Organisational structure. • Training requirements. • Environmental requirements. • Environmental Mainstreaming Tools (EMT).	• Section 34A of the EQA 1974.
	Written Notification	• <u>Air pollution control system:</u> ✓ Form AS/PUB/N-BAGFILTER - Written Notification on Air Emission Sources (Air Pollution Control System (Bag Filter)). ✓ Form AS/PUB/N-CHIMNEY - Written Notification on Installation of Exhaust/ Vent.	• Environmental Quality (Clean Air) Regulations 2014.

Project Stage	Requirement	Detail	Legal Provision
		✓ Form AS/PUB/N-ESP - Written Notification on Air Emission Sources (Air Pollution Control System (Electrostatic Precipitator)). ✓ Form AS/PUB/N-APB - Written Notification on Air Emission Sources (Fuel Burning Equipment). ✓ Form AS/PUB/N-INS - Written Notification on Air Emission Sources (Incinerator). ✓ Form AS/PUB/N-SCRUBBER - Written Notification on Air Emission Sources (Air Pollution Control System (Scrubber). ✓ Form AS/PUB/N-CYCLONE - Written Notification on Air Emission Sources (Air Pollution Control System (Centrifugal Dust Collector)). ✓ Form AS/PUB/N-JANA - Written Notification on Air Emission Sources (Generator). • <u>Water pollution control system:</u> ✓ Second Schedule – Notification for New or Altered Sources of Discharge of Industrial Effluent or Mixed Effluent.	• Environmental Quality (Industrial Effluent) Regulations 2009.
Construction	**Department of Environment (DOE)**		
	Environmental Monitoring	• Performance, compliance and impact monitoring such as: ✓ Ambient air monitoring. ✓ Noise monitoring. ✓ Silt trap discharge sampling. ✓ Surface water sampling.	• Environmental Quality Act 1974.
	Environmental Reporting	• Form EIA 1-18 – EIA Project Information Status. • Form EIA 2-18 – EIA Approval Conditions Compliance Report.	• Section 34A of the EQA 1974.

Project Stage	Requirement	Detail	Legal Provision
	Environmental Audit	• Audit Site Administrative Details. • Regulatory Compliance Summary. • Audit Findings. • Recommendations.	• Section 33A of the EQA 1974.
	Competent Person	• Certified Erosion, Sediment and Storm Water Inspector (CESSWI). • Certified Inspection of Sediment and Erosion Control (CISEC).	• Section 49A of the EQA 1974. • Environmental Quality (Clean Air) Regulations 2014.
Pre-Operation	**Department of Environment (DOE)**		
	Environmental Management Plan (EMP) for Operation	• Company's environmental policy. • Organisational structure. • Training requirements. • Environmental requirements. • Environmental Mainstreaming Tools (EMT).	• Section 34A of the EQA 1974.
	License for Prescribed Premises	• Form AS 12 – Application for A License Under Section 18, Environmental Quality Act 1974 to Set Up Secure Landfill. • Form A.S. 1 – Pin. 1/86 (Pindaan 2019) – Application for A License/Renewal of A License/Transfer of A License Under the Environmental Quality Act 1974.	• Section 11 to 18 of the EQA 1974. • Environmental Quality (Licensing) regulations 1977.
	Department of Irrigation and Drainage (DID)		
	Drainage and Stormwater Management	• Project Location and Site Descriptions. • Proposed Project Development. • Site Identifications. • Hydrological Data Analysis. • Development of Stormwater Management Master Plan. • Drainage and Conveyance System Plans. • Wet/Dry Pond Plans.	• Section 70 of the Street, Drainage and Building Act 1974 [Act 133]. • Section 70A of the Street, Drainage and Building Act 1974 [Act 133].

Project Stage	Requirement	Detail	Legal Provision
		• Onsite Detention (OSD) Plans. • Gross Pollutant Traps (GPTs) Plans. • Filtration Plans. • Infiltration Plans.	
Operation	**Department of Environment (DOE)**		
	Environmental Monitoring	• Performance, compliance and impact monitoring such as: ✓ Stack monitoring. ✓ Ambient air monitoring. ✓ Noise monitoring. ✓ Industrial effluent treatment system (IETS) discharge sampling. ✓ Surface water sampling. ✓ Groundwater sampling.	• Environmental Quality Act 1974.
	Environmental Reporting	• Form EIA 1-18 – EIA Project Information Status. • Form EIA 2-18 – EIA Approval Conditions Compliance Report.	• Section 34A of the EQA 1974.
	Environmental Audit	• Audit Site Administrative Details. • Regulatory Compliance Summary. • Audit Findings. • Recommendations.	• Section 33A of the EQA 1974.
	Competent Person	• Certified Environmental Professional in Scheduled Waste Management (CePSWaM). • Certified Environmental Professional in Bag Filters Operation (CePBFO). • Certified Environmental Professional in Scrubber Operation (CePSO). • Certified Environmental Professionals in The Leachate Treatment Plant Operation (CePLTPO).	• Section 49A of the EQA 1974. • Environmental Quality (Clean Air) Regulations 2014. • Environmental Quality (Industrial Effluent) Regulations 2009.

Project Stage	Requirement	Detail	Legal Provision
		• Certified Environmental Professional in the Operation of Industrial Effluent Treatment Systems (CePIETSO).	
	Written Declaration	• Form AS/PUB/DECLARE – Written Declaration on Design and Construction of Air Pollution Control System. • Third Schedule - Written Declaration on Design and Construction of Industrial Effluent Treatment System.	• Environmental Quality (Clean Air) Regulations 2014. • Environmental Quality (Industrial Effluent) Regulations 2009.
	Emission Declaration	• Form AS/PUB/EMISSION - Emission Declaration of Air Emission Sources Under Regulations 18 of the Environmental Quality (Clean Air) Regulation 2014.	• Environmental Quality (Clean Air) Regulations 2014.
	Renewal of License	• Form A.S. 1 – Pin. 1/86 (Pindaan 2019) – Application for A License/Renewal of A License/Transfer of A License Under the Environmental Quality Act 1974.	• Environmental Quality (Licensing) regulations 1977.
Pre-Abandonment/Closure	**Department of Environment (DOE)**		
	Abandonment/Closure Plan	• Overall decommissioning and abandonment/closure strategy.	• Section 34A of the EQA 1974.
Abandonment/Closure	**Department of Environment (DOE)**		
	Environmental Monitoring	• Stack monitoring. • Surface water sampling. • Groundwater sampling.	• Environmental Quality Act 1974.
	Environmental Reporting	• Report on the post abandonment/closure.	• Section 34A of the EQA 1974.

Note: The list is not exhaustive and not all the above may be relevant to the project. It is the responsibility of the Project Proponent and the Qualified Person to determine the relevant requirements required for environmental assessment and compliance.

2.7 STAKEHOLDER ENGAGEMENT

2.7.1 Identification of Stakeholder

The EIA process has provided adequate mechanisms to enable the stakeholders to provide relevant inputs as well as contribute their views and comments for the decision-making process by the relevant approving authority. All the relevant inputs from the stakeholders will be addressed in the TOR and EIA reports.

There will be at least 2 stages of stakeholder engagements throughout the EIA process as follows:

- **Stage 1** – Preliminary engagement before the preparation of TOR.
- **Stage 2** – Engagement during the preparation of EIA.

Generally, stakeholders can be grouped into six groups (**Figure 2-8**). Each group plays important and specific roles and shoulder different responsibilities in the EIA process. Satisfying the requirements of each of these groups, so far as is practical, is a key to a successful EIA.

[**Note:** Public engagement (public display and public comment) is mandatory for the Second Schedule EIA as stipulated in the Sub-regulation 3(3) of the Environmental Quality (Prescribed Activities) (Environmental Impact Assessment) order 2015. However, voluntary public engagement is highly encouraged for the First Schedule EIA].

Figure 2-8 Relevant Stakeholders to be Engaged in the EIA Process

2.7.2 Roles and Responsibilities

Table 2-8 below provides the list of possible stakeholders to be considered for the stakeholder engagement process related to scheduled waste projects. Please note that the list provided below is indicative, but non-exhaustive, where the relevant stakeholders may vary, depends on the project nature and location. The Qualified Person may identify any relevant stakeholders to be engaged for the project.

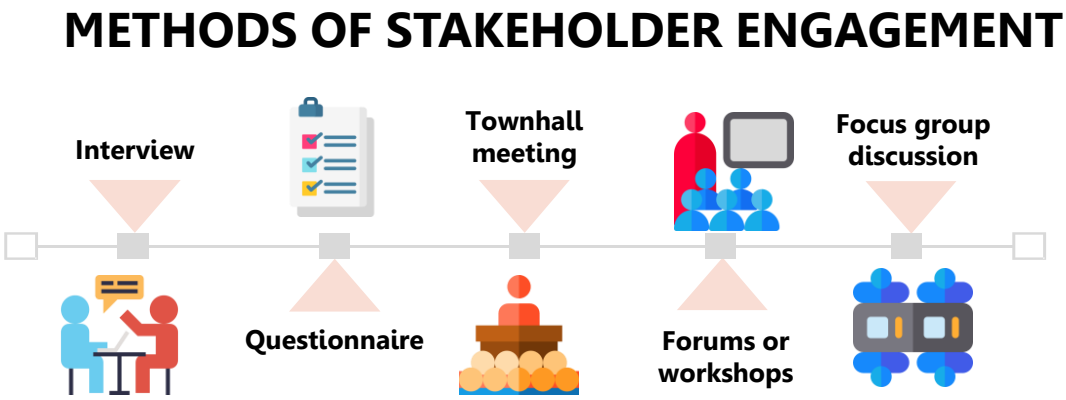
Table 2-8 Roles and Responsibilities of Possible Stakeholders in the EIA Study

Stakeholder	Roles and Responsibilities
Department of Environment (DOE)	• Administration of the EIA process under EQA 1974. • Responsible for the issuance of the COA for the EIA. • Post EIA approvals, monitoring and enforcement.
Project Proponent	• Plan, develop and/or manage the project. • Responsible for obtaining all necessary approvals for the project. • Involved in the management of the project at all stages of development.
Government Agencies: • Department of Mineral and Geoscience (JMG). • Public Works Department (PWD). • Department of Drainage and Irrigation (DID). • Federal Department of Town and Country Planning (PLANMalaysia). • Ministry of Health (MOH). • State Water Authority.	• Provide relevant inputs in respective areas and expertise. • Review the impacts of the project to their respective area of interest. • Ensure the impacts to within the acceptable levels. • List of pertinent requirements that need to be addressed is shown in **Table 2-5**.
Approving Authority: • Federal agency. • State agency. • Local authority.	• Ensure the impacts to be within the acceptable levels. • Give approval to the project after due consideration.
Affected Groups: • Local community. • Business owner. • Land owner.	• Give relevant inputs for protection of local interest. • Give feedback to the impact findings.
Interest Groups: • NGO's related to environment. • Experts. • Environmental practitioners.	• Provide inputs based on their technical knowledge and expertise.

Note: The list is not exhaustive and not all the above may be relevant to the project. It is the responsibility of the Project Proponent and the Qualified Person to identify the relevant stakeholders to engage for the project.

2.7.3 Methods of Engagement

Several engagement methods can be used to engage with stakeholders. Each method has its advantages and disadvantages. It is up to the Qualified Person to determine which method is suitable and effective in getting the inputs from the stakeholders. For example, a one-to-one interview may give more inputs than a workshop but it consumes more time. Detailed explanation for the methods that can be used for public engagement can be referred in the Manual for Social Impact Assessment (SIA) for Project Development, Second Edition, 2018 published by PLANMalaysia.



2.7.4 Documentation and Reporting

The public participation process shall be properly documented and reported in the EIA report. The report shall contain the following:

- Details of the programme (dates, venue, itinerary).
- Attendance list of participants.
- Copies of survey forms (if required).
- A brief summary of findings from the event, e.g. reports, minutes of the meeting, list of questions and responses, photographs of the event.
- Video or voice recordings (optional and only as reference).

The report shall form part of the appendix in the EIA report, and the issues brought up by the stakeholders and responses from the Project Proponent, shall be clearly stated and discussed in the EIA report.

EIA GUIDELINES

Waste Treatment & Disposal – Scheduled Waste

3 TERMS OF REFERENCE (TOR)

CHAPTER 3

TERMS OF REFERENCE

3.1 INTRODUCTION

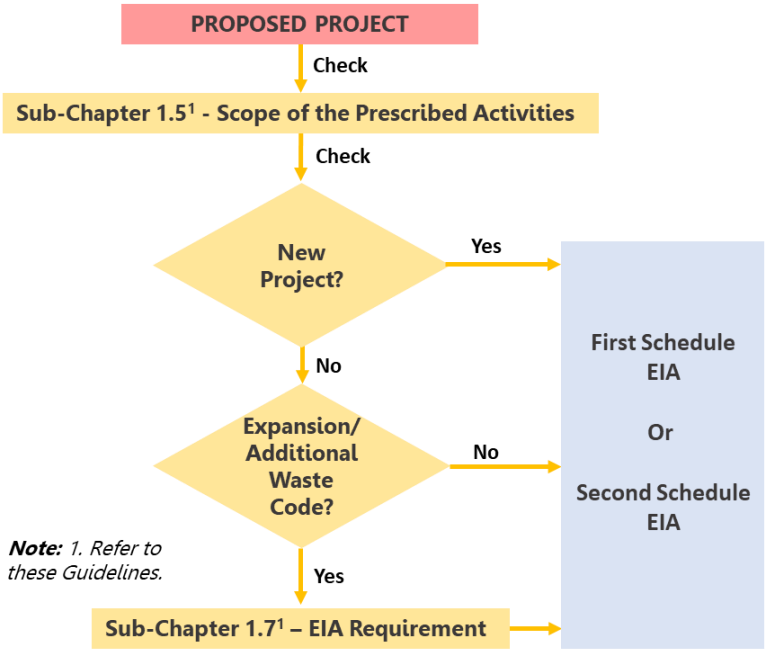
The Terms of Reference (TOR) is the first major milestone in the overall Environmental Impact Assessment (EIA) process. Typically, the TOR will:

- Define the types of information to be presented in the EIA Report.
- Specify the assessments or studies to be performed.
- Identify the EIA team member to conduct the assessments or studies.
- State the study timeline.
- Outline the methodologies to be used in the evaluation of impacts.

3.2 ENVIRONMENTAL SCREENING PROCEDURES

Environmental Screening is carried out to determine whether a proposed project is a prescribed activity under the Environmental Quality (Prescribed Activity) (Environmental Impact Assessment) Order 2015. The flowchart for the screening procedure for the scheduled waste activities is as shown in **Figure 3-1**.

Figure 3-1 Flowchart for Screening Procedure for the Scheduled Waste Activities

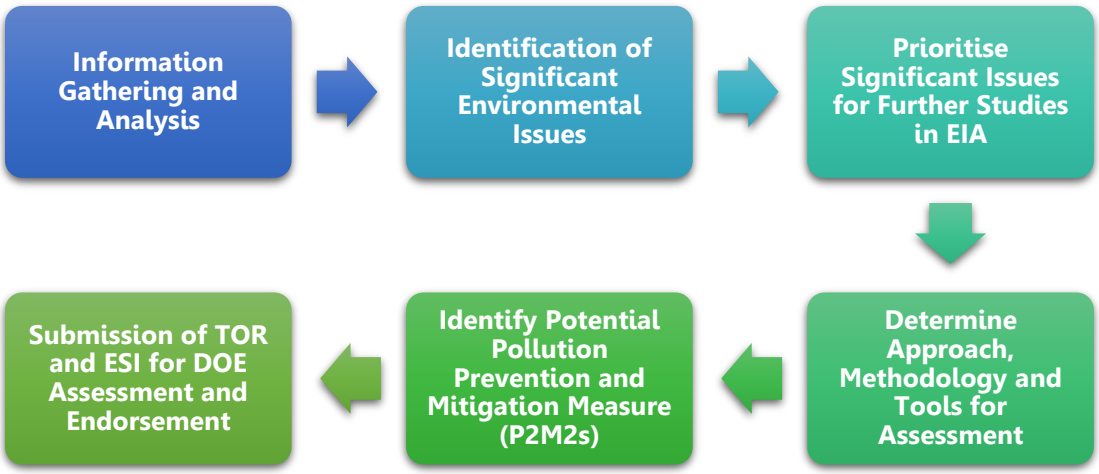


3.3 ENVIRONMENTAL SCOPING

Scoping is very important to determine the key concerns and to set the scope of the EIA study. This helps the decision-makers to receive information in a focus and clear manner, unhindered by voluminous reports containing irrelevant data assessment. **Figure 3-2** shows the general flow path for environmental scoping. There are several objectives of the scoping as follows:

- Sets the limits, boundaries and focus of the EIA study.
- Defines the key environmental concerns which need to be addressed in detail.
- Determines the required baseline data.
- Sets the level of assessment and evaluation criteria.

Figure 3-2 Flow Path for Environmental Scoping



3.4 SITE SUITABILITY ASSESSMENT

A site suitability assessment (SSA) shall be undertaken to determine the acceptability of the site in view of environmental consideration by the DOE. Alternatives and options shall be considered for the proposed site, concept, layout, design and methodologies.

Generally, these options are evaluated during the feasibility study whereby certain criteria are used for the areas identified such as site characteristics and project requirements. These criteria are assessed and ranked based on the priority where it helps in deciding the best option available. The outcome from the feasibility study will form the basis in the scoping exercise.

Practical pollution prevention and mitigation measures (P2M2s) and best management practices (BMPs) related to the development of scheduled waste treatment and disposal facilities will be incorporated in the final option as part of the

scoping exercise. Details of the SSA and its related comments shall be reported in the EIA report. **Table 3-1** shows the examples of considerations in project alternatives and options while site selection criteria for scheduled waste activities are appended in **Appendix B**.

Buffer requirement is one of the criteria in the site selection process. Two guidance documents published by the DOE can be used for guidance namely Guidelines for Siting and Zoning of Industry and Residential Areas (SZIRA 2012) and Environmental Essentials for Siting of Industries in Malaysia (EESIM 2017). The Local Authority will have the final decision on the buffer requirement which essentially depends on the findings of the impact evaluation in the EIA study and advice from the DOE.

A 'No Project' option shall also be assessed and its implications discussed comparatively with the 'With Project' option.

Table 3-1 Considerations in Project Alternatives and Options

Options	Considerations
Project siting	• Adherence to national, state and local policies and plans. • Site constraints to the project and vice versa. • Location and proximity to sensitive receptors. • Buffer/setback availability and requirements. • Any alternative sites proposed for the project.
Process technology options	• Availability of technology to minimise impacts. • Best available technology (BAT) options. • Benchmarking with alternative technology. • Green technology adoption. • Cleaner production concept adoption. • Refer **Appendix C** for examples of technologies.
Pollution prevention and mitigation measures (P2M2s) technology options	• Availability of technology to minimise impacts. • Best available control technology (BACT) options. • Benchmarking with alternative technology. • Green technology adoption. • Zero waste or near zero emissions options. • Refer **Appendix D** for examples of technologies.
Project component and design	• Layout consideration. • Choice of construction methods.
Social	• Need for land acquisition or relocation. • Location of workers camp. • Location within or close to sensitive land & historical sites, cemeteries, places of worship. • Location within or close to populated areas, parks and scenic areas.

Note: The list is not exhaustive and additional criteria/ information may be required by relevant agencies. It is the responsibility of the Project Proponent and the Qualified Person to engage with relevant agencies on a case-by-case basis.

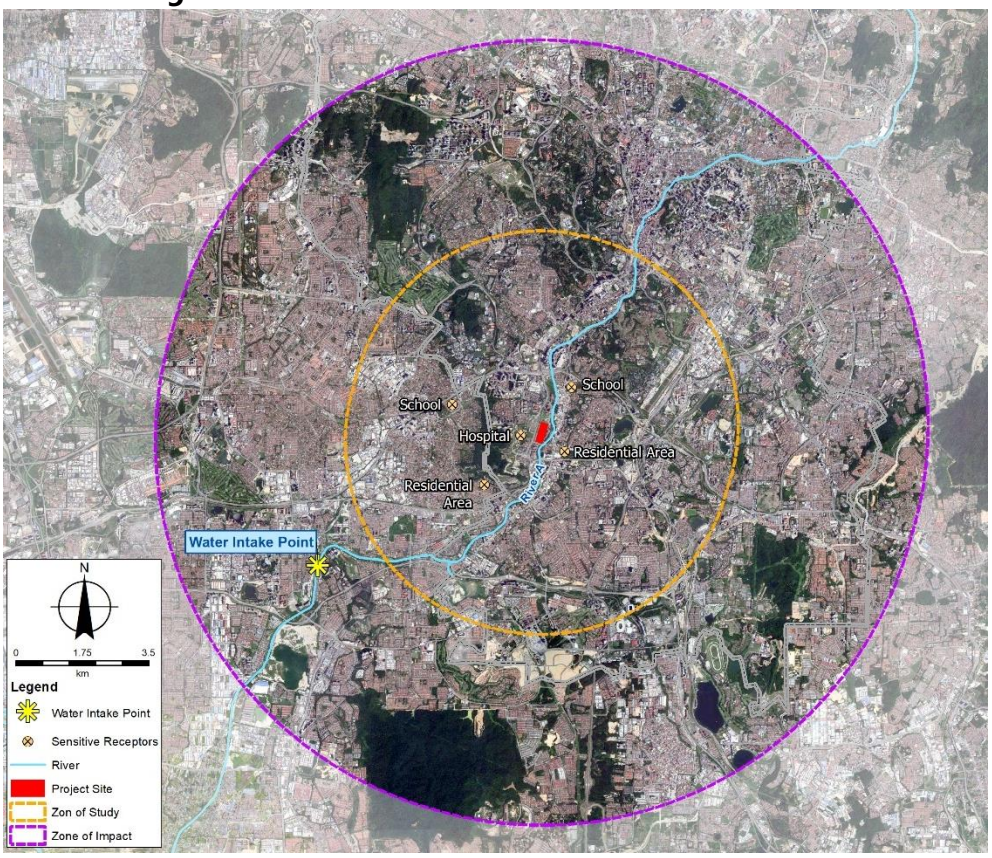
3.5 STUDY BOUNDARY

The study boundaries for each of the significant environmental elements shall be identified in the scoping exercise. These boundaries draw the limit of the study so that only necessary information is gathered and the impact assessment covers thoroughly the critical group of sensitive receptors. There are two types of boundaries as follows:

1) **Zone of Study (ZOS)** – The study area generally encompassing a 5-km radial zone from the project boundary. Qualified Person would need to define the limits of the spatial boundary for each environmental element depending on the location of sensitive receptors.

2) **Zone of Impact (ZOI)** - The spatial area of the potential impacts to extend beyond the ZOS. The ZOI may vary depending on the size of the project. The extent of the ZOI shall be determined by the Qualified Person based on the nature and extent of significant impacts. For example, if there is a water intake point located outside of the ZOS but still within the impact range of the effluent discharge, it should be considered under the ZOI (**Figure 3-3**).

Figure 3-3 Illustration of ZOS and ZOI



3.6 BASELINE DATA REVIEW

A reliable database is a vital element in undertaking an EIA study. The accuracy of predictions of impacts depends on the understanding cause-effect relationship and the status and changes to the physical, chemical, biological and human characteristics of the environment.

The scoping exercise defines the components of which data required and the extent of baseline data collection. Construction of a comprehensive database with regards to the significant issues is important to ensure that the true understanding of the characteristics of the environment could be well established. Justification for the selection of environmental baseline components (i.e. water quality, air quality, noise and vibration sampling) should be included in the TOR/ESI.

If certain environmental aspects have been identified as not significant in the scoping exercise, then that aspect could be omitted from the EIA study and therefore no baseline information need to be gathered. For instance, if vibration impact is not significant, then no baseline for vibration is needed for the EIA study. **Table 3-2** shows an indicative list of required baselines for scheduled waste activities.

Table 3-2 List of Required Baselines for Scheduled Waste Activities

Key Areas	Required Information	
 **Physical**	• Land use • Topography and terrain • Geology and hydrogeology	• Hydrology and river system • Climate and meteorology • Traffic
 **Environmental**	• Surface water quality • Groundwater quality • Marine water quality • Air quality	• Odour • Noise and vibration • Soil (for expansion/upgrading/brownfield development case)
 **Biological**	• Terrestrial and aquatic flora • Terrestrial and aquatic fauna	• Environmental sensitive areas

Key Areas	Required Information	
 **Socio-economic**	• Demography • Public health • Development needs and potential	• Infrastructure facilities • Economic activities
 **Infrastructure and utilities**	• Physical communications • Points of access and transportation routes	• Essential infrastructure • Public amenities

Note: The list is not exhaustive and additional baseline information/sampling may be required by relevant agencies. It is the responsibility of the Project Proponent and the Qualified Person to engage with relevant agencies on a case-by-case basis.

3.7 DETERMINATION OF KEY PROJECT ACTIVITIES

Typically, there are four main phases involve throughout the entire lifecycle of the development of scheduled waste treatment and disposal facilities namely:

- Pre-construction phase;
- Construction phase;
- Operation phase; and
- Abandonment phase.

Generally, key project activities during pre-construction, construction and abandonment phases are quite common in nature. A big chunk of the activities during these phases revolve around civil and structural activities particularly earthworks activities.

On the other hand, activities during the operation phase are different for each of the prescribed activity. These activities shall be determined by the Qualified Person together with the Project Proponent's team to make sure focus is given to address the key project activities. A list of key project activities general for the development scheduled waste treatment and disposal facilities is appended in **Appendix E**.

3.8 IDENTIFICATION OF SIGNIFICANT IMPACTS AND PRIORITY SETTING

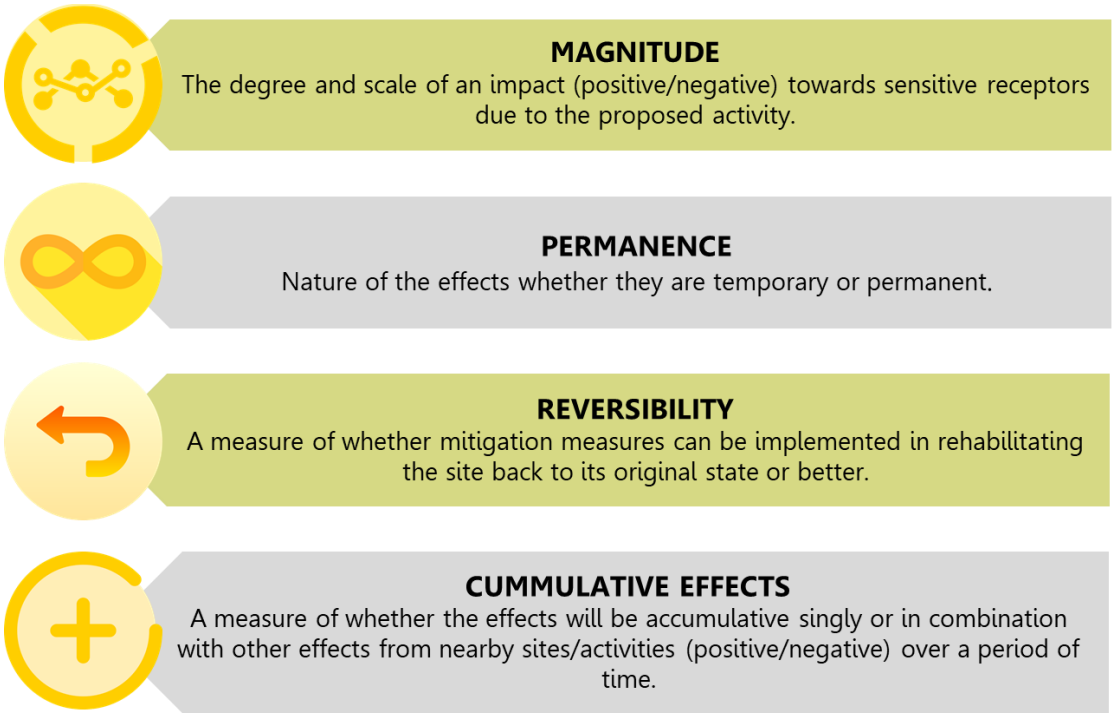
3.8.1 Priority Setting

Following the identification of key project activities, a short list of key environmental issues is drawn up. This involves:

- **Categorization and grouping** of the effects under particular environmental components such as air, water quality, etc.
- **Priority setting:** Key issues or concerns are determined based on their importance, either by decision makers or the uncertainty in their significance of environmental impact that may results. Issues that can be excluded from further assessment are identified and reasons for their exclusion documented for the EIA. Further issues, considered beyond the scope of the EIA, that need resolution are listed.

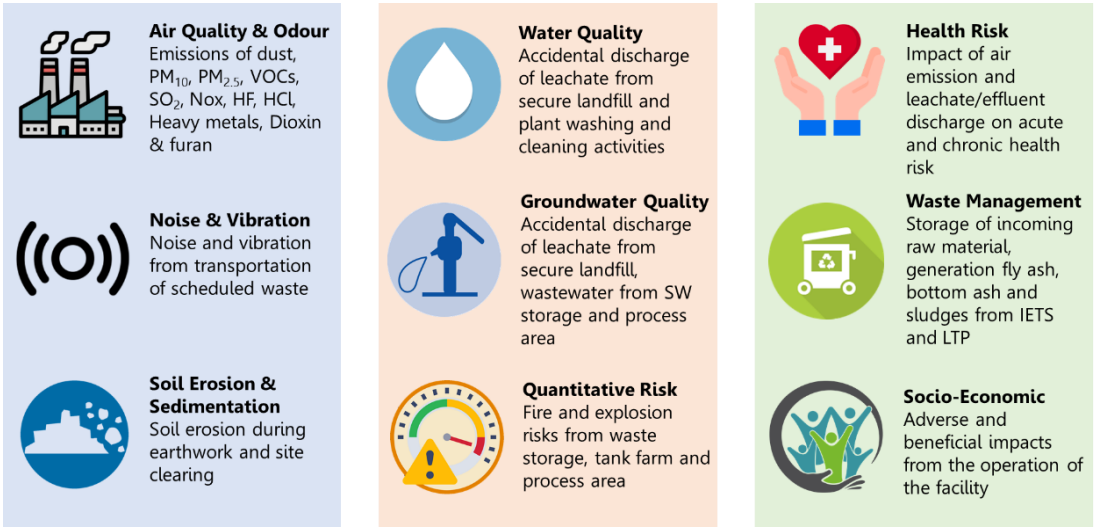
Several criteria need to be considered in setting the priority of the significant impact to be studied in the EIA (**Figure 3-4**). By considering all these criteria, the Qualified Person can use the Environmental Scoping Matrix (ESM) as one of the methods to produce a priority list or the likely significance of environmental impacts to be studied in the EIA **(Appendix F)**. The impact significance will be further evaluated based on the impact assessment results in the EIA stage.

Figure 3-4 Criteria for Determining Significance of Environmental Impacts



3.8.2 Key Issues Related to Scheduled Waste Treatment and Disposal Projects

Key issues related to the scheduled waste treatment and disposal projects that should be highlighted in the EIA report are shown below. The key issues identified below have taken into consideration the way forward in the scheduled waste treatment and disposal projects, whereby an Integrated Scheduled Waste Management Facility is anticipated to be developed.



Note: The key issues listed above may differ according to the project activities and inputs. The Qualified Person shall further scrutinise the key issues and potential impacts that will be generated from the specific prescribed activity. Refer to **Chapter 5.2** for further guidance.

3.9 ESTABLISHMENT OF STUDY REQUIREMENT

Several individual studies are required to address the identified impacts of the project activities. The type of study is dependent on the scale and extent of the Project Site by considering the adjacent land uses and sensitive receptors. The Qualified Person shall provide the methodologies, assessment or modelling tools, and expected outputs for each study.

Table 3-3 shows the general studies required for the scheduled waste treatment and disposal projects. Consultation between the Qualified Person and related Government Agencies is important to ensure all the requirements by Government Agencies are covered in the EIA report.

Table 3-3 List of Applicable Studies to be Considered in the EIA Report

Type of Study	Government Agencies	Activity						
		First Schedule			Second Schedule			
		Activity 14(a)(i) – Recovery Plant (Off-Site)	Activity 14(a)(ii) – Wastewater Treatment Plant (Off-Site)	Activity 14(a)(iii) – Storage Facility (Off-Site)	Activity 14(a)(i) – Thermal Treatment Plant	Activity 14(a)(ii) – Recovery Plant for Lead Acid Battery	Activity 14(a)(iii) – Recovery or Treatment (Upstream of WIP)	Activity 14(a)(iv) – Secure Landfill Facility
Air Quality Assessment	DOE	✓	✓	✓	✓	✓	✓	✓
Water Quality Assessment	DOE/DID	✓	✓	✓	✓	✓	✓	✓
Noise and/or Vibration Assessment	DOE	✓	✓	✓	✓	✓	✓	✓
Waste Management	DOE	✓	✓	✓	✓	✓	✓	✓
Geological Assessment	DOE/JMG	✓	✓	✓	✓	✓	✓	✓
Hydrogeological Assessment	DOE/JMG					✓		✓
Quantitative Risk Assessment (QRA)	DOE/DOSH	✓		✓	✓	✓		✓
Health Impact Assessment (HIA)	DOE/MOH	As required			✓	✓	✓	✓
Socio Economic Study	DOE				✓	✓	✓	✓
Social Impact Assessment (SIA)	PLANMalaysia				✓*			✓*
Soil erosion and sedimentation assessment including LD-P2M2	DOE/DID	✓	✓	✓	✓	✓	✓	✓
Erosion Soil Control Plan (ESCP)	DID	✓	✓	✓	✓	✓	✓	✓
Traffic Impact Assessment (TIA)	PWD	As required						
Ecological Study (terrestrial and aquatic flora and fauna)	DWNP/ FDPM/DOF	As required						

Note: The list is not exhaustive and additional studies may be required by relevant agencies. It is the responsibility of the Project Proponent and the Qualified Person to engage with relevant agencies on a case-by-case basis. * Refer to the Manual for Social Impact Assessment (SIA) for Project Development, Second Edition, 2018.

3.10 SELECTION OF MITIGATION MEASURES

After the significant impacts have been determined, possible mitigation measures shall be identified based on the Best Available Techniques Economically Achievable (BATs), Best Management Practices (BMPs) from similar projects and other options for pollution prevention and mitigation measures (P2M2s) to address these identified impacts. Possible mitigation measures for pre-construction, construction, operation and abandonment phases shall be described qualitatively in this section and to be further detailed in the EIA study. **Table 3-4** shows the example of brief descriptions of possible mitigation measures to be implemented.

Table 3-4 Brief Descriptions for Mitigation Measures

Environmental Impacts	Descriptions of Mitigation Measures
 Land Acquisition	Engage the affected communities with regards to land acquisition and relocation at the early stage to minimize adverse impacts and ensure adequate support and fair compensation, to be further detailed in the Social Impact Assessment.
 Water Quality	Treatment of sediment, sewage and wastewater as well as control of water pollution including those which may arise from accidental discharge and spillage.
 Soil Erosion & Sedimentation	Implement land disturbing pollution prevention and mitigation measures (LD-P2M2) to minimize soil erosion and sedimentation to the identified watercourses.
 Air Quality	Control of point and fugitive sources of air emissions and odour.
 Noise & Vibration	Control noise level and vibration levels to acceptable limits during construction and operational phases to minimize nuisance to the communities.

Environmental Impacts	Descriptions of Mitigation Measures
 Health Risk	Protection of social well-being and health of the surrounding population within the impact zone.
 Solid wastes & Scheduled Wastes	Implement best management practices to handle the biomass, construction, solid and scheduled wastes.
 Fire & Explosion Risk	Safety and risk planning and management to minimise risks of fire and explosion as a result of accidental events.
 Ecology	Minimise disturbance to the ecology by implementing by formulating and implementing the wildlife management plan, etc.
 Traffic	Minimize traffic congestion during the construction and operation phases by formulating and implementing traffic management plans.

3.11 STUDY TEAM

The Project Proponent is required to appoint a Qualified Person to conduct an EIA for any prescribed activities (i.e. scheduled waste treatment and disposal) as stipulated in Section 34A(2) of the Environmental Quality Act 1974. A Qualified Person is an individual who is registered with the DOE (i.e. Environmental Consultant or Subject Specialist). **Figure 3-5** shows the proposed study team to be considered for the preparation of the EIA report for the scheduled waste and treatment activities. The EIA Team Leader shall identify his or her team members according to the potential environmental issues that may arise.

3.11.1 Requirement for Engaging Qualified Consultants to Prepare Detailed Design of Pollution Control System at the EIA Stage

The EIA Team Leader shall include a Qualified Consultant under the EIA study team to prepare the detailed design for the pollution control system. The pollution control systems in this notice referred to:

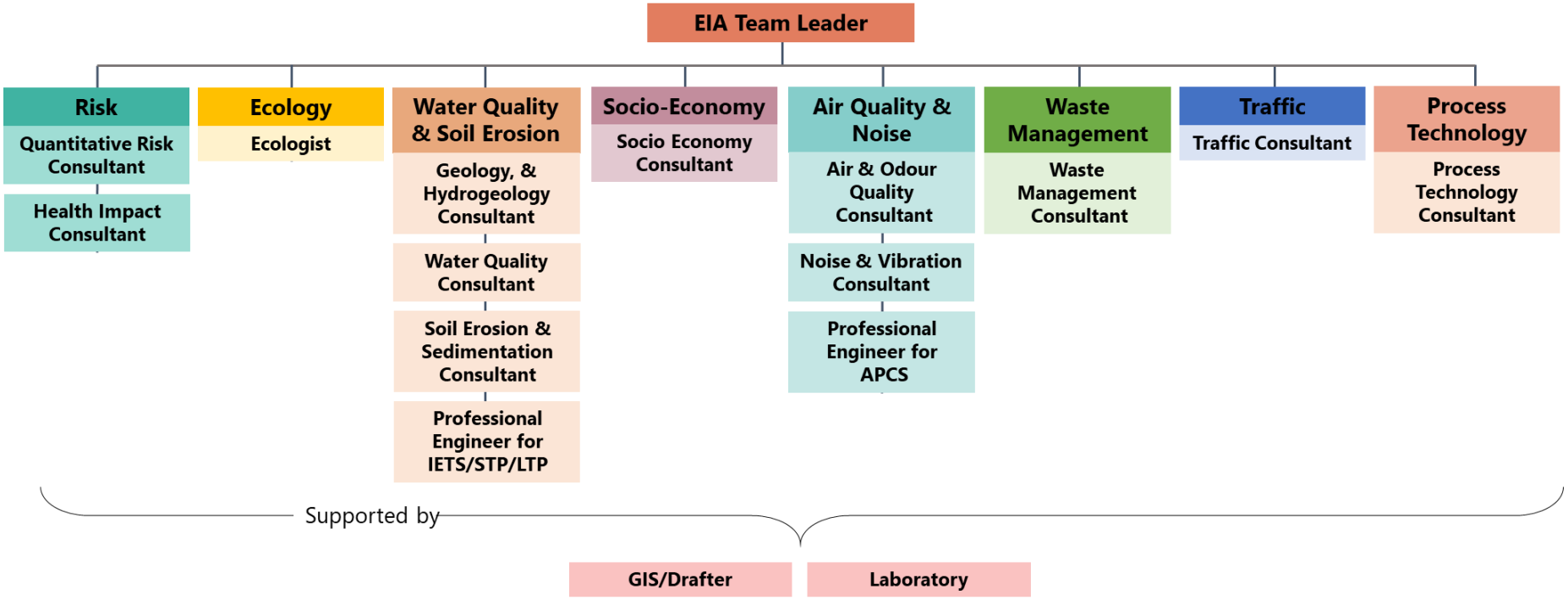
- Industrial Effluent Treatment System (IETS);
- Air Pollution Control System (APCS);
- Leachate Treatment Plant (LTP); and
- Sewage Treatment Plant (STP).

