Report and recommendations of the Environmental Protection Authority

Port Hedland Outer Harbour Development

BHP Billiton Iron Ore

Report 1427

January 2012

Public Environmental Review
Environmental Impact Assessment Process Timelines

Date	Progress stages	Time (weeks)
05/05/08	Level of assessment set	
04/09/08	Final ESD approved	17
18/04/11	Public Environmental Document (PER) released for public review	154
13/06/11	Public review period for PER closed	8
01/12/11	Final Proponent response to PER issues raised	24
23/01/12	Publication of EPA report	7
06/02/12	Close of appeals period	2

Timelines for an as sessment may vary according to the complexity of the project and are usually agreed with the proponent soon after the level of assessment is determined.

In this case, the Environmental Protection Authority met its timeline objective in the completion of the assessment and provision of a report to the Minister.

Dr Paul Vogel
Chairman
23 January 2012

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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 by BHP Billiton Iron Ore (BHPBIO) to construct and operate an Outer Harbour Development, including rail and or e stockpile facilities, in Port Hedland Western Australia.

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
- 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 pr ocedures 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 EP Act.

Key environmental factors and principles

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

(a) Marine habitat – mangroves;

(b) Marine habitat – subtidal marine benthic communities;

(c) Marine fauna;

(d) Marine environmental quality;

(e) Terrestrial biodiversity; and

(f) Emissions (dust and noise).

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

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

(a) the principle of the conservation of biological diversity and ec ological integrity;

(b) the principle of intergenerational equity;

(c) the principle of the conservation of biological diversity and ecological integrity;

(d) the principle relating to improved valuation, pricing and incentive mechanisms; and

(e) the principle of waste minimisation.

Conclusion

The EPA has considered the proposal by BHPBIO to construct and operate a new shipping berth and ore stockpile facility located at Finucane Island in Port Hedland Western Australia.

The proposal will be constructed in four stages, with the combined offshore and onshore construction period lasting approximately eight years if each stage is built sequentially. Onshore and offshore infrastructure associated with the proposal includes rail and iron ore handling, stockpiling and shiploading facilities (and associated infrastructure), jetty, wharf and shipping channel offshore of Finucane Island.

Marine habitat - mangroves

Implementation of the proposal would result in an unavoidable residual impact to mangrove habitat through the permanent loss of 29.5 hectares (ha).

The proponent has indicated that the potential impacts of the causeway footprint and potential impacts to mangroves have been minimised:

- by reducing the infrastructure corridor from 150 metres (m) to 80 m width;
- by planning construction of the corridor from end-to-end, thereby reducing the footprint to only the embankments and the conveyor/road corridor; and
- as a tidal flushing study has been undertaken and a commitment has been given to maintain the tidal flows upstream of the proposed corridor.

However, the EPA is of the view that although 29.5 ha will be directly lost, opportunities exist to reduce this impact through evaluating and implementing best practice infrastructure design, namely using an alternative elevated trestle-type causeway design to the proposed earthen embankment causeway. The EPA has therefore recommended conditions 7-1 and 7-2 for the proposal, which effectively requires the proponent investigate alternative best practice infrastructure designs prior to construction in an attempt to reduce this impact further. Furthermore, the EPA is satisfied that management measures detailed in the Public Environmental Review (PER) document, together with condition 7-3, will limit the direct impact to no more than 29.5 ha.

The EPA notes the loss of 29.5 ha will increase the development-related cumulative loss of mangrove benthic primary producer habitat (BPPH) from the Port Hedland Industrial Area Local Assessment Unit (PHIALAU) to around 14% based on calculations for previous assessments. However, the proponent has undertaken additional studies that provide data to inform

judgements regarding the potential for unacceptable impacts to ecological integrity. These studies along with the estimates of development-related loss of mangroves suggest that the percentage losses within the PHIALAU would be within a range of 5.7% to 14%.

The EPA considers that with the implementation of the recommended conditions, impacts to mangrove habitats could be further minimised and, while noting that there would be a reduction in abundance, productivity and geographic distribution at a local scale, the EPA's objective would be met.

Marine habitat – sub-tidal marine habitat

Implementation of the proposal would result in unavoidable impacts to sub-tidal BPPH and other benthic communities. Some of the impacts would be permanent however the majority of benthic communities are predicted to recover within five years.

The proponent anticipates that the dredging campaign for the proposal would take approximately four years and involve the dredging and disposal in Commonwealth Waters of approximately 42 million cubic metres of spoil. Impacts are based on modelling results which predicted the extent of water quality perturbations, including reduced light at the seabed and sedimentation rates. Hard corals are likely to be the most sensitive benthic communities within State waters affected by the dredging.

As a result of the dredging campaign, the proponent predicts that the permanent losses from the footprint of the proposal will be up to 3.8 ha of BPPH and a further 34 ha due to indirect impacts such as sedimentation and shading. Up to 9 ha of this loss is expected to be hard coral communities. In addition, there are also likely to be additional indirect impacts on corals from resuspension of fine particles, however, these impacts are considered to be reversible (not expected to suffer mortality) and full recovery is expected to occur in less than five years. The proponent has prepared a Dredging and Spoil Disposal Management Plan that will be applied during the dredging campaign to ensure actual impacts are no greater than predicted.

The proponent recognises that direct and indirect impacts/risks remain to BPPH and has therefore proposed a package of offset projects to mitigate the residual impacts of the proposal. In relation to marine sub-tidal habitats, the proponent proposes to commit $3 million over two years to improve the understanding and management of the impacts of dredging on tropical marine communities.

Accordingly, the EPA finds that the dredging campaign could be implemented and managed to in a way that is unlikely to compromise the ecological functioning of the marine environment locally and regionally. The EPA has therefore concluded that its objective for this factor at this location could be met subject to proactive dredge management to control and limit impacts to benthic communities and through the implementation of recommended condition 6.

Marine environmental quality

The EPA has identified the key marine environmental quality issues associated with the proposal to be:

- potential environmental quality impacts on receiving water quality in Salmon Creek should dewatering during the construction of the car dumpers be required; and
- ongoing contaminant inputs from operational activities at the wharf and unloading area.

The EPA notes that initial testing of Boodarie groundwater showed that the following metals, arsenic, chromium, mercury, selenium, silver, vanadium and zinc, were above the marine water quality guidelines for 99% species protection. In view of the uncertainties and risks from direct discharge of dewater to Salmon Creek, the EPA considers that reuse and/or alternative options should be fully investigated by the proponent prior to the consideration of discharge to the marine environment. However, if discharge to Salmon Creek is unavoidable the EPA has recommended condition 12 which will formalise the proponent's commitment to undertake further hydrogeological and water quality investigations to determine the suitability of water for construction use, as well as any requirements for treatment, should it be discharged. Based on current volumes the proponent has advised that most of the dewatering effluent will be used for construction activities. Should the dewatering abstraction exceed the construction demand then there is also the option of re-injection, or infiltration through an existing "turkey's nest" dam at Boodarie.

The EPA is aware that ongoing port operational activities will introduce a range of uncontrolled contaminant inputs such as shedding of antifouling paints, bulk material spillage, and leaks and spills. The EPA has recommended that a 'high' Level of Environmental Protection (LEP) would continue to apply to the offshore marine waters outside the moderate LEP, consistent with the Pilbara Coastal Water Quality Consultation Outcomes.

The EPA has recommended condition 9 be applied to the proposal to require the proponent to monitor offshore water and sediment quality and demonstrate that the above moderate and high LEPs surrounding the wharf area are being achieved.

Marine fauna

The EPA has identified the following issues relating to impacts on marine fauna:

- construction (noise and vessel movements) – temporary impacts on turtles, dugongs and migrating whales;
- construction (dredging) – loss of marine BPPH for dugongs, turtles and sawfish; and
- operational impacts – port operation (vessel movements etc) and potential ongoing disruption, avoidance and displacement of marine fauna from the

project site. This is considered to have an unavoidable level of residual impact that will be offset by BHPBIO.

The EPA considers that noise associated with vessel activity during the construction of the proposal is unlikely to result in significant impacts on marine fauna. While underwater noise produced by vessels may result in altered behaviours, the Port Hedland Port area already contains significant vessel movements and associated noise levels. Collision with vessels engaged in construction also poses a risk to marine fauna, however management measures proposed in the form of observers will reduce the risk of vessel strikes and significant behavioural changes. The EPA has recommended conditions 8-1 to 8-3 to manage this issue. Furthermore, to increase the predictive capacity of underwater noise modelling, the EPA recommends a Noise Monitoring and Review Program be completed prior to construction, as specified in conditions 8-17 to 8-19.

Artificial lighting at night has the potential to modify the behaviour of marine turtles by deterring females from nesting beaches and disorientating hatchlings on the beach and at sea. The proponent has committed to a range of mitigation measures to reduce the impact of light spill on marine turtles consistent with the EPA's Environmental Assessment Guideline No. 5 *Protecting Marine Turtles from Light Impacts*. The EPA recommends that these measures be included in the Marine Fauna Management Plan required under condition 8-11.

The proponent has recognised that significant residual impacts and risks to critical and high value State and nationally listed species will occur and recognises the need for offsets. An offsets package totalling $10 million has been proposed over five projects (refer Schedule 3). Of these projects, three are specifically focused on marine fauna, namely supporting research on sawfish, whales, dolphins, dugongs and turtles. The three projects are outlined below:

- Commitment of $0.5 million over two years to increase the understanding the ecology of sawfish, and contribute to the regional studies being undertaken to understand sawfish migration.
- Commitment of $3 million over four years to support research on marine fauna (whales, dolphins, dugongs and sea turtles) in the Pilbara region.
- Commitment of $2.5 million over six years to improve marine fauna knowledge consistent with the strategies and actions in the proposed 80 Mile Beach Marine Park Management Plan.

The EPA is satisfied that the offset projects are reasonable given the scale of impacts and the significant risk of impacts to marine fauna and habitat in particular. The EPA has recommended condition 16 and Schedule 3 which incorporates the proponent's offset package.

Terrestrial biodiversity

Clearing for the proposal would result in the direct loss of approximately 940 ha of terrestrial vegetation communities and fauna habitat. The EPA understands that none of the vegetation communities proposed to be impacted are considered to be of conservation significance as they are not Threatened Ecological Communities or Priority Ecological Communities and are well represented in the local area and Pilbara region.

The EPA is aware that clearing has the potential to cause a direct loss of four of the five Priority Flora species that were recorded within the proposed disturbance envelope. The Department of Environment and Conservation (DEC) raised this issue in the submissions phase and encouraged the proponent to consult with it in relation to these species and the extent of their local populations to confirm that the impact from development on their conservation status would be low. The EPA is aware that the flora surveys conducted have indicated that the proposed loss through clearing is only likely to effect the local representation and therefore will not compromise the conservation status of these Priority Flora species.

The EPA is also aware that this habitat type is well represented locally and regionally. The fauna occurring in the area are not specifically reliant on this habitat within the disturbance envelope for breeding or foraging resources, and therefore the impacts on fauna are not considered to be significant.

The EPA considers that the removal of approximately 940 ha of terrestrial vegetation communities and fauna habitat would not compromise the EPA's environmental objectives for this factor.

Emissions (dust and noise)

Dust

In terms of the dust targets in Ministerial Statement 740, the proponent's modelling of current and proposed BHPBIO operations indicates that for the Hospital and Taplin Street locations:

- the PM_{10} 24 hour short term concentration target is achieved;
- the annual average PM_{10} target should be met;
- the TSP annual average target will be achieved; and
- using the Hospital criteria as a comparison, the dust impact at South Hedland and Wedgefield meet criteria limits.

The EPA notes from the proponent's prediction that there will be a g eneral increase in the ground level dust concentrations across all receptor locations, however, with the introduction of relevant engineering controls the model predicts the dust performance targets in *Ministerial Condition 740 - Upgrade dust management at Finucane Island and Nelson Point, Port Hedland* (2007) are achievable.

Notwithstanding the above, this proposal will add cumulatively to the existing dust problem in Port Hedland. The EPA has been made aware from previous assessments of proposals in Port Hedland (ie. Roy Hill Port Infrastructure and North West Infrastructure's Multi-user Iron Ore Export Facility) that the interim dust guideline for Taplin Street in the Port Hedland Air Quality and Noise Management Plan (PHAQNMP) (10 exceedances per year) is unlikely to be met based on current and approved operations alone. Hence this proposal, combined with all other existing and approved dust sources, would cause a further exceedance of the guideline.

The EPA notes that Government and industry are currently implementing the recommendations of the PHAQNMP and there is an expectation that the proponent will contribute towards these programs and initiatives, including the integrated ambient air quality monitoring network, further improvements and research into dust management and a noise management strategy. Therefore, the EPA would like to reinforce the need for appropriate actions to be taken now to ensure that cumulatively, dust emissions will be compliant with the interim guideline of 70 $\mu g/m^3$ at (and east of) Taplin Street as prescribed in the PHAQNMP, with a maximum of 10 exceedances of this level per year will be achieved by 2015.

Noise

Stage 1 and 2 have been modelled for noise by the proponent and the results show that with the range of mitigation measures available at the proponent's disposal, the assigned levels in the *Environmental Protection (Noise) Regulations 1997* would be met.

A summary of the proponent's noise assessment for Stages 1 and 2 are as follows:

- Stage 1 and 2 in isolation assessment has been finalised and assigned levels can be met (32 dB at hospital);
- Stage 1 cumulative assessment has been finalised indicating there will be no net increase to current impacts (57.2 dB at hospital); and
- Stage 2 cumulative noise emissions are currently under assessment, however preliminary information suggests that cumulative targets can be met.

A high level analysis for Stages 3 and 4 has been conducted by the proponent which demonstrates that sufficient noise mitigation control options are available for in-isolation noise levels to meet assigned levels and for no net increase to current cumulative impacts.

Although the BHPBIO's noise modelling, which includes the detailed mitigation measures for all four stages have yet to be finalised, the EPA considers that sufficient information has been provided at this stage to demonstrate that the noise emissions can be managed to meet the EPA's objectives through Part V of the EP Act.

The EPA notes that the proponent has identified the key environmental factors associated with the proposal and has prepared a comprehensive framework that will form a basis for management plans to address the potential environmental impacts.

The EPA considers that the ongoing regulation of dust and noise emissions in terms of setting and enforcing operational targets and limits, and specifying control and contingency measures is most effectively managed under Part V of the EP Act (and in accordance with the PHAQNMP), rather than applying Ministerial conditions on this proposal under Part IV of the EP Act. As such it has not recommended any conditions for noise and dust management.

The EPA has therefore concluded that the proposal can be managed to meet the EPA's environmental objectives, provided that there is satisfactory implementation by the proponent of the recommended conditions set out in Appendix 4.

Recommendations

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

1. That the Minister notes that the proposal being assessed is for the construction of an Outer Harbour Development, and associated landside infrastructure, in Port Hedland Western Australia.
2. That the Minister considers the report on the key environmental factors and principles as set out in Section 4;
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 proponent's commitments and information provided in this report, the EPA has developed a set of conditions that the EPA recommends be imposed if the proposal by the BHPBIO to construct the Outer Harbour Development is approved for implementation. These conditions are presented in Appendix 4. Matters addressed in the conditions include the following:

(a) protection of mangroves;

(b) marine subtidal benthic communities;

(c) marine environmental quality;

(d) marine fauna; and

(e) protection of native vegetation.

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1. Introduction and background

This report provides the Environmental Protection Authority's (EPA's) advice and recommendations to the Minister for Environment on BHP Billiton Iron Ore's (BHPBIO) proposal to establish an Outer Harbour Development, including rail and ore stockpile facilities, offshore from Finucane Island, Port Hedland Western Australia. The proposal will enable an additional nominal export capacity through Port Hedland of approximately 240 million tonnes per annum (Mtpa).

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 has determined under Section 40 of the EP Act that the level of assessment for the proposal is Public Environmental Review (PER). The EPA's decision was made on 5 May 2008. This report provides the EPA advice and recommendations in accordance with Section 44 of the EP Act.

The proponent submitted a PER document setting out the details of the proposal, potential environmental impacts and proposed commitments to manage those impacts. The PER was released for public comment from 18 April 2011 to 13 June 2011.

The EPA considers that the proposal, as described, can be managed to meet the EPA's environmental objectives, subject to the EPA's recommended conditions being made legally binding.

This assessment does not address activities in Commonwealth waters, except in so far that a hydrocarbon spill in Commonwealth waters may impact Western Australian waters, islands or coastline. The proposal is being formally assessed as the construction and operation of the onshore facilities would have the potential to cause significant impacts to the terrestrial environment and the construction and operation and maintenance of the marine facilities would have the potential to cause significant impacts to the marine environment. The proposal is also being assessed by the Commonwealth Department of Sustainability, Environment, Water, Population and Communities (DSEWPC) under the *Environment Protection and Biodiversity*

Conservation Act 1999 (EPBC Act) due to the proposal's potential impacts to matters of national environmental significance.

Further details of the proposal are presented in Section 2 of this report. Section 4 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 Appendix 4. Section 5 presents 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

BHPBIO proposes to develop the Outer Harbour Development (the proposal), including rail and ore stockpile facilities, offshore from Finucane Island, Port Hedland Western Australia (Figure 1). The proposal will enable an additional nominal export capacity through Port Hedland of approximately 240 Mtpa.

The proposal will be constructed in four stages (Figure 2), with the combined offshore and onshore construction period lasting approximately eight years if each stage is built sequentially. Onshore and offshore infrastructure associated with the proposal includes rail and iron ore handling, stockpiling and shiploading facilities (and associated infrastructure), jetty, wharf and shipping channel offshore of Finucane Island.

Iron ore will be transported from inland Pilbara mines along the existing BHPBIO Port Hedland-Newman Railway and proposed Western Spur Railway to stockyard facilities at Boodarie. The Boodarie Estate stockyard infrastructure would supply iron ore via a 6 kilometre (km) overland conveyor to a new transfer pad located to the west of the existing Finucane Island facilities. A 4 km jetty would supply the ship loaders located at the proposed Outer Harbour.

The proposal's disturbance envelope for the onshore infrastructure and construction activities is approximately 4,270 ha. The disturbance envelope also encompasses partially disturbed land and includes existing infrastructure and decommissioned facilities such as BHPBIO's decommissioned Hot Briquetted Iron (HBI) Plant at Boodarie. It is proposed to permanently disturb approximately 940 ha within the disturbance envelope.

Onshore development includes:

The key components of the onshore infrastructure will comprise the following:

- rail connections and spur from the existing BHPBIO mainline to proposed stockyards at Boodarie. The total length of new track is approximately 32 km;

- rail loops at Boodarie;
- stockyards and associated infrastructure at Boodarie (e.g. car dumpers, stackers, reclaimers and lump rescreening plant). The Stockyards will have a nominal total capacity to support 300 Mtpa;
- an infrastructure corridor (including conveyors, access roadway and utilities) from the stockyards to the proposed marine jetty (offshore Finucane Island);
- a transfer station and conveyors on Finucane Island; and
- conveyor connections to the inner harbour berths.

Key marine structures include:

The proposed marine infrastructure for the offshore loading facility will be constructed from Finucane Island. It will extend offshore in a northerly direction with a new jetty approximately 4 km in length and wharf 2 km in length to be constructed adjacent to the existing Inner Harbour shipping channel (Figure 2).

The key components of the offshore marine infrastructure will comprise the following:

- an access jetty structure, including abutment works;
- a deck for the transfer station where the jetty meets the wharf;
- a wharf structure;
- berthing and mooring dolphins;
- ship access gangways and conveyor cross-overs and cross-unders;
- aids to navigation;
- a ship arrestor barrier structure; and
- berth pockets, departure basins, swing basins, link channels, new departure channel and tug access channel.

At completion, vessel movements from the Outer Harbour facilities would be in the range of 960 to 1400 vessel movements per year.

It should be noted that the offshore spoil grounds are not included in the EPA's area for assessment as they are located in Commonwealth waters, and subsequently, the proposal will be required to conform with appropriate Commonwealth legislation and standards for sea dumping of dredged material.

The main characteristics of the proposal are summarised in the table below:

Table 1: Summary of key proposal characteristics

Element	Description
General	
Proponent	BHP Billiton Iron Ore Pty Ltd.
Project Location	Port Hedland, Western Australia.
Proposal Description	Staged development of rail, iron ore handling, stockpiling and shiploading facilities at Port Hedland. Infrastructure includes a jetty, wharf and shipping channel offshore of Finucane Island with onshore infrastructure including ore transport (rail) and ore handling infrastructure (car dumpers, stockyards and conveyor system) and associated supporting infrastructure.
Construction Period	Staged construction, each stage nominally 2-3 years.
Marine Infrastructure	
Export Capacity	Marine infrastructure nominal capacity of approximately 240 Mtpa.
Wharf	Approximately 2 km in length. Eight berths and four shiploaders.
Jetty	Approximately 4 km in length (piled construction)
Shipping Channel	Approximately 32 km in length
Dredge Material	Volume: Approximately 42 million cubic metres (Mm^3).
Landside Infrastructure	
Capacity	Landside infrastructure nominal capacity of 300 Mtpa.
Infrastructure Corridor	From the Boodarie stockyards to Finucane Island and includes: • Access roadway and tracks; • Five conveyors up to 8 km in length; and • Power, water and communication utilities.
Stockyards	Staged development. Each stage comprises ore stockpiles, a c ar dumper, two stackers, reclaimer and lump screening plant. Two rescreened fines yard.
Rail	Loop: Five rail loops, one for each car dumper. Connections to the existing rail infrastructure. Western Spur: approximately 32 km in length.
Footprint	
Vegetation Clearing	Total area: Up to 940 ha; Up to 29.5 ha of Mangroves

The details of the proposal are discussed by the proponent in section 1.1 of the PER document, *Proposed Outer Harbour Development, Port Hedland*, April 2011 (BHPBIO, 2011).

