



BHP Billiton Mitsubishi Alliance

Dredging and Blasting Environmental Management Plan

**Hay Point Coal Terminal Expansion Phase 3
(HPX3)**

BM Alliance Coal Operations Pty Ltd

EPBC Approval No: EPBC 2009/4759

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Revision 13.3

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List of Abbreviations

AQIS	Australian Quarantine and Inspection Service
AS	All Staff
BBO	Boat-Based Observer (Monitoring Team)
BMA	BM Alliance Coal Operations Pty Ltd
BMAPM	BMA Project Manager
CL	Checklist is to be completed
CM	Construction Manager
CMC	Contractor Monitoring Coordinator
CPM	Contractor Project Manager
DAFF	Queensland Department of Agriculture, Fisheries and Forestry
DBEMP	Dredging and Blasting Environmental Management Plan
DBS	Dredging and Blasting Superintendent
DBSV	Drill & Blast Supervisor
DEHP	Department of Environment and Heritage Protection
DERM	Department of Environment and Resource Management
DEWHA	Department of the Environment, Water, Heritage and the Arts
DoE	Department of the Environment
DEEDI	Department of Employment, Economic Development and Innovation
DSV	Dredging Supervisor
EA	Environmental Advisor
EAR	Environmental Assessment Report
EMP	Environmental Management Plan (Marine Ecology) for Dredging and Dredged Material Disposal (EMP)
EPBC Act	<i>Environment Protection and Biodiversity Conservation Act 1999</i>
ES	Environmental Superintendent
F&S	Foremen and Subcontractors
GBRMP	Great Barrier Reef Marine Park
GBRMPA	Great Barrier Reef Marine Park Authority
HPCT	Hay Point Coal Terminal
HPCTM	Hay Point Coal Terminal Manager
HPTH	Hay Point Tug Harbour
HPX	Hay Point Coal Terminal Expansion
IEMS	Integrated Environmental Management System
MBES	Multibeam Echo Sounder
MER	Monthly Environmental Report
MIC	Maximum Instantaneous Charge
MRC	Mackay Regional Council
MSQ	Maritime Safety Queensland
NAGD	National Assessment Guidelines for Dredging
NQBP	North Queensland Bulk Ports Corporation Ltd
NRW	Department of Natural Resources and Water
PD	Project Duration (Construction)
PM	Project Manager
PreC	Pre Construction
PstC	Post Construction
QPWS	Queensland Parks and Wildlife Service

BMA



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SBMP	Site Based Management Plan
SEWPaC	Department of Sustainability, Environment, Water, Population and Community
SSS	Sidescan Sonar
VI	Visual Inspection
WR	When Required

1. Introduction

1.1 Aim of the DBEMP

The purpose of this *Dredging and Blasting Environmental Management Plan* (DBEMP) is to detail the performance objectives, actions and procedures to be carried out during the dredging and blasting for the proposed Berth 3 pocket and apron area to minimise potential environmental impacts as part of the proposed Hay Point Coal Terminal Expansion (HPX).

This DBEMP is one of two key reference documents which identifies actions and commitments to be followed by the BMA Project Development Group and Hay Point Services team and contractors during the Berth 3 dredging and blasting activities. The other key document is the *Environmental Management Plan (Marine Ecology) for Dredging and Dredged Material Disposal* (EMP).

The DBEMP and EMP have been developed to assist in minimising environmental impacts from the project in compliance with regulatory approvals and requirements, in particular the approvals and permit granted under the:

- *Environment Protection and Biodiversity Conservation Act 1999 (EPBC Act)*
- *Environment Protection (Sea Dumping) Act 1981 (SD Act)*
- *Great Barrier Reef Marine Park Regulation 1983*

The DBEMP is primarily focussed on the effectiveness of environmental protection and management during the blasting phase of the Project. This shall be achieved by specifying monitoring, reporting and auditing requirements, with nominated responsibilities and timing to ensure necessary performance objectives are met. This DBEMP also makes provision, as appropriate, for unforeseen events by outlining corrective action which may be implemented in these situations.

While the DBEMP contains information of the higher level management of the broader dredging program, specific details for the (non-blasting) dredging activities, management, monitoring and reporting are contained in the EMP. Both documents should be read and applied in conjunction.

To increase the useability of this DBEMP, it has been written as a stand-alone document which will be reviewed regularly and updated to reflect changes in scope, processes, controls and procedures.

This DBEMP provides the overall general environmental management requirements for the dredging and blasting process. Specific environmental management requirements for the dredging, blasting and construction contractors will be dependent on the nature and scale of the scope of works.

1.2 Project description

The establishment of the proposed Berth 3 pocket and apron area will result in the removal of up to 275,000 m³ of dredged material, comprising approximately 185,000 to 245,000 m³ of alluvial and weathered rock material and 30,000 to 90,000 m³ of bedrock requiring pre-treatment by drill and blast.

The following dredging works are planned:

- Dredging of an estimated 185,000 m³ of soft material in the proposed Berth 3 and apron, and disposal of the material offshore
- Dredging (including drill and blast) of remaining bedrock and weathered rock and disposal of the material onshore
- Reprocessing or removal of HPX3 dredged material greater than 400 mm in any dimension in the spoil ground

BMA

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1.3 Environmental assessments

This DBEMP is based on findings of the studies that have been undertaken as part of the HPCT Berth Pocket Dredging Environmental Assessment Report (EAR) prepared in 2005, the EPBC Referral for the Project submitted to the Department of the Environment (DoE; formerly Department of Sustainability, Environment, Water, Population and Community; SEWPAC) in February 2009 and further documentation provided to DoE in July 2009.

2. DBEMP overview

The purpose of environmental management during dredging and blasting for the proposed Berth 3 pocket and apron area is to minimise and mitigate potential environmental impacts through planned and programmed implementation of appropriate control measures.

Where the contractors' work covers routine and non routine activities not stipulated in this DBEMP, it is the responsibility of the dredging and blasting contractor(s) to identify the environmental aspects associated with these activities and develop appropriate environmental plans to address these activities.

This DBEMP defines the environmental issues of the proposed development by addressing the following:

- The environmental policies of BHP Billiton and the dredging and blasting contractor(s)
- Environmental responsibilities
- Environmental site induction
- Environmental monitoring
- Environmental reporting
- Environmental incidents/complaints
- Environmental audits
- A management plan for each relevant environmental element

Each of these elements is outlined below.

2.1 BHP Billiton Charter

BHP Billiton (BHPB) Metallurgical Coal is the largest supplier of seaborne traded coking coal. BMA is owned (50%) and operated by BHP Billiton.

BHP Billiton (BHPB) operates under the BHPB Charter. The BHPB Charter value of Sustainability, which means putting health and safety first, being environmentally responsible and supporting our communities, underpins everything we do. BHPB achieves Sustainability when *everyone*:

- Takes responsibility for the health, safety and welfare of self and others and takes the necessary action to minimise environmental impacts
- Identifies and understands relevant health, safety, environment and community risks
- Builds and maintains meaningful, long-term relationships with internal and external stakeholders

BMA is committed to sustainable development. The dredging contractor must work with a similar commitment, which will be achieved through three key strategies:

- Environmental awareness training for all employees;
- Continuing research and development targeting emissions reductions, improved energy efficiencies and waste minimisation; and
- Environmental transparency and adherence to all State and local environmental standards.

The BHP Billiton Charter is shown in Figure 2-1.

Our Charter

We are BHP Billiton, a leading global resources company.

Our purpose is to create long-term shareholder value through the discovery, acquisition, development and marketing of natural resources.

Our strategy is to own and operate large, long-life, low-cost, expandable, upstream assets diversified by commodity, geography and market.

Our Values

Sustainability

Putting health and safety first, being environmentally responsible and supporting our communities.

Integrity

Doing what is right and doing what we say we will do.

Respect

Embracing openness, trust, teamwork, diversity and relationships that are mutually beneficial.

Performance

Achieving superior business results by stretching our capabilities.

Simplicity

Focusing our efforts on the things that matter most.

Accountability

Defining and accepting responsibility and delivering on our commitments.

We are successful when:

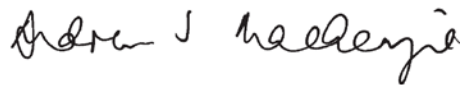
Our people start each day with a sense of purpose and end the day with a sense of accomplishment.

Our communities, customers and suppliers value their relationships with us.

Our asset portfolio is world-class and sustainably developed.

Our operational discipline and financial strength enables our future growth.

Our shareholders receive a superior return on their investment.



Andrew Mackenzie
Chief Executive Officer

May 2013



Figure 2-1 BHPB Charter

2.2 Dredging and blasting contractor's environmental policy

The dredging and blasting contractor(s) shall document an environmental policy appropriate to the nature, scale and potential environmental impacts of the proposed development. The policy should include a commitment to comply with this DBEMP, approval conditions, monitoring requirements, relevant environmental legislation, and regulations and policies. The policy is to be approved by the BMA Project Manager (BMAPM), the Project Manager (PM) and the BMA Environmental Superintendent (ES).

2.3 Management structure

During dredging and blasting, the overall management of the development shall be under the supervision of the BMA Project Manager (BMAPM) with day-to-day control of the project under the Project Manager (PM). This person shall delegate as necessary to the Construction Manager (CM) to direct the Contractor Project Manager (CPM), who then manages the Foremen and Subcontractors. The CM and the CPM shall liaise with the Environmental Superintendent (ES) to ensure environmental issues are being correctly managed. The ES shall ensure that all operational staff have been trained in environmental awareness and the requirements of this EMP and all related policies, plans, and procedures. The ES (Sara James) is also the 24-hour on-site liaison for the ESS to contact as and when required.

The 24 hour site contact details are:

- Sara James (ES), phone: 0488 250 453
- Tony Baker (OFAM), phone: 0428 697 433

The management structure illustrated in Figure 2-2 has been chosen to provide a clear chain of authority for the implementation of this EMP. From this structure a clear set of environmental responsibilities, accountabilities and authorities has been developed for key roles and are summarised below.

Hay Point Coal Terminal Manager (HPCTM)

- Day to day management of the Hay Point Coal Terminal

BMA Project Director (BMAPD)

- Manages the project and its execution
- Ensures the expansion needs of Hay Point Services are satisfied in accordance with approved implementation plan

BMA Owner's Site Representative (OSR)

- Reports to the BMAPD
- Responsible for the day-to-day management of site activities in coordination with the CM
- Reviews Environmental Events
- Monitors EMP implementation

BMA Environmental Superintendent (ES)

- Reports to the BMA HSE Manager (HSEM)
- Reviews compliance with permits and management plans
- Facilitates MRG Meetings
- Monitors environmental performance
- Participates in community consultation
- Undertakes liaison with relevant Government bodies and other authorities or interested parties
- Provides environmental advice to project team during construction
- Provides monitoring results to Department of Environment and Heritage Protection (DEHP; (formerly Department of Environment and Resource Management; DERM) r), North Queensland Bulk Ports Corporation Limited (NQBP; formerly Ports Corporation of Queensland) and Mackay Regional Council (MRC), Maritime Safety Queensland

(MSQ) and Department of Sustainability, Environment, Water, Population and Communities (DSEWPC) when requested

- Monitors complaints and reports the status of complaints to OSR
- Ensures corrective action has occurred within a reasonable timeframe
- Approves the training programme
- Maintains a master copy of this EMP containing a record of the completed actions, monitoring, and reports supplied by the Construction Supervision staff
- Coordinates staff when necessary to implement and monitor the actions contained in this EMP
- Reviews and updates environmental management plans

Hay Point Services Environmental Advisor (EA)

- Reports to the HPCTM
- Responsible for managing the day-to-day environmental issues associated with operating the HPCT
- Involved in environmental issues during the construction phase as required

Construction Manager (CM)

- Reports to the PM
- Responsible for the day-to-day management of site activities
- Reviews Environmental Events
- Monitors EMP implementation

Senior Environmental Advisor (SEA)

