09 ENVIRONMENTAL MANAGEMENT PLAN

9.1 Introduction

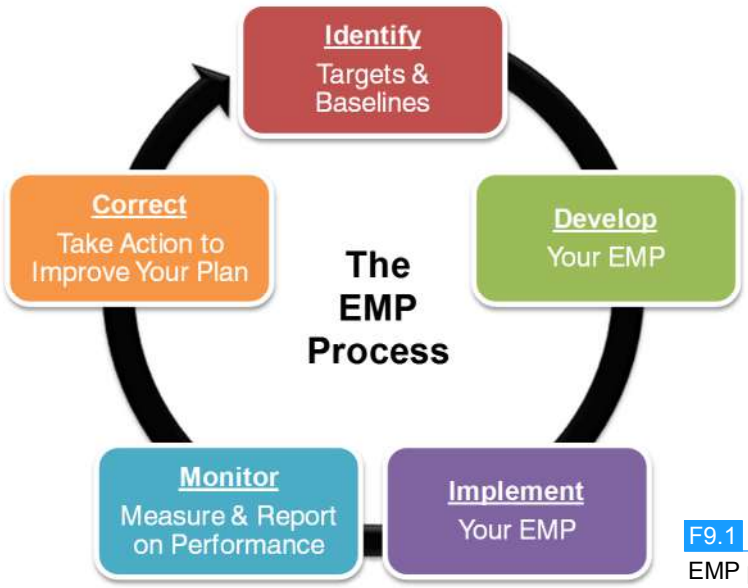
The preparation of an Environmental Management Plan (EMP) is meant to provide the means to manage various environmental impacts that may arise during the construction and operational phases of the development, as well as to provide information, guidance and instruction on environment-related issues to personnel associated with the Project. It is required for the formulation, implementation and monitoring of environmental protection measures during and after the commissioning of projects.

The Environmental Quality (Amendment) Act 2012 was gazetted on 16 August 2012 to fit the current mould in protecting the environment and better the quality of life. The amendment states that it may require “an environmental audit”, which means a periodic, systematic, documented and objective evaluation to determine the compliance status to environmental regulatory requirements, the environmental management system and the overall environmental risk of the premises. An “environmental management system”, on the other hand, means a system comprising of an organisational structure with its responsibilities, practices, procedures, processes and resources for implementing and maintaining the system relating to the management of the environment, which is included in the EMP.

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 the personnel concerned, namely:

a) liaising with the Malaysian authorities on environment related matters;
b) submission of reports on environmental performance;
c) coordinating environmental training and awareness;
d) preventing non-compliances;
e) identifying and recording environmental problems and issues;
f) controlling non-conformance until the condition has been mitigated and corrected; and
g) implementation of corrective actions.

The EMP process can be illustrated simply as depicted in F9.1.



F9.1
EMP process

9.2 Objectives of the EMP

Before starting the Project, an EMP must be submitted for the Department of Environment's (DOE) approval. The implementation of an EMP is the sole responsibility of the Project Proponent. The objectives of the EMP for PSR are to:

a) place the PSR in the context of Penang and south of Penang Island;
b) adequately describe all components of the PSR so that DOE can consider approval of a well-defined project as given in *Chapter 5: Project Description*;
c) identify the environmental issues/risks associated with the PSR as given in *Chapter 7: Evaluation of Impacts*;
d) provide the basis of the Project Proponent's environment management programme, which shows that the environmental impacts resulting from the PSR activities can be managed well;
e) ensure effectiveness of the environmental protection and conservation measures proposed;
f) ensure the Project's compliance with the overall Project's environmental objectives;
g) address all concerns and issues raised in the EIA's stakeholder consultation process and those that will likely continue to arise during the Project's lifetime; and
h) provide a framework for implementing Project environmental commitments (i.e. the mitigation measures discussed in *Chapter 8: Pollution Prevention and Mitigation Measures*).

The above objectives will be achieved by means of in-place operational controls, environmental monitoring, inspections and auditing activities as detailed in the subsections of this chapter.

All these components will be highlighted in the EMP framework. A detailed action plan will be proposed post-EIA. Post-EIA will be controlled by the operation sector of the Project Proponent. Monitoring, inspection and auditing can be assigned to a specialised body in-house or contracted-out.

9.3 Compliance with the Relevant Environmental Requirements

The EMP includes the legislative requirements that need to be observed and abided by, but not necessarily limited to the following matters:

a) Compliance with the Environmental Quality Act (Amendment) 2012;
b) Contamination as stated in the Environmental Quality Act 1974 (Act 127) and subsidiary legislation made hereunder;
c) Implementation of wherever necessary and applicable the Environmental Impact Assessment Guidelines produced by the DOE that are relevant to the Project;
d) Compliance with the Terms and Conditions of Approval that are issued by the Authorities for the duration of this Project; and
e) Compliance wherever possible with all the Malaysian environmental guidelines produced by the DOE and other relevant authorities.

9.4 Guided Self Regulation Through Environmental Mainstreaming Tools

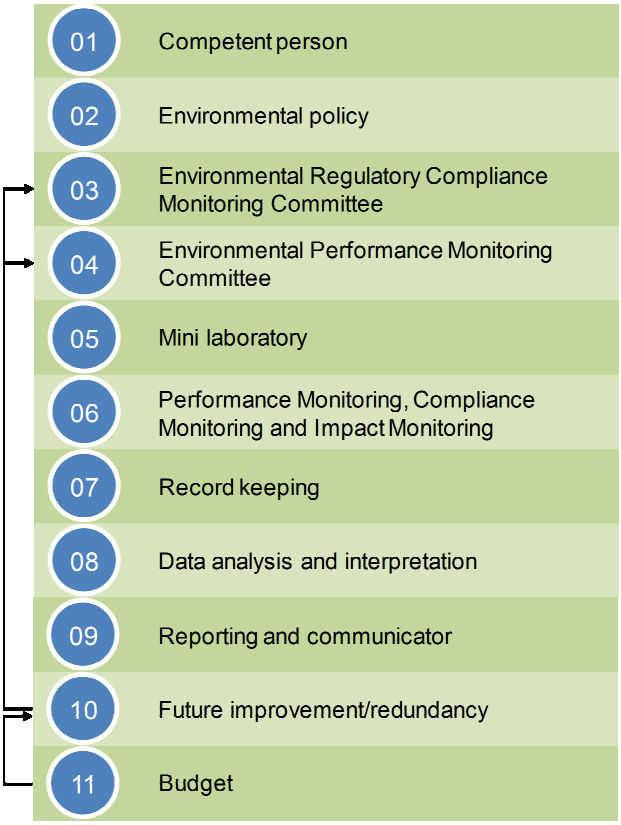
A self-guided regulation (GSR) is adopted as a long-term goal to be achieved and a culture to be inculcated by the Project Proponent through mainstreaming of the environmental agenda. The implementation of environmental mainstreaming is to promote and instil self-regulation that will be translated into regulatory requirements on compliance and performance monitoring of pollution control measures, scheduled reporting, record keeping, competent persons, and involvement of environmental professionals playing specific roles. Therefore, the Project Proponent will be entrusted with full responsibility and accountability for taking environmental friendly options and instituting effective pollution prevention and mitigation measures (P2M2) and self-demonstration of regulatory compliance at all stages of project implementation. The purposes of GSR are to:

a) ensure Project Proponent's commitment /initiatives for further improvement;
b) ensure the Project Proponent provide competent persons at all levels of the organizational structure;
c) comply with recommended ranges:
d) set a trend status of performance monitoring data;
e) take immediate corrective actions; and
f) conduct further investigation to find root causes of non-compliances, hence to avoid non-compliance problems.