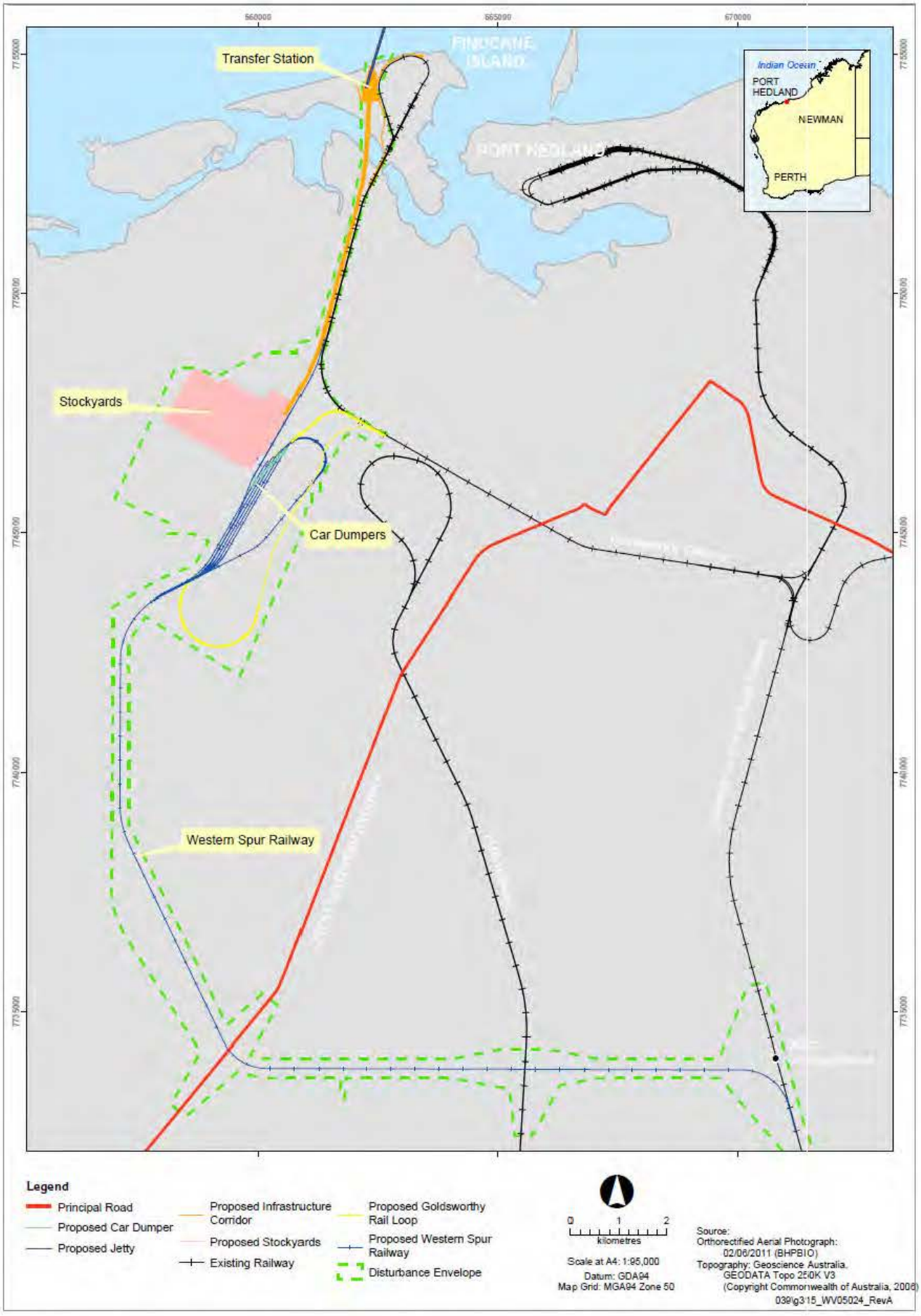

Figure 1 – BHPBIO Outer Harbour Development Landside Infrastructure Layout

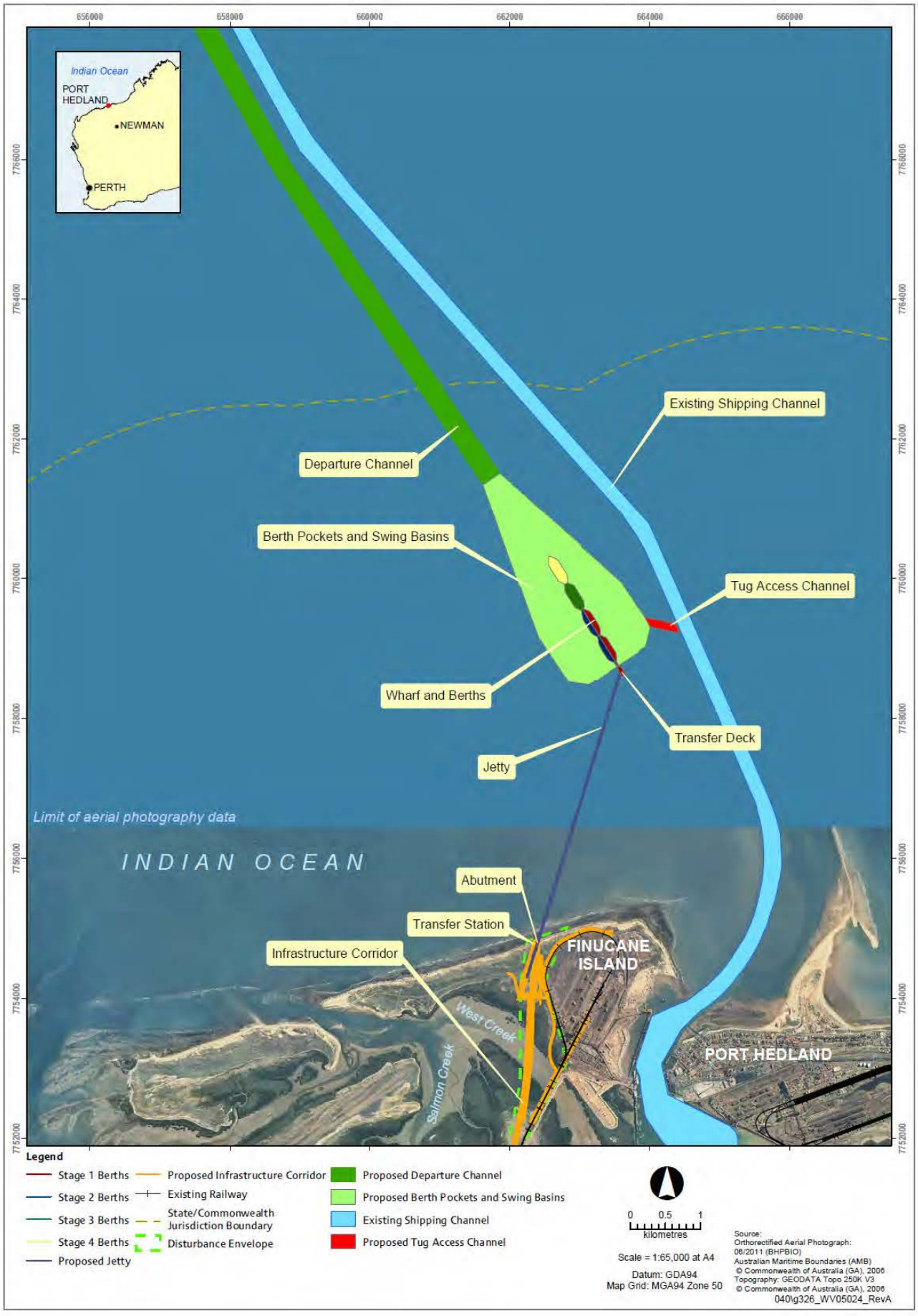

Figure 2 – BHPBIO Outer Harbour Development Marine Infrastructure

3. Consultation

A number of discussions and meetings have been held by the proponent with the relevant traditional owners, government agencies and non-government organisations. Key agencies that were consulted in the process included the Office of the Environmental Protection Authority (OEPA), Department of Environment and Conservation (DEC), Department of Water, Department of Planning and Infrastructure, Port Hedland Port Authority and the Department of Indigenous Affairs. The proponent has committed to ongoing consultation with relevant stakeholders during the environmental approval process and the detailed design stage.

A detailed synopsis of the consultation undertaken is provided in Section 4 of the PER document, *Proposed Outer Harbour Development, Port Hedland*, April 2011 (BHP Billiton, 2011).

4. Key environmental factors

Section 44 of the EP Act 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:

- groundwater impacts;
- greenhouse gases; and
- Aboriginal heritage,

are very relevant to the proposal, but the EPA is of the view that the information set out in Appendix 3 provides sufficient evaluation.

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

(a) Marine habitat – mangroves;

(b) Marine habitat - subtidal marine benthic communities;

(c) Marine environmental quality;

(d) Marine fauna;

(e) Terrestrial biodiversity; and

(f) Emissions (dust and noise).

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 4.1 - 4.6. 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.

4.1 Marine habitat - mangroves

The key intertidal benthic primary producer (BPP) communities that are considered relevant to the proposal are primarily mangrove communities (Figure 3). Other BPP communities within the proposal footprint include salt marshes (samphire) and cyanobacterial algal mats. These intertidal habitats would be impacted by the proposal as a result of construction activities and the presence of the proposed infrastructure, which includes the stockyard and conveyor corridor that would traverse from the Boodarie Estate to the offshore ship loading facility.

Seven species of mangrove have been recorded within the Port Hedland Industrial Area Local Assessment Unit (PHILAU) (Table 2). All seven species are found elsewhere in the Pilbara region and none are listed as threatened under the *Environmental Protection Biodiversity Conservation Act 1999* or the *Wildlife Conservation Act 1950* (WC Act). Two species (*Osbornia octodonta* and *Bruguiera exaristata*) are locally rare, occurring near the southern limit of their range, and there is an absence of suitable habitat in the harbour. However, both species are well represented further north along the Western Australian coastline wherever the required habitats are present (Figure 3).

Table 2 – Mangrove species in the Port Hedland Harbour

Scientific name	Common name
Aegialitis annulata	Club mangrove
Aegiceras corniculatum	River mangrove
Avicennia marina var. marina[1]	Western white mangrove
Ceriops australis[2]	Smooth-fruited yellow mangrove
Osbornia octodonta	Myrtle mangrove
Rhizophora stylosa	Long-style stilt mangrove
Bruguiera exaristata	Large leafed orange mangrove

The predicted extent of irreversible loss of mangrove communities that would result from proposal implementation is 29.5 ha (Figure 4). The greatest mangrove association loss is estimated to occur within the *A. marina* (scattered mangrove vegetation association (11 ha), followed by the *A. marina* (closed canopy, landward edge) habitat (7 ha). These two vegetation associations occupy the highest intertidal positions of the five mangrove vegetation associations under consideration. The closed canopy, seaward edge *A. marina* forest in the low intertidal zone would be the least impacted of

the mangrove vegetation associations, with estimated loss of 1.5 ha, while the losses of high value stands of *R. stylosa* would be up to 5.5 ha.

Direct and indirect impacts to mangrove communities

A number of direct and indirect impacts may potentially occur to mangrove communities during the proposal's construction and operational phases. The main aspects of concern include the infrastructure corridors traversing West Creek and the dewatering activities proposed at Boodarie Estate.

As mentioned above, the proposed infrastructure corridor across West Creek to Finucane Island could result in a direct loss of up to 29.5 ha of mangrove communities. This prediction is based on a causeway type of crossing which includes the in-filling of West Creek (and the installation of culverts) which would provide the maximum extent of disturbance. The proposed infrastructure corridor causeway over West Creek will influence the tidal flushing of West Creek and the proponent predicts that a likely outcome would be the continuation of a gradual build up of sediment, over time creating areas of intertidal habitat that may be suitable for mangrove colonisation within West Creek. This indirect impact of sedimentation upstream of the causeway will be minimised to some extent by the installation of appropriate culverts but is considered by the proponent to be an unavoidable impact of causeway construction.

Other potential risks include creeks becoming completely in-filled, and mangrove communities buried as a result slippage of fill which may spread out and smother tidal flats. The areas where slippage of fill is most likely to occur are on the banks of West Creek where the infrastructure corridor will cross the channel.

The construction of the railcar dumpers potentially involves undertaking dewatering at the Boodarie Estate and, if necessary, discharging this water to Salmon Creek or the Inner Harbour. Depending on the final dewatering disposal strategy, dewatering discharge could occur for a period of approximately nine to 12 months for each car dumper with up to a 12 month break between each dumper excavation. During the first 12 months up to 7 ML/day of abstracted groundwater could be discharged. This activity has the potential to indirectly impact on mangroves by imposing physical and chemical pressures (detailed in Section 4.3 *Marine water quality*) on the habitat. The potential physical pressures would be increased erosion and scouring of substrates.

A Mangrove Management Plan forms part of the PER document and details the management measures for direct and indirect impacts on mangrove communities. The Plan aims to ensure that the predicted loss of up to 29.5 ha is not exceeded through implementation of this proposal.

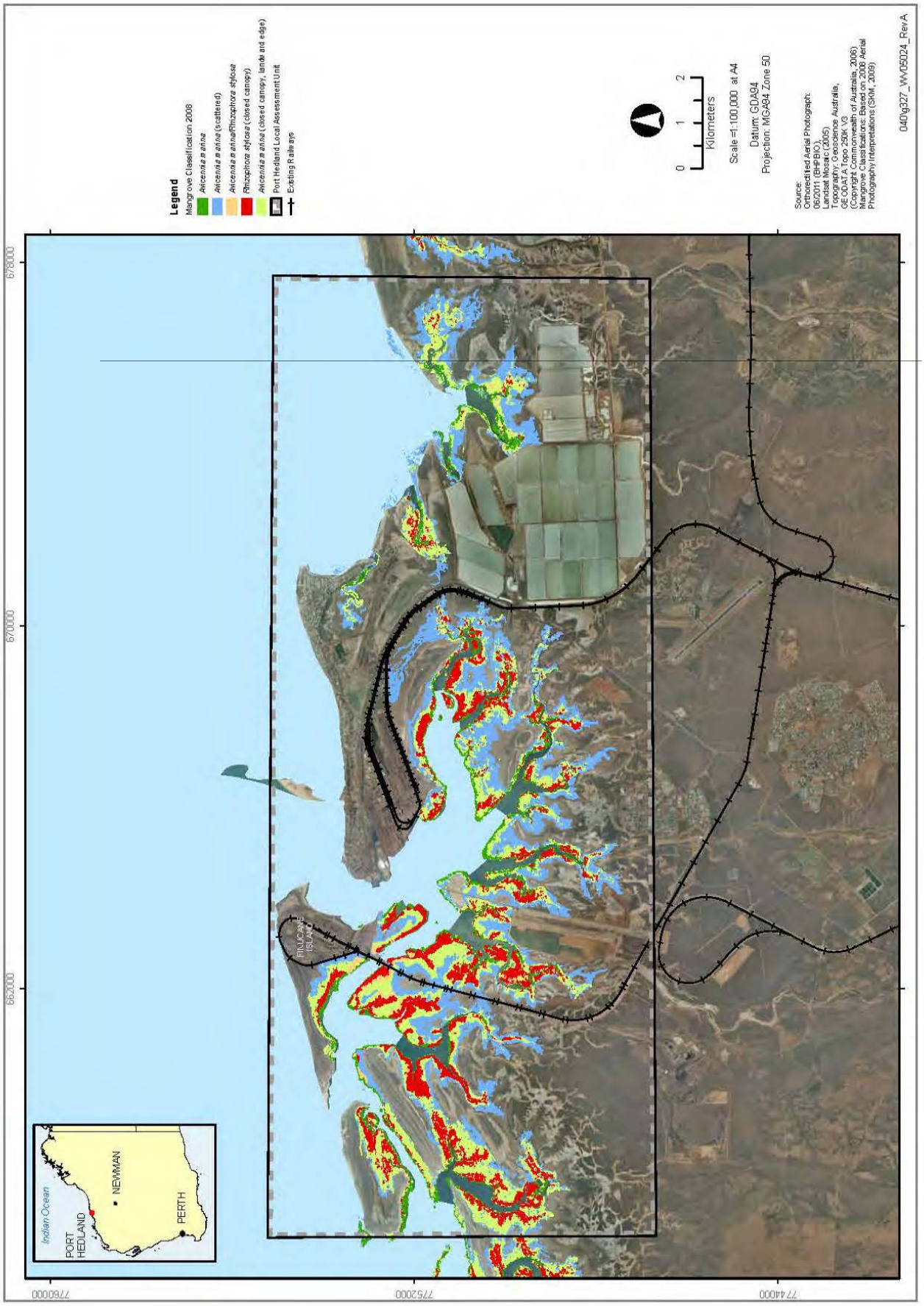

Figure 3 – Distribution of Mangrove Communities

Figure 4 – Mangrove Loss within the Proposal's Footprint

Summary of submissions

Public and Government submissions that the EPA considers of high environmental importance included the following issues:

- potential ecological consequences of BPPH loss;
- ecological integrity of the PHIALAU;
- indirect impacts to intertidal habitat;
- proposed causeway corridor traversing West Creek; and
- cumulative loss of mangrove habitat.

Assessment

The EPA's environmental objective for this factor is to maintain the abundance, diversity, geographical distribution and productivity of mangroves and other benthic primary producer habitat (BPPH) at species and ecosystem levels through the avoidance or management of adverse impacts and improvement in knowledge.

The EPA notes that the residual environmental impact to mangrove communities resulting from the implementation of this proposal will be an unavoidable loss of 29.5 ha. Although this prediction is based on t he maximum disturbance footprint from a causeway type crossing, the EPA notes that the proponent has attempted to minimise impacts by reducing the proposed infrastructure corridor from 150 m to 80 m width, and planning construction of the corridor from end-to-end, thereby reducing the footprint to only the embankments and the conveyor/road corridor.

Cumulative loss of mangrove communities in PHIALAU

EPA's consistent approach to the assessment of mangrove loss within the PHIALAU

The Port Hedland harbour is located within a m angrove-fringed tidal creek system with broad adjoining intertidal mud flats. The cumulative losses of mangrove and other intertidal habitats associated with development in and around Port Hedland harbour are significant issues for the EPA's assessment of development proposals in the area. Subsequently, the EPA published Environmental Assessment Guidelines (EAG) No.3 *Protection of Benthic Primary Producer Habitats in Western Australia's Marine Environment*, December 2009 (EAG No.3) as part of its environmental impact assessment (EIA) reform agenda, which aims to provide guidance for EIA of proposals that may cause cumulative loss of, and/or serious damage to, BPPH. The primary objective of EAG No.3 is to encourage proponents to avoid and minimise loss of BPPH.

With regard to the predicted direct loss of 29.5 ha of mangroves that would result from this proposal, the EPA notes that the proponent has evaluated the cumulative habitat loss considering the guidance provided in the EPA's EAG No.3.

Previously reported losses of mangroves within the PHIALAU[1] comprise approximately 347 ha. This is equivalent to approximately 13% cumulative mangrove loss as calculated from the original historical mangrove extent estimated at 2,676 ha. The cumulative loss guideline assigned to the PHIALAU is 10%.

The proposal would result in a further incremental loss of 29.5 ha and bring the cumulative loss level to approximately 14%. A summary of historic and proposed cumulative loss of mangrove BPPH within the PHIALAU is shown in Table 3.

Table 3: Direct impact (loss) of mangroves - calculations for the PHIALAU

Benthic Primary Producer Habitat (Mangroves)	**Port Hedland Industrial Area Local Assessment Unit (ha)**	**Percentage Impact (%)**
Total size of management unit	15,430	
Historical area of mangroves as defined by the EPA	2,676	
Current area of mangroves as defined by the EPA	2,378.9	
Estimated historic and approved mangrove loss by difference (Inclusive of; 40 ha for South West Creek, 5 ha for Roy Hill Infrastructure, and 4.5 Multi-user Iron Ore, NWI)	342.1	12.8
Potential permanent loss due to this proposal	29.5	
Potential cumulative loss including BHPBIO Outer Harbour Proposal	**376.1**	14%
Resulting extent of mangroves	2299.9	

The EPA is of the view that the proposal is not predicted to have any direct or indirect impacts on the area of regional significance as defined in EPA's Guidance Statement No. 1, *Protection of Tropical Arid Zone Mangroves along the Pilbara Coastline* (EPA, 2001). This area is also defined in Guidance Statement No.1 as 'Area No.21' or 'The Oyster Passage Barrier' and the

[1] **Note** – the EPA recently released Environmental Protection Bulletin (EPB) No. 14, *Guidance for the assessment of benthic primary producer habitat loss in and around Port Hedland* (EPA, 2011), which establishes a contemporary and common spatial basis for calculating cumulative loss of intertidal and tidal creek-associated BPPH in Port Hedland. The advice and supporting data presented in EPB No.14 effectively supersedes the PHIALAU which has been used previously for consideration of BPPH loss within the Port Hedland region. **At the direction of the EPA, EPB No.14 is to be related to new referrals to the EPA only.**[1]

reason is primarily to do with the separation distance between the proposal footprint and Area No.21.

The EPA notes that the proponent has characterised the predicted loss of up to 29.5 ha of mangroves in the PHIALAU within the context of EAG No. 3. This would take the cumulative loss figure for the PHIALAU to approximately 14%. The EPA also notes that the proponent has given due consideration to both the overarching assessment principles and the overall risk to the ecological integrity of the mangroves located within the PHIALAU.

BHPBIO's additional work on mangrove loss within the PHIALAU.

EAG No.3 is very clear that the cumulative loss guidelines are not intended to be definitive acceptability criteria. Rather, similar to a water quality guideline value, cumulative loss guidelines represent a level of cumulative loss that, if not exceeded, is considered unlikely to pose unacceptable risk to ecological integrity of the local assessment unit. However, if a cumulative loss guideline is likely to be or has already been exceeded, EAG No.3 establishes an expectation that proponent's present a substantiated technically rigorous case that additional cumulative losses would not cause ecological integrity to be significantly compromised.

The EPA's reports for both proposals, BHPBIO RGP5 (Report No. 1305), *Dredging at Finucane Island* and BHPBIO's RGP6 *Nelson Point Dredging* (Report No. 1377) made specific reference to additional studies undertaken by BHPBIO that consider natural dynamics across space and time in mangrove community cover within the PHIALAU. The EPA stated the following:

"The proponent has recently commenced research into mangrove loss and accretion in the Port Hedland Industrial Area Management Unit and the EPA is supportive of this science continuing. Initial information suggests that there have been increases in the area of some mangrove vegetation associations and that the current cumulative loss of mangroves may be less than 10%, however the information regarding quantification of cumulative mangrove loss requires verification.' (RGP5, November 2008 & RGP6 September 2009 respectively)."

BHPBIO's studies on mangrove community dynamics found that the total area of mangroves estimated to be present in 1963 is 2,699 ha. A more contemporary estimate of mangrove extent based on spatial analysis of aerial imagery taken in 2008 is 2,640 ha. The proponent's interpretation of these data is that in areas of the PHILAU, there have been some natural gains and losses in cover of the different components of mangrove communities (Table 2). Table 2 shows that while the natural gains in mangrove cover within the PHILAU over a 45 year period until 2008 were enough to keep development-related losses in check to some degree, natural trends were not sufficient to completely counterbalance the development-related loss.

Table 4: Cumulative changes in extent of mangrove associations in 1963 and 2008

Vegetation Association	1963 total (ha)	2008 total (ha)	% Cumulative losses or gains
Avicennia marina (closed canopy, seaward edge)	223	220	-1.3
Rhizophora stylosa (closed canopy)	570	589	+3.3
Rhizophora stylosa/*Avicennia marina* –(closed canopy)	126	89	-29.6
Avicennia marina (closed canopy, landward edge)	891	1,027	+15.3
Avicennia marina (scattered)	889	715	-19.6
Totals	**2,699**	**2,640**	**-2.2**

Based on the findings of its studies into mangrove dynamics over a 45-year period up until 2008 and, the approved and proposed development-related losses within the PHILAU since 2008, the proponent estimates that the percentage loss of mangroves may be around 5.7% (Table 5).

While the results of BHPBIO's research are yet to be verified by the EPA, the findings suggest that an overall level of mangrove loss from the PHILAU may be less than the 10% cumulative loss guideline.

Table 5: Historical and Cumulative Loss of Mangrove BPPH in Port Hedland Industrial LAU using Revised Estimates

Management Unit	2008 Extent of Mangroves	Losses since 2008 Mangrove Area Estimate	Cumulative Loss (%)
Port Hedland Industrial Area (154.3 km^2)	2640 ha	PHPA Utah Point – 18.6 ha BHPBIO RGP5 – 6.5 ha BHPBIO RGP6 – 4.0 ha Roy Hill Iron Ore 5 ha PHPA South West Creek – 40.0 ha **Cumulative loss since 2008 = 74.1 ha**	2.2% from 2008 estimate
Port Hedland Industrial Area (154.3 km^2)	Current extent of mangroves 2565.9 ha	*Worst-case loss scenario:* Port Hedland Outer Harbour project: 27 ha	5.7%

West Creek management

The EPA has recently recommended in its reports on previous proposals, namely Roy Hill Port Infrastructure (EPA, 2010) and North West Multi-user Iron Ore Export (EPA 2011), that the utilisation of elevated trestle-type conveyors is considered best practice infrastructure design to avoid and minimise direct impacts to mangroves. This issue was raised by the OEPA with the proponent through the submission/response to submission process in the context of impact avoidance and minimisation. The proponent's response, in summary, was that the causeway footprint and potential impact to mangroves would be minimised:

- by reducing the infrastructure corridor from 150 m to 80 m width;
- by planning construction of the corridor from end-to-end, thereby reducing the footprint to only the embankments and the conveyor/road corridor; and
- as a tidal flushing study has been undertaken and a commitment has been given to maintain the tidal flows upstream of the proposed corridor.

In addition, the proponent argues that West Creek is already a disturbed environment and the construction of the original causeway to Finucane Island has interrupted tidal flows that kept West Creek channel open.

The EPA notes that the residual environmental impact to mangrove communities resulting from the implementation of this proposal will be an unavoidable loss of 29.5 ha. The EPA is of the view that although 29.5 ha will be directly lost, opportunities exist to reduce this impact through implementing best practice infrastructure design, namely using an alternative elevated trestle-type causeway design to the proposed earthen embankment causeway. For this reason, the EPA has recommended conditions 7-1 and 7-2, which will effectively require that the proponent investigates alternative infrastructure crossing and designs prior to construction in an attempt to reduce this impact. Furthermore, the EPA is satisfied that management measures detailed in the PER document will contained the direct impact to no more than 29.5 ha. This is addressed in condition 7-3.

In addition, the EPA has considered that the cumulative loss of 29.5 ha will increase the development-related cumulative loss of mangrove BPPH from the PHILAU to around 14%. The EPA notes that the proponent has undertaken additional studies that provide data to inform judgements regarding the potential for unacceptable impacts to ecological integrity. The findings of these studies along with the estimates of development-related loss of mangroves suggest that the percentage losses within the PHIALAU would be within a range of 5.7% to 14%.

Summary

Having particular regard to the:

- the unavoidable loss of 29.5 ha of mangroves;

- the findings of BHPBIO's studies that the cumulative percentage losses within the PHIALAU would be within a range of 5.7% to 14%; and
- EPA's recommended Conditions 7-1 and 7-2,

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

4.2 Marine habitat – subtidal marine benthic communities

The subtidal benthic habitat offshore of Port Hedland is characterised by extensive plains of sand/silt/rubble substratum and low relief limestone ridgelines of hard pavement. These ridgelines support occasional patches of sparse biota, including hard corals, macroalgal beds, sponges and soft corals.

Hard corals are likely to be the most sensitive benthic primary producers within State waters affected by dredging activities. The dominant corals present are from the genus Turbinaria and from the families Faviidae and Poritidae.

Marine waters in the proposal area are tidally dominated by a large semi-diurnal regime, with the highest astronomical tide being 7.9 m. These large tides drive strong currents of around 1 m/s (2 knots), which can increase at the entrances to tidal creeks along the coastline, and are typically aligned north-west to south-east. Wind is also important to nearshore water movement, resulting in long-term drift towards the east and north-east during spring and summer months (wet season). In autumn and winter (dry season), weaker and less persistent current reversals occur.

Nearshore environments, in water depths shallower than 5 to 10 m, were characterised by variable turbidity, high sedimentation rates and highly variable light and temperature conditions. Much of the variability observed in marine water quality conditions is attributable to season, weather, tide and distance offshore.

The dominant sediment types were medium to coarse grain sands containing shell fragments. Sedimentation studies indicated that fine sedimentary material present in the water column settles out. The physical environment causes fine particles to be resuspended and to accumulate on the seabed. Fine material therefore only accumulates in quiet water or depositional locations, such as in the lee of islands.

Macroalgae

The most abundant macroalgae found during the surveys were brown algae (Phaeophyta), including species from the genera *Sargassum*, *Dictoyopteris* and *Padina*. Also, species from the group of green algae (Chlorophyta) were common: *Caulerpa* and the calcareous *Halimeda*. Representation of red algae (Rhodophyta) included corallines (e.g. *Amphiroa* and *Galaxaura*) and algal turf.

At Weerdee Ridge, 11 km west of the Port Hedland Harbour entrance, macroalgal cover varied between 0 and 71% of the substrate. *Caulerpa* and *Halimeda* spp. were the most common algae at this site (SKM 2009a).

Seagrass

Seagrasses are not common in the Port Hedland area and those that do occur are ephemeral species such as *Halophila ovalis*. Patches of ephemeral species were recorded inshore of Weerdee Island, as well as small, sparse patches offshore of Weerdee Island and in a small intertidal lagoon at the entrance. Other species recorded include, *Thalassia hemprichii*, *Halodule uninervis*, and *Halophila decipiens*.

