Albany Port Expansion

Albany Port Authority

Report and recommendations of the Environmental Protection Authority

Environmental Protection Authority
Perth, Western Australia

Report 1346
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Environmental Impact Assessment Process Timelines

Date	Progress stages	Time (weeks)
10/10/05	**Level of Assessment set (date appeals process completed)**	
24/9/07	**Proponent Document Released for Public Comment**	**102**
19/11/07	**Public Comment Period Closed**	**8**
19/10/09	**Final Proponent response to the issues raised**	**100**
13/1/2010	**EPA report to the Minister for Environment**	**12**
18/1/2010	**Publication of EPA report**	**5 days**
1/2/2010	**Close of appeals period**	**2**

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Summary and recommendations

This report provides the Environmental Protection Authority's (EPA's) advice and recommendations to the Minister for Environment on the proposal to expand the Port of Albany by the Albany Port Authority (APA).

Section 44 of the *Environmental Protection Act 1986* (EP Act) requires the EPA to report to the Minister for Environment on the outcome of its assessment of a proposal. The report must set out:

- The key environmental factors identified in the course of the assessment; and
- The EPA's recommendations as to whether or not the proposal may be implemented, and, if the EPA recommends that implementation be allowed, the conditions and procedures to which implementation should be subject.

The EPA may include in the report any other advice and recommendations as it sees fit.

The EPA is also required to have regard for the principles set out in section 4A of the *Environmental Protection Act 1986.*

Key environmental factors

The EPA decided that the following key environmental factors relevant to the proposal required detailed evaluation in the report:

(a) Marine benthic communities – impacts on benthic primary producer communities from dredging and reclamation;

(b) Water and Sediment Quality – mobilisation of contaminated sediments;

(c) Water Quality (post-dredging) – impacts of widening and deepening the entrance channel on the circulation and flushing of Princess Royal Harbour (PRH);

(d) Marine fauna – impacts of dredging and construction on protected and migratory fauna;

(e) Sedimentation – stability of offshore disposal site; and

(f) Water quality – impacts of dredging on recreational and commercial activities.

There were a number of other factors which were relevant to the proposal, but the EPA is of the view that the information set out in Appendix 3 provides sufficient evaluation.

Conclusion

The EPA has considered the proposal by APA to expand the Port of Albany. The proposal would require capital dredging in Princess Royal Harbour (PRH) and King George Sound (KGS) for a shipping channel, berth pocket and turning basin. Dredged material would be used to reclaim land to construct an additional berth adjacent to the port, with excess dredge material placed in deep water within KGS. Up to 12 million cubic metres of material would be dredged over a seabed area of approximately 247 hectares (ha).

Marine benthic communities – The APA predicts that the proposal would result in the permanent loss of up to 0.78 and 16.6 ha of seagrass in PRH and KGS respectively. Up to a further 7.7 ha of seagrass in PRH and 11.3 ha in KGS would experience temporary loss impacts such as reductions in shoot density. There are no impacts predicted to seagrass communities in Oyster Harbour.

The EPA notes that on the basis of the APA's predicted impacts, seagrass losses are unlikely to compromise ecological integrity.

However, the EPA has considered the level of confidence and uncertainties in the APA's predictions. The uncertainties are largely a function of the range of assumptions in the APA's overall investigations but particularly in relation to the seagrass loss thresholds developed by the APA.

In view of the uncertainties, the EPA considers that the dredging and disposal would need to be comprehensively monitored and proactively managed to ensure that the APA's predictions are not exceeded and that the ecological values of PRH, KGS and Oyster Harbour are not compromised.

The EPA recommends conditions be imposed on APA to limit the extent of impacts to seagrass such that permanent seagrass loss does not exceed the APA's predictions. The EPA has also recommended conditions in relation to the implementation of monitoring and management measures for seagrass communities, outside the zone of loss, as described in section 3.1 of this report.

In view of the historical losses of seagrass in PRH, the APA has committed to rehabilitating an equivalent area of seagrass by utilising seagrass material from areas to be affected by the proposal. This commitment is supported by the EPA and reflected in its recommended conditions.

The APA has predicted that there will be no impacts to the reef communities at Gio Batta Patch and Michaelmas Reef as a result of the proposal. The EPA considers it would be appropriate for conditions to be imposed to demonstrate the reef communities are not being affected by the proposal by requiring surveys to be undertaken before and after the dredging program.

Water and sediment quality – Mercury has been identified in sediments along a portion of the proposed shipping channel. The APA's sediment investigations showed mercury above the National Ocean Guidelines for Dredged Material screening levels. Subsequent pore water testing shows that mercury was at, or above, the 99% species protection trigger level in a number of samples and suggests there is a risk it may be bioavailable during dredging. To reduce the risk of water column effects during dredging, APA has committed to selectively dredge this portion of the channel without overflow and to place the material in the centre of the offshore spoil ground for burial.

The EPA considers there is still a small risk that sediments containing mercury will enter the marine environment during dredging. A key issue is the proximity of the dredging to the mussel farms in the vicinity of Mistaken Island and the potential for mercury in sediments to enter the food chain. The EPA has recommended conditions

which require the APA to monitor water and sediment quality during and after the dredging program to ensure levels do not exceed concentrations that pose a risk to ecosystem integrity or human health. It is also recommended that monitoring of mussels occur during the dredging program to determine whether the environmental quality objective of maintenance of seafood for human consumption is being met at key sites such as the mussel farms in the vicinity of Mistaken Island.

Water quality (flushing of PRH) - The APA has adequately demonstrated through hydrodynamic modelling that the widening and deepening of the entrance channel between PRH and KGS for the berth pocket and turning basin will not adversely affect the circulation and flushing of PRH and therefore does not pose a risk for long term water quality of the harbour.

Stability of offshore spoil ground – The EPA notes that a number of submissions on the PER expressed a view that the APA should have selected the outer disposal site as part of the proposal to minimise environmental impacts on KGS. The EPA notes that the disposal of the sediments at a site outside KGS would reduce the risk to key environmental and social values of KGS due to its greater distance from sensitive receptors such as aquaculture leases, benthic primary producer communities and recreational diving sites.

Notwithstanding the view expressed by submitters that the outer spoil site should be chosen, the EPA considers that the APA has undertaken the necessary investigations to conclude that the proposed inner spoil ground is likely to be stable and not cause sedimentation of marine communities in KGS. Additionally, it is noted that at a finished depth of 35 metres, the proposed disposal ground would be one of the deepest sites in Western Australia and below the influence of orbital velocities from waves and swell.

As the dumping of material offshore requires a sea dumping permit under the Commonwealth *Environment Protection (Sea Dumping) Act 1981*, conditions will be imposed by the Department of Environment, Water, Heritage and the Arts (DEWHA) to require the APA to survey the pre and post-dumping bathymetry of the disposal ground to verify the stability of the disposal ground.

Water quality – impacts on recreational and commercial fishing activities – The EPA notes that the proposal would result in turbid plumes in a large portion of KGS and small portions of PRH and Oyster Harbour during the duration of the dredging campaign. Recreational activities in KGS such as swimming, diving and whale watching are likely to be affected by turbid plumes to varying degrees depending on the timing and location of the dredge, and the prevailing wind and current conditions. The EPA has recommended a condition to prevent dredging of the shipping channel in KGS from occurring during the summer season to minimise impacts on seagrass communities. This condition would also serve to minimise impacts on recreational activities in the Sound by avoiding dredging of the channel when it is expected that the recreational usage of KGS and PRH will be at its highest.

In relation to impacts on the commercial pilchard fishery, the EPA notes and supports the APA's commitment to work with the Department of Fisheries and fishing industry representatives to monitor the impacts of the proposal. There are still further

opportunities for the APA to work with the fishing industry to identify further measures to reduce impacts during the peak fishing season.

Having particular regard to the fact that water clarity and turbidity will return to background levels following the completion of the dredging program, it is the EPA's opinion that it is unlikely that the EPA's objectives for this factor will be compromised in the long term.

In view of the potential impacts on recreational users, commercial fisheries and aquaculture operations the EPA considers that a Community Stakeholder Reference Group be established by the APA to provide a mechanism for information exchange between the APA and users of KGS. Membership of the group should comprise of representatives from commercial dive operators, mussel farm operators, commercial fisheries, the City of Albany and the Department of Water. The EPA advises that this group will need to be established prior to the commencement of dredging and be regularly convened during the dredging program. Issues to consider within this group include the ways in which the dredge schedule, timing and management can be planned to avoid or minimise impacts to the recreational users of KGS, dive sites, aquaculture operations and the pilchard fishery's peak season.

The APA has developed a draft Dredging and Land Reclamation Management Plan (DLRMP) to manage the impacts of the proposal during dredging. This Plan serves to document and consolidate the APA's proposed monitoring, management measures and responses, and reporting protocols.

The EPA considers this plan will be an important vehicle for the APA to set out the manner in which it will achieve the requirements set out in the recommended conditions and most importantly, demonstrating that management responses would be undertaken before detrimental impacts occur. As a result of this assessment, the EPA considers that this plan will need to be modified and expanded to:

a) incorporate the advice of the EPA set out in this report;
b) be aligned with and incorporate the targets, measures and reporting protocols set out in the recommended conditions in Appendix 4; and
c) provides for the establishment of Community Stakeholder Reference Group as discussed in this report.

This plan will require further consultation with the Departments of Water, Health, Fisheries, and Environment and Conservation and will need to be finalised prior to the commencement of dredging.

The EPA has therefore concluded that it is unlikely that the EPA's objectives would be compromised provided there is satisfactory implementation by the proponent of the recommended conditions set out in Appendix 4 and summarised in Section 4.

Recommendations

The EPA submits the following recommendations to the Minister for Environment:

1. That the Minister notes that the proposal being assessed is for the expansion of the Port of Albany;

2. That the Minister considers the report on the key environmental factors and principles as set out in Section 3;
3. That the Minister notes that the EPA has concluded that it is unlikely that the EPA's objectives would be compromised, provided there is satisfactory implementation by the proponent of the recommended conditions set out in Appendix 4, and summarised in Section 4, including the proponent's commitments; and
4. That the Minister imposes the conditions and procedures recommended in Appendix 4 of this report.

Conditions

Having considered the information provided in this report, the EPA has developed a set of conditions that the EPA recommends be imposed if the proposal by APA to expand the Port of Albany is approved for implementation. These conditions are presented in Appendix 4. Matters addressed in the conditions include the following:

(a) Dredging – that no dredging of the shipping channel should occur between 1 November and 28 February in any year.

(b) Seagrass communities – conditions specifying the zone of total permanent loss of seagrass in KGS and PRH.

(c) Seagrass communities – conditions requiring ongoing monitoring of underwater light attenuation and seagrass health against seagrass health indicators. Management responses to be implemented in the event seagrass health criteria are exceeded.

(d) Seagrass communities – conditions in relation to the rehabilitation of at least 1 hectare of seagrass in PRH.

(e) Reef communities – conditions to ensure that the proposal does not impact on the reef communities at Gio Batta Patch and Michaelmas Reef in King George Sound.

(f) Water and sediment quality (mercury) – conditions requiring monitoring of mercury in water and sediments to ensure that environmental quality objective for maintenance of ecosystem integrity and the criteria established for this objective is met during the dredging program.

(g) Water and sediment quality (mercury) – conditions requiring that dredging of the portion of the proposed shipping channel with sediments containing mercury be undertaken without overflow.

(h) Mussel monitoring – conditions requiring the monitoring of mercury in mussels in the vicinity of Mistaken Island to ensure the EPA's environmental quality objective for the *maintenance of seafood safe for human consumption* is being met during and after the dredging program.

(i) Introduced Marine species – conditions requiring the inspection of any dredging equipment/plant for this proposal for marine pests and the implementation of a management strategy should pests be detected.

Contents

Page

Summary and recommendations i

1. Introduction and background 1

2. The proposal 2

3. Key environmental factors and principles 4

3.1 Marine benthic communities – impacts on benthic primary producer communities from dredging and reclamation 7

3.2 Water and Sediment Quality – mobilisation of contaminated sediments 19

3.3 Water Quality (post-dredging) – impacts of widening and deepening the entrance channel on the flushing of PRH 23

3.4 Marine fauna – impacts of dredging and construction on protected and migratory fauna 25

3.5 Sedimentation – stability of the offshore disposal site 27

3.6 Water quality – impacts of turbidity on recreational and commercial activities 30

3.7 Environmental principles 35

4. Conditions 35

4.1 Recommended conditions 35

5. Other Advice 36

6. Recommendations 37

Tables

1. Key characteristics of the final revised Albany Port Expansion Proposal compared to characteristics shown in the PER 3
2. Summary of APA's final predictions for permanent seagrass loss in hectares and as percent of seagrass originally present in each local assessment unit 12
3. Summary of APA's final predictions for temporary seagrass loss in hectares in each local assessment unit. 12

Figures

1. Location map showing Albany Port Expansion proposal, land reclamation at Semaphore Point, shipping channel, Albany Port Authority Area, Princess Royal Harbour and King George Sound
2. Layout of land reclamation area at Semaphore Point, berth pocket, turning basin and approach channel
3. Benthic primary producer communities in King George Sound and a portion of Princess Royal Harbour, and location of candidate areas for marine reserve

Appendices

1. List of submitters
2. References
3. Summary of identification of key environmental factors
4. Recommended Environmental Conditions and nominated Decision-Making Authorities
5. Summary of submissions and proponent’s response to submissions

1. Introduction and background

This report provides the advice and recommendations of the Environmental Protection Authority (EPA) to the Minister for Environment on the key environmental factors and principles for the proposal by Albany Port Authority (APA), to expand the Port of Albany to allow Cape size vessels to enter Princess Royal Harbour (PRH) and be fully loaded.

The proposal would require capital dredging within PRH and King George Sound (KGS). Dredged material will be used to reclaim land to construct an additional berth adjacent to the port, with excess dredge material placed in deep water within KGS.

This proposal is part of the Grange Resources Pty Ltd's Albany Iron Ore Project. Dredging and reclamation at the port is required to support Grange Resources' port loading facilities for the Southdown Magnetite proposal and the export of magnetite product.

The Southdown Magnetite proposal involves the construction and operation of an open cut magnetite mine located approximately 90 kilometres north-east of Albany, and pipelines for ore slurry transport and return water, connecting the mine site and new port loading facilities. The proposal has been assessed by the EPA at the level of Public Environmental Review (EPA Report 1291) and was approved by the Minister for Environment subject to environmental conditions on 24 November 2009 (Ministerial Statement 816).

Since the APA's proposal involves potential impacts on environmental issues which fall under both State and Commonwealth jurisdictions, the environmental impact assessment was carried out jointly by the Western Australian EPA and the Commonwealth's Department of Environment, Water, Heritage and the Arts (DEWHA). In addition, the offshore disposal component of the proposal requires a permit under the *Environment Protection (Sea Dumping) Act 1981* (Sea Dumping Act). The PER assessment has therefore been scoped so that it meets the information requirements of the WA *Environmental Protection Act 1986* (EP Act), the Commonwealth *Environmental Protection and Biodiversity Conservation Act 1999* (EPBC Act) and the Sea Dumping Act.

The Level of Assessment (LOA) was set by the EPA at Public Environmental Review (PER) under the EP Act, and at Public Environmental Report under the EPBC Act. An eight-week public review period was set and a common PER document (Ecologia, 2007) was produced for both environmental impact assessment processes. The public review period commenced on 24 September 2007, and closed on the 19 November 2007.

Further details of the proposal are presented in Section 2 of this report. Section 3 discusses the key environmental factors and principles for the proposal. The conditions to which the proposal should be subject, if the Minister determines that it may be implemented, are set out in Section 4. Section 5 provides Other Advice by the EPA and Section 6, the EPA's Recommendations.

Appendix 5 contains a summary of submissions and the proponent's response to submissions and is included as a matter of information only and does not form part of the EPA's report and recommendations. Issues arising from this process, and which have been taken into account by the EPA, appear in the report itself.

2. The proposal

APA is proposing to deepen and widen its shipping channel to provide access for Cape size vessels (16 m draft). This is to enable the port to export magnetite product associated with GR's Southdown Magnetite proposal. As well as widening and deepening channel, the project involves land reclamation adjacent to the port and offshore disposal in KGS.

It is proposed to dredge up to 12 million cubic metres (Mm^3). The majority of the material to be dredged is unconsolidated sediments (mostly sand). A small proportion is to be placed in the reclamation area (300,000 Mm^3) with the rest of the material (11.7 Mm^3) requiring offshore disposal in KGS at a location between Bald Head on Flinders Peninsula and Breaksea Island. Geotechnical investigations by the APA have confirmed that no rock will be encountered along the depth of the proposed shipping channel and therefore no blasting will be required.

Following the release of the PER, APA has advised that the implementation of the dredging campaign would occur over two main stages. The stages can be described as follows:

Stage 1 of the proposal includes the dredging of the berth pockets and turning basin with a cutter suction dredge (CSD) and placement of this material directly into a reclamation area for a new berth. Other aspects include wharf construction which involves construction of the seawall, pile driving, and preparation of the reclamation area for its intended use. The duration of Stage 1 will be 3 months.

Stage 2 is the dredging of sediments for the proposed shipping channel. All this material will be placed in the offshore spoil disposal area by a trailer suction hopper dredge (TSHD). The duration of Stage 2 will be 20 weeks.

The APA has confirmed that Stage 1 can be implemented independent of Stage 2 and has therefore modelled Stage 1 as a discrete exercise and also modelled the impacts of Stages 1 and 2 as a combined exercise.

Since release of the PER, the APA has made a number of modifications to the proposal and has further defined the characteristics of the proposal in a number of areas. The main characteristics of the final revised proposal compared to the characteristics described in the APA's PER are summarised in Table 1 below.

Table 1 - Key characteristics of the final revised Albany Port Expansion Proposal compared to characteristics shown in the PER

Key Aspect	Final Revised Description	PER Description
Dredging		
Dredge methods	Cutter Suction Dredge (CSD) for the berth pocket and reclamation batter and Trailer Suction Hopper Dredge (TSHD). No blasting is required	Trailer Suction Hopper Dredge and Cutter Suction Dredge. No blasting is required
Total quantity of dredge material to be generated	12Mm^3	7.85Mm^3 to 13.54Mm^3 depending on channel depth
Total area to be dredged	247.7 hectares (ha) including all channel batters and revised footprint. 247.7 ha includes 47.3 ha of existing channel.	214 ha
Total maximum duration	32 weeks	4-7 months
Stage 1 Dredging (Independent CSD Dredging		
Quantity of material	~300,000 cubic metres for reclamation area by CSD	n/a
Stage 1 duration	12 weeks independent of the TSHD at any time of the year	Included in the 4-7 months
Stage 2 Dredging (TSHD Dredging)		
Quantity of material	11.7Mm^3 dredged by TSHD	7.85Mm^3 to 13.54Mm^3 depending on channel depth
Stage 2 duration	20 weeks	4-7 months
Berth and Channel Characteristics		
Berth pocket depth	-17.8m CD	-16.0m CD
Maximum channel depth	-19.2m CD	Max. depth previously linked to dredge volume range of 7.85 – 13.54 Mm^3 of material
Land Reclamation Area		
Area	Up to 9.00 ha	Up to 9.00 ha
Height	+4m CD	+4m CD
Construction of sea wall	Continuous rock armoured sea wall, lined with geotextile filter cloth	Continuous rock armoured sea wall, lined with geotextile filter cloth
Clearing of native vegetation	Nil	The reclaim area will be backfilled to +4m on the northern side, requiring clearing of 0.78 ha of vegetation. Of the 0.78 ha, 60% is degraded, weedy vegetation and 40% is remnant native vegetation in Mt Adelaide A Class Reserve number 27068
Length of rocky shoreline to be reclaimed	~360m	~360m
Seawall length	~900m in total and ~570m	~900m in total and ~450m

Key Aspect	Final Revised Description	PER Description
	along the berth edge	along the berth edge
Drainage	Reclamation area will be filled and graded to achieve internal drainage until adequate stormwater system is constructed for the intended use	Reclamation area will be filled and graded to achieve internal drainage until adequate stormwater system is constructed for the intended use
Rock Armour material	Granite rock	Granite rock
Offshore Disposal Area		
Disposal location	In deep water within King George Sound (see Figure 1)	In deep water within King George Sound
Disposal footprint	250 ha	250 ha
Disposal depth	Finished depth to the top of the disposal site is -35m CD	Depth of dredge material 3.5 to 6.5m, with a finished depth of -35m CD
Disturbance Footprint		
Total Albany Port Expansion Proposal disturbance footprint	506.7 ha	473 ha

Figures 1 and 2 show the locations and extent of the reclamation area, shipping channel and offshore disposal site.

