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resourcing the future

Executive Summary

Proposed Outer Harbour Development, Port Hedland

Public Environmental Review/ Draft Environmental Impact Statement

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1.1 Overview of the Proposed Development

Executive Summary

BHP Billiton Iron Ore is seeking approval under the Western Australian *Environmental Protection Act 1986* (EP Act), the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) and the Commonwealth *Environment Protection (Sea Dumping) Act 1981* to develop an iron ore export facility adjacent to existing operations in Port Hedland (Figure ES.1). BHP Billiton Iron Ore is undertaking the State and Commonwealth assessments through a coordinated approach and the submission of this joint Public Environmental Review/Draft Environmental Impact Statement (PER/ Draft EIS) has been developed to satisfy the requirements of both State and Commonwealth legislation.

1.1.1 The Proponent

BHP Billiton Iron Ore is a member of the BHP Billiton Group (BHP Billiton), which is the world's largest diversified resources company. BHP Billiton Iron Ore is one of the world's premier suppliers of iron ore, employing 3000 direct employees and more than 10,000 contractors across the Pilbara. The Company's operations currently involve a complex integrated system of seven mines, more than 1,000 km of rail and four operating berths at Port Hedland. A significant expansion program encompassing mines, rail and additional port facilities is currently underway.

BHP Billiton Iron Ore is committed to sustainable development that derives value for the company, its employees, contractors, the environment and the communities in which it operates. Central to the BHP Billiton operating philosophy is its desire to be regarded by the community as a valued citizen.

BHP Billiton Iron Ore is committed to minimising impacts and enhancing benefits in undertaking the proposed Outer Harbour Development; to continuous improvement to the health, safety and environmental performance of its operations; and to maintaining constructive relationships and ongoing engagement with the Indigenous and non-Indigenous local and regional communities.

1.1.2 The Existing Port Hedland Operations

Iron ore exports commenced from Port Hedland in the 1960s when Mount Goldsworthy Mining Associates and BHP Billiton's Mount Newman Joint Venture independently commenced export operations. Port developments initiated at this time to accommodate the fledgling industry included the dredging of an expanded approach channel and turning basin, the reclamation of tidal land at East Creek and the construction of wharves for the loading of iron ore.

Ore from BHP Billiton Iron Ore northern, eastern and central Pilbara region operations is transported by rail to port facilities on both sides of the Port Hedland Inner Harbour, at Nelson Point and at Finucane Island, where ore is loaded for shipping to customers.

BHP Billiton Iron Ore is in a period of significant growth and has focused on growing the business to meet the expected demand in iron ore. Development of the proposed Outer Harbour is an integral part of BHP Billiton Iron Ore's expansion plans and is a required step change to increase export volume and to support the company's long-term growth plans in the Pilbara.

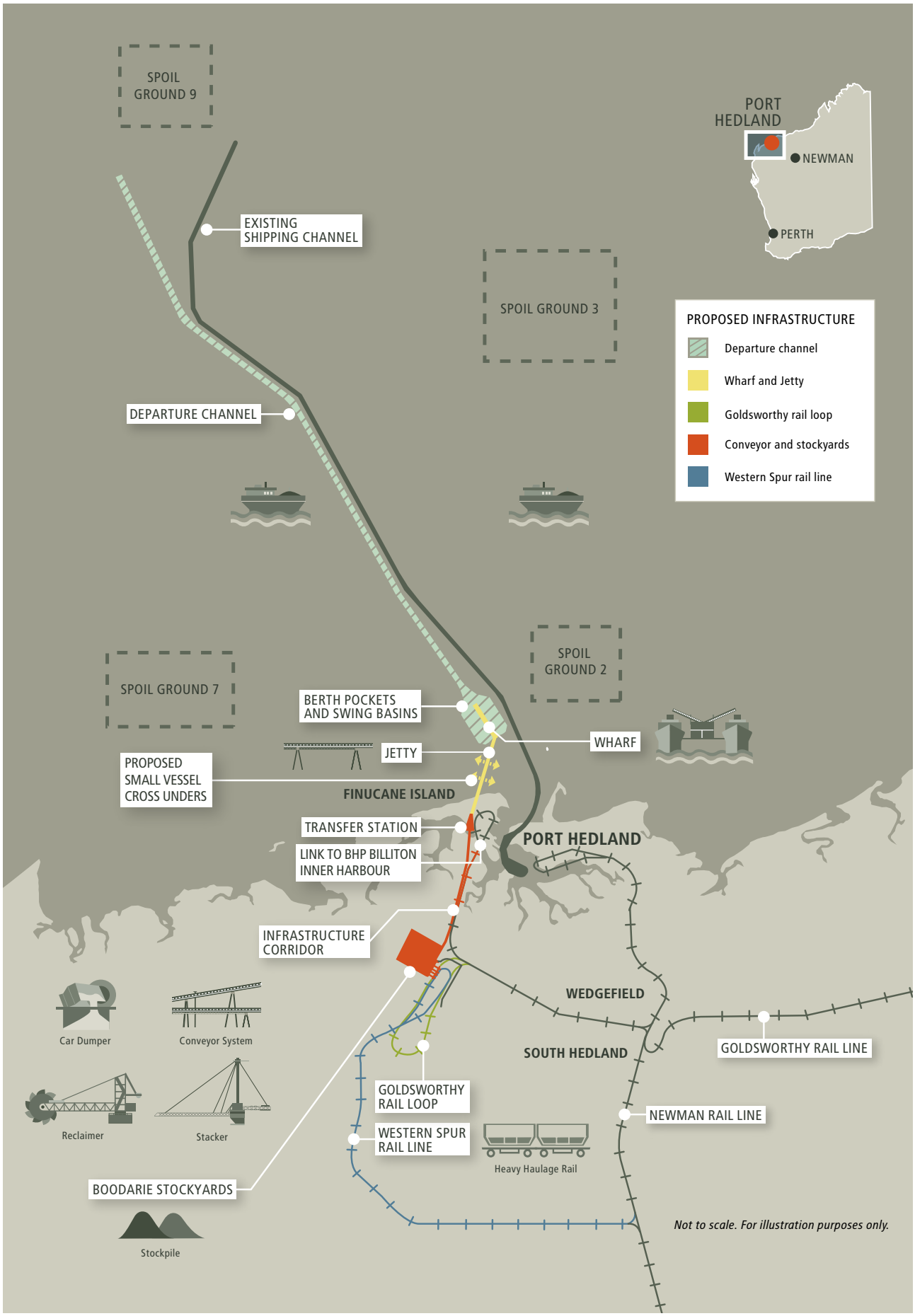


Figure ES.1 – Outer Harbour Development General Arrangement

1.1 Overview of the Proposed Development

1.1.3 The Proposed Outer Harbour Development

The proposed Outer Harbour Development Project (the project) is subject to relevant Government approvals and approval from the BHP Billiton Board.

The project will involve construction and operation of landside and marine infrastructure for the handling and export of iron ore. The scope of the project assessed in this PER/Draft EIS includes:

- rail connections and spur from the existing BHP Billiton Iron Ore Newman rail line 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.

BHP Billiton Iron Ore's investment in the development of the Outer Harbour proposal remains subject to external factors, which are outside of its control, such as market conditions. BHP Billiton Iron Ore will make investment decisions at each stage of the development subject to external factors at that time.

This document has been prepared based on an estimated throughput capacity of 240 Mtpa for the Outer Harbour. This estimated capacity has been applied for the purpose of the environmental impact assessment.

At this stage it is anticipated that construction will be completed over four stages, with each stage nominally taking two to three years to complete. The timing and the composition of the stages will ultimately be dependant on market demand for iron ore as well as internal and external approvals and construction methodology.

The key characteristics of the project are outlined below in Table ES.1.

Table ES.1 – Key Project 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	Four stages; each stage nominally 2-3 years.
Marine Infrastructure	
Export Capacity	Marine infrastructure estimated nominal capacity of approximately 240 Mtpa.
Wharf	Approximately 2 kilometres (km) in length. Eight berths and four shiploaders.
Jetty	Approximately 4 km in length.
Shipping Channel	Approximately 34 km in length (first 2 km located in State waters and remaining 32 km located in Commonwealth waters).
Dredge Material	Volume: Approximately 54 million cubic metres (Mm3). Disposal: Four offshore spoil grounds located in Commonwealth waters.
Landside Infrastructure	
Capacity	Landside infrastructure estimated 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.
Element	**Description**
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: Approximately 940 hectares (ha).

1.1 Overview of the Proposed Development

Marine Infrastructure

New ship loading facilities are proposed to be built to the north of Finucane Island. These will comprise an access jetty and wharf approximately 4 km and 2 km in length, respectively. Four shiploaders will be installed, along with four wharf conveyors, to service the eight shiploading berths. The jetty conveyors will be constructed to transfer ore material from a transfer station on Finucane Island to a transfer deck, then onto the wharf conveyors and into the shiploaders (refer to Figure ES.1). For the purpose of safety, BHP Billiton Iron Ore is seeking relevant government approvals to allow the passage of recreational water craft under the elevated jetty trestle, at controlled locations.

The project will require dredging to enable vessel access to the wharf and for loaded vessels to depart to deep water. Dredging operations will create new berth pockets, swing basins, departure basins, a departure link channel to the existing shipping channel, a departure channel, a crossover link channel and tug access channel from the existing channel into the berth pockets. Dredged material, estimated to be approximately 54 Mm3, will be disposed at offshore spoil disposal grounds located in Commonwealth waters. The capacity of these spoil grounds is sufficient to accommodate the requirement of the proposed dredging program (refer to Figure ES.1).

Landside Infrastructure

The project will require material handling infrastructure. Iron ore will be transported from inland Pilbara mines along the existing BHP Billiton Iron Ore Port Hedland-Newman rail line and the proposed Western Spur rail line to proposed stockyard facilities at Boodarie. Ore will be offloaded from the trains by car dumpers and either directly transported on overland conveyers through to the ships at the wharf facility or sent to the stockyard for storage or to the screening facilities. Ore will be carried by overland conveyors from the Boodarie stockyards to a proposed transfer station on Finucane Island. The ore will then be conveyed across the marine jetty to the wharf and shiploaders.

A proposed infrastructure corridor, which will extend from the stockyards at Boodarie to the jetty on the northern shore of Finucane Island, will cross West Creek via an elevated causeway.

Project Terrestrial Footprint

The disturbance envelope for landside infrastructure and construction activities for the project is approximately 4,270 ha. The current project configuration will require permanent disturbance of approximately 940 ha for the infrastructure footprint. The disturbance envelope approach has been followed to allow for flexibility in locating project infrastructure during detailed engineering design. The proposed disturbance envelope also encompasses partially disturbed land and includes existing infrastructure and decommissioned facilities such as the Boodarie Hot Briquetted Iron Plant.

Boodarie Station, the surrounding land for the proposed stockyards facility, is owned by BHP Billiton Iron Ore.

Support Services and Utilities

The project will require supporting infrastructure and ancillary works including temporary construction facilities, borrow areas and roads. Utilities such as power and water will also be required. The forecast power requirement for the proposed Outer Harbour Development is up to 113 MW and will be provided by a third party via gas-fired power stations at Boodarie and Port Hedland. The indicative water demand for the project is approximately 10 GL/a. BHP Billiton Iron Ore is working with the Water Corporation to determine sustainable water supply options for the project and augment the existing supply for operations in Port Hedland. Approvals for these support services and utilities, if required, will form separate assessments.

Social and Environmental Considerations

An important part of the proposed Outer Harbour Development will be the effective management of the social and environmental impacts and the sustainable development of the Pilbara region as a whole. This goal is underpinned by the Company's commitment to sustainable development.

BHP Billiton Iron Ore's growth will bring with it considerable economic benefits for the region and the State, including Government taxes and royalties, new business opportunities for suppliers of goods and services, and employment and contracting opportunities.

At the national, regional and local levels, BHP Billiton Iron Ore shares responsibility with governments, local suppliers, contractors and employees for ensuring that the wealth generated from natural resources derives community benefit that leaves a positive legacy for future generations. BHP Billiton Iron Ore's investment in Pilbara communities for the 2010 financial year was approximately A$36 million.

1.2 Stakeholder Consultation and Engagement

BHP Billiton Iron Ore recognises that developments within Port Hedland have the potential to impact the local community and environment. As part of BHP Billiton Iron Ore's expansions, it is considered critical that community and government stakeholders are adequately briefed on projects and associated implications so as to allow for an informed assessment of the potential impacts.

Communities in the Port Hedland, South Hedland and Wedgefield districts, government agencies, services and local media have been consulted on this and other BHP Billiton Iron Ore's growth projects. Their feedback has assisted in the development of the PER/Draft EIS.

Stakeholder consultation and engagement in support of the preparation of the PER/Draft EIS has included:

- a comprehensive identification and analysis of stakeholders;
- development of stakeholder engagement and corporate social responsibility policy frameworks, communications strategies, social issues management and mitigation plans;
- public workshops to register key community issues that may be impacted by or created by company growth works;
- regular stakeholder engagement by community teams located in Port Hedland establishing solid work-based relationships;
- focus on the development and implementation of impact management strategies;
- development of a schedule of consultation and engagement processes;
- integration with other internal asset development and environmental approvals processes and relevant procedures;
- development of electronic information repositories and data capture systems; and
- consultation and engagement in accordance BHP Billiton Iron Ore ongoing consultation process.

BHP Billiton Iron Ore is committed to working with the communities in which it operates to help ensure social services such as health, education and amenity are effective. Programs that assist in facilitating this process include the Pilbara Education Partnership with the Department of Education, Pilbara Health Partnership with the Department of Health and the Local Government Sustainability Partnership with the relevant shires in the Pilbara.

Under the joint government statutory process, public consultation for this project is consistent with that of a PER/ Draft EIS level assessment including an eight-week public exhibition of the document. During this period regular consultation and engagement will be held in Port Hedland to seek public feedback.

1.3 Assessment Methodology

BHP Billiton Iron Ore believes that the impact assessment presented in this PER/Draft EIS aligns with relevant legislation and government guidelines, policies and procedures. By applying the relevant principles of environmental protection at the design stage, the project aims to avoid unnecessary environmental impact.

Emphasis has been placed on the prevention of pollution by adapting production processes to avoid unnecessary impacts from factors such as noise and dust on neighbouring communities.

The impact assessment builds on the current understanding of the existing operations, lessons learnt from previous Port Hedland expansion projects and dredging projects both in the Pilbara and on the eastern sea-board. Detailed studies and investigations have been undertaken to address information and knowledge gaps. Comprehensive dust, noise and marine dispersion models were employed to predict the impact of various emissions from the construction and operation of the proposed Outer Harbour Development. All modelling has been conducted by recognised technical experts and in accordance with EPA guidelines. BHP Billiton Iron Ore has drawn on experienced consultants to undertake specialist studies and where appropriate, modelling and analysis have been subjected to independent technical review.

The project has been subjected to a rigorous options evaluation which assessed the proposal against potential environmental and social impacts and related criteria. A high level screening process was completed to identify the potential key and relevant environmental factors associated with the proposal.

The key environmental factors were defined as those:

- having a critical, major or moderate impact significance;
- requiring a more detailed assessment; and
- requiring a higher level of management measures and controls to ensure potential impacts are minimised.

Those environmental factors not considered key have been termed relevant environmental factors.

