Coordinator-General's Report

on the

Environmental Impact Statement

for the proposed

Port of Hay Point Apron Areas and Departure Path Capital Dredging Project

UNDER PART (4) OF THE QUEENSLAND
STATE DEVELOPMENT AND PUBLIC WORKS ORGANISATION ACT 1971

October 2005

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1.0 Introduction

This Report has been prepared pursuant to s.35 of the *State Development and Public Works Organisation Act 1971* (Qld) (SDPWO Act) and provides an evaluation of the Environmental Impact Statement (EIS) process for the Port of Hay Point Apron Area and Departure Path Capital Dredging, herein referred to as the Departure Path Project (DPP). The EIS was conducted by the Ports Corporation of Queensland and prepared on its behalf by GHD Pty Ltd.

An Initial Advice Statement was lodged with the Department of State Development and Innovation (DSDI) on 9 August 2004 and the project was declared to be a "significant project for which an EIS is required", pursuant to s.26 of the SDPWO Act, on 16 September 2004.

The project was referred to the Commonwealth Government under the *Environment Protection and Biodiversity Conservation Act 1999* (Cwlth) (EPBC Act) on 10 September 2004 (Department of Environment and Heritage reference number EPBC 2004/1775). The proposal was determined to be a 'controlled action' under the EPBC Act on 7 October 2004.

The objective of this report is to summarise the key issues associated with the potential impacts of the DPP on the physical, social and economic environments at the local, regional, state and national levels. It is not intended to record all the matters which were identified and subsequently settled. Instead, it concentrates on the substantive issues identified during the EIS process.

This report represents the end of the State impact assessment process. Essentially, it is an evaluation of the project, based on information contained in the EIS, Supplementary EIS (SEIS), submissions made on the EIS and information and advice from Advisory Agencies and other parties, and states conditions under which the project may proceed.

2.0 Project Description

2.1 The Proponent

The Proponent for the DPP is the Ports Corporation of Queensland (PCQ), a Government Owned Corporation and a Port Authority under the *Transport Infrastructure Act 1994*. PCQ is the Port Authority responsible for managing 13 ports throughout Queensland, including the Port of Hay Point which lies within the Shire of Sarina, approximately 40 kilometres south of Mackay.

2.2 The Project

The Proponent proposes to undertake capital dredging to increase the allowable draught of departing vessels. This will reduce short loading of ships and increase the coal export capacity of the Port.

The project involves dredging of apron areas and the departure path to a depth of -14.9 metres Lowest Astronomical Tide (LAT). The current depth is -13.1 metres LAT. The actual dredged depth will be slightly deeper at a peak depth of about -15.6 metres to provide for insurance depths at times between maintenance dredging and to allow for the imprecise nature of dredging.

The apron areas and departure path will be 500 metres wide near the wharf and for the first 500 metres and then taper to 300 metres wide over the next 3 kilometres. It will remain at 300 metres wide for the next 6.5 kilometres (see Fig 1, p 41). The total departure path length is about 9.5 kilometres. The width is measured at the base of the path so, with side slopes, would be slightly wider at the natural sea bed.

It is expected that 9 million cubic metres of dredged material from the capital works will require disposal together with up to 1 million cubic metres per annum from maintenance dredging over the following 5 years. Over a five year period, a total of approximately 14 million cubic metres of dredged material will require unconfined marine disposal within the Great Barrier Reef Marine Park.

The departure path remains within the port limits, but a large part of the project also lies in the Great Barrier Reef Marine Park due to an overlap of the two areas.

2.3 Project Rationale

The Port of Hay Point is vital infrastructure for coal mines in central Queensland. Currently large ships are departing the Port short-loaded due to draught depth restrictions. This has a negative impact on the efficiency of exports through the Port and increases the number of ship visits required to export the coal.

The increase in shipping draught gained by this project will have three major benefits. The extra 1.8 metre draught will reduce short loading by 1.7 million tonnes per annum at an estimated value of $100 million. Vessels are currently restricted from sailing by the tide. The increased draught will provide for earlier sailing times thus freeing terminals for the next ship and reducing demurrage. The increased capacity of the two terminals due to earlier sailing times is estimated at 1.8 million tonnes per annum. Terminal infrastructure of $30 million would be required to achieve this capacity. ‘Dead freight’, the lost opportunity to transport product due to short loading, is estimated to cost port users $55 million per annum. This would be saved by dredging the aprons and departure path as proposed in the DPP.

3.0 Impact Assessment Process

3.1 Significant Project Declaration & Controlled Action

An Initial Advice Statement was lodged with the Department of State Development and Innovation (DSDI) on 9 August 2004 and the project was declared to be a "significant project for which an EIS is required", pursuant to s.26 of the SDPWO Act, on 16 September 2004.

On 7 October 2004, the delegate of the Commonwealth Minister for the Environment and Heritage determined that the DPP constituted a controlled action pursuant to Section 75 of the EPBC Act. The Part 3, Division 1, controlling provisions were identified as being:

- sections 12 and 15A (World Heritage);
- sections 18 and 18A (Listed threatened species and communities);
- sections 20 and 20A (Listed migratory species); and,
- sections 23 and 24A (Marine environment).

On 12 October 2004, the delegate of the Commonwealth Minister for the Environment and Heritage determined that the Bilateral Agreement between the Australian Government and the Queensland Government was applicable and the SDPWO Act EIS process was the appropriate level of assessment.

The Proponent subsequently made application for permits under the *Great Barrier Reef Marine Park Act 1975* and the *Environment Protection (Sea Dumping) Act 1981* for related parts of the project. These matters will also be assessed under the SDPWO Act EIS.

3.2 Review and Refinement of the EIS Terms of Reference

An Initial Advice Statement was released for public information and Draft Terms of Reference (ToR) were advertised for public comment on 7 March 2005. Comments were accepted until close of business (cob) 8 April 2005. A final ToR was issued to the Proponent on 6 May 2005. Comments on the ToR were received from:

- Department of Emergency Services
- Department of Employment and Training
- Department of Main Roads
- Department of Natural Resources and Mines
- Department of the Premier and Cabinet
- Department of Primary Industries & Fisheries
- Environmental Protection Agency
- Queensland Transport
- Queensland Treasury
- Great Barrier Reef Marine Park Authority
- Mr C Cochran
- Mr P Dallas
- Mr R George
- Ms B Hobbs
- Mrs J Neilsen
- Mr B and Mrs M Piekart
- Mr D Wilson

3.3 Public Review of the EIS

The EIS was advertised on Saturday 30 July 2005 in The Australian, The Courier Mail, The Daily Mercury (Mackay) and the Pioneer News (Sarina) on Thursday 4 August, inviting submissions from the public until cob on Tuesday 30 August 2005. The two-volume print version of the EIS could be purchased for $50 and the CD-ROM edition for $6.00 from the Proponent.

The EIS was displayed at:

- State Library of Queensland, Info Zone, South Bank, Brisbane;
- Mackay City Library, Alfred Street, Mackay; and
- Sarina Shire Library, Broad Street, Sarina.

Volume 1 of the EIS was also available via the PCQ and GHD web sites.

The following Advisory Agencies were approached formally to conduct an evaluation of the EIS:

- Department of Aboriginal and Torres Strait Islander Policy
- Department of Communities
- Department of Emergency Services
- Department of Employment and Training
- Department of Local Government, Planning, Sport and Recreation
- Department of Main Roads
- Department of Natural Resources and Mines
- Department of Primary Industries and Fisheries
- Department of the Premier and Cabinet
- Department of Transport
- Environmental Protection Agency
- Queensland Treasury, Office of Government Owned Corporations
- Sarina Shire Council
- Great Barrier Reef Marine Park Authority

Following the 22 business-day public review of the EIS a total of 8 submissions were received all from Advisory Agencies as follows:

- Department of Aboriginal and Torres Strait Islander Policy
- Department of Emergency Services
- Department of Employment and Training
- Department of Main Roads
- Department of Natural Resources and Mines
- Department of Primary Industries and Fisheries
- Environmental Protection Agency
- Commonwealth Department of the Environment and Heritage (incl Great Barrier Reef Marine Park Authority)

No submissions were received from members of the public.

The substantive issues raised in submissions were as follows:

- Degree of impact on seagrass, coral and algae from the dredge plume;
- Seagrass, coral and algae impact mitigation;
- Impact on dugong and other marine life;
- Introduction and spread of marine species;
- Road infrastructure; and
- Cultural Heritage notification process.

Submissions were forwarded to the Proponent and following discussions with the Proponent's representatives and its technical consultants it was determined that preparation of a Supplementary EIS (SEIS) was necessary to address issues raised.

3.4 Review of Supplementary EIS

On the 12 September 2005, the SEIS was forwarded to Advisory Agencies. Comments were requested by 26 September 2005.

The following agencies advised that they were satisfied that all issues had now been addressed:

- Department of Aboriginal and Torres Strait Islander Policy;
- Department of Communities;
- Department of Emergency Services;
- Department of Natural Resources and Mines;
- Department of Transport; and,
- Great Barrier Reef Marine Park Authority.

The following agencies made comment or provided advice, which has been subsequently noted by the Proponent or included as conditions in this report:

- Department of Main Roads; and,
- Department of Primary Industries and Fisheries.

Final comments on the SEIS were not received from the following agencies:

- Department of the Premier and Cabinet;
- Department of Employment and Training;
- Department of Local Government, Planning, Sport and Recreation;
- Office of Government Owned Corporations; and
- Sarina Shire Council.

The Environmental Protection Agency (EPA) provided comments included in this report as:

- Appendix 2 – Conditions to which any development approvals for the project given under the *Integrated Planning Act 1997,* for which the EPA is Assessment Manager, should be subject.
- Appendix 4 – Advice in relation to requirements for subsequent development approval under the *Integrated Planning Act 1997* (IPA). This information can be requested by EPA when an application is made under IPA. EPA has only included it to properly inform the proponent. It does not need to be a Condition of this Report.