It should be noted that the construction of port infrastructure on the reclaimed land for the transport, storage, loading and export of product material on vessels is not part of this proposal. If the APA's proposal receives environmental approval and is implemented, the APA would lease the reclaimed land and the new berth to Grange Resources to accommodate its port infrastructure. Grange Resources' proposed port infrastructure is part of the Southdown Magnetite proposal and was subject of an EPA's assessment in 2008 (EPA Report 1291). That proposal was recently approved by the Minister for Environment subject to the conditions in Ministerial Statement 816.

The potential impacts of the proposal initially predicted by APA in the PER document (Ecologia, 2007) and their proposed management are summarised in Table S2 of the PER's Executive Summary.

3. Key environmental factors and principles

Section 44 of the *Environmental Protection Act 1986* requires the EPA to report to the Minister for Environment on the environmental factors relevant to the proposal and the conditions and procedures, if any, to which the proposal should be subject. In addition, the EPA may make recommendations as it sees fit.

The identification process for the key factors selected for detailed evaluation in this report is summarised in Appendix 3. The reader is referred to Appendix 3 for the evaluation of factors not discussed below. A number of these factors, such as visual amenity, are relevant to the proposal, but the EPA is of the view that the information set out in Appendix 3 provides sufficient evaluation.

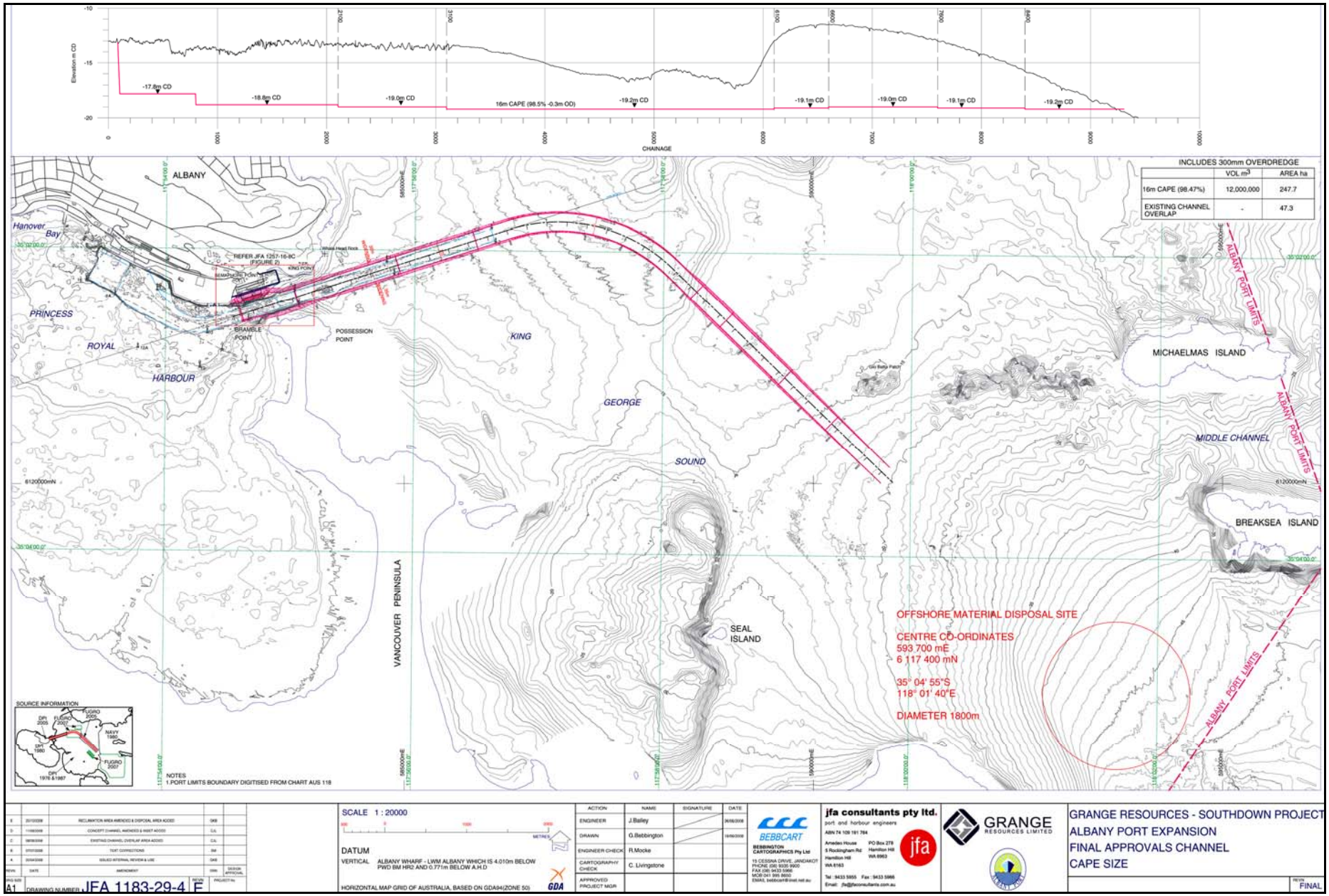

Figure 1: ***Location map showing Albany Port Expansion proposal, land reclamation at Semaphore Point, shipping channel, Albany Port Authority Area, Princess Royal Harbour and King George Sound***

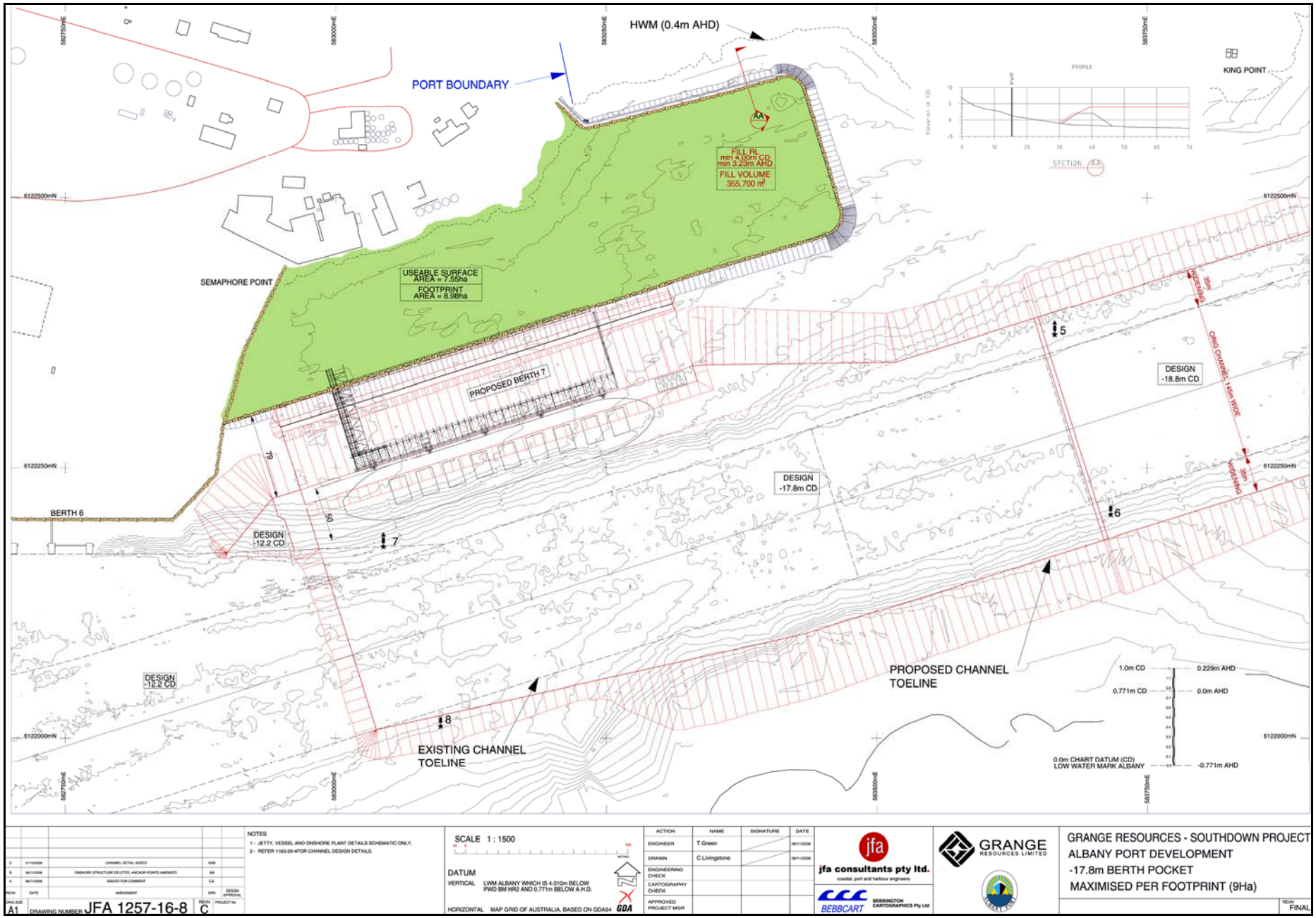

Figure 2: Layout of land reclamation area at Semaphore Point and berth pocket, turning basin and approach channel

It is the EPA's opinion that the following key environmental factors along with the corresponding issues for the proposal require detailed evaluation in this report:

a) Marine benthic communities – impacts on benthic primary producer and reef communities from dredging and reclamation;

b) Water and Sediment Quality – mobilisation of contaminated sediments;

c) Water Quality (post-dredging) – impacts of widening and deepening the entrance channel on the circulation and flushing of PRH;

d) Marine fauna – impacts of dredging and construction on protected and migratory fauna;

e) Sedimentation – stability of offshore disposal site; and

f) Water quality – impacts of dredging on recreational and commercial activities.

The above key factors were identified from the EPA's consideration and review of all environmental factors generated from the PER document and the submissions received, in conjunction with the proposal characteristics.

Details on the key environmental factors and their assessment are contained in Sections 3.1 - 3.5 of this report. The description of each factor shows why it is relevant to the proposal and how it will be affected by the proposal. The assessment of each factor is where the EPA decides whether or not a proposal meets the environmental objective set for that factor.

The following principles were considered by the EPA in relation to the proposal:

(a) the precautionary principle;

(b) the principle of intergenerational equity; and

(c) the principle of conservation of ecological integrity.

The key policy settings covering the coastal and marine areas of this project are the *State Water Quality Management Strategy No. 6* (Govt. of WA 2004) and the EPA's Environmental Quality Management Framework (EQMF); and the EPA's Environmental Assessment Guideline No. 3 *Protection of Benthic Primary Producer Habitats In Western Australia's Marine Environment* (formerly the EPA's Guidance Statement No. 29 – *Benthic Primary Producer Habitat Protection for Western Australia's Marine Environment*).

3.1 Marine benthic communities – impacts on benthic primary producer communities from dredging and reclamation

Description

This issue relates to the impacts of the proposal from dredging the berth pocket, shipping channel, reclamation, and the offshore disposal of dredge spoil. The impacts on benthic primary producer (BPP) communities are primarily determined by direct impacts caused by the proposal's 'footprint' combined with the indirect impacts caused by pressures such as shading and sedimentation from suspended sediments.

At a regional level, the marine habitats found in KGS and PRH are generally described in the Report of the Marine Parks and Reserves Selection Working Group

on *A Representative Marine Reserve System for Western Australia* (MPRSWG, 1994). Two areas in the Albany Harbours were recognised in the MPRSWG Report as candidate areas for marine reserves (Figure 3). In relation to these two areas the Report states the *'Working group recognised that King George Sound, Princess Royal Harbour and Oyster Harbour are extensively used for port and recreational purposes and that the two inlets show evidence of environmental degradation. Nevertheless these areas are of such biological importance that reservation of some parts of them for conservation purposes should be considered.'*

The marine benthic habitat types in PRH and KGS have been described in the APA's PER (Section 6.5). The APA has identified marine habitat types based on the information gathered from previous marine surveys, the APA's own marine surveys and the interpretation of satellite imagery and bathymetric charts. The APA's benthic habitat map (Figure 3) generally describes a mosaic of bare sand, seagrass communities, and macroalgal cover in PRH, KGS and Oyster Harbour. The most common seagrasses to occur in the Albany Harbours belong to the genera *Posidonia* and *Amphibolis.*

Two reef systems (Gio Batta Patch and Michaelmas Reef) occur in the vicinity of the proposed shipping channel, west of Michaelmas Island. The Gio Batta Patch and Michaelmas reef are heavily dissected limestone reefs and support macroalgal communities and a rich and diverse invertebrate fauna of encrusting sponges, bryozoans, ascidians and soft corals. These reef systems also offer attractions for recreational divers, including the commercial dive tour industry. The APA predicts that there will be no impacts on these reef communities as a result of dredging the channel.

Benthic Primary Producer Habitats
Elements of the proposal that would have direct and irreversible impacts on the seabed and potentially BPP communities include the:

- reclamation of marine sandy habitat and subtidal rocky shoreline, and its conversion to a hardstand area for future port facilities (up to 9 hectares);
- dredging of the shipping channel (247.7 hectares – of which 47.3 hectares is an existing shipping channel); and
- offshore disposal of material dredged from the shipping channel in KGS at depths greater than 35 metres (250 hectares).

Indirect impacts of the proposal from sedimentation and light deprivation are more difficult to predict and relies on undertaking simulation modelling to establish the extent and severity of pressure fields and an understanding of the sensitivities of benthic communities to those dredge-related pressures. The framework used by the APA to predict the impacts of dredging on seagrass communities was to spatially define the extent of the zones of permanent loss, temporary loss and influence. The zones of permanent and temporary loss are described below.

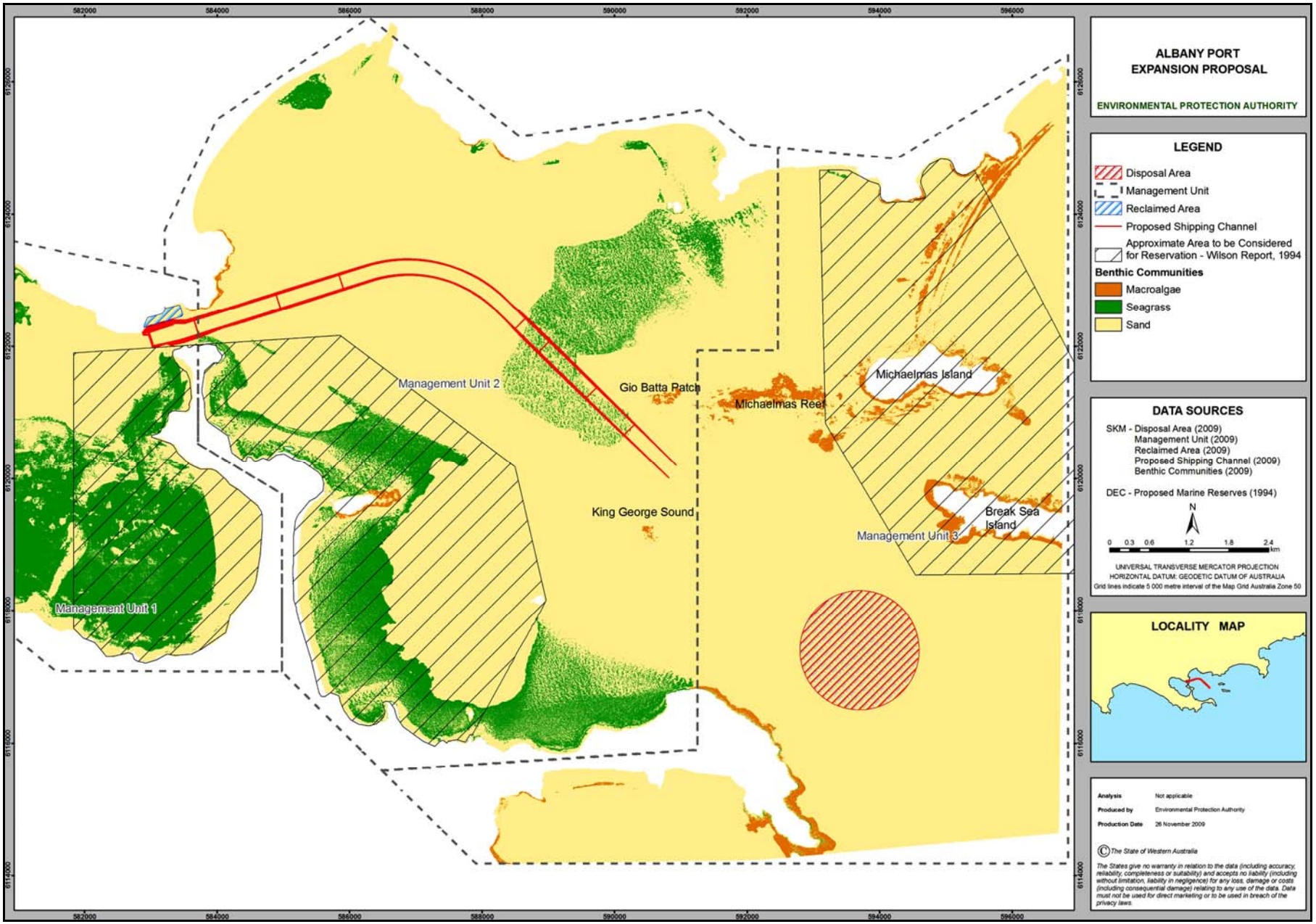

Figure 3: ***Benthic primary producer communities in King George Sound and a portion of Princess Royal Harbour, and location of candidate areas for marine reserves***

Zone of permanent loss (irreversible impacts) – This zone defines the area where mortality of, and long term (months to years) serious damage to, seagrass and their habitats would be predicted. It is generally defined around areas directly affected (eg. the channel and reclamation areas) and the area immediately about/surrounding the proposed dredging and disposal, which is indirectly affected (eg. by smothering or light deprivation); and

Zone of temporary loss (reversible impacts) – Within this zone, sub-lethal effects on key benthic biota would be predicted, but there should be no mortality of seagrass and no long term damage to, or modification of, the communities they form. This is likely to be observed as slight to moderate reductions in seagrass shoot density.

The approach taken by APA to predicting the zones of impact can be summarised as follows:

a) Running a hydrodynamic model to predict the direction and velocity of currents in PRH and KGS;

b) Compiling sediment particle size information from geotech surveys in the proposed shipping channel as input into the model;

c) Coupling the hydrodynamic model to a transport model (DREDGE3D model) to predict the fate of sediments particles that would be liberated to the water column by dredging and spoil disposal;

d) Developing minimum threshold levels for light available to seagrass that, if not met, may lead to mortality or sub-lethal effects on seagrass which are used to represent permanent and temporary levels of impact to seagrass respectively. For this proposal the APA has based its thresholds on experimental work undertaken in PRH and documented in– *Changes to the structure and productivity of a Posidonia sinuosa seagrass meadow in Princess Royal Harbour, Western Australia, during and after imposed shading* - DEP Technical Series 50 (Gordon et al, 1994).

e) Establishing a relationship between total suspended solids (the model output) and light attenuation;

f) Interrogating outputs of the turbidity model to predict the spatial extent and boundaries of zones of permanent loss, temporary loss and influence; and

g) Make judgements, based on published literature, about the recovery potential of impacted seagrass.

The APA has predicted zones of impact over three main weather scenarios. This included dredging starting in winter-spring (July to October, dominated by westerly winds); spring-summer (November to February, dominated by westerly winds) and autumn (March to June, dominated by easterly winds). These are shown in the PER in Figures 9.22, 9.23 and 9.24 respectively, and summarised in Table 9.9. APA is also proposing seagrass rehabilitation, through the use of donor material from affected areas, as a means of achieving a no net loss outcome for seagrass loss in PRH.

While turbid plumes may occasionally enter Oyster Harbour during the dredging campaign, the APA predicts that it would not have any temporary or permanent impacts on seagrass communities in Oyster Harbour.

Submissions

Submissions on the PER focussed on the following issues:

- the historical loss of seagrass in PRH;
- the important of seagrass in the overall health of Albany Harbours;
- the potential regional significance of the reefs at Gio Batta Patch and Michaelmas Reef; and
- the confidence in the proponent's predictions to benthic communities and effectiveness of its proposed monitoring and management.