Relevant environmental factors were defined as those:

- having a minor or low impact significance;
- requiring a less detailed assessment; and
- requiring a lower level of management measures and controls to ensure impacts are minimised and in general can be managed via existing management controls.

BHP Billiton Iron Ore has incorporated principles of sustainability into the project through the integration of the engineering design and impact assessment processes. BHP Billiton Iron Ore evaluated a number of design options to increase its export capacity in the Pilbara region of Western Australia. Through locating the project at Port Hedland, adjacent to existing operations, BHP Billiton Iron Ore reduces the environmental footprint (through synergies with existing Port infrastructure) by developing in a location that has previously been disturbed.

The marine environment has undergone previous perturbations associated with the existing shipping channel and Port operations. The proposed stockyards are to be located at Boodarie, which is the site of the decommissioned Hot Briquetted Iron Plant.

The environmental impact assessment team worked closely with the BHP Billiton Iron Ore management and design teams in an iterative process where designs were modified and management measures were identified to minimise residual impacts and maximise benefits ('residual' being the impacts remaining after modifications and management measures have been applied).

In accordance with the principle of 'hierarchy of controls' avoidance measures were employed where possible, to eliminate the need for other control measures. In some cases where control measures were required, assessments were undertaken on several occasions with design modifications or management measures applied each time, to establish cost-effective and environmentally, socially and culturally acceptable outcomes.

Listed in Table ES.2 are the environmental factors identified through the high level screening process. A detailed impact assessment has been conducted on each of these key environmental factors. Also listed in Table ES.2 are the relevant environmental factors, which although relevant to the assessment, did not require further assessment or more detailed management measures beyond standard practice.

1.3 Assessment Methodology

Table ES.2 – Key and Relevant Environmental Factors

Key Environmental Factors	Relevant Environmental Factors
Terrestrial Environment	
► Terrestrial Flora and Vegetation ► Terrestrial Fauna ► Geology, Soils (including Acid Sulphate Soils) and Landforms	► Short-range Endemic Fauna ► Subterranean Fauna ► Surface Water ► Groundwater
Marine Environment	
► Marine Water and Sediment Quality ► Marine Habitat ► Marine Fauna ► Geomorphology and Coastal Processes	► Avifauna (Shorebirds and Seabirds)
Social Surrounds	
► Community Services ► Indigenous Heritage ► Public Amenity ► Visual Amenity	► Public Health ► European Heritage ► Recreation ► Commercial Fisheries ► Climate Change

1.3.1 Key Environmental Factors – Managing the Impacts

Terrestrial Flora and Vegetation

Clearing for the proposed development will 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. None of the vegetation communities proposed to be impacted is 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 (ENV 2009a, 2009b). 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 surveys (ENV 2009a, 2009b).

Clearing has the potential to impact four of the five recorded Priority Flora species within the proposed disturbance envelope. The proposed loss through clearing is only likely to affect the local representation of two Priority Flora, namely *Pterocaulon sp* and *Goodenia nuda*. These are well represented outside the project footprint.

All remaining impacts on flora and vegetation are considered to be of low significance as they may be avoided through the implementation of the proposed management measures or involve localised or short-term impacts. A Significant Species Management Plan will be implemented to facilitate the management of significant flora species recorded or potentially occurring within the proposed disturbance envelope. The Construction Environmental Management Plan will include measures to further mitigate potential impacts on flora and vegetation.

Terrestrial Fauna

The project will result in the removal of approximately 940 ha of fauna habitat, with the majority of disturbance within sandplain habitat. Fauna of conservation significance recorded within the sandplain habitat during fauna baseline surveys (ENV 2009g, 2009f) included the Woma Python (*Aspidites ramsayi*) (Schedule 4, Priority 1), the Australian Bustard (*Ardeotis australis*) (Priority 4) and the Rainbow Bee-eater (*Merops ornatus*) (Migratory - EPBC Act). The habitat 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.

Vegetation clearing will impact two habitat types considered to be of conservation significance, dunal systems and riverine areas (ENV 2009c, 2009d). These habitats are generally well-represented in the local Port Hedland area outside of the proposed disturbance envelope. As a result, 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.

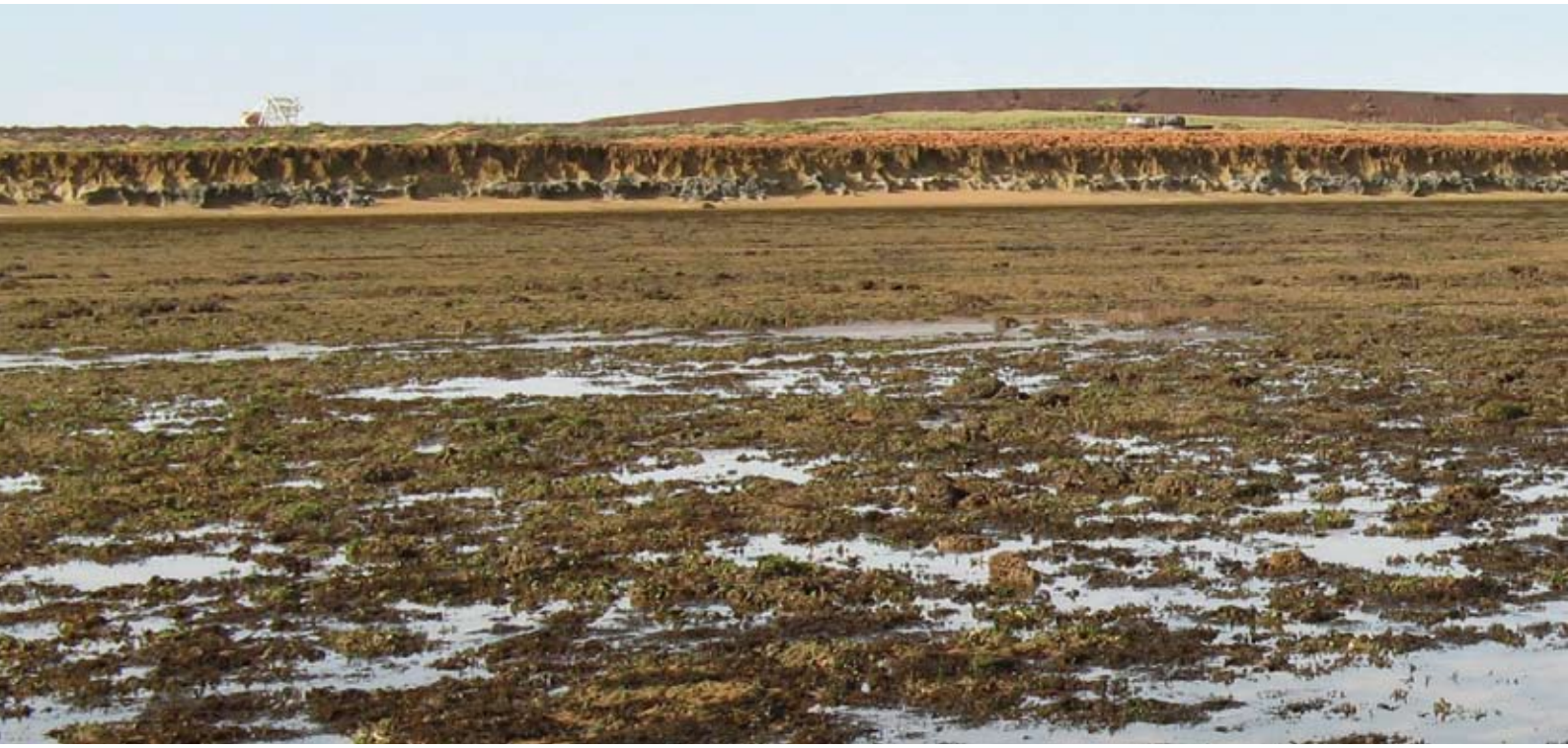
The direct loss of fauna of conservation significance due to clearing and earthworks and other clearing/construction activities are unlikely to threaten fauna at the population level. The loss of or injury to fauna of conservation significance due to clearing and earthworks or physical interaction is likely to result in only individual deaths, and therefore is unlikely to affect the conservation status of the species involved. The Rainbow Bee-eater, Australian Bustard, Grey Falcon, Peregrine Falcon, Star Finch, Ghost Bat and Pilbara Leaf-nosed Bat are not considered to be at risk of mortality or injury due to construction or operational activities as they are highly mobile species and no nests characteristic of these species were recorded within the project area during baseline fauna surveys (ENV 2009e, 2009f).

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 proposed Outer Harbour Development 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, 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 Mulgara are associated with in the Boodarie area is regionally widespread, so impacts would be localised. A regional fauna survey inclusive of Port Hedland and the project disturbance envelope is being undertaken in Autumn 2011 by BHP Billiton Iron Ore. Measures in the Significant Species Management Plan will be implemented to minimise impacts to fauna of conservation significance that exist or potentially occur in the project area.

The Significant Species Management Plan will be implemented to facilitate the management of significant fauna species recorded or potentially occurring within the proposed disturbance envelope. The Construction Environmental Management Plan to be developed will incorporate management measures to further mitigate impacts on fauna and habitat.

1.3 Assessment Methodology



Geology, Soils (including Acid Sulphate Soils) and Landforms

Uncontrolled clearing and shallow excavations (up to 2 m) required for construction of the transfer station and infrastructure corridor, may result in the oxidisation of potentially acid sulphate soils, and therefore generate acid sulphate soils. Potential for acidification of the soil is considered low due to the neutralising capacity of the calcareous soils in this area.

Investigations into the extent of acid sulphate soils will be undertaken in accordance with Department of Environment Conservation's guideline series prior to commencing construction activities. Acidification of soil, surface water and groundwater due to clearing and earthworks or groundwater dewatering will be avoided or managed through the implementation of an Acid Sulphate Soils Management Plan. This will also mitigate against compromising infrastructure integrity due to increased acidity.

Marine Water and Sediment Quality

Marine water quality will be impacted during the proposed Outer Harbour Development by construction dredging activities and intermittently, during maintenance dredging activities. Impacts to marine water quality will include increased Total Suspended Solids (TSS) concentrations and sedimentation rates whilst dredging activities are underway. In addition, localised alteration of marine water and sediment quality will result from unconfined ocean disposal of dredged materials.

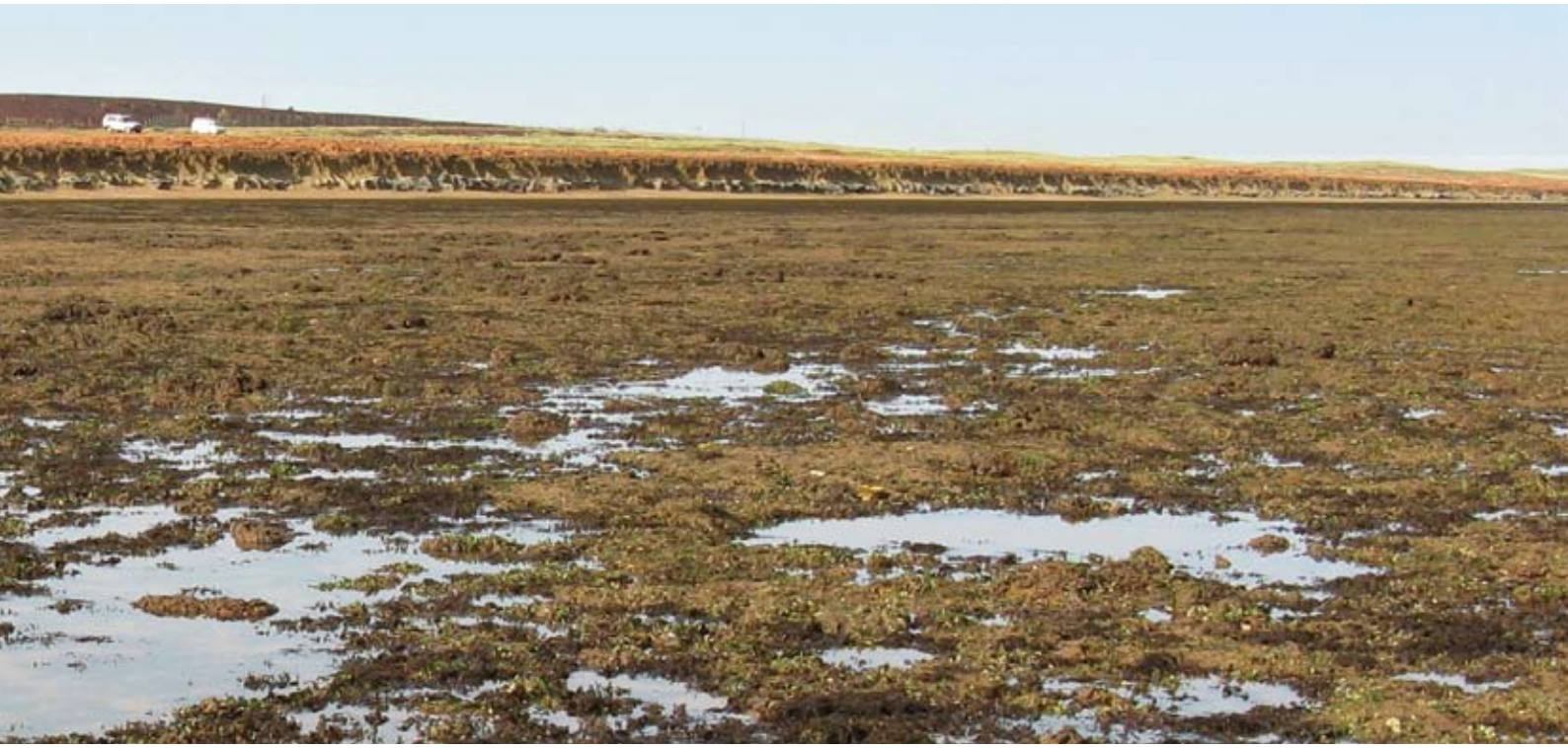
The impacts to marine water and sediment quality however will be confined to proposed dredging periods and the management and monitoring measures proposed will lead to a reduction in the extent and severity of impacts. Dredged material to be disposed of at spoil grounds is considered acceptable for unconfined ocean disposal. Material disposed of at the spoil grounds will be monitored during post-completion surveys to ensure spoil has been disposed of as approved. Following the completion of construction activities, the return of ambient marine water and sediment quality conditions within the project area is expected.

Marine Habitat

The 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.

The mangrove vegetation associations, salt marsh and cyanobacterial mats present in the area within and adjacent to the proposed infrastructure corridor to Finucane Island are not unusual, and are representative of the broad vegetation associations recorded throughout the harbour and the wider Pilbara region.

The direct removal of subtidal and intertidal marine habitat as a result of dredging and marine construction activities associated with the proposed Outer Harbour Development will occur. Furthermore, indirect impacts particularly to



subtidal marine benthic primary producers are also predicted to occur due to changes in water quality during dredging and disposal activities.

Within Western Australian jurisdiction, the construction on the Outer Harbour Development is predicted to result in the direct loss of 27.0 ha of onshore mangroves, 1.7 ha of coastal intertidal benthic primary producer habitat, and 147.9 ha of subtidal benthic primary producer habitat. It is also predicted that 80.3 ha of hard substrate benthic habitat due to the marine infrastructure and spoil ground disposal areas will be lost. This direct loss of benthic primary producer habitat associated with the infrastructure and construction activities of the proposed Outer Harbour Development represent a very small fraction of affected area in relation to the entire ecosystem offshore from Port Hedland.