Substantive issues raised in submissions are discussed individually in the following section.

4.0 Evaluation of Environmental Effects

4.1 Introduction

The *SDPWO Act* defines 'environment' to include:

a) ecosystems and their constituent parts, including people and communities;
b) all natural and physical resources; and
c) the qualities and characteristics of locations, places and areas, however large or small, that contribute to their biological diversity and integrity, intrinsic or attributed scientific value or interest, amenity, harmony and sense of community; and
d) the social, economic, aesthetic and cultural conditions that affect, or are affected by, things mentioned in paragraphs (a) to (c).

'Environmental effects' means "the effects of development on the environment, whether beneficial or detrimental". These effects can be direct or indirect, of short, medium or long-term duration and cause local or regional impacts.

The following section outlines the major environmental effects identified during the EIS process, including those raised in the EIS, SEIS, in submissions on the EIS and in consultation with Advisory Agencies and other key stakeholders. I have provided comments on these matters and, where necessary, set conditions to mitigate adverse impacts.

This Report states conditions, collated in Appendix 1, which must attach to any Development Approval issued pursuant to IPA. The Environmental Protection Agency will be the Assessment Manager for development approval for the following:

- works within tidal waters pursuant to the *Coastal Protection and Management Act 1995*; and
- undertaking Environmentally Relevant Activities (ERA's) pursuant to the *Environmental Protection Act 1994*.

These approvals are obtained through the Integrated Development Assessment System (IDAS) in the *Integrated Planning Act 1997* (IPA).

4.2 Construction Impacts

EIS Findings and/or Key Points

Capital dredging of the Apron Areas and Departure Path is expected to be carried out throughout 2006. The Departure Path is 500 metres wide tapering to 300 metres wide and approximately 9.5 kilometres in length. About 9 million cubic metres of dredged material from the capital works will require disposal.

Conclusion

The principal impacts of this activity will be in the areas of disposal of dredge spoil, water quality management and marine fauna and flora. Construction of the DPP will require a development permit under the *Integrated Planning Act 1997* for the following assessable development for which the EPA is the administering authority:

- Material Change of Use, Environmentally Relevant Activity 71 Port – operating a port (other than an airport) under the *Transport Infrastructure Act 1994.*
- Operational work - tidal work and disposal of dredge spoil (Schedule 8, part 1, Table 4, Item 5 (a) and (b)(ii) of the *Integrated planning Act 1997.*

The EPA has nominated provisions that will apply to these aspects of development. These provisions, listed in Appendix 2, are designed to control and limit potential impacts on the environment from contaminants that may result from construction activities.

I therefore state the following condition:

Condition 1

The provisions in Appendix 2 of this Report, which relate to the following aspects of development, must be attached to the development approval granted by the Assessment Manager:

- **Environmentally Relevant Activity 71 Port – operating a port (other than an airport) under the *Transport Infrastructure Act 1994.***
- **Operational work - tidal work and disposal of dredge spoil (Schedule 8, part 1, Table 4, Item 5 (a) and (b)(ii) of the *Integrated Planning Act 1997.***

Pursuant to s.41 of the SDPWO Act, I nominate the Environmental Protection Agency as the concurrence agency for this condition.

The EPA has also provided a list of information which will be requested when an application for approval under the Integrated Development Assessment System of the *Integrated Planning Act 1997* against the provisions of the *Coastal Protection and Management Act 1995* for operational work – tidal work and disposal of dredge spoil. This is provided for information purposes only in Appendix 3.

4.3 Impacts on Marine Flora and Fauna

EIS Findings and/or Key Points

The Department of Primary Industries and Fisheries (DPIF) considers that the proposed dredging will impact on the protection and management of marine plants and fish habitats. Based on the hydrological modelling for the area, DPIF expects that the sediment plume will cause light attenuation over seagrass meadows, particularly to the dense meadow immediately north of the apron area, and that this is likely to lead to seagrass mortality. It is also expected that the sediment plume will reach the reefs surrounding Round Top and Flat Top islands and may result in stress and possible mortality of corals and other reef species. The spoil disposal will also result in significant changes to the benthos in this area.

DPIF accepts that it is not possible to accurately determine the severity of dredging impacts, particularly the indirect impacts that the project will have on the seagrass meadows surrounding the Port. This is because it is not possible at this time to predict the critical level of light attenuation caused by the sediment plume, or to differentiate dredging impacts from seasonal variation in seagrass abundance and distribution. However, DPIF is of the belief that there will be significant, temporary losses of seagrass as a result of the project and that these losses should be adequately mitigated as detailed under DPIF Policy (*Mitigation and compensation for works or activities causing marine fish habitat loss - FHMOP005*).

To address mitigation requirements for the loss of seagrasses DPIF, in cooperation with the Proponent, has developed a research and monitoring program to help quantify the impacts of the dredging operation on deep-water seagrasses and to improve existing knowledge of the dynamics of deepwater seagrasses and their importance to fisheries. This program will provide useful information to both the

PCQ for future dredging projects, port management, and to DPIF in managing these fish habitats and assessing impacts on seagrasses.

Conclusion

Dredging and consequent sediment plumes will impact on marine flora and fauna in the vicinity of the port. To quantify the impacts of dredging a research and monitoring program has been devised. A copy of the program; *Deepwater seagrass and algae dynamics in Hay Point; measuring viability and monitoring impacts of capital dredging,* is attached as Appendix 4.

The research and monitoring program is to be implemented by the Proponent, in consultation with DPIF.

I therefore state the following conditions:

Condition 2

A research and monitoring program to determine the impact and mitigation of impacts shall be undertaken in accordance with the program design – "*Deepwater seagrass and algae dynamics in Hay Point: measuring variability and monitoring impacts of capital dredging*". This research and monitoring program shall commence prior to the disturbance of any marine plants associated with the capital dredging of the apron areas and departure path for the Port of Hay Point.

Pursuant to s.41 of the SDPWO Act, I nominate the Department of Primary Industries and Fisheries as the concurrence agency for this condition.

Condition 3

Written notification of the date of commencement of dredging works must be provided to the District Officer, Queensland Boating and Fisheries Patrol (Fax No 4951 3004) and the Manager, Fisheries and Aquaculture Development, Department of Primary Industries and Fisheries (Fax No 4035 4664), at least 15 days prior to the commencement of dredging works.

Pursuant to s.41 of the SDPWO Act, I nominate the Department of Primary Industries and Fisheries as the concurrence agency for this condition.

Condition 4

A written report which details the completed development works must be provided to the District Officer, Queensland Boating and Fisheries Patrol (PO Box 668, Mackay Qld 4740), and the Manager, Fisheries and Aquaculture Development, Department of Primary Industries and Fisheries (PO Box 5396, Cairns Qld 4870) within 15 days of the completion of development works.

Pursuant to s.41 of the SDPWO Act, I nominate the Department of Primary Industries and Fisheries as the concurrence agency for this condition.

4.4 Risk of Introduction of Marine Pests

EIS Findings and/or Key Points

The EIS (s. 3.2.6) indicates that the port-wide survey conducted in 1998 by the Centre for Research on Introduced Marine Pests found no evidence of any targeted marine pest species. DPIF advises that it does not believe that it is safe to assume that the area to be dredged is free from introduced marine pests on the basis of the study undertaken and given the tonnage of shipping coming through the Port. In

addition, DPIF is not re-assured the hard substrate settling plate monitoring will detect marine pests or introduced species that may be present in the soft substrate to be dredged and relocated.

DPIF is concerned that more recent investigations have not been undertaken for soft bottom introduced marine pests in the areas to be dredged. If marine pest species are present, they could potentially be spread by dredging activities. A port-wide baseline survey is likely to be required in 2008. The protocols for that survey are yet to be finalised. With this in mind, DPIF has requested a survey targeting the apron area, the departure path and dredge spoil deposition site to be conducted in conjunction with this project. If spot incursions of marine pests were detected by such a survey, the proposed dredging operations could be utilised to dispose of the problem, possibly on land, thereby mitigating its spread. DPIF believes that a pre- and post-dredging marine pest survey of the apron and departure path areas and spoil deposition site could be integrated with the existing seagrass and benthos monitoring program.

Further to this, while current border control mechanisms may address concerns regarding the introduction of marine pests through ballast water, they may not adequately address concerns raised regarding potential introduction of marine pests translocated in other internal spoil pathways of the dredge vessel, principally the hopper. These areas would not be subject to analysis under the national ballast water management system, but could carry marine pests from the port of origin into Australian waters.

Conclusion

There is a risk that marine pest species may be introduced to the dredged area from an overseas dredge. There is also a risk that pest species may be spread to the spoil area in dredged material.

The Proponent must develop a strategy to minimise this risk in consultation with the Department of Primary Industries and Fisheries.

I therefore state the following condition:

Condition 5

A strategy to reduce the risk of introduction and spread of marine pest species must be developed by the Ports Corporation of Queensland in consultation with the Department of Primary Industries and Fisheries. The strategy must include:

(a) protocols to minimise the risk of introduction of marine pests from the spoil pathways and hopper of the dredge, and

(b) pre- and post-dredging sampling surveys for known introduced marine pests within the apron area, departure path and spoil disposal site according to minimum standards agreed between DPIF and PCQ and achievable within the projected timeframes of the project.

5.0 Environmental Management Plan

5.1 Introduction

PCQ is responsible for environmental management of the Port of Hay Point. The EIS indicates that The Proponent targets the achievement of high environmental standards and strives to ensure that activities within the Port are ecologically sustainable, providing minimal impact on water quality and sensitive marine flora and fauna communities. PCQ has an Environmental Management System in place which is externally certified to AS/NZS ISO 14001-2004.

It will be necessary to implement management measures to control and minimise potential impacts associated with the proposed capital and maintenance dredging and disposal of dredge spoil. The objective of these management measures will be to ensure that the dredging and disposal of dredged material can be carried out without significant adverse long-term impact on the environment in the vicinity of the proposed dredged area and spoil ground. Some short-term impacts such as elevated turbidity will occur but will be minimised through the proposed management measures.