Assessment

The EPA's assessment of this factor has focused on the predicted loss of benthic primary producer habitat, comprising seagrass and reef communities.

The EPA's overarching environmental objective for this factor is to avoid loss or damage to key benthic primary producer communities as much as possible. Where losses are unavoidable, the intent is to manage the cumulative loss of BPPHs and communities such that marine ecological integrity is maintained.

The area considered for assessment of this issue is the marine waters and seabed of PRH, KGS and Oyster Harbour.

Seagrass communities

The EPA acknowledges the important role provided by seagrass communities in the overall health of the marine ecosystem within PRH and KGS. In assessing this proposal, the EPA is particularly cognisant of the cumulative loss of seagrass communities in PRH. Previous research has indicated that approximately 80% of the original seagrass meadows have been lost as a result of pollution and nutrient enrichment (EPA, 1990). While there has been substantial seagrass regrowth since the implementation of pollution control and catchment measures, the cumulative loss of seagrass remains significant and the EPA objective for PRH is that there is no further net loss of seagrass.

In accordance with the EPA's Environmental Assessment Guideline No. 3 *Protection of Benthic Primary Producer Habitats In Western Australia's Marine Environment* (formerly the EPA's Guidance Statement No. 29 – *Benthic Primary Producer Habitat Protection for Western Australia's Marine Environment*), the APA has defined Local Assessment Units (LAUs) (previously referred to as Management Units). LAUs have been defined for PRH (LAU 1), KGS (LAU 2) and the outer portion of KGS (LAU 3) and assigned appropriate categories and cumulative loss guidelines (CLGs) for each LAU. CLGs are percentage values against which the calculated cumulative loss for each different benthic primary producer habitat are evaluated. The EPA considers the LAUs and the assigned categories to be appropriate for the assessment of this proposal and has undertaken its assessment of permanent losses in the context of the CLGs below. The assigned categories for each LAU are as follows:

Local Assessment Units	Categories (from EAG No. 3)	Cumulative loss guideline
LAU 1 – Princess Royal Harbour	Category F – Area where cumulative loss guideline has been significantly exceeded	No net damage/loss
LAU 2 – King George Sound	Category D – Non-designated areas	5%
LAU 3 – Outer King George Sound	Category C – Other designated areas	2%

Following the release of the PER the APA has provided additional information to evaluate the level of confidence that can be placed on its impact predictions and proposed management. In response to recommendations of peer reviews commissioned by the APA on the numerical models and EPA queries on various aspects of the modelling and predicted zones of impacts, the APA provided further information and undertook additional modelling which incorporated revised sediment settling velocities. The APA also undertook a sensitivity analysis using a number of seagrass minimum light requirement (MLR) scenarios. This further work has resulted in revised zones of impacts and therefore revised seagrass loss predictions compared to those in the PER and are shown in Figures 5.1, 5.2 and 5.3 of the APA's supplementary response to submissions document in Appendix 5. In assessing the impacts of the proposal on seagrass communities, the EPA has drawn on the results of these revised predictions. The APA's revised predictions for permanent and temporary losses are summarised in Tables 2 and 3 below.

Table 2: Summary of APA's final predictions for permanent seagrass loss in hectares in each local assessment unit.

Seasons	**Local Assessment Units**				
	1 (PRH) No net loss	**2 (KGS) CLG is 5%**		**3 CLG is 2%**	
	ha	**ha**	%	**ha**	**%**
July - October	0.78	16.58	2.03	0	0
November – February	0.78	16.09	1.97%	0	0
March – June	0.78	15.93	1.95%	0	0

Table 3: Summary of APA's final predictions for temporary seagrass loss in hectares in each local assessment unit.

Seasons	**Local Assessment Units**		
	PRH	**KGS**	**Outer disposal area**
	ha	**ha**	**ha**
July - October	7.78	11.38	0
November – February	138.9	63.25	0
March – June	0.78	10.05	0

The areas of seagrass in PRH at risk of permanent loss are patches of dense *Posidonia australis* and *Posidonia sinuosa* seagrass meadows in shallow water (3-4 m) in the vicinity of the entrance channel. In terms of cumulative seagrass loss, other recent

developments that will affect seagrass within PRH are Anzac Peace Park and the Albany Foreshore Redevelopment projects. These projects have been approved and will result in a predicted total loss of approximately 0.06 ha. The Albany Protected Harbour development which was assessed by the EPA (EPA Report 1301) and approved in February 2009 was for the loss of approximately 1.6 ha. Combined with the APA proposal, this represents a total cumulative loss of approximately 2.5 ha of seagrass (at a range of densities) as a result of recent developments in PRH. As the CLG for PRH has already been significantly exceeded, the APA is proposing to rehabilitate an equivalent area of seagrass in PRH using donor material from the areas to be impacted as a means of achieving a 'no net loss' outcome. This is further discussed below under *Seagrass Rehabilitation*.

In KGS the areas at risk are in the centre of the sound, towards the end of the proposed shipping channel (see Figure 2) where clumps of *Posidonia coriacea* (at less than 20% cover) are found close to their depth limits (-16-20 m). The predicted permanent loss of seagrass from this proposal combined with the historical losses in the KGS LAU is within the CLG of 5%.

In terms of the temporary losses, the largest extent of impacts is associated with the November – February modelled scenario. The EPA notes that for this modelled scenario up to 138 ha of seagrass are likely to experience temporary impacts in PRH and 63.5 ha in KGS which is significantly greater than the July – October and March June seasons. It is also noted that the area of impacts for the November-February scenario extend to the seagrass meadows on both sides of Vancouver Peninsula which was identified in the MRRSWG report as being of particular importance to this potential marine reserve area. Seagrass meadows off Middleton Beach are also predicted to be affected.

To minimise the extent of predicted temporary loss impacts, the APA has advised the EPA that it is committed to undertake dredging of the shipping channel outside the November-February period. The EPA supports this commitment from the APA and has recommended a condition (condition 5-1) which requires the APA to undertake dredging of the shipping channel (Stage 2 dredging) outside the November-February period, in any year. Dredging outside this period would also have the effect of minimising impacts to the recreational values of KGS during the summer period (see section 3.6). In view of the APA's commitment, the EPA has not considered the environmental impacts of dredging in November-February period any further.

In considering the acceptability of the proposed losses of seagrass communities the EPA has also had regard for the confidence in the APA's predictions. The EPA requested the APA to engage an independent expert to undertake a peer review of the APA's seagrass loss predictions in view of the specialist nature of the investigations and risks to the environment. The EPA's analysis of available information in relation to predicted seagrass loss suggests that the proposal's impacts on seagrass communities are likely to be greater than predicted by the APA. The EPA's reservations are also reflected in the findings of the peer review undertaken by Professor Paul Lavery (dated 3 December 2007) on the APA's assessment of BPPH impacts. The peer review report is available in Appendix 5 of this report.

The peer review has identified that recently published data suggest that the threshold light level for permanent loss of seagrasses used in the simulation modelling has been set too low and that this would result in an under-estimation of impact for a given reduction in light availability in the model.

The EPA notes that the while the APA has responded to the findings of the peer review (see Appendix 5), its response has not resulted in any material modifications to APA's approach to defining the threshold levels for seagrass loss and therefore has not had an effect on the APA's predicted zones of effect and the final predictions. For this reason there remains conjecture regarding the confidence of the APA's predicted impacts. This could result in the permanent loss of seagrass communities outside the APA's predicted zone of 'Permanent Loss'.

The APA's view is that overall it believes its predictions are extremely conservative and that the seagrass will recover from any indirect impacts in the medium term, that is, over several growing seasons. Characteristics of the proposal that the APA has identified in support of its conclusion include the predominantly fine to medium grained siliceous sands in KGS which would rapidly settle out of the water column and the relatively short duration of the channel dredging (20 weeks). The APA also advised the EPA that *"Regardless, of where the theoretical lines are located on the predictions, the rigorous approach of implementing an appropriately triggered and actioned monitoring and staged management process will ensure the proposal will be implemented in an environmentally acceptable manner"* (letter from APA to EPA dated 19 October 2009).

A draft Dredging and Land Reclamation Management Plan (DLRMP) (Appendix 5) has been prepared by the APA which proposes a tiered management response approach to dredging based on monitoring of underwater light and seagrass. The monitoring of underwater light and seagrass is linked to a range of management responses such as reducing turbid overflow from barges, reduce loading times etc. However, seagrass health is only proposed to be monitored in the event a sequence of water quality trigger levels is exceeded.

If the proposal is approved to proceed, it is recognised that there will be risks to seagrass communities if the turbidity-related pressure fields from dredging exceed those predicted by APA. The EPA notes the considerable modelling and investigations that have been undertaken and that while the overall approach taken by the APA to predicting seagrass impacts is sound, it is aware of the inherent uncertainties in the final predictions as highlighted in the peer review. In recognition of those uncertainties and the APA's view that its predictions are extremely conservative and manageable, the EPA considers that legally binding conditions should be set on the APA which imposes limits on the total allowable permanent loss of seagrass in PRH and KGS as a result of this proposal. For seagrass outside the zone of permanent loss (and in the zone of temporary loss) the EPA considers that conditions will need to be imposed which requires dredging to be actively managed based on a comprehensive monitoring program which includes pre-determined management triggers for seagrass health and underwater light to ensure impacts do not exceed the APA's predictions.

Based on the APA's current predictions, the EPA considers that the proposal could be managed to meet the EPA's objective for this factor provided that the following outcomes and measures are included in the conditions on the proposal:

- Dredging of the shipping channel be undertaken outside the November-February season to reduce the risk of losses outside the predicted zone of permanent loss. The APA has advised the EPA that it is able to undertake dredging of the channel outside this period and is committed to doing so. Recommended condition 5-1 gives effect to the above.

- The implementation of the proposal does not cause the permanent loss of seagrass greater than predicted by the APA – ie. less than 0.8 ha in PRH and less than 16.6 ha in KGS. Recommended condition 5-2 provides for the limits and locations of these areas to be defined.

- For seagrass outside the zone of permanent loss, the dredging campaign will need to be monitored and managed to ensure that impacts are no greater than predicted i.e. only sub-lethal effects are predicted in the zone of temporary loss. The EPA has recommended seagrass health criteria to apply both during the dredging campaign and for a period following the completion of the proposal. These criteria are measures of seagrass shoot density and are based on the percentile-based approach of deriving criteria from baseline/pre-dredging surveys. During dredging, the APA will need to ensure that seagrass shoot density at impact sites is greater than the 1st percentile of pre-dredging shoot density determined from the same site. Following the completion of dredging the APA will need to demonstrate the recovery of seagrass health by monitoring impacts sites to show that the shoot density is greater than or equal to the 20th percentile of the pre-dredging shoot density for at least two consecutive years.

  These seagrass health criteria described above are consistent with the approach and framework provided in the *State Environmental (Cockburn Sound) Policy*, which are considered to be appropriate for the Albany waters and for meadow forming species of the genus *Posidonia*. See recommended conditions 5-7, 5-8 and 5-9.

  The need to identify and monitor reference sites before and during the dredging campaign is also recommended as a requirement in order to assist in distinguishing impacts on seagrass caused by dredging from those resulting from other regional pressures.

- Seagrass health would need to be monitored using fixed relocatable quadrats before, during and after dredging and the methods should be consistent with the Environmental Protection Authority's *Manual of Standard Operating Procedures for Environmental Monitoring against the Cockburn Sound Environmental Quality Criteria* (March 2005) or any other appropriate and well justified protocol. It is recommended that seagrass health be monitored fortnightly throughout the dredging program.

- The APA undertake management responses which include the cessation and relocation of the dredge vessel should the seagrass health criterion mentioned above be exceeded. See recommended condition 5-8.

- Ongoing monitoring of seagrass health following the completion of the dredging campaign to confirm that both:
  - the losses caused by the proposal do not extend beyond the specified zones of permanent loss; and
  - that the health of seagrass outside the zones of loss is not significantly affected. Recommended conditions 5-7 and 5-9.

In addition to the above, the APA is expected to undertake monitoring of underwater light attenuation and give effect to the linked management responses as committed to in its draft DLRMP. However, the APA will need to ensure that pre-determined trigger levels for light attenuation are conservative and informed by at least 12 month of baseline data. It is noted that the APA has commenced a program of baseline data collection to inform the further development of its monitoring program. It will also be important for the triggers to be linked to early management responses to avoid potential impacts or exceedance to the seagrass health criteria described above.

Seagrass rehabilitation

The APA has prepared a preliminary seagrass rehabilitation plan which aims to replant seagrass in a nearby area within PRH using donor material from the areas that would be directly impacted by the channel and reclamation area. As donor material will come from the seagrass to be directly impacted by the proposal, APA's proposed seagrass rehabilitation would need to be initiated prior to the commencement of dredging and reclamation. The commitment by the APA is for 1 ha of seagrass to be rehabilitated at a density which achieves at least 75% seagrass cover within 10 years.

The APA will need to demonstrate the effectiveness of its seagrass rehabilitation as an offset to ensure that no net loss of seagrass within PRH is achieved. The APA proposes to develop completion criteria in relation to indicators such as survival rates, shoot density, seagrass production, and habitat function. Further detailed completion criteria will need be developed in consultation with the Department of Environment and Conservation (DEC) and the Department of Water (DoW) and this will need to be given effect and included in a revised seagrass rehabilitation plan.

The EPA has recommended condition 6 in Appendix 4 which reflects the broad outcomes in the APA's commitment. These conditions for seagrass rehabilitation are also consistent with the approach and requirements imposed on LandCorp as the proponent for the nearby Albany Protected Harbour proposal (Ministerial statement 787).

Reef communities

As described above, the APA has identified and described reef communities at Michaelmas Reef and Gio Batta Patch in the vicinity of the proposed shipping channel. These reef systems support diverse encrusting invertebrate, filter feeding and coral communities. The APA predicts there will be no impacts to these communities.

The EPA notes the findings of the peer reviewer which states that the reef assessments undertaken by the APA *".. are entirely qualitative, comprising of written descriptions of the dominant biota and a series of photographs, which do not appear to be geo-referenced. The report clearly states that the use of quadrat sampling was considered inappropriate, though the reasoning is not provided. The qualitative data provided are a useful overall description of the reefs, and therefore meet the stated purpose (as per Morrison, above). However, the surveys will not provide adequate baseline data for any future assessment of impact."* (Peer Review report in Appendix 5)

It is noted that monitoring of the reef systems are not provided for in the APA's draft DLRMP. In view of the above, the EPA considers that the APA should undertake further surveys of the reef systems in manner which would assist the APA in confirming its predictions with respect to these reefs. Surveys should occur prior to the commencement of dredging to provide adequate baseline data, followed by further surveys after the completion of dredging to confirm the APA's predictions that dredging has not impacted on these reef systems.

In addition, given that the APA has predicted that Michaelmas and Gio Batta Patch reef systems are outside the area of influence and therefore won't be impacted by turbid plumes, a monitoring program should be developed prior to the commencement of dredging to demonstrate no effect on the water quality parameters that support coral/encrusting invertebrate communities at Gio Batta Patch and Michaelmas reefs or the reef systems fringing the Michaelmas and Breaksea Islands.

The EPA recommends that the APA's draft DLRMP be amended to include a monitoring program that is able to measure and detect changes in the water quality and reef communities at the Gio Batta Patch and Michaelmas reef as described above in order to confirm the APA's predictions that the proposal will not have an impact on these reef communities.

Dredge model validation

The EPA notes it is difficult to calibrate and validate the modelling of total suspended solids (by way of the DREDGE3D model) in the absence of a dredging event and hence there remain uncertainties in the dredge plume predictions until such time as the dredging has commenced. The APA has made a commitment to collect data on currents and suspended solids and to re-run the DREDGE3D model in real-time during the dredging period. The EPA recommends that the APA undertake a program of data collection of key responses to dredging and spoil dumping (e.g. temporal and spatial variations in TSS, sedimentation rates, light attenuation, etc) so that the DREDGE3D model can be validated (calibrated and verified) against the key response parameters to dredging and spoil dumping. The EPA supports the APA's commitment to undertake real time model validation to enable an early evaluation of the accuracy of the predicted turbidity against the actual turbidity generated, to assist in the APA's dredge management and planning process.

The program of data collection should also be used to determine the relationship between underwater light attenuation and total suspended solids and assist in confirming the appropriateness of the APA's proposed water quality trigger values and modification, if necessary, of the values if impacts exceed the predictions.

The EPA recommends that the data collection program and model programming for undertaking such validation should be incorporated into the APA's draft DLRMP.

Duration of dredge campaign

The APA has modelled and evaluated a range of environmental predictions based on a hypothetical dredge schedule which simulates a particular method and capacity of dredge that is capable of completing the proposal within the durations described in Section 2 of this report. The EPA understands that if there are changes in the dredge method and capacity of the dredge plants to be used by APA then there could be implications on the dredge schedule, which can among other things increase the duration of the overall project. This could in turn increase risk to seagrass and reef communities if the duration of the project is greater than simulated by the APA and assessed by the EPA. As such it will be important for the APA to secure dredging equipment which is able to complete channel dredging within the 20 week period specified in Schedule 1 of the recommended conditions.

Summary

The EPA notes that on the basis of the APA's predicted impacts on seagrass communities in PRH and KGS, seagrass losses are unlikely to compromise ecological integrity and are therefore environmentally acceptable.

However, the EPA has considered the level of confidence and uncertainties in the APA's predictions which have been highlighted by the peer reviewer. The uncertainties are largely a function of the range of assumptions in the APA's overall investigations but particularly in relation the fate of plumes and the seagrass loss thresholds developed by the APA.

In view of the uncertainties, the EPA considers that the dredging and disposal would need to be comprehensively monitored and proactively managed to ensure that the APA's predictions are not exceeded and that the ecological values of PRH, KGS and Oyster Harbour are not compromised.

The EPA recommends conditions 5 and 6 be imposed to reflect the extent of impacts identified by the APA, its proposed management and implementation of a monitoring and management programme for seagrass communities, as described above. Conditions have also been recommended in relation to the proponent's commitment to rehabilitate seagrass in PRH to achieve a no net loss outcome for seagrass. This will ensure seagrass loss is not greater than that predicted by the proponent and that the planting extent and density is achieved.

Conditions 5-11 and 5-12 have also been recommended to protect the reef communities at Gio Batta Patch and Michaelmas Reef from the impacts of dredging. The recommended conditions require surveys of the reef to be undertaken before and after the dredging program.

Provided the above conditions are imposed and implemented by the APA, the EPA considers that the proposal can meet the EPA's objective for this factor.

3.2 Water and Sediment Quality – mobilisation of contaminated sediments

Description

The APA is required to apply for a licence under the Commonwealth's *Environment Protection (Sea Dumping) Act 1981* (the Sea Dumping Act) to dredge and dispose approximately 11.7 Mm^3 at its proposed offshore disposal site. The APA's sediment investigations were therefore required to follow the guidelines in the Commonwealth National Ocean Disposal Guidelines for Dredged Material (NODGDM) (Commonwealth of Australia, 2002) which has recently been superseded by the National Assessment Guidelines for Dredging (Commonwealth of Australia, 2009). The investigations are required to be undertaken in consultation with the Commonwealth Department of Environment, Water, Heritage and Arts (DEWHA).

The APA's sediment investigations have identified elevated levels of mercury and silver in a portion of the proposed shipping channel, south of the bend in the centre of KGS. Initial sediment sampling identified mercury and silver exceeded NODGDM screening levels. Mercury exceeded the guidelines in 16 samples from 7 sampling sites, where concentrations were 0.4 mg/kg in surface sediments (0-0.5 m) and 0.3 mg/kg in sub-surface sediments (0.5-1.0 m), compared to a screening level of 0.15 mg/kg. Silver concentrations were found to be marginally above the screening level of 1.0 mg/kg, with concentrations of 1.2 mg/kg in both surface and sub-surface sediments.

Within the hierarchical NODGDM framework, exceedence of the screening guidelines requires further testing to determine the bioavailability of the contaminant of concern and ultimately whether disposal at sea is permissible. The results of these tests include comparing concentrations against the ANZECC/ARMCANZ guidelines for toxicants in water. For the waters of KGS the EPA considers that the concentrations for metals should be compared with the ANZECC 99% species protection trigger level which is relevant to achieving a 'high' level of ecosystem protection.