The seagrass was mapped to cover approximately 86 ha or 4.8% of the embayment in beds of sparse (5 to 25% cover) to medium (25 to 50% cover) density. The proponent suggests that it is likely that the distribution of seagrass, specifically *Halophila* spp., throughout the Port Hedland region is spatially and temporally dynamic. In addition, it was noted that seagrasses in the study area are preferentially located in areas that offer shelter from prevailing metocean conditions (e.g. in the lee of islands).

Hard corals

The species richness of coral taxa at all sites surveyed in the study area was very low in comparison to other studies carried out in the Pilbara region and no corals considered endangered or unique to the region were recorded.

A total of 51 species of coral from 19 genera were identified from areas offshore from Port Hedland, which is considerably lower than the 120 coral species from 43 genera recorded in the Dampier Port and inner Mermaid Sound, Dampier (Blakeway & Radford 2005). The estimate for the offshore Port Hedland region is based on a smaller sampling effort when compared with the Mermaid Sound region. Although more species may be present offshore from Port Hedland, the number of coral genera recorded during field surveys is considered to be representative of the actual number of coral genera present in these coral communities.

The dominant corals present are from the genus Turbinaria and from the families Faviidae and Poritidae. The dominance of *Turbinaria* spp. and overall low species richness and abundance (0 - 21.6 % cover) of corals within subtidal waters in the Port Hedland area suggest that these coral communities experience, and are adapted to, high turbidity and sedimentation rates. This type of coral community is considered typical of the broader marine environment of the Pilbara region, and is also similar to other Turbinaria dominated coral communities in macrotidal, turbid waters elsewhere in northern Australia.

Based on the generally low species richness and abundance of corals and the dominance of corals of the genus Turbinaria, coral communities that inhabit subtidal habitats in the Port Hedland region can be described as

predominantly high turbidity (low light), high sedimentation adapted communities (SKM 2009c).

Proponent's predictions of impacts

For marine subtidal benthic habitats, the predicted impacts of dredging include loss of substrate, smothering and turbidity induced light reduction leading to reduced photosynthesis in benthic primary producers.

The proponent has predicted the impacts of the proposal on benthic habitats in accordance with EPA's Environmental Assessment Guideline No.7 for *Marine Dredging Proposals*, September 2011 (EAG No.7) (Figure 4). A fundamental part of EAG No. 7 is guidance for the application of a spatial zonation scheme that has been designed to provide clarity and consistency to the way predicted impacts of dredging activities on benthic habitats are presented. This spatial zonation scheme allows impacts to be presented in simple map-forms that convey information about the predicted extent, severity and duration of impact.

Outputs of sediment transport and water quality modelling were interrogated against a number of pressure thresholds for benthic communities to allow the locations of boundaries for the zone of high impact, zone of moderate impact and zone of influence to be predicted. Generating the predictions in this way has also allowed the proponent to calculate the potential permanent losses of BPPH and present those predictions in the context of Environmental Assessment Guideline No. 3 (EPA, 2009).

Modifications to the zones of impact since the release of the PER

The modelled zones of impact presented in the recent response to submissions by the proponent (November 2011) have changed since the release of the PER in April 2011. The zone of high impact has been reduced and the zone of moderate impacts has increased significantly. Remodelling of the dredge plume was primarily undertaken due to changes of the following components:

- impact assessment has been revised to account for the cumulative effects of the proposed dredging programme on the BPPH;
- marine infrastructure design and footprint (removal of link channel and dredging the departure channel in Stage 1);
- dredge volume reduced through optimisation of the turning basin and removal of the link channel;
- number and location of spoil grounds reduced from four proposed spoil grounds to one spoil ground, with two additional spoil grounds for contingency;
- dredging timeframe has reduced from five years to four years through reduced volume, and use of a larger Cutter Suction dredge;
- additional environmental baseline data collected (24 months) was utilised in both the modelling and development of water quality thresholds; and

- additional geotechnical data from 190 drillholes was utilised in to develop a detailed dredge programme with the dredging contractor, who then predicted the percentage of fine materials that the dredging operations may yield. This increased the percentage content of fines in the material to be dredged for some stages of the dredging programme from 5 to 30%. This was incorporated into the dredge plume modelling.

The remodelling was based on a revised dredge program and schedule from the dredging contractor, and utilised the actual equipment proposed for the project. In addition, the remodelling provided an opportunity to incorporate more contemporary information that was collected since the previous modelling exercise and the application of new environmental guidelines.

A summary of impacts within each zone is as follows:

Zone of High Impact (ZoHI)

This zone refers to the area of predicted permanent or irreversible loss of BPPH and its communities. Since the release of the PER, the ZoHI has been reduced by 110 ha to cover the direct footprint of dredging and the area immediately surrounding the footprint which would be impacted by high levels of sedimentation and smothering of BPP. T he area of BPPH to be permanently lost from the footprint of the proposal is now 3.8 ha and a further 34 ha will be lost due to indirect impacts such as sedimentation and shading. Up to 9 ha of this loss is expected to be hard coral communities.

The proponent considers the direct loss of BPPH associated with the infrastructure and construction activities of the proposal represent a very small proportion of affected area in relation to the entire ecosystem offshore from Port Hedland (Table 4).

Table 5: Subtidal BPPH impacts

	Area	Total area (ha)	BPPH (ha)	BPP (ha)
Zone of High Impact	Direct Footprint	380	3.8 (1.0%)	2.4 (0.6%)
	Irreversible loss from sedimentation	929	33.7 (3.6%)	18.6 (2.0%)
	Subtotal	1, 309	37.5 (2.8%)	21.0 (1.6%)

Zone of Moderate Impact (ZoMI)

This zone refers to the area of predicted sub-lethal impacts and/or reversible loss of BPPH (recovery timeframe is predicted to be less than five years) resulting from elevated sedimentation and a reduction in the surface irradiance (SI) of light at the seabed from elevated Total Suspended Solids

(TSS). This zone is therefore comprised of those areas anticipated to receive the following range of impacts; sedimentation causing mortality but recovery expected within five years (reversible loss), sedimentation causing sub-lethal impacts, reduction of SI causing mortality but recovery expected within five years (reversible loss) and reduction in SI causing sub-lethal impacts.

The proponent has identified certain hard coral species as the most sensitive to dredge related pressures known to be present in the study area. Hence, by using the tolerances for these species to generate the potential extent of the ZoMI, the proponent considers this would apply to all benthic habitats combined. The proponent considers that macroalgae are not expected to suffer mortality and that other components of the benthic community such as sponges and soft corals are also not expected to suffer any significant impacts.

There are however some uncertainties associated with the actual distribution of benthic habitats, habitat recovery potential and predictions in relation to the continued resuspension of fine particles at a large distance from the source.
As mentioned above, the area of the moderate zone has increased significantly since the PER. The proponent has indicated that this is primarily due to the revised modelling assumptions including the incorporation of background water quality values in the model outputs and the increase in the proportion of fines from 5% to 30% based on recent geotechnical information. The proponent has noted however, that the accuracy of predictions, and the severity of the impacts both decline with distance from the source of impact.

The ZoMI for corals may extend 15 km to the west and 10 km to the east of the proposal in a band about 4-5 km wide, if photosynthetic active radiation is less than 15% of natural levels for any 40 days in a 60 day period.

Zone of Influence (ZoI)

This zone refers to the area where, at some time during the proposed dredging and spoil disposal activities, small changes in sediment-related environmental quality which are outside natural ranges might be expected. However, the intensity, frequency and duration of this change is such that no measurable effects on benthic biota or their habitats are predicted. This zone is comprised of the ZoIs for both sedimentation and SI.

Mitigation

Although direct and indirect (recoverable within five years) losses of marine habitat would occur, all marine habitats that will be affected are well represented in the Pilbara region and none support species that are exclusively dependent on the habitats that will be affected. In addition, mitigation and management measures would be implemented to either remove or greatly minimise the potential impacts, these include:

- engineering design of project footprint and infrastructure;
- spoil disposal grounds are purposely located in areas with little marine habitat present supporting significant marine communities;

- marine infrastructure design and footprint (removal of link channel and dredging the departure channel in Stage 1);
- dredge volume reduced through optimisation of the turning basin and removal of the link channel (from 54 Mm^3 to 42 Mm^3);
- number and location of spoil grounds reduced from four proposed spoil grounds to one spoil ground, with two additional spoil grounds for contingency;
- dredging timeframe has reduced from five years to four years through reduced volume, and use of a larger Cutter Suction dredge; and
- clear briefings and instructions to contractors regarding procedures to be undertaken to minimise the disturbance envelope.

Assessment

The EPA's environmental objectives for this factor are to maintain ecological integrity, and protect the biodiversity and environmental values of WA's marine environment.

The EPA notes that the implementation of the proposal would result in unavoidable impacts to sub-tidal BPPH and other benthic communities, some of which would be permanent but the majority of which are predicted to recover within five years. These zones of impact are depicted in Figure 4 and discussed below.

Zone of High Impact

Up to 38 ha of benthic primary producer habitats coincide with the ZoHI and will be permanently lost as a result of the proposal. Although described in the PER as a mosaic or mixed assemblage benthic community, the predominant organisms supported by the BPPH are hard corals, macroalgae and sponges. No direct or indirect losses to seagrasses are predicted as no seagrasses have been observed within the ZoHI.

The predicted cumulative losses have been calculated as per EAG No. 3 to include historical, direct and indirect losses from the proposal within the Local Assessment Unit No. 8 (LAU 8) (Figure 10.23 of the PER). Based on total areas of BPPHs in the LAU 8, approximately 12% will be lost. This is marginally above the cumulative loss guideline of 10% for development areas in EAG No. 3, which has been assigned by the proponent and is appropriate for this proposal in view of it occurring in the Port Hedland Port Authority outer harbour boundary.

The proponent has advised in the response to submissions that the ecological significance of the losses is considered to be minimal based on its observations that:

- the direct losses of BPPH associated with the marine infrastructure represent a very small fraction of the total BPPH of this type in the Port Hedland region;

- any areas in which indirect losses occur are expected to be rapidly recolonised because the supply of coral recruits through the extensive representation of this benthic community and habitat will be available;
- from a regional perspective, the species richness of coral taxa in the area affected is very low in comparison to elsewhere in the Pilbara region. In addition, these coral communities do not appear to contain endemic species and are not considered to be regionally significant coral communities with high preservation values; and
- there is little evidence of carbonate accretion onto the tops of the limestone ridges on which the coral communities are found, suggesting that the extreme metocean conditions the coral communities experience during the seasonal storms and frequent cyclones that occur in this area are likely responsible for the observed low diversity, relatively small colonies and low percent cover of coral.

The EPA considers that in view of the fact that the calculated cumulative losses are not materially above the cumulative loss guideline, the permanent losses are considered to be acceptable provided that conditions are applied to limit the allowable extent of irreversible loss of benthic habitats associated with the proposal. In this regard, the EPA has recommended condition 6 which reflects the extent of the ZoHI and to demonstrate that the actual impacts do not exceed the proponent's prediction.

Zone of Moderate Impact

The EPA notes that the area encompassed by the predicted revised ZoMI is significantly larger than the zone predicted in the PER document for reasons explained above.

Although predicted changes in turbidity and sedimentation due to the dredging and disposal activities for the proposal are spatially extensive, the resultant indirect impacts to benthic habitats measured as loss of BPP's are considered to be a small proportion of the total area of study area and the combined area of the zones of impact (365,000 ha). The limited extent of impact is a reflection of the sparseness of benthic habitat that actually supports hard corals, and the strong tidal influence, which would disperse the dredging and disposal plumes rapidly.

It is also noted that the low level of cover of BPPH throughout the area and the acclimatisation of the communities and individuals to elevated turbidity and high levels of disturbance give confidence to the predictions of low levels of loss and high likelihood of recoverability outside of the ZoHI. The species present are considered turbid water specialists that are physiologically suited to colonising disturbed habitats. The high level of variability throughout the study area both in terms of spatial and temporal distribution indicate that the recovery is likely to occur. The proponent has advised based on its observations that the natural turnover of corals within the study area appears to be on a timescale of approximately five years, hence it is expected that the communities present would recover to pre-dredge levels within this period.

Once dredging finishes, the proponent anticipates that light conditions within the predicted ZoMI would return to those typical of the normal range, allowing re-colonisation and recovery of receptor organisms within that zone to occur within a period of five years.

The EPA recommends that, to minimise the risk to ecological integrity associated with the above indirect impacts, conditions should be imposed to limit the spatial extent of the ZoMI and establish clear environmental protection outcomes that must be achieved. The environmental protection outcomes in recommended condition 6-1 for the ZoMI and ZoI are as follows:

- no irreversible loss of, or serious damage to benthic habitats outside of the Zone of High Impact shown in Figure 2 of Schedule 1, unless and until a revised Zone of High Impact has been approved by the CEO in accordance with Condition 6-10 to have effect;

- no detectible net negative change to benthic habitats relative to the baseline state of those habitats, outside of the Zone of High Impact and Zone of Moderate Impact, shown in Figure 2 of Schedule 1, unless and until revised Zones of High and/or Moderate Impact have been approved by the CEO in accordance with Condition 6-10 to have effect.

Proposed environmental offsets

The proponent recognises that direct and indirect impacts/risks remain to benthic primary producer habitats and has therefore proposed a package of offset projects to mitigate the residual impacts of the proposal. In relation to marine sub-tidal habitats, the proponent proposes to commit $3 million over two years to improve the understanding and management of the impacts of dredging on tropical marine communities. The EPA is satisfied that the proposed offset project for this factor is reasonable given the scale of impacts and the residual risk of impacts to BPPHs. Accordingly, the EPA has recommended condition 16 and Schedule 3 which incorporates the proponent's offset project.

Summary

The EPA finds that the dredging campaign could be implemented and managed in a way that is unlikely to compromise the ecological functioning of the marine environment locally and regionally. The EPA has therefore concluded that its objective for this factor at this location could be met subject to proactive dredge management to control and limit impacts to benthic communities and through the implementation of recommended condition 6. Recommended condition 6 requires the proponent to monitor and manage its dredging operations against pre-determined environmental protection outcomes and boundaries for the zone of moderate impact and the zone of influence. Recommended condition 16 requires the proponent to implement its proposed offset project.

4.3 Marine environmental quality

The marine environment of the proposal area includes the waters of the Port Hedland inner harbour, including Salmon Creek and the marine offshore waters surrounding the jetty and wharf component of the proposal, up to the Commonwealth waters.

The key marine environmental quality issues associated with the proposal are considered to be:

- potential environmental quality impacts on receiving water quality in Salmon Creek caused by the potential dewatering discharge from the construction of the car dumpers; and
- ongoing contaminant inputs from operational activities at the wharf and unloading area.

Other aspects that could potentially impact marine environmental quality include:

- liquid and solid waste disposal during construction and operation;
- leaks and spills during construction and operation; and
- discharge of stormwater.

Salmon Creek Dewatering Discharge

The construction of the car dumpers will require dewatering and potentially the disposal of a significant volume of water from de-watering through the upper reaches of Salmon Creek. The exact location of the discharge and final volumes have yet to be determined, and the effluent streams have yet to be fully characterised at present. At this stage it is estimated that dewatering of up to seven megalitres per day will be required for a period of nine to 12 months during construction, for each car dumper.

The proponent has clarified in its response to submissions, that it is still examining alternative options for the dewater to avoid and minimise the need to discharge to the marine environment. It will investigate the reuse, recycling and alternative disposal options when dealing with this dewater, but may still require the water to be discharged into Salmon Creek if the volumes exceed requirements and/or water quality does not allow for reuse. The proponent has advised that the final option will depend on the results of further hydrogeological and water quality investigations and modelling.

In the absence of having completed this investigation, the proponent has undertaken modelling and an impact assessment of the 'worst-case' scenario; that is, all dewatering discharge is pumped to Salmon Creek. The proponent expects that discharge into a creek that is flushed by twice-daily tidal changes will promote rapid mixing and accelerate dilution of the discharge contaminants.

Ongoing port operational impacts

Ongoing port operational activities will introduce a range of uncontrolled contaminant inputs around the Outer Harbour and dredge channel such as shedding of antifouling paints, bulk material spillage, and leaks and spills.

The *Consultation Outcomes: Environmental Values and Environmental Quality Objectives* (DEC, 2006a) establishes an environmental quality management framework for the Pilbara region to help manage and protect the marine environment from the effects of waste inputs and pollution. The plan establishes environmental values to be protected, the environmental quality objectives (EQOs) that should be met and spatially defines the levels of ecological protection (LEPs) for the harbour. The environmental values to be protected in the harbour are:

- Ecosystem health;
- Cultural and spiritual;
- Fishing and aquaculture;
- Recreation and aesthetics; and
- Industrial water supply.

The EQO for *Maintenance of Ecosystem Integrity* has two LEPs that apply in the waters surrounding the Port Hedland harbour – high and moderate. Most of the working areas of the inner harbour at Port Hedland have been assigned a 'moderate' LEP in recognition of existing and approved proposals as at 2006. The allocation of a moderate LEP in the inner harbour recognises that in areas about wharves, jetties and ship turning basins, there is enhanced potential for a range of uncontrolled contaminant inputs (eg. shedding of antifouling paints) in addition to turbidity and sediment mobilisation during ship berthing.

The dredging footprint for this proposal to provide for new berth pockets, swing basins and departure channel occur in an area that is currently assigned a 'high' level of ecological protection (LEPs). As a consequence, the proponent has proposed revised LEPs from 'high' to 'moderate' as shown in Figure 5. The revised boundaries would capture future berth facilities associated with the proposed berth pockets and are a maximum of 250 m from the edge of the berth pockets. This modification is consistent with the guidance provided in the *Pilbara Coastal Water Quality Consultation Outcomes* (DEC, 2006a) for applying a moderate LEP area to working port areas.

Sediment quality

The suspension of sediment and associated release of contaminants into the water column from dredging and loading of vessels during the construction and operational phases of the proposal is considered to have the potential to impact on marine environmental quality in the proposal area.

Capital (construction) dredging for the proposal involves the dredging of 42 million cubic metres of sediment to accommodate the construction of the 34 km navigational channel and berthing facilities. It is estimated that the majority of the dredging will be conducted in State waters around the berth pocket and swing basin.

The proposed dredging footprint commences approximately 4 km offshore, in an area distant from potential land-based and industrial contaminant inputs. The nearest potential source of contaminants to the sediment within the proposed dredging footprint are the existing shipping channel 1 km to the east and the entrance to the Inner Harbour, approximately 5 km south-east. The lack of nearby sources of contaminants indicates that it is unlikely that sediments are contaminated from anthropogenic sources and are considered relatively clean.

To confirm this, a detailed Sampling and Analysis Plan (SAP) for the dredging component was prepared to assess sediment quality. Superficial sediment samples taken from a total of 213 sites and a summary of the findings include:

- Arsenic (95% upper confidence level (UCL)) was found to exceed the National Assessment Guidelines for Dredging (NAGD) screening level but was below the maximum level. Arsenic is believed to be a naturally-occurring element in the sediments and base material of the region (DEC 2006b) and subsequent testing indicated that it was neither bioavailable nor toxic.
- Chromium (95% UCL) was found to not exceed the NAGD screening level.
- Nickel (95% UCL) was found to exceed the NAGD maximum level but not in surficial material. Nickel is likely to be a naturally-occurring element in the base material of the region (DEC 2006b) and subsequent testing indicated that it was neither bioavailable nor toxic.
- Tributyltin was below analytical detection levels in all samples not exceed the NODGDM screening level (5 µg Sn/kg) in any superficial samples or borehole samples.
- Organic compounds (polychlorinated biphenyls, polycyclic aromatic hydrocarbons and organochlorine pesticides) were found to be below analytical detection in all samples tested.

Based on sediment analysis results, material within the proposed dredging footprint are considered to be suitable for unconfined sea disposal. Furthermore, bioavailability studies have shown that contaminants detected in sediments do not pose a risk to the environmental values in the marine water and sediment quality in the State Waters (SKM 2009a, SKM 2009b).

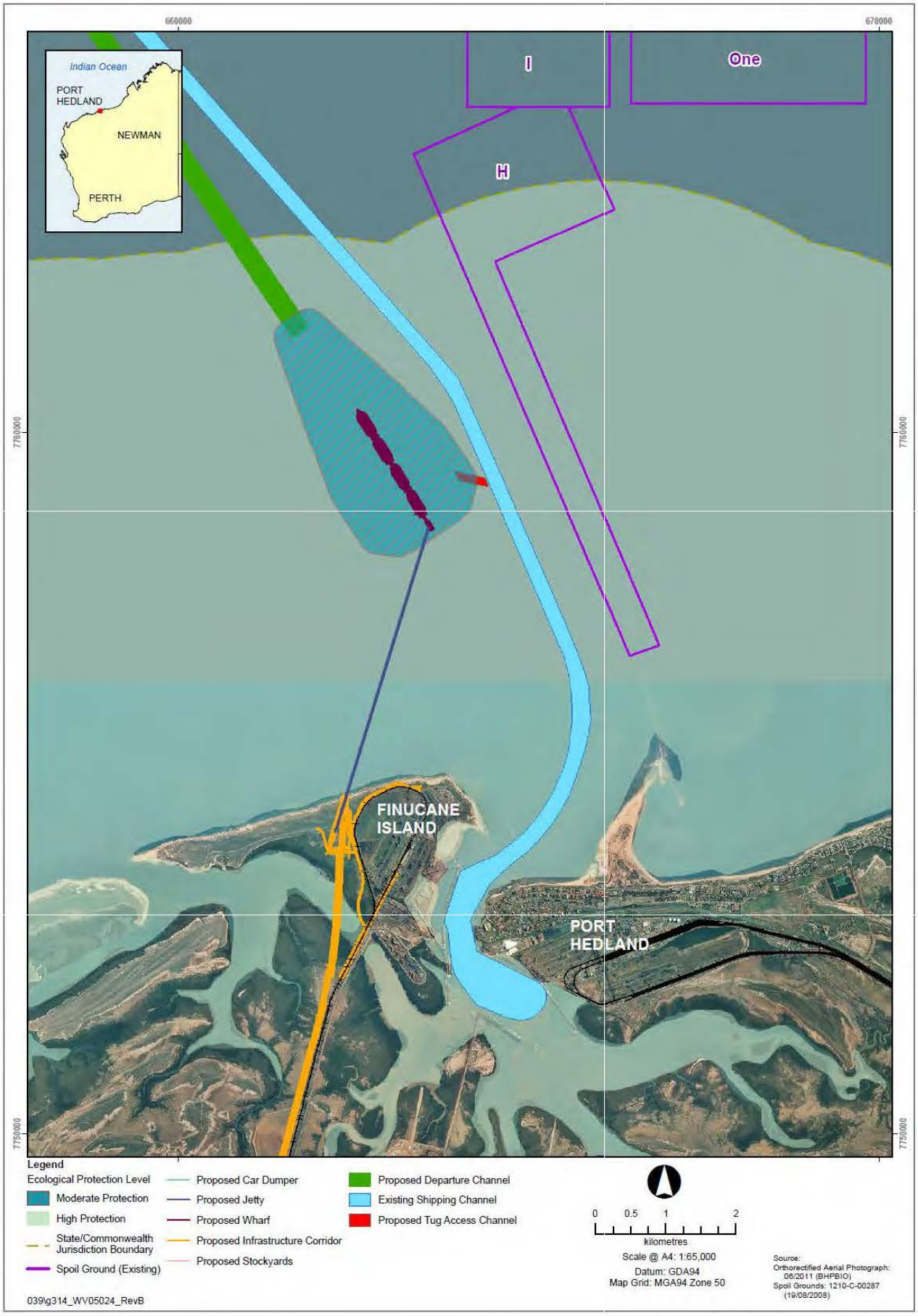

Figure 5 – Levels of Ecological Protection

Summary of submissions

Public and Government submissions that the EPA considers of high environmental importance included the following issues:

- bio-accumulation from suspended sediments; and
- dewatering and rapid dilution of water through Salmon Creek.

Assessment

The EPA's environmental objective for this factor is to maintain the quality of waters, sediment and/or biota so that the environmental values, both ecological and social, are protected.

Construction dewatering

As mentioned above the proponent has undertaken a 'worst-case' impact assessment based on a scenario where all dewatering will be discharged to the marine environment. The EPA notes that initial testing of Boodarie groundwater showed that the following metals: arsenic, chromium, mercury, selenium, silver, vanadium and zinc, were above the marine water quality guidelines for 99% species protection for a high level of ecological protection. The 99% species protection levels are applicable to the headwaters of Salmon Creek.

However, the results of further investigations and ecotoxicity testing have shown that the groundwater samples are not toxic to sea urchin fertilisation, amphipods or fish but are moderately toxic to microalgae, sea urchin and rock oyster larval development, and would need a 1:20 dilution to achieve this 99% species protection. The proponent considers that if this was achieved there would be no predicted downstream toxic impacts to the receiving environment of Salmon Creek.

The near-field hydrodynamic modelling indicated that an initial mixing zone of 3 to 4 m would be sufficient to dilute the heavy metal concentrations to levels below the ANZECC/ARMCANZ (2000) trigger levels (99% of species) when the water depths were greater than 0.5 m. However, the EPA notes that under low tide conditions there would be no dilution; the discharge would constitute the majority of the flow and potentially cause an impact on creek biota.

In addition to impacts from metals, it is also noted that there are elevated concentrations of nutrients which would contribute a significant loading of nitrogen and phosphorus to Salmon Creek, in the vicinity of 5 kg of available phosphorus and 520 kg of available nitrogen per year. This would make the Boodarie groundwater discharge a significant point source of nutrients to the macrotidal system of Port Hedland. This could cause long term impacts downstream in terms of eutrophication, where nuisance macroalgae and microalgae grow in abundance. The nutrient related impacts to marine environmental quality have yet to be fully investigated.

