5.3 ZONES OF IMPACT

In addition to outlining LAU boundaries, the State assessment process requires the definition of impact zones in accordance with requirements of EAG No. 7. The zones required are:

- **Zone of High Impact (ZoHI)**: the area directly impacted (e.g. the channel and spoil disposal site) and a zone immediately about the proposed dredging and disposal areas where indirect impacts are predicted to be severe and irreversible. This zone defines the area where mortality of, and long term (i.e. months to years) serious damage to, biota and their habitats would be predicted. The impacts on the BPPHs and their habitats would be predicted. The impacts on the BPPHs within the ZoHI should be considered in the context of EAG No. 3;

- **Zone of Moderate Influence (ZoMI)**: abuts, and lies immediately outside of, the ZoHI. Within this zone sub-lethal effects on key benthic biota would be predicted, but there should be no long term damage to, or modification of, the benthic organism, the communities they form or the substrates on which they grow. Proponents should provide information about impacts in this zone both in the context of what would be impacted and what would be protected. The outer boundary of this zone is coincident with the inner boundary of the next zone, the Zone of Influence;

- **Zone of Influence (ZoI)**: the area where at some time during the proposed dredging and spoil disposal activities small changes in sediment-related environmental quality which are outside natural ranges might be expected however the intensity and duration is such that no detectable effects on benthic biota or their habitats should be experienced; and

- **Outer Boundary of the Zone of Influence**: the point beyond which there should be no dredging (or spoil disposal) related changes from natural conditions. This is the area where it would be appropriate to establish suitable reference sites for the purpose of monitoring potential effects of dredging in the ZoHI, ZoMI and ZoI.

Threshold values were developed for benthic primary producers under which impacts and ultimately losses are predicted to occur. In particular, threshold values were developed for altered water column conditions as indicated by total suspended solid concentrations and sedimentation rates.

The threshold values set to delineate the Zone of High Impact are based on TSS concentrations that occlude all light from reaching the benthic community. The threshold values set to delineate the Zone of Moderate Impact are based on TSS concentrations that will occlude 40% of light from reaching the benthic community. When these TSS concentrations occur frequently in a 14-day period then this period is termed a “low-light” fortnight. If the “low-light” fortnights are consecutive then impacts on the hard coral community, as a sentinel to the broader benthic primary producer community, are assumed to have occurred. The actual number of consecutive reduced light fortnights that occur and the assigned loss of hard coral were determined using:

- the literature available on the length of “low-light” periods which correspond to hard coral mortality; and

- the periods of “low-light” the hard coral communities at Port Hedland experience from the baseline light climate data already collected, and the measures of mortality of these communities during and after the periods of “low-light”.

Based on these investigations arbitrary values for hard coral loss due to reduction in the light climate were developed:

- the Zone of High Impact is predicted to experience 100% coral loss if at any stage during the dredging program there is one period of four consecutive “low light” fortnights; and

- the Zone of Moderate Impact is predicted to experience 0% coral loss if at any stage during the dredging program there is one period of four consecutive “low light” fortnights.

Sedimentation threshold values have been estimated from baseline monitoring data collected in State waters on gross sedimentation rates to determine the Zones of High and Moderate Impact. Sedimentation rates in both the wet and dry seasons have been taken into account when interrogating

the model outputs. Zones of High and Moderate Impact are based on the increases in sedimentation due to project activities in the State waters as described below:

- the Zone of High Impact is predicted to encompass areas which experience twice the maximum background mean daily gross sedimentation rates in any 14 day period; and
- the Zone of Moderate Impact is predicted to encompass areas which experience 1.1 times the maximum baseline mean daily gross sedimentation rates in any 14 day period.

A summary of the decision rules that have been used to determine the impact zones are summarised in **Table 5.6**. **Figure 5-8** illustrates the Zones of Impact within State waters for the proposed Outer Harbour Development.

Table 5.6 Decision Rules Used to Determine the Zones of Impact and their Boundaries

Zone	Description of Decision Rule
Zone of High Impact	Anywhere that direct removal of BPPH is proposed to occur; where the benthic environment is predicted to experience one period of four consecutive “no light” fortnights; and where twice the maximum background mean daily gross sedimentation rates is predicted to occur.
Zone of Moderate Impact	Areas predicted to experience one period of four consecutive “low light” fortnights; and where 1.1 times the maximum baseline mean daily gross sedimentation rates is predicted to occur.
Zone of Influence	Water column TSS concentrations are greater than 5 mg/L above background concentrations
Outer Boundary of the Zone of Influence	Water column TSS concentrations are 5 mg/L or less above background at any point in time

For further information on the development of threshold values for predicting the zones of impact refer to **Appendix A2** of the PER/EIS.

650000

700000

7800000

7750000

Spoil Ground 9

COR

COX

Spoil Ground 3

J

MIB

Spoil Ground 2

I

One

H

Spoil Ground 7

CTH

WIS

LTI

Little Turtle Island

This figure is an indicative representation of the current design of the Outer Harbour Development.

Changes may be necessary as the engineering design progresses to ensure it is efficient, practical and within land disturbance requirements at the time of construction.

Final design drawing files will be forwarded to the relevant Government authorities on finalisation and completion.

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Legend

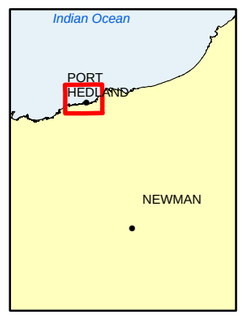
- Monitoring Sites

Zones of Impact (SKM, Dec 2010)

- Zone of High Impact
- Zone of Moderate Impact
- Direct Impact

Zones of Influence

- TSS - Dry Season Extent
- TSS - Wet Season Extent
- Study Area
- Existing Shipping Channel
- Lowest Astronomical Tide (LAT)
- Spoil Ground (Existing)
- Spoil Ground (Proposed)
- State/Commonwealth Jurisdiction Boundary



0 5 10
kilometres

Scale =1:288,000 at A3
Datum: GDA94
Projection: MGA94 Zone 50

Source:
Channel: 112-SK-00500 (FAST JV 01/11/2008)
Channel: Navy Hydrographer, AUS00740
Topography: GEODATA Topo 250K V3

Figure 5-8 Zones of Impact within State Waters for the Proposed Outer Harbour Development

6 ENVIRONMENTAL MANAGEMENT FRAMEWORK

6.1 BHP BILLITON IRON ORE ASSET DEVELOPMENT PROJECTS ENVIRONMENTAL MANAGEMENT PLAN

For the proposed Outer Harbour Development, a number of measures will be implemented to manage the potential environmental impacts resulting from construction and operational activities. These management measures have been identified from the PER/EIS risk assessment, regulatory requirements, BHP Billiton Iron Ore's operational experience, BHP Billiton Iron Ore's current operational environmental management programs, and stakeholder consultation. The proposed measures include standard practices which are routinely applied at BHP Billiton Iron Ore's Port Hedland facilities and projects through BHP Billiton Iron Ore's AS/NZ ISO 14001 certified Environmental Management System and project-specific measures which specifically relate to reducing the key environmental risks associated with the proposed Outer Harbour Development.

The environmental management program is an overarching strategy that will be used to translate the commitments and management measures contained in the PER/EIS into the planning documents, engineering designs, contract documents and the day-to-day construction and operation of the proposed Outer Harbour Development. The existing BHP Billiton Iron Ore's Health, Safety and Environmental Management System and its regulatory regime will continue to be used as the mechanism through which environmental management, monitoring and reporting is implemented for the proposed expansion.

The BHP Billiton Iron Ore Asset Development Project (ADP) Environmental Management Plan (EMP) (PP-13-100) outlines the minimum environmental management requirements for all growth projects.

A number of additional BHP Billiton Iron Ore documents are relevant to various aspects of this DSDMMP, including:

- BHP Billiton Iron Ore Health Safety Environment and Community (HSEC) Standards;
- BHP Billiton Iron Ore Health and Safety Management Plan (PP-09-100);
- BHP Billiton Iron Ore ADP Environmental Management System Overview (PP-13-022);
- BHP Billiton Iron Ore Major and Minor Spill Response (WIN-IEN-HC-001); and
- BHP Billiton Iron Ore Hazardous Materials Management (PP-09-101).

6.2 RELEVANT DETAIL FROM THE SUPPORTING MANAGEMENT PLANS

As described in **Section 2.2**, this DSDMMP is supported by a number of other management plans. The supporting management plans provide management strategies for activities proposed for both construction and operational activities of the proposed Outer Harbour Development, across a number of sensitive environmental factors or threats including marine turtles, marine mammals, mangroves and invasive marine species.

Incorporated into this DSDMMP are the management strategies for each of these factors/threats pertaining to the construction dredging and spoil disposal activities only. For further detail on management strategies for these environmental factors/threats beyond construction dredging and disposal activities as described in **Section 3**, please refer to the relevant supporting management plan.

6.3 ORGANISATIONAL STRUCTURE, ROLES AND RESPONSIBILITIES

As the proponent, BHP Billiton Iron Ore is responsible for the implementation of the proposal and adherence to the commitments made within the DSDMMP. **Table 6.1** identifies the responsibilities associated with the key management positions.