The implementation of GSR involves three relevant parties which are shown in F9.2. Each party plays a vital role in order to implement the GSR. 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). DOE, on the other hand, shall facilitate the Project Proponent to further improve the EIA (COAs) if the environmental requirements cannot be complied with although mitigating measure had been implemented on site.

F9.3 entails the mainstreaming tools that will be implemented by the Project Proponent throughout the project implementation. Each of the mainstreaming tools will be further described in the following section.

F9.2 Environmental management system in GSR implementation



F9.3 Environmental mainstreaming tools

9.4.1 Competent Person

Environmental professionals (environmental consultant and environmental auditors) who have been certified by the Director-General of DOE as a competent person are the responsible individuals to supervise the environmental components (potentially impacted) during reclamation and dredging operation. The individuals need to go through the certification process and comply with all the requirements before they can be certified competent. The required competent persons for the proposed Project are as follows:

a) Registered Environmental Consultant by Department of Environment;
b) Registered Environmental Auditor by Department of Environment;
c) Certified Erosion, Sediment and Storm Water Inspector (CESSWI); and
d) Certified Environmental Professional in Scheduled Waste Management (CePSWaM).

9.4.2 Environmental Policy

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 Environmental (QSHE) by providing timely delivery of quality products/services, safe and healthy working condition and environmentally sustainable and responsible approach to their business. Their policy states that they aim to:

a) Meet the needs and expectations of their customers and other stakeholders;
b) Comply with or exceed the relevant legal and other requirements;
c) Prevent safety and health incidents and environmental pollutions; and
d) Continual improvement of QSHE management system and performance.

Their drives are to:

a) integrate QSHE requirements into their business processes;
b) inculcate a self-regulation mindset by taking personal ownership;
c) walk the talk by all employees;
d) adopt open and honest communication;
e) foster real teamwork; and
f) develop their people.

9.4.3 Environmental Management Committee

An Environmental Management Committee (EMC) shall be established by the Project Proponent to ensure all the proposed P2M2 are implemented accordingly. The objective of the EMC is to provide independent and external advice, information, and recommendations to the Project Proponent on environmental issues relating to the proposed Project. The committee is also responsible to identify applicable best management practices and provide counsel on how to integrate these into the Environmental Compliance Programme. In general, there are two (2) types of EMC which consist of:

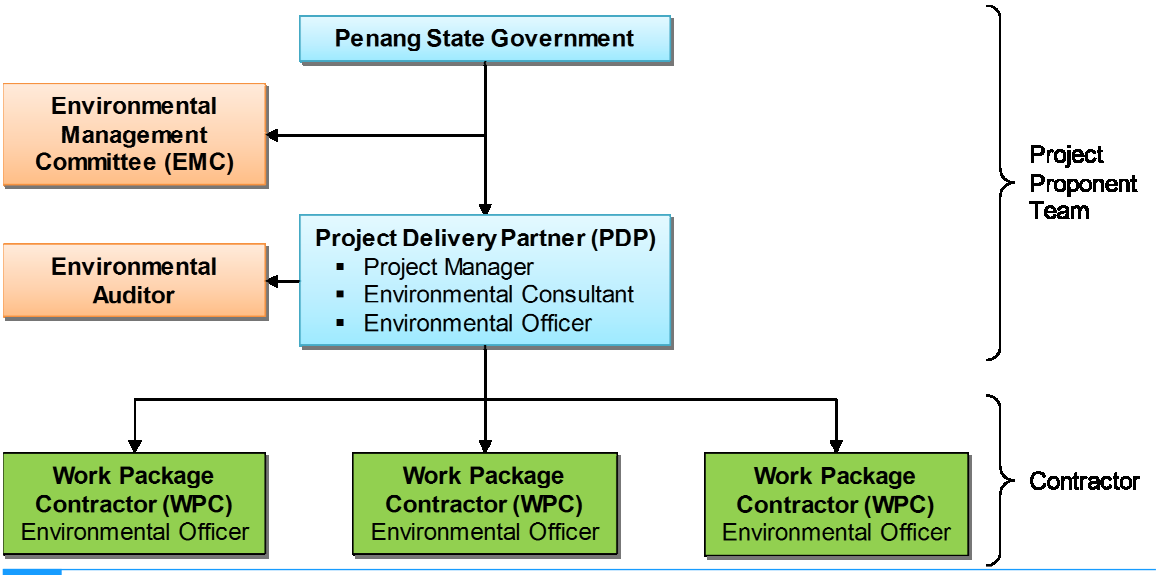
a) Environmental Regulatory Compliance Monitoring Committee (ERCMC):

    i) Focusing on the compliance of the environment regulations to optimize and further improve the environmental aspects of the Project.
    ii) Meetings shall be held at a minimum of four (4) times a year.

b) Environmental Performance Monitoring Committee (EPMC):

    i) Focusing on the efficiency and performance of the proposed mitigating measures.
    ii) Meetings shall be held at a minimum of four (4) 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 for the proposed Project together with the roles and responsibilities of key personnel who will oversee the operation of dredging and reclamation works as shown in F9.4. This structure may be amended and/or updated from time to time. The committee will be comprised of representative from the State Government, PDP, Work Package Contractor (WPC), environmental consultant, environmental officer (EO) and other relevant technical individuals to the proposed Project. The Project Proponent must have an office for Environmental Management on site.



F9.4 Environmental organization structure for Environmental Regulatory Compliance and Performance Monitoring Committee

9.4.3.1 Roles and Responsibilities

9.4.3.1.1 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.

9.4.3.1.2 Project Delivery Partner

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

9.4.3.1.3 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. He must be a competent person certified by DOE with relevant qualifications such as:

a) Registered Environmental Consultant by Department of Environment;
b) Registered Environmental Auditor by Department of Environment;
c) Certified Erosion, Sediment and Storm Water Inspector (CESSWI); and
d) Certified Environmental Professional in Scheduled Waste Management (CePSWaM).

The EO will be responsible for the following:

a) conduct a thorough initial site inspection of environmental controls prior to works commencement;
b) attend EMC meetings as required;
c) supervise works on installed/implemented mitigating measures and BMPs according to specifications which are suitable for the condition of the project site and the project's Environmental Management;
d) update the Site Daily Logbook;
e) carry out daily inspections on the P2M2;
f) maintain all environmental-related documents and information;
g) liaise with the local authorities on environmental issues;
h) investigate any environmental problems (e.g. spills and pollution) complaints and non-compliance with the regulatory and EIA requirements and reporting to the EMC and DOE, if required;
i) hold a site meeting every two weeks with the Project Proponent and the Contractor;
j) conduct *in situ* measurements of the turbidity parameter outside the silt curtain and to examine the condition of the silt curtain in the sea;
k) verify compliance with the Approval Conditions (DOE, DID and Marine Department); and
l) submit an environmental control and progress report on a regular basis.

The EO shall investigate and report any environmental issues that occur on site during the on-going project period and be able to recommend or carry out actions to prevent the issues from recurring. He must also ensure that the work area is clean, safe, well-maintained and environmentally friendly.