The Qualified Consultant must be a professional engineer who is registered under Section 10(2) of the Registration of Engineers Act 1967 (Revised 2015).

3.11.2 Requirement for Engaging Competent Professionals to Prepare Land Disturbing Pollution Prevention and Mitigation Measures

Another requirement from the DOE is the engagement of a Competent Professional to prepare the Land-Disturbing Pollution Prevention and Mitigation Measures (LD-P2M2) whenever there are land disturbing or site preparation activities. This requirement is specified in the Appendix 4 - Guidance Document for the Preparation of the Document on LD-P2M2 (EGIM). The Qualified Professional must be a registered consultant and holds a Certified Professional in Erosion and Sediment Control (CPESC) certification recognised by the DOE.

Figure 3-5 Proposed EIA Study Team



Notes:

1. A geology and hydrogeology consultant is a person registered under the Board of Geologist in accordance to the Geologist Act 2008 (Act 689).
2. A Professional Engineer is a person registered under Section 10(2) of the Registration of Engineers Act 1967 (Revised 2015).
3. Appointed laboratory conducting environmental monitoring and analysis of environmental samples shall be accredited with Skim Akreditasi Makmal Malaysia (SAMM).
4. IETS means Industrial Effluent Treatment System.
5. STP means Sewage Treatment Plant.
6. LTP means Leachate Treatment Plant.
7. APCS means Air Pollution Control System.
8. List of the EIA Study team is not exhaustive. The EIA Team Leader shall identify his or her team members according to the potential environmental issues that may arise.

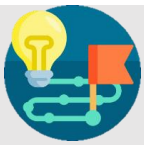
3.12 PREPARATION OF TOR/ESI

Results from the screening and scoping exercises are translated into the Environmental Scoping Information (ESI) and subsequently into the Terms of reference (TOR). The ESI identifies the issues to be addressed in detail, whereas the TOR sets the objectives, defines the scope, and establishes the strategy and schedule for the EIA process to address these issues. If any new information which was not highlighted in the scoping report or at the time of TOR comes to the attention of the DOE, new components and parameters can be added to the EIA Study.

Table 3-5 shows the typical contents of a TOR document which is following the format detailed under the Guidance Document for Preparing TOR under Appendix 8 of the EGIM.

Table 3-5 Contents of a Typical TOR for EIA Report

Contents	Description
 **Introduction**	This Terms of Reference is for the preparation of an Environmental Impact Assessment (EIA) Study for "Project Title".
 **List of Consultant/Study Team**	Details of each individuals (must be registered with DOE) who will carry out the EIA study, which include: • DOE Registration number. • Academic background. • Experience. • Area of study. • Declaration (signatures). The EIA consultant team is to be led by a Team/Project leader/ manager who is responsible for the EIA report. Include contact details (complete address, phone and fax numbers) of the appropriate and responsible person(s) to whom enquiries regarding EIA should be directed.
 **Project Scope**	List out those components of the Project which fall under the Prescribed Activities under the EIA Order, and describe with enough details to understand the scope of the significant project work components, without the technical details, including a well described engineering implementation programme of the Project.

Contents	Description
 **Alternatives Consideration**	Outline alternative solutions (project site, technologies, etc) that will be studied or described to justify that the Project will result in the least environmental impacts.
 **Environmental Impacts**	List and describe those significant environmental impacts which will potentially be affected by the project works or components which will need to be covered in detail in the EIA.
 **Study Boundary**	Delineate study boundaries for each of the above significant environmental elements to be investigated, and identifying the critical groups of sensitive receptors and how the impacts on the sensitive receptors will be studied.
 **Assessment Standards**	List out standards, criteria, acceptable limits, etc that will be used to obtain baseline data and assess the environmental impacts.
 **Timeline of Study**	Details of all studies/investigations to be carried out: who, where, when, how, etc. with indicative dates.
 **Consideration of Concurrent Projects**	List out potential concurrent or planned project that may result in cumulative impacts.
 **Description of Modelling Tools and Assessment Methodologies**	List out modelling tools, methodologies, etc for undertaking impact assessment and evaluation of significance. The extent of accuracy of these tools will also need to be provided, including, name of models, applicability of models and tools, verifiability of results, how results are verified, grid size (for water modelling).
 **Possible Mitigation Measures**	Outline possible mitigation measures or best management practices from similar projects that may be used to address the environmental impacts on this project.

EIA GUIDELINES

Waste Treatment & Disposal – Scheduled Waste

4 BASELINE DATA

Pulau Lang Tengah, Terengganu

CHAPTER 4

BASELINE DATA

4.1 INTRODUCTION

An EIA shall contain a description of the existing environment before the project development (termed as "baseline conditions") that may or may not be affected directly or indirectly from the proposed project.

Objectives for the description on baseline conditions include:

a) Identify existing environmental conditions which may influence project design decisions (e.g. site layout, structural or operational characteristics).
b) Identify sensitive issues or areas requiring mitigation or compensation.
c) Provide input data to analytical models for prediction of impacts.
d) Provide baseline reference for compensation during project implementation stage

The following Chapters shall detail the requirements for baseline data collection as part of the EIA.

4.2 BASELINE DATA COLLECTION

Usually, preliminary baseline data are required for the preparation of TOR/ESI. This is to provide an overview of the existing environment to determine the suitable approach and methodology for the impact assessment. For example, if the project were to discharge effluent into the estuarine area, suitable modelling tools and water sampling approaches should be used to consider the tidal effect.

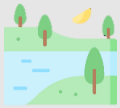
The approach and methodology in obtaining detailed baseline data and technical studies will be identified in the TOR/ESI. Generally, the detailed baseline data, particularly baseline monitoring (e.g. air, water and noise), can be carried out once the DOE endorses the TOR.

Baseline data can be collected from the following sources:

1) Primary source (field studies); and
2) Secondary source (desktop studies).

Baseline studies may address the main components listed in **Table 4-1**.

Table 4-1 List of Requirements for Main Baseline Components

Components	Requirements	Data Sources
Physical		
 **Land-use**	• Land use maps and photos. • Description of existing and future land use. • Identification of Environmentally Sensitive Areas (ESAs) and impact receptors. • Land-use compatibility assessment.	**Primary Source:** ✓ Site survey. ✓ Aerial photos (Drone). **Secondary Source:** ✓ Topography map (JUPEM). ✓ Satellite imagery (Google Earth). ✓ Structure Plan and Local Plan (PLANMalaysia). ✓ Local Authority. ✓ Industrial park developer. ✓ Past studies.
 **Geology and Hydrogeology**	• Description of local and regional geology. • Locations of aquifer and groundwater abstraction wells.	**Primary Data** ✓ Sub-strata survey such as geophysical work (if necessary). **Secondary Source:** ✓ Geological maps (JMG). ✓ Hydrogeological maps (JMG). ✓ Past studies.
 **Soil and Terrain**	• Soil investigation (SI). • Soil erosion potential. • Description of existing topography. • Construction suitability map.	**Primary Source:** ✓ Site survey. ✓ SI report. ✓ Land surveyor report. **Secondary Source:** ✓ Soil erosion risk map (DOA). ✓ Reconnaissance soil map (DOA). ✓ Past studies.
 **Hydrology and Drainage**	• Description of hydrological systems within project area and ZOS or ZOI, whichever is greater. • Flood prone areas. • Drainage network.	**Primary Source:** ✓ Site survey. **Secondary Source:** ✓ Topography map (JUPEM). ✓ Flood map (DID).

Components	Requirements	Data Sources
		✓ Drainage network (Local Authority). ✓ Past studies.
Environmental		
 **Climate**	• Climate data (minimum 10 years). • Surface air data. • Upper air data.	**Secondary Source:** ✓ METMalaysia. ✓ 5th Generation Mesoscale Model (NCAR MM5). ✓ Weather Research and Forecasting (WRF) mesoscale model. ✓ Past studies.
 **Water Quality**	**Surface Water:** • Sampling and analysis of surface water quality. • Measurement of flow rate in waterways and calculation of pollution load at the project area (if required). • Locations of water pollution sources. • Identification of downstream receptors such as water intake points, fish cage cultures, recreational park, etc. • River hydraulic data. • River water quality trends. **Groundwater:** • Sampling and analysis of groundwater quality. • Identification of groundwater flow regime. **Marine Water (if necessary):** • Sampling and analysis of marine water quality. • Marine sediment.	**Primary Source:** ✓ Water sampling. ✓ Site survey. **Secondary Source:** ✓ Hydraulic data (DID). ✓ State Water Authority (e.g. LUAS). ✓ Groundwater (JMG). ✓ Environmental Quality Report and Environment Quality Monitoring System (DOE). ✓ Compendium of Environment Statistics by the Department of Statistics (DOSM). ✓ Past studies.
 **Air Quality**	• Sampling and analysis of ambient air quality of the project site and nearby sensitive receptors. • Locations of air pollution sources. • Identification of air sensitive receptors. • Air quality trends.	**Primary Source:** ✓ Air monitoring. ✓ Site survey. **Secondary Source:** ✓ Environmental Quality Report and Environment Quality Monitoring System (DOE). ✓ Compendium of Environment

Components	Requirements	Data Sources
		Statistics by the Department of Statistics (DOSM). ✓ Past studies.
 **Odour**	• Sampling and analysis of odour of the project site and nearby sensitive receptors. • Locations of odour sources. • Identification of air sensitive receptors.	**Primary Source:** ✓ Odour measurement. ✓ Site survey. **Secondary Source:** ✓ Past studies.
 **Noise and Vibration**	• Measurement and analysis of ambient noise and vibration levels of the project site and nearby sensitive receptors. • Locations of noise pollution sources. • Identification of sensitive receptors.	**Primary Source:** ✓ Noise and vibration monitoring. ✓ Site survey. **Secondary Source:** ✓ Past studies.
Biological		
 **Ecology**	• Description of existing ecology and habitats. • Identification of ESAs (forest reserve, wildlife reserves and sanctuaries, wetlands, mangroves, fisheries, etc.). • Presence of endemic, rare, threatened, endangered and near extinct flora and fauna.	**Primary Source:** ✓ Ecological survey. **Secondary Source:** ✓ FDPM. ✓ DWNP. ✓ DOF. ✓ DOE. ✓ Past studies.
Socio-economic		
 **Demography**	• Data on demography and socio-economic profiles of stakeholders within the ZOI.	**Primary Source:** ✓ Field survey. ✓ Social Impact Assessment (SIA) report. **Secondary Source:** ✓ Local profile reports from community leaders. ✓ Population Census (DOSM). ✓ Local Plans (Local Authority). ✓ Past studies.

Components	Requirements	Data Sources
 **Public Health**	• Communicable disease data (monthly data for at least 1 year). • Chronic non-communicable disease (yearly data for at least 5 years). • Disease prevalence within the ZOI. • Health issues within the ZOI. • Site specific exposure (not mandatory).	**Primary Source:** ✓ Field survey. **Secondary Source:** ✓ State Health Department. ✓ Past studies.
 **Road Network and Traffic**	• Access to the project site. • Existing traffic condition within and surrounding the project site.	**Primary Source:** ✓ Traffic survey. ✓ Traffic Impact Assessment (TIA) report. **Secondary Source:** ✓ Road Traffic Volume Malaysia (PWD). ✓ Past studies.
 **Infrastructure, Utilities and Amenities**	• Availability of existing and future utilities (water, electricity, sewerage, waste management, road networks, telecommunications, etc.). • Identification of existing and proposed sewerage lines.	**Secondary Source:** • Water Supply Authority/Provider. • Indah Water Konsortium (IWK) or State-based Sewerage Operator. • Tenaga Nasional Berhad (TNB). • PWD. • Local Authority. • Past studies.
Cultural/Heritage		
 **History, Culture and Archaeology**	• Locations of historical and cultural sites. • Location of Orang Asli areas and settlements.	**Secondary Source:** ✓ National Heritage Department. ✓ Department of Museum. ✓ JAKOA. ✓ Past studies.

Note: The list is not exhaustive, and not all items listed above are applicable to all EIA studies. The subject areas to be covered in the baseline study should focus only on those aspects that are likely to be affected. The areas generally depend on the nature, scale, location of the proposed project, and the extent of the impact.

4.3 BASELINE MONITORING AND ANALYSIS

Baseline monitoring is one of the primary sources of data. These data are collected to complement the information identified during the TOS/ESI stage for detailed assessment. The baseline monitoring area shall be carried within the boundary of the project site and nearby sensitive receptors within the Zone of Study (ZOS) as mentioned in **Chapter 3.5**.

However, if the impacts are predicted to be much farther away, the Qualified Person shall include the sensitive receptors within the Zone of Impact (ZOI) in the baseline monitoring programme. For example, if there is a water intake point located outside of the ZOS but still within the impact range of the effluent discharge from the project, the water sample shall be collected there.

Generally, the validity of baseline data collection for an EIA study is within two (2) years from the date of field monitoring. If the duration of EIA study extends for more than 2 years, the collected baseline data can still be used provided that the Qualified Person can justify that there are no significant changes to the surrounding physical, biological and human environments within the zone of impact of the project site.

Samples collected must be analysed by a *Skim Akreditasi Makmal Malaysia* (SAMM) accredited laboratory. This includes ensuring that the analysis method for each parameter is SAMM accredited. The laboratory report or at least the Certificate of Analysis (COA) shall be included in the EIA as an appendix. The list of baseline monitoring and analysis is appended in **Appendix G**.

4.3.1 Good Practices for Sampling

The procedures established in this chapter are intended solely for the guidance of the user only. They are not intended and cannot be relied upon to create any rights, substantive or procedural, enforceable by any party.

Water Quality

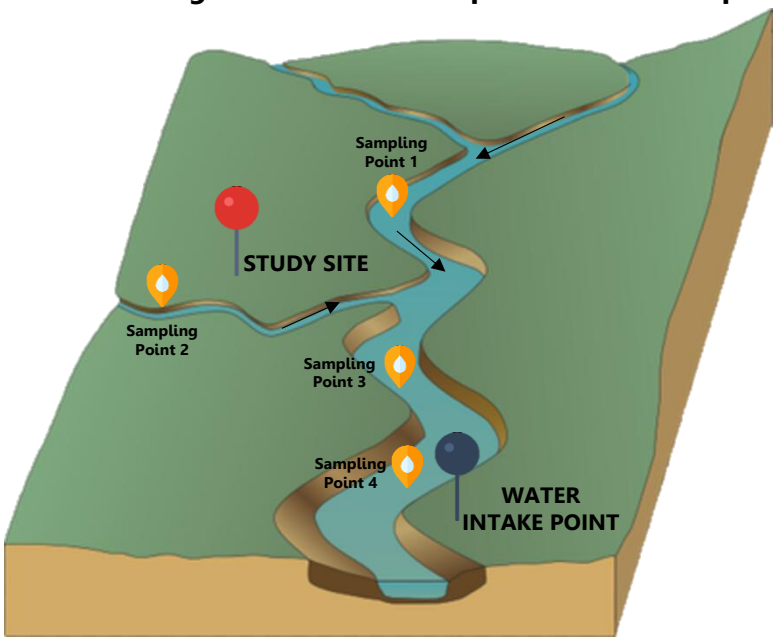
The sampling practice for water quality measurement can be referred in the Water Quality Monitoring - A Practical Guide to the Design and Implementation of Freshwater Quality Studies and Monitoring Programmes 1996 by UNEP/WHO. Some general practice to be considered from the procedure when conducting water quality sampling are as follow:

- Sites must be easily and safely accessed under all weather conditions.
- Sampling depth is measured from the water surface to the middle of the sampler.
- A bottle that is to be used for transport or storage of the sample should be rinsed three times with portions of the sample before being filled. This does

not apply, however, if the storage/transport bottle already contains a preservative chemical.

- The temperature of the sample should be measured and recorded immediately after the sample is taken.
- At any time that the sample bottles are not closed, their tops must be kept in a clean place.
- A small air space should be left in the sample bottle to allow the sample to be mixed before analysis.
- All measurements taken in the field must be recorded in the field notebook before leaving the sampling station.
- All supporting information should be recorded in the field notebook before leaving the sampling station. Such conditions as the ambient air temperature, the weather, the presence of dead fish floating in the water or of oil slicks, growth of algae, or any unusual sights or smells should be noted.
- Samples should be transferred to sample bottles immediately after collection if they are to be transported.
- Sample bottles should be placed in a box for transport to the laboratory. Sturdy, insulated plastic boxes will protect samples from sunlight, prevent the breakage of sample bottles, and should allow a temperature of 4 °C to be attained and maintained during transport.

Figure 4-1 Examples of Water Sampling Locations



Notes:

1. **Sampling Point 1 & 2:** To obtain baseline river water quality before sewage discharge point
2. **Sampling Point 3:** To obtain baseline river water quality after sewage discharge point
3. **Sampling Point 4:** To obtain baseline river water quality after sewage discharge point near water intake point (if present). This is to observe the impact of sewage discharge to the water supply operation.

Groundwater Quality

The sampling practice for groundwater quality measurement can be referred in the Groundwater Sampling Procedure (SESDPROC-301-R4) by USEPA. Some general practice to be considered from the procedure when conducting groundwater sampling are as follow:

- Always sample from the anticipated cleanest, i.e., least contaminated location, to the most contaminated location. This minimizes the opportunity for cross-contamination to occur during sampling.
- Sample containers for samples suspected of containing high concentrations of contaminants shall be stored separately.
- Sample collection activities shall proceed progressively from the least suspected contaminated area to the most suspected contaminated area if purging and sampling devices are to be reused. Samples of waste or highly contaminated media must not be placed in the same cooler as environmental (i.e., containing low contaminant levels) or background samples.
- Clean plastic sheeting will be placed on the ground at each sample location to prevent or minimize contaminating sampling equipment by accidental contact with the ground surface.
- Samplers must use new, verified certified-clean disposable or non-disposable equipment cleaned according to procedures contained in SESD Operating Procedure for Field Equipment Cleaning and Decontamination (SESDPROC-205) or SESD Operating Procedure for Field Equipment Cleaning and Decontamination at the FEC (SESDPROC-206) for collection of samples for trace metals or organic compound analyses.
- During sample collection, make sure that the pump discharge line or the bailer does not contact the sample container.
- All samples requiring preservation must be preserved as soon as practically possible, ideally immediately at the time of sample collection.
- Sample containers should be placed in an ice-filled cooler as soon as possible after filling. Ice in coolers should be in bags with minimal pooled water and the cooler should be periodically checked and replenished to maintain sample storage temperature.
- In order to determine when a well has been adequately purged, field investigators should monitor, at a minimum, the pH, specific conductance and turbidity of the groundwater removed and the volume of water removed during purging. The measurements should be recorded in a purge table in the field logbook that includes the start time of purging, the parameter measurements at intervals during purging, estimated pumped volumes, depths to water for Low-Flow sampling, and any notes of unusual conditions.

Air Quality

The Qualified Person should consider the following when placing air sampling station [adopted from the Superfund Program Representative Sampling Guidance, Volume 2: Air (Short-Term Monitoring) 1995 by USEPA and IS 5182 (Part 14):2000 Methods for Measurement of Air Pollution, Part 14: Guidelines for Planning the Sampling of Atmosphere]:

- Location of potential on-site emission sources, as identified from the review of site background information or from preliminary on-site inspections.
- The impact of potential off-site emission sources located upwind of the sampling location(s). Study local wind patterns to determine the location of off-site sources.
- Location of topographic features which affect the dispersion and transport of airborne toxic constituents. Avoid natural obstructions when placing air monitoring stations, and account for channelization around those obstructions. (As a general rule, the distance away from the obstruction should be 10 times the height of the obstruction.)
- Proximity of large water bodies which affect atmospheric stability and dispersion of air contaminants.
- Roadways (dirt or paved) which may generate dust that could mask site contaminants. Traffic patterns may also affect results.
- Vegetation such as trees and shrubs which stabilize soil and slow the process of subsurface contaminants becoming airborne. Vegetation also affects air flow and scrubs some contaminants from the air. Thick vegetation can make an otherwise ideal air monitoring station location inaccessible.
- Sampling station location should be representative of the area selected.

Noise

The sampling practice for noise measurement can be referred in the Guidelines for Environmental Noise Limits and Control Third Edition 2019 by the DOE. Some general practice to be considered from the guideline when conducting noise measurement are as follow:

- Calibration of sound level meters and noise monitoring units should be conducted by a calibration laboratory or original equipment manufacturer at intervals not exceeding two years or other frequency recommended by manufacturer.
- The sound level meter may be hand held for simple spot readings, but for extended monitoring shall be mounted onto a tripod during the entire measurement duration. A standard accessory of extension cable with pre-amplifier may be used to enable the microphone to be installed at higher levels detached from the sound level meter body.

- Care should be taken not to make noises whilst observing the meter in this method and ensuring the least amount of reflective surface from your body is exposed to the meter.
- A noise reading should always be taken at the height of the receptor. If the receptor is at the ground level, take a measurement at the ground level (at least 1.2–1.5 m above the ground).
- The measurement location shall be at least 3.5 m away from walls, buildings or other sound reflecting structures. However, when circumstances dictate, measurements may be made at greater heights or closer to a wall and these special conditions must be indicated in the measurement records.
- The microphone must be placed in an open location without any obstructions or affected by reflections or shielded from the noise sources. This includes sound level meter underneath an umbrella or adjacent an air quality measurement equipment (which inherently emits noise)
- Hand held sound level meters shall preferably be manned during the duration of monitoring.
- Unmanned monitoring shall only be undertaken with monitoring units or smart monitors designed for automated unmanned environmental noise monitoring fitted with all-weather waterproof microphone and automatic data logging.
- A wind shield approved by the microphone manufacturer shall be used. Measurements cannot normally be made if the wind speed exceeds 5m/s at the microphone position. For continuous remote monitoring, the wind speed may be monitored concurrently with the sound levels.

It is important to note that all noise monitoring shall be carried out in accordance with the relevant standards such as follow:

- ISO1996-1:2016 Acoustics - Description and Measurement of Environmental Noise.
- BS 5228-1:2009 Code of practice for noise and vibration control on construction and open sites – Part 1: Noise.
- Any new standards that are available from time to time.

Figure 4-2 Minimum Height of Sound Level Meter Above the Ground Level

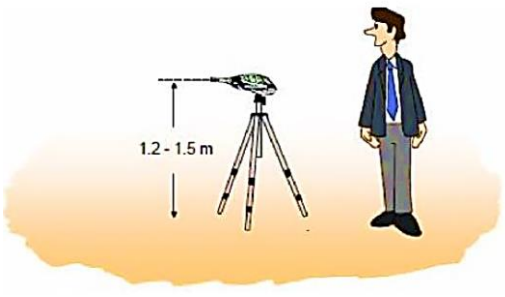
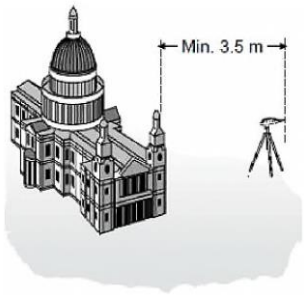


Figure 4-3 Minimum Distance to Nearest Reflective Surface Outside Premises



Vibration

The sampling practice for vibration can be referred in The Planning Guidelines for Vibration Limits and Control in the Environment 2nd Edition 2007 by the DOE. Some general practice to be considered from the guideline when conducting vibration measurement are as follow:

- Vibration measuring equipment shall consist of the following parts: a transducer or pick-up sensor, an amplifying device, an amplitude or level indicator or recorder and/or signal analyser.
- Calibration of all vibration measuring equipment shall be done properly in accordance with current standards or recommendations based on the equipment manufacturer's instructions.
- Monitoring location should be normally be at the nearest building and/or locations; and the best position for the monitoring point(s) would often be on the floor slab or foundation. Monitoring points should be accessible to all parties concerned.
- When measuring vibration at the foundation, the transducers for the three axes of vibration shall be placed close to one another in the lowest storey of the building under investigation, either on the foundation of the outer wall or in the outer wall, or in recesses in the outer wall.
- When measuring buildings having no basement, the point of measurement shall lie no more than 0.5 m above ground level. The location of measuring points shall be located on the side of the building facing the source of excitation.
- For buildings of large ground area, measurements shall be taken simultaneously at several points.
- Measurements taken at the foundation and at the uppermost storey, where necessary the vertical axis vibration of floors shall be measured approximately at the centre of the floor area.
- Measurement for blasting and other explosions related impulsive vibration excitation, if measured outside buildings, shall preferably be measured on a hard surface on ground as close to the property of interest or real property boundary as the case may be. Transducers may be buried in the ground if no hard surface is available.
- Vibration measurements shall include:
  - Background (ambient) vibration levels at a receiver location(s) and/or at the real property boundary of a source(s). These may be undertaken at locations prior to a project development. It could also be undertaken in the absence of the source(s) operating
  - Vibration levels at a receiver location(s) and/or at the real property boundary of a source with the plant operating, construction in progress, and/or completion and operation of a project (transit trains, industrial plant, etc.).
  - Vibration characteristics of each source as may be required to evaluate the contribution of each source.

- Vibration measurements shall be undertaken within a frequency range of 1 Hz to 100 Hz minimum.

It is important to note that all vibration monitoring shall be carried out in accordance with the relevant standards such as follow:

- ISO 4866:2010 Mechanical vibration and shock — Vibration of fixed structures — Guidelines for the measurement of vibrations and evaluation of their effects on structures.
- BS ISO 4866: 2010 Mechanical vibration and shock. Vibration of fixed structures. Guidelines for the measurement of vibrations and evaluation of their effects on structures.
- ISO 7626-5:2019 Mechanical vibration and shock. Experimental determination of mechanical mobility. Measurements using impact excitation with an exciter which is not attached to the structure.
- BS ISO 7626-5:2019 Mechanical vibration and shock. Experimental determination of mechanical mobility. Measurements using impact excitation with an exciter which is not attached to the structure.
- Any new or revised standards that are available from time to time.

Other general factors to be considered in the selection of sampling sites:

- Sites must be easily and safely accessed under all weather conditions.
- Sites must be easily identifiable so that they can be sampled repeatedly. Global Positioning Systems (GPS) are useful tools, especially in the marine environment.

EIA GUIDELINES

Waste Treatment & Disposal – Scheduled Waste

5

EVALUATION OF IMPACTS

CHAPTER 5

EVALUATION OF IMPACTS

5.1 INTRODUCTION

The prediction and evaluation of impact are carried out by comparing the existing environmental elements against the potential transformation derived from the project activities throughout the scheduled waste treatment and disposal project development.

There are many methods to predict and evaluate the environmental impact either qualitative or quantitative method by considering the environmental elements in their most unfavourable condition (worst-case). While no one method that fits all requirements, the predictive and assessment method chosen must have at least the following attributes:

a) **Model/Method** - Established models or methods.
b) **Data** - Adequate, accurate and up-to-date data.
c) **Results** - Reproducible by independent evaluators.
d) **Software** – Cost-effective and available to be purchased.

The Qualified Person shall select the best method to conduct investigations and generate reliable scenarios and datasets to ascertain the magnitude, extent and significance of any impacts from the project.

5.2 PRESCRIBED ACTIVITY AND KEY ISSUES

Significant issues are identified from the project activities during each phase of the project. The nature of the impacts is different for each phase whereby usually all activities have a common impact during pre-construction phase, construction phase and abandonment phase. Major activities during these phases are related to earthworks, civil and structural activities as well as decommissioning activities. **Table 5-1** shows the summary of the general project activities list and their potential significant environmental impacts during pre-construction, construction, operation and abandonment stages.

Table 5-1 Typical Project Activities and the Key Environmental Impacts for Scheduled Waste Project

Project Stage	Project Activities	Key Environmental Impacts
All Types of Scheduled Waste Prescribed Activities		
Pre-Construction	Access tracks. Survey.	• Soil erosion & sedimentation. • Ecology.
	Site investigation.	• Soil contamination. • Groundwater quality.
	Land acquisition.	• Socio-economic.
Construction	Site construction facilities.	• Water quality. • Air quality. • Noise. • Solid & scheduled wastes. • Health risk. • Soil contamination. • Socio-economic.
	Site clearance & site formation. Ancillary/Infrastructural works.	• Water quality. • Soil erosion & sedimentation. • Air quality. • Noise & vibration. • Solid & scheduled wastes. • Ecology. • Traffic.
	Abandonment during construction.	• Water quality. • Soil erosion & sedimentation. • Solid & scheduled wastes. • Soil contamination. • Noise & Vibration.
Operation & Maintenance	Collection of wastes from waste generator. Transportation of waste to recovery facility or residual waste to secure landfill.	• Water quality. • Soil contamination. • Noise. • Traffic.
Abandonment/Safe Closure	Decommissioning, dismantling and removal of Plant. Demolition and disposal of buildings and structures. Site restoration and rehabilitation.	• Water quality. • Soil contamination. • Air quality • Noise. • Solid & scheduled wastes. • Traffic
First Schedule, Activity 14(a)(i) – Recovery Plant (Off-Site)		
Operation & Maintenance	Waste resource recovery (gas-liquid separation, filtering, decanting, distillation, rinsing, settling, washing, scrubbing).	• Water quality. • Air quality. • Odour. • Health risk. • Noise. • Solid & scheduled wastes. • Fire & explosion risk.
	Flue gas treatment.	• Air quality. • Odour.

Project Stage	Project Activities	Key Environmental Impacts
		• Health risk. • Noise.
	Wastewater treatment.	• Water quality. • Air quality. • Odour. • Health risk. • Noise.
	Sludge treatment.	• Water quality. • Scheduled waste. • Noise.
First Schedule, Activity 14(a)(ii) – Wastewater Treatment Plant (Off-Site)		
Operation & Maintenance	Storage of chemicals for wastewater treatment (acid, caustic soda, coagulant polymer, catalyst, chlorine, etc.)	• Water quality. • Air quality. • Health risk. • Soil contamination.
	Wastewater treatment processes (physical, chemical and biological treatment).	• Water quality. • Air quality. • Odour. • Noise.
	Sludge treatment.	• Water quality. • Scheduled waste. • Noise.
First Schedule, Activity 14(a)(iii) – Storage facility (Off-Site)		
Operation & Maintenance	Storage of various types of scheduled wastes.	• Water quality. • Soil contamination. • Groundwater quality. • Air quality. • Health risk. • Noise. • Scheduled waste. • Fire & explosion risk.
Second Schedule, Activity 14(a)(i) – Thermal Treatment Plant		
Operation & Maintenance	Waste preparation and handling (cutting, crushing, shredding, settling, separation, neutralization, etc.).	• Air quality. • Noise. • Solid waste.
	Tank farm facility for liquid wastes and fuel storage.	• Water quality. • Soil contamination. • Air quality. • Fire & explosion risk.
	Thermal treatment plant (incineration, gasification or pyrolysis).	• Air quality. • Health risk. • Noise & vibration. • Scheduled waste. • Fire & explosion risk. • Socio-economic.
	Flue gas treatment system.	• Air quality.

Project Stage	Project Activities	Key Environmental Impacts
		• Odour. • Health risk. • Noise & vibration. • Scheduled waste.
Second Schedule, Activity 14(a)(ii) – Recovery Plant for Lead Acid Battery		
Operation & Maintenance	Battery breaking and components separation.	• Noise & vibration. • Solid waste.
	Plastic recovery.	• Air quality. • Odour. • Noise & vibration.
	Sulfur removal.	• Water quality.
	Smelting and refining processes.	• Air quality. • Groundwater quality. • Health risk. • Noise & vibration. • Scheduled waste. • Fire & explosion risk. • Socio-economic.
	Flue gas treatment system.	• Air quality. • Odour. • Health risk. • Noise & vibration. • Scheduled waste.
Second Schedule, Activity 14(a)(iii) – Recovery or Treatment (Upstream of WIP)		
Operation & Maintenance	Waste resource recovery (gas-liquid separation, filtering, decanting, distillation, rinsing, settling, washing, scrubbing).	• Water quality. • Air quality. • Odour. • Health risk. • Noise. • Solid & scheduled wastes. • Fire & explosion risk.
	Wastewater treatment processes (physical, chemical and biological treatment).	• Water quality. • Air quality. • Odour. • Health risk. • Noise. • Scheduled waste. • Ecology. • Socio-economic.
Second Schedule, Activity 14(a)(iv) – Secure Landfill Facility		
Operation & Maintenance	Daily cover needs.	• Soil erosion & sedimentation. • Water quality. • Traffic.
	Landfill operations.	• Water quality. • Soil contamination. • Groundwater quality. • Air quality.

Project Stage	Project Activities	Key Environmental Impacts
		• Odour. • Health risk. • Noise & vibration. • Socio-economic. • Ecological impact.
	Leachate treatment plant.	• Water quality. • Ecology. • Air quality. • Odour. • Noise. • Scheduled waste. • Ecological impact.
	Surface water treatment plant.	• Water quality. • Noise. • Solid waste.
Abandonment/Safe Closure	Landfill closure.	• Air quality. • Noise. • Soil erosion. • Water quality. • Solid & scheduled wastes. • Health risk.

Note: The list is not exhaustive and not all the above may be relevant to the project. It is the responsibility of the Project Proponent and Qualified Person to determine the relevant information required for environmental assessment and compliance.

5.3 PREDICTION AND EVALUATION OF IMPACTS

The basis for prediction and evaluation of impacts is the methodologies which consequently determine the suitable predictive tools to be used. The TOR /ESI would have determined the significant environmental impacts to be studied and how to assess and evaluate their significance. Certain outputs need to be achieved to evaluate the significance of the impact. The level of details in the prediction and evaluation of impact shall commensurate with the following factors:

i) The scale of the project (land area, total disturbed areas, etc.).
ii) The intensity of development (total land clearing, phasing of land clearing).
iii) Potential pollution sources from the project.
iv) Magnitude and complexity of impacts.
v) Area of impacts (localised versus transboundary).
vi) Probability of cumulative impacts (effects of the project on adjacent land areas and vice versa).
vii) The sensitivity of nearby receptors (e.g. Environmentally Sensitive Areas).

[**Note:** Only significant issues shall be assessed in detail in the EIA. Issues that are not significant shall only be addressed qualitatively. However, the DOE or the Appointed Individuals can request for a quantitative assessment with proper justification].

The process begins with the identification of potential impacts, determination of inputs, execution of methods/tools and evaluation of outputs by comparing them with certain established criteria. It is important to make sure the accuracy of the input used for any kind of assessment. The quality of the output is determined by the quality of the input or GIGO (garbage in, garbage out). Any assumptions used in assessment as well as limitations and uncertainties of any data should be stated clearly in the EIA report. **Table 5-2** shows the summary of the prediction and evaluation of impacts for scheduled waste activities.

Table 5-2 Summary of Prediction and Evaluation of Impacts

Potential Impacts	Typical Input	Methods and Tools	Typical Output	Evaluation Criteria
 **Soil Erosion and Sedimentation**	• Rainfall erosivity factor. • Soil erodibility factor. • Slope length and degree factor. • Land-cover management factor. • Conservation practice factor. • Runoff volume. • Peak discharge.	• Calculation (i.e. manual or aid of software like ArcGIS) of: ✓ Annual soil erosion rate – Revised Universal Soil Loss Equation (RUSLE). ✓ Sediment yield – Modified Universal Soil Loss Equation (MUSLE).	• Annual soil erosion rate. • Sediment yield. • Potential soil erosion risk map. • Impact significance evaluation.	Not available.
 **Water Pollution**	• Hydraulic data. • Discharge flowrate. • Pollutants data (i.e. concentration). • River water quality baseline data. • Marine water quality baseline data.	• Simple mass balance models. • Water quality simulation models: ✓ QUAL2K. ✓ WASP8. ✓ MIKE11.	• Graph of concentration of pollutants over spatial for normal scenario and worst scenarios. • Pollution loading calculation (if required).	**Discharge Limits:** • Environmental Quality (Sewage) Regulations 2009. • IETS: Environmental Quality (Industrial Effluent) Regulations 2009. • LTP: Discharge shall comply to the limits prescribed by the Director General of Environmental Quality. **Ambient Limits:** • National Water Quality Standards (NWQS). • Malaysia Marine Water Quality Standard (MMWQS).