Table 6.1 Responsibilities for the Management of the Construction Dredging Program

Position	Responsibilities
Project Manager	• Overall responsibility for implementation of the DSDMMP • Overall responsibility for compliance with statutory requirements
Construction Manager	• Day to day implementation of the DSDMMP • Directs dredging contractors with respect to environmental controls • Day to day coordination of the project • Ensures adequate training of all personnel within area of responsibility
Dredging Contractor – Project Manager	• Prepares and implements an environmental management plan in accordance with the requirements of this DSDMMP • Implements the management actions • Ensures adequate training of all personnel within area of responsibility • Ensures all equipment is adequately maintained and correctly operated
Environmental Superintendent	• Provides advice on dredging and dredge material management related environmental issues • Oversees implementation of environmental controls, monitoring programs, inspections and audits • Completes compliance reporting requirements • Coordinates the training and induction process • Responsible for the implementation of the environmental monitoring programs and inspection • Prepares environmental monitoring reports • Provides advice with respect to environmental issues as required
All persons involved in project	• Comply with the requirements of this DSDMMP • Comply with all legal requirements under the approvals documents and relevant Acts • Exercise a duty of care to the environment at all times • Report all environmental incidents

7 ENVIRONMENTAL MANAGEMENT STRATEGIES

Each management strategy identifies the performance objectives and their indicators against which environmental performance is to be measured. An adaptive management program including reactive and contingency measures will ensure environmental outcome targets will be achieved during construction dredging and spoil disposal activities.

Where applicable, the management component of each strategy is divided into proactive and reactive management measures. Proactive management measures are those undertaken on a routine basis (i.e. during normal operations), while reactive management measures are those undertaken in the event that a problem is identified.

It should be noted that where a stand alone, factor specific management plan has been developed for the project (e.g. Marine Mammal Management Plan), the management plan is referenced here within this DSDMP and an overview of the key management measures is provided. The stand alone management plan should be referred to for full details of the required management measures.

An example of how each management strategy has been structured is shown in **Table 7.1**.

Table 7.1 Structure of the Management Strategies

Management Area:	**Specific area to be managed (e.g. Marine Fauna)**
Performance Objective:	The applicable performance objectives against which environmental performance is measured.
Key Performance Indicators:	Criteria against which the implementation of the management measures and performance against outcomes targets is quantifiably measured.
Management:	The proposed management strategies including trigger levels and responses and contingency measures.
Monitoring:	The applicable proposed monitoring programs.
Reporting:	The required reporting including frequency and recipient.
Risk Assessment:	The residual risk ranking (i.e. end risk, taking into consideration management and monitoring measures).

The management strategies presented in this DSDMMP are:

- **Strategy 1**: Benthic Habitat Management (**Section 7.1**);
- **Strategy 2**: Marine Mammals and Turtle Management (**Section 7.2**);
- **Strategy 3**: Invasive Marine Species (**Section 7.3**);
- **Strategy 4**: Spoil Ground Management (**Section 7.4**);
- **Strategy 5**: Waste Management (**Section 7.5**); and
- **Strategy 6**: Hydrocarbon Management (**Section 7.6**).

7.1 STRATEGY 1: BENTHIC HABITAT MANAGEMENT

The management strategy detailed in this section of the DSDMP will meet the management objectives for marine habitat thereby delivering the required environmental outcomes. A key component of the management strategy is management of the altered water quality conditions that may occur during the dredging and disposal activities. Management of dredging and disposal activities that cause sediment particles to be suspended in the water column is therefore included in this management strategy.

7.1.1 Management Objectives

The management strategy for the management of impacts to benthic habitat will achieve the following management objectives:

- ensure that the environmental values or the health, welfare and amenity of people and land uses are not adversely affected.
- meet statutory requirements and acceptable standards.
- maintain the abundance, diversity, geographic distribution and productivity of flora at species and ecosystem levels through the avoidance or management of adverse impacts and improvement in knowledge.
- maintain the integrity, ecological function, and environmental values of the seabed and coast.

7.1.2 Target Environmental Outcomes

The management and monitoring measures for benthic habitats will provide the following Environmental Outcomes:

State

- No more than 99 ha of coastal intertidal BPPH, or a total cumulative loss of 29.8% in the Port Hedland Industrial LAU and 3.5% in LAU B, will be lost.
- No more than 127 ha of subtidal BPPH, or a total cumulative loss of 46.0% in LAU 8, will be lost.

Commonwealth

- No more than 81 ha of hard substrate benthic habitat due to the marine infrastructure and spoil ground disposal areas will be lost.
- Losses of marine habitats are not predicted to result in impacts to marine fauna listed under the EPBC Act.

7.1.3 Regulatory Context

Guidance on the assessment and management of impacts to benthic primary producer habitat and benthic primary producers exists at a State level. In addition, the consideration of impacts to benthic habitats in the interests of conservation significant species is undertaken at a Commonwealth level. A summary of the assessment guidance documents relating to the management of marine habitats considered in this impact assessment is provided in **Table 7.2**.

Table 7.2 Guidance Documents Specific to Management of Benthic Habitats

Document	Description
Environmental Assessment Guideline (EAG) No. 3 – Environmental Assessment Guidelines for Protection of Benthic Primary Producer Habitat in Western Australia's Marine Environment (EPA 2009).	Provides an assessment framework for impacts to benthic habitats and requires an estimate of historical and cumulative losses of benthic primary producers and their habitats.
Environmental Assessment Guidelines No. 7 – Marine Dredging Proposals (EPA 2010)	Provides a spatially-based framework for the presentation and assessment of impacts on benthic communities and habitats that are predicted to arise from marine dredging.

EAG No. 3

EAG No. 3 (EPA 2009) requires an estimate of historical and cumulative loss of benthic primary producers and their habitats to be developed for each benthic primary producer habitat type in each local assessment unit (LAU). Within the guideline, the following definition of the LAU is provided:

'The LAU is generally geomorphologically determined, ...and defined considering local biophysical and geomorphic features, ...taking into account key physical and biological ecosystem attributes such as bathymetry, water circulation patterns, habitat and substrate types etc.'

EAG No. 7

The stated aim of EAG No. 7 is to provide a spatially-based assessment framework to guide proponents in the clear and consistent representation of predicted impacts associated with marine dredging proposals – both direct and indirect impacts of dredging on benthic communities and habitats are considered.

A summary of the definitions used in EAG No. 7 to describe impacts to benthic communities and habitats is provided in **Table 7.3**.

Table 7.3 List of Terms Used to Define Impacts to Benthic Communities and Benthic Habitats

Term	Definition
Loss	Direct removal or destruction of BPPH. Considered to be irreversible.
Damage	Alteration to the structure or function of a community.
Serious damage	Timeframe for full recovery is expected to be longer than five years.
Minor damage	Timeframe for full recovery is expected to be less than five years.

7.1.4 Background and Potential Impacts

Full further details of the existing benthic habitats with the project area and the impacts to benthic habitats predicted to occur as a result of the Outer Harbour development, refer to **Section 10.3** of the PER/EIS.

As described in **Section 5**, potential impacts to benthic organisms inhabiting hard and soft substrate environments are predicted due to the proposed construction dredging activities. The predicted impacts are:

- direct losses of benthic habitat (hard substrate) within the construction dredging footprint, that supports a mosaic of attached organisms including hard corals, macroalgae, and sponges and other filter feeders;
- water quality induced impacts to hard and soft substrate benthic habitats, affecting the attached mosaic described above and seagrass communities, respectively; and
- impacts to benthic habitat resulting from construction dredging and spoil disposal activities are predicted for localised areas in State and Commonwealth waters.

Note that the management of impacts to benthic habitat due to dredge spoil disposal is considered in **Section 7.4**, *Spoil Ground Management*.

The limits of acceptable net habitat loss for each Zone of Impact described in **Section 5.2** and are shown in **Table 7.4**. The derivation of the predicted impact and the limits of acceptable coral loss are described in **Section 10.3** of the PER/EIS.

Table 7.4 Limits of Acceptable Change

Zone	Limit of Acceptable Change
Zone of High Impact (Total Mortality) (ZoHI)	0% Protected
Zone of Moderate Impact (Benthic Community Effect) (ZoMI)	Up to 50% averaged net community change across the zone
Zone of Influence (No measurable effect) (ZoI)	100% Retained

7.1.5 Management Strategy

7.1.5.1 Overview

A two phase approach will be implemented to manage predicted impacts to benthic organisms due to removal, smothering, sedimentation and light deprivation resulting from the proposed construction dredging and spoil disposal activities consisting of:

- preventive management; and
- compliance monitoring and responsive management.

Compliance monitoring and responsive management will be used to monitor impacts to sensitive receptors and provide a management framework to be implemented in the event that unacceptable impacts occur. The aim of the compliance monitoring and management is to address any observed impacts to benthic communities and minimise risk of exceeding the limits of acceptable net coral loss.

Subtidal habitats that may be affected by the dredging and spoil management activities are mosaic benthic communities present on hard substrates including benthic primary producer (e.g. hard corals and macroalgae) and non-benthic primary producer (e.g. soft corals and sponges) community members (**Figure 7-1**). In addition, seagrasses are present on soft substrates within the predicted Zone of Influence. There is no one dominant BPP type in a mosaic community and the mosaic nature of these benthic communities is likely to support a disparate suite of ecological functions (e.g. primary production and filter feeding heterotrophy). It is therefore necessary to monitor at a community level for the impacts caused by the dredging and spoil management activities. The presence of the mosaic communities presents strong evidence that the community composition and the percent cover of individual community components vary through space and time.

Figure 7-1 Example of Mosaic Benthic Community

7.1.5.2 Monitoring for Management

Water quality management triggers will be developed based on environmental data collected prior to commencement of construction dredging and disposal activities for the Zone of Influence. Water quality triggers will utilise an approach incorporating intensity-duration-frequency, as defined by McArthur et al. (2002). Finalisation of the water quality triggers will occur prior to the commencement of dredging operations in consultation with the DEC.