In addition, the EO will assist the Environmental Consultant in carrying out monthly environmental monitoring activities.

9.4.4 Mini Laboratory

Being equipped with necessary basic instruments to monitor the important components of the environment would enhance the effectiveness of environmental monitoring. This would in turn determine the ambient environmental conditions and, in case of non-compliance, necessary actions can be taken well in advance. Therefore, the Contractor shall provide and maintain a mini laboratory or provide necessary equipment on site to facilitate amongst which includes daily water quality inspection. In view of the importance of obtaining good quality sand for reclamation fill material, certain procedures are required to be undertaken on site to ensure the particle size of sand is as specified in the contract.

The mini laboratory must be equipped with proper testing apparatus and must be able to carry out simple analyses (T9.1).

T9.1 *In-situ* and mini laboratory analyses

Item	Test	Equipment
Fill material	Soil compaction	Soil compactor
	Sieve analysis	Sieve
	Visual inspection	-
Water quality	Total Suspended Solids (TSS) and turbidity	Portable hand-held turbidity and suspended solids measuring instrument
	DO, pH, temperature, conductivity and salinity	Multiparameter instrument

More specialised analyses such as air quality and noise monitoring shall be out-sourced to a laboratory accredited by the Laboratory Accreditation Scheme of Malaysia (SAMM).

9.4.5 Performance Monitoring , Compliance Monitoring and Impact Monitoring

Environmental monitoring is a fundamental programme to ensure that the project activities do not pose any impacts towards the existing environment. The programme provides useful information to:

a) assist in detecting the development of any unwanted environmental impacts, and thus provide opportunities for adopting appropriate mitigating measures;
b) define the monitoring mechanism and identify the monitoring parameters; and
c) evaluate the performance and effectiveness of the mitigation measures proposed in the EMP and suggest improvements, if required.

The proposed environmental monitoring programme can be divided into three (3) types of monitoring:

a) Performance Monitoring;
b) Compliance Monitoring; and
c) Impact Monitoring.

9.4.5.1 Performance Monitoring

Performance Monitoring (PM) is to prevent system function failures and to ensure that it is working properly and optimally. For this project, the PM is required for the efficiency of the perimeter rock bund structures, maintaining the silt curtains and vessels operation.

a) Daily Turbidity and TSS Monitoring

The most common major environmental problem resulting from dredging and reclamation works is sediment plume. Sediment plume will directly elevate the level of turbidity and TSS which in turn will affect the quality of a water body. Considering the impact that it can have towards the environment, the daily level of turbidity and TSS around the Project area will be supervised by daily turbidity and TSS level monitoring.

The turbidity and TSS compliance levels are monitored against the pre-determined limits. If daily compliance limits are violated, mitigation actions will be implemented. If no violations of limit occur, dredging and reclamation works will continue together with the monitoring process.

Monitoring stations will be similar to the established baseline water quality stations. Additional stations may be determined if needed, particularly near ESAs (i.e. Pulau Kendi, fishing grounds, etc.), in order to provide an initial respond mechanism to any changes in suspended sediment concentrations.

Setting a trigger value for suspended solids and/or turbidity is important as the sediment plume resulting from the land reclamation and dredging works may stay in the water column for an extended period of time. It is deemed appropriate to set a trigger value lower than the standard DOE guidelines. This will provide a window period for the problem to be rectified before the TSS concentration values exceed the guideline's limits. Doorn-Groen and Foster (2007) has proposed an impact severity matrix for excess concentration and sedimentation for corals habitat as shown in T9.2. Consequently, 30 mg/L above the ambient concentration

can be considered as the appropriate trigger value.

Daily data obtained from the monitoring will be recorded and analysed. The data will be compiled weekly and a report will be submitted during each week to the DOE. A summary of the monthly data will also be incorporated in the monthly compliance monitoring report that will be presented to the DOE.

T9.2 Impact severity matrix for corals

Severity	Excess Concentration	Excess Sedimentation
No Impact	> 5 mg/L for less than 5% of the time	< 0.05 kg/m^2/day
Slight Impact	> 5 mg/L for less than 20% of the time > 10 mg/L for less than 5% of the time	< 0.10 kg/m^2/day
Minor Impact	> 5 mg/L for more than 20% of the time > 10 mg/L for less than 20% of the time	< 0.20 kg/m^2/day
Moderate Impact	> 10 mg/L for more than 20% of the time > 25 mg/L for less than 5% of the time	< 0.50 kg/m^2/day
Major Impact	> 25 mg/L for more than 20% of the time > 100 mg/L for more than 1% of the time	> 0.05 kg/m^2/day

9.4.5.2 Compliance Monitoring

The Compliance Monitoring (CM) programme for this Project will include water quality, sediment quality, air quality and noise monitoring; and Dredging and Disposal Monitoring System (DDMS).

a) Water Quality Monitoring Programme

Location: 18 stations (as per T6.9 and F6.34 in *Chapter 6: Existing Environment*)
Parameter: Temperature, Salinity, pH, Conductivity, Turbidity, DO, BOD, COD, TSS, Oil and Grease, Ammoniacal Nitrogen, Phosphate, Nitrate, Sulphide, Heavy Metals, Faecal Coliform and *E. coli*
Period: Flooding phase during spring tide
Depth: Three (surface, middle and bottom)
Frequency: Monthly

An example of the water quality monitoring summary sheet is as given in T9.3.

b) Sediment Quality Monitoring Programme

Location: 13 stations (as per T6.14 and F6.35 in *Chapter 6: Existing Environment*)
Parameter: Arsenic, Cadmium, Chromium, Copper, Lead, Zinc, and Nickel
Frequency: Quarterly

An example of the sediment quality monitoring summary sheet is as given in T9.4.

T9.3 Example of Compliance Monitoring Summary Sheet for Water Quality

Compliance Monitoring				**Water Quality**	
General Information	Project Proponent			Penang State Government	
	Project Delivery Partner				
	Environmental Consultant				
	No. of stations			18	
	Coordinates of sampling stations				
	List of Environmental Management Committee (EMC)			As given in F9.4	
	Date				
	Time				
	Weather				
	Tide conditions				
	Depth			Three (surface, middle and bottom)	
Parameters	**Baseline**	**Results**	**Parameters**	**Baseline**	**Results**
Temperature			Oil and grease		
Salinity			Ammoniacal nitrogen		
pH			Phosphate		
Conductivity			Nitrate		
Turbidity			Sulphide		
Dissolved Oxygen (DO)			Heavy metals		
Biological Oxygen Demand (BOD)			Faecal coliform		
			E. coli		
Chemical Oxygen Demand (COD)			Total Suspended Solid (TSS)		

T9.4 Example of Compliance Monitoring Summary Sheet for Sediment Quality

Compliance Monitoring				**Sediment Quality**	
General Information	Project Proponent			Penang State Government	
	Project Delivery Partner				
	Environmental Consultant				
	No. of stations			13	
	Coordinates of sampling stations				
	List of Environmental Management Committee (EMC)			As given in F9.4	
	Date				
	Time				
	Weather				
	Tide conditions				
Parameters	**Baseline**	**Results**	**Parameters**	**Baseline**	**Results**
Arsenic			Lead		
Cadmium			Zinc		
Chromium			Nickel		
Copper					

c) Air Quality Monitoring Programme

Location: 3 stations (as per T6.20 and F6.37 in *Chapter 6: Existing Environment*)
Parameter: TSP, $PM_{2.5}$, NO_2, SO_2 and CO
Frequency: Quarterly

An example of the air quality monitoring summary sheet is as given in T9.5.

d) Noise Monitoring Programme

Location: 3 stations (as per T6.17 and F6.37 in *Chapter 6: Existing Environment*)
Parameter: L_{Amax}, L_{Amin}, L_{Aeq}, L_{A10}, L_{A50} and L_{A90}
Frequency: Quarterly

An example of the noise monitoring summary sheet is as given in T9.6.