Potential Impacts	Typical Input	Methods and Tools	Typical Output	Evaluation Criteria
 **Groundwater Pollution**	• Topography. • Pollutants data (i.e. concentration). • Groundwater level. • Groundwater quality. • Rainfall data. • Hydraulic conductivity. • Geology data. • Geophysics work (if necessary). • Pumping rate. • Well yield.	• Groundwater flow models: ✓ MODLFOW. ✓ FEFLOW. ✓ Aqua3D. ✓ GoldSim.	• Contaminant transport maps for normal case and worst-case scenarios. • Geophysics plot (if necessary).	**Ambient Limits:** • Malaysia Groundwater Quality Standards for Conventional Raw Water Treatment (Drinking Water).
 **Air Pollution**	• Air dispersion: ✓ Source data (stack dimension, pollutants etc.). ✓ Meteorological data. ✓ Terrain data. ✓ Building data (building dimension). ✓ Sensitive receptors (residential areas, etc.). • GHG estimation: ✓ Amount or quantity of parameter of concern. ✓ Type of technology. ✓ Emission factor.	• Modelling of air dispersion for normal case and worst-case scenarios using air dispersion modelling software (ADMS): ✓ SCREEN. ✓ AERSCREEN. ✓ AERMOD. ✓ CALPUFF. • GHG estimation: ✓ Equation in the 2006 IPCC Guidelines (i.e. Volume 5 – Waste).	• Air dispersion: ✓ Maximum average incremental concentration (MAIC). ✓ Ground level concentration (GLC). ✓ Dispersion contours. ✓ Impact significance evaluation. • GHG estimation: ✓ Total CO2 equivalent. ✓ Opportunities for GHG reduction.	**Emission Limits:** • Environmental Quality (Clean Air) Regulations 2014. **Ambient Limits:** • Malaysia Ambient Air Quality Standard (MAAQS) 2013. • Ontario Ambient Air Quality Criteria (AAQC), 2003.

Potential Impacts	Typical Input	Methods and Tools	Typical Output	Evaluation Criteria
 **Odour Pollution**	• Predictive: ✓ Source data (source dimension, odour concentration etc.). ✓ Meteorological data (wind direction, wind speed, etc). ✓ Terrain data (elevation data). ✓ Building data (building dimension). ✓ Sensitive receptors (residential areas, etc.). • Observational/Empirical: ✓ Intensity, frequency, duration, offensiveness. ✓ Measured concentration (Dilutions-to-Threshold). ✓ Odour diaries. ✓ Community survey. ✓ Complaint records.	• Predictive: ✓ Qualitative (e.g. Source-Pathway-Receptor concept). ✓ Semi-quantitative (e.g. screening models, look-up tables & nomographs). ✓ Modelling (e.g. AERMOD & CFD tools). • Observational/Empirical: ✓ Monitoring of odour in ambient air (e.g. sensory & compound analysis). ✓ Actively using the community as the "sensor" (e.g. odour diaries & community surveys). ✓ Passively using the community as the "sensor" (e.g. complaints analysis).	• Predictive: ✓ A relative risk score or descriptor. ✓ Estimated concentration. ✓ Predicted concentrations (ou/m^3), usually as 98^{th} percentiles of 1-hour mean. ✓ Image representation of flow patterns. • Observational/Empirical: ✓ Odour exposure. ✓ Days (%) on which odour detected above a given intensity. ✓ Percentage (%) annoyed or % experiencing nuisance. ✓ Frequency of complaints.	**Recommended Ambient Limits:** • IAQM Guidance on the assessment of odour for planning – version 1.1.
 **Noise**	• Sound power level. • Sound pressure level. • Source classification (area, point, line) and mobile sources. • Existing background noise and existing noise sources.	• Calculation of noise incremental level for normal case and worst-case scenarios: ✓ BS 5228-1:2009. ✓ ISO 9613-2. ✓ FHWA Traffic Noise Model Version 2.5.	• Absolute numerical noise limit. • Change in noise levels relative to the existing baseline level. • Noise map.	**Ambient Limits:** • Guidelines for Environmental Noise Limits and Control Third Edition, 2019.

Potential Impacts	Typical Input	Methods and Tools	Typical Output	Evaluation Criteria
	• Type of noise (continuous, intermittent, impulse). • Propagation factors. • Directionality. • Ground effect (soft, hard, porous ground). • Location and height of source. • Total attenuation from factors such as atmospheric absorption, absorbing ground, diffraction by barriers and other miscellaneous factors.	✓ Calculation of Road Traffic Noise (CRTN). ✓ CadnaA Datakustik. ✓ SoundPLAN. ✓ GIS based noise model.		
 **Vibration**	• Reference PPV from reliable publication. • Distance from equipment / activities to the receiver. • Attenuation rate of the ground.	• Equation for prediction of vibration level: ✓ Continuous vibration $PPV_{Equipment} = PPV_{Ref}(25/D)^{n}$ *(in/sec)* ✓ Ground vibration - Australian Standards 2187.2-2006 $V = K_G \left(\frac{R}{Q^{\frac{1}{2}}}\right)^{-B}$	• Prediction of peak particle velocity (PPV). • Damage risk in structural damage. • Level of human annoyance.	**Ambient Limits:** • The Planning Guidelines for Vibration Limits and Control in the Environment 2nd Edition 2007.

Potential Impacts	Typical Input	Methods and Tools	Typical Output	Evaluation Criteria
 **Fire and Explosion Risks**	• Hazardous substance data (i.e. physical and chemical properties). • Equipment specifications (i.e. pressure, dimension, etc.). • Possible accident scenario (i.e. leak, rupture, etc.). • Failure frequency data. • Meteorological data (i.e. wind direction, atmospheric stability, etc.).	• Consequence modelling software for multiple and different type of hazard sources for normal case and worst-case scenarios using: ✓ ALOHA. ✓ PHAST. ✓ EFFECTS. ✓ TEREX. ✓ WHAZAN.	• Individual risk. • Societal risk. • Individual risk contours. • F-N Curve (societal risk). • Impact significance evaluation.	**<u>Individual Risk Criteria:</u>** • Industry: 1 x 10^{-5} fatalities/person/year. • Public: 1 x 10^{-6} fatalities/person/year.
 **Health Risk**	• Community health data. • Local health statistics. • Air quality assessment result (inhalation pathway). • Water quality assessment result (skin contact and ingestion pathways). • Groundwater quality assessment result (ingestion pathway).	Health risk assessment (HRA): • Qualitative risk assessment. • Quantitative risk assessment: ✓ Issues identification ✓ Hazard identification. ✓ Dose-response assessment. ✓ Exposure assessment. ✓ Risk characterisation. ✓ Uncertainty analysis.	• Health risk calculation at certain level of exposure: ✓ Non-carcinogenic risk – Hazard Quotient (HQ). ✓ Carcinogenic risk – Lifetime Cancer Risk (LCR). • Impact significance evaluation.	**<u>Public Health Criteria:</u>** • Non-carcinogenic: Hazard quotient (HQ) < 1. • Carcinogenic risk: Generally acceptable risk (10^{-4} to 10^{-6}).

Potential Impacts	Typical Input	Methods and Tools	Typical Output	Evaluation Criteria
 **Socio-Economic Impact**	• Details of demographics • Local economic profile. • Feedback from stakeholders engagement.	• Social impact matrix.	• Risk matrix with socio economic concerns and the magnitude of impact.	• Manual for Social Impact Assessment (SIA) for Project Development, Second Edition, 2018.
 **Waste Generation**	• Incoming waste information. • Source of waste. • Waste generation rate. • Number of workers.	• Estimation of total amount of waste: ✓ Waste generation rates (WGR) from published literatures are multiplied with the quantity (Q) of waste.	• Estimated weight of waste generated. • Estimated volume of waste generated. • Impact significance evaluation.	Not available.
 **Ecology**	• Presence of forest reserves in surrounding area. • Presence of protected areas. • Flora composition. • Fauna composition.	• Secondary data from existing literature • Basic fieldwork to document existing composition	• List and map of habitat type. • Species listing with conservation statues (to determine sensitivity). • Maps of plant and wildlife distribution.	• IUCN Listing.

5.3.1 Soil Erosion and Sedimentation Impact Assessment

5.3.1.1 Sources of Pollution

The following activities can generally contribute to soil erosion and sedimentation if not properly controlled (**Table 5-3**).

Table 5-3 Sources of Soil Erosion and Sedimentation

Project Stage	Description
Construction  	Site clearance and site formation including earthwork. <u>Typical Pollutant of Concern:</u> ✓ Total suspended solids (TSS). ✓ Turbidity. ✓ Others (to be included on case-by-case basis).
Operation  *Photo credit: Kualiti Alam Sdn Bhd.*	Daily cover for a secure landfill. <u>Typical Pollutant of Concern:</u> ✓ Total suspended solids (TSS). ✓ Turbidity. ✓ Others (to be included on case-by-case basis).

5.3.1.2 Impact Assessment

<u>Methodology</u>

The assessment shall be guided by the following guidelines:

- Appendix 3 - Guidance Document for Addressing Soil Erosion and Sediment Control Aspects in the Environmental Impact Assessment (EIA) Report, EGIM;
- Guidelines on Land Disturbing Pollution Prevention and Mitigation Measures (LD-P2M2) (DOE, 2017);
- Guideline for Erosion and Sediment Control in Malaysia (DID, 2010); and
- Urban Stormwater Management Manual for Malaysia (MSMA) 2nd Edition (DID, 2012).

Two parameters need to be considered in the assessment namely:

- Annual potential soil loss.
- Sediment yield.

Annual soil erosion rate can be calculated using the Revised Universal Soil Loss Equation (RUSLE) while the sediment yield can be calculated using the Modified Universal Soil Loss Equation (MUSLE). Factors to be considered for RUSLE and MUSLE are as follows:

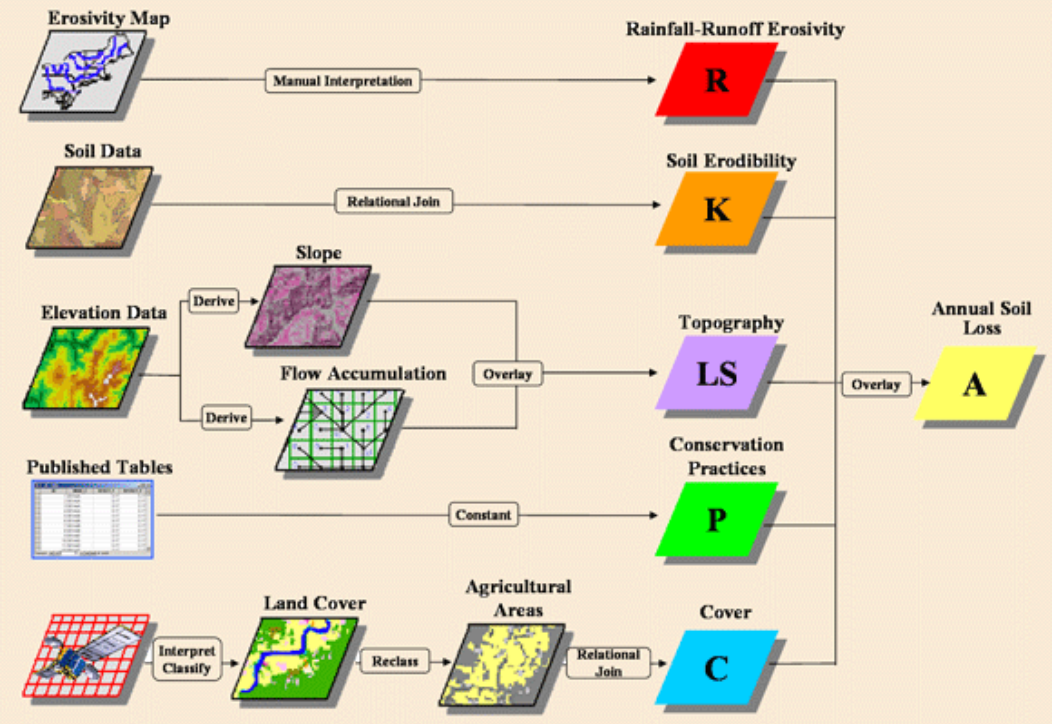
Table 5-4 RUSLE and MUSLE Equations

RUSLE	MUSLE
$A = R \times K \times LS \times C \times P$ Where, **A** – Average annual potential soil loss (tons/acre/year). **R** – Rainfall-runoff erosivity factor. **K** – Soil erodibility factor **LS** – Slope length and degree factor. **C** – Land cover management factor **P** – Conservation practice factor.	$Y = 89.6 \times (VQ_p)^{0.56} \times (K \times LS \times C \times P)$ Where, **Y** – Sediment yield per storm event. **V** – Runoff volume in cubic meter. **Q_p** – Peak discharge in m^3/s. **K** – Soil erodibility factor **LS** – Slope length and degree factor. **C** – Land cover management factor **P** – Conservation practice factor.

Assessment Tools

The above parameters can be calculated manually or using a geographic information system (GIS) software like ArcGIS. GIS integrates many types of data and analyses spatial location and organizes layers of information into visualizations using maps. **Figure 5-1** shows the protocol of calculation using ArcGIS software. All the factors will be overlaid together to calculate the annual potential soil loss and produce the potential soil erosion risk map.

Figure 5-1 Protocol of Calculation using ArcGIS Software (adopted from Soo Huey Teh, 2011)

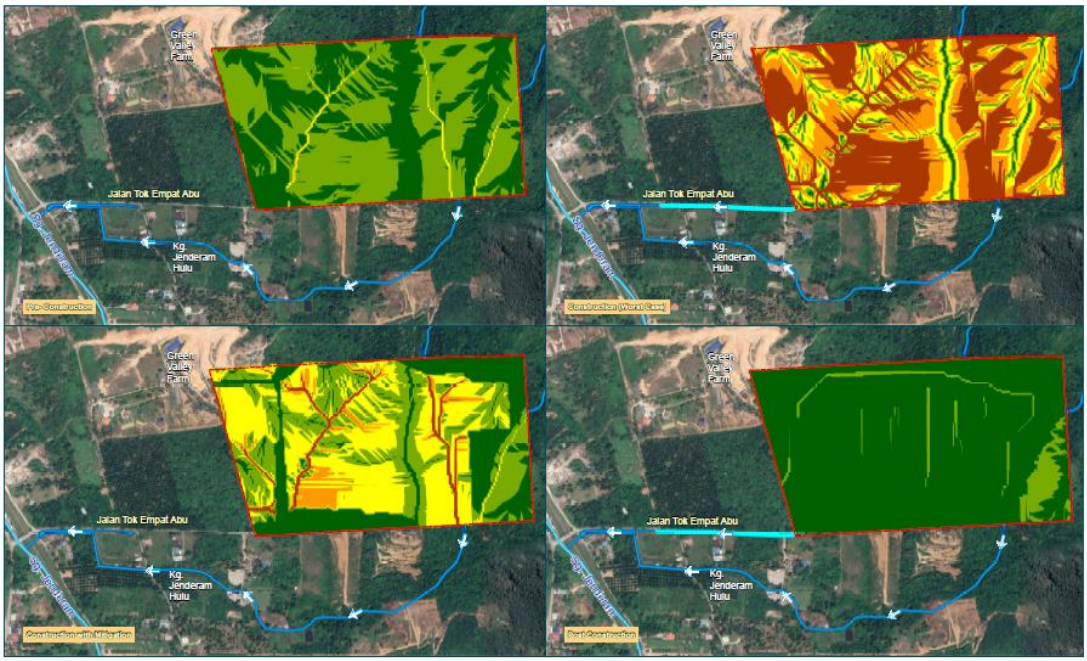


5.3.1.3 Output

The objective of the assessment is to ensure that the soil erosion and sediment risks are reduced by implementing Land Disturbing Pollution Prevention and Mitigation Measures (LD-P2M2) like cover and conservation practices. At the moment, there are no specific criteria for evaluation to assess the significance of soil erosion and sediment impacts. Potential soil erosion risk map (**Figure 5-2**) is usually produced for four different scenarios:

- Pre-Construction (existing condition).
- Construction during worst case scenario (bare soil with no mitigation measures).
- Construction with mitigation measures.
- Post Construction.

Figure 5-2 Example of Potential Soil Erosion Risk Map Produced using ArcGIS



5.3.2 Water Quality Impact Assessment

Water quality impact assessment is conducted to predict whether the aquatic life and beneficial users are at risk, or that the assimilative capacity of receiving water body may be exceeded as a result of silt trap/sediment basin discharge during construction stage and effluent/leachate discharge during operational stage.

If the prediction modelling result shows the significant impact to the water quality of the receiving waterbodies, then suitable mitigation measures such as conducting pollution loading carrying capacity study shall be considered. The Qualified Person may also refer to any available Total Maximum Daily Load (TMDL) Study for the same river within the Project Site area as a reference. The DOE may request the Qualified Person to conduct water quality assessment for related emerging pollutants on a case-by-case basis.

5.3.2.1 Sources of Pollution

The following activities can generally contribute to river water pollution in case of improper management or accidental discharge due to the malfunctions of the Leachate Treatment Plant (LTP) and Industrial Effluent Treatment System (IETS) (**Table 5-5**).

Table 5-5 Sources of Water Pollution

Project Stage	Description
Construction 	Site clearance and site formation including earthwork. <u>Typical Pollutant of Concern:</u> ✓ Total suspended solids (TSS). ✓ Turbidity. ✓ Others (to be included on case-by-case basis).
Construction 	Sewage discharge from on-site workers quarters. <u>Typical Pollutant of Concern:</u> ✓ Dissolved oxygen (DO). ✓ Biochemical oxygen demand (BOD). ✓ Ammoniacal nitrogen (NH_3-N). ✓ Others (to be included on case-by-case basis).
Operation  Photo credit: Kualiti Alam Sdn Bhd.	Operation of Leachate Treatment Plant (LTP). <u>Typical Pollutant of Concern:</u> ✓ Dissolved oxygen (DO). ✓ Biochemical oxygen demand (BOD). ✓ Total suspended solids (TSS). ✓ Ammoniacal nitrogen (NH_3-N). ✓ Nitrate nitrogen (NO_3-N). ✓ Total phosphorus (T-P). ✓ Heavy metals (Pb, As, Hg, Cd, Ni). ✓ Others (to be included on case-by-case basis).
Operation  Photo credit: Kualiti Alam Sdn Bhd.	Operation of Industrial Effluent Treatment System (IETS). <u>Typical Pollutant of Concern:</u> ✓ Dissolved oxygen (DO). ✓ Biochemical oxygen demand (BOD). ✓ Total suspended solids (TSS). ✓ Ammoniacal nitrogen (NH_3-N). ✓ Nitrate nitrogen (NO_3-N). ✓ Total phosphorus (T-P). ✓ Heavy metals (Pb, As, Hg, Cd, Ni). ✓ Others (to be included on case-by-case basis).

5.3.2.2 Impact Assessment

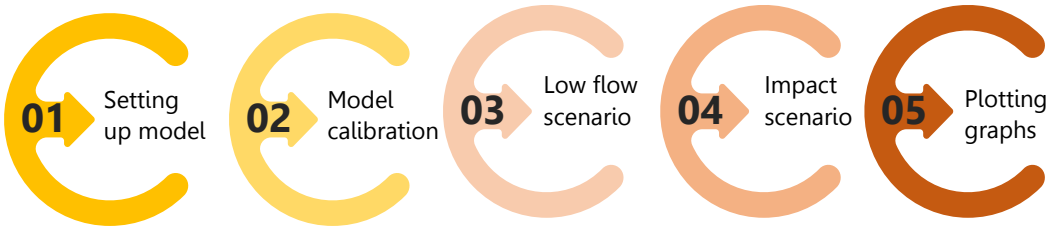
Methodology

Before carrying out water quality impact assessment, the following details must be identified as inputs to the model:

- Potential point source and non-point source pollutions;
- Existing sensitive receptors;
- River data (flowrate and concentrations of pollutants/particles);
- Meteorological data (rainfall); and
- Terrain data (topography).

Baseline water quality sampling shall be carried out at various locations along the waterways near the project site and sent to an accredited laboratory for analysis. This is to ensure that the model is calibrated according to the actual field measurements. Modelling shall be carried out for low flow and impact scenarios (normal and worst-case scenario) based on the inputs identified earlier. Modelling results will be plotted out based on the modelled scenarios. The overall methodology for water quality impact assessment can be referred to in **Figure 5-3**.

Figure 5-3 Methodology for Water Quality Impact Assessment



Assessment Tools

Various assessment tools can be used for water quality impact assessment. The appropriate tool can be determined based on the scale of the sensitivity of the project and also the potential scale of impact. Assessment can either be carried out using simple mass balance models or water quality simulation models. Examples of the water quality simulation models and their respective features are tabulated in **Table 5-6**.

Table 5-6 Examples of Water Quality Simulation Models

Assessment Tool	Features
WASP8	• Able to dynamically model contaminate fate and transport in rivers, estuaries, lakes, • Can be applied in one, two or three dimensions • Simulation includes temperature, BOD, DO, nutrients, eutrophication, bacteria and other variables
QUAL2K	• One-dimensional river and stream water quality model • Able to represent a well-mixed channel both vertically and laterally with steady state hydraulics, non-uniform steady flow, and diel heat budget and water-quality kinetics • Multiple loadings and abstractions can be input to any reach
MIKE11	• One-dimensional river model for river water quality model • Able to simulate flow and water level, water quality and sediment transport in rivers, flood plains, irrigation canals, reservoirs and other inland water bodies

Note: The list is not exhaustive. Proposed assessment models shall be well established and acceptable to the DOE.

5.3.2.3 Output

The main objective of carrying out a water quality impact assessment is to predict the incremental values and ambient values of the discharges towards the waterbody. The ambient limits of river water shall be compared with the National Water Quality Standards for Malaysia (NWQS) and the ambient limits of marine water shall be compared with the Malaysian Marine Water Quality Standards (MMWQS). Whereas, the values of discharge shall be compared with the Environmental Quality (Industrial Effluent) Regulations 2009.

Outputs for water quality assessment to be included in the EIA report are as follows:

i) Describe the input data and the effect of different variations of data on the modelling result

ii) Presentation of predicted pollutants concentrations such as dissolved oxygen (DO), biochemical oxygen demand (BOD), total suspended solids (TSS) and ammoniacal nitrogen (NH3-N) (example as shown in **Figure 5-4 and Figure 5-5**)

iii) Calculation of pollution loading carrying capacity if the modelling result shows significant impact to the river water quality. For example, sewage discharge will cause river quality to degrade from Class III to Class IV of NWQS.

iv) Identification of the highly impacted area where sensitive receptors such as water intake, aquaculture ponds, water recreational park, sensitive aquatic species spawning grounds are located.

v) Discussion on the accuracy of modelling results.

Figure 5-4 Example of TSS Modelling Result from Sediment Basin Discharge Using QUAL2K

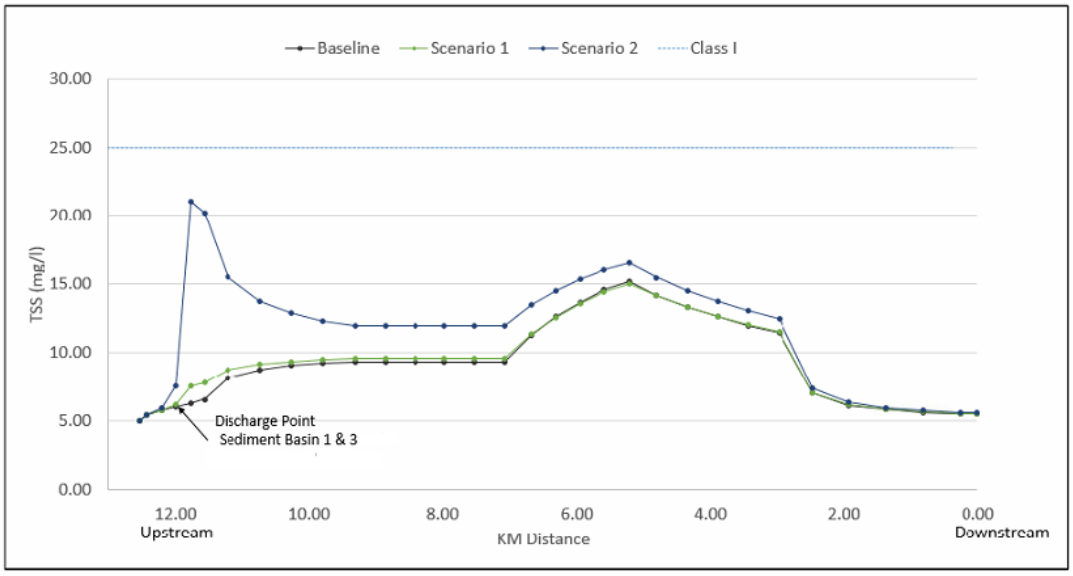
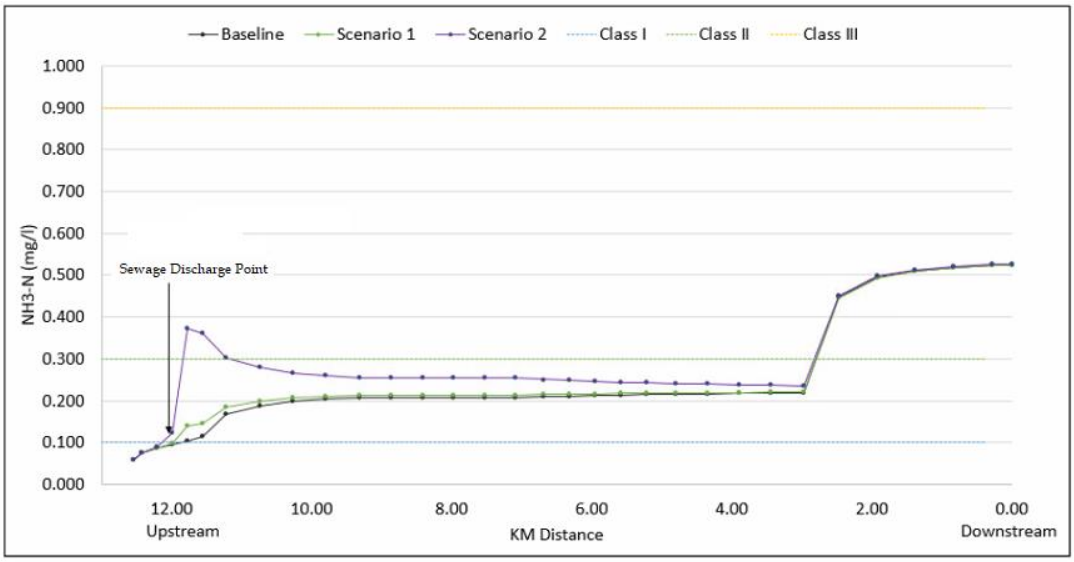


Figure 5-5 Example of NH3-N Modelling Result from Sewage Discharge Using QUAL2K



5.3.3 Groundwater Quality Impact Assessment

Groundwater quality impact assessment shall be conducted for a secure landfill project. Other scheduled waste and treatment projects (e.g. recovery plant for lead acid battery wastes) that are located near to a groundwater aquifer that is used for portable and non-portable usage may need to conduct this assessment too. It is the responsibility of the Project Proponent and Qualified Person to engage with relevant agencies in order to determine requirement to conduct groundwater impact assessment.

5.3.3.1 Sources of Pollution

The following activities can generally contribute to ground water pollution in the case of improper management or accidental discharge (**Table 5-7**).

Table 5-7 Sources of Groundwater Pollution

Project Stage	Description
Operation 	Wastewater from washing and cleaning activities. <u>Typical Pollutant of Concern:</u> ✓ Total suspended solids (TSS) ✓ Turbidity ✓ Others (to be included on case-by-case basis).
Operation 	Scheduled waste storage and process area. <u>Typical Pollutant of Concern:</u> ✓ Total dissolved solids (TDS). ✓ Total suspended solids (TSS). ✓ Biochemical oxygen demand (BOD). ✓ Heavy metals (Pb, As, Hg, Cd, Ni). ✓ Oil. ✓ Others (to be included on case-by-case basis).
Operation 	Leachate from the secure landfill. <u>Typical Pollutant of Concern:</u> ✓ Total dissolved solids (TDS). ✓ Total suspended solids (TSS). ✓ Biochemical oxygen demand (BOD). ✓ Heavy metals (Pb, As, Hg, Cd, Ni). ✓ Others (to be included on case-by-case basis).

5.3.3.2 Impact Assessment

To develop a model that mimics the catchment behaviour, the following parameters are required as model inputs:

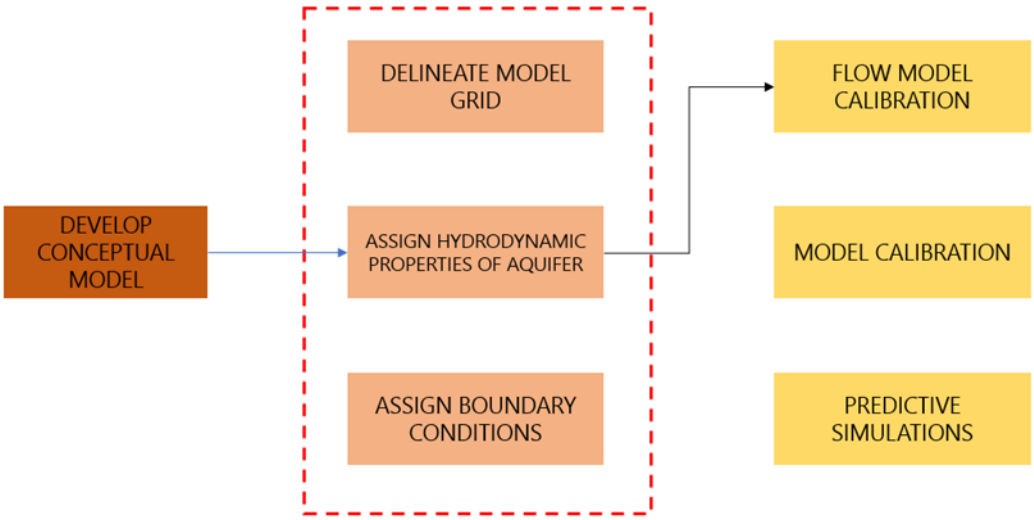
- Topography.
- Hydrogeology (piezometric levels, well yield, pump rate, flow boundaries, geology, soil conductivity).
- Hydrology (rainfall, evapotranspiration, inflow and outflow).

The conceptual model developed will implement the integration of a geospatial database framework. A centralized geospatial database of the study basin is first developed to store all the required data to develop the model. ArcGIS tools can then be used to delineate the model grid into smaller boundaries. The hydrodynamic properties of the aquifer and boundary conditions are also assigned to the model.

Groundwater flow model calibration will then be carried out with respect to water level measurements collected at intervals over a period of time. Following that, model calibration shall be demonstrated to ensure that the model can successfully simulate the observed aquifer behaviour.

After calibration is completed, the Qualified Person shall proceed to model predictive simulations based on the conditions of the project. The overall process for groundwater quality impact assessment is shown in **Figure 5-6**.

Figure 5-6 Methodology for Groundwater Quality Impact Assessment



Assessment Tools

Various assessment tools can be conducted to determine groundwater quality. The appropriate tool can be determined based on the scale of the sensitivity of different projects and also the potential scale of impact. One of the commonly used mathematical model is MODFLOW. Some features of the groundwater modelling tools are tabulated in **Table 5-8**.

Table 5-8 Examples of Groundwater Quality Modelling Tools

Groundwater Model	Features
USGS science for a changing world **MODFLOW by USGS**	• Three-dimensional groundwater and porous media finite difference model • Able to simulate coupled groundwater/surface-water systems, solute transport, variable-density flow, aquifer-system compaction and land subsidence, parameter estimation and groundwater management • Modular system where new packages (functions) are added frequently • Cannot simulate complex geological features, such as angled faults and simulate steep hydraulic gradients such as rewetting/drying cells using the same code • Hydraulic conductivity must be perpendicular to the face of each model cell.
FE **FEFLOW by DHI group**	• Two and three-dimensional groundwater and porous media finite element model • Able to model fluid flow, groundwater age, contaminant and heat transport in saturated and unsaturated porous media • Has direct coupling with solute and heat transport and fracture modelling • Accommodates more complex triangular model mesh which allows for better representation of anisotropy • Simulate complex hydrogeological features (such as re-wetting cells)
Aqua3D by Scientific Software group	• Three-dimensional groundwater and solute transport finite element model • Solves transient groundwater flow and contaminants; heat with advection, decay, adsorption and velocity-dependent dispersion and anisotropic flow conditions. • Able to handle flow and transport in saturated aquifers

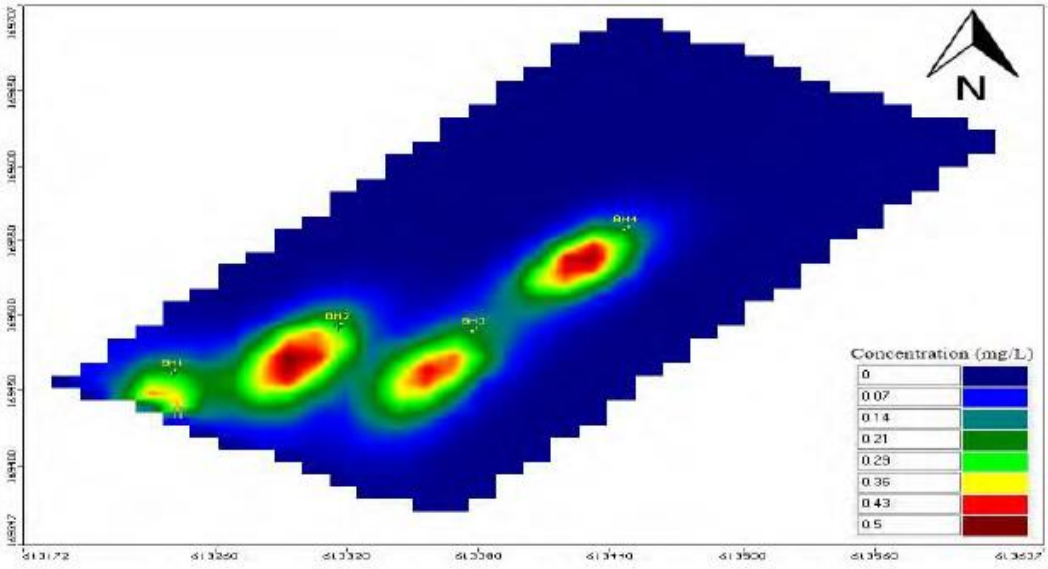
Note: The list is not exhaustive. Proposed assessment models shall be well established and acceptable to the DOE.

5.3.3.3 Output

By carrying out groundwater quality impact assessment, the Qualified Person shall be able to develop groundwater flow and transport using site-specific parameters and simulate and predict the potential migration of contaminants. The values of concentration predicted should be compared with the limits listed in the Groundwater Quality Standards for Conventional Raw Water Treatment (Drinking Water). Some of the key information to be included in the report are:

i) Describe the input data and the effect of different variations of data on the modelling result.
ii) Presentation of predicted pollutants concentrations (example as shown in **Figure 5-7**).
iii) Identification of the highly impacted surrounding community, especially the sensitive receptors.
iv) Discussion on the accuracy of modelling results.

Figure 5-7 Example of Simulation Result for COD Contaminant Using MODFLOW



Source: EIA Report for Proposed Development of Solid Waste Transfer Station, on 12.474 Acres of Land on Lots 1336 & 1337, Pekan Nenas,Mukim Jeram Batu, Daerah Pontian, Johor Darul Takzim for Jabatan Pengurusan Sisa Pepejal Negara (JPSPN).

5.3.4 Air Quality and Odour Impact Assessments

5.3.4.1 Sources of Pollution

The following activities will contribute to emissions of particulates, odour and toxic pollutants that can degrade the air quality of the surrounding areas (**Table 5-9**).

Table 5-9 Sources of Air and Odour Pollutions

Project Stage	Description
Operation  Photo credit: Monroe Environmental.	Emissions from the flue gas treatment system. <u>Typical Pollutant of Concern:</u> ✓ Particulates (PM_{10} & $PM_{2.5}$). ✓ Volatile organic compounds (VOCs). ✓ Sulphur Dioxide (SO_2) and Nitrogen Dioxide (NO_2). ✓ Hydrogen Fluoride (HF). ✓ Hydrogen Chloride (HCl). ✓ Heavy metals (e.g. Hg, Pb, etc.). ✓ Dioxin and furan (PCCD/PCDF). ✓ Greenhouse gases (e.g. CO_2, CH_4, N_2O). ✓ Others (to be included on case-by-case basis).

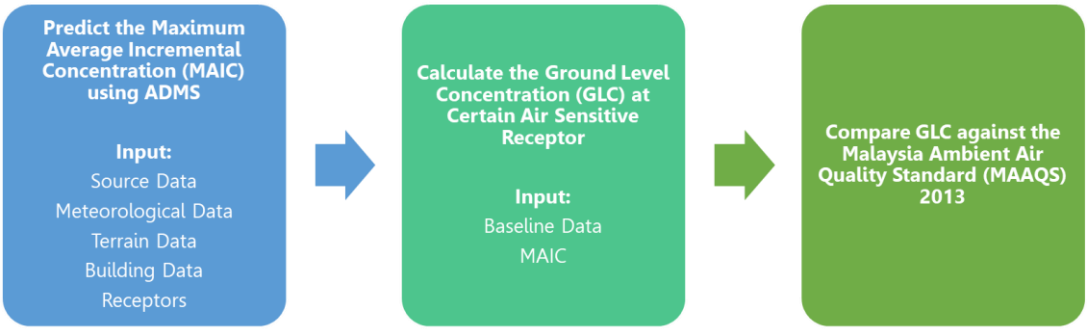
5.3.4.2 Impact Assessment

<u>Methodology for Air Quality Impact Assessment</u>

The general methodology to conduct air quality assessment is shown in **Figure 5-8**. There are several inputs required for the prediction of the Maximum Average Incremental Concentration (MAIC) and calculation of Ground Level Concentration (GLC) of a specific pollutant. The Ground Level Concentration (GLC) of a specific pollutant at the identified Air Sensitive Receptor (ASR) is calculated by adding the MAIC with the baseline data.

This GLC will then be compared with the ambient limits in the Malaysia Ambient Air Quality Standard (MAAQS) 2013. Other ambient air quality standard limits such as the Ontario Ambient Air Quality Criteria (AAQC), 2003 can be adopted if the ambient air quality standard limits of certain pollutants are not available in the MAAQS 2013.

Figure 5-8 General Methodology for Air Quality Assessment



Methodology for Odour Impact Assessment

There are various methods to assess the odour impact from the scheduled waste treatment and disposal project (e.g. incineration plant). Details of the methods can be referred in Bull *et al* (2018) - IAQM Guidance on the assessment of odour for planning – version 1.1.