It is essential that a whole of benthic community monitoring program be established for the proposed Outer Harbour Development so as to meet the requirements of EAG Nos. 3 and 7. The mosaic benthic communities will be monitored directly using towed video to ensure a whole of community impact assessment. Replicate transects will be established at monitoring locations within the Zone of Moderate Impact and the Zone of Influence that are representative of the mosaic benthic communities present in State waters. At each monitoring location, replicate transects will be established and towed video will be filmed every three months, at each of the monitoring locations. A monitoring location will be no greater than a radial area of 500 m with sufficient habitat to enable the establishment of replicate transects. The total number of monitoring locations will be dependent on the extent of habitat considered representative of the local mosaic community and meets the needs of the spatial monitoring approach as described. Video footage will be analysed for community composition and coverage. This approach to footage analysis will allow spatial (e.g. within and between transect community variability, and community differences between monitoring locations) and temporal (e.g. prior to commencement of dredging activities, during dredging and post-completion of dredging) change to be determined. At present, it is not possible to forecast what range of natural variability in percent cover can be expected in these mosaic communities on a seasonal and interannual basis. For the purposes of setting **interim** management triggers for change in percent community cover a level of natural variability of 15% is assumed. During the baseline data gathering period, the rates of natural variability observed in these mosaic benthic communities will be utilised to review the interim management triggers.

Water quality monitoring locations for the collection of baseline data in the Zone of Moderate Impact and Zone of Influence, for establishment of background water quality I-D-F will be established coincident to benthic community monitoring locations. Instrumentation will allow monthly changeover and maintenance meaning detailed water quality monitoring and reporting will occur at a monthly frequency.

7.1.5.3 Impact Monitoring

In accordance with EAG No. 3 (EPA 2009), and with the Sea Dumping Permit (Appendix B), an assessment of subtidal benthic habitats in State and Commonwealth marine areas is required to prior and post-completion of development activities. The intent of the assessment is to provide an estimate of the areal extent of benthic habitat loss attributable to the development.

The impact monitoring program will be used to evaluate the areal loss of benthic habitat due to the impacts of construction dredging and disposal activities, and to confirm that the areal extent of loss meets the predicted and approved limits. In addition, where indirect losses of benthic communities have occurred yet benthic habitats remain the likelihood of recovery of benthic communities will be assessed.

7.1.5.4 Management Measures

Management Area:	**Benthic Habitat Management**
Target Environmental Outcome (key performance indicators):	State • Although marine water and sediment quality will be impacted during construction activities of the proposed Outer Harbour Development, return of ambient marine environmental conditions are expected upon completion of construction. • No more than 1.7 ha of coastal intertidal BPPH, or a total cumulative loss of 14.2% in the Port Hedland Industrial LAU will be lost. • No more than 148 ha of subtidal BPPH, or a total cumulative loss of 53% in LAU 8 and 2.2% in the Port Hedland Industrial LAU, will be lost.

Management Area:	Benthic Habitat Management
	Commonwealth • Although marine water and sediment quality will occur at spoil ground disposal locations, disturbances will be temporary and localised. • No more than 81 ha of BPPH due to the marine infrastructure and spoil ground disposal areas will be lost.
Management:	***Overview*** The management of water quality and associated potential impacts to benthic communities will be managed via: • Preventive management, including: • General preventive management measures to be applied whenever practicable during the dredging and spoil management activities • Monitoring for management, including: • Monthly water quality with associated management responses and bi-monthly benthic community monitoring within ZoHI and ZoI • Pre and post-dredging habitat loss within the ZoHI, ZoMI and ZoI to determine the actual loss that occurred • Contingency water quality monitoring at supplementary sites in the event that water quality triggers are exceeded, with associated management responses ***Preventive Management*** • The following routine management measures will be implemented throughout the dredging and spoil disposal program to manage direct and indirect impacts to benthic communities: • TSHDs will be fitted with a turbidity reducing (green) valves within the overflow pipe. • During sediment transport by the TSHD, the level of the overflow pipe will be raised to its highest point to ensure minimum spillage. • Hopper door seals will be maintained in good condition to ensure minimum loss of material during transport. • Within operational constraints, sailing routes to the disposal areas will be planned to minimise propeller wash (for example, utilisation of the channel where possible). • Hopper dewatering will be confined to areas away from sensitive receptors and where practical will only occurring within the dredging and spoil disposal areas. • Well maintained and properly calibrated dredging equipment will be utilised • Vessels will include features such as on-line visualisation of bathymetric charts, loading diagrams, production statistics and vessel movement. ***Compliance Monitoring and Responsive Management Procedures*** Compliance monitoring and associated management responses will be implemented to manage potential impacts that increased turbidity may have on benthic communities. *Water Quality Monitoring – Areas of Low Impact and Areas of Influence* Continuous water quality monitoring in ZoMI and ZoI will be undertaken throughout the duration of the works. • Benthic Community Monitoring Benthic community monitoring will consist of: • Bi-monthly monitoring of transects using towed video at a minimum of 3 sites within ZoMI • Bi-monthly monitoring of transects using towed video at a minimum of 3 sites within ZoI • Bi-monthly monitoring of transects using towed video at a minimum of 3 sites within reference areas. Management Response levels for ZoHI, ZoMI and ZoI.

<table>
<tr><td>Management Area:</td><td>Benthic Habitat Management</td></tr>
<tr><td></td><td>
<table>
<tr><th>Zone</th><th>Limit of Acceptable Change</th><th>Triggers</th></tr>
<tr><td>Zone of High Impact (Total Mortality) (ZoHI)</td><td>0% Protected</td><td>N/A</td></tr>
<tr><td rowspan="3">Zone of Moderate Impact (Benthic Community Effect) (ZoMI)</td><td rowspan="3">Up to 50% averaged net community change across the zone</td><td>Level 3: 40% averaged net community cover change</td></tr>
<tr><td>Level 2: 25% averaged net community cover change</td></tr>
<tr><td>Level 1: 15% averaged net community cover change*</td></tr>
<tr><td rowspan="3">Zone of Influence (No measurable effect) (ZoI)</td><td rowspan="3">100% Retained</td><td>Level 3: 15% averaged net community cover change*</td></tr>
<tr><td>Level 2: 10% averaged net community cover change and water quality disturbance attributable to dredging</td></tr>
<tr><td>Level 1: 99th%ile of water quality background conditions (I-D-F)#</td></tr>
</table>
* Expected range of variability and therefore a change above 15% can be considered to be detectable and ecologically significant
# As per McArthur et al. (2002)
The following actions will be undertaken in the event that water quality or trigger levels are exceeded:
Level 1 Exceedance
• report exceedance within 48 hours of detection;
• investigate exceedance, determine the cause and if it is likely to continue or reoccur;
• maintain close scrutiny of benthic community characteristics at all monitoring locations at which the exceedance was detected and at supplementary sites; and
• report exceedance and details of investigations to DEC on a monthly basis.
Level 2 Exceedance
• report exceedance within 48 hours of detection;
• develop an Impact Management Plan, detailing management procedures that will be implemented to reduce further impacts;
• implement Impact Management Plan;
• investigate exceedance to determine the cause and if it remains or is likely to reoccur; and
• report details of the exceedance and investigations in monthly report.
Level 3 Exceedance
• report exceedance within 24 hours of detection;
• cease dredging and spoil disposal activities that are contributing to the exceedance within 24 hours of detection of the exceedance;
• advise the Minister of potential non-compliance with allowable limits;
• investigate exceedance, determine the cause and if it is likely to reoccur;
• undertake rapid assessment in the zone impacted to assess the impact to benthic communities against allowable limits; and
• report details of the exceedance and results of investigations to DEC and the Minister as soon as practicable.
Potential Responsive Management Procedures
</td></tr>
</table>

Management Area:	Benthic Habitat Management
	The following management measures will be considered for implementation in the event that any Level 2 or 3 water quality management trigger is exceeded as a result of dredging and/or spoil disposal: • reduction or cessation of overflow during times when the dredge plume is likely to further impact the affected benthic communities; • optimisation of disposal location based on met-ocean conditions and location monitoring sites contributing to the exceedance; • a reduction in the amount of dredging undertaken on a daily basis in the areas contributing to the exceedance; • re-location of dredging operation; or • temporary cessation of dredging activities. • In the case that the investigation concludes that the source of the impact is no longer occurring (for example, dredging in the area causing the impact has ceased), a 'do nothing' option may be appropriate.
Monitoring:	The Monitoring for Management and Impact Monitoring programs are outlined in **Sections 7.1.5.2** and **7.1.5.3**, respectively. There are two main components to these monitoring programs: Dredge Monitoring: • To effectively manage the potential impacts of dredging and spoil disposal on benthic habitats to within allowable limits stated in [Hold: Ministerial Condition X.X]; Pre- versus post-dredging assessment of potential benthic habitat loss • To determine whether impacts have exceeded limits of allowable loss as proposed in the PER/EIS and stated in [Hold: Ministerial Condition X.X] • To assess the recovery of potential losses of BPP after the completion of dredging and spoil disposal activities.
Reporting:	• Weekly interim water quality monitoring reports (**Section 8.1**) • Monthly water quality monitoring reports to the DEC (**Section 8.1**) • Bi-monthly benthic community monitoring reports to the DEC (**Section 8.1**)

7.2 STRATEGY 2: MARINE MAMMALS AND TURTLES MANAGEMENT

7.2.1 Management Objectives

The management strategy for the management of impacts to marine fauna is required to achieve the following management objectives:

- To maintain the abundance, diversity, geographic distribution and productivity of fauna at species and ecosystem levels through avoidance or management of adverse impacts and improvement in knowledge;
- To provide for the protection of the environment, especially matters of NES and to conserve Australian biodiversity; and
- To be consistent with all relevant legislation and guidance.

7.2.2 Target Environmental Outcomes

To meet the above management objectives, this DSDMP and factor specific management plans have been prepared. The management measures for managing the impacts to marine fauna will be applied resulting in the following Environmental Outcomes:

State

- Although individual organisms may be impacted during the proposed Outer Harbour Development, impacts will not occur at the population or ecosystem levels.
- The EPA's objectives for the maintenance of abundance, diversity, geographic distribution and productivity of fauna at species and ecosystem levels, and improvement in knowledge, will be achieved.