In view of the uncertainties and risks from the worse-case option of direct discharge to Salmon Creek, the EPA considers that reuse and/or alternative options should be fully investigated by the proponent prior to the consideration of discharge to the marine environment and therefore recommends condition 12. Condition 12 is recommended to formalise the proponent's commitment to undertake further hydrogeological and water quality investigations to determine the suitability of water for construction use, as well as any requirements for treatment should it be discharged. Based on current volumes the proponent has advised that most of the dewatering effluent will be used for construction activities. Should the dewatering abstraction exceed the construction demand then there is also the option of re-injection, or infiltration through an existing "turkey's nest" dam at Boodarie.

In the event that discharge to the marine environment is unavoidable and still necessary, then the EPA has recommended condition 12-4 which sets out the requirements on the proponent to undertake further water quality investigations, propose treatment measures for the effluent and detail the monitoring and management of the discharge. Should marine discharge not be necessary, then this condition would not need to be implemented.

Ongoing port operations

The EPA is aware that ongoing port operational activities will introduce a range of uncontrolled contaminant inputs such as shedding of antifouling paints, bulk material spillage, and leaks and spills. In addition, there are also pulses of turbidity and sediment mobilisation during ship berthing. However, the influence of these inputs would be restricted to areas about wharves, jetties and ship turning basins. The EPA has recommended that a 'high' LEP would continue to apply to the offshore marine waters outside the moderate LEP, consistent with the Pilbara Coastal Water Quality Consultation Outcomes and the EPA's Environmental Quality Management Framework.

Therefore, the EPA has recommended condition 9 to be applied to the operational phase of the proposal during operations to require the proponent to prepare an Operational Marine Environmental Quality Management Plan to monitor offshore marine water and sediment quality and demonstrate that the above Moderate and High LEPs surrounding the wharf area are being achieved.

The operation of the proposal will result in an increase in the number of ships entering Port Hedland Port Authority waters and therefore increase the risk of vessel collisions and consequent impacts from oil spills. The Port Hedland Port Authority currently has an oil spill contingency plan in place and is required to implement response measures to oil spills in port controlled waters. The plan is required to be consistent with the Port's overarching emergency response plan. As a consequence of this proposal, the EPA recommends that BHPBIO work with the Port Authority to undertake an assessment of the risks associated with the increase in ship movements and identify areas of the oil spill contingency plan which would need to be modified commensurate with the additional risks.

Summary

Having particular regard to:

- the requirement to undertake further investigations into reuse and alternative dewatering discharge options prior to adopting a dewatering discharge strategy (recommended condition 12-1);
- the additional requirements on the proponent to undertake further water quality investigations, propose treatment measures for the effluent and detail the monitoring/management of the discharge (recommended condition 12-4) in the event marine discharge is still necessary; and
- recommended condition 9 to apply to the operational phase of proposal to require the proponent to monitor offshore water and sediment quality and demonstrate that the above Moderate and High LEPs surrounding the wharf area are being achieved,

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

4.4 Marine fauna

A total of 50 conservation significant marina fauna may occur in the proposal area. These consist of five marine mammal species, seven marine reptile species, four species of sharks and rays and 34 species of birds, of which four are either endangered, vulnerable or a priority for conservation. These species are listed below (BHPBIO, 2011).

Species Name		**EPBC Act Status E:Endangered V:Vulnerable M:Migratory**	**Wildlife Conservation Act/DEC listing**
Mammals			
Blue whale	*Balaenoptera musculus*	E M	Rare
Humpback whale	*Megaptera novaeangliae*	V M	Rare
Australian snubfin dolphin	*Oracaella brevirostri*	M	P4
Indo-Pacific humpback dolphin	*Sousa chinensis*	M	P4
Dugong	*Dugong dugon*	M	Specially protected
Reptiles			
Loggerhead turtle	*Caretta caretta*	E M	Rare
Olive Ridley turtle	*Lepidochelys olivacea*	E M	Rare
Green turtle	*Chelonia mydas*	V M	Rare
Leatherback turtle	*Dermochelys coriacea*	E M	Rare
Hawksbill turtle	*Eretmochelys imbricata*	V M	Rare
Flatback turtle	*Natator depressus*	V M	Rare
Saltwater Crocodile	*Crocodylus porosus*	M	Specially protected

Sharks and Rays			
Dwarf sawfish	*Pristis clavata*	V	P1
Green sawfish	*Pristis zijsron*	V	Rare
Freshwater sawfish	*Pristis microdon*	V	P3
Whale shark	*Rhincodon typus*	V M	-
Birds			
Southern giant petrel	*Macronectes giganteus*	E M	Rare
Australian painted snipe	*Rostratula benghalensis australis*	V M	Rare
Australian lesser noddy	*Anous tenuirostris melanops*	V	Rare
Eastern curlew	*Numenius madagascariensis*	M	P4

The proponent identified seven of these species with the potential to experience significant impact: humpback whale, Indo-Pacific humpback dolphin, Australian snub-fin dolphin, dugong, flatback turtle, green turtle and the green sawfish. The proponent considered that, although the species were of high conservation status and were likely to be present in or near the proposal area at some time, long-term population decrease was unlikely because large populations were not restricted to the proposal area, nor were critical habitats present in the proposal area.

Humpback whales can be encountered in the project area during their northern migration in late June to early August, and during their southern migration (with calves) during late August to mid October. The Port Hedland area is not known to support calving, aggregation or feeding areas for this species and migrating whales typically remain well offshore in waters greater than 20 m depth, although individual animals or pods do venture closer to shore. Australian snubfin dolphins and Indo-Pacific humpback dolphins may also at times be present in the nearshore area and are likely to be a resident in the Port Hedland area at least seasonally. Dugongs feed on seagrass and are usually found in shallow water (less than 5 m depth) in areas with extensive seagrass coverage. While seagrass species and extensive beds have been recorded in the Port Hedland region, seagrass patches of limited extent were found in the proposal area. Port Hedland is not considered an important foraging aggregation area for dugongs and animals are likely to be only seasonally present as they forage, rest and traverse the nearshore waters of the coast.

Adult and juvenile turtles use the Port Hedland area for foraging and females nest at a number of beaches in the Port Hedland area. The nearest known flatback turtle nesting site is located at Cemetery Beach, approximately 5 km from the proposed dredging location. This beach also has the highest nesting density of beaches in the vicinity of the proposal. Surveys showed that turtles occupy habitat up to 60 km offshore from Cemetery Beach between the successive laying of clutches of eggs. Turtles have been sighted in offshore waters both foraging and migrating through the waters of the Pilbara, with turtles seen in the waters of the proposal area. Hatchling turtles entering the

water after emerging from a nest are also likely to be present in the proposal area.

The green sawfish is the only species of protected fish that will potentially occur in the proposal area in high numbers. The species occurs in areas of shallow water and muddy substrate and migrates between marine areas to estuaries to breed. The species has been captured in the Pilbara region, however it is not known which tidal creeks are important for breeding and whether these creeks occur in the vicinity of Port Hedland.

Construction and operational impacts

Direct and indirect impacts would be likely throughout the proposed dredging and piling campaigns and through increased light spill during construction and operation of the proposal. The potential impacts on marine fauna for the proposal are summarised and listed below:

- mortality of, or injury to, marine fauna;
- physical interaction between fauna and construction vessels (increased frequency of barges and work boats etc);
- seabed disturbance leading to a loss of habitat and food sources, and increased turbidity (short term for construction, long-term with regard to the predicted zone of high impact (permanent loss));
- light spill (greater during construction through the proposed 24/7 dredging schedule, ongoing through operational phase for safety and operational lighting);
- noise and vibration (greater predicted impact through construction as a result of the piling requirement);
- physical presence of marine structures;
- leaks and spills; and
- introduced marine species.

Proponent's management

BHPBIO has proposed Construction Environmental Management Programs (CEMPs) to provide a framework for the environmental management of proposal activities. As part of the CEMPs, a number of management plans have been prepared focusing on minimising and managing impacts to marine fauna:

- Dredging and Spoil Disposal Management Plan;
- Marine Fauna Management Plan; and
- Invasive Marine Species Management Plan.

The proponent has proposed the following management measures with respect to dredging, piling and light spill.

Dredging

- Placement of spoil disposal grounds in areas with low representation of significant BPPH.
- Marine infrastructure design and footprint (removal of link channel and dredging the departure channel in Stage 1).
- Dredge volume reduced through optimisation of the turning basin and removal of the link channel.
- Number and location of spoil grounds reduced from four proposed spoil grounds to one spoil ground, with two additional spoil grounds for contingency.
- Dredging timeframe has reduced from five years to four years through reduced volume, and use of a larger Cutter Suction dredge.

Piling

- Vessel and construction equipment will be well maintained to minimise noise emissions.
- Vessel crew will undertake site inductions and awareness programs covering procedures to be undertaken to minimise disturbance to marine fauna.
- Soft start for piling to be undertaken to allow marine fauna close to the source to move away.
- Marine fauna observers to record fauna in the vicinity of operations.
- A marine fauna watch system will be established with a direct line of communication between the fauna observer and the pile drive supervisor.
- Trained marine fauna observers will monitor and report observations of marine fauna within a designated monitoring zone (2500 m radius of piling barge) around the pile driving operations. In the event that marine fauna (all cetaceans, dugongs and turtles) are sighted within a designated exclusion zone (1500 m radius for marine mammals, 300 m radius for marine turtles), piling activities will cease until the individual marine fauna moves out of the exclusion zone by its own accord or is not sighted in the exclusion zone for 30 minutes. Pile driving that has been suspended for more than 15 minutes shall recommence with soft start-up procedures. No marine pile-driving operations shall occur between the hours of sunset and sunrise during the peak southern migration of mother and calf humpback whales defined as 10 August to 10 October in any year.

Light Spill

- Minimise light intensity to as low as reasonably practicable in nearshore areas.
- Avoid use of white lights (e.g. mercury vapour, metal halide, halogen and fluorescent light) in proximity to turtle beaches. Use high pressure sodium lights where possible.
- Reduce lighting spill through shielding, directional alignment, window covering and other techniques.
- Reduce horizon glow through the use of downward facing luminaries, attention to reflecting surfaces and minimisation of external visibility of indoor lighting.
- Lighting on moored vessels at night will be kept to a minimum for safe operations.
- Regular monitoring for the presence of hatchlings by trained vessel crew in waters around dredge vessels during construction and around the jetty during operations.

Submissions

The DEC was the only submitter to raise issues regarding marine fauna, and recommended the following:

- a number of modifications to the procedures to be undertaken during the pile driving operations, including which species the procedures applied to, how to recommence pile driving activities after a marine fauna sighting and incident reporting;
- that marine fauna surveys should be undertaken prior, during and post the construction phase to assist in understanding any displacement of marine fauna due to the proposal;
- that the creek causeway design allows for unimpeded movement of protected sawfish species; and
- offsets should be considered to counter for the likely displacement of marine fauna from the proposal area.

Assessment

The EPA's environmental objectives for this factor are:

- to maintain the abundance, diversity, geographic distribution and productivity of fauna at species and ecosystem levels through avoidance or management of adverse impacts and improvement in knowledge; and
- to avoid or manage potential impacts from light overspill and comply with acceptable standards.

The key issues relating to impacts on marine fauna are considered to be:

- construction (noise and vessel movements) – temporary impacts on turtles, dugongs and migrating whales;

- construction (dredging) – loss of marine BPPH for dugongs, turtles and sawfish; and
- operational impacts – port operation (vessel movements etc) and potential ongoing disruption, avoidance and displacement of marine fauna from the project site. This is considered to have an unavoidable level of residual impact that will be offset by BHPBIO.

Construction

Pile driving can impact a range of marine faunal groups, resulting in either avoidance behaviour or, temporary or permanent hearing loss and the most sensitive marine fauna is considered to be turtles, cetaceans and dugongs. An assessment of the impacts of pilling noise on marine fauna undertaken by the proponent predicted the zone of actual physical injury due to noise is approximately 200 m but that behavioural modification, such as a startle response, could be exhibited within tens of kilometres of the noise source.

In considering the effects of noise on marine fauna, the EPA notes that the proposed suspension zone for pile driving activities is 500 m for marine mammals and 100 m for turtles. Furthermore prior to the commencement of pile driving activities, a marine fauna observer will verify that no marina fauna are sighted within 1500 m for marine mammals and 300 m for turtles for 30 minutes prior to the start of the piling activity. To further minimise impacts to marine fauna, pilling shall commence with soft start-up procedures, whereby the intensity of the noise emissions will slowly increase over a 15 minute period.

During the period 10 August to 10 October, humpback whales will be present in offshore waters, and particularly during the southern migration, females and calves are more often found in waters shallower than 20 m depth. Therefore the EPA believes that piling operations should be suspended at night during this peak migration period.

Underwater noise, particularly from pile driving, has increasingly become an issue to be considered during the assessment of proposals. Therefore to increase the predictive capacity of underwater noise modelling, the EPA recommends a Noise Monitoring and Review Program to be completed prior to construction, as specified in conditions 8-17 to 8-19.

The EPA also considers that noise associated with vessel activity during the construction of the proposal is unlikely to result in significant impacts on marine fauna. While underwater noise produced by vessels may result in altered behaviours, the Port Hedland Port area already contains significant vessel movements and associated noise levels. With the exception of recently born young, most species within the Port Hedland area will have become habituated to vessel noise. Collision with vessels engaged in construction also poses a risk to marine fauna, however management measures proposed in the form of observers will reduce the risk of vessels such as dredgers moving close to marine fauna and any behavioural changes

that may result will not lead to the mortality of individuals. The EPA has recommended conditions 8-1 to 8-3.

As all species likely to be affected are highly mobile, it is likely that these animals will avoid areas where noise emissions are at uncomfortable levels. The EPA believes that although the proposal is likely to influence marine fauna over the construction period, the management measures above will not result in significant impacts, and recommends condition 8.

Loss of marine habitat

Temporary or permanent loss or reduction in quality or quantity of habitat has the potential to reduce the breeding and foraging areas available for marine fauna. Although seagrass species suitable for foraging dugongs are known to occur in the Port Hedland region, surveys undertaken for the proposal found only sparse seagrass patches of limited extent near Weerdee, Finucane and North Turtle islands. During the marine surveys for the proposal, a number of dugongs have been seen in the region, namely near Little Turtle Island and Weerdee Island, however no feeding scars were observed anywhere in or adjacent to the study area and the extent of these seagrasses is not considered adequate to support permanent populations. Dugongs are therefore only likely to be within the proposal area as they move between preferred calving and feeding grounds to the north and south of Port Hedland. In addition, sediment plume modelling predicts no direct losses or indirect impacts to these seagrass areas. Humpback whales are also unlikely to be affected by loss of marine habitat as there is no recognised feeding or breeding areas for whales in the immediate vicinity of Port Hedland Harbour. Therefore the EPA expects no significant impacts to dugongs or humpback whales.

Marine turtles will be affected by habitat loss as juvenile and adult turtles have been observed within the direct footprint of the proposal and utilise foraging habitat within the broader proposal area. Sediment plume modelling predicts zones of moderate and high impact over locations where turtles have been observed. However, preliminary satellite telemetry data indicates the most important foraging habitat for flatback, green, hawksbill and loggerhead turtles is around the offshore islands near the De Grey River, where significant aggregations have been observed. Fewer turtles have been observed in areas of high or moderate impact.

Inter-nesting females from Cemetery Beach may also experience temporary habitat loss due to the proposal as they are the most sensitive to physical interactions from dredging during the construction phase. Preliminary satellite telemetry has shown that flatback turtles nesting at Cemetery Beach use the waters of the existing navigation channel for inter-nesting in addition to the waters immediately offshore and stretching 60 km to the east. However, sediment plume modelling during the wet season predicts the zone of influence from dredging activities to occur predominately to the south and east of the proposal area, whereas the preliminary satellite telemetry shows that, while some turtles stay in the vicinity of the navigation channel, most head north and east. Therefore while impacts to marine turtles are expected, the

EPA considers that the impacts to marine turtles from habitat loss are not considered to be significant.

It was identified in submissions that it was important that the causeway design for West Creek allows for unimpeded movement of protected sawfish species as well as tidal movement. The proponent has committed to maintaining tidal flow through the creek causeway through the incorporation of culverts to allow for unimpeded movement of protected sawfish species. Anecdotal evidence is that protected sawfish species have been caught upstream of roads that utilise culverts (D. Morgan, 2011).

Ongoing operational impacts

Ongoing impacts that have the potential to affect marine fauna are light spill, increased vessel movements and habitat displacement.

Artificial lighting at night has the potential to modify the behaviour of marine turtles by deterring females from nesting beaches and disorientating hatchlings on the beach and at sea. Studies undertaken by the proponent on existing and cumulative light spill did predict that while it is unlikely that light spill from will have a significant or detectable impact on nesting female turtles, a small portion of turtle hatchlings may become entrapped in the light spill and be subject to increased predation. The EPA's EAG No. 5, *Protecting Marine Turtles from Light Impacts*, sets out the policy, legislative and scientific context for protecting marine turtles from light impacts. BHPBIO has committed to a range of mitigation measures to reduce the impact of light spill on marine turtles as outlined in the Environmental Assessment Guideline and the EPA recommends that these measures be included in the Marine Fauna Management Plan required under condition 8-11.

Increased vessel movements will occur as a result of the proposal and pose risks to marine fauna due to vessel collisions, noise and disturbance. Turtles, and particularly the adult green, flatback, hawksbill and loggerhead turtles from southern Pilbara nesting sites, migrate through the area to foraging habitats of the De Grey River and the Kimberley. At greatest risk are resident foraging (juvenile and adult green, flatback and hawksbill turtles) and seasonal breeding migrant turtles (principally flatback). Humpback whales on their northern and southern migration may also be at risk however, the EPA notes that the proposed shipping channel will not cross any migratory, feeding or calving areas. The shipping channel may, however, act as an impediment to smaller marine fauna species including dugongs and dolphins.

While the construction phase will have the most number of vessel movements, the operational phase of the proposal will see an increase in bulk carrier, tugs and pilot boat movements. The larger bulk carriers will be restricted to the access channel, which minimises the potential impact to marine fauna. Smaller vessels including tugs and pilot boats, which would traverse larger areas, will generally have minimal draught and it is expected to have minimal impact to marine fauna on the sea bed. The Marine Fauna Management Plan, recommended under condition 8-11 and 8-12 requires the

proponent to identify the environmental stressors to marine fauna and measures on how to avoid or mitigate these stressors.

In the long term, the EPA expects that marina fauna will be permanently displaced from the port area as a result of the proposal being implemented. This impact is unlikely to be fully mitigated and a level of residual risk of marine fauna displacement can be expected to persist. Given that this is an unavoidable residual impact, the proponent has proposed an offset package that is further discussed below.

Proponent's proposed offsets

The proponent has recognised that significant residual impacts and risks to critical and high value State and nationally listed species will occur and recognises the need for offsets. In presenting an offsets strategy, the proponent has addressed both State and national offset policies and outlined its strategies to mitigate impacts prior to offsets.

An offsets package totaling $10 million has been proposed over five projects (refer Schedule 3). Of these projects two are specifically focused on marine fauna, namely supporting research on sawfish, whales, dolphins, dugongs and turtles. A third project (Project E in Schedule 3) is focused on improving the conservation of marine fauna consistent with the guidance provided by the indicative or final 80 Mile Beach Marine Park Management plan.

Little is known about sawfish species in the Pilbara, and while the addition of culverts is expected to minimise impacts to sawfish and prevent any barriers to sawfish spawning and migration, residual risks to sawfish is likely as a result of the proposal. The proponent proposes to commit $0.5 million over two years to increase the understanding the ecology of sawfish, and contribute to the regional studies being undertaken to understand sawfish migration.

Displacement of marine mammals and turtles from the proposal area is most likely to occur, affecting predominately marine turtles and smaller mammals such as dolphins and dugongs. Turtles, particularly foraging residents and interesting female flatback turtles nesting at beaches in Port Hedland, are those most likely at risk due to loss of local foraging habitat. The navigation channel may also become an impediment for smaller marine fauna. The proponent proposes to commit $3 million over four years to support research on marine fauna (whales, dolphins, dugongs and sea turtles) in the Pilbara region.

The final project is to improve the conservation of marine fauna consistent with the guidance provided in the final or indicative 80 Mile Beach Marine Park Management Plan. 80 Mile Beach is a known nesting location for flatback turtles and is thought to have similar nesting density as Mundabullangana, which is currently considered one of the largest flatback rookeries in the world. Further survey work however is required to confirm the importance of 80 Mile Beach for turtle nesting. Dugongs are also regularly sited in the bays in the

southern end of the proposed marine park and anecdotal evidence suggests humpback mother and calf pairs may also come further inshore in this area. While the large tidal range and shallow water would limit larger marine mammals in much of the proposed marine park, smaller cetaceans such as dolphins are likely to be found in the marine park but the spatial and temporal extent of the species and the significance of areas is currently not known. The proponent proposes to commit $2.5 million over six years to improve marine fauna knowledge consistent with the strategies and actions in the proposed marine park management plan.

The EPA is satisfied that these proposed mitigation actions are reasonable given the scale of impacts and the significant risk of impacts to marine fauna and habitat in particular. Accordingly, the EPA has recommended condition 16 and Schedule 3 which incorporates the proponent's offset package.

Summary

Having particular regard to the:

- population and distribution of marine fauna in the area of the proposal, including the regional significance of habitats elsewhere in the Pilbara;
- the mitigation and management measures proposed by the proponent; and
- the offsets proposed by the proponent,

it is the EPA's opinion that it is likely that the EPA's environmental objectives for this factor can be achieved provided conditions are imposed requiring the proposal to:

- engage dedicated marine fauna observers during construction as per condition 8-1;
- undertake pile driving in accordance with conditions 8-5 to 8-11 to minimise the impact of underwater noise on marine fauna;
- prepare and implement a Marine Fauna Management Plan in accordance with conditions 8-11 to 8-16;
- undertake a underwater noise monitoring and r eview program in accordance with conditions 8-17 to 8-19; and
- implement the offsets package.

4.5 Terrestrial biodiversity

The proposal is located within the Roebourne sub-region of the larger Pilbara bioregion. No existing or proposed Commonwealth or State conservation reserves/areas are located within 50 km of the proposal area.

Flora and vegetation

Clearing and earthworks are required as part of site preparation activities for the project. A total area of approximately 940 ha is proposed to be cleared for

the construction of the Outer Harbour Development. None of the vegetation communities to be impacted are considered to be of conservation significance as they are not Threatened Ecological Communities (TECs) or Priority Ecological Communities (PECs) (Figure 6). Furthermore, they are well represented in the local area and Pilbara region (ENV 2009a). No TECs are known to occur in the Roebourne subregion of the Pilbara bioregion.

A total of 394 taxa (including species, subspecies and variants) were recorded within the study area during surveys conducted in both summer and winter. Marginally more taxa were recorded in the winter survey than the summer survey; 334 and 250 taxa, respectively. The 394 taxa recorded consisted of 58 families and 158 genera. The most commonly recorded families were Poaceae (57 taxa), Papilionaceae (45 taxa) and Malvaceae (25 taxa). The most commonly recorded genera were *Acacia* (22 taxa) and *Sida* (12 taxa).

A total of 34 vegetation communities (excluding areas devoid of native vegetation such as disturbed, washout and bare sand areas) were mapped within the terrestrial study area, of which 19 are present within the disturbance envelope (ENV 2009a, 2009b).

Key findings relevant to the flora and vegetation are summarised below:

- no Endangered or Vulnerable species under the EPBC Act, or Declared Rare Flora species under the *Wildlife Conservation Act 1950* (WC Act) were recorded;
- a search of the EPBC Act database list of threatened species and ecological communities did not identify any listed flora or vegetation;
- ten Priority Flora species are listed as potentially occurring in the study area;
- four Priority Flora species were recorded within the disturbance envelope, including *Abutilon pritzelianum MS* (Priority 1), *Heliotropium muticum* (Priority 1), *Tephrosia rosea var. venulosa MS* (Priority 1) and *Gomphrena pusilla* (Priority 2);
- one vegetation community associated with South West Creek contains low numbers of *Melaleuca argentea*, a phreatophyte (dependant on groundwater for water uptake);
- no TEC were identified as occurring; and
- ten introduced species were recorded, none of which were Declared Plants under the *Agriculture and Related Resources Protection Act 1976*.

Terrestrial fauna

The study area consists of five major fauna habitat types: Beach/Dunal, Tidal Flats, Mangroves, Riverine and Sandplain. Additional minor habitats were located throughout the study area: Billabong, Low Hill, Granite Hill, Quartz Hill, Rockpile and Quarry. The Beach/Dunal, Tidal Flats, Mangroves and Riverine

habitats were all given ‘High’ habitat value and Sandplain habitat was deemed as having ‘Moderate’ habitat value.

Habitats considered to be of ‘High’ habitat value constitute approximately 10.87% of the study area. The majority of the study area (67.9%) was composed of the moderate value Sandplain habitat. A total of 311 vertebrate species have been recorded within the vicinity of the study area. This includes 10 amphibian, 73 reptile, 187 bird and 41 mammal species.