Although changes in turbidity and sedimentation due to the dredging and disposal activities for the proposed Outer Harbour Development are spatially extensive, the resultant indirect impacts to benthic habitats measured as loss of benthic primary producers are small and considered a small proportion of the total project area of 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 will disperse the dredging and disposal plumes rapidly.

The causeway constructed over West Creek will be designed to permit tidal exchange to occur thereby greatly reducing the likelihood and scale of any potential impacts. Any residual indirect impacts to marine habitats that may occur as a result of altered tidal regimes are likely to be minimal and not affect ecosystem function.

Although losses of marine habitat will 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 will be implemented to either remove or greatly minimise the potential impacts, including: engineering design of project footprint and infrastructure; spoil disposal grounds are purposely located in areas with little marine habitat present supporting significant marine communities; and clear briefings and instructions to contractors regarding procedures to be undertaken to minimise the disturbance envelope. The management measures will be fully documented in a Dredging and Spoil Disposal Management Plan.

Marine Fauna

Green and Flatback turtles, both of which are listed as vulnerable under the EPBC Act, use the Port Hedland area for foraging. Breeding females use the waters of the project area for inter-nesting. The nearest known turtle nesting sites are located over 5 km from the proposed dredging location. Many turtles present in the project area are transitory or visitors, with more significant habitats supporting feeding and breeding located either to the north or south.

1.3 Assessment Methodology

Humpback whales may be encountered in the project area during their migration. However, the Port Hedland area does not support calving, aggregation or feeding areas. The Spotted Bottlenose Dolphin and Dugong are also found in the project area, although no resident populations are known to occur. Potentially occurring species listed as "marine species" under the EPBC Act in the project area include 28 species of pipefish and five species of seahorse. Three species of Sawfish may occur in the area and are listed as vulnerable under the EPBC Act. The Whale Shark occurs in offshore waters and is listed as a vulnerable under the EPBC Act. The Port Hedland region is not an area featuring extensive seagrass meadows.

Marine fauna may be impacted by the proposed Outer Harbour Development through physical interactions with construction and operations vessels leading to injury or mortality; loss of habitat leading to changed/lost foraging or breeding grounds; changes in behaviour and physiology due to noise and light; contamination from chemicals and wastes; and added competition for resources through introduction of invasive marine pests.

Although individual organisms may be impacted during the proposed Outer Harbour Development, impacts will not occur at the population or ecosystem levels. The lack of predicted impacts at these levels is largely attributable to the nature of the existing marine environment. A great deal of information has been generated, particularly for marine turtles, in the Port Hedland region directly as a result of the impact assessment process undertaken for the proposed Outer Harbour Development. Through this information it is clear that many of the significant marine fauna present (e.g. turtles) are transitory or visitors to the project area, with more significant habitats supporting feeding and breeding located either to the north or south of the project area. In addition, extensive management measures have been identified for the construction and operation activities of the proposed Outer Harbour Development, including but not limited to: providing training to construction vessel crew on marine fauna observation; soft-start to activities that generate noise; reduced vessel speeds within the construction areas; and invasive marine species (IMS) inspections.

Geomorphology and Coastal Processes

Coastal landforms in the project area include a sandy beach and low limestone cliff near the location of the proposed jetty on the north side of Finucane Island with lines of sand dunes above the beach and a low rocky limestone platform extending seaward from the intertidal zone. To the south of Finucane Island the landform is one of silty tidal channels fringed with mangroves, mud flats, salt flats and sandy plains. Dredging and construction activities will alter the existing configuration of the Port Hedland near shore environment, and alter tidal flows in West Creek with the construction of a causeway.

The key aspects of the project that may impact geomorphology and coastal processes include the modification of the seabed through dredging and spoil disposal leading to increased sedimentation rates in dredged areas; interruption of coastal processes through establishment of infrastructure leading to a seasonal build-up of sand lobes against the jetty abutment; and infilling of West Creek due to alteration of tidal flushing associated with the causeway structure.

The interruption of sediment transport due to infrastructure has either been avoided or greatly minimised through the design of these structures and the integrity and ecological function of the seabed will be retained despite removal of material within the dredging footprint, and disposal of material in designated areas. As such, the significance of the residual impact of the project on geomorphology and coastal processes is considered to be low.

Community Services

Through its active Community Investment Program, BHP Billiton Iron Ore aims to minimise the negative and maximise the positive impacts to the local community, the social profile and all services and facilities from the construction and operation of the project.

BHP Billiton Iron Ore is committed to its Community Investment Program which is aimed at relieving pressures associated with growth of the Town of Port Hedland while contributing financially to its development. In addition, BHP Billiton Iron Ore will continue to be guided by community consultation to identify specific growth impacts and opportunities in which to invest directly and via partnerships. This will assist in mitigating impacts on the provision of community services associated with construction and operation of the project. Therefore, any on-going social issues are considered likely to be minor in nature, and the significance of the residual impacts low.

BHP Billiton Iron Ore will continue to support existing and new programs to ensure the provision of community services in the town. As a key member of the Town of Port Hedland community, BHP Billiton Iron Ore will continue to partner with governments, local suppliers, contractors and employees to ensure that the wealth generated from the export of iron ore helps drive sustainable community development.

Examples of the mitigation strategies include: BHP Billiton Iron Ore assistance to small business to develop in the region; community investment programs and partnerships aimed at improving recreation infrastructure and services and integrating fly-in fly-out workers, will reduce anti-social behaviour, by providing opportunities for alternative activities for people. BHP Billiton Iron Ore, in partnership with YMCA, has recently provided 120 child care places and seven units of accommodation for child care workers in the Town of Port Hedland.

Indigenous Heritage

The proposed Outer Harbour Development falls within the Kariyarra Native Title Claim. Ethnographic surveys and archaeological surveys have been conducted with members of the Kariyarra Native Title Claimant group (the Kariyarra) in relation to nearly all of the project area, excluding the Western Rail Spur. Ethnographic work was conducted in 1994 and 2008 and archaeological surveys were conducted in 1994, 1995, 2003 and 2008. As a result of these surveys, potential archaeological sites were identified, recorded, and registered with the Department of Indigenous Affairs (DIA). Surveys within the proposed Western Spur rail line footprint, commenced in 2010.

Detailed surveys will be conducted prior to the commencement of any construction activities. BHP Billiton Iron Ore will consult with the Kariyarra and if necessary seek consent under section 18 of the *Aboriginal Heritage Act 1972*, to impact any heritage sites. An agreed Cultural Heritage Management Plan will be implemented, as well as other consents to be obtained under the provisions of the Native Title Act. Therefore the project is likely to have only a minor impact on Indigenous heritage.

Public Amenity

The emission of dust and noise from the construction and operation of the project has the potential to adversely affect the amenity of nearby residents. From a public amenity perspective, dust in the atmosphere can reduce visibility, potentially affecting amenity. Dust deposition may result in a prominent and unsightly coating over surfaces resulting in nuisance and loss of amenity. Similarly, noise emissions generated during construction and operational phases of the proposed development may reduce amenity for some residents.

Dust and noise mitigation studies for BHP Billiton Iron Ore's existing and proposed operations in Port Hedland are being carried out to achieve the most practicable and efficient emission reductions which ensure that potential impacts on public amenity are minimised. These studies are ongoing and allow for new proposed expansions (including the proposed Outer Harbour Development) to be designed with particular focus on ensuring dust and noise emissions can be mitigated to as low as reasonably practicable.

Comprehensive noise and dust impact assessments conducted by BHP Billiton Iron Ore have identified a number of appropriate engineering options, inclusive of locating the iron ore stockpiles at Boodarie, such that the proposed Outer Harbour Development (in isolation and cumulatively) complies with the relevant noise and dust objectives. A further evaluation of the proposed dust and noise controls will be undertaken as part of the detailed engineering design stage for the proposed Outer Harbour Development.

Taking into account the proposed dust controls, the predicted minimal increase in annual average dust levels and the proposed community initiatives for the project, the significance of the impact to public amenity arising from dust emissions from the project is considered to be minor.

1.3 Assessment Methodology

Given the temporary nature of construction activities, noise impacts on public amenity are also expected to be low. Ahead of full definition of engineering noise controls and given the location of the proposed facilities, it is likely that the additional noise generated by the operation of the project will not cause a nuisance. The significance of impact is therefore likely to be minor.

BHP Billiton Iron Ore is committed to supporting the recommended outcomes of the Port Hedland Dust and Noise Taskforce and has been working in collaboration with the relevant agencies and the Taskforce in actioning the recommendations. The Taskforce considered the Port Hedland Port Authority Ultimate Development Plan, including the Outer Harbour Development, and with the assistance of BHP Billiton Iron Ore, was able to effectively model cumulative dust emission scenarios for a maximum inner and outer harbour (equivalent to 750 Mtpa) case. The Taskforce Report which has been endorsed by Western Australian Government, includes improved controls for land use planning and development and revised dust emission target boundaries. Within these boundaries a structured land use planning approach is recommended.

Visual Amenity

The visual landscape in Port Hedland is dominated by the operation of the Inner Harbour and associated industrial infrastructure. The visual landscape of the Boodarie Industrial Area is characterised by the decommissioned Hot Briquetted Iron Plant and associated rail and road infrastructure, power station, rail corridor to Finucane Island, tidal creeks surrounded by mangroves to the north and west and low shrub bushland which supports pastoral uses.

Based on the results of a visual assessment, the visual impact from the proposed development will be minimal due to either large separation distances between infrastructure and sensitive receptors or existing infrastructure and intervening vegetation blocking views of proposed infrastructure.

The reduction in visual amenity due to artificial lighting associated with marine vessels or marine infrastructure will have minimal impact on coastal facing areas such as the northern coast of Finucane Island, Point Laurentius and Port Hedland West and Port Hedland East as existing night-time views from these areas are already dominated by offshore lights associated with navigational beacons and marine vessels. A reduction in the visual amenity at South Hedland or Wedgefield due to artificial lighting associated with proposed terrestrial infrastructure is also unlikely as predicted light spill will be similar to that currently present. Permanent lighting will be shielded to minimise light spill into residential areas, where practicable.

1.3.2 Relevant Environmental Factors – Managing the Impacts

Short-range Endemic Fauna

A survey of the project area in June and October 2008 identified limestone rocky outcrops, located on the northern side of Finucane Island and within the project footprint of the proposed transfer station as the only potential short-range fauna habitat. At the species level, no invertebrates considered to be short-range endemic fauna were recorded, as all the invertebrates recorded had widespread geographic distributions.

Short-range endemic fauna habitat that may be impacted by the project is well represented in the region, and no short-range endemic fauna taxa were located within the proposed disturbance envelope. The direct loss of short-range endemic fauna as a result of the project is not considered significant as the majority of impacts may either be minimised or avoided through the management measures proposed or the effects are short-term or localised.

Subterranean Fauna

The EPA's stated objective of ensuring adequate protection of important habitats for subterranean fauna will be met as an assessment undertaken to determine the potential occurrence of subterranean fauna within the study area indicated that the habitats present are not unique or restricted in distribution. Proposed groundwater dewatering and abstraction activities are unlikely to permanently impact stygofauna habitat and deep soil excavations are planned in coastal areas which are unlikely to support troglofauna. Impacts to groundwater and the soil profile will be managed in accordance with existing measures implemented through the Construction Environmental Management Plan.

Surface Water

South West Creek and South Creek are the two dominant water courses in the vicinity of the project, however, no permanent surface water bodies occur within the project footprint.

Impacts to surface water are considered to be of low significance as the majority of impacts may be minimised or avoided through the management measures proposed, and design of infrastructure to manage surface water flows.

Erosion and sedimentation will be avoided or managed through the inclusion of erosion control features in the project design (for example, rock armouring, and capture of surface run-off within settlement ponds). Chemicals or hydrocarbons will be stored in bunded areas and contaminated surface water run-off will be captured and treated prior to discharge to the environment.

Flooding due to the physical presence of infrastructure will be avoided or managed through the inclusion of drainage features in the project design (e.g. culverts, diversion channels). The specific location of areas vulnerable to flooding and requiring drainage features will be defined following further hydrological investigations undertaken in the detailed design phase.

Disturbance to acid sulphate soils during construction and subsequent acidification of groundwater will be managed in accordance with an Acid Sulphate Soils Management Plan should the proposed detailed investigations identify the presence of acid sulphate soils.

Groundwater

Although the construction of the proposed Outer Harbour Development will involve groundwater dewatering and abstraction activities, these activities are unlikely to result in permanent aquifer drawdown. Based on the hydrogeological investigations, groundwater abstraction will be undertaken at sustainable rates. It is not expected that other groundwater users such as the pastoral industry which currently extracts water for livestock watering purposes, will be negatively impacted by abstraction or dewatering planned for the proposed Outer Harbour Development. Furthermore, negative impacts to vegetation, fauna habitats or stygofauna are not considered likely.

Avifauna

Surveys of avifauna in the project area and regional surrounds have noted that although the area to be affected is accessed by some shorebird and seabird species for feeding, no nesting has been observed in these areas. Therefore, the seabirds and shorebirds occurring in the area are not reliant on the habitats in the project footprint for nesting, and foraging resources in the regional area are well represented. Risks to avifauna through ingestion and exposure to wastes and hazardous materials will be greatly minimised through waste management and spill prevention and response planning.

As a result, it is considered that it is highly unlikely that there will be a significant impact on avifauna at a local, population or ecological level.

Public Health

Dust generated by activities associated with the construction and operation phases of the proposed Outer Harbour Development has the potential to impact on the health of the local residents and the project workforce. A number of other aspects can potentially cause indirect impacts to public health, these include but are not limited to exposure to nuisance insects and potential contamination from inappropriate disposal of wastes.

Dust emissions from the project during construction will be localised and temporary, and at a distance from residents.

1.3 Assessment Methodology

Dust mitigation studies for BHP Billiton Iron Ore's existing and proposed operations in Port Hedland are being carried out in a holistic approach to ensure that potential impacts on public health are minimised. These studies are ongoing and allow for new proposed expansions (including the Outer Harbour Development) to be designed with particular focus on ensuring dust emissions are mitigated. Taking into account the proposed dust controls, the significance of impacts to public health arising from dust particulate emissions from the project are likely to be low.

The dust model predicts there will be a general increase in ground level dust concentrations, however, with the introduction of relevant engineering controls the model predicts that the proposed Outer Harbour Development can be managed such that dust emissions meet statutory requirements and acceptable standards, and will not adversely affect the health of the local community.

Potential impacts associated with exposure to nuisance insects and the inappropriate disposal of wastes will be managed through standard procedures and include: scheduling earthworks to avoid water ponding on the construction site; strategies aimed at reducing unnecessary ponded water within its area of influence through good housekeeping; appropriate larval and adult mosquito control measures, if necessary; and training and awareness programs will be held for employees and contractors. Potential impacts on the health of the local community from the influx of construction and operations workforce will be managed through BHP Billiton Iron Ore's partnership with the Pilbara Health, Western Australia Country Health Service and other providers.

European Heritage

Key aspects of the project that may impact European heritage include the inadvertent disturbance or loss of European heritage sites and the accidental disturbance of shipwrecks.