The bioavailability of these metals was subsequently determined by measuring pore water concentrations. The APA's consultants undertook pore water analysis to determine the potential impacts of disposal on sediment infauna. This analysis shows that silver was found to be below the ANZECC 99% species protection trigger level and therefore poses a low risk. Mercury was found to be detectable and was at, or above, the ANZECC 99% species protection trigger level for a number of samples.

The APA stated in the PER that it will seek to reduce the risk of contamination through selective removal of sediments with slightly elevated levels of mercury, in the initial stages of dredging. The APA has delineated the spatial extent of the channel containing elevated levels of mercury and determined that it is confined to the top one metre of sediments. The TSHD will selectively dredge this area with no overflow of water and deposit it at the centre of the offshore disposal area. At the disposal site, subsequent loads of clean sediment will be placed around and cover the sediment with elevated levels of mercury to reduce the likelihood of re-suspension and mobilisation of this material, as well as reducing its availability to sediment biota. The APA

estimates that the volume of material to be selectively removed to a depth of 2 metres is approximately 360,000 cubic metres. In its response to submissions, the APA advised that the TSHD that would carry out the dredging will have a very accurate Differential Global Positioning System (DGPS) and positioning system installed that can accurately locate the position of the suction mouth of the drag head. The APA has further advised that this, coupled with hydrographic surveys, would allow accurate removal of material.

Based on its investigations the APA has concluded that neither silver nor mercury found in the sediments pose any environmental risk and as such the material should be suitable for unconfined disposal.

The DEWHA has advised the EPA that it is satisfied that the results of the additional investigations by the APA has shown the dredged material to be suitable for unconfined sea disposal and that no further sampling is required.

Sediment analysis of the remainder of the sediments from the berth pocket and entrance channel for placement in the reclamation area has shown that metals, tributyltin and organics were below the NODGDM screening levels or below detection in the full depth of sediments sampled.

Submissions

Submissions on the PER focussed on the following issues:

- the risks to the mussel farms in the vicinity of Mistaken Island;
- the need for monitoring of mussels to occur during dredging; and
- the effectiveness of the proponent's commitment to selectively remove sediments containing mercury and bury at disposal site.

Assessment

The EPA's environmental objective for this factor is that the environmental values of ecosystem health, and fishing and aquaculture are protected.

The environmental quality objective for the ecosystem health value is *maintenance of ecosystem integrity*. The environmental quality objectives for the fishing and aquaculture value are:

- *Maintenance of seafood for human consumption* – seafood is safe for human consumption when collected or grown in marine waters; and
- *Maintenance of aquaculture* – water is of a suitable quality for aquaculture purposes.

The areas considered for assessment are the marine waters of KGS, PRH and Oyster Harbour.

The EPA notes there is potential for dredging and disposal to result in the temporary suspension of contaminated sediments in the water column and the redistribution of these sediments in KGS, and potentially into PRH.

The EPA also notes from the APA's sediment investigations that the contaminant of concern is mercury. The EPA considers that the risk from the proposal needs to be considered in the context of historical contamination of PRH with mercury and the risks of additional pathways for contamination. Important receptors include marine biota such as fish and filter feeders, and the aquaculture mussel farms at Mistaken Island which are approximately 3 km from the channel. The mussel farm provides a potential exposure pathway from suspended sediments to consumers of mussels. Turbidity modelling shows that this location will experience turbid events from dredging from time to time, particularly during easterly winds.

In relation to the APA's assessment of sediments, the EPA notes the advice of the peer reviewer who stated: "*This review concludes that the method used to evaluate bioavailability was too limited to provide certainty of bio-available metal concentrations under real dredging conditions. A more appropriate range of testing, including elutriate test, may result in different concentrations of bio-available forms of metals and that these could approach or breach the level of habitat protection criteria set for Dredge Area 3.*"

The APA's view on the issue is that pore water testing was undertaken to assess the impacts of contaminated spoil on the ecology of the spoil ground. This was as a result of the commitment to dredge the contaminated material without overflow and that the impact was then limited to the infauna and epifauna of the spoil ground. The APA stated that pore water was determined to be the best method of assessment in this instance and is considered to be conservative.

The EPA notes that if the further tests recommended by the peer reviewer were undertaken then there would have been a higher level of confidence in the APA's predictions with respect to mercury release. The EPA also notes however, that in relation to the Commonwealth's sea dumping process, the APA's sediment and water quality investigations have satisfied the Commonwealth DEWHA's requirements.

Notwithstanding the above, the results of the porewater water analysis suggest that small quantities of mercury may be bioavailable during dredging and disposal and hence presents a risk to the marine environment. The EPA considers that the overall risks from the proposal will depend on the effectiveness of the APA's proposed management, the extent of monitoring and the APA's management response to the results of monitoring.

Management

The EPA supports the APA's commitment to dredge without overflow for the portion of the channel containing elevated mercury. Dredging without overflow is likely to result in the minimisation of material loss during dredging of these sediments. The EPA considers that APA should, through its planning of the dredge campaign, ensure that appropriate TSHD plant and technology is selected and that dredge scheduling is undertaken to ensure the APA's commitment can be effectively implemented and audited.

Similarly with respect to the commitment to the cover the material with subsequent loads of clean sands, the EPA considers that APA should ensure selection of

equipment which allows accurate positioning of vessels for precise placement of the dredge material.

Further dredge management responses may be required if monitoring detects any exceedance of water/sediment quality trigger levels.

Monitoring

The EPA notes the Department of Health's (DoH) advice in its PER submission:

It is recommended that an increased sampling program (in addition to current WASQAP testing requirements for the harvest areas in the region) is implemented during the dredging program and for a reasonable period following dredging to monitor the water quality for aquaculture suitability. This would need to include sampling of the water and mussels/oysters.

Commercial oyster and mussel harvest areas are monitored and managed under the Western Australian Shellfish Quality Assurance Program (WASQAP). This program operates to manage the risks associated with mussel and oyster production for human consumption.

Although the APA has committed to enhancing and supplementing the WASQAP monitoring protocols and has had preliminary discussions with the Department of Fisheries to ensure the aquaculture operations are not negatively affected, the EPA notes the APA's draft DLRMP does not set out the manner in which monitoring of mercury in water, sediments and mussels would occur nor does it specify the trigger levels, management responses and reporting protocols that would apply in the event trigger levels are exceeded.

Consistent with the DoH's advice, the EPA considers that there is a need for APA to implement a monitoring program using sentinel mussels as bio-indicators to determine whether the proposal is causing mercury to enter the marine food chain and/or affecting the operations of the mussel farms in the vicinity of Mistaken Island.

The EPA considers that the use of sentinel mussels should be carried out at the pre-construction phase to determine the background concentration of mercury as recommended by DoH. Fresh mussels should also be deployed immediately before excavation starts and each set of mussels should be harvested and tested after four weeks. Fresh sentinel mussels should then be deployed on a regular basis (every four-six weeks) and tested, and this regime should be continued for at least six months following completion of dredging activities. The EPA envisages that mussels would be deployed at a number of sites including reference sites and sites in the vicinity of the aquaculture leases at Mistaken Island, and that the sample size and analysis of samples would consist of at least five mussels each time.

The EPA also expects that the APA will test for all the target compounds in the Australian and New Zealand Food Standards Code (in accordance with Standard 1.4.1) (ANZFA 2000) for molluscs.

The EPA has recommended that a condition be placed on the APA (Recommended Condition 8) to ensure a sentinel mussel monitoring programme is designed and

implemented during dredging and for six months following the completion of dredging. The draft condition also sets out criteria that should not be exceeded and a management response in the event that the trigger value for mercury is exceeded. As advised by the DoH the monitoring of mussels should supplement the existing monitoring at sites in the vicinity of the aquaculture leases of Mistaken Island.

The EPA has recommended Condition 7 which provides for the regular monitoring of mercury in water and sediments during the dredging campaign as early warning indicators of mercury release.

The EPA advises that the approach set out above and the recommend conditions are consistent with the Ministerial conditions imposed on LandCorp for its Albany Protected Harbour proposal (Ministerial Statement 787).

In view of the historical mercury contamination of PRH, the proximity of the mussel farms at Mistaken Island, the advice of the DoH and the small risk of contaminated sediments entering the environment, the EPA considers these recommended conditions to be necessary.

Summary

Having particular regard to the:

a) the sediment analysis undertaken by the APA;

b) the advice from DEWHA that it is satisfied that the results of the additional investigations by the APA, has showed the dredged material is suitable for unconfined sea disposal and that no further sampling is required;

c) the APA's proposed management measures; and

d) the EPA's recommended conditions 7 and 8 relating to water and sediment quality, and mussel monitoring,

it is the EPA's opinion that the proposal can be managed to meet the EPA's environmental objective(s) for this factor.

3.3 Water Quality (post-dredging) – impacts of widening and deepening the entrance channel on the flushing of PRH

Description

Widening and deepening of the entrance channel in between King Point and Vancouver Peninsula has the potential to impact on the flushing of PRH with unintended consequences on water quality. The key question is whether the predicted reduction in current speeds in the channel (and therefore reduction in momentum transport into PRH) caused by an enlarged entrance channel would change the internal circulation of PRH and influence the flushing and residence characteristics of PRH.

The PER document describes that the deepening and widening of the entrance channel would cause the cross sectional area to increase from 4283 square metres (m^2) to 5660 m^2 (a 32% increase). Following the release of the PER, the APA has modified its proposal including the depths of the channel and turning basin, which subsequently

increased the cross sectional area to 6447 m^2 (representing a 50% increase). The new cross sectional area has been evaluated by the APA.

There are a number of physical processes contributing in different ways to the flushing of PRH, including tidal ebb and flow, tidal jetting, wind driven surface circulation and vertical overturning. The use of a three dimensional numerical model, will be necessary to assess the combined effects of these processes on the flushing of PRH.

The APA's assessment of this issue involved running a high resolution three dimensional hydrodynamic model for the two entrance configurations (pre- and post dredging) using a numerical 'dye' tracer technique for a duration of 15 days. Based on this study the APA concluded that there would be a slight increase in the exchange of waters between PRH and KGS, which will slightly improve flushing and will have no impacts on the tidal range in PRH. This is further explained in Section 11 of the APA's *Port Development Oceanographic Studies and Dredging Program Simulation Studies* (GEMS, 2009) in Appendix 5 of this report.

Submissions

Submissions on the PER focussed on the following issues:

- the potential for the proposal to alter the dynamics of currents and flushing of PRH and KGS; and
- the potential for the proposal to affect sediment transport processes.

Assessment

The EPA's environmental objective for this factor is to ensure that the effects of the proposal on the water circulation and flushing do not result in adverse effects on the long-term water quality and ecological integrity of PRH.

The area considered for assessment of this factor is the marine waters of PRH and the entrance channel between PRH and KGS.

The EPA notes that previous research has suggested that the depth and width of the entrance channel are important factors in tidal exchange between PRH and KGS and that changes in the configuration of the channel could effect water circulation in, and flushing of, the harbour (Mills and D'Adamo, 1993).

Following the public review of the PER document the EPA requested the APA to undertake further analysis and provide further information in relation to the hydrodynamic modelling described in Technical Appendix 16.1 of the PER (GEMS, 2007). This request for further information was based on a variation to the proposed channel dimensions which increased the new cross-sectional area from 5700 m^2 to 6447 m^2 and for further technical information on the methodology of the APA's assessment.

Based on the new information in the APA's revised the modelling report (GEMS, 2008) (see Appendix 5), the EPA considers that the proponent has undertaken the necessary investigations to demonstrate that the proposed change to the PRH entrance

configuration would not cause dramatic changes in flushing and circulation of PRH and therefore does not pose a risk for long term water quality of the harbour.

Summary

Having particular regard to the additional information provided by the APA, it is the EPA's opinion that the APA has adequately demonstrated through hydrodynamic modelling that the widening and deepening of the entrance channel will not adversely affect the circulation and flushing of PRH and that proposal can be managed to meet the EPA's environmental objective for this factor provided dredging of the entrance channel is implemented in accordance with the berth pocket and channel dimensions described in Schedule 1 of the recommended conditions in Appendix 4.

3.4 Marine fauna – impacts of dredging and construction on protected and migratory fauna

Description

The waters of Albany Harbours are important habitats for both cetaceans (whales) and pinnipeds (seals).

Humpback whales (*Megaptera novaeangliae*) pass through Albany waters on their way to and from their calving grounds in tropical waters, while southern right whales (*Eubalaena australis*) are frequently sighted within the Albany area from mid-April through to October and have occasionally been known to calve within KGS (June to August). These two species are listed in Schedule 1 of the *Wildlife Conservation Act* as species that are rare or likely to become extinct. They are also listed as migratory species and as vulnerable and endangered under the Commonwealth EPBC Act.

Australian sea lions (*Neophoca cinerea*) and New Zealand fur seals (*Arctocephalus fosteri*) are residents in the Albany area, hauling out on the islands and rocks within KGS and vicinity. King Point, adjacent to the Harbour entrance, is a known location where predominately New Zealand fur seals either haul out or rest in the shallow rocky pools. These two species are listed in Schedule 4 of the *Wildlife Conservation Act* and the sea lion is listed as vulnerable under the EPBC Act.

As the APA's geotechnical surveys have shown that rock will not be encountered over the dredge profile, no blasting will be required to implement the proposal. Key elements of the proposal with the potential to impact on marine fauna include dredging and spoil disposal and pile driving activities associated with the construction of the reclamation area.

The PER indicates that noise emissions from dredging activities will result in constant rather than intermittent noise. The noise generated is likely to be at low frequency due to the nature of the seabed and equipment being used. The PER also states that noise from piling activities will be intermittent and is likely to be of a higher frequency than dredging, and may be comparable to noise emitted from acoustic surveys.

In the PER and the response to submissions, the APA commits to strategies for observing cetaceans and establishing a 300 metre marine fauna exclusion zone to

apply during dredging and dredge spoil disposal. The draft DLRMP also commits to establishing a fauna exclusion zone during pile driving activities.

Submissions

Submissions on the PER focussed on the following issues:

- The potential impacts and mitigation on pinnipeds, cetaceans and avifauna.

Assessment

The EPA's environmental objective for this factor is to maintain the abundance, diversity, geographic distribution and productivity of marine fauna at species and ecosystem levels through avoidance or management of adverse impacts and improvement in knowledge.

The area considered for assessment of this factor is the marine waters of KGS and PRH.

The EPA's preference is for the APA to evaluate critical windows of marine environmental sensitivity for protected marine fauna species and to schedule and manage dredging and construction activities to eliminate or reduce the additional dredging-related and construction stress levels to as low as possible.

The proposal, if unmanaged, is likely to have adverse environmental impacts on marine mammals as a result of dredging and piling noise during port construction. Of these two activities, piling noise is considered to be the most significant.

It is recognised that pile driving can impact a range of marine faunal groups, resulting in either avoidance behaviour or temporary or permanent hearing loss. Whether a particular population of animals will be affected, is highly dependant on the physical and geological features of a site, as well as factors such as the method of piling and the pile's material type, size and force applied. While tolerance limits for cetaceans and pinnipeds have been developed, the variable quality and quantity of the available data means that a precautionary approach should be taken. Pinnipeds are more susceptible to behavioural and physiological effects than cetaceans.

The APA has not undertaken numerical modelling of underwater noise, instead proposing the establishment of a marine fauna exclusion zone of 300 metres for cetaceans. APA proposes to utilise a 'soft start-up' procedure to allow cetaceans not sighted to leave the exclusion zone before piling commences. The EPA considers that the APA's procedures for marine fauna impact mitigation will need to be more comprehensive than currently provided for in the draft DLRMP given the proximity of marine mammals and the known use of the area.

The EPA recommends that marine fauna procedures should also provide for the protection of pinnipeds and for an exclusion zone of at least 500 metres. Procedures should also provide for the marine fauna exclusion zone to be maintained by a suitably trained marine fauna observer and, in the event marine fauna is observed within 100 metres of a single piling operation or 150 metres of a concurrent pile driving operations, shut down procedures are invoked. Soft start up procedures should only commence if no marine fauna have been sighted within the exclusion zone

during the pre-start-up visual observations. Piling should only occur during daylight hours.

With the implementation of the above management procedures, the EPA is satisfied that the proposed pile driving operations would not present an unacceptable risk of disrupting cetaceans and pinnipeds.

The EPA understands from advice received from the DEWHA that it has the capacity to impose conditions in relation to the mitigation of marine fauna impacts through the Commonwealth sea dumping permit process and the EPBC Act, should the 'actions' be approved. The EPA has therefore not recommended conditions regarding marine fauna mitigation in order to avoid duplication of requirements between decisions. However, the EPA expects that its advice set out above to be given effect by DEHWA through the either the Sea dumping permit process or the EPBC Act.

In any event the APA's draft DLRMP should be modified to ensure the proposal, and specifically piling activities, is implemented in the manner described above.

Summary

Having particular regard to the:

a) important marine habitats in KGS for both pinnipeds and cetaceans;

b) EPA's advice that the management procedures proposed by the APA for pile driving will need to be more comprehensive than currently provided for in the APA's draft DLRMP, and should this advice be given effect then risks to marine fauna would be manageable; and

c) advice from the DEWHA that in the event the action is approved under the EPBC Act, conditions will be imposed in relation to marine fauna mitigation,

it is the EPA's opinion that the proposal can be managed to meet the EPA's environmental objective(s) for this factor.

3.5 Sedimentation – stability of the offshore disposal site

Description

The implementation of the proposal will generate approximately 11.7 Mm^3 of dredge spoil for offshore sea dumping which will require approval under the Commonwealth's Sea Dumping Act. The APA has evaluated two potential offshore disposal sites in the KGS. The inner site (the preferred site) is located in deep water (approximately 40 metres deep) within KGS in the South Channel between Bald Head and Breaksea Island and is within the APA controlled waters. The outer disposal site is located outside of KGS and the APA port limits. The APA's evaluation of the two sites is described in Section 10 of the PER.

Both disposal sites have been characterised in relation to sediment physical and chemical characteristics and infaunal assemblage. Hydrodynamic investigations of the two sites involved collecting bottom current velocities in order to make preliminary predictions about the stability of both disposal sites. Measured bottom current velocities at the outer disposal site were observed to be similar to the magnitude of

surface current velocities. Based on this data the APA has inferred that strong westerly winds during winter generate what appears to be a shelf wave along the continental shelf outside of KGS resulting in relatively high current speeds at depths of up to 40 metres.

Based on the measured bottom current data, the APA concluded that the outer disposal site would not be stable and therefore, would not provide an environmentally acceptable outcome as the risk of re-suspension at this site is comparatively higher than at the inner disposal site.

Also based on the comparative hydrodynamic investigations of the two sites, the APA therefore eliminated the outer disposal site from further consideration and is seeking environmental approval of the inner disposal site only. No further investigations by way of modelling sedimentation or turbidity were undertaken by the APA for the outer disposal site.

The APA has undertaken simulations of sediment accumulation at the preferred disposal area over 12 months and predicted that while there is likely to be some migration of sediments from the disposal site, most of the sediments will remain at the site and not re-enter KGS. However, the PER has also indicated that these sedimentation predictions are subject to a number of uncertainties due largely to a limited ability to accurately simulate the re-suspension processes driven by ocean currents near the sea bed and by orbital velocities generated near the sea bed by wave action.

Field observations in support of the preferred disposal site include the dominant particle size for the inner disposal area which was determined to be very fine sand (~125 µm) whereas that for the outer disposal area was fine sand (~250 µm), suggesting milder bottom current velocities at the preferred site. In addition, observations from one survey show there are no signs of wave action by way of sand ripples on the seabed of the preferred site suggesting that the site may be stable.

Overall the APA concludes that sediments placed at this site will be largely non-dispersive and will not re-enter KGS; ensuring that benthic habitat, recreational areas, aquaculture and fisheries will not be adversely impacted.

The disposal of material at the APA's preferred site will have impacts on benthic epifuana and infaunal communities over the footprint of the disposal site (approximately 250 hectares) through burial and smothering. The APA's investigations show that there is greater species richness and abundance of fauna at the preferred disposal site than at the outer disposal site. This is attributable to the greater depth of sand and habitat at the preferred site. The APA predicts that benthic infauna and epifauna will recolonise the disposal site over a period of 2-4 years and return to a similar condition. As such the APA expects that the impact will be short-term and reversible.

Submissions

Submissions on the PER focussed on the following issues:

- a preference for the alternative disposal site, outside KGS, to be utilised by the proponent to minimise impacts on environmental and social values;
- other alternative disposal sites to be examined by APA; and
- the stability of material placed at the proponent's preferred disposal site.