One of the methods is to predict the odour impact by using ADMS like AERMOD. The general methodology for air quality assessment as shown in **Figure 5-8** can be used for odour impact assessment. The differences are in terms of:

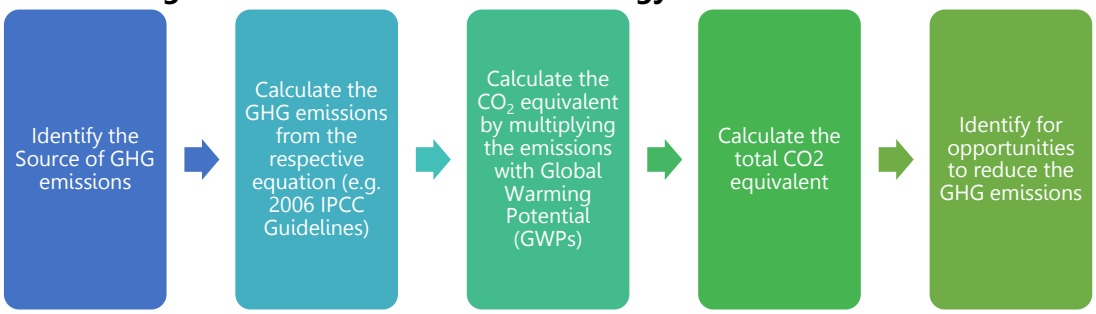
- Odour concentration unit (ou/m^3).
- Compliance limits.
- Evaluation criteria.

At the point of the preparation of this guidance document, the regulations for odour compliance are still in draft stage.

Methodology for Greenhouse Gas Assessment

Greenhouse gas (GHG) emissions from the scheduled waste treatment and disposal facilities (i.e. incineration) can be calculated by following the steps given below:

Figure 5- 9 General Methodology for GHG Calculation



The 2019 Refinement to the 2006 IPCC Guidelines for National Greenhouse Gas Inventories (2006 IPCC Guidelines) and the 2006 IPCC Guidelines (i.e. Volume 5 – Waste) can be referred to calculate the GHG emissions.

Assessment Tools for Air Quality and Odour Impacts

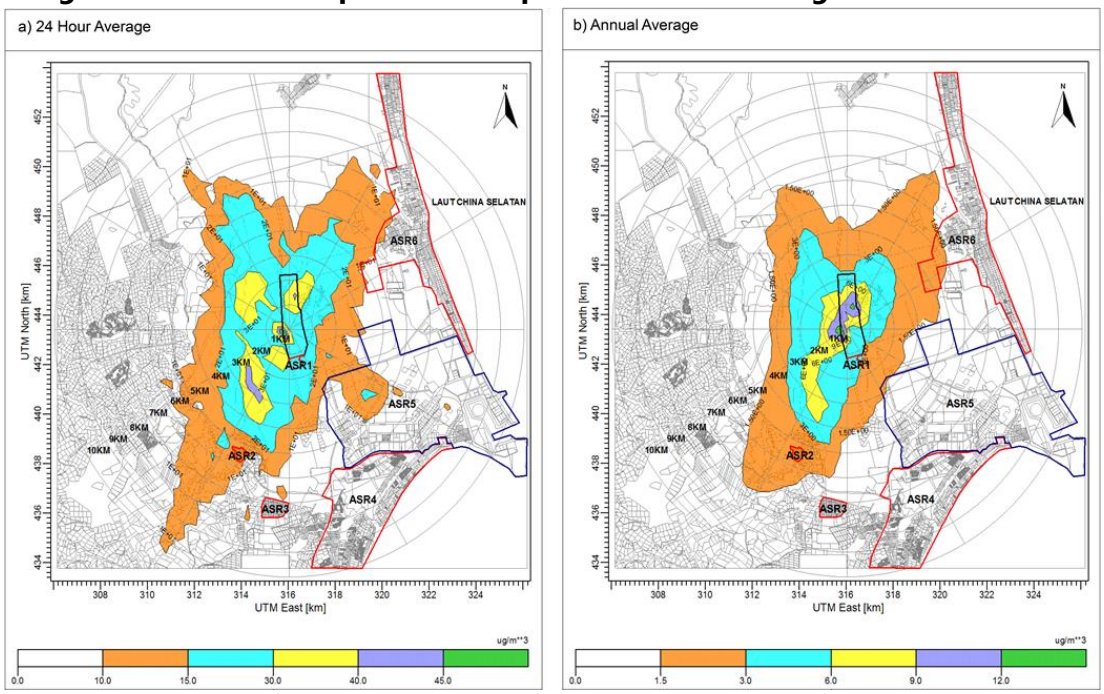
There are a few Air Dispersion Modelling Software (ADMS) that can be used to predict the maximum average incremental concentration from the point, area and volume sources release. AERMOD and CALPUFF are among the most common software used for air modelling. There are several other ADMS available in the market that can be used as well. The comparison of selected ADMS can be found in **Appendix H.**

5.3.4.3 Output

Maximum Average Incremental Concentration (MAIC)

The output from the modelling will be in the form of iso-plots of MAIC of a specific pollutant as shown in **Figure 5-10**. It will show the extent and magnitude of the pollutant dispersion.

Figure 5-10 Example of Air Dispersion Contour using CALPUFF View™



Ground Level Concentration (GLC)

As mentioned above, the GLC of a specific pollutant at the identified ASR is calculated by adding the MAIC with the baseline data. Hence, it is expected that the GLC results at the identified ASR are tabulated in the table and where available compared with the limits in the MAAQS 2013 or other ambient air quality standard limits.

Evaluation Criteria:

The main evaluation criteria for air quality assessment are the MAAQS as shown in **Table 5-10**. As mentioned above, the Ontario Ambient Air Quality Criteria (AAQC), 2003 can also be adopted if the ambient air quality standard limits of certain pollutants are not available in the MAAQS 2013.

Table 5-10 Malaysia Ambient Air Quality Standard 2013

Pollutants	Averaging Time	Standard 2020 (µg/m³)
Particulate Matter <10 micron (PM_{10})	1-Year	40
	24-Hour	100
Particulate Matter <2.5 micron ($PM_{2.5}$)	1-Year	15
	24-Hour	35
Sulphur Dioxide (SO_2)	1-Hour	250
	24-Hour	80
Nitrogen Dioxide (NO_2)	1-Hour	280
	24-Hour	70
Ground Level Ozone (O_3)	1-Hour	180
	8-Hour	100
Carbon Monoxide (CO) in mg/m³	1-Hour	30
	8-Hour	10

5.3.5 Noise Quality Impact Assessment

5.3.5.1 Sources of Pollution

The following activities will contribute to noise emission to the surrounding areas (**Table 5-11**).

Table 5-11 Sources of Noise and Vibration Pollution

Project Stage	Description
Construction 	Noise and vibration from piling activities for scheduled waste treatment process area and its supporting facilities.
Operation 	Noise and vibration from operation of plant equipment (i.e. ID fan, pump, compressor, turbine etc.).

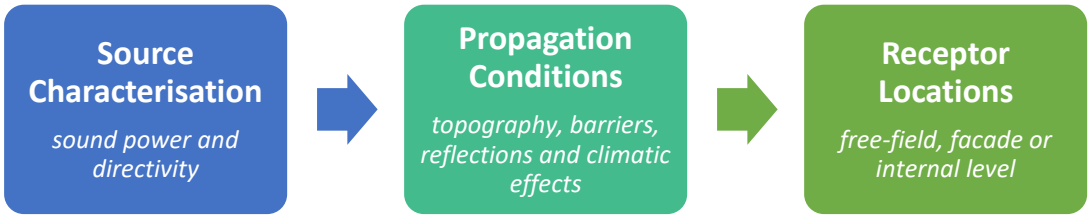
Project Stage	Description
Operation  Photo credit: Cenviro Services.	Noise and vibration from transportation of scheduled waste.

5.3.5.2 Impact Assessment

Methodology

Noise assessment aims to determine the effect of the expected change in the acoustic environment arising from the proposed development. Prediction of noise at the receptor is estimated based on the sound pressure level generated at noise source. Different prediction methods need to be considered for construction and operation. The basic prediction procedure involves consideration of the nature and noise level of the sources, the propagation along the paths between sources and receptors and location as shown in **Figure 5-11**.

Figure 5-11 Components of Noise Assessment



Before carrying out the noise impact assessment, the following information must be identified as inputs to carry out the assessment (**Table 5-12**).

Table 5-12 Typical Input for Noise Impact Assessment

Information	Description
Source Characterization	• Sound power level, sound pressure level • Source classification (area, point, line) and mobile sources • Propagation factors (reduction in level with distance from a point source correspond to the sound wave) • Directionality • Ground effect (soft, hard, porous ground) • Location of source

Information	Description
	• Height of source • Type of noise (continuous, intermittent, impulse) • Phasing of works (if any) • Existing background noise and existing noise sources
Meteorological Effects	• Atmospheric absorption • Atmospheric refraction • Wind speed • Temperature gradient
Topographical Effects	• Barriers (types, height) • Reflections from vertical surfaces such as tall building • Total attenuation from factors such as atmospheric absorption, absorbing ground, diffraction by barriers and other miscellaneous factors
Receiver	• Existing background noise and existing noise sources • Land use of receiver (residential, institution, public facilities) • Location of receiver, distance between source to receiver, height of receiver
Attenuation	• Topography of assessment area, ground effect (soft, hard, porous), screening, reflection

The selection of assessment method depends on the nature of noise source and available information that are needed as input to the assessment method. It is important for the noise assessor to strike a balance between the convenience of a simple model or assessment and the need for accurate predictions. Some of the prediction schemes and models for noise assessment are shown in **Table 5-13**.

Table 5-13 Prediction Schemes and Models for Noise Assessment

Prediction Tools	BS 5228-1:2009 Code of practice for noise and vibration control on construction and open sites – Part 1: Noise ISO 9613-2 Acoustics – Attenuation of sound during propagation outdoors Part 2: General method of calculation FHWA Traffic Noise Model Version 2.5 Calculation of Road Traffic Noise (CRTN)
Modelling Software	CadnaA Datakustik SoundPLAN GIS based noise model

Note: The list is not exhaustive. Proposed assessment models shall be well established and acceptable to the DOE.

5.3.5.3 Output

Noise could be assessed against an absolute numerical noise limit or on the change in noise levels relative to an existing baseline level as described in Guidelines for Environmental Noise Limits and Control 2019 Third Edition published by Department of Environment, Malaysia. As for the community annoyance of the noise, assessment will be based on the human perception of the change in ambient noise levels. Output

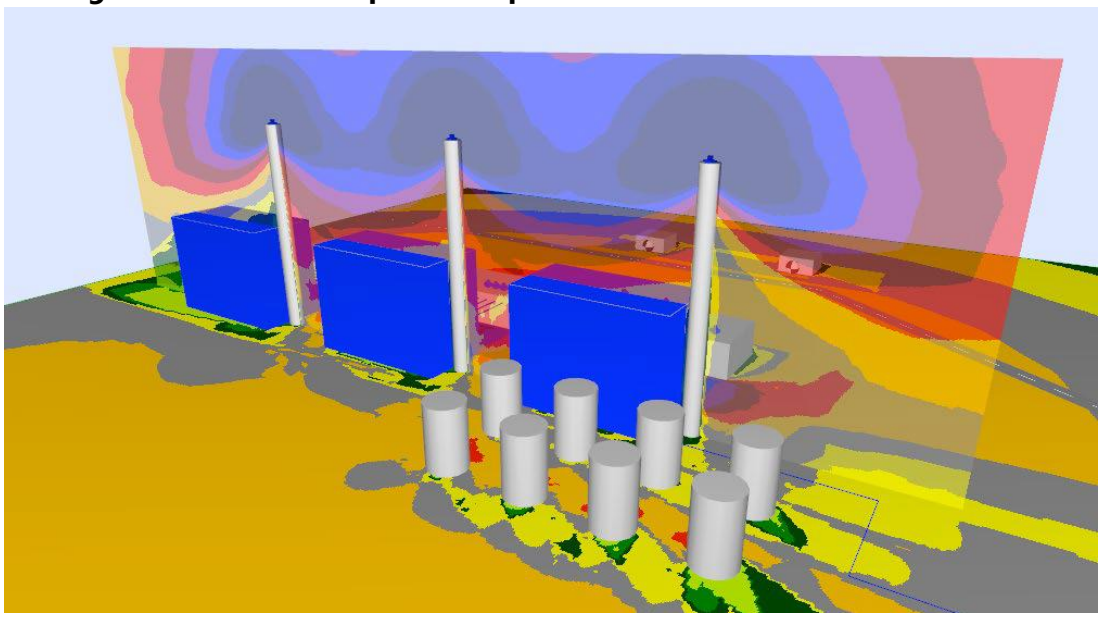
for noise assessment can be presented in tabular form (**Table 5-14**) or noise contours from modelling software (**Figure 5-12**).

Table 5-14 Sound Pressure Levels of Heavy Machinery and Equipment on Site during Construction of Access Road

Site Activity	Sub Activity	Machinery / Equipment	Sound Power Level (dBA)	Sound Pressure Level at 220m (dBA)	Sound Pressure Level of Sub Activity (dBA)
Site preparation	Site Clearing	Tracked loader (205 kW)	96.0	38.0	48.4
		Tracked excavator (71 kW)	105.0	47.0	
		Bulldozer (240 kW)	103.0	45.0	
Access Road Works	Ground Excavation	Tracked excavator	105	47.0	46.5
		Tracked loader	96.0	38.0	
	Tipping and Spreading Fill	Dump truck (50 t)	107	49.0	49.8
		Tracked excavator	105.0	47.0	
		Bulldozer	103.0	45.0	
	Levelling Ground	Bulldozer	103.0	45.0	46.1
		Grader	101.0	43.0	

Source: ERE Consulting Group Sdn Bhd.

Figure 5-12 Example of Output from CadnaA Datakustik Software



Source: CadnaA Datakustik.

5.3.6 Vibration Impact Assessment

5.3.6.1 Sources of Pollution

The source of vibration for the scheduled waste and disposal activities is similar to source of noise as shown in **Table 5-11**.

5.3.6.2 Impact Assessment

Vibration impact during construction stage shall be assessed if there is a significant vibration impact from construction activities to the nearby sensitive receptors.

Methodology

i. Continuous Vibration

The assessment for the prediction of peak particle velocity (PPV) from the construction machinery is estimated by the following formula:

$$PPV_{Equipment} = PPV_{Ref}(25/D)^{n} \quad \textit{(in/sec)}$$

Where:

PPV_{Ref}	=	Reference PPV at 25 ft
D (ft)	=	Distance from equipment to the receiver
n	=	1.1 (the value related to the attenuation rate through ground)

ii. Ground Vibration

Based on Australian Standards 2187.2-2006, ground vibration is estimated using the following equation:

$$V = K_G \left(\frac{R}{Q^{\frac{1}{2}}}\right)^{-B}$$

Where:

V (mm/s)	=	Peak vector sum ground vibration peak particle velocity (mm/s)
R (metres)	=	Distance from blast area to the nearest structures
K_G, B	=	Site constraints related to site and rock properties for estimation purpose
Q (kg)	=	Maximum instantaneous charge (kg)

iii. Human Annoyance and Discomfort

Human annoyance and discomfort are assessed by comparing the level of peak particle value with the Recommended Limits for Human Response and Annoyance from Short Term Vibrations in accordance with the Planning Guidelines for Vibration Limits and Control in The Environment 2007.

5.3.6.3 Output

Vibration can be assessed against an absolute numerical vibration limit and/or assessed based on the increase of the vibration levels with respect to the ambient level without the offending source. Based on the assessment, damage risk of building, predicted vibration level and human annoyance from the predicted vibration level will be compared with the permissible levels stated in The Planning Guidelines for Vibration Limits and Control in the Environment Second Edition 2007 published by the DOE.

The output for vibration assessment can be presented in tabular form (**Table 5-15** and **Table 5-16**) and plotted in PPV versus distance graph (**Figure 5-13**).

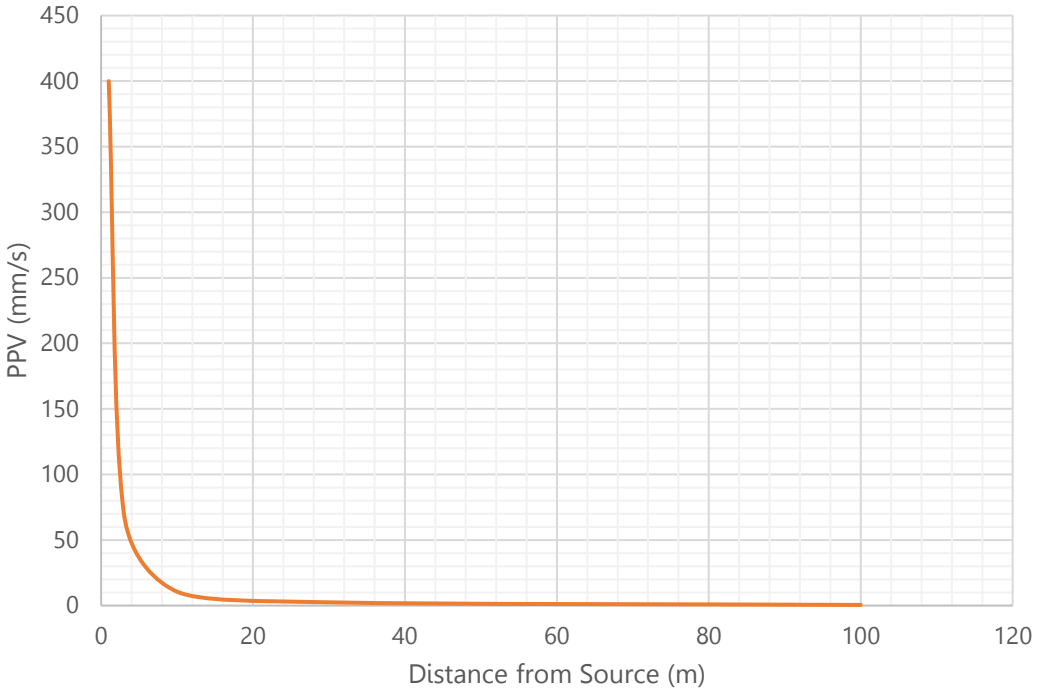
Table 5-15 Sum of Vibration Levels and Recommended Limits for Damage Risk in Building from Short Term / Steady State Vibration

Vibration Axes	Vibration Velocity (mm/s)	Recommended Limits for Damage Risk in Building from Short Term / Steady State Vibration
Transverse (z-axis) Vertical (y-axis)		
Longitudinal (x-axis) Sum ($\sqrt{(x^2 + y^2 + z^2)}$)		

Table 5-16 Sum of Vibration Levels and Recommended Limits for Human Response and Annoyance

Vibration Axes	Vibration Velocity (mm/s)	Recommended Limits for Human Response and Annoyance
Transverse (z-axis) Vertical (y-axis)		
Longitudinal (x-axis) Sum ($\sqrt{(x^2 + y^2 + z^2)}$)		

Figure 5-13 Typical Vibration Levels, PPV with Distance from Source



5.3.7 Quantitative Risk Assessment

5.3.7.1 Sources of Hazard

The following activities will contribute to accidental fire, toxic dispersion and explosion (**Table 5-17**).

Table 5-17 Sources of Hazard

Project Stage	Description
Operation 	Accidental release of natural gas from pipeline. <u>Typical Possible Consequences:</u> ✓ Jet fire. ✓ Flash fire. ✓ Others (to be included on case-by-case basis).

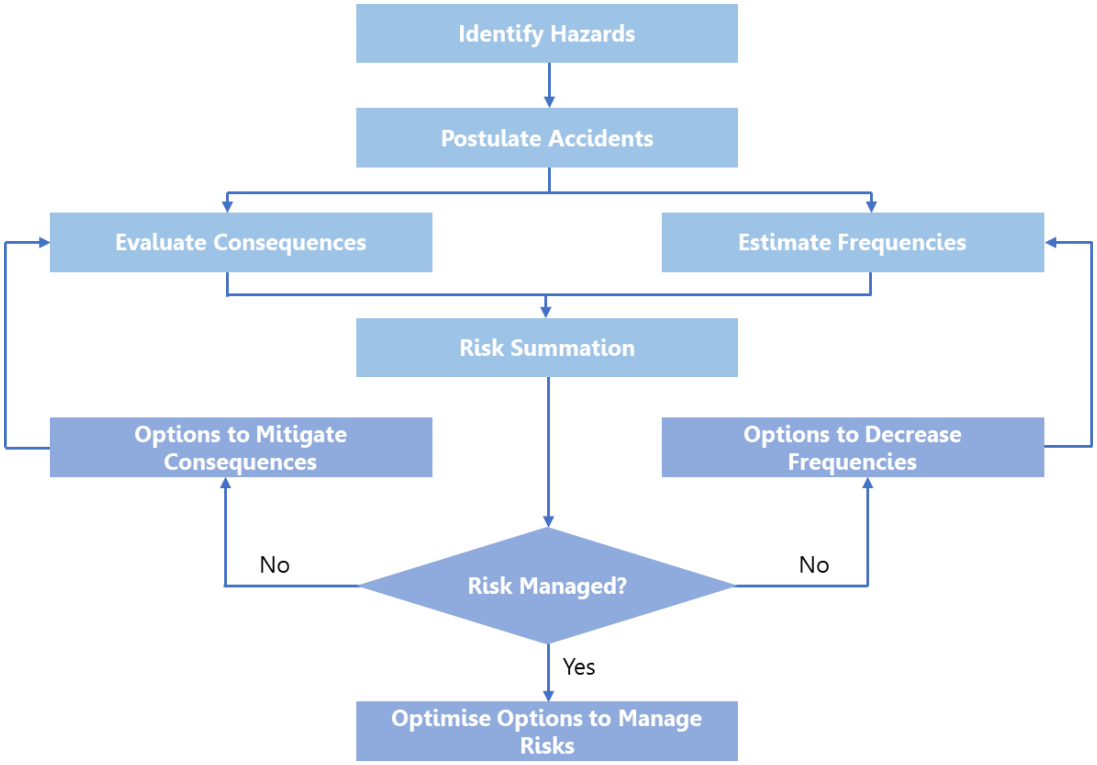
Project Stage	Description
Operation 	Accidental release of diesel from storage tanks. Typical Possible Consequences: ✓ Pool fire. ✓ Others (to be included on case-by-case basis).
Operation 	Incompatible scheduled waste storage. Typical Possible Consequences: ✓ Jet fire. ✓ Flash fire. ✓ Pool fire. ✓ Vapor cloud explosion. ✓ Toxic cloud dispersion. ✓ Others (to be included on case-by-case basis).

5.3.7.2 Impact Assessment

Methodology

A quantitative risk assessment (QRA) shall be carried out according to the Environmental Impact Assessment Guidelines for Risk Assessment (DOE, 2004). The risks of the scheduled waste project to the surrounding areas can be analysed by the application of methodology shown in **Figure 5-14**. As a result, a numerical representation of the frequency and extent of a specified level of exposure or harm, to specified people or the environment are produced to quantify the risk.

Figure 5-14 Procedure for Quantitative Risk Assessment



Assessment Tools

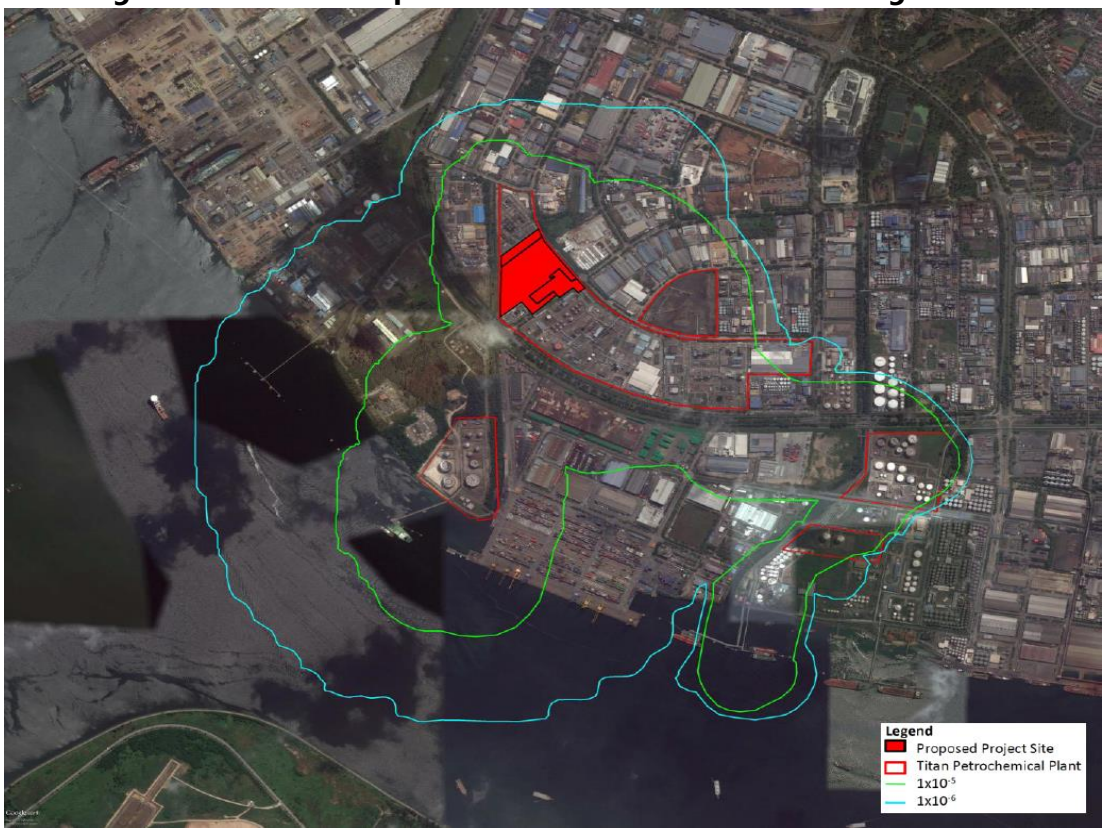
There are a few modelling software packages that can be used to predict the consequences or severity of the pre-identified hazardous events such as fire, explosion and also toxic gas dispersion. ALOHA and PHAST are among the most common software used to perform the consequence analysis. There are several other software available in the market that can be used as well. The comparison of selected software for consequence analysis is shown in **Appendix I.**

5.3.7.3 Output

Individual Risk

Individual risk is the probability of fatality in a year of an individual in a given location as a result of the realization of any hazardous events. The surrounding population is not taken into account in the individual risk calculation. The individual risk results are usually plotted as a series of iso-risk contours originating from the source of hazard. **Figure 5-15** shows the example of individual risk contours produced using PHAST overlaid onto Google Earth.

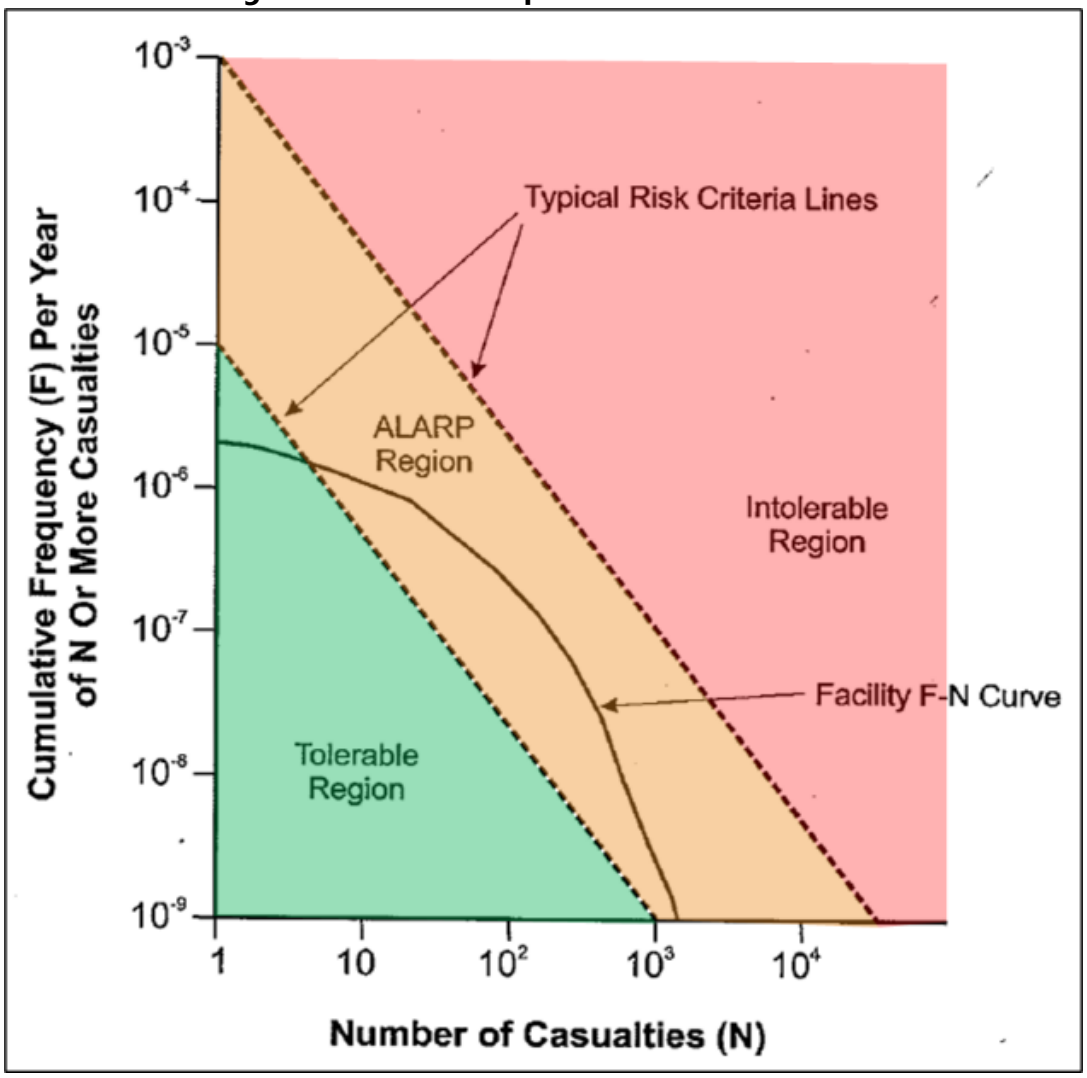
Figure 5-15 Example of Individual Risk Contours using PHAST



Societal Risk

Societal risk provides the actual risk measurement to a given population at or near the source of hazard. Results are usually plotted in the F-N Curve to determine the risk acceptability. F-N Curve provides a logarithmic plot of cumulative frequency of fatal events versus the number of fatalities within a given period, usually set for 1 year. **Figure 5-16** shows the example of societal risk F-N Curve.

Figure 5-16 Example of Societal F-N Curve



Evaluation Criteria

The sum of the individual risk calculation for each hazardous event can be compared against the individual risk criteria set in the Environmental Impact Assessment Guidelines for Risk Assessment (DOE, 2004). The recommended risk tolerability criteria for Malaysia are:

- **Industry:** $1x10^{-5}$ fatalities/person/year individual risk contour should not extend beyond industrial developments.
- **Public:** $1x10^{-6}$ fatalities/person/year individual risk contour should not encompass involuntary recipients of industrial risks.

5.3.8 Health Impact Assessment

5.3.8.1 Sources of Impact

The following activities will give impact to the health of the workers and nearby local residents (**Table 5-18**).

Table 5-18 Sources of Health Impact

Project Stage	Description
Construction 	Communicable diseases (vector borne diseases, zoonotic diseases, etc.) from the establishment of workers quarters.
Operation  Photo credit: Monroe Environmental.	Non-communicable diseases due to the inhalation of air emissions release from the flue gas treatment system.
Operation 	Non-communicable diseases due to the skin contact and ingestion of effluent/leachate discharge into the river or groundwater.

5.3.8.2 Impact Assessment

Methodology

Health Impact Assessment (HIA) shall be carried out according to the Guidance Document on Health Impact Assessment (HIA) in the Environmental Impact Assessment (EIA) 2012. There are 4 steps taken in the HIA study as follows:

i) **Step 1** – Screening.
ii) **Step 2** – Scoping.
iii) **Step 3** – Description of Existing Public Health Status.
iv) **Step 4** – Health Risk Assessment (HRA).

Assessment Tools

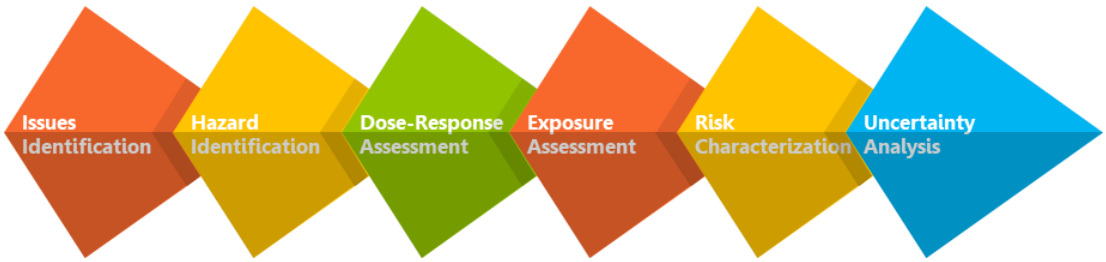
HRA is the main tool to assess the impact of the proposed project on the health of the surrounding population. There are two forms of HRA namely:

- **Qualitative risk assessment** – Merely characterizes or compares the hazard of a chemical relative to others or defines the hazard in only qualitative terms such as mutagen or carcinogen.
- **Quantitative risk assessment** – Generates a numerical measure of the risk or safety (i.e. non-carcinogenic and carcinogenic) of chemical exposure.

Quantitative risk assessment is the preferred assessment for HIA in EIA whenever this is possible. However, certain health risks that may be associated with risk due to communicable diseases may not lend well to quantitative risk assessment. Therefore, the Qualified Person shall identify a suitable method to be used for HIA.

There are 6 steps involve in the quantitative health risk assessment as shown **Figure 5-17**. Details of the method can be referred to in the guidance document mentioned above.

Figure 5-17 Quantitative Health Risk Assessment Procedure



5.3.8.3 Output

Chronic Health Risk

The main objective of HIA is to determine the acceptability of the health risks either the non-carcinogenic risk or carcinogenic risk. Different sets of formula are used to calculate the health risk depending on the route of intake namely ingestion and inhalation.

Evaluation Criteria

The risk tolerability criteria recommended in the Guidance Document on HIA in Environmental Impact Assessment by DOE Malaysia (2012) are:

- **Non-carcinogenic risk:**
  - ✓ A Hazard Quotient **(HQ) < 1** is categorised as an acceptable risk.
  - ✓ A Hazard Quotient **(HQ) > 1** signifies a hazardous condition.

- **Carcinogenic risk:**
  - ✓ Lifetime excess cancer risk within **10^{-6} to 10^{-4}** are given as a range of acceptable risk; or
  - ✓ Between 1 cancer for every million of exposed population to 1 cancer for every 10,000 of exposed population, over a lifetime duration of 70 years.
  - ✓ Lifetime excess cancer risk $<10^{-6}$ will be deemed as "clearly acceptable''
  - ✓ Lifetime excess cancer risk $>10^{-4}$ will be deemed as ''clearly unacceptable''.

5.3.9 Socio-Economic Study

5.3.9.1 Sources of Impact

Table 5-19 shows some of the possible socio-economic concerns that may arise during the construction and operation stages.

Table 5-19 Sources of Socio-Economic Impact

Stage	Possible Sources
Construction	• Possible relocation or resettlement of community. • Increase in traffic volume that may cause potential accidents or disturbances if not properly controlled. • Possible provision of new employment opportunities for local people. • Foreign workers involved may contribute to criminal case within the area.
Operation	• Air emissions may cause impact to the health of the community. • Odour generation from leachate which would cause a nuisance to the nearby community.

Stage	Possible Sources
	• Effluent discharge may cause impact to the health and disrupt economic activity of the community who depends on the river as their source of income (if relevant). • Possible provision of new employment opportunities for local people (positive impact). • Improving scheduled waste management and reducing illegal scheduled waste dumping (positive impact).

5.3.9.2 Impact Assessment

Methodology

The Qualified Person can refer to the Manual for Social Impact Assessment (SIA) for Project Development, Second Edition 2018 as one of the references to conduct socio-economic study. There are 4 steps to follow in conducting socio-economic study:

Step 1 - Scoping

Identify key stakeholders, issues to be covered by the study, and level of stakeholder engagement.

Step 2 - Collect Social Baseline Data

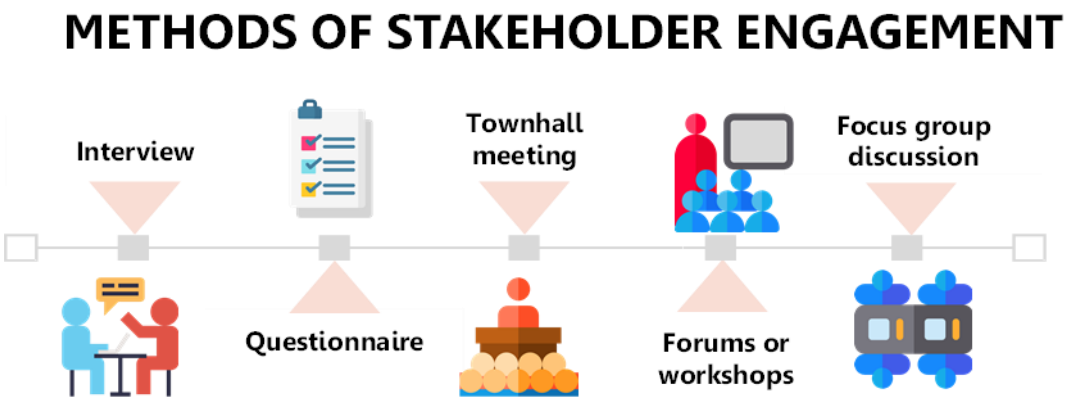
Population and demographic data from DOSM will be used to give an overview of the demographic profile.

Step 3 - Conduct Stakeholder Engagement

Quantitative method for collecting basic socio-economic information and gathering opinions/issues from local population about the Project. Example of stakeholder engagement is shown below.

Step 4 - Socio-Economic Impact Assessment

Assess socio-economic impact based on the inputs from stakeholder engagement by using social impact matrix.