Key findings relevant to the terrestrial environment include:

- six fauna habitats (excluding areas devoid of native vegetation such as disturbed areas, washout and bare sand) were mapped within the study area including: Dunal, Riverine, mangrove, tidal flats, Sandplain and Samphire.
- riverine and dunal habitats are considered to be of conservation significance;
- one species, *Aspidites ramsayi* (Woma Python), listed as Schedule 4 under the WC Act and as Priority 1 by the DEC, was recorded in the sandplain habitat outside of the disturbance envelope;
- one additional Priority listed species was recorded in the project area, the Priority 4 listed *Ardeotis australis* (Australian Bustard); one bird species, *Merops ornatus* (Rainbow Bee-eater), that is listed as a Migratory species under the EPBC Act was recorded within the project area;
- a further nine Schedule or Priority fauna species are likely to occur within the study area including: *Dasycercus blythii* (Brush-tailed Mulgara) (Vulnerable, Schedule 1, Priority 4), *Rhinonicteris aurantia* (Pilbara Leaf-nosed Bat) (Vulnerable, Schedule 1), Falco peregrines (Peregrine Falcon) (Schedule 4), *Ramphotyphlops ganei* (Blind Snake) (Priority 1) *Leggadina lakedownensis* (Lakeland Downs Mouse) (Priority 4), *Macroderma gigas* (Ghost Bat) (Priority 4), *Falco hypoleucos* (Grey Falcon) (Priority 4), *Burhinus grallarius* (Bush Stone-curlew) (Priority 4) and *Neochmia ruficauda clarescens* (Star Finch) (Priority 4); and
- Matters of National Environmental Significance that are relevant to the terrestrial environment include fauna listed under the EPBC Act which occur within the study area, such as the migratory species *M. ornatus* (Rainbow Bee-eater), or those that are likely to occur such as the Vulnerable listed Dasycercus.

Short Range Endemics (SRE)

The only potential SRE fauna habitat identified within the proposal area was limestone rocky outcrops, which were located on the northern side of Finucane Island and within the project footprint of the proposed transfer station.

At the species level, no invertebrates considered to be SRE fauna were recorded, as all the invertebrates recorded had widespread geographic distributions.

Subterranean fauna

Relevant key findings from the subterranean fauna risk assessment are summarised below:

- Athalassic stygofauna, i.e. those living in groundwater that is not of marine origin, are considered unlikely to occur between the decommissioned HBI Plant at Boodarie and Finucane Island based on the high groundwater salinities in these areas (10 to 60 g/L TDS). Instead, it is possible this area supports marine species of stygofauna, which are typically widespread.
- Marine stygofauna are considered likely to occur on Finucane Island.
- Athalassic stygofauna, which in contrast to marine stygofauna can have restricted distributions, may occur within the southern part of the project area based on geology and records in the vicinity.
- Athalassic stygofauna, if present in the southern extent of the project area, are likely to have relatively large ranges covering several river catchments, based on survey results from nearby catchments and the lack of geographical barriers.
- Troglofauna are unlikely to occur in the colluvial and alluvial soils or sandy/clayey soils found within project area which are considered to be unfavourable troglofauna habitat.
- Troglofauna are unlikely to occur within the coastal margin (including Finucane Island, proposed infrastructure corridor and stockyards) due to the shallow depth to groundwater, but may occur further inland (including the proposed Western Spur Railway) where depth to groundwater is greater.

Weeds

Activities associated with the proposal that have the potential to spread weeds include vegetation clearing, topsoil disturbance (earthworks), the movement of machinery and light vehicles, and the importation. Native flora and vegetation within the terrestrial study area may be indirectly impacted by the introduction and spread of weeds through increased rates of competition for light, nutrients, water and space, which may ultimately reduce biodiversity. None of the ten introduced species recorded during baseline flora and vegetation surveys (ENV 2009a) are Declared Plants, although *Cenchrus ciliaris* (Buffel Grass) and *Aerva javanica* (Kapok) are considered to be serious environmental weeds under the DEC's Environmental Weed Strategy (Department of Conservation and Land Management 1999).

A weed management program, developed in consultation with DEC, will be implemented to prevent further spread of weeds. Key measures incorporated into the program include (but are not limited to):

- provide facilities for cleaning equipment;
- complete and submit a weed hygiene certificate;
- dispose material containing weed seeds must be disposed of on advice of environmental personnel;
- identify, record, monitor and notify all contractors of weed risk areas; and
- conduct weed control in accordance with the priority determined for each species.

Summary of submissions

Public and Government submissions that the EPA considers of high environmental importance included the following issues:

- impacts to Priority 1 and 2 flora species.

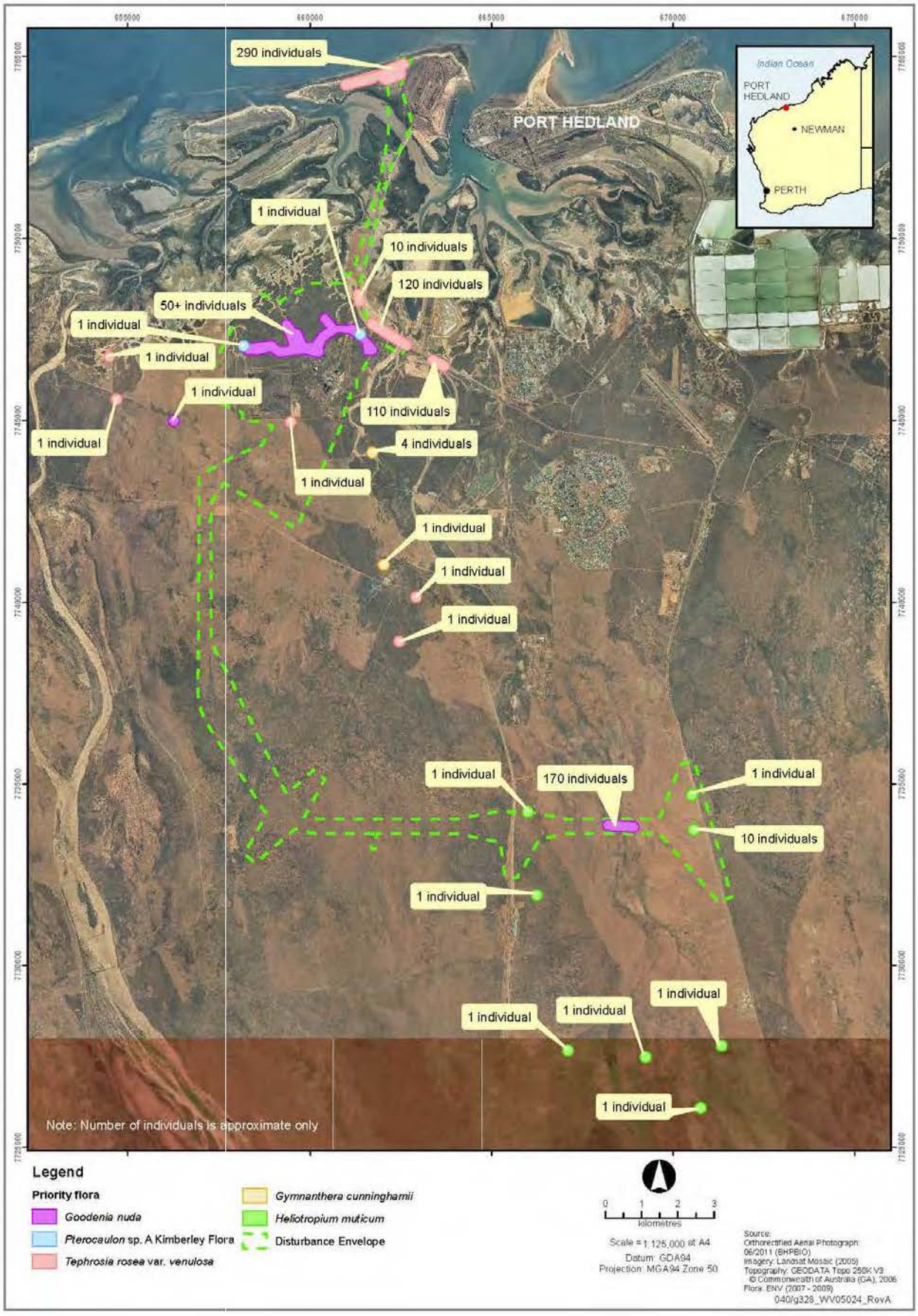

Figure 6 – Flora of Conservation Significance recorded within the Proposal's Footprint

Assessment

The EPA's environmental objectives for this factor are:

- to maintain the abundance, diversity, geographic distribution and productivity of flora at species and ecosystem levels through the avoidance or management of adverse impacts and improvement in knowledge; and
- to maintain the abundance, diversity, geographic distribution and productivity of fauna at species and ecosystem levels through the avoidance or management of adverse impacts and improvement in knowledge.

The EPA notes that a Construction Environmental Management Plan (CEMP) has been developed and provides a framework for the environmental management of the terrestrial construction activities associated with the proposal. The program will include detailed strategies, procedures and work practices, to avoid, mitigate or minimise impacts resulting from construction tasks or actions. Management measures proposed include, but are not limited to:

- erosion control features incorporated into the project design to manage erosion and sedimentation, topsoil and soil quality (for example, slope stabilisation, diversion of surface run-off);
- soil contamination from leaks and spills of chemicals or hydrocarbons and incorrect solid and liquid waste disposal will be avoided through the proposed management measures. In addition, project design will include features to capture potentially contaminated surface water runoff prior to discharge to the environment in high risk areas; and
- the potential disturbance of ASS will be managed in accordance with an Acid Sulphate Soils Management Plan which will be revised following completion of the ASS investigations prior to commencement of construction activities. Further detailed ASS investigations will also be undertaken prior to construction to confirm the presence or absence of ASS within the proposed disturbance envelope.

Terrestrial flora and vegetation

Clearing for the proposal would result in the direct loss of approximately 940 ha of terrestrial vegetation communities, primarily those associated with sandplains, drainage lines, dunal systems, limestone hills and quartz outcrops. The EPA understands that none of the vegetation communities proposed to be impacted are considered to be of conservation significance as they are not TECs or PECs and are well represented in the local area and Pilbara region. Furthermore, the vegetation communities that could be impacted (i.e. that are located within the disturbance envelope) are relatively small compared with the occurrence of these vegetation communities mapped outside of the disturbance envelope during flora and vegetation baseline survey.

The EPA is aware that clearing has the potential to cause a direct loss of four of the five recorded Priority Flora species that were recorded within the proposed disturbance envelope, namely *Abutilon pritzelianum* MS (Priority 1), *Heliotropium muticum* (Priority 1), *Tephrosia rosea* var. *venulosa* MS (Priority 1) and *Gomphrena pusilla* (Priority 2). Additionally, the DEC raised this issue in the submissions phase and encouraged the proponent to consult with the DEC in relation to these species and the extent of their local populations to confirm that the impact from development on their conservation status is low. The EPA is aware that the flora surveys conducted have indicated that the proposed loss through clearing is only likely to effect the local representation and will not compromise the conservation status of these Priority Flora species.

The EPA is of the view that the removal of approximately 940 ha of terrestrial vegetation communities would not compromise the EPA's environmental objectives for this factor. The EPA has recommended environmental condition 10 for this factor, which aims to minimise potential impacts of construction on significant flora species and spatially defines the footprint of the proposal and the extent of habitat clearing that would be required.

Terrestrial fauna

The proposal would result in the removal of approximately 940 ha of fauna habitat, with the majority of disturbance within sandplain habitat. The EPA understands that this habitat type is well represented locally and regionally, and as the fauna occurring in the area are not specifically reliant on this habitat within the disturbance envelope, breeding or foraging resources are not likely to be significantly reduced.

The EPA notes that vegetation clearing would impact two habitat types considered to be of conservation significance. These are the dunal systems and riverine areas. These habitats are generally well-represented in the local Port Hedland area outside of the proposed disturbance envelope. As a result, the EPA is of the view that fauna are unlikely to be specifically reliant on riverine or dunal habitats within the proposed disturbance envelope and it is unlikely there will be significant reduction in fauna resources caused by clearing of these habitats.

Vegetation clearing may cause fragmentation of fauna habitat reducing connectivity of fauna populations. However, the proposed stockyards, rail loop, infrastructure corridor and transfer station on Finucane Island are adjacent to existing infrastructure which already bisects existing habitat.

The EPA notes that the direct loss of fauna of conservation significance due to clearing and earthworks and other clearing and construction activities is unlikely to threaten fauna at the population level. The loss of or injury to fauna of conservation significance due to clearing and earthworks or physical interaction is likely to result in only individual deaths, and therefore is unlikely to affect the conservation status of the species involved.

The EPA is of the view that changes in fauna behaviour due to the physical presence of infrastructure, increased noise levels, light spill and vehicular and human traffic are also unlikely to threaten fauna at the population level.

The proposal may impact on Matters of National Environmental Significance through clearing activities resulting in the death of individuals of the Brush-tailed Mulgara, if present. However, the EPA is of the view that it is unlikely that a long term decrease in population levels will occur. Fauna surveys completed for the project area did not trap Mulgara. The habitat with which Mulgara are associated in the Boodarie area is regionally widespread, so impacts would be localised.

The EPA considers that the removal of approximately 940 ha of terrestrial vegetation communities and fauna habitat would not compromise the EPA's environmental objectives for this factor.

Summary
Having particular regard to the:

- the findings of the proponent's studies that the extent and geographic of priority flora populations will not be reduced a regional scale; and
- EPA's recommended condition 10 to restrict the clearing of native vegetation from the proposal to within a predetermined envelope,

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

4.6 Emissions (dust and noise)

Dust

The primary atmospheric emission that would result from the construction and operation of the proposal is dust. Dust is a key health and nuisance concern for residents in Port Hedland, largely due to the proximity of residential areas to port operations.

The Port Hedland town site has been exposed to elevated dust levels through iron ore operations at Nelson Point and Finucane Island since the mid to late 1960s. The semi-arid landscape of the Pilbara is also a naturally dusty environment with wind-blown dust being a significant contributor to ambient dust levels within the region. The levels of dust have been found to exceed the National Environment Protection Measure standard for particulate matter (PM_{10}) of 50 µg/m^3 on a regular basis. Contributing to these naturally high background levels are emissions from local industry, compounded by the frequent proximity of industry to residential areas.

Policy context

The proponent is required to evaluate the dust impacts of the proposal in the context of the:

- dust management performance targets outlined in Ministerial Statement 740 which sets conditions for the proponent's Nelson Point and Finucane Island Operations; and

- interim guidelines in the *Port Hedland Air Quality and Noise Management Plan, The Port Hedland Dust Management Taskforce Report,* March 2010.

These are further discussed below.

The significance of dust and noise from an environmental and health perspective resulted in the formation of the Port Hedland Dust Management Taskforce (Dust Taskforce), which is comprised of industry and government representatives, and the development of the *Port Hedland Air Quality and Noise Management Plan,* March 2010 (Department of State Development, 2010) (PHAQNMP). The management plan provides an implementation strategy for ongoing air quality and noise management in Port Hedland, with an implementation strategy and governance framework. The development of the Plan has been informed by a review of existing scientific reports and studies, including dust emission modelling for a range of development scenarios in Port Hedland including on the basis of full inner and outer harbour development throughputs.

Management of dust in Port Hedland is an ongoing issue that requires collaboration of industry and government with further research and monitoring, however the Taskforce Report has established interim guidelines for dust levels in Port Hedland. This guideline is for a PM_{10} level of 70 $\mu g/m^3$ at (and east of) Taplin Street, with up to 10 exceedances of this level per year. This interim guideline is to apply over a five year period from 2010 to 2015 after which it will be reviewed by the Taskforce.

The proponent's port operations were previously bound by the conditions set in Ministerial Statement 433 *Upgrade Dust Management at Finucane Island and Nelson Point, Port Hedland*, 1996. In August 2006, the proponent sought amendments to this Ministerial Statement under section 46 of the EP Act. This amendment was progressed so that the Ministerial Conditions were more closely aligned with improvements to dust management at the site and ongoing expansions at the existing Nelson Point and Finucane Island operations. The aim of the Section 46 amendment was to capture:

- continued management and reduction of ambient dust levels;
- assessment of dust emission performance against targets, to better reflect current community and regulator expectations;
- initiatives to improve water-use efficiency; and
- initiatives and developments in community consultation programs.

As a result of the section 46, revised conditions (Ministerial Statement 740) were set for the Nelson Point and Finucane Island operations. These conditions require the implementation of a revised Dust Management Program

which sets the framework for a multi-faceted approach to dust management and improved water-use efficiency. Ministerial Statement 740 also defines performance-based targets (air quality, PM_{10} and amenity-related TSP) to measure the success of the BHPBIO Dust Management Program.

The dust reduction targets prescribed in Ministerial Statement 740 are based on concentrations measured at the hospital monitoring site, whilst the PHAQNMP is based on dust concentrations measured at Taplin Street.

The Taskforce considered the Port Hedland Port Authority's Ultimate Development Plan, including the proposed Outer Harbour Development, and with the assistance of BHPBIO was able to effectively model cumulative dust emission scenarios for maximum inner and outer harbour (equivalent to 750 Mtpa) cases.

Proponent's predictions

Potential sources of dust from the proponent's operations would include:

- train unloading;
- vehicle generated dust;
- ore stock piling and reclaiming;
- wind erosion from stockpiles and unsealed areas;
- conveyor movements and transfers; and
- ship-loading.

The proponent's predicted 24-hour PM_{10} concentrations at the Hospital monitoring station and the proposed Taplin Street locality from the proposal area, with and without background concentrations, are shown in Table 6. From Table 6, it is evident that the proposal, as a standalone operation, will have a minimal impact to the Hospital and Taplin Street receptors. It is predicted that this interim target will be exceeded twice based on the results of this cumulative assessment modelling.

Table 5. Predicted PM_{10} Ground Level Hospital and Taplin Street Concentrations from the Proposed Outer Harbour Development (ug/m^3)

Operation	Receptor	Maximum	99th Percentile	95th Percentile	90th Percentile	70th Percentile	Annual Average	Annual Exceedences of 70 □ 3
Background concentration		71	57	39	32	22	20.2	1
Outer Harbour Development (200 Mtpa) without additional dust abatement Without background data	Hospital	7	5	4	3	2	1.6	0
	Taplin St	6	5	4	3	2	1.3	0
Outer Harbour Development (200 Mtpa) Without background data	Hospital	4	3	2	2	1	0.9	0
	Taplin St	4	3	2	2	1	0.8	0
Outer Harbour Development (200 Mtpa) With background data	Hospital	71	58	40	33	23	21.0	1
	Taplin St	71	58	40	33	23	20.9	1
Outer Harbour Development (200 Mtpa) and PHIHP (220 Mtpa) With background data	Hospital	76	64	47	42	33	29.4	1
	Taplin St	73	61	45	40	29	26.1	1

To assist in reducing dust emissions from this proposal the following additional dust abatement techniques will be integrated into the emission calculations to reduce dust emissions:

- an emission reduction of 40% to account for the installation of belt washes stations on all new conveyor systems;
- an emission rate capped at 1.5 g/s to account for the use of chemical surfactants on stockpiles and open areas;
- enclosure and dust extraction on all proposed car dumpers;
- fogging on the new transfer station on Finucane Island;
- belt wash stations on all new conveyors;
- extraction and wet scrubber on lump rescreening plants;
- use of a predictive meteorological system to predict adverse meteorological conditions to ensure that appropriate dust reductions are undertaken;

- use of chemical surfactants on the stockpiles and open areas, as directed by the predictive meteorological system, to reduce emissions associated with wind erosion; and
- a boundary monitoring system at Nelson Point operations linked to area misting cannons that are automatically activated if levels exceed trigger levels.

Noise

The ambient noise level in Port Hedland, particularly at the west end, is largely dominated by operational emissions from existing infrastructure that often operates continuously. Current noise levels within the Port Hedland township exceed levels permitted under the *Environmental Protection (Noise) Regulations 1997* (Noise Regulations) due to the close proximity of port operations to commercial and residential areas.

Noise modelling and environmental noise survey work carried out in 2011 confirmed that the environmental noise emissions from the existing facilities exceed the maximum allowable noise levels within the township of Port Hedland by:

- Night-time (2200 – 0700) by up to 26.3 dB(A).
- Evening-time (1900 – 2200) by up to 21.3 dB(A).
- Day-time (0700 – 1900) by up to 16.3 dB(A).

The proposal would introduce a number of additional sources of industrial noise. These include:

- overland conveyors;
- overland conveyor drives;
- transfer conveyors and drives for the conveyors;
- wharf conveyors; and
- ship loaders.

The proponent is to ensure that the new plant associated with the proposal complies with the prescribed standards in the Noise Regulations for cumulative noise. To do so, the proponent has integrated noise management through the implementation of an Environmental Noise Reduction Management Program to improve the control and management of noise emissions from its Port Hedland operations.

Following the release of the PER, BHPBIO has undertaken an evaluation for both the proposed Outer Harbour Development in-isolation and the cumulative noise of the development and existing inner harbour developments. BHPBIO is currently undertaking engineering design and will be seeking a Works Approval for Stages 1 and 2 of the proposal development. This approval will be submitted to the DEC in early 2012. The assessment includes the in-isolation cases for Stage 1 and Stage 2, assessed against the compliance of

in-isolation criteria as per the Noise Regulations. Stage 1 and 2 have been modelled by the proponent and the results show that with the range of mitigation measures available to the proponent, the assigned levels in the Noise Regulations would be met. This will be consolidated and form part of the proponent's Works Approval application under Part V of the EP Act.

Also, included in the assessment will be the cumulative assessment of Stage 1 and 2 with BHPBIO's existing operations (inclusive of the currently proposed Port Hedland Inner Harbour Project (PHIHP)), demonstrating compliance with BHPBIO's Noise Reduction Management Plan objectives, which are as follows:

- reduce noise to as low as reasonably practicable, acknowledging growth and, where reasonably practical, comply with the requirements of the Noise Regulations (including seeking exemptions if necessary;
- where it is not reasonably practical to comply with the Noise Regulations, ensure continuous improvement is facilitated through a Noise Reduction Management Plan; and
- ensure new plant and infrastructure being planned for the Port facilities particularly Prescribed Plant as defined by the EP Act 1986 complies with the Noise Regulations.

The assessment will also include a high level impact assessment demonstrating that BHPBIO will meet the Noise Reduction Management Plan objectives for all four stages of the Outer Harbour proposal cumulatively with the current operations (up to and including PHIHP and all four stages of the Outer Harbour proposal), and not exceed the current received levels for noise at the Hospital receptor.

Summary of submissions

Public and Government submissions that the EPA considers of high environmental importance included the following issues:

- assurance to the community that dust and noise from the development will not adversely impact upon Port Hedland and South Hedland.
- best practice in dust and noise management are being utilised to reduce impacts during both construction and operation;
- that the proponent adheres to the recommendations of the Port Hedland Air Quality and Noise Management Plan.

Assessment

The EPA's environmental objectives for this factor are:

- to ensure that emissions do not adversely affect environment values or the health, welfare and amenity of people and land uses by meeting statutory requirements and acceptable standards: and

- to protect the amenity of nearby residents from noise impacts resulting from activities associated with the proposal by ensuring the noise levels meet statutory requirements and acceptable standards.

Dust

The EPA acknowledges that effective dust management is complicated in Port Hedland because of the range of dust sources and the lack of an adequate buffer between the existing port operations and sensitive land uses. The significance of dust and noise from an environmental and health perspective has been extensively examined by the EPA in previous assessments in Port Hedland and resulted in the formation of the Dust Taskforce.

The EPA notes that the proponent's predictions and dust contours are similar to the cumulative dust modelling undertaken by the Dust Taskforce for a throughput of 687 mtpa and hence there is a high level of confidence in the proponent's cumulative dust assessment.

In terms of the targets in Ministerial Statement 740, modelling of current and proposed BHPBIO operations indicates that for the Hospital and Taplin Street locations:

- the PM_{10} 24 hour short term concentration target is achieved;
- the annual average PM_{10} target should be met;
- the TSP annual average target will be achieved; and
- using the Hospital criteria as a comparison, the dust impact at South Hedland and Wedgefield meet criteria limits.

The EPA notes from the proponent's prediction that there will be a general increase in the ground level dust concentrations across all receptor locations, however, with the introduction of relevant engineering controls the model predicts the dust performance targets in Ministerial Condition 740 are achievable.

Cumulative dust issues

Notwithstanding the above, this proposal will add to the existing dust problem in Port Hedland. The EPA has been made aware from previous assessments of proposals in Port Hedland (ie. Roy Hill Port Infrastructure and North West Infrastructure's Multi-user Iron Ore Export Facility) that the interim dust guideline for Taplin Street in the PHAQNMP (10 exceedances per year) is unlikely to be met based on current and approved operations alone. Hence this proposal, combined with all other existing and approved dust sources, would cause a further exceedance of the guideline.

The EPA notes that Government and industry are currently implementing the recommendations of the PHAQNMP and there is an expectation that the proponent will contribute towards these programs and initiatives, including the integrated ambient air quality monitoring network, further improvements and research into dust management and a noise management strategy. In line

with this, the EPA reiterates its previous advice (EPA Report 1419) that there should be a rapid deployment of the air monitoring network to validate predictions and assess effectiveness of management actions.

In addition, the EPA also considers that the Port Hedland Industry Council (PHIC) should implement, as a matter of priority, a continuous dust improvement program across industry as set out in the PHAQNMP. As a result of this proposal, the EPA is also of the view that the proponent should consider undertaking a gap assessment of industry technology for ongoing dust minimisation in Port Hedland with the PHIC.

Noise

The EPA notes that the Dust Taskforce Report, in the context of environmental management controls, recommended that the EPA should prepare for Government's consideration a State Environmental Policy for Port Hedland to monitor and manage noise using Regulation 17 exemptions where appropriate. This includes:

- developing a cumulative noise model;
- defining noise sensitive zones;
- clarifying planning measures; and
- clarifying building standards.