Assessment

The EPA's environmental objective for this factor is to ensure that environmental values of KGS are maintained and protected from the effects of sedimentation from the disposal site.

The area considered for assessment of this factor is the marine waters and seabed in KGS between Bald Head and Breaksea Island.

The EPA notes that a number of submissions on the PER have expressed a view that the APA should have selected the outer disposal site as part of the proposal to reduce its environmental impacts on KGS. The EPA notes that the disposal of the sediments at the outer disposal site would reduce the risk to key environmental and social values of KGS due to its greater distance from sensitive receptors such as aquaculture leases, benthic primary producer communities and recreational diving sites.

The EPA also notes that the APA has selected the inner disposal site on the basis of other issues such as dredge cycle times (i.e. the time taken to transport material to the disposal site and return to dredging) which could have a bearing on the overall duration of the dredging campaign. If the outer disposal site is further considered and selected by the APA then the dredging campaign would need to be remodelled to determine the effect of a new disposal location and potentially longer dredge cycle times on the overall duration of the proposal and its implications on key environmental attributes such as seagrass communities.

Notwithstanding the view expressed by submitters that the outer disposal site should be chosen, the EPA considers that the APA has undertaken the necessary investigations to conclude that the proposed inner spoil ground is likely to be stable and not cause sedimentation of marine communities in KGS. Additionally, it is noted that at a finished depth of 35 metres, the proposed disposal ground would be one of the deepest sites in Western Australia and below the influence of orbital velocities from waves and swell.

The EPA considers that monitoring requirements with respect to the disposal ground should cover the following:

- The APA should delineate the perimeter boundaries of the disposal site and undertake bathymetric surveys immediately following the completion of proposal to verify: (a) that the spoil has been located in the correct area; and (b) to determine whether there has been any significant loss of dredge spoil from the area during the dredging program.

- A further bathymetric survey 12 months following the completion of the spoil ground would also be required to confirm the APA's prediction that the disposal ground will be stable.

The DEWHA has advised that conditions on the sea dumping permit would require the APA to survey the pre and post-dumping bathymetry of the disposal ground. Hence, to avoid duplication of requirements the EPA is not recommending conditions for the ongoing monitoring and management of the spoil ground.

Summary

Having particular regard to the:

a) APA's investigations which suggest that the outer disposal site option is unlikely to be stable;

b) APA's investigations which concludes that its preferred spoil ground in KGS is likely to be stable; and

c) the ability of DEWHA to impose conditions on APA to monitor the stability of the spoil ground,

it is the EPA's opinion that the proposal can be managed to meet the EPA's environmental objective for this factor provided conditions are imposed by DEWHA through the sea dumping permit to require the APA to monitor the stability of the spoil ground and verify the APA's predictions.

3.6 Water quality – impacts of turbidity on recreational and commercial activities

Description

Recreational activities

The marine waters of KGS are extensively used by people for recreation including boating, fishing, swimming, diving and whale watching. Swimming beaches include Middleton, Goode, Gull Rock and Whalers Beach in Frenchman Bay. Commercial dive tours operate in the Sound utilising dive sites near Michaelmas and Breaksea Islands and the HMAS Perth dive wreck near Seal Island. Whale watching occurs from June to October.

Section 9.1.6 of the PER provides further details regarding the predicted impacts on recreational values. Activities such as swimming and scuba diving in KGS are likely to be affected intermittently during the implementation of the proposal due to increased turbidity from dredging. Modelling of the dredging program has been undertaken to predict Total Suspended Solid (TSS) concentrations at key sites. It is noted that these outputs do not include background TSS concentrations. Based on the outputs of the dredge plume modelling the APA predicts that:

- Some of the beaches in Frenchman Bay will be exposed to an average TSS concentration of 1 mg/L during the July to October scenario and 5 mg/L during the March to June and November to February scenarios.

- Middleton Beach will be exposed to an average TSS of between 1 and 5 mg/L during the March to June and November to February scenarios, with less turbidity (average 1 mg/L) predicted during the July to October scenario.

- Gull Rock Beach will be exposed to an average TSS of 10 mg/L during the March to June and July to October scenarios, with less TSS (average 5 mg/L) during the November to February scenario.

- Some portions of Oyster Harbour may be subjected to very occasional low TSS concentrations (average 1 mg/L) at various times throughout the dredge programme.

Although the APA does not expect the HMAS Perth dive site and reefs will be affected by the proposal, it is noted that time-series plots of TSS in Figures 9.11, 9.12 and 9.13 of the PER show that the dive site is likely to receive short term turbid events (between 1 and 4 mg/L) for a number of days during the March to June scenario while Gio Batta Patch site is likely to receive more frequent and intense turbid events between 1 and 10 mg/L during the March to June scenario and between 1 and 6 mg/L during the July to October scenario.

Commercial fishing and aquaculture
Pilchard is the most abundant species harvested in KGS through the South Coast purse-seine fishery. A feature of the pilchard fishery in KGS is that the fish are normally caught relatively close to the unloading jetty at Emu Point and consequently can be landed quickly and in very fresh conditions. The proposal could have impacts on the fishery if dredging activity drives pilchard schools out of the KGS, and into more distant waters. The APA predicts that fish stocks will not be impacted by the proposal.

The aquaculture operations in the vicinity of Mistaken Island in KGS are at risk of being influenced by changes in water quality due to dredging. These operations are used to cultivate mussels on long lines. Based on modelling of the dredge plume the APA predicts that the aquaculture leases near Mistaken Island are potentially exposed to an average TSS concentration of 1 mg/L under the July to October and November to February scenarios, and an average of 5 mg/L under the March to June scenario. The time-series plots of TSS also suggests that the March to June season is likely to result in the most intense and frequent number of short term turbid events, with some events being well over 15 mg/L due mainly to the prevailing easterly wind patterns. In the PER the APA predicts that it is anticipated that short periods of sediment loading greater than the predicted average of 1 to 5 mg/L will not adversely impact mussel production as mussels can withstand high silt loading over short periods by closing their valves.

Submissions
Submissions on the PER focussed on the following issues:

- potential impacts on marine based recreational activities in KGS such as diving, whale watching and swimming;
- potential impacts on commercial fisheries such as the pilchard fishery during the dredging program;

- potential impacts on mussel farms at Mistaken Island ; and
- potential for loss of fishing grounds as a result of the proposal.

Assessment

Recreational activities

The EPA's environmental objective for this factor is to ensure that the environmental value of recreational and aesthetics is protected. The EPA's environmental quality objectives (EQOs) for this value:

- Maintenance of primary contact recreation values;
- Maintenance of secondary contact recreation values; and
- Maintenance of aesthetic values,

apply throughout KGS, Oyster Harbour and PRH.

The impacts of the proposal on water quality from the dredging of potentially contaminated sediments and the EPA's recommended requirements for this issue is set out in section 3.2 of this report.

The EPA notes that modelling of average TSS concentrations during the dredging program indicates that a large portion of KGS and small portions of PRH and Oyster Harbour will be subject to some influence of turbidity from dredging.

On the basis of the information provided, the EPA concludes that impacts from dredging on recreational and aesthetic values will affect activities such as swimming and diving in high usage areas such as Middleton, Gull Rock and Frenchman Bay beaches, and other sections of KGS and PRH, at certain times depending on the wind and currents during dredging. It is expected however that water clarity and turbidity will return to within natural variation following the completion of the dredging program.

As part of the EPA's assessment of the impacts of the proposal on seagrass communities, the EPA has recommended a condition which would effectively require the APA to undertake the dredging of the channel outside the November to February season (see recommended condition 5-1). The EPA considers that this requirement would also have the effect of avoiding impacts on the recreational activities during summer when it is expected that the recreational usage of KGS and PRH will be at its peak.

In view of the EPA's recommended condition which requires the dredging of the shipping channel to occur outside the peak summer period, combined with the fact that impacts from dredging on recreational activities and amenity will be temporary, it is the EPA's opinion that proposal will not significantly compromise the EPA's objectives for this factor.

Notwithstanding the above, should the Stage 2 dredging program occur during the spring or autumn period the EPA recommends that the APA develops and implements a program of monitoring during the dredging program that is linked to an appropriate management and communication framework to determine whether the above EQOs are being achieved. The program should include monitoring of turbidity and/or TSS at

high usage areas such as the swimming beaches in KGS and dive sites, against pre-determined trigger levels.

Water quality monitoring at beaches should also be undertaken to analyse for toxicants such as mercury against primary contact screening values given in the NHMRC (2008) *Guidelines for Managing Risks in Recreational Waters*. If these values are exceeded the DoH, DoW and City of Albany should be notified immediately and appropriate actions implemented.

All monitoring results, including any exceedance and management actions implemented, should be communicated to the relevant users of the Sound, such as commercial dive tour operators, and be made publicly available.

The EPA notes that while the APA has committed to engaging with the City of Albany to formulate and supplement an appropriate recreational water quality monitoring program for the proposal, the details of monitoring program have not yet been developed. The EPA considers that such a program should incorporate the advice set out above.

Commercial fishing and aquaculture
The EPA's environmental objective for this factor is that the environmental value of fishing and aquaculture is maintained. The corresponding environmental quality objectives are:

- Maintenance of seafood safe for human consumption; and
- Maintenance of aquaculture.

These environmental quality objectives have also been discussed in section 3.2 of this report in the context of the potential release of toxicants from sediments.

The EPA notes there is uncertainty regarding the pilchard fishery and its response to or potential recovery from dredging related pressures such as suspended sediments. The key issue in relation to the commercial pilchard fishery is understood to be the potential short to medium-term avoidance of KGS by pilchards during and following dredging, and the reduced access to fishing grounds in KGS as a result of the proposal.

In relation to schools of pilchards leaving the KGS due to dredging, the EPA notes the advice of the DoF that this outcome is not anticipated, on the basis modelling provided in the PER, but that it is important that a mechanism is available to address the situation should it occur.

The APA has indicated in its response to submissions that commercial fisherman will still be able to fish in the proposed channel outside times of shipping movements.

The EPA notes and supports the APA's commitment to liaise with the DoF and fishing industry representatives to utilise the existing fish monitoring program and stock assessments as the basis of monitoring the impacts of the proposal. The details of such a program should be finalised prior to the commencement of dredging.

The EPA supports the advice of the DoF that there should be a consultative mechanism is established whereby the South Coast purse seine fishery can provide input into any unforseen impact on the pilchard fishery and the APA's management responses. It is noted that the APA has included the formation of such a group in the draft DLRMP.

In relation to the aquaculture operations near Mistaken Island the EPA considers that APA should monitor the impacts of the proposal at the mussel farm operations against site-specific turbidity/TSS trigger levels to determine whether the EPA's EQO for maintenance of aquaculture is being maintained. The development of the trigger levels should be informed by consultation with the mussel farm operators, an adequate baseline data set and advice from the Department of Fisheries. The EPA has recommended a condition which requires the APA to develop turbidity trigger levels, monitor against the agreed trigger levels and undertake management responses in the event the trigger levels are exceeded (see recommended condition 10). The EPA has also recommended condition (see section 3.2) for the establishment of a sentinel mussel program to operate in the vicinity of the mussel farm.

The trigger levels for turbidity and response protocols should be incorporated into the APA's final DLRMP.

In view of the potential impacts on recreational users, commercial fisheries and aquaculture operations the EPA considers that a Community Stakeholder Reference Group be established by the APA to provide a mechanism for information exchange between the APA and users of KGS. This includes making available the results of monitoring and the APA's responses to any exceedances. Membership of the group should comprise of representatives from commercial dive operators, mussel farm operators, commercial fisheries, the City of Albany and the Department of Water. The EPA advises that this group will need to be established prior to the commencement of dredging and be regularly convened during the dredging program. Issues to consider within this group include the ways in which the dredge schedule, timing and management can be planned to avoid or minimise impacts to the recreational users of KGS, dive sites, aquaculture operations and the pilchard fishery's peak season.

Summary

Having particular regard to:

a) the EPA's recommended condition 5-1, which if implemented, would avoid dredging impacts on marine based recreational activities during summer and that that impacts from the proposal on recreational and aesthetic values outside the summer period would be temporary;

b) the APA's commitment to monitor the recreational impacts of the proposal;

c) the APA's commitment to liaise with the DoF and the fishing industry on monitoring the impacts of the proposal on the pilchard fishery; and

d) the EPA's recommendation that a community stakeholder reference group be established by the APA to provide a mechanism for users of KGS and the APA to exchange information about monitoring and management of the proposal, and to minimise impacts on the social values of KGS; and

e) the EPA's recommended condition 10 in relation to the management of impacts on the mussel farm operations near Mistaken Island,

it is the EPA's opinion that the proposal can be managed to meet the EPA's environmental objective(s) for this factor.

It is expected that the EPA's recommendations and advice set out above is incorporated into the APA's draft DLRMP.

3.7 Environmental principles

In preparing this report and recommendations, the EPA has had regard for the object and principles contained in s4A of the *Environmental Protection Act (1986).* Appendix 3 contains a summary of the EPA's consideration of the principles.

4. Conditions

Section 44 of the *Environmental Protection Act 1986* requires the EPA to report to the Minister for Environment on the environmental factors relevant to the proposal and on the conditions and procedures to which the proposal should be subject, if implemented. In addition, the EPA may make recommendations as it sees fit.

In developing recommended conditions for each project, the EPA's preferred course of action is to have the proponent provide an array of commitments to ameliorate the impacts of the proposal on the environment.

4.1 Recommended conditions

Having considered the information provided in this report, the EPA has developed a set of conditions that the EPA recommends be imposed if the proposal by APA to expand the port of Albany, is approved for implementation.

These conditions are presented in Appendix 4. Matters addressed in the conditions include the following:

a) Dredging – that no dredging of the shipping channel should occur between 1 November and 28 February in any year.

b) Seagrass communities – conditions specifying the zone of total permanent loss of seagrass in KGS and PRH.

c) Seagrass communities – conditions requiring ongoing monitoring of underwater light attenuation and seagrass health against seagrass health indicators. Management responses to be implemented in the event seagrass health criteria are exceeded.

d) Seagrass communities – conditions in relation to the rehabilitation of at least 1 hectare of seagrass in PRH.

e) Reef communities – conditions to ensure that the proposal does not impact on the reef communities at Gio Batta Patch and Michaelmas Reef in King George Sound.

f) Water and sediment quality (mercury) – conditions requiring monitoring of mercury in water and sediments to ensure that environmental quality objective for

maintenance of ecosystem integrity and the criteria established for this objective is met during the dredging program.

g) Water and sediment quality (mercury) – conditions requiring that dredging of the portion of the proposed shipping channel with sediments containing mercury be undertaken without overflow.

h) Mussel monitoring – conditions requiring the monitoring of mercury in mussels in the vicinity of Mistaken Island to ensure the EPA's environmental quality objective for the *maintenance of seafood safe for human consumption* is being met during and after the dredging program.

i) Introduced Marine species – conditions requiring the inspection of any dredging equipment/plant for this proposal for marine pests and the implementation of a management strategy should pests be detected.

5. Other Advice

Role of Department of Water

The Department of Water (DoW) is the lead agency in relation to the environmental management of the Albany harbours (Oyster and PRH), particularly with regard to seagrass and water quality management. The proposal, should it proceed, will require a dredging licence from the DoW under the *Waterways Conservation Act* for the proposed works in PRH which will need to detail the dredging methods, management measures and monitoring program.

It is understood that as part of the licence application process the DoW will require the APA to prepare a Dredging and Reclamation Management Plan as a means of documenting and consolidating the APA's environmental management measures, monitoring program and contingencies. It is expected that this Dredging and Reclamation Management Plan would address the APA's Stage 1 dredging as a discrete component of the proposal. Stage 1 of the proposal includes the dredging of the berth pockets and turning basin with a CSD and placement of this material directly into the reclamation area for a new berth. Other aspects include wharf construction which involves construction of the seawall, pile driving, and preparation of the reclamation area for its intended use. The duration of Stage 1 will be 3 months.

The EPA expects the following issues to be clearly set out in the Stage 1 Dredging and Reclamation Management Plan:

- the detailed construction and timing of the reclamation area;
- best practice dredging management including the specification of management measures to minimise turbidity generation;
- development of trigger levels for turbidity, light attenuation and seagrass health linked to a agreed and pre-determined set of management responses;
- the precise monitoring locations for water quality and seagrass health parameters; and

- the ongoing monitoring and management of any organic material that may accumulate in the narrow enclosed area between the reclaimed structure and the existing rocky shoreline to avoid any adverse ecological and amenity impacts.

The above items are not considered to be sufficiently detailed in the current version of APA's draft DLRMP and will need to be further developed to provide greater certainty about the manner in which the reclamation works will be managed and monitored. This has not been recommended as a condition under the EP Act as it is understood that the dredging licence under the *Waterways Conservation Act* would require the APA's draft DLRMP to be modified as necessary for the Stage 1 works.

6. Recommendations

The EPA submits the following recommendations to the Minister for Environment:

1. That the Minister notes that the proposal being assessed is for the expansion of the Port of Albany;
2. That the Minister considers the report on the key environmental factors and principles as set out in Section 3;
3. That the Minister notes that the EPA has concluded that it is unlikely that the EPA's objectives would be compromised, provided there is satisfactory implementation by the proponent of the recommended conditions set out in Appendix 4, and summarised in Section 4; and
4. That the Minister imposes the conditions recommended in Appendix 4 of this report.

Appendix 1

List of submitters

Organisations:
Downtime Shells
Conservation Council of Western Australia
Western Australian Fishing Industry Council
Smithson Planning
Fish Processing Factory
Department of Health
Department of Planning and Infrastructure
Department of Water
Department of Environment and Conservation
Western Australian Museum
Department of Indigenous Affairs
Heritage Council of Western Australia
Department of Fisheries

Individuals:
Richard Keeler
Tony Harrison

Appendix 2

References

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Appendix 3

Summary of identification of key environmental factors and principles

Preliminary Environmental Factors	Proposal Characteristics	*Government Agency and Public Comments*	Identification of Key Environmental Factors
BIOPHYSICAL			
Benthic Primary Producer Habitat	<u>Dredging</u> Dredging of 12 Mm^3 of marine sediment over an area of 274 ha. <u>Reclamation</u> Up to 9ha. <u>Disposal Site</u> Preferred site is located in deep water (-40m) within King George Sound.	In relation to <u>dredging and the disposal site</u>, submissions from the public focused on issues including: • The high level of risk with channel dredging of this magnitude. • Turbidity caused by dredging affecting the health and vigour of seagrasses including long-term redistribution of sediment. • Inadequate and inappropriate sediment plume management. • Inadequate description and mapping of seagrass habitat. • Potential for the reef coral communities of Gio Batta Patch and Michaelmas Reef to be affected by dredging program. • That the benthic habitat of Oyster Harbour, which is potentially in the area of influence, may be impacted. • Concern that seagrass transplanting will not be successful and therefore 'a like for like or better' will not occur resulting in a loss of seagrass meadow. • Seagrass meadows, its inhabitants and functions will be lost before the replacement meadows are established. • Concern that the predicted 250ha footprint containing the dredged material will expand to a larger area in a short period of time. • Several reef complexes in close proximity to the preferred disposal site that are not acknowledged in the PER may be affected by sedimentation. • The re-suspension and relocation of disposed sediment from the disposal site to other areas including Gio Batta Patch and Michaelmas Reef. The DEC raised issues regarding: • Benthic habitat mapping and recommends the mapping be revised and subject to expert review. • Modeling of impacts associated with dredging, land reclamation and spoil disposal. • The modeling for zones of impact, effect and influence lacking and believes the modeling should be peer reviewed. • Lack of information on the modeling of the alternative disposal sites. • Insufficient monitoring of seagrass health and the reef systems The DEC considers it necessary for the proponent to: • Demonstrate the effectiveness of seagrass rehabilitation as an offset and prepare an offset strategy. • Undertake real time modeling validation be undertaken to enable	**The EPA considers that Benthic Primary Producer Habitat is a key environmental factor. See discussion in Section 3.1 of this report.**