Assessment Tools

Socio-economic impact analysis can be carried out using the social impact matrix where a list of social impacts is identified from the data collected. The probability of the occurrence and severity of the impact shall then be assessed accordingly by using the equation below. The calculated significance scoring will be ranked on a scale from 1 to 16 (**Table 5-20**). The higher the score is, the more significant the impact will be on the surrounding community.

Table 5-20 Scale for Probability and Severity

Significance = Probability x Severity

Scale for Probability	**Scale for Severity**
1 = Remotely and rarely occurring	1 = Minor social impact
2 = Rarely occurring	2 = Moderate social impact
3 = Frequently occurring	3 = High social impact
4 = Continuously occurring	4 = Severe negative impact

Colour Code	Green	Yellow	Orange	Pink	Red
Score	1-2	3-5	6-7	8-11	12-16
Rating	Not significant	Significant (Low Priority)	Significant (Medium Priority)	Significant (High Priority)	Significant (Very High Priority)
Outcome	No mitigation needed	Continual improvement or control mitigation measures	Preventive measures	Immediate preventive and mitigation measures	Project shall not be approved unless site is relocated or redesigned

Source: Manual for Social Impact Assessment (SIA) for Project Development, Second Edition, 2018.

5.3.9.3 Outputs

The output of the socio-economic study may be presented in risk matrix tabulation or discussion format in the EIA report. An example of scoring for social impact matrix is shown in **Table 5-21**.

Table 5-21 Example for Participatory Impact Analysis Using Social Impact Matrix

Identified Social Impacts	Probability				Average Scale	Severity				Average Scale	Colour Code
	1	2	3	4		1	2	3	4		
1. Influx of foreign/temporary workers in local settlements	0.7	6.9	15.9	76.6	3.7	1.4	6.9	20.0	71.7	3.6	13.3
2. Increased employment/downstream economic opportunities to local communities	37.9	38.6	20.0	3.4	1.9	39.3	44.1	12.4	4.1	1.8	3.4
3. Local communities do not have access to employment/downstream economic opportunities	30.3	25.5	23.4	20.7	2.3	29.0	26.2	24.1	20.7	2.4	5.5
4. Increased security issues in local settlements	1.4	2.8	19.3	76.6	3.7	1.4	2.1	19.3	77.2	3.7	13.8
5. Negative impacts on the environment	1.4	8.3	34.7	55.2	3.4	2.1	8.3	29.9	59.7	3.5	12.0
6. Negative impacts on local lifestyle, cultural and religious values	35.2	36.6	11.0	17.2	2.1	36.6	35.2	11.0	17.2	2.1	4.4
7. Positive impacts on local lifestyle, cultural and religious values	59.7	35.9	4.1	-	1.4	59.7	36.1	3.5	0.7	1.5	2.1
8. Negative impacts on the health of local communities	2.8	6.2	20.0	71.0	3.6	0.7	5.5	24.8	69.0	3.6	13.0
9. Negative impacts due to increase in natural disasters	10.4	20.8	35.4	33.3	2.9	9.7	22.2	34.7	33.3	2.9	8.5
10. Increase in the living conditions of the local communities	38.6	39.3	18.6	3.4	1.9	38.6	40.7	16.6	4.1	1.9	3.5
11. Increase opportunities for rental of temporary housing for foreign/temporary workers	58.6	24.1	11.0	6.2	1.6	57.9	21.4	13.8	6.9	1.7	2.8
12. Increased pressure on existing facilities and amenities originally meant for the local communities	54.5	25.5	13.1	6.9	1.7	55.2	22.8	12.4	9.7	1.8	3.0
13. Increased pressure on natural resources and recreational areas previously only used by the local communities	48.3	26.9	12.4	12.4	1.9	51.7	17.2	15.9	15.2	1.9	3.7

5.3.10 Waste Management Assessment

5.3.10.1 Sources of Waste Generation

The following activities will generate solid waste and scheduled waste (**Table 5-22**).

Table 5-22 Sources of Waste Generation

Project Stage	Description
Construction  	Typical Solid Waste Generation: ✓ Tree biomass. ✓ Unsuitable material. ✓ Construction waste. ✓ Domestic waste from site workers. Typical Scheduled Waste Generation: Maintenance of construction vehicles. ✓ SW 305 - Spent lubricating oil. ✓ SW 306 - Spent hydraulic oil. ✓ SW 312 - Oily residue from automotive service workshop, oil or grease interceptor. ✓ SW 408 - Contaminated soil, debris or matter resulting from cleaning-up of a spill of chemical, mineral oil or scheduled wastes. ✓ SW 410 - Used oil filter from vehicles.

Project Stage	Description
Operation 	Typical Scheduled Waste Generation: Various types of scheduled wastes from the incoming feedstock or raw material at the waste reception area.
Operation  *Photo credit: Monroe Environmental.*	Typical Scheduled Waste Generation: Fly ash and bottom ash (SW 406) from flue gas cleaning system of thermal treatment plant.
Operation 	Typical Scheduled Waste Generation: Sludges containing one or several metals including chromium, copper, nickel, zinc, lead, cadmium, aluminium, tin, vanadium and beryllium (SW 204) from the operation of IETS and LTP.

5.3.10.2 Impact Assessment

Solid Waste Generation

The estimated waste generation from the Project shall be assessed for the construction and operation stages. To estimate the total amount of waste, waste generation rates (WGR) from published literature are multiplied with the quantity (Q) that has been determined from the Project (i.e. estimated area of cleared vegetation, roadworks areas, amount of excavation and demolished structures and number of workers). Examples of waste generation rates are shown in **Table 5-23**.

Amount of Waste Generated= WGR × Q

Table 5-23 Examples of Waste Generation Rates

Project Stage	Category of Waste	Waste Generation Rates
Site clearing	Palm Oil Tree	40.77 tonnes/hectare
	Mangrove	99.4 tonnes/hectare
	Small, growing stands	Low: 26 tonnes/hectare High: 116 tonnes/hectare
	Mixed small, mature stands	Low: 130 tonnes/hectare High: 155 tonnes/hectare
	Mature, dense stands	Low: 168 tonnes/hectare High: 414 tonnes/hectare
	Mature, very dense stands	Low: 427 tonnes/hectare High: 569 tonnes/hectare
Construction	IBS	0.018 tonne/m^2
	Conventional	0.046 tonne/m^2
	Mixed construction method	0.0446 tonne/m^2
	Demolition	1.3086 tonne/m^2
Operation	Industry, commercial	0.41 tonne/m^2

Scheduled Waste Generation

Scheduled waste generated from specific activities like the operation of flue gas treatment system, IETS and LTS can be calculated from the mass balance approach.

5.3.10.3 Output

The output from the estimation of waste generation shall be presented in the tabular, graph or in any manner which is deemed suitable. The output shall consist of the weight or volume of waste generation. Examples of output shall contain the category of waste, weight of waste or volume of waste as shown in **Table 5-24**.

Table 5-24 Output for Estimated Waste Generation from the Project

Project Stage	Category	Details	Quantity (ha/m^2)	Waste Generated	
				Tonne	Percentage (%)
Construction	Biomass				
	Construction Waste				
	Domestic Waste				
	Excavated Materials				
	TOTAL				
Operation	Domestic Waste				
	Sludge				
	TOTAL				

Based on the volume or weight of waste generation, the impacts of improper waste management shall be described in detail in relevant to the type and source of waste. The waste impacts shall be described in the following manner shown in **Table 5-25**.

Table 5-25 Potential Impact from Poor Waste Management

Impacts	Sensitive Receptors
Water Pollution • Increased level of total suspended solids and turbidity due to runoff from excavated materials. • Increased concentration of ammoniacal nitrogen, BOD, COD, and high risk of eutrophication due to high organic content of biomass and domestic waste. • Toxic pollution of river due to illegal dumping of scheduled waste.	Receiving river and its beneficiaries
Flooding • Waterway obstruction and disruption of water flow from illegal dumping of excavated materials, biomass, construction, and domestic waste.	
Air Pollution • Localised haze and air pollution from open burning of biomass, construction and domestic waste. • Foul odour due to the breakdown of organic matter from domestic waste. • Release of toxic fumes from illegal dumping of scheduled waste.	Flood prone areas
Others • Disease outbreak (e.g. dengue, leptospirosis) due to illegal dumping of biomass, construction, and domestic waste that serves as pest/vermin breeding ground. • Littering problem of domestic waste from workers' camps and construction site. • Ground contamination from scheduled waste spillage.	Residential and public areas

5.3.11 Ecological Impact Assessment

5.3.11.1 Sources of Impacts

The possible sources of ecological impacts from scheduled waste treatment and disposal facilities particularly secure landfill can vary throughout the different stages of the project (**Table 5-26**).

Table 5-26 Potential Activities Contributing to Ecological Impacts

Project Stage	Type of Impact	Description
Construction	• Habitat disturbance • Habitat fragmentation	• Site clearance including earthwork • Cell preparation of landfill • Establishment of access road

Project Stage	Type of Impact	Description
	• Human-wildlife conflicts	• Mobilisation of machinery and equipment • Attracting nuisance wildlife due to construction waste
Operation	• Habitat disturbance • Habitat fragmentation	• Site clearing of new cell

5.3.11.2 Impact Assessment

Methodology

Core components that need to be considered in the assessments include:

- Type of habitat in the surrounding area (between 500m – 2km from the project site).
- Presence of forest reserves (if any) in the surrounding area.
- Flora composition.
- Fauna composition.

Information pertaining to the four core components can be collated through collation of secondary data and consultation with relevant stakeholders such as:

- State Forestry Departments.
- State Department of Wildlife and National Parks.
- Research institutions.
- Local environmental NGOs (e.g. Malaysian Nature Society, WWF-Malaysia).

Where secondary data is not available, quick fieldwork should be conducted to document the existing conditions of the surrounding environment in terms of habitat and species composition (for both flora and fauna). The collected data can then be used to assess the sensitivity of the surrounding environment and the severity of potential impacts in terms of habitat disturbance and fragmentation, as well as potential loss of flora and fauna species that are of conservation importance.

Figure 5-18 Methodology for Ecological Impact Assessment

Assessment Tools

Supporting tools that can be used to facilitate ecological impact assessments are generally in the form of ecological planning documents, and species conservation rankings. These supporting tools can be used to assess if the project site is situated within a sensitive landscape, and whether project activities, especially during the construction stages, may pose threats in terms of species loss (for both flora and fauna) (**Table 5-27**).

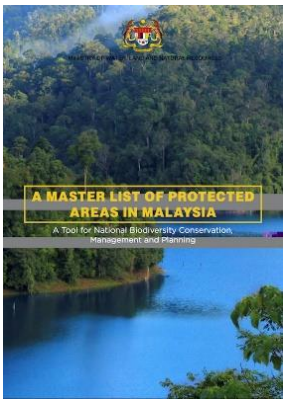
Where applicable, Google Earth can be used to calculate potential habitat fragmentation impacts, especially if construction of access road through forested areas are expected to occur. Components required for this type of assessment include:

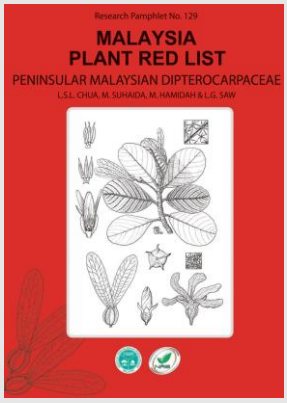
- Forest reserve / protected area boundary
- Project site boundary
- Access road alignment

The degree of potential habitat fragmentation can be calculated as follows:

$$\frac{Area\ of\ individual\ forest\ fragments\ (ha)}{Overall\ area\ of\ PRF\ (ha)}\ X\ 100\%$$

Table 5-27 Examples of Supporting Tools for Ecological Assessment

Assessment Tool	Supporting Info
 **Master List of Protected Areas in Malaysia**	• Presents a list of forest reserves that are considered to be protected areas for strict conservation. • Covers both Peninsular Malaysia, Sabah and Sarawak. • Examples of forest reserves considered as protected areas: ✓ Water catchment forest ✓ Soil protection forest ✓ Virgin jungle reserves ✓ Wildlife reserves ✓ Bird sanctuaries
	• Presents a network of ecological corridors to improve ecological connectivity throughout Peninsular Malaysia. • Areas within the ecological corridors include state land forests as well as plantations. • Corridors were developed based on movement of large mammals e.g. deers, tapirs, elephants.

Assessment Tool	Supporting Info
 **Central Forest Spine Master Plan**	• Best management practices are proposed to preserve or enhance ecological connectivity.
 **Red List of Mammals for Peninsular Malaysia**	• Presents a list of mammals that are threatened due to declining population. • Can be used to determine if there are any wildlife in the surrounding landscape that are of conservation importance. • List is ranked using the IUCN Red List categories: ✓ Least Concern ✓ Near Threatened ✓ Vulnerable ✓ Endangered ✓ Critically Endangered ✓ Extinct in Wild ✓ Extinct
 **Malaysia Plant Red List**	• Presents a list of plants, specifically dipterocarps, that are threatened due to declining population. • Can be used to determine if there are any plants in the surrounding landscape that are of conservation importance. • List is ranked using the IUCN Red List categories: ✓ Least Concern ✓ Near Threatened ✓ Vulnerable ✓ Endangered ✓ Critically Endangered ✓ Extinct in Wild ✓ Extinct

Note: The list is not exhaustive. Proposed assessment models shall be well established and acceptable to the DOE.

5.3.11.3 Output

The objective of the ecological assessment is to ensure that impacts such as habitat disturbance and fragmentation are minimised. At the same time, this will help reduce or avoid potential loss of plants and wildlife, if any are present in the surrounding landscape. The main output of ecological assessments are tables documenting the type of plants and wildlife that can be found within and around a project site (**Table 5-28**).

Table 5-28 Example of Species Listing with Conservation Status

Family	Common Name	Species Name	Conservation Status	
			IUCN Red List	Local Red List[1]
Sciuridae	Plaintain Squirrel	*Callosciurus notatus*	LC	LC
	Black Giant Squirrel	*Ratufa bicolor*	NT	NT
Cercopithecidae	Long-tailed Macaque	*Macaca fascicularis*	LC	LC
	White-thighed Leaf Monkey	*Presbytis siamensis*	NT	NT
	Dusky Leaf-monkey	*Presbytis obscurus*	NT	NT
Lorisidae	Sunda Slow Loris	*Nycticebus coucang*	VU	NT
Mustelidae	Smooth Otter	*Lutrogale perspicillata*	VU	LC
Suidae	Eurasian Wild Boar	*Sus scrofa*	LC	LC
Cervidae	Barking Deer	*Muntiacus muntjak*	LC	NT
Ursidae	Malayan Sunbear	*Helarctors malayanus*	VU	VU
Tapiridae	Malayan Tapir	*Tapirus indicus*	EN	EN
Elephantidae	Asian Elephant	*Elephas maximus*	EN	VU
Felidae	Leopard Cat	*Prionailurus bengalensis*	LC	NT
	Leopard	*Panthera pardus*	VU	EN

Notes:
[1] Red List of Mammals for Peninsular Malaysia

Legend:
LC – Least Concern
NT – Near Threatened
VU – Vulnerable
P – Protected
TP – Totally Protected
EN – Endangered

Where applicable, maps can also be generated to show potential habitat fragmentation if access roads need to be constructed. These outputs intend to guide the development of suitable mitigation measures to address the identified impacts during both construction and operation stages of a project.

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EIA GUIDELINES

Waste Treatment & Disposal – Scheduled Waste

6

MITIGATION MEASURES

CHAPTER 6

MITIGATION MEASURES

6.1 INTRODUCTION

This chapter aims to focus on the pollution prevention and mitigation measures (P2M2s) to reduce the significant adverse environmental impacts identified during the scoping and impact assessment of the EIA. The purpose of the implementation of P2M2s are as follows:

i) Avoid negative impacts by selecting alternatives to implement preventive measures.
ii) Adopt relevant mitigation measures and best management practices (BMP) to minimize impacts when an impact cannot be avoided.
iii) Enhance and amplify the beneficial impacts.
iv) Ensure residual impacts are kept within acceptable levels.

This chapter illustrates the minimum mitigation measures to be implemented by the Project Proponent and serves as a guide only. It is the responsibility of the Project Proponent and Qualified Person to tailor-make the mitigation measures based on the project parameters such as technology and project site location. Project Proponent must understand all P2M2s stated in the EIA and implement all P2M2s throughout the development of the project.

6.2 PRINCIPLES OF ADOPTION OF P2M2

The main principles of P2M2s adoption are as follows:

i) **The need and extent** of P2M2s required shall correspond to the significance of the predicted impact. Once an impact is identified as significant, P2M2s shall be recommended in the EIA Report. For minor issues, simple management actions will be sufficient (i.e. operating water bowser for dust control at the site and hoarding installation as noise control at the site).

ii) **Priority** shall be given to control at source (i.e. use of erosion control covers on slopes and platforms to reduce erosion) rather than to rectifying the impacts (i.e. maintenance of silt traps and removal of accumulated silt from drainage).

iii) Propose P2M2 should not be a generic measure. It has to be **project-specific** and designed for the site conditions. P2M2s should be practical, easy to implement and effective with a minimum cost.

iv) **Adequate explanation** on the design and function of a P2M2s should be included in EIA reports. It can be supported by diagrams, illustrations, photos and maps. The EIA report should also include technical reports and specifications as an appendix.

v) Project Proponent is encouraged to use **new technology** by considering the components outlined in **Table 3-1** provided it is proven effective in mitigating the impacts. Project Proponent or the Qualified Person should provide proof and supporting documents that the proposed technology is tried and tested, and able to address the impacts.

vi) P2M2s require regular **inspection, maintenance and rehabilitation**. These shall be incorporated as part of the management requirements of the project, including the allocation of adequate budgets for such purposes.

vii) Effectiveness of P2M2s shall be documented through the implementation of a **monitoring programme**.

viii) Qualified Person should propose **Best Management Practices (BMPs)** based on the findings of the EIA for the project site.

The P2M2s and BMPs shall be incorporated into the overall design of the project. Submission of the EIA and the pledge given by the Project Proponent shall reflect the agreement and commitment towards ensuring implementation of the mitigation measures on-site throughout the development of the project.

6.3 APPROACHES TOWARDS P2M2 ADOPTION

The Qualified Person shall detail out P2M2s as specific as possible in the EIA report. The Project Proponent and Qualified Person shall also recommend any alternative measures and/or introduce newer technology provided it is proven effective. The key P2M2s that are applicable include:

- Air Pollution Control.
- Water Pollution Control.
- Noise and Vibration Control.
- Erosion and Sediment Control.
- Scheduled Waste Management.

Other mitigation measures that may be required include:

- Safety and Health.
- Traffic.

A list of recommended P2M2s for scheduled waste recovery and disposal can be referred in **Appendix J.**

6.4 LAND-DISTURBING POLLUTION PREVENTION AND MITIGATION MEASURES

The Land-Disturbing Pollution Prevention and Mitigation Measures (LD-P2M2) is required for any land disturbing activities during the construction phase. Qualified Person should prepare LD-P2M2 document by following Guidance Document for the Preparation of the Document on LDP2M2 in Appendix 4 of the EGIM and Guidelines on LD-P2M2 2017.

The LD-P2M2 report shall include all required information as per the LD-P2M2 standard requirements for submission (**Table 6-1**) and accompanied by relevant technical drawings and maps.

Table 6-1 Standard Requirements for the LD-P2M2 Submission

Requirement	Information to be Included
Project Activity and Implementation	• Phasing plan. • Project implementation schedule. • Description of construction activities. • Construction schedule complete with timeline or charts for P2M2s installation. • Construction method statements.
Information and Analysis on Project Development	• Selected weather and rainfall data. • Site runoff velocity and flow rates (pre and post-development). • Description of site soil and geological characteristics (type, erodibility, hydrologic group, percentage dispersible material, • excavation depth, etc.). • Description of adjacent affected areas by land disturbance. • List of drainage, streams and river onsite as well as receiving streams and rivers. • List of P2M2s proposed. • Access roads and project components located outside of • project boundary. • Earthworks cut and fill volume. • Availability of rocks materials. • Biomass management. • Solid (construction waste) and domestic waste management. • Spill prevention and control plan. • Hazardous waste management.

Requirement	Information to be Included
	• Soil loss prediction (pre, during and post-development) for with and without LD-P2M2 implementation scenarios. • Calculation for sediment traps/basins and projected runoff flows.
Map of Site Plan with Existing Conditions	• Topographic survey map. • Geological Terrain Map. • Erosion risk map. • Landuse map. • Site development plan map.

Source: Guidance Document for the Preparation of the Document on LD-P2M2, EGIM.

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7

ENVIRONMENTAL MANAGEMENT PLAN

CHAPTER 7

ENVIRONMENTAL MANAGEMENT PLAN

7.1 INTRODUCTION

The Environmental Management Plan (EMP) is a legal document prepared by the Project Proponent, incorporating pollution prevention and mitigation measures (P2M2s) and best management practices (BMPs) stipulated in the Conditions of Approval (COAs) by the DOE.

The EMP shall function as a project implementation tool for the Environmental Management Team to carry out mitigation works on-site. The key contents of the EMP are required to be translated into a format for incorporation into the Bill of Quantities (BQ) for the work scopes of the contractors during construction and operations.

Other than mitigation measures, the EMP shall include self-regulation requirements, which are environmental monitoring and audit programme. This is to assess the effectiveness of the P2M2 implementation.

The EMP is a living document that has to be updated if there are major changes to the project design, layout or method statement that may result in environmental impacts not originally stated in the EMP.

7.2 EMP FRAMEWORK

During the EIA stage, the project may not have sufficient information on the project work plan to produce a comprehensive EMP. The EMP chapter in the EIA should only be an EMP framework for eventual morphing into a full EMP post the EIA approval stage.

The Project Proponent can submit the detailed EMP concurrently with the EIA Report if there is already sufficient information for the EMP. The EMP can later be updated to incorporate the requirements of the COAs. The standard COAs to be included are:

(a) Monitoring of water quality of receiving water body by the Accredited Laboratory or any other frequency as determined by the DOE.

(b) Monitoring of TSS and Turbidity at inlets and outlets of sediment structures or any other frequency as determined by DOE.

(c) In-situ monitoring of TSS and Turbidity after rain event.

(d) Monitoring of air, noise and vibration qualities depending on receptor sensitivity.

(e) Planning, construction and maintenance of LD-P2M2 on site.

(f) P2M2 notification and implementation.

(g) Identification of need of competent persons to undertake specific task on site.

(h) Description and implementation details of EMT.

(i) Clear documentation on any transfer of ownership or proponent of Approved EIA.

(j) Allocation and reporting of sufficient resources to undertake the project activities on-site

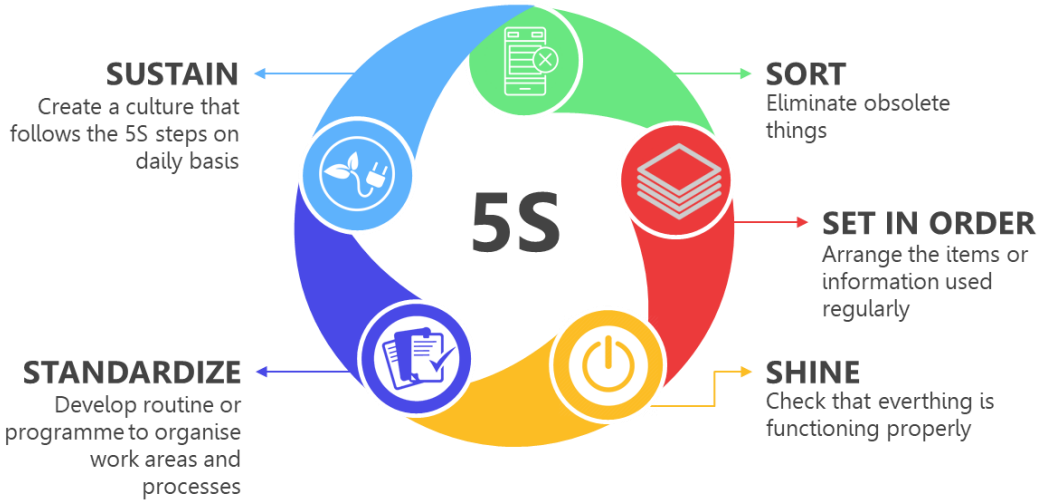
(k) Temporary/permanent abandonment/project closure plan details for all phases.

(l) Implementation of 5S concept in good housekeeping practices (**Figure 7-1**).

(m) Any other green initiatives undertaken for site development activities.

The EMP format shall be based on the requirements stated within the EGIM (or any updated/most current requirements) and shall contain details from the LD-P2M2 Document, and the proposed monitoring and audit programmes.

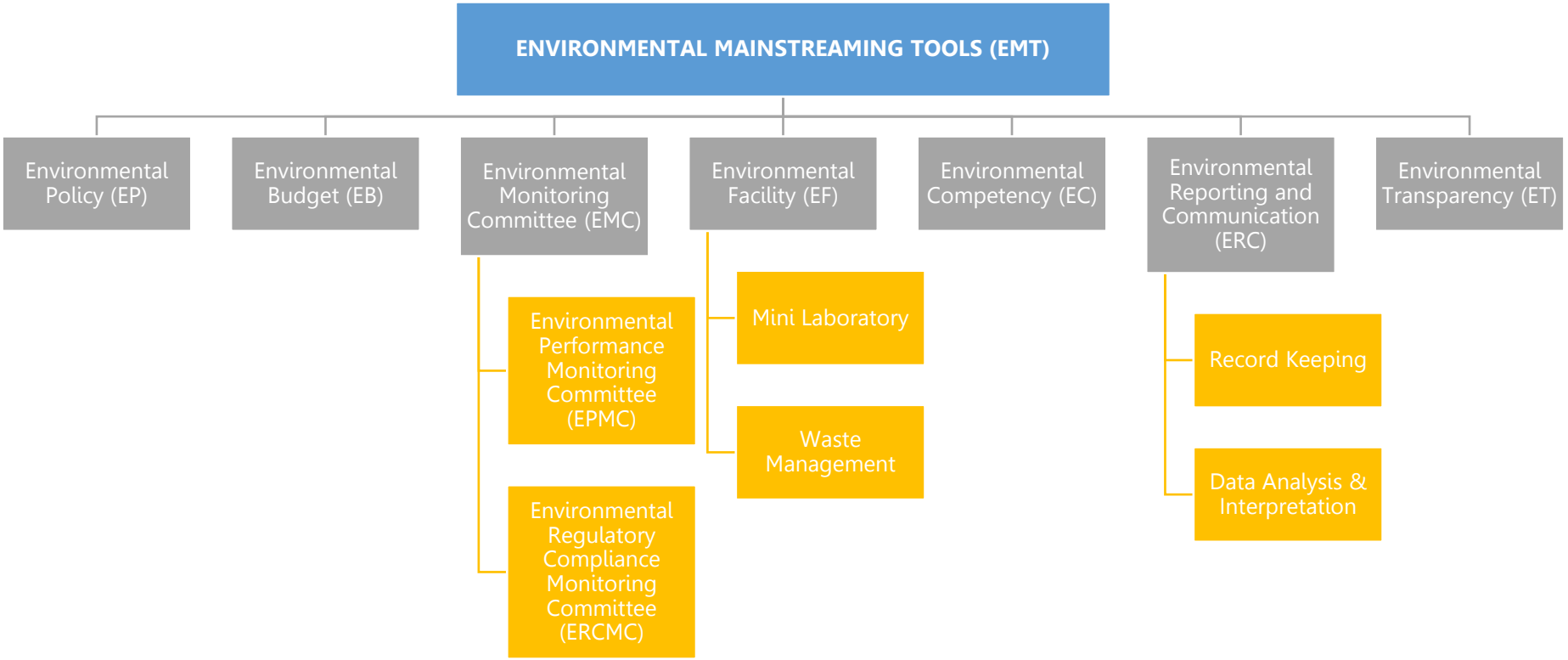
Figure 7-1 Application of 5S in Upkeeping Environmental Compliances



7.3 SELF-REGULATION

Environmental Mainstreaming Tools (EMT) are strategic tool that allow for the cultural evolution of embracing the environmental agenda at all levels of the organisational structure of the Project Proponent. All key personnel in an organisation can play a role in effectively safeguarding the environment through the execution of Guided Self-Regulation (GSR) required for all prescribed activities during the project implementation stages. An overview of the EMT can be referred in **Figure 7-2**.

Figure 7-2 Environmental Mainstreaming Tools



Source: DOE Malaysia (2018).

7.3.1 Environmental Policy

Environmental Policy (EP) refers to the commitment from the Project Proponent on their strong environmental accountability to ensure compliance is through the responsibility of all personnel.

7.3.2 Environmental Budgeting

A sufficient budget shall be allocated for the implementation of the EMP in the Organisation and shall be reviewed regularly to ensure top priority is given to achieve environmental excellence in its perpetuity.

The Project Proponent has to provide an environmental budget for environmental related commitments, i.e. personnel, P2M2, monitoring, auditing, training, remedial and rehabilitation works.

The budget requirements shall also form part of the bill of quantity (BQ) for the contractors at the contractual stage.

7.3.3 Environmental Monitoring Committee

Environmental Monitoring Committee (EMC) shall play an important role in identifying all future improvements needed to ensure the EMP has achieved its goal. Implementation of future improvements must be scheduled, and financial resources allocated to ensure that these improvements can be made without delay. The EMC shall comprise of the Environmental Performance Monitoring Committee (EPMC) members and the Environmental Regulatory Compliance Monitoring Committee (ERCMC) Members.

At the operational level, the EPMC is chaired by a senior officer of the organisation. Whereas at the policy level, the ERCMC is headed by the Chief Executive Officer or the chairman of the organisation.

For large-scale projects involving multiple contractual work packages by many contractors, the respective main contractors are required to have their respective Environmental Management Teams (EMTs) comprising at least a minimum number of personnel such as an Environmental Manager (EM) and an Environmental Officer (EO).

7.3.3.1 Environmental Performance Monitoring Committee

Environmental Performance Monitoring Committee (EPMC) is a committee set up to monitor operations, maintenance and performance of all P2M2s implemented to

minimize any adverse impacts of the company's operations on the receiving environment. Members must be appointed by the decision makers in the company and must meet monthly to monitor and report on Environmental Targets met.

The objectives of the EPMC are as follows:

(a) Establish a maintenance programme for pollution control structures, waste management, nuisance factors and all erosion and sedimentation control elements regularly.

(b) Develop training programmes for on-site workers to include awareness of the requirements on good environmental practices and consistent environmental compliance.

(c) Allocate administrative responsibilities for planning and managing the environmental requirements as outlined in the EIA COAs.

(d) Ensure the implementation of P2M2.

(e) Implement a monitoring programme (i.e. Impact Monitoring, Compliance Monitoring and Performance Monitoring) to check the effectiveness of the mitigation measures provided.

(f) Ensure that mitigation measures are incorporated in all relevant contracts and design of the site.

7.3.3.2 Environmental Regulatory Compliance Monitoring Committee

Environmental Regulatory Compliance Monitoring Committee (ERCMC) is a committee set up to monitor the implementation of the EP and to review the regulatory compliance of the EP periodically.

The objectives of the ERCMC are as follows:

(a) Implement the EP and make revisions as and when necessary.

(b) Study implications of new environmental regulations on the Company's activities.

(c) Provide financial resources for any environmental improvement projects.

(d) Understand and take ownership of the Company's performance in EM.

(e) Address any non-compliance issues.

7.3.4 Environmental Facility

The EMP shall provide the range of Environmental Facilities (EF) in the project, such as Air Pollution Control System (APCS), Industrial Effluent Treatment System (IETS), Leachate Treatment System (LTS), BMPs, P2M2 structures and associated supporting utilities and facilities that need operational and maintenance support.

Monitoring is required to show compliance with the relevant standards as stipulated in the Environmental Quality Act 1974 and its subsidiary Regulations.

Besides, Project Proponent and contractors must ensure to comply with all the EIA terms of approval conditions, P2M2 mentioned in EIA report, applicable laws, regulations and guidelines.

7.3.4.1 Mini Laboratory

Project Proponent should set up a mini laboratory on-site to ensure immediate results on the performance of P2M2 on-site. Qualified Person should analyse the treated effluent from IETS and LTS by using proper equipment and follow the accredited analysis. In-situ instruments such as pH meter, DO meter, and Turbidity meter should also be provided.

7.3.4.2 Waste Management

The Project Proponent has to establish an efficient waste management system by ensuring that proper waste collection or disposal complies with the environmental regulatory requirements and prevents environmental pollution.

7.3.5 Environmental Competency

Training requirements are needed to ensure competency for environmental management for all relevant site personnel. The competency also acts as a bridge between the Project Proponent to ensure that there is continuous regulatory compliance from the Project Proponent. The role of the Competent Person is as follows:

(a) Ensures P2M2 is implemented on-site.
(b) Conducts and supervises in-situ sampling and testing.
(c) Supervises environmental monitoring.
(d) Ensures corrective actions are implemented.
(e) Conducts daily inspection on site.
(f) Reviews Environmental monitoring reports (EMRs) for compliance to COAs.
(g) Ensure timely submission of the Environmental Monitoring Compliance Reports (EMCRs) and other reports to the DOE.

7.3.6 Environmental Reporting and Communication

EMP framework shall contain a reporting schedule for various submissions during the post EIA stage, which includes:

(a) Environmental Management Plan.
(b) Environmental Monitoring Reporting.
(c) Environmental Audit Reporting

The mode of communication between the ERCMC, EPMC and the respective EMTs should be clearly defined. Lines of communication between the Project Proponent and EMC with the relevant stakeholders must also be spelled out, these are not only limited to project site management but also in engagements with affected communities and the general public to manage any potential grievances and expectations.

7.3.7 Environmental Transparency

This refers to the Project Proponent's initiative to be transparent on its implementation and performance of environmental management. Such sharing may be in the form of the environmental sustainability report, website, billboard, or fliers.

7.4 MONITORING PROGRAMME

The environmental monitoring programme is an important component of the EMP. Monitoring shall be implemented during the post-EIA stage.

7.4.1 Monitoring Category

Environmental monitoring can be categorised into three main types:

(a) Performance Monitoring (PM)
(b) Compliance Monitoring (CM)
(c) Impact Monitoring (IM)

7.4.1.2 Performance Monitoring

Performance Monitoring (PM) relates to the monitoring of the performance treatment systems such as:

- Air Pollution Control System (APCS).
- Industrial Effluent Treatment System (IETS).
- Leachate Treatment Plant (LTP).

This shall be undertaken by a Competent Person with expertise in the related treatment system

7.4.1.3 Compliance Monitoring

Compliance Monitoring (CM) relates to the monitoring of P2M2 within the site and their performance. Samplings and measurements are usually taken either at the emission or discharge points (i.e. stacks, silt trap discharge, etc.). This shall be carried out by a Competent Person associated with an accredited laboratory.

7.4.1.4 Impact Monitoring

Impact Monitoring (IM) may only be required in cases where there is a possibility that the impacts may still affect receptors outside of the project boundary despite the implementation of P2M2. Samplings and measurements are usually taken either from the ambient air, odour, water, noise and vibration and/or from sensitive receptors such as nearby residents and if there are water beneficial activities downstream of the project. This shall be carried out by a Competent Person associated with the accredited laboratory.

7.4.2 Monitoring Programme

The extent of monitoring shall be determined by the scale of the project and of the predicted impacts. Monitoring covers both within the project site and outside of its boundary where the impacts are perceived to affect sensitive receptors.

Details of the monitoring programme are decided upon by the Qualified Person and approved by the DOE, before implementation. The monitoring locations, frequencies, parameters to monitor, recommended limits, instrumentation and personnel requirements have to be identified in the EMP. The monitoring programme shall be tailored for requirements of the project, based on the site conditions and types of development activities (**Appendix K**). DOE has the authority to mandate any changes to or requires additional information and data apart from those specified in the EMP.

7.5 AUDIT PROGRAMME

Environmental auditing is a post-EIA evaluation process to determine the effectiveness and performance of the P2M2s in compliance with the COAs by the Project Proponent. Audit requirements are guided by the Environmental Audit Guidance Manual (DOE, 2011). The audit shall be undertaken by an independent third-party and DOE registered auditor.

7.5.1 Pre-Audit

Preparation of a pre-audit checklist and information request to the auditee. Submission of a notification of audit to DOE and auditee.

7.5.2 On-Site Audit

Briefing to the auditee by Lead Auditor. Audit shall include documentation review, site inspection, interviews with relevant personnel to obtain the necessary information to gauge compliance and site sampling (optional). Auditee will be briefed at the Closing Meeting with the on-site Audit Summary submitted to the state DOE.

7.5.3 Post Audit

Lead Auditor shall submit an Audit Report to DOE within 14 calendar days after the site audit. The auditee shall develop a Corrective Action Plan for any non-compliances which shall be submitted to DOE within 21 calendar days of the site audit.

7.6 EMERGENCY RESPONSE PLAN

Emergencies may occur during project implementation and operation. Types of emergencies can be caused by natural hazards and human-induced hazards. Examples of natural hazards include natural disaster such as floods, thunderstorms, forest fires, local and national outbreak, outbreaks due to pathogens with pandemic potential and pandemic. As for human-induced hazards, the emergencies may be due to technological hazards that can originate from dangerous procedures, infrastructure failures, technological or industrial conditions or specific human activities. Examples include industrial pollution, transport accidents, factory explosions, fires and chemical spills.

Anticipating emergencies and planning a response can greatly lessen the extent of injuries and limit equipment, material and property damage. During EIA stage, it is important for the Project Proponent to provide the expected types of emergencies that may occur in their facility and the basic framework of ERP that shall be included in the EIA report. While it is not possible to plan and be ready for all emergencies, preparedness for emergencies is a means to reduce risks to the project and to the environment. Emergency Response Plan(s) or ERP(s) are intended to provide appropriate guidance on what to do in an emergency.

This guideline is not intended to deal in detail how ERPs are to be formulated. This is best left to the Project Proponent working in tandem with the relevant authorities, such as the police, fire department, Department of Safety and Health and other emergency services. Nevertheless, ERPs should outline the basic preparedness steps needed to handle the anticipated emergencies and should provide appropriate guidance on what to do during an emergency. A sound response plan should include:

- Clear, written policies that designate a chain of command, listing names and job titles of the people (or departments) who are responsible for making decisions, monitoring response actions and recovering back to normal operations;
- Names of those who are responsible for assessing the degree of risk to life and property and who should be notified for various types of emergencies.
- Specific instructions controlling the spread of the damage arising from the emergency situation to the environment including the nearest sensitive receptors
- Procedures for evacuation of surrounding population who are at risk;
- Specific training and practice schedules and equipment requirements for employees who are responsible for rescue operations, medical duties, hazardous responses, firefighting and other responses specific to the work site; and
- The preferred means of reporting fires and other emergencies.

