

## CHAPTER 9 ENVIRONMENTAL MANAGEMENT PLAN

### 9.0 INTRODUCTION

A good environmental management framework is needed to ensure that a proper system is in place to address, communicate and manage the environmental issues and concerns that have been identified. Relevant mitigating measures will be implemented and monitored by the relevant parties. In addition to this, communication with the relevant stakeholders is vital, in view of the potential impacts that are likely to affect certain groups of communities during the construction stage.

The environmental framework will address the environmental monitoring and auditing requirements. Listed in this chapter are monitoring and auditing requirements in terms of environmental quality (water quality, noise level, vibration level and air quality), along with the implementation of the pollution prevention and mitigation measures proposed in the EIA. The Environmental Management Plan (EMP) will be prepared for the Project and submitted to the Department of Environment (DOE) for approval. Only after the EMP has been approved will the construction works commence. The EMP shall be prepared according to the format and requirements specified in Chapter 6 - Post Submission Stage of EIA Report in the Environmental Impact Assessment Guideline Malaysia 2016.

The EMP is a concrete plan of action which is explicit, illustrative, action-oriented, time-bound and definitive. It should include the structure, manpower and specific responsibilities of personnel, including the following:

1. Liaising with the authorities on environmental related matters;
2. Submission of report on environmental performance;
3. Coordinating environmental training and awareness;
4. Preventing non-compliances;
5. Identifying and recording environmental problems and issues;
6. Controlling non-conformances until they have been mitigated and corrected;
7. Implementation of corrective actions.

## 9.1 OBJECTIVES OF THE EMP

The objectives of the EMP for the Project are to:

1. Provide the basis for the Project Proponent's environment management programme, demonstrating that environmental impacts can be managed well;
2. Ensure effectiveness of the environmental protection measures proposed;
3. Ensure the Project's compliance with the overall Project environmental objectives;
4. Translate the pollution prevention and mitigation measures (P2M2s) recommended in the EIA Report and the approval conditions (COAs) into action; and
5. Specify in detail the pollution prevention and mitigation measures (P2M2s) that will be implemented in order for the Project activities to be compliant with the COAs.

The EMP is a living document and shall be revised and updated when there exists certain circumstances which require changes to be made, including changes to project details and surrounding areas and inadequacy of the control measures to comply with regulatory standards.

## 9.2 COMPLIANCE WITH RELEVANT ENVIRONMENTAL REQUIREMENTS

The EMP includes the legislative requirements that need to be observed and complied with, including but not limited to the following:

1. Environmental Quality Act and its subsidiary regulations;
2. Environmental Guidelines relevant to the Project issued by DOE; and
3. Conditions of Approval for the Project issued by authorities.

## 9.3 GUIDED SELF REGULATION THROUGH ENVIRONMENTAL MAINSTREAMING TOOLS

The Project Proponent is committed to mainstreaming environmental protection into the Project and implementing guided self-regulation (GSR) to ensure the quality of the environment is protected during the construction and operation of the Pan Island Link 1 (PIL1) Highway. The implementation of environmental mainstreaming is to promote and instil self-regulation that will be translated into regulatory requirements on performance and compliance monitoring of pollution control measures, scheduled reporting, record keeping, competent persons and involvement of environmental professionals in specific roles.

The purposes of GSR are to:

1. Ensure the Project Proponent's commitment/initiatives for further improvement;
2. Ensure the Project Proponent provides competent persons at all levels of the organizational structure;
3. Comply with standards and guidelines;
4. Set a trend status of performance monitoring data;
5. Take immediate corrective actions; and
6. Conduct further investigation to find root causes of non-compliances, in order to prevent non-compliances.

As the owner of the Project, the Penang State Government together with the Project Delivery Partner is committed to instituting effective pollution prevention and mitigation measures (P2M2) and regulatory compliance at all stages of project implementation. Self-regulation is an important aspect of good governance, and therefore the Project Proponent will ensure organizational commitment to environmental regulatory compliance by all personnel and at all levels of the Project organization, including its consultants, contractors, suppliers and all other parties involved in the Project implementation. Competent persons will be appointed to operate the various pollution control and waste management systems of the Project.

Implementation of GSR involves three main parties, namely the DOE, Project Proponent and Environmental Consultant. The Project Proponent shall comply with all statutory requirements while the Environmental Consultant shall verify the implementation of the Project in accordance with the EIA Conditions of Approval (COAs). The DOE shall facilitate the Project Proponent to further improve the COAs and its compliance.

The Environmental Mainstreaming tools specified in the Environmental Mainstreaming Directive issued by the DOE on 1 June 2017 are listed below and described in the following subsections:

1. Environmental policy (EP)
2. Environmental budgeting (EB)
3. Environmental monitoring committee (EMC)
4. Environmental facility (EF)
5. Environmental competence (EC)
6. Environmental reporting and communication (ERC)
7. Environmental transparency (ET)

### 9.3.1 Environmental Policy (EP)

The Penang State Government as the Project Proponent and their Project Delivery Partner (PDP) shall commit to be the industry leader in Quality, Safety, Health and Environment (QSHE) by providing timely delivery of quality products/services, safe and healthy working conditions and environmentally sustainable and responsible approach to their business. Their policy states that they aim to:

1. Meet the needs and expectations of their customers and other stakeholders
2. Comply with or exceed the relevant legal and other requirements;
3. Prevent safety and health incidents and environmental pollution; and
4. Continual improvement of QSHE management system and performance.

Their drives are to:

1. Integrate QSHE requirements into their business processes;
2. Inculcate a self-regulation mindset by taking personal ownership;
3. Walk the talk by all employees;
4. Adopt open and honest communication;
5. Foster real teamwork; and
6. Develop their people.

### 9.3.2 Environmental Budgeting (EB)

Sufficient funding will be allocated for the purpose of implementing measures to comply with environmental regulations and environmental mitigation measures. The budget allocation will include the installation of pollution control facilities, setting up of mini laboratory facilities, provision of personnel and purchase of performance monitoring equipment during construction stage, as well as budget for pollution control and waste management during the operational phase. The environmental budget for each of the packages will be detailed in the EMP Report.

### 9.3.3 Environmental Monitoring Committee (EMC)

An Environmental Management Committee (EMC) shall be established by the Project Proponent to ensure all the proposed P2M2 are implemented accordingly and to promote collective responsibility. The EMC is responsible for identifying best management practices and provide counsel on how to integrate these into the environmental compliance programme. In general, there are two types of EMC, which consist of:

## 1. Environmental Regulatory Compliance Monitoring Committee (ERCMC)

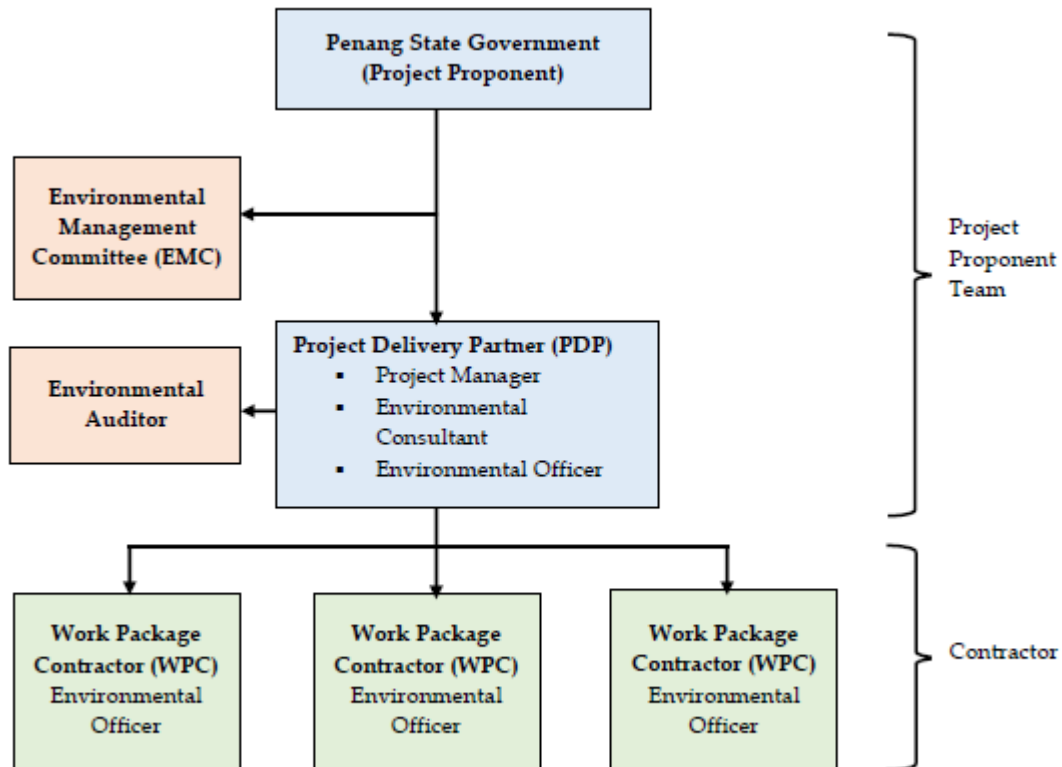
- i. Focusing on compliance of environmental regulations to optimize and further improve environmental aspects of the Project (at the policy level);
- ii. Chaired by the chief executive officer or chairman of the Project Proponent; and
- iii. Meetings shall be held at a minimum of four times a year.

## 2. Environmental Performance Monitoring Committee (EPMC)

- i. Focusing on environmental performance and effectiveness of the proposed P2M2 measures (at the working level);
- ii. Chaired by a senior officer from the Project Proponent; and
- iii. Meetings shall be held at a minimum of four times a year.