T9.5 Example of Compliance Monitoring Summary Sheet for Air Quality

Compliance Monitoring					**Air Quality**
General Information	Project Proponent				Penang State Government
	Project Delivery Partner				
	Environmental Consultant				
	No. of stations				3
	Coordinates of sampling stations				
	List of Environmental Management Committee (EMC)				As given in F9.4
	Date				
	Time				
Parameters	**Baseline**	**Results**	**Parameters**	**Baseline**	**Results**
Total Suspended Particles (TSP)			Carbon monoxide (CO)		
Particulate Matter ($PM_{2.5}$)			Sulphur dioxide (SO_2)		
Nitrogen dioxide (NO_2)					

T9.6 Example of Compliance Monitoring Summary Sheet for Noise

Compliance Monitoring					**Noise**
General Information	Project Proponent				Penang State Government
	Project Delivery Partner				
	Environmental Consultant				
	No. of stations				3
	Coordinates of sampling stations				
	List of Environmental Management Committee (EMC)				As given in F9.4
	Date				
	Time				
Parameters	**Baseline**	**Results**	**Parameters**	**Baseline**	**Results**
L_{Amax}			L_{A10}		
L_{Amin}			L_{A50}		
L_{Aeq}			L_{A90}		

e) Dredging and Disposal Management System

A Dredging and Disposal Monitoring System (DDMS) will be used for tracking the movements of TSHDs from the dredging area to the disposal site off Pulau Kendi. Advantage will be taken of the capabilities of DDMS to determine the sequence of the disposal activities based on the movement of the TSHD. Any spillage from the loads of dredged materials can be traced through the system.

9.4.5.3 Impact Monitoring

The Impact Monitoring (IM) will cover offset monitoring, bathymetry survey and public complaint monitoring.

a) Offset Monitoring

There will be trade-offs from the proposed PSR Project and the Project Proponent must conduct offset programmes. Monitoring of several of the offset programmes must be conducted to determine the success rate of the programmes.

- Mangroves Replanting Programme

The Project Proponent has pro-actively conducted an offset programme at Sungai Acheh called "*Sembang Bakau*". The success of this programme can be quantitatively determined by monitoring the planted mangroves. An example of the replanted mangroves monitoring summary sheet is as given in T9.7.

The following monitoring regime for replanted mangroves at Sungai Acheh is recommended:

i) At least bi-annually from the date of replanting and for a minimum of two (2) years.
ii) The monitoring should be transect-based, with quantitative outputs. A minimum of four (4) transect lines should be involved.
iii) The monitoring report shall be submitted bi-annually to DOE for a minimum of two (2) years.

T9.7 Example of Offset Monitoring Summary Sheet for Replanted Mangroves

Offset Monitoring		**Replanted Mangroves**	
General Information	Project Proponent	Penang State Government	
	Project Delivery Partner		
	Environmental Consultant		
	Coordinates of locations		
	List of Environmental Management Committee (EMC)	As given in F9.4	
	Date		
	Time		
	Weather		
Parameters		**Baseline**	**Results**
Length of coastline replanted (m)			
No. of seedling survived/No. of seedling planted			
Plant height (m)			
Stem diameter (m)			

- Artificial Reefs

Successful artificial reef construction will be determined by the planning process of the Project Proponent. The planning process should involve the Department of Fisheries and scientists. The planners should:

i) Acquire an adequate environmental and biological database of the selected site;
ii) Select safe weather and water conditions appropriate to the type of transportation and construction technique;
iii) Employ reputable and competent personnel;
iv) Coordinate with any biologists, oceanographers or engineers studying the reef;
v) Coordinate with the Marine Department;
vi) Assure that all equipment is tested and sufficient for the task to be performed;
vii) Obtain liability insurance, if needed, to protect all involved;
viii) Maintain staging area(s) to be compatible with the surroundings and to avoid potential conflicts at the staging area(s);
ix) Stage and deploy primary or emergency navigational aids, as required;
x) Manage the flow of raw materials to the staging area and the movement of completed units to the reef site;
xi) Assess daylight and other operational constraints;
xii) Supervise any required clean-up after placing reef materials on the site;
xiii) Be prepared to cancel operations if necessary to ensure the safety of participants and the proper placement of materials; and
xiv) Secure funding and other support to complete construction.

An example of the artificial reefs monitoring summary sheet is as given in T9.8.

T9.8 Example of Offset Monitoring Summary Sheet for Artificial Reefs

Offset Monitoring		**Artificial Reefs**
General Information	Project Proponent	Penang State Government
	Project Delivery Partner	
	Environmental Consultant	
	Coordinates of locations	
	List of Environmental Management Committee (EMC)	As given in F9.4
	Date / Time	
	Weather	
Parameters	Findings/Results	

The constructed artificial reefs will have the following recommended monitoring regime:

i) At least bi-annually from the date of the reef's construction for the whole Project duration.
ii) The monitoring should involve the documentation of material stability and structural integrity throughout the life of the reef through simple bathymetric surveying instrumentation or more sophisticated gear such as side-scan sonars or magnetometers.
iii) The monitoring should also involve the on-going evaluation of an artificial reef to determine whether or not the reef is accomplishing the purpose(s) for which it was established. This can detect whether the reef is having any unexpected negative

consequences which then provides room for future modifications to the construction techniques or reef placement.

iv) The monitoring report shall be submitted bi-annually to DOE during the whole Project duration.

- Coral Reefs

The monitoring of coral reefs at Pulau Rimau would enable the health and status of these areas to be measured and any adverse impacts on the habitats due to the reclamation and operation of the proposed Project can be closely monitored. An example of the coral reefs' monitoring summary sheet is as given in T9.9.

The following monitoring regime for coral reefs is recommended to ensure the proposed Project would not affect these sensitive habitats:

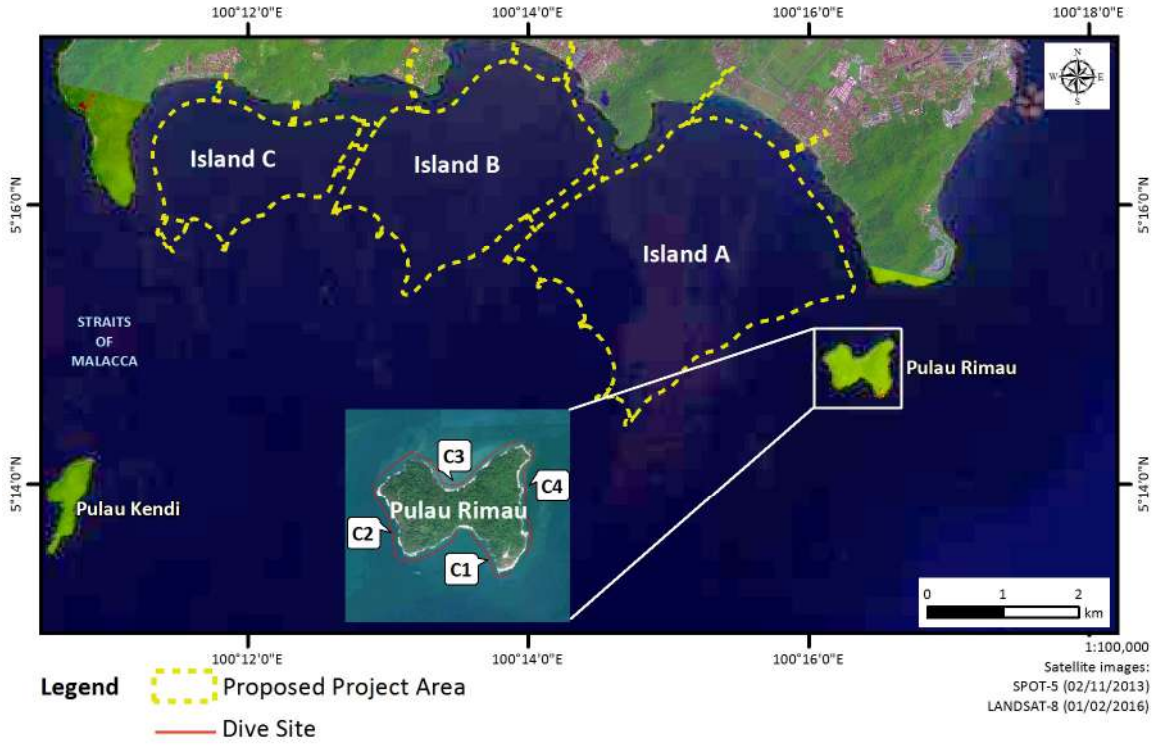
i) Quarterly during the reclamation phase. Upon completion, habitat monitoring shall be continuously conducted for at least another two quarters and half-yearly during the operation phase;
ii) The monitoring should be transect-based, with quantitative outputs to enable clear comparison of habitat health. A total of four (4) transect lines will be involved for coral reef monitoring (T9.10 and F9.5).
iii) The primary benchmark would be confirmation there is no significant deterioration of habitat health and status at the study area as compared with the baseline data as presented in *Chapter 6: Existing Environment*.
iv) The monitoring report shall be submitted quarterly to DOE during the reclamation phase and half-yearly during the operation phase.

T9.9 Example of Offset Monitoring Summary Sheet for Coral Reefs

Offset Monitoring		**Coral Reefs**	
General Information	Project Proponent	Penang State Government	
	Project Delivery Partner		
	Environmental Consultant		
	Location	Pulau Rimau	
	List of Environmental Management Committee (EMC)	As given in F9.4	
	Date		
	Time		
	Weather		
	Tide conditions		
Parameters		**Baseline**	**Results**
Coral cover			

T9.10 Coordinates of the transect lines for coral reefs monitoring

Transect	**Coordinates**			
	Latitude	**Longitude**	**Latitude**	**Longitude**
	Start		**End**	
C1	05° 14.618' N	100° 16.549' E	05° 14.746' N	100° 16.419' E
C2	05° 14.755' N	100° 16.378' E	05° 14.916' N	100° 16.951' E
C3	05° 14.928' N	100° 16.126' E	05° 15.035' N	100° 16.597' E
C4	05° 15.025' N	100° 16.608' E	05° 14.671' N	100° 16.590' E



F9.5 Locations of the diving sites for coral reefs monitoring

b) Bathymetric Survey

Periodic bathymetric and nearshore monitoring surveys are recommended to assess beach and bed level changes during and after the implementation of the proposed development.

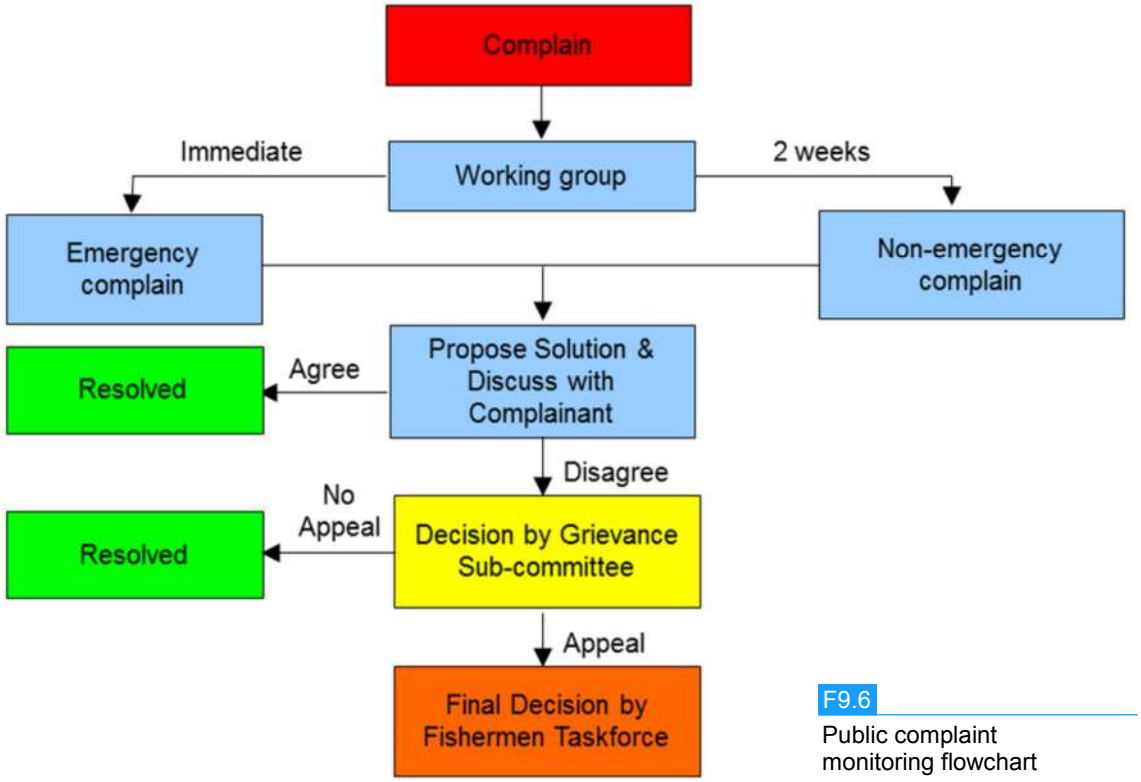
Monitoring surveys covering the area between Tanjung Teluk Tempoyak to Tanjung Gertak Sanggul and around Pulau Rimau are recommended. The survey shall extend 50 m landward of the High Water mark and sufficiently far seaward of the coastline. It is recommended for the shore-parallel survey lines to be taken at 200 m intervals. Around Pulau Rimau, a closer interval of 100 m is recommended. F9.5 shows the extent and details of the survey.

Each survey campaign shall be carried out at three-month intervals during the construction phase. The report for each survey shall be submitted to the Department of Irrigation and Drainage (DID). The survey can be done at half-yearly intervals during the post-construction phase for up to three years or after receiving consent from DID to discontinue the survey. Information from the periodic survey can also be used to determine the need and extent of maintenance dredging required after the development is completed.