Searches of the national and international databases identified one heritage place of potential interest to the project which is the 'Coastal Islands from Dixon Island, Cape Preston to Cape Keraudren, Port Hedland' area. Searches of State heritage databases revealed two terrestrial sites of European Heritage significance located within the project area. These are the Coastal Margin Cape Preston to Cape Keraudren, an indicative place on the Register of National Estate; and the De Grey-Mullewa Stock Route No. 9701, listed under the Heritage Council of Western Australia's Assessment Program. A search of the National Shipwrecks Database revealed 12 potential shipwrecks are located in the Port Hedland area, however, none occur within the project footprint.

Given the minimal disturbance to the De Grey-Mullewa Stock Route No 9701, and the absence of direct impacts to shipwrecks from dredging and dredge disposal activities, any changes to the biophysical environment arising from the project will not adversely affect European heritage and will comply with relevant heritage legislation.

Recreation

The construction and operational phases of the project have the potential to impact on existing recreational activities and areas in Port Hedland. Coastal recreational activities, such as fishing, are very popular in the Town of Port Hedland, and are supported by two major boat-launching areas, one at the north western end of Finucane Island and the other to the north of the PHPA berths.

There will be temporary changes to access to beaches and the boat ramp at Finucane Island; however, in general, public access to western and northern sections of Finucane Island will be maintained throughout the construction period. Residents and stakeholders will be notified via local newspapers, website and networks of scheduling and impacts of major works. Existing access roads impacted by the operation of the proposed Outer Harbour Development will be realigned to permit continued public access in the long-term.

To minimise small vessel traffic around the proposed berths and associated safety issues, the jetty has been designed to accommodate the passage of recreational water craft under the elevated jetty trestle at a number of controlled locations. BHP Billiton Iron Ore is seeking relevant government approval to allow this access. Nominal restricted areas will be put in place around the larger construction vessels to maintain the safety of recreational craft and other marine traffic.

Commercial Fisheries

Given the distance of most fisheries from the project area, the temporary and localised nature of the construction and dredging activities and the proposed management measures, the loss of intertidal habitat associated with the construction of the project is unlikely to significantly affect local fish nurseries. Any disruption to commercial fishers resulting from restricted access, or increased travel time to fishing grounds during construction and operation will be minimal given the distance of the fisheries from the facility.

Climate Change

Greenhouse gas emissions will occur during the construction and operation phases of the proposed Outer Harbour Development. These emissions will be minimised to levels as low as practicable through the implementation of cleaner production initiatives at detailed design and the incorporation of energy efficient operational procedures. Improvements in operational efficiencies and plant utilisation further reduce the port facility's overall greenhouse gas emissions.

1.3.3 Summary of Potential Environmental Impacts and Management

Potential environmental impacts associated with the proposed Outer Harbour Development are summarised in Table ES.3. The project will be undertaken in a manner that will minimise impacts on the surrounding biophysical and social environments. BHP Billiton Iron Ore has made specific commitments about the planning, construction and ongoing operation of the project in the PER/Draft EIS. These management actions are also summarised in Table ES.3. By applying the principles of environmental protection at the design phase, measures have been identified to avoid the unnecessary creation of dust and noise, and the direct impacts on terrestrial and marine flora and fauna have been minimised.

The impact assessment demonstrated that the Outer Harbour Development is not expected to pose any significant long-term risk to the biodiversity, physical or socio-economic environmental values of Port Hedland. For all factors assessed, it is considered that with the implementation of the proposed mitigation and management, the EPA and BHP Billiton Iron Ore's environmental objectives can be met. BHP Billiton Iron Ore considers the proposal to be environmentally acceptable.

Table ES.3 – Potential Environmental Impacts and Management

Key factors Relevant factors

Environmental Factor	Environmental Objective	Existing Environment	Key Potential Impacts	Applicable Standards, Guidelines and Policies	Key Avoidance, Mitigation and Management Measures	Predicted Environmental Outcomes
Terrestrial Biophysical						
Flora and Vegetation (excluding intertidal)	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. To protect Declared Rare Flora and Priority Flora.	A search of the EPBC Act database list of threatened species and ecological communities did not identify any listed flora or vegetation. Five Priority Flora species were recorded during baseline flora and vegetation surveys and targeted Priority Flora surveys: ► *Tephrosia rosea var. venulosa* (Priority 1); ► *Heliotropium muticum* (Priority 1) ► *Pterocaulon sp. A Kimberley Flora* (B.J. Carter) (Priority 2); ► *Goodenia nuda* (Priority 3); and ► *Gymnanthera cunninghami* (Priority 3). ► Vegetation communities containing vadophytes and vadophytes were recorded. ► Ten introduced species, none of which were Declared Plants were recorded.	► Direct loss of vegetation communities, vegetation of conservation significance, and flora of conservation significance (e.g. DRF and Priority flora). ► Direct loss of vegetation outside the disturbance envelope. ► Degradation of vegetation. ► Introduction and spread of weeds.	► EPA Position Statement No. 2: Environmental Protection of Native Vegetation in Western Australia (EPA 2000). ► EPA Position Statement No. 3: Terrestrial Biological Surveys as an Element of Biodiversity Protection (EPA 2002). ► EPA Guidance Statement No. 51: Terrestrial Flora and Vegetation Surveys for Environmental Impact Assessment in Western Australia (EPA 2004a).	**Clearing and earthworks** In accordance with the Construction Environmental Management Plan and Significant Species Management Plan: ► Clearing will be minimised as far as practicable through engineering design. ► Planned clearing boundaries are to be adjusted where practicable, to avoid clearing of Priority Flora. ► Clearly demarcate proposed areas to be cleared on construction plans. ► Survey and peg proposed areas to be cleared, including any nearby locations of Priority Flora. ► Tracking of clearing and ground disturbance activities using relevant databases. ► Restriction of vehicle and equipment movements to within project footprint and designated areas where possible. ► Construction laydown will be located in previously disturbed areas and rehabilitated post completion of construction activities, unless required for other purposes. ► Existing Priority Flora, significant vegetation types and weed infested areas to be managed in accordance with BHP Billiton's Project Environmental Aboriginal Heritage Review (PEAHR) process. ► Awareness of local flora and fauna species of interest and conservation issues through site Environmental Awareness Program. ► Fill required will be acquired from weed-free sources. ► Weed hygiene to be applied to all ground engaging and tracked mobile machinery and equipment. ► A weed management program will be implemented. **Fire** ► Fire hazard awareness and management training for all staff and contractors. ► Fire fighting equipment will be provided in work areas according to fire hazard, and regularly inspected and maintained. ► Spark shields will be used where appropriate. ► Fire restrictions, including hotwork in designated areas only. **Particulate emissions** ► Dust control measures will be used to minimise dust generation. ► Staff and contractors will be made aware of the need to minimise dust generation through site Environmental Awareness Program. ► Vehicle movements and speeds restricted to reduce dust emissions.	**State** ► Direct disturbance of up to 940 ha; ► Impact to four Priority Flora species Heliotropium muticum (Priority 1), Tephrosia rosea var. venulosa (Priority 1), Pterocaulon sp. A Kimberley Flora (Priority 2), and Goodenia nuda (Priority 4); and ► Impacts to groundwater dependent vegetation are unlikely due to their distance from de-watering activities, and groundwater abstraction will be a short-term activity and if aquifer drawdown does occur it is likely to recover following completion of construction activities. **Commonwealth** ► The EPBC Act objective to "provide for the protection of the environment, especially those aspects of the environment that are matters of national environmental significance" will be met as no EPBC Act listed flora or vegetation were recorded in the project area.

Environmental Factor	Environmental Objective	Existing Environment	Key Potential Impacts	Applicable Standards, Guidelines and Policies	Key Avoidance, Mitigation and Management Measures	Predicted Environmental Outcomes
					Physical presence ► Design of infrastructure will minimise impacts to surface water flows, including installation of culverts and "environmental culverts". **Groundwater abstraction/ dewatering** ► Groundwater abstraction will be in accordance with the agreed Department of Water license. ► Abstracted groundwater will be re-used or recycled for dust suppression where possible. **Spills and leaks** ► Hydrocarbons and chemicals will be appropriately stored to minimise potential for contamination. ► Hydrocarbon waste is to be segregated from stormwater and other water via closed systems. **Solid and liquid waste disposal** ► Potentially hazardous solid and liquid wastes will be stored within enclosed containers. ► Domestic rubbish is to be frequently collected and removed to municipal landfill. ► Controlled wastes as defined by the Environmental Protection (Controlled Wastes) Regulations 2004, will be properly removed from sites. ► On site solid waste disposal will be minimised and properly managed. ► Containers will be reused or recycled where possible.	

Environmental Factor	Environmental Objective	Existing Environment	Key Potential Impacts	Applicable Standards, Guidelines and Policies	Key Avoidance, Mitigation and Management Measures	Predicted Environmental Outcomes
Terrestrial Fauna	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. To provide for the protection of the environment, especially those aspects of the environment that are matters of national environmental significance.	► Dunal, riverine and sand plain habitats are present in the project area. ► Riverine and dunal habitats are considered to be of conservation significance. ► One species, *Aspidites ramsayi* (the Woma Python), listed as Schedule 4 under the Wildlife Conservation Act 1950 and as Priority 1 by the DEC was recorded in the sandplain habitat outside of the proposed disturbance envelope. ► One additional Priority listed species was recorded, the Priority 4 listed *Ardeotis australis* (the Australian Bustard). ► One bird species, *Merops ornatus* (Rainbow Bee-eater), was recorded during the survey listed as Migratory species under the EPBC Act. ► A further nine Schedule or Priority fauna species are likely to occur in the project footprint. ► Matters of National Environmental Significance that are relevant to the terrestrial fauna include threatened fauna listed under the EPBC Act which exist in the project footprint (migratory and vulnerable species).	► Direct loss or degradation, of general fauna habitat used for breeding, nesting or foraging. ► Direct loss of fauna habitat of conservation significance used for breeding, nesting or foraging. ► Fragmentation or isolation of habitat. ► Direct loss, or injury to, fauna and conservation significant fauna. ► Change in fauna behaviour / movement. ► Spread of vermin.	► EPA Position Statement No. 2: Environmental Protection of Native Vegetation in Western Australia (EPA 2000). ► EPA Position Statement No. 3: Terrestrial Biological Surveys as an Element of Biodiversity Protection (EPA 2002). ► EPA Guidance Statement No. 56: Terrestrial Fauna Surveys for Environmental Impact Assessment in Western Australia (EPA 2004b).	All measures described above under Flora and Vegetation Management plus the following initiatives to specifically address impacts on fauna: ► A Significant Species Management Plan will be implemented to manage potential impacts to significant species recorded or potentially occurring within the proposed disturbance envelope. ► Existing fauna of conservation significance and significant habitats are to be managed in accordance with the Project Environmental Aboriginal Heritage Review (PEAHR) process. ► Suitable fauna management requirements are to be included in the PEAHR authorisation forms for areas to be cleared. These may include but are not necessarily restricted to: • clearing methods to be used in order to minimise potential harm to fauna species (i.e. staged clearing to maximise the potential for mobile species to move to adjoining areas, checking for nests or burrows prior to clearing); • requirements to salvage and temporarily stockpile particular vegetation types or habitat features (i.e. vegetation, stumps, logs, boulders) for use in rehabilitation programs; and • specific management measures to minimise impacts on species of conservation significance that may occur within the proposed clearing area. ► Key infrastructure, such as stockyards, rail loop, infrastructure corridor, transfer station, has been located in or adjacent to previously disturbed areas.	**State** ► Direct disturbance of approximately 940 ha of terrestrial fauna habitat; ► The clearing of habitat will result in changes to the localised abundance and distribution of terrestrial fauna. The project will not conflict with the intent of the WC Act, as the project will not change the conservation status of any vertebrate or invertebrate fauna species; ► Dunal and riverine habitat types likely to be most affected at a local scale, which both represent widespread vegetation communities (and habitat types) in the Pilbara Bioregion; and ► Regional terrestrial fauna habitat status and associated biodiversity values are unlikely to be affected by implementation of the project.

Environmental Factor	Environmental Objective	Existing Environment	Key Potential Impacts	Applicable Standards, Guidelines and Policies	Key Avoidance, Mitigation and Management Measures	Predicted Environmental Outcomes
					► Surface water will be diverted and collected to minimise impacts on fauna habitat. ► The use of barbed wire will be avoided, except where necessary. ► Where barbed wire must be used due to hazards the use of deflectors to reduce impacts on birds and bats should be considered. ► The installation of visual/sonic deflectors for powerlines and overhead wires should be considered. **Light spill** ► Lighting required during construction and for security purposes will be minimised where possible whilst maintaining compliance with levels required for safe working conditions. ► On Finucane Island and the abutment, flood lights will utilise lighting with an asymmetric distribution (i.e. focused lighting) to avoid unnecessary light spill in fauna habitats. **Noise and vibration** ► All construction activities will be undertaken in accordance with the Environmental Protection (Noise) Regulations 1997. ► Measures put in place to control noise emissions for public amenity will also apply to fauna. **Physical interaction** ► Designate roads and tracks to be utilised by vehicles where practicable. ► Road awareness program for employees and strict enforcement of effective vehicle speed limits to minimise impacts on fauna of conservation significance during construction and operation. ► Implement and provide appropriate signage for speed limits to reduce vehicular collisions with fauna. ► Specific trench monitoring and clearing protocols (to be developed to the requirements of DEC). ► Retain windrows on sides of tracks or roads to deter fauna from accessing these areas, where practicable. ► Any fauna mortalities involving significant species must be reported to DEC.	