Commonwealth

- No significant impact to any marine fauna listed as "Endangered" under the EPBC Act will occur
- No significant impact to any marine fauna listed as "Vulnerable" under the EPBC Act will occur
- No significant impact to any marine fauna listed as "Migratory" under the EPBC Act will occur

  Note: With respect to the target environmental outcomes for listed marine fauna, 'significant impact' is defined as per the criteria provided within the EPBC act.

7.2.3 Regulatory Context

State

EPA Environmental Assessment Guideline No 5 sets out the policy, legislative and scientific context for protecting marine turtles from light impacts. It aims to improve the scientific understanding of the effects of light on turtles, demonstrates how light impacts can be avoided and mitigated early on during the project design, and it provides potential solutions for impacts that could occur. The key principles for light management can be summarised as:

- Keep it off (keep light off the beach and lights off when not needed)
- Keep it low (mount lights low down with the lowest intensity for the job)
- Keep it shielded (stop all light escaping upwards and outwards) and
- Keep it long (use long wavelengths lights).

Commonwealth

The EPBC Act provides a legal framework to protect and manage the environment, especially matters of national significance, including nationally threatened and migratory species. This act is supported by the EPBC Regulations 2000; which have specific measures to manage interactions with cetaceans.

The key principles outlined within Part 8 of the EPBC Regulations 2000 (Cth) can be summarised as:

- Within the caution zone (300m) operate at less than 6 knots
- Apply an exclusion zone of 100m for whales and 50m for dolphins; if a calf is present the exclusion zone extends to 300m
- If a vessel is within the exclusion zone of a whale or whale/calf, the vessel must reduce the speed (6 knots) and continue away from the whale or disengage gears and wait for whale to exit the exclusion zone
- If a vessel is within the exclusion zone of a dolphin the vessel must maintain their course and speed

7.2.4 Background and Potential Impacts

Full further details of the existing marine fauna with the project area and the impacts to marine fauna predicted to occur as a result of the Outer Harbour development, refer to **Section 10.4** of the PER/EIS.

Green and flatback turtles, both of which are listed as vulnerable reptiles under the EPBC Act, frequently use the Port Hedland area, primarily for foraging. The nearest known turtle nesting sites are at Cemetery Beach located over 5 km from the proposed dredging location (Pendoley Environmental 2009).

Humpback whales, listed as a vulnerable mammal under the EPBC Act, may be encountered during their northern migration past Port Hedland to breeding grounds in late June to early August, and southwards migration (with calves) during late August to mid October. However, the Port Hedland area does not represent a calving, aggregation or feeding area (NHT 2005).

The periods of mammal and turtle activity in the Port Hedland area are shown in **Table 7.5**.

Table 7.5 Predicted Occurrence Periods for Sensitive Marine Fauna in the Port Hedland Area

Receptor	Month											
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Turtle Nesting	■	▒	▒								▒	■
Emerging Hatchlings	■	■	▒	▒								▒
Humpback Whales							▒	■	■	▒		
Coral Spawning		■	■	■							■	■
Legend	■ Predicted Occurrence				▒ Potential Occurrence					Unlikely to Occur		

Potential impacts on marine fauna resulting from aspects associated with the dredging and spoil disposal works are:

- physical interaction between fauna and dredge vessels;
- seabed disturbance leading to a loss of habitat and increased turbidity;

- light spill;
- noise and vibration;
- liquid and waste disposal; and
- leaks and spills.

7.2.5 Management Strategy

Management Area:	Marine Turtles and Mammals Management
Target Environmental Outcome (key performance indicators):	State • Although individual organisms may be impacted during the proposed Outer Harbour Development, impacts will not occur at the population or ecosystem levels. • The EPA's objectives for the maintenance of abundance, diversity, geographic distribution and productivity of fauna at species and ecosystem levels, and improvement in knowledge, will be achieved. Commonwealth • No significant impact to any marine fauna listed as "Endangered" under the EPBC Act will occur • No significant impact to any marine fauna listed as "Vulnerable" under the EPBC Act will occur • No significant impact to any marine fauna listed as "Migratory" under the EPBC Act will occur Note: With respect to the target environmental outcomes for listed marine fauna, 'significant impact' is defined as per the criteria provided within the EPBC act.
Management:	Detailed management, monitoring and reporting strategies for marine turtles and marine mammals are detailed in the Marine Turtle Management Plan (MTMP) and the Marine Mammal Management Plan (MMMP). Management measures within these plans specific to the dredging and spoil disposal operations include: Note, within the following management measures, marine fauna refers to Marine Turtles, Marine Mammals and Whale Sharks (but does not include dolphins). Where a management measure applies only to marine turtles or marine mammals (except dolphins) this is stated. **General** • Prior to commencement of construction, designated crew (one per vessel) will be trained as Marine Fauna Observers, and trained to observe for marine turtles and marine mammals, record sightings and the actions to be taken in event of sightings, injury or mortality. • Site inductions for all vessel crew and awareness programmes covering procedures to be undertaken to minimise disturbance to marine fauna. • Operators of specified vessels will be required to maintain a watch for marine turtles and marine mammals, and if they are spotted, vessels will avoid impacting the fauna (within safe operational constraints of the vessel). • If marine mammals or marine turtles are sighted in the area, relevant project vessels operating in the area will be notified. • The maximum allowed speed for construction vessels will be in accordance with Port Hedland Port Authority Regulations. • A log detailing marine turtle and marine mammal (except dolphin) sightings will be maintained on all vessels. • Any incidents that relate to mammal injury/mortality will be documented and reported to BHP Billiton Iron Ore. BHP Billiton Iron Ore report all incidents of injury or mortality to the DEC and DEWHA within 48 hours. **CSD Operations**

Management Area:	Marine Turtles and Mammals Management
	• Within the operating constraints of the CSD, the dredge pumps will only be turned on when the cutter head is close to the sea bed. • Within the operating constraints of the CSD, the dredge pumps will be turned off as soon as possible after the cutter head clears the sea bed (generally after the discharge pipe is clear). **TSHD Dredging Operations** • Upon arrival at the dredging location (each cycle) and prior to the commencement of dredging, the area within 300m of the dredge (exclusion zone) will be visually inspected (during daylight hours). If any marine fauna are sighted within the exclusion zone, dredging will not commence until the marine fauna has moved out of the exclusion zone or has not been sighted for 10 minute (note : the dredge may move location to ensure the marine fauna is out of the exclusion zone). • Within the operating constraints of the THSD, the dredge pumps will only be turned on when the drag head is close to the seabed. • Within the operating constraints of the TSHD, the dredge pumps will be turned off as soon as possible after the drag head clears the seabed (generally after the dredge pipes are clear of dredged slurry) • The vessels MFO will maintain a watch for the marine fauna (during daylight hours) during the dredging operations. In the event that a marine fauna enters the exclusion zone during the dredging works, dredging operations will cease until the marine mammal is outside of the exclusion zone or has not been seen for 10 minutes. • During transit avoidance action will be taken where necessary to attempt to maintain distance of 1000 m or more between vessel and whales. • During transit, if a marine mammal is sighted with 300m, a maximum vessel speed of 6 knots will be applied. • Turtle exclusion devices (tickler chains) will be used. The type of exclusion device utilised will be similar to that used on project throughout Western Australia. **TSHD Spoil Disposal Operations** • Upon arrival at the spoil ground (each cycle) and prior to the commencement of disposal operations the area within 300m of the dredge (exclusion zone) will be visually inspected. If any marine fauna are sighted within the exclusion zone, disposal will not commence until the marine fauna has moved out of the exclusion zone or has not been sighted for 10 minutes (note : the dredge may move location to ensure the marine mammal is out of the exclusion zone).
Monitoring:	<u>Marine Turtles</u> The following monitoring and reporting methods will be undertaken: • Monitoring of the exclusion zone (300m from vessel) marine turtles by trained Marine Fauna Observer. • Subject to safe working practices, visual inspections of dredge hopper will be undertaken any observations of turtle remains will be reported. • Ecological Monitoring (including satellite tracking as described in the MTMP. <u>Marine Mammals</u> The following monitoring and reporting methods will be undertaken: • Monitoring of zone close to dredging vessels for marine mammal by trained Marine Fauna Observer. • A log detailing marine mammal sightings will be maintained on all vessels.
Reporting:	<u>Marine Turtles</u> • Any injuries or mortalities of marine turtles will be documented and reported to DEC/ DSEWPaC. • Sick or injured turtles may occur naturally within the area of proposed

Management Area:	Marine Turtles and Mammals Management
	marine construction and/or dredging activities. Any sick or injured turtles observed by construction or dredging vessels will be recorded on the Marine Mammal and Turtle Observation Records form and reported to BHP Billiton Iron Ore who will report to DEC/ DSEWPaC as required. An annual review of observation data and incident reports will be undertaken by BHP Billiton Iron Ore, in consultation with a marine turtle specialist and dredge operators to enable consideration of the need for changes to turtle impact controls and management procedures. <u>Marine Mammals</u> As per DEC and DSEWPaC requirements, any incident that involves the injury or mortality of a mammal will be reported to BHP Billiton Iron Ore, who will notify DEC and DSEWPaC within 48-hours of its occurrence. The incident will be reported to the on-site BHP Billiton Iron Ore Environmental Supervisor who is then responsible for contacting DEC and DSEWPaC. Details of the incident including time and date of incident, cause of injury/ mortality and the species (if known) will be recorded and reported. Reports will be in electronic and hard copy form. Any recoverable remains will be made available to a mammal biologist for species identification. Any incident that results in marine mammal injury or fatality will be documented using a Marine Mammal Sighting Report Form

7.3 STRATEGY 3: INVASIVE MARINE SPECIES

7.3.1 Management Objectives

The management strategy for the management of impacts from the introduction of invasive marine species is required to achieve the following management objectives:

- To maintain the abundance, diversity, geographic distribution and productivity of fauna at species and ecosystem levels through avoidance or management of adverse impacts and improvement in knowledge;
- to maintain the abundance, diversity, geographic distribution and productivity of flora at species and ecosystem levels through the avoidance or management of adverse impacts and improvement in knowledge; and
- To be consistent with all relevant legislation and guidance.