In addition to the monitoring required by DID, it is recommended that the dredged channels are to be monitored at least on a yearly basis to ensure these channels are sufficiently deep for safe navigation and effective flushing.

c) Public Complaint Monitoring

Any complaints from the public related to the Project can be made at the *Pusat Perkhidmatan Setempat Nelayan (PPSN)* set up by the Project Proponent (F9.6). These complaints shall be monitored and recorded to ensure that they are responded to and with proper action taken accordingly. Complaints from the public may also come from issues concerning noise and dust.



F9.6
Public complaint monitoring flowchart

9.4.6 Environmental Auditing

An environmental audit of the PSR Project is proposed to be conducted during the construction phase. This is to assess the overall environmental compliance, compliance of the environmental mainstreaming requirements and the fulfilment of the Environmental Pledge by the Project Proponent.

A summary of the proposed monitoring programme for the whole duration of the development is presented in T9.11.

T9.11 Summary of the overall proposed Environmental Monitoring Programme

Item		Parameter	Monitoring Stations	Sampling Frequency	Environmental Quality Criteria	Reporting Requirement
Performance Monitoring	Daily Turbidity and TSS Monitoring	TSS and turbidity in surrounding waters	As per T6.x and F6.x in *Chapter 6: Existing Environment*	Daily	TSS value must not be more than 30 mg/ L above ambient concentration	a) Report to be submitted to DOE weekly. b) Summary of the monthly data to be incorporated in the monthly compliance monitoring report for submission to DOE.
Compliance Monitoring	Water Quality	Temperature, Salinity, pH, Conductivity, Turbidity, DO, BOD, TOC, TSS, and Oil and Grease, AN, Phosphate, Nitrate, Heavy Metals, Faecal Coliform, *E.coli*	As per T6.x and F6.x in *Chapter 6: Existing Environment*	Monthly	Results will be compared with the baseline and Malaysia Marine Water Quality Criteria and Standard (MWQCS)	Report to be submitted to DOE monthly and quarterly
	Sediment Quality	Zinc, Nickel, Copper, Chromium, Lead, Arsenic, Cadmium	As per T6.x and F6.x in *Chapter 6: Existing Environment*	Quarterly	Results will be compared with the baseline and US EPA Standard	Report to be submitted to DOE quarterly
	Air Quality	TSP, $PM_{2.5}$, SO_2, NO_2, O_3 and CO	As per T6.x and F6.x in *Chapter 6: Existing Environment*	Quarterly	Results will be compared with the baseline and New Malaysia Ambient Air Quality Standard	Report to be submitted to DOE quarterly
	Noise	L_{min}, L_{max}, L_{10}, L_{50}, L_{90}, L_{eq} (24 hours profile)	As per T6.x and F6.x in *Chapter 6: Existing Environment*	Quarterly	Results will be compared with the baseline and DOE's "Interim Guidelines for Maximum Permissible Sound Levels by Receiving Land Use" (Schedule 1)	Report to be submitted to DOE quarterly
	Dredging and Disposal Management System (DDMS)	To track the movement of TSHD from the dredging area to the disposal site off Pulau Kendi.	During dredging and reclamation works	-	-	-
Impact Monitoring	Offset Monitoring	To monitor whether proposed offset programmes in *Chapter 8* are conducted correctly and are successful. [As per *Section 9.4.5.3 (a)*]	Mangroves Replanting	Bi-annually	-	Report to be submitted to DOE bi-annually
			Artificial reefs	Bi-annually		Report to be submitted to DOE bi-annually
			Coral reefs at Pulau Rimau	a) Quarterly during the reclamation phase b) Upon completion, continued monitoring for at least another two (2) quarters c) Bi-annually during operation phase		Report to be submitted to DOE quarterly during reclamation phase and bi-annually during operation phase.
	Public Complaint Monitoring	Complaints from the public can be made at PPSN set up by the Project Proponent.	The whole Project's implementation and its activities	-	-	-
Environmental Audits		To audit the compliances with the EIA approval conditions and the relevant environmental regulations and guidelines	The whole Project's implementation and its activities	Quarterly	Environmental Audits should be carried out by a third party Environmental Auditor (registered with DOE)	Report to be submitted to DOE quarterly

9.4.7 Record Keeping

Information related to the results of the monitoring activities, compliance with the approval conditions, and the efficiency of the proposed mitigation measures will also be recorded on a regular basis. The forms for monitoring record-keeping must include the following:

a) type of monitoring;
b) name of person-in-charge;
c) date of sampling/monitoring;
d) time of sampling/monitoring;
e) weather;
f) tide conditions;
g) coordinates of location;
h) parameters chosen; and
i) baseline data (if applicable).

Additional records will also include:

a) daily inspection notes/records by the proponent's resident engineers/technicians to ensure that the recommended environmental control and mitigation measures are being undertaken and immediate actions are taken in case of non-compliance;
b) records from weekly/monthly site visits by the proponent's environmental officer in order to assess the environmental compliance of the contractor; and
c) records of complaints received with regard to the project and subsequent actions taken.

An online database system shall be established to record all information and supporting data related to the Project for swift access.

9.4.8 Data Analysis and Interpretation

The samples obtained during the monitoring activities will be analysed using accredited laboratories and by the subject experts affiliated with the proposed Project.

9.4.9 Reporting and Communication

Monthly and quarterly reporting of findings, issues identified and corrective measures implemented should be reported to DOE. The findings from on-site monitoring conducted must be reported to the EO and presented and coordinated first in the EMC meeting before the monthly reports are submitted. This is to ensure coherent interpretation and analyses of the findings of the monitoring activities.

9.4.10 Future Improvement and Budget

Funding and budget allocation shall be provided by the Project Proponent which could further improve the proposed mitigation measures, the regulatory compliances and corporate environmental image of the organization. Future improvement works will be identified through EMC if the proposed mitigation measures are found to be inadequate or inappropriate.

9.5 Emergency Response Plan

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.

9.5.1 Emergency Response Plan Priorities

The ERP observes the following response priorities:

a) protection of human lives;
b) protection of public health;
c) protection of environmental/subsistence resources;
d) Protection of socio-economic and cultural resources; and
e) Protection of public and private properties.