The management measures and site monitoring required to ensure that potential impacts are identified and minimised are presented in the draft Environmental Management Plan prepared by the Proponent (see EIS s. 5).

5.2 Aim of the EMP

The aim of an EMP is to detail the actions and procedures to be carried out during the project in order to mitigate adverse impacts and enhance beneficial environmental impacts. It addresses the proposed mitigation measures, records performance objectives and establishes the framework to ensure they are implemented during the project. It will also serve as the benchmark for measuring the effectiveness of environmental protection and management, and makes provision, as appropriate, for unforseen events by outlining corrective actions which may be implemented in these situations.

5.3 Format of the EMP

The draft EMP is structured as follows for each environmental element:

- Element – the environmental aspect of construction or operation requiring management consideration
- Policy – the guiding operational policy that applies to the element
- Policy implementation – the mechanisms and actions through which the policy will be achieved
- Performance requirements – the criteria by which the success of the implementation of the policy will be determined.
- Monitoring and reporting – the process of measuring actual performance, or how well the policy has been achieved, including the format, timing and responsibility for reporting and auditing of the monitoring results.
- Corrective action – the action to be implemented and by whom in the case where a performance requirement is not met.

5.4 Environmental Elements

The following table summarises the elements of the project for which environmental management strategies have been prepared.

Project Element	Construction	Operation
Water Quality	**X**	**X**
Sediment Mobilisation from Dredge Head	**X**	
Sediment Mobilisation from Spoil Disposal	**X**	**X**
Marina Flora and Fauna	**X**	**X**
Storage and Handling of Hazardous Substances	**X**	
Waste Management	**X**	
Noise and Hours of Operation	**X**	
Air Quality	**X**	
Environmental Emergency Procedures	**X**	
Site Access	**X**	
Management and Staff Responsibilities	**X**	
Staff Environmental Training	**X**	

Conclusion

Implementation of the EMP will ensure the effective management of environmental impacts of the DPP. Furthermore the monitoring measures proposed within the document will gauge the success of that effectiveness and through reporting arrangements lead, where necessary, to appropriate corrective action being taken.

I therefore state the following condition:

Condition 6

An Environmental Management Plan (EMP) must be prepared to address the construction and operational phases of the project. The EMP must be submitted to the EPA for comment at least 28 days prior to the commencement of construction activities. Any comments from the EPA received within 21 days of the EMP being received, should be considered when implementing the EMP. The EMP must be generally consistent with the findings and conditions of the Coordinator-General's Report and the findings of the EIS and SEIS. Construction work must not commence until the EPA has given written acceptance of those elements of the EMP relevant to the conditions set out in Appendix 2 of this Report.

Pursuant to s.41 of the SDPWO Act, I nominate the Environmental Protection Agency as the concurrence agency for this condition.

6 Assessment of Relevant Impacts of the Project on Matters of National Environmental Significance

6.1 Introduction

This chapter addresses those sections of Part 5 of the *State Development and Public Works Organisation Regulation 1999* ("SDPWO Regulation 1999") which deal with the requirements of the Coordinator-General's report for proposals:

- declared as a significant project for which an EIS is required; and
- for which the Commonwealth has accredited assessment of the relevant impacts pursuant to the Queensland *State Development and Public Works Organisation Act 1971*.

6.2 The Project

The Proponent proposes to undertake capital dredging to increase the allowable draught of departing vessels from the Port of Hay Point. This will reduce short loading of ships and increase the coal export capacity of the Port.

The project involves dredging of apron areas and departure path to a depth of -14.9 metres Lowest Astronomical Tide (LAT). The current depth is -13.1 metres LAT. The actual dredged depth will be slightly deeper at a peak depth of about -15.6 metres to provide for insurance depths at times between dredging and to allow for the imprecise nature of dredging.

The apron areas and departure path will be 500 metres wide near the wharf and for the first 500 metres and then taper to 300 metres wide over the next 3 kilometres. It will remain at 300 metres wide for the next 6.5 kilometres. The total departure path length is expected to be about 9.5 kilometres (see Fig 1, p 41). The width is measured at the base of the path so, with side slopes, would be slightly wider at the natural sea bed.

Approximately 9 million cubic metres of dredged material from the capital works will require disposal together with up to 1 million cubic metres per annum from maintenance dredging. The annual siltation rate is expected to be relatively minor and as a consequence maintenance dredging can be scheduled at fairly infrequent intervals. Over a five year period, a total of about 14 million cubic metres of dredged material will require disposal within the Great Barrier Reef Marine Park.

The entire departure path lies within port limits and the Great Barrier Reef World Heritage Area, but a large part of the project also lies in the Great Barrier Reef Marine Park due to an overlap of the two areas.

The capital dredging will be undertaken throughout 2006.

6.3 Controlling Provisions for the Project

On 7 October 2004, and pursuant to Section 75 of the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC), the Commonwealth Minister for the Environment and Heritage determined that the DIP constituted a controlled action (EPBC reference no. 2004/1775).

The Part 3, Division 1, controlling provisions were identified as being:

- sections 12 and 15A (World Heritage);

- sections 18 and 18A (Listed threatened species and communities);
- sections 20 and 20A (Listed migratory species); and,
- sections 23 and 24A (Marine environment).

6.4 Summary of the Project's Relevant Impacts

For the purpose of assessing the impacts of the project on matters of national environmental significance, this section describes the relevant impacts as defined by s. 82 of the EPBC Act. In the case of the Port of Hay Point Capital Dredging project, herein referred to as DPP, the relevant impacts are those that the project has, will have or is likely to have on the controlling provisions. The relevant impacts of the project are summarised below for each of the controlling provisions.

6.4.1 World Heritage Values

The DPP lies wholly within the Great Barrier Reef World Heritage Area (GBRWHA). The World Heritage values for the GBRWHA are listed in the table below. The DPP has the potential to impact on these values as shown in the right-hand column of the table.

Great Barrier Reef World Heritage Values	Potential Impacts
Criterion (i) an outstanding example representing a major stage of the earth's evolutionary history. The Great Barrier Reef is by far the largest single collection of coral reefs in the world. The World Heritage values of the property include: • 2,904 coral reefs covering approximately 20,055km^2; • 300 coral cays and 600 continental islands: • reef morphologies reflecting historical and on-going geomorphic and oceanographic processes: • processes of geological evolution linking islands, cays, reefs and changing sea levels, together with sand barriers, deltaic and associated sand dunes; • record of sea level changes and the complete history of the reef's evolution are recorded in the reef structure; • record of climate history, environmental conditions and processes extending back over several hundred years within old massive corals; • formations such as serpentine rocks of South Percy Island, intact and active dune systems, undisturbed tidal sediments and "blue holes"; • record of sea level changes reflected in distribution of continental island flora and fauna.	The proposed development is unlikely to cause the loss of any of the natural or cultural values associated with the World Heritage listing.
Criterion (ii) an outstanding example representing significant ongoing geological processes, biological evolution and man's interaction with his natural environment. Biologically the Great Barrier Reef supports the most diverse ecosystem known to man and its enormous diversity is thought to reflect the maturity of an ecosystem, which has evolved over millions of years on the northeast Continental Shelf of Australia. The World Heritage values include: • the heterogeneity and interconnectivity of the reef assemblage;	The proposed development is unlikely to cause the loss of any of the natural or cultural values associated with the World Heritage listing. Sediment tests show that the dredged material is suitable for unconfined ocean disposal.

• size and morphological diversity (elevation ranging from the sea bed to 1,142m at Mt. Bowen and a large cross-shelf extent encompass the fullest possible representation of marine environmental processes);
• on going processes of accretion and erosion of coral reefs, sand banks and coral cays, erosion and deposition processes along the coastline, river deltas and estuaries and continental islands;
• extensive *Halimeda* beds representing active calcification and sediment accretion for over 10,000 years;
• evidence of the dispersion and evolution of hard corals and associated flora and fauna from the "Indo-West Pacific centre of diversity" along the north-south extent of the reef;
• inter-connections with the Wet Tropics via the coastal interface and Lord Howe Island via the East Australia current;
• indigenous temperate species derived from tropical species;
• living coral colonies (including some of the world's oldest);
• inshore coral communities of southern reefs;
• five floristic regions identified for continental islands and two for coral cays;
• the diversity of flora and fauna, including:
  • Macroalgae (estimated 400-500 species);
  • Porifera (estimated 1,500 species, some endemic, mostly undescribed);
  • Cnidaria: Corals – part of the global centre of coral diversity and including:
  • hexacorals (70 genera and 350 species, including 10 endemic species);
  • octocorals (80 genera, number of species not yet estimated);
  • Tunicata: Ascidians (at least 330 species);
  • Bryozoa (an estimated 300-500 species, many undescribed);
  • Crustacea (at least 1,330 species from 3 subclasses);
  • Worms:
  • Polychaetes (estimated 500 species);
  • Platyhelminthes: include free-living Tubelleria (number of species not yet estimated), polyclad Tubelleria (up to 300 species) and parasitic helminthes (estimated 1,000's of species, most undescribed);
  • Phytoplankton (a diverse group existing in two broad communities);
  • Mollusca (between 5,000-8,000 species);
  • Echinodermata (estimated 800 extant species, including many rare taxa and type specimens);
  • fishes (between 1,200 and 2,000 species from 130 families, with high species diversity and heterogeneity; includes the Whale Shark *Rhynchodon typus*);
  • seabirds (between 1.4 and 1.7 million seabirds breeding on islands);
  • marine reptiles (including 6 sea turtle species, 17 sea snake species, and 1 species of crocodile);
  • marine mammals (including 1 species of dugong (*Dugong dugon*), and 26 species of whales and dolphins);
	1565ha of seagrass (28% of seagrass recorded within the port limits) will be removed. However 70% of the area is of low density (<5% cover). The species are widely represented in the surrounding area.
	