Preliminary Environmental Factors	Proposal Characteristics	*Government Agency and Public Comments*	Identification of Key Environmental Factors
		early evaluation of the accuracy of the predicted turbidity • Provide an analysis of the likely receptors that will be affected by spoil disposal.	
Marine Fauna	Dredging and disposal Increased underwater noise emissions from dredging and construction activities. Physical injury to cetaceans due to vessel strike. Habitat degradation and reduction.	In relation to dredging and the disposal site, public submissions focused on issues including: • Filter feeding planktivores such as pilchards will be sensitive to turbid waters that may clog their gills when foraging. This could lead to short to medium term avoidance of King George Sound during and following dredging. • Reef complexes that provide habitat for highly localized gastropods may be affected by sedimentation. DEC's submission highlighted • Information gaps on pinnipeds, cetaceans, and avifauna. • The dredge schedule lacks information on the timing of dredging in relation to whale migration, seagrass recruitment/growth and coral spawning. The DEC considers that the proponent needs to identify how the project activities will be managed to avoid and mitigate impacts.	**The EPA considers that Marine Fauna is a key environmental factor. This is further discussed in section 3.4 of this report.**
Flora and Vegetation	Removal of 0.78ha of vegetation (0.31 remnant native and 0.48ha degraded vegetation. 0.31 ha from within Mt Adelaide A Class Reserve 27068.	The DPI is supportive of the alternative option for the land reclamation area which would create a rocky tidal pool and limit impacts on the adjacent 'A' Class Reserve 27068. The DoW considers that impacts to the rocky shoreline and vegetation could be reduced if the size of the land reclamation area was reduced. The WA Museum considers it inappropriate to clear native vegetation protected in an A class reserve. The DEC is concerned that conservation significant flora located adjacent to the reclamation area will be impacted and the proponent needs to identify threats and provide management actions.	The APA has modified the proposal to avoid any impact to the flora and vegetation within Mt Adelaide A Class Reserve 27068. **In view of the above, the EPA considers that Flora and Vegetation does not require further consideration in the EPA's report.**
Introduced marine species	Dredging and disposal Potential for dredge vessels and other construction equipment to introduce or spread exotic marine organisms. Ongoing Port Operations /Following Dredging and Reclamation	The Department of Fisheries recommends that the Dredge Management Plan address the issue of introduced marine species on dredge, equipment and support vessels.	The EPA has recommended a condition which requires the APA to inspect any dredging and marine construction equipment for marine pests and implement management strategies in consultation with the Department of Fisheries in the event marine pests are identified. See recommended condition 9 in

Preliminary Environmental Factors	Proposal Characteristics	*Government Agency and Public Comments*	Identification of Key Environmental Factors
	The number of ships visiting the port will increase the risk of marine pest incursions		Appendix 4. An increase in vessel movements to and from Albany Port will increase the risk of marine pest incursions to the Sound. The regulation of ballast water from international shipping is a Federal issue under the control of the Australian Quarantine and Inspection Service (AQIS). All vessels entering Australian waters from overseas ports must comply with AQIS Australian Ballast Water Management Requirements (2000). **In view of the EPA's recommended condition to manage marine pests from dredging equipment and existing controls on ballast water from shipping, the EPA considers that introduced marine species does not require further evaluation in the EPA's report.**
Coastal Processes/Hydrodynamics	Deepening and widening the channel into the port and land reclamation may alter flushing and channel flow, tides and shoreline wave action, alongshore erosion and sediment transport processes.	Submissions from the public and Government Agencies in relation to the deepening and widening of the channel and land reclamation expressed concern that the proposal will potentially cause the dynamics of the currents to change resulting in changes to flushing of King George Sound and cause sediment deposition in other areas of King George Sound and PRH.	**The EPA considers that the impacts of the proposal on the flushing of PRH is considered to be a key environmental factor and is discussed further in section 3.3 of this report.** The APA has undertaken modelling of the potential effects of the proposed shipping channel on wave heights off Middleton Beach. The modelling shows that the wave heights off Middleton Beach were unchanged and hence APA predicts that the proposal is unlikely to result in changes to

Preliminary Environmental Factors	Proposal Characteristics	*Government Agency and Public Comments*	Identification of Key Environmental Factors
			coastal processes and will not alter the existing pattern of seasonal erosion and accretion. **Sediment transport processes therefore does not require further discussion in the EPA's report.**
POLLUTION			
Marine sediment and water quality	Dredging, disposal and land reclamation	In relation to dredging, public submissions focused on issues including: • Extended periods of turbidity may result in chronic effects on water quality. • Potential for the release and redistribution of mercury and other contaminants from the sediments. In relation to the disposal site, an issue was raised that dredged spoil may be anoxic and contain Hydrogen Sulphide which could lead to reduced dissolved oxygen levels on the sea floor and also toxicity which could have biological impacts on the sea floor surrounding the disposal site. The DPI raised the issue of the discharge of water and stormwater and recommends that a drainage and stormwater management plan be prepared for the reclamation area. The DoW raised issues regarding dredging and land reclamation, including: • Inadequacy of the Dredge Management Plan in terms of the timing and monitoring plan. In particular the management of the sediment plume, advising the proposed tiered management response will result in a considerable period of time lapsing between impacts and a response occurring. It recommends that pre-determined water quality criteria parameters be used as a trigger rather than seagrass monitoring. • Recommends monitoring of shellfish from the nearby aquaculture farms be monitored for mercury and lead. • The DoW should be consulted in relation to water quality monitoring, seagrass mapping, seagrass offset, reporting and for obtaining a dredging license. The DEC submission identified issues with dredging and disposal: • The baseline water quality study insufficient and recommends that	**The EPA considers that Marine sediment and water quality is a key environmental factor and is discussed further in section 3.2 of this report.**

Preliminary Environmental Factors	Proposal Characteristics	*Government Agency and Public Comments*	Identification of Key Environmental Factors
		an adequate study be undertaken in consultation with DEC and DOW prior to commencement of dredging and reclamation. • The information on sediment sampling and recommends sampling be undertaken across entire area of influence. • The dredge spoil and recommends and operational sediment sampling program of dredge spoil be undertaken. • Monitoring of water quality. In relation to <u>on-going operations</u>, the DOH advised that increased shipping operations could potentially impact on water quality and marine sediment quality in the port area due to vessel maintenance, TBT, other antifoulants, ballast and spills. It recommends an ongoing monitoring plan be developed for location close to recreation beaches and mussel farms.	
Noise	<u>Construction</u> Noise generated by construction activities including transport, pile driving, dredging and land preparation may impact noise-sensitive premises near the port.	In relation to <u>noise</u>, the DEC identified two issues being:- • pile driving; and, • materials transport for land reclamation. The DEC recommends the proponent: • Commit to using other pile driving methods that have lower sound power. • Consult with the occupiers of R2 regarding piling noise and make an arrangement with them that minimises noise impact. • Assess the potential noise impact n the community from materials transport and identify how any impacts will be managed. • Develop a Noise Management Plan under Noise Regulation 13, for approval by the DEC or City of Albany. The issue of noise was also noted by DPI as needing to be managed. The DoH raised issues regarding noise and dust and recommends: • A Dust Management Plan be incorporated into the construction phase and also for continual monitoring of the air emission during port activities • The potential impacts of transport on the local communities be considered and managed by the proponent.	Construction Noise will be managed under Regulation 13 of *Environmental Protection (Noise) Regulations 1997*, which will require submission of a Noise Management Plan to the City of Albany prior to construction. The APA has committed to prepare a noise management plan for all aspects of dredging and reclamation. The plan will outline how noise will be reduced through design, operational procedures and will outline monitoring strategies to measure the effectiveness of these controls. **Accordingly, the impacts of noise do not require further consideration by the EPA.**
SOCIAL SURROUNDINGS			
Heritage and Cultural Significance	<u>Dredging</u> Potential for unidentified maritime sites to be impacted	Concern was expressed that the maritime heritage sites Semaphore Point and Ataturk Passage may be impacted by sedimentation. The WA Museum raised issues including:	The DIA has advised that the port expansion has no aboriginal heritage sites and that no issues or concerns are apparent.

Preliminary Environmental Factors	Proposal Characteristics	*Government Agency and Public Comments*	Identification of Key Environmental Factors
	through direct disturbance or sedimentation from turbidity dynamics.	• That no consideration has been given to the possibility that Aboriginal heritage materials may be found in the dredge area. • The limited desktop analysis into maritime heritage and recommended a more thorough analysis utilising primary archival and summaries of secondary sources be undertaken by a qualified archaeologists. • Artifacts may be uncovered and their significance not recognised. It recommends an archaeologist be involved in the survey phase to identify possible archaeological features and then on-site when dredging of these areas occurs.	There are no historic heritage places within the footprint of the proposed and two immediately adjacent; Point King Lighthouse and the Pilot's Houses, Semaphore Point. The APA has committed to reviewing the results of a magnetometer survey with the WA Museum and have any possible archaeological features that may be identified being further examined by divers before dredging commences. The APA also has procedure in place for the discovery of any maritime sites during the implementation of the proposal. In view of the above the EPA does not consider this factor requires further consideration in the EPA's report.
Visual and landscape values	Land reclamation will extend industrial land eastwards reducing natural foreshore.	Public submissions expressed concern: • That the size of the port expansion and the shed is out of scale with the natural environment and will damage the visual amenity of the harbour entrance from a number of view points. • Dredging will impact the visual amenity for local residents, recreational boating, scenic tourist sites and charter boat tours. The DPI considers the visual impacts significant and recommends orientating the reclaimed area, supports the use of local granite, that built structures be dark grey and have different features such as ridges. The WA Museum considers the decrease in amenity for views from the Boardwalk and Ataturk's Memorial unacceptable. The Heritage Council of WA considers there will be a high adverse impact on the views from Mt Adelaide and Mt Clarence as a consequence of the reclamation and new berthing facilities and stated	The EPA notes the proposed Port expansion is an extension of an existing reclaimed port area that is already visible from several vantage points. It is noted that there will be a further reduction of visual amenity caused by this proposal and combined with the implementation of the Southdown Magnetite proposal. The use of granite rock armouring as proposed in the APA's PER document will limit impacts. It should be noted that the proposal being considered is for the land reclamation only and does not

Preliminary Environmental Factors	Proposal Characteristics	*Government Agency and Public Comments*	Identification of Key Environmental Factors
		that it is not clear how the impacts can be ameliorated given the nature and location of the proposal.	include the construction and operation of port facilities such as storage sheds and loading facilities. These elements form part of the proposal by Grange Resources for the Southdown Magnetite Proposal which have been assessed by the EPA and approved by the Minister for Environment by way of Ministerial Statement 816. Ministerial Statement 816 includes conditions which require the proponent to prepare a Visual Impact Management Plan for the mine and port infrastructure to minimise impacts on the visual amenity of the surrounding area. **Based on the above Visual Amenity does not require further discussion in the EPA's report.**
Recreation and commercial activities	Dredging and land reclamation Recreation Turbidity associated with the proposal may impact water quality at nearby beaches, dive wrecks, decrease visual amenity and impact tourism. Commercial Higher sediment loads may impact marine species behavior such as feeding and cause physiological disturbance such as clogging filter–feeding features of commercial marine species. .	Public submissions in relation to recreation raised the issue of dredging and its potential impacts in users of KGS. Activities likely to be affected include swimming, diving, whale watching and fishing. Submissions from the commercial fishing and shellfish industry expressed concern on several issues including: • The potential for contamination of pilchards from the release of mercury from the sediments. • The loss of 1.8 km of traditional fishing grounds as maritime law does not permit fishing in navigation channels. In addition, the dredged channel will provide habitat sought after by sardines being deep water with steep banks. • The potential for disposed sediments to impact on nearby reefs that provide habitat for gastropods whose shells are commercially harvested. • Changes to the currents as a result of the changed bathymetry could have significant impacts on plankton distribution and productively and therefore on the distribution, abundance and availability of pilchards to both fishers.	**The impacts of the proposal on recreational activities and commercial fishing and aquaculture is considered to be a key environmental factor and is further discussed in section 3.6 of this report.**

Preliminary Environmental Factors	Proposal Characteristics	*Government Agency and Public Comments*	Identification of Key Environmental Factors
	<u>Ongoing Port Operations /Following Dredging and Reclamation</u> Conflicts with existing users.	• The expansion, specifically the dredging activity and dumping of spoil, will severely impact and potentially close fishing, as a result of: – Short term impacts on fish populations within King George Sound once dredging commences. – Reduced access to fishing grounds in the channel, the disposal site and the areas the plumes will occur. – The proposed disposal site for dredge spoil being one of the key fishing areas, particularly over the summer months. – Long term irreparable damage that results in pilchard populations no longer inhabiting King George Sound long after dredging activities ceases. The DoH noted the area is fished and crabbed, frequented by swimmers and SCUBA divers and that mussels are farmed nearby. It recommends: • A management plan and response protocol be prepared • That an increased sampling program of water and mussels (in addition to current WASQAP testing requirements for the harvest area and guidelines for recreational areas) during dredging and for a reasonable period afterwards be undertaken.	

PRINCIPLES		
Principle	**Relevant Yes/No**	**If yes, Consideration**
1. The precautionary principle *Where there are threats of serious or irreversible damage, lack of full scientific certainty should not be used as a reason for postponing measures to prevent environmental degradation.* *In application of this precautionary principle, decisions should be guided by –* *(a) careful evaluation to avoid, where practicable, serious or irreversible damage to the environment; and* *(b) an assessment of the risk-weighted consequences of various options.*		
	Yes	In considering this principle, the EPA has been aware that there is a degree of uncertainty around the likely impacts associated with a number of factors considered in this assessment. Where the level of uncertainty is moderate to high and the significance of the environmental values associated with a factor is also high, then the EPA has taken a precautionary approach to its assessment and applied stringent conditions. This approach has been applied in particular to: - impacts on benthic primary producer habitats, and - potential mobilisation of toxicants from sediments.
2. The principle of intergenerational equity *The present generation should ensure that the health, diversity and productivity of the environment is maintained and enhanced for the benefit of future generations.*		
	Yes	In considering this principle the EPA notes that: - this proposal is for dredging and reclamation which could take up to 32 weeks. The majority of impacts of the proposal will be confined to during the duration of the dredging and reclamation. - It is expected that the environmental and social values of KGS and PRH will continue to be maintained once the proposal is completed.
3. The principle of the conservation of biological diversity and ecological integrity *Conservation of biological diversity and ecological integrity should be a fundamental consideration.*		
	Yes	In considering this principle the EPA notes that: - the ecological and social values of KGS and PRH and the EPA's environmental quality objective of *Maintenance of ecosystem integrity* are considered relevant and are discussed in the body of this report under the relevant factors of benthic primary producer communities and water and sediment quality.

Appendix 4

Indentified Decision-Making Authorities
and
Recommended Environmental Conditions

Nominated Decision-Making Authorities

Section 44(2) of the *Environmental Protection Act 1986* (EP Act) specifies that the EPA's report must set out (if it recommends that implementation be allowed) the conditions and procedures, if any, to which implementation should be subject. This Appendix contains the EPA's recommended conditions and procedures.

Section 45(1) requires the Minister for Environment to consult with decision-making authorities, and if possible, agree on whether or not the proposal may be implemented, and if so, to what conditions and procedures, if any, that implementation should be subject.

The following decision-making authorities have been identified for this consultation:

Decision-making Authority	Approval
1. Minister for Transport	Port Authorities Act 1999
2. Department of Water	Waterways Conservation Act

Note: In this instance, agreement is only required with DMA #1 since this DMA is a Minister.

RECOMMENDED ENVIRONMENTAL CONDITIONS

STATEMENT THAT A PROPOSAL MAY BE IMPLEMENTED (PURSUANT TO THE PROVISIONS OF THE *ENVIRONMENTAL PROTECTION ACT 1986)*

ALBANY PORT EXPANSION PROJECT

Proposal: The proposal is for the dredging of 12 million cubic metres of sediments to widen and deepen the existing shipping channel into Princess Royal Harbour and to extend the shipping channel into King George Sound to allow access of cape-size vessels to the Port. Dredged material will be disposed offshore at a location in King George Sound.

A portion of the dredged material will be used for reclamation of up to 9 hectares of Princess Royal Harbour to construct a new berth (Berth 7). The proposal is documented in schedule 1 of this statement.

Proponent: Albany Port Authority

Proponent Address: 85 Brunswick Road,
ALBANY WA 6330

Assessment Number: 1594

Report of the Environmental Protection Authority: Bulletin 1346

The proposal referred to in the above report of the Environmental Protection Authority may be implemented. The implementation of that proposal is subject to the following conditions and procedures:

1 Proposal Implementation

1-1 The proponent shall implement the proposal as documented and described in schedule 1 of this statement subject to the conditions and procedures of this statement.

2 Proponent Nomination and Contact Details

2-1 The proponent for the time being nominated by the Minister for Environment under sections 38(6) or 38(7) of the *Environmental Protection Act 1986* is responsible for the implementation of the proposal.

2-2 The proponent shall notify the Chief Executive Officer (CEO) of the Office of the Environmental Protection Authority of any change of the name and address of the proponent for the serving of notices or other correspondence within 30 days of such change.

3 Time Limit of Authorisation

3-1 The authorisation to implement the proposal provided for in this statement shall lapse and be void five years after the date of this statement if the proposal to which this statement relates is not substantially commenced.

3-2 The proponent shall provide the CEO with written evidence which demonstrates that the proposal has substantially commenced on or before the expiration of five years from the date of this statement.

4 Compliance Reporting

4-1 The proponent shall prepare and maintain a compliance assessment plan to the satisfaction of the CEO of the Office of the Environmental Protection Authority.

4-2 The proponent shall submit to the CEO of the Office of the Environmental Protection Authority, the compliance assessment plan required by condition 4-1 prior to the commencement of the implementation of the proposal. The compliance assessment plan shall indicate:

1 the frequency of compliance reporting;

2 the approach and timing of compliance assessments;

3 the retention of compliance assessments;

4 reporting of potential non-compliances and corrective actions taken;

5 the table of contents of compliance reports; and

6 public availability of compliance reports.

4-3 The proponent shall assess compliance with conditions in accordance with the compliance assessment plan required by condition 4-1.

4-4 The proponent shall retain reports of all compliance assessments described in the compliance assessment plan required by condition 4-1 and shall make those reports available when requested by the CEO of the Office of the Environmental Protection Authority.

4-5 The proponent shall advise the CEO of the Office of the Environmental Protection Authority of any potential non-compliance within seven days of that non-compliance being known.

4-6 The proponent shall submit a compliance assessment report annually from the date of commencement of proposal implementation addressing the previous twelve month period or other period as agreed by the CEO of the Office of the Environmental Protection Authority. The compliance assessment report shall:

1 be endorsed by the proponent's CEO or a person delegated to sign on the CEO's behalf;

2 include a statement as to whether the proponent has complied with the conditions;

3 identify all potential non-compliances and describe corrective and preventative actions taken;

4 be made publicly available in accordance with the approved compliance assessment plan; and

5 indicate any proposed changes to the compliance assessment plan required by condition 4-1.

5 Marine Benthic Communities

5-1 The proponent shall not dredge the shipping channel using a trailer suction hopper dredge as described in Schedule 1 of this statement between 1 November and 28 February in any year.

Seagrass communities

5-2 The proponent shall ensure that the implementation of the proposal does not cause the permanent loss of seagrass, either through direct or indirect impacts, other than the seagrass located within the zones of permanent loss in:

i. King George Sound, as shown in Figure 4 in Schedule 1 of this statement (not to exceed 16.6 hectares); and

ii. Princess Royal Harbour, as shown in Figure 5 in Schedule 1 of this statement (not to exceed 0.8 hectares),

unless authorised by the Minister for Environment.

Note: 'Permanent loss' is defined as the mortality of, or long-term serious damage to, seagrass communities.

5-3 The proponent shall ensure the implementation of the proposal does not cause the permanent loss, either through direct or indirect impacts, of any macroalgal communities within the Albany Port Authority area, as shown in Figure 1 in Schedule 1 of this statement.

5-4 Prior to the commencement of dredging, the proponent shall establish a monitoring program to monitor underwater light attenuation and seagrass health (by way of seagrass shoot density) using permanent relocatable quadrats, to allow for repeated measures over time, before, during and after the implementation of the proposal. This monitoring program is to establish the frequency and locations of monitoring. The monitoring locations shall be established in Princess Royal Harbour and King George Sound but outside the zones of permanent loss in condition 5-2 and include:

a) impact monitoring sites - at locations where seagrass is found and where water clarity has the potential to be affected by dredging operations; and

b) reference monitoring sites - which are similar to each impact monitoring site in all respects including water depths and the presence of seagrass and where water clarity does not have the potential to be affected by dredging operations,

to the requirements of the CEO of the Office of the Environmental Protection Authority. The monitoring program is to include protocols and procedures which are consistent with the Environmental Protection Authority's *Manual of Standard Operating Procedures for Environmental Monitoring against the Cockburn Sound Environmental Quality Criteria* (March 2005) or any other appropriate protocol acceptable to the CEO of the Office of the Environmental Protection Authority.