7.7 ABANDONMENT PLAN

Project abandonment can occur during the construction stage or operation stage of the Project due to unforeseen circumstances. The Project Proponent must submit a project abandonment plan to the DOE prior to the abandonment of the Project. In essence, the project abandonment plan shall address the environmental issues arise from the decommissioning including demolition and dismantling activities (but not limited to) such as:

- Air pollution.
- Noise impact.
- Soil erosion.
- Water pollution.
- Solid waste.
- Scheduled waste.

Action plans or measures to be taken shall be outlined in the abandonment plan following all the requirements set by the relevant agencies.

7.8 SAFE-CLOSURE PLAN

Secure landfills are permanent disposal sites and are closed with wastes in place. They are subject to closure and post-closure care requirements including:

- Installing and maintaining a final cover.
- Continuing operation of the leachate collection and removal system until leachate is no longer detected.
- Maintaining and monitoring the leak detection system.
- Maintaining groundwater monitoring.
- Preventing storm water run on and runoff.
- Installing and protecting surveyed benchmarks.

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Waste Treatment & Disposal – Scheduled Waste

8

REPORTING AND REVIEW

CHAPTER 8

REPORTING AND REVIEW

8.1 INTRODUCTION

This chapter provides the format and procedures for an EIA report to be submitted to the DOE for approval, after the completion of all other necessary studies and requirements.

8.2 EIA REPORT

An EIA shall be written in a concise manner that is easy to understand and be able to convey the main message to the decision-makers. EGIM provides the specifications and format for EIA reporting. The DOE has introduced 3 new elements to improve the existing procedure outlined in EGIM (starting from 1 September 2020) as follows:

- Submission and distribution of TOR/ESI and EIA reports;
- Enhance public display; and
- Restructuring of the Executive Summary.

It will increase the accessibility and dissemination of information digitally. The information will be presented in an easy way to understand, interactive and give a high impact on the stakeholders and public understanding.

8.2.1 EIA Report Format

The EIA Report shall typically include the following contents:

(a) Environmental Pledge from the Project Proponent and Declaration from the Qualified Person in the format detailed in Appendix 9 of the EGIM. The declaration must be printed in the respective company's letterhead and attached to the EIA.

(b) Executive Summary of the EIA Report in Bahasa Malaysia and English.

(c) Brief Introduction to the Project, Project Proponent (address, key person and contact information), Environmental Firm (address, key person and contact information) and EIA Team Members (name, academic qualifications, areas of study, signature).

(d) Review of the policy, regulatory and legal requirements for the Project (refer to **Chapter 2** of this EIA Guideline for details).

(e) Terms of Reference (TOR) for the EIA Study as endorsed by the DOE (refer to **Chapter 3** of this EIA Guideline for details). Endorsement letter from DOE to be attached as an appendix to the EIA Report.

(f) Statement of need for the Project. Supporting arguments for the project to justify its needs and necessity shall be included as part of the report.

(g) Deliberation on the alternatives and project options.

(h) Detailed description of the project including site information, concept and breakdown of major components, material and manpower requirements, project activities. Mandatory to be addressed is rehabilitation of site if the project is abandoned at any stage of project activity.

(i) Description of the baseline conditions (physicochemical, biological and human environment) within the ZOS or the ZOI, whichever is greater that may be impacted by the project (see **Chapter 4** of this EIA Guideline).

(j) Assessment of the significant impacts (positive and negative), prediction of the extent and effects on nearby sensitive receptors and proposal of P2M2 to minimise or enhance these impacts and any potential residual impacts (see **Chapter 5 and 6** of this EIA Guideline).

(k) Details of public consultation and engagement as part of EIA requirements.

(l) Environmental Management Plan (EMP) incorporating the LD-P2M2, monitoring and audit programme (see **Chapter 7** of this EIA Guideline).

(m) Appendices containing technical studies, supporting documentation, results of analysis, list of references, etc. to be included.

8.2.2 Executive Summary

The Executive Summary shall be prepared in infographic format in both Bahasa Malaysia and English**,** presenting the following information:

(a) Introduction.
(b) Project Proponent & Qualified Person.
(c) Legislative requirements.
(d) Statement of need.
(e) Project location including relevant maps showing project location and sensitive receptors.
(f) Project Description – include flow diagram of main process.

(g) Project Activities:
- Pre-construction Stage.
- Construction Stage.
- Operation Stage.

(h) Existing Environment.

(i) Impact Assessment & Mitigation Measures:
- A description of performance monitoring (PM) program, compliance monitoring (CM) for pollution prevention and mitigation measure (P2M2) and tabulation of relevant PM parameter, recommended limits, monitoring, locations and frequencies.

Softcopy of the Executive Summary (in PDF format) shall be submitted to the DOE along with softcopy of the full EIA Report.

8.2.3 Data Deliverables

The Project Proponent shall make available all relevant data collected during the EIA study (in raw or processed format) along with the EIA Report, when requested by the DOE.

Examples of such data include sampling results (certificates and raw data), modelling databases, baseline data (surveys, hydrographic data and climate data), metadata files, etc. This data shall also be provided to the relevant government agencies upon request

8.2.4 Conclusion to the EIA Report

When concluding the EIA Report, the Qualified Person should provide fair and unbiased conclusion of the EIA study based on the expert opinion of the impact assessment for the purpose of informed decision-making.

8.3 EIA REPORT SUBMISSION AND REVIEW PROCESS

EIA report submission shall be in line with the steps and procedures outlined in the EGIM and the current requirements by the DOE mentioned above. The EIA submission and review process for First and Second Schedule EIA is presented in **Table 8-2**.

Table 8-1 Submission and Review Process for First Schedule and Second Schedule EIA

Components	First Schedule Activities	Second Schedule Activities
Submission of Report	• DOE State	• DOE HQ
TOR/ESI Report Submission	• Three (3) hardcopies and one (1) softcopy in PDF format via email • Distribution of softcopy (CD) to agencies/AI/NGO for comments	• Three (3) hardcopies and one (1) softcopy in PDF format via email • Distribution of softcopy (CD) to agencies/AI/NGO for comments
EIA Report Submission	• Three (3) hardcopies and one (1) softcopy (CD) to DOE State • One (1) softcopy (CD) to DOE HQ • Distribution of softcopy (CD) to agencies/AI/NGO for comments • Softcopy of ES and RE in infographic	• Three (3) hardcopies and one (1) softcopy (CD) to DOE HQ • One (1) hardcopy to DOE State • Distribution of softcopy (CD) to agencies/AI/NGO for comments • Softcopy ES and RE in infographic
Review Timeline	• Twenty-five (25) working days (5 weeks)	• Sixty (60) working days (12 weeks)
Public Participation in EIA Study	• Required	• Required
Public Display of EIA Report	• Not required	• Required
Advertisement of EIA Report	• Not required	• Online advertisement in two (2) major newspapers for three (3) consecutive days

Note: The Qualified Person shall refer to the latest or updated requirements by the DOE.

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Waste Treatment & Disposal – Scheduled Waste

APPENDIX A

Project Description

APPENDIX A – PROJECT DESCRIPTION

Content	Description
Project Location	• General site plan including ZOS (5-km radius) and ZOI (if necessary). • Project boundary and layout (with coordinates). • Description of location in relation to identifiable landmarks (i.e. city centres, main roads, towns etc.).
Project Components	Descriptions of the project components together with the complete layout plan should be given as follows: • Reception area with weighbridge and laboratory unit for sampling purposes. • Special waste reception area. • Recovery and treatment plant buildings, machinery, and related infrastructure. • Truck cleaning area. • Bund walls and drainage systems isolating handling/storage/cleaning and operational areas. • Emergency on-site storage pond for liquid wastes. • Lined storm water retention pond/stormwater system as a contingency for excessive runoff from contaminated areas. • Floor linings of adequate design, incorporating a surface concrete layer, usually underlying a sand layer and a final PVC layer. • Roofing of potentially contaminated areas and storage areas with separate drainage. • Tank farm area. • Processing/recovery/treatment systems. • Secured landfill area and phasing. • Industrial effluent treatment system (IETS). • Leachate treatment system (LTS). • Air pollution control system (APCS). • Ventilation systems. • Fire-fighting system, sprinkler system and facilities. • Security fencing, boundary fencing and controlled access.
Type of Scheduled Waste	To identify the suitable scheduled waste for recovery/treatment/final disposal, there must be a complete explanation on the description of scheduled waste as follows: • Source, type and categories of scheduled waste and also the process involved in the generation of the scheduled waste; and • Chemical composition analysis of scheduled waste contains heavy metals (weight/dry weight) and other pollutants such as sulphur, benzene, etc.
Waste Acceptance Criteria (WAC)	• WAC for the scheduled waste to be received by the treatment and disposal facility. • Level of pollutants (impurities) in the scheduled waste that can be accepted in the recovery/treatment/final disposal including the level/percentage of precious metals that can be economically recovered.
Process Technology	• Detailed explanation on the concept of selected recovery/treatment/final disposal including the criteria involved and the maximum capacity.

Content	Description
	• Process flow diagram and mass balance. • Produce track record data of similar plant that is in operation. • Expected lifespan of the plant.
Detailed Design for Pollution Control System	Detailed design of the pollution control system should be included in the report as follows: • Effluent/leachate/air emission information. • Process flow chart including the pollution generation points and mass balance. • Flowrate and quality of effluent/leachate/air emission for each source. • Discussion of the significant effluent/leachate/air emission parameters (maximum and average concentration). • Description of the technologies proposed. • Discussion and statement that the pollution control systems are the "best available technologies" or "best available technologies not entailing excessive cost" or "state of the art technologies". • Working engineering drawings, P&ID, performance monitoring procedure and instruments.
Mass Balance Calculation	• Overall waste flow. • Quantification of total materials into and out of the process. • Difference between inputs and outputs (waste streams).
Project Activities	• Method statement for major project activities during pre-construction, construction, and operational stages. • Manpower requirements. • Workers quarters location (on-site or off-site). • Resource requirements (i.e. soil and aggregate sources, spoil disposal area, etc.).
Infrastructure, Utilities and Amenities Requirement	Details of the estimated demand for: • Water supply. • Electricity. • Sewerage. • Telecommunications. • Transport system. • Waste management.
Project Implementation Schedule	• Estimated timeline for phases implementation from planning to construction and operational phases. • Details of each stages of implementation.

Note: The list is not exhaustive and not all the above may be relevant to the project. It is the responsibility of the Project Proponent and Qualified Person to determine the relevant information required for environmental assessment and compliance.

EIA GUIDELINES

Waste Treatment & Disposal – Scheduled Waste

APPENDIX B

General Site Selection Criteria

APPENDIX B – GENERAL SITE SELECTION CRITERIA

Criteria	Description
Land use category	Scheduled waste treatment and disposal facilities should be sited within an area that is currently zoned for this type of land use: Allowable area: • Heavy industry area. • Medium industry area. Non-allowable area: • Light industrial area. • Area that is not gazette as industrial area.
Access	Good all-weather access roads should be provided. For easy entry and exit of waste transportation, the facility should be preferably positioned near a highway. The utilization of secondary roadways or streets is undesirable because of noise impacts and traffic congestion on routes not designed for heavy truck use.
Odour	Waste treatment and disposal facilities which would emit odour are best located downwind of human dwellings to minimize odour nuisance, and as far from the public right-of-way and habitable buildings as economically practicable.
Noise	Secluded locations are best if feasible. If not, suitable buffers and distances from human dwellings must be kept.
Land value	Land value and property value are likely to be affected by the placement of scheduled waste treatment and disposal facilities in a given area. The type of land use along roadways leading to the site entrance and the degree of residential development in the vicinity need to be considered.
Ecology	Avoid unique habitat areas. Siting the plant near or in ecologically or environmentally sensitive areas (e.g. mangroves, estuaries, wetlands, coral reeves) and areas which have important ecosystem services that can cause irreversible damage to these habitats.
Water pollution	Siting scheduled waste treatment and disposal facilities along water courses can be the cause of their eventual degradation, and affect critical beneficial uses downstream such as public water supply intake, fisheries or a basic riverine livelihood. This facility should preferably be located downstream of water intake points.
Geology/Soils	Geologically unstable areas are defined as locations where natural or manmade features pose a substantial risk to the integrity of a secured landfill. A secured landfill facility should not be sited within unstable areas which comprise: • Areas directly underlain by karstified limestone; • Areas prone to subsidence caused by previous mining activity; • Areas underlain by weak or unstable sub-soils not capable of remediation; and • Areas prone to landslip or slope failure.
Hydrogeology	Siting of scheduled waste treatment and disposal facilities especially a secured landfill for scheduled waste disposal should have due regard for their potential to contaminate groundwater reserves: • Avoid areas of significant natural resource quality in terms of usable groundwater or groundwater recharge areas. No secured landfill facilities to be developed on regionally important aquifers. • Avoid areas with shallow groundwater table. A deep-water table region is preferred to avoid contamination of groundwater by the leachate (if any).
Air pollution	Siting in areas where air pollution from emission will seriously affect local communities should be avoided. Locate to minimize odour and air pollution from point and fugitive

<table>
<tr><th>Criteria</th><th>Description</th></tr>
<tr><td></td><td>sources. Where emissions of carcinogenic or mutagenic substances are possible, due account should be made for environmental health risks.</td></tr>
<tr><td>Proximity</td><td>The scheduled waste treatment and disposal facilities should be distant to sensitive potential receptors of impacts such as schools, places of worship, nursing home, hospitals.</td></tr>
<tr><td>Social/cultural</td><td>Avoid populated areas, parks and scenic areas. Public participation and local interest groups consultation to gain local acceptance and an assessment of the impact on cultural resources would be necessary.</td></tr>
<tr><td>Buffers</td><td>Appropriate buffer zones should be included for a specific category of scheduled waste treatment and disposal facilities with potential to give rise to air, water and noise pollution and solid and toxic waste problems. Extensive control problems will be expected in most cases and should be examined on a case by case basis. Bushes, trees, banks provide barriers to neighbors and an aesthetic view to the facility.

The minimum buffer requirement for treatment and disposal of hazardous waste (SZIRA 2012) are as follows:

<table>
<tr><th rowspan="2">Waste Treatment and Disposal</th><th colspan="2">Buffer (in meters)</th></tr>
<tr><th>Overall</th><th>Primary</th></tr>
<tr><td>Disposal at landfill for:
• Toxic and hazardous waste
• Scheduled wastes
• Toxic and/or contaminated animals
• Other contaminated waste</td><td>1000</td><td>800</td></tr>
</table>

<table>
<tr><th rowspan="2">Treatment and Disposal of Hazardous Waste</th><th colspan="2">Buffer (in meters)</th><th rowspan="2">Remarks</th></tr>
<tr><th>Overall</th><th>Primary</th></tr>
<tr><td>Operation of facilities for treatment of hazardous waste</td><td rowspan="2">1000</td><td rowspan="2">800</td><td rowspan="2">Buffer not applicable for radioactive nuclear waste.

Overall buffer is minimum; final buffer shall be determined by modeling.</td></tr>
<tr><td>Incineration of hazardous waste</td></tr>
<tr><td>Treatment and disposal of toxic live or dead animals and other contaminated waste</td><td>500</td><td>500</td><td>Overall buffer is minimum; final buffer shall be determined by modeling.</td></tr>
<tr><td>Disposal of used goods such as refrigerators to eliminate harmful waste</td><td>350</td><td>300</td><td>-</td></tr>
</table>

As mentioned in Chapter 3.4, The Local Authority will have the final decision on the buffer requirement which essentially depends on the findings of the impact evaluation in the EIA study and advice from the DOE.</td></tr>
<tr><td>Risk of toxic clouds, fire and explosion</td><td>Locate so that the outer hazard distances coincide with the outer boundary of the buffer zone and human settlements.</td></tr>
</table>

Note: The list is not exhaustive and additional criteria may be required by the relevant agencies. It is the responsibility of the Project Proponent and the Qualified Person to engage with relevant agencies on a case-by-case basis.

EIA GUIDELINES

Waste Treatment & Disposal – Scheduled Waste

APPENDIX C

Process Technology Options

APPENDIX C – TREATMENT PROCESS TECHNOLOGY OPTIONS

Category	Code	Description	Characteristic	Possible Source	Treatment Method
SW 1 **Metal and metal-bearing wastes**	SW 101	Waste containing arsenic or its compound	Toxic, Corrosive	Wood preservatives; Fertilizer; Pesticide; Pharmaceuticals; Semiconductor manufacturing industry; Car battery manufacturing industry; Phosphoric acid recovery plant	Material recovery
	SW 102	Waste of lead acid batteries in whole or crushed form	Toxic, Corrosive	Lead acid battery manufacturing industry; Lead acid batteries recovery plant; Automobile workshop; Maintenance service	Thermal treatment; Material recovery
	SW 103	Waste of batteries containing cadmium and nickel or mercury or lithium	Toxic, Corrosive	Button or rechargeable battery manufacturing industry; Maintenance service	Thermal treatment; Material recovery
	SW 104	Dust, slag, dross or ash containing aluminum, arsenic, mercury, lead, cadmium, chromium, nickel, copper, vanadium, berryllium, antimony, tellurium, thallium or selenium excluding slag from iron and steel factory	Toxic, Reactive, Corrosive	Metal smelting industry; Scheduled waste incinerator	Thermal treatment; Material recovery
	SW 105	Galvanic sludges	Toxic	Zinc processing industry; Electroplating industry; Galvanizing industry	Thermal treatment; Material recovery; Immobilization
	SW 106	Residues from recovery of acid pickling liquor	Corrosive	Iron and steel industry; Electroplating industry	Thermal treatment; Immobilization
	SW 107	Slags from copper processing for further processing or refining containing arsenic, lead or cadmium	Toxic, Reactive, Corrosive	Copper smelting, processing and refining industry	Thermal treatment; Material recovery
	SW 108	Leaching residues from zinc processing in dust and sludges form	Toxic	Zinc processing and electroplating industry	Material recovery

Category	Code	Description	Characteristic	Possible Source	Treatment Method
	SW 109	Waste containing mercury or its compound	Toxic	Medical equipment manufacturing (i.e. barometer and thermometer); Flourescent bulb manufacturing industry; LCD tv manufacturing industry; Computer monitor manufacturing industry	Material recovery; Physicochemical treatment
	SW 110	Waste from electrical and electronic assemblies containing components such as accumulators, mercury-switches, glass from cathode-ray tubes and other activated glass or polychlorinated biphenylcapacitors, or contaminated with cadmium, mercury, lead, nickel, chromium, copper, lithium, silver, manganese or polychlorinated biphenyl	Toxic	Electrical and electronic manufacturing industry; Metal recovery industry	Material recovery
SW 2 **Wastes containing principally inorganic constituents which may contain metals and organic materials**	SW 201	Asbestos wastes in sludges, dust or fibre forms	Toxic	Clutch plate, brake pad and gasket manufacturing industry; Roof, ceiling and panel manufacturing industry	Thermal treatment; Mechanical treatment; Chemical treatment; Biological treatment
	SW 202	Waste catalysts	Toxic	Refinery; Automobile industry; Recovery of waste catalyst plant	Material recovery
	SW 203	Immobilized scheduled wastes including chemically fixed, encapsulated, solidified or stabilized sludges	(Depends on the constituents)	Treatment and disposal of scheduled waste plant or facility	None (Proper disposal)
	SW 204	Sludges containing one or several metals including chromium, copper, nickel, zinc, lead, cadmium, aluminium, tin, vanadium and beryllium	Toxic	Wastewater treatment plant from: Electroplating industry; Galvanizing industry; Metal work industry; Metal recovery industry	Chemical treatment; Mechanical treatment; Material recovery

Category	Code	Description	Characteristic	Possible Source	Treatment Method
	SW 205	Waste gypsum arising from chemical industry or power plant	Toxic	Chemical industry; Power plant (desulphurisation process)	Biological treatment
	SW 206	Spent inorganic acids	Toxic, Corrosive	Iron and steel industry; Electroplating industry; Metal work industry; Automobile industry	Physicochemical treatment; Immobilization; Material recovery
	SW 207	Sludges containing fluoride	Toxic	Electronics manufacturing industry; Toothpaste manufacturing industry; Solar panel manufacturing industry	Material recovery
SW 3 **Wastes containing principally organic constituents which may contain metals and inorganic materials**	SW 301	Spent organic acids with pH less or equal to 2 which are corrosive or hazardous	Toxic, Corrosive	Iron and steel industry; Automobile industry; Metal work industry (rust removal)	Physicochemical treatment; Material recovery
	SW 302	Flux waste containing mixture of organic acids, solvents or compounds of ammonium chloride	Toxic, Reactive, Corrosive	Automobile industry; Metal work and steel furniture industry (soldering, welding and brazing)	Physicochemical treatment; Thermal treatment; Material recovery
	SW 303	Adhesive or glue waste containing organic solvents excluding solid polymeric materials	Flammable	Resin manufacturing industry; Furniture industry; Automobile manufacturing industry	Biological treatment; Material recovery
	SW 304	Press cake from pretreatment of glycerol soap lye	Toxic	Soap manufacturing industry	Thermal treatment
	SW 305	Spent lubricating oil	Toxic, Flammable	Industrial machine and automobile workshop	Physicochemical treatment; Biological treatment; Thermal treatment; Material recovery
	SW 306	Spent hydraulic oil	Toxic, Flammable	Petrochemical industry	Physicochemical treatment; Biological treatment; Thermal treatment; Material recovery
	SW 307	Spent mineral oil-water emulsion	Toxic, Flammable	Petrochemical industry	Physicochemical treatment; Biological treatment; Material recovery
	SW 308	Oil tanker sludges	Toxic, Flammable	Tanker desludging	Thermal treatment; Immobilization;

Category	Code	Description	Characteristic	Possible Source	Treatment Method
					Chemical treatment; Biological treatment
	SW 309	Oil-water mixture such as ballast water	Toxic, Flammable	Shipping industry (oil cargo)	Mechanical treatment; Physical treatment; Chemical treatment
	SW 310	Sludge from mineral oil storage tank	Toxic, Flammable	Mineral oil storage tank (underground or surface tank)	Thermal treatment; Material recovery
	SW 311	Waste of oil or oily sludge	Toxic, Flammable	Most industries and workshops	Physical treatment
	SW 312	Oily residue from automotive workshop, service station oil or grease interceptor	Toxic, Flammable	Automotive workshop; Service station; Other related industries	Physicochemical treatment; Biological treatment; Thermal treatment; Material recovery
	SW 313	Oil contaminated earth from re-refining of used lubricating oil	Toxic, Flammable	Re-refining of used lubricating oil industry	Physical treatment; Immobilization
	SW 314	Oil or sludge from oil refinery plant maintenance operation	Toxic, Flammable	Oil refinery	Physicochemical treatment; Biological treatment; Thermal treatment; Material recovery
	SW 315	Tar or tarry residues from oil refinery or petrochemical plant	Toxic, Flammable	Oil refinery; Petrochemical plant	Thermal treatment
	SW 316	Acid sludge	Toxic, Corrosive	Acid manufacturing industry; Acid recovery industry	Physicochemical treatment; Thermal treatment
	SW 317	Spent organometallic compounds including tetraethyl lead, tetramethyl lead and organotin compounds	Toxic, Flammable	Petrochemical industry; Catalyst manufacturing industry	Biological treatment
	SW 318	Waste, substances and articles containing or contaminated with polychlorinated biphenyls (PCB) or polychlorinated triphenyls (PCT)	Toxic	Electronic manufacturing industry (i.e. capacitor, transformer); Cooling liquid manufacturing industry (coolant or transformer oil); Pesticides manufacturing industry; Hydraulic fluid and lubricant manufacturing industry	Thermal treatment; Chemical treatment
	SW 319	Waste of phenols or phenol compounds including	Corrosive, Toxic	Phenol manufacturing industry; Resin manufacturing industry; Pharmaceutical manufacturing	Physical treatment; Chemical treatment; Biological treatment

Category	Code	Description	Characteristic	Possible Source	Treatment Method
		chlorophenol in the form of liquids or sludges		industry; Herbicide manufacturing industry; Cosmetics, hair dyes and skin lightening manufacturing industries	
	SW 320	Waste containing formaldehyde	Toxic, Corrosive	Formaldehyde manufacturing industry; Automobile manufacturing industry; Textiles manufacturing industry; Plywood manufacturing industry; Carpeting manufacturing industry; Paint manufacturing industry; Explosives manufacturing industry; Disinfectant or biocide manufacturing industry; Wood cabinet manufacturing industry	Physical treatment; Biological treatment
	SW 321	Rubber or latex wastes or sludges containing organic solvents or heavy metals	Toxic, Flammable	Rubber or latex based industry (i.e. rubber gloves)	Material recovery
	SW 322	Waste of non-halogenated organic solvents	Toxic, Flammable	Organic solvent manufacturing industry; Paint manufacturing industry; Lacquer manufacturing industry; Resin manufacturing industry; Glue manufacturing industry; Printing industry	Physical treatment; Thermal treatment; Immobilization; Chemical treatment; Material recovery
	SW 323	Waste of halogenated organic solvents	Toxic, Flammable	Cleaning chemicals manufacturing industry	Physical treatment; Thermal treatment; Immobilization; Chemical treatment; Material recovery
	SW 324	Waste of halogenated or unhalogenated non-aqueous distillation residues arising from organic solvents recovery process	Flammable	Organic solvent recovery industry	Physical treatment; Thermal treatment; Immobilization; Chemical treatment
	SW 325	Uncured resin waste containing organic solvents or heavy metals including epoxy resin and phenolic resin	Reactive, Toxic, Flammable	Resin manufacturing industry; Furniture industry; Automobile manufacturing industry	Material recovery; Thermal treatment

Category	Code	Description	Characteristic	Possible Source	Treatment Method
	SW 326	Waste of organic phosphorus compound	Reactive	Pesticide or fertilizer manufacturing or repacking industry	Biological treatment; Thermal treatment; Immobilization
	SW 327	Waste of thermal fluids (heat transfer) such as ethylene glycol	Flammable	Gas processing plant; Coolant manufacturing industry; Metal work manufacturing industry; Wafer manufacturing industry; Automobile workshop	Material recovery
SW 4 **Wastes which may contain either inorganic or organic constituents**	SW 401	Spent alkalis containing heavy metals	Toxic, Corrosive	Electroplating industry; Iron and steel industry; Metal work industry	Physicochemical treatment; Material recovery
	SW 402	Spent alkalis with pH more or equal to 11.5 which are corrosive or hazardous	Toxic, Corrosive	Soap manufacturing industry; Biodiesel manufacturing industry; Food preparation industry	Physicochemical treatment
	SW 403	Discarded drugs containing psychotropic substances or containing substances that are toxic, harmful, carcinogenic, mutagenic or teratogenic	Toxic	Clinics; Hospitals; Pharmaceutical industry	Thermal treatment
	SW 404	Pathogenic wastes, clinical wastes or quarantined materials	Toxic	Clinics; Hospitals	Thermal treatment
	SW 405	Waste arising from the preparation and production of pharmaceutical product	Corrosive, Toxic, Reactive	Pharmaceutical industry	Material recovery;
	SW 406	Clinker, slag and ashes from scheduled wastes incinerator	Toxic	Scheduled waste incinerator facility	Physicochemical treatment; Thermal treatment
	SW 407	Waste containing dioxins or furans	Toxic	Ash of industrial incinerator; PVC based cleaning chemicals; Toy manufacturing industry; Clothing manufacturing industry	Thermal treatment; Biological treatment; Immobilization
	SW 408	Contaminated soil, debris or matter resulting from cleaning-up of a spill of chemical, mineral oil or scheduled wastes	(Depends on the constituents)	Most industries and workshops	Biological treatment; Chemical treatment; Physical treatment; Immobilization
	SW 409	Disposed containers, bags or equipment contaminated with chemicals, pesticides, mineral oil or scheduled wastes	(Depends on the constituents)	Most industries and workshops	Biological treatment; Thermal treatment; Material recovery; Immobilization

Category	Code	Description	Characteristic	Possible Source	Treatment Method
	SW 410	Rags, plastics, papers or filters contaminated with scheduled wastes	(Depends on the constituents)	Most industries and workshops	Material recovery
	SW 411	Spent activated carbon excluding carbon from the treatment of potable water and processes of the food industry and vitamin production	Reactive	Wastewater treatment plant; Scrubber	Material recovery
	SW 412	Sludges containing cyanide	Toxic, Reactive	Electroplating industry; Precious metal recovery industry; Iron and steel industry	Biological treatment; Thermal treatment
	SW 413	Spent salt containing cyanide	Toxic, Reactive	Iron and steel industry (carburation process)	Chemical treatment; Biological treatment
	SW 414	Spent aqueous alkaline solution containing cyanide	Toxic, Reactive	Iron and steel industry; Metal recovery industry (oxidation of CN)	Physicochemical treatment; Biological treatment; Material recovery
	SW 415	Spent quenching oils containing cyanides	Toxic	Iron and steel industry	Biological treatment; Thermal treatment; Material recovery
	SW 416	Sludges of inks, paints, pigments, lacquer, dye or varnish	(Depends on the constituents)	Ink, paints, pigments, lacquer dye or varnish manufacturing industry; Printing industry; Textile industry; Automobile industry; Furniture manufacturing industry	Physicochemical treatment; Biological treatment; Thermal treatment
	SW 417	Waste of inks, paints, pigments, lacquer, dye or varnish	(Depends on the constituents)	Ink, paints, pigments, lacquer dye or varnish manufacturing industry; Printing industry; Textile industry; Automobile industry; Furniture manufacturing industry	Biological treatment; Thermal treatment
	SW 418	Discarded or off-specification inks, paints, pigments, lacquer, dye or varnish products containing organic solvent	(Depends on the constituents)	Ink, paints, pigments, lacquer dye or varnish manufacturing industry; Printing industry; Textile industry; Automobile industry; Furniture manufacturing industry	Physicochemical treatment; Biological treatment; Thermal treatment; Material recovery

Category	Code	Description	Characteristic	Possible Source	Treatment Method
	SW 419	Spent di-isocyanates and residues of isocyanate compounds excluding solid polymeric material from foam manufacturing process	Reactive, Toxic, Flammable	Paint manufacturing industry; Lacquer manufacturing industry; Foam manufacturing industry	Biological treatment; Thermal treatment
	SW 420	Leachate from scheduled waste landfill	Toxic, Corrosive	Scheduled waste landfill	Biological treatment; Physicochemical treatment
	SW 421	A mixture of scheduled wastes	(Depends on the constituents)	Most industries and workshops	Material recovery
	SW 422	A mixture of scheduled and non-scheduled wastes	(Depends on the constituents)	Most industries and workshops	Material recovery
	SW 423	Spent processing solution, discarded photographic chemicals or discarded photographic wastes	Toxic	Photographic shop and industry	Material recovery
	SW 424	Spent oxidizing agent	Reactive	Textile manufacturing industry; Wafer manufacturing industry	Chemical treatment
	SW 425	Wastes from the production, formulation, trade or use of pesticides, herbicides or biocides	Toxic	Pesticide, herbicide or biocide manufacturing or repacking industry	Biological treatment; Thermal treatment; Immobilization
	SW 426	Off-specification products from the production, formulation, trade or use of pesticides, herbicides or biocides	Toxic	Pesticide, herbicide or biocide manufacturing or repacking industry	Physicochemical treatment; Biological treatment; Thermal treatment
	SW 427	Mineral sludges including calcium hydroxide sludges, phosphating sludges, calcium sulphite sludges and carbonates sludges	Toxic	Automobile industry; Petrochemical refinery industry	Material recovery; Thermal treatment
	SW 428	Wastes from wood preserving operation using inorganic salts containing copper, chromium or arsenic of fluoride compounds or using compound containing chlorinated phenol or creosote	Toxic, Corrosive	Wood based industry	Material recovery
	SW 429	Chemicals that are discarded or off-specification	Toxic	Certain industry; Laboratories	Physicochemical treatment; Biological treatment; Thermal treatment; Material recovery; Immobilization
	SW 430	Obsolete laboratory chemicals	Toxic	Laboratories	Chemical treatment; Biological treatment

Category	Code	Description	Characteristic	Possible Source	Treatment Method
	SW 431	Waste from manufacturing or processing or use of explosives	Reactive, Flammable	Manufacturing or processing or use of explosives industry	Thermal treatment
	SW 432	Waste containing, consisting of or contaminated with peroxides	Toxic, Corrosive, Flammable	Peroxides manufacturing industry; Textile manufacturing industry; Recycle paper manufacturing industry; Wafer manufacturing industry	Thermal treatment
SW 5 **Other Wastes**	SW 501	Any residues from treatment or recovery of scheduled wastes	(Depends on the constituents)	Scheduled wastes treatment and recovery facility	Thermal treatment

EIA GUIDELINES

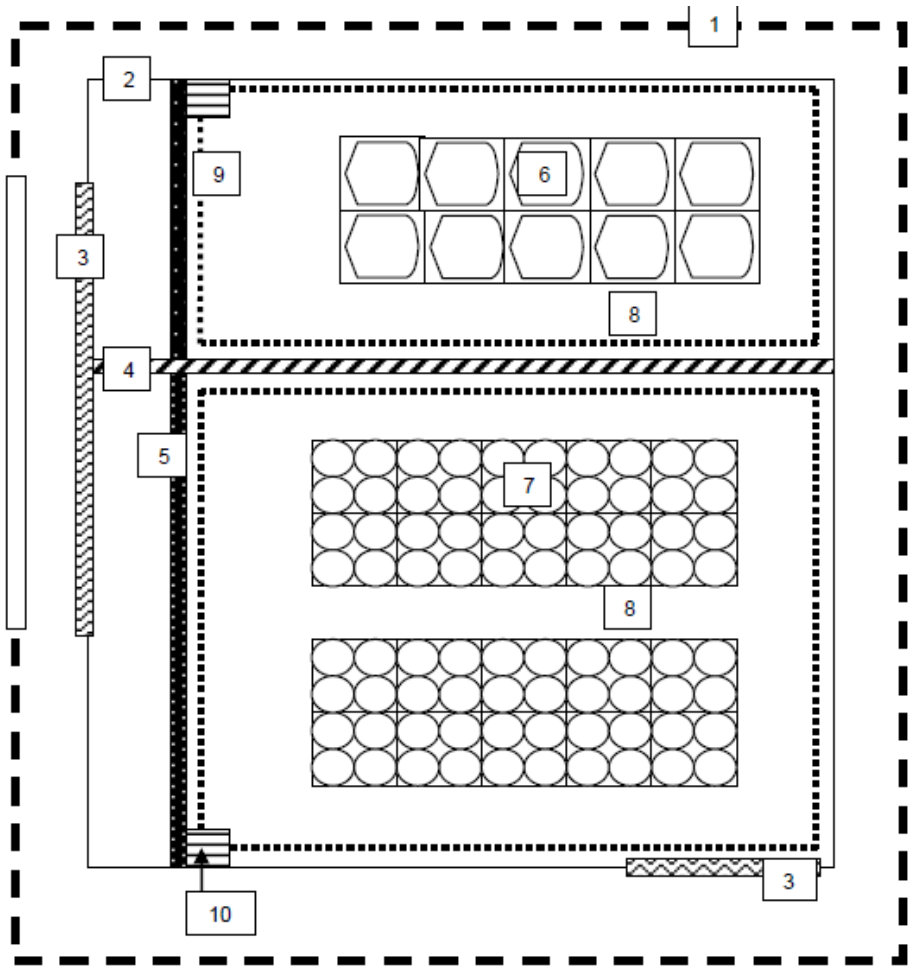
Waste Treatment & Disposal – Scheduled Waste

APPENDIX D

P2M2 Technology Options

APPENDIX D – P2M2 TECHNOLOGY OPTIONS

A) Scheduled Waste Storage Layout



1	:	• The entire storage area must be fenced-in.
2	:	• The storage place is sheltered or roofed or covered with suitable covering material and equipped with ventilation system for volatile wastes • The floor of the storage is covered with concrete or any suitable lining material, free of cracks and gaps.
3	:	• Entrance / emergency exit
4	:	• Separate compartments for different groups of incompatible wastes
5	:	• The storage area is surrounded by a concrete dyke or other equivalent structure to contain any spillage.
6	:	• A jumbo bag containing scheduled wastes is placed on a pallet. The pallet is placed in rows by two pallets wide.
7	:	• 4 drums containing scheduled wastes is placed on a pallet. The pallet is placed in rows by two pallets wide.
8	:	• Containers should be stored with an ample aisle space between groups of containers
9	:	• Perimeter drain
10	:	• The storage area should be graded to a sump.

Source: Guidelines for Packaging, Labelling and Storage of Scheduled Wastes in Malaysia, 2014.

B) Waste Compatibility Chart for the Storage of Hazardous Waste

No	Name of reactivity group	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	101	102	103	104	105	106	107
1	Acids, minerals, non-oxidising	1																																							
2	Acids, minerals, oxidising		2																																						
3	Acids, organic		G H	3																																					
4	Alcohols, glycols	H	H F	H P	4																																				
5	Aldehydes	H P	H F	H P		5																																			
6	Amides	H	H GT				6																																		
7	Amines, aliphatic, aromatic	H	H GT	H		H		7																																	
8	Azo compounds, diazo comp., hydrazines	H G	H GT	H G	H				8																																
9	Carbamates	H G	H GT						H G	9																															
10	Caustics	H	H	H		H				H G	10																														
11	Cyanides	GT GF	GT GF	GT GF					G			11																													
12	Dithiocarbamates	H GF F	H GF F	H GF GT		GF GT		U	H G				12																												
13	Esters	H	H F						H G		H			13																											
14	Ethers	H	H F												14																										
15	Fluorides, inorganic	GT	GT	GT												15																									
16	Hydrocarbons, aromatic		H F														16																								
17	Halogenated organics	H GT	H F GT					H GT	H G		H GF	H						17																								
18	Isocyanates	H G	H F GT	H G	H P			H P	H G		H P G	H G	U						18																							
19	Ketones	H	H F						H G		H	H								19																						
20	Mercaptans, other organic sulphides	GT GF	H F GT						H G									H	H	H	20																				
21	Metals, alkali, alkaline earth, elemental	GF H F	GF H F	GF H F	GF H F	GF H F	GF H	GF H	GF H	GF H	GF H	GF H	GF GT H	GF H				H E	GF H	GF H	GF H	21																			
22	Metals, other elemental and alloys as powders, vapours or sponges	GF H F	GF H F	GF					E F GT	U	GF H							H E	GF H		GF H F		22																		
23	Metals, other elemental and alloys as sheets, rods, drops, moldings, etc.	GF H F	GF H F						H F G									H F						23																	
24	Metals and metal compounds, toxic	S	S	S			S	S			S														24																	

B) Waste Compatibility Chart for the Storage of Hazardous Waste (cont'd).