- Reports to the SHE Manager (SHEM)
- Responsible for monitoring and reporting contractor's compliance with the EMP, and incident investigations as required
- Conducts regular site inspections and audits
- Reviews Monthly Environmental Report from Contractor(s)
- Ensures any non-conformances are followed up and corrected
- Ensures monitoring specified in this EMP is undertaken
- Ensures all reports and monitoring records are kept onsite and can be located easily
- Arranges regular environmental auditing at the construction site(s)
- Reviews and approves Contractor's detailed Environmental Management Plans associated with dredging and blasting operations
- Ensures audits are undertaken on the implementation of this EMP
- Ensures all Project Staff are trained in environmental awareness, site issues and the actions contained in this EMP
- Conducts environmental site inductions
- Responsible for the day-to-day management of the overall project
- Maintains a register of inducted personnel

Marine Area Superintendent (MAS)

- Reports to the CM
- Ensures all project staff are appropriately briefed on the requirements of this EMP prior to starting any construction works
- Maintains a record of all training undertaken for project employees and gives a copy of records to the CM
- Provides copies of this EMP and the project Environmental Management Plan (EMP) to all relevant Project Staff with nominated responsibilities under this EMP
- Maintains a copy of this EMP and the project EMP containing a record of completed actions, monitoring records, reports etc, which are to be made available during audits
- Monitors performance by regularly reviewing monitoring results and complaints received
- Addresses complaints received in accordance with this EMP (in accordance with the ES)
- Identification and reporting of non-conformances to the CM, also reports any other environmental issues which may arise during construction

- Develops and/or implements corrective actions required as a result of monitoring undertaken, complaints received or required under an external audit
- Onsite monitoring and reporting as required by this EMP

Dredging and Blasting Superintendent (DBS)

- Reports to the MAS
- Conducts regular site inspections and audits of the dredging and blasting operations
- Ensures activities are in compliance with EMP
- Provides data for regulatory reporting and audits
- Supervises dredging and blasting operations

Dredging Supervisor (DSV)

- Reports to the DBS
- Undertakes visual observations of plumes during all dredging operations
- Undertakes visual observations for marine animals during dredging operations

Drill and Blast Supervisor (DBSV)

- Reports to the DBS
- Coordinates marine fauna observers activities with operational activities

Blast Observer (BO)

- Responsible for supervising and communicating with visual and passive acoustic monitoring teams
- Enters all visual and acoustic marine fauna detection/monitoring information, including species, numbers of individuals, time and location of detection and behaviour, into a marine tracking and detection database

Boat-Based Observers (BBOs)

- Report to the BO
- Responsible for performing visual monitoring of the Exclusion Zone and deploying mobile hydrophones for passive acoustic monitoring during blasting operations

Ground Observers (GBOs)

- Report to the BO
- Responsible for performing visual monitoring of the Exclusion Zone

Contractor Project Manager (CPM)

- Reports to the CM through the MAS
- Represents the Contractor and oversees any Subcontractors and Foremen
- Obtains necessary approvals not obtained by the project
- Ensures all contractor staff (including Subcontractors) are appropriately briefed on the requirements of this EMP prior to starting any construction works
- Maintains a record of all training undertaken for contractor employees and gives a copy of records to the CM
- Provides copies of this EMP and their own Environmental Management Plan (EMP) to all relevant Staff with nominated responsibilities under this EMP
- Maintains a copy of this EMP and their own EMP containing a record of completed actions, monitoring records, reports etc, which are to be made available during audits
- Monitors performance by regularly reviewing monitoring results and complaints received
- Addresses complaints received in accordance with this EMP (in conjunction with the ES)
- Identification and reporting of non-conformances to the CM, also reports any other environmental issues which may arise during construction
- Develops and/or implements corrective actions required as a result of monitoring undertaken, complaints received or required under an external audit
- Onsite monitoring and reporting as required by this EMP



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Contractor Monitoring Coordinator (CMC)

- Reports to the CPM
- Responsible for supervising the blast operation
- Responsible for communicating with visual and passive acoustic monitoring teams through the BO
- Responsible for the Go/No-Go decision process for blasting

Foremen and Subcontractors (F&S)

- Implementation of actions in accordance with this EMP or as directed by the CPM or DBS

This DBEMP operates in the framework of the BHBP Charter and Sustainable Development Policy, as well as the HPCT Environmental Policy and Management System and the HPX HSEC Management Plan. The DBEMP also aligns with four additional environmental management plans that have been developed to address specific components and activities of the HPX3 project. The relationship of these policies, guidelines and management plans is shown in Figure 2-3.

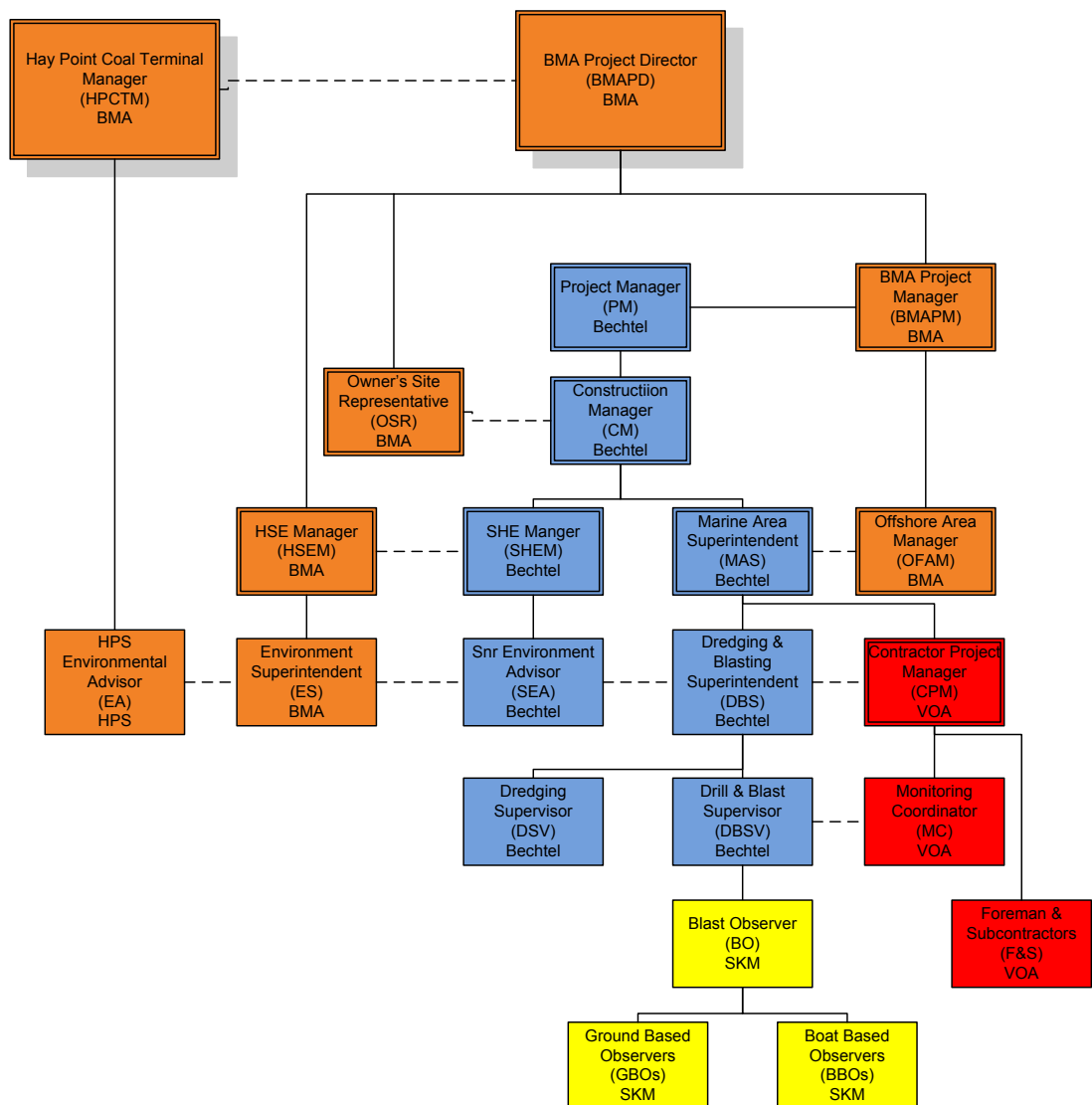


Figure 2-2 Environmental management structure for the HPX3 project



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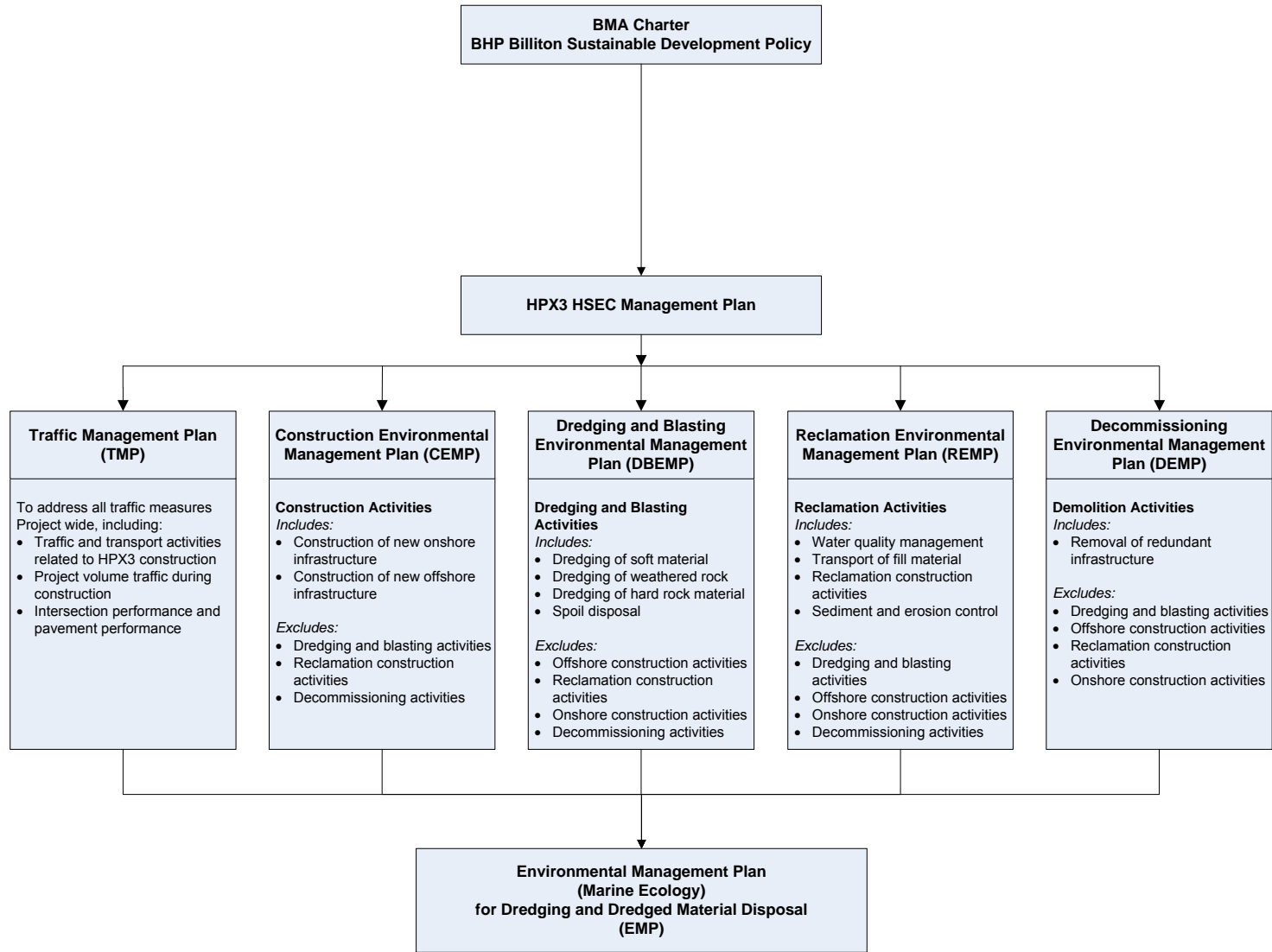


Figure 2-3 Relationship of the EMP to other environmental plans and policies

2.4 Environmental site induction

All personnel entering or working on the site must attend a Bechtel and Dredging Contractor induction covering all relevant positions of this DBEMP, environmental commitments in the EMP (Marine Ecology) and the Contractors' CEMP. The training is to incorporate the following:

- Information to provide a basic understanding of this DBEMP and site specific environmental issues
- Information on sensitive issues and the need to carry out work activities with as little impact as possible
- An explanation of environmental reporting protocols, complaint procedures, non-compliances and actions required in the event of an incident
- Information of known environmental hazards, relating to site activities and site emergency preparedness and response plans

The CM shall maintain a register of inducted personnel. The register is to include as a minimum, date of induction, the name of the person inducted and elements of the induction delivered.