5-5 Prior to the commencement of dredging the proponent shall commence implementing the monitoring program required by condition 5-4 to the satisfaction of the CEO of the Office of the Environmental Protection Authority.

5-6 Prior to the commencement of dredging, the proponent shall submit a report on pre-dredging underwater light attenuation and seagrass shoot density data from the locations required by condition 5-4. In the report the proponent shall establish the:

a) calculated median, 20^{th} and 1^{st} percentile of pre-dredging seagrass shoot density for each impact monitoring site; and

b) calculated median, 20^{th} and 1^{st} percentile of pre-dredging seagrass shoot density for each reference monitoring site.

5-7 During dredging, the proponent shall monitor underwater light and seagrass health in accordance with the monitoring program required by condition 5-4, to ensure that the following seagrass health criterion is met during the dredging operations.

(a) The median seagrass shoot density for each impact monitoring site is greater than the 1^{st} percentile of pre-dredging seagrass shoot density determined for each impact monitoring site.

5-8 In the event that monitoring required by conditions 5-4 and 5-5 indicate that the seagrass health criterion in condition 5-7 is not being met, or that the proponent is unable to undertake seagrass health monitoring during dredging, the proponent shall:

a) report such findings including evidence which allows the determination of the cause of the decline in seagrass health; and

b) immediately cease and relocate dredging activities.

The proponent shall report the above to the CEO of the Office of the Environmental Protection Authority within 4 days of the decline in seagrass health being identified.

5-9 Following the completion of dredging, the proponent shall demonstrate that the median seagrass shoot density at impact sites is greater than or equal to the 20^{th} percentile of pre-dredging seagrass shoot density for each impact site as determined in accordance with condition 5-6 (a) for at least two consecutive years.

5-10 The proponent shall report to the CEO of the Office of the Environmental Protection Authority the total loss of seagrass and macroalgal communities:

a) 2 months;
b) 12 months, and
c) 24 months,

following the completion of the implementation of the proposal to demonstrate that the requirements of conditions 5-2 and 5-3 have been met.

The reports shall include co-ordinates and a map showing the areas of seagrass and macroalgal losses caused by the proposal.

Reef communities

5-11 The proponent shall ensure that the proposal does not cause the mortality of, or long-term serious damage to, the high relief reef communities at Gio Batta Patch and Michaelmas Reef in King George Sound as shown in Figure 3 of schedule 1.

5-12 To verify that the requirements of condition 5-11 are met the proponent shall:

a) submit a proposed monitoring program to measure the cover, diversity and abundance of high relief reef communities at Gio Batta Patch and Michaelmas Reef to the requirements of the CEO of the Office of the Environmental Protection Authority;

b) undertake baseline survey of the reef communities prior to the commencement of dredging;

c) undertake surveys following the completion of dredging; and

d) submit a report with results of the surveys in items b) and c) above to demonstrate that the requirements of condition 5-11 has been met.

6 Seagrass Rehabilitation and Monitoring

6-1 Prior to the commencement of dredging and reclamation the proponent shall commence the rehabilitation of a minimum of 1 hectare of seagrass in Princess Royal Harbour using seagrass donor material from the zone of loss in Figure 5 of Schedule 1 at a planting density that achieves 75% average cover in those areas within 10 years following planting at a location(s) to the requirements of the CEO of the Office of the Environmental Protection Authority on advice of the Department of Water and the Department of Environment and Conservation.

The species to be used in seagrass rehabilitation shall include *Posidonia sinuosa* and *Posidonia australis.*

6-2 The proponent shall design and implement a monitoring program for the seagrass rehabilitation required by condition 6-1 within 1 year of completion of construction activities. The monitoring program shall include monitoring of the survival and shoot density of rehabilitated seagrass annually for the four years following rehabilitation to

confirm that survival and growth are sufficient to attain 1 hectare of seagrass meadow of 75% average cover within 10 years following planting.

6-3 The proponent shall report to the Office of the Environmental Protection Authority on the progress of seagrass rehabilitation required by condition 6-2 annually for four years following planting, and then every two years thereafter until it can be demonstrated to the satisfaction of the CEO of the Office of the Environmental Protection Authority on advice of the Department of Water and Department of Environment and Conservation that the requirement of condition 6-1 has been met.

7 Marine Water and Sediment Quality (Mercury)

7-1 The proponent shall ensure that the dredging of the portion of the shipping channel shown in Figure 6 of Schedule 1 is undertaken in a manner that does not cause any overflow of turbid water into the environment from the dredge vessel.

7-2 From commencement of dredging of the shipping channel in King George Sound and the disposal of material at the offshore disposal ground, the proponent shall ensure that contaminant levels in the vicinity of the dredge channel and the disposal ground are below the ANZECC/ARMCANZ 2000[1] guidelines for mercury in water (0.1 micrograms per litre) and sediment (0.15 milligrams per kilogram).

7-3 Prior to the commencement of dredging the proponent shall develop and submit a monitoring program to monitor mercury in sediments and water to the requirements of the CEO of the Office of the Environmental Protection Authority on advice of the Department of Water. The monitoring program shall include the frequency and locations of monitoring sites to be established.

7-4 The proponent shall implement the monitoring program required by condition 7-3, prior to, during, and following the completion of dredging and disposal activities.

7-5 The proponent shall undertake sediment quality monitoring for metals bi-annually for two years following the completion of dredging activities to ensure ANZECC/ARMCANZ 2000 criteria referred to in condition 7-2 are being met.

7-6 The proponent shall submit monitoring results required by:

a) condition 7-2 every 2 weeks from the commencement of Stage 2 dredging activities; and

b) condition 7-5 within 2 months following the completion of dredging and every 12 months following the completion of dredging for two consecutive years.

to the CEO of the Office of the Environmental Protection Authority.

7-7 In the event that monitoring indicates that the requirement of condition 7-2 is not being met or not being likely to be met:

1. the proponent shall report such findings to the CEO of the Office of the Environmental Protection Authority within 2 days of the exceedance being identified;

2. the proponent shall provide evidence which allows determination of the cause of the decline;

3. if determined by the CEO of the Office of the Environmental Protection Authority to be a result of activities undertaken in implementing the proposal, the proponent shall submit actions to be taken to remediate the decline within 2 days of the determination being made to the CEO of the Office of the Environmental Protection Authority; and

4. the proponent shall implement actions to remediate the exceedance of the criteria in condition 7-2 upon approval of the CEO of the Office of the Environmental Protection Authority on advice of the Department of Environment and Conservation and shall continue until such time the CEO of the Office of the Environmental Protection Authority determines that the remedial actions may cease.

7-8 The proponent shall make the monitoring reports required by conditions 7-6 publicly available in a manner approved by the CEO of the Office of the Environmental Protection Authority.

[1] Australia and New Zealand and Conservation Council (ANZECC) & Agriculture and Resource Management Council of Australia and New Zealand (ARMCANZ) October 2000, *Australian and New Zealand guidelines for fresh and marine water quality*.

8 Sentinel Mussel Monitoring

8-1 The proponent shall ensure that the implementation of the proposal does not compromise the environmental objective for the maintenance of seafood safe for human consumption in King George Sound and Oyster Harbour.

8-2 To verify the requirements of condition 8-1, prior to the commencement of dredging the proponent shall develop and submit a Sentinel Mussel Monitoring Program to the requirements of the CEO of the Office of the Environmental Protection Authority on advice of the Department of Fisheries, Department of Health and the Department of Water.

The monitoring program is to include protocols and procedures which are consistent with the Western Australian Shellfish Quality Assurance Program (February 2004).

The Sentinel Mussel Monitoring Program shall operate in the vicinity of Mistaken Island within King George Sound and at other location as agreed with the CEO of the Office of the Environmental Protection Authority.

8-3 Subject to the requirements of conditions 8-4 and 8-5, the proponent shall implement the Sentinel Mussel Monitoring Program required by condition 8-2 prior to, during and for at least 12 months following the completion of dredging.

8-4 Prior to the commencement of dredging activities the proponent shall deploy sentinel mussels and harvest and analyse these mussels after four weeks to determine background concentrations of mercury.

8-5 Immediately prior to dredging the proponent shall deploy sentinel mussels and harvest these mussels for monitoring of contaminant levels in Clause 2 of *Standard 1.4.1 Contaminants and Natural Toxicants of the Australia and New Zealand Food Standards Code* after four weeks. Fresh sentinel mussels shall then be deployed at four to six week intervals, then harvested and analysed as above, and this regime continued during dredging and for at least six months following completion of dredging. The sample size and analysis of samples shall consist of at least five mussels each time.

8-6 If the level of mercury in sentinel mussels at any site harvested under condition 8-5 exceeds a trigger level of 0.4 mg/kg (mean value):

a) the proponent shall report such findings to the CEO of the Office of the Environmental Protection Authority, Department of Health and Department of Fisheries within 24 hours of the exceedance being identified;

b) the proponent shall provide evidence which allows determination of the cause of the exceedance;

c) if determined by the CEO of the Office of the Environmental Protection Authority to be a result of activities undertaken in implementing the proposal, the proponent shall submit actions to be taken to remediate the cause of the exceedance within 2 days of the determination being made to the CEO of the Office of the Environmental Protection Authority; and

d) the proponent shall implement actions to remediate the exceedance of the trigger level upon approval of the CEO of the Office of the Environmental Protection Authority on advice of the Department of Health and Department of Fisheries and shall continue until such time the CEO of the Office of the Environmental Protection Authority determines that the remedial actions may cease.

8-7 Subject to the requirements of condition 8-6, the proponent shall ensure that the environmental objective of the maintenance of seafood safe for human consumption is met, and in doing so ensure contaminant levels in sentinel mussels do not exceed the standards specified in the Table to Clause 2 of *Standard 1.4.1 Contaminants and Natural Toxicants of the Australia and New Zealand Food Standards Code.*

8-8 If the level of one or more of the contaminants in sentinel mussels harvested under conditions 8-4 or 8-5 exceeds the levels set by condition 8-7, the proponent is to report that exceedance to the CEO of the Office of the Environmental Protection Authority, the Department of Fisheries and the Department of Health as soon as possible, but in any event, not later than 24 hours of the exceedance being identified.

8-9 The proponent shall submit the results of the monitoring programme required by condition 8-2 to the CEO of the Office of the Environmental Protection Authority, the Department of Health and the Department of Fisheries;

- prior to the commencement of dredging;
- every 6 weeks during the implementation of Stage 2 dredging; and

then at such intervals as required by the Sentinel Mussel Monitoring Program required by condition 8-2.

8-10 The proponent shall make the monitoring reports required by conditions 8-9 publicly available in a manner approved by the CEO of the Office of the Environmental Protection Authority.

9 Introduced Marine Species and Dredging Equipment

9-1 Prior to the arrival of any dredging and other marine equipment and vessels associated with the proposal, the proponent shall prepare a Marine Pests Management Strategy capable of detecting and managing any introduced marine pest to the requirements of the CEO of the Office of the Environmental Protection Authority on advice of the Department of Fisheries.

9-2 Prior to commencement of dredging and within 48 hours following entry of dredging and other marine equipment and other vessels associated with the proposal within the Albany Port Authority area as shown in Figure 1 in Schedule 1 of this statement, the proponent shall arrange and undertake an inspection by an appropriately qualified expert to ensure that:

1. there is no sediment on or within the dredging equipment;

2. ballast water (if any) has been managed according to the Australian Quarantine Inspection Service ballast water requirements; and

3. any fouling organisms on or in the dredging equipment do not present a risk to the ecosystem integrity of the marine waters of Albany harbours as shown in Figure 1 in Schedule 1 of this statement.

9-3 The proponent shall manage any sediment or fouling organism found as a consequence of the inspection required by condition 9-2, in accordance with the Marine Pests Management Strategy required by condition 9-1, prior to the commencement of dredging, to the requirements of the CEO of the Office of the Environmental Protection Authority on advice of the Department of Fisheries.

9-4 In the event that the dredging equipment is to be transferred from the Albany Port Authority area to another location within Western Australian territorial waters following completion of dredging and disposal activities, the proponent shall undertake an investigation employing an appropriately qualified marine scientist to identify the presence of / the potential for introduced marine pest species in accordance with the Marine Pests Management Strategy required by condition 9-1.

9-5 In the event that any introduced marine pest species are detected, the proponent shall implement the Marine Pests Management Strategy required by condition 9-1 prior to the dredge equipment being moved from the Albany Port Authority area to ensure that introduced marine pest species are not transferred to other locations within Western Australian territorial waters to the requirements of the CEO of the Office of the Environmental Protection Authority on advice of the Department of Fisheries.

10 Maintenance of aquaculture

10-1 The proponent shall ensure that the Environmental Quality Objective for the 'Maintenance of aquaculture operations' is maintained during the implementation of the proposal at the aquaculture operations in the vicinity of Mistaken Island.

10-2 Prior to the commencement of dredging the proponent shall develop a monitoring program for measuring turbidity which includes turbidity trigger levels for management and contingency actions in order to demonstrate the requirements of condition 10-1 are being met.

10-3 The proponent shall implement the monitoring program and monitor turbidity against the turbidity trigger levels required by condition 10-2.

10-4 In the event the monitoring required by condition 10-3 indicates that the requirements of condition 10-1 are not being met or are not likely to be met, the proponent shall immediately provide and implement proposed management measures to the satisfaction of the CEO of the Office of the Environmental Protection Authority on advice of the Department of Fisheries and the Department of Water.

Notes

1. Where a condition states "on advice of the Department of Environment and Conservation", the Department of Environment and Conservation will provide that advice to the Office of the Environmental Protection Authority for the preparation of written notice to the proponent.

2. The Office of the Environmental Protection Authority may seek advice from other agencies or organisations, as required.

3. The Minister for Environment will determine any dispute between the proponent and the Office of the Environmental Protection Authority over the fulfilment of the requirements of the conditions.

Schedule 1

Albany Port Expansion Proposal (EPA Assessment No. 1594)

The proposal consists of the dredging of 12 million cubic metres of sediments to widen and deepen the existing shipping channel into Princess Royal Harbour and to extend the shipping channel into King George Sound to allow access of cape-size vessels to the Port. Dredged material will be disposed offshore at a location in King George Sound.

A portion of the dredged material will be used for reclamation of up to 9 hectares of Princess Royal Harbour to construct a new berth (Berth 7). Construction of the seawall will involve the importation of core and armour material by road transport. Pile driving activities will be required to construct the new berth.

The location of the proposal is shown in Figure 1. The constructed elements of the proposal are shown in Figure 2. The offshore disposal site is shown in Figure 3.

The key characteristics of the proposal are shown in Table 1 below.

Table 1 - Key Proposal Characteristics

Key Aspect	**Description**
Dredging	
Dredge methods	Cutter Suction Dredge (CSD) for the berth pocket and reclamation batter. Trailer Suction Hopper Dredge (TSHD) for the shipping channel. No blasting is required.
Total quantity of dredge material to be generated	12 million cubic metres (Mm^3).
Total area to be dredged	247.7 hectares (ha) including all channel batters. 47.3 ha of which is an existing channel and has been dredged.
Total maximum duration	32 weeks.
Independent CSD Dredging (Stage 1 dredging)	
Total quantity of dredge material to be generated	~300,000 m^3 for reclamation area by CSD.
Stage 1 duration	12 weeks independent of the TSHD (or Stage 2 dredging) at any time of the year.
TSHD Dredging (Stage 2 dredging)	
Total quantity of dredge material to be generated	11.7 Mm^3 dredged by TSHD.
Stage 2 duration	20 weeks.
Berth and Channel Characteristics	
Berth pocket depth	-17.8 metres (m) Chart Datum (CD), as shown in Figure 2.
Maximum channel depth	-19.2m CD, as shown in Figure 2.
Land Reclamation Area	
Area	Up to 9 ha.
Height	+4m CD.
Construction of sea wall	Continuous rock armoured sea wall, lined with geotextile filter cloth.
Clearing	Nil.

Key Aspect	Description
Length of rocky shoreline to be reclaimed	~360m.
Seawall length	~900m in total and ~570m along the berth edge.
Surface drainage	Reclamation area will be filled and graded to achieve internal drainage until adequate stormwater system is constructed for the intended use.
Rock armour material	Granite rock
Offshore Disposal Area	
Disposal location	In deep water within King George Sound as shown in Figure 3 of this statement.
Disposal footprint	250 ha. Diameter is 1800 metres.
Disposal depth	Finished depth to the top of the disposal site is -35m CD.
Disturbance Footprint	
Total Albany Port Expansion Proposal marine disturbance footprint	506.7 ha

Figures (attached)

Figure 1. Location map showing Albany Port Expansion proposal, land reclamation at Semaphore Point, shipping channel, Albany Port Authority Area, Princess Royal Harbour and King George Sound
Figure 2. Layout of land reclamation area at Semaphore Point and berth pocket, turning basin and approach channel
Figure 3. Location of offshore disposal site between Bald Head and Breaksea Island
Figure 4. Zone of permanent loss coinciding with seagrass in King George Sound
Figure 5. Zone of permanent loss coinciding with seagrass in Princess Royal Harbour
Figure 6. Area which requires dredging to be undertaken with no overflow

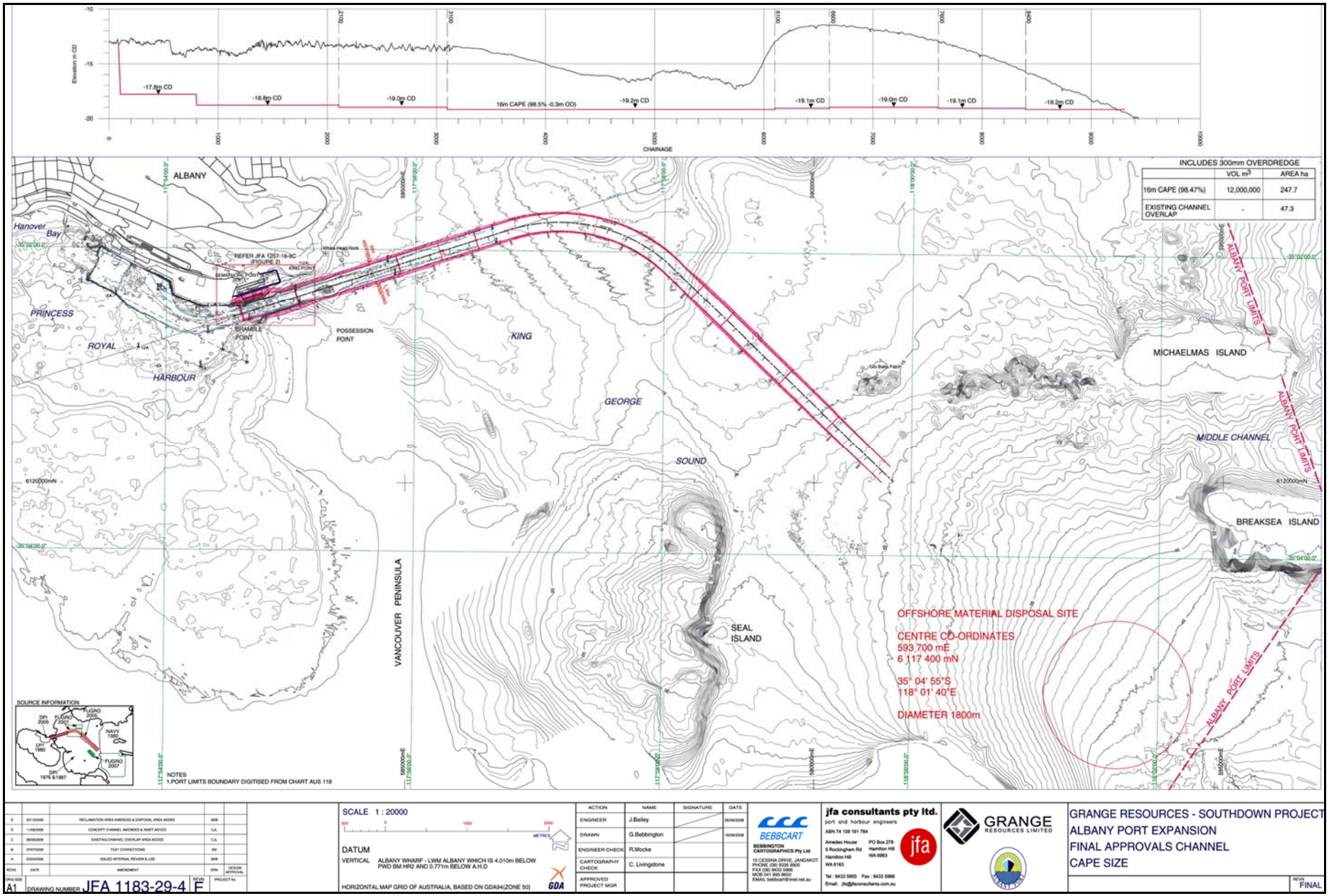


Figure 1: ***Location map showing Albany Port Expansion proposal, land reclamation at Semaphore Point, shipping channel, Albany Port Authority Area, Princess Royal Harbour and King George Sound***