9.5.2 Emergency Response to General Accidents and Occupational Injuries

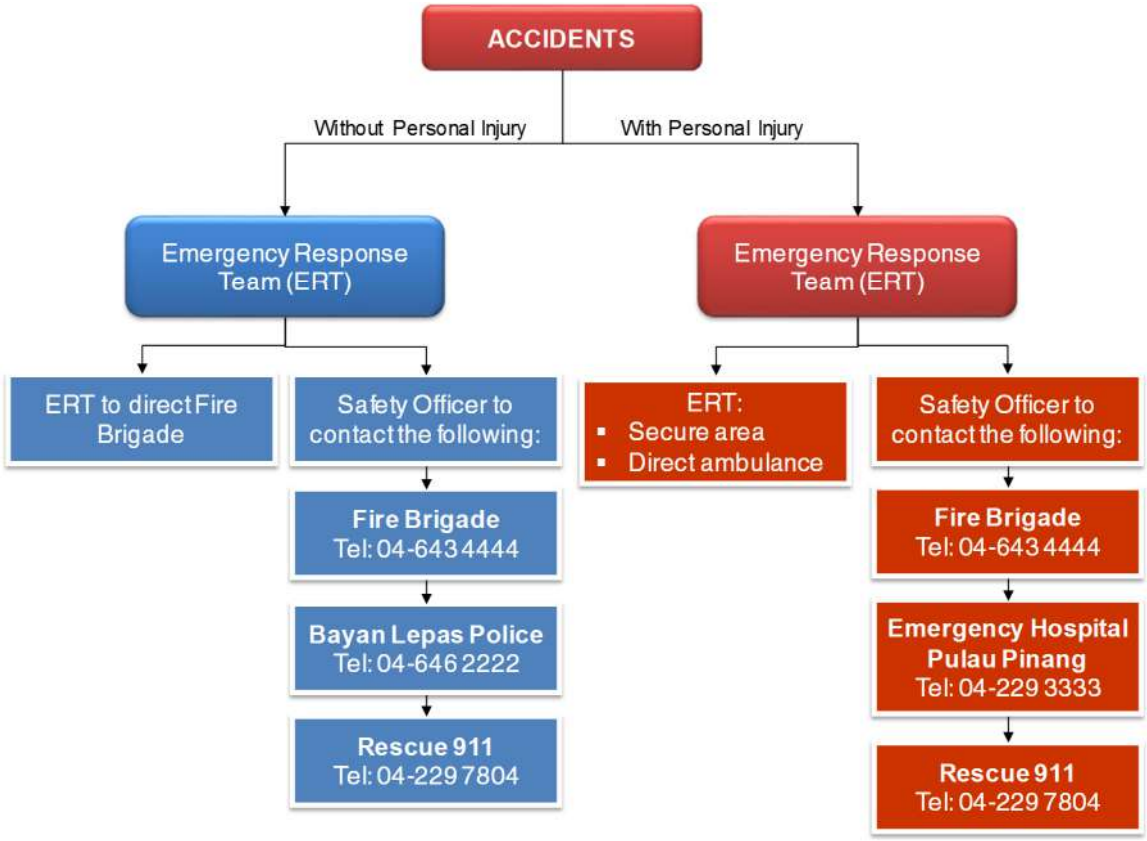
Occupational injury is meant as personal injury, illness or death sustained in connection with work. Causes of occupational accidents may be attributed either directly or indirectly to one or more of the following:

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

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

a) Assess the situation and shout for assistance;
b) 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;
c) Unless trained, DO NOT attempt to give medical assistance/first aid assistance to the injured person (if any);
d) Evacuate the area safely;
e) Safety Officer (SO) shall report to the PDP and other relevant authorities about the accident and the number of people injured; and
f) 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 F9.7.



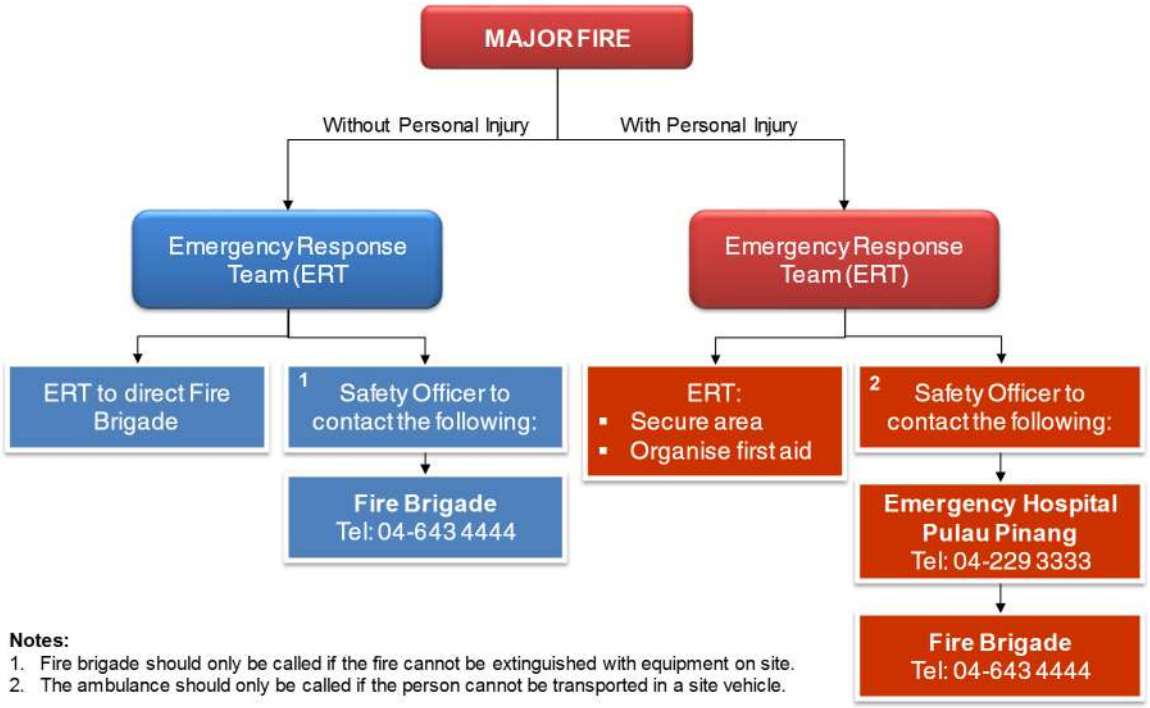
F9.7 Emergency response plan to general accidents and occupational injuries

9.5.3 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:

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

A flowchart of the emergency response to fire is shown in F9.8.



