SINCLAIR KNIGHT MERZ

SKM

Port Hedland Port Authority

Utah Point Berth Project
Public Environmental Review

June 2008

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Invitation to make a submission

The Environmental Protection Authority (EPA) invites people to make a submission on this proposal. Both electronic and hard copy submissions are most welcome.

Port Hedland Port Authority proposes to develop a new port berth at Utah Point, Finucane Island, Port Hedland. The proposed development, known as the Utah Point Berth Project, will include a new berth, stockyards and access road. The Utah Point Berth Project is designed to cater for the export of bulk commodities by smaller resource companies and will provide additional capacity for the future increase in exports from Port Hedland.

In accordance with the Environmental Protection Act, a Public Environmental Review (PER) has been prepared which describes this proposal and its likely effects on the environment. The PER is available for a public review period of 4 weeks from **Saturday 14 June 2008** closing on **Monday 14 July 2008**.

Comments from government agencies and from the public will help the EPA to prepare an assessment report in which it will make recommendations to government.

Why write a submission?

A submission is a way to provide information, express your opinion and put forward your suggested course of action - including any alternative approach. It is useful if you indicate any suggestions you have to improve the proposal.

All submissions received by the EPA will be acknowledged. Submissions will be treated as public documents unless provided and received in confidence subject to the requirements of the Freedom of Information Act, and may be quoted in full or in part in the EPA's report.

Why not join a group?

If you prefer not to write your own comments, it may be worthwhile joining a group interested in making a submission on similar issues. Joint submissions may help to reduce the workload for an individual or group, as well as increase the pool of ideas and information. If you form a small group (up to 10 people) please indicate all the names of the participants. If your group is larger, please indicate how many people your submission represents.

Developing a submission

You may agree or disagree with, or comment on, the general issues discussed in the PER or the specific proposal. It helps if you give reasons for your conclusions, supported by relevant data. You may make an important contribution by suggesting ways to make the proposal more environmentally acceptable.

When making comments on specific elements of the PER:

- clearly state your point of view;
- indicate the source of your information or argument if this is applicable;
- suggest recommendations, safeguards or alternatives.

Points to keep in mind

By keeping the following points in mind, you will make it easier for your submission to be analysed:

- attempt to list points so that issues raised are clear. A summary of your submission is helpful;
- refer each point to the appropriate section, chapter or recommendation in the PER;
- if you discuss different sections of the PER, keep them distinct and separate, so there is no confusion as to which section you are considering;
- attach any factual information you may wish to provide and give details of the source. Make sure your information is accurate.

Remember to include:

- your name;
- address;
- date; and
- whether, and the reason why, you want your submission to be confidential.

Information in submissions will be deemed public information unless a request for confidentiality of the submission is made in writing and accepted by the EPA. As a result, a copy of each submission will be provided to the proponent but the identity of private individuals will remain confidential to the EPA.

The closing date for submissions is: Monday 14 July 2008

The EPA prefers submissions to be made electronically using one of the following:

- the submission form on the EPA's website: www.epa.wa.gov.au/submissions.asp;
- by email to submissions.eia@dec.wa.gov.au.

Alternatively, submissions can be

- posted to: Chairman, Environmental Protection Authority, Locked Bag 33, CLOISTERS SQUARE WA 6850, Attention: Melinda Macleod; or
- delivered to the Environmental Protection Authority, Level 4, The Atrium, 168 St Georges Terrace, Perth, Attention: Melinda Macleod; or
- faxed to (08) 6467 5562, Attention: Melinda Macleod.

If you have any questions on how to make a submission, please ring the EPA assessment officer, Melinda Macleod on (08) 6467 5427.

Executive Summary

Development Background

Port Hedland Port Authority (PHPA) is a statutory authority owned by the Western Australian Government that is responsible for the management of the Port of Port Hedland, in Western Australia's Pilbara region.

The Port is the key export centre for many mines operating in the Pilbara region; with iron ore the main export commodity, along with other products such as salt, manganese ore, chromite ore, copper concentrate and general cargo. It is Australia's largest tonnage port, with more than 113 million tonnes of cargo handled in the 2006/2007 financial year. It is forecast that the volume of cargo exported through the Port will increase significantly in the next five years, with trade likely to exceed 300 million tonnes per annum (Mtpa).

This increase in trade will require the development of new port berths and improved infrastructure at the Port of Port Hedland. In particular, Berth 1, one of three berths managed by PHPA, is currently operating at close to maximum capacity. Therefore, PHPA proposes to expand capacity by constructing a new bulk commodities berth at Utah Point on Finucane Island. This berth will be allocated for the export of iron, chromite and manganese ores as well as provide capacity for future export for an increased range of bulk commodities.

The proposal, known as the Utah Point Berth Project (UPBP), consists of two separate stages:

- Stage A: Dredging and Reclamation; and
- Stage B: Construction and Operation.

Stage A of the UPBP was approved by the Minister for the Environment as an amendment to the existing Fortescue Metals Group (FMG) approval and the works for Stage A have been successfully completed.

For Stage B, the EPA determined that the proposal required formal assessment under Section 38 of the *Environmental Protection Act 1986* at a Public Environmental Review (PER) level of assessment. This was set on 11 December 2006 and encompassed the construction and operation of the wharf, stockyards and associated infrastructure. Herein, this PER document refers only to Stage B of the proposed development.

Project Description

The proposed UPBP development is located within the Port Hedland harbour on the eastern shores of Finucane Island. It is located west of the existing port facilities at Nelson Point and directly opposite the existing public berths managed by PHPA. To the north of the UPBP development site

is the BHP Billiton Iron Ore (BHPBIO) Finucane Island stockpile and port berth facility. To the south-east of the UPBP site is the FMG stockpile and port berth facility at Anderson Point (refer to **Figure ES 1**).

Current plans allow for the export of 9 Mtpa of product from the UPBP facility, delivered to the UPBP site by road trains. The proposed footprint for the UPBP development includes the following:

- Dedicated multi-user access road to Finucane Island including causeway widening over West Creek;
- Stockyard area on Stanley Point, Finucane Island;
- Elevated perimeter road around stockyards for right-side road train dumping;
- Seawalls around perimeter road to protect from storm surge and high spring tides;
- Workshops, security control room, fuel storage, offices and associated infrastructure;
- Potential borrow pit areas located along the access road;
- Power supply, potable water, dust suppression, fire protection, settlement ponds and miscellaneous services;
- Materials conveying system including transfer towers and sample station;
- Mobile loadout hopper trains on rails over a stockyard central conveyor;
- Travelling Shiploader; and
- Wharf designed to accommodate Panamax and small Cape size vessels, including associated facilities and services.

The characteristics of the proposed UPBP development are summarised in **Table ES 1**.

FINUCANE ISLAND

West

Utah Point

Harriet Point

Nelson Point

Creek

Creek

Stanley Point

Anderson Point

BHP RAIL

BHPBIO FINUCANE ISLAND ACCESS RD

PROPOSED UPBP ACCESS RD

South West Creek

South Creek

Legend

- Stockyard
- Proposed Access Road
- Principal Road
- Secondary Road
- Minor Road
- BHP Railway
- Potential Borrow Pit Areas

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Client
Port Hedland Port Authority

Project
Utah Point Berth Project

Drawing Title
Locality Map of the UPBP Stockyards and Access Road

Drawing No.
Figure ES-1

Revision No. 0
Date: 15.05.08
Project WV03278

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Table ES 1 Summary of Project Characteristics

Element	Description
Project life	>30 years
List of major components:	*Access Road:* - 7 km long from FMG's construction access road approx. 50 m offset from BHPBIO's public access road (Finucane Island Rd); - elevated stockyard perimeter road with surrounding sea wall. *Stockyard:* - 9 Mtpa capacity (trucked), base of the stockyard minimum of 9 m CD; - individual stockpile areas located inside the stockyard perimeter road. *Wharf:* - 272 m in length, 21.5 m in width (minimum) and 11.1 m CD deck height sloping gently from the front to the rear of the wharf; - intended to cater for Panamax and small Cape size vessels.
Area of disturbance	Maximum total area to be disturbed is approx. 87 ha including: - access road approx. 35 ha; - stockyard area approx. 19 ha; - wharf development approx. 3 ha; - connecting area wharf to stockyards approx. 4.5 ha; and - potential borrow and spoil areas approx. 25 ha.
Area of mangrove clearance	Total mangrove clearance approx. 18.7 ha (including approx 1.8 ha of closed canopy mangroves).
Power supply	To be negotiated by PHPA from either: - BHPBIO's existing 66 kV power line; or - 22 kV feeder connected to Horizon Power's South West Creek substation.
Water supply	Maximum water supply required (sourced from town's potable water supply): - 0.715 GL per year; - 1,960 kL per day average.

Benefits of the Project

The UPBP will provide the following benefits:

- Relocation of dusty operations away from the Port Hedland township;
- Improving the efficiency of port operations and product handling methods;
- Increased local employment and training opportunities;
- Reduction in heavy road train traffic through Port Hedland Township;
- Facilitate junior iron ore exporters to reach international markets;
- Increased government revenue from the additional sale of mineral products; and
- Significant additional investment into the Western Australian economy.

Stakeholder Consultation

Ongoing consultation was undertaken with key stakeholders during the development of this PER. Key stakeholders who participated in the consultation process included government agencies, potential port proponents, industries within the Port Hedland area, local community groups and interested community members.

Key community consultation events that were undertaken as part of the PER process included:

1) Discussions with representatives from the Kariyarra community together with the Pilbara Native Title Service (PNTS) and further negotiations with the Marapikurrinya people and their representatives;
2) Key community group meetings in which specialist contributors involved in impact assessment for the UPBP made a three-day visit to Port Hedland to meet with stakeholders; and
3) Open day community information sessions about the UPBP, including potential impacts and management, hosted by PHPA and project staff in Port Hedland over a two-day period.

Key themes that emerged during community consultation were:

- A desire to see employment opportunities on the project for Aboriginal people;
- General agreement that the project will improve the dust and noise situation;
- A recognition that more work needs to be done about the most appropriate approach and location for mangrove loss offset areas, but a general acceptance that proposed mangrove loss is as low as reasonable practical;
- Concerns about water quality management; and
- Concerns about traffic impacts, including traffic congestion and traffic safety impacts.

Key Environmental Issues

The key environmental issues (requiring a fuller assessment than applicable factors) associated with the development of the UPBP are listed below:

- Terrestrial flora, vegetation and fauna;
- Loss of mangrove communities;
- Impacts on the marine environment and fauna;
- Air quality impacts;
- Noise impacts from port operations;
- Traffic impacts; and
- Aboriginal heritage.

Environmental Impacts and Management

Terrestrial Vegetation and Flora

Vegetation clearance for the UPBP will be limited to the minimum area necessary for safe and efficient construction and operation. The construction of the access road for the UPBP will result in approximately 21.6 ha of terrestrial vegetation being cleared including 4.6 ha of hummock grassland (*Triodia epactia* and *Triodia secunda*) and 17 ha of scattered low shrubs (*Halosarcia indica subsp. leiostachya, H. halocnemoides subsp. tenuis* (samphire) and *Muellerolimon salicorniaceum*). Should potential borrow pit areas need to be utilised an additional 24.7 ha of hummock grassland will be cleared (bringing the total terrestrial vegetation clearance to 46.3 ha).

It is expected that the construction of the UPBP will not significantly impact upon the conservation status of flora or vegetation communities. A Terrestrial Vegetation and Flora Management Plan will be implemented as part of an overall Environmental Management Plan for the UPBP, detailing management and mitigation methods to limit impacts on terrestrial vegetation and flora.

Terrestrial Fauna

Impacts on terrestrial fauna as a result of the UPBP are likely to be minimal. No impacts on threatened fauna taxa are expected as a result of the construction and operation of the UPBP development. The management of any impacts on terrestrial fauna generally coincides with management and mitigation measures for terrestrial vegetation and flora, including limiting vegetation clearance and disturbance to the minimum area necessary. A Terrestrial Fauna Management Plan will also be implemented to limit impacts to terrestrial fauna.

Mangroves

The construction of the UPBP will result in the clearance of approximately 18.7 ha of mangroves which includes approximately 1.8 ha of closed canopy mangroves. This equates to approximately

0.7 % of the mangrove representation within the Port Hedland harbour management unit (total mangrove area prior to European Settlement has been determined to be 2 676 ha). Mangroves at the UPBP site are regionally significant in terms of coastal productivity and the fauna they support, but are not unique and no longer exist in a tidal ecosystem wilderness.

Mangrove clearance for the UPBP will be limited to the minimum practical area necessary for construction and operations. Construction activities will be concentrated in the centre of the proposed footprint of disturbance and radiate outwards only as required for development. PHPA are committed to offsetting mangrove losses attributed to the UPBP and within the Port Hedland harbour in general. As part of the PHPA Ultimate Development Plan (UDP), offsets for past and future degradation and/or loss of mangrove habitat within the Port Hedland harbour are currently being investigated in consultation with mangrove specialists and the Department of Environment and Conservation (DEC).

Marine Environment

Potential impacts the UPBP could have on the marine environment include the disturbance and loss of mangrove habitat for marine fauna, and the potential for spills and contamination of marine waters. Minimal impacts on marine fauna are expected as a result of the UPBP development, as there is no significant loss of feeding and breeding habitat (i.e. for turtles and dugongs) and more suitable habitat areas exist elsewhere within the Port Hedland region. The development and implementation of Marine Water Quality and Turtle Management Plans will assist in preventing impacts to the marine environment and detail procedures and protocols to be followed in the event of spills and contamination occurring.

Air Quality

Ambient dust levels at Port Hedland are high and are known to exceed the NEPM criteria for air quality. Dust is a key health and nuisance concern for residents in Port Hedland, due to the proximity of residential areas to port operations. Compared to the existing situation and the future scenario without UPBP, the proposed UPBP development demonstrates a general reduction in the dust concentration in areas immediately adjacent PHPA operations at Berth 1 and negligible impact on receptors at Wedgefield, Port Hedland Primary School and Hedland Senior High School. This is due to the relocation of dusty operations away from the Port Hedland townsite and the designed improvement of facilities and handling methods for the UPBP and at Berth 1. The development and implementation of a suitable Air Quality Management Plan for the UPBP will aid further in minimising dust emissions.

Noise

Construction, traffic and operational (industrial) noise impacts may result from the UPBP. Construction noise impacts are expected to be minimal with construction works to be carried out in

accordance with regulatory standards and construction activities to be limited during the evening and night-time (1900 – 0700) and on Sundays and public holidays. As a result of the UPBP, traffic noise will increase by up to 3.5 dB in Wedgefield and South Hedland, which is considered to be just perceptible. Traffic noise impacts will be minimised by encouraging proponents who utilise the road network on route to the UPBP site to regularly maintain their vehicles to reduce engine and exhaust noise.

Noise within the Port Hedland township currently exceeds levels permitted under Western Australian noise regulations. During UPBP operations, noise in the Port Hedland township will not be noticeably higher than the existing situation due to improved design, handling methods and equipment at the UPBP facility and at Berth 1, as well as the increased distance between the township and UPBP facility. PHPA will continue to liaise with the Port Hedland community regarding noise impacts and any concerns raised will be promptly addressed.

Traffic

Potential traffic impacts as a result of the UPBP development include potential traffic delays and road closures during construction, and increased traffic congestion during operations. Traffic modelling of the worst case future traffic scenario shows congestion and delay to be within acceptable limits during off-peak times and morning peak times. However, there could be noticeable impacts during the afternoon peak due to key intersections already operating at capacity at these times. The introduction of a self imposed curfew on truck movements through these intersections during the afternoon peak should prevent noticeable impacts on traffic during these times.

With the announcement of state funding to be provided to MRWA to upgrade the Great Northern Highway, it is also anticipated that many of the issues identified in traffic modelling will be alleviated. The proposed works will re-align the Great Northern Highway, reducing traffic noise and congestion in the vicinity of Wedgefield and providing a safer and more direct route for trucks travelling to the UPBP site. PHPA will continue to liaise with MRWA and other parties to co-ordinate the upgrade works with the UPBP Access Road detailed design and construction and to improve traffic management in general.

Aboriginal Heritage

Previous surveys have identified an Aboriginal heritage site, a shell midden named “Sounness Drive Camp” within the UPBP development area. Further investigations are currently being undertaken by Marapikurrinya to provide information on the location and significance of this site. Prior to construction and operations, an Aboriginal Heritage Management Plan will be developed in consultation with the Department of Indigenous Affairs (DIA) detailing procedures for the protection and management of Aboriginal heritage sites, materials and artefacts. PHPA will

continue to liaise with the Marapikurrinya people regarding Aboriginal heritage management and other culturally significant issues.

Table ES 2 summarises the impacts and proposed management and mitigation measures that will be implemented as part of the UPBP.

- **Table ES 2 Summary of Key Environmental Factors**

Environmental Factor	Relevant Area	Environmental Objective	Existing Environment	Potential Impacts	Management and Mitigation	Predicted Outcome
Biophysical						
Terrestrial Flora and Vegetation	■ Access road and stockyards.	■ To maintain the abundance, diversity, geographic distribution and productivity of terrestrial flora at species and ecosystem levels through the avoidance or management of adverse impacts and improvement in knowledge.	■ There are three terrestrial vegetation types (excl. mangroves) within the proposed development area. ■ Vegetation is generally highly disturbed and weedy. ■ No Declared Rare Flora recorded in the proposed development area. ■ One Priority 3 species *Bulbostylis burbidgeae* is recorded close to the Finucane Island access road.	■ Clearing of native vegetation. ■ Impacts on significant flora species. ■ Introduction and/or spread of weeds. ■ Dust deposition. ■ Hydrological changes. ■ Waste pollution or contamination of surrounding vegetation.	■ A Weed Hygiene and Management Plan will be prepared in consultation with the DEC prior to the commencement of construction. ■ Areas disturbed by construction activities will be revegetated in accordance with a Terrestrial Flora and Vegetation Management Plan.	■ The construction and/or operations of the proposal will not significantly impact upon the conservation status of flora or vegetation communities.
Terrestrial Fauna	■ Access road and stockyards.	■ To maintain the abundance, diversity, geographic distribution and productivity of fauna species and ecosystem levels through the avoidance or management of adverse impacts and improvement in knowledge.	■ Three listed Priority and six Migratory fauna species considered likely to occur in the proposed development area.	■ Habitat disturbance and fragmentation. ■ Reduction in the local abundance of fauna populations due to interruption to fauna behaviour, including displacement, injury or death. ■ Inadvertent injury and/or mortality as a result of increased vehicle strikes from increased traffic. ■ Impacts on significant fauna species.	■ Clearing will be kept to the minimum area necessary for safe and efficient construction and operations. ■ A Terrestrial Fauna Management Plan will be implemented to minimise the direct and indirect impacts on significant and migratory fauna.	■ Impacts on terrestrial fauna and constituent habitats are likely to be minimal.
Marine Flora and Fauna	■ Stockyards and wharf. ■ Shipping operations.	■ To maintain the abundance, diversity, geographic distribution and productivity of marine flora and fauna species and ecosystem levels through the avoidance or management of adverse impacts and improvement in knowledge.	■ Dredging has considerably altered the natural depth and configuration of the harbour. ■ Marine fauna present in the Port Hedland area include diatoms, plankton, infauna, epifauna, reptiles, fish and a number of listed migratory and threatened species (e.g. the Flatback Turtle).	■ Loss of habitat for mangrove dependent fauna (Little North-Western Mastiff Bat). ■ Disturbance of marine fauna (e.g. by increased lighting and shipping movements). ■ Introduction of marine pest species. ■ Spills and contamination of marine waters.	■ Marine Water Quality and Turtle Management Plans will be implemented detailing measures for preventing impacts to the marine environment and procedures and protocols to be followed in the event of contamination occurring.	■ Minimal impacts on marine fauna are expected as a result of the proposal.
Mangroves	■ Access road, stockyards and wharf.	■ To maintain the abundance, diversity, geographic distribution and productivity of marine flora species, particularly mangroves, through the avoidance or management of adverse impacts and improvement in knowledge.	■ Mangroves are the dominant marine flora and/or Benthic Primary Producer Habitat (BPPH) within the harbour. ■ Mangroves within the proposed development area comprise some 0.64 km^2. ■ The proposed development site supports six mangrove species.	■ Loss of 18.7 ha of mangroves, including 1.8 ha of closed canopy mangroves.	■ Clearing and disturbance of mangroves will be kept to the minimum area necessary. ■ Areas cleared for construction will be rehabilitated as soon as possible, where applicable. ■ Offset options are being considered at a strategic level to compensate for past and future loss of mangroves within the Port Hedland harbour are currently being investigated.	■ Although the proposal will result in the loss of approximately 18.7 ha of mangroves, the total loss of mangroves for the development will be kept to the minimum practicable level.
Hydrology and Groundwater	■ Stockyards and wharf.	■ Maintain the quantity and quality of water so that existing and potential environmental	■ The proposed development site is located in the Port Hedland Coast Basin within	■ Alteration of surface drainage networks and flow pathways. ■ Contamination of surface and	■ Stockyards will be purposely constructed to allow for no infiltration of surface water	■ No adverse impacts are expected for surface and groundwater as a result of the