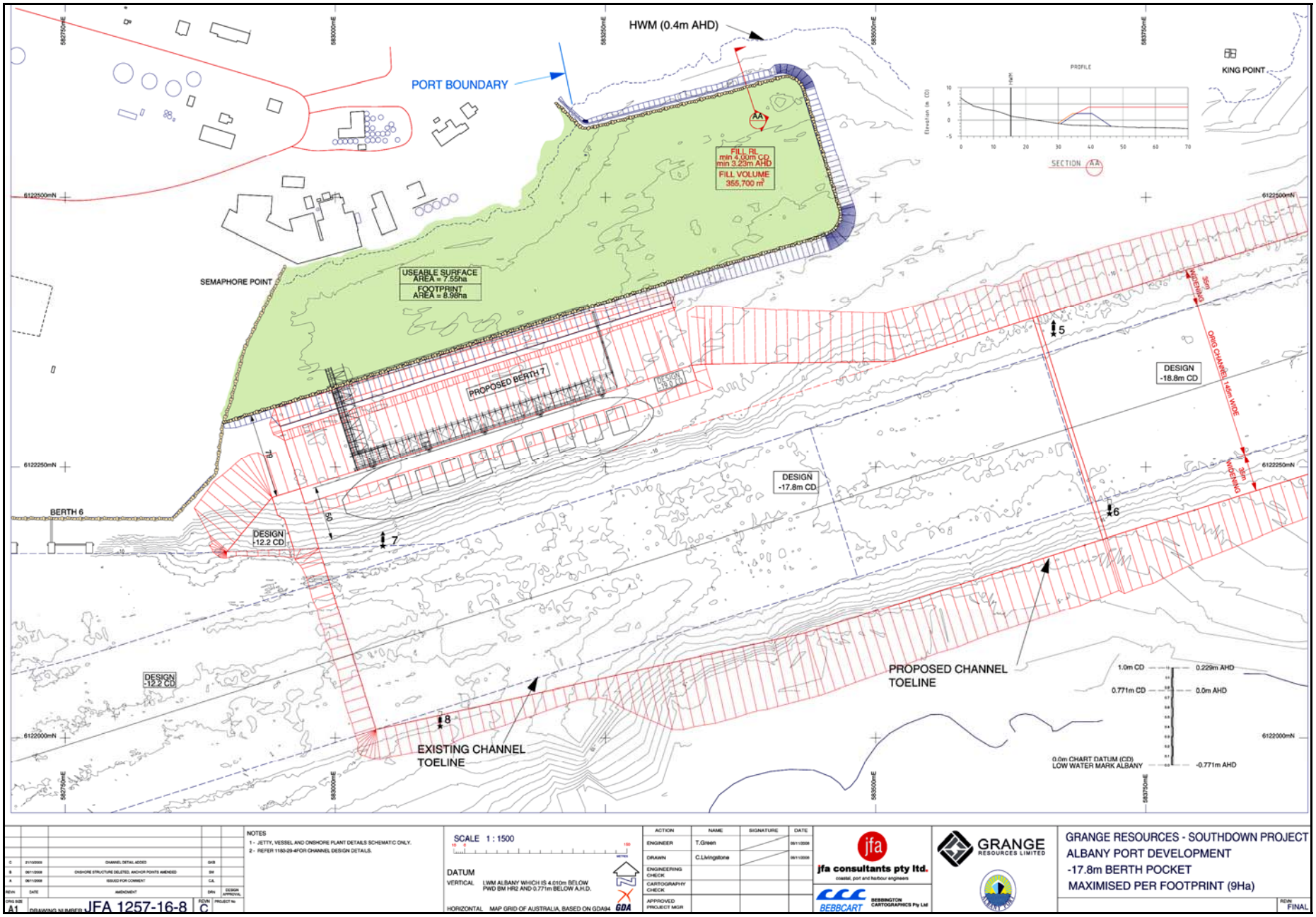


Figure 2: Layout of land reclamation area at Semaphore Point and berth pocket, turning basin and approach channel

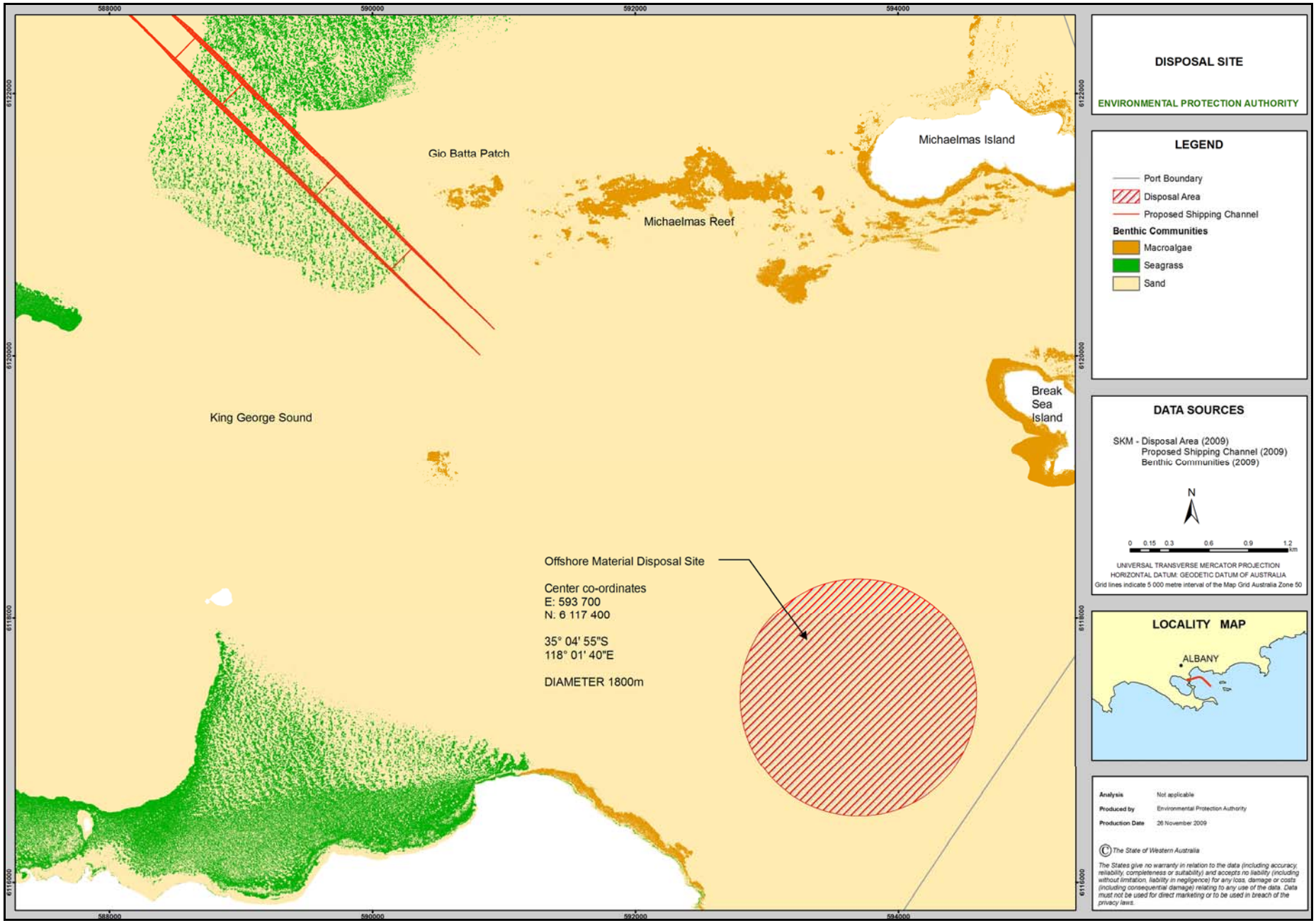
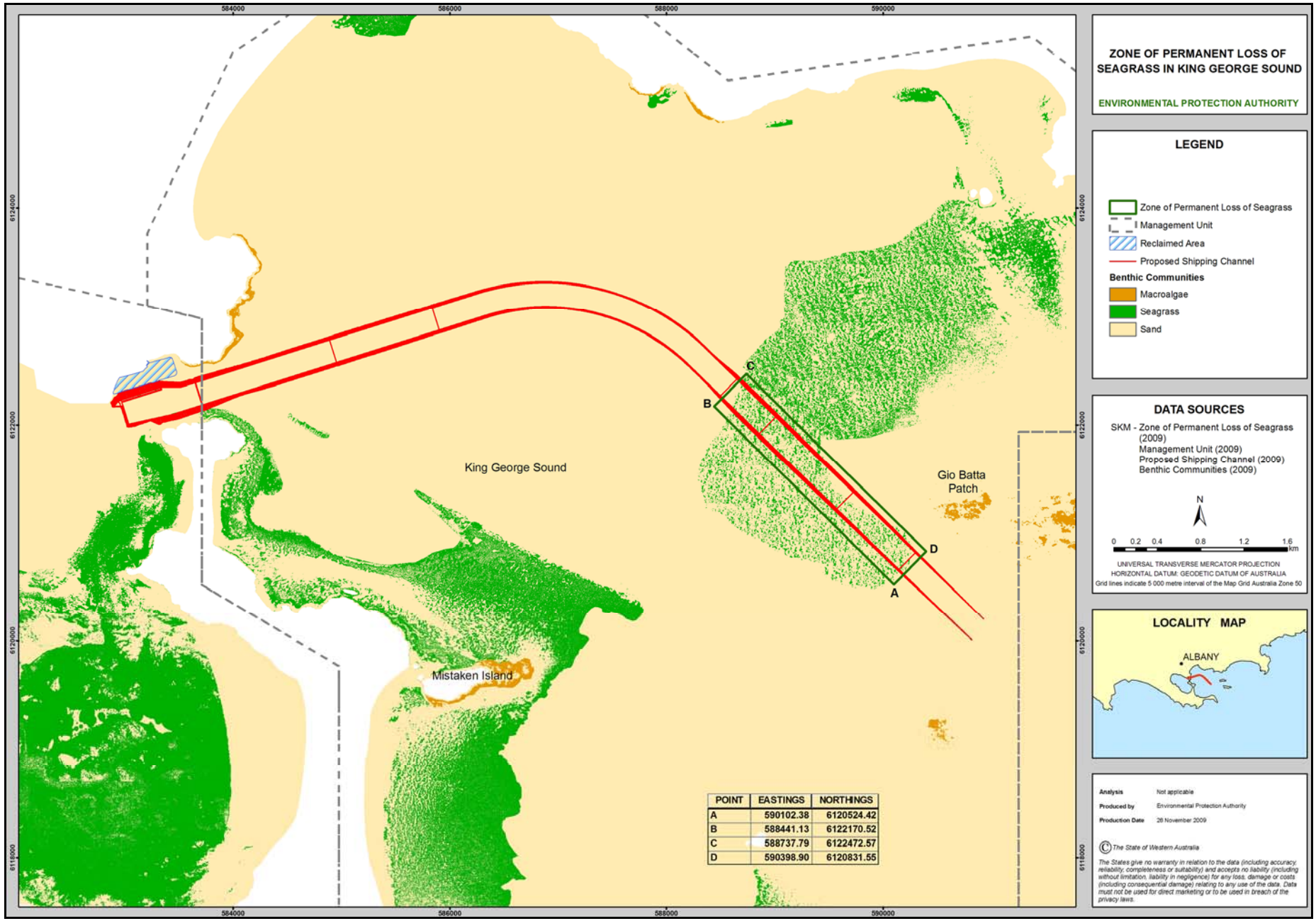


Figure 3: Location of offshore disposal site between Bald Head and Breaksea Island



POINT	EASTINGS	NORTHINGS
A	590102.38	6120524.42
B	588441.13	6122170.52
C	588737.79	6122472.57
D	590398.90	6120831.55

Figure 4: Zone of permanent loss coinciding with seagrass in King George Sound

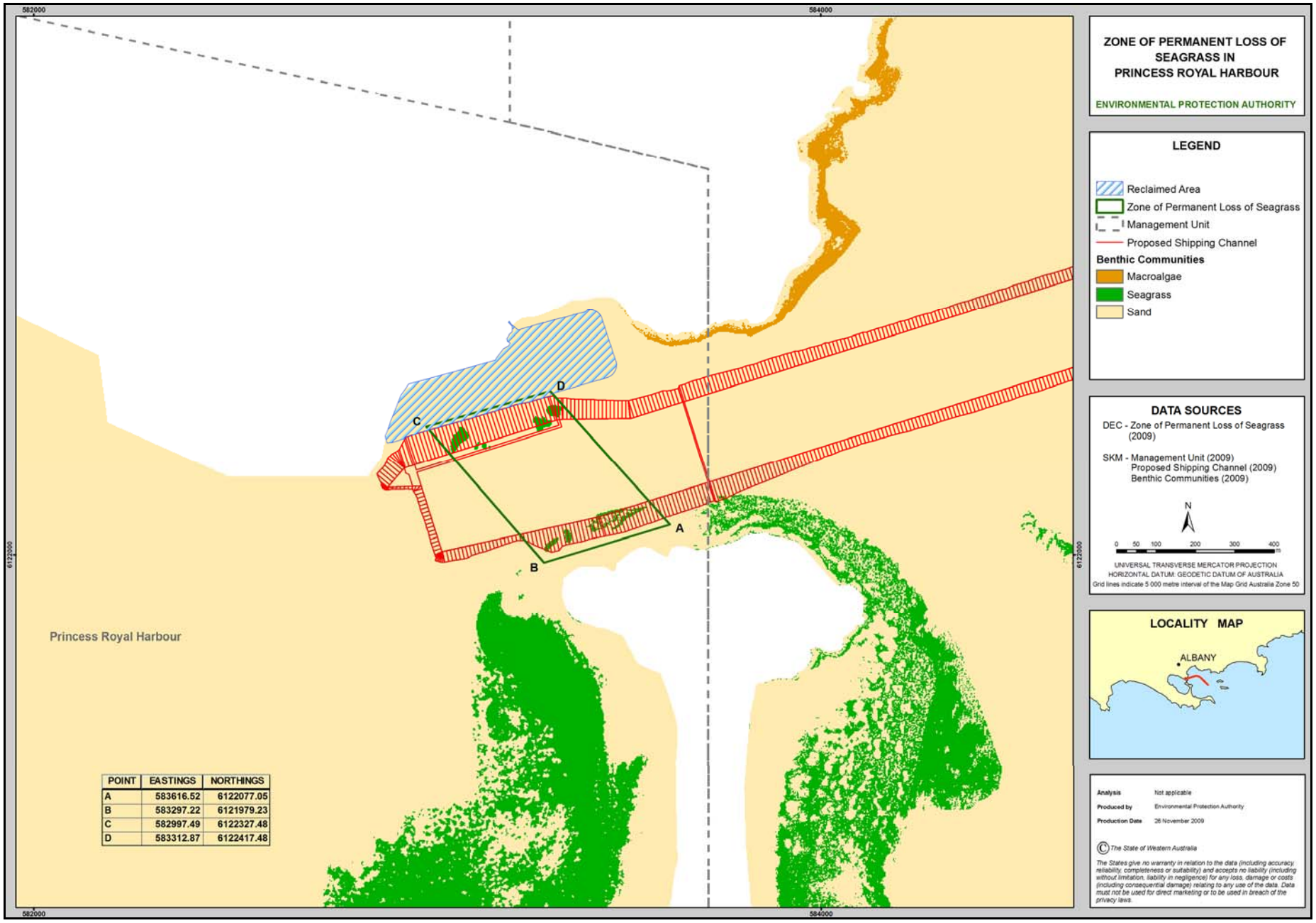


Figure 5: Zone of permanent loss coinciding with seagrass in Princess Royal Harbour

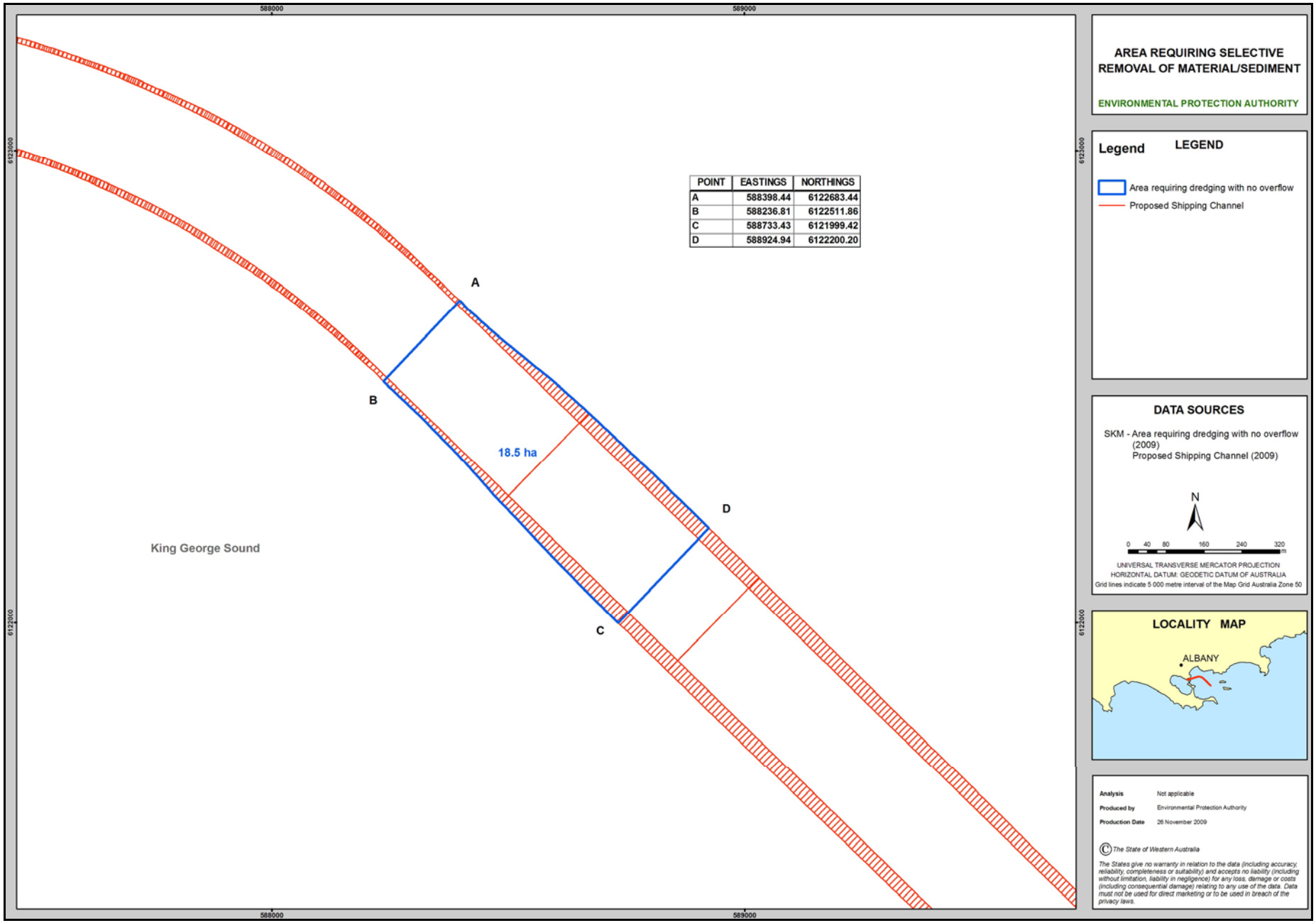


Figure 6: Area which requires dredging to be undertaken with no overflow

Appendix 5

Summary of Submissions and
Proponent's Response to Submissions

CD attached