Staff with specific environmental duties (e.g., Blasting Observers, Boat-Based Observers) will have specific and detailed training and experience in the area of responsibility.

3. Existing environment

3.1 Existing situation

The Port of Hay Point lies within the boundaries of the Great Barrier Reef World Heritage Area which extends 2,000 km along the Queensland coastline. The Hay Point Coal Terminal (HPCT) is located within the limits of the Port of Hay Point, within the Mackay Regional Shire, and is situated approximately 38 km south of Mackay in Central Queensland. The terminal is located outside, but adjacent to the Great Barrier Reef Marine Park (GBRMP) and Great Barrier Reef Coastal Marine Park.

A search of the Department of the Environment (DoE; formerly the Department of Sustainability, Water, Environment, Population and Community; SEWPaC) EPBC Act Protected Matters Database (for a 5 km offshore radius surrounding Hay Point) has indicated the presence of a number of threatened species, migratory species, listed marine species and whales. Marine fauna species which are known to be present within the area surrounding the Port of Hay Point include sea turtles, dolphins, dugongs and humpback whales. There are no Fish Habitat Areas or Dugong Protection Areas located within a 15 km radius of Hay Point.

The Port of Hay Point is a tropical coastal system surrounded by a variety of habitats including mangrove forest, intertidal and sub-tidal rocky reef, and soft sand and muddy silt substrates. Previous surveys of the study area have identified fringing rocky reef communities occurring at Round Top Island and Flat Top Island located. A rocky reef, referred to as Hay Reef, also exists at Hay Point, this being located on the inside of the existing HPCT trestle and approximately 300 m offshore from the point.

Dredging and spoil disposal works as part of the proposed Berth 3 pocket and apron area may result in a minor increase in turbidity, nutrient loads and suspended sediment concentration. These activities have the potential to produce impacts on water quality, marine habitats, seagrass productivity, flora composition and growth. Given that currents tend to run in a north-north-west/south-south-east direction, turbid plumes would likely move past (eastwards of) Hay Reef, Flat Top and Round Top Islands which would reduce the risk of impacts to these sensitive environments. However, mitigation measures will need to be implemented to manage potential water quality impacts.

Furthermore, dredging and blasting activities are likely to generate noise, underwater pressure waves, ground vibration and airblast, which could cause harm on marine species and noise sensitive receptors.

Consequently, While the nature of the dredging, drilling, blasting and spoil disposal activities will be short-term, the mitigation measures outlined in this DBEMP and in the EMP will need to be implemented to minimise the potential for impacts to occur on the receiving environment during these works.

3.2 Overall environmental objectives

- Minimise the impacts of dredging, drilling, blasting and spoil disposal activities on the receiving environment
- Comply with statutory approval conditions
- Reduce the potential for sediment dispersion and generation of turbid plumes
- Minimise adverse impacts on the aquatic ecosystems of the area
- Implement proactive measures to mitigate impacts at the source, path and receptor to minimise environmental complaints from land based sensitive receptors during dredging, drilling, blasting and spoil disposal activities

3.3 Overall performance criteria

- Ensure no marine fauna mortalities result from dredging, drilling and blasting operations
- Minimise injury and disturbance to marine fauna
- Ensure no marine fauna present within the determined Exclusion Zone during HPCT dredging, drilling and blasting
- Minimal impacts to existing coral and seagrass communities identified within vicinity of the dredging and blasting area
- No significant decrease in water quality as a result of the proposed works associated with the construction of the new Berth 3
- Sediment is to be removed and disposed of in accordance with the framework outlined in the National Assessment Guidelines for Dredging (NAGD)
- Establishment of an initial 2 km exclusion zone around drilling and blasting operations for cetaceans, and an 1,150 m exclusion zone for dugongs, marine turtles and large schools of fishes, subject to review during initial blasting on the basis of ongoing acoustic monitoring
- For testing mobile plant and equipment, noise measurement procedures shall be guided by the requirements of Australian Standard 2012.1-1990 "*Acoustics – Measurements of airborne noise emitted by earth-moving machinery and agricultural tractors – Stationary test condition: Part 1: Determination of compliance with limits for exterior noise*"

4. Dredging management plan

4.1 Existing situation

The proposed Berth 3 pocket has dimensions of 460 m long and 71 m wide. Including the apron area, the total footprint for dredging works is approximately 145 m wide and 620 m long. The existing geotechnical information indicates that the top of the rock in the area of the proposed Berth 3 pocket is at approximately RL -14.1 m Lowest Astronomical Tide (LAT) in some locations. A declared depth of RL-19 m LAT is to be achieved for the proposed Berth 3 dredging operations, and a declared depth of RL-14.9 m LAT for the apron area.

The establishment of the proposed Berth 3 pocket and apron area will result in the removal of approximately 275,000 m³ of dredge material, as described above. Based on these dimensions and volumes it is anticipated that dredging of the proposed Berth 3 and apron would involve a total sea floor area of approximately 9 ha, all located within the port limits of the Port of Hay Point, with none of the dredging occurring within the GBRMP.

These activities are scheduled for the 2011 dredging season (April to November). Dredging volumes and operations will be confirmed following detailed geotechnical investigations and negotiations with dredging contractors to define the best available plant and equipment.

Of the underlying rock material, it is estimated that up to approximately 90,000 m³ of bedrock and up to 30,000 m³ of weathered rock material will require removal by pre-treatment with drilling and stemmed blasting. The volume of rock requiring pre-treatment by drilling and stemmed blasting is dependent upon the plant and equipment available.

Ports Corporation of Queensland (PCQ), now known as NQBP, completed dredging for the Port of Hay Point Departure Path and Apron Dredging Program in 2006. The PCQ Departure Path and Apron Dredging Program incorporated dredging and disposal of approximately 9 million m³ of material (GHD 2007). While the volume of material to be dredged and disposed of as part of HPX will be in the order of approximately 275,000 m³ (3% of the PCQ dredging program by volume).

Given that the proposed Berth 3 is to be located in the vicinity of Berths 1 and 2, it is anticipated that similar conditions prevail and maintenance dredging requirements will be limited in both volume and frequency. The exact requirement for maintenance dredging will be determined during further detailed engineering investigations.

4.2 Reprocessing or Removal of Oversized Material

Oversized material larger than 400 mm identified in the spoil ground post-dredging will be reprocessed or removed within two years of the completion of the capital dredging disposal. It is envisaged that the reprocessing or removal shall be undertaken in two phases:

1. Phase 1 to include a combination of seabed levelling using a mechanical plough and raking of oversized material into predetermined stockpile areas. The raking and stockpiling of material requires the design and construction of specialised equipment not readily used or available within the dredging industry. This will necessitate proof trials taking place before a full-scale remedial work program is undertaken. The trial is to be completed by end September 2012.
2. Phase 2 to include the retrieval of oversized material from the seabed stockpiles and either screening the material to size and returning to the seabed or loading onto barges and transferring the material onshore. The remedial work program will be completed by end September 2014.

Equipment associated with the spoil ground remedial work is considered to be dredging plant.

4.2.1 Completion Criteria and Verification Process

Multibeam echosounder (MBES) and sidescan sonar (SSS) surveys, with validation studies as required, will be conducted during remedial works and no later than two months after completion of Phase 2 to confirm the effectiveness of the remedial works. The methodology for the MBES/SSS surveys is described in the Environmental Management Plan (Marine Ecology), Revision 5.5, Section 5.2.5 (BMA 2014).

If no areas with a density of more than 10 items/ha of material >400 mm are identified by the high-resolution MBES/SSS surveys, the reprocessing will be complete.

Final reprocessing will be conducted if the MBES/SSS does detect areas of material >400 mm at a density of 10 items/ha or more. If necessary, any ambiguity regarding targets (for example, distinguishing aggregations of smaller material from a single larger target) will be resolved by field validation.

A report of results of the full-coverage survey and any resulting validation surveys will be submitted to GBRMPA for approval within 30 days of completion of the surveys. If areas with >10 items/ha of oversized material are identified, the report will include a final clearance plan specifying the locations of areas that require final reprocessing.

Final reprocessing, if required, will be completed in accordance with the approved clearance plan. MBES imagery will be recorded before and after final reprocessing at all of the locations specified in the final clearance plan. A report including before/after MBES imagery documenting the completed reprocessing, and GPS vessel tracks during reprocessing in relation to specified locations in the final clearance plan, will be submitted to GBRMPA within 30 days of completion of final reprocessing. Georeferenced MBES imagery and vessel tracks will also be provided in electronic format.

The verification process for the completion of reprocessing in accordance with the completion criterion is summarised in Figure 2-1.

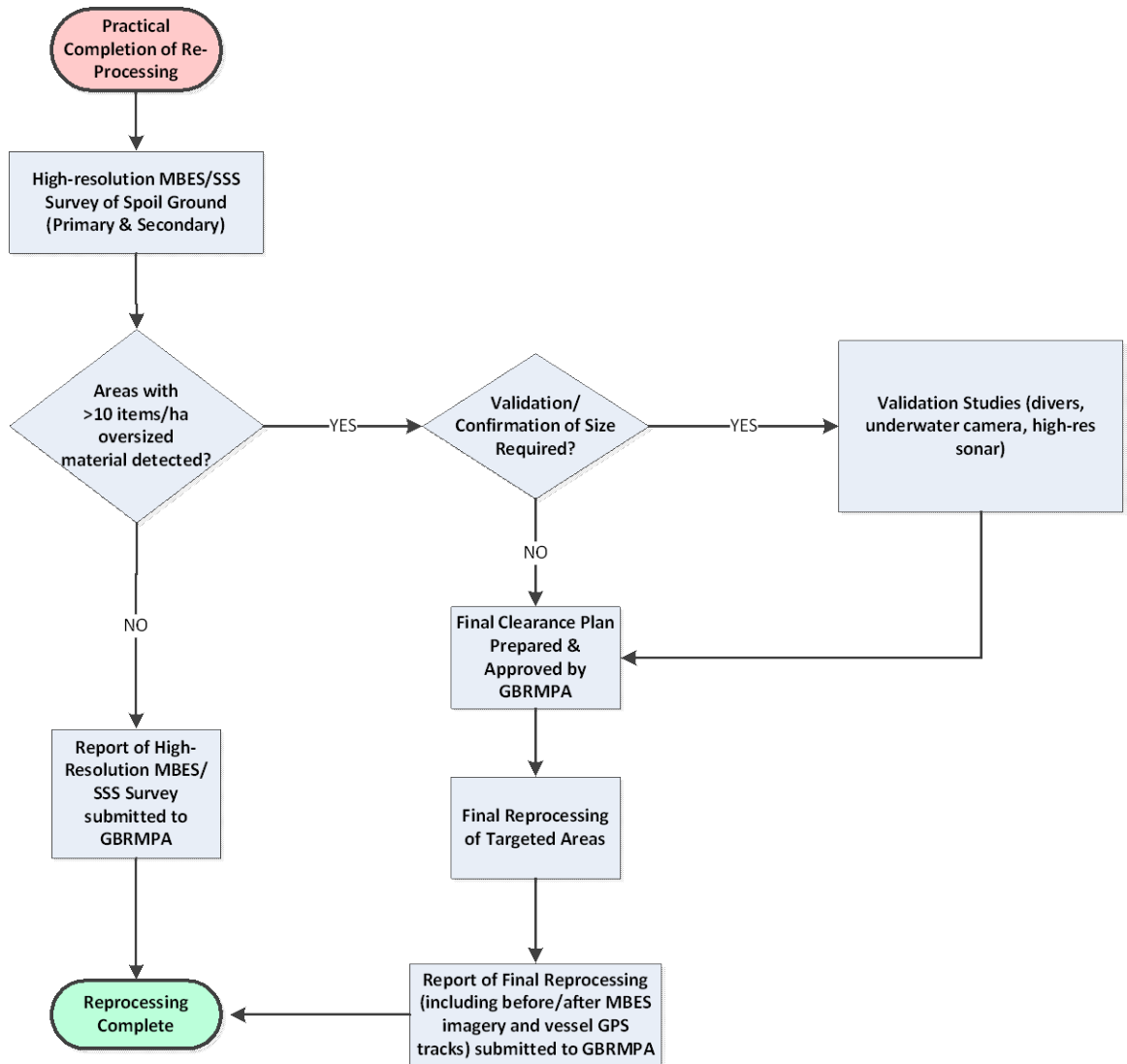


Figure 4-1 Process for verifying compliance with the completion criterion of no more than 10 items/ha over 400 mm in size

4.3 Objectives

The objectives of this DBEMP are to:

- Minimise any impacts of dredging operations on marine life and water quality, particularly from the activities of drilling and blasting.