Environmental Factor	Relevant Area	Environmental Objective	Existing Environment	Potential Impacts	Management and Mitigation	Predicted Outcome
		values, including ecosystem function, are protected.	coastal plain alluvial deposits.	groundwater. ■ Increased pressure on water sources.	within potential risk areas to groundwater to prevent contamination. ■ Contaminant and Groundwater Management Plans will be implemented for the proposal.	proposal.
Landforms, Geology and Soils	■ Access road, stockyards and wharf.	■ To maintain the integrity, ecological functions and environmental values of landforms, geology and soils.	■ Landscape of tidal flats featuring bare sand, mangrove associations, salt tolerant shrubs and grasses. ■ Location for stockyards is a limestone outcrop surrounded by mangrove muds. ■ Proposed stockyard site is susceptible to tidal inundation.	■ Substantial landform modification of the proposed stockyard site. ■ Wind and water erosion. ■ Potential disturbance of acid sulfate soils.	■ The proposed area for the stockyards is centred on a limestone outcrop, sparsely covered with vegetation. ■ Restriction of construction activities and operations to the defined development area. ■ An Acid Sulfate Soil Management Plan will be developed in consultation with the DEC, should disturbance of PASS be deemed necessary.	■ No adverse impacts are expected due to the presence of PASS as a result of the proposal.
Pollution Management						
Air Quality	■ Construction activities and operations at facility.	■ To ensure that atmospheric emissions do not impact on environmental values, or the health, welfare and amenity of the population and land uses, by meeting statutory requirements and acceptable standards and guidelines.	■ The Pilbara is a naturally dusty environment and background levels of dust often exceed the NEPM PM_{10} standard of 50 $\mu g/m^3$.	■ Generation of dust during construction, such as from earthworks and vehicle movement on unsealed areas. ■ Generation of dust during operations, such as from uploading, stacking, reclaiming, conveyor transfers, shiploading and wind action on stockpiles. ■ Generation of dust from the transport of export materials to the site. ■ Nuisance through dust deposition and reduced visual amenity.	■ An Air Quality Management Plan will be prepared and include detail on methods of dust prevention and suppression.	■ The proposed development generally results in a reduction in dust and improvement in air quality for the Port Hedland township immediately adjacent the port.
Noise	■ Construction activities and operations at facility.	■ To avoid adverse noise impacts on environmental values, or the health, welfare and amenity of the population and to ensure that noise levels comply with statutory requirements.	■ The ambient noise environment in Port Hedland is largely dominated by port operations. ■ Assigned noise levels are already exceeded at noise sensitive receptors in the West End district of Port Hedland.	■ Generation of construction noise such as from earthworks, piling and laying of site drainage and internal roads. ■ Generation of traffic noise from vehicle movement onsite and on-route to the UPBP development area. ■ Generation of operational (industrial) noise such as from front end loaders, hoppers, conveyors, shiploading, and low speed truck movements.	■ Prior to construction, an overall Noise Management Plan will be prepared detailing noise management procedures and protocols. ■ PHPA will continue to liaise with the Port Hedland community regarding noise impacts and any concerns raised will be promptly addressed.	■ Construction noise is not anticipated to have a significant impact due to high existing background noise levels and the implementation of suitable administrative and engineering control methods. ■ Overall the noise environment is expected to improve as a result of the proposal.
Waste Management	■ All aspects of construction and operations.	■ To ensure that potential impacts associated with liquid and solid wastes are managed appropriately.	■ Significant volumes of waste are generated by industrial activities within the Port Hedland area. ■ As yet there is no recycling program operates in the Port Hedland area.	■ Contamination of surface, ground and marine waters. ■ Impacts on visual amenity (i.e. the presence of litter). ■ Entanglement or ingestion of waste by local wildlife. ■ Attraction of vermin.	■ A Waste Management Plan will be developed for the construction and operational phases of the proposal.	■ Minimal impacts are expected as a result of waste produced during construction and operations of the proposed development.

Environmental Factor	Relevant Area	Environmental Objective	Existing Environment	Potential Impacts	Management and Mitigation	Predicted Outcome
				▪ Generation of odours.		
Marine Environmental Quality	▪ Access road, stockyards and wharf.	▪ To maintain sediment, water and biota quality within the marine environment.	▪ The constant movement of ships, highly modified bathymetry, large tidal range and presence of large volumes of silt and mud in the harbour result in a high level of turbidity. ▪ Moderately elevated levels of copper and zinc occur in the harbour, yet, no organic chemicals have been detected in the harbour and dissolved concentrations of other metals approach those found in the open ocean.	▪ Increased water turbidity as a result of harbour maintenance dredging. ▪ Introduction of marine pest species. ▪ Spills and contamination of marine waters.	▪ Marine Water Quality and Contaminant Management Plans will be implemented detailing measures for preventing impacts to the marine environment and procedures and protocols to be followed in the event of contamination occurring.	▪ Minimal impacts on marine environmental quality are expected as a result of the proposal.
Traffic	▪ Access road and proposed haulage route.	▪ To ensure that potential impacts associated with traffic and truck movements are managed appropriately.	▪ Peak hours of traffic volume occur between 6-7 am and 4-5 pm. ▪ Existing traffic concerns in the Port Hedland area include traffic congestion and traffic delays at railway crossings.	▪ A reduction in the level of service of roads. ▪ Traffic delays and road closures during construction.	▪ Management and mitigation methods for traffic during construction and operations will be detailed in a Traffic Management Plan.	▪ If managed appropriately traffic impacts should be limited. ▪ PHPA will continue to liaise with MRWA and other parties to improve traffic management.
Social Surroundings						
Aboriginal Heritage	▪ All project components.	▪ To ensure that the proposal complies with the requirements of the *Aboriginal Heritage Act 1972*.	▪ Previous surveys have identified an Aboriginal heritage site, a shell midden named “Sounness Drive Camp” within the proposed development area. ▪ Ongoing investigations are being undertaken to investigate Aboriginal heritage concerns.	▪ Disturbance of Aboriginal Heritage sites and/or culturally significant sites. ▪ Excavation of material of cultural significance during construction. ▪ Impacts on cultural associations to the proposed development site and surrounding areas.	▪ Prior to construction and operations, an Aboriginal Heritage Management Plan will be developed detailing procedures for the protection and management of Aboriginal heritage sites, materials and artefacts.	▪ The disturbance of one Aboriginal Heritage site within the proposed development area is likely to be unavoidable. ▪ PHPA will continue to liaise with the Marapikurrinya people regarding Aboriginal heritage management and other culturally significant issues.
European Heritage	▪ All project components.	▪ To ensure that the proposal complies with the requirements of the *Heritage of Western Australia Act 1990* and Commonwealth requirements.	▪ No places of European heritage significance are located within or in close proximity to the proposed development site.	▪ Excavation of material of cultural significance during construction.	▪ If European heritage artefacts are identified during construction they will be appropriately managed in accordance with statutory requirements and community expectations.	▪ No adverse impacts on European heritage are expected as a result of the proposal.
Recreational Activity	▪ All project components.	▪ To minimise potential impacts on recreational uses of the area.	▪ Coastal recreational pursuits, such as fishing, are popular in the Port Hedland region.	▪ Restricted access to recreational fishing areas surrounding the proposed development area.	▪ A new boat ramp will be constructed as part of the yacht club redevelopment on the spoil bank. ▪ The access road for the proposed development will allow for improved public access to the Finucane Island boat ramp.	▪ Ongoing community consultation will be undertaken to ensure that any community concerns regarding recreational fishing access are addressed.
Visual Amenity	▪ All project components.	▪ To minimise impacts on the visual amenity of the area adjacent to the project.	▪ The visual landscape of the Port Hedland area is considerably influenced by existing port facilities and operations.	▪ Impacts on visual amenity values from the development of the stockyards and access road.	▪ All practicable measures will be implemented to design and operate facilities to minimise impacts on visual amenity.	▪ Minimal impacts to visual amenity values are expected as a result of the proposal.
Risk and Safety	▪ All project components.	▪ To ensure that the risk to the workforce and public is as low	▪ Risk and safety aspects associated with port	▪ Potential health and safety risks to the workforce and	▪ Management strategies will be implemented to ensure	▪ The proposal is not expected to impact on the health and

Environmental Factor	Relevant Area	Environmental Objective	Existing Environment	Potential Impacts	Management and Mitigation	Predicted Outcome
		as reasonably practicable.	operations are particularly important in Port Hedland.	general public.	workforce and public health and safety are protected, as part of all specific management plans.	safety of the workforce and the general public.
Social Impacts	▪ All project components.	▪ To minimise potential impacts on the local community including impacts on social dynamics; health; services and facilities; and, housing and accommodation.	▪ The Town of Port Hedland includes both Port Hedland and South Hedland, located 15 km inland. ▪ The population of Port Hedland population fluctuates with the construction and operation of large resource projects.	▪ Outsourcing of labour through Fly-In Fly-Out operations. ▪ Increased transient population during construction. ▪ Reduced quality of affordable housing. ▪ Increased demand on local services and infrastructure.	▪ Workers will be sourced locally and training will be provided to local people as feasible.	▪ The proposal is expected to result in a net community benefit for the Town of Port Hedland. ▪ Ongoing community consultation will be undertaken where applicable to ensure that any community concerns are addressed.

The actions undertaken during the design, construction and operations of the UPBP to address EPA Principles for environmental management are summarised in **Table ES 3**.

▪ **Table ES 3 Actions Undertaken as Part of the UPBP to Address EPA Principles**

Principle	Objective	Actions
Precautionary Principle	Where there are threats of serious or irreversible damage, lack of full scientific certainty should not be used as a reason for postponing measures to prevent environmental degradation.	Detailed investigations have been undertaken of the existing environment and in assessing environmental impacts, particularly for mangroves, terrestrial flora and fauna, noise, air and traffic. Management plans for key factors will be implemented including Surface and Groundwater, Contaminant, Turtle, Air Quality, Noise, Traffic and Aboriginal Heritage Management Plans. Should disturbance of PASS be deemed necessary in the future further investigations of PASS will be undertaken and an ASS Management Plan will be developed.
Intergenerational Equity	The present generation should ensure that the health, diversity and productivity of the environment is maintained and enhanced for the benefit of future generations.	The UPBP has been designed and will be constructed to minimise environmental impacts. Dust emissions and impacts on the local Port Hedland community will be minimised through improved design and handling methods and the movement of operations away from sensitive receptors. Ongoing monitoring of groundwater will continue and will be reported to the DEC. Ongoing monitoring and assessment of marine water quality will be undertaken periodically over the life of the port berth and as appropriate.
Conservation of Biological and Ecological Diversity	Conservation of biological diversity and ecological integrity should be a fundamental consideration.	The UPBP has been designed and will be constructed to minimise mangrove loss. Clearing and disturbance of vegetation will be kept to the minimum area necessary for safe and efficient operations. No clearing activities are planned to occur within the vicinity of significant flora species (*Bulbostylis burbidgeae*) (Priority 3). Offset options to compensate for past and future mangrove loss will be investigated at a strategic level as part of the Ultimate Development Plan for the harbour.
Improved Valuation, Pricing and Incentive	Environmental factors should be included in the valuation of assets and services.	The design of the UPBP has been iterative with the development of this PER to minimise environmental impacts. Environmental impacts will be taken into consideration at all stages during final design, construction and operation. As a multi-user facility, all users will contribute to environmental management of site. Equipment used for construction and operations will be the most environmentally appropriate equipment available (i.e. the quietest) where practicable. PHPA will continue to liaise with relevant stakeholders, including local community groups and the Marapikurrinya people to identify and appropriately manage any concerns that may arise.
Waste Minimisation	All reasonable and practicable measures should be taken to minimise the generation of waste and its discharge into the environment.	Measures to minimise the generation of waste during construction and operations will be incorporated into detailed design and planning prior to the commencement of works. The UPBP will be purposely designed to minimise water wastage and promote water recycling and reuse. Surface runoff will be collected within the stockyards, settlement ponds and truck wash and treated as applicable for reuse. A Waste Management Plan will be implemented.

Environmental Commitments

The PHPA Environmental Policy that will be adopted for the UPBP states:

PHPA is committed to protect the environment of the port area and to minimise the impacts of the port activities on the environment.

PHPA will:

- *comply with all applicable legislation and regulations, and aim for best practice;*
- *identify, assess and document aspects of its activities and services that have or may have an impact on the environment and minimise these impacts;*
- *develop, document and achieve environmental objectives and targets;*
- *integrate environmental consideration into all aspects of decision making, planning, design, construction and operational processes and aim for sustainability;*
- *use resources efficiently and minimize waste;*
- *ensure that all employees and other port users are made aware of the importance of achieving conformance with the environmental requirements of this policy;*
- *hold all employees, contractors and other port users accountable for their implementation of this Environmental Policy;*
- *develop and update an Environmental Management Plan and Incident Management Plan to be able to effectively protect the environment and respond to accidents and emergency situations associated with all activities and services;*
- *monitor, measure and report its overall environmental management performance in an effective way to measure progress towards the achievement of environmental goals and objectives as well as to recognize deficiencies and take the opportunity to improve;*
- *investigate non-conformances and take action to mitigate any impacts caused and initiate and complete corrective and preventive action;*
- *annually review the environmental performance and act on results to ensure continuing suitability, adequacy and effectiveness; and*
- *communicate openly and honestly on its environmental performance to port users, government and the general public.*

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1. Introduction

1.1 Development Background

Port Hedland Port Authority (PHPA) is a statutory body responsible for the management of the Port of Port Hedland in Western Australia's Pilbara region (**Figure 1-1**). The port is the key export centre for many mines operating in the Pilbara region; with iron ore the main export commodity, along with other products such as salt, manganese ore, chromite ore, copper concentrate and general cargo. It is Australia's largest tonnage port, with more than 113 million tonnes of cargo handled in the 2006/2007 financial year.

It is forecast that the volume of cargo exported through the port will increase significantly in the next five years, with trade likely to exceed 300 million tonnes per annum (Mtpa). This increase in trade will require the development of new port berths and improved infrastructure at the Port of Port Hedland.

PHPA currently manages three berths at the port, which are used for a variety of cargoes such as chromite and manganese ores, copper concentrate, salt and general cargo. Berth No. 1 is a dedicated bulk commodities berth through which manganese and chromite ores, and copper concentrate are handled. This berth is currently operating at close to maximum capacity and PHPA therefore proposes to build a new bulk commodities berth at Utah Point on Finucane Island (**Figure 1-1**). This berth will be allocated to the export of iron, chromite and manganese ores as well as provide capacity for future export for an increased range of bulk commodities.

The Utah Point Berth Project (UPBP) forms part of the Ultimate Development Plan (UDP) for the Port Hedland harbour, which is being developed in parallel with this PER. The UDP details two key phases of development at Utah Point. Phase 1, the Utah Point Berth Project, is the key focus of this report and includes the construction of a wharf, stockyards and access road for port operations. Phase 2 allows for the construction of stockyards and additional infrastructure by others to facilitate further exports from the Port of Port Hedland into the future (refer to **Figure 1-1**).

For Phase 1, the Utah Point Berth Project consists of two separate stages, summarised as:

- Stage A: Dredging and Reclamation.
- Stage B: Construction and Operations.

Both Stage A and Stage B were originally referred to the Environmental Protection Authority (EPA) on 6 September 2006 as one project, however it was determined that the project should be staged to ensure that the opportunity to utilise dredging plant available in the harbour was not lost. The referral for Stage A was approved by the Minister for the Environment as an amendment to the existing FMG approval and the works have been successfully completed. For Stage B, the EPA

determined that the proposal required formal assessment under Section 38 of the *Environmental Protection Act 1986* at a Public Environmental Review (PER) level of assessment. This was set on 11 December 2006 and included for the construction and operation of the wharf, stockyards and associated infrastructure. Herein, this PER refers only to Stage B of the proposed development.

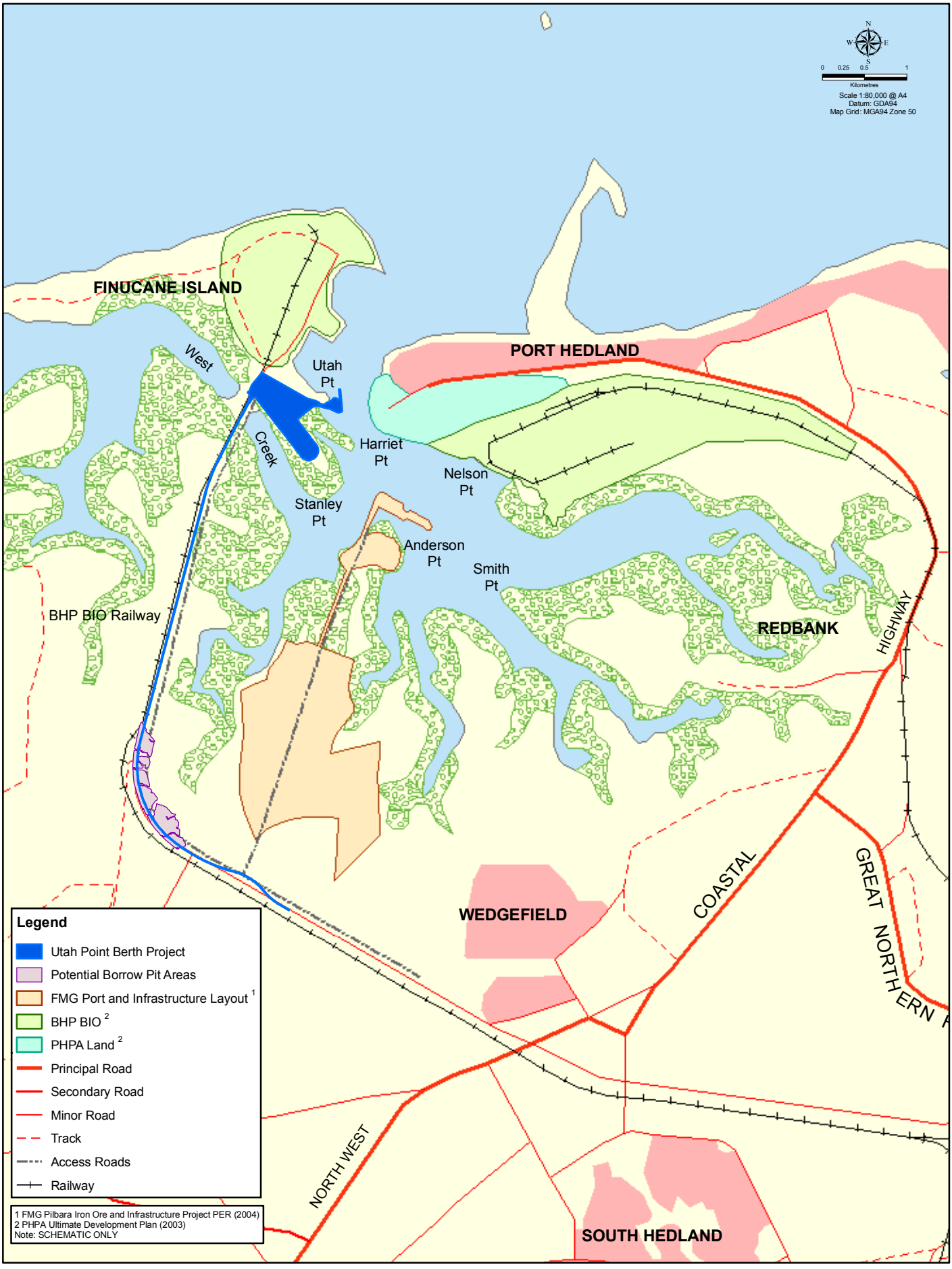
1.2 Development Rationale

PHPA public berths export approximately 5 Mtpa of materials. The capacity of these berths is measured as percentage berth utilisation rather than volume capacity, as some cargo types are quicker to load/unload than others. In general, the maximum capacity of general user berths, such as PHPA public berths, is 75-80% berth utilisation, whereas single cargo berths, such as the BHPBIO berths, can maintain a maximum berth utilisation of approximately 95%.