Environmental Factor	Environmental Objective	Existing Environment	Key Potential Impacts	Applicable Standards, Guidelines and Policies	Key Avoidance, Mitigation and Management Measures	Predicted Environmental Outcomes
Geology, Soils (including Acid Sulphate Soils) and Landforms	To maintain integrity, ecological functions and environmental values of the soil and landform. Potentially ASS disturbing activities are avoided or managed to avoid harm to the surrounding environment (DEC 2009).	► Located on the coastal plain which is relatively flat, fringed to the north by mangroves, tidal creeks, salt flats and coastal dunes. ► Coastal areas are primarily composed of saline muds and marine sands. Hard, red alkaline earths and Pindan soils occur in frequent patches further inland. ► Proposed infrastructure corridor and transfer pad are located over land assigned medium to high risk of ASS occurring within 3 m of the natural surface. ► Proposed stockyards, rail loops and car dumpers are located over land assigned of no known risk of ASS occurring within 3 m of the natural surface, although an area of moderate to high risk is located with 1 km. ► ASS investigations indicate potential or actual ASS on Finucane Island and along the proposed infrastructure corridor, ► There is low risk of encountering soil or groundwater contamination within the project area, with the exception of an area of the proposed stockyards and rail loop, which is undergoing remediation to ensure the site is suitable for future development.	► Increased erosion and sedimentation. ► Loss of topsoil. ► Deterioration of soil quality. ► Acidification of soils due to exposure to ASS. ► Integrity of infrastructure compromised. ► Soil contamination due to leaks and spills from hazardous materials and waste streams.	► Contaminated Sites Management Series: Assessment Levels for Soil, Sediment and Water, Draft for Public Comment, Version 3, November 2003 (DEC 2003). ► Identification and Investigation of Acid Sulphate Soils and Acidic Landscapes – Acid Sulfate Soils Guideline Series, Contaminated Sites Branch, Department of Environment and Conservation, May 2009 (DEC 2009a). ► Draft Treatment and Management of Soils and Water in Acid Sulfate Soil Landscapes – Acid Sulfate Soils Guideline Series, Contaminated Sites Branch, Department of Environment and Conservation, January 2009 (DEC 2009b). ► Western Australian Planning Commission Planning Bulletin 64: Acid Sulfate Soils, January 2009 (WAPC 2009a).	Disturbance to potential areas of acid sulphate soils will be managed in accordance with the Acid Sulphate Soils Management Plan, which will be updated with the findings from the further detailed acid sulphate soils investigation. Specific management measures include: ► Project design is to incorporate corrosion resistant design materials based upon field identification of acid sulphate soils, if required. ► Following further detailed acid sulphate soils investigations, for areas confirmed with acid sulphate soils present, excavated soil is to be treated during construction to prevent acidic fluids leaching into surface water or groundwater. ► Water quality of groundwater abstracted during dewatering will be monitored, and appropriately treated prior to discharge if required.	**State** ► Impacts to geology, soils and landforms are not considered significant as the majority of impacts may be minimised or avoided or involve short-term or localised effects. **Commonwealth** ► There will be no impact to Matters of National Environmental Significance as a result of changes to geology, soils and landforms

Environmental Factor	Environmental Objective	Existing Environment	Key Potential Impacts	Applicable Standards, Guidelines and Policies	Key Avoidance, Mitigation and Management Measures	Predicted Environmental Outcomes
Short-range Endemic Fauna	To maintain the abundance, diversity, geographic distribution and productivity of short-range endemic fauna at species and ecosystem levels through the avoidance or management of adverse impacts and improvement in knowledge.	► No short-range endemics were recorded. ► Limestone rocky outcrops on Finucane Island were identified as potential short-range endemics habitat. These rocky outcrops are well-represented outside of the project area and along the Pilbara coast.	► Direct loss of potential short-range endemic habitat. ► Fragmentation or isolation of habitat. ► Loss of potential short-range endemic fauna habitat.	► EPA Position Statement No. 2: Environmental Protection of Native Vegetation in Western Australia (EPA 2000). ► EPA Position Statement No. 3: Terrestrial Biological Surveys as an Element of Biodiversity Protection (EPA 2002). ► EPA Guidance Statement No. 20: Sampling of Short-range Endemic Invertebrate Fauna for Environmental Impact Assessment in Western Australia (EPA 2009). ► EPA Guidance Statement No. 56: Terrestrial Fauna Surveys for Environmental Impact Assessment in Western Australia (EPA 2004b).	All measures described above under Flora and Vegetation, and Terrestrial Fauna Management.	**State** The project will pose a low residual risk to short-range endemic fauna due to the following reasons: ► The short-range endemic fauna habitat to be impacted by the project is well represented in the region. ► No short-range endemic fauna were located within the proposed disturbance envelope. ► Clearing of short-range endemic fauna habitat has been minimised through the project design. **Commonwealth** ► There will be no impact to Matters of National Environmental Significance as a result of changes to short-range endemic fauna

Environmental Factor	Environmental Objective	Existing Environment	Key Potential Impacts	Applicable Standards, Guidelines and Policies	Key Avoidance, Mitigation and Management Measures	Predicted Environmental Outcomes
Subterranean Fauna	To ensure adequate protection of important habitats for these species.	► Stygofauna are unlikely to occur in the stockyards or car dumpers as groundwater is considered too saline for them to occur. ► Marine stygofauna are likely to occur on Finucane Island. ► Athalassic stygofauna may occur in the southern part of the project area. These are likely to have large ranges and cover several river catchments. ► Troglofauna are unlikely to occur in the colluvial and alluvial soils or clayey soils found within the project area, or within the coastal margin. ► Troglofauna may occur further inland (including the proposed Western Spur Railway) where depth to groundwater is greater.	► Loss of stygofauna and stygofauna habitat. ► Loss of troglofauna and troglofauna habitat.	► EPA Position Statement No. 3: Terrestrial Biological Surveys as an Element of Biodiversity Protection (EPA 2002). ► EPA Guidance Statement No. 54: Consideration of Subterranean Fauna in Groundwater and Caves during Environmental Impact Assessment in Western Australia (EPA 2003).	All measures described above under Flora and Vegetation, and Terrestrial Fauna Management and the following initiatives to specifically address impacts on subterranean fauna: ► Minimise soil excavation volumes and depth of excavation where possible during construction of the Western Spur Railway.	**State** ► Proposed groundwater dewatering and abstraction activities are unlikely to permanently impact stygofauna habitat and deep soil excavations are planned in coastal areas which are unlikely to support troglofauna. **Commonwealth** ► There will be no impact to Matters of National Environmental Significance as a result of changes to subterranean fauna

Environmental Factor	Environmental Objective	Existing Environment	Key Potential Impacts	Applicable Standards, Guidelines and Policies	Key Avoidance, Mitigation and Management Measures	Predicted Environmental Outcomes
Surface Water	To maintain the quantity of and quality water so that existing and potential environmental values, including ecosystem maintenance, are protected.	► No permanent water bodies occur within the disturbance envelope. ► South West Creek and South Creek are the two dominant water courses in the vicinity of the project.	► Erosion and sedimentation. ► Acidification of surface water due to disturbance of ASS. ► Freshwater flooding due to impediment of surface water flows or increased surface water run off. ► Deterioration of water quality in nearby streams and creeks.	► Australian and New Zealand Guidelines for Fresh and Marine Water Quality, 2000, Australian and New Zealand Environment and Conservation Council (ANZECC) and Agriculture and Resource Management Council of Australia and New Zealand (ARMCANZ). ► Department of Water Stormwater Management Manual for Western Australia 2004-2007. ► Water and Rivers Commission (2000). Environmental Water Provisions Policy for Western Australia: Statewide Policy No. 5 (WRC 2000).	**Clearing and earth works** ► Clearing is to be minimised through engineering design. ► Areas used for construction laydown will be located in previously disturbed areas where practicable and rehabilitated post completion of construction activities, unless required for other purposes. ► Project design will incorporate erosion and sediment controls to minimise erosion. ► Cleared surfaces where practicable will be designed to prevent erosion. ► Undertake groundwater abstraction in accordance with the agreed Department of Water (DoW) Licence. ► Re-use or recycle abstracted groundwater for dust suppression where possible. **Physical presence** ► Suitable sized culverts will be installed or diversion channels widened, in accordance with hydrological modelling to maintain surface water flows across the landscape. ► Detailed engineering design will ensure culverts along the railway line maintain surface water flows and minimise impacts to surface water dependent vegetation. ► All project infrastructure will be designed to minimise the risk of inundation during flood conditions. ► Settlement ponds and controlled drainage basins will be used where appropriate. ► Slurry capture sumps will be installed on plant where appropriate. **Leaks and spills** ► To prevent surface water contamination, storm water will be diverted around the boundary of the stockyards with the use of cut-off drains to collect and divert surface flows. Where possible drainage networks within the project will be connected to Controlled Discharge Basins (CDBs) for storage and release. **Solid and liquid waste disposal** ► Waste management structures to be installed to minimise potential contamination of nearby streams or creeks. ► During construction and operations, water drainage will be regularly monitored to confirm water drainage systems are effective and water flow pathways are maintained as expected.	**State** ► The quality of surface water will be maintained so that existing and potential environmental values, including ecosystem maintenance, are protected. **Commonwealth** ► There will be no impact to Matters of National Environmental Significance as a result of changes to surface water.

Environmental Factor	Environmental Objective	Existing Environment	Key Potential Impacts	Applicable Standards, Guidelines and Policies	Key Avoidance, Mitigation and Management Measures	Predicted Environmental Outcomes
Groundwater	To maintain the quantity of water so that existing and potential environmental values, including ecosystem maintenance, are protected.	► 71 registered boreholes exist in the vicinity of project area, mainly used for livestock purposes. ► No proclaimed drinking water sources occur in the project area. ► Groundwater in the proposed stockyards and rail loop areas varies in depth between 3 m to 5 m AHD and 2 m to 3 m AHD for areas closer to the ocean. ► Recharge of aquifers is tidally dominated close to the coast and dependent on surface water infiltration following rainfall events for aquifers located further inland.	► Aquifer drawdown. ► Acidification of groundwater. ► Reduced infiltration rates. ► Groundwater pollution.	► Australian and New Zealand Guidelines for Fresh and Marine Water Quality, 2000, Australian and New Zealand Environment and Conservation Council (ANZECC) and Agriculture and Resource Management Council of Australia and New Zealand (ARMCANZ). ► Environmental Protection (Unauthorised Discharges) Regulations 2004. ► Water and Rivers Commission (2000). Environmental Water Provisions Policy for Western Australia: Statewide Policy No. 5 (WRC 2000).	**Groundwater abstraction** ► Hydrogeological investigations will be undertaken to ensure groundwater abstraction or dewatering is undertaken at rates to sustain local aquifers. ► Groundwater abstraction will be undertaken in accordance with the agreed Department of Water (DoW) License. ► Abstracted groundwater will be re-used or recycled for dust suppression where possible. ► Water quality of groundwater abstracted during dewatering will be monitored, and appropriately treated prior to discharge if required. **Physical presence** ► Infrastructure will be designed to minimise impacts on groundwater flows. **Leaks and spills** ► Groundwater monitoring will be undertaken in accordance with the Environmental Management Plan. ► Bunded areas will be regularly inspected and cleaned out as required. **Liquid and solid waste disposal** ► Groundwater will be monitored prior to construction, and during construction and operations.	**State** ► Groundwater dewatering and abstraction activities for the project are unlikely to result in permanent aquifer drawdown. ► No non-BHP Billiton Iron Ore groundwater users will be impacted. **Commonwealth** ► There will be no impact to Matters of National Environmental Significance as a result of changes to groundwater.

Environmental Factor	Environmental Objective	Existing Environment	Key Potential Impacts	Applicable Standards, Guidelines and Policies	Key Avoidance, Mitigation and Management Measures	Predicted Environmental Outcomes
Marine Biophysical						
Marine Water and Sediment Quality	To ensure that the environmental values and health, welfare and amenity of people and land users are not adversely affected by the project.	Baseline surveys revealed: ► Marine waters in the project area are tidally dominated by a large semi-diurnal range, which along with winds drive strong currents. ► Nearshore environments are characterised by variable turbidity, high sedimentation rates and highly variable light and temperature conditions. ► Analysis of sediments in the project area indicated naturally occurring elevated levels of arsenic, chromium and nickel at some locations.	► Reduction in water and sediment quality.	► Australian and New Zealand Guidelines for Fresh and Marine Water Quality (ANZECC and ARMCANZ 2000). ► National Ocean Disposal Guidelines for Dredge Management (Environment Australia 2002). ► Pilbara Coastal Water Quality Consultation Outcomes: Environmental Values and Environmental Quality Objectives (DoE 2006b). ► State Water Quality Management Strategy Document No. 6 (DoE 2004c). ► Environmental Assessment Guidelines no. 7 – Marine Dredging Proposals (EPA 2010).	**Seabed disturbance** ► Use of a green valve within the hopper overflow of each TSHD. ► The level of the overflow pipe during sediment transport will be raised to its highest point to ensure minimum spillage. ► Hopper door seals will be well maintained to minimise loss of material during transport. ► Sailing routes to disposal grounds will be planned to minimise propeller wash where possible. ► Hopper dewatering will be undertaken in areas away from sensitive receptors and where practicable only within the dredging and disposal areas. ► Dredging vessels will be well maintained and properly calibrated and include features such as on-line visualisation of bathymetric charts, loading diagrams, production statistics and vessel movement. ► An impact assessment will be conducted prior to maintenance dredging. ► Compliance with the Sea Dumping Permit will be met throughout proposed construction dredging and disposal activities. **Liquid and solid waste disposal** ► All waste materials from the dredging vessels will be managed as per the requirements of MARPOL 73/78) and Port Hedland Port Authority requirements. ► Solid waste will be placed in suitable containers and recycled or disposed via a licenced contractor. ► Waste storage will be clear signed and covered. ► Waste disposal will be recorded. ► Hazardous waste will be appropriately stored and labelled prior to disposal. ► Empty oil and chemical containers will be returned to the supplier for recycling where appropriate. ► Hazardous waste will be disposed via a licensed contractor to a licenced hazardous waste facility. ► Records will be kept of hazardous waste disposal. ► An IMO certified sewage treatment plant will be used on all major vessels. ► All discharge of sewage and grey water will be in accordance with Protection of the Sea (Prevention of Pollution from Ships) Act 1983 (Commonwealth)/MARPOL 73/78 requirements.	**State** ► Direct disturbance of up to 940 ha; ► Direct loss of four Priority Flora species *Heliotropium muticum* (Priority 1), *Tephrosia rosea* var. *venulosa* (Priority 1), *Pterocaulon* sp. A Kimberley Flora (Priority 2), and *Goodenia nuda* (Priority 4); and ► Impacts to groundwater dependent vegetation are unlikely due to their distance from de-watering activities, and groundwater abstraction will be a short-term activity and if aquifer drawdown does occur it is likely to recover following completion of construction activities. **Commonwealth** ► The EPBC Act objective to "provide for the protection of the environment, especially those aspects of the environment that are matters of national environmental significance" will be met as no EPBC Act listed flora or vegetation were recorded in the project area.

Environmental Factor	Environmental Objective	Existing Environment	Key Potential Impacts	Applicable Standards, Guidelines and Policies	Key Avoidance, Mitigation and Management Measures	Predicted Environmental Outcomes
					► No untreated sewage will be discharged within 12 nm of the nearest land. ► No controlled waste will be discharged to the marine environment. **Leaks and spills** ► Hydrocarbon and chemical spills will be managed as per BHP Billiton Iron Ore's Spill Response Procedure, the dredge contractor's EMP and PHPA requirements. **Hydraulic Oil Spills** ► The hydraulic oil system will be of a high quality, well-maintained and regularly inspected. ► The main hydraulic system of each dredging vessel will be equipped with standard low pressure/level alarms and shut down systems to minimise hydrocarbon loss in the event of a burst hydraulic hose. **Storage and Handling** ► Hazardous material storage areas will be designed to handle the volumes and operating conditions specifically required for each substance. ► Hazardous materials (including hazardous waste) will be stored in appropriately labelled drums or tanks. ► MSDS for each chemical and hazardous material will be kept on all vessels; ► Personnel handling hazardous materials will be provided with information and training concerning those materials, as detailed in the MSDS; ► All chemicals and detergents will be stored below deck in appropriate holds; ► Oil and grease drums will be stored below deck in appropriate holds where practicable and space permitting; and ► Hydrocarbons stored above deck will be stored within bunded areas to contain any leaks or spills. **Bilge Waters** ► All vessels greater than 400 gross tonnage will have bilge oil/water separators that comply with the requirements of Annex I of MARPOL 73/78 and Part II of the Protection of the Sea (Prevention of Pollution from Ships) Act 1993 (Cth) to ensure that oil concentrations in discharges are less than 15 ppm. ► No bilge waters with an oil content of more than 15 ppm will be discharged. ► Any discharge of bilge waters will be done whilst en route with oil discharge monitoring, filtering and control systems operating.	