Additionally, in association with the EMP, the management measures being applied to the project are designed to:

- Reduce the potential impacts from noise generated by dredge equipment
- Minimise sediment (turbid plume) mobilisation
- Reduce the risk of marine pests incursion
- Protect sensitive species and environments, including areas of the Great Barrier Reef Marine Park

4.4 Performance criteria

- There will be no significant decrease in marine water quality at sensitive locations as a result of the proposed dredging
- There will be no significant impacts on the marine environment as a result of dredging activities
- Disposal of the dredge spoil will be in accordance with the framework outlined in the NAGD
- Disposal of dredge spoil will be in accordance with the Sea Dumping and Marine Park Permits
- Noise from dredging activities must not cause an environmental nuisance at any “noise sensitive place” as defined under the *Environmental Protection (Noise) Policy 1997*
- No complaints received regarding excessive noise or vibration due to dredging activities



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Table 4.1 Dredging management measures

			Monitoring and Reporting Compliance				
Actions			Action Timing	Action Performed By	Activity	Activity Timing	Activity Performed by
Dredge Equipment							
A1	Dredge equipment and dredging methodology will be selected on the basis of the type of dredger, the nature of the material to be dredged, to minimise the generation of turbid plumes, and to minimise dredging timeframes.		PreC	CPM	Assessment during Tender Evaluation	PreC	PM
A2	Subject to equipment availability, a large dredge may be employed to enable the completion of the dredging programme in the shortest possible timeframe.		PD	PM and CPM	VI and CL	PD	SEA
A3	Dredge plant shall conform to AQIS Guidelines to minimise the risk of the introduction of any introduced marine species.		PD	CPM	VI and CL	WR	SEA
A4	Where practical and dependent upon the type of dredging equipment utilised, submerged diffusers will be used for release of spoil to reduce spread of sediments in water columns.		PD	CPM	VI	WR	SEA, DSV

MER Monthly Environmental Report
 PM Project Manager
 CM Construction Manager
 DBS Dredging and Blasting Superintendent
 CPM Contractor Project Manager
 ES Environmental Superintendent
 CMC Contractor Monitoring Coordinator
 DBSV Drill & Blast Supervisor

AS All Staff
 F&S Foremen and Subcontractors
 WR When Required
 VI Visual Inspection
 PD Project Duration (Construction)
 SEA Senior Environmental Advisor
 BMAPM BMA Project Manager
 PR BMA Public Relations

CL Checklist is to be completed
 PstC Post Construction
 PreC Pre Construction
 NOBP North Queensland Bulk Ports Corporation Ltd
 HPCTM Hay Point Coal Terminal Manager
 EA Hay Point Services Environmental Advisor
 DSV Dredging Supervisor



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			Monitoring and Reporting Compliance			
Actions	Action Timing	Action Performed By	Activity	Activity Timing	Activity Performed by	
Dredge Operations						
A5	Key personnel will be trained in marine impact management and informed of proposed dredging procedures.	PD	ES and CPM	Maintain training records	PD	SEA, DSV
A6	Dredging is to be conducted in a way that minimises the generation of turbid plumes.	PD	CPM	VI and CL	PD	DSV
A7	Dredging operations shall not be undertaken in unsuitable conditions (ie outside the operational parameters of the dredge such as in high energy situations such as storm surges).	PD	CPM	VI	WR	DSV
A8	All dredging equipment will be operated and maintained in a safe and efficient manner to ensure that noise levels generated comply with manufacturer specifications.	PD	CPM	Weekly	WR	DSV
A9	Where marine mammals or sea turtles are identified within the vicinity of dredging works, operations will be halted to avoid potential impacts. Works will not recommence unless the animals are observed to have moved outside the exclusion zone or until at least 30 minutes after the last sighting within the relevant exclusion zone.	PD	CPM and PM	VI and CL	PD	DSV
Noise and Vibration						
A10	The dredging contractor is to advise the CM of planned atypical noise and/or vibration events 72 hours prior to the event.	PD	CPM	MER	Monthly	CMC
A11	Residents shall be advised of the proposed dredging programme at least 24 hours prior to dredging activities, and/or when there are planned changes.	PD	EA	MER	Monthly	ES, SEA

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			Monitoring and Reporting Compliance			
Actions	Action Timing	Action Performed By	Activity	Activity Timing	Activity Performed by	
A12	Where possible, efficient noise suppression and muffling devices will be installed on all dredge related equipment, plant and vehicle engines to minimise noise levels.	PD	CPM	VI	PD	DSV
A13	All dredge related equipment, plant and vehicles will be turned off when not in use.	PD	AS	VI and CL	Daily	DSV
A14	All noise complaints shall be recorded and reported to the ES and CM within 2 hours of receipt of a complaint.	PD	CPM	MER	Monthly	SEA, DSV
A15	When requested by the DEHP or ES, noise monitoring additional to dredging licence requirements will be undertaken by the CPM or nominated trained representative to investigate any complaint of noise nuisance. The DEHP and ES will be notified of the results within 14 days of the complaint.	PD	CPM	VI and CL	WR	SEA
A16	When requested by the DEHP or ES, vibration monitoring will be undertaken by the CPM to investigate any complaint of nuisance. The DEHP and ES will be notified of the results within 14 days of the complaint.	PD	CPM	VI and CL	WR	SEA
Water Quality						
A17	The <i>Environmental Management Plan (Marine Ecology) for Dredging and Dredged Material Disposal (EMP)</i> will be implemented prior to, during and post dredging, drilling, blasting and spoil disposal works.	PreC, PD, PstC	CMC	VI and CL	PD	SEA
A18	Dredging shall be carried out in one continuous cycle to increase the utilisation and efficiency of the dredge, and minimise generation of plumes throughout the period of the works.	PD	CPM	PD	PD	SEA, DSV

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			Monitoring and Reporting Compliance			
Actions	Action Timing	Action Performed By	Activity	Activity Timing	Activity Performed by	
A19	Following completion of initial monitoring, visual observations of the plume from capital dredging shall be undertaken at a distance of approximately 500 m downstream from the dredging operations.	PD	DBO and CMC	VI and CL	PD	DSV
A20	Turbid plumes generated during dredging shall be monitored to ensure that they do not pose a significant risk to the environment	PD	CPM	VI and CL	PD	DSV
A21	Necessary precautions shall be taken to prevent spillage of fuels and other contaminants from the dredging equipment.	PD	CPM	CL	PD	DSV
Monitoring						
A22	Where dredging is carried out visual surveys shall be undertaken and a spotter shall be used to identify any marine fauna species that may be in the dredge area.	PD	SEA and CMC	VI and CL	WR	DSV

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4.5 Corrective actions

- Revision of dredging and/or construction activities as required
- The CPM shall immediately notify the CM and SEA of any incident that has the potential to impact on the receiving environment in the vicinity of dredging activities
- All noise and dredging-related complaints are to be dealt with by the CPM within 48 hours of their receipt and corrective action implemented immediately
- An incident/accident report form shall be filled out if any non conformances are found and remedial actions are to be nominated to ensure compliance
- All non conformances shall be corrected as soon as possible and strategies implemented to reduce the likelihood of the incident reoccurring
- The source of the complaint is to be remedied as soon as practicable
- The CM is to close out all reported incidents
- Where appropriate, the CM will liaise with the complainant to outline the measures undertaken to mitigate the noise and/or vibration impact
- If necessary, supplementary monitoring is to be undertaken to identify the source of non conformance and may involve modification of dredging techniques to avoid recurrence
- In the event of an environmental incident, appropriate emergency response measures shall be implemented to ensure environmental harm from the event is minimised
- In the event of an injury or death to marine wildlife, the ES shall contact the 1300 ANIMAL hotline (1300 264 625)

5. Drilling and blasting management plan

5.1 Existing situation

The establishment of the proposed Berth 3 pocket will require pre-treatment by drilling and blasting to achieve the final design lines and levels. It is proposed that drilling be performed 24 hours per day, and blasting conducted during daylight hours only.

Underwater blasting operations will likely be undertaken using the Overburden Drilling method. This involves using a set of steel tubes with ringbits to drill through the overburden and into the bedrock. Drilling is then carried out using a string of rods and a drill bit, and when it is withdrawn, drill cuttings are carried back to the surface. Once the drilling operations are complete, detonators and plastic tubes filled with explosives will be inserted into the drill hole for blasting.

The proposed drilling and blasting operations have the potential to generate underwater pressure waves, ground vibration and airblast pressures, which could pose a risk to people, structures or marine life in the immediate vicinity of the blasts. Therefore, all blasting and drilling activities shall comply with the exclusion requirements defined in Sections 5.4.5 and 5.4.6 below. Drawing H330-0300-W-0068 illustrates the maximum exclusion zone around the proposed Berth 3 pocket, included as Appendix A.

As such, mitigation measures will be developed and implemented to minimise the potential noise and vibration impacts on the marine environment and residential communities, and to ensure the safe and efficient conduct of the proposed blasting programme.

5.2 Objectives

The objectives of the Drilling and Blasting Management Plan are to:

- Establish a strategy for effective operation, management of drilling, blasting and associated activities
- Minimise impacts from blasting on marine life, the surrounding environment, onshore and offshore structures, and residential communities
- Reduce the potential impacts from vibration, underwater pressure and airblast generated by drilling and blasting operations
- Implement mitigation and control measures at the source, path and receptor to minimise noise, vibration and airblast complaints during the underwater blasting and drilling works

5.3 Performance criteria

- The likelihood of adverse impacts on marine life and sensitive marine habitats as a result of blasting activities is minimised
- Vibration from underwater blasting and drilling activities must not cause an environmental nuisance at any vibration sensitive place
- Noise from drilling and blasting activities must not cause an environmental nuisance at any “noise sensitive place” as defined under the *Environmental Protection (Noise) Policy 1997*
- Blasting activities shall comply with the vibration criteria and operation times specified in the Queensland EPA’s Guideline on “*Noise and Vibration from Blasting*”
- Where blasting activities fall outside the hours detailed in the Queensland EPA’s “*Noise and Vibration from Blasting*”, blasting schedules shall be guided by the human comfort vibration criteria nominated in the NSW EPA’s “*Environmental Noise Control Manual*”
- Guidance shall be taken from the German Standard DIN 4150 “*Structural Vibration Part 3: Effects of Vibration on Structures*” in relation to blast vibration damage criteria for berths and offshore conveyor support structures
- No complaints received regarding excessive noise or vibration due to drilling and blasting activities

5.4 Initial blast plan and design

5.4.1 Blasting methods

The geotechnical information for the proposed Berth 3 pocket indicates that 10 to 30% of material consists of rock with various degrees of fracturing. Notwithstanding the fracture rate, it is apparent that a large quantity of rock, if not all the rock at the lower layers of the area of the berth, will require drilling and blasting.