Within the Port Hedland harbour, PHPA currently operates three berths. Berth No. 1 is used for the export of ore, including manganese, chromite, copper concentrate and general cargo, and is currently operating at approximately 67% berth utilisation. Berth No. 2 is used for the export of general cargo and is operating at full capacity for a mixed cargo berth (77%). Berth No. 3 which is predominantly used for the export of salt, has a ship loader owned and operated by Dampier Salt with subsequent restrictions on cargo loading. General cargo is also handled at Berth No.3 including fuel and oil, acid, container and break bulk cargoes. Berth No. 3 is operating at approximately 49% capacity.

PHPA is in discussion with a number of small companies wishing to export significantly larger volumes of bulk materials in the short to medium term. The addition of an extra 1 Mtpa of iron ore through Berth No. 1 would increase berth utilisation to 90%, which is well above capacity for a mixed berth given the longer equipment cleaning times required between different products. All public berths are therefore operating at or near capacity, and PHPA is under increasing pressure from industry to meet increased export demands. Additional export facilities are therefore required to meet these demands, with a new berth facility at Utah Point identified as the preferred development option (development alternatives are discussed in **Section 3**).

The development of a new berth facility at Utah Point on Finucane Island will handle a variety of ore exports from small scale ('junior') mining companies in the Pilbara in addition to the current export of manganese and chromite ores being handled through Berth No. 1. There will be significant gains to the Port Hedland community through the removal of the manganese and chromite ores currently being hauled through, and handled in close proximity to the town of Port Hedland. Export of these ore through Utah Point is expected to result in a significant reduction in truck movements through the township, with resultant improvements in dust, noise and severance issues. Manganese and chromite dust generated from the ore handling and ship loading activities at Berth No. 1 will be reduced in volume due to an improved purpose built facility at Utah Point, and there is the added benefit of relocating these products away from residential areas.



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Client
Port Hedland Port Authority

Project
Utah Point Berth Project

Drawing Title
Location Plan

Drawing No.
Figure 1-1

Revision No. 3
Date: 15.05.08
Project WV03278

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1.3 Development Timing

Commencement of works for the UPBP is currently scheduled for Q4 2008. Construction is planned to commence as soon as possible after obtaining the necessary approvals including environmental and heritage clearances. Construction will occur in a staged fashion over a 15 month period with the port opened for operation by Q1 2010 (refer to **Section 4.7** for further details).

1.4 Development Proponent

The proponent for the proposed UPBP is PHPA.

PHPA is a statutory authority owned by the Western Australian Government. PHPA has a charter to operate along commercial lines and the primary purpose is to facilitate trade through the port. PHPA is responsible for the management of the Port Hedland port and has a responsibility to plan for and manage new developments whilst protecting the environment of the port and harbour.

The proponent's contact details for the purpose of this proposal are as follows:

Craig Wilson
Environment Manager
PHPA
Email: craig.wilson@phpa.com.au
Phone: (08) 9173 0021

Note that submissions for this PER should not be forwarded directly to the proponent, but should be directed to the EPA as per the invitation at the front of this document.

1.5 Approvals Process

The proposed UPBP development is subject to the requirements of the *Environmental Protection Act 1986*, and requires formal assessment and approval in accordance with Part IV of the Act (Environmental Impact Assessment). The EPA has determined that the proposal is to be assessed at the level of PER.

This document will be released for a public review period of four weeks. During this time, government agencies, private organisations and members of the community are invited to make submissions to the EPA regarding the proposal. The EPA will evaluate the PER document, the submissions received and the proponent's response to these submissions, and will provide recommendations to the Minister for the Environment on the environmental acceptability of the proposal.

Subsequent to the release of the EPA Report and Recommendations, a two week statutory appeal period allows for the proponent and members of the public to appeal the content of the EPA's report. After consideration of the EPA's advice and any appeals received, the Minister may then approve the project subject to a number of Ministerial Conditions. Following Ministerial approval, any other subsequent approvals necessary can be sought to enable the project to proceed.

This PER has been prepared by Sinclair Knight Merz Pty Ltd (SKM) on behalf of PHPA. The key objectives of the PER are to:

- Place the proposal in the context of the local and regional environment;
- Adequately describe all components of the proposal, so that the Minister for the Environment can consider approval of a well-defined project;
- Provide the basis of the proponent's environmental management program, which shows that the environmental impacts resulting from the proposal, including cumulative impact, are minimised and can be acceptably managed;
- Communicate clearly with stakeholders (including the public and government agencies), so that the EPA can obtain informed comment to assist in providing advice to government; and
- Provide a document which clearly sets out the reasons why the proposal should be judged by the EPA and the Minister for the Environment to be environmentally acceptable.

Importantly, the design of the UPBP has followed an iterative process in an effort to 'design out' adverse effects identified in the assessment and 'design in' mitigating measures and minimise environmental impacts to "As Low As Reasonably Practicable" (ALARP).

1.6 Limitations and Assumptions

Factors that could potentially have minor impact on the outcomes of the UPBP PER assessment include:

- Inability to predict and/or control global economic forces and trends which may affect future port operations;
- Inability to predict long-term future users of the UPBP and their export product characteristics given that the UPBP design is intended to provide multi-user capability;
- Limited knowledge about other projects which may arise in the future, including developments by other parties in the area; and
- Limited available knowledge concerning the Department of Health investigation of the health impacts from dust in the Port Hedland community with the results still to be released to the public.

During the preparation of this PER document, a number of assumptions concerning the UPBP development have been made. These assumptions are listed below.

- It is assumed that the Hope Downs Iron Ore Project, which gained environmental approval for a port berth at Harriet Point in November 2002, will not proceed as per the submitted and approved design (refer to **Section 3.5**). Environmental impacts detailed in the Hope Downs PER document have therefore been discounted from the assessment of cumulative impacts for the UPBP.
- With the exception of the Hope Downs Project and the relocation of manganese ore and chromite ore exports from Public Berth No.1 to Utah Point, it is assumed that new and existing operations by other parties in the Port Hedland area will continue and / or proceed as currently approved.
- The area of previously disturbed land immediately south of the lease boundary with BHPBIO may be partially developed by others concurrent with this proposal. The loss of mangroves in the footprint of this area has been included within this PER proposal as a secondary settlement pond will be constructed in this area as part of the UPBP.
- It is assumed other new and existing operations with reduced dust emissions, such as the import and export of container materials and copper concentrate, will continue at Berth 1. In association with the UPBP, it is also assumed that facilities at Berth 1 will be improved, through the construction of a new multi-user concentrate shed and upgrades to the materials handling infrastructure.
- It is assumed that surveys undertaken as part of this PER are realistic to the scope of the UPBP, although they may not be an exhaustive or conclusive account of all parameters studied.

Limitations and assumptions specific to the investigation, analysis and assessment of each of the key environmental topics are discussed separately within each of the relevant sub-sections in **Sections 6** and **7**.

2. Stakeholder Engagement

2.1 Overview of Consultation to Date

This PER document has been prepared to enable stakeholders to gain an understanding of the UPBP including government agencies, private organisations and members of the broader public. This PER document considers alternatives to the UPBP; the rationale for the development to proceed; the local receiving environment; potential impacts on the environment; and, the proposed management and mitigation measures for minimising adverse effects.

In an effort to capture and understand local community interest and concern for the UPBP, stakeholder consultation commenced during the scoping stage.

The focus of community consultation was how best to design, construct and operate the UPBP so that the project benefits could be realised and residual environmental and social impacts would be acceptable. The public participation program was designed to obtain input at key decision making stages of the PER process (**Table 2-1)**.

Table 2-1 Engagement Objectives and Events

Decision Stage	Engagement Objective	Technique & Timing
Confirmation of environmental challenges and of scope of the environmental assessment	Inform stakeholders of the project scope, determine significant issues and preview EIA workplan	Stakeholder briefings in Port Hedland in February 2007
Data collection to model impacts	Involve specialist knowledge-holders to gather input to specialist studies	Interviews and data collection with technical specialists and or government agencies from March 2007 to September 2007
Establishment of impact significance criteria and mitigation priorities	Consult for a critical analysis of significance criteria	Development of a Stakeholder Briefing Note Workshops with community groups 25-27 September 2007 Publicly-advertised Open House drop-in event 20-21 October 2007 Site visits with traditional custodians facilitated through the Pilbara Native Title Service
Finalisation of project design options in response to predicted impacts	Consult to ground-truth the impact predictions and the acceptability of mitigation objectives	
Evaluation of impact mitigation options against objectives	Consult stakeholders to gauge acceptability of high level plans	
Decision: Ministerial Conditions	Consult with decision-makers on the with full range of views on the proposal via the statutory process	Response to be provided to stakeholder comments received during statutory process

Details of consultation undertaken including the specifics of meetings conducted, materials prepared for community meetings and feedback received from community groups, are provided in **Appendix B**.

2.2 Stakeholders and Outcomes

Stakeholders that have participated in the public participation process include:

- DEC including:
  - Pilbara Regional Office (Karratha);
  - Air Quality Management Branch; and
  - Species and Communities Branch;
- Department of Water (DOW) Karratha Regional Office;
- Department of Planning and Infrastructure (DPI);
- Department of Industry and Resources (DoIR);
- EPA Marine Ecosystems Branch EPA Service Unit;
- Department of Indigenous Affairs (DIA);
- MRWA;
- BHPBIO;
- FMG;
- Town of Port Hedland - elected members and administration;
- Kariyarra community together with the Pilbara Native Title Service (PNTS);
- Marapikurrinya community;
- Care for Hedland Environmental Association,
- Wedgefield Association;
- Port Hedland Progress Association;
- Iron Ore Holdings Ltd;
- Consolidated Minerals Ltd;
- Aurox Resources Ltd;
- Ferraus Minerals Ltd;
- Process Minerals International Ltd;
- Atlas Iron Ltd;
- Polaris Metals Ltd; and
- PHPA Operations personnel.

Subsequent to undertaking data modelling and impact assessment, three key consultation events were hosted in August, September and October 2007.

During August 2007, discussions were held with representatives from the Kariyarra community, facilitated by PNTS. These discussions included the presentation of information and materials

regarding the project description, scope and potential impacts, and detailed discussions were held on Aboriginal heritage concerns regarding the proposed development. Subsequent meetings have also been held with the Marapikurrinya people since these initial discussions took place.

During September 2007, specialist contributors to the environmental impact assessment made a three-day visit to Port Hedland to meet with stakeholders. Port Hedland community groups attending these sessions included Care for Hedland Environmental Association, Wedgefield Association, Port Hedland Progress Association, MRWA and Town of Port Hedland. Presentations were structured, yet suitably flexible and tailored to the requests of the audience. Sessions varied in length from 1-3 hours depending on the number and complexity of queries tabled.

During October 2007, community open day information sessions were held over a two-day period in Port Hedland. These information sessions were open to all interested community members. At the open days, information and materials regarding the project, including potential impacts and management measures, were presented in the form of poster displays and video modelling displays. Guests were encouraged to ask questions and raise any concerns with PHPA and SKM project staff in attendance.

Key themes that emerged from the consultation program were:

- A desire to see employment opportunities on the project for Aboriginal people;
- General agreement that the project will improve the ambient dust and noise levels;
- A recognition that more work is required to determine the most appropriate approach and location for mangrove loss offset areas, but a general acceptance that proposed mangrove loss is as low as reasonable practical;
- Concerns about water quality management; and
- Concerns about traffic impacts in the morning peak period and some concerns about congestion and safety impacts.

3. Development Alternatives

3.1 Overview

Prior to the submission of the referral document for this proposal to the EPA, alternative development options were considered by PHPA. These alternatives, summarised below, were not considered as preferred options as they did not adequately address the issues currently facing PHPA. Therefore, the new berth at Utah Point is proposed as the preferred option for development and is consistent with the Ultimate Development Plan for the port area.

3.2 No Development Option

A No-Development Option would mean that there would continue to be no facilities available for new market entrants ("Iron Ore Juniors") to export ore from Port Hedland. This option fails to address increasing pressures on the town of Port Hedland in relation to the impacts from truck movements, dust and loss of amenity resulting from the existing and projected increased throughput over the Port Hedland public berths.

3.3 Upgrade Public User Current Facilities

PHPA commissioned WorleyParsons to investigate possible upgrade and improvement options for the current three public user berths. These options focused on new ship loaders and conveyor systems to improve loading times. In order to increase throughput capacity such an upgrade would require an increase in the speed of the conveyors at Berth 1, resulting in further degradation of the manganese or chromite ores already compromised by the multiple product handling. The stockyard area available to support increased throughput is limited, particularly at Berth 2 and the entire materials handling infrastructure and supply chain would need to be significantly upgraded or replaced with limited real-estate being a significant design impediment (WorleyParsons 2006). Although, the cost of these upgrades was estimated to be less than the cost of the new development, this option was not considered to be viable as the potential for improvement was limited and any capacity gains would soon be overtaken by projected growth.

3.4 Utah Point Development

Two sites on Finucane Island were considered for the development of the stockyard in support of a new berth. The first site, located to the north west of Utah Point (immediately south of lease boundary) has previously been cleared but was considered unsuitable as the area is not large enough to accommodate a 9 Mtpa multi-user facility. Also, this area has been set aside for use by future proponents for exports delivered to the port via means other than trucking, such as via rail or piping, and discussions are in progress to develop part of this area concurrent with the UPBP.

The second site, located on Stanley Point to the south-west of Utah Point, required some clearing of mangroves but was considered more suitable for the proposed development as the site has

sufficient capacity for large stockyard operations, is available for development and aligned well with the overall Ultimate Development Plan (UDP) of the Port Hedland harbour. The Stanley Point site provides design options for flexible expansion for future proponent development.

The proposal to develop a new berth at Utah Point and associated stockyards at Stanley Point is considered the most appropriate option for addressing the future growth in port throughput for Port Hedland. Most importantly, this option also presents the added benefit of reducing the manganese ore and chromite ore dust concentrations in Port Hedland through the relocation of these activities to Utah Point which is both further away from residential areas and in a more favourable orientation to the prevailing wind conditions. The full details of the proposed Utah Point development are outlined in **Section 4**.

3.5 Previously Approved Proposals

In the immediate and surrounding area of Utah Point, there are a number of approved planning developments that have either commenced construction (as in the case of FMG) or have not commenced and are understood to be subject to further negotiations i.e. Hope Downs Iron Ore Project.

The Hope Downs Iron Ore Project gained environmental approval for a berth at Harriet Point in November 2002. The berth proposed for Harriet Point is located immediately south of Utah Point with stockyards on the mainland immediately south of the causeway adjacent to the Finucane Island Road. Environmental approval for the Hope Downs proposal lapsed in November 2007 and due to recent developments in the UDP for the harbour, the project, as approved by the Minister for the Environment in 2002, will not proceed in accordance with Hope Downs previously proposed design.

In a letter to Hope Downs Joint Venture (HDJV) dated 19th June 2007 (refer to **Appendix A**), PHPA, as manager of the Port of Port Hedland advised that it was in the process of allocating the rights to develop berths at Harriet Point to others and access to berths at Harriet Point was no longer available for HDJV.

Subsequent to HDJV's PER approval in 2002, PHPA determined that in the light of the EPA's Guidance Statement 29 related to Benthic Primary Producer Habitat Protection, it was necessary to reconsider the long term port development strategy with a view to optimising operational efficiency and limiting mangrove destruction. The planned removal of 88 ha of mangroves per HDJV PER development plans was deemed excessive and as such alternative berth and stockyard locations have been earmarked to reduce the clearance to more acceptable levels. These areas are subject to further consideration and negotiation with HDJV. Environmental impacts identified as part of the assessment for Hope Downs have not been included in the baseline for the environmental impact assessment for this proposal.

4. Development Description

4.1 PHPA Utah Point Proposal Overview

The UPBP involves the construction of a new berth at Utah Point, Finucane Island, for PHPA. Utah Point is located within the Port Hedland harbour on the eastern shores of Finucane Island (refer to **Figure 1-1**). It is located west of the existing port facilities at Nelson Point and directly opposite the existing public berths managed by PHPA. To the north of Utah Point is the BHPBIO Finucane Island stockpile and port facility (Berth C and D), which is connected to the BHPBIO berths at Nelson Point via a 1.4 km under-harbour tunnel that passes directly beneath the proposed berth at Utah Point. To the south-east of the UPBP site is the proposed FMG stockpile and port berth facility at Anderson Point.

Current plans allow for the export of 9 Mtpa of product from the UPBP facility, delivered to the UPBP site by road trains. The proposal footprint for the UPBP contains the following:

- Dedicated multi-user access road to Finucane Island including causeway widening over West Creek;
- Stockyard area on Stanley Point, Finucane Island;
- Elevated perimeter road around stockyards for right-side road train dumping;
- Seawall around perimeter road to protect from storm surge and high spring tides;
- Workshops, security control room, fuel storage, offices and associated infrastructure;
- Potential borrow pit areas located along the access road;
- Power supply, potable water, dust suppression, fire protection, settlement ponds and miscellaneous services;
- Materials conveying system including transfer towers and sample station;
- Mobile loadout hopper trains on rails over a stockyard central conveyor;
- Travelling Shiploader; and
- Wharf and associated facilities and services.

The characteristics of the proposed development are summarised in **Table 4-1**.

The Utah Point berth is designed to be a multi-user facility, with a combination of manganese, chromite and iron ores to be exported initially, with potential for an increase in the volume of ore to be exported in the future (refer to **Figure 4-1**).

Table 4-1 Summary Table of Project Characteristics

Element	Description
Planned export tonnage	9 Mtpa (delivered via road)
Project life	>30 years
List of major components:	*Access Road:* - 7 km long from FMG's construction access road approx. 50 m offset from BHPBIO's public access road (Finucane Island Rd); - elevated stockyard perimeter road with surrounding sea wall. *Stockyard:* - 9 Mtpa capacity (trucked), base of the stockyard minimum of 9 m CD; - individual stockpile areas located inside the stockyard perimeter road. *Wharf:* - 272 m in length, 21.5 m in width (minimum) and 11.1 m CD deck height sloping gently from the front to the rear of the wharf; - intended to cater for Panamax and small Cape size vessels.
Area of disturbance	Maximum total area to be disturbed is approx. 87 ha including: - access road approx. 35 ha; - stockyard area approx. 19 ha; - wharf development approx. 3 ha; - connecting area wharf to stockyards approx. 4.5 ha; and - potential borrow and spoil areas approx. 25 ha.
Area of mangrove clearance	Total mangrove clearance approx. 18.7 ha (including approx 1.8 ha of closed canopy mangroves).
Power supply	To be negotiated by PHPA from either: - BHPBIO's existing 66 kV power line; or - 22 kV feeder connected to Horizon Power's South West Creek substation).
Water supply	Maximum water supply required (sourced from town's potable water supply): - 0.715 GL per year; - 1,960 kL per day.

- **Figure 4-1 Photomontage of the Proposed UPBP**

4.2 Berth and Wharf

The wharf will be a piled trestle structure designed to accommodate Panamax and small Cape size vessels whilst minimising impacts on tidal movements. It will be approximately 272 m in length and 21.5 m in width. The deck height of the wharf will be 11.1 m CD, with a 0.5 m cross fall to the back of the wharf where there will be a scupper drain to collect all surface water runoff from the wharf.

The berth will accommodate a new 7,500 tph bulk ore shiploader for vessels up to small Cape size (120,000 t). There will be an elevated conveyor at the rear of the wharf to feed the shiploader which will be located on rails towards the front of the wharf. The shiploader will be capable of being fitted with a Cleveland Cascading Chute (or equivalent) for dust suppression and to reduce product degradation.

The berth will be constructed using percussion impact hammered piles of similar size and depth as previously used for PHPA's Berth 1 extension, at BHPBIO's Berth C and for the construction of FMG's Anderson Point Berth. The piles will be driven in using a floating barge and overland construction methods utilising access ramps to the UPBP berth. Precast concrete components comprising of pile caps, tie beams and deck panels will be lifted into position and reinforcement

bars placed in the correct locations. A 250 mm thick concrete slab will then be progressively poured across the wharf.