7.3.2 Target Environmental Outcomes

To meet the above management objectives, this DSDMP and an Invasive Marine Species Management Plan (IMSMP) have been prepared. The management and monitoring measures invasive marine species will be applied resulting in the following Environmental Outcomes:

- No introduction to and establishment of marine pests in the waters adjacent to the project area.

7.3.3 Regulatory Context

To reduce the risk of introducing harmful aquatic organism into Australia's marine environment through ship's ballast water "Australian Ballast Water Management Requirements" were established under the Quarantine Act 1908 (AQIS 2008) which sets out management guidelines and reporting requirements that are consistent with the International Maritime Organisations (IMO). Additionally there is a National Introduced Marine Pest Identification System (NIMPIS) (Hewitt et al. 2002) which aims to prevent new pests arriving, provide management and mitigation measures to respond when a new pest does arrive, and minimise the spread and impact of pests that are already established in Australia.

7.3.4 Background and Potential Impacts

As dredging vessels generally are mobilised to Western Australian dredging projects from areas outside of the applicable bioregion, they present a risk of acting as a vector for the introduction of invasive marine species (IMS).

The National Introduced Marine Pests Coordination Group (NIMPCG 2006) has developed a target list of 55 pest species of concern to Australia. Huisman et al. (2008) described the known introduced species present in Port Hedland and found that the species known to be present within the Port Hedland Inner Harbour are either well known cosmopolitan, common fouling species or species with less obvious impacts or inconspicuous by nature (refer to Section 6 of the PER/EIS for full list of introduced marine species within Port Hedland).

There have been no introduced species recorded at the site of the proposed Outer Harbour Development. Given that the proposed development location is more than 4 km beyond the existing Inner Harbour operation and is not presently used for any shipping activities including anchoring or loading, there is a very low likelihood of any IMS being present in the area.

Potential impacts from the introduction of non-indigenous species include:

- The establishment of non-indigenous species which out-compete local species resulting in a loss of biodiversity

- The introduction of new diseases (viruses and bacteria) and other microorganisms (e.g. dinoflagellates) for the local population, particularly for fish assemblages, pearl oysters and other cultured species.

7.3.5 Management Strategy

Management Area:	**Invasive Marine Species (IMS) Management**
Target Environmental Outcome (key performance indicators):	No introduction to and establishment of marine pests in the waters adjacent to the project area.
Management:	A risk assessment will be undertaken for all vessels and/or immersible equipment prior to arrival on site to determine the likelihood of the vessel and/or immersible equipment being infected by IMS. Refer to the IMSMP for full details of the risk assessment process The application of the risk assessment procedure will be undertaken in consultation with the DoF. Completed Vessel / Equipment Risk Assessment Scoring Sheets (VRASS or ERASS) will be provided to the DoF, and consultation will occur with respect to the determined IMS risk status and any required management measures prior to the vessel / equipments mobilisation. The IMSMP detailed the required response, based on the risk assessment results. The IMSMP details the inspection procedure that will be undertaken in the event inspections of vessels and /or immersible equipment is required.
Monitoring:	Inspection proceedures as per IMSMP
Reporting:	At the conclusion of the vessel and immersible equipment risk assessment process, cleaning, treatment and re-inspection requirements, copies of completed assessment sheets, inspection forms and associated relevant documentation will be compiled by BHP Billiton Iron Ore and submitted to the DoF, PHPA and DEC. Documentation may include: • Vessel History Questionnaire (including FCC certification and cleaning/maintenance history documentation); • a copy of the completed Risk Assessment Scoring Sheet (VRASS or ERASS) for each vessel and immersible equipment item; • a copy of the completed Vessel and Immersible Equipment Inspection Checklist and Inspection Form signed by the Lead IMS Inspector; • a copy of the final IMS inspection report (including photographs); and • correspondence detailing actions undertaken following the initial risk assessment.

7.4 STRATEGY 4: SPOIL GROUND MANAGEMENT

The management strategy detailed in this section of the DSDMP is targeted at achieving the management objectives for the management of the spoil grounds with the resultant environmental outcomes as described. Consideration of the altered water quality conditions that will occur due to the disposal activities are addressed in Strategy 1 – Management of Benthic Habitats (Section 7.1)

7.4.1 Management Objectives

The management strategy for the management of the spoil grounds is required to achieve the following management objectives:

- To maintain the abundance, diversity, geographic distribution and productivity of fauna at species and ecosystem levels through avoidance or management of adverse impacts and improvement in knowledge;
- to maintain the abundance, diversity, geographic distribution and productivity of flora at species and ecosystem levels through the avoidance or management of adverse impacts and improvement in knowledge; and
- To be consistent with all relevant legislation and guidance.

7.4.2 Target Environmental Outcomes

To meet the above management objectives, this DSDMP has been prepared. The management and monitoring measures for the management of the spoil grounds will be applied resulting in the following Environmental Outcomes:

- Full compliance with the relevant Sea Dumping Permit.

7.4.3 Regulatory Context

Disposal of dredged material for sea dumping is governed by the Commonwealth *Environment Protection (Sea Dumping) Act 1981* which is under the jurisdiction of the Department of Sustainability, Water, Environment, Population and Communities (DSEWPaC[11]). The process of assessing the suitability of the dredged material for unconfined ocean disposal for the proposed Outer Harbour Development was undertaken using the National Ocean Disposal Guidelines for Dredged Material (NODGDM) (Environment Australia 2002). These Guidelines were applicable as the assessment was conducted prior to the release of the National Assessment Guidelines for Dredging (NAGD) (Commonwealth of Australia 2009), which replaced the NODGDM in February 2009.

7.4.4 Background and Potential Impacts

The conditions and requirements applicable to the disposal activities and spoil grounds are specified within the applicable Sea Dumping Permit (SDP). Potential environmental impacts of non-compliance with the SDP include direct and indirect impacts to integrity of the marine ecosystem in the vicinity of the spoil grounds.

[11] Previously Department of Environment, Water, Heritage and Arts (DEWHA) – http://www.environment.gov.au/

7.4.5 Management Strategy

Management Area:	Spoil Ground Management
Target Environmental Outcome (key performance indicators):	Full compliance with the relevant Sea Dumping Permit.
Management:	**Overview** To ensure potential environmental impacts are minimised the spoil disposal activities and spoil grounds will be managed via: • Preventive management • Responsive management **Risk-based preventive management** • Establish by Differential Global Positioning System (DGPS) that immediately prior to dumping the vessel is within the approved spoil placement area. • Ensure that the each load of dredged material is disposed of in a manner that ensures material is distributed evenly over the spoil placement areas. • The hopper doors on the dumping vessel will be completely closed prior to leaving the spoil ground at the end of each disposal event. • Any dredge used in connection with the disposal activities and any associated towing vessels must comply with the relevant state, national or international standards with respect to seaworthiness, safety and environmental requirements, or any rules or conditions laid down by the certifying classification society, and be capable of disposing dredged material at the disposal locations in accordance with the SDP. • Spoil disposal will be confined to the designated spoil grounds as shown in **Figure 1-1**. **Responsive management** • Examine where material has been dumped within each spoil ground to minimise movement toward the area of water quality and/or benthic habitat impacts. • Examine the timing of dumping to ensure tides carry material away from sensitive marine areas. • Switch spoil disposal to another spoil ground (e.g. Spoil Ground 9). • Time spoil ground use so that any generated sediment plumes tend to move away from sensitive areas due to prevailing weather conditions.
Monitoring:	Surveyed dredged quantities (net measured *in situ*) will be recorded and compared fortnightly against the approved disposal quantities. A bathymetric survey of the spoil placement areas will be undertaken: • Prior to the commencement of dredging • Every month during dredging and spoil disposal activities • Within one month of the completion of all dumping activities authorised under the SDP • Within 12 months of completion of all dumping activities authorised under the SDP
Reporting:	Weekly plotting sheets including the following, will be retained for audit purposes: • the times and dates of when each dumping run is commenced and finished; • the position (as determined by DGPS) of the vessel at the beginning and end of each dumping run, with the inclusion of the path of each disposal run; and • estimates of the volume of dredge spoil (m^3) disposed and its weight

Management Area:	Spoil Ground Management
	in dry tonnes at each of the disposal grounds for the specific operational period. A report on the bathymetric surveys will be provided to the DEWHA within two months of the final bathymetric surveys of the spoil grounds being undertaken. To facilitate annual reporting to the International Maritime Organisation (IMO), the proponent will report to the DEWHA by 31st January each year: • permit start and expiry date; • nature of material; • permit quantity; • quantity dumped in proceeding calendar year; and • dumping method used.

7.5 STRATEGY 5: WASTE MANAGEMENT

7.5.1 Management Objectives

The management strategy for the management of the waste is required to achieve the following management objectives:

- To maintain the abundance, diversity, geographic distribution and productivity of fauna at species and ecosystem levels through avoidance or management of adverse impacts and improvement in knowledge;
- To be consistent with all relevant legislation and guidance.

7.5.2 Target Environmental Outcomes

To meet the above management objectives, this DSDMP has been prepared. The management measures for the management of wastes will be applied resulting in the following Environmental Outcomes:

- No non compliance with the requirements of the *Protection of the Sea* (*Prevention of Pollution from Ships) Act 1983 (Cwth*) which is based on the MARPOL 73/78 Convention Annex IV (sewage) and Annex V (Garbage).

7.5.3 Regulatory Context

The discharge of wastes into the marine environment is regulated by the *Protection of the Sea* (*Prevention of Pollution from Ships) Act 1983 (Cwth*) which is based on the MARPOL 73/78 Convention Annex IV (sewage) and Annex V (Garbage) to which Australia is a signatory.