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					Contaminated Deck Wash ► Drainage from decks and work areas with potential for oil, grease or hydrocarbon contamination will be collected and processed through an oil/water separator and managed according to International Oil Pollution Prevention (IOPP) procedures prior to discharge or stored for onshore disposal. ► Onboard spills will be contained and cleaned up immediately and shall not be washed overboard. Product MSDSs shall be adhered to during clean-up. ► Sufficient and appropriate equipment, materials and resources will be available to prevent and respond to spills. ► The dredge contractor will comply with and align spill response preparedness with the existing Port Hedland Oil Spill Contingency Plan (OSCP). ► All vessels shall have a current International Oil Pollution Prevention Certificate (IOPP) issued by the State in which the vessel is registered and an approved Shipboard Oil Pollution Emergency Plan (SOPEP). ► Spill response will be undertaken in accordance with onboard oil spill procedures and emergency drills will be conducted as required by vessel management system. ► Suitable and sufficient oil spill response equipment (spill response kits), including oil absorbent booms and pads, will be available and easily accessible in case of a hydrocarbon spill. ► Only Australian Maritime Safety Authority (AMSA) approved dispersants will be used at any time. **Stormwater discharge** ► Stormwater drains across the project will collect stormwater from site drains located on roads and culverts. Triple Interceptors will be installed and maintained where stormwater may potentially come from workshops or maintenance areas. ► Discharge monitoring will be undertaken and if results indicate high concentrations this will trigger internal investigations. ► Hydrocarbon spill kits will be available across site and managed by the workshops and plant areas. ► Oily Waste and Waste Oil will be controlled by separate waste systems in each of the workshops ensuring separation of the waste from general run-off.	

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					► Specific management: • stormwater egress will not drain into hydrocarbon storage areas. • all clean water will run off into the environment via sumps and infiltration basins. • normal clean runoff will be redirect as much as possible to the water recycling facilities, to be treated and reused. • hydrocarbon waste will be segregated from stormwater and other water via closed systems. • all hydrocarbons will be stored in lube facilities etc, and these areas are subject to regulations about bunding and water separators etc. • All discharge from site must contain less than 5 mg/L hydrocarbons. **Physical presence** ► All vessels under control of the Proponent will comply with the International Convention on the Control of Harmful Anti-fouling on Ships as monitored by AQIS.	
Marine Habitat (Intertidal and Subtidal Benthic Primary Producer Habitats and associated biota)	To maintain the abundance, diversity, geographic distribution and productivity of flora at species and ecosystems levels through avoidance or management of adverse impacts and improvement in knowledge. To maintain the integrity, ecological function, and environmental values of the seabed and coast.	Baseline surveys revealed: ► The intertidal areas are typical of arid zone coastlines of North-Western Australia, characterised by dense stands of mangroves along seaward margins of tidal channels and creeks. ► Seven species of mangrove recorded. ► The upper intertidal areas are a mosaic of samphires and other salt marsh plants, cyanobacterial mats and large areas of bare substrate.	► Direct removal of subtidal BPPs and BPPH due to dredging and marine infrastructure. ► Smothering mortality of subtidal BPPS and BPPH due to dredge spoil. ► Indirect impacts to subtidal BPPs and BPPH from dredging and spoil disposal. ► Sub-lethal effects on reproduction success of coral spawning.	► Guidance Statement No.1 – Guidance Statement for the Protection of Tropical Arid Zone Mangroves along the Pilbara Coastline (EPA 2001). ► Environmental Assessment Guidelines No.3 - Protection of Benthic Primary Producer Habitats in Western Australia's Marine Environment (EPA 2009a). ► Environmental Assessment Guidelines (EAG) No. 7 – Marine Dredging Proposals (EPA, 2010).	**Seabed disturbance** ► Where practicable the proposed channel alignment will be designed to mirror the existing Port Hedland shipping channel. ► The volume of dredging to be undertaken will be minimised. ► Spoil grounds are located in large sandy areas away from limestone ridge lines where benthic primary producer habitat has been mapped. ► Management checks to ensure that disposal of dredge spoil occurs within the approved spoil ground footprints. ► All vessels will include features such as on-line visualisation of bathymetric charts, loading diagrams, production statistics and vessel movements on all vessels. ► A green valve will be used within the hopper overflow pipe of each TSHD. ► During sediment transport by the TSHD, the level of the overflow pipe will be raised to its highest point during transport to the spoil ground to ensure there is minimum spillage. ► Hopper door seals will be maintained in good condition to ensure minimum loss of material during transport. ► Within operational constraints sailing routes to the disposal areas will be planned to minimise propeller wash.	**State** ► No more than 27.0 ha of mangrove habitat, or a total cumulative loss of 5.7%, in the Port Hedland Industrial LAU will be lost. ► No more than 1.7 ha of coastal intertidal BPPH, or a total cumulative loss of 30% in the Port Hedland Industrial LAU, will be lost. ► No more than 147.9 ha of subtidal BPPH, or a total cumulative loss of 52% in LAU 8, will be lost. **Commonwealth** ► No more than 80.3 ha of hard substrate benthic habitat due to the marine infrastructure and spoil ground disposal areas will be lost.

Environmental Factor	Environmental Objective	Existing Environment	Key Potential Impacts	Applicable Standards, Guidelines and Policies	Key Avoidance, Mitigation and Management Measures	Predicted Environmental Outcomes
		► The coastal intertidal marine habitat in the project area is defined as follows: • Comprises two habitat categories: sediments (20,397 ha) and hard substrates supporting mixed assemblages (1,294 ha); • The intertidal platform of Finucane Island is comprised of hard substrates supporting a mixed assemblage community including macroalgae and motile and non-motile invertebrates. Hard corals were also observed however these were constrained to the lower intertidal zone. ► The subtidal habitat in the project area is defined as follows: • Mainly bare and sandy with some hard substrate with BPPs and non-BPPs; • The greatest diversity and abundance of macroalgae was observed at Little Turtle Island; and • The most extensive seagrass observed throughout the area was approximately 86 ha of Halophilia ovalis found inshore of Weerdee Island.	► Direct removal of intertidal BPPs and BPPH due to infrastructure. ► Indirect impacts to intertidal BPPs from alteration of tidal/ drainage patterns.		► Hopper dewatering will be confined to areas away from sensitive receptors and where practical will only occur within the dredging and spoil disposal areas. ► Well maintained dredging vessels and properly calibrated equipment will be used. ► Dredging vessels will include features such as on-line visualisation of bathymetric charts, loading diagrams, production statistics and vessel movement. ► Jetty and abutment structure will be designed and located to minimise as much as practicable the removal of BPPH. ► Clear briefings and instructions will be provided to contractors regarding the procedures to be undertaken to prevent disturbance outside the proposed footprint. ► West Creek crossing will be designed such that the impact to tidal/ drainage patterns is minimised. ► Coloured flagging tape (where practical) will be used to clearly define the mangrove disturbance envelope. ► Clear briefings and instructions to contractors will be provided regarding the procedures to be undertaken to prevent disturbance outside of the approved project footprint. ► Mangroves and other vegetation will be removed using both land based and floating equipment where appropriate, access paths will be minimised through the mangroves and will not disturb outside the approved project footprint. ► Construction machinery will remain within the approved project footprint to ensure that there are no unplanned losses or damage of adjacent areas of mangrove. ► Where the proposed conveyor corridor traverses existing channels within the mangrove habitat, culverts will be installed to maintain tidal flows to the area. ► Any fill to the base of the conveyor, road and causeway structures will be stabilised to prevent washout and erosion. **Physical presence** ► Design of the West Creek crossing such that the impact to tidal/ drainage patterns is minimised.	► Loss of marine habitats is not predicted to result in impacts to marine fauna listed under the EPBC Act.

Environmental Factor	Environmental Objective	Existing Environment	Key Potential Impacts	Applicable Standards, Guidelines and Policies	Key Avoidance, Mitigation and Management Measures	Predicted Environmental Outcomes
		► The most distinctive characteristics of Commonwealth habitats were: • The greatest diversity of hard coral taxa, and cover, within the project area was recorded at monitoring locations in Commonwealth waters; and • The most dominant genera within Commonwealth waters were Turbinaria and Acropora.				
Marine Fauna (including listed, migratory and resident)	To maintain the abundance, diversity, geographic distribution and productivity of marine fauna at species and ecosystem levels through the avoidance or management of adverse impacts and improvement in knowledge. To provide for the protection of the environment, especially Matters of National Environmental Significance and to conserve Australian biodiversity.	► Green and Flatback turtles use the Port Hedland area for foraging. The nearest known turtle nesting sites are located over 5 km from the proposed dredging location. Breeding females use the waters of the project area for inter-nesting. ► Humpback whales may be encountered in the project area during their migration. However, the Port Hedland area does not support calving, aggregation or feeding areas. ► The Spotted Bottlenose Dolphin and Dugong are also found in the project area, although no resident populations are known to occur. ► The Port Hedland region is not an area featuring extensive seagrass meadows.	► Mortality of, or injury to, marine fauna. ► Loss of habitat and reduced productivity of fauna. ► Change in foraging/ habitat use. ► Physiological impacts to marine organisms. ► Ingestion of solid waste by marine fauna. ► Toxic effects of discharges, leaks and spills on marine fauna. ► Marine fauna behavioural changes.	► EPA Guidance Statement No. 1: Protection of Tropical Arid Zone Mangroves along the Pilbara Coastline (EPA 2001). ► EPA Guidance Statement No. 8: Environmental Noise (Draft) (EPA 2007). ► Australian and New Zealand Environment and Conservation Council Code of Practice for Anti-fouling and In-Water Hull Cleaning and Maintenance (ANZECC 1997). ► Intergovernmental Agreement on a National System for the Prevention and Management of Marine Pest Incursions, April 2005. ► Australian Quarantine and Inspection Service (AQIS) guidelines for ballast water management (AQIS 2008). ► National Introduced Marine Pest Identification System (NIMPIS) (Hewitt *et al.* 2002).	Impacts on marine fauna will be managed primarily through measures and controls detailed in the Marine Turtle Management Plan, Marine Mammal Management Plan, and the Invasive Marine Species Management Plan. Note: within the following management measures, marine fauna refers to Marine Turtles, Marine Mammals and Whale Sharks (but does not include dolphins). Where a management measure applies only to marine turtles or marine mammals (except dolphins) this is stated. **Physical interaction** ► Prior to commencement of construction, designated crew will be trained as Marine Fauna Observers, and trained to observe for marine turtles and marine mammals,, record sightings and the actions to be taken in event of sightings, injury or mortality. ► Site inductions for all vessel crew and awareness programs covering procedures to be undertaken to minimise disturbance to marine fauna. ► Operators of specified vessels will be required to maintain a watch for marine turtles and marine mammals,, and if they are spotted, vessels will aim to avoid impacting the fauna (within the safe operational constraints of the vessel). ► If marine mammals or marine turtles are sighted in the area, relevant project vessels operating in the area will be notified. ► The maximum allowed speed for construction vessels will be in accordance with Port Hedland Port Authority Regulations. ► A log detailing marine turtle and marine mammals (except dolphin) sightings will be maintained on all vessels.	**State** ► Although individual organisms may be impacted during the proposed Outer Harbour Development, impacts will not occur at the population or ecosystem levels. ► The EPA's objectives for the maintenance of abundance, diversity, geographic distribution and productivity of fauna at species and ecosystem levels, and ecological protection proposed around the marine facilities will ensure that the EPA's objectives of maintaining improvement in knowledge, will be achieved under the proposed construction and operational measures. ► Operational management measures in combination with the zone of moderate marine ecosystem integrity and use of the environment for recreation and aquaculture are met (refer to Section 6.7.2).

Environmental Factor	Environmental Objective	Existing Environment	Key Potential Impacts	Applicable Standards, Guidelines and Policies	Key Avoidance, Mitigation and Management Measures	Predicted Environmental Outcomes
		► Potentially occurring species in the project area listed as "marine species" under the EPBC Act include 28 species of pipefish and 5 species of seahorse. 3 species of Sawfish may occur in the area and are listed as vulnerable under the EPBC Act. As well, the Whale Shark occurs in offshore waters and is listed as a vulnerable under the EPBC Act.	► Introduction and subsequent establishment of invasive marine species. ► Generation of artificial substrates from project infrastructure. ► Light which may deter nesting female turtles. ► Light overspill – adverse effects on turtle and other marine fauna navigation.	► Commonwealth Action Plan for Australian Cetaceans (Bannister *et al.* 1996). ► Commonwealth Recovery Plan for Marine Turtles in Australia (DEH 2003). ► Draft Marine Turtle Recovery Plan for Western Australia 2009-2016. Wildlife Management Program No. 45 (DEC 2009c). ► EPA Environmental Assessment Guidelines No. 5, Environmental Guidance for Protecting Marine Turtles from Light Impacts (EPA 2010).	► Any incidents that relate to mammal injury/mortality will be documented and reported to BHPBIO, who will report all incidents of injury or mortality to the DEC and DEWHA within 48 hours. **CSD Operations** ► Within the operating constraints of the CSD, the dredge pumps will only be turned on when the cutter head is close to the sea bed. ► Within the operating constraints of the CSD, the dredge pumps will be turned off as soon as possible after the cutter head clears the sea bed (generally after the discharge pipe is clear). **TSHD Dredging Operations** ► Upon arrival at the dredging location (each cycle) and prior to the commencement of dredging, the area within 300m of the dredge (exclusion zone) will be visually inspected (during daylight hours). If any marine fauna are sighted within the exclusion zone, dredging will not commence until the marine fauna has moved out of the exclusion zone or has not been sighted for 10 minute (note : the dredge may move location to ensure the marine fauna is out of the exclusion zone). ► Within the operating constraints of the THSD, the dredge pumps will only be turned on when the drag head is close to the seabed. ► Within the operating constraints of the TSHD, the dredge pumps will be turned off as soon as possible after the drag head clears the seabed (generally after the dredge pipes are clear of dredged slurry) ► Watch will be maintained for the marine fauna (during daylight hours) during the dredging operations. In the event that a marine fauna enters the exclusion zone during the dredging works, dredging operations will cease until the marine fauna is outside of the exclusion zone or has not been seen for 10 minutes. ► During transit, avoidance action will be taken where necessary to attempt to maintain distance of 1000 m or more between vessel and whales. ► During transit, if a marine mammal is sighted with 300 m, a maximum vessel speed of 6 knots will be applied. ► Turtle exclusion devices (tickler chains) will be used. The type of exclusion device utilised will be similar to that used on project throughout Western Australia.	**Commonwealth** ► It is unlikely that there will be a significant impact to any marine fauna listed as "Endangered, Vulnerable, Migratory" under the EPBC Act.