As mentioned above, the proponent is undertaking a noise modelling study for the proposal to support the Works Approval application for construction and operation. The study includes cumulative noise for BHPBIO operations, definition of noise sensitive zones and development of appropriate mitigation and monitoring measures in accordance with regulations. The study will cover both operational and construction noise. Specific noise mitigation measures will be incorporated into the Noise Reduction Management Plan and implemented in consultation with the EPA and the DEC. Although the assessment has yet to be finalised, preliminary information indicates the following:

- Stage 1 and 2 in isolation assessment has been finalised and assigned levels can be met (32 dB at hospital);
- Stage 1 cumulative assessment has been finalised indicating there will be no net increase to current impacts (57.2 dB at hospital); and
- Stage 2 cumulative noise emissions are currently under assessment, however preliminary information suggests that cumulative targets can be met.

A high level analysis for Stages 3 and 4 has been conducted by the proponent which demonstrates that sufficient noise mitigation control options are available for in-isolation noise levels to meet assigned levels and for no net increase to current cumulative impacts.

Although the BHPBIO's noise modelling, which includes the detailed mitigation measures for all four stages have yet to be finalised, the EPA

considers that sufficient information has been provided at this stage to demonstrate that the noise emissions can be managed to meet the EPA's objectives through Part V of the EP Act.

The proponent, as a member of the Dust Taskforce, is aware of the need to limit noise emissions to the lowest practicable level and to play an ongoing role in the implementation of the Taskforce Report recommendations. Given the preliminary finding of its noise assessment, the location of the stockyard away from the harbour and residential areas, and the inclusion of a range of design measures to limit noise emissions from ship loading and ore handling at the berth, the impact on sensitive receptors within the residential area is not expected to be significant for all sites.

The EPA concludes that operational noise emissions from the proposal are likely to comply (if all proposed mitigation methods are applied) with the assigned levels under the Noise Regulations and the State Planning Policy 5.4 Road and Rail Transport Noise and Freight Considerations in Land Use Planning, at all noise sensitive premises. Furthermore, construction noise emissions would be effectively addressed through the mitigation measures proposed by the proponent.

The EPA notes however, that while the proposal will comply with the Noise Regulations in isolation, overall there will be a minor increase in noise levels in Port Hedland. The EPA is aware that cumulative noise emissions in Port Hedland do not meet the regulations and believes that this matter is best considered through a Noise Regulation 17 exemption process.

The EPA expects that the proponent will consider noise emissions of plant and equipment when sourcing in order to minimise as much as practicable the proponent's contribution to noise levels in Port Hedland.

Ongoing regulation of dust and noise

Consistent with the previous assessment of the North West Infrastructure's Multi-user Iron Ore Port Facility (EPA Report 1419), where it liaised with the DEC on the ongoing management of the proposed facility, the EPA concludes that the most appropriate way to regulate dust and noise emissions is under Part V of the EP Act and in accordance with the PHAQNMP. This includes Section 62A (1) (q) of the EP Act, which relates to the requirement for environmental management and improvement plans. As such, the EPA has not recommended an environmental condition for dust and noise under Part IV of the EP Act.

Furthermore, Part V licensing allows for ongoing review of dust and noise management from the proposal and annual review of licence conditions by the DEC and would provide greater responsiveness and flexibility in developing actions to respond to contemporary information. The EPA also recommends that the DEC require best practice emission controls on the proposal on the Works Approval and operating Licence, as committed to by the proponent.

Based on the above and the controls available under Part V of the EP Act, the EPA considers that the proposal is capable of being managed to meet the EPA's objectives for dust and noise emissions.

Summary

Having particular regard to the:

- long standing dust and noise problems in the region of Port Hedland;
- the proponent's assessment which concludes that the dust performance targets in Ministerial Statement 740 can be achieved as a result of this proposal;
- likelihood that implementation of the proposal would only lead to a minor increase in the levels of fugitive dust and noise to the Port Hedland air-shed;
- proposal design and use of best practice and plant available; and
- proposal, if implemented, would be subject to licensing under Part V of the EP Act that can have regard for air quality limits for dust and noise,

it is the EPA's opinion that whilst the implementation of this proposal will likely lead to an overall increase in dust and noise levels within Port Hedland, it would not compromise the EPA's environmental objectives for this factor provided that Port-wide improvements to dust and noise management continue to be made through the work of the Dust Taskforce.

5. Recommendations

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

1. That the Minister notes that the proposal being assessed is for the construction and operation of an Outer Harbour Development, offshore from Finucane Island, Port Hedland;
2. That the Minister considers the report on the key environmental factors and principles as set out in Section 4;
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.

Appendix 1

List of submitters

Organisations:

Department of Mines and Petroleum
Department of Environment and Conservation
Department of Fisheries
WA Fishing Industry Council
Port Hedland Community Progress Association Inc
Soroptimists International
West End Action Group
Port Hedland Port Authority
Robin Chapple MLC
Town of Port Hedland

Appendix 2

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Sinclair Knight Merz (2009a) *Port Hedland Outer Harbour Development Marine Subtidal Benthic Primary Producer Habitat Impact Assessment*. Report prepared for BHP Billiton Iron Ore

Sinclair Knight Merz (2009b) *Sea Dumping Permit Application*. Prepared for BHP Billiton Iron Ore

Sinclair Knight Merz (2009c) *Port Hedland Outer Harbour Development Baseline Coral Health Monitoring Report Periods 1 – 13*. Report prepared for BHP Billiton Iron Ore

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			
Terrestrial			
Terrestrial Flora & Vegetation	Proposed clearing of 940 hectares (ha). Terrestrial communities include; sandplains, drainage lines, dunal systems, limestone hills and quartz outcrops.	**Office of the Environmental Protection Authority (OEPA) & Department of Environment and Conservation (DEC) had concerns that:** • a number priority 1 and 2 flora species and samphire species in the Port Hedland area with uncertain taxonomy and/or regional conservation status. Quantitative information of the extent of local and regional impacts on these species is not presented in the PER.	**Considered to be a key environmental factor. This is further discussed in Section 4.5 of this report.**
Terrestrial Fauna	Proposed clearing of 940 hectares (ha). Terrestrial communities include; sandplains, drainage lines, dunal systems, limestone hills and quartz outcrops.	**OEPA, DEC had concerns that:** • the presence of the gecko, 'Gehyra nana' within or nearby the proposal needs to be further investigated. • additional fauna surveys would be required to determine the presence of other vertebrate fauna that may occur at the restricted habitats present at the proposal site (quartz outcrops, rock piles and limestone hills).	**Considered to be a key environmental factor. This is further discussed in Section 4.5 of this report.**

Water Supply	Water is required primarily for the suppression of dust	**Town of Port Hedland (ToPH) , Private Submission No.1, Private Submission No.2 and Port Hedland Community Progress Association (PHCPA) commented that:** • BHPBIO should be able to seek innovative solutions to be developed using non-potable water for dust control purposes.	BHPBIO has formulated Proposed Water Supply Strategy for the existing Inner Harbour and the staged proposed Outer Harbour proposal.
Groundwater		**ToPH recommended that:** • BHPBIO is encouraged to seek more innovative solutions to reduce the usage of potable water on the stockpiles fir dust control. **DEC commented that:** • BHPBIO should consider implementing a groundwater monitoring program for the detection of hydrocarbons from the proposal.	BHPBIO already undertakes such activities and this program would be expanded in accordance with Department of Water licensing requirements for dewatering of the car dumper facility.
MARINE			
Marine Water & Sediment Quality	Impacts from dredging	**Private Submission No.2 raised the issue of:** • the potential for impacts on p earl oysters from bioaccumulation of marine sediments or smothering. • the likelihood that naturally occurring metals such as Mercury and Nickel may be mobilised as part of the dredging campaign. • the impact on nearby aquaculture industry from the disposal of large volumes of water resulting from dewatering activities, in particular, ambient salinity changes. **Western Australian Fishing Industries Council**	**Considered to be a key environmental factor. This is further discussed in Section 4.3 of this report.**

		(WAFIC) stated: • the importance of maintaining a high level of water quality to ensure commercial fishing operations near the proposal; are not adversely affected. **OEPA recommended that:** • the area proposed as a m oderate ecological protection area (MEPA) be modified to be consistent with the Pilbara Coastal Water Quality Outcomes – Environmental Values and Environmental Quality Objectives (DoE, 2006a) document. • extra baseline data is presented for the 'water quality monitoring program'. • BHPBIO submits a Dredging and D redge Spoil Management Plan to the OEPA to be considered as part of this assessment. **DEC made recommendations that:** • BHPBIO develops a management plan for the required dewatering during construction of the proposal. • elutriate testing be undertaken on any dredge spoil materials that are discharged onshore.	
Marine Biota	• Potential for displacement of marine fauna and impacts from dredging and piling activities. • Potential for changes	**DEC made recommendations that:** • BHPBIO considers positive conservation measures to offset the displacement of marine fauna, particularly those listed as either specially protected or priority fauna. • BHPBIO would utilise 'soft' start-up procedures with marine fauna observers (MFO)	**Considered to be a key environmental factor. This is further discussed in Section 4.4 of this report.**

	to water quality both during construction and operational phases of the proposal.	• provision of t rained MFO's, associated with the required piling activity, that would also record dolphins, identified to species level where possible • BHPBIO should undertake further marine surveys (primarily for species of conservation significance, including turtles, cetaceans (including dolphins), dugongs, seabirds and shorebirds). These should be designed in consultation with the DEC prior to, during and post construction of the proposal. • the causeway design for West Creek allows for unimpeded movement of protected sawfish species and maintenance of tidal movement. • all marine vessel operators be made aware of the requirements of the Wildlife Conservation (closed season for mammals) Notice 1998 by BHPBIO. • Any significant fauna disturbance incidents involving marine fauna are to be reported to the DEC within 24 hours of the occurrence and appropriate DEC approved management responses are implemented to prevent further disturbances. **OEPA recommended that:** • BHPBIO should consider indirect impacts to seagrass habitat that may be utilized by green sea turtles and dugongs. • BHPBIO comment on the seasonal variance of both the seagrass distribution and movements of turtles and dugongs and the potential ecological inter relationships and what level of environmental sensitivity may exist that needs to be considered	

		with regard to the proposed dredging.	
Intertidal and Subtidal Benthic Primary Producer Habitat (BPPH)	Proposal would result in the the direct loss of 27.0 hecraes (ha) of onshore mangroves, 1.7 ha of coastal intertidal benthic primary producer habitat (BPPH) and 147.9 ha of subtidal BPPH.	**Port Hedland Community Progress Association (PHCPA) commented that:** • the spoil bank is mobile and needs to be managed more appropriately. **OEPA recommended that:** • BHPBIO confirm that the threshold values listed in table 5.6 of the PER document. • BHPBIO confirms the Local Assessment Unit (LAU) that is utilized for prediction of BPPH loss is consistent with EPA guidance. • more consistency is required with regard to the management plans/PER when defining the Zones of High Impact (ZoHI). • further information be provided on t he seasonal variation in segrass and macroalgae and the level of confidence in the modeled data provided that indicates estimates of distribution. • BHPBIO confirm that loss of BPPH within the Zone of Moderate Impact (ZoMI) is anticipated to be 'reversible' in accordance with EPA guidelines. • BHPBIO is to provide a more clear explanation of the application of the 'no light' and 'low light' thresholds with regards to potential coral loss within both the ZoHI and ZoMI and discuss how cumulative light stress has been addressed. • clarification is provided on the predicted loss of BPPH in LAU 8 and further analysis of the data collected for individual BPPH types.	**Considered to be a key environmental factor. This is further discussed in Sections 4.1 and 4.2 of this report.**

		• BHPBIO provide more information regarding the loss of BPPH in LAU 8 as the cumulative loss amount already exceeds the EPA's cumulative loss guideline. • BHPBIO clarify whether it is correct that there is no zone of moderate impact predicted for an area between the ZoHI and the ZoI for the habitat ridge in 3 to 5 m on Figure 10.28 of the PER. If so, explain in clear terms how this prediction was generated. What are the monitoring and management actions that the proponent intents to take to avoid impact to the habitat outside of the ZoHI along this inshore ridge of habitat. • that BHPBIO has applied impact and avoidance in accordance with EAG No.3 with regard to the proposed designs of the causeway over west creek. • with regard to irreversible loss of mangroves, BHPBIO has provided an alternate scenario for the calculation of proposed loss. An estimate, based on the most contemporary data should also be included. • BHPBIO provide clear statement that there is no anticipated direct or indirect impacts on the adjacent 'Oyster Passage Barrier Mangroves'.	
Hydrodynamics and Coastal Processes		**Private Submission No.1 raised the issue of:** • the need to consider sea level rise that may result from climate change.	BHPBIO has indicated that A combined storm and flood study is

		• projections for storm surge in conjunction with a 1/100 year event have not been adequately considered.	currently being undertaken for the proposed development area. The study will take into account all known infrastructure that is to be built in the area, including that of other proponents. Allowances for sea level rise are also being considered as part of this study.
Non-endemic Marine Species		**Private Submission No.2 and WA FIC raised the issue of:** • the potential increase in risk of pest organisms and/or other pathogens being discharged into the water via ballast water. **Department of Fisheries commented that:** • inspections of all vessels that would be mobilized as part of the proposal should be undertaken i.e. not just dredging and dredge support vessels. • modifications to the Invasive Species Management Plan were required.	The management of the risk associated with invasive marine species will be m anaged via the Invasive Marine Species Management Plan (IMSMP). This plan details the management measures that will be applied to prevent introduction of invasive species including ballast water management. All construction and operational vessels that have travelled internationally will be required to adhere to the

			Australian Quarantine and Inspection Service Mandatory Ballast Water Requirements.
POLLUTION			
Dust	Increase in the amount of fugitive dust to the Port Hedland air-shed.	**Town of Port Hedland (ToPH) had concerns that:** • construction of the proposed facility would result in a significant increase in noise and dust levels both in Port and South Hedland. **Port Hedland Port Authority (PHPA):** • Whether or not the proposed access roads would be sealed or not. **Private Submission No.1 raised the issue of:** • the cumulative dust impacts of constructing stockpiles 2,3 and 4 at Boodarie Estate have not been extensively considered. • problematic dust emissions from existing BHPBIO stockpiles on Finucane Island. • alternative location for the proposed stockyards should be to the south of the decommissioned HBI Plant. **DEC made recommendations that:** • BHPBIO should more fully acknowledge and make reference to the Port Hedland Air Quality and Noise Management Plan (PHAQNMP), in particular the interim guidelines that have been produced. • BHPBIO should explicitly state an i ntention to comply with the interim guideline prescribed in the	**Considered to be a key environmental factor. This is further discussed in Section 4.6 of this report.**

		PHAQNMP which is for particles measured as PM10 based on the following: 1. 70µm/m^3 (24 hour average); 2. 10 exceedances per calendar year: and 3. Applies to residential areas east of Taplin Street. • BHPBIO should remove from the report use of the term, 'nuisance dust' as it is a term that generally describes amenity related issues rather than environmental harm. • further information was requested regarding how some of the modeling results were derived (Table 8.2 PER Document) in relation to predicted maximum concentrations of PM^{10} at the hospital site.	
Noise	Noise from construction and operation of the proposal (including marine noise, blasting and vibration)	**ToPH:** • the construction of the proposed facility would result in a significant increase in noise and dust levels both in Port and South Hedland. **DEC made recommendations that:** • the proponent adheres to the recommendations of the Port Hedland Air Quality & Noise Management Plan (PHAQNMP) to monitor and manage noise using Noise Regulation 17 where appropriate. Including; developing a cumulative noise model, defining noise sensitive zones, clarifying planning measures and building standards. • the proponent provide DEC with an updated Noise Assessment Report (SVT 2011) and a copy of the	**Considered to be a key environmental factor. This is further discussed in Section 4.6 of this report.**

		Environmental Noise Reduction Management Plan (October 2011). • the proponent propose noise control measures that would result in the proposal being compliant, in isolation of other existing proposals. • further studies in relation to propagation of noise from piling, dredging and vessel movement. • no blasting occurs without appropriate consideration of potential impacts to significant marine fauna.	
Marine Discharges	Solid and liquid waste disposal from vessels	**PHPA, Private Submission No.2 and OEPA commented that:** • further information would be required with regard to quarantined wastes and other vessels wastes such as sewage.	All solid and liquid wastes (within WA waters) will be discharged to the shore and dealt with in accordance with the appropriate regulatory requirements. Note: > 12 Nautical offshore, all sewage will be treated in accordance with MARPOL Convention 1973/1978.
Hydrocarbons & Hazardous Materials		**Private Submission No.2 commented that:** • the need for contingency plans relating to uncontrolled spills of toxic materials such as hydrocarbons, paint and anti-fouling agents.	BHPBIO will develop a spill prevention and response plan which would apply to all marine activities associated with this proposal.
Greenhouse Gases		**PHPA commented that:** • further information was required as to the estimated	Estimates provided in the PER/Draft EIS do not

		sources of these emissions.	include emissions from ship, tug and small vessel movements associated with the operation of the facility.
Social Surroundings			
Community Services		**ToPH had concerns that:** • BHPBIO needs to focus on achieving a balance between fly in – fly out (FIFO) workforce and a residential based workforce.	BHPBIO remains committed to maintaining a strong residential presence in Port Hedland. The Company has made significant investment in accommodation in the Pilbara including dwellings for singles, couples and families. More than $340 million was invested in the first two phases of the Hedland and Newman accommodation projects and a third phase of accommodation development is currently underway. It is anticipated that both residential and FIFO workforces will need to increase to implement the proposed Outer Harbour Development and

			additional accommodation will be required to house construction and operational workforces.
Economic Advantage		**ToPH commented that:** • the decision to dump all of the dredged spoil off-shore is a waste of a resource that could be utilised for future residential development. • industrial tourism has been identified as a growth opportunity and it was requested that this proposal capitalises on this. • that BHPBIO assist to maximize long-term legacy outcomes in accordance with the ToPH's existing City Growth Plan. **PHCPA commented that:** • there is a mining plan that spans 40-50 years whilst the town operates on a 5-10 year plan with government reliant funding. • it would encourage BHPBIO to continue and expand existing and new relationships with stakeholders, similarly to that already completed with the Port Hedland Industries Council. • there are buildings of heritage value that are in need of restoration in the West End of Port Hedland. The need for a preservation plan has also been identified. • the preference for expansion of existing accommodation camps. • alternate transport arrangements for commuters	Investigations into the onshore disposal of dredged material have demonstrated that this is not a viable option due to a Limited portion of material that would be suitable for use as fill. BHPBIO remains committed to working in partnership with the Town of Port Hedland to realise their vision. This includes actively working with them to improve both the physical amenities of the area and expand community infrastructure to support a growing population.

		should be examined. • continued support for the arts.	
Indigenous Heritage		**Private Submission No.1 raised the issue of:** • known cultural material in the vicinity of the Boodarie Estate with regard to cumulative land impacts for all foreseeable proposals.	
Recreation		**ToPH raised the issue that:** • public access to the Finucane Island boat ramp needs to be maintained during the construction and operation phases of the operation. **Private Submission No.2 raised the issue of:** • increased small vessel movements and the potential impact on anglers. **DoF commented that:** • the projected increase in population of Port Hedland will be a factor in increasing recreational fishing pressure. **PHCPA commented that:** • should the proposal be constructed, the need for further boat launching facilities would be required.	Public access to Finucane Island boat ramp will be maintained during the construction and operation phases of the proposed development. Minor temporary changes, may be required from time-to-time but overall access will continue. Fishing and boating will still be permitted during the construction, however, exclusion zones will apply to development areas and these will be r egularly monitored by security patrols.
Commercial Fisheries		**WAFIC and DoF had concerns that:** • the proposal has the potential to impact upon the existing fisheries including:	These industries are considered to be located a significant distance from

		1. pearling and aquaculture operations; 2. marine aquarium; 3. specimen shell; 4. Pilbara developmental crab; 5. Pilbara wetline, trap and trawl; and 6. Mackerel. • accessibility to commercial fishing operations. • loss of 64 hectares (ha) of benthic fish habitat.	the proposal so as any impact is viewed highly unlikely to be significant. Proposal is unlikely to have a s ignificant long-term impact on commercial fishing operations. BHPBIO will continue to liaise with all involved parties and the loss of 64 ha of habitat is not anticipated to have impacts at ecosystem level.
Climate Change			
Decommissioning		**Department of Mines and Petroleum rasied the issue of:** • a lack of detail as to how the proposal would be decommissioned.	The infrastructure would be kept in good operating condition and should BHPBIO wish to decommission, all non removable plant would become the property of the state under the *Iron Ore (Mt Goldsworthy) Agreement Act 1964*.

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.*		
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.*		
3. The principle of the conservation of biological diversity and ecological integrity *Conservation of biological diversity and ecological integrity should be a fundamental consideration.*		

4. Principles relating to improved valuation, pricing and incentive mechanisms *(1) Environmental factors should be included in the valuation of assets and services.* *(2) The polluter pays principles – those who generate pollution and waste should bear the cost of containment, avoidance and abatement.* *(3) The users of goods and services should pay prices based on the full life-cycle costs of providing goods and services, including the use of natural resources and assets and the ultimate disposal of any waste.* *(4) Environmental goals, having been established, should be pursued in the most cost effective way, by establishing incentive structure, including market mechanisms, which enable those best placed to maximize benefits and/or minimize costs to develop their own solution and responses to environmental problems.*		
5. The principle of waste minimisation *All reasonable and practicable measures should be taken to minimize the generation of waste and its discharge into the environment.*		

Appendix 4

Identified Decision-making Authorities
and
Recommended Environmental Conditions

Identified Decision-making Authorities

Section 44(2) of the 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
Minister for Water	*Rights in Water and Irrigation Act 1914* – license to dewater
Department of Environment and Conservation	Works Approval and Licence (Part V)
Minister for State Development	*Agreement Acts*
Minister for Mines & Petroleum	*Mining Act 1978*
Minister for Indigenous Affairs	*Aboriginal Heritage Act 1972* – Section 18 Clearances
Minister for Lands	*Land Administration Act 1997*
Minister for Transport	*Port Authority Act 1999*

Statement No. xxxx

RECOMMENDED ENVIRONMENTAL CONDITIONS

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

PROPOSED OUTER HARBOUR DEVELOPMENT – PORT HEDLAND
BHP BILLITON IRON ORE (BHPBIO)

Proposal: The proposal is to construct and operate the Outer Harbour Development which includes landside and marine infrastructure for the handling and export of iron ore from BHPBIO's operations (Figure 1).

The Boodarie stockyard infrastructure will supply an overland conveyor to a transfer pad located to the west of the existing Finucane Island facilities. A piled jetty will transfer ore material to the ship loaders located at the piled wharf.

The proposal is further documented in schedule 1 of this statement.

Proponent: BHP Billiton Iron Ore Pty Ltd

Proponent Address: 225 St Georges Terrace, PERTH WA 6000

Assessment Number: 1735

Related Implementation Statement: 00740

Report of the Environmental Protection Authority: Report 1427

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:

Published on

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 of the Office of the Environmental Protection Authority (CEO) 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.

4-2 The Proponent shall submit to the CEO the compliance assessment plan required by condition 4-1 at least six months prior to the first compliance report required by condition 4-6, or prior to implementation, whichever is sooner.

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 the method of reporting of potential non-compliances and corrective actions taken;

5 the table of contents of compliance assessment reports; and

6 public availability of compliance assessment 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.

4-5 The Proponent shall advise the CEO of any potential non-compliance within seven days of that non-compliance being known.

4-6 The Proponent shall submit to the CEO the first compliance assessment report fifteen months from the date of issue of this Statement addressing the twelve month period from the date of issue of this Statement and then annually from the date of submission of the first compliance assessment report.

The compliance assessment report shall:

1 be endorsed by the proponent's Managing Director or a person delegated to sign on the Managing Director'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 Public Availability of Data

5-1 Subject to condition 5-2, within a reasonable time period approved by the CEO of the issue of this Statement and for the remainder of the life of the proposal the Proponent shall make publicly available, in a manner approved by the CEO, all validated environmental data (including sampling design, sampling methodologies, empirical data and derived information products (e.g. maps)) relevant to the assessment of this proposal and implementation of this Statement.

5-2 If any data referred to in condition 5-1 contains particulars of:

- A secret formula or process; or
- Confidential commercially sensitive information,

the Proponent may submit a request for approval from the CEO to not make this data publically available. In making such a request the Proponent shall provide the CEO with an explanation and reasons why the data should not be made publically available.

6 Marine Benthic Communities

6-1 The Proponent shall ensure that the dredging of the berth pockets, swing basin and shipping channel as described in Schedule 1, achieves the following environmental protection outcomes:

i. no irreversible loss of, or serious damage to benthic habitats outside of the Zone of High Impact shown in Figure 2 of Schedule 1, unless and until a revised Zone of High Impact has been approved by the CEO in accordance with Condition 6-10 to have effect;

ii. no detectible net negative change to benthic habitats relative to the baseline state of those habitats, outside of the Zone of High Impact and Zone of Moderate Impact, shown in Figure 2 of Schedule 1, unless and until revised Zones of High and/or Moderate Impact have been approved by the CEO in accordance with Condition 6-10 to have effect.

Note: For the purpose of condition 6-1 the terms "**irreversible loss**" and "**serious damage**", will have the same meaning as those terms in the Environmental Protection Authority's Environmental Assessment Guideline Number 3 (2009).

6-2 At least two months prior to the commencement of dredging of the berth pockets, swing basin and shipping channel, unless otherwise approved by the CEO, the Proponent shall revise the *Draft BHPBIO Outer Harbour Development Dredging and Spoil Disposal Management Plan* (October 2011, Rev 0) to meet the objectives set out in condition 6-3 and address the requirements of condition 6-4, to be approved by the CEO.