	2365ha of algae will be physically disturbed. However 1% of this area has a coverage >5%. The species are widely represented in the surrounding area.
	
	Coral is limited to communities around Victor Islet and Round Top and Flat Top Islands. It is not considered to be regionally significant within the GBRWHA. The communities indicate a tolerance to natural sedimentation from storm events occurring in the area. Strong currents and tides around the islands act to remove sediment deposition naturally.
	
	Benthic communities in existing spoil areas show a long-term ability for recolonisation of disturbed areas. It is expected that this will occur within the proposed spoil area.
	
	The potential effects of bathymetry changes on hydrodynamics will not significantly impact on current magnitudes and directions.
	
	It is not considered that there will be a significant impact on turtles, dolphins, whales or dugongs in the study area.

• terrestrial flora: see "Habitats: Islands" and; • terrestrial fauna, including: ▪ invertebrates (pseudoscorpions, mites, ticks, spiders, centipedes, isopods, phalangids, millipedes, collembolans and 109 families of insects from 20 orders, and large over-wintering aggregations of butterflies); and ▪ vertebrates (including seabirds (see above), reptiles: crocodiles and turtles, 9 snakes and 31 lizards, mammals); • the integrity of the inter-connections between reef and island networks in terms of dispersion, recruitment, and the subsequent gene flow of many taxa; • processes of dispersal, colonisation and establishment of plant communities within the context of island biogeography (e.g. dispersal of seeds by air, sea and vectors such as birds are examples of dispersion, colonisation and succession); • the isolation of certain island populations (e.g. recent speciation evident in two subspecies of the butterfly *Tirumala hamata* and the evolution of distinct races of the bird *Zosterops spp);* • remnant vegetation types (hoop pines) and relic species (sponges) on islands. • evidence of morphological and genetic changes in mangrove and seagrass flora across regional scales; and • feeding and/or breeding grounds for international migratory seabirds, cetaceans and sea turtles.	Following development of a Cultural Heritage Management Plan, the proposed development is not expected to interfere with cultural heritage issues.

Criterion (iii) contain unique, rare and superlative natural phenomena, formations and features and areas of exceptional natural beauty. The Great Barrier Reef provides some of the most spectacular scenery on earth and is of exceptional natural beauty. The World Heritage values include: • the vast extent of the reef and island systems which produces an unparalleled aerial vista; • islands ranging from towering forested continental islands complete with freshwater streams, to small coral cays with rainforest and unvegetated sand cays; • coastal and adjacent islands with mangrove systems of exceptional beauty; • the rich variety of landscapes and seascapes including rugged mountains with dense and diverse vegetation and adjacent fringing reefs; • the abundance and diversity of shape, size and colour of marine fauna and flora in the coral reefs; • spectacular breeding colonies of seabirds and great aggregations of over-wintering butterflies; and • migrating whales, dolphins, dugong, whale sharks, sea turtles, seabirds and concentrations of large fish.	The proposed development is unlikely to cause the loss of any of the natural or cultural values associated with the World Heritage listing. It is not considered that there will be a significant impact on turtles, dolphins, whales or dugongs in the study area.

Criterion (iv) provide habitats where populations of rare and endangered species of plants and animals still survive. The Great Barrier Reef contains many outstanding examples of important and significant natural habitats for *in situ* conservation of species of conservation significance, particularly resulting from the latitudinal and cross-shelf	The proposed development is unlikely to cause loss of any of the natural or cultural values associated with World Heritage listing.

completeness of the region.
The World Heritage values include:
• habitats for species of conservation significance within the 77 broadscale bioregional associations that have been identified for the property and which include:
  • over 2,900 coral reefs (covering 20,055km^2) which are structurally and ecologically complex;
  • large numbers of islands, including:
  • 600 continental islands supporting 2,195 plant species in 5 distinct floristic regions;
  • 300 coral cays and sand cays;
  • seabird and sea turtle rookeries, including breeding populations of green sea turtles and Hawksbill turtles; and
  • coral cays with 300-350 plant species in 2 distinct floristic regions;
  • seagrass beds (over 5,000km^2) comprising 15 species, 2 endemic;
  • mangroves (over 2,070km^2) including 37 species;
  • *Halimeda* banks in the northern region and the unique deep water bed in the central region; and
  • large areas of ecologically complex inter-reefal and lagoonal benthos; and
  • species of plants and animals of conservation significance.
	1565ha of seagrass (28% of seagrass recorded within the port limits) will be removed. However 70% of the area is of low density (<5% cover). The species are widely represented in the surrounding area.
	
	Coral, not considered to be regionally significant within the GBRWHA, is limited to communities around Victor Islet and Round Top and Flat Top Islands. These communities indicate a tolerance to natural sedimentation from storm events occurring in the area. Strong currents and tides around the islands act to remove sediment deposition naturally.

The following discussion identifies the aspects of the development which have the potential to impact on World Heritage values. It analyses the likelihood of those potential impacts. Any conditions addressing those potential impacts on matters of national environmental significance including any monitoring, enforcement or review procedures are included at the end of the discussion for each issue.

Sediment Quality

Sediment testing has been undertaken in accordance with the National Ocean Disposal Guidelines for Dredged Material and a sediment sampling and analysis plan approved by DEH (see EIS s. 3.5).

The results (EIS s. 4.6) indicate that the material to be dredged is clean sediment suitable for unconfined ocean disposal within the GBRWHA.

Benthic Communities

A description of the benthic communities located within and adjacent to the Port has been included in the EIS (s. 3.2) together with an analysis of the potential impacts of the project on these communities (s. 4.3). A brief summary of the impacts is as follows:

- seagrass and algae communities will be impacted through direct removal during dredging and spoil disposal, by smothering with silt from turbid plumes and the light attenuating effects of plumes.
- approximately 1565 hectares of seagrass will be physically disturbed. This is 28% of the total seagrass within the port limits. Of the area to be disturbed, approximately 70% is recorded as low density (<5%) cover. The seagrasses to be removed are a pioneering species which are widely represented in surrounding areas.

- approximately 2365 hectares of algae will be physically disturbed. Coverage is low, with only 1% of the area having a coverage of > 5%. The algal communities that will be disturbed represent a small proportion of the total habitat within the study area and do not contain unique species.
- coral communities are limited to areas outside of Port limits at Victor Islet, and Round Top and Flat Top Islands. These communities are not considered to be regionally significant within the GBRWHA. Plume modelling (s. 4.4) indicates that raised turbidity levels and minor sedimentation may be expected to occur on the fringing reefs of the abovementioned islands. These communities regularly experience naturally occurring raised turbidity levels and sedimentation for short periods. Strong currents and tidal movements act to remove sediment deposition. The fringing reef corals indicate a tolerance to sedimentation. Removal of a limited number of soft coral individuals will occur within the area to be dredged.
- the identification of low to medium density benthic communities in the existing spoil ground suggests the long-term ability for recolonisation of disturbed areas. It is expected that similar recolonisation will occur within the proposed spoil ground. A program to implement a mosaic pattern for the disposal of maintenance dredged material is being investigated. This should allow quicker recovery of benthic organisms.

Conclusion

If the project proceeds the loss of stated seagrass and algal communities through direct physical disturbance will be inevitable. However the commitments made in the EIS and the SEIS and the measures outlined in the Environmental Management Plan, together with Conditions 2, 3 and 4 of this report should ensure that the impact on marine fauna and flora outside of the direct area of disturbance will be minimised. Conditions 2 to 4 require a research and monitoring program to be undertaken in accordance with DPIF requirements which will determine the impact and mitigation of impacts.

Fringing coral reef communities are the primary sensitive receiving habitat potentially affected by the plume generated by dredging. The process of managing the impacts of the project on the coral communities is supported by a targeted monitoring regime. The proposed monitoring program incorporates baseline and routine coral condition surveys in combination with remotely assessed 24hr telemetry based monitoring to provide key physical features.

Hydrodynamic Processes

Following the proposed dredging there will be two major changes to the bathymetry in the vicinity of Hay Point; a depression formed by the apron area and departure path, and a spoil ground raised 820 mm.

The effects of these changes were assessed in the EIS (see s. 3.3 and 4.4). Additional modelling was also discussed in s. 2.2 of the SEIS. It was concluded that:

- the maximum change in current velocity will not exceed 0.06 m/s and maximum change in direction will not typically exceed 6 degrees with one or two maximums reaching 30 degrees.
- the changes in current magnitude are confined to the vicinity of the departure path and spoil ground.

Conclusion
The change in bathymetry as a result of the project does not appear to have any significant impact on the current magnitudes and directions at the Port.

Dredge Management

Minimisation of the time frame in which the dredging is undertaken is a key measure in managing the impact on habitat by elevated turbidity levels.

Highest peaks in sediment concentrations at Round Top Island occur on the spring ebb phase of the tide. Refuelling and supplying of the dredge outside the Port will be requested to coincide with the spring tide as far as practicable. Where this is not possible, the dredge will be requested to move to more remote parts of the departure path and the dredge spoil will be deposited to the east of the spoil ground during the spring tidal phase.

Where exceedances in turbidity levels are detected, and two dredges are in operation, the larger dredge may be able to be moved to a more remote part of the departure path.

Obviously operational limitations such as weather conditions, shipping movement restrictions associated with works in the apron area and the proportion of works to be undertaken in the apron areas compared with the departure path may affect the management measures proposed.

Conclusion
If the dredge management processes described above are able to be implemented it should be possible to restrict exceedances of turbidity levels impacting on nearby habitat.

Introduced Marine Pest Species

The EIS (s. 3.2.6) indicates that the port-wide survey conducted in 1998 by the Centre for Research on Introduced Marine Pests found no evidence of any targeted marine pest species. DPIF advises that it does not believe that it is safe to assume that the area to be dredged is free from introduced marine pests on the basis of the study undertaken and given the tonnage of shipping coming through the Port. In addition, DPIF is not re-assured the hard substrate settling plate monitoring will detect marine pests or introduced species that may be present in the soft substrate to be dredged and relocated.