Environmental Factor	Environmental Objective	Existing Environment	Key Potential Impacts	Applicable Standards, Guidelines and Policies	Key Avoidance, Mitigation and Management Measures	Predicted Environmental Outcomes
					TSHD Spoil Disposal Operations ► Upon arrival at the spoil ground and prior to the commencement of disposal operations, the exclusion zone will be visually inspected. If any marine fauna are sighted within the exclusion zone, disposal will not commence until the marine fauna has moved out of the exclusion zone or has not been sighted for 10 minutes (note : the dredge may move location to ensure the marine mammal is out of the exclusion zone). ► Placement of spoil disposal grounds in areas with low representation of significant BPPH. **Light spill** ► Minimise light intensity to as low as reasonably practicable in nearshore areas. ► Avoid use of white lights in proximity to turtle beaches. Use of high pressure sodium lights where possible. ► Reduce lighting spill through shielding, directional alignment, window covering and 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. ► Periodic monitoring of the waters by trained vessel crew around dredge vessels during construction and around the jetty during operations for the presence of hatchlings. **Marine noise and vibration** ► 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. ► A marine fauna watch system will be established with a direct line of communication between the fauna observer and the pile drive supervisor. ► The marine fauna observer will record fauna in the vicinity of operations.	

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					► Trained fauna observers will monitor and report observations of marine turtles within a designated monitoring zone around the pile driving operations. In the event that marine fauna is sighted within a designated exclusion zone, piling activities will cease until the individual marine mammal moves outside of the exclusion zone or is not sighted for 20 minutes. **Liquid and solid waste disposal** ► Waste hierarchy program will be developed. ► Wastes will be stored in appropriate containers and facilities with clear signage. ► Waste will not be released into the marine environment. ► Vessels will be maintained in a clean and tidy manner. ► Storage/segregation of recyclable materials in a designated area until their removal from site. ► Reuse or recycling of containers where possible. ► In event of spillages of waste to the environment the vessel master will immediately notify BHP Billiton Iron Ore and remedial measures will be employed. **Leaks and spills** ► Appropriate storage and handling of chemicals, fuels and other hazardous material. ► Spill contingency plans to manage refuelling, storage and spill management. ► Spill response kits will be in close proximity to storage areas for prompt response in an event. **Physical presence** ► A risk assessment will be undertaken for all vessels and/or immersible equipment prior to arrival on site to determine the likelihood of the vessel and/or immersible equipment being infected by IMS. All dredging vessels to be mobilised from outside Port Hedland will undergo IMS inspection prior to commencement of activities. ► The application of the risk assessment procedure will be undertaken in consultation with Department of Fisheries ► If suspected introduction of marine species are identified during pre-mobilisation inspections or vessel risk assessment, vessels will be subject to cleaning and reinspection prior to remobilisation. ► Implementation of ballast controls as per AQIS (2008).	

Environmental Factor	Environmental Objective	Existing Environment	Key Potential Impacts	Applicable Standards, Guidelines and Policies	Key Avoidance, Mitigation and Management Measures	Predicted Environmental Outcomes
Geomorphology and Coastal Processes	To maintain the integrity and stability of the coast, seafloor, the intertidal environment and the tidal creek systems. To maintain the integrity, ecological functions and environmental values of the seabed and coast.	► Coastal landforms in the project area include a sandy beach and low limestone cliff near the location of the proposed jetty on the north side of Finucane Island, with lines of sand dunes and a low rocky limestone platform extending seaward from the intertidal zone. ► To the south of Finucane Island the landform is one of silty tidal channels fringed with mangroves, mud flats, salt flats and sandy plains. ► Rocky features control the coastal processes in the region, including submerged offshore ridges, low cliffs along Finucane Island and fractured rock masses near Cooke Point. These features strongly limit the mobility of sediment under wave and current conditions. ► The structure of coastal sedimentary features is typically aligned slightly north of east, suggesting a general eastwards transport of coastal sediments. ► The sedimentation rate for the channel has been conservatively estimated for this location as 250,000 m3 per annum. This rate equates to an annual deposition rate of 10 to 16 cm of sediment over the seabed.	► Modification of seabed and localised alteration of sea bed morphology through dredging and disposal of dredge spoil. ► Alteration of natural movement of sediment potentially leading to enhanced erosion and alteration of coastline features. ► Changes to local coastal processes due to presence of project infrastructure.	► State Coastal Planning Policy No. 2.6 (WAPC 2003).	**Seabed disturbance** ► The jetty design will ensure seasonal longshore sediment transport is maintained. ► Location of the three proposed spoil grounds recognises the expected dispersive nature of the grounds by proposing them in areas generally surrounded by habitat that does not support many BPPs. **Physical presence** ► The placement and design of the jetty abutment has been designed to avoid direct disturbance of marine BPPH. ► The infrastructure corridor causeway crossing West Creek will be designed to maintain tidal flushing at rates.	**State** ► The EPA's objectives to maintain the integrity and stability of the coast, seabed and tidal creeks can be achieved. ► The EPA's objective to maintain the integrity, ecological functions and environmental values of the seabed and coast can be achieved. **Commonwealth** ► There will be no impact to Matters of National Environmental Significance as a result of changes to geomorphology or coastal processes.

Environmental Factor	Environmental Objective	Existing Environment	Key Potential Impacts	Applicable Standards, Guidelines and Policies	Key Avoidance, Mitigation and Management Measures	Predicted Environmental Outcomes
		► There is a net supply of sediments from riverine sources, with very high sediment loads from the De Grey River, which has formed and extensive delta east of Port Hedland.				
Avifauna (Shorebirds and Seabirds)	To maintain the abundance, diversity, geographic distribution and productivity of avifauna at species and ecosystem levels through the avoidance or management of adverse impacts and improvement in knowledge.	► The project area provides suitable foraging habitat for species of seabirds and shorebirds within dunal, mangrove and tidal flat habitat areas on and around Finucane Island. Seabirds also utilise the shallow tidal channels and embayments along the coastline and the shallow coastal waters to forage. ► 14 seabird species were observed, including 3 which are listed as migratory under the EPBC Act. ► 26 shorebird species were observed, including 18 which are listed as migratory under the EPBC Act; ► The project is considered to have the potential to support a further 2 seabird species and 19 shorebird species which were not recorded during field surveys. ► Whilst the project area was not found to support large numbers of any of these species, it may be considered important habitat for migratory shorebirds due to the diversity of species recorded.	► Attraction and possible disorientation. ► Deterrence of nesting shorebirds. ► Ingestion of solid wastes and toxicity through external contact with wastes. ► Injury dur to entanglement in solid waste. ► Removal of habitat.	► EPA Position Statement No. 3: Terrestrial Biological Surveys as an Element of Biodiversity Protection (EPA 2002). ► EPA Guidance Statement No. 56: Terrestrial Fauna Surveys for Environmental Impact Assessment in Western Australia (EPA 2004b).	**Light spill** ► Minimise lighting required during construction and for security purposes. ► Flood lights will utilise lighting with an asymmetric distribution (i.e. focused lighting) to avoid unnecessary light spill into fauna habitats. **Liquid and solid waste disposal** ► A clean, rubbish-free environment will be maintained, particularly around administration and contractor areas, in order to discourage scavenging and reduce the potential for colonisation of vermin.	**State** ► The EPA's objective to maintain abundance, diversity, geographic distribution and productivity of avifauna at species and ecosystem levels through avoidance or management of adverse impacts and improvement in knowledge will be achieved **Commonwealth** ► It is unlikely that there will be a significant impact to any avifauna listed as "Endangered, Vulnerable and Migratory" under the EPBC Act.

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Social Surroundings						
Community Services	To minimise the negative and maximise the positive impacts to the local community, the social profile and all services and facilities.	► Temporary accommodation currently experiences high occupancy rates all year round. ► There is a housing shortage in Port Hedland for both rented and purchased housing. ► Community consultation has confirmed that provision of infrastructure and services are key concerns for residents of Port Hedland. ► Regional infrastructure and social services have come under pressure from a number of concurrent and significant resource developments.	**Benefits:** ► Payment of salaries, taxes and royalties that benefit local, state and National economies. ► Increased opportunity for indigenous employment. ► Increased opportunity for small business. ► Impacts: ► Increased pressure on local permanent and temporary accommodation. ► Anti-social behaviour generated by an increase in the transient construction population. ► Reduced access to community services. ► Traffic congestion/ delays and / or reduced road safety.	► Town of Port Hedland - Hedland Future Today Community Infrastructure Implementation Plan 2009 - 2104. ► Department of Environment Interim Industry Guide to Community Involvement (2003). ► The Plan for the Future 2008 – 2013 (Draft). ► Pilbara Cities (Department for Regional Development and Lands) 2010.	**Physical Presence** ► Development of an employment model and maintained employment for construction workforce. ► Training and social conduct awareness programs for all employees and contractors. ► BHP Billiton Iron Ore will continue to participate in initiatives such as: • Implement Small Business Incubation Strategy. • Indigenous Economic Engagement Programs. • Training and Indigenous Employment Strategy and programs. • Development of multipurpose accommodation suitable for use during construction and operations. • Provision of housing to public and not for profit sector by BHP Billiton Iron Ore. • Contribution to the Accommodation Strategy and Township Accommodation Plan. • Contribution to construction of Town of Port Hedland Recreation Facility. • Community Safety Partnership with Town of Port Hedland and WA Police. • Partnership with YMCA to provide child care facilities. • Education partnerships. **Physical interaction** ► Bus transport to and from work for construction workforce. ► Separating construction traffic from general traffic by ensuring construction traffic utilises mainly non public roads where possible. ► Working with appropriate authorities where necessary to separate and manage traffic flow. ► Development of Construction Traffic Management procedures where required. ► Signage to alert public of construction activities. ► Construction of grade separation at the intersection of the Great Northern Highway and the Western Spur Railway.	**State** ► Construction and operation of the project has potential to generate both positive and negative outcomes for the provision of community services. ► Further development of BHP Billiton Iron Ore's established Community Investment Program will greatly assist in minimising the negative and maximising the positive impacts to the local community, the social profile and all services and facilities from construction and operation of the project.

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Indigenous Heritage	To ensure that changes to the biophysical environment minimise any adverse affect on historical and cultural associations and comply with relevant heritage legislation.	An archaeological survey of the project area identified archaeological sites within the project footprint vicinity.	► Disturbance, damage or loss to sites or artefacts of Aboriginal heritage.	► EPA Guidance Statement No. 41: Assessment of Aboriginal Heritage (EPA 2004d).	Impacts on Indigenous Heritage will be managed through measures and controls including: ► Infrastructure designed to minimise disturbance to or loss of Aboriginal sites of cultural significance. ► Avoid Aboriginal sites where practical and where practicable revise the disturbance footprint if an Aboriginal site is identified. ► Entry into a previously recorded Aboriginal heritage site by unauthorised person is prohibited. ► All employees and contractors required to promptly report any Aboriginal heritage sites discovered in the vicinity of operations. ► No disturbance permitted without an internal written approval via the Project Environmental and Aboriginal Heritage Review process (PEAHR). ► Establish appropriate management and protective measures for Aboriginal heritage sites including fencing, signage, salvage and scientific studies in accordance with the *Aboriginal Heritage Act 1972*. ► Ensure that any proposals to disturb an Aboriginal heritage site for the purposes of the proposed activities take into account the provisions of the *Aboriginal Heritage Act 1972*, other relevant legislation and following consultation with the Kariyarra. ► Implementation of BHP Billiton Iron Ore Cultural Heritage Management Plan.	**State** ► Indigenous heritage may be impacted by the clearing and earthwork activities associated with site preparation. ► Through implementation of an agreed Cultural Heritage Management Plan, other consents to be obtained under the Native Title Act and protection afforded by processes under the Aboriginal Heritage Act, the project will ensure that changes to the biophysical environment minimise any adverse affect on historical and cultural associations, and comply with relevant heritage legislation.
Public Amenity	To ensure that emissions resulting from activities associated with the project do not adversely affect the amenity of nearby residents by ensuring that emission levels meet the statutory requirements and acceptable standards.	► Port Hedland residents consider dust to be an amenity issue. ► Dust emissions from current operations are managed through the Dust Management Program which sets the framework for a multi-faceted approach to dust management and associated improved water-use efficiency. ► The close proximity of port operations to residential areas in Port Hedland has historically given rise to community concerns regarding noise impacts.	► Reduced amenity for residents and sensitive receptors due to dust and noise emissions. ► Potential non-compliance with Ministerial Statement 740.	► EPA Guidance Statement No. 18 Prevention of Air Quality Impacts from Land Development Sites (EPA 2000a). ► Ministerial Statement 740 issued in 2007. ► Environmental Protection (Noise) Regulations 1997. ► State Planning Policy 5.4: Road and Rail Transport Noise and Freight Considerations in Land Use Planning (WAPC 2009c). ► EPA Draft Statement of Environmental Impact Assessment No.14, Version 3: Road and Rail Transportation Noise (EPA 2000b).	**Particulate emissions** ► The Construction Environmental Management Program incorporates dust controls such as restricting vehicle movements to established tracks and roads, watering unsealed roads, restricting vehicle speed. ► The BHP Billiton Iron Ore environmental management framework includes the Dust Management Plan for Port Hedland. Proposed dust emission controls to be considered during operations include: • Integrated use of stockyard water cannons. • Enclosure and dust extraction on the new transfer station on Finucane Island. • Enclosure and dust extraction on the jetty wharf. • Use of the Proactive Management 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 Proactive Management System, to reduce emission associated with wind erosion. • Restricting vehicle movement to sealed areas where practicable.	**State** Cumulative dust modelling conducted for the proposed BHP Billiton Iron Ore expansions, including the Outer Harbour Development, predicts: ► a cumulative annual average concentration of 58.1 µg/m3 at the Hospital receptor; and ► a cumulative annual average concentration of 39.1 µg/m3 and 48.9 µg/m3 at South Hedland and Wedgefield, respectively.