There are basically three blasting methods:

- Surface blasting, with Maximum Instantaneous Charge (MIC) 100 to 200 kg per blast
- Mass blasting, MIC 150 kg to 2,000 kg per blast
- Blasting with delayed detonation of blastholes using non-electric or electric delays between blastholes, MIC 10 kg to 50 kg per delay

For the situation evident at Hay Point, surface blasting or mass blasting will not provide appropriate work methods in view of the surrounding environment, as well as vibration impacts to nearby wharf structures and vessels alongside HPCT Berth 1. Therefore, blasting with delayed detonation of blastholes is the method to be employed. There will be a maximum of 24 blastholes in a shot.

5.4.2 Blast design – key issues

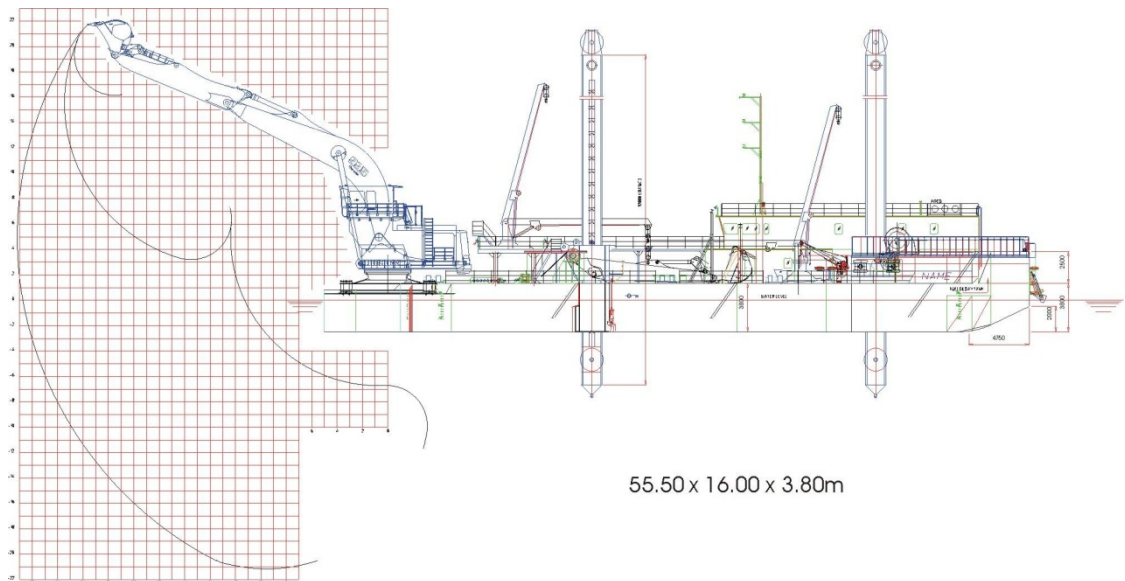
The key issues to be considered in determining the most effective blast design are:

- The level of fracturing of rock required in order to facilitate its removal
- Minimising disturbance to the environment (in terms of potential impacts on marine life and the surrounding structures and activities)
- The overall timeframe required for the works (within the dredging window)

It will be preferable for both the environment and the Project to complete all blasting works in a single dredging window (April to November), rather than require blasting disturbance over multiple dredging seasons.

While it is possible (as occurred in Newcastle, NSW 1980-1982) to remove drilled and blasted rock, shot to very small fragmentation with a TSHD or with a CSD and barges, it makes more sense (economically) to drill with a larger pattern to suit a backhoe and grab dredge removal (mechanical dredgers). The ability to remove material by a mechanical dredger will facilitate the largest drilling pattern and the shortest blasting period for the Project, however the drilling pattern must be designed to suit the rock strength and natural fracturing patterns in order to avoid areas with poor fragmentation.

The blast design and drilling pattern is significantly enhanced by blasting to an open face (to assist with rock fracturing). Therefore, it is recommended that the mechanical dredging follows the drilling and blasting closely at all times in order to clear blasted material before undertaking further drilling and blasting. The following schematic details a grab dredge removing blasted rock. In the most ideal situation, the next rows of holes for blasting are drilled adjacent to a free face in order to facilitate maximum fragmentation and ease of dredging in freshly bulked blasted rock.



Schematic - Showing the Removal of Drilled and Blasted Rock

5.4.3 Initial blast methodology

The vibration impact from blast detonation will depend on the type and quality of rock in which the blasts are detonated. Relationships between:

- i) The maximum instantaneous charge per delay detonator (MIC)
- ii) Level of vibration and distance from the charge
- iii) Airblast as well as underwater pressure pulse and distance from the charge

are known as the Site Law. An assumed Site Law is adopted (based on geotechnical investigation interpretation) for the initial blast design. Monitoring of the vibrations from the first (and also subsequent) blasts can then result in more accurate definition of the Site Law at this location.

In order for the Site Law to be defined and monitored for this site at the commencement of drilling and blasting activities, it is proposed that the initial charges be located:

- At shallow rock levels to the design depth (centre of berth pocket leading to northern outcrop in Berth 3)
- Within one or two shallow holes charged with smaller explosive charges (approximately 10 kg per delay)

This will allow the verification of the adopted Site Law which will then be progressively developed from the monitoring of results. The Site Law will be reviewed continuously to take account of the local ground conditions and circumstances during the progress of the works.

For normal drilling and blasting operations, the single decking process of charging blastholes will be used unless vibration levels, airblast and underwater pressure are assessed as likely to become excessive. As a consequence, in areas where deep holes are required it may be necessary to double-deck the blastholes. This will reduce the MIC and thus reduce the vibration and airblast levels. The MIC of fully charged double deck blast holes is approximately 40% to 45% of single deck blastholes for the same rock depth.

5.4.4 Initial blast design

One of the key parameters (apart from MIC) in determining blast outcomes is the diameter and spacing of the drilled holes in which the charges are placed. A standard drill hole diameter is 100 mm, in which 80 mm diameter explosive cartridges would be placed. Holes are drilled from a large jack-up barge platform.



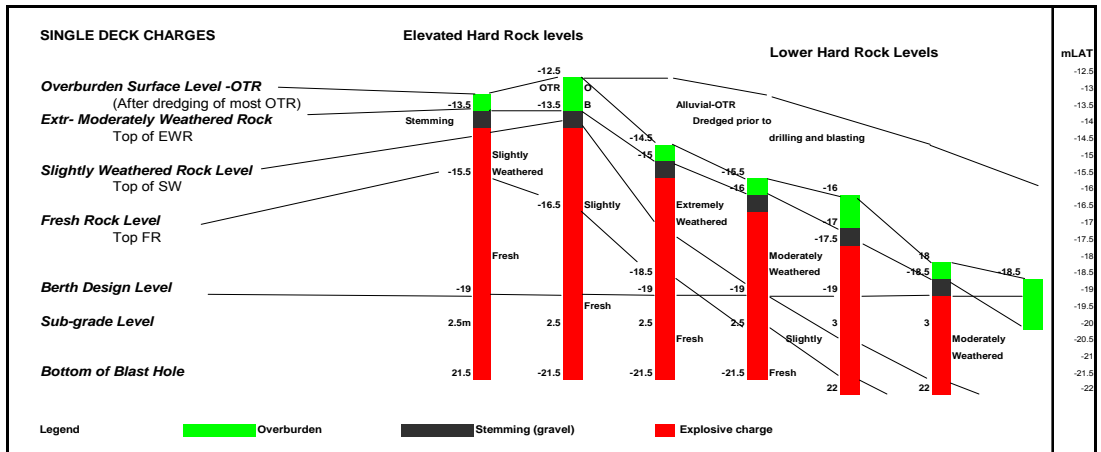
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For the geotechnical information obtained at Hay Point, adoption of a 100 mm drill hole diameter will likely require a drill hole pattern of approximately 2.25 m x 2.25 m. With an increase in hole diameter to 125 mm and the use of 100 mm diameter explosive cartridges, the drill hole pattern could be increased to 3 m x 3 m. The large drill hole pattern results in significant time savings but also results in a higher MIC in each blast hole. The following table illustrates the preliminary blast design (based on an assumed Site Law) undertaken for this Project, as based on the available geotechnical data.

Blast Design - Abbreviated Version

Explosive Charges per Blast Hole fired by Nonel Delay Detonators for various Rock Depths

Berth BMA 3 - Schematic - Long Section (North to South = Left to Right))



Depth of rock drilled							
Depth of hole in Rock	8 m	8	6.5	5.5	5	3.5	0
Reduction for top stemming	0.5 m	0.5	0.5	0.5	0.5	0.5	0
Depth of hole charged (with exo) <small>(unless double decked or double lifted with double decking)</small>	7.5 m	7.5	6	5	4.5	3	0

Details of blast information for 100mm dia rock drills operated by hydraulic drill rigs (2 or 3 off)							
Single decked charges							
Nos Cartridges at 400x80mm(2.08kg) <small>Source: Orica-Powergel Buster</small>	18.75 Cartridges	18.75	15	12.5	11.25	7.5	0
MIC-Charge per hole (in kgs) <small>Approx Blast Pattern 2.25x2.25m=5.06m2</small>	39 kgs/delay	39	31.2	26	23.4	15.6	0
Blast Ratio kgs/Gross m3	0.96	0.96	0.95	0.93	0.92	0.88	

Details of blast information for 125mm dia rock drills operated by hydraulic drill rigs (2 or 3 off)							
Single decked charges							
Nos Cartridges at 500x100mm(4.5kg) <small>Source: Orica-Powergel Buster Special Order</small>	15 Cartridges	15	12	10	9	6	0
MIC-Charge per hole (in kgs) <small>Approx Blast Pattern 3.00x3.00m=9.00m2</small>	67.5 kgs/delay	67.5	54	45	40.5	27	
Blast Ratio kgs/Gross m3	0.94	0.94	0.92	0.91	0.89	0.86	NA

Blast Ratios in excess of 0.85 to 0.9 kg/m³ is normally found to be in excess of the requirement and is adjusted by opening the blast pattern after successful trial dredging of pretreated rock.
Quantities expressed in gross cubic meters included the subgrade volume of the pattern
MIC in red are over the standard limit and these holes require : a) double decking, as shown in table 2 or double lifting. (Double lifting is a term used for the blasting of an area in 2 separate blasting and dredging operations for top and bottom lifts. Triple lifting may be required in sensitive areas.

Assessment of blast impacts (refer Section 5.4.5 below) indicates that a MIC of 50 kg is a preferred upper limit – providing practicalities in terms of monitoring distances and potential impacts. It is noted from the above preliminary design and assumed Site Law that adoption of a single deck for the deeper rock experienced at the northern end of the proposed Berth 3 pocket may result in MIC values greater than the preferred upper limit of 50 kg for use in the 125 mm drill holes (and thus 100 mm cartridges).

Adoption of double decking for the larger diameter drill holes and cartridges reduces the MIC values to 22.5 kg (instead of 54 kg), and 31.5 kg (instead of 67.5 kg) for the deeper holes.