It is proposed for the Penang State Government and the PDP to set up the EMC for regulatory compliance and performance monitoring of the Project together with the roles and responsibilities of key personnel who will oversee the Project implementation (**Figure 9.1**). The environmental management structure will comprise of representatives from the Penang State Government, PDP, Work Package Contractor (WPC), environmental consultant, environmental officer (EO) and other relevant technical individuals for the Project. This structure may be amended and/or updated from time to time. The Project Proponent shall provide an office for Environmental Management on site. Environmental requirements must be stipulated in the tender documents to ensure that all environmental requirements will be addressed by the relevant WPC.

**Figure 9.1. Environmental Management Structure**



### 9.3.3.1 Penang State Government

The Penang State Government is the ultimate owner of the Project and the highest decision-making party in the Project. A steering committee headed by State Executive Councillor has been formed as the highest decision-making body for the Project. The steering committee will delegate some of its authority to a Special Purpose Vehicle (SPV) to oversee the day to day operation of the Project.

### 9.3.3.2 Project Delivery Partner

The Project Delivery Partner (PDP) is employed by the State Government to manage day to day operation of the Project. The PDP is tasked with implementation of all the measures in the EMP and supervision to ensure the Work Package Contractor (WPC) adheres to the Conditions of Approval (COA) and all environmental regulations. The PDP will be assisted by Environmental Consultant (EC) and Environment Officer (EO) to carry out its duty.

### 9.3.3.3 Environmental Officer

The Environmental Officer (EO) is responsible for matters directly relevant to the environmental components of the Project and on matters concerning the implementation of the EMP throughout each phase of the Project. The EO must be a competent person certified by DOE with relevant qualifications.

The EO will be responsible for the following:

1. Conducting a thorough initial site inspection of environmental controls prior to commencement of work;
2. Attending EMC meetings as required;
3. Supervising works on installed/implemented P2M2 and BMPs according to specifications which are suitable for the condition of the Project site and the Project's environmental management;
4. Updating the Site Daily Logbook;
5. Carrying out daily inspections of the P2M2;
6. Maintaining all environmental-related documents and information;
7. Liaising with local authorities on environmental issues;
8. Investigating environmental problems, complaints and non-compliance with regulatory and EIA requirements and reporting to the EMC and DOE, if required;
9. Holding site meetings every two weeks with the Project Proponent and WPC;
10. Conducting in situ measurements where necessary;
11. Verifying compliance with the COA for various authorities;
12. Preparing the Environmental Performance Monitoring Document;
13. Submitting environmental control and progress reports and Performance Monitoring Reports on a regular basis.

The EO shall investigate any environmental issues that occur on site during the Project construction period and be able to recommend or carry out actions to prevent the issue(s) from recurring. The EO must also ensure that the work area is clean, safe, well-maintained and environmentally friendly. In addition the EO will assist the Environmental Consultant to carry out monthly environmental monitoring activities.

### 9.3.4 Environmental Facility (EF)

The Environmental Facility (EF) ensures that the Project is equipped with the necessary basic equipment to monitor important components of the environment, in order to enhance the effectiveness of environmental monitoring and enable prompt action to be taken in the event of any non-compliance. The WPC shall provide and maintain the necessary mini laboratory equipment on site to facilitate *in-situ* measurements of basic environmental parameters such as turbidity or total suspended particulates. The exact requirements for *in-situ* measurements shall be detailed in the EMP. The assessment of the adequacy of the EFs installation and their effectiveness in complying with the regulatory standards and requirements or conditions approval will be rated and documented as part of the Guided Self-Regulation (GSR).

### 9.3.5 Environmental Competency (EC)

Environmental professionals (Environmental consultant, environmental auditor and environmental officer) who have been certified as competent persons by the DOE are the responsible individuals to supervise the environmental management of the Project. The individuals are required to go through the certification processes for competent persons, including:

1. Registered Environmental Consultant by DOE;
2. Registered Environmental Auditor by DOE;
3. Certified Erosion, Sediment and Storm Water Inspector (CESSWI); and
4. Certified Environmental Professional in Scheduled Waste Management (CePSWaM)

Competent persons will be appointed to operate the various pollution control and waste management systems of the Project. In addition, a comprehensive training program to produce competent persons and trained support staff will be provided to ensure full compliance with the DOE requirements. The names of the competent persons and the training plans will be submitted to DOE.

The monitoring program will be supervised by competent personnel who are able to understand, interpret and analyse the results in relation to the on-going construction works or possible external factors that leads to any non-compliances.



### 9.3.6 Environmental Reporting and Communication (ERC)

Environmental reporting will be ongoing throughout the various stages of the Project. The main objective is to document environmental status/progress and ensure that issues arising from each of the work packages are taken care of.

The reports are prepared to monitor and regulate the actions being taken to manage the Project's impacts on the environment. Reports will be prepared by PDP for submission to DOE to fulfill the environmental legal requirements. Reports will also be prepared by PDP for submission to the Penang State Government.

PDP will be responsible to ensure that each WPC prepares and submits the relevant environmental reports for submission to the state government and to DOE. Such reporting will assist in the effectiveness of the EMP, LD-P2M2 and other mitigating measures being implemented as well as in terms of monitoring compliance.

#### 9.3.6.1 External Reporting

Environmental reports for regulatory compliance will be prepared at various levels of the Project. Within the environmental management structure of the Project, the environmental reporting consists of two stages which are:

- preparation of reports by WPCs for submission to the Project Proponent Team to fulfill contractual requirements.
- preparation of reports by the Project Proponent Team for submission to DOE to fulfill the environmental legal requirements and EIA Conditions of Approval.

The main objective of the environmental reporting is to document environmental status/progress and any issues arising from each work package to ensure that specific actions can be carried out. The types of reports prepared are as tabulated in **Table 9.1**.

The PDP will be responsible to ensure that each WPC prepare and submit relevant environmental reports for submission to the DOE. Such reporting will assist not only in terms of monitoring compliance but also effectiveness of the EMP, LD-P2M2 and other mitigating measures that are being implemented.

**Table 9.1.** Types of Environmental Reports and Submission Responsibility

Types of Report	Responsibility	
	WPC	Project Proponent Team
1. Master EMP prepared by Environmental Consultant	N/A	Review and submit to DOE
2. Master ESCP prepared by Consultant	N/A	Review and submit to DID
3. Work Package Specific Baseline Environmental Monitoring Report	Prepare the report	Review, compile & submit to DOE
4. Work Package Specific EMP	Prepare the report	Review, compile & submit to DOE
5. Work Package Specific Erosion Sediment and Control Plan / LD-P2M2	Prepare the ESCP / LD-P2M2	Review, compile & submit to DID / DOE
6. Weekly online BMPs inspection (soil erosion and sedimentation measures)	Prepare and submit to DOE	-
7. Quarterly Monitoring Report for submission to DOE	Prepare the report	Review, compile & submit to DOE
8. EIA 1-08 and 2-08 every quarter	Prepare the report	Review, compile & submit to DOE

### 9.3.6.2 Internal Reporting

In accordance to the DOE's guided self-regulation requirements, internal environmental reports will be prepared during the Project's construction stage, including:

- Environmental Performance Monitoring Document (EPMD)
- Performance Monitoring Report (PMR)

### Environmental Performance Monitoring Document

Before the commencement of site works for each construction package, the Environmental Officer (EO) will prepare the Environmental Performance Monitoring Document (EPMD). The EPMD will describe in detail how the contractor will comply with the EIA Conditions of Approval (COA) as well as ensuring that all the P2M2 are functioning and effective in mitigating the impacts. The details will include, among others, performance monitoring equipment/ instruments, sampling protocols and analysis, monitoring parameters, sampling frequency, preventive and corrective maintenance procedure for the P2M2, discharge

compliance, record keeping and others. The EPMD will also include Compliance Monitoring (CM) and Impact monitoring (IM), wherever relevant.

### Performance Monitoring Report

Environmental monitoring will be conducted as specified in the EPMD and the findings or results obtained from the monitoring exercise will be discussed in the Performance Monitoring Report (see templates in **Figure 9.2** and **Figure 9.3**). The results or findings will be analysed and evaluated to gauge the effectiveness of the P2M2 implemented at the site. Comparison will be made against the recommended standards or guidelines. Statistical techniques and graphical presentations of the results will be prepared wherever appropriate. The PMR will also make definitive conclusions on the overall performance of the P2M2 and suggest improvement measures to be taken, if necessary. The PMR will be submitted to the EPMC of the Project and the document shall be kept and maintained for inspection by DOE officers.

#### 9.3.6.3 Communication Channels

The Penang State Government and PDP have established and will maintain several channels for stakeholders and the public to provide feedback or lodge complaints (**Table 9.2**).

**Table 9.2.** Communication Channels

Channels	Description
SRS Hotline (1-800-88-6393 )	<ul style="list-style-type: none"> <li>• 24-hour hotline service</li> <li>• Once the complaints are registered in the system, steps will be taken to resolve the issue according to Standard Operating Procedures (SOP)</li> </ul>
PTMP Email	<ul style="list-style-type: none"> <li>• pgmasterplan@penang.gov.my</li> </ul>
PTMP Website	<ul style="list-style-type: none"> <li>• pgmasterplan.penang.gov.my</li> </ul>
PTMP Information Centre	<ul style="list-style-type: none"> <li>• To provide information on PTMP</li> <li>• To gather feedback from the public</li> </ul>
Engagement with Stakeholders	<ul style="list-style-type: none"> <li>• Engagement sessions could be in the form of town-hall, group meetings or one-on-one discussions</li> <li>• Information to be shared at the engagement sessions</li> </ul>

These communication channels must be maintained well so that any feedback or complaints regarding adverse impacts on the surrounding environment can be addressed immediately and efficiently.