7.5.4 Background and Potential Impacts

The unintentional or uncontrolled release of waste material can adversely impact on the marine environment. Waste streams requiring management include:

- solid wastes (domestic wastes, packaging etc.);
- hazardous wastes (used oil spill equipment, hazardous substance storage containers, waste oil, etc.); and
- sewage and grey water.

In the event that solid and liquid wastes are disposed of into the marine environment from marine vessels or infrastructure, marine fauna (e.g. turtles, fish, birds) may be attracted to food scraps/ sewage and may ingest solid wastes that are potentially harmful (e.g. polystyrene containers, plastic bags).

7.5.5 Management Strategy

Management Area:	Waste Management
Target Environmental Outcome (key performance indicators):	No non compliance with the requirements of the *Protection of the Sea* (*Prevention of Pollution from Ships) Act 1983 (Cwth*) which is based on the MARPOL 73/78 Convention Annex IV (sewage) and Annex V (Garbage).
Management:	**Preventative management** • All waste materials from the dredging vessels including solid waste, hazardous waste and sewage / grey water will be managed as per the requirements of the International Convention for the Prevention of Pollution from Ships, 1973, as modified by the protocol of 1978 relating thereto (MARPOL 73/78) and PHPA requirements. Solid waste • Solid waste will be placed in suitable containers (e.g. skip bins) and recycled or disposed of via a licensed contractor. • Clear signage and coverage of wastes will be provided. • Records of waste disposal will be kept. Hazardous waste • Hazardous waste will be stored and labelled in an appropriate manner prior to disposal. • Empty oil and chemical containers will be returned to the supplier for recycling where appropriate. • Hazardous waste will be disposed of via a licensed contractor to a licensed hazardous waste facility. • Records of disposal of hazardous wastes will be kept. Sewage and grey water • An International Maritime Organisation (IMO) certified sewage treatment system will be used on all major vessels. • All discharge of sewage and grey water will be in accordance with the Protection of the Sea (Prevention of Pollution from Ships) Act 1983 (Commonwealth)/ MARPOL 73/78 requirements. • No untreated sewage will be discharged within 12 nm of the nearest land. No controlled waste (as defined by the Environmental Protection [Controlled Waste] Regulations 2004) will be discharged to the marine environment. Controlled wastes and all other non-biodegradable solid wastes will be sent for onshore treatment and disposal or recycling and reuse as appropriate. **Responsive management** • Any incidents involving the uncontrolled discharge of wastes into the marine environment from dredgers will be managed in accordance with MARPOL 73/78, the dredge contractor's EMP, the BHP Billiton Iron Ore ADP EMP and PHPA requirements.
Monitoring:	Regular visual inspections of equipment and plants.
Reporting:	Waste disposal records will be maintained and will be made available upon request.

7.6 STRATEGY 6: HYDROCARBON MANAGEMENT

7.6.1 Management Objectives

The management strategy for the management of the waste is required to achieve the following management objectives:

- To maintain the abundance, diversity, geographic distribution and productivity of fauna at species and ecosystem levels through avoidance or management of adverse impacts and improvement in knowledge;
- To provide for the protection of the environment, especially matters of NES and to conserve Australian biodiversity; and
- ensure that the environmental values or the health, welfare and amenity of people and land uses are not adversely affected; and
- To be consistent with all relevant legislation and guidance.

7.6.2 Target Environmental Outcomes

To meet the above management objectives, this DSDMP has been prepared. The management measures for the management of wastes will be applied resulting in the following Environmental Outcomes:

- No impact to marine fauna through the release of hydrocarbons as a result of the dredging and spoil disposal operations
- No non compliance with the requirements of the *Protection of the Sea* (*Prevention of Pollution from Ships) Act 1983 (Cwth*) which is based on the MARPOL 73/78 Convention Annex I (Pollution by Oil) to which Australia is a signatory.

7.6.3 Regulatory Context

The discharge of hydrocarbons is regulated by Part II of the *Protection of the Sea (Prevention of Pollution from Ships) Act 1993* (Cth) which is based on MARPOL 73/78 Convention Annex I (Pollution by Oil) to which Australia is a signatory.

7.6.4 Background and Potential Impacts

Hydrocarbons (including diesel fuel, hydraulic oils, engine oils, greases and lubricants) are used and handled everyday during the dredging operations. The accidental release of these substances presents a potential risk to the environment. The main potential sources of release of hydrocarbons into the marine environment are:

- grease;
- diesel spills during refuelling (bunkering);
- hydraulic oil spills due to equipment failure (e.g. burst hydraulic hose);
- incorrect storage and handling of hydrocarbons;
- release of oily bilge waters; and
- contaminated deck wash.

Potential impacts from hydrocarbon leaks and/or spills associated with the proposed Outer Harbour Development are:

- chronic or acute toxic action through external contact of marine fauna leading to impaired physiological function or death
- accidental or unavoidable ingestion, particularly for permanently immersed aquatic organisms (e.g. invertebrates)
- toxicity to shorebirds and seabirds if ingested, including the potential for ingestion through preening of feathers
- the loss of the birds' ability to waterproof feathers and subsequently regulate body temperature and buoyancy
- Benthic invertebrate food sources of shorebirds may be reduced (through lethal effects on invertebrates) or contaminated.

7.6.5 Management Strategy

Management Area:	**Hydrocarbon Management**
Target Environmental Outcome (key performance indicators):	• No impact to marine fauna through the release of hydrocarbons as a result of the dredging and spoil disposal operations • No non compliance with the requirements of the *Protection of the Sea* (*Prevention of Pollution from Ships) Act 1983 (Cwth*) which is based on the MARPOL 73/78 Convention Annex I (Pollution by Oil) to which Australia is a signatory.
Management:	Hydrocarbon and chemical spills will be managed as per BHP Billiton Iron Ore's Spill Response Procedure outlined in the BHP Billiton Iron Ore ADP EMP (PP-13-100), the dredge contractor's EMP and PHPA requirements. **Preventative management** Bunkering • Detailed refuelling procedures shall be developed by the dredge contractor prior to commencement of work on site and shall include the following requirements: o Fuel transfer to occur in accordance with port authority and pollution regulations o Specific safety boundaries used when refuelling o Requirement of refuelling to be undertaken in fair weather conditions to reduce risk of spills o Requirement for open communication channels to be maintained during refuelling o Instructions for visual monitoring o Emergency response procedures. • A work instruction will be prepared to provide guidance to crew and staff with regards to minimising the risk of spills during bunkering. • A pre-task Job Hazard Analysis (JHA) will be undertaken prior to refuelling activities. • Bunkering will be undertaken using suitable equipment and experienced personnel who will continuously monitor the bunkering equipment and tanks. • Bunkering will not take place during adverse sea state/weather conditions. • The rise of the level of fuel in the fuel tank will be constantly monitored during refuelling. • Fuel hoses will be inspected for signs of wear. • Spill avoidance devices such as 'dry couplings' and spill trays will be employed.

Management Area:	Hydrocarbon Management
	• Personnel involved with refuelling or fuel transfer shall be trained in their roles, functions and responsibility, including emergency response prior to engaging in refuelling or fuel transfer. Hydraulic Oil Spills • The hydraulic oil system will be of a high quality, well-maintained and regularly inspected. • The main hydraulic system of each dredging vessel will be equipped with standard low pressure/level alarms and shut down systems to minimise hydrocarbon loss in the event of a burst hydraulic hose. Storage and Handling • Hazardous material storage areas shall be designed to handle the volumes and operating conditions specifically required for each substance, including product identification, transportation, storage, control and loss prevention (e.g. bunding and drainage). • Hazardous materials (including hazardous waste) shall be stored in appropriately labelled drums or tanks. Complete up to date list of Material Safety Data Sheets (MSDS)s shall be available and stored with relevant products. • An MSDS for each chemical will be kept on all vessels; • Personnel handling hazardous materials will be provided with information and training concerning those materials, as detailed in the MSDS; • All chemicals and detergents will be stored below deck in appropriate holds; • Oil and grease drums will be stored below deck in appropriate holds where practicable and space permitting; and • Hydrocarbons stored above deck will be stored within bunded areas to contain any leaks or spills. Bilge Waters • All vessels greater than 400 gross tonnage shall have bilge oil/water separators that comply with the requirements of Annex I of MARPOL 73/78 and Part II of the Protection of the Sea (Prevention of Pollution from Ships) Act 1993 (Cth) to ensure that oil concentrations in discharges are less than 15 ppm. • No bilge waters with an oil content of more than 15 parts per million will be discharged. • Any discharge of bilge waters will be done whilst en route with oil discharge monitoring, filtering and control systems operating. Contaminated Deck Wash • Drainage from decks and work areas with potential for oil, grease or hydrocarbon contamination shall be collected and processed through an oil/water separator and managed according to International Oil Pollution Prevention (IOPP) procedures prior to discharge or stored for onshore disposal. • Onboard spills shall be contained and cleaned up immediately and shall not be washed overboard. Product MSDSs shall be adhered to during clean-up. **Responsive management** • Sufficient and appropriate equipment, materials and resources shall be available to: o prevent spills to marine environment from working machinery (e.g. spill trays, one-way valves or other spill prevention features) o respond to spills to the marine environment o respond to spills to ground (on board vessels). • The dredge contractor will comply with and align spill response

Management Area:	Hydrocarbon Management
	preparedness with the existing Port Hedland Oil Spill Contingency Plan (OSCP). • All vessels shall have a current International Oil Pollution Prevention Certificate (IOPP) issued by the State in which the vessel is registered and an approved Shipboard Oil Pollution Emergency Plan (SOPEP). • If vessel does not have an existing approved SOPEP the vessel shall prepare a vessel specific Spill Contingency Plan (SCP) that bridges to the Port Hedland OSCP to ensure an effective, integrated response to any spill. • Spill response will be undertaken in accordance with onboard oil spill emergency drills will be conducted as required by vessel management system. • Suitable and sufficient oil spill response equipment (spill response kits), including oil absorbent booms and pads, will be available and easily accessible in case of a hydrocarbon spill. • Only Australian Maritime Safety Authority (AMSA) approved dispersants will be used at any time.
Monitoring:	Audits of each vessel's hydrocarbon handling procedures and equipment including spill kits will be undertaken before operations commence and on a regular ongoing basis.
Reporting:	All hydrocarbon and chemical spills will be reported as per BHP Billiton Iron Ore's Spill Response Procedure (PP-13-013) and PHPA requirements, in accordance with the OSCP.