The overall approach based on this preliminary design can be summarised as follows:

- Commence drilling and blasting in the middle of the Berth 3 pocket, with low MIC to verify the Site Law
- Work toward the northern end, and thus working a rock “face” for maximum efficiency
- Continually monitor and update the Site Law and all impacts with each blast
- Determine an appropriate point at which double decking or other measures (drill hole diameter, spacing etc) are necessary in order to maintain an acceptably low MIC

5.4.5 Environmental impacts

Underwater blasting noise could potentially result in a hierarchy of impacts on marine organisms of decreasing severity, including severe organ trauma and mortality, permanent or temporary hearing loss (permanent threshold shift, PTS, and temporary threshold shift (TTS, respectively), and behavioural disturbance. Table 5.1 shows the predicted safe distances for these effects based on acoustic modelling and established exposure criteria (SKM 2009).

Table 5.1 Predicted safe distances to meet noise exposure criteria for marine animals

Criterion	Metric	Type of impact	Applies to	Range (m)	
				20 kg MIC	50 kg MIC
<i>P_{max} criteria – no frequency weighting</i>					
224 dB re 1 µPa	P _{max}	TTS/Behavioural disturbance	Humpback whales, dolphins, dugongs and turtles	165	230
230 dB re 1 µPa	P _{max}	PTS/Organ trauma	Humpback whales, dolphins, dugongs and turtles	80	115
<i>SEL Criteria – no frequency weighting</i>					
183 dB re 1 µPa ² -s	SEL	TTS/Behavioural disturbance	Humpback whales and turtles	840	1,150
195 dB re 1 µPa ² -s	SEL	No injury	0.1 g fish	205	280
198 dB re 1 µPa ² -s	SEL	PTS/Organ trauma	Humpback whales, dolphins, dugongs and turtles	145	200
200 dB re 1 µPa ² -s	SEL	No injury	1 kg fish	115	155
<i>SEL Criteria – Using M-weighting for mid-frequency cetaceans</i>					
183 dB re 1 µPa ² -s	SEL	TTS/Behavioural disturbance	Dolphins, dugongs	585	793

5.4.6 General mitigation measures

In relation to mitigation and control, all reasonable noise, vibration and blast emission mitigation measures will be implemented wherever feasible, during dredging, drilling and blasting. In general, the quietest plant and equipment will be utilised in combination with management measures in order to minimise the noise impacts on the local community, including the use of hydraulic (rather than pneumatic) drills.

A range of approaches to reduce the dredging and blasting impacts is described below, again, to be applied where reasonable and feasible:

- A fundamental objective is to ensure that the best available technology and best management practices are used at the work sites in order to minimise the extent of adverse noise, vibration and blast emissions impacts
- Regular maintenance of all plant and machinery will be undertaken in order to assist in minimising noise emissions
- A program will also be put in place to forewarn and advise the local community about the progress of the works and to explain response mechanisms

There are a number of measures that will be implemented to mitigate the adverse environmental effects of underwater blasting on marine life, including:

- a) Reducing the plan area of the blasting footprint by using dredging plant to the limit of its capabilities, thereby minimising the volume of material that requires pre-treatment by blasting
- b) Careful planning of the blast program to minimise the size of the charge
- c) Timing of the blasting to avoid the turtle nesting and hatching season
- d) Where practicable, use of explosive products with lower detonation velocities, but noting that this would require more explosives to achieve the same blast result
- e) Use of detonating caps with built-in time delays, as this effectively reduces each detonation into a series of small explosions
- f) Use of a procedure ("decking the charge") which subdivides the charge in one blast hole into a series of smaller explosions, with drill patterns restricted to a minimum separation from any other loaded hole
- g) Over-drilling the holes to ensure fracturing of the rock
- h) Use of gravel (road base) or similar material to stem the blast hole to the seabed level after the charge is in place
- i) Staggering the detonation for each blast hole in order to spread the explosive's total overpressure over time
- j) Matching, to the extent possible, the energy needed in the "work effort" of the borehole to the rock mass to minimise excess energy vented into the water column

5.4.7 Monitoring and management program

It is proposed to establish a monitoring and mitigation program in addition to the mitigation measures listed above, to ensure that marine mammals, turtles and fishes will not be injured or killed during blasting and that impacts on marine life will be minimised where practicable.

The design of the monitoring and management program is a recognised component of construction activities and will form a primary element of the *Environmental Management Plan (Marine Ecology) for Dredging and Dredged Material Disposal (EMP)*.

5.4.8 Monitoring and management of the Exclusion Zone

To minimise the likelihood of adverse impacts on marine fauna, Exclusion Zones will be monitored for the presence of marine mammals, sea turtles and large schools of fish, as well as large flocks of seabirds and/or concentrations of jellyfish. Detonation will not occur if these animals are detected within the designated Exclusion Zone, until the animals move out of the exclusion zone of their own volition. The Exclusion Zone for cetaceans will extend 2 km around the blasting site, subject to review on the basis of acoustic monitoring of preliminary detonations. The Exclusion Zone for dugongs, marine turtles and large fish schools will extend 1,150 m from the blasting site.

Any proposed changes to the Exclusion Zone are to be submitted to DoE for approval. The exclusion zone must not be reduced until approval is given.

Visual monitoring

Ground Observers

Ground Observers will visually monitor the Exclusion Zone from Transfer Towers TT7 (sub12) and TT8 (sub3-11) on the existing terminal facility servicing Berths 1 and 2, which are at elevations of 23.11 m and 22.52 m above Chart Datum, respectively. The observer teams will maintain radio contact with the Blast Observer. All personnel involved in visual monitoring will receive specific training in the monitoring methods and procedures.

Boat-based observers

Two teams of boat-based observers will also visually monitor the seaward portion of the exclusion zone. One team will be located 1,150 m from the works. The second team will be located at the seaward edge of the 2 km exclusion zone and will monitor both the Exclusion Zone and the surrounding area to provide warning of approaching animals. Like the Ground Observers, the Boat-Based Observers will maintain radio contact with the Blast Observer and receive specific training in methods and procedures defined in the procedures manual.

A procedures manual will be developed for pre-detonation visual surveys and will include:

- Provisions for structured sector-by-sector searches for prescribed time intervals
- A prescribed elevation for the observer (at a minimum, standing in the boat)
- Minimum visibility conditions
- Prescribed intervals for alternating between searching with binoculars and the naked eye

Passive acoustic detection

Passive acoustic detection refers to the detection of marine mammals by listening for the sounds/calls that they make. If these sounds are getting louder with time, then the assumption can be made that these mammals are approaching the monitoring location. This means of detection is only meant to support visual detection methods and should not be considered the prime method of monitoring the safety zone.

The presence of marine mammals will be monitored by placing a hydrophone in the water at the outer rim of the safety zone (at 2 km) and at 1,150 metres from blasting site. The output of the hydrophone will be monitored aurally using a headset, and visually using a computer display of the acoustic frequency spectrum. The presence of marine mammals will be associated with their calls, and when picked up, this information will be relayed to the Blast Observer. If the marine mammal sounds continue and are getting louder, then the visual observers will be notified to be on the lookout. If the marine mammal sound level decreases, this indicates that the marine mammal is leaving the area and the visual lookouts will be notified accordingly.

All relevant personnel will be trained in the use of the equipment including familiarisation with the different possible sounds associated with marine mammals that frequent the area.

Proposed monitoring/mitigation program methodology

This section presents an indicative procedure to be followed during the monitoring/mitigation program at HPCT. The procedure will be refined in relation to the exact procedures developed in the monitoring procedures manual.

All monitoring teams (Boat-Based Observers and Ground Observers) will report to the Monitoring Coordinator, who will be responsible for supervising and communicating visual and acoustic detections and to halt the blast detonation in the event that an animal is spotted within or approaching the Exclusion Zone. The blast countdown will not resume until the animal moves away from the area of its own volition. Marine mammals and sea turtles must not be herded away or harassed into leaving. If the animal is not sighted a second time, the event will not resume until half an hour after the sighting.

Pre-blast monitoring

The purposes of pre-blast monitoring are to:

- Evaluate the site for environmental suitability in terms of monitoring and blasting
- Verify that the Exclusion Zone is free of detectable marine mammals, sea turtles, large schools of fish, large flocks of seabirds, and large concentrations of jellyfish (both are possible indicators of turtle presence)

The monitoring procedure will be executed as follows:

- a) Monitoring will be undertaken during daylight hours and in conditions where visibility is adequate to monitor the Exclusion Zone.
- b) Half an hour prior to the blasting (following the cessation of blasthole drilling), monitoring of the Exclusion Zone and surrounding area will commence. The visual and acoustic monitoring teams will combine to monitor the Exclusion Zone. The Monitoring Coordinator will enter all visual and acoustic marine fauna detection/monitoring information, including species, numbers of individuals, time and location of detection and behaviour, into a marine animal tracking and detection database.
- c) Go/No-Go Decision Process: the Monitoring Coordinator will have the authority to declare the range fouled and recommend a hold until monitoring indicates that the Exclusion Zone is and will remain clear of detectable animals. The fire mission will be postponed if any marine mammal, sea turtle, large school of fish, large flock of seabirds, or concentration of jellyfish is visually or acoustically detected within or approaching the designated Exclusion Zone (2 km for cetaceans and 1,150 m for dugongs, turtles and large schools of fish). The delay will continue until the animal(s) that caused the postponement are confirmed to have moved outside the Exclusion Zone or until at least 30 minutes after the last sighting within the relevant Exclusion Zone”.

Post-blast monitoring

Post-blast monitoring is designed to determine the effectiveness of the pre-blast mitigation by reporting any sightings of dead or injured marine mammals or sea turtles. Post-detonation monitoring will commence immediately after each blast. Boat-based and ground-based visual monitoring is intended to be utilised for post-blast monitoring. If any animals are observed or detected in the Exclusion Zone during the post-blasting monitoring, the location, number, species and behaviour will be recorded.

5.4.9 Monitoring and management of fish communities

Fish mortality was not observed in previous blasting at Dalrymple Bay Coal Terminal but the acoustic modelling indicates that the eastern part of the existing Berth 1 lies within range of potential adverse impacts on fishes from blasting in the western portion of the proposed Berth 3. It is expected that the fishes at the existing infrastructure at Berth 1 are mostly widespread and common species that also occur more widely in the surrounding area on natural structures such as reefs, so that population-level impacts are not expected. Potential impacts on these fish communities will, however, be monitored and assessed, and if necessary mitigation measures will be put in place.

Baseline survey

A baseline fish survey will be conducted as an input to development of the EMP. The survey will include the existing Berth 1. The survey will provide detailed information on present fish diversity and abundance. The development of a species list will assist in further assessing potential impacts of blasting and their biological significance. The proposed survey technique proposed is a Timed Point Count Fish Census. The proposed methodology includes:

- Visual surveys using a video drop camera
- Survey locations at the Berth 1 piles
- 20 point counts per location at which the number and species of fish are recorded
- Point counts to be undertaken over a period of 10 minutes

Monitoring during blasting

It is proposed that monitoring of fish mortality at Berth 1 is undertaken during blasting operations. This is likely to take the form of:

- Surface collections of floating specimens for identification and measurement when possible; and
- Quantitative seabed surveys using remote video equipment to count, and where possible identify and estimate the size of dead fishes that sink to the bottom.

Quantitative seabed surveys will be undertaken at the Berth 1 piles. During the initial preliminary blasting and first two weeks of routine operational blasting, a large enough number of seabed sites will be monitored to provide statistical rigor to the program. Surface counts during the remainder of the blasting program will also be carried out following each individual blast. Additional monitoring may be carried out if the initial monitoring indicates that it is necessary.

Post-construction surveys

A post-construction survey of the Berth 1 piles will be conducted within one month after blasting and dredging have ceased to determine whether the fish community has changed substantially. The survey will use the same methodology as the baseline survey. If major changes are observed, the surveys will be repeated at intervals of six and, if necessary, 12 months to assess recovery.