It is envisaged that there will be a need to bore pile the piles closest to the BHPBIO Nelson Point tunnel crossing to reduce vibration impact to the tunnel. This may generate temporary localized turbidity which will be no greater than that generated during the dredging operation previously carried out. The small volume of remnant earthworks removed will be utilised as base fill material in stockyard area, subject to prior PASS and heavy metal testing.

A preliminary design of the wharf is included in **Appendix C**, with the detailed design of the berth to be based upon this Preliminary Design.

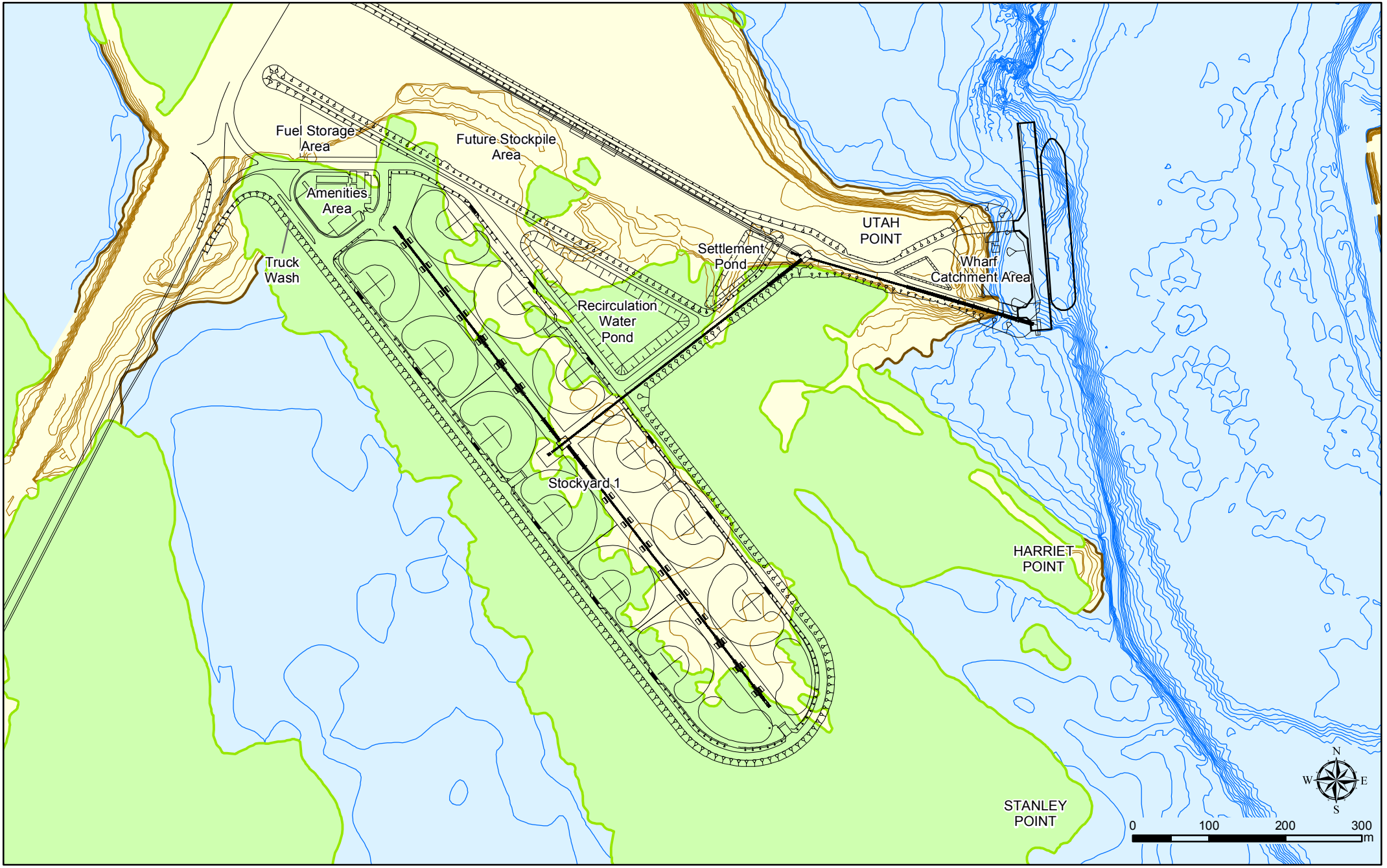
4.3 Stockyards

The stockyard area for the UPBP is located on a limestone ridge that runs along the southern arm of Finucane Island and extends onto the marine muds and associated mangrove habitats at Stanley Point. The development footprint and construction methodology aims to minimise loss of mangroves, and in particular the dense closed canopy mangroves.

The concept layout for the stockyards, which is capable of 9 Mtpa throughput of trucked ore, is shown in **Figure 4-2**. This drawing shows the size and configuration of stockpiles within the stockyard area. This concept layout is the result of consultation with likely users of the facility and shall be the basis of the detailed design of the stockyard with no major modifications to the footprint and concepts permitted without the approval of the Project Manager.

The stockyard facility consists of a 10 m wide elevated perimeter ring road (11.5 m Chart Datum (CD) suitable for quad trailer road trains to unload and to pass one another safely. The ring road is located on top of a 4.5-6.0 m high perimeter embankment earth wall that surrounds a stockyard approximately 1,000 m long by 210 m wide. Road barriers are to be installed to prevent trucks rolling over into the stockyard or over the flexmat concrete sea wall. At 11.5 m CD, the sea walls are unlikely to be breached during cyclone tidal surges even if they occur at high tide. The seawall construction will be managed to minimise mangroves disturbance.

As the stockyards are located within the intertidal zone of the harbour, up to 2.5 m of fill will be placed under the area occupied by the stockpiles which sit at a finished surface level of around 9 m CD. Road trains unload by travelling in a clockwise direction around the perimeter road and right-side dumping into a series of concrete unloading bunkers within the inside stockyard area which is generally 2.5 m lower than the elevation of the perimeter road.



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Project
Utah Point Berth Project

Drawing Title
Design of UPBP Stockyards and Berth

Drawing No.
Figure 4-2

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Mobile radial stackers (luffing and slewing) will typically stockpile the material into 70,000 t kidney shaped stockpiles within defined areas. Up to three front end loaders will load the material onto the overland conveyor for transfer to vessels berthed at Utah Point.

Provision of ore unloading and stockpile stacking infrastructure will be the responsibility of the individual port users who will be free to select and supply the stacking equipment or methodologies suited to their own products and work methods. Stacking methods expected to be adopted range from pick up and stack using front end loaders, to fixed or mobile luffing and slewing stackers fed from fixed or mobile feed hoppers.

A single stevedoring company will manage the common reclaim conveyor system. Three front-end loaders will feed a series of three interconnected mobile hoppers and belt feeders on rails which will supply ore to a conveyor running down the central spine of the stockyard. The overland conveyor will be designed as close to ground level as practical with a concrete apron beneath for collection and control of wash-down material and water for re-cycling. A preliminary design of a suitable hopper is included in **Appendix C**.

4.4 Road Access

It is proposed that a 7 km access road will be located from the end of the existing FMG Anderson Point construction access road to the UPBP stockyards at Stanley Point. The alignment of the access road will be parallel to the BHPBIO Finucane Island access road and railway and lie within a 50 m wide road and services corridor east of the existing overhead power supply line. The road will extend across a widened causeway over West Creek before exiting onto the stockyard area at an intersection that enables a transition across to the BHPBIO Finucane Island Guard House and preserves the access to the public boat ramp to the west on Finucane Island. A second northbound lane will be provided for 800 m prior to the stockyard intersection to enable vehicles to pass road trains queued at the stockyard entrance (refer to **Figure 4-3**).

The access road will be designed to MRWA standard suitable for multi-user vehicles ranging from light vehicles through to quad road trains. It will have two 3.5 m lanes with a 1 m sealed shoulder and 1 m unsealed shoulder for a total width of 11 m. The road will have a two coat seal with localised asphalt surfacing at the intersections. Street lighting will be provided at the intersections at each end of the road (Anderson Point turnoff and stockyard entrance).

It is anticipated that the access road will accommodate all light and heavy vehicles going towards Finucane Island from Wedgefield including BHPBIO and FMG light and heavy vehicle traffic. The existing BHPBIO access road adjacent to the railway will become a BHPBIO private access maintenance road.

4.5 Water Drainage and Recirculation Pond

The wharf area and stockyard areas within the UPBP site will function as contained catchments enclosed by bunding and by the elevated perimeter road surrounding the stockyard. There will be no direct drainage of stormwater or water runoff from these areas into the harbour.

Wharf Catchment Area

The wharf catchment area encompasses an area of approximately 2.8 ha and consists of the wharf concrete deck and approach slabs, back of wharf laydown area and approach roads (refer to **Figure 4-2**). There will be no ore stockpiling within this area and therefore contamination of stormwater runoff from export materials will be restricted to any ore spillage or dust that escapes from the enclosed conveyor systems or shiploader which will be cleaned down between shipments (average every 24-36 hrs). The laydown area behind the wharf will be for limited storage of containerised imports and light vehicle parking and will not be used for bulk materials storage.

Any hydrocarbon spillage that might occur from vehicles using the wharf or approach roads will be contained and cleaned up at the time of spillage as part of an agreed Contamination Management Plan so that it does not present a stormwater contamination risk.

The wharf deck will slope backwards from the front fender line and will be designed to ensure that water does not flow uncontrolled into the harbour by way of bunding and stormwater collection and washdown systems linked with the shiploader and tripper conveyor washdowns.

The wharf catchment will be designed to contain all stormwater runoff from approximately a 35 mm rainfall event, within a lined settlement pond or tank adjacent to the wharf which is capable of holding a minimum 1000 m^3 of run-off. All stormwater flows in excess of the 1000 m^3 (generally associated with a cyclone event) that cannot be contained within the wharf catchment area will be subject to controlled discharge to the harbour.

Importantly, the wharf settlement pond will as a minimum contain all first flush water runoff, which could potentially contain contaminants. Therefore, subsequent runoff which is in excess of the capacity of the wharf settlement pond is unlikely to contain any contaminants. Furthermore, as part of cyclone management practices to be implemented prior to site lock-down, the wharf area will be washed down to be free of any potential contaminants.

Water collected in the wharf settlement pond from surface and stormwater runoff will be able to be re-used for wharf washdown once settled or treated as applicable.

Stockyard Catchment Area

The stockyard catchment area is bounded to the south and east by the elevated perimeter road and embankment; to the north by the lease boundary with BHPBIO; and to the west by BHPBIO's Finucane Island access road.

Within the stockyard catchment area there are 5 major sub-catchments (refer to **Figure 4-2**) which can be characterised as follows:

- **Sub-catchment No.1:** Main Stockyard (18.2 ha) – located on Stanley Point and used for the storage and reclamation of trucked exports (i.e. manganese, chromite and iron ores).
- **Sub-catchment No.2:** Future Stockyard Area (8.5 ha) – containing a settlement pond and located to the north of Stanley Point to allow for future exports, subject to further approvals.
- **Sub-catchment No.3:** Offices and Amenities Area (2.7 ha) – used for the locating of offices and amenities, fixed plant workshop, mobile plant workshop and light vehicle parking. This catchment also contains the Truck Washdown Facility, which is a fully contained system.
- **Sub-catchment No.4:** Fuel Storage Area (0.6 ha) – a fully contained and controlled area for managing fuel storage and distribution.
- **Sub-catchment No.5:** Recirculation Water Pond Area (4.3 ha) – located within the central wedge shaped area that lies between the two stockyards.

In the main stockyard (sub-catchment No.1), there will be 14 discrete micro catchments (of approximately 1.2 ha) for each of the different proponent stockpiles. Each of these micro-catchments will have a forced low point at the toe of the perimeter road embankment where a substantial concrete sump and pump will be located. These sumps will allow for the primary collection and settlement of water runoff collected within each of the discrete stockpile areas.

This design will allow each proponent to manage waste product and/or sediments collected within their sumps, such as to remove contaminated waste off site as part of periodic maintenance or pre-cyclone and post-cyclone clean-up.

During a storm and/or cyclone event, water runoff will initially be collected in each of the discrete micro-catchments up to a level which does not compromise site operations (in a minor rainfall event) and/or site electrics and employee safety (in a major rainfall event). Water will then be preferentially pumped, after undergoing primary settlement in the stockyard, from one or more of the micro-catchments to the recirculation water pond.

The design of the sumps and water pumping system will allow water to be extracted from a height above settlement of particulates so that the majority of sediments are contained within each of the proponent's stockpile areas rather than being pumped to the recirculation water pond.

Sub-catchment 2 (the area set aside for future stockyards) will have a temporary settlement pond constructed at the eastern end of the sub-catchment. This settlement pond will be capable of containing a 1:100 year storm event and will be connected via a pump system to the recirculation pond. Any future development of this site will require the implementation of a stormwater management regime similar to the system adopted for the main stockyard area to ensure that water

is primarily treated by settlement at source and transferred via the settlement pond to the recirculation pond when an acceptable water quality has been achieved.

Recirculation Water Pond

The recirculation water pond will be a lined compacted earth structure located within sub-catchment No. 5 and will have an approximate storage capacity of 50 000 m^3 (based on average 2.5 m pond depth). This volume is approximately equivalent to holding in a single pond all stormwater that occurs across the entire site in a 140 mm rain event, or, with the exclusion of sub-catchment No. 2 (which will feature its own settlement pond to contain all runoff from this sub-catchment as necessary), will hold stormwater runoff from a 210 mm storm event, which is in excess of all stormwater that occurs across the site in a 1:10 year one day storm event (188 mm).

Water held in the recirculation pond will be further settled if required, to enable it to be harvested for re-use in the recirculation water system (for dust suppression, wash-down water and fire suppression water). The recirculation pond and associated water system will be fitted with a filtration system if required to ensure low maintenance operation of pipes, water cannons and valves. If the quality of water in the recirculation pond is not adequate to report to the recirculation water system, water will remain in the recirculation pond and the recirculation water system operated on potable water with the use of recirculated stormwater held back until the water quality is acceptable.

Due to the large volume of water consumed in site operations for dust suppression and washdown (up to 2000 m^3/day), as soon as the stormwater stored in the recirculation pond settles and achieves an acceptable water quality it will be consumed during re-use, by evaporation and in conditioning exported ores. Therefore, with less than 30 rain days per year in Port Hedland, the recirculation pond will be regularly emptied. When the recirculation pond is empty, sediments and waste material can be easily cleaned out as part of periodic maintenance. The recirculation pond will have an impermeable lining and will have a concreted low drainage area capable of being accessed by bob-cat for maintenance.

In extreme rainfall events, greater than a 1:10 year storm event, when the recirculation pond is full and when operations cannot withstand protracted delay caused by ponding of water in the stockyards, a valve will be activated that prevents further water reporting to the recirculation pond. Water will then be pumped to the harbour outfall channel pipe, subject to meeting specified water quality discharge criteria.

FINUCANE ISLAND

West

Utah Point

Harriet Point

Nelson Point

Creek

Creek

Stanley Point

Anderson Point

BHP RAIL

BHPBIO FINUCANE ISLAND ACCESS RD

PROPOSED UPBP ACCESS RD

South West Creek

South Creek

Legend

- Stockyard
- Proposed Access Road
- Principal Road
- Secondary Road
- Minor Road
- BHP Railway
- Potential Borrow Pit Areas

N

W E

S

0 250 500 750 1,000 m

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Project
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Drawing Title
Locality Map of the UPBP Stockyards and Access Road

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Figure 4-3

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In the event that water within the recirculation pond exceeds the 50 000 m^3 capacity of the pond and the water level within the recirculation pond reaches a set freeboard limit (0.5 m below road level), water will automatically be diverted to the harbour outfall pipe. An emergency overflow pipe will also be set 300 mm below road level in the recirculation pond to ensure that in an extreme storm event and/or in the event of failure of the harbour outfall pipe, water can be discharged from the site without threatening the roads and seawall embankment.

Further details on stormwater management and design, including discharge of water to the harbour following extreme rainfall events, are provided in **Sections 7.4** and **7.6**.

Truck Wash Facility

The truck wash facility will contain inbuilt contaminant treatment measures. Contaminated heavy and light vehicles will be required to utilise the automatic truck wash facility prior to exiting the UPBP site. Water runoff from heavy and light vehicle bays will firstly drain into a sump located immediately adjacent to the truck wash facility. Water will then be pumped to a secondary sump in which solid materials will be separated from water runoff and collected in the basin of the sump. Remaining water runoff will then pass through an oil separator tank and into water storage tanks for reuse.

Access Road

Water runoff from the access road will drain to the east and north, as the BHPBIO railway embankment prevents the drainage of water to the west and south. On the eastern and northern sides of the road there will be shallow spoon drains at the toe of the road embankment that will drain water from the road into natural depressions of formed drains. On the western and southern sides of the road, water will drain to shallow spoon drains which at regular intervals will drain under the road through small culverts to the east. These small culverts will also allow water at high tide to traverse under the roadway to ensure that the few mangroves situated between the access road and the BHPBIO road will continue to survive (refer to **Figure 4-3**).

4.6 Services and Facilities

Currently the site is a ‘greenfield’ site with no existing services. Water requirements for the site will be met from the town’s reticulated water supply, supplemented by re-use water harvested from stormwater runoff reporting to the recirculation water pond. Potable water requirements are estimated at 0.715 GL per year when in full operation or an average of 1,960 kL per day. The proposed facilities will improve water efficiency relative to the existing manganese ore and chromite ore operations at Nelson Point (which are planned to be moved over to the new facilities) due to reduced handling of ore and more efficient and automated stockpiling and reclamation processes.

Power will be negotiated by PHPA and will be provided from either:

- BHPBIO's existing 66 kV power line which feeds a termination pole adjacent to the site near the existing BHPBIO gate house; or
- a 22 kV feeder connected to Horizon Power's South West Creek substation.

Other services and infrastructure associated with the project include:

- approximately 1,000 m^3 potable water tank;
- fire suppression system including fire reserve water tanks;
- security boom gate and gatehouse;
- security fencing;
- light vehicle car park;
- road train lay-by area;
- crib rooms and ablutions (at security area and adjacent to wharf);
- offices and meeting rooms (for stevedore and multi-users);
- shed(s) for temporary storage of imports and consumables/spares for each user and the Stevedore;
- control room and associated communication and control systems including CCTV and traffic information control system (TICS);
- ore sample station;
- ships power supply;
- automated vacuum mooring system at wharf;
- fuel storage area;
- maintenance workshop for mobile plant and for fixed plant;
- water treatment and recycling facilities;
- recycled water distribution for dust suppression and conveyor washdown;
- dust suppression water cannons;
- potable water distribution and eye wash facilities; and
- conveyor wash stations and wash water collection systems.

4.7 Preliminary Development Schedule

Preliminary Timeframes for the UPBP are shown in **Table 4-2**.

Table 4-2 Preliminary Timeframes for the UPBP

Task (Design and Construction)	Start	Finish
Berth and Wharf	21/10/08	04/09/09
Shiploader	02/07/09	24/11/09
Materials handling (conveyors)	24/04/09	15/09/09
Services and facilities	03/06/09	26/11/09
Stockyard area	21/10/08	09/04/09
Access Road	21/10/08	14/04/09
Sea Wall	31/12/08	09/04/09
Perimeter road (stockyard)	27/02/09	13/08/09

5. Legislative Framework

5.1 Environmental Legislation

The UPBP is required to comply with existing International Agreements, as well as Commonwealth and State Legislation and Regulations. These are described below.

5.1.1 International Agreements

International environmental agreements to which Australia is a signatory and which are of relevance to the UPBP are listed in **Table 5-1**.