### **9.3.7 Environmental Transparency (ET)**

The best option to implement the environmental transparency (Environmental Sustainability Report / Web site / Billboards/ fliers, etc.) will be taken into consideration and implemented at a later date during construction and operation stages. Environmental sustainability reporting is proposed to be incorporated into the company's corporate reporting.

### **9.3.8 Environmental Mainstreaming Tools Compliance Report**

The Environmental Mainstreaming Tools Compliance Report (EMT Compliance Report) will be submitted to the DOE, at least thirty days before the commencement of work on site. The example of the template is shown in **Figure 9.4**.

**Figure 9.2.** Performance Monitoring Report Template

<b>PAN ISLAND LINK 1 (PIL1) PROJECT</b> <b>NAME OF THE CONTRACTOR</b> <b>Contract No:</b> <b>LD-P2M2 COMPONENTS (e.g. silt trap, hydroseeding)</b>						
						Date :
<u>DESCRIPTION OF MAINTENANCE</u>						
<div style="border: 1px solid black; width: 100%; height: 100%; display: flex; align-items: center; justify-content: center;"> Photo and Description </div>						
<u>PURPOSE OF MAINTENANCE</u>						
<div style="border: 1px solid black; width: 100%; height: 100%; display: flex; align-items: center; justify-content: center;"> Photo and Description </div>						
NOTE:						
ITEM	MATERIAL/EQUIPMENT USED	UNIT	QUANTITY		REMARKS	PHOTO
1.						
2.						
3.						
4.						
<b>Person carrying out maintenance:</b>  <b>Name:</b>  <b>Date:</b>  <b>Signature:</b>		<b>Name of the Environmental Officer:</b>  <b>Name:</b>  <b>Date:</b>  <b>Signature:</b>		<b>Name of the contractor:</b>  <b>Name:</b>  <b>Date:</b>  <b>Signature:</b>		

**Figure 9.3.** Performance Monitoring - Environmental Control Measures Template

<div style="border: 1px solid black; padding: 5px; margin-bottom: 10px;"> Date of ELA Approval:  Condition of Approval (COA) Ref. No. :  Date of EMP Approval:  EMP Approval Ref. No. :  Date of ESCP Approval:  ESCP Approval Ref. No. : </div>										
No	Location	Control Measure	Provision		Status (Installation)	Response From Contractor	Observations/Findings/ Suggestions (Last Inspection - Date)	Observations/Findings/ Suggestions (Recent Inspection - Date)	Observations/Findings/ Suggestions (Latest Inspection - Date)	Accepted (✓/X)
			ESCP	Actual						
<b>A. Silt Trap And Vicinity Area</b>										
1.	Location A	Silt Trap No.			Installation Date :  Status:  Last Maintenance Date :	Proposed Action / Action Taken:  Next Maintenance Date:	Observation:  Suggestions/ Recommendations:	Observation:  Suggestions/ Recommendations:	Observation:  Suggestions/ Recommendations:	
2.	Location B									

**Figure 9.4.** Environmental Mainstreaming Tools (EMT) Compliance Report

EMT		Date of Implementation	Self-assessment strength of EMT	Comments (if any)
Environmental Policy EP				
Environmental Budgeting EB				
EMC Environmental Monitoring Committee	EPMC			
	ERCMC			
EF Environmental Facility	BMPs			
	IETS			
	APCS			
	SWMI			
	LABF			
	PMI			
	Others			
EC Environmental Competency	CSEC			
	CePIETSO			
	CePSWAM			
	CePSO			
	CeBFO			
	Others			
ERC Environmental Reporting and Communication	CC			
	DA			
	IR			
	Others			
ET Environmental Transparency	ESR			
	WS			
	BB			
	FL			

**Note.** Explanatory notes for filling out the *Environmental Mainstreaming Tools Compliance Table* is described in the DOE Malaysia web-site (Ref.: **DOE Environmental-Mainstreaming-and-EMT-Compliance-report.pdf**)

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## 9.4 ENVIRONMENTAL MONITORING PROGRAMME

To ensure that the Project Proponent is able to monitor the effectiveness of the environmental protection measures, an Environmental Monitoring Programme will be implemented during the construction and operation stage. The monitoring programme will include the following components:

- Water Quality Monitoring
- Noise and Vibration Monitoring
- Air Quality Monitoring

The monitoring can be further categorized into Performance Monitoring (PM), Compliance Monitoring (CM) and Impact Monitoring (IM), which are discussed in the following subsections.

### 9.4.1 Performance Monitoring (PM)

Performance monitoring aims to ensure that the implemented mitigating measures are functioning at optimum levels. This includes preventive and corrective maintenance of any equipment or material used, so that its function is not compromised.

#### 9.4.1.1 Water Quality

Impacts on water quality are caused by soil erosion and sedimentation. Performance monitoring would involve monitoring of silt traps, temporary earth drains, check dams, temporary slope protection, turfing and silt fences at the construction locations and making sure that they are not damaged or faulty. After a certain period of time, these might not be functioning optimally and so it will be necessary to replace or repair them. This monitoring should be carried out on:

- a daily basis by the Environmental Officer or
- after the occurrence of heavy rain.



#### 9.4.1.2 Noise and Vibration

To ensure that the noise levels emitted from construction activities do not cause a disturbance, temporary noise barriers should be installed. These barriers need to be monitored throughout the construction period so that they function optimally and effectively decrease the noise levels.

Diesel generator sets are a source of noise and so should be enclosed in acoustic enclosures which are fitted with silencers at the exhaust and at the air intake. These noise emitting and noise dampening equipment should be maintained and serviced regularly.

As for vibration levels, soil trenches should be created to minimize surface wave propagation from piling and other ground borne vibration impacts such as heavy vehicles. These soil trenches must then be maintained throughout the construction activity period. Diaphragm sheet piles are another way of reducing vibration propagation and must be maintained and replaced if needed.

#### 9.4.1.3 Air Quality

Air pollution from construction activities arises mainly from dust emission at the viaduct and interchange construction. Dust levels will increase during the site clearing and earthworks stage from the movement of construction vehicles. Other contributors are combustion emission due to vehicular movement and construction machinery.

To minimize the impacts, hoarding or equivalent barriers should be provided around the construction area. Areas that are cleared for open spaces, e.g. tunnel portal, must be turfed as soon as possible and there should be regular water spraying of the haul road and of uncovered stockpiles that could emit dust. These hoarding and turfing must be maintained well to control the dust emission from the construction site.

With regards to the construction vehicles, all entry or exit points should have a wheel washing facility to ensure that the public roads used are clean and free from construction dirt (earth, debris, etc.). Very importantly, fuel-efficient and well-maintained haulage trucks must be used to minimize exhaust emissions. Smoke belching vehicles and equipment should strictly not be allowed and removed from the project area. The wheel washing facility and vehicles must be monitored to maintain good functionality.

#### 9.4.2 Compliance Monitoring (CM)

Compliance monitoring will be carried out to ensure that the EIA conditions of approval (COAs) are complied with during construction. It will involve the monitoring of discharges and emissions from all work sites during the construction of all PIL1 components and support facilities such as the Batching Plant, Crusher Plant, Casting Yard and the CLQ.

##### 9.3.2.1 Water Quality

For the PIL1 Project, the parameters to be monitored are as indicated in **Table 6.1.22**. The sampling and analysis should be carried out by a “Skim Akreditasi Makmal Malaysia” (SAMM) accredited laboratory on a monthly basis.

A registered chemist shall sign the results from the laboratory. As required under the Environmental Quality Act (1974), the analytical methods used shall be in accordance to the latest edition of ‘Standard Methods for the Analyses of Water and Wastewater’.

##### 9.4.2.2 Noise and Vibration

To ensure compliance to DOE noise and vibration acceptance limits for construction activities in residential areas, there will be noise and vibration monitoring during piling activities. Noise from construction activities shall comply with recommended noise limits as stipulated in DOE’s Guidelines for Environmental Noise Limits and Control (2007), Annex A, Schedule 6. The maximum permissible sound levels (percentile L90) for residential areas are 60 dBA during day time (7AM – 7PM) and 55 dBA during evening (7PM – 10PM) while for commercial areas it is 65 dBA during day time and 60 dBA during evening. During night time (10PM – 7AM) the maximum permissible sound level (LAeq) is 45 dBA for suburban residential and 50 dBA for urban residential areas.

##### 9.4.2.3 Air Quality

Air quality monitoring will be carried out to ensure compliance with the Malaysian Ambient Air Quality Standards (MAAQS). The MAAQS 24-hour concentration limits are  $150 \mu\text{g}/\text{m}^3$  for  $\text{PM}_{10}$  and  $75 \mu\text{g}/\text{m}^3$  for  $\text{NO}_2$ . As for CO, the MAAQS limit is  $35 \text{ mg}/\text{m}^3$  for 1-hour averaging time. For the PIL1 Project, the parameters to be monitored are TPM,  $\text{PM}_{2.5}$ , CO, and  $\text{NO}_2$ .

### 9.4.3 Impact Monitoring (IM)

Impact monitoring will be conducted to verify that the potential impacts identified during the EIA study are correct and prevention measures are properly implemented. This is to ensure that the measures are effective in mitigating the adverse impacts to the environment.

#### 9.4.3.1 Water Quality

Water quality monitoring during the construction stage will include river water quality (notably Sg. Ara and Sg. Kluang) and marine water quality (Sg. Kluang estuary) during the construction of the viaducts and interchanges.

Exact locations of the water quality monitoring locations will be determined at the Master EMP or Site Specific EMP for each work package. There will be two kinds of monitoring; river water quality monitoring, marine water quality monitoring and silt trap discharge monitoring.