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Table 5.2 Drilling and blasting management measures

			Monitoring and Reporting Compliance			
Actions		Action Timing	Action Performed By	Activity	Activity Timing	Activity Performed by
Blasting Operations						
B1	The CM shall coordinate with NQBP to ensure that shipping movements are controlled at or within the vicinity of the 2 km Exclusion Zone during initial blasting operations.	PD	CPM and CM	CL	Pre-blasting and during blasting	SEA, CPM
B2	The Blasting Contractor will utilise a sound warning device eg, blasting of horn, to indicate the commencement of blasting activities in 5-10 minutes.	Pre-blasting	CPM	CL	During blasting	CPM
B3	All staff working at the blasting site will be properly trained in the safe use of explosives and in the conduct of blasting works.	Pre-blasting	CM and CPM	CL	Pre-blasting	DBS
Blasting Controls						
B4	The blast design shall be planned carefully based on available geotechnical information to ensure compliance with the site law and nominated vibration limits to minimise the size of the charge required.	Pre-blasting	CPM	Environmental Assessment	Pre-blasting	PM and DBS
B5	The site law shall be refined (if necessary) following initial site works, and shall take into consideration all relevant environmental issues to ensure minimal impacts on the marine environment are maintained.	Pre-blasting	PM and CM	Environmental Assessment	Pre-blasting	SEA
B6	Where practicable, a blasting cap or cap and primer will be used in preference to a detonating cord to minimise the potential impacts on the environment. In addition, only Nonel or electronic detonators shall be used.	PD	CPM	VI and CL	WR	DBS, DBSV
B7	Where practicable, explosive products with low detonation velocities shall be used.	PreC	CPM	Environmental Assessment	PreC	CM

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 WR When Required
 VI Visual Inspection
 PD Project Duration (Construction)
 SEA Senior Environmental Advisor
 BMAPM BMA Project Manager
 PR BMA Public Relations

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 DSV Dredging Supervisor



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			Monitoring and Reporting Compliance			
Actions	Action Timing	Action Performed By	Activity	Activity Timing	Activity Performed by	
B8	Detonation caps with built-in time delays shall be used, as this effectively reduces each detonation into a series of small explosions.	PD	CPM	Environmental Assessment, VI and CL	WR	CM
B9	The process of decking the charge may be implemented, whereby the charge in one blast hole is subdivided into a series of explosions, reducing the charge size and thus the blast overpressure and vibration levels.	PD	CPM	CL	WR	SEA
B10	Over drilling of the blast holes shall be undertaken to ensure effective fracturing of the rock.	PD	CPM	CL	WR	SEA
B11	Granular material shall be used to stem the blast hole to the seabed level after the charge is in place, so as to contain the blast below the seafloor, thus minimising energy loss from the drill hole and increasing blast efficiency.	PD	CPM	VI	WR	SEA
Noise and Vibration						
B12	Where possible, drill equipment will be fitted with noise suppression devices to minimise noise emission levels.	PD	CPM	VI	PD	SEA
B13	Real time monitoring of vibration and underwater pulse pressure levels will be conducted with site law analysis at specific locations during blasting activities to ensure compliance with criteria and thresholds.	PD	CMC	CL	PD	SEA
B14	All noise complaints shall be recorded and reported to the ES and CM within 2 hours of receipt of a complaint.	PD	CPM	MER	Monthly	SEA

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			Monitoring and Reporting Compliance		
Actions	Action Timing	Action Performed By	Activity	Activity Timing	Activity Performed by
B15	When requested by the DEHP or ES, vibration monitoring will be undertaken by the CPM to investigate any complaint of nuisance. The DEHP and ES will be notified of the results within 14 days of the complaint.	CPM	VI and CL	WR	ES, SEA
Marine Ecology					
B16	The EMP will be implemented prior to, during and post dredging, drilling, blasting and spoil disposal operations.	PreC, PD, PstC	VI and CL	PD	ES, SEA
B17	A blast plan shall be developed which takes account of the potential effects on marine life.	PM and CM	Environmental Assessment	Pre-blasting	SEA, DBSV
B18	Visual and passive acoustic monitoring of the 1,150 m and 2 km Exclusion Zones will be conducted commencing a half-hour prior to detonation during daylight hours and in visibility conditions adequate to monitor the Exclusion Zones. Blasting operations will be placed on hold if a dugong, sea turtle, large school of fish, or large flocks of seabirds or concentrations of jellyfish is observed within the 1,150 m Exclusion Zone, or if cetaceans are observed within the 2 km Exclusion Zone, until the animal(s) move to outside the respective Exclusion Zone or until at least 30 minutes after the last sighting within the relevant Exclusion Zone.	PM and CPM	VI	PD	SEA, DBSV
B19	Visual monitoring of the Exclusion Zone shall be conducted by Ground Observers and two teams of Boat-Based Observers prior to and following blasting in accordance with the Procedures Manual.	PM and CPM	VI	PD	SEA, DBSV

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			Monitoring and Reporting Compliance			
Actions	Action Timing	Action Performed By	Activity	Activity Timing	Activity Performed by	
B20	Passive acoustic monitoring of the Exclusion Zones shall be conducted by placing a hydrophone in the water at the outer rim of the safety zone (at 2 km) and at 1,150 metres from blasting site. The output of the hydrophone will be monitored and the presence of marine mammals will be relayed to the Blast Observer. If the marine mammal sounds continue and are getting louder, then the visual observers will be notified to be on the lookout. If the marine mammal sound level decreases, this indicates that the marine mammal is leaving the area and the visual lookouts will be notified accordingly.	PD	PM and CPM	VI	PD	DBSV
B21	The energy needed in the work effort of the borehole shall be matched to the rock mass to minimise excess energy vented into the water column.	PD	CPM	VI and CL	WR	SEA, DBSV

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5.5 Corrective actions

- Blasting activity to cease immediately until marine animals are outside the designated 1,150 m and 2 km Exclusion Zones
- All vibration and blasting-related complaints are to be dealt with within 48 hours by the PM and corrective action implemented immediately
- In the event of an environmental incident, appropriate emergency response measures shall be implemented to ensure environmental harm from the event is minimised
- Incident/accident forms to be filled out during audits if any non conformances are found and shall nominate remedial actions to ensure compliance
- All non conformances shall be corrected as soon as possible and strategies implemented to reduce likelihood of the incident reoccurring
- The CM is to close out all reported incidents
- The CM will liaise with the complainant to outline the measures undertaken to mitigate the noise and/or vibration impact
- If necessary, supplementary monitoring will be undertaken to identify the source of non conformance and may involve modification of blasting techniques to avoid recurrence
- If necessary, blasting strategies are to be modified subject to approval by PM. Changes in the blasting strategy will have to be approved by the BMAPM prior to implementation.
- In the event of an injury or death to marine wildlife, the ES shall contact the 1300 ANIMAL hotline (1300 264 625),
- Within 72 hours of a reportable incident a report will be provided to the Queensland Parks and Wildlife Services (QPWS), Queensland Department of Agriculture, Fisheries and Forestry (DAFF), DEHP, DoE, and GBRMPA detailing:
 - the incident;
 - the measures taken to manage and correct the incident; and
 - any additional measure implemented to avoid future incidents.

The success of any additional measures applied to address the incident will be reported as part of the regular reporting and audit of the project.

6. Spoil disposal management

6.1 Existing situation

PCQ, now known as NQBP, completed dredging for the Port of Hay Point Departure Path and Apron Dredging Program in 2006. It is understood that the dredge spoil disposal ground was located within the GBRMP. The PCQ Port of Hay Point Departure Path and Apron Dredging Program incorporated dredging and disposal of approximately 9 million m³ of material. While the volume of material to be dredged and disposed of as part of HPX will be in the order of approximately 275,000 m³ (3% of the PCQ dredging program by volume). Material dredged as part of HPX will be disposed of in the same location that PCQ used for its Departure Path and Apron Dredging Program.

Sediment sampling conducted as part of the PCQ EIS for the Port of Hay Point Departure Path and Apron Dredging Program, which includes the area of the proposed Berth 3 pocket, did not identify contaminants in excess of the National Assessment Guidelines for Dredging (NAGD) to a depth of RL -14.9 m LAT. As such, it is not expected that the remaining soft sediment material below this level will contain elevated levels of contaminants.

Additionally, sediment sampling in the proposed Berth 3 pocket has not identified exceedances of the NAGD which would allow disposal of the material at sea. A comprehensive sediment testing program has been carried out in accordance with the NAGD. In addition a spoil disposal options assessment has been prepared which evaluated the alternative uses of spoil material and recommended disposal of spoil offshore.

This information has been provided to GBRMPA to support applications for a Permit to Dispose of Dredged or Excavated Material at Sea under the *Environment Protection (Sea Dumping) Act 1981* (Commonwealth) and a Marine Park Permit under the *Great Barrier Reef Marine Park Act 1975*.

6.2 Objective

The objective of spoil disposal management is to establish appropriate disposal procedures that will minimise the potential impacts on the marine environment. Specific measures to manage and monitor spoil disposal are contained in the *Environmental Management Plan (Marine Ecology) for Dredging and Dredged Material Disposal* (EMP).

6.3 Performance criteria

- Disposal of dredge spoil in accordance with EPBC Act approval, Sea Dumping and Marine Park Permits
- There will be no significant decrease in water quality as a result of the proposed dredge disposal activities
- The concentration of turbid plumes must not significantly exceed values predicted from the sediment modelling
- Sediment will be removed and disposed in accordance with the framework outlined in the NAGD



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Table 6.1 Spoil disposal management measures

			Monitoring and Reporting Compliance			
Actions	Action Timing	Action Performed By	Activity	Activity Timing	Activity Performed by	
C1	The Dredging Contractor will follow a mosaic pattern of spoil dumping to prevent smothering of benthic life within the dredge spoil disposal ground, and in accordance with requirements of approvals.	PD	CPM	VI	WR	DBS, DSV
C2	Alluvial and weathered rock disposal shall be to the offshore spoil ground in accordance with approvals. Disposal of drill and blast material shall be to the Tug Harbour (onshore) in accordance with approvals.	PreC	PM	Environmental Assessment	PreC	SEA, DSV
C3	Dredge spoil will be disposed of in accordance with conditions of the approvals granted under the <i>Great Barrier Reef Marine Park Act 1975</i> and <i>Environment Protection (Sea Dumping) Act 1981</i> .	PD	CPM	VI and CL	WR	SEA, DSV
C4	Where possible, the thickness of the spoil material deposited on the sea floor is to be minimised and a thin-layer placement adopted, so as to reduce potential for the burial of benthic organisms.	PD	CPM	VI	WR	SEA, DSV
C5	The Dredging Contractor shall monitor the spoil disposal operation on a continual basis and will report any incidents that are likely to cause environmental harm to the disposal ground and surrounding areas.	PD	CPM	VI and CL	PD	SEA, DSV
C6	Turbid plumes generated during spoil disposal shall be monitored to ensure that they do not pose a significant risk to the environment.	PD	CPM	VI and CL	PD	SEA, DSV
C7	The <i>Environmental Management Plan (Marine Ecology) for Dredging and Dredged Material Disposal</i> will be implemented prior to, during and post dredging, drilling, blasting and spoil disposal operations.	PreC, PD, PstC	CMC	VI and CL	PD	SEA, DSV

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6.4 Corrective actions

- Revision of spoil disposal activities as required
- The Dredging Contractor shall immediately notify the CM and SEA of any incident that has the potential to decrease water quality within the dredge spoil disposal ground and nearby sensitive areas
- An incident/accident form shall be filled out if any non conformances are found and remedial actions are to be nominated to ensure compliance
- All non conformances shall be corrected as soon as possible and strategies implemented to reduce likelihood of the incident reoccurring
- In the event of an environmental incident, appropriate contingency and emergency response measures shall be implemented to ensure environmental harm from the event is minimised
- The CM is to close out all reported incidents

7. Community consultation management plan

7.1 Existing situation

Dredging and blasting operations associated with HPX will be undertaken within the limits of the Port of Hay Point, with the nearest communities situated at Half Tide, Salonika Beach and Louisa Creek.

Consultation with potentially affected residents is to occur prior to the commencement of and during dredging and blasting activities. The existing Hay Point Services' community consultation framework shall be used to provide access to information for the community and to maintain positive relations with residents.