If there are introduced organisms in the area to be dredged then the proposed dredging and spoil disposal will spread these organisms to another area. Further, DPIF considers that the SEIS does not satisfactorily address the risk posed by the overseas dredge in introducing soft substrate marine pests held in sediment in the hopper and other equipment from previous dredging operations.

Conclusion
There is a risk that marine pest species may be introduced to the dredged area from an overseas dredge. There is also a risk that pest species may be spread in dredged material to the spoil area.

The Proponent must develop a strategy to minimise this risk in consultation with the Department of Primary Industries and Fisheries. Condition 5 of this report reflects this requirement.

6.4.2 Listed Threatened Species and Communities

The EPBC Act lists all of Australia's protected species.

Schedule 3 of the *Nature Conservation Act 1992* and *Nature Conservation (Wildlife) Regulation 1994* lists all Queensland's vulnerable wildlife.

Turtles

Six species of turtle, the Flatback (*Natator depressus*), Green (*chelonian mydas*), Logerhead (*Caretta caretta*), Leatherback (*Dermochelys coriacea*), Hawksbill (*Ertmochelys imbricata*) and the Olive Ridley (*Lepidochelys olivacea*) have been recorded utilising the off-shore, inter-tidal, estuarine and shoreline habitats in the area. All of these species of turtle are listed as Endangered or Vulnerable under the EPBC Act and the *Nature Conservation Act*. Details of the nesting behaviour of these species near Hay Point are described in s. 3.2.8 of the EIS.

The EIS (s. 4.16.3) states that is not considered that the proposed dredging and spoil disposal will have a significant impact on the turtle populations in the study area given that:

- there is little evidence of a large resident population of turtles in the Hay Point area.
- a low number of nests have been recorded on local beaches.
- turtles have not been recorded as captured during previous dredging at the Port.
- there are a relatively low number of turtles recorded as captured by dredgers compared with other activities such as boat strikes and traditional hunting.
- dredgehead design, management and operational practices will be used to reduce the potential for turtle capture.

In addition the seagrass in the area is sparse. Its removal is not considered to represent a significant impact on the ability of the region to support the current turtle population.

Measures outlined in the EIS (s. 4.16.3) to protect turtles include:

- fitting turtle excluding devices to the dredgehead.
- reducing suction pump speed when the suction head is lifted from the seabed.
- commencing dredging as soon as possible after the cyclone season and using a large dredge so as to avoid as much of the turtle nesting season commencing in October as possible.
- using a spotter to identify marine fauna in the dredge path should works extend into the turtle nesting season commencing in October.
- completion of an Environmental Management Plan (s. 5.12.4) to manage the impacts on marine fauna (and flora).

Cetaceans

Seven species of dolphin and, five species of whales and dugong were identified as potentially occurring in the area. Four of these, the Humpback Whale (*Megapteranovaeangliae*), Blue Whale (*Balaenoptera musculus*), Irrawaddy Dolphin (*Orcaella brevirostris*) and Indopacific Humpbach Dolphin (*Sousa chinensis*) are listed as Endangered or Vulnerable under the EPBC Act or the *Nature Conservation Act*.

The primary impact on cetaceans is considered to be underwater noise and vibration generated by dredging (s.4.16.3). As cetaceans are highly mobile and will avoid the dredging, it is considered that such noise and vibration will not have a significant impact on them. Whales will locate further offshore. Therefore it is considered unlikely that dredging will impact on their migratory pattern.

An Environmental Management Plan (s. 5.12.4) will be completed and implemented to manage the impacts on marine fauna by moving the dredge to avoid contact. No conditions in addition to EMP requirements are required to ameliorate the impacts of the DPP.

Conclusion
On this basis it is considered that no impacts on listed threatened species are severe enough to warrant rejection of the project.

6.4.3 Listed Migratory Species

In addition to the impacts on the migratory species of turtle and cetacean mentioned above, impacts on the Dugong were also considered.

The EIS (.s 3.2.10 and 4.16.4) states that sightings of dugong in the port area are infrequent, indicating that the area is not a critical habitat for this species. Seagrass species within the port are a preferred type for dugong and may provide seasonal food for dugong migrating between Dugong Protection Areas to the north and south of the Port. However the seagrass beds are of an ephemeral nature and in quite deep water, so they are not considered to be of critical habitat or food source.

Due to the mobility of dugongs and their ability to avoid the area during dredging activities, it is considered that there is little risk of injury during dredging. No previous dredging campaigns at the port have reported dugong strikes.

An Environmental Management Plan (s. 5.12.4) will be completed and implemented to manage the impacts on marine fauna by moving to avoid contact. No conditions in addition to EMP requirements are required to ameliorate the impacts of the DPP.

Conclusion
It is considered that the extent of impacts on migratory species should not curtail the development of DPP.

6.4.4 Commonwealth Marine Environment

Some of the proposed dredging will take place in a Commonwealth marine area, i.e. those areas of the departure path beyond the 3 nautical mile limit of State waters. The issues here are the same as those for Queensland State waters and have been dealt with in the proceeding sections.

Conclusion
There appear to be no impacts involving Commonwealth marine areas which warrant rejection of the project.

6.5 Project Alternatives

The following Project Alternatives were investigated in the EIS (s. 1.7.3 to 1.7.5):
- alternative of taking no action;
- departure path options;
- spoil disposal options.

6.5.1 Alternative of Taking No Action

The alternative of not undertaking the project was investigated in the EIS (s. 1.7.3).

This alternative would see the State and national economy forgo the following:
- an estimated $55 million in dead freight savings;
- an opportunity for additional coal sales of $100 million;
- the opportunity to substantially improve the competitive position of the Port of Hay Point by reducing the overall coal transport costs;
- the opportunity to increase the coal terminal capacity at a time when there is a high demand for the additional capacity; and
- a reduction in demurrage.

6.5.2 Departure Path Options

An investigation of five Departure Path route options was undertaken based on engineering constraints, principally the volume required to be dredged, and an initial review of navigational constraints.

Two options were selected for simulation at the Australian Maritime College, Launceston in consultation with the Marine Safety Queensland, Regional Harbour Master and Port Pilots to determine their operational performance.

The simulation indicated that the current proposal provided the optimum manoeuvring path and least risk for ships departing the port. The simulation also supported the development of the 500 metre wide Apron Area and 500 metre, reducing to 300 metre, wide Departure Path (s. 1.7.4).

Assessment of seagrass, algae and coral distribution in the port area indicated that the selected route would have minimal impacts on marine environmental values.

6.5.3 Spoil Disposal Alternatives

Navigational restrictions dictating the depth of water preclude the existing spoil ground from being used. Investigations of suitable spoil disposal options were commissioned by the Proponent.

Conclusions from WBM's 2004 report for land-based disposal are summarised below:

- all terrestrial sites investigated are highly constrained due to; environmental values, topographical constraints, existing or proposed land uses and potential to impact on adjacent land uses.
- two sites were identified adjacent to the coal stockpiles. However both sites were too small to accommodate all dredged material and would require a secondary disposal strategy.
- engineering constraints associated with pumping dredge material long distances represent significant constraints.

Two options for ocean disposal were identified. Sites were located to the landward and seaward of the existing spoil ground. The seaward location was considered preferable due to: capacity (area and water depth), potential to impact on environmentally sensitive areas (being further seaward and less likely to impact upon Round Top and Flat Top Islands and surrounding seagrass and algal communities), and better navigational safety (greater footprint with shallower depth of spoil deposition).

Conclusion
No realistic alternatives for construction of the Departure Path and Spoil Disposal Grounds are apparent.

6.6 Conclusion

The likely impacts that the Port of Hay Point Apron Areas and Departure Path project will have on each of the controlling provisions have been studied. It is considered that the project can be completed in accordance with the commitments made in the EIS and SEIS and the conditions which have been imposed.

Further conditions may be imposed by the Commonwealth Government as part of its approvals process under the EPBC Act.

7.0 Statement Pursuant to s.39 of the SDPWO Act

Pursuant to s.35 of the SDPWO Act I have evaluated the environmental effects of the Project through the material presented in the EIS process and state conditions as set out in this report.

Pursuant to s.39(1)(a) of the SDPWO Act I state for the Assessment Manager the conditions, collated in *Appendix 1 and 2 pursuant to Section 39 of the SDPWO Act 1971*, that must attach to the development approval.

7.1 Evidence or Other Material Relied Upon

In forming my decision, I had regard to the following materials:

a) Port of Hay Point Apron Area and Departure Path Capital Dredging Project Environmental Impact Statement Volumes 1 and 2 – GHD, August 2005;
b) Port of Hay Point Apron Area and Departure Path Capital Dredging Project Supplementary Environmental Impact Statement – GHD, September 2005;
c) properly made submissions on the EIS and Supplementary EIS received from persons and Advisory Agencies; and
d) relevant Queensland and Commonwealth legislation.

7.2 Findings on Material Questions of Fact

Discussed in Section 4.0 - Evaluation of Environmental Effects, 5.0 - Environmental Management Plan, and 6 - Assessment of Relevant Impacts of the Project on Matters of National Environmental Significance.

7.3 Reasons for Conditions

The conditions contained in this report establish the environmental requirements to enable construction of the project. The conditions are designed to control and limit potential impacts that may result from construction activities. These conditions apply to the whole of the proposed dredged area and the spoil disposal.

These conditions ensure that the project is undertaken by the Proponent in the manner described in the EIS and that the Proponent fulfils the commitments made in the EIS and SEIS. They are consistent with information provided in the Port of Hay Point Apron Area and Departure Path Capital Dredging Project Environmental Impact Statement Volumes 1 and 2 - August 2005 and the Port of Hay Point Apron Area and Departure Path Capital Dredging Project Supplementary Environmental Impact Statement - September 2005.

8.0 Conclusion

The documentation provided during the EIS process is considered to have satisfied the requirements of the Queensland Government for impact assessment in accordance with the *State Development and Public Works Organisation Act 1971*. It has provided sufficient information to government and to the community to allow an informed evaluation of potential environmental impacts which could be attributed to the DPP. Careful management of the dredging activities should ensure that any potential environmental impacts will be reduced or avoided.