Table 5-1 International Agreements

International Agreements	Agreement Summary	Relevance to UPBP
Convention on the Conservation of Migratory Species of Wild Animals (Bonn Convention) 1979	The Bonn Convention aims to improve the status of all threatened migratory species through national action and international agreements between range states of particular groups of species.	Fauna Assessment and Management Sections 6.4 & 7.5
International Convention for the Prevention of Pollution from Ships (MARPOL Convention) 1973 / 1978	This convention aims to preserve the marine environment through the complete elimination of pollution by oil and other harmful substances and the minimisation of accidental discharge of such substances.	Marine Environmental Management Section 7.6
The China-Australia Migratory Bird Agreement (CAMBA) 1986	This agreement recognises the special international concern for the protection of migratory birds and birds in danger of extinction that migrate between Australia and China.	Fauna Assessment and Management Sections 6.4 & 7.5
The Japan-Australia Migratory Bird Agreement (JAMBA) 1974	This agreement recognises the special international concern for the protection of migratory birds and birds in danger of extinction that migrate between Australia and Japan.	Fauna Assessment and Management Sections 6.4 & 7.5

5.1.2 Commonwealth Legislation

The primary Commonwealth Legislation of relevance to the UPBP is the *Environment Protection and Biodiversity Conservation Act* 1999 *(EPBC Act)*.

The *EPBC Act* is administered by the Commonwealth Minister of Environment, Water, Heritage and the Arts and protects matters of National Environmental Significance including:

- World Heritage properties;
- National Heritage places;
- Ramsar wetlands of international significance;
- Nationally listed threatened species and ecological communities;

- Listed migratory species;
- Commonwealth marine areas; and
- Nuclear actions (including uranium mining).

Based on the assessments completed during the PER process, it was considered that there was a possibility that the construction and operation of the UPBP may constitute a controlled action under the *EPBC Act 1999*, due to the potential impacts on Benthic Primary Producing Habitats (i.e. mangrove habitats). As a result of this and the adoption of the precautionary principle, the UPBP was referred to the Commonwealth Department of Environment, Water, Heritage and the Arts (DEWHA) for consideration in March 2008. In May 2008 it was determined by DEWHA that the UPBP was not a controlled action and, as such, does not require assessment and approval by the Minister for Environment, Heritage and the Arts before it can proceed.

A summary assessment against the *EPBC Act 1999* is included in **Table 5-2**.

Table 5-2 Assessment of the UPBP under the *EPBC Act 1999*

Matter	Comments
World Heritage Areas	The UPBP will not have impacts on any declared World Heritage Properties.
National Heritage Place	The UPBP will not have impacts on any National Heritage place.
Ramsar wetlands	The UPBP is not located in the vicinity of any Ramsar wetlands.
Nationally Threatened Species	Of the ten (10) Nationally Threatened Species that may occur within the UPBP area, only one species, the Pilbara Leaf-nosed Bat (*Rhinonicteris aurantius*) may be impacted. Potential impacts through habitat loss are considered medium to high, as roosting may occur within the mangrove habitat inside the proposed impact area. The area of habitat loss represents approximately 18.7ha which is approximately 0.7% of all mangrove habitats within Port Hedland harbour. Three (3) turtle species may occur in the harbour and tidal creeks surrounding the UPBP. These include the Flatback Turtle (*Natator depressus*), Green Turtle (*Chelonia mydas*) and the Hawksbill Turtle (*Eretmochelys imbricate*). The UPBP is not anticipated to directly impact on the habitat and/or breeding grounds of any of these species.
Migratory Species	Of the nineteen (19) Migratory species that may occur within the UPBP area, three (3) species are likely to be impacted. These include, Little Curlew (*Numenius minutes*), Oriental Plover (*Charadrius veredus*) and Oriental Pratincole (*Glareola maldivarum*). **Little Curlew (*Numenius minutes*)** The Little Curlew's abundance in the Pilbara region is variable. Johnstone and Storr (1998) found it to be scarce south of Port Hedland, however the species has been sighted in the Port Hedland vicinity. The Little Curlew prefers short-grass plains as habitat, including sports grounds and tidal mud flats. The proposed project is unlikely to cause significant loss of intertidal mudflat and grassland habitat for this species. **Oriental Plover (*Charadrius veredus*)** The Oriental Plover has been sighted within 60 km of the proposed project area, typically inhabiting sparsely vegetated plains, beaches and tidal flats. The Oriental Plover is relatively common, and as such, the proposed Utah Point development is unlikely to impact on the conservation status of the species. **Oriental Pratincole (*Glareola maldivarum*)** Large flocks of Oriental Pratincoles have been sighted in the Port Hedland vicinity. The species typically roosts on bare ground beside water and feeds at tidal flats and floodwaters (Johnstone and Storr 1998). The proposed Utah Point development is unlikely to cause significant intertidal mudflat habitat loss for this migratory species.
Commonwealth Marine Areas or Commonwealth land	The UPBP will occur within the 3 nm state boundary however the development of the project has the potential to impact on Commonwealth marine areas through extra shipping traffic and maintenance dredging. Both of these activities already occur at scale at Port Hedland and the proposed development is unlikely to result in any significant increase in these activities.
Nuclear Actions	The proposal is not a nuclear action.

Other relevant Commonwealth Legislation and Guidelines include those listed in **Table 5-3**:

- **Table 5-3 Commonwealth Legislation and Guidelines**

Statute / Regulation	Application	Administrator	Relevance to UPBP
ANZECC Guidelines for Fresh and Marine Water Quality 2000	Outlines water quality guidelines and management framework for natural and semi-natural marine and fresh water resources.	Department of Environment, Water, Heritage and the Arts	Catchment Hydrology and Groundwater Management Section 7.4 Marine Environmental Management Section 7.6
Australian Ballast Water Management Requirements 2001	Regulates the discharge of ballast water in Australian ports and waters.	Australian Quarantine and Inspection Service	Marine Environmental Management Section 7.6
Environment Protection and Biodiversity Conservation Regulations 2000	Regulates the administration and management of matters of national significance.	Department of Environment, Water, Heritage and the Arts	Vegetation, Flora and Fauna Assessment and Management Sections 6.4, 6.5, 7.5 & 7.6
Environment Protection (Sea Dumping) Act 1981	Regulates the dumping of dredge material at sea.	Department of Environment, Water, Heritage and the Arts	Marine Environmental Management Section 7.6
National Strategy for the Management of Coastal Acid Sulfate Soils ANZECC / ARMCANZ 2000	Addresses the management of coastal acid sulfate soils including objectives to identify, avoid disturbance of, mitigate impacts of and rehabilitate acid sulfate soils.	Department of Environment, Water, Heritage and the Arts	Landform, Geology and Soil Management Section 7.3
Quarantine Act 1908	Regulates national quarantine conditions, restrictions and requirements.	Australian Quarantine and Inspection Service	Marine Environmental Management Section 7.6

5.1.3 State Legislation

The key State Legislation for the UPBP is the *Environmental Protection Act 1986*. This Act is administered by the EPA and the Minister for the Environment. The Act provides guidance for the prevention, control and abatement of pollution; for the conservation, protection, enhancement and management of the environment; and for Environmental Impact Assessment.

The Act includes five core principles (that were included as an amendment to the Act in 2003), which the EPA applies when making decisions and providing advice on environmental assessments. These five principles are outlined below.

- The precautionary principle:

Where there are threats of serious or irreversible damage, lack of full scientific certainty should not be used as a reason for postponing measures to prevent environmental degradation. In the application of the precautionary principle, decisions should be guided by:

a) careful evaluation to avoid, where practicable, serious or irreversible damage to the environment; and

b) an assessment of the risk-weighted consequences of various options.

- The principle of intergenerational equity:

The present generation should ensure that the health, diversity and productivity of the environment is maintained or enhanced for the benefit of future generations.

- The principle of the conservation of biological diversity and ecological integrity:

Conservation of biological diversity and ecological integrity should be a fundamental consideration.

- Principles relating to improved valuation, pricing and incentive mechanisms:

a) Environmental factors should be included in the valuation of assets and services.

b) The polluter pays principle — those who generate pollution and waste should bear the cost of containment, avoidance or abatement.

c) The users of goods and services should pay prices based on the full life cycle costs of providing goods and services, including the use of natural resources and assets and the ultimate disposal of any wastes.

d) Environmental goals, having been established, should be pursued in the most cost effective way, by establishing incentive structures, including market mechanisms, which enable those best placed to maximise benefits and/or minimise costs to develop their own solutions and responses to environmental problems.

- The principle of waste minimisation:

All reasonable and practicable measures should be taken to minimise the generation of waste and its discharge into the environment.

Other State Legislation relevant to the UPBP include the Statutes and Regulations listed below in **Table 5-4**:

Table 5-4 State Legislation

Statute / Regulation	Application	Administrator	Relevance to UPBP
Aboriginal Heritage Act 1972	Protects Aboriginal places and objects of cultural and/or spiritual significance from disturbance.	Department of Indigenous Affairs	Heritage Assessment and Management Sections 6.10 & 7.11
Agriculture and Related Resources Protection Act 1976	Provides guidance for the management and control of plant and animal pests. It prohibits and/or regulates the introduction, spread and keeping of certain plants and animals	Agriculture Protection Board of Western Australia	Vegetation, Flora and Fauna Management Sections 7.5 & 7.6
Bush Fires Act 1954	Manages fire safety including prevention, control and extinguishment of bush fires.	Fire and Emergency Services Authority of Western Australia.	Vegetation, Flora and Fauna Management Section 7.5
Clean Air (Determination of Air Impurities in Gases Discharged to the Atmosphere) Regulations 1983	Outlines standard concentrations of gases and solid particles. Outlines regulations for the assessment of gases, solid particles and dark smoke discharged to the atmosphere.	Department of Environment and Conservation	Air quality Assessment and Management Sections 6.6 & 7.7
Conservation and Land Management Act 1984	Regulates the use, protection and management of nature reserves, state forest, and marine parks including the flora and fauna within these areas.	Department of Environment and Conservation	Vegetation, Flora and Fauna Management Sections 7.5 & 7.6
Contaminated Sites Act 2003	Regulates the identification, recording, management and remediation of contaminated sites.	Department of Environment and Conservation	Existing and/or Marine Environmental Management Section 7.6
Environmental Protection Regulations 1987	Provides guidance on the control of pollution and monitoring. Regulates landfill levies, penalties and infringements.	Department of Environment and Conservation	Environmental Impact Assessment and Management Sections 6 and 7
Environmental Protection (Clearing of Native Vegetation) Regulations 2004	Provides procedures and protocols for clearing native vegetation for mining, for infrastructure maintenance and within existing transport corridors.	Department of Environment and Conservation	Vegetation, Flora and Fauna Management Sections 7.5 & 7.6
Environmental Protection (Controlled Waste) Regulations 2004	Provides procedures and protocols for the generation, transport and disposal of 'controlled	Department of Environment and Conservation	Catchment Hydrology and Groundwater Management Section 7.4

Statute / Regulation	Application	Administrator	Relevance to UPBP
	waste'.		Marine Environmental Management Section 7.6
Environmental Protection (Noise) Regulations 1997	Provides guidance on noise limits and methods for noise assessment and control.	Department of Environment and Conservation	Noise Assessment and Management Sections 6.7 & 7.8
Heritage of Western Australia Act 1990	Provides for the conservation of places which are of significance to the cultural heritage of the State and for the establishment of the Heritage Council of Western Australia.	Heritage Council of Western Australia	Heritage Assessment and Management Sections 6.10 & 7.11
Marine and Harbours Act 1981	Provides guidelines for efficient and safe shipping and for the provision of facilities and services in ports and harbours.	Department for Planning and Infrastructure	Marine Environmental Management Section 7.6
Native Title (State Provisions) Act 1999	Provides alternative provisions to the *Commonwealth Native Title Act 1993*.	Department of Treasury and Finance	Heritage Assessment and Management Sections 6.10 & 7.11
Pollution of Waters by Oil and Noxious Substances Act 1987	Provides guidance on the preservation of the environment in general and the marine environment in particular, from release of oil and other harmful substances from ships.	Department for Planning and Infrastructure	Marine Environmental Management Section 7.6
Port Authorities Act 1999	Provides guidance on port authorities including their functions, how they operate and the areas that they control and manage.	Department for Planning and Infrastructure	Marine Environmental Management Section 7.6
Port Authorities Regulations 2001	Regulates port operations including vessels in ports, pilotage, goods and cargo, vehicles and the conduct of persons in ports. Provides provisions specific to each of the port authorities.	Department for Planning and Infrastructure	Marine Environmental Management Section 7.6
Ports and Harbours Regulations 1966	Regulates port operations including signalling, vessel length, anchorage, fire prevention and standards of health.	Department for Planning and Infrastructure	Marine Environmental Management Section 7.6
Shipping and Pilotage Act 1967	Provides guidance on shipping and pilotage in ports, fishing boat	Department for Planning and Infrastructure	Marine Environmental Management Section 7.6

Statute / Regulation	Application	Administrator	Relevance to UPBP
	harbours and mooring control areas.		
Soil and Land Conservation Act 1945	Provides guidance on the conservation of soil and land resources including mitigation of the effects of erosion, salinity and flooding. Prevents disturbance to soil without authority.	Department of Agriculture and Food	Landform, Geology and Soil Management Section 7.3
Soil and Land Conservation Regulations 1992	Regulates the draining or pumping of water from land, primarily due to salinity.	Commissioner of Soils and Land Conservation	Landform, Geology and Soil Management Section 7.3 Catchment Hydrology and Groundwater Management Section 7.4.
Waterways Conservation Act 1976	Provides guidance on the conservation and management of water and the associated land and environment.	Department of Water	Catchment Hydrology and Groundwater Management Section 7.4 Marine Environmental Management Section 7.6
Western Australian Marine Act 1982	Provides guidance for the conservation of marine waters and the associated land and environment.	Department for Planning and Infrastructure	Catchment Hydrology and Groundwater Management Section 7.4 Marine Environmental Management Section 7.6
Wildlife Conservation Act 1950	Provides for the conservation and protection of native, rare and endangered flora and fauna.	Department of Environment and Conservation	Vegetation, Flora and Fauna Management Sections 7.5 & 7.6

5.2 State Policies

There are several existing State and Local Government policies, strategies and plans that are applicable to the UPBP.

5.2.1 State Planning and Development Control Policies

The Western Australian Planning Commission (WAPC) has a number of State Planning Policies (SPPs) (formerly Statement of Planning Policies), that serve to guide decision-making on land use and development in Western Australia. SPPs relevant to the Utah Point Berth Project include *SPP No. 2.0 Environment and Natural Resources Policy* (WAPC 2003_c); *SPP No 2.6 State Coastal Planning Policy* (WAPC 2003_d); and *SPP No 4.1 State Industrial Buffer Policy* (WAPC 1997).

PHPA will comply with the policies, planning and management guidelines implicit in each of these SPP's, with the exception of the requirement of physical setbacks outlined in SPP No. 2.6 as under Schedule One G(c) of this SPP the UPBP is an industrial development which is dependent on a foreshore location.

The WAPC also has a range of Development Control (DC) Policies that serve as operational guidelines for the development of land. DC Policies relevant to the Utah Point Project include *DC No 4.2 Planning for Hazards and Safety* (WAPC 1991) and *DC No 6.1 Country Coastal Planning Policy* (WAPC 1989).

5.2.2 Other State Policies and Strategies

Other applicable State policies and strategies include the *Coastal Protection Policy for Western Australia* (DPI 2006); the *Coastal Zone Management Policy for Western Australia (Draft)* (WAPC 2001); the *State Water Quality Management Strategy No.6 (SWQ 6)* (DOE 2004_b); and, the *Pilbara Coastal Water Quality Consultation Outcomes: Environmental Values and Environmental Quality Objectives* (DOE 2006_b).

Notably, the *State Water Quality Management Strategy No.6 (SWQ 6)* (DOE 2004_b) outlines the framework for Western Australia for fresh and marine water quality and water quality monitoring and reporting. The framework requires that all significant resources in Western Australia are spatially defined on a priority basis and that environmental values (EVs) are developed for each of these resources. For each EV, there are environmental quality objectives (EQOs) and subsequent environmental quality criteria (EQC). EQC may include environmental quality guidelines (EQGs) and environmental quality standards (EQSs). Where insufficient local information is available, the Australian and New Zealand Guidelines for Fresh and Marine Water Quality (ANZECC 2000) maybe used as default EQGs.

As an outcome of the *State Water Quality Management Strategy No.6 (SWQ 6),* the *Pilbara Coastal Water Quality Consultation Outcomes: Environmental Values and Environmental Quality Objectives* (DOE 2006_b) defines five key EVs including ecosystem health; recreation and aesthetics; cultural and spiritual; fishing and aquaculture; and, industrial water supply. EQOs are detailed for each of these EVs and interim EQGs are provided on levels of ecological protection (LEP) (low, moderate, high and maximum). For various areas along the Pilbara coastline these levels of ecological protection are mapped, incorporating feedback received from community residents and stakeholders. For the Port Hedland area levels of ecological protection are moderate to high surrounding the port area, with a moderate level of ecological protection required in close proximity to Utah Point (DOE 2006_b) (refer to **Figure 5-1**). Importantly, the EPA endorses the EVs, EQOs and LEP identified by the *Pilbara Coastal Water Quality Consultation Outcomes* as a guide to Environmental Impact Assessment (EIA) and natural resource management.

5.3 Port Hedland Plans

Port Hedland Plans that are applicable to the UPBP include the *Town of Port Hedland Town Planning Scheme No. 5* (ToPH 2001); the *2004-2009 Port Hedland Coastal Management Plan (Draft)* (Ecoscape 2004); the *2007-2012 Port Hedland Strategic Plan (Draft)* (ToPH 2007_a); and the *Port Hedland Land Use Master Plan (Draft)* (ToPH 2007_b).

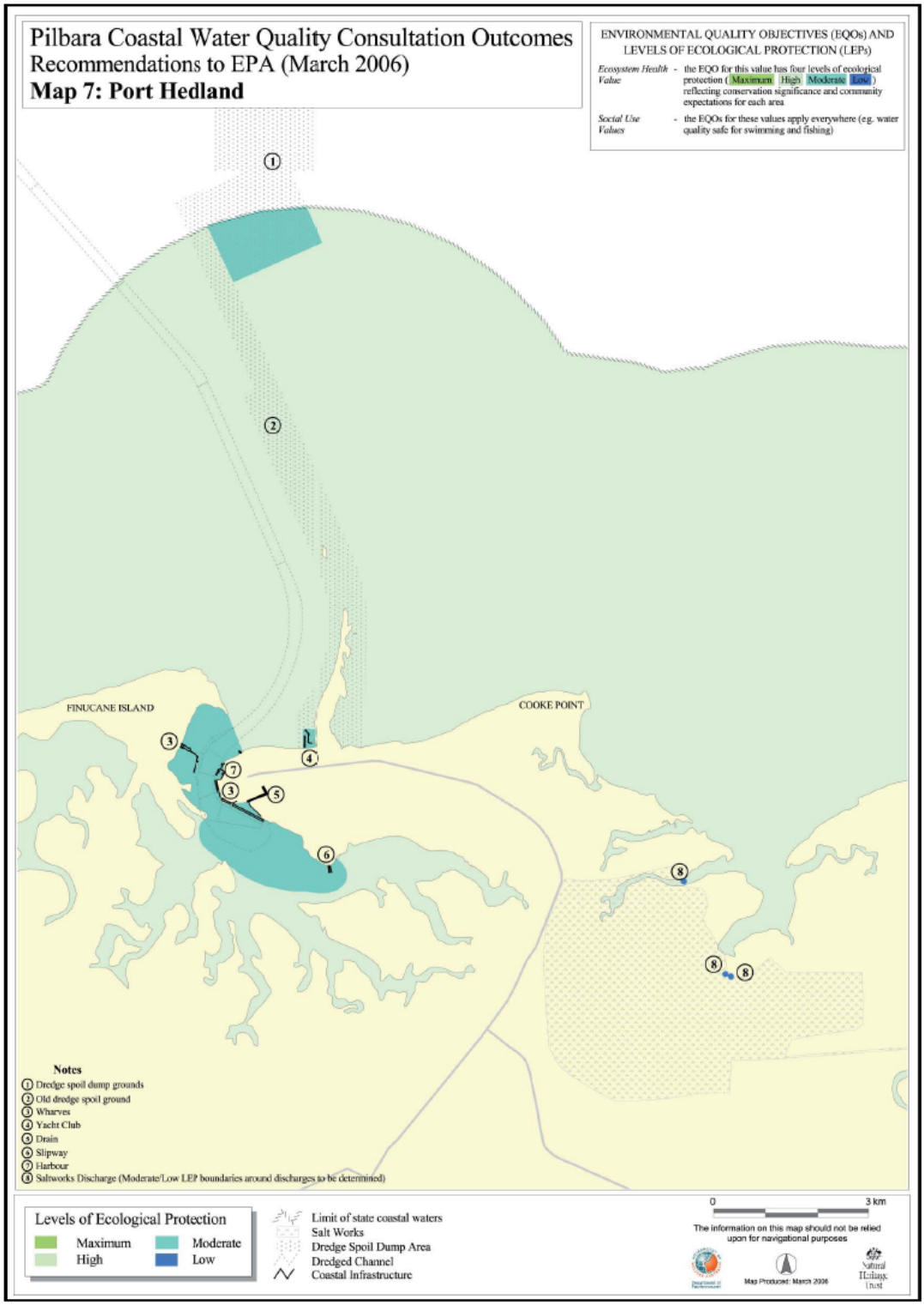
Notably, the *Port Hedland Land Use Master Plan (Draft)* (ToPH 2007_b) was developed by the Town of Port Hedland as a guide to the growth and development of Port Hedland through the next 20-25 years. It defines the community's long range vision of how the town should develop and will be incorporated into future statutory regulations controlling the location and forms of future development. The *Land Use Master Plan (Draft)* outlines key recommendations for the future land use and development of infrastructure and industry within the districts of South Hedland; Wedgefield; Redbank; West End; Cemetery Beach; Cooke Point; Pretty Pool and in the Port Hedland region in general.