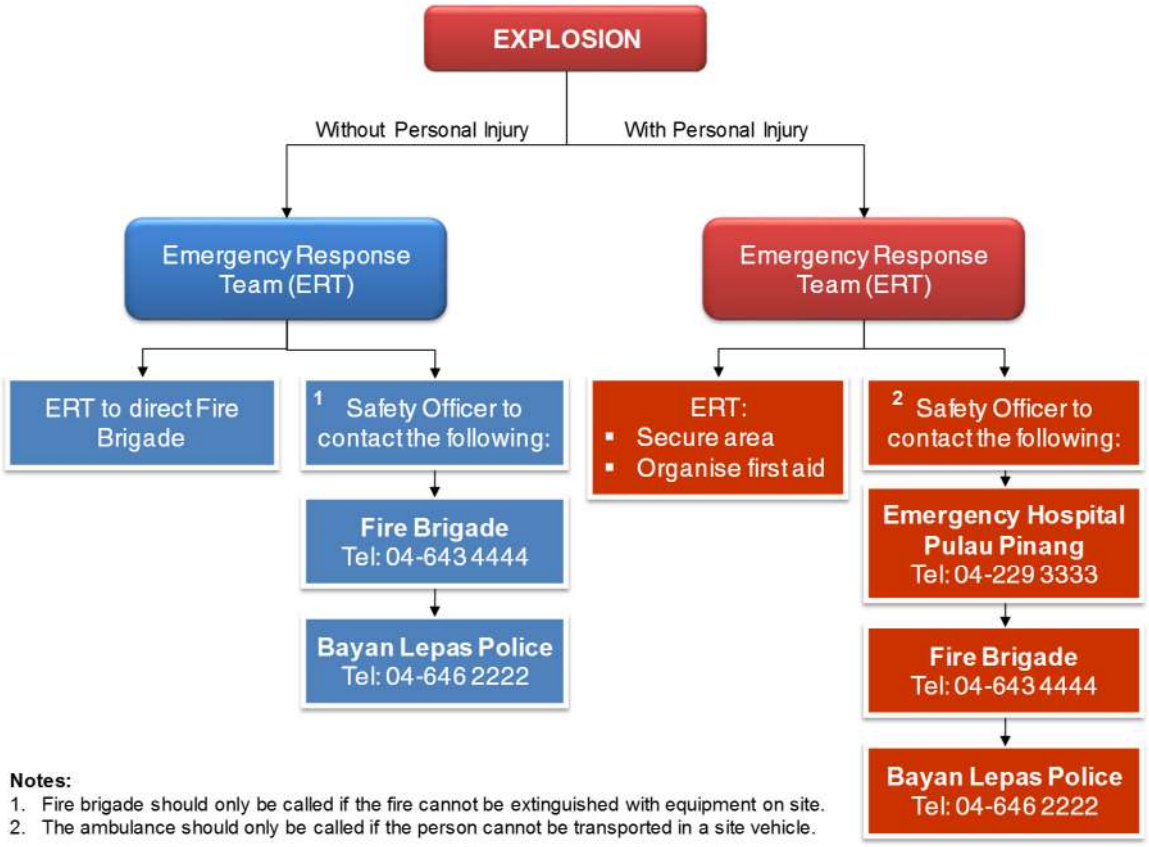
F9.8 Emergency response plan to fire

9.5.4 Emergency Response to Explosion

Should an explosion occur:

a) Stay low to the ground and crawl to the safety area;
b) Cease operations and IMMEDIATELY contact the relevant authorities;
c) Call the ERT immediately. Advise of the exact location, nature of injuries (if any) and request other emergency services as required;
d) Do not switch on lights or any other equipment. If lights are already on, leave them on;
e) Evacuate the area or the building and move to the nearest area of safety and follow the appropriate emergency procedures for the conditions;
f) In the event of a fire on a tanker, ensure that all cargo operations cease immediately, and that all lines and hoses are water-plugged, and all openings, including sullage ports, are closed; and
g) Ensure that the vessel's agent, and those of other vessels in the vicinity, are informed of the emergency.

A flowchart of the emergency response to explosion is shown in F9.9.



F9.9 Emergency response plan to explosion

9.5.5 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:

a) 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;
b) Stop the source of spill if possible;
c) 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;
d) Evacuate the area immediately;
e) Unless trained, DO NOT attempt to clean up the spill yourself;
f) SO shall write a report and hand in to the Project Manager and other relevant authorities; and
g) Keep the report for future reference for a specific time frame.

9.5.6 Emergency Response to Oil Spill on Vessel

In the event that oil products are spilled into the sea or an oil slick is observed, the Captain/ Vessel Master shall be notified immediately by the person observing the oil spill, giving sufficient details so that the necessary steps can be taken.

The source of spill should be isolated immediately, if possible, and followed by the deployment of oil booms. The Captain/Vessel Master is responsible for the compliance and execution of the Shipboard Oil Pollution Emergency Plan (SOPEP), where applicable, and for ensuring the vessel is carrying oil pollution prevention equipment appropriate for clean-ups of minor spills.

9.5.7 Emergency Response to Stranding or Grounding

Immediately after stranding or grounding of the vessel, the Captain/Vessel Master shall order the termination of all operations and to choose all necessary means with regard to the security of the vessel.
In the case of stranding or grounding being observed, the actions to be carried out by the crew should be as follows:

a) Stop engines;
b) Sound the general emergency alarm;
c) Close all watertight doors, if fitted;
d) Show lights/shapes and make any appropriate sound signals;
e) Switch on deck lighting at night;
f) Check hull for damage;
g) Sound bilges and tanks;
h) Visually inspect compartments, where possible;
i) Sound around vessel;
j) Determine which way deep water lies; and
k) Determine the nature of the sea bottom.

9.5.8 Emergency Response to Engine or Steering Failure

An engine or steering failure (or blackout) should be considered as a critical situation on board vessels. Whenever an engine or steering failure occurs, the vessel is not manoeuvrable anymore and thus all actions must be taken to ensure the safety of the vessel and its crew.

In the case of an engine or steering failure being observed, the actions to be carried out by the crew should be as follows:

a) Inform the Captain/Vessel Master;
b) Prepare for anchoring if in shallow water;
c) Exhibit/show "*Not under command*" shapes/lights; and
d) Commence sound signalling.

In case of a steering failure:

a) Inform the engine room;
b) Engage emergency steering;
c) Prepare the engines for manoeuvring; and
d) Decide if ongoing activities must be suspended.

9.5.9 Emergency Response when Man Overboard

People working in exposed situations where there is the risk of falling into the water are required to wear safety harnesses, lifelines, and/or life jackets. A life vest must be worn at all times where there is a possibility of falling into water more than 0.5 m deep. All crew shall be able to swim a minimum of 50 m unaided.

The procedure for recovery will be as follows:

a) Release the lifebuoy nearest to the man in the water;
b) Keep the man in sight as long as possible, while shouting "*Man Overboard!*";
c) Utilise the nearest intercom installation to inform the bridge/site office;
d) The Captain/Master or on-duty officer announces "*Man Overboard!*" over the address system and gives location if known;
e) Searchlights shall be used as necessary to locate and keep the man in sight; and
f) Weather permitting and if there is no workboat in the vicinity, lower lifeboat with an appointed crew.

The following are to be kept in mind when retrieving a man after an overboard fall:

a) He may have injured himself in the fall when hitting the water, and abdomen/chest injuries may make his breathing extremely painful. Caution should be exercised in his retrieval;
b) He may have been drowning and therefore may have water in his lungs. He could also have vomited and choked in the process. Unconscious people rescued out of the water should be handled with a minimum of manipulation, have their airways cleared, respiration checked and, if it is not present, mouth-to-mouth resuscitation should be started as early as possible. Life-giving first aid must not be stopped while asking others to get help; and
c) Initiate the medical emergency procedure.

9.5.10 Emergency Contact Details

The key contacts for environmental emergencies are listed in T9.12.

T9.12 Emergency contact details

Department	Contact Number
Fire Brigade, Penang	04 – 643 4444
Hospital Pulau Pinang	04 – 2293333
Klinik Desa Gertak Sanggul	04 – 649 5606
Klinik 1Malaysia Teluk Kumbar	04 – 649 2351
Marine Department Northern Region (Penang Port Office)	04 – 657 9636
Civil Defence Department (Rescue 911)	04 – 226 3876
Department of Environment (DOE), Penang	04 - 333 4441
Department of Occupational Safety and Health	04 – 399 1144
Penang Port Office	04 – 210 2211

9.6 Abandonment Plan

In the event that the Project is stopped halfway, an abandonment plan must be implemented. The following actions should also be carried out:

a) The relevant authorities (i.e. DOE, Marine Department, APMM, local council, etc.) must be informed in writing within 14 days of the abandonment;
b) A detailed report should also be submitted to the relevant authorities. This report should detail out the activities that have been carried out, structures (if any) which have been erected, wastes generated, etc.;
c) All wastes (especially scheduled wastes) should be inventoried and disposed of properly;
d) Structures (on land or submerged in water) must be removed. This is important, especially of those submerged since they can impede navigation;
e) Any objects prone to become breeding grounds for diseases (like dengue) must be disposed of;
f) If these structures cannot be removed, the area should be cordoned off by fencing. Appropriate warning signs must be put up to restrict access to the area; and
g) If the need arises, the cordoned area must be guarded on a 24-hour basis.