While it is unlikely that dredging and blasting will have adverse impact on residential communities, mitigation measures have been developed to minimise the potential complaints from the community resulting from the dredging and blasting activities.

7.2 Objectives

The objectives of the Community Consultation Management Plan are to:

- Identify community issues and concerns in relation to dredging and blasting operations
- Manage and minimise environmental complaints from the community in relation to dredging and blasting activities
- Maintain a structured, open and accountable communication system with the community on all aspects of the Project
- Proactively work with the community to identify strategies that would minimise negative impacts as a result of dredging and blasting

7.3 Performance criteria

- A construction complaints register is to be established to document all complaints received
- All complaints to be investigated and corrective actions provided. Complaint records are properly signed off once they have been managed



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Table 7.1 Community consultation management measures

			Monitoring and Reporting Compliance		
Actions	Action Timing	Action Performed By	Activity	Activity Timing	Activity Performed by
D1 Various techniques shall be used to disseminate information to the community. These could be achieved via bulletin boards/public display boards, print media, etc.	PreC, PD and PstC	PM/PR	PD	MER	PR
D2 Methods of information collection such as informal interviews and community meetings, feedback forms and phone calls shall be implemented to assess public perception.	PreC, PD and PstC	PM/PR	PD	MER	PR
D3 Communities shall be given opportunities for feedback and evaluation via letter box drop or regular meetings.	PreC, PD and PstC	PM/PR	PD	MER	PR
D4 A community consultation committee shall be established, and roles and responsibilities identified.	PreC, PD and PstC	PM/PR	PD	MER	PR
D5 Regular consultation meetings shall be conducted to discuss any issues and concerns raised.	PreC, PD and PstC	PM/PR	PD	MER	PR
D6 The Blasting Contractor shall advise the CM of planned atypical noise and/or vibration events 72 hours prior to the event.	PD	CPM	CL	WR	PR
D7 Residents shall be advised of the proposed blasting programme at least 24 hours prior to blasting activities, and/or when there are planned changes.	Pre-blasting	CM/PR	CL	WR	PR
D8 Direct discussions with potentially affected residents are to occur prior to commencement of blasting operations.	Pre-blasting	CM/PR	CL	WR	PR

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			Monitoring and Reporting Compliance		
Actions	Action Timing	Action Performed By	Activity	Activity Timing	Activity Performed by
D9 All complaints shall be recorded and reported to the PR within 2 hours of receiving the complaint. PR shall report the complaint to ES EA within 1 hour of receiving the complaint. Action taken to resolve the issue shall be signed and recorded in the register before closure.	PD	PR	MER	Monthly	PR
D10 Where appropriate, undertake a dilapidation survey within the community and at the HPCT prior to the commencement of blasting and dredging activities.	PD	PR	MER	Monthly	PR

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7.4 Corrective actions

- Incident/accident forms to be filled out during audits if any non conformances are found and remedial actions shall be nominated to ensure compliance
- All non conformances shall be corrected as soon as possible and strategies implemented to reduce likelihood of incident occurring again
- Where appropriate, BMA Public Relations (PM) will liaise with the complainant to outline the measures undertaken to mitigate the impact(s)
- The Community Consultation Committee should regularly review the effectiveness of the programme and modify strategies, if necessary
- All complaints to be closed out by PR

8. Emergency management plan

8.1 Existing situation

The DBEMP addresses routine management of dredging, drilling and blasting activities from an environmental perspective, as well as detailing responses to general environmental incidents. The DBEMP will form the basis of the Emergency Management Plan for the establishment of the proposed Berth 3 pocket. This Emergency Management Plan will incorporate potential incidents that could occur during the dredging and blasting works, and also detail the standard procedure required to be followed by all parties present should such incidents occur.

While this plan outlines the management procedures to be adopted in the event of an environmental incident, the implementation of best management practices will ensure that the potential for an environmental incident to occur during the dredging operations will be prevented and minimised.

8.2 Objectives

The objectives of the Emergency Management Plan are to:

- Identify the relevant authorities to be contacted in the event of an emergency situation
- Identify appropriate actions to be undertaken in the event of an environmental incident

8.3 Performance criteria

- Emergency situations are responded in a timely manner
- Appropriate authorities are notified in the event of an emergency
- Environmental harm resulting from the emergency event is minimised



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Table 8.1 Emergency management measures

			Monitoring and Reporting Compliance		
Actions	Action Timing	Action Performed By	Activity	Activity Timing	Activity Performed by
E1 In the event of an emergency situation, the HPCTM, BMAPM, PM, CM, ES, CPM and Harbour Master will all be immediately notified.	WR	AS	VI	WR	SEA, DBS
E2 An appropriate response to the emergency incident will be developed based on the nature of the emergency situation and based on HPCT Emergency Response Procedures. A response plan shall be coordinated with relevant authorities.	WR	PM	VI	WR	SEA, DBS
E3 In the event of an environmental incident, an incident report and corrective action report shall be completed by the SEA and forwarded on to the ES and reported to agencies (GBRMPA and DoE).	WR	SEA	VI	WR	SEA, DBS
E4 In the event of an oil or chemical spill to the marine environment, the HPCTM, BMAPM, ES and CPM will be notified immediately. DoE will also be notified.	WR	AS	VI	WR	SEA, DBS
E5 In the event of an oil or chemical spill to the marine environment, the HPCTM, BMAPM, Regional Harbour Master, Maritime Safety Queensland (MSQ) and DoE are to be notified as soon as practicable, and the First-Strike Oil Spill Response Plan be implemented as required.	WR	ES	VI	WR	ES, SEA

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8.4 Corrective actions

- Appropriate response to the emergency situation will be formulated and implemented
- Incident/accident forms to be filled out during audits and remedial actions to be nominated through a Corrective Action Report (CAR) to ensure compliance
- All non conformances shall be corrected as soon as possible and strategies implemented to reduce likelihood of incident occurring again
- The HSE Manager to close out all reported incidents

References

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BMA

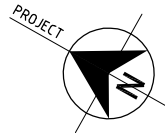


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Appendix A

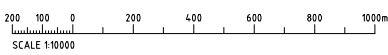
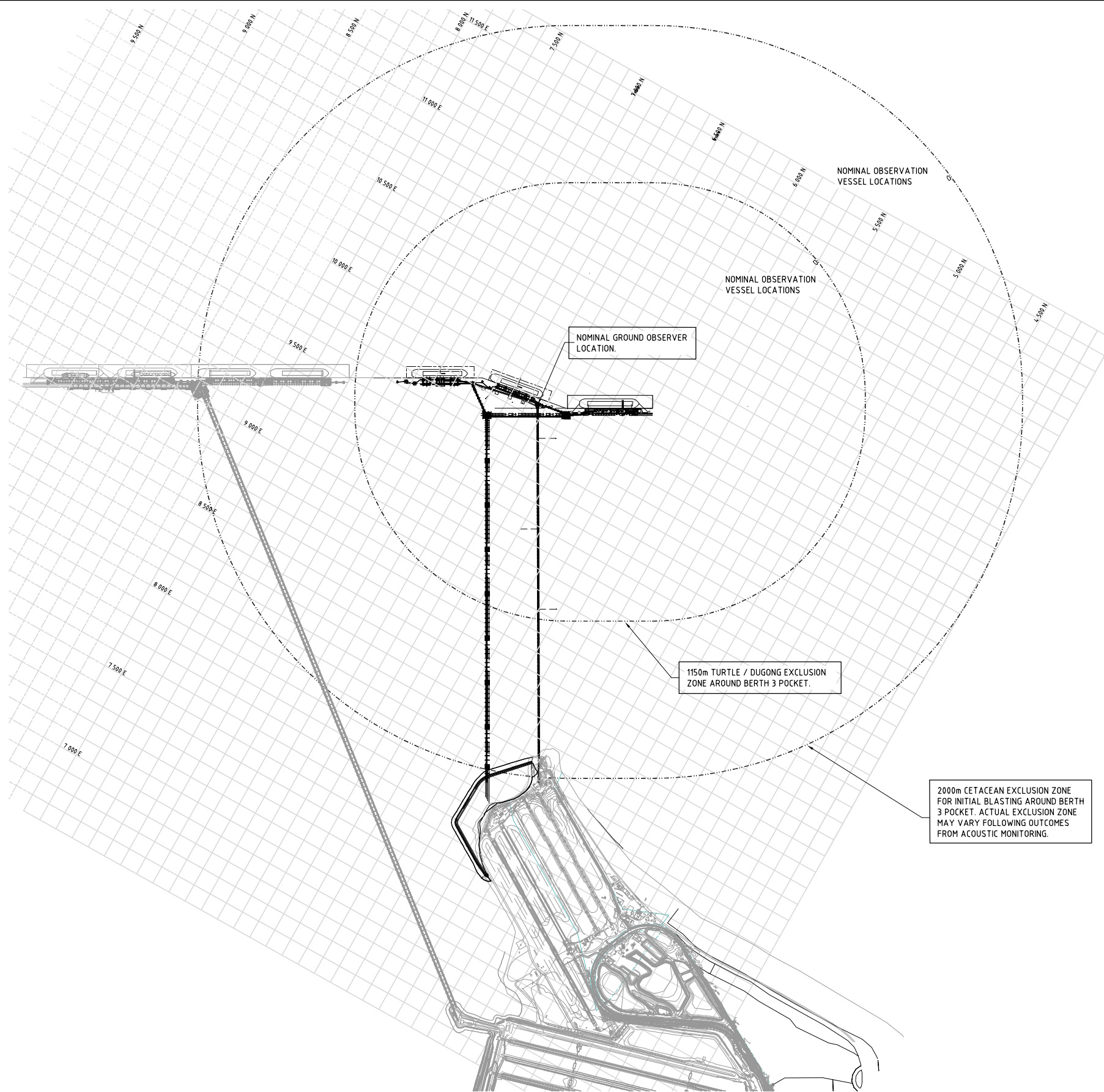
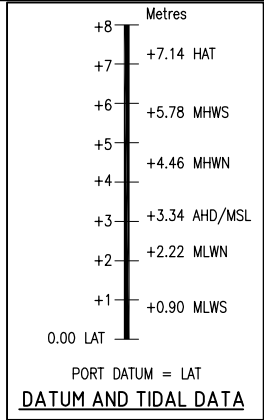
Drawing H330-0300-W-0068 – Blasting Exclusion Zones

B1



NOTES:

- 1. PROJECT HORIZONTAL DATUM : HPS 2004.
- 2. PROJECT VERTICAL DATUM : AHD (DREDGING AND MARINE WORKS TO LAT)
ALL LEVELS SHOWN ARE BASED ON PSM 38627 - RL 14.713 AHD
RL 18.053 LAT



PLAN
1:10000

CLIENT APPROVAL		
Initials	Signed	Date
BMA-HPX		
BMA-HPS		

FOR CONSTRUCTION

Rev.	Date	Revision Details	By	Ver.	App.	Rev.	Date	Revision Details	By	Ver.	App.
1	05.03.10	EXCLUSION ZONE UPDATE	KPH	SJB	SJB						
0	18.11.09	FOR CONSTRUCTION	JAF	AON	SJB						

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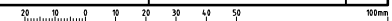
BMA
 BHP Billiton Mitsubishi Alliance
HAY POINT SERVICES
 A.B.N. 67 096 412 752
 M.S. 283, Mackay, QLD. 4740
 Tel. 0749 438 201 Fax: 0749 563 421

Project: **BMA HAY POINT SERVICES HAY POINT EXPANSION PHASE 3**
 Contract No: **25490-101-HC3-CM50-00001**

Drawn	Signed	Date
JAF	JAF	18.11.09
Designed	Signed	Date
SJB	SJB	18.11.09
Verified	Signed	Date
AON	AON	18.11.09
Approved	Signed	Date
SJB	SJB	18.11.09

Project No: **H330156**
 Drawing Title: **BERTH No. 3 BLASTING EXCLUSION ZONES**

Project No.	Scale	Drawing No.	Rev.
H330156	1:10000	H330-0300-W-0068	1



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