5.4 Port Hedland Port Authority Plans

PHPA has two plans that are applicable to the Utah Point Berth Project. These plans are the *Port Hedland Port Authority Ultimate Development Strategy* (WorleyParsons 2003) and the *Port Hedland Port Authority Environmental Management Plan* (PHPA 2007).

The *Port Hedland Port Authority Ultimate Development Plan* (UDP) (WorleyParsons 2003) provides an overview of the rationale for the future port developments and operations. The UDP outlines areas that are potentially available for development in the PHPA lease boundary and gives an overview of potential future development models for PHPA and other parties, including BHPBIO, FMG and Hope Downs. The *Ultimate Development* Plan is currently being reviewed in parallel to this PER and will take into consideration recent commercial developments.

The *Port Hedland Port Authority Environmental Management Plan (PHPA EMP)* is released on an annual basis to address environmental management of the port area. The *PHPA Environmental Management Plan 2007* (PHPA 2007) identifies 5 key environmental management areas. These environmental management areas are generally related to activities within the confines of the existing port and including soil and groundwater; emissions management; coastal habitat values; waste management; and, energy and resource use. For each of these key management areas an environmental action plan has been developed to maintain and improve environmental management, including key performance indicators, monitoring, reporting and mitigation measures.



- **Figure 5-1 Levels of Ecological Protection defined for the Port Hedland Harbour (DOE 2006$_b$)**

6. Existing Environment

6.1 Overview

The immediate and surrounding environs of Port Hedland have been traditionally occupied by Aboriginal people for many thousands of years. The original inhabitants, the Kariyarra people, refer to Port Hedland as Marapikurrinya which reflects the hand shaped formation of the tidal creeks coming off the natural harbour (ToPH 2007$_b$).

In late 1896, Port Hedland was first gazetted as a townsite functioning as a service centre for the pastoral, gold mining and pearling industries. In the 1960s Port Hedland experienced major growth, as a direct result of the emerging iron ore industry. In 1966, growing pressure on the Port Hedland township saw the development and establishment of South Hedland located 14 km south of Port Hedland.

Port Hedland is now one of the largest iron ore shipping ports in the world and is home to a large-scale solar salt operation. In addition to iron ore, the port exports minerals such as manganese ore, copper concentrate and chromite ore sourced from the east Pilbara region. Live cattle export has also recently emerged as a growing export industry in the town. The Town of Port Hedland now supports a population of approximately 13,500 people with a combination of residential, commercial, administrative and industrial facilities, including the port operations (ToPH 2006).

Port Hedland is considered to be at a critical stage of development with the current resources boom in the State expected to stimulate further growth in the Pilbara region, which is likely to be accompanied by an increase in exports through the port of Port Hedland. Industrial activities at the port are vital to the prosperity of the town, though it is recognised that effective management is required to ensure that all future and existing land use planning issues within Port Hedland are given consideration.

Further details on the social setting of the regional area are provided in **Section 6.9**.

6.1.1 Climate

The Pilbara region, which encompasses the Port Hedland area, is classified as sub-tropical, becoming more arid inland (BOM 2008). Peak rainfall occurs in the summer months between January and March with a smaller peak in May and June, generally as a result of cold fronts moving across the south of the State, which occasionally extend into the Pilbara (BOM 2008).

Meteorological data (including temperature, humidity, evaporation, rainfall and wind speed) has been recorded by BOM since 1942 at the regional Port Hedland meteorological station. A summary for the period 1942–2008 is presented in **Table 6-1**.

- **Table 6-1 Summary of Climate Averages for Port Hedland (Station 4032) 1942 - 2008**

Month	Temperature* (°C)		Relative Humidity (%)		Mean Daily Evaporation (mm)**	Mean Monthly Rainfall (mm)	Wind Speed (km/hr)	
	Mean Daily Maximum	Mean Daily Minimum	9 am Mean	3 pm Mean			9 am Mean	3 pm Mean
Jan	36.4	25.5	56	51	10.5	58.3	14.5	25.5
Feb	36.2	25.4	59	53	9.6	94.3	14.3	23.4
Mar	36.8	24.5	50	45	9.3	48.3	15.1	21.4
Apr	35.2	21.3	41	37	8.7	23.7	16.8	19.5
May	30.6	17.3	41	36	7.4	28.0	19.6	18.1
Jun	27.5	14.1	43	35	6.4	21.4	20.6	17.6
Jul	27.1	12.3	40	32	6.6	10.8	20.6	18.5
Aug	29.1	13.1	36	31	7.4	5.2	19.9	19.9
Sept	32.2	15.3	33	31	8.9	1.2	18.2	22.2
Oct	32.2	18.3	33	35	10.6	0.9	17.8	25.2
Nov	36.2	21.3	37	39	11.4	2.6	15.8	26.4
Dec	36.6	24.0	46	45	11.4	18.3	15.0	26.7
Annual[1]	33.2	19.4	43	39	9.0	26.1	17.4	22.0

Note 1: Approximation based upon mean daily values within each monthly period

** Temperature averages from 1948-2008*

*** Evaporation averages from 1967-2008*

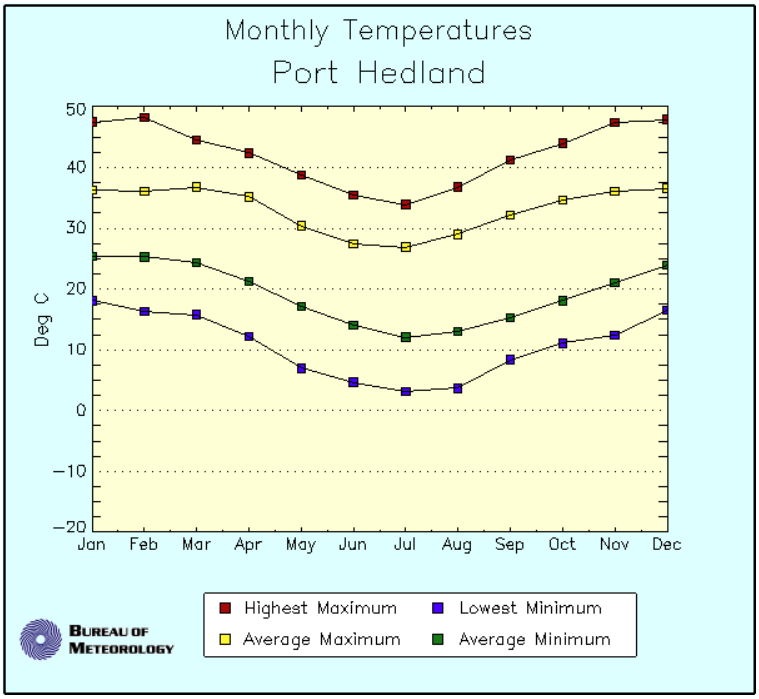
Source: Bureau of Meteorology 2008

Temperature

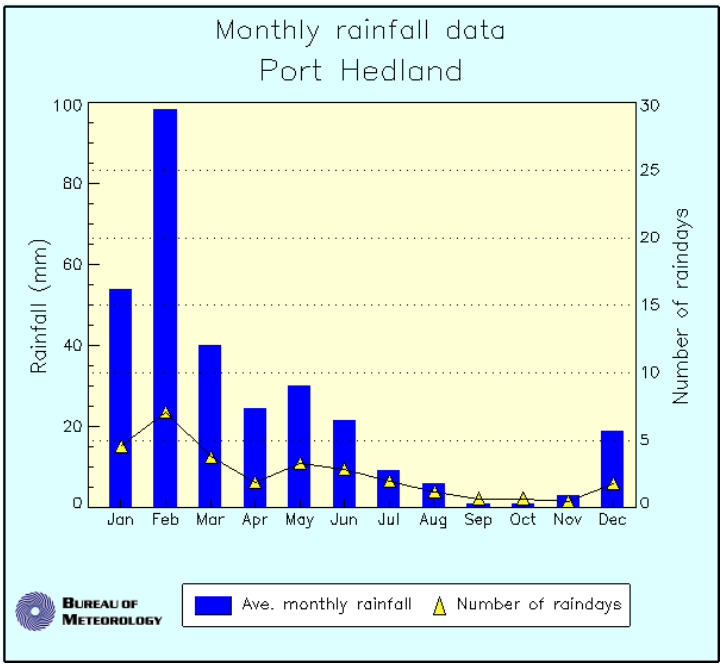
Temperatures in the summer months are very high (maxima often exceeds 40°C, minima around 25°C), especially in inland areas. Some relief is provided by light sea breezes in the summer. Winters are generally milder with average temperatures ranging from a 13°C minima to a 28°C maxima (**Figure 6-1**). Frost does not normally affect the coastal areas but following strong cold fronts some susceptible inland locations may experience light frosts.

Rainfall

Average annual rainfall for the Pilbara varies between 250–400 mm, with many years reporting no significant rainfall events (BOM 2008). The majority of rain falls during the summer months and is generally associated with scattered thunderstorms and tropical cyclones. The Pilbara region receives an average of 20-30 thunderstorms per annum, with an average of 15-20 thunderstorms occurring near the coast (BOM 2008). These thunderstorms and tropical cyclones can cause tidal surges which can be of concern in a region, such as Port Hedland, characterised by a flat low lying coastal plain due to the potential for localised flooding to occur (ToPH 2007_b) (**Figure 6-2**).



- **Figure 6-1 Monthly Temperature Data for Port Hedland (Station 4032)**



- **Figure 6-2 Monthly Rainfall Data for Port Hedland (Station 4032)**

Winds

Winds at Port Hedland vary in direction and strength from season to season with the windiest conditions generally experienced in summer followed by winter, spring and autumn (refer to **Figure 6-3** and **Figure 6-4)**.

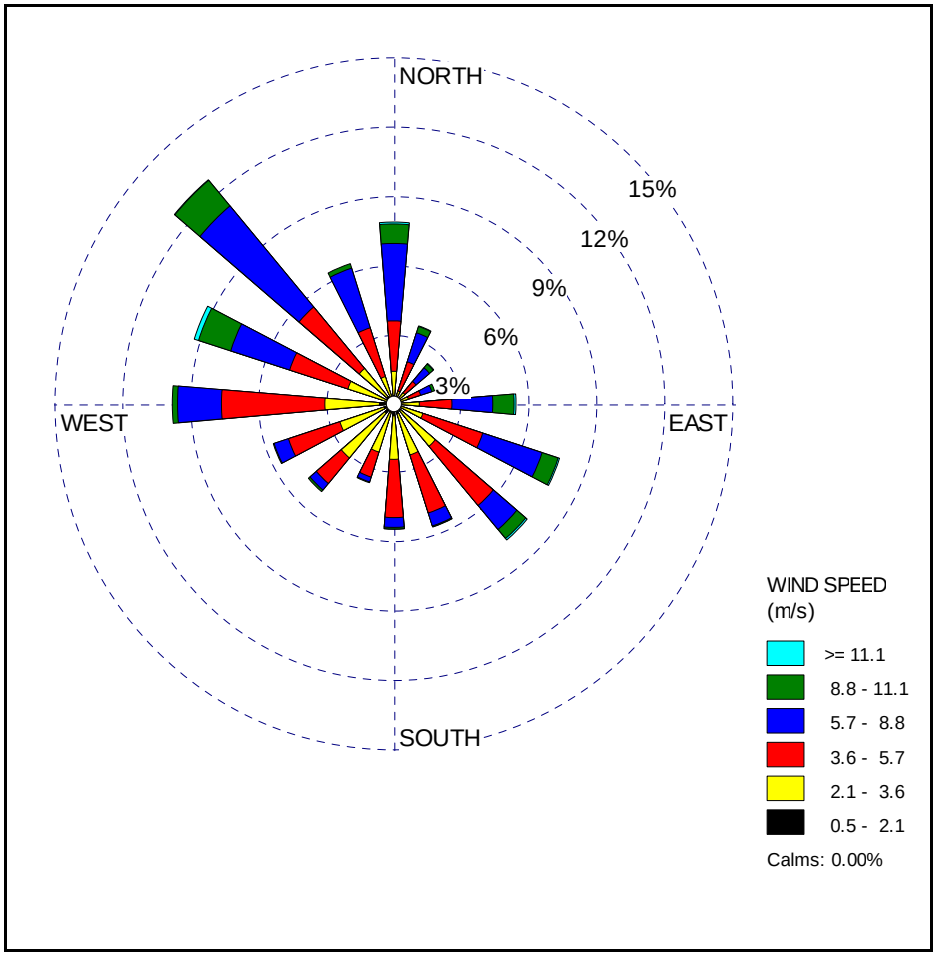
In summer, spring and for most parts of autumn, west and north-westerly winds dominate. In general, westerly winds are dominant in the morning, shifting to north-westerly in the afternoon. Average wind speeds vary from 14 km/hr and 29 km/hr, respectively, with an increase in speed from morning to afternoon (BOM 2008).

In winter, east to south-easterly winds are dominant in the mornings and shift to north-easterlies in the afternoon before easing in the evening in response to diurnal land temperature changes. Average wind speeds generally range from approximately 16 km/hr to 25 km/hr, however, wind gusts from these directions can exceed 78 km/hr during storms. These high speed wind gusts are generated by the interaction of high pressure belts and northern tropical low pressure systems (BOM 2008).

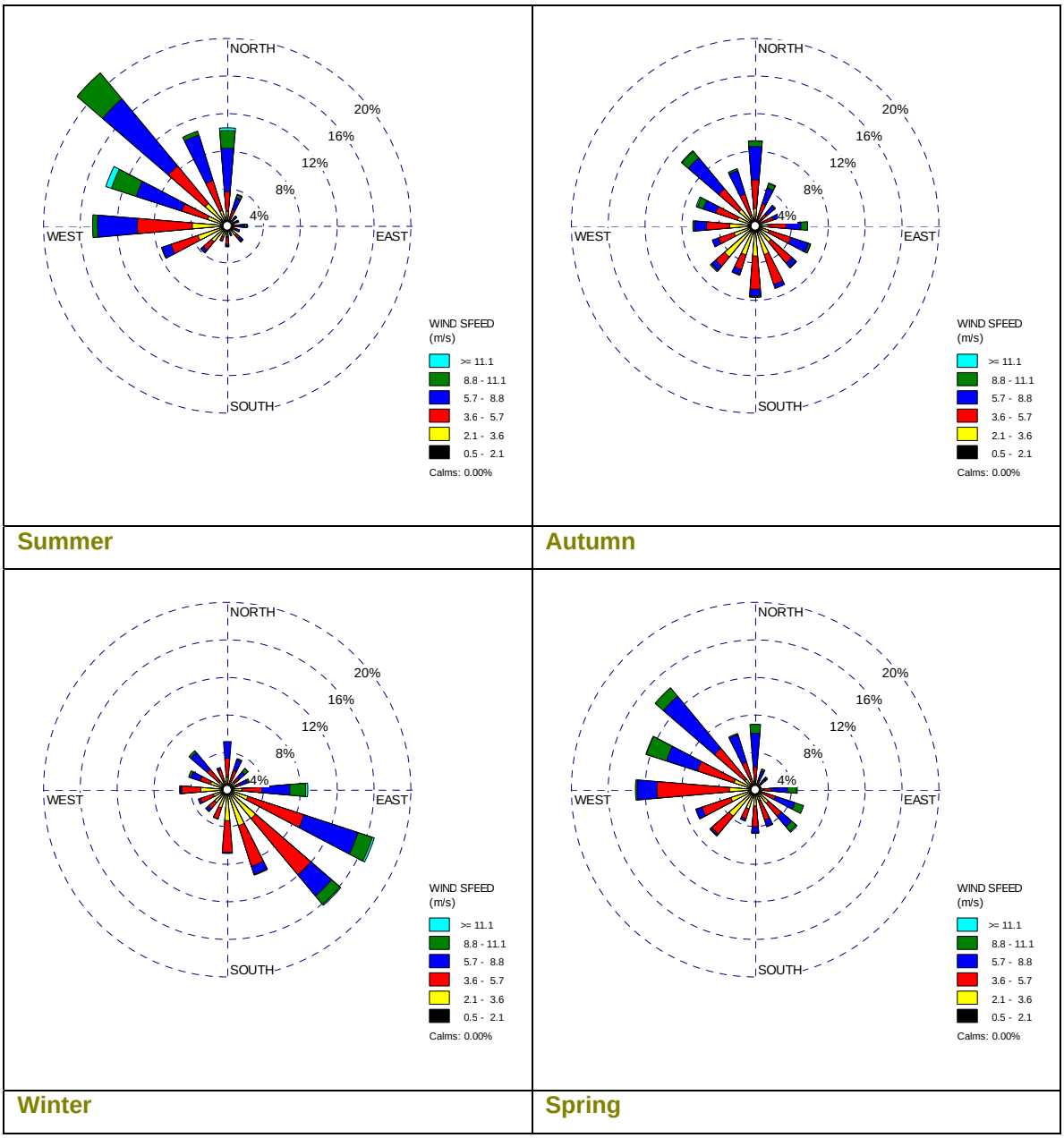
Tropical Cyclones

The coast from Port Hedland to Exmouth Gulf is considered the most cyclone prone area in Australia (BOM 2008). In general, the cyclone season lasts from 1st November to 30th April, although tropical cyclones do occur outside of this window. These cyclones normally develop over ocean waters to the north of Australia and follow a south-westerly course parallel to the northwest-Australian coastline. Two thirds of these cyclones then change direction and head southeast, crossing the coast and moving inland, bringing heavy rainfall.

These tropical cyclones can be very intense with recorded wind speeds of in excess of 250 km/hr and central pressures as low as 905 mb. Significantly, in the last 30 years Port Hedland has been severely impacted by several tropical cyclones with one of the most damaging being Cyclone Joan in December 1975 causing damage estimated at $20 million (BOM 2008).



- **Figure 6-3 Annual Wind Rose for Port Hedland Airport for the Year 2004/05**



- **Figure 6-4 Seasonal Wind Roses for Port Hedland Airport for the Year 2004/05**

6.1.2 Previous Surveys

In the immediate and surrounding area of UPBP there are a number of approved planning developments that have either commenced construction and/or operations, as in the case of FMG, or have not commenced and are understood to be subject to further negotiations (i.e. Hope Downs Iron Ore Project) (refer to **Section 3.5**).

Environmental approvals associated with these development proposals required detailed biological surveys of the immediate and surrounding environs of Finucane Island (including Utah and Stanley Points). A number of these studies were undertaken recently and are relevant to the UPBP. These include:

- Hope Downs to Port Hedland Rail Vertebrate Fauna Survey (Biota 2001_a);
- An Assessment of the Distribution of the Mulgara *Dasycercus cristicauda* and Bilby *Macrotis lagotis* along and adjacent to the proposed Hope Downs to Port Hedland Rail Corridor (Biota 2001_b);
- Hope Downs Rail Corridor, Port Hedland to Weeli Wolli Creek Vegetation and Flora Survey (Biota & Trudgen 2002)
- Proposed Hope Downs Rail Corridor from Weeli Wolli Siding to Port Hedland Vertebrate Fauna Survey (Biota 2002_a);
- Hope Downs Rail Corridor Mulgara *Dasycercus cristicauda* and Bilby *Macrotis lagotis* Surveys (Biota 2002_b);
- Vegetation and Flora Survey of the Proposed FMG Stage A Rail Corridor (Biota 2004_a);
- Fauna Habitats and Fauna Assemblage of the Proposed FMG Stage A Rail Corridor (Biota 2004_b); and
- Port Hedland Solar Saltfield Expansion Fauna Survey (Biota 2006).