No	Name of reactivity group	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	101	102	103	104	105	106	107
25	Nitrides	GF H F	H F E	H GF	GF H E	GF H			U	H G	U	GF H	GF H	GF H				GF H	U	GF H	GF H	E				25																
26	Nitrites	H GT F	H F GT						U													H P			S	GF H	26															
27	Nitro compounds, organic		H F GT			H			H E													H GF E				H GF E		27														
28	Hydrocarbons, aliphatic, unsaturated	H	H F			H																	H E						28												
29	Hydrocarbons, aliphatic, saturated		H F																											29												
30	Peroxides and hydroperoxides, organic	H G	H E		H F	H G		H GT	H F E	H F GT		H E GT	H E GT					H E	H	E	H F GT	H E	P G		H G	H GF E	H P GT		H P		30											
31	Phenols and cresols	H	H F						H G										H P			GF H				GF H					H	31										
32	Organophosphates, phosphoyhioates, phosphodithioates	H GT	H GT						U		H E											H									U		32									
33	Sulphides, inorganic	GT GF	HF GT	GT		H			E										H											H GT			33								
34	Epoxides	H P	H P	H P	H P	U		H P	H P		H P	H P	U								H P	H P	H P		H P	H P				H P	H P	U	H P	34							
101	Combustible and flammable materials, misc.	H G	H F GT																			H G F				H GF F				H F GT					101						
102	Explosives	H E	H E	H E					H E		H E			H E							H E	H E	H E	H E	E	E				H E	H E		H E	H E	H E	102					
103	Polymerisable compounds	P H	P H	P H					P H		P H	P H	U								P H	P H	P H	P H	P H	P H				P H	P H		P H			H E	103				
104	Oxidising agents, strong	H GT		H GT	H F	H F	H F GT	H F GT	H E	H G GT		H F GT	H F GT	H F	H F		H F	H GT	H F GT	H F	H F GT	H F E	H F E	H F		H F E	H F GT	H E	H F	H F	H G	H F GT	H F GT	H F G	H F G	H E	H F GT	104			
105	Reducing agents, strong	H GF	H F GT	H GF	H GF F	GF H F	GF H	H GF	H G				H GT	H F				H E	GF H	GF H	GF H						H GF	H E			H E	GF H	GT GF H		H	GF H	H E	H P GF	H F E	105		
106	Water and mixtures containing water	H	H						G										H G			GF H	GF H		S	GF H							GT GF						GF GT	106	
107	Water-reactive substances									**Extremely reactive! Do not mix with any chemical or waste material!**																																		107
	No	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	101	102	103	104	105	106	107

NB: Key: Reactivity code (capital letter): consequences of mixing/blending

H: Heat generation F: Fire G: Innocuous and non-flammable gas generation GT: Toxic gas generation

GF: Flammable gas generation E: Explosion P: Violent polymerisation S: Solubilisation of toxic substances U: May be hazardous but unknown

Source:[31, LaGrega et al. 1994]

Source: Antoine Pinasseau, Benoit Zerger, Joze Roth, Michele Canova, Serge Roudier; Best Available Techniques (BAT) Reference Document for Waste treatment Industrial Emissions Directive 2010/75/EU (Integrated Pollution Prevention and Control); EUR 29362 EN; Publications Office of the European Union, Luxembourg, 2018; ISBN 978-92-79 94038-5, doi:10.2760/407967, JRC113018.

C) Best Available Techniques to Reduce the Channeled Emissions from the Incineration Plant.

Reduction of Dust, Metals & Metalloids Emissions	Reduction of Acid Gases (HCl, HF & SO_2) Emissions	Reduction of NOx, N_2O, CO & NH_3 Emissions	Reduction of PCDD/F & PCBs Emissions	Reduction of Mercury Emissions
•Bag filter •Electrostatic precipitator •Dry sorbent injection •Wet scrubber •Fixed or moving bed adsorption	•Wet scrubber •Semi-wet scrubber •Dry sorbent injection •Direct desulphurisation •Boiler sorbent injection	•Optimisation of the incineration process •Flue gas recirculation •Selective non-catalytic reduction (SNCR) •Selectiv catalytiv reduction (SCR) •Catalytic filter bags •Optimisation of the SNCR/SCR design and operation •Wet scrubber	•Optimisation of the incineration process •Control of waste feed •On-line and off-line boiler cleaning •Rapid flue gas cooling •Dry sorbent injection •Fixed or moving grate adsoprtion •SCR •Catalytic filter bags •Carbon sorbent in a wet scrubber	•Wet scrubber (low pH) •Dry sorbent injection •Injection of special highly reactive activated carbon •Boiler bromine addition •Fixed or moving bed adsorption

Source: Frederik Neuwahl, Gianluca Cusano, Jorge Gómez Benavides, Simon Holbrook, Serge Roudier; Best Available Techniques (BAT) Reference Document for Waste Incineration; EUR 29971 EN; doi:10.2760/761437.

D) Best Available Techniques to Reduce Water Usage and to Prevent the Generation of Wastewater from the Incineration Plant.

Technique	Description	Applicability
Waste-water-free Flue Gas Cleaning (FGC) techniques	• Use of FGC techniques that do not generate waste water (e.g. dry sorbent injection or semi-wet absorber).	• May not be applicable to the incineration of hazardous waste with a high halogen content.
Injection of waste water from FGC	• Waste water from FGC is injected into the hotter parts of the FGC system.	• Only applicable to the incineration of municipal solid waste.
Water reuse/recycling	• Residual aqueous streams are reused or recycled.	• Generally applicable.

Technique	Description	Applicability
	• The degree of reuse/recycling is limited by the quality requirements of the process to which the water is directed.	
Dry bottom ash handling	• Dry, hot bottom ash falls from the grate onto a transport system and is cooled down by ambient air. No water is used in the process.	• Only applicable to grate furnaces. • There may be technical restrictions that prevent retrofitting to existing incineration plants.

Source: Frederik Neuwahl, Gianluca Cusano, Jorge Gómez Benavides, Simon Holbrook, Serge Roudier; Best Available Techniques (BAT) Reference Document for Waste Incineration; EUR 29971 EN; doi:10.2760/761437.

E) Best Available Techniques to Reduce Emissions to Water from Scheduled Waste Treatment Facility

Techniques	Typical Pollutants Targeted
Primary Techniques	
Optimisation of the incineration process and/or the FGC system (e.g. SNCR or SCR).	• Organic compounds including PCDD/F, ammonia/ammonium
Secondary Techniques	
Preliminary and Primary Treatment	
Equalisation	• All pollutants
Neutralisation	• Acids, alkalis
Physical separation (e.g. screens, sieves, grit separators, grease separators, oil-water separation or primary settlement tanks)	• Gross solids, suspended solids, oil/grease
Physico-Chemical Treatment	
Adsorption on activated carbon	• Organic compounds including PCDD/F • Adsorbable dissolved non-biodegradable or inhibitory pollutants [e.g. hydrocarbons, mercury, adsorbable organic halides (AOX)]
Distillation/rectification	• Dissolved nonbiodegradable or inhibitory pollutants that can be distilled (e.g. some solvents)
Precipitation	• Precipitable dissolved non-biodegradable or inhibitory pollutants (e.g. dissolved metals/metalloids, sulphate phosphorus)
Chemical oxidation	• Sulphide, sulphite, organic compounds

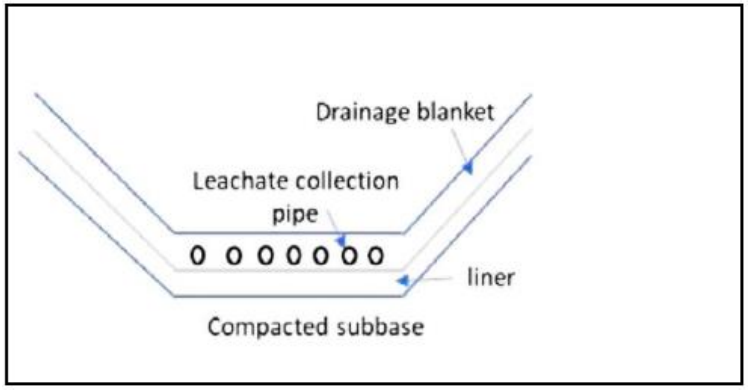
Techniques	Typical Pollutants Targeted
	• Oxidisable dissolved nonbiodegradable or inhibitory pollutants (e.g. nitrite, cyanide)
Chemical reduction	• Reducible dissolved nonbiodegradable or inhibitory pollutants [e.g. hexavalent chromium (Cr(VI))]
Evaporation	• Soluble contaminants
Ion exchange	• Ionic dissolved nonbiodegradable or inhibitory pollutants (e.g. dissolved metals/metalloids)
Stripping	• Purgeable pollutants (e.g. hydrogen sulphide (H2S), ammonia (NH3), some AOX, hydrocarbons
Reverse osmosis	• Ammonia/ammonium, metals/metalloids, sulphate, chloride, organic compounds
Biological Treatment	
Activated sludge process	• Biodegradable organic compounds
Membrane bioreactor	
Nitrogen Removal	
Nitrification/denitrification when the treatment includes a biological treatment	• Total nitrogen, ammonia
Final Solids Removal	
Coagulation and flocculation	• Suspended solids, particulate-bound metals/metalloids
Sedimentation	
Filtration (e.g. sand filtration, microfiltration, ultrafiltration)	
Flotation	

Source: Frederik Neuwahl, Gianluca Cusano, Jorge Gómez Benavides, Simon Holbrook, Serge Roudier; Best Available Techniques (BAT) Reference Document for Waste Incineration; EUR 29971 EN; doi:10.2760/761437.

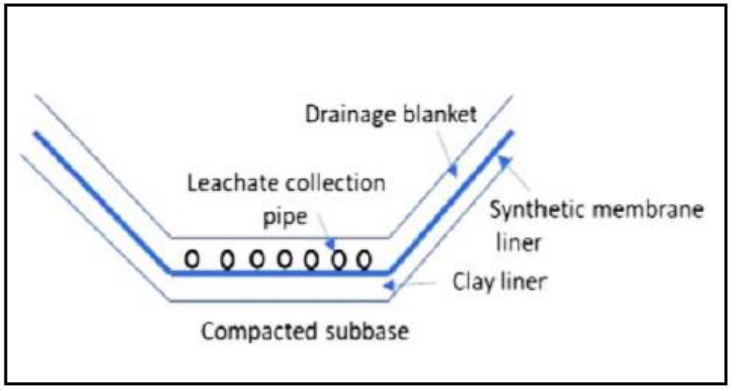
F) Best Available Techniques to Reduce Noise and Vibration Emissions

Technique	Description	Applicability
Appropriate location of equipment and buildings	Noise levels can be reduced by increasing the distance between the emitter and the receiver, by using buildings as noise screens and by relocating building exits or entrances.	• For existing plants, the relocation of equipment and building exits or entrances may be restricted by a lack of space or excessive costs.
Operational measures	This includes techniques such as: i. Inspection and maintenance of equipment; ii. Closing of doors and windows of enclosed areas, if possible; iii. Equipment operation by experienced staff; iv. Avoidance of noisy activities at night, if possible; v. Provisions for noise control during maintenance, traffic, handling and treatment activities.	• Generally applicable.
Low-noise equipment	This may include direct drive motors, compressors, pumps and flares.	• Generally applicable.
Noise and vibration control equipment	This includes techniques such as: i. Noise reducers; ii. Acoustic and vibrational insulation of equipment; iii. Enclosure of noisy equipment; iv. Soundproofing of buildings.	• Applicability may be restricted by a lack of space (for existing plants).
Noise attenuation	Noise propagation can be reduced by inserting obstacles between emitters and receivers (e.g. protection walls, embankments and buildings).	• Applicable only to existing plants, as the design of new plants should make this technique unnecessary. For existing plants, the insertion of obstacles may be restricted by a lack of space. • For mechanical treatment in shredders of metal wastes, it is applicable within the constraints associated with the risk of deflagration in shredders.

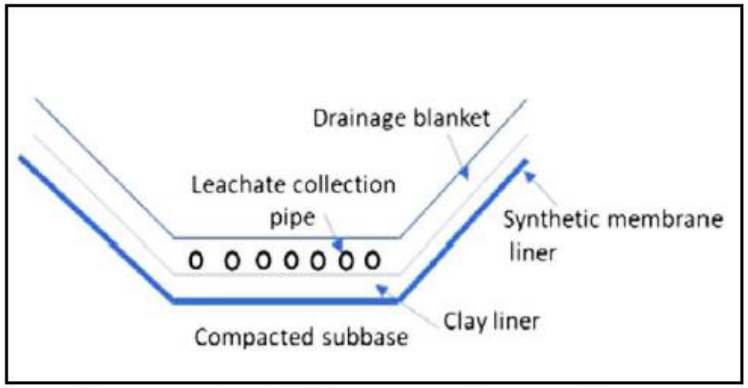
G) Examples of Options for Landfill Base Liners



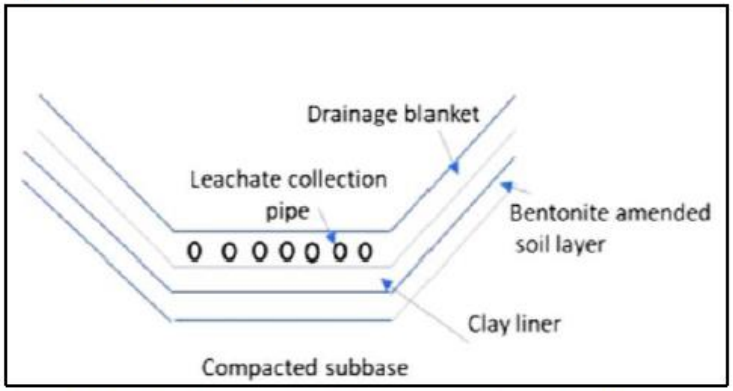
Single-Lined Landfill



Double-Lined Landfill with a Single Collection System: Scheme 1

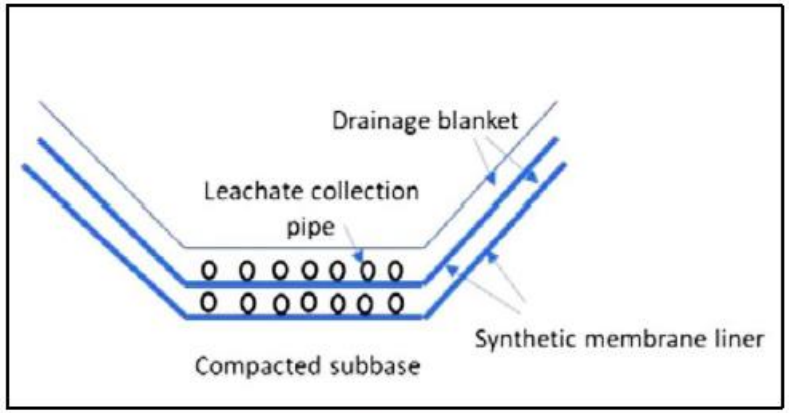


Double-Lined Landfill with a Single Collection System: Scheme 2

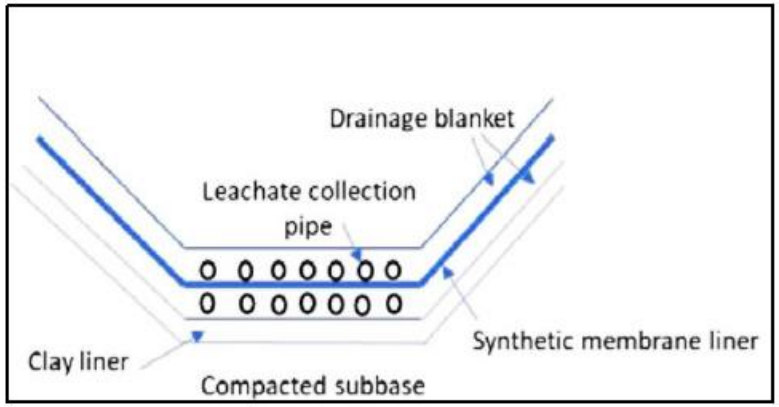


Double-Lined Landfill with a Single Collection System: Scheme 3

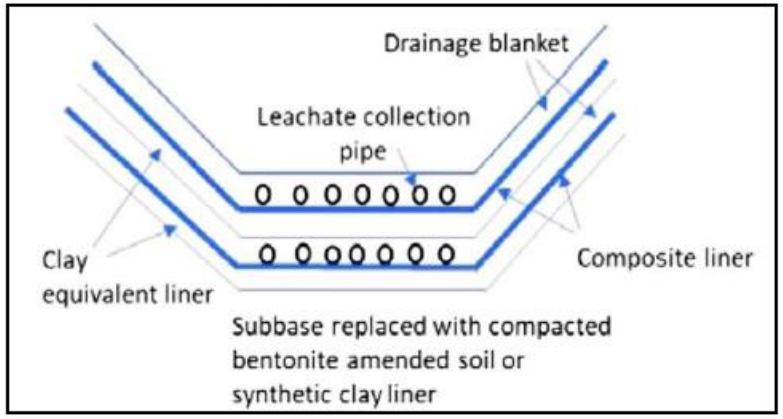
G) Examples of Options for Landfill Base Liners (cont'd).



Multiple-Lined Landfill with Two (2) Collection System: Scheme 1



Multiple-Lined Landfill with Two (2) Collection System: Scheme 2



Multiple-Lined Landfill with Two (2) Collection System: Scheme 3

Source: Adopted from EIA Report for the Proposed Development of Sustainable Scheduled Waste Treatment Centre (SSWTC) at PT1682 Bukit Tagar Sanitary Landfill.

EIA GUIDELINES

Waste Treatment & Disposal – Scheduled Waste

APPENDIX E

Key Project Activities

APPENDIX E – KEY PROJECT ACTIVITIES

<table>
<tr><th rowspan="2">Prescribed Activities</th><th colspan="4">Stages</th></tr>
<tr><th>Pre-Construction</th><th>Construction</th><th>Operation</th><th>Abandonment/Post Closure</th></tr>
<tr><td>First Schedule, Activity 14(a)(i) – Construction recovery plant (off-site)</td><td rowspan="3"><u>Survey</u>
• Topographic
• Land use

<u>Site investigation</u>
• Soil
• Hydrological
• Hydrogeological
• Geological
• Geotechnical
• Ecological
• Archaeological

<u>Land acquisition</u>
• Acquire land
• Relocation</td><td rowspan="3"><u>Site construction facilities</u>
• Access roads
• Workshops
• Workers camp
• Toilet facility

<u>Site clearance</u>
• Removal of existing structures
• Removal of vegetation
• Temporary drainage
• Waste disposal

<u>Site formation</u>
• Excavation, drilling, blasting, filling
• Import/ export of fill
• Construction/reinforcement of dykes/bunds/slopes
• Construction/reinforcement of site and access roads
• Construction of surface drainage

<u>Ancillary/Infrastructural works</u>
• Heavy machineries
• Construction of buildings amenities and utilities
• Construction of supporting infrastructure
• Construction of main facilities
• Plant commissioning</td><td>• Collection of wastes from waste generator.
• Waste resource recovery (gas-liquid separation, filtering, decanting, distillation, rinsing, settling, washing, scrubbing).
• Flue gas treatment.
• Wastewater treatment processes (physical, chemical and biological treatment).
• Sludge treatment.
• Transportation of residual waste to secure landfill.</td><td rowspan="3">• Decommissioning, dismantling and removal of Plant
• Demolition and disposal of buildings and structures
• Site restoration and rehabilitation</td></tr>
<tr><td>First Schedule, Activity 14(a)(ii) – Construction of wastewater treatment plant (off-site)</td><td>• Storage of chemicals for wastewater treatment (acid, caustic soda, coagulant polymer, catalyst, chlorine, etc.)
• Wastewater treatment processes (physical, chemical and biological treatment).
• Sludge treatment.
• Transportation of residual waste to secure landfill.</td></tr>
<tr><td>First Schedule, Activity 14(a)(iii) – Construction of storage facility (off-site)</td><td>• Collection of wastes from waste generator.
• Storage of various types of scheduled wastes.
• Transportation of waste to treatment or recovery facility.</td></tr>
</table>

Prescribed Activities	Stages			
	Pre-Construction	Construction	Operation	Abandonment/Post Closure
Second Schedule, Activity 14(a)(i) – Construction of thermal treatment plant		Abandonment during construction. • Demolition • Disposal • Site restoration	• Collection of wastes from waste generator. • Waste preparation and handling (cutting, crushing, shredding, settling, separation, neutralisation, etc.). • Tank farm facility for liquid wastes and fuel storage. • Thermal treatment plant (incineration, gasification or pyrolysis). • Flue gas treatment system. • Transportation of residual waste to secure landfill.	
Second Schedule, Activity 14(a)(ii) – Construction of off-site recovery plant for lead acid battery			• Collection of wastes from waste generator. • Battery breaking and components separation. • Plastic recovery. • Sulfur removal. • Smelting and refining processes. • Flue gas treatment system. • Transportation of residual waste to secure landfill.	
Second Schedule, Activity 14(a)(iii) – Construction of off-site recovery plant or treatment facility that generates significant amount of wastewater which is located at the upstream of public water supply intake			• Collection of wastes from waste generator. • Waste resource recovery (gas-liquid separation, filtering, decanting, distillation, rinsing, settling, washing, scrubbing). • Flue gas treatment. • Wastewater treatment processes (physical, chemical and biological treatment).	

Prescribed Activities	Stages			
	Pre-Construction	Construction	Operation	Abandonment/Post Closure
			• Sludge treatment. • Transportation of residual waste to secure landfill.	
Second Schedule, Activity 14(a)(iv) – Construction of secure landfill			• Collection of wastes from waste generator. • Daily cover needs. • Landfill operations. • Leachate treatment plant. • Surface water treatment plant. • Landfill gas venting.	• Dismantling and removal of structures • Demolition waste management (disposal) • Site restoration and rehabilitation • Landfill closure.

Note: The list is not exhaustive and not all the above may be relevant to the project depending on the scale, nature and location of the project.

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Waste Treatment & Disposal – Scheduled Waste

APPENDIX F

Environmental Scoping Matrix

APPENDIX F – ENVIRONMENTAL SCOPING MATRIX

A. All Scheduled Waste Prescribed Activities

Key Project Activities	Environmental Components											
	Air Quality & Odour	Surface Water Quality	Noise & Vibration	Geology & Soil	Groundwater Quality	Waste Generation	Terrestrial &Aquatic Flora & Fauna	Land Use	Land Traffic & Transportation	Socio-Economic	Public Health	Risk
Pre-Construction												
Access Tracks												
Survey												
Site Investigation												
Land Acquisition												
Construction												
Site construction facilities.												
Site clearance & site formation												
Ancillary/Infrastructural works												
Abandonment during construction												
Operation & Maintenance												
Collection of wastes from waste generator												
Transportation of waste to recovery facility or residual waste to secure landfill.												
Abandonment / Safe Closure												
Decommissioning, dismantling and removal of Plant.												
Demolition and Disposal of Building Structures												
Site Restoration and Rehabilitation												

B. First Schedule, Activity 14(a)(i) – Recovery Plant (off-site)

Key Project Activities	Environmental Components											
	Air Quality & Odour	Surface Water Quality	Noise & Vibration	Geology & Soil	Groundwater Quality	Waste Generation	Terrestrial &Aquatic Flora & Fauna	Land Use	Land Traffic & Transportation	Socio-Economic	Public Health	Risk
Operation & Maintenance												
Waste resource recovery (gas-liquid separation, filtering, decanting, distillation, rinsing, settling, washing, scrubbing).												
Flue gas treatment.												
Wastewater treatment.												
Sludge treatment.												

C. First Schedule, Activity 14(a)(ii) – Wastewater Treatment Plant (off-site)

Key Project Activities	Environmental Components											
	Air Quality & Odour	Surface Water Quality	Noise & Vibration	Geology & Soil	Groundwater Quality	Waste Generation	Terrestrial &Aquatic Flora & Fauna	Land Use	Land Traffic & Transportation	Socio-Economic	Public Health	Risk
Operation & Maintenance												
Storage of chemicals for wastewater treatment (acid, caustic soda, coagulant polymer, catalyst, chlorine, etc.)												
Wastewater treatment processes (physical, chemical and biological treatment).												
Sludge treatment.												

D. First Schedule, Activity 14(a)(iii) – Storage facility (off-site)

Key Project Activities	Environmental Components											
	Air Quality & Odour	Surface Water Quality	Noise & Vibration	Geology & Soil	Groundwater Quality	Waste Generation	Terrestrial &Aquatic Flora & Fauna	Land Use	Land Traffic & Transportation	Socio-Economic	Public Health	Risk
Operation & Maintenance												
Storage of various types of scheduled wastes.												

E. Second Schedule, Activity 14(a)(i) – Thermal Treatment Plant

Key Project Activities	Environmental Components											
	Air Quality & Odour	Surface Water Quality	Noise & Vibration	Geology & Soil	Groundwater Quality	Waste Generation	Terrestrial &Aquatic Flora & Fauna	Land Use	Land Traffic & Transportation	Socio-Economic	Public Health	Risk
Operation & Maintenance												
Waste preparation and handling (cutting, crushing, shredding, settling, separation, neutralization, etc.).												
Tank farm facility for liquid wastes and fuel storage.												
Thermal treatment plant (incineration, gasification or pyrolysis).												
Flue gas treatment system.												

F. Second Schedule, Activity 14(a)(ii) – Recovery Plant for Lead Acid Battery

Key Project Activities	Environmental Components											
	Air Quality & Odour	Surface Water Quality	Noise & Vibration	Geology & Soil	Groundwater Quality	Waste Generation	Terrestrial &Aquatic Flora & Fauna	Land Use	Land Traffic & Transportation	Socio-Economic	Public Health	Risk
Operation & Maintenance												
Battery breaking and components separation.												
Plastic recovery.												
Sulfur removal.												
Smelting and refining processes.												
Flue gas treatment system.												

G. Second Schedule, Activity 14(a)(iii) – Recovery or Treatment (Upstream)

Key Project Activities	Environmental Components											
	Air Quality & Odour	Surface Water Quality	Noise & Vibration	Geology & Soil	Groundwater Quality	Waste Generation	Terrestrial &Aquatic Flora & Fauna	Land Use	Land Traffic & Transportation	Socio-Economic	Public Health	Risk
Operation & Maintenance												
Waste resource recovery (gas-liquid separation, filtering, decanting, distillation, rinsing, settling, washing, scrubbing).												
Wastewater treatment processes (physical, chemical and biological treatment).												

H. Second Schedule, Activity 14(a)(iv) – Secure Landfill Facility

Key Project Activities	Environmental Components											
	Air Quality & Odour	Surface Water Quality	Noise & Vibration	Geology & Soil	Groundwater Quality	Waste Generation	Terrestrial &Aquatic Flora & Fauna	Land Use	Land Traffic & Transportation	Socio-Economic	Public Health	Risk
Operation & Maintenance												
Daily cover needs.												
Landfill operations.												
Leachate treatment plant.												
Surface water treatment plant.												
Abandonment / Safe Closure												
Landfill closure.												

Note:

Positive Impact
P1 Low
P2 Medium
P3 High

Negative Impact
N1 Low
N2 Medium
N3 High

0 Neutral

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Waste Treatment & Disposal – Scheduled Waste

APPENDIX G

Proposed Baseline Monitoring and Analysis

APPENDIX G – PROPOSED BASELINE MONITORING AND ANALYSIS

Environmental Components	Parameters	Unit	Criteria for Data Analysis	Remarks
Ambient Air Quality	Particulate Matter (PM_{10})*	24 hours	• Malaysia Ambient Air Quality Standards (MAAQS) 2013.	• Within project site and surrounding sensitive receptors(s) especially at sensitive receptor(s) located downwind to the project area. • * air quality monitoring should consider the basic parameters in MAAQS 2013. • Wind measurement (wind direction and wind velocity) at each monitoring location should be taken throughout the monitoring period (i.e. 24-hr). • The Qualified Person should consider baseline for the sensitive receptor(s) and other parameters that will be predicted/modelled in the air quality impact assessment.
	Particulate Matter ($PM_{2.5}$)*	24 hours		
	Sulphur Dioxide (SO_2)*	24 hours		
	Nitrogen Oxides (as NO_2)*	1 hour		
	Carbon Monoxide (CO)*	8 hours		
	Ground Level Ozone (O_3)*	8 hours		
	Volatile Organic Compounds (VOC)	Total & Screening (24hr)		
	Hydrogen Chloride (HCl)	Total (8hr)		
	Hydrogen Fluoride (HF)	Total (8hr)		
	Heavy metals – Cadmium, Thallium, Mercury, Antimony, Arsenic, Lead, Chromium, Cobalt, Copper, Manganese, Nickel, Vanadium, Aluminium	Total in PM samples		
	Dioxin and Furan (PCDD/PCDF)	Total (24hr)		
Odour	Perceived Odour	D/T	• Currently no standards/guidelines available.	• Within project site and surrounding sensitive receptor(s) especially at sensitive receptor(s) located downwind to the project area. • To note the wind speed, wind direction, surface temperature and relative humidity at each sampling point during sampling. • The Qualified Person should consider baseline for the sensitive receptor(s) that will be predicted/modelled in the odour impact assessment.
	Odour Concentration	OU/m^3		
Noise	LA_{eq}, LA_{max}, LA_{min}, LA_{90}, LA_{10}	24 hours	• Guidelines for Environmental Noise Limits and Control Third Edition, 2019. Schedule of Permissible Sound Levels.	• Within project site and surrounding sensitive receptor(s).

Environmental Components	Parameters	Unit	Criteria for Data Analysis	Remarks
				• The Qualified Person should consider baseline for the sensitive receptor(s) that will be predicted/modelled in the noise impact assessment.
Vibration	Peak particle velocity be measured simultaneously in the three orthogonal x, y, z axes, computed vectorial sum	m/s	• The Planning Guidelines for Vibration Limits and Control in the Environment Second Edition, 2007. Annex A: Schedule of Recommended Vibration Limits.	• Within project site and surrounding sensitive receptor(s). • The Qualified Person should consider baseline for the sensitive receptor(s) that will be predicted/modelled in the vibration impact assessment.
Surface Water Quality	Temperature (in-situ reading)	^{o}C	• National Water Quality Standards (NWQS).	• Samples should be analyzed for all parameters coherent to the Environmental Quality (Industrial Effluent) Regulations 2009. • **#** Parameters in the Water Quality Index (WQI) should be included the baseline sampling. • Upstream and downstream of the project point of discharge. • ***** means parameter to be considered if the river has a tidal effect. • Hydraulic measurement (depth, width and velocity) should be taken for modelling purposes. • The Qualified Person should consider baseline for the sensitive receptor(s) that will be predicted/modelled in the water quality impact assessment.
	pH (in-situ reading)**#**	-		
	Biological Oxygen Demand (BOD_5)**#**	mg/l		
	Suspended Solids**#**	mg/l		
	Mercury (Hg)	mg/l		
	Cadmium (Cd)	mg/l		
	Chromium Hexavalent (Cr^{6+})	mg/l		
	Chromium Trivalent (Cr^{3+})	mg/l		
	Arsenic (As)	mg/l		
	Cyanide (Cn)	mg/l		
	Lead (Pb)	mg/l		
	Copper (Cu)	mg/l		
	Manganese (Mn)	mg/l		
	Nickel (Ni)	mg/l		
	Zinc (Zn)	mg/l		
	Boron (B)	mg/l		
	Iron (Fe)	mg/l		
	Silver (Ag)	mg/l		
	Aluminium (Al)	mg/l		
	Selenium (Se)	mg/l		
	Barium (Ba)	mg/l		
	Fluoride (F)	mg/l		
	Formaldehyde	mg/l		

Environmental Components	Parameters	Unit	Criteria for Data Analysis	Remarks
	Phenol	mg/l		
	Free Chlorine	mg/l		
	Sulphide	mg/l		
	Oil and grease	mg/l		
	Ammoniacal Nitrogen (NH_3-N)#	mg/l		
	Colour	ADMI		
	Chemical Oxygen Demand (COD)#	mg/l		
	Dissolved Oxygen (DO) (in-situ reading)#	mg/l		
	DO Saturation (in-situ reading)	%		
	Turbidity	NTU		
	E.coli count	Count/100 mL		
	Salinity (in-situ)*	ppt		
	Conductivity (in-situ)*	µS/cm		
Marine Water Quality	Dissolved Oxygen (DO) (in-situ reading)#	mg/l	• Malaysian Marine Water Quality Standards (MMWQS).	• Sampling needed if the project site is located adjacent to the coast. • # Parameters in the Malaysian Marine Water Quality Index (MMWQI) should be included in the baseline sampling.
	Total Suspended Solids#	mg/l		
	Phosphate#	µg/l		
	Nitrate#	µg/l		
	Ammonia#	µg/l		
	Mercury	µg/l		
	Cadmium	µg/l		
	Chromium (VI)	µg/l		
	Copper	µg/l		
	Cyanide	µg/l		
	Lead	µg/l		
	Zinc	µg/l		
	Arsenic (III)	µg/l		
	Aluminium	µg/l		
	Tributyltin (TBT)	µg/l		

Environmental Components	Parameters	Unit	Criteria for Data Analysis	Remarks
	Polynuclear Aromatic Hydrocarbons (PAH)	µg/l		
	Total Phenol	µg/l		
	Oil & Grease	mg/l		
	Faecal coliform#	CFU/100 ml		
	Temperature	°C		
	pH	-		
Groundwater Quality	Total Coliform	CFU/100 ml	• Groundwater Quality Standards for Conventional Raw Water Treatment (Drinking Water).	• Upstream and downstream of the project site in the direction of groundwater flow. • Focus on aquifer important as source of water for drinking purposes. • **#** Parameters in the National Groundwater Quality Index (NGQI) should be included in the baseline sampling.
	E. Coli#	CFU/100 ml		
	Turbidity	NTU		
	Colour	TCU		
	pH#	-		
	Temperature	^{o}C		
	Conductivity	µS/cm		
	Total Dissolved Solids#	mg/l		
	Chloride	mg/l		
	Ammonia	mg/l		
	Nitrate#	mg/l		
	Iron#	mg/l		
	Fluoride	mg/l		
	Total Hardness	mg/l		
	Manganese	mg/l		
	COD	mg/l		
	Anionic Detergent (MBAS)	mg/l		
	BOD	mg/l		
	Nitrite	mg/l		
	Mercury	mg/l		
	Cadmium	mg/l		
	Arsenic	mg/l		
	Cyanide	mg/l		
	Lead	mg/l		
	Chromium	mg/l		
	Copper	mg/l		
	Zinc	mg/l		

Environmental Components	Parameters	Unit	Criteria for Data Analysis	Remarks
	Sodium	mg/l		
	Sulphate#	mg/l		
	Selenium	mg/l		
	Silver	mg/l		
	Magnesium	mg/l		
	Oil	mg/l		
	Pesticides	mg/l		
	Phenol#	mg/l		
	Nickel	mg/l		
	Gross alpha	Bq/l		
	Gross beta	Bq/l		

Note: The list above is not exhaustive and there may be other parameters that may be relevant depending on the scale, nature and location of the project. The Qualified Persons shall determine other relevant requirements based on the project needs.

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Waste Treatment & Disposal – Scheduled Waste

APPENDIX H

Examples of Air Dispersion Modelling Software

APPENDIX H – EXAMPLES OF AIR DISPERSION MODELLING SOFTWARE

Tools	SCREEN View	AERMOD View	AERSCREEN View	TSCREEN	CTSCREEN
Description	• User friendly interface for SCREEN3. • Preliminary modelling with SCREEN View can remove the need for more complicated modelling, saving time and resources.	• Complete and powerful air dispersion modelling package used extensively to assess pollution concentration and deposition from a wide variety of sources. • Incorporates building downwash algorithms, advanced depositional parameters, local terrain effects, and advanced meteorological calculations.	• User friendly interface for AERSCREEN screening-level air quality model and associated modelling programs. • Estimate worst-case impacts of ground level concentrations for a single source by interfacing with the screening mode of the AERMOD model.	• Toxics Screening Model (TSCREEN) is a Gaussian model that implements the procedures to correctly analyse toxic emissions and their subsequent dispersion from one of many different types of possible releases for superfund sites.	• CTSCREEN is a Gaussian plume dispersion model designed as a screening technique for regulatory application to plume impaction assessments in complex terrain. CTSCREEN is a screening version of the CTDMPLUS model.
Input Required	• Source type • Source parameters (emission rate, stack height and diameter, stack gas exit velocity and temperature, ambient air temperature)	• Source type • Source parameters (GPS coordinate, emission rate, stack height and diameter, stack gas exit velocity and temperature)	• Source type • Source parameters (emission rate, stack height and diameter, stack gas exit velocity and temperature, air temperature) • Building data	• Particulate matter emission type • Source parameters (emission rate, stack height and diameter, stack gas exit velocity and temperature) • Building parameters	• Terrain data • Wind speed • Terrain height • Wind directions

Tools	SCREEN View	AERMOD View	AERSCREEN View	TSCREEN	CTSCREEN
	• Dispersion coefficient • Receptor data (height above ground)		• Meteorological data • Terrain data • Receptors' distances	• Terrain type • Averaging time	
Output	• Distance vs concentration graph	• Maximum concentration by distances • 3D visualization of emission concentration	• Final maximum concentration and maximum concentration at the minimum ambient distance • Fumigation results • Maximum concentrations by distance • Meteorology associated with the maximum concentration	• Maximum concentration and the distance to the maximum • Dispersion characteristics and pollutant • Concentrations of the resulting plume	• Worst-case 1hour concentration
Price	Free	Paid (inquire from developer)	Paid (inquire from developer)	Free	Free

Source: Environmental. Essential for Siting of Industries in Malaysia 2017.