Environmental Factor	Environmental Objective	Existing Environment	Key Potential Impacts	Applicable Standards, Guidelines and Policies	Key Avoidance, Mitigation and Management Measures	Predicted Environmental Outcomes
		► Currently noise levels within some areas of Port Hedland are not in compliance with Environmental Protection (Noise) Regulations 1997.	► Potential non-compliance with BHP Billiton Iron Ore air quality amenity targets and Noise Regulations.	► Port Hedland Air Quality and Noise Management Plan – The Port Hedland Dust Management Taskforce Report, March 2010.	• Restricting vehicle speeds. • Cleaning up spilled ore and sweeping sealed roads to remove dust from roads. • Watering unsealed areas that are in regular use. **Noise and vibration** ► Implementation of Noise Construction EMP including: • All construction activities being undertaken in accordance with Environmental Protection (Noise) Regulations 1997. • All construction work carried out in accordance with the control of noise practices set out in AS 2436-1981 Guide to Noise Control on Construction, Maintenance and Demolition Sites". • Regular monitoring and maintenance of equipment so that equipment remains in good working condition and noise emissions are kept to a minimum. • Noise concerns raised by the local community will be addressed through BHPBIO existing community response mechanisms. ► The BHP Billiton Iron Ore environmental management framework (Noise Reduction Management Plan) will be extended to encompass the operation of the proposed Outer Harbour Development.	As the predicted cumulative annual average concentrations of TSP are less than the long-term public amenity target of 65 µg/m3, the dust emission levels from the proposed Outer Harbour Development will meet the relevant statutory requirements and will not adversely affect the amenity of the local community. Noise modelling conducted for the operation of fixed plant at the proposed Outer Harbour Development indicates that under worst case meteorological conditions and without the implementation of noise mitigation measures, noise criteria at/in and around Port Hedland is predicted to be exceeded for all but Wedgefield. Cumulative noise modelling conducted for the operation of fixed plant at the proposed BHP Billiton Iron Ore expansions and the Outer Harbour Development indicates that under worst case meteorological conditions and without the implementation of noise mitigation measures, noise criteria at/in and around Port Hedland is predicted to be exceeded for all but Wedgefield. BHP Billiton Iron Ore's prime aim is to achieve compliance with the in-isolation assessment scenario where reasonably practicable, based on optimisation of noise controls across BHP Billiton

Environmental Factor	Environmental Objective	Existing Environment	Key Potential Impacts	Applicable Standards, Guidelines and Policies	Key Avoidance, Mitigation and Management Measures	Predicted Environmental Outcomes
						Iron Ore's Port Hedland operations. The final package of engineering noise controls will be confirmed as part of the Works Approval application. This will also allow for optimisation of noise controls across BHP Billiton Iron Ore's Port Hedland operations and integration with factors such as trade-offs with water and energy use.
Visual Amenity	To ensure that visual amenity is considered and measures are adopted to reduce adverse visual impacts on the surrounding environment as low as reasonably practicable.	► Numerous port operations exist in and around Port Hedland and are visible to residential areas. ► Local residents are familiar with views of port facilities. ► At most key residential areas, views of the Outer Harbour Development are blocked by or dominated by existing port infrastructure. ► Light spill from the town, existing operations and existing lighting from numerous moored ships has become a regular part of the existing environment lighting levels in the Port Hedland Harbour region. ► Port Hedland Harbour already includes considerable stockpiles and export facilities which operate 24 hours per day requiring significant lighting.	► Reduction in visual amenity.	► Visual Landscape Planning in Western Australia: a Manual for Evaluation, Assessment, Siting and Design (WAPC 2007). ► Guidance on the New Approach to Appraisal (Department of Environment, Transport and the Regions 1998). ► Visual Landscape Planning in Western Australia: A Manual for Evaluation, Assessment, Siting and Design (Department of Planning and Infrastructure 2007).	**Physical Presence** ► Use of consistent colours to unify the variety of structures to provide a cohesive appearance. ► Use of colours similar to those found in the local landscape such as vegetation colour in a well vegetated area, earth tones in sparsely vegetated landscape and shades of grey for tall structures. ► Minimal use of zincalume to reduce the visibility of structures. **Light Spill** ► Use of luminaries with asymmetric light distribution. ► Utilisation of light shielding where possible. ► Minimising light usage by moored ships or marine construction vessels.	**State** For terrestrial infrastructure, large separation distances and intervening structures or vegetation will result in minimal visual impacts. While the proposed Outer Harbour Development marine infrastructure will be visible, visual impacts and light spill from existing industrial infrastructure will mitigate the significance of the impact from the proposed infrastructure.

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Public Health	To ensure that emissions, by meeting statutory requirements and acceptable standards, do not adversely affect the health and welfare of people. To ensure that the physical presence of the project does not adversely affect environmental values or the health, welfare and amenity of people and land uses.	► Dust generated by the project has the potential to impact on the health of local residents and the project workforce. ► Epidemiological studies have linked levels of ambient particulate matter with a variety of human health problems, including mortality, increased hospital admissions and changes to the respiratory system. ► Mosquito borne diseases such as Murray Valley Encephalitis, Ross River Virus and Barmah Forrest Virus are prevalent in the Pilbara region, especially during the wet season. ► Provision of improved health care services is currently a key component of BHP Billiton Iron Ore's Community Investment Program, aimed at attracting and retaining health professionals to Port Hedland.	► Potential health impacts on residents and sensitive receptors due to dust emissions. ► Potential health impacts (sexually transmitted diseases, drugs and alcohol, and mental health). ► Increased incidents of mosquito-borne diseases. ► Impacts to the health, welfare and amenity of people and land uses as a result of incorrect management and disposal of solid and liquid waste.	► EPA Guidance Statement No. 18 Prevention of Air Quality Impacts from Land Development Sites (EPA 2000a). ► Ministerial Statement 740 issued in 2007. ► Mosquito-borne Disease in Western Australia Factsheet (Department of Health 2009). ► Landfill Waste Classification and Waste Definitions 1996 (as amended) (DoE 2005).	**Particulate Emissions** ► As for Public Amenity. **Physical interaction** ► Pre-screening of employees and contractors. ► Random Drug and alcohol testing of workforce. ► Provision of private counselling to employees and drug and alcohol issues. ► Training and awareness programs. ► Provision of paramedic and emergency response at the construction site. ► Ongoing commitment to health care partnerships by BHP Billiton Iron Ore in Port Hedland. **Exposure to nuisance insects** ► Scheduling and planning earthworks to avoid ponding on the construction site. ► Implementation of larval and adult mosquito control measures as required. ► Training and awareness programs for employees and contractors. **Liquid and solid waste disposal** ► Implementation of a Waste Management Plan.	**State** ► Modelling of current and proposed BHP Billiton Iron Ore operations indicates that at the Hospital monitoring station and the proposed Taplin Street location: ► the PM10 24 hour short term concentration target will be achieved; ► the annual average PM10 target should be met; and ► using the Hospital criteria as comparison, the dust impact at South Hedland and Wedgefield will meet criteria limits. ► Therefore it is concluded that the proposed Outer Harbour Development can be managed such that dust emissions meet statutory requirements and acceptable standards, and will not adversely affect the health of the local community.
European Heritage	To ensure that changes to the biophysical environment do not adversely affect historical and cultural associations and comply with relevant heritage legislation.	Two sites considered to be of European heritage significance are located within the current footprint of the Outer Harbour Development. These sites are: ► the De Grey-Mullewa Stock Route No. 9701; and ► the Coastal Margin Cape Preston to Cape Keraudren. One shipwreck (origin/name unknown) is located approximately 2 km from the proposed maritime footprint.	► Planned or unplanned disturbance, damage or loss to sites of European Heritage. ► Increased sedimentation over shipwrecks.	► Register of the National Estate. ► Register of the National Estate. ► Register of the Heritage Council Western Australia.	**Clearing and earthworks** ► All contractors and personnel involved in clearing and earthworks will be required to participate in training and awareness program(s). **Seabed disturbance** ► All contractors and personnel involved in dredging and dredge spoil will be required to participate in training and awareness program(s). ► Regular independent surveys of dredging areas to confirm locations and volumes of material moved. ► Daily dredge logs which track daily work programs undertaken by the dredger. ► Implementation of the Dredging and Spoil Disposal Management Plan (DSDMP) which will manage the environmental impacts from dredging and spoil disposal activities.	**State** ► No adverse affects to historical and cultural associations ► Compliance with relevant heritage legislation.

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		A geophysical survey conducted within the maritime footprint has confirmed that no other shipwrecks exist.	► Disturbance to or loss of European heritage including shipwrecks.			
Recreation	To ensure that existing and planned recreational uses of the environment are not compromised.	Coastal recreational activities such as fishing and boating are very popular in Port Hedland. A number of recreational features considered to be of value to the community are located within the project footprint including: ► the public access road to Finucane Island; ► the public boat ramp on Finucane Island; and ► public beaches. Tourism is also an expanding industry in the Pilbara region and Port Hedland is one of the largest towns in the Pilbara.	► Interference with recreational boating and access to coastal areas. ► Impacts on recreational fisheries. ► Reduced amenity of immediate surroundings. ► Loss of recreational areas used for fishing.	The Pilbara Coastal Water Quality Consultation Outcomes: Environmental Values and Environmental Quality Objectives (DoE 2006b). Occupational Health and Safety Regulations 1996.	► Notify stakeholders via local newspapers, website and networks of scheduling and impacts of major works. ► Realignment of existing access roads to permit continued public access in the long-term. ► BHP Billiton Iron Ore will work with the local community to identify opportunities for maintaining coastal access for recreational use. ► Implementation of the specific management measures within the Dredging and Spoil Disposal Management Plan and construction to minimise water quality and land disturbance impacts. ► Provision of access for recreational boaters to pass under the elevated jetty at controlled locations.	**State** ► Access to recreational areas accessed via both land and sea will be largely maintained during construction. ► The area occupied by the proposed jetty and wharf, access to marine and shoreline recreational areas will be maintained post construction. ► Impacts on recreational fisheries will be localised and limited to the construction phase. ► The new recreation centre will provide additional recreational facilities during and post the project. ► Existing and planned recreational uses will not be compromised in the short or long term as a result of the project.
Commercial Fisheries	To ensure that existing and planned commercial fisheries are not compromised.	The main commercial fisheries and their primary target species which operate within the Port Hedland area are: ► Nickol Bay Prawn Fishery; ► Mackerel Fishery; ► Pearl Oyster Fishery; ► Non-maxima Pearl Oyster Aquaculture Lease; and ► Pilbara Demersal Finfish Fishery.	► Loss of intertidal habitat affecting fish nurseries. ► Disruption to commercial fishers from restriction of access, or increased travel time to fishing grounds.	The Pilbara Coastal Water Quality Consultation Outcomes: Environmental Values and Environmental Quality Objectives (DoE 2006b).	► Minimisation of the dredge footprint. ► Implementation of Dredging and Spoil Disposal Management Plan to minimise construction impacts. ► Implementation of mangrove monitoring and management plan during construction. ► Distance of fisheries from dredging and construction activities. ► Commencement of pile driving with a partial/low energy strike of the hammer on the pile to encourage marine animals to move away from the noise.	**State** ► The impact on commercial fisheries will be such that existing and planned fisheries are not compromised.

Key factors Relevant factors

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		However, operations for the commercial fisheries are located a considerable distance from the activities associated with the Outer Harbour Development. Juveniles of a number of the target species are dependent on inshore habitats, particularly mangrove-lined creeks. There are extensive mangrove areas adjacent to Port Hedland including the mouth of the De Grey River, immediately adjacent to the main fishing grounds.	► Noise disturbance on target fish or fish prey species, leading to migration away from the area. ► Effects on commercial fish in the form of damage to gills.			
Climate Change	To minimise greenhouse gas emissions to levels as low as reasonably practicable on an on-going basis and consider offsets to further reduce cumulative emissions.	► Based on 2007/2008 data, current port operations with an export capacity of 155 Mpta emit approximately 1.65 kg CO2-e per tonne of iron ore export. ► Over the phased nominal eight year construction period of the project a total of approximately 570,000 tonnes CO2-e will be generated. ► A total of approximately 450,000 tonnes CO2-e would be generated per annum during full operational activities, equating to an emissions of 1.87 kg CO2-e per tonne of iron ore export.	Contribution to climate change through generation and emission of greenhouse gases during operation and construction phases.	► Department of Climate Change (DCC) National Greenhouse Accounts Factors (DCC 2008). ► Intergovernmental Panel on Climate Change (IPCC) Guidelines for National Greenhouse Gas Inventories (IPCC 2006). ► EPA Guidance Statement no. 12: Minimising Greenhouse Gas Emissions (EPA 2008).	► Identify and implement cleaner production initiatives to increase energy efficiency and minimise greenhouse gas emissions during construction and operation phases. ► Implement runtime efficiency measures where practical (e.g. conveyors will be shutdown during no-load periods), energy efficiency (lighting), alternative energy, maintenance. ► Procedures will be established for regular maintenance or service of infrastructure, equipment, vehicles and machinery to maximise operating efficiency and prolong equipment life. ► Monitor of energy usage and efficiency as the basis for identifying areas of efficiency improvement. ► Corporate participation in Greenhouse Challenge and Energy Reporting program.	**State** ► The EPA objective 'to minimise emissions to levels as low as practicable on an on-going basis and consider offsets to further reduce cumulative emissions' of greenhouse gases is predicted to be met.

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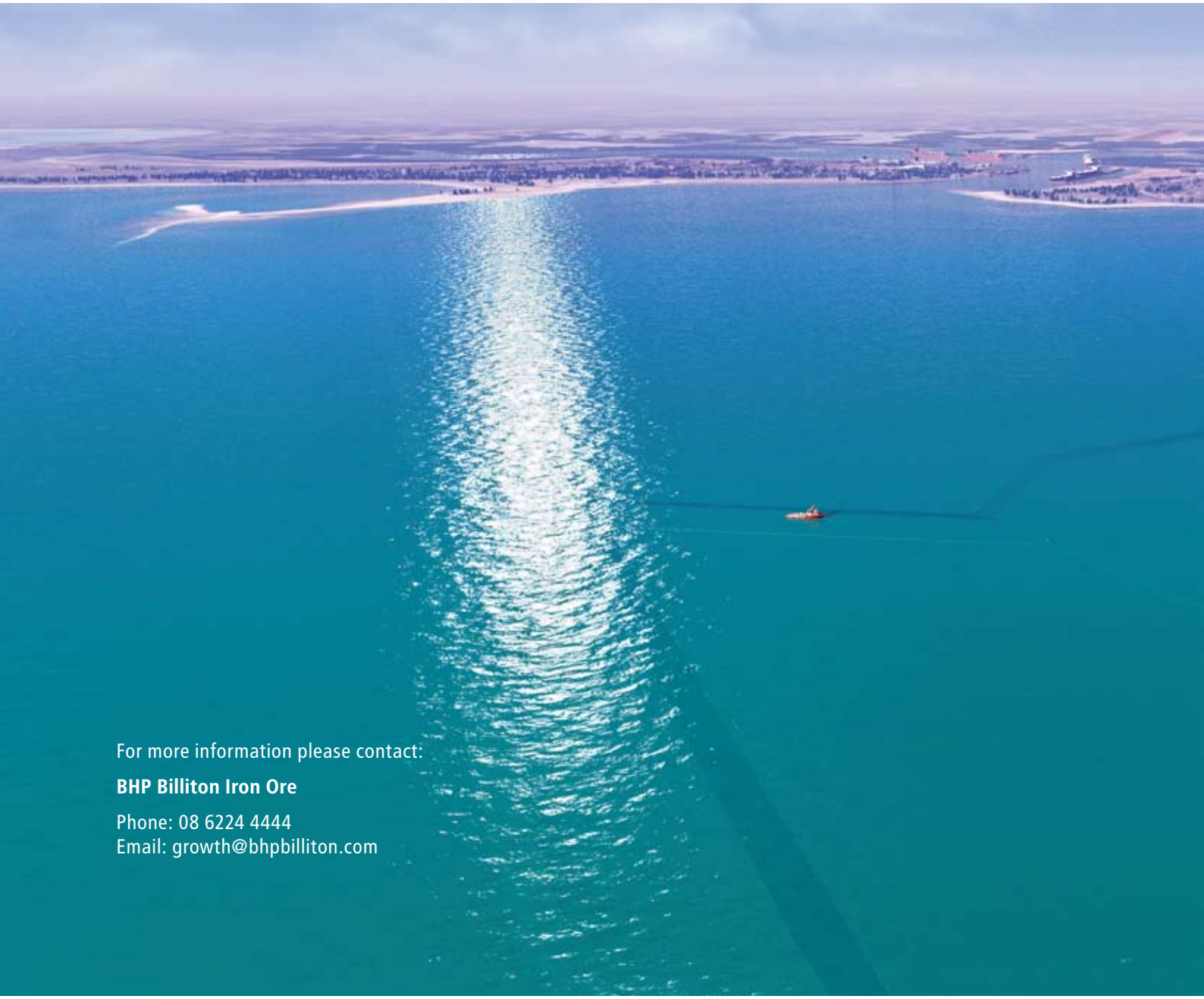

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