The baseline river and marine water quality monitoring stations in the EIA can be used as guidance (**Table 6.1.21**). The frequency shall be at monthly intervals and the parameters follow those in **Table 6.1.22**.

#### 9.4.3.2 Noise and Vibration During Construction

The exact locations for noise and vibration monitoring stations during the construction stage will be determined at a later stage, during the preparation of the Master EMP or Site Specific EMP. This is because the specific locations cannot be determined as it largely depends on the types of construction activities and its locations. The monitoring strategy involves the permanent monitoring of noise emissions at work sites and the periodic monitoring of noise and vibration levels at all sensitive areas.

The baseline noise and vibration monitoring stations in the EIA can be used as guidance.

Construction works of viaducts and interchanges typically involve piling works progressing in a linear run manner, from a pier to the subsequent pier. On this basis semi-permanent noise and vibration monitoring units shall be used to continuously permanently monitor piling works so that noise and vibration levels throughout the piling process are obtained. The monitoring shall track the piling machines with monitoring to be undertaken at the nearest receptors. Periodic

monitoring (typically on a monthly basis) shall be undertaken for ambient noise and vibration of general construction activities and road traffic noise.

Overall, baseline measurements, applicable to the different type of works sites, shall be undertaken at all noise sensitive receptors located in close proximity of the work sites over and above noise monitoring locations conducted in this EIA to establish the prevailing noise and vibration climate prior to commencement of construction (i.e. immediately upon site possession by the Works Package Contractors).

These baseline levels shall be used for assessment of noise and vibration levels in addition to limits prescribed in the respective Schedules of the DOE Noise and Vibration Guidelines. The noise levels ( $L_{eq}$ ), statistical percentile  $L_{10}$ ,  $L_{90}$  and instantaneous maximum  $L_{max}$  levels for daytime and night time shall be reported.

#### 9.4.3.3 Air Quality

During the construction stage, the main air pollutants that would be emitted are particulates from earthworks, vehicle and machinery engine exhaust and the movement of construction vehicles.

The exact locations of the air quality monitoring locations along the alignment will be determined at the Master EMP or Site Specific EMP preparation. The baseline air quality monitoring stations in the EIA can be used as guidance. The parameter of monitoring is proposed in **Table 6.1.15**.

### 9.5 ENVIRONMENTAL AUDITING

Environmental third party site audits will be carried out to identify any non-compliance with the EIA/EMP requirements as well as put a stop to practices that could be contributing towards the deterioration of noise, water and air quality. The third party audit will be carried out every four months during the construction phase by DOE registered Auditors.

**Table 9.3.** Proposed Monitoring Programme

Monitoring Components	Location	Frequency	Parameters	Compliance Level	Reporting Requirements
<b>Construction Stage</b>					
<b>Noise and Vibration</b>	<b>Performance Monitoring</b> <ul style="list-style-type: none"> <li>Temporary hoarding, maintenance of the vehicles</li> </ul>	<ul style="list-style-type: none"> <li>Continuous monitoring (during piling works) at areas of concerns, or</li> <li>Weekly</li> </ul>	<ul style="list-style-type: none"> <li>Structural integrity, functionality, practicality and frequency of maintenance</li> </ul>	<ul style="list-style-type: none"> <li>Comply with the EIA approval conditions</li> <li>Environmental Management Plan (EMP)</li> </ul>	<ul style="list-style-type: none"> <li>Weekly reporting on Performance Monitoring Report (PMR)</li> </ul>
	<b>Compliance and Impact Monitoring</b> <ul style="list-style-type: none"> <li>48 locations tabulated in <b>Table 6.1.19</b></li> </ul>	<ul style="list-style-type: none"> <li>Continuous monitoring (during piling works) at areas of concerns.</li> <li>Quarterly (after piling works completed)</li> </ul>	<ul style="list-style-type: none"> <li>Noise : Leq, Lmax, L10, L90 (24 hours monitoring)</li> <li>Vibration : Peak Particle Velocity, ppv (mm/s)</li> </ul>	<ul style="list-style-type: none"> <li>The Planning Guidelines For Environmental Noise Limits And Control (Schedule 6)</li> <li>The Planning Guidelines For Environmental Vibration Limits And Control (Schedule 5)</li> </ul>	<ul style="list-style-type: none"> <li>Quarterly reporting to DOE Penang</li> </ul>

Monitoring Components	Location	Frequency	Parameters	Compliance Level	Reporting Requirements
<b>Construction Stage</b>					
<b>Water Quality</b>	<b>Performance Monitoring</b> <ul style="list-style-type: none"> <li>Silt traps, temporary earth drains, check dams, temporary slope protection, turfing, silt fences</li> </ul>	<ul style="list-style-type: none"> <li>Weekly or</li> <li>After heavy rainfall</li> </ul>	<ul style="list-style-type: none"> <li>Structural integrity, functionality, practicality and frequency of maintenance</li> </ul>	<ul style="list-style-type: none"> <li>Comply with the EIA approval conditions</li> <li>Comply with approved Erosion and Sediment Control Plan (ESCP)</li> <li>Comply with the approved Environmental Management Plan (EMP)</li> </ul>	<ul style="list-style-type: none"> <li>Weekly reporting on Performance Monitoring Report (PMR)</li> <li>On line reporting for the inspection of the BMPs</li> </ul>
	<b>Compliance and Impact Monitoring</b> <ul style="list-style-type: none"> <li>Silt trap discharge points</li> <li>River and marine water quality.</li> <li>CLQ, Batching Plant, etc.</li> </ul>	<ul style="list-style-type: none"> <li>Monthly</li> </ul>	<ul style="list-style-type: none"> <li>Total Suspended Solids (TSS)</li> <li>Turbidity</li> </ul>	<ul style="list-style-type: none"> <li>50 mg/L</li> <li>250 NTU</li> </ul>	<ul style="list-style-type: none"> <li>Quarterly reporting to DOE Penang</li> </ul>

Monitoring Components	Location	Frequency	Parameters	Compliance Level	Reporting Requirements
<b>Construction Stage</b>					
<b>Air Quality</b>	<b>Performance Monitoring</b> <ul style="list-style-type: none"> <li>Temporary hoarding, washing facilities</li> </ul>	<ul style="list-style-type: none"> <li>Weekly</li> </ul>	<ul style="list-style-type: none"> <li>Structural integrity, functionality, practicality and frequency of maintenance</li> </ul>	<ul style="list-style-type: none"> <li>Comply with the EIA approval conditions</li> <li>Comply with the approved Environmental Management Plan (EMP)</li> </ul>	<ul style="list-style-type: none"> <li>Weekly reporting on Performance Monitoring Report (PMR)</li> </ul>
	<b>Compliance and Impact Monitoring</b> <ul style="list-style-type: none"> <li>Select locations tabulated in <b>Table 6.1.15</b></li> </ul>	<ul style="list-style-type: none"> <li>Quarterly</li> </ul>	<ul style="list-style-type: none"> <li>PM<sub>10</sub>, PM<sub>2.5</sub>, NO<sub>2</sub>, CO</li> </ul>	<ul style="list-style-type: none"> <li>Malaysian Ambient Air Quality Guidelines (IT-2 (2018) and Standard (2020)</li> </ul>	<ul style="list-style-type: none"> <li>Quarterly to DOE Penang</li> </ul>

Note: The proposed monitoring programme is not exhaustive and will be refined during the preparation of the EMP based on the EIA approval conditions and site conditions

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## 9.6 EMERGENCY RESPONSE PLAN – DURING CONSTRUCTION

On-site emergency plans will be prepared to protect personnel and the public in terms of health, safety and environment in any case of an accident or natural disaster affecting or relating to the Project. The Emergency Response Plan (ERP) described in this section is an outline of the details that later will be detailed out and developed in the EMP. The preparation of this plan is carried out in accordance with the Occupational Health and Safety Act (1994). This plan covers several events that may occur by equipment failure, human mistakes or natural causes at or nearby the Project site.

### 9.6.1 Emergency Response Plan Priorities

The ERP observes the following response priorities:

1. Protection of human lives;
2. Protection of public health;
3. Protection of environmental/subsistence resources;
4. Protection of socio-economic and cultural resources; and
5. Protection of public and private properties

### 9.6.2 Emergency Response to General Accidents and Occupational Injuries

Occupational injury is meant as personal injury, illness or death sustained in connection with work. Causes of occupational accidents may be attributed either directly or indirectly to one or more of the following:

1. Human factors due to an employee or other individuals;
2. Situational work factors and practices contributed to by tools, facilities, equipment, and materials; and
3. Environmental factors or conditions caused by vibration, extreme heat and noise.