6.1.3 Current Studies and Surveys

Notwithstanding the relevance of existing documentation and previous surveys to the UPBP, additional surveys were identified and commissioned to ground-truth and target site specific terrestrial ecology and indigenous heritage within the study area. All studies and field surveys used employed approved methodologies and approaches to satisfy EPA regulatory requirements and guidelines. The key studies undertaken included:

- Aboriginal Heritage – site survey by Kariyarra people to assess the site for Aboriginal heritage value, facilitated by the Marapikurrinya Pty Ltd (to be completed);
- Air Quality – detailed modelling for a range of scenarios including current impacts, impacts from the proposed development and cumulative impacts;

- Geotechnical Investigation – site survey and soil sampling to assess soil geotechnical conditions and identify if acid sulfate soils were present at the site;
- Mangroves – utilisation of existing survey data and site visit to re-assess mangrove health, condition and significance;
- Marine Water – dispersion modelling for proposed stormwater discharge;
- Noise – detailed modelling to assess potential noise impacts attributed to the operation of the proposed development including noise attributed to traffic;
- Preliminary Site Investigation – site visit and review of existing data to document past, present and future land uses on the site which may result in site contamination, including ore leachability studies;
- Soil and Groundwater Sampling – undertaken in parallel with the PER and ongoing during construction and operations;
- Terrestrial Fauna – utilisation of existing survey data and site visit to confirm the occurrence and extent of fauna habitat;
- Terrestrial Flora and Vegetation – review of previous studies and baseline surveys to re-assess vegetation health, condition and presence of declared rare and priority flora;
- Traffic Assessment – undertaken in parallel with the PER; and
- Turtle Assessment – review of turtle species and habitats within the Port Hedland area and assessment of potential impacts of the UPBP on turtles.

A number of desktop studies were also undertaken, including:

- Ecotoxicological effects of manganese and chromite ores;
- European heritage;
- Hydrology and hydrogeology;
- Landforms and soils;
- Marine flora and fauna;
- Marine water quality;
- Recreational activity;
- Risk and safety;
- Social impacts;
- Visual amenity; and
- Waste management.

6.1.4 Land Tenure

A review of available historical aerial photography (1971, 1976, 1977, 1979, 1985, 1993, 2004 and 2005) suggests that the site proposed for the UPBP is relatively unaltered from its natural state. The stockyard area generally consists of a central calcarenite area surrounded by mangroves to the east, south and west. The central calcarenite area is limestone sparsely covered in shrubs. The only structures observed at the site were three beacon towers and remnants of a fence in the central calcarenite area.

Land upon which the berth stockyard and access road are to be located lies within the PHPA boundary and has been vested with PHPA since 2003 (**Figure 6-5**). Copies of the certificates supplied by Landgate, for the UPBP study area, show that the area holds a certificate of Crown Land Title, dated 29 April 2003 (as documented in volume LR3118, folio 753 of the Western Australian Office of Titles). The Crown Land Title specifies the UPBP site is identified as Forrest Location 370 on Land Administration Diagram 35619 and includes a vesting order for the site directing that the land be vested in and held by the PHPA (refer to **Appendix H** for further details).

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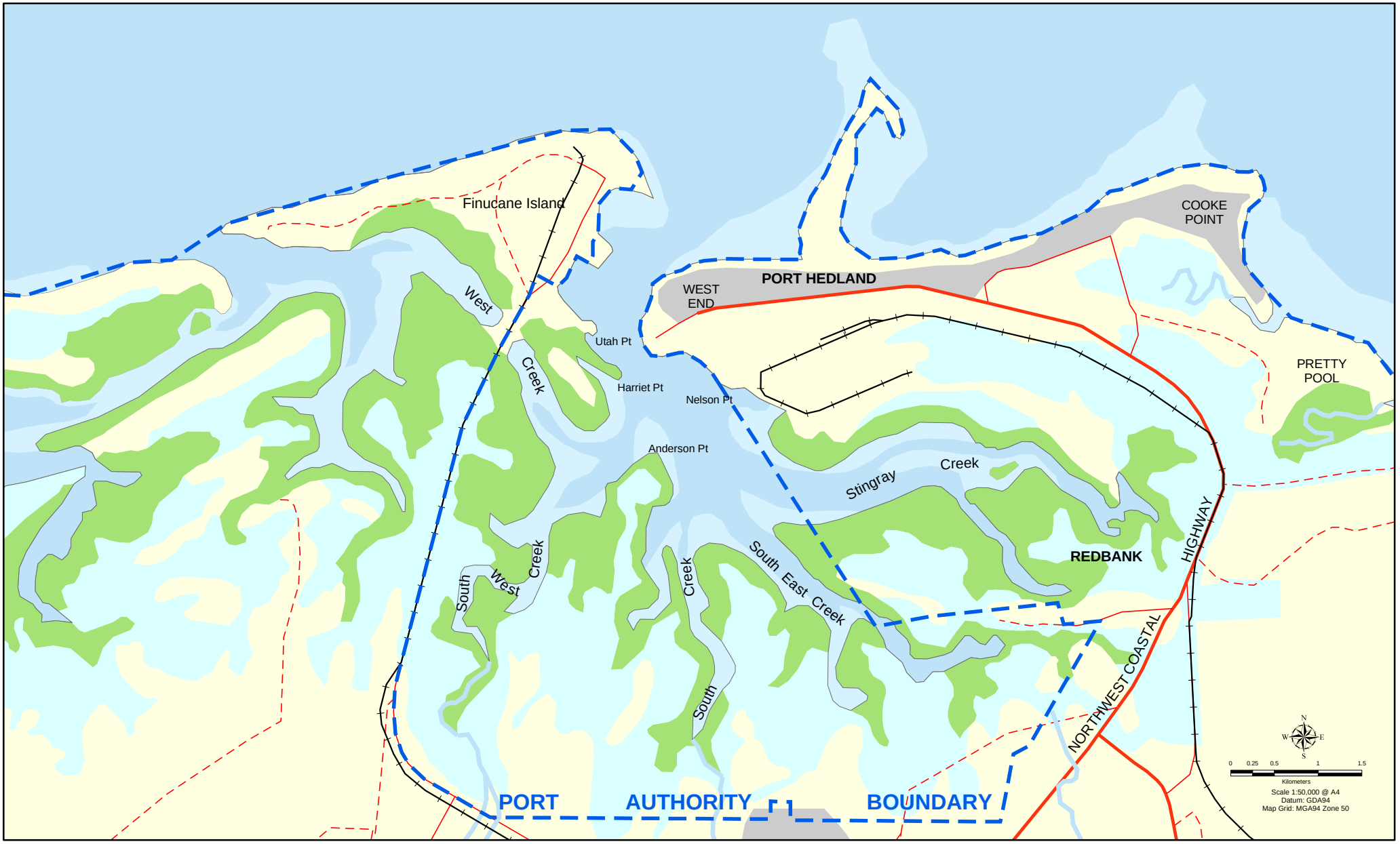

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Client
Port Hedland Port Authority

Project
Utah Point Berth Project

Drawing Title
Port Hedland Port Authority Boundary

Drawing No.
Figure 6-5

Revision No. A
Date: 18.07.07
Project WV03278

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6.2 Landform, Geology and Soils

6.2.1 Physiographic Unit

The Fortescue Province occupies approximately 160,050 km^2 (6.3% of Western Australia) and is located in the northern Pilbara. Included in this province are the towns of Port Hedland, Karratha, Dampier, Roebourne, Newman, Tom Price, Paraburdoo, Pannawonica, Marble Bar, Nullagine and Jigalong (Department of Agriculture and Food 2006). The Fortescue Province consists of hills and ranges (with stony plains, some alluvial plains and sandplains) on the volcanic, granitic and sedimentary rocks of the Pilbara Craton.

The UPBP site is situated within the coastal plain section of the Abydos Plain, one of eight physiographic units with distinctive vegetation located within the Fortescue Botanical District. The Abydos plain extends from Cape Preston in the east to Pardoo Creek, and south to the Chichester Ranges. It includes alluvial plains, low stony hills and granite outcrops and is comprised largely of granitic soils, with alluvial sands on the coastal portion.

6.2.2 Landforms and Topography

The Pilbara region is typically flat featuring occasional rocky outcrops up to 200 m Australian Height Datum (AHD) and geologically very old, having remained largely unchanged for 100 million years (WAPC 2003$_b$). Wind and water erosional processes over this time have resulted in a highly weathered landscape (WAPC 2003$_b$).

The topography of the Port Hedland area consists of flat sandy lowlands, bare coastal mudflats, intertidal mudflats, tidal creeks and an open harbour which has been significantly altered (refer to **Section 6.5**). The coastal portion of the plain dips gently to the sea resulting in a 5-10 km belt of supratidal area characterised by tidal lagoons, samphire flats and mangroves (Environ 2004).

The Port Hedland area contains five broad landform units:

- coastal dunes;
- coastal flats;
- floodplains;
- offshore islands; and
- the northern dissected plateau (the Pilbara Block).

The UPBP site, including the access road, stockyards and port facilities, is situated on a flat coastal plain with some sections susceptible to tidal inundation. Tidal flats in this area are characterised by bare sand, mangrove associations, salt tolerant shrubs and grasses (HDMS 2002).

The stockyard site, located at Stanley Point, occupies an area of approximately 20 ha and is situated in flat low-lying topography centred on a limestone ridge with sparse vegetation. The ground elevation of the stockpile site is approximately 7.5 m CD along the central axis and drops nominally 1 m on the south-eastern side (Coffey 2007).

The access road alignment is situated on flat low-lying topography, becoming slightly more undulating towards its southern end (Coffey 2007).

6.2.3 Geology and Soils

The Port Hedland area is located on the Holocene, Bossut Formation, a body of unconsolidated sedimentary soils described as sandy calcarenite, oolite and calcilutite, which outcrops discontinuously near the coast. These dune, beach ridge, beach and offshore bar deposits are predominantly marine with the exception of the barrier dune system which is of Aeolian origin. Soils of the area are predominately red due to the presence of iron oxide.

Finucane Island occurs in the Littoral Land System unit, which is characterised by bare coastal mudflats with mangroves present on the seaward fringes, with samphire flats, sandy islands, coastal dunes and beaches (Payne 1995).

A review of geotechnical, landform and soil studies for the study area was undertaken by Coffey Geotechnics Pty Ltd (2007) and the results are presented in **Appendix D**. The investigations incorporated both a 'desktop' review and ground investigation at two locations:

- The Stockyard: the proposed multi-user stockyard area and associated facilities at Stanley Point; and
- The Access Road: along the alignment of the proposed haul road (parallel to the BHPBIO Finucane Island access road and railway).

The Stockyard

Results of the ground investigation determined that the subsurface profile at the stockyards is comprised of a central corridor of calcarenite rock cemented material exposed at the surface, with an increasing thickness of mangrove mud overlying the rock further out from the centre of the site (Coffey 2007). The mangrove mud generally consists of brown to grey sandy clay of medium plasticity extending to a maximum depth of 1.7 m.

The Access Road

The subsurface conditions along the proposed access road are able to be separated into two distinct areas: the northern section of the road alignment; and, the southern section of the road alignment.

The northern section of the road alignment generally features mangrove mud extending to a maximum depth of 0.6 m overlying red beds, or, mangrove mud extending to a maximum depth of 1.8 m overlying calcarenite (Coffey 2007).

The southern section of the road alignment generally features fine to medium grained orange sand extending to a maximum depth of 1.5 m overlying red beds of red clayey sand (Coffey 2007).

6.2.4 Preliminary Site Assessment

SKM performed a Preliminary Site Investigation (PSI) of the UPBP study area, to document current and past operations conducted at the site and to assess the potential and known impacts of these operations on the environmental condition of the study area and surrounding properties (included in **Appendix H**). The PSI details the existing land tenure for the site; previous land use; contaminated site assessment to date; and, potential areas of concern (PAOC) for the future development of the UPBP as summarised below.

The UPBP site is not listed on the DEC Contaminated Sites Database or on the DEC Reported Sites Register. The primary PAOC or risk to the environment that was identified as part of the PSI was the potential leaching of chromium and manganese from ore stockpiles and subsequently entering the underlying groundwater or adjacent marine environment.

Chromium generally exists in two forms in the environment: chromium (III) and chromium (VI). Chromium (III) compounds are not usually considered health hazards. However, hexavalent chromium (i.e. chromium (VI)) compounds can be toxic if orally ingested or inhaled. In chromite, chromium-iron oxide - $FeCr_2O_4$, chromium exists as chromium (III). Chromite is a relatively inert metal and chromium (III) is relatively insoluble, in contrast to chromium (VI) which is the most mobile form of chromium in the environment (Becker et al., 2006, Kotas & Stasicka, 2000). Both chromium (III) and chromium (VI) are considered to have high chronic toxicity to aquatic life (DEWHA 2005).

Manganese is an essential trace element nutrient that plays a role in bone mineralization; protein and energy metabolism; metabolic regulation; cellular protection from damaging free radical species; and, the activation of enzymes (ATSDR 2000). However, long term exposure to manganese dust is known to be associated with neurological damage (Myers et al. 2003_a, Myers et al. 2003_b, Lucchini et al. 1999). Manganese commonly exists as Mn(II), Mn(III) and Mn(IV). In manganese oxide (MnO_2), manganese exists as manganese (IV). Manganese oxide is insoluble in water and only soluble in acidic conditions (DEWHA 2004). In general, manganese is considered to have moderate acute and chronic toxicity to aquatic life (DEWHA 2004).

Leaching studies have shown that there is potential for chromium (III), chromium (VI) and manganese to be leached from chromium and manganese ores (refer to **Appendix H**). However,

the interaction of leachates with the underlying groundwater and/or marine water is affected by a number of variables that will affect the end concentrations reaching these receptors including:

- quantities of leachate produced;
- surface area over which the run-off will be distributed;
- standing time or run-off speed from source to collection;
- permeability of surface material;
- depth to groundwater; and
- dilution in water applied to the site, during infiltration and/or actually in the receptive water bodies.

The risk of these contaminants impacting on the environment as a result of the UPBP will be substantially reduced by lining potential risk areas where contaminants may leach to groundwater (such as within the chromite stockpile areas) and by ensuring all surface water runoff is captured and treated within these areas. Management of potential contaminants is discussed in detail in **Section 7**.

6.2.5 Acid Sulfate Soils

The DEC, formerly Department of Environment (DOE 2006$_a$), use the following definitions for Acid Sulfate Soils (ASS):

Potential Acid Sulfate Soils (PASS):

> *"are soils or sediments which contain iron sulfides and/or other sulfic minerals that have not been oxidised by exposure to air. The field pH of these soils in their undisturbed state is more than pH 4 and is commonly neutral to alkaline (pH 7 to pH 9). These soils or sediments are invariably saturated with water in their natural state. The waterlogged layer may be peat, clay, loam, silt, or sand and is usually dark grey and soft but may also be dark brown, or medium to pale grey to white."*

Actual Acid Sulfate Soils (AASS):

> *"are soils or sediments which contain iron sulphides and/or other sulfic minerals that have previously undergone some oxidation to produce sulfuric acid. This results in existing acidity (pH <4) and often a yellow and/or red mottling (jarosite/iron oxide) in the soil profile. AASS commonly also contain residual un-oxidised iron sulfides or potential acidity as well as existing acidity."*

Preliminary site and field investigations and limited sampling by Coffey (2007) has determined that there are no AASS found across any of the sample sites though there are PASS expected across the northern portion of the stockyard site.

Impacts from acid sulfate soils are discussed in **Section 7.3** and an outline ASS Management Plan has been included in **Appendix K** which describes management and mitigation measures in greater detail.

6.3 Catchment Hydrology and Groundwater

6.3.1 Port Hedland Catchment

The major rivers of the Pilbara region include the De Grey, Yule, Shaw, Turner, Ashburton, Fortescue and Robe Rivers. These rivers drain the Chichester, Hamersley and Ophthalmia Ranges flowing into the Indian Ocean via five main coastal basins: the Ashburton River Basin, Onslow Coast Basin, Fortescue River Basin, De Grey River Basin and the Port Hedland Coast Basin (HDMS 2002).

The Port Hedland Coast Basin, in which the UPBP study area is located, covers an area of 35,190 km^2 and includes the Maitland, Harding, George, Sherlock, Yule and Turner Rivers (HDMS 2002).

6.3.2 Surface Drainage

Several creeks converge at the Port Hedland harbour. These creeks include Stingray Creek, South Creek, South East Creek, South West Creek and West Creek. South West Creek and South Creek are the dominant natural watercourses draining into the Port Hedland harbour (WAPC 2003_b).

These creeks are dry for the majority of the year, as is the case with other ephemeral rivers of the Pilbara region. However, significant runoff is generated after heavy rainfall with water often overflowing from these creeks inundating the coastal plain. Coastal inundation also occurs as a result of storm surge when creeks overflow during more extreme storm events (WAPC 2003_b).

The nearest waterways to the UPBP site include West Creek, South West Creek, South Creek and the Port Hedland harbour. The UPBP access road traverses West Creek, South West Creek and South Creek Catchments and crosses South West Creek at its southern extent (refer to **Figure 6-5**).

6.3.3 Hydrogeology

The four main hydrogeological formations of the Pilbara region are the coastal plain alluvial deposits (chainage 50 m to 66,000 m); the regional granite terrain (chainage 66,000 m to 216,000 m); the Fortescue Group and Marra Mamba Iron Formation (chainage 216,000 m to 254,000 m); and, the Wittenoom Formation (chainage 254,000 m to 346,000 m) (Environ 2004).

The Port Hedland area, including the UPBP study area, predominately lies within coastal plain alluvial deposits. The Hydrological Atlas of Western Australia (DOW 2006) shows that the majority of the Port Hedland coastal region is comprised of superficial sediments with minor

occurrences of fractured and weathered rocks of low permeability, namely sandstone, near South West Creek.

6.3.4 Groundwater Sources

The most important groundwater resources for the Pilbara coast are the alluvial aquifers associated with main rivers. Three aquifer units have been identified within the alluvial deposits:

Upper Aquifer – An unconfined aquifer within alluvium, calcarenite and/or paleosol stratigraphic units;

Middle Aquifer – Located within red beds of clays and sands of low permeability; and

Lower Aquifer – An aquifer of low permeability conglomerate with highly permeable gravel lenses.

Groundwater from the coastal plain aquifers is generally highly saline and brackish, but is still considered suitable for industrial and domestic use. Groundwater reserves on the Yule and De Grey Rivers are used for this purpose and are managed by the Water Corporation through the Port Hedland Regional Water Supply Scheme (ToPH 2006). Other well fields also exist at Goldsworthy and Shay Gap to the east of the De Grey, which could potentially be used to supplement existing water sources (WAPC 2003_b).

6.4 Terrestrial Environment

6.4.1 Flora and Fauna Assessment

On behalf of PHPA, Biota Environmental Sciences Pty Ltd (Biota) investigated the terrestrial flora and fauna within the UPBP study area (refer to **Figure 6-9** which shows the UPBP study area). Research undertaken by Biota (2007) included:

- Field surveys of vegetation to identify any significant flora and to map and describe vegetation types;
- A review of past surveys of flora and fauna within surrounding areas; and
- A desktop assessment of significant flora and fauna likely to occur in the UPBP study area.

Field surveys of the UPBP study area were undertaken between the 11th and 13th of April 2007. A 3 km section, with a width of 250 m, at the southern end of the UPBP access road was unable to be surveyed as this area was fenced and occupied by FMG constructions (Biota 2007). However, given existing information available from previous surveys, the type and condition of flora and fauna in this section is well known and is not considered to be a limitation to the survey.

The key findings of Biota's research are outlined below and detailed in **Appendix E**.

6.4.2 Vegetation

Three terrestrial vegetation types (excluding mangrove vegetation which is discussed in **Section 6.5**) were recorded within the study area:

- *Halosarcia indica* subsp. *leiostachya*, *H. halocnemoides* subsp. *tenuis* (samphire), *Muellerolimon salicorniaceum* scattered low shrubs to low open shrubland extending along the mudflats, merging with the mangroves. This vegetation was commonly encountered in the study area, extending along the saline coastal mudflats bordered by the mangroves. Other associated species included *Frankenia ambita*, *Trianthema turgidifolia*, *Neobassia astrocarpa*, *Calandrinia* sp. *Pinga*, *Hemichroa diandra*, *Enchylaena tomentosa* and occasional *Avicennia marina* (**Figure 6-6**).