8 REPORTING AND AUDITING

8.1 REPORTING

Table 8.1 below presents a summary of the reporting requirements under this DSDMMP.

Table 8.1 Summary of Reporting Requirements

Report Name	Contents	Recipient	Frequency/Schedule
Marine Water Quality and BPPH			
Water Quality and Benthic Community Monitoring Baseline Report	Summary of the results of the water quality and benthic community monitoring at all baseline monitoring locations.	DEC	Upon completion of the baseline monitoring program.
Water Quality Monitoring Report	Results of the water quality monitoring at the impact, influence and reference sites. Commentary on any trigger exceedances and resulting management measures.	DEC	Monthly; if exceedances fortnightly
Benthic Community Monitoring Report	Results of the benthic community monitoring at the impact, influence and reference sites. Commentary on any water quality trigger exceedances and resulting management measures.	DEC	Bi-monthly
Water Quality / Benthic Habitat Final Dredging and Spoil Disposal Monitoring Report	Summary of the water quality and benthic habitat monitoring program.	DEC	Upon completion of dredge and spoil disposal monitoring program.
Water Quality and Benthic Habitat Monitoring Post-dredging Report	Summary of the results of the post-dredging water quality and benthic habitat monitoring program.	DEC	TBC
Marine Fauna			
Marine fauna incident report	Incident report on any injury or mortality to marine mammal or marine turtle	DEC, DSEWPaC	Per Occasion
Marine fauna sighting report	Log of marine mammal and marine turtle sightings	Internal (available to DEC, DSEWPaC on request)	Maintained daily
Invasive Marine Species			
Invasive Marine Species Inspection checklist	Results of any vessel inspections for invasive marine species	DoF, DEC and PHPA	Initial report within 28 hours, detailed report within 14 days of inspection
Vessel Risk Assessments	Results of vessel and immersible equipment risk assessments	DoF	Prior to mobilisation of vessel or immersible equipment.
Offshore Disposal and Spoil Ground			
Weekly plotting sheets	The times and dates of when each dumping run is commenced and finished. The position (as determined by DGPS) of the vessel at the beginning and end of each dumping run, with the inclusion of the path of each disposal run. A means of estimating the volume of	Retained for audit purposes	Weekly

Report Name	Contents	Recipient	Frequency/Schedule
	dredge spoil (in cubic metres) dumped and weight in dry tonnes at the spoil ground for the specified disposal period.		
Spoil ground bathymetry report	Chart showing change in bathymetry within spoil ground. Written commentary on volume of spoil retained within disposal ground.	DSEWPaC	Within 2 months of the completion of offshore disposal during Stage 3
IMO report	Permit start date. Permit expiry date. Nature of material. Permit quantity. Quantity dumping in proceeding calendar year. Dumping method used.	DSEWPaC	By 31 January each year.
Hydrocarbon Management			
Hydrocarbon Spill reports	Incident report on any hydrocarbon spill including response measure implemented.	DEC, PHPA, DSEWPaC	Per occasion.

8.2 COMPLIANCE AUDITING AND REPORTING

8.2.1 Compliance Audit Schedule

A compliance audit schedule will be developed based on the conditions contained within the various approvals documents. The finalised audit criteria schedule will be provided to the DEC and DEWHA for approval.

The environmental compliance reports will address each element of the audit program approved by the CEO and will be prepared and submitted in a format acceptable to the CEO.

The environmental compliance report will address each element of the audit program:

- be endorsed by signature of the proponent's Managing Director or a person, approved in writing by the CEO, delegated to sign on behalf of the proponent's Managing Director;
- state whether the proponent has complied with each condition and procedure contained within the ministerial approvals documentation;
- provide verifiable evidence of compliance with each condition and procedure contained within the SDP and ministerial approval documentation;
- state whether the proponent has complied with each key action contained in the DSDMMP;
- provide verifiable evidence of conformance with each key action contained in the DSDMMP;
- identify all non-compliances and non-conformances and describe the corrective and preventative actions taken in relation to each non-compliance or non-conformance;
- review the effectiveness of all corrective and preventative actions taken; and
- describe the state of implementation of the proposal.

BHP Billiton Iron Ore will make the environmental compliance reports publically available.

8.2.2 Auditing and Reporting

State Government

BHP Billiton Iron Ore will submit environmental compliance reports annually to the CEO of the DEC, reporting on the previous twelve month period, unless required by the CEO to report more frequently. The environmental compliance reports will address each element of the audit program described in **Section 8.2.1**.

Commonwealth Government

An independent audit of compliance with this DSDMMP and the relevant SDP will be conducted by an approved auditor. This audit will be undertaken as per the requirement of the SDP. A report on the audit results will be provided to the DSEWPaC.

8.2.3 Access for Observers

Upon request, at least two Australian government nominees will be afforded to witness, inspect, examine or audit any part of the operations, including any dumping or monitoring activity, the vessel or any other equipment, or any documented records, and are to be provided with any necessary assistance in carrying out their duties.

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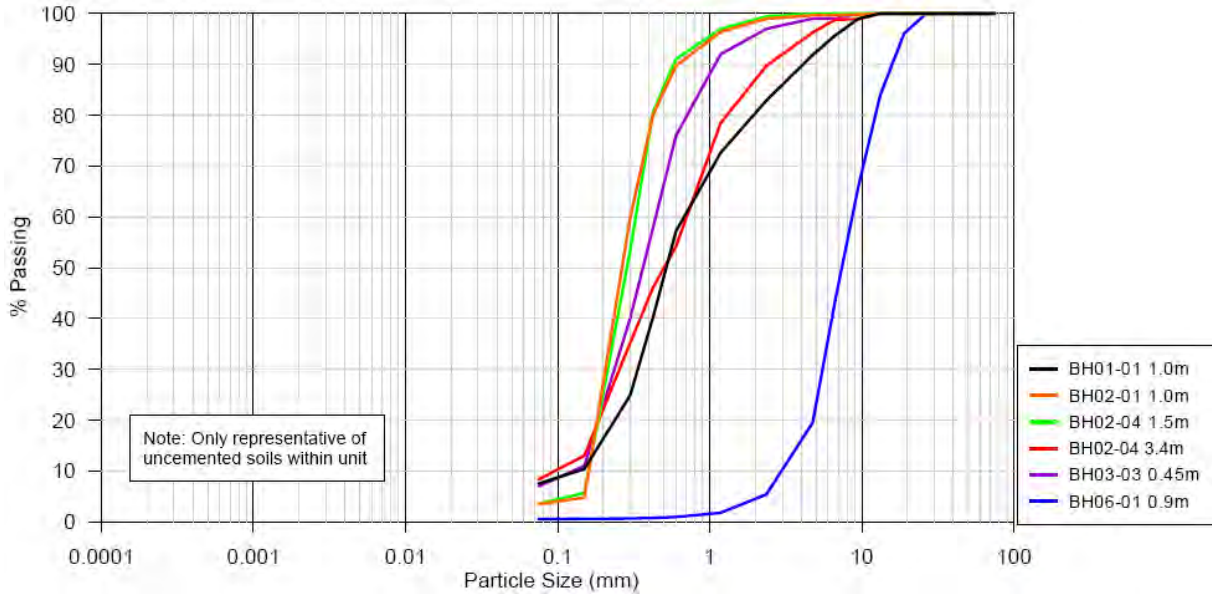
Appendix A Particle Size Distribution of Geotechnical Borehole Soil Units



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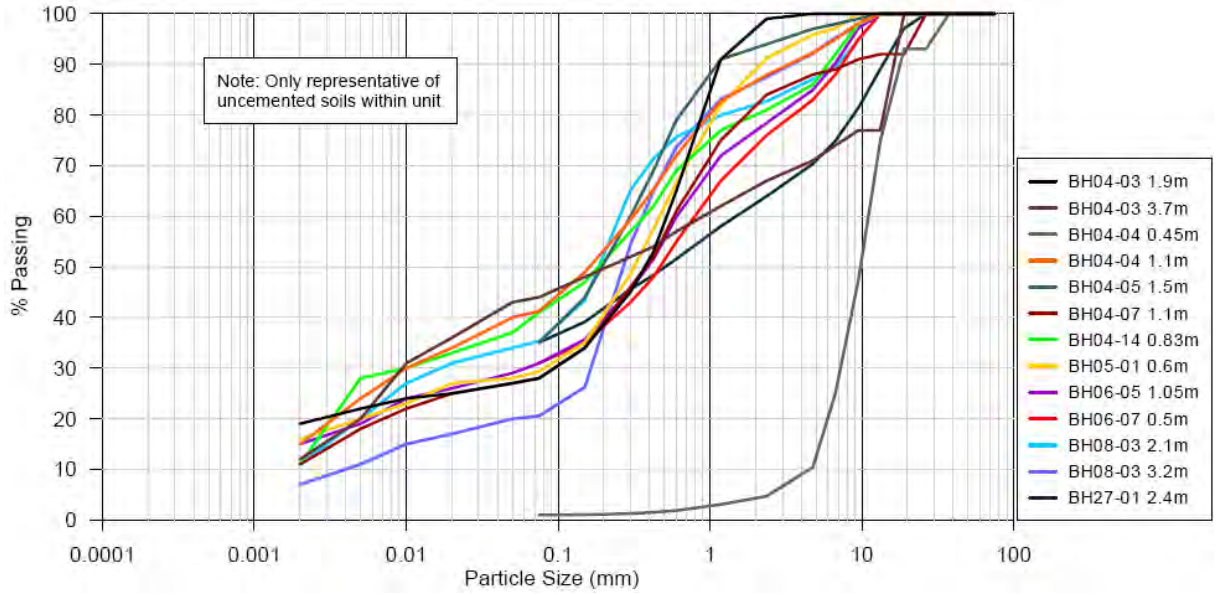