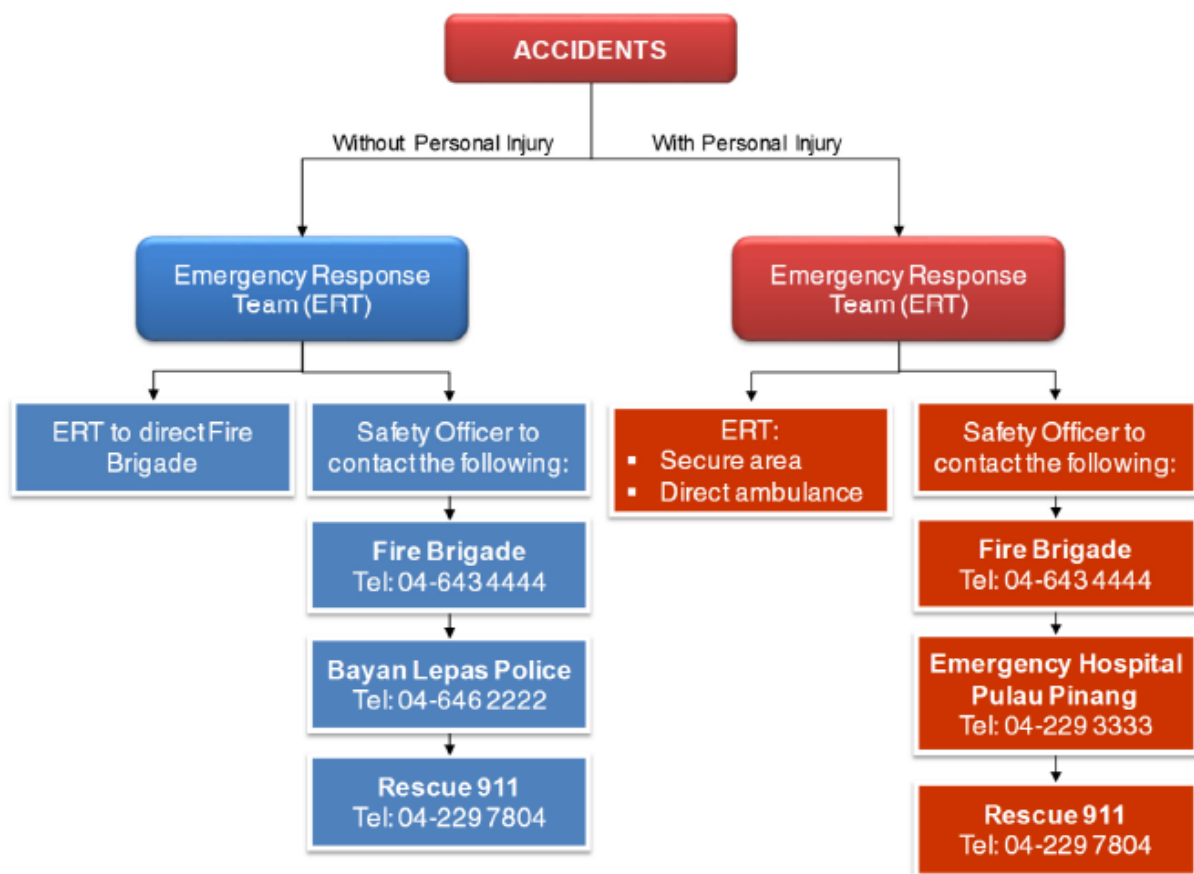


Should an accident occur, the following actions are to be implemented:

1. Assess the situation and shout for assistance;
2. Call the Emergency Response Team (ERT) immediately. The ERT will be formed under the WPC. Advise of the exact location, nature of injuries (if any) and request other emergency services as required;
3. Unless trained, DO NOT attempt to give medical assistance/first aid assistance to the injured person (if any);
4. Evacuate the area safely;
5. Safety Officer (SO) shall report to the PDP and other relevant authorities about the accident and the number of people injured; and
6. Write a report and keep it for future reference for a specific time frame.

A flowchart of the emergency response to general accidents is shown in **Figure 9.5**.

**Figure 9.5.** Emergency response plan to general accidents and occupational injuries



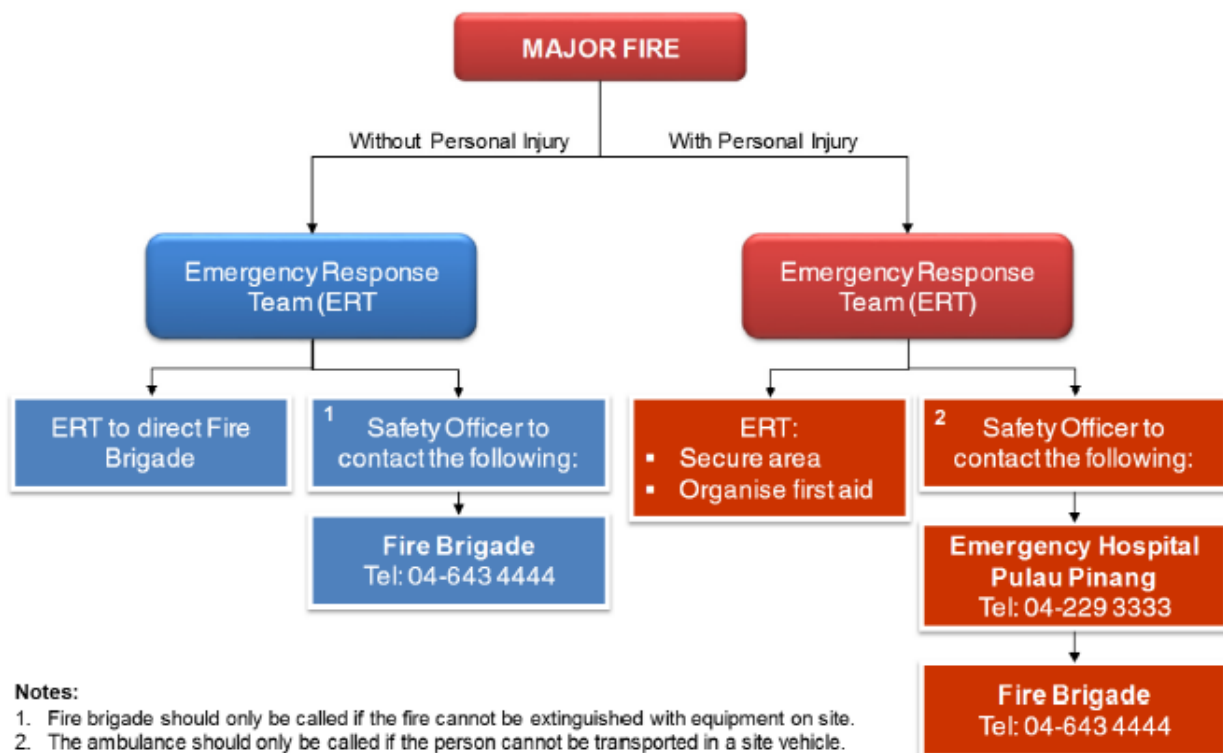
### 9.6.3 Emergency Response to Fire

At all times, when following any fire procedure, one's self must be out of danger first before trying to complete any other emergency task. Small fires must be handled as soon as possible using available fire-fighting equipment before they become unmanageable. If a fire is too big or other emergencies are identified:

1. Call the ERT immediately;
2. Provide sufficient information such as size of the fire, location and nature of injuries (if any);
3. Inform the Fire Brigade;
4. Evacuate the area safely;
5. SO shall write a report and hand in this report to the PDP and other relevant authorities; and
6. Keep the report for future reference for a specific time frame.

A flowchart of the emergency response to fire is shown in **Figure 9.6**.

**Figure 9.6.** Emergency response plan to fire



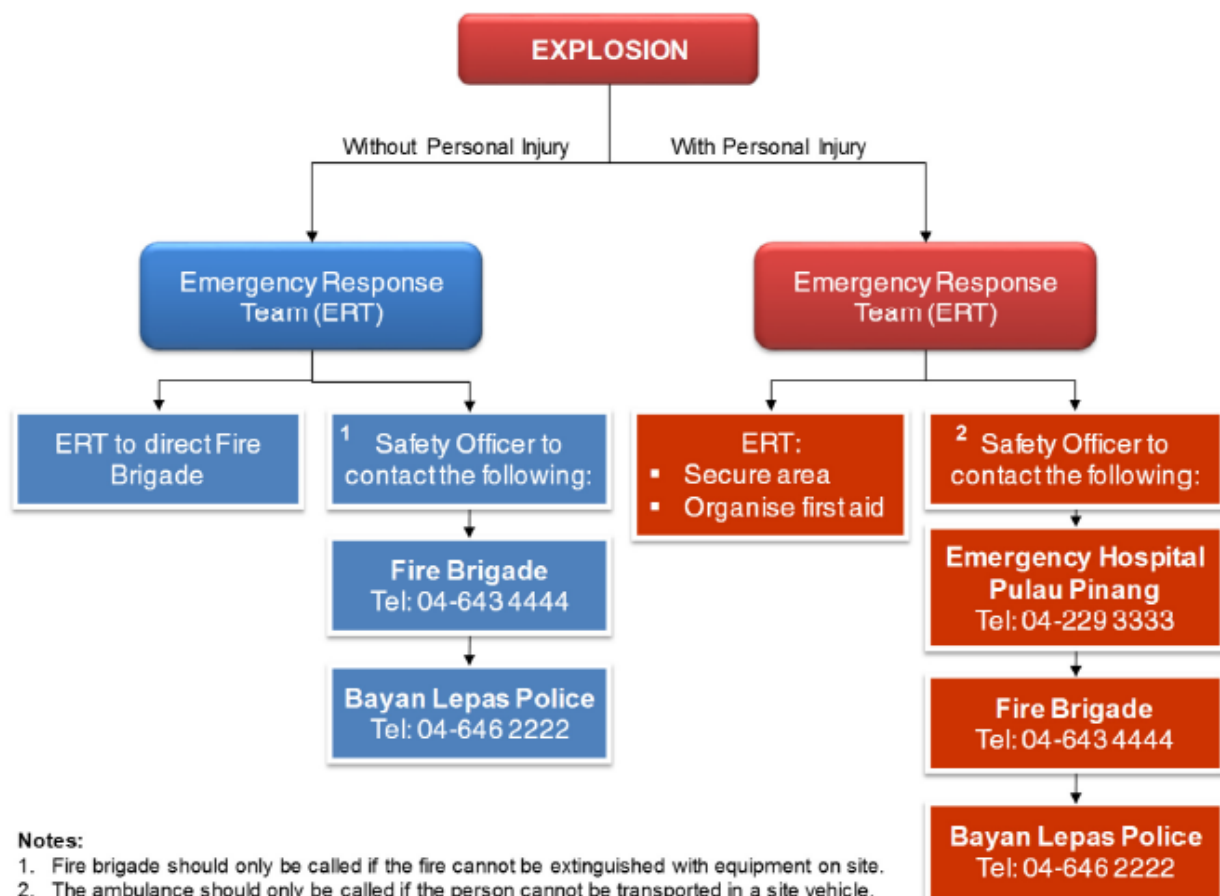
### 9.6.4 Emergency Response to Explosion

Should an explosion occur:

1. Stay low to the ground and crawl to the safety area;
2. Cease operations and IMMEDIATELY contact the relevant authorities;
3. Call the ERT immediately. Advise of the exact location, nature of injuries (if any) and request other emergency services as required;
4. Do not switch on lights or any other equipment. If lights are already on, leave them on; and
5. Evacuate the area or the building and move to the nearest area of safety and follow the appropriate emergency procedures for the conditions.