I consider that on balance there are appropriate environmental safeguards in place and substantial public benefits which would accrue as a result of construction of the DPP. Therefore, I recommend that approval of the project, as described in detail in the EIS and SEIS and summarised in Section 2 of this report, be granted and that the conditions, contained in *Appendix 1 – Conditions pursuant to Section 39 of the SDPWO Act 1971*, must be attached to the development approval by the Assessment Manager.

The Ports Corporation of Queensland and its agents, lessees, successors and assigns, as the case may be, must implement the conditions in this Report and all commitments presented in the EIS and SEIS and subsequent negotiations with Advisory Agencies. In the event of any inconsistencies between the EIS documents and the conditions in this Report, the conditions in this Report prevail.

Copies of this Report will be issued to the:

- Proponent, pursuant to s.35(5)(a) of *the State Development and Public Works Organisation Act 1971* (Qld) {This Report should then comprise part of the Proponent's application for development approval pursuant to the *Integrated Planning Act 1997* (Qld)}; and
- Assessment Manager pursuant to s.40 of *the State Development and Public Works Organisation Act 1971* (Qld);
- The Commonwealth Minister for the Environment and Heritage pursuant to Section 17(2) of the State Development and Public Works Organisation Regulation to enable a decision to be made about the controlled actions for this project pursuant to Section 133 of the *Environment Protection and Biodiversity Conservation Act 1999*.

A copy of this Report will also be made publicly available on the Department of State Development, Trade and Innovation's web site.

Signed Ross Rolfe

Ross Rolfe
Coordinator-General
Date 31 October 2005

APPENDIX 1

CONDITIONS PURSUANT TO SECTION 39 OF THE *STATE DEVELOPMENT AND PUBLIC WORKS ORGANISATION ACT 1971*.

Conditions provided by the Coordinator-General to be attached to the development approval granted by the Assessment Manager under the *Integrated Planning Act 1997.*

Condition 1

The provisions in Appendix 2 of this Report, which relate to the following aspects of development, must be attached to the development approval granted by the Assessment Manager:

- Environmentally Relevant Activity 71 Port – operating a port (other than an airport) under the *Transport Infrastructure Act 1994.*
- Operational work - tidal work and disposal of dredge spoil (Schedule 8, part 1, Table 4, Item 5 (a) and (b)(ii) of the *Integrated planning Act 1997.*

Pursuant to s.41 of the SDPWO Act, I nominate the Environmental Protection Agency as the concurrence agency for this condition.

Condition 2

A research and monitoring program to determine the impact and mitigation of impacts shall be undertaken in accordance with the program design – "*Deepwater seagrass and algae dynamics in Hay Point: measuring variability and monitoring impacts of capital dredging*". This research and monitoring program shall commence prior to the disturbance of any marine plants associated with the capital dredging of the apron areas and departure path for the Port of Hay Point.

Pursuant to s.41 of the SDPWO Act, I nominate the Department of Primary Industries and Fisheries as the concurrence agency for this condition.

Condition 3

Written notification of the date of commencement of dredging works must be provided to the District Officer, Queensland Boating and Fisheries Patrol (Fax No 4951 3004) and the Manager, Fisheries and Aquaculture Development, Department of Primary Industries and Fisheries (Fax No 4035 4664), at least 15 days prior to the commencement of dredging works.

Pursuant to s.41 of the SDPWO Act, I nominate the Department of Primary Industries and Fisheries as the concurrence agency for this condition.

Condition 4

A written report which details the completed development works must be provided to the District Officer, Queensland Boating and Fisheries Patrol (PO Box 668, Mackay Qld 4740), and the Manager, Fisheries and Aquaculture Development, Department of Primary Industries and Fisheries (PO Box 5396, Cairns Qld 4870) within 15 days of the completion of development works.

Pursuant to s.41 of the SDPWO Act, I nominate the Department of Primary Industries and Fisheries as the concurrence agency for this condition.

Condition 5

A strategy to reduce the risk of introduction and spread of marine pest species must be developed by the Ports Corporation of Queensland in consultation with the Department of Primary Industries and Fisheries. The strategy must include:

(a) protocols to minimise the risk of introduction of marine pests from the spoil pathways and hopper of the dredge, and

(b) pre- and post-dredging sampling surveys for known introduced marine pests within the apron area, departure path and spoil disposal site according to minimum standards agreed between DPI&F and PCQ, and achievable within the projected timeframes of the project.

Condition 6

An Environmental Management Plan (EMP) must be prepared to address the construction and operational phases of the project. The EMP must be submitted to the EPA for comment at least 28 days prior to the commencement of construction activities. Any comments from the EPA received within 21 days of the EMP being received, should be considered when implementing the EMP. The EMP must be generally consistent with the findings and conditions of the Coordinator-General's Report and the findings of the EIS and SEIS. Construction work must not commence until the EPA has given written acceptance of those elements of the EMP relevant to the conditions set out in Appendix 2 of this Report.

Pursuant to s.41 of the SDPWO Act, I nominate the Environmental Protection Agency as the concurrence agency for this condition.

APPENDIX 2

CONDITIONS TO WHICH ANY DEVELOPMENT APPROVALS GIVEN UNDER THE *INTEGRATED PLANNING Act 1997* FOR THE PROJECT FOR WHICH THE ENVIRONMENTAL PROTECTION AGENCY IS ASSESSMENT MANAGER, ARE TO BE SUBJECT.

Tidal work and disposal of dredge spoil (Schedule 8, Part 1, Table 4, Item 5(a) and Item 5(b)(ii) of the *Integrated Planning Act 1997*).

General

A1. The administering authority must be advised in writing of the date of commencement of capital dredging, at least ten days prior to that date.

A2. All reasonable and practicable measures must be taken to prevent environmental harm being caused, and to minimise environmental harm where impact on the marine environment is unavoidable.

Environmental Management Plan

A3. Prior to the commencement of works, the permit holder must prepare, or have prepared, an Environmental Management Plan and submit this plan to the administering authority.

A4. The permit holder must not carry out any of the works permitted herein unless the administering authority has advised the permit holder in writing that the relevant components of the Environmental Management Plan have been approved.

A5. The permit holder must provide any amendments to the Environmental Management Plan to the administering authority at least 28 days prior to the implementation of the proposed amendments, except where amendments must be implemented to prevent environmental harm or to ensure compliance with this development approval.

A6. If the administering authority provides the permit holder with any comment on the proposed amendments (referenced in condition A5) within 21 days of receiving the document, the permit holder must have due regard to those comments when implementing the proposed amendments.

A7. The permit holder, employees, officers, subcontractors and agents must comply with and ensure that all activities undertaken in connection with this development approval are undertaken in accordance with the development approval, and the Environmental Management Plan as approved by the administering authority from time to time.

Construction of the departure path and apron

A8. The removal of material from the departure path and apron is to be confined within the boundaries as detailed on Figure ES1 dated 27 April 2005 and Figure 2-1 dated 6 June 2005 (Port of Hay Point Apron Area and Departure Path Capital Dredging Draft Environmental Impact Statement, August 2005).

A9. The maximum depth of the departure path and apron is to be limited to 15.6 metres below Lowest Astronomical Tide, including over-dredging.

A10. If material has been removed from outside of the boundaries specified, or if the batters are steeper than those designated, those areas may need to be repaired to the satisfaction of the administering authority.

A11. Capital dredging is to be carried out using a trailer suction hopper dredge only.

A12. No blasting is to be undertaken.

A13. No dredging is permitted for the period between November and March inclusive in order to minimise impacts on seagrass and coral communities. The period when dredging is permitted may be extended with the written agreement of the administering authority.

Dredge spoil disposal

A14. Dredge spoil is to be disposed of within the area marked as proposed spoil ground in Figure ES1 dated 27 April 2005 (Port of Hay Point Apron Area and Departure Path Capital Dredging Draft Environmental Impact Statement, August 2005).

A15. The level of dredge spoil within the spoil ground must not exceed a maximum height of 10 metres below Lowest Astronomical Tide.

A16. Any material that is deposited outside of the boundaries of the proposed spoil ground may be required to be removed to the satisfaction of the administering authority.

Protected species

A17. An effective turtle deflector device must be fitted to the dredge head. Evidence that this device has been installed and used on the dredge for the entire period of the dredging activity must be provided to the administering authority.

A18. Operating procedures that minimise the risk of turtle capture by the dredge head, and the risk from all activities of injury to marine species of conservation significance, must be developed prior to the commencement of dredging activities, and implemented, to the satisfaction of the administering authority.

A19. Dredging and spoil disposal activities must cease, or relocate to another site, if dugongs, turtles, or other marine species of conservation significance, are either likely to be struck or captured, or are observed within 150 metres of the activities being undertaken.

A20. The administering authority is to be immediately notified of any turtle captures by the dredge, or of injury to any marine species of conservation significance.

Water quality management

A21. Monitoring of coral communities for the effect of suspended sediment on coral health, must be undertaken at the locations and frequency specified in the Environmental Management Plan (referenced in Condition A3).

A22. Sediment plume validation monitoring must be undertaken over a range of sea state conditions during the first four (4) weeks of commencement of dredging activities in accordance with methodology defined in consultation with the administering authority.

A23. Dredge track records that are time stamped and indicate the draught of the dredge are to be retained.

A24. A report detailing the extent to which modelled data correlates with recorded data, and the implications of any significant variation for biodiversity values within areas affected by the sediment plume, must be submitted to the administering authority within 1 month of completion of the sediment plume validation monitoring.

A25. If the coral health impact limits specified in the Environmental Management Plan are exceeded, measures must be implemented to reduce the impact of the sediment plume on coral communities in accordance with corrective action specified in the Environmental Management Plan.

A26. If the turbidity and/or coral health impact limits specified in the Environmental Management Plan are exceeded, the administering authority must be advised, within 24 hours of the event, of the corrective action that has been or will be implemented.