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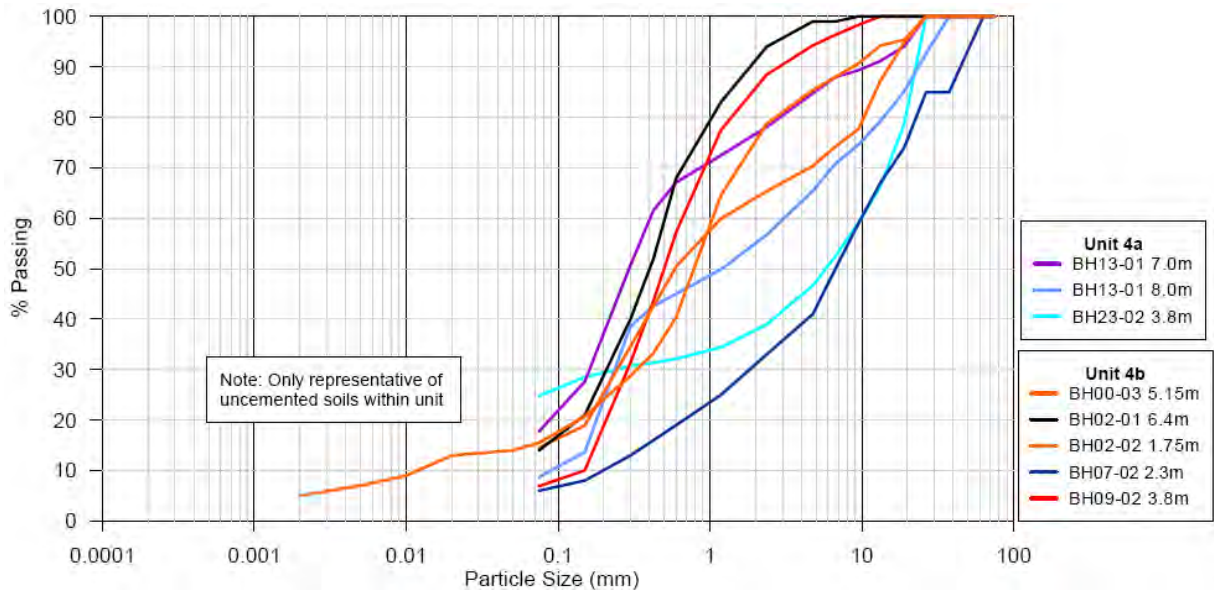
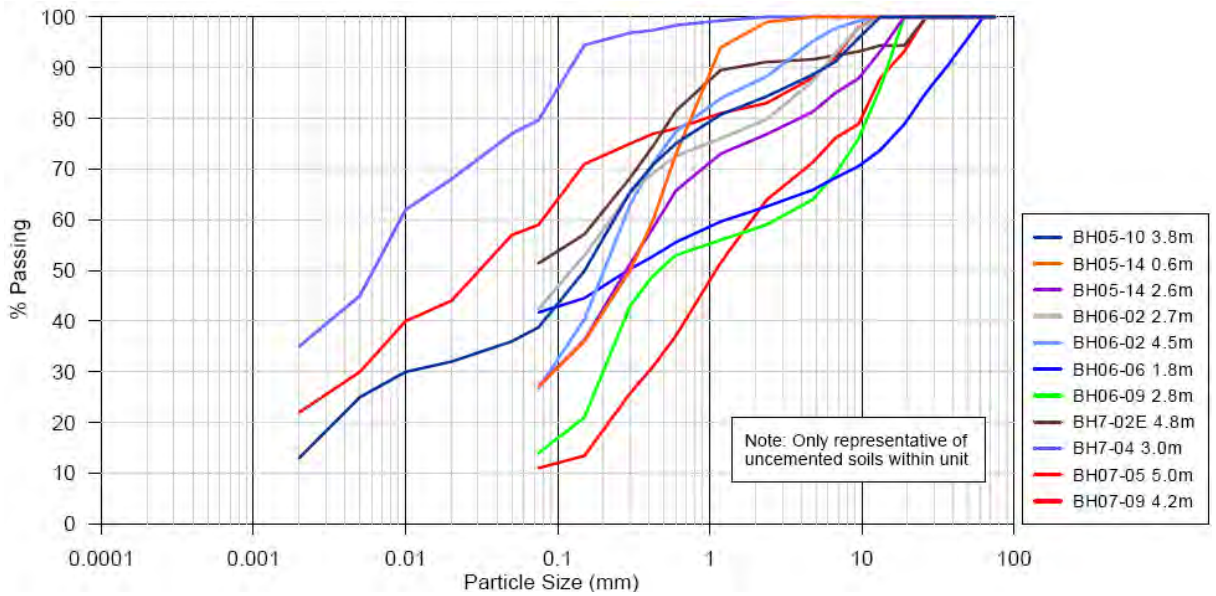


Unit 4a and Unit 4b



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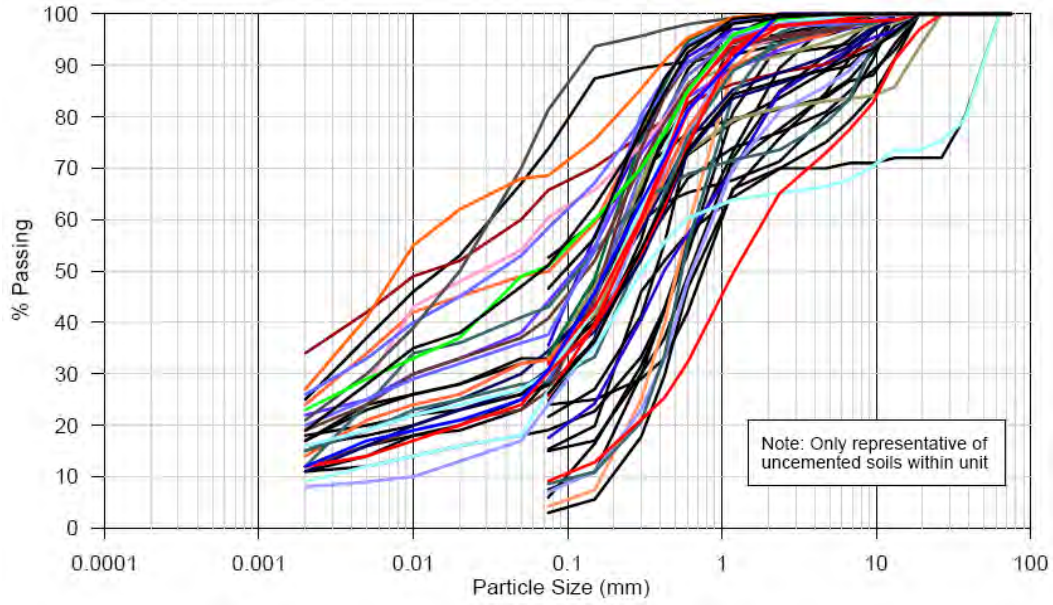

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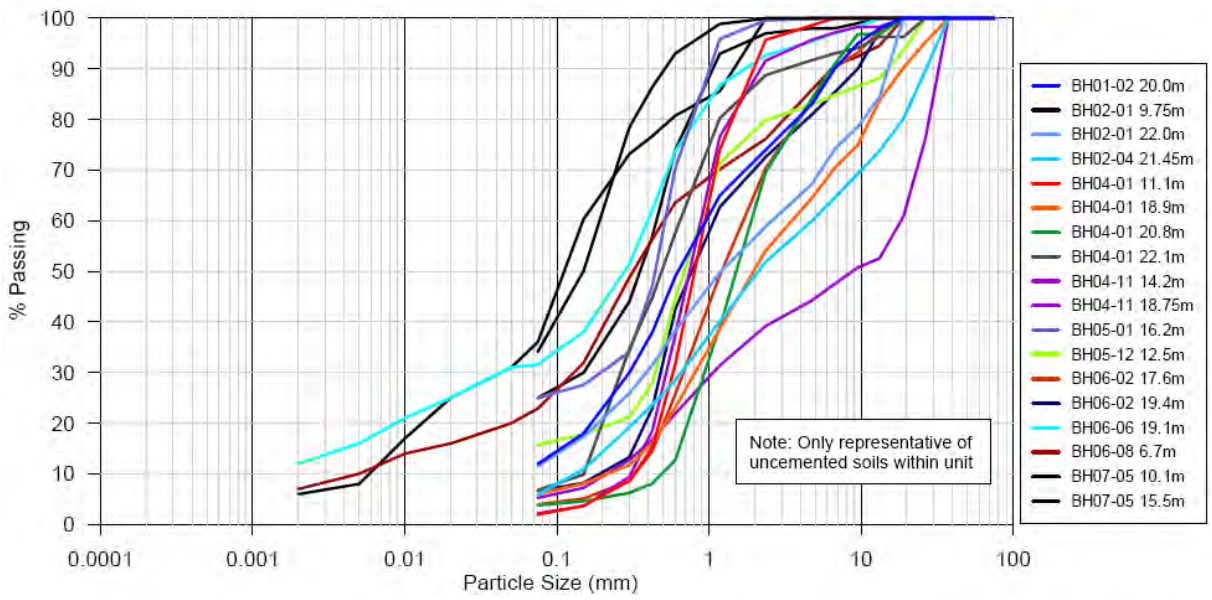

Unit 6b

Appendix B Sea Dumping Permit

[**HOLD: to be provided when available**]