A flowchart of the emergency response to explosion is shown in **Figure 9.7**.

**Figure 9.6.** Emergency response plan to explosion



### 9.6.5 Emergency Response to Hazardous Materials, Chemical and Oil Spills

Hazardous materials, chemical and oil spills on land or into the sea have the potential to cause serious impact. To successfully minimise pollution from the spill, an effective response strategy has to be in place. When a spill occurs:

1. Call the ERT immediately. Provide as much information as possible such as location, nature of injuries (if any), type and the quantity of material that has been spilled;
2. Stop the source of spill if possible;
3. Fence the spilled area with barricade tape and block with sand, earth or any absorbent to prevent the liquid from entering drains or water bodies;
4. Evacuate the area immediately;
5. Unless trained, DO NOT attempt to clean up the spill yourself;
6. SO shall write a report and hand in to the Project Manager and other relevant authorities; and
7. Keep the report for future reference for a specific time frame.

## 9.7 EMERGENCY RESPONSE PLAN – DURING OPERATION

### 9.7.1 Introduction

The management of an incident or an emergency situation in the proposed 19.5 km PIL1 Highway is complex due to the fact that it is an elevated highway (viaduct) and includes several tunnel sections. The viaduct makes access to the highway limited at the interchange locations only (excluding aerial access) whilst the closed characteristics makes tunnels different to open space in incident management - if an incident occurs, it will be harder to communicate, provide rescue and handle the situation.

It is proposed that the Project Proponent prepare an **Emergency Response Plan** specifically tailored to handle potential incidents and emergencies on the PIL 1 Highway. It shall be called the “*Integrated Safety and Emergency Response Plan for the PIL1 Highway*” (referred to as the **Emergency Response Plan or ERP**).

The principal requirements are as follows:

- To ensure that, in the event of an emergency occurring on or affecting the highway, a response is initiated as quickly as possible in order to minimise the danger to all parties and any disruption and delay to the highway user.
- To provide sufficient resources, available for call out 24 hours on every day, capable of attending at any location on the highway within the Emergency Response Times stipulated and with due regard to the safety of all parties at all times.

When a disaster happens, the rescue works should be executed immediately and finished in the shortest time to minimize damage. The key points concerning emergency response operations are presented below. An example of the Incident Management Plan and an Incident Management Set-up is shown below.

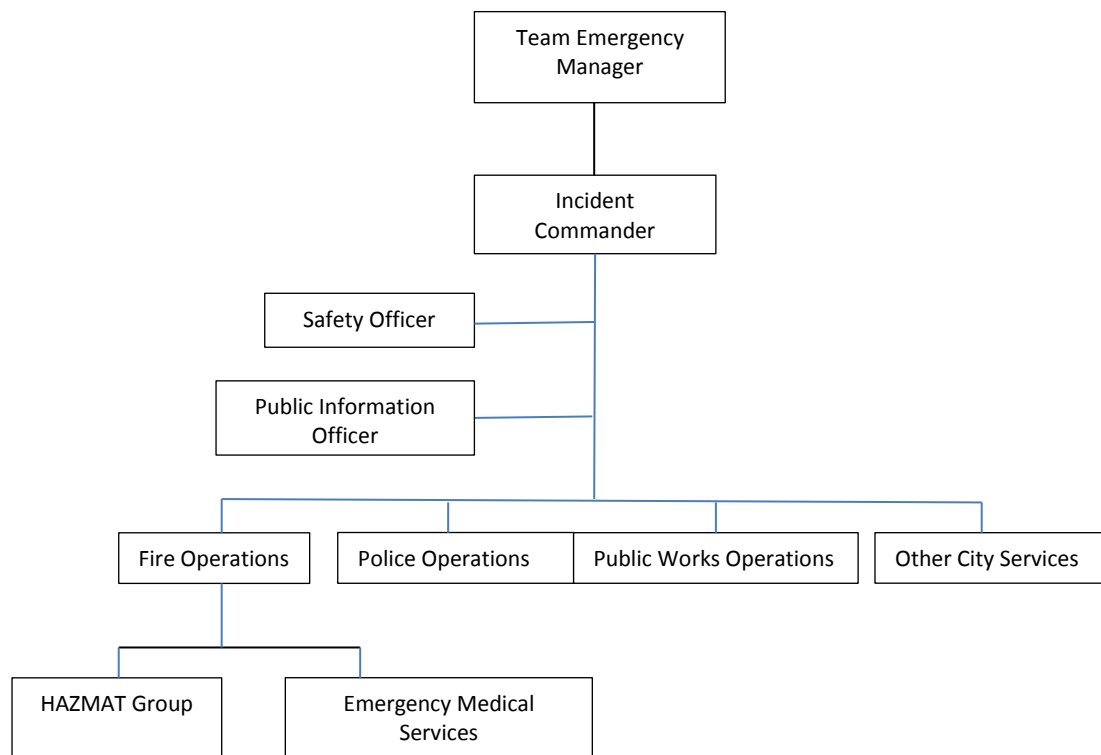
The core components of an ERP for the PIL1 Highway ERP shall include the following sections:

- Introduction
- Incident/Emergency Management Arrangements
- Incident/Emergency Named Personnel
- Notification of Emergencies
- Management Communication and Instruction Arrangements for Mobilisation of the Initial, Secondary and Contingency Resources
- Transport Emergency Contact Details
- Control of Emergency Response Resources and Coordination with Emergency Services in the Execution of Emergency Response and Recovery
- Liaison Arrangements
- Monitoring of Response Times
- External Communications
- Structures Related Incidents
- Contingency Arrangements for Communication in the Event of Failure of Critical Supplies and Services

### Example of Incident Management Plan



### Example of Incident Management Set-up



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## INTEGRATED SAFETY AND EMERGENCY RESPONSE PLAN FOR THE PIL1 HIGHWAY

The Integrated Safety and Emergency Response Plan covers important aspects such as safety management, incident management and rescue operations for the long elevated PIL 1 Highway and its' tunnel sections.

The following terms shall be defined.

### Highway

The PIL1 Highway is a new highway in elevated form stretching from Gurney Drive area in north of Penang Island running through the Penang Hills area via a combination of viaducts and tunnels and exiting at Sg. Ara on viaduct form to end at the LCE in Bayan Lepas.

### Control Room and Highway Control Centre

These terms shall be provided by the PIL1 Highway Operator - to ensure they can be contacted immediately when an incident occurs.

### Incident

An incident is defined as "any non-recurring event that causes a reduction of roadway capacity or an abnormal increase in demand." Under this definition, events such as traffic crashes, disabled vehicles, spilled cargo, highway maintenance and reconstruction projects, and special non-emergency events (e.g. games, concerts, or any other event that significantly affects roadway operations) are classified as an incident. (*Traffic Incident Management Handbook*)

### Incident Commander

Role assigned to the first emergency responder arriving at the scene of any highway incident. This role will change as the incident changes.

### Responders

Personnel on the scene of any incident.

### Traffic Control Devices

Items that are used to warn and alert drivers of potential hazards and to guide or direct motorists safely past the hazard(s). May include cones, flares, and signal lights. Advance warning arrow panels (arrow boards) are intended to supplement other traffic control devices.

### Incident Safety Zone

That portion of the roadway that is closed to traffic and set aside for responders, equipment and material.

### Traffic Incident Management (TIM)

Traffic incident management is the process of coordinating the resources of a number of different partner agencies and private sector companies to detect, respond to, and clear traffic incidents as quickly as possible to reduce the duration and impacts of incidents on safety and congestion, while protecting the safety of on-scene responders and the traveling public.

The TIM Program is part of a larger all-hazards program called the **Emergency Transportation Operations (ETO)**.

### Emergency Transportation Operations (ETO)

ETO describes a wide range of activities, including response, recovery, mitigation, prevention and preparedness, relative to incidents or circumstances that impact the highway transportation system by reducing capacity, increasing demand, or otherwise threatening public health and safety.

ETO, as defined here, applies to all of the following situations:

- Minor traffic crashes, disabled or abandoned vehicles, debris in the roadway, and other circumstances that disrupt traffic flow and create hazards.
- Major traffic crashes involving fatalities, injuries, overturned vehicles, and serious property damage.
- Highway construction and maintenance work zones.
- Law enforcement and security activities that cause major traffic disruptions.
- Hazardous material spills on the highway.
- Severe weather and natural disasters.
- Acts of terrorism that target the highway.

### Tunnel Operating Permit

The tunnel opening permit is issued on the basis of the safety documentation sent by the owner to the Local Authority / Highways department, JKR. Given the time needed to review the application, the ERP must be available for inclusion in the documentation earlier.