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Waste Treatment & Disposal – Scheduled Waste

APPENDIX I

Examples of QRA Modelling Software

APPENDIX I – EXAMPLES OF QRA MODELLING SOFTWARE

Name	ALOHA™	PHAST™	EFFECTS	TEREX	WHAZAN
Application	➢ Rapid prediction of source strength and dispersion during emergency response ➢ Generates a variety of scenario-specific output, including threat zone pictures, threats at specific locations, and source strength graphs. ➢ Calculates how quickly chemicals are escaping from tanks, puddles, and gas pipelines – and predicts how those release rates change over time. ➢ Models many release scenarios: toxic gas clouds, BLEVEs, jet fires, vapor cloud explosions, and pool fires. ➢ Evaluates different types of hazard (depending on the release scenario): toxicity, flammability, thermal radiation, and overpressure. ➢ Models the atmospheric dispersion of chemical spills on water.	➢ Phast is the industry standard tool for process hazard analysis. ➢ It is used to estimate, understand and visualize the effects from loss of containment scenarios. ➢ Comprehensive hazard analysis facilities to examine the progress of a potential incident from the initial release to its far-field effects. ➢ Predict all possible complex consequences from possible release of hazardous material. ➢ PHAST includes a wide range of models for discharge and	➢ Assess the physical effects of accidental releases of toxic or flammable chemicals. ➢ Detailed modelling and quantitative assessment of release rate pool evaporation, atmospheric dispersion, Vapour Cloud Explosion, Combustion, heat radiation effects from fires etc.	➢ Simulating concrete risk sources in industrial processes ➢ Civil crisis planning where the main threat is a terrorist attack ➢ Army modelling for an attack with hazardous substances, chemical and combat weapons for determining the area struck ➢ The rapid determination of the extent of the threat and the realization of subsequent measures for population protection, especially the area struck and the necessary evacuation. ➢ Basic modules to assess accident events:	➢ Explore the consequences of a set of release scenarios (outflow of chemical, behaviour immediately after release, dispersion in the atmosphere, fires and explosion, indoor gas build up etc.)

Name	ALOHA™	PHAST™	EFFECTS	TEREX	WHAZAN
		dispersion as well as flammable, explosive and toxic effects.		-Dangerous chemical substances (TOXI, UVCE, FLASH FIRE) -Explosive systems (TEROR) -Toxic agents (POISON)	
Limitation	➢ ALOHA's concentration estimates (Gaussian assumption) can be less accurate when any condition exists that reduces mixing in the atmosphere. ➢ Concentration patchiness, particularly near the source makes the estimate unreliable. ➢ ALOHA does not account for some effects such as: - Byproducts from fires, explosions, or chemical reactions - Particulates - Chemical mixtures - Wind shifts and terrain steering effects - Terrain - Hazardous fragments	➢ PHAST has limitations on the source term for maximum temperature and cannot deal with temperatures above 600°C.			➢ Only 30 chemicals are available in the supplied database. ➢ Software does not produce consequence data for all situations (e.g. dust explosion) ➢ The program does not make estimates of the frequency of the scenarios or risk.
Input	➢ Scenario information (e.g. chemical, weather conditions, and the type of release)	➢ Basic information about storage or process conditions and material properties			➢ Quantities of hazardous substances and site conditions

Name	ALOHA™	PHAST™	EFFECTS	TEREX	WHAZAN
					➢ Physical and chemical Data from built in chemical database
Output	➢ Graphical outputs ➢ GIS-Compatible output (ALOHA's threat zones can be displayed on maps)	➢ Graphical or report outputs ➢ GIS-Compatible output	➢ Graphical outputs ➢ Reports ➢ Contours on map (incorporated GIS tool)	➢ Situation of modelling ➢ Characteristics of a danger ➢ Marking out a danger zone ➢ GIS-compatible	➢ Consequence calculation in both graphical and tabular form
Special Feature	➢ A part of CAMEO® software suite. ➢ Large chemical library (approximately 1,000 common hazardous chemicals) ➢ Pre-accident modelling	➢ Integrated material property database containing more than 1,600 pre-defined pure component chemicals	➢ Complete and industry standard chemical database, containing over 2200 toxic and flammable values and all thermodynamic properties. ➢ Pre accident modelling ➢ Modelling the effects of accidental release of hazardous substances	➢ Post-accident modelling	➢ Process hazard screening tool

Source: Environmental. Essential for Siting of Industries in Malaysia 2017.

EIA GUIDELINES

Waste Treatment & Disposal – Scheduled Waste

APPENDIX J

List of Pollution Prevention and Mitigation Measures (P2M2)

APPENDIX J – POLLUTION PREVENTION AND MITIGATION MEASURES

Activities	Environmental Aspect	Significant Potential Impacts	Pollution Prevention and Mitigation Measures
Ground survey	Social Impact	• Community disputes	• Ground survey to clearly establish the boundary of the acquired land shall be conducted before any land clearing work starts to avoid disputes. Areas to be acquired/ developed and areas to be preserved (buffer zone) must be clearly defined and agreed upon by all parties. • Consult owner regarding the acquisition of the affected land.
Earthwork activities	Air Quality	• Suspension of dust	• Wetted and covered earthwork area. • Minimize the size of exposed areas and material stockpiles and the periods of their existence. • Switch off engines when idling. • Use low sulphur diesel for trucks and diesel-fuelled construction equipment if available. • Maintain and check the construction equipment regularly.
	Land Disturbance	• Erosion of earth surface that produce sediment during the development activities	• All vehicles going out of the Project site must pass through a washing bay or wash trough to wash away the dirt. The water in the washing bay must be channelled to nearby drainage network then to detention pond. • Covered lorries that transport earth and soil with tarpaulin to reduce spillage on roads. • Regularly spraying the dusty surfaces and the water channelled into a nearby drainage network then to detention pond. • Before commencing on the earthworks, temporary earth drains are required to be established to cater the sediment and channel to sediment basin. • Sediment basins are required and to be maintained until the site area is permanently protected against erosion or a permanent detention basin or water quality control structure constructed. • Check dam is also recommended to be constructed across a temporary earth drain as to reduce the velocity of storm water, erosion and sedimentation. • Temporary earth drain shall be provided near the access road to channel the water sediment basin and subsequently to detention pond. • De-silted of sediment basin and check dam should be performed regularly to ensure it function effectively. • Regular maintenance shall be performed as well on the drainage networks to avoid flood event.
Construction works	Waste Management	• Generation of solid wastes such as construction wastes and municipal solid wastes	• Implement construction materials inventory management system to minimize over-supply of the construction materials. • Minimize generation of solid waste by sound planning of material usage, using reusable items and encourage 4Rs (Reuse, Reduce, Recovery and Recycle) concept. • Designate a proper site for solid waste disposal. • No open burning is allowed. • Waste clean-up measures are to be undertaken on at least a monthly basis to collect any waste or unused materials from the construction site. • Provide adequate number of waste bins at strategic locations around the site office and work areas.
	Health Impact	• Health risks to local residents from the prolonged exposure to air emission pollutants and water contaminants.	• Proper traffic management. • Wet method to control dusts and good traffic management. • Implementation of safe work practises. • Clean water supply and proper solid waste disposal. • Project site is always clean and not being a potentially surface water holding area that can be mosquito breeding ground. • All wastes including construction waste and solid waste need to be collected, put in a closed container and stored in a proper area that is roofed. • The logistic of the machineries, construction equipment and materials is planned properly and maintained regularly to minimise the emission of dust. • Any cases involving infectious disease at site must be immediately reported to local District Health Office.

Activities	Environmental Aspect	Significant Potential Impacts	Pollution Prevention and Mitigation Measures
		• Air quality related health problems are respiratory diseases. • Transmission of vector-borne disease particularly dengue fever and dengue haemorrhagic fever due to the availability of mosquito breeding places. • Communicable disease from foreign workers.	• All construction raw materials that are flammable and acidic need to be placed in a proper container and area. • The Project Site sanitation must be kept at optimum level at all-time where all wastes must be disposed properly and provide enough toilet with clean water for the uses of workers at site. • Associated monitoring programs will be recommended to minimize the health impact of proposed project towards the community. • Conduct ambient air quality monitoring. • All workers at site undergo health screening to avoid infectious disease epidemic. • Any cases involving infectious disease at site must be immediately reported to local District Health Office. • All the workers shall undergo necessary vaccination in accordance to relevant requirement (i.e. MOH). • Any complaints should be immediately investigated and necessary action should be taken.
	Water Quality	• Pollutants swept away by surface runoff to nearby river. • Domestic wastewater discharge, inappropriate waste storage and disposal.	<u>Erosion and Sedimentation</u> Provide adequate temporary drainage infrastructure including detention ponds to avoid flooding • Provide sediment basins to prevent sediments and other debris from being washed into the nearby rivers. • A network of drains will be built surrounding the landfill site to channel the run-off from the landfill perimeter to prevent soil erosion that may increase solids in the surface water discharges from site. • Water monitoring and audit programme shall be carried out to determine the levels of pollutants in the river. • Proper stacking of vegetative wastes at the Project site for natural degradation. It can also be used as mulches over undeveloped area and slope area to control runoff and erosion. • Turf completed work area surface within 7 days after work completion. Slope shall be turfed upon slope work completion. • Clean vehicle tyres of any mud/dirt prior to using the public road via the vehicle washing bay. • Erect sediment fence of woven/non-woven geotextile at the down flow area of the stockpile to contain the stockpile runoff. • Submit an ESCP plan to DID and the plan must be followed accordingly and maintained by a qualified Environmental Officer (EO) (i.e. CESSWI Certified or equivalent). <u>Wastewater Discharge</u> • Provision of temporary sanitation facility (i.e. portable toilet) according to the requirements set by DOSH and SPAN. • Sewage discharge to meet limits stipulated in the Environmental Quality (Sewage) Regulations, 2009. • Periodical de-sludging of sewage treatment system to ensure that the treatment systems are effective at all times. • Installation of oil and grease trap for sullage. <u>Waste Storage and Disposal</u> • Segregate scheduled wastes and non-hazardous wastes and provide appropriate containers for the type of waste. • All temporary fuel tanks and storage areas should be provided with drip collection devices and be sited on sealed areas with a bunded enclosure capable of containing 110% of the inventory of the largest tank. • The Project Proponent shall refer to the Guidelines for Packaging, Labelling and Storage of Scheduled Wastes in Malaysia

Activities	Environmental Aspect	Significant Potential Impacts	Pollution Prevention and Mitigation Measures
			• Limit access to scheduled waste storage areas to employees who have received proper training • Conduct periodic inspections of waste storage areas and document the findings • All scheduled wastes shall be handled, stored and disposed of in accordance with the Environmental Quality (Scheduled Wastes) Regulations, 2005 <u>Spills and Leakages</u> • Skid tanks to be constructed with protection perimeter bunds to contain any accidental spillage of oil. • The disposal of oil rags and used spill kit materials is to be in accordance with the Environmental Quality (Scheduled Waste) Regulation 2005. • All site workers are to be trained regarding the appropriate use, handling and disposal of site-based chemicals and lubricants, as well as emergency spill response.
	Noise Quality	• Noise generated from heavy machineries and vehicles • Noise induced by vehicle movements and transportation of materials and equipment	• The boundary of the construction site will be fenced with temporary hoarding to contain the noise generated by the construction activities. • All construction equipment and vehicles will be maintained in line with manufacturers' recommendations. • Noise control engineering techniques will be in use where practical i.e. the use of mufflers, silencers, enclosures etc. • Scheduling of construction materials transportation process. • Regular maintenance and inspection of all plant facilities. • Limit hours of operation to reduce noise disturbance. • Workers at site to be provided with proper Personal Protective Equipment (PPE) (i.e. earmuff, earplug, safety helmet, safety shoes, respirator, etc.). • Any complaints should be immediately investigated and necessary action should be taken.
Maintenance	Waste Management	• Spent lubricating oil/hydraulic oil during periodic maintenance of equipment	• Scheduled wastes shall be stored in containers which are compatible with the scheduled wastes to be stored, durable and which are able to prevent spillage of the scheduled waste into the environment. • Assign proper equipment maintenance area to prevent the used engine oil or lubricant from entering the waterway.
Storage of scheduled wastes and transportation	Waste Management	• Spillage of waste • Chemical leakage	• Suitable spill clean-up materials (example: sands or sawdust) must be kept available on or close to the designated storage area, in order to deal quickly with any accidental spillage. • Designate a roofed-storage area to avoid contact between the household E-waste with water. • The waste should be arranged in proper manner to minimize safety hazard to operators. • Employment of trained and qualified operators. • Provisions of safety work-wear / accessories-masks / glove, etc. • Supervisions of house-keeping practices. • Automated loading systems and handling equipment. • Ensure the use of durable storage container material and routine inspection of storage areas /vessels. • Ensure ventilation of potentially hazardous waste storage materials to prevent gas build up. • Applied fire safety regulations.
	Quantitative Risk Assessment	• Accidental fire, toxic dispersion and explosion due unintended releases of hazardous	• Safe or standard operating procedures should be established. • Establish an Emergency Response Plan (ERP) as tool for effective disaster or emergency management in case of an incident or accident.

Activities	Environmental Aspect	Significant Potential Impacts	Pollution Prevention and Mitigation Measures
		substances from storage	
Thermal treatment plant operation	Air Quality	• Emission of pollutants that potentially causes diseases, allergies, damage to human and other living organisms such as animals and crops. • Degradation of air quality due to emissions of pollutants from stacks. • Residue (fly ash and bottom ash) generation.	• Installation of Air Pollution Control System (APCS) and sufficient stack height. • APCS shall be in continuous operation to remove harmful pollutants from the emissions. • Equipped with Continuous Emission Monitoring System (CEMS) that continuously monitors the flue gas emission concentration emitted from the stack to ensure plant performance at all times. • Performance monitoring of the thermal treatment processes is essential in order to ensure that all every component and APCS functions according to the intended performance level with minimum deviation or abnormal conditions. • Scheduled and preventive maintenance shall be implemented as part of the project's operating procedures. • Pollution control equipment shall be operated and maintained by competent person who are trained in the operational and emergency response procedures. • An effective emergency response system for control system failures is required to be in place. This involves the stoppage of operations, where necessary, to minimize uncontrolled emissions to the atmosphere. • The bag filters require periodic cleaning and regular maintenance. • Submission of written notification and declaration erection of air.
	Health Impact	• Health risks to local residents from the prolonged exposure to air emission pollutants and water contaminants. • Air quality related health problems are respiratory diseases. • Transmission of vector-borne disease particularly dengue fever and dengue	• Proper traffic management. • Wet method to control dusts and good traffic management. • Implementation of safe work practises. • Clean water supply and proper solid waste disposal Project site is always clean and not being a potentially surface water holding area that can be mosquito breeding ground. • All wastes including construction waste and solid waste need to be collected, put in a closed container and stored in a proper area that is roofed. • The logistic of the machineries, construction equipment and materials is planned properly and maintained regularly to minimise the emission of dust. • Any cases involving infectious disease at site must be immediately reported to local District Health Office The project site sanitation must be kept at optimum level at all-time where all wastes must be disposed properly and provide enough toilet with clean water for the uses of workers at site. • Associated monitoring programs will be recommended to minimize the health impact of the project towards the community. • Proper plant operating conditions and operation shall be implemented. • Conduct ambient air quality monitoring. • All workers at site undergo health screening to avoid infectious disease epidemic. • Any cases involving infectious disease at site must be immediately reported to local District Health Office. • All the workers shall undergo necessary vaccination in accordance to relevant requirement (i.e. MOH). • Any complaints should be immediately investigated and necessary action should be taken. • Chemical Health Risk Assessment (CHRA) and a medical surveillance need to be carried out.

Activities	Environmental Aspect	Significant Potential Impacts	Pollution Prevention and Mitigation Measures
		haemorrhagic fever due to the availability of mosquito breeding places. • Communicable disease from foreign workers	• Training on safe manual handling and infectious disease protocols must be properly given to the workers handling chemical wastes.
	Waste Management	• Generation of scheduled waste such as residue (fly ash and bottom ash). • Generation of domestic wastes	<u>Scheduled Wastes</u> • Bottom ash will be contained in a proper container and sent to secure landfill for disposal or for co-processing subject to their waste acceptance criteria. • Fly ash will be contained in a proper container and sent to solidification facility or for co- processing subject to their waste acceptance criteria. • Fly ash will be contained in a proper container and sent to solidification facility or for co- processing subject to their waste acceptance criteria. • Scheduled wastes shall be stored in containers which are compatible with the scheduled wastes to be stored, durable and which are able to prevent spillage of the scheduled waste into the environment. • Establish Emergency Response Plan (ERP) framework detailing action required in case of spillage emergencies which shall be adhered strictly. • Spill response equipment must be available at all times at the waste reception area. • Ensure the use of durable container material and routine inspection of storage areas. • Incompatible scheduled wastes should be stored separately. • The SW storage area shall meet the proposed criteria and comply with all the requirement specified in the Environmental Quality (Scheduled Wastes) Regulations 2005. <u>Solid Wastes</u> • Waste minimisation, reusing and recycling should take place whenever possible.
Leachate treatment plant operation	Water Quality	• Deterioration of river quality due to discharge	• Water monitoring and audit programme shall be carried out to determine the levels of pollutants in the river. • Capping layer consisting of an impermeable layer shall be put in the used secure landfill cells. • The network of leachate collection pipes and leachate irrigated pipes shall be inspected regularly. • The leachate throughput will be regularly monitored A substantial and rapid fluctuation in this throughput would be investigated. • The LTP will incorporate monitoring program of influent and treated effluent quality.

Activities	Environmental Aspect	Significant Potential Impacts	Pollution Prevention and Mitigation Measures
Overall plant operation	Air Quality	• Principal pollutants emitted from the landfill operation will include PM, methane, non-methane organic compound and hydrogen sulphide. Operational air emissions will inevitably give rise to some increases in ambient downwind pollutant concentration. • Emission from standby generator set.	• Maintain the vegetative buffer around the Project site as natural barrier to filter airborne particulate matter. • Where possible, landfill activity shall be halted during adverse weather conditions with strong wind. • Landfill shall be properly compacted at all times and covered when the cells have reached its designed capacity, to reduce odour and pest issue. • Limiting the vehicles' speed limit within the landfill facility to 20 – 40 km/hr while the speed limit on the internal haul road (on the landfill) and treatment plant area to be 20 km/hr or less. • All trucks entering and leaving the Project site shall be covered. • All trucks shall be properly cleaned prior to leaving the Project site. • Visual observation on-site will allow for dust emission to be monitored on a regular basis If observation indicate that dust is being generated within the site, additional dust management techniques will be adopted (i.e. water trucks or spray water). • Regular maintenance of transportation vehicles. • Ensure that all drum lids are tightly closed, and storage facility is well ventilated at all times. • Workers are to wear proper PPE if hydrocarbon gases are present in the air. • Submission of written notification and declaration erection of Air Pollution Control System (APCS). • Air pollution control will be operated and supervised by competent person, Certified Environmental Professional in Scrubber Operation (CePSO). • Conduct ambient air quality monitoring.
	Soil Contamination	• Exposure of schedule waste to rainstorm might pollute the watercourses due to the generation of leachate. • Potential contamination of soil.	• Ensure no leftovers wastes i.e. all hazardous wastes present on-site shall be disposed of properly. • Reduce exposure of the site to the elements. • Conduct soil assessment at the decommissioned site to ensure that the soil / groundwater is not contaminated.
	Water Quality	• Sewage and surface runoff • Wastewater discharge • Spills and leaks	<u>Sewage and Surface Runoff</u> • Implement adequate sanitary facilities for on-site personnel according to the DOSH and SPAN requirements. • Oil water separators and grease traps should be installed and maintained as appropriate at garage/ workshops. • Stormwater shall be separated from leachate and sanitary wastewater streams in order to reduce the volume of wastewater to be treated prior to discharge. <u>Wastewater Discharge.</u> • Oil water separators and grease traps should be installed and maintained. • Stormwater shall be separated from leachate and sanitary wastewater stream.

Activities	Environmental Aspect	Significant Potential Impacts	Pollution Prevention and Mitigation Measures
			Increased Impervious Surface • Ensure that drainage channel is designed with enough capacity to accommodate the increased rainfall runoff. • Minimum drainage dimension should be constructed as compliance to Urban Stormwater Management Manual to cater for peak surface runoff. Spills and Leaks • Emergency response plan (ERP) shall incorporate the response to any chemical or oil spills on-site. • SW storage area to be constructed to prevent the unintentional release of hazardous substance and the accumulation of any liquid spills or fugitive vapours and gases. • Guidelines and procedures should be established for immediate clean up actions following any spillages of oil, fuel or chemicals
	Groundwater Quality	• Changes in permeability of the ground cause the changes in groundwater condition in terms of head and flow. • An increase of pollutant concentration that deteriorate the groundwater quality.	• Groundwater levels and quality in the Project site is to be regularly monitored via the installed monitoring wells. • Installation of high-quality engineered liners to prevent any possible leakage of leachate. Below the geomembrane liner, the bottom liner is equipped with leachate detection layer and compacted soil layer which provides additional protection for possible leachate intrusion to groundwater. • The proposed temporary scheduled waste storage area shall be designed and covered with concrete to prevent any leakages and infiltration of contaminants into the ground. • Install groundwater monitoring wells downstream of the landfills for monitoring purposes. • Install off-site groundwater monitoring wells downstream of the groundwater flow direction from the landfills for monitoring purposes. • Prepare a separate ERP in case of major spills or leakages
	Quantitative Risk Assessment	• Accidental fire, toxic dispersion and explosion due unintended releases of hazardous substances Safety risk to workers	• Safe or standard operating procedures should be established. • Establish an Emergency Response Plan (ERP) as tool for effective disaster or emergency management in case of an incident or accident. • Proper housekeeping at working area. • Operators to be provided with proper PPE (i.e. safety shoes, safety helmet, gloves, coverall, earplug, etc.). • "Strictly No Smoking" or "No Naked Fire" signage must be erected at landfills. • An Environmental, Safety and Health (ESH) committee which comply with the requirements of the Occupational Safety and Health (Safety and Health Committee) Regulations 1996 should be set up to oversee the overall ESH performance and compliance.
	Social Impact	• Disturbing of community health safety and surrounding environment quality. Increasing job opportunities	• The Project Proponent should engage with surrounding community to continuously provide accurate information of the project. • Project Proponent should consider undertaking Corporate Social Responsibility (CSR) for the affected community and workers. • Employment opportunities be given consideration to the locals. • Safe or standard operating procedures should be established especially for activities such as transportation of waste within the site and waste handling and storage; and • Emergency Response Plan (ERP) should be developed as tool for effective disaster or emergency management in case of an incident or accident.

Activities	Environmental Aspect	Significant Potential Impacts	Pollution Prevention and Mitigation Measures
		among local residents.	
	Noise Quality	• Noise generated from plant operation	• Carry out regular noise monitoring. • Select equipment that has low noise emission levels. • Use buildings to contain inherently noisy fixed plant equipment and consider use of sound-insulating materials in construction. • The plant shall be designed and constructed to reduce the operating noise level as much as possible. • Vehicles and forklifts should observe appropriate speed limits while entering and exiting the Project site. • Safety signage shall be installed to inform workers of areas with high noise level. • To ensure a safe and healthy workforce, proponent and its contractors shall provide workers who work in high noise level areas with adequate protective devices such as earmuffs or earplugs. • Exposure to high noise levels shall be managed and limited as prescribed in the Occupational Safety and Health (Noise Exposure) Regulations 2019.
	Traffic	Traffic impact encountered during the operational stage of this Project to the surrounding road networks	• All appointed contractors and sub-contractors shall comply with the safety procedures and regulations as stipulated by the Road Transport Department (RTD). • Speed limit and other traffic laws should be strictly observed. • Vehicular movements for transportation purposes and other associated activities, particularly heavy, slow- moving vehicles, should be avoided during peak traffic hours. • Regular maintenance of vehicles and use of manufacturer approved parts to minimise potentially serious accidents caused by equipment malfunction or premature failure. • All transporters of scheduled wastes shall be licensed transporter with DOE. • Movement and transfer of scheduled wastes shall be informed to DOE by waste generator, contractor and receiver for each time of transportation activities with the consignment note in the Sixth Schedule of Environmental Quality (Scheduled Wastes) Regulations 2005 or using the Electronic Scheduled Waste Information System (ESWIS). • Dry scheduled wastes must be well packed and should not be allowed to be moved while being transported. Used oil drums must be secured with plastic/ steel tape or band and/or stretch wrapped pallets to minimise the possibility of tipping over during transportation. • Transport vehicle must be correctly labelled to identify the corrosive and hazardous products being transported. • A minimum set of equipment necessary to combat any simple spillage or leakage problems should be provided and the transport team should be trained on how to use it. • Transporters should have a spill response plan in place in the event of spillage/ leakage while transporting. • Transportation should be carried out during minimal traffic time. • Personal protection equipment should be provided for the transport team and they should be trained in the use of the equipment, in the case of any accident. • Establish Emergency Response Plan (ERP) framework detailing action required in case of spillage emergencies. • Hazardous waste transport should always choose routes that minimise the risk of possible accidents or other specific problems.
	Odour Quality	• Unpleasant smell from the scheduled waste and leachate	• Maintain a strong growth of existing trees and/or plant rows of trees/shrubs along the secure landfill boundary to act as a buffer area to break winds to prevent entrainment of fugitive dust and reduce odour at sensitive receptors. • Applying adequate cover material sufficiently at the secure landfill, frequently and effectively. • The scheduled waste will be placed in proper and closed container based on its characteristics and compatibility to contain the odour.

Activities	Environmental Aspect	Significant Potential Impacts	Pollution Prevention and Mitigation Measures
			• Leachate Treatment Plant efficiency will be monitored regularly and all the equipment will be maintained to ensure its efficiency.
Abandonment	Safety and health impact	• Dismantling or demolition of the whole facilities, including covering and landscaping all the landfill cells. • Dismantling and removal of construction material from the site	• An abandonment plan shall be submitted to DOE at least three (3) months prior to project abandonment. In the event of abandonment, this plan is shall be followed closely to allow for a systematic and proper abandonment. • All scheduled wastes shall be properly disposed of at a licensed disposal facility upon Project abandonment. • Ample time should be allowed for the demolishing and removal of on-site equipment, machinery and building structure. • Appropriate cover vegetation to be established on cleared area to ensure no severe soil erosion. • All construction waste should be properly disposed by the Proponent such that it will not be a burden to the local council. • Conduct soil assessment at the decommissioned site to ensure that the soil / groundwater is not contaminated.

Note: The list is not exhaustive and not all the above may be relevant to the project depending on the scale, nature and location of the project.

EIA GUIDELINES

Waste Treatment & Disposal – Scheduled Waste

APPENDIX K

Proposed Monitoring Programme

APPENDIX K – PROPOSED MONITORING PROGRAMME

A) Construction Stage (Water Quality)

Type of Monitoring	Description	Proposed Parameter	Proposed Monitoring Frequency	Proposed Reporting Frequency	Compliance Limit	Reference
Water Quality						
Performance Monitoring (PM)	All P2M2 on-site: • Earth drains • Silt fence • Silt trap	Structural integrity, functionality, practicality and frequency of maintenance for all P2M2	Weekly After heavy rainfall	Quarterly	Design of P2M2 to comply with MSMA 2nd Edition specifications.	Urban Stormwater Management Manual Malaysia (MSMA 2nd Edition
Compliance Monitoring (CM)	Silt trap discharge	Total suspended solids (TSS)	Monthly		50 mg/l	-
		Turbidity	Monthly		250 NTU	
	Septic tank discharge	pH	Monthly		Limit values depends on the location of the project (upstream or downstream of the water intake point)	Environmental Quality (Sewage) Regulations 2009
		COD	Monthly			
		BOD	Monthly			
		TSS	Monthly			
		NH_3-N	Monthly			
		E. coli	Monthly			
Impact Monitoring (IM)	Beneficial users along the river within the ZOI.	TSS	Monthly		Limit values based on the river water class	National Water Quality Standards (NWQS)
		Turbidity	Monthly			
		Temperature	Monthly			
		pH	Monthly			
		DO	Monthly			
		BOD	Monthly			
		NH_3-N	Monthly			
		E. coli	Monthly			

Note: The list is not exhaustive and not all the above may be relevant to the project depending on the scale, nature and location of the project. The proposed monitoring frequency is subjected to the significance of the impact.

B) Construction Stage (Air Quality)

Type of Monitoring	Description	Proposed Parameter	Proposed Monitoring Frequency	Proposed Reporting Frequency	Compliance Limit	Reference
Air Quality						
Impact Monitoring (IM)	Nearby residential areas within ZOI	Particulate Matter < 10µm (PM_{10})	Monthly/Quarterly	Quarterly	100 µg/m^3 (24-hr)	Standard 2020 of the Malaysia Ambient Air Quality Standard (MAAQS) 2013

Note: The list is not exhaustive and not all the above may be relevant to the project depending on the scale, nature and location of the project. The proposed monitoring frequency is subjected to the significance of the impact.

C) Construction Stage (Noise)

Type of Monitoring	Description	Proposed Parameter	Proposed Monitoring Frequency	Proposed Reporting Frequency	Compliance Limit	Reference
Noise						
Compliance Monitoring (CM)	Noise at plant boundary	L_{10} (Day time 12-hr)	Monthly/Quarterly	Quarterly	80 dBA	Guidelines for Environmental Noise Limits and Control Third Edition, 2019.
Impact Monitoring (IM)	Nearby residential areas within ZOI	L_{10} (Day time 12-hr)	Monthly/Quarterly	Quarterly	75 dBA	

Note: The list is not exhaustive and not all the above may be relevant to the project depending on the scale, nature and location of the project. The proposed monitoring frequency is subjected to the significance of the impact.

D) Construction Stage (Vibration)

Type of Monitoring	Description	Proposed Parameter	Proposed Monitoring Frequency	Proposed Reporting Frequency	Compliance Limit	Reference
Vibration						
Impact Monitoring (IM)	Nearby residential areas and vibration sensitive areas within ZOI	Peak particle velocity (measured in three orthogonal x, y, z axes)	Monthly/ Quarterly	Quarterly	Limits based on the receiving land use category in the guideline	The Planning Guidelines for Vibration Limits and Control in the Environment, 2007

Note: The list is not exhaustive and not all of the above may be relevant to the project depending on the scale, nature and location of the project. The proposed monitoring frequency is subjected to the significance of the impact.

E) Operation Stage (Air Quality)

Type of Monitoring	Description	Proposed Parameter	Proposed Monitoring Frequency	Proposed Reporting Frequency	Limit	Reference
Air Quality						
Performance Monitoring (PM)	Bag filter	Pressure	Daily	Quarterly	Design specification	Technical Guidance on Performance Monitoring of Air Pollution Control Systems (APCS)
		Flowrate	Daily			
		Stack condition	Daily			
		Hopper condition	Daily			
	Wet scrubber	Gas flow	Daily			
		Pressure	Daily			
		Temperature	Daily			
		pH of liquor	Daily			
		Wet scrubber spray flowrate	Daily			
		Opacity/stack condition	Daily			
Compliance Monitoring (CM)	Stack emission	Total PM	Continuous*	Quarterly	100 mg/m^3	Item K, Waste Incinerators in All Sizes of the Environmental Quality (Clean Air) Regulations 2014
		NMVOC as total organic carbon	Continuous*		10 mg/m^3	
		Hydrogen chloride (HCl)	Continuous*		40 mg/m^3	
		Hydrogen fluoride (HF)	Continuous*		1 mg/m^3	
		Sum of SO_2 and SO_3 expressed as SO_2	Continuous*		50 mg/m^3	
		Sum of NO and NO_2 expressed as NO_2	Continuous*		200 mg/m^3	
		Carbon monoxide (CO)	Continuous*		50 mg/m^3	
		Cadmium and its compound, expressed as cadmium (Cd)	Quarterly		Total 0.05 mg/m^3	
		Thallium and its compound, expressed as thallium (Th)	Quarterly		Total 0.05 mg/m^3	
		Mercury and its compound, expressed as mercury (Hg)	Quarterly		0.05 mg/m^3	
		Antimony (Sb), Arsenic (As), Lead	Quarterly		Total 0.5 mg/m^3	

Type of Monitoring	Description	Proposed Parameter	Proposed Monitoring Frequency	Proposed Reporting Frequency	Limit	Reference
Air Quality						
		(Pb), Chromium (Cr), Cobalt (Co), Copper (Cu), Manganese (Mn), Nickel (Ni), Vanadium (V), and their compounds expressed as the element				
		PCCD/PCDF	Bi-annually	Bi-annually	0.1 ng TEQ/m^3	
Impact Monitoring (IM)	Sensitive receptors (residential within ZOI)	Odour	Monthly/Quarterly	Quarterly	-	-
		Particulate Matter < 10µm (PM_{10})	Monthly/Quarterly		100 µg/m^3 (24-hr)	Standard 2020 of the Malaysia Ambient Air Quality Standard (MAAQS) 2013
		Particulate Matter < 2.5µm ($PM_{2.5}$)	Monthly/Quarterly		35 µg/m^3 (24-hr)	
		Sulphur Dioxide (SO_2)	Monthly/Quarterly		80 µg/m^3 (24-hr)	
		Nitrogen Dioxide (NO_2)	Monthly/Quarterly		70 µg/m^3 (24-hr)	
		Ground Level Ozone (O_3)	Monthly/Quarterly		180 µg/m^3 (1-hr)	
		Carbon Monoxide (CO)	Monthly/Quarterly		30 mg/m^3 (1-hr)	

Notes:

1. *Averaging time for continuous monitoring is 30 minutes.
2. The list is not exhaustive and not all the above may be relevant to the project depending on the scale, nature and location of the project.
3. The proposed monitoring frequency is subjected to the significance of the impact.

F) Operation Stage (Water Quality)

Type of Monitoring	Description	Proposed Parameter	Proposed Monitoring Frequency	Proposed Reporting Frequency	Limit	Reference
Water Quality						
Performance Monitoring (PM)	✓ Leachate Treatment Plant (LTP) discharge ✓ Industrial Effluent Treatment System (IETS) discharge	pH Turbidity DO Pressure	Daily	Quarterly	Design specification	Guidance Document on Performance Monitoring of Industrial Effluent Treatment Systems (IETS)
		MLSS TSS	Weekly			
Compliance Monitoring (CM)	✓ Leachate Treatment Plant (LTP) discharge ✓ Industrial Effluent Treatment System (IETS) discharge	Temperature	Monthly/Quarterly	Quarterly	LTP: Discharge shall comply to the limits prescribed by the Director General of Environmental Quality. IETS: Limit values depends on the location of the project (upstream or downstream of the water intake point)	IETS: Environmental Quality (Industrial Effluent) Regulations 2009
		pH Value	Monthly/Quarterly			
		Biochemical Oxygen Demand (BOD5) at 20°C	Monthly/Quarterly			
		Chemical Oxygen Demand (COD)	Monthly/Quarterly	Quarterly		
		Suspended Solids	Monthly/Quarterly			
		Ammoniacal Nitrogen	Monthly/Quarterly			
		Mercury	Monthly/Quarterly			
		Cadmium	Monthly/Quarterly			
		Chromium Hexavalent	Monthly/Quarterly			
		Chromium Trivalent	Monthly/Quarterly			
		Arsenic	Monthly/Quarterly			
		Cyanide	Monthly/Quarterly			
		Lead	Monthly/Quarterly			
		Copper	Monthly/Quarterly			
		Manganese	Monthly/Quarterly			
		Nickel	Monthly/Quarterly			
		Tin	Monthly/Quarterly			
		Zinc	Monthly/Quarterly			
		Boron	Monthly/Quarterly			
		Iron	Monthly/Quarterly			
		Silver	Monthly/Quarterly			
		Selenium	Monthly/Quarterly			

Type of Monitoring	Description	Proposed Parameter	Proposed Monitoring Frequency	Proposed Reporting Frequency	Limit	Reference
Water Quality						
		Barium	Monthly/Quarterly			
		Fluoride	Monthly/Quarterly			
		Formaldehyde	Monthly/Quarterly			
		Phenol	Monthly/Quarterly			
		Sulphide	Monthly/Quarterly			
		Oil and Grease	Monthly/Quarterly			
		Colour	Monthly/Quarterly			
Impact Monitoring (IM)	Beneficial users along the river within the ZOI.	Ammoniacal Nitrogen	Monthly/Quarterly	Quarterly	Limit values based on the river water class	National Water Quality Standards (NWQS)
		Biochemical Oxygen Demand (BOD)	Monthly/Quarterly			
		Chemical Oxygen Demand (COD)	Monthly/Quarterly			
		Dissolved Oxygen (DO)	Monthly/Quarterly			
		pH	Monthly/Quarterly	Quarterly		
		Temperature	Monthly/Quarterly			
		Total Suspended Solid (TSS)	Monthly/Quarterly			
		Oil & Grease	Monthly/Quarterly			
		Cadmium (Cd)	Monthly/Quarterly			
		Arsenic (As)	Monthly/Quarterly			
		Lead (Pb)	Monthly/Quarterly			
		Chromium (Cr)	Monthly/Quarterly			
		Zinc (Zn)	Monthly/Quarterly			
		E. coli	Monthly/Quarterly			

Note: The list is not exhaustive and not all the above may be relevant to the project depending on the scale, nature and location of the project. The proposed monitoring frequency is subjected to the significance of the impact.

G) Operation Stage (Noise)

Type of Monitoring	Description	Proposed Parameter	Proposed Monitoring Frequency	Proposed Reporting Frequency	Compliance Limit	Reference
Noise						
Performance Monitoring (PM)	-	-	-	-	-	-
Compliance Monitoring (CM)	Noise at plant boundary	L_{Aeq}	Monthly/Quarterly	Quarterly	70 dBA (daytime) 65 dBA (night time)	Guidelines for Environmental Noise Limits and Control Third Edition, 2019.
Impact Monitoring (IM)	Nearby residential areas within ZOI	L_{Aeq}	Monthly/Quarterly	Quarterly	Limits based on the density of the residential area	

Note: The list is not exhaustive and not all the above may be relevant to the project depending on the scale, nature and location of the project. The proposed monitoring frequency is subjected to the significance of the impact.

ISBN 978-983-9795-43-1