6-3 The objectives of the final *BHPBIO Outer Harbour Development Dredging and Spoil Disposal Management Plan* are to ensure that the dredging of the berth pockets, swing basin and shipping channel is managed:

i. to achieve the environmental protection outcomes set in condition 6-1; and

ii. with the aim of meeting the management targets and reducing adverse impacts on marine benthic habitats, as far as practicable.

6-4 The *Draft BHPBIO Outer Harbour Development Dredging and Spoil Disposal Management Plan* (October 2011, Rev 0) revised in accordance with condition 6-2 shall include:

i. locations of impact and reference monitoring sites;

ii. descriptions of impact and reference monitoring sites, including key physical attributes, geographic locations and measures of the baseline condition of benthic communities to be monitored;

iii. descriptions of the management targets, and the environmental variables to be monitored for the evaluating the achievement of objectives set in 6-3 (i) and (ii);

iv. the monitoring and data evaluation procedures to be applied so as to assess achievement of the objectives set in condition 6-3 (i) and (ii);

v. the monitoring methodologies and procedures to be applied to:

   a. measure relevant physical indicators (e.g. water currents, water quality conditions including turbidity, photosynthetic radiation and light attenuation coefficient, and sediment deposition rates) at a frequency to allow adaptive dredge management; and

   b. measure biological indicators (depending on weather conditions) to inform adaptive environmental management at an appropriate frequency;

vi. management trigger indicators and values for relevant physical and biological indicators to be applied in a risk-based tiered approach for the management of the environmental impacts of turbidity generating activities;

vii. evidence demonstrating that the monitoring required to assess achievement of objectives set in condition 6-3 (i) and (ii), is based on tests using appropriate effect size(s) and statistical power values;

viii. management actions that will be implemented in the event that the management triggers values set in condition 6-4 (vi) are not met;

ix. methods and procedures that will be implemented to regularly characterise, spatially-define and report the observed plume caused by the dredging of the berth pockets, swing basin and shipping channel; and

x. procedures for timely reporting of monitoring data, management responses and contingency measures.

6-5 The Proponent shall provide relevant stakeholders with a final copy of the *BHPBIO Outer Harbour Development Dredging and Spoil Disposal Management Plan* required under conditions 6-2.

6-6 The Proponent shall implement the approved *BHPBIO Outer Harbour Development Dredging and Spoil Disposal Management Plan* required under conditions 6-2 to 6-4 and make that plan publicly available in a manner approved by the CEO.

6-7 In the event that monitoring carried out under the approved *BHPBIO Outer Harbour Development Dredging and Spoil Disposal Management Plan* determines that any of the environmental protection outcomes set in conditions 6-1 are not being achieved during the dredging of the berth pockets, swing basin and shipping channel, the Proponent shall:

i. immediately suspend turbidity-generating activities that are contributing to the non-achievement;

ii. within 24 hours of that suspension, report the non-achievement to the CEO and that it has suspended the relevant turbidity-generating activities; and

iii. within 48 hours of that suspension, report to the CEO:

a. the results of the monitoring that led to that suspension;

b. the findings of investigations into the status of relevant environmental measures against achievement of the environmental protection outcomes set in condition 6-1;

c. the turbidity-generating activities and metocean conditions which occurred in the monitoring period prior to the non-achievement and until the time of suspension at the time of the non achievement of environmental protection outcomes set in condition 6-1; and

d. the results of the most recent water quality and sediment deposition monitoring.

6-8 If, after suspending any turbidity-generating activities under condition 6-7, in the report required by condition 6-7(iii), the Proponent:

i. determines that environmental protection outcomes set in conditions 6-1 are being achieved; or

ii. provides strong evidence that a particular turbidity generating activity did not cause the non-achievement,

and the CEO concurs with the findings of the Proponent's report, then the Proponent may recommence turbidity-generating activities.

6-9 If condition 6-8 does not apply, and the Proponent wishes to recommence the turbidity-generating activities which are suspended under condition 6-7, the Proponent:

i. shall submit to the CEO a report detailing the following:

a. the results of the most recent environmental monitoring for relevant monitoring and reference sites, including identifying where an environmental protection outcome is not being achieved, and those sites where there is strong evidence that non-achievement of an environmental protection outcome is reasonably expected to be recorded as part of the same event;

b. the turbidity-generating activities which were being undertaken in the monitoring period prior to the environmental protection outcome not being achieved and until the time of suspension;

c. the metocean conditions as monitored in the most recent monitoring period prior to the environmental protection outcome not being achieved and until the time of suspension;

d. the results of the most recent monitoring of relevant physical indicators (eg. water quality and sediment deposition);

e. proposed revised Zone of High Impact and/or Zone of Moderate Impact;

f. additional management actions proposed to be implemented so that the recommencement of turbidity-generating activities which are part of the dredging of the berth pockets, swing basin and shipping channel which will ensure environmental protection outcomes set in condition 6-1 are achieved in the proposed revised zones; and

g. any other information considered relevant by the Proponent in support of its Proposal to recommence all turbidity-generating activities that remain suspended after implementing condition 6-7.

6-10 The CEO may, having regard to a report submitted by the Proponent under condition 6-9, approve revised Zones of High or Moderate Impact to have effect for the purpose of condition 6-1 in which case the Proponent may then continue or recommence turbidity-generating activities which are part of the dredging of the berth pockets, swing basin and shipping channel subject to the approved revised Zones. The CEO may also, having regard to a report submitted by the Proponent under condition 6-4(x) or 6-9, require the Proponent to implement other additional practicable management actions proposed in this report, as part of the approved *BHPBIO Outer Harbour Development Dredging and Spoil Disposal Management Plan* (conditions 6-2 to 6-4).

Marine benthic surveys

6-11 The Proponent shall, within six months following the date of this Statement, or at least four months prior to the commencement of any marine works that may impact the marine environment, whichever is sooner, unless otherwise approved by the CEO, prepare a Scope of Works for surveys of the marine environment referred to in condition 6-12 for the approval of the CEO.

6-12 The surveys of the marine environment are to be conducted in accordance with the approved Scope of Works at the times as indicated below, unless otherwise approved by the CEO, so as to establish the following:

i. the baseline state of the marine environment prior to the commencement of any marine works;

ii. the state of the marine environment at the mid-term of the marine works period associated with the dredging of the berth pockets, swing basin and shipping channel;

iii. the first post-development state of the marine environment associated with the dredging of the berth pockets, swing basin and shipping channel; and

iv. a second post-development state of the marine environment having regard to the findings of previous surveys.

6-13 The Scope of Works for surveys of the marine environment required in condition 6-12 shall include the following where relevant having regard to when the survey is conducted:

i. Procedures and methods for the collection of quantitative environmental data for:

a. water quality;

b. hydrodynamic conditions including direction and velocity of water currents;

c. the physical characteristics of native sediments and development-influenced sediments suspended in the water column and deposited on the benthos;

d. the natural and development-influenced rates, and spatial and temporal patterns of sediment deposition;

e. the spatial extent, distribution, community composition (at a suitable taxonomic resolution to differentiate different communities), natural variability including seasonality and condition of benthic habitats; and

f. confirming the extent, distribution and condition of benthic habitats at representative sites.

ii. timing for the implementation and completion of the surveys having regard to the types and sequence of surveys referred to in condition 6-12;

iii. procedures for the use of survey data to assess compliance with relevant environmental protection outcomes in condition 6-1; and

iv. timing and frequency of reporting.

6-14 Prior to the commencement of dredging and in accordance with the approved Scope of Works required under condition 6-13, the Proponent shall undertake the baseline state of the marine environment survey.

6-15 At the time specified in the approved Scope of Works and in accordance with the approved Scope of Works, the Proponent shall undertake the surveys for the state of the marine environment at the mid-term of the marine works.

6-16 At the time specified by the approved Scope of Works and in accordance with the approved Scope of Works, the Proponent shall undertake the surveys for the state of the marine environment at the completion of dredging of the berth pockets, swing basin and shipping channel as described in Schedule 1.

6-17 No longer than 5 years following completion of dredging of the berth pockets, swing basin and shipping channel and in accordance with the approved Scope of Works, the Proponent shall undertake a second post-development state of the marine environment survey to determine compliance with the environmental protection outcomes set in condition 6-1 (or any approved revised environmental protection outcome), unless otherwise approved by the Minister.

6-18 The Proponent shall report the findings of the baseline state of the marine environment survey required by condition 6-14 to the CEO within three months of having completed that survey.

6-19 The Proponent shall report the findings of subsequent state of the marine environment surveys required by conditions 6-15, 6-16 and 6-17 and include in each report an appraisal of compliance with environmental protection outcomes set in condition 6-1, to the CEO within four months of having completed each survey.

7 Protection of Intertidal Habitats (mangroves)

West Creek Crossing

7-1 Prior to the commencement of construction, the Proponent shall prepare a West Creek Crossing Plan for the infrastructure corridor across West Creek, to be approved by the CEO.

The objective of the Plan is to identify the crossing type and construction methodology to be adopted which minimises impacts on mangrove communities, tidal flows and aquatic habitats in West Creek.

The actual type of infrastructure crossing to be adopted above shall be contained within the disturbance envelope referred to in condition 7-3 and shown in Figure 3.

7-2 The Proponent shall construct the West Creek crossing infrastructure according to the option identified and adopted in the approved West Creek Crossing Plan required by condition 7-1.

Mangroves

7-3 The Proponent shall ensure that the implementation of the proposal does not cause the permanent loss of mangroves, either through direct or indirect impacts, other than the mangroves located within the disturbance envelope in Figure 3 in Schedule 1 of this statement.

Note: 'Permanent loss' is defined as the mortality of, or long term serious damage to, mangrove communities. This includes a long-term decline in the crown condition of the mangrove communities.

7-4 The total area of mangroves to be affected by permanent loss within the disturbance envelope shall not exceed the agreed mangrove loss as defined in Table 1 of Schedule 1.

7-5 Following the completion of the construction of the West Creek crossing, the Proponent shall undertake mangrove health surveys and report to the CEO the total permanent loss of mangrove communities caused by the proposal after:

a) 2 months;
b) 1 year; and
c) 2 years, or
at a frequency to the satisfaction of the CEO,

to verify the requirements of conditions 7-3 and 7-4 have been met.

The reports shall include co-ordinates and a map confirming the area of mangrove loss caused by the proposal does not exceed the area of permanent loss referred to in condition 7-4.

8 Marine Fauna Interaction – Marine Pile Driving, Dredging and Marine Construction Vessels and Onshore Facility light sources

8-1 The Proponent shall engage dedicated Marine Fauna Observers who must:

i. demonstrate a knowledge of marine wildlife species in the Pilbara region, including Threatened and Migratory Species listed under the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act), and *Wildlife Conservation (Specially protected fauna) Notice 2010(2)* and priority listing, and their behaviours;

ii. have the capacity, subject to safety considerations, to move and make observations and other relevant records independently within the vicinity of marine construction activities (including pile driving and dredging);

iii. be on duty during all daylight hours when pile-driving and/or dredging operations are conducted; and

iv. maintain a log of:

a. observations of cetaceans in a format consistent with the National Cetacean Sightings and Strandings Database;

b. observations of marine fauna, including injured or dead fauna within 500 metres of the marine construction activities referred to in condition 8-1(ii);

c. observations of fauna behaviour, in particular any behaviour that could be in interpreted as a display of disturbance or distress;

d. management response by the Proponent in relation to observation of disturbed or distressed fauna, and injured or dead fauna; and

e. observation hours in relation to the duration of the pile driving and dredge activity.

8-2 The Proponent shall within six months of completing pile driving operations, lodge cetacean records with the National Cetacean Sighting and Strandings Database at the Australian Antarctic Division and with the DEC.

8-3 At least one member of the crew on each vessel undertaking construction activities (dredge, piling vessels) will be trained in marine fauna observations and mitigation measures, including the requirements of the *Wildlife Conservation (Closed Season for Marine Mammals) Notice 1998*, as amended or replaced from time to time, and maintain a watch and a log of fauna observed during transit and construction activity consisting of: GPS coordinates; species (if known); and behaviour. Logs are to be submitted to

the DEC on an annual basis at the same time as submitting the compliance assessment report required by condition 4-6 to the CEO.

8-4 Vessels engaged in construction of the nearshore or offshore marine facilities shall not exceed those speeds specified in the Marine Fauna Management Plan required under condition 8-11 or a speed designated by the Department of Transport or relevant Port Authority, whichever is lesser.

8-5 Subject to condition 8-9, no marine pile driving operations shall commence until the Marine Fauna Observer (or observers) required by condition 8-1 have verified that no cetacean(s) or dugong(s) have been observed within a radius of 1,500 metres or marine turtle(s) within a radius of 300 metres from piling operations during the 30 minute period immediately prior to commencement of piling operations.

8-6 Prior to commencement of full power marine pile driving, the Proponent shall implement soft start-up procedures that slowly increase the intensity of noise emissions over a period of no less than 15 minutes.

8-7 If the Marine Fauna Observer(s) required by condition 8-1, or any other person, observes a marine turtle enter within 100 metres of a piling operation, or cetacean or dugong within 500 metres of a piling operation, that piling operation is to be suspended.

8-8 Marine pile driving that has been suspended in accordance with condition 8-7 shall not recommence until the cetacean or dugong has moved beyond 1,500 metres from the suspended piling operation or the marine turtle beyond 300 metres of their own accord, or the cetacean, dugong or marine turtle has not been observed within the exclusion zone for a period of 30 minutes. Marine pile driving that has been suspended for more than 15 minutes shall recommence with soft start-up procedures as required by condition 8-6.

8-9 No marine pile driving operations shall occur between the hours of sunset and sunrise during the peak southern migration of mother and calf humpback whale pods defined as 10 August to 10 October in any year.

Marine Fauna Management Plan

8-11 Prior to the commencement of constructing the marine components of the proposal, unless otherwise approved by the CEO, the Proponent shall prepare a Marine Fauna Management Plan in consultation with the DEC and Commonwealth Department of Sustainability, Environment, Water, Population and Communities, which is to be approved by the CEO.

The objective of this Marine Fauna Management Plan is to ensure that the Proponent constructs and operates the proposal so as to:

i. detect; and

ii. avoid, or where this is not practicable, mitigate,

impacts upon conservation significant marine fauna, from construction and operation of the proposal.

Note: For the purposes of this condition the term 'conservation significant marine fauna' includes marine mammals, marine turtles and sawfish listed as threatened under the EPBC Act or *Wildlife Conservation (Specially protected fauna) Notice 2010(2)* as amended or replaced from time to time.

8-12 The Proponent shall include the following in the Marine Fauna Management Plan:

i. a description of the environmental stressors relating to the construction and operation of the marine components of the proposal which are likely to impact on conservation significant marine fauna. (environmental stressors may include, but are not limited to, noise, vibration, light spill and glow, vessel strike, dredge entrainment, and changes to coastal processes with the potential to impact on important marine fauna habitats);

ii. a description of design features and management actions which the Proponent will implement to avoid, or where this is not practicable, mitigate impacts of the environmental stressors relating to the construction and operation of the marine components of the proposal on conservation significant marine fauna (for example, darkness strategies that avoid, or where this is not practicable, significantly reduce the level of light glow from the construction and operations of the Proposal, and associated vessels to a degree that minimises interference with nesting turtles and hatchlings);

iii. environmental performance standards to determine whether the design features and management actions are achieving the plan objectives referred to in condition 8-11; and

iv. a process (including a monitoring programme) to determine that the environmental performance standards are being achieved.

8-13 The Proponent shall implement the approved Marine Fauna Management required under conditions 8-11 and 8-12.

8-14 The Proponent shall make the approved Marine Fauna Management Plan required under conditions 8-11 and 8-12 publicly available in a manner approved by the CEO.

8-15 The Proponent shall review annually the approved Marine Fauna Management Plan.

8-16 The Proponent shall report to:

i. the CEO any non-achievement of the environmental performance standards referred to in condition 8-12(iii) within 21 days of it having determined non-achievement and its recommendations as to how the plan should be amended to ensure standards are achieved; and

ii. the DEC any natural or Proposal attributable injury or mortality of conservation significant marine fauna within 24 hours of the observation.

Underwater Noise Monitoring and Review Plan

8-17 Prior to commencement of marine pile driving activities, unless otherwise approved by the CEO, the proponent shall prepare, with the advice of an expert(s) in the field of noise propagation modelling in the marine environment, an Underwater Noise Monitoring and Review Plan for the marine pile driving activities, to be approved by the CEO, which:

i. measures underwater noise from pile driving operations to establish a library of sound signals:

a. at varying distances from the noise source;

b. when driving piles of different sizes and types;

c. during the concurrent piling of different numbers of piles;

d. in conditions of different water depths; and

e. in different driving conditions (substrate types);

ii. reviews the predictive capacity of the noise propagation model used for the pile driving and make recommendations for improving the accuracy of underwater noise modelling in the future.

8-18 The Proponent shall implement the approved Underwater Noise Monitoring and Review Plan required under condition 8-17.

8-19 The results of the approved Underwater Noise Monitoring and Review Plan are to be published within one year after the completion of the pile driving operations in a manner approved by the CEO.

9 Operational Marine Environmental Quality

9-1 During the operation of the proposal, the Proponent shall manage activities associated with the marine components of the proposal as set out in Schedule 1, with the aim of achieving the environmental quality objectives and levels of ecological protection as indicated in Figure 4.

9-2 The Moderate Ecological Protection Area for the port is defined as the area contained within 250 metres of the shipping berths and ship turning basin as indicated in Figure 4 of Schedule 1. Outside of the Moderate Ecological Protection Area a High Level of Ecological Protection shall be maintained.

Note: Schedule 2 describes Environmental Quality Objectives and associated Levels of Ecological Protection and provides guidance on allowable levels of change and appropriate guidance on trigger values.

9-3 Prior to the commencement of commissioning the marine components of the proposal, unless otherwise approved by the CEO, the proponent shall prepare a Port Marine Environmental Quality Management Plan.

The objective of the Marine Environmental Quality Management Plan is to ensure that the operational activities of the proposal are managed to ensure the requirements of conditions 9-1 and 9-2 are met.

The Marine Environmental Quality Management Plan shall include:

i. protocols and procedures for monitoring and evaluating the quality of water and sediment in marine waters surrounding the proposal;

ii. a threat assessment and baseline sediment and water quality data for indicators relevant to identified threats over a number of tidal cycles and seasons;

iii. environmental quality indicators and associated 'trigger' levels (i.e. environmental quality guidelines and environmental quality standard) based on the guidelines and recommended approaches in the *Australian and New Zealand Guideline for Fresh and Marine Water Quality (ANZECC & ARMCAMZ, 2000)* and the State Water Quality Management Strategy Document No. 6 for assessing performance against the environmental quality objectives and associated levels of ecological protection set out in Schedule 2;

iv. the reporting procedures, including the format, timing, and frequency for the reporting of monitoring data against the relevant trigger levels and environmental quality objectives;

v. a framework for development of management and contingency actions to be implemented in the event that any trigger levels referred to in iii. are not met; and

vi. location of impact and reference monitoring sites.

9-4 The Proponent shall implement the approved plan required by Condition 9-3.

9-5 In the event that monitoring required by condition 9-4 indicates that the environmental quality objectives and levels of ecological protection established through condition 9-1, and described in Schedule 2, are not being met, or are not likely to be met, the proponent shall report the findings to the CEO within seven working days, along with a description of the management actions to be taken to meet the required level of environmental quality.

10 Terrestrial Flora and Vegetation

10-1 The Proponent shall implement actions and measures set out in the *Port Hedland Outer Harbour Development Significant Terrestrial Species Management Plan* (Significant Species Management Plan) dated September 2011, during the construction of the proposal. The objective of the Significant Species Management Plan is to minimise potential impacts of construction on significant flora species and their habitats during construction of the landside infrastructure component as described in Schedule 1.

10-2 The Proponent shall not clear or directly disturb the ground or any vegetation beyond the proposal disturbance envelope depicted in Figure 5 and defined in Table 1 of this Statement.

11 Introduced Marine Pests

11-1 The Proponent shall manage non-trading vessel activities and immersible equipment activities whilst engaged for the implementation of the Proposal with the objective of preventing the introduction of marine pests into State waters. For the purpose of this condition, Introduced Marine Pests are those species known to be introduced marine pests, or any other species demonstrating invasive characteristics.

11-2 Prior to the departure of any non-trading vessels and associated immersible equipment engaged for the implementation of the Proposal (including dredges and pile driving barges), from any port into State waters, the Proponent shall:

i. undertake a risk assessment for Introduced Marine Pests. The risk assessment will be undertaken in accordance with a risk assessment procedure approved by Department of Fisheries; and

ii. submit the risk assessment, including all inputted data and results to the Department of Fisheries for a determination of the risk level (high, or low) to be assigned to the vessels or associated immersible equipment.

11-3 The Proponent shall ensure that any non-trading vessel or immersible equipment assessed in accordance with conditions 11-2(i) and (ii) and determined by the Department of Fisheries to be of high risk of Introducing Marine Pests, do not enter State waters unless and until:

i. the non-trading vessel or immersible equipment has been inspected by an Officer of the Department of Fisheries, or a suitably qualified invasive marine pest expert approved by the Department of Fisheries; and

ii. the Proponent has provided evidence to the Department of Fisheries, certifying that:

a. there is no sediment on or within the non-trading vessel and immersible equipment;

b. ballast water (if any) has been, or will be, managed according to the Australian Quarantine and Inspection Service ballast water requirements as amended or replaced from time to time;

c. no Introduced Marine Pests have been identified on or within any vessel or immersible equipment inspected or;

d. where an Introduced Marine Pest has been identified on or within any vessel or immersible equipment then;

1. the vessel has been subsequently cleaned and the cleaned vessel has been inspected by an Officer of the Department of Fisheries or a suitably qualified invasive marine pest expert approved by the Department of Fisheries,

2. any cleaning or treatment activities undertaken to address Introduced Marine Pests risk, has been undertaken to an extent that the non-trading vessel or associated immersible equipment is determined by the Department of Fisheries to represent a low risk to the West Australian marine environment; and

iii. vessel and immersible equipment inspections have been conducted no more than 7 days prior to vessel or immersible equipment departure for Port Hedland; or

iv. if a vessel is determined by the Department of Fisheries to be of a high risk and has entered State waters, without meeting the requirements of conditions 11-3 (i), (ii) and (iii), then it must be inspected within 48 hours of arrival in State waters by an Officer of the Department of Fisheries or a suitably qualified invasive marine pest expert approved by the Department of Fisheries.

Note: Arrangements for inspection within the Port of Port Hedland shall be carried out in consultation with the Harbour Master.

11-4 If non-trading vessels and associated immersible equipment are to be transferred without exemption (condition 11-5) from Port Hedland to other locations within State waters, the Proponent shall, at least 14 days prior to departure from Port of Port Hedland, undertake an inspection or submit a demobilisation risk assessment report to the Department of Fisheries that is informed by the Introduced Marine Pests monitoring of Port Hedland Introduced Marine Pests monitoring shall:

i. be consistent with monitoring design, implementation and reporting standards set out as part of the National Monitoring Network for the Prevention and Management of Marine Pest Incursions, as approved by the Monitoring Design Assessment Panel of the Marine Pest Sectoral Committee (MPSC), or as otherwise approved by the Department of Fisheries.

ii. include a review of target priority Introduced Marine Pest species prior to each monitoring survey;

iii. include a range of sample sites focusing on habitats considered most capable of facilitating the establishment of priority target species throughout all areas of port activities including anchorages, wharves, jetties, slipways, harbours and natural substrates, within the waters of the marine leases held by the Proponent;

iv. be undertaken a minimum of once each year for the life of the Proposal; and

v. include suitable targeted sampling and analysis of specimens removed during port and vessel maintenance activities.

11-5 Specified vessels and immersible equipment and vessels used to undertake single or multiple bunkering or other routine operational activities at neighbouring ports such as Dampier will be exempt from the Introduced Marine Pests risk mitigation measures referred to in condition 11-4 if, prior to arriving or departing from Port Hedland, the Department of Fisheries, has issued a written exemption for that specified vessel and immersible equipment to enter and or leave Port Hedland prior to an identified date, based on comprehensive information submitted by the Proponent that includes a risk assessment supported by documentation demonstrating biofouling management actions and a vessel activity profile since the most recent dry-dock cleaning.

11-6 The Proponent shall, throughout the life of the Proposal notify the Department of Fisheries, the Port Hedland Harbour Master and the CEO of any known or suspected Introduced Marine Pests detected in the waters within the marine leases held by the Proponent at or adjacent to Port Hedland within 24 hours following detection, or following subsequent sample analysis undertaken as part of inspection or monitoring activities.

11-7 In the event that Introduced Marine Pests are detected during either the inspection of non-trading vessels and immersible equipment required by condition 11-3, or during monitoring surveys required by condition 11-4, and the introduction is a result of proposal related activities, the Proponent shall, in consultation with the Department of Fisheries and the CEO, develop and implement an Introduced Marine Pests Management Strategy to prevent wherever practicable, the establishment and proliferation of that organism, aiming to control and potentially eradicating that organism, and to minimise

the risk of that organism being transferred to other locations within Western Australia.

11-8 The Proponent is to submit a report detailing the outcomes of the implementation of the Introduced Marine Pests Management Strategy to the Department of Fisheries and the CEO within a month of the commencement of the implementation of the Introduced Marine Pests Management Strategy and thereafter as required by the CEO.