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### Incident classification

#### (1) Grade 1: Slight Incident

It only results in light traffic interference in the tunnel. Example: scattering of materials/substances or vehicle malfunction, can be managed by the PIL1 Highway operator and authorized contractors. The tunnel traffic can be maintained by at least one lane with simple traffic control.

#### (2) Grade 2: Serious Incident

It causes full closure of a one direction tunnel and traffic interruption. Traffic has to detour. Example: car crash series. Needs other agencies to assist rescue works (e.g. fire fighting force, incident investigation crew, highway police, towing vehicle, Bomba & Rescue, local medical agencies and hospitals).

#### (3) Grade 3: Dangerous Incident

Causes closure of two direction tunnels for emergency rescue. Example: incident happens because of fire from car accident, accident from violation vehicle carrying chemicals or toxic hazardous goods, terrorist attack, etc. Depending on the situation development, may even need assistance from the National Disaster Response Centre to lead rescue works.

### Traffic Incident Management Partners

Traffic Incident Management is a planned and coordinated program process to detect, respond to, and remove traffic incidents and restore traffic capacity as safely and quickly as possible. This coordinated process involves a number of public and private sector partners, including:

- Law Enforcement
- Fire and Rescue
- Emergency Medical Services
- Transportation
- Public Safety Communications
- Emergency Management
- Towing and Recovery
- Hazardous Materials Contractors
- Traffic Information Media

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### Law Enforcement

Law enforcement agencies include State Police and Highway Patrols, Federal Police and other agencies which have officers sworn to enforce laws. On the scene of a traffic incident the duties of these officials include:

- Securing the incident scene
- Providing emergency medical aid until help arrives
- Safeguarding personal property
- Conducting accident investigations
- Serving as incident commander
- Supervising scene clearance
- Assisting disabled motorists
- Directing traffic

Jurisdiction of law enforcement agencies may vary from state to state. Typically, State Police and Highway Patrols have jurisdiction on State highways and Federal Police have jurisdiction off the State highway system. State Police and Highway Patrols have state wide coverage. In many locations, State law enforcement agencies receive assistance from local agencies. Law enforcement agencies are first responders at traffic incident scenes, providing 24-hour emergency response and operating under a paramilitary command structure. At many traffic incidents, law enforcement officers act alone and are trained to make unilateral command decisions.

### Fire and Rescue

Fire and rescue services are provided by the Fire and Rescue Department (BOMBA). Typical roles and responsibilities at traffic incidents assumed by the Fire and Rescue Department include:

- Protecting the incident scene
- Suppressing fires
- Providing emergency medical care
- Serving as incident commander
- Providing initial HAZMAT response and containment
- Rescuing crash victims from contaminated environments
- Rescuing crash victims from wrecked vehicles
- Arranging transportation for the injured
- Assisting in incident clearance
- Providing traffic control until law enforcement arrival.

In most incidents, the Fire and Rescue Department is the primary emergency response agency for hazardous materials spills. Like law enforcement agencies, the Fire and Rescue Department also operate as first responders under a well-defined command structure providing 24-hour emergency response. The Fire and Rescue Department operate under a highly organized team structure with the close supervision of a commanding officer. The Fire and Rescue Department and emergency medical service providers (EMS) also act at the direction of one decision maker and may not respond individually to requests from other response agencies unless their command officer directs them to do so.

In most large urban areas, the Fire and Rescue Department is manned by full time professional personnel. In many suburban and in most rural areas, volunteers may primarily provide fire and rescue services.

#### Emergency Medical Services (EMS)

The primary responsibilities of the EMS are the triage, treatment, and transport of crash victims. In many areas, the Fire and Rescue Department provide emergency medical services. In some areas, other agencies or private companies provide these services to local jurisdictions under contract. Typical roles and responsibilities assumed by EMS at traffic incidents include:

- Providing advanced emergency medical care
- Determining of destination and transportation requirements for the injured
- Coordinating evacuation with fire, police and ambulance or airlift
- Serving as incident commander for medical emergencies
- Determining approximate cause of injuries for the trauma center
- Removing medical waste from incident scene

Emergency medical services have evolved as primary care givers to individuals needing medical care in emergencies. As with police, emergency medical personnel have a defined set of priorities. They focus on providing patient care, crash victim rescue, and ensuring the safety of their personnel.

#### Transportation

Transportation agencies are typically responsible for the overall planning and implementation of traffic incident management programs. Typically, these agencies are also involved in the development, implementation, and operation of traffic operations centers (TOC), as well as the management of service patrols.

Typical operational responsibilities assumed by transportation agencies and their service patrols include:

- Assist in incident detection and verification
- Initiate traffic management strategies on incident impacted facilities
- Protect the incident scene
- Initiate emergency medical assistance until help arrives
- Provide traffic control
- Assist motorist with disabled vehicles
- Provide motorist information
- Provide sand for absorbing small fuel and anti-freeze spills
- Provide special equipment clearing incident scenes
- Determine incident clearance and roadway repair needs
- Establish and operate alternate routes
- Coordinate clearance and repair resources
- Serve as incident commander for clearance and repair functions
- Repair transportation infrastructure

Transportation agencies are secondary responders. That is, they are typically called to the incident scene by first responders, usually law enforcement. Transportation agencies are rarely connected directly to public safety emergency communications and dispatch systems.

#### Public Safety Communications

Public safety communications services are the 999 call takers and dispatchers. In large urban areas, call taking and dispatching duties may be separated. Call takers route emergency calls to appropriate dispatch. In some areas, all public safety emergency calls (police, fire and rescue, and emergency medical) are handled in one joint centre with call takers sending calls to appropriate agency dispatch depending on the nature of the call. In smaller urban areas and in many rural areas, call-takers may also dispatch public safety response. Most calls on highway emergencies come from cellular telephones.

#### Emergency Management

State and local governments have agencies whose duties are to coordinate multi-agency response to large-scale emergencies such as natural and man-made disasters. They have specific responsibilities under both federal and state law. Even very large highway incidents rarely activate emergency response plans unless they necessitate evacuation due to a spill or presence of hazardous materials.

Emergency management agencies maintain lists of the location of many public and private sector resources that might be needed in a major emergency. These lists and contacts for activating resources are valuable tools in planning multi-agency response to major highway incidents.

### Towing and Recovery

Towing and recovery service providers are responsible for the safe and efficient removal of wrecked or disabled vehicles, and debris from the incident scene. Their typical responsibilities include:

- Recover and remove vehicles from incident scene
- Protect victims' property and vehicles
- Remove debris from the roadway
- Provide other services, such as traffic control, as directed or under contract

Towing and recovery companies are secondary responders operating under a towing arrangement usually maintained by the highway operator. The highway operator may also have their own, but limited, towing and recovery facilities. Towing and recovery arrangements generally fall under one of two major types – rotation or contract. In rotation towing, a police department will maintain a list of pre-qualified companies and will rotate the call of those companies. In many locations, rotation lists are classified by specific company capabilities so that a company with only automobile towing equipment doesn't get called to a truck incident. Rotation lists may also be maintained by location zones so that companies closer to the incident scene will get called. In contract towing, companies are contracted to provide specific services on call.

Towing and recovery companies that respond to highway incidents are indispensable components of all incident management programs. Even programs that include service patrols with relocation capability depend heavily on towing and recovery service providers. Challenges facing this industry are unique because they are not public agencies. As such, they must remain profitable to retain a skilled work force, purchase and maintain expensive and complex equipment, and to stay in business.

### Hazardous Materials Contractors

Hazardous materials are managed by the Fire and Rescue Department. They are trained and equipped to clean up and dispose of toxic or hazardous materials. Most common (and small quantity) engine fluid spills (oil, diesel fuel, gasoline, anti-freeze, etc.) can be contained and cleaned up without calling the Fire and Rescue Department.

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### Traffic Information Media

The Traffic Information service provider is primarily the highway operator who gathers and disseminates traffic condition information. They are the primary source of information for commercial radio traffic information broadcasts, the most common source of traffic information for motorists. They also package specific information on a route or time of day basis to clients who subscribe for the information. In recent years, many Internet sites have been created to provide road condition and traffic information. A mixture of public sector agencies and private information service providers may maintain these sites.

Traffic Incident Management Partners e.g. Police, Fire & rescue services, EMS, etc.

### PIL 1 : Safety Management

*Height limit:* Height limit gates/bars shall be installed at the entry of each tunnel at the tunnel portal area and at the entrance to the interchanges to prevent vehicles higher than the limitation from entering the tunnel.

The following signs and markings shall be installed:

- “No Changing of Lanes”.
- “Safe Distance Identification” providing reference for users to keep a least 50 meters safe distance.
- “Turn on Head Lamp in Tunnel”.
- “Forbid vehicles Loaded with Hazardous Goods Entering”
- Location of facilities such as emergency telephone, connecting tunnels, etc.

### Electrical power supply and distribution system.

- a. The main power shall be provided by 2 sets of independent high-voltage power supplied by TNB.
- b. Two (2) high-voltage substations shall be installed at the north and south portals of each tunnel (each substation with 2 power circuits, one for regular and one for backup). The capacity of each feed line can supply the load for all facilities in the tunnel.
- c. UPS (capacity for 60 minutes) and diesel power generators (designed to start up automatically in 20 seconds) shall be provided for backup power supply if out-source power breaks off (for important facilities such as emergency lighting, ventilation, fire alarm, fire-fighting, communications equipment, traffic control system).