Reporting

A27. A monthly monitoring report must be prepared and submitted to the administering authority throughout the period that the dredging and spoil disposal works are being undertaken. This report shall include, but not be limited to:

- results of the monitoring required by this development approval and the Environmental Management Plan;
- a daily summary of dredge movements and disposal activity (map based);
- an evaluation or explanation of the data from these monitoring programs;
- details of any turtle captures by the dredge and the species involved;
- details of any complaints received including investigations undertaken, conclusions formed, and action taken;
- a summary of significant equipment failures or events that have potential environmental management consequences;
- an outline of corrective actions that will or have been taken to minimise or reduce environmental harm; and
- the quantity (volume in cubic metres) and location of dredging material removed and disposed of.

A28. Within three (3) months of completion of both the capital dredging and the maintenance dredging and associated spoil disposal, submit a report from a Registered Professional Engineer of Queensland to the administering authority certifying that the works (including any other associated works) have been constructed in accordance with the approved drawings and these conditions.

Hydrographic survey requirements

A29. Prior to the commencement of the capital or maintenance dredging and associated spoil disposal, and within three (3) months of completion of these works, hydrographic surveys of the bed levels of the area dredged and spoil disposal site must be completed.

A30. The hydrographic surveys must be carried out in accordance with the following requirements:

- Sounding lines shall be spaced at not more than 20 metre centres along the entire survey area (or over a lesser area or density if supported by the administering authority);
- Soundings shall include all areas where dredged material was removed and deposited, and shall continue 100 metres beyond those areas;
- Soundings shall be taken at every change in grade so as to accurately define the profile of the bed along the line;
- Soundings shall be plotted on a plan to a suitable scale;
- The datum for levels shall be Port Datum (Lowest Astronomical Tide);
- The plans of the surveys shall clearly identify the location of the batters, departure path, apron, adjacent berths, and other features;
- The report shall include representative cross sections from the hydrographic survey, detailing the previous and current bed levels, and design depth; and
- The plans of the surveys and cross sections shall be forwarded in duplicate to the administering authority, within one month of completion of each survey.

Environmentally Relevant Activity 71 Port - operating a port (other than an airport) under the *Transport Infrastructure Act 1994.*

General

B1. The administering authority must be advised in writing of the date of commencement of dredging, at least ten days prior to that date.

B2. All reasonable and practicable measures must be taken to prevent environmental harm being caused, and to minimise environmental harm where impact on the marine environment is unavoidable.

B3. A competent person(s) must conduct any monitoring required by this approval.

B4. All instruments, equipment and measuring devices used for measuring or monitoring in accordance with any condition of this approval must be calibrated, and appropriately operated and maintained.

Environmental Management Plan

B5. Prior to the initial commencement of maintenance dredging, an Environmental Management Plan (current revision) must be submitted to the administering authority for review and finalised by the permit holder, having due regard to the comments provided by the administering authority.

B6. The Environmental Management Plan (current revision) must be implemented, except where the Environmental Management Plan is inconsistent with this development approval.

B7. The permit holder must provide any amendments to the Environmental Management Plan to the administering authority at least 28 days prior to the implementation of the proposed amendments, except where amendments must be implemented to prevent environmental harm or to ensure compliance with this development approval.

B8. If the administering authority provides the permit holder with any comment on the proposed amendments (referenced in condition B7) within 21 days of receiving the document, the permit holder must have due regard to those comments when implementing the proposed amendments.

Dredge spoil disposal

B9. Dredge spoil from maintenance dredging is to be disposed of within the boundaries detailed on Figure ES1 dated 27 April 2005 (Port of Hay Point Apron Area and Departure Path Capital Dredging Draft Environmental Impact Statement, August 2005), or alternatively used for beach nourishment or beneficial use on land. Spoil is to be deposited in a mosaic pattern within the spoil disposal site to minimise impact on the regeneration of benthic flora and fauna, in accordance with the Environmental Management Plan (referenced in condition B5).

B10. Prior to the commencement of maintenance dredging, a report shall be provided to the administering authority containing information on the rate of siltation within areas to be dredged, the quantity of material to be removed, and the extent of migration of dredge spoil within and outside of the spoil ground.

Noise

B11. Noise from activities must not cause an environmental nuisance at any noise affected premises.

B12. When requested by the administering authority, noise monitoring must be undertaken to investigate any complaint of noise nuisance, and the results notified within 14 days to the administering authority. Monitoring must include:

- $L_{A10, adj, 10 mins}$
- $L_{A1, adj, 10 mins}$
- the level and frequency of occurrence of impulsive or tonal noise;
- atmospheric conditions including wind speed and direction;
- effects due to extraneous factors such as traffic noise; and
- location, date and time of recording.

B13. The method of measurement and reporting of noise levels must comply with the latest edition of the Environmental Protection Agency's Noise Measurement Manual.

Complaints

B14. All complaints received must be recorded including investigations undertaken, conclusions formed, and action taken. This information must be made available to the administering authority on request.

Records

B15. Record, compile and keep all monitoring results required by this development approval and present this information to the administering authority when requested, in a specified format.

APPENDIX 3

INFORMATION REQUIRED FOR ASSESSMENT FOR DEVELOPMENT APPROVAL

The following information is required for assessment of an application under the Integrated Development Assessment System of the *Integrated Planning Act 1997* (IP Act) against the provisions of the *Coastal Protection and Management Act 1995* for operational work - tidal work and disposal of dredge spoil.

NB: This information can be requested by the EPA when application is made for approval under the IP Act and therefore does not need to be a condition of approval in the Coordinator-General's Report but is included here to properly inform Ports Corporation Queensland.

Three (3) copies of all plans detailing the boundaries of the areas to be dredged, constructional drawings of the apron area and departure path, and the location of the spoil disposal area. Constructional drawings are required to be signed by a Registered Professional Engineer of Queensland. Details should include, but not be limited to, the following:

- the location of the works with respect to adjacent lease boundaries (where applicable);
- the location of the works defined by either metes and bounds or alternatively, the co-ordinate positions of the corners of the areas of the works, where a co-ordinate position for a defined real property or lease boundary point is also provided;
- the quantity of material to be dredged and disposed (cubic metres);
- the full dimensions of the plan view of the proposed works;
- the existing bed level by way of a hydrographic survey of the area to be dredged and the disposal site;
- details of dredging methodology and any proposed staging;
- the design criteria for the proposed works (eg. rate of dredging, solids/water content);
- typical cross sections of the completed works detailing:
    - the finished levels of the works and tolerance;
    - the levels of Lowest Astronomical Tide (LAT), Mean High Water Springs (MHWS), Highest Astronomical Tide (HAT);
    - the datum for the levels shown (relative to Lowest Astronomical Tide); and
    - design batter slopes.

APPENDIX 4

Deepwater seagrass and algae dynamics in Hay Point:

Measuring variability and monitoring impacts of capital dredging

Monitoring and research program devised by:

Marine Ecology Group
Northern Fisheries Centre
Department of Primary Industries and Fisheries
PO Box 5396 Cairns Qld 4870

Background

Significant areas of deepwater seagrass (>10m below MSL) were found within the Port of Hay Point in a benthic survey conducted in July 2004 (Rasheed *et al.* 2004). The majority of this seagrass was low density (<5% cover of the substratum) although there were patches of higher density seagrass within the survey area. There were also large areas of low density macrophytic algae communities within the port limits. Very little is known about the dynamics of these types of deepwater seagrass and algae communities or the role they play in primary and fisheries production. It is likely that they vary significantly from year to year and between seasons and are usually considered to be ephemeral in nature.

A proposal for a major expansion of the Port of Hay Point including capital dredging of an approach channel, expanded apron area and spoil disposal has the potential to significantly impact on substantial areas of these seagrass and algae communities. The capital dredging program is expected to take 6 months with an anticipated start date of May 2006. Three major types of impact on marine plants are likely:

1. Direct burial from the disposal of spoil
2. Prolonged shading from high turbidity plume associated with dredging
3. Direct removal from the dredged areas

From the mapping conducted in July 2004, the planned location of dredge spoil and preliminary hydrodynamic modelling of dredge plumes approximately 4,500ha of this low cover marine plant habitat could be lost as a result of the proposed works. From the limited information we currently have on these types of habitats in other locations, recovery of seagrass meadows could occur within three years of the disturbance.

This proposed research project aims to fill some of the gaps in existing knowledge on how these deepwater habitats change naturally through time, their roles in fisheries productivity and their resilience and capacity for recovery from disturbance associated with dredging. This project will provide both local information on the status of the Hay Point marine environment and information with a broad applicability to greatly aid the decision making process for similar developments that affect deepwater marine plant communities in the future.

Sampling Approach

Due to the limited knowledge of the dynamics of these types of marine plant communities two different approaches to the project are proposed. The decision on which approach to implement will depend on the status of the seagrass resources that is revealed in the first sampling event. The two approaches are:

1. **Assessing the impacts of dredging on deepwater marine plants and their recovery** If substantial areas of seagrass are still present in the sampling event prior to dredging a *Before/After/Control/Impact* (BACI) design to assess the various impacts associated with dredging on marine plants and their recovery would be implemented.
2. **Dynamics of deepwater marine plant communities**

   If the area of seagrass has declined substantially from that recorded in the July 2004 baseline prior to dredging a BACI design may not be possible. In this instance the focus of the program would be to investigate the dynamics of deepwater seagrass at Hay Point. This would require a different sampling design set up to detect recruitment and changes in seagrass abundance.

Sampling Design

Impacts of dredging and recovery

Sampling will be conducted to encompass the two major types of impact on marine plants associated with the proposed works. Changes associated with the impacts will be compared to two reference (control) sites (Figure 1). The first impact site will be to the north of the apron dredging zone and be in the area continually affected by the high turbidity section of the dredge plume (Figure 1). The second impact site will be in the proposed dredge spoil ground and examine the impact of burial by spoil. Two reference sites within the port that will be largely unaffected by dredging will act as controls to compare with changes at the impact sites and measure natural seasonality and variability.