12 Construction Dewatering Effluent Management

12-1 Prior to the commencement of construction of the car dumpers the proponent shall submit a Hydrogeological and Dewatering Effluent Investigation Report to be approved by the CEO. The objective of the Report is to investigate appropriate onsite reuse options for dewatering effluent from the construction of the car dumpers, prior to the consideration of effluent disposal to the marine environment. The Report shall include:

i. results of groundwater monitoring and modelling, including defining the lateral extent of the predicted cone of depression of the water table caused by dewatering;
ii. required volumes and flow rates for dewatering;
iii. dewatering effluent water quality, including defining action criteria for chemical parameters that would trigger the implementation of contingency plans if exceeded;
iv. evaluation of options for reuse of dewatering effluent onsite including dust suppression (and other construction activities);
v. evaluation of options for reinjection/infiltration;
vi. evaluation of options for disposal to the marine environment;
vii. prediction of the toxicity and bioaccumulatory/biomagnification potential of the final discharge under typical conditions;
viii. identification of management and treatment options for dewatering effluent; and
ix. comparison of environmental impacts of options considered in iv, v and vi.

12-2 Based on the Hydrogeological and Dewatering Effluent Investigation Report required by condition 12-1, the proponent shall identify a dewatering and effluent disposal strategy for implementation, to be approved by the CEO.

12-3 The proponent shall implement the dewatering and effluent disposal strategy approved under condition 12-2.

12-4 If discharge of dewatering effluent to the marine environment is part of the strategy approved in condition 12-2, then the proponent shall prepare a Groundwater and Effluent Discharge Operating Strategy to be approved by

the CEO, prior to the construction of the car dumpers. The Strategy shall include:

i. interim Environmental Quality Objectives and levels of ecological protection that would apply for the period of the discharge;
ii. predictions of the number of dilutions required to achieve the Environmental Quality Objectives and levels of ecological protection, based on predictions in condition 12-1(vii);
iii. design of discharge infrastructure to achieve the necessary number of dilutions;
iv. an environmental quality monitoring plan to monitor and manage the environmental consequences of the discharge spanning the range of expected conditions, and including for bioaccumulatory/biomagnifying substances;
v. water quality triggers and environmental quality criteria, for constituents of the discharge considered relevant by the CEO, that should be achieved to maintain the interim environmental quality objectives and levels of ecological protection in the Port Hedland Harbour;
vi. timing and volume of effluent discharge;
vii. protocols and procedures for water quality monitoring under a range of tidal conditions;
viii. treatment and management actions to apply to the effluent prior to discharge, to meet the environmental quality criteria referred to above in v;
ix. contingency options for additional treatment or management actions should environmental quality objectives not be achieved; and
x. procedures for reporting the results of water quality monitoring, non-achievement of any environmental quality objectives and effectiveness of the contingency actions.

12-5 The proponent shall implement the approved operating strategy required by condition 12-4 during the construction of the car dumpers.

13 Staging of Plans

13-1 Where a plan, program, report or survey is required by these conditions to be prepared and approved prior to the commencement of an activity, it is required that the plan, strategy, report or survey can be prepared and approved as per the relevant condition requirements for a component or stage of the activity, allowing staged implementation.

14 Review of Plans

14-1 If the Proponent amends any plan, program, report or strategy or other document required by these conditions, the Proponent must implement the amended plan from the date of the amendment.

14-2 If any plan, program, report or strategy is required to be approved under these conditions, the Proponent may only make a significant amendment to the plan, program, report or strategy if the amendment is also approved. Significant amendments are those amendments which alter the obligations of the Proponent, that is, are not minor or administrative.

15 Decommissioning

15-1 At least six months prior to the anticipated date of closure, the proponent shall submit a decommissioning and rehabilitation management plan, as approved by the CEO.

16 Residual impact and risk management measures

16-1 In order to mitigate for significant residual impacts and risks (permanent and temporary) of the Proposal to marine benthic habitat, mangroves, marine fauna, the Proponent shall undertake the following residual impact and risk management measures, consistent with financial, governance and accountability arrangements described in Schedule 3 (Proponent residual impact and risk management measures – BHPBIO Outer Harbour project), unless otherwise agreed with the CEO.

16-2 The Proponent will contribute $500,000 over two years to relevant scientific research, on the basis described in Schedule 3 (Project A). The aim of the project is to understand the ecology of the Green Sawfish (*Pristis zijsron*) and contribute to regional studies being undertaken to understand sawfish migration. By 30 September 2012, or unless otherwise approved with the CEO, the Proponent, in consultation with the Department of Fisheries and the Department of Sustainability, Environment, Water, Population and Communities, will submit a plan for approval by the CEO to fund relevant research.

16-3 The Proponent will contribute $3 million over four years to relevant scientific research, on the basis described in Schedule 3 (Project B). The aim of the project is to add to the understanding and management of the impacts and risks to conservation significant marine fauna (ie. whales, dugongs, dolphins, sea turtles) from marine and coastal development in the Pilbara region. By 30 September 2012, unless otherwise approved by the CEO, the Proponent, in consultation with the Department of Environment and Conservation, will submit a plan for approval by the CEO to fund relevant research.

16-4 The Proponent will contribute $3 million over two years to the Western Australian Marine Science Institute dredging science node, on the basis described in Schedule 3 (Project C). The aim of the project is to add to the understanding and management of the impacts of dredging on tropical marine communities in Western Australia. By 30 September 2012, or unless otherwise approved by the CEO, the Proponent will submit a plan to fund relevant research.

16-5 The Proponent will undertake or fund marine habitat mapping (Project D), on the basis described in Schedule 3 ($1 million over four years). The aim of the project will be to map intertidal habitat at the mouth of the DeGrey River, Mandora Marsh, and the Turner River delta. By 30 September 2012, or unless otherwise approved by the CEO, the Proponent will submit a plan for approval by the CEO to fund the project according to a methodology and standard agreed by the CEO on advice of the DEC.

16-6 The Proponent will contribute $2.5 million over 6 years to management actions that improve the conservation of marine fauna (Project E). By 30 September 2012, or unless otherwise agreed by the CEO, the proponent, in consultation with the DEC, will submit a plan for approval by the CEO to fund relevant conservation actions consistent with the guidance provided by the indicative or final 80 Mile Beach Marine Park management plan.

16-7 The Proponent shall make publicly available, in a manner approved by the CEO, all conservation and research outcomes from Projects A, B, C, D and E.

16-8 The CEO may approve redirection of all or part of the financial contributions from Projects A, B, C D, or E to another project identified in condition 16 if the Proponent and the CEO agree that better environmental outcomes may be achieved.

Schedule 1

The Proposal (Assessment No. 1735)

The proposal will involve the construction and operation of landside and marine infrastructure for the handling and export of iron ore. The proposal includes:

- rail connections and spur from the existing BHP Billiton Iron Ore mainline to proposed stockyards at Boodarie;
- rail loops at Boodarie;
- stockyards and associated infrastructure at Boodarie (e.g. car dumpers, stackers, reclaimers and lump screening plant);
- an infrastructure corridor (including conveyors, access roadway and utilities) from the stockyards to the proposed marine jetty (offshore from Finucane Island);
- an abutment, jetty, wharf, dredged channel, basins and berthing pockets offshore from Finucane Island, to accommodate bulk carriers; and
- supporting infrastructure including access roads, upgrades to existing roads and utilities, buildings, temporary construction facilities and communication systems.

The Outer Harbour Development will be established in four stages, with incremental expansions brought online over a five year period to reach the maximum capacity. The combined offshore and onshore construction period will last approximately eight years if each stage is built sequentially.

The proposal is expected to provide an additional nominal export capacity of approximately 240 M tpa of iron ore to BHP Billiton Iron Ore's Port Hedland operations.

The location of the various project components is shown in Figure 1.

The main characteristics of the proposal are summarised in Table 1 b elow. A detailed description of the proposal is provided in sections 1 to 2 of the BHP Billiton Iron Ore, Proposed Outer Harbour Development, Port Hedland, Public Environmental Review, prepared by BHP Billiton Iron Ore, Perth Western Australia (April 2011).

Figures (attached)

1. Location of all project components.
2. Zones of Impact from Dredging
3. Estimated loss of mangroves required for infrastructure corridor
4. Levels of Ecological Protection for the Proposed Outer Harbour
5. Terrestrial disturbance envelope

Table 1: Summary of Key Proposal Characteristics

Element	Description
General	
Proponent	BHP Billiton Iron Ore Pty Ltd.
Project Location	Port Hedland, Western Australia.
Proposal Description	Staged development of rail, iron ore handling, stockpiling and shiploading facilities at Port Hedland. Infrastructure includes a jetty, wharf and shipping channel offshore of Finucane Island with onshore infrastructure including ore transport (rail) and ore handling infrastructure (car dumpers, stockyards and conveyor system) and associated supporting infrastructure.
Construction Period	Staged construction, each stage nominally 2-3 years.
Marine Infrastructure	
Export Capacity	Marine infrastructure nominal capacity of approximately 240 Mtpa.
Wharf	Approximately 2 kilometres (km) in length. Eight berths and four shiploaders.
Jetty	Approximately 4 km in length (piled construction).
Shipping Channel	Approximately 2 km in length
Dredge Material	Volume: Approximately 42 million cubic metres (Mm^3).
Landside Infrastructure	
Capacity	Landside infrastructure nominal capacity of 300 Mtpa.
Infrastructure Corridor	From the Boodarie stockyards to Finucane Island and includes: • Access roadway and tracks; • Five conveyors up to 8 km in length; and • Power, water and communication utilities.
Stockyards	Staged development. Each stage comprises ore stockpiles, a car dumper, two stackers, reclaimer and lump screening plant. Two rescreened fines yard.
Rail	Loop: Five rail loops, one for each car dumper. Connections to the existing rail infrastructure. Western Spur: approximately 32 km in length.
Footprint	
Vegetation Clearing	Total area: Up to 970 hectares (ha); which includes up to 29.5 ha of Mangroves

Schedule 2

The Environmental Quality Objectives and Levels of Ecological Protection to be achieved in marine waters for the Proposal (Condition 9)

Area	Environmental Quality Objectives	Level of Ecological Protection for Maintenance of Ecosystem Integrity
Marine waters within 250 m from ship turning basin and berthing areas.	• Maintenance of ecosystem integrity. • Maintenance of seafood for human consumption. • Maintenance of aquaculture. • Maintenance of primary contact recreation. • Maintenance of secondary contact recreation. • Maintenance of aesthetic values. • Maintenance of cultural and spiritual values. • Maintenance of industrial water supply.	**Moderate** - To allow moderate changes in the quality of water, sediment and biota (eg moderate changes in contaminant concentrations that cause small changes, beyond natural variation, in ecosystem processes and abundance/biomass of marine life, but no detectable changes from the natural diversity of species and biological communities). For this protection level the 90% species protection guideline trigger values* for toxicants in water apply. For other physical and chemical parameters the trigger values are based on the 95th percentile of natural background measurements. Trigger values should be derived in accordance with the recommended approaches in ANZECC & ARMCANZ (2000). For sediments the ISQG-low* apply. For dissolved oxygen the median dissolved oxygen concentration in waters ≤0.5 metres from the seafloor, calculated over a period of up to 6 weeks, should not fall below 80% saturation at any site, and they should never fall below 60% saturation.
Marine waters beyond the areas of Moderate.	• Maintenance of ecosystem integrity. • Maintenance of seafood for human consumption. • Maintenance of aquaculture. • Maintenance of primary contact recreation. • Maintenance of secondary contact recreation. • Maintenance of aesthetic values. • Maintenance of cultural and spiritual values. • Maintenance of industrial water supply.	**High** – To allow small changes in the quality of water, sediment and biota (e.g. small changes in contaminant concentrations with no resultant detectable changes beyond natural variation in the diversity of species and biological communities, ecosystem processes and abundance/biomass of marine life). For this protection level the 99% species protection guideline trigger values* for toxicants in water apply. For other physical and chemical parameters the trigger values are based on the 80th percentile of natural background measurements. Trigger values should be derived in accordance with the recommended approaches in ANZECC & ARMCANZ (2000). For sediments the ISQG-low* apply. For dissolved oxygen the median dissolved oxygen concentration in waters ≤0.5 metres from

		the seafloor, calculated over a period of up to 6 weeks, to fall below 90% saturation at any site, and should never fall below 60% saturation.

* From National Water Quality Management Strategy Report 4, *Australian and New Zealand Guidelines for Fresh and Marine Water Quality* (2000) or its updates.

Schedule 3

Schedule: Proponent Residual Impacts and Risk Management Measures

Project	Value and Timeframe	Responsibility to implement	Governance	Cost
Project A Understanding the ecology of sawfish, and contribute to the regional studies being undertaken to understand sawfish migration.	$250,000 by 30 September 2012 $250,000 by 30 September 2013	BHP Billiton Iron Ore CEO OEPA to approve	SEWPaC/ BHP Billiton Iron Ore / DoF	$0.5 million over 2 years
Project B Support research on marine fauna (whales, dolphins, dugongs and s ea turtles) in the Pilbara region.	$750,000 by 30 September 2012; $750,000 by 30 September 2013; $750,000 by 30 September 2014; $750,000 by 30 September 2015.	BHP Billiton Iron Ore / Partner CEO OEPA to approve	BHP Billiton Iron Ore / DEC / OEPA	$3 million over 4 years
Project C Improve the understanding and management of the impacts of dredging on tropical marine communities.	$1.5 million by 30 September 2012; $1.5 million by 30 September 2013	BHP Billiton Iron Ore / WAMSI CEO OEPA to approve	OEPA/ WAMSI / BHP Billiton Iron Ore	$3 million over 2 years
Project D Contribute to the regional data - regional mapping and surveys of Mangroves (intertidal BPPH) at the mouth of the De Grey River, Mandora Marsh and the Turner River delta.	$250,000 by 30 September 2012; $250,000 by 30 September 2013; $250,000 by 30 September 2014 $250,000 by 30 September 2015	BHP Billiton Iron Ore / Partner CEO OEPA to approve	BHP Billiton Iron Ore / DEC / OEPA	$1 million over 4 years
Project E Improve the	$300,000 by 30 September 2012;	BHP Billiton Iron Ore /	BHP Billiton Iron Ore /	$2.5 million

conservation of marine fauna consistent with the guidance provided by the indicative or final 80 M ile Beach Marine Park management plan.	$300,000 by 30 September 2013; $400,000 by 30 September 2014; $500,000 by 30 September 2015; $500,000 by 30 September 2016; $500,000 by 30 September 2017	Partner CEO OEPA to approve	DEC	over 6 years

Figure 1 Location of major components of the proposal

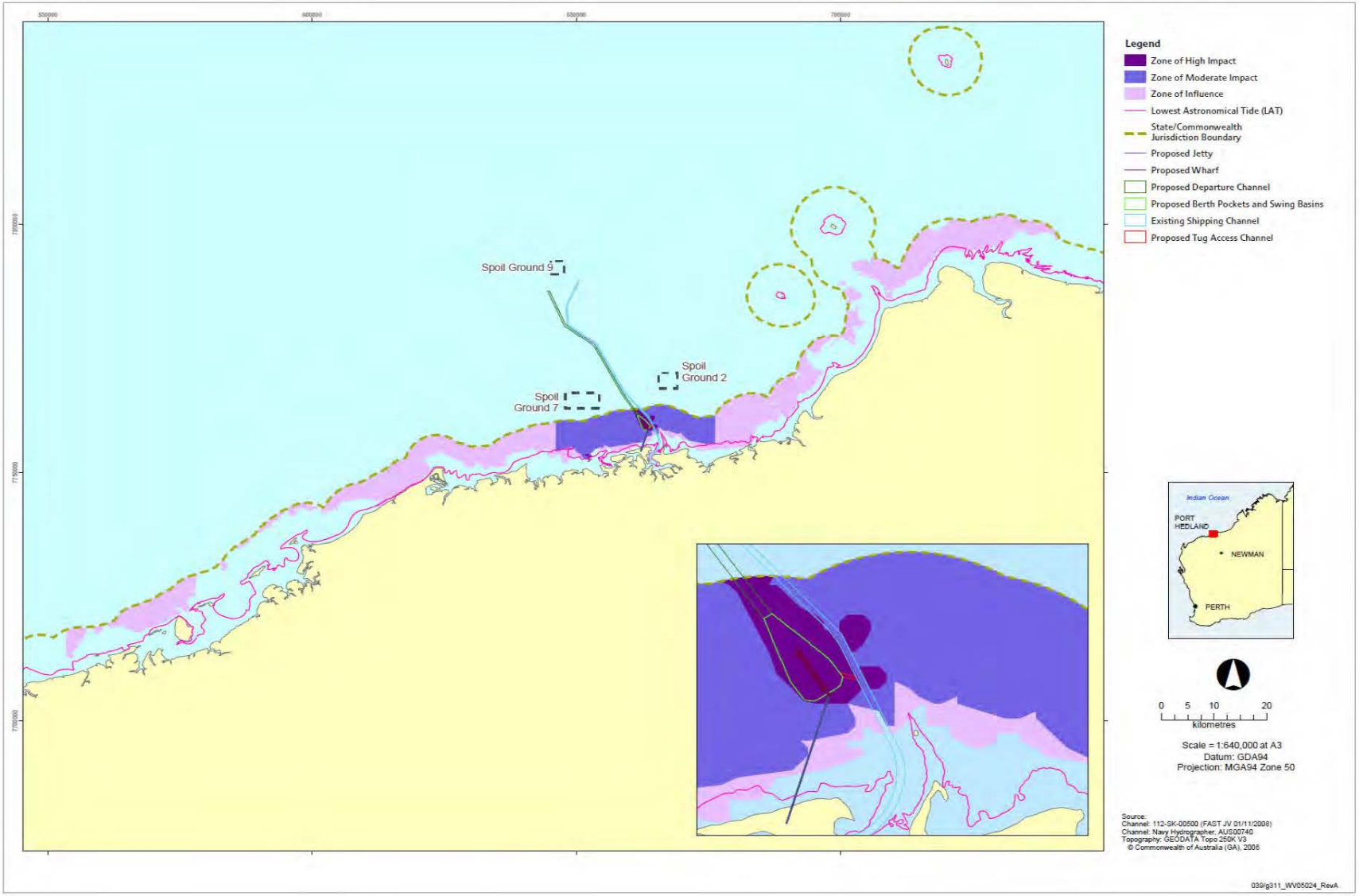

Figure 2: Zones of Impact from Dredging

Figure 3: Estimated loss of mangroves required for infrastructure corridor

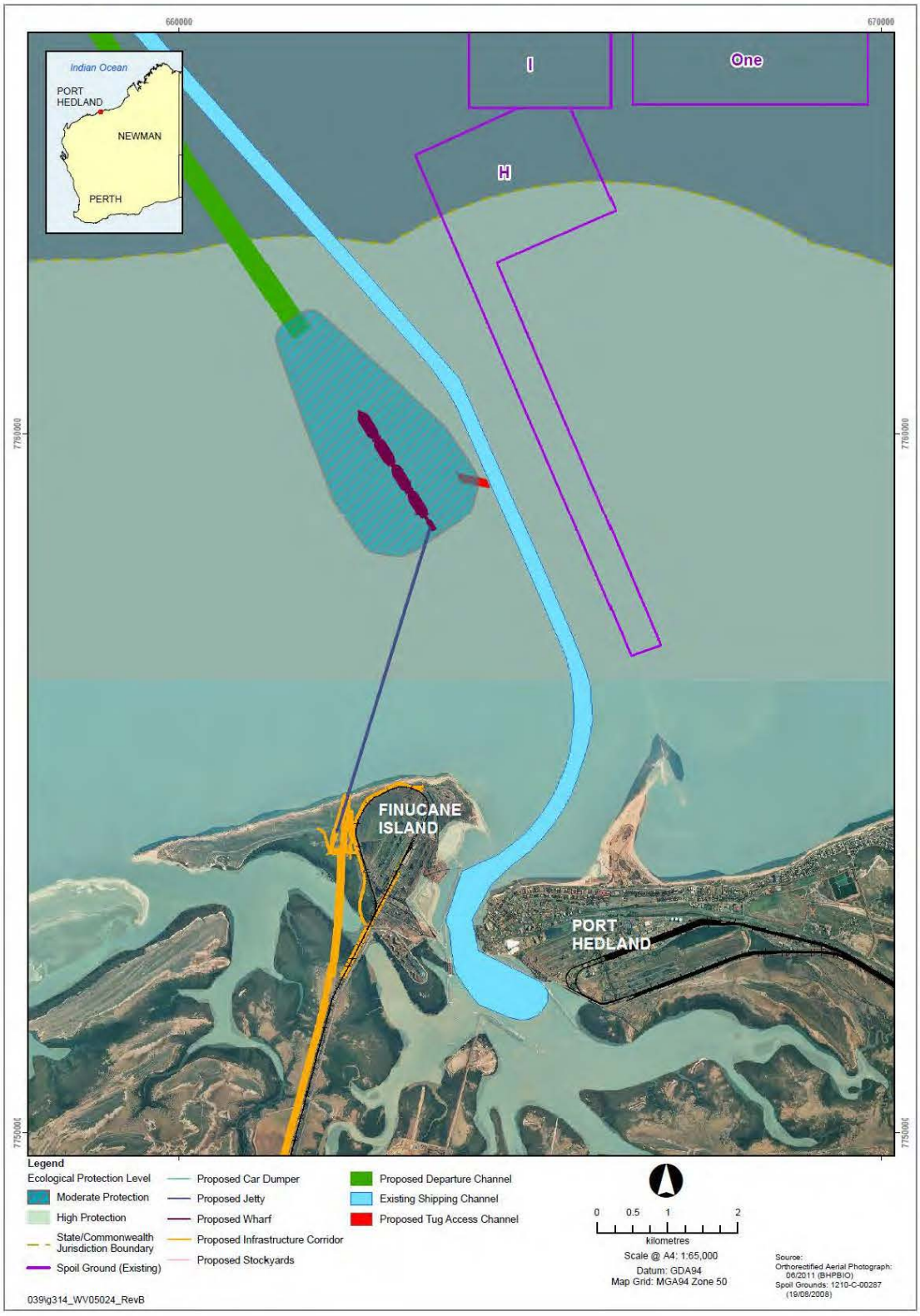

Figure 4: Levels of Ecological Protection for the Proposed Outer Harbour

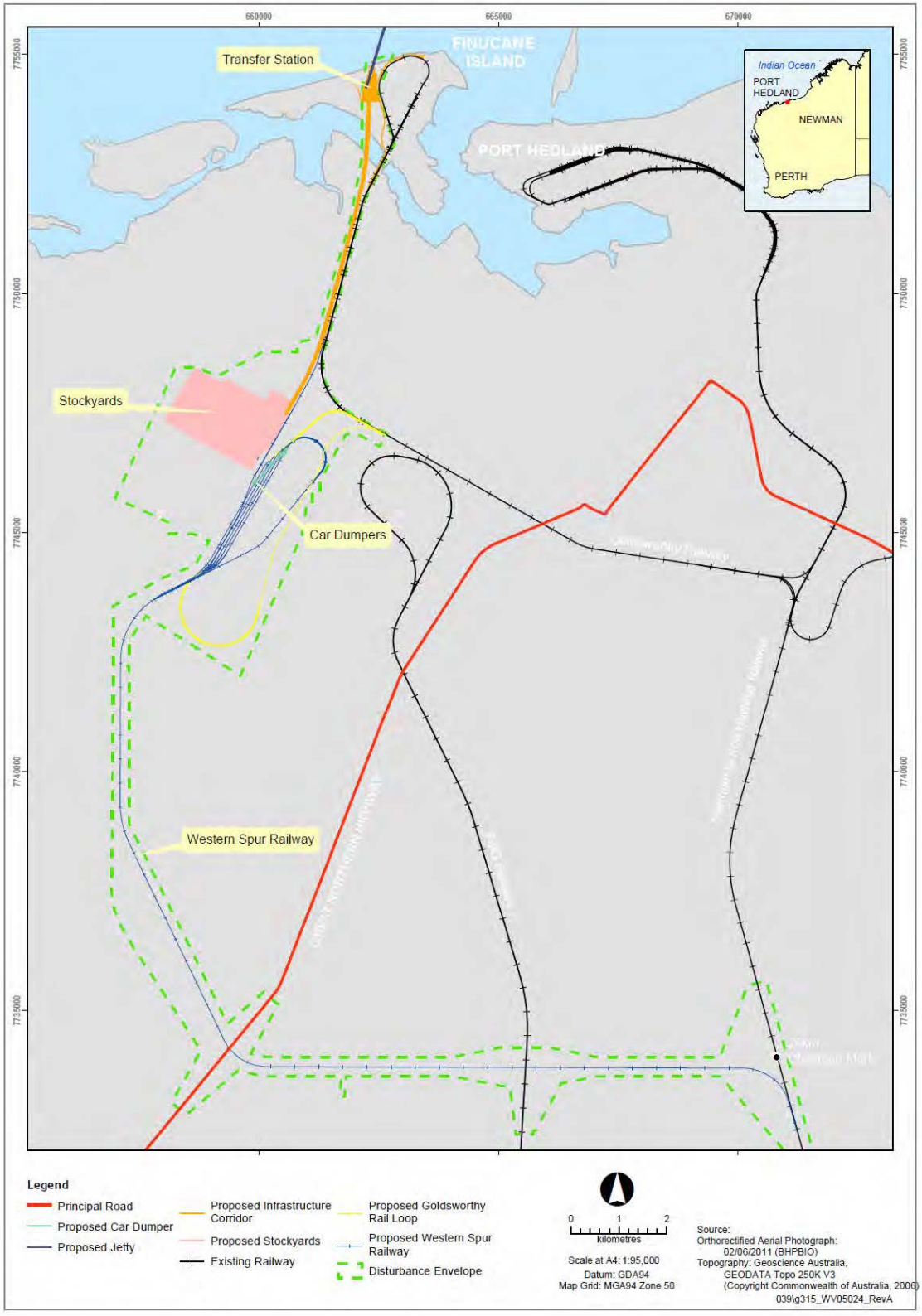

Figure 5: Terrestrial disturbance envelope.

Appendix 5

Proponent’s referral document and response to submissions