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### Tunnel lighting system

- a. Tunnel lighting is designed for traffic, moving at design speed, to approach, enter, travel through and exit the road tunnel at a safety level equal to that on adjacent stretches of open road. Fluorescent lamps shall be used for the main lighting in the tunnels and high-pressure sodium vapour lights shall be used for enhanced lighting on entering and exiting tunnel sections. The operator in the Tunnel Control Centre can monitor and control the lighting situation.
- b. Escape guiding lights shall be installed per 50 meter intervals along the tunnel sidewall. The lights will auto-light up at fire alarm. There shall also be escape direction guiding signs per 100 meters to mark the distance to the connecting tunnels.

### Ventilation system

- a. An appropriate ventilation system (e.g. 'Enhanced Longitudinal ventilation System') shall be installed to provide ventilation and exhaust smoke.
- b. There shall be CO and NO<sub>x</sub> detectors in the tunnels. In normal, according to detection, the system auto-control the fans operating to keep good air quality and clear vision in the tunnel. In case of fire, according to the fire alarm, the system auto-start up a preset mode or the operator manually operates an appropriate mode to exhaust smoke in order to let users escape and rescuers execute a rescue.

### Fire alarm system

- a. There shall be fire detectors in the main tunnels, connecting tunnels, and machine rooms. The detecting fire alarm signal can auto-transfer to the control center, and then gear with fire-fighting, ventilation, lighting and traffic control system.
- b. Additionally, it shall allow manual notification by pressing the fire alarm button on the hydrant box that shall be located along the tunnel per 50 meters, or using the emergency telephone to communicate with the control centre.

### Fire-fighting system

- a. There shall be a hydrant box (containing 2 20 pounds ABC type powder fire extinguishers, 1 or 2 water valves, 30 meters fire hose, emergency power supply socket, telephone sockets, and fire alarm button on the box) per 50 meter intervals along the main tunnel L/R-side wall and in every connecting tunnel.
- b. There shall be a 200 tons hydrant water tank at the north and south portals to supply hydrant water.

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### Monitoring and Control system

The whole tunnel is monitored and controlled in the Tunnel Control Centre. The operators can watch the operating status of all equipment from their workstation. They can handle present situation in the tunnel and take appropriate measures. The system can monitor and control the operating status of power supply, ventilation, lighting, fire alarm, firefighting, air conditioner in the machine rooms and other mechanical-electrical equipment.

### Traffic control system

The Traffic control system collects event data via detectors auto-detection and manual report, and then judges and start up the appropriate reaction plan. Traffic and event data collection equipment shall include vehicle detector (VD), CCTV, emergency telephone (ET), etc. It then executes appropriate traffic control measures, displaying and announcing messages to achieve the goal of traffic management for the PIL1 Highway.

An Event reaction plan program will produce a management strategy. After confirmation, operators execute traffic control and information display, and announce related event, conduct and rescue units. When an emergency event occurs, the Tunnel Control Centre can coordinate and command rescue units in cooperation by wave-radio system.

Before the PIL1 Highway is opened to traffic, a promotion is recommended to inform the public and road users concerning safe use of the PIL1 Highway. It may include short film, DVD, posters, multi promotion channels e.g. printed media (newspapers, magazines), electrical media (TV, broadcasts and Internet), etc.

### Parking of Response Vehicles

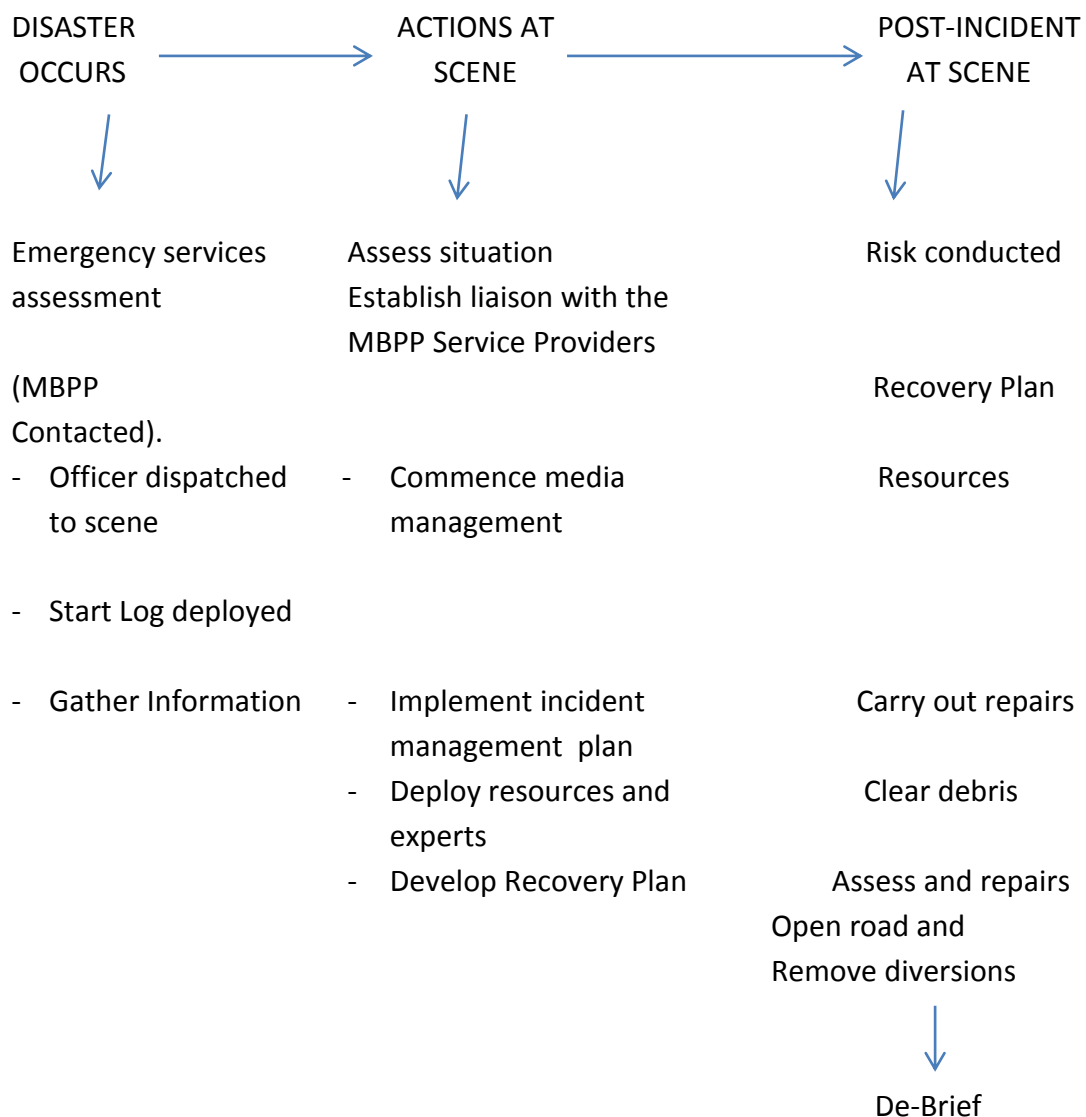
Providing a safe incident scene for emergency responders is a priority at every emergency incident. However, consideration must be given to keeping as many traffic lanes open as possible. Except for those vehicles needed in the operation and those used as a shield for the incident scene, other response vehicles should be parked together ("staging area"). As a matter of routine, the parking of response vehicles should be on one side of the roadway. Parking should be on either the shoulder or median area, if one exists, but not both. Parking response vehicles completely out of available travel lanes greatly assists in the movement of traffic. If not needed to illuminate the scene, drivers should remember to turn vehicle headlights off when parked at incidents. Recovery personnel are to report to the incident commander who will then direct them to a safe or "staging" area.



## Incident Management Response

The response is based on the premise that the preservation of life, health, safety, and property and the minimization of human suffering are the top priorities during an emergency/disaster response.

The principal responding partners for incident management on the PIL1 Highway are the Local Authority, Local Authority Service Providers, Police, and Fire & Rescue Services.



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### **Establish Management and Rescue Organization**

It is very important to integrate and use existing facilities, manpower (police, fire fighting, medical, etc.), supporting agencies and apply rescue strategies when a disaster happens.

For maintaining the Highway facilities function under normal conditions and for executing rescue works in emergencies, cooperation with the police and fire fighting departments and the health department in conjunction with the Local Authority is required.

#### **PIL1 Highway operator – Local Authority Engineering Department:**

The Engineering Department shall conduct facility maintenance and safety management works. Their works will include facilities maintenance and management, command rescue work at accident and disaster scenes in cooperation with the Police, and traffic control system management.

Towing service work - may be contracted out to a private company.

Support is also needed from other agencies for traffic control, fire-fighting assistance, emergency medical treatment, etc.

#### **Police Department:**

The Police shall take charge of the enforcement and traffic control works on the PIL1 Highway during emergencies and disasters. They shall also be involved in disaster rescue operation processes.

#### **Fire-fighting and Rescue Department (BOMBA & Penyelamat):**

Jabatan BOMBA & Penyelamat shall be involved in fire-fighting and disaster rescue standard operations.

### **Emergency Planning Exercises**

Exercises can be arranged to test internal procedures and involve the Local Authority as one of a number of organizations. As such, they can be 'desk-top' or 'mock' situations involving actors either on the Highway Network or other suitable locations.

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Tactical Diversion Routes are those routes used to divert traffic off the PIL 1 Highway onto local roads to assist incident management. These routes need to be established as part of contingency planning arrangements.

### **Information and the Media**

In major incidents, the responsibility of the Local Authority in cooperation with the Police to maintain a presence with regard to media outputs and supplying information to the public will be substantial.

Access to the incident site is a police responsibility, put in place whenever practical, and intended to allow rescue services to carry out their work unhindered and to preserve evidence at what may be the scene of a crime.