At each of the four sites replicate video transects are to be sampled using the standard methodology developed by DPI&F for analysis of deepwater seagrass and benthic communities (see Rasheed *et al.* 2004; 2001; 2003; Coles *et al.* 1996; 2000; 2002). Transects are to be surveyed using a CCTV camera system, with real-time monitor towed from a research vessel. At each transect the real-time underwater camera system will be towed for 200 metres at drift speed (less than one knot). Footage will be observed on a TV monitor and recorded to digital tape. The camera is mounted on a sled that incorporates a sled net 600 mm width and 250 mm deep with a net of 10 mm-mesh aperture (Plate 1). Surface benthos including seagrass and macrophytic algae is captured in the net and used to confirm algal and seagrass habitat characteristics observed on the monitor. The technique ensures a large area of seafloor is integrated at each site so that patchily distributed marine plant habitats that typify the survey area can be effectively measured.

Data recorded at each site will include:

1. **Seagrass species composition -** Seagrass identifications in the field and from video according to Kuo and McComb (1989). Species composition measured from the sled net sample and from the video screen when species are distinct.
2. **Seagrass biomass** - Estimates of seagrass biomass from video images using a calibrated visual estimates technique adapted from Mellors (1991). This involves making random video grabs from the digital videotape with the constraint that visibility is acceptable for the selection. A visual estimate of above ground biomass is made by an observer viewing the screen. All observers are calibrated to a standard set of video images that have been harvested and measured.
3. **Algae** - Algae type and percent cover (identified according to Cribb 1996). Percent cover will be measured from the video grab. Algae collected in the sled net and grab will provide a taxa list.
4. **Coordination with Turbidity Monitoring Program** – To increase the effectiveness of the seagrass program it would be advantageous to have turbidity monitoring occur at the four seagrass impact and control sites. This would enable actual turbidity values to be directly linked to any changes to seagrasses observed in the program. We could supply the details of site locations and coordinate with the consultants undertaking the turbidity monitoring associated with the dredging program to ensure that maximum value in the program is achieved.

Sampling frequency

Frequency of sampling is designed to ensure the best chance of answering the research and monitoring questions (Table 1).

Two sampling events prior to dredging in December 2005 and March 2006 will establish a pre-dredge baseline for comparisons as well as sample in the ideal time to detect the presence of seasonal species (December).

One of the research questions is to determine the resilience of seagrasses to the prolonged shading associated with the dredge plume. Therefore monthly sampling will be conducted during the 6 month dredging campaign in order to measure any changes associated with the dredge plume and determine the length of time required by this type of impact for loss of seagrass to occur. Monthly sampling will continue for two months after the cessation of dredging to pick up any rapid recolonisation. After this, sampling will be conducted every 3 months to track the progress of recovery through to November 2007 (Table 1). This will allow 13 months of post impact recovery to be assessed.

Given the expectation that these types of habitats to vary substantially seasonally and between years, frequent sampling will enable the best opportunity to determine impact and recovery associated with the Hay Point dredging. Sampling frequency and the use of the two control (reference) sites will also allow a determination of the extent of natural variability for these habitats over the 2 year period for future considerations of likely impacts from developments.

Table 1 Proposed schedule of sampling dates

Dredging phase	Sampling month	Field duration
Pre-dredge	Dec-05*	5 nights
	Mar-06*	3 nights
Dredging	May-06	2 nights
	Jun-06*	2 nights
	Jul-06	2 nights
	Aug-06	2 nights
	Sep-06*	2 nights
	Oct-06	2 nights
Post Dredging	Nov-06	2 nights
	Dec-06*	2 nights
	Mar-07*	2 nights
	Jun-07*	2 nights
	Aug-07*	2 nights
	Nov-07	2 nights

* Beam trawling for invertebrate and fish communities

Dynamics of deepwater marine plant communities

Should initial sampling in December 2005 show that there was insufficient seagrass within the proposed impact and control zones for an effective BACI designed monitoring program a different sampling design will be implemented. Sites will be spread throughout the port area rather than focus on the impact zones, and measure recruitment and changes in seagrass and algae abundance through time. This design will provide information on the natural variability of these types of marine plant habitat and will also examine if there are any differences to recruitment between impacted and un-impacted areas of the port.

While location of sites will vary from the BACI design program the methodology for collecting information would remain the same. If this approach is utilised sampling would be conducted every 2 months from December 2005 to December 2007 rather than the staggered frequency that was designed to pick up the loss of seagrasses in the dredge plume zone for the BACI design

Sampling invertebrate and fish communities

While it is assumed that these seagrass meadows play a role as habitat for fisheries species little is known of their relative importance compared to higher density coastal meadows that have been well studied. In addition it is unclear if impacts from dredging that affect these seagrasses will also negatively impact on the associated fish and invertebrate communities. To determine the utilisation of these seagrass habitats by invertebrate and fish communities and the impact of dredging on invertebrate and fish communities, beam trawling on seagrass meadows will be conducted in conjunction with the seagrass sampling. In a similar manner to the seagrass sampling, fish and invertebrate sampling will be conducted using a BACI design with beam trawling conducted at both impact sites and a control site within the port. Sampling will be conducted at 3 monthly intervals (Table 1) to pick up any seasonal recruitment of invertebrates and fish. Sampling will occur prior to, during and after dredging (BACI) to determine any impact of the plume or spoil burial on invertebrates and fish and recovery when compared with the control site. Three monthly monitoring at the control site will also answer the broader question of the value of these types of seagrass meadows as a nursery ground for fisheries species.

Sampling will be conducted at the time of high water at night. A beam trawl (1.5 m wide, 0.5 m high with a 2.0 mm mesh) will be towed along a 100 m transect. Four replicate trawls will be conducted at each site as previous studies in north Queensland have shown that this is sufficient to adequately sample the representative fauna (Coles et al. 1993).

All Penaeidae (prawns) will be identified to species according to Dall (1957) and Grey *et al.* (1983) and carapace length measured. All fish will be identified as far as possible and standard length (tip of snout to last vertebra) measured.

Numbers of Brachyura (crabs), squid, sepiolids (cuttlefish) and miscellaneous crustaceans (shrimps, isopods, amphipods, and stomatopods) will be recorded for each trawl. Biomass (g dry weight) of fish, penaeids (all species pooled), crustaceans and miscellaneous from each trawl will also be determined by drying (60^{o}C, 48 hrs) and weighing samples.

References

Cribb AB. (1996). Seaweeds of Queensland - A naturalists guide. The Queensland Naturalists' Club: Handbook No. 2. 130pp.

Coles, R.G., Lee Long, W.J., Watson, R.A., and Derbyshire, K.J. (1993). Distribution of seagrasses, and their fish and penaeid prawn communities, in Cairns Harbour, a tropical estuary, northern Queensland, Australia. Australian Journal of Marine and Freshwater Research. 44, 193-210.

Coles, R.G., Lee Long, W.J., McKenzie, L.J., Short, M., Rasheed, M.A., Vidler, K.P. (1996). 'Distribution of deep-water seagrass habitats between Cape Weymouth and Cape Tribulation, north-eastern Queensland'. Queensland Department of Primary Industries Information Series QI96 (Queensland Fisheries Service, Department of Primary Industries: Cairns), 33 pp.

Coles, R.G., Lee Long, W.J., McKenzie, L.J., Roelofs, A.J. and De'ath G. (2000). Stratification of seagrasses in the Great Barrier Reef World Heritage Area, North-eastern Australia, and the implications for management. *Biol. Mar. Medit.* 7(2): 345-348

Coles, R.G., Lee Long, W.J., McKenzie, L.J., and Roder C.A.(Eds) (2002). Seagrass and Marine resources in the Dugong Protection Areas of Upstart Bay, Newry Region, Sand Bay, Ince Bay, Llewellyn Bay and Clairview Region, April/May 1999 and October 1999. Research Publication 72 Great Barrier Reef Marine Park Authority; Australia 131pp

Dall, W. (1957). A revision of the Australian species of the Penaeinae. (Crustacea: Decapoda: Penaeidae). Australian Journal of Marine and Freshwater Research. 8 136-239.

Grey, D.L., Dall, W., and Baker, A. (1983). A guide to the Australian Penaeid prawns. (Northern Territory Government Printing, Darwin) 140 pp.

Kuo, J. and McComb, A.J. (1989). Seagrass taxonomy, structure and development. In `Biology of Seagrasses: A treatise on the biology of seagrasses with special reference to the Australian region.' (Eds A.W.D. Larkum, A.J. McComb and S.A. Shepherd) Chpt.2. pp.6-73. (Elsevier, New York)

Mellors, J.E. (1991). An evaluation of a rapid visual technique for estimating seagrass biomass. *Aquatic Botany* 42, 67-73.

Rasheed, M.A., Roelofs, A.J., Thomas, R. and Coles, R.G. (2001). 'Port of Karumba Seagrass Monitoring - First 6 Years.' EcoPorts Monograph Series No. 20 (Ports Corporation of Queensland, Brisbane) 38pp.

Rasheed, M.A., Roder, C.A., and Thomas, R. (2001). Port of Mackay Seagrass, Macro-Algae and Macro-Invertebrate Communities. February 2001. CRC Reef Research Centre, Technical Report No. 43, CRC Reef Research Centre, Townsville, 38 pp

Rasheed, M.A., Thomas, R., Roelofs, A.J. Neil, K.M. and Kerville, S.P. (2003). Port Curtis and Rodds Bay seagrass and benthic macro-invertebrate community baseline survey, November/December 2002. DPI Information Series QI03058 (DPI, Cairns), 47 pp.

Rasheed, M.A., Thomas, R. and McKenna, S.A. (2004). Port of Hay Point seagrass, algae and benthic macro-invertebrate community survey July 2004. DPI&F Information Series QI04084 (DPI&F, Cairns), 29 pp.