- *Triodia epactia*, *Triodia secunda* hummock grasslands over very open to open tussock grassland on sandy islands scattered within the mudflats. A variety of other species were present including *Commelina ensifolia*, *Hemichroa diandra*, *Cyperus bulbosus*, *Frankenia ambita*, *Cassytha capillaris* and *Hybanthus aurantiacus*. This vegetation type occurred on low sandy islands scattered within the saline coastal mud flats (**Figure 6-7**).

- *Acacia stellaticeps* low open shrubland over hummock grassland of *Triodia epactia* over *Sorghum plumosum* open tussock grassland with a rich herbland of variable species. This vegetation was found within a small area at the south-eastern end of the corridor, near Wedgefield. The open tussock grassland included species such as *Sorghum plumosum*, *Cenchrus ciliaris* (Buffel Grass, a weed species), *Eriachne obtusa*, *Aristida holathera* var. *holathera* and *Dactyloctenium radulans*, while the herbland comprised various species, including *Corchorus incanus* subsp. *incanus*, *Hybanthus aurantiacus*, *Tephrosia* spp., *Solanum ellipticum*, *Glycine canescens*, *Rhynchosia minima*, *Evolvulus alsinoides* var. *villosicalyx* and *Melhania oblongifolia* (**Figure 6-8**)

The samphire shrublands were considered to be of moderate conservation significance, as they are restricted to the narrow saline mudflat habitats along the coast, and are susceptible to disturbance. The *Triodia* hummock grasslands were also considered to be of moderate conservation significance, as *Triodia secunda* has a relatively limited distribution in the Pilbara. The remaining *Acacia stellaticeps* over *Triodia epactia* vegetation type is relatively widespread in the locality and is considered to be of low conservation significance. **Figure 6-9** shows the distribution of these vegetation types across the UPBP study area.

The condition of vegetation in the study area varied from poor to good (Biota 2007). The study area was significantly disturbed as a consequence of the high level of industrial development in the locality, including infrastructure such as a road, powerlines, drains, buildings and tracks.

Considerable rubbish was also present and there were a number of weed species recorded throughout the study area (**Section 6.4.4**), particularly along the current access road.

6.4.3 Significant Flora

A total of 111 taxa of native vascular flora from 78 genera belonging to 35 families were recorded during the 2007 surveys (Biota 2007). The families with the greatest number of native taxa within the study area are shown in **Table 6-2**.

Table 6-2 Most Species Rich Families within the UPBP Study Area

Family	Number of Native Taxa (No. of Introduced Taxa)
Poaceae (grass family)	14 (3)
Papilionaceae (pea family)	13 (1)
Convolvulaceae (morning glory family)	7
Mimosaceae (wattle family)	7
Malvaceae (Hibiscus family)	7
Chenopodiaceae (samphire family)	6
Cyperaceae (sedge family)	6

No Declared Rare Flora were recorded in the UPBP study area and neither of the Declared Rare Flora species known to occur in the Pilbara (*Lepidium catapycnon* and *Thryptomene wittweri*) are considered likely to occur in the area. Within the wider Port Hedland area, seven priority species are known to occur. During the 2007 survey one Priority flora, *Bulbostylis burbidgeae* (Priority 3), was recorded in the UPBP study area (Biota 2007).

Bulbostylis burbidgeae (Priority 3) was recorded twice within the sandy island vegetation (samphire shrublands and *Triodia* hummock grasslands) close to the Finucane Island access road, forming dense stands of around 20 individuals. This species was also recorded a number of times in association with granitic boulder outcrops on the Abydos Plain during the Hope Downs rail corridor survey and appeared to be restricted to these isolated soil pockets. Within the UPBP study area, *Bulbostylis burbidgeae* occurred in a more general habitat type and in a disturbed environment. These findings suggest that the distribution of this species may be less restricted than previously documented, and that further populations may be identified with additional surveying through the Pilbara during favourable conditions.

- **Figure 6-6 Vegetation of the Saline Coastal Mudflats**

- **Figure 6-7 Sandy Island Vegetation Occurring Within the Saline Coastal Mudflats**

- **Figure 6-8 *Acacia stellaticeps* Low Open Shrubland over Hummock Grassland, Open Tussock Grassland and Closed Herbland**

6.4.4 Introduced Flora

Five species of introduced flora were recorded in the UPBP study area and are listed in **Table 6-3**.

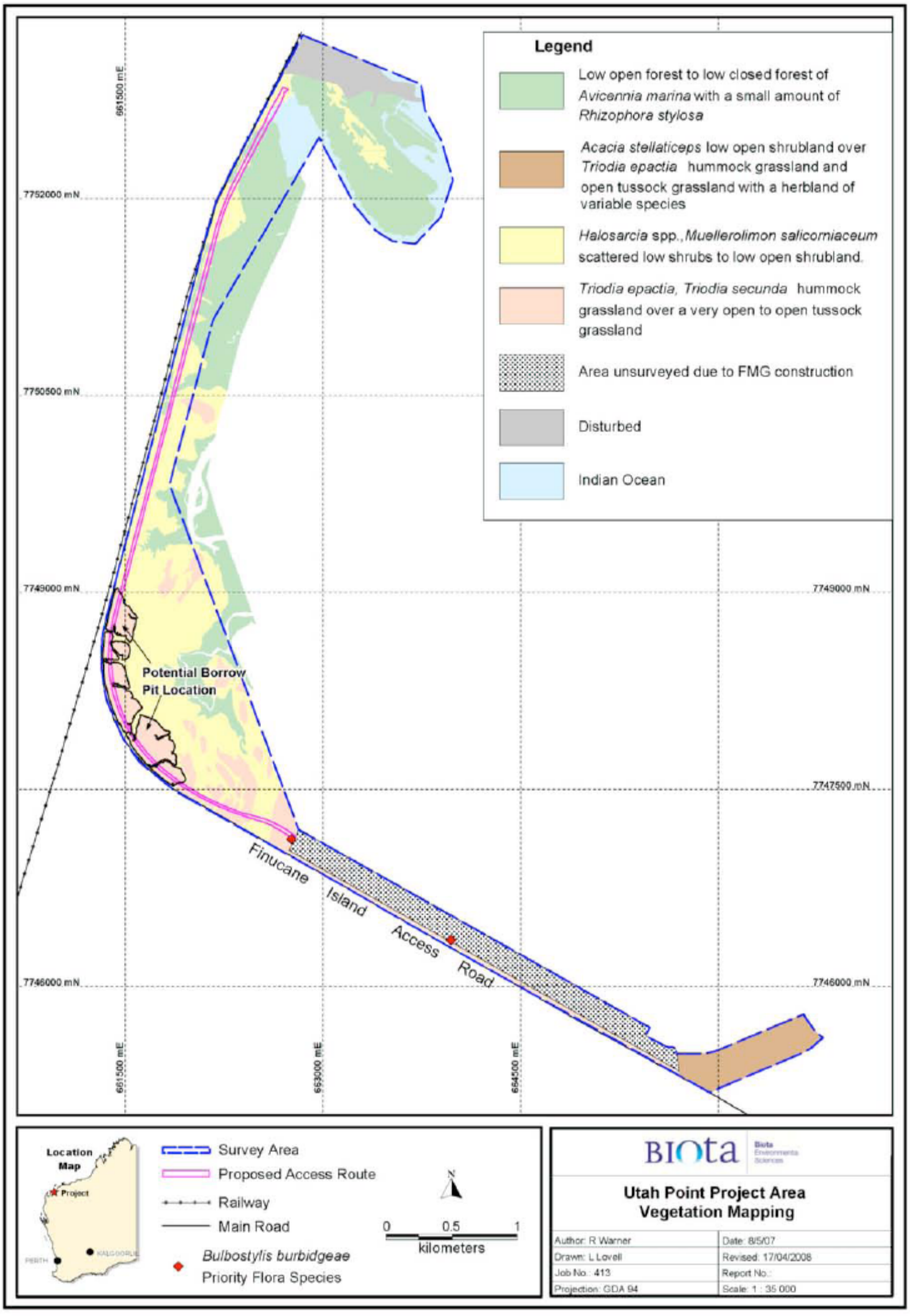
Table 6-3 Introduced Flora in the UPBP Study Area

Introduced Flora	Number of Records	Location within Study Area
Birdwood Grass *Cenchrus setiger*	15	Scattered along the roadside and through sections of the study area.
Buffel Grass *Cenchrus ciliaris*	27	Dense along Finucane Island access road.
Feathertop Rhodes Grass *Chloris virgata*	9	Scattered along the roadside
Kapok *Aerva javanica*	22	Scattered throughout the study area
Verano Stylo *Stylosanthes hamata*	3	Bordering the roadside at the south-eastern end of the study area.

While none of the species are Declared Plants according to the Department of Agriculture and Food, the *Cenchrus* species and *Stylosanthes hamata* are considered to be serious environmental weeds.

Buffel Grass (*Cenchrus ciliaris*) and the less common Birdwood Grass (*C. setiger*) have been historically introduced by pastoralists as fodder species for cattle. Buffel Grass has demonstrated allelopathic capacities, whereby it releases chemicals that inhibit the growth of other plants, and both species are aggressive and effective competitors with native flora. These perennial grasses form dense tussock grasslands, particularly along creeklines, floodplains and in sandy coastal areas. Buffel grass was common within the study area, occurring predominantly along the roadside bordering the study area. Birdwood Grass was encountered less frequently, and was typically found in association with Buffel Grass along roadsides.

Verano Stylo (*Stylosanthes hamata*) is a softly hairy perennial herb with yellow flowers which occurs in disturbed areas, particularly along seepage areas and creeks. It was found bordering the grassland vegetation at the south-eastern end of the corridor of the UPBP study area (Biota 2007).



- **Figure 6-9 Distribution of Vegetation Types Across the UPBP Study Area**

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6.4.5 Significant Fauna

After evaluation of terrestrial vegetation the following fauna habitat types were recorded in the UPBP study area:

- Mangroves and intertidal habitats: these areas may be of high fauna conservation significance as they provide habitat foraging, feeding and roosting habitat for several species of birds and bats (Hutchings and Recher 1982; Churchill 1998; Johnstone and Storr 1998);
- Samphire/Mudflats: the small areas of intertidal samphire/mud flats occurring within the study area may support a high diversity of benthic macroinvertebrates including polychaetes, molluscs and crustaceans (Hutchings and Recher 1982). The areas devoid of vegetation are generally hypersaline and are unlikely to be utilised on a regular basis by terrestrial fauna; and
- Sandy Islands: scattered within the saline coastal flats these areas were generally small, somewhat isolated and represent a low *Triodia* hummock grassland habitat widespread in the locality (Biota 2002$_a$).

A desktop review of fauna species potentially present within the UPBP study area revealed a total of five Schedule 4 and eight Priority species potentially occurring in the Port Hedland region. However, after informed consideration of the habitat types within the study area only three Priority and seven Migratory listed fauna species were considered likely to occur (Biota 2007). These include:

- **Little North-western Mastiff Bat (*Mormopterus loriae cobourgensis*) (Priority 1):**

  The Little North-western Mastiff Bat has been recorded within the study area and is assumed to rely, at least partly, on the mangrove habitat for prey foraging (Biota 2002$_a$). The bat is listed as a Priority 1 species, with few or poorly known populations on threatened lands along the north west coast (Churchill 1998). This species has a strong preference for mangal habitat but can be found in adjacent areas as well. It generally roosts in hollows in the mangrove *Avicennia marina* (Churchill 1998).

- **Australian Bustard (*Ardeotis australis*) (Priority 4)**:

  This species has previously been recorded at various locations within the Abydos Plain and one bird was sighted flying over *Acacia* low shrubland within ~20 km of the study area (Biota 2006). The Australian Bustard occurs over much of Western Australia, with its wider distribution including eastern Australia and New Guinea. The species prefers open or lightly wooded grassy plains including sandplains with spinifex *Triodia* (Johnstone and Storr 1998).

- **Eastern Curlew (*Numenius madagascariensis*) (Priority 4 / Migratory)**:

  A previous survey of the study area recorded the Eastern Curlew on mudflats adjacent to the mangroves at Finucane Island (Biota 2006). This species occurs throughout coastal Western Australia, south to Bunbury (Johnstone and Storr 1998), and breeds in northern Asia. It is a summer migrant to Australia and is considered moderately common along the tidal mudflats, reef flats and sandy beaches of the Pilbara coast (Johnstone and Storr 1998).

- **Common Sandpiper (*Tringa hypoleucos*) (Migratory):**

  A few individuals have been recorded foraging along the tide margin on the mudflats within the study area (Biota 2002_a). The Common Sandpiper is generally found on the edge of sheltered waters such as mangrove creeks and estuaries along the West Australian coast and on many islands (Johnstone and Storr 1998).

- **Grey-tailed Tattler (*Tringa brevipes*) (Migratory)**:

  The Grey-tailed Tattler, whilst scarce in the study area, inhabits tidal mud flats and estuarine sand flats along most north-western Australian coasts (Johnstone and Storr 1998). Biota (2002) recorded a few foraging birds in the vicinity of a tidal creek pool on Finucane Island.

- **Little Curlew (*Numenius minutus*) (Migratory):**

  The Little Curlew's abundance in the Pilbara region is variable. Johnstone and Storr (1998) found it to be scarce south of Port Hedland, however, the species has been sighted in the Port Hedland vicinity. The Little Curlew prefers short-grass plains as habitat, including sports grounds and tidal mud flats.

- **Oriental Plover (*Charadrius veredus*) (Migratory)**:

  The Oriental Plover has been sighted within 60 km of the study area, typically inhabiting sparsely vegetated plains, beaches and tidal flats. The Oriental Plover is considered to be relatively common.

- **Oriental Pratincole (*Glareola maldivarum*) (Migratory)**:

  Large flocks of Oriental Pratincoles have been sighted in the Port Hedland vicinity. The species typically roosts on bare ground beside water and feeds at tidal flats and floodwaters (Johnstone and Storr 1998).

- **Whimbrel (*Numenius phaeopus variegates*) (Migratory)**:

  The species has been recorded from mudflat habitats within the study area, usually foraging or roosting in moderate sized groups (Biota 2002_a). The Whimbrel is a migratory species, common on north-west Australian coasts south to Cape Naturaliste (Johnstone and Storr 1998).

6.5 Marine Environment

6.5.1 Port Hedland Harbour

The Port of Port Hedland covers an area of approximately 41,822 ha and encompasses the inner harbour and the seaward area in a 10 nm radius of Hunt Point, from the entrance of the inner harbour to the high water mark at the shoreline (PHPA 2006). The Port Hedland harbour has a maximum natural depth of 9 m and is generally very shallow. However, dredging of the approach channel to the harbour, turning basin and berthing pockets has considerably altered the natural depth and configuration of the harbour (PHPA 2006). Between 1965 and 1984 approximately 1.2 billion cubic metres of dredge material was removed from the harbour and deposited in two offshore spoil dumps and east of the harbour mouth forming the spoil bank (HDMS 2002, HGM 1993).

Tidal flow through the harbour entrance dominates water movement in the harbour (Environ 2004). Tides range from 1.5 m during neaps to 5.8 m at springs and are predominantly semi-diurnal (PHPA 2003). Tidal currents generally peak at approximately one knot but currents of three knots can occur at some locations (HGM 1997). These currents can impact on ship handling during berthing and departure (HGM 1997).

From an environmental perspective, the harbour lies at the southern edge of the great biogeographical region of the tropical Indo-West Pacific. Many species of marine animals and plants are distributed widely in this region, which is regarded as the most diverse biogeographical region on earth for marine species. The harbour is therefore considered to be a complex estuarine system with significant environmental value (PHPA 2006).

6.5.2 Marine Flora

The subtidal zone of the Port Hedland harbour is characterised by fine mud or shell grit that supports occasional benthic flora, such as filamentous green algae, and scattered invertebrates (Environ 2004). However, no areas of cyanobacterial mats (Paling *et al.* 1989, Paling and McComb 1994) occur in the vicinity of Utah Point itself due the more elevated limestone substrate of the site and the local mangrove communities are the dominant marine flora and/or Benthic Primary Producer Habitat (BPPH) within the UPBP study area.

6.5.3 Benthic Primary Producer Habitat

Benthic Primary Producer Habitat (BPPH) is described as communities of marine plants (seagrasses, seaweeds, turf algae and mangroves) and invertebrates (scleractinian corals), and the substrata supporting these communities (EPA 2004_a).

Port Hedland is surrounded by a large area of arid zone mangroves associated with the creek systems running into the harbour. These mangrove areas are home to a large variety of animals

including invertebrates (e.g. insects and spiders) and some species of birds and bats that are restricted to mangroves in particular (Paling *et al.* 2001).

On behalf of the PHPA, V & C Semeniuk Research Group (VCSRG) investigated the mangrove communities located in the Port Hedland area, including those within the UPBP study area. Research undertaken by VCSRG included a review of the available literature; desktop studies of data previously collected in the area (from 1976 to 2006); field surveys and assessment; analysis of field samples; and, interpretation of aerial photography (VSCRG 2007). Key research findings are outlined below and detailed in **Appendix F**.

The mangroves of Port Hedland harbour cover approximately 16.37 km^2 in total. The mangroves at Utah Point comprise some 0.64 km^2. Seven mangrove species are known to occur in the Port Hedland area including *Aegiceras corniculatum*; *Aegialitis annulata*; *Avicennia marina*; *Bruguiera exaristata*; *Ceriops tagal*; *Osbornia octodonta*; and *Rhizophora stylosa*. The UPBP study area supports six of these species, excluding *Osbornia octodonta* which only occurs in specific localised habitats in the Port Hedland region. *Avicennia marina* and *Rhizophora stylosa* are the dominant mangrove species within the UPBP study area, followed by *Bruguiera exaristata, Ceriops tagal, Aegialitis annulata* and *Aegiceras corniculatum.*

The UPBP study area supports four general assemblages of mangrove species:

- A zoned sequence of species and structure across the limestone barrier, where muddy tidal flat deposits flank and bury the limestone ridge to form barrier-fringing muddy tidal flats. The assemblage consists of *Avicennia marina* low forest to scrub; followed by wide band of *Rhizophora stylosa* low forest to scrub, with local pockets of a mix of *Avicennia marina* and *Rhizophora stylosa* low forest to scrub; followed to landward by a wide zone of *Avicennia marina* scrub to open heath. Mangrove floristic/structural banding occurs parallel to the environmental gradients of groundwater salinity, soilwater salinity and the frequency of inundation across the tidal flat. This pattern dominates the study area, including areas along the access road and stockyard area.
- A narrow fringe of *Ceriops tagal*, with lesser *Bruguiera exaristata* and *Avicennia marina*, where the mangroves abut a limestone ridge. This assemblage is commonly linearly extensive but narrow (one or two shrubs wide). This pattern occurs along the length of limestone ridges and essentially is a limestone ridge assemblage of mangroves.
- Patches of *Avicennia marina*, with lesser *Ceriops tagal*, *Bruguiera exaristata*, *Aegialitis annulata* and *Aegiceras corniculatum*, where the mangroves inhabit sandy beaches or sand on limestone. This assemblage occurs locally on the areas of sand and on beaches.

- A narrow fringe of low open heath *Aegialitis annulata*, *Aegiceras corniculatum* and *Avicennia marina*. This assemblage occurs in accreting soft sediment zones, adjoining and occurring just seaward of the main mangrove zones.

These mangrove assemblages are simplified into the following units:

- *Avicennia marina* low forest to scrub (*A. marina* in closed formations with plants 3-6 m high);
- Mixed *Avicennia marina* and *Rhizophora stylosa* low forest to scrub (*A. marina* and *R. stylosa* occur in a 50:50 mix, in closed formations with plants 3-6 m high);
- *Rhizophora stylosa* low forest to scrub (*R. stylosa* in closed formations with plants 3-6 m high); and
- *Avicennia marina* scrub to open heath (*A. marina* in closed formations with plants 3 m high grading to open formation with 50% cover, with plants 1-2 m high).

Using these units, **Figure 6-10** shows the spatial distribution of mangrove vegetation for the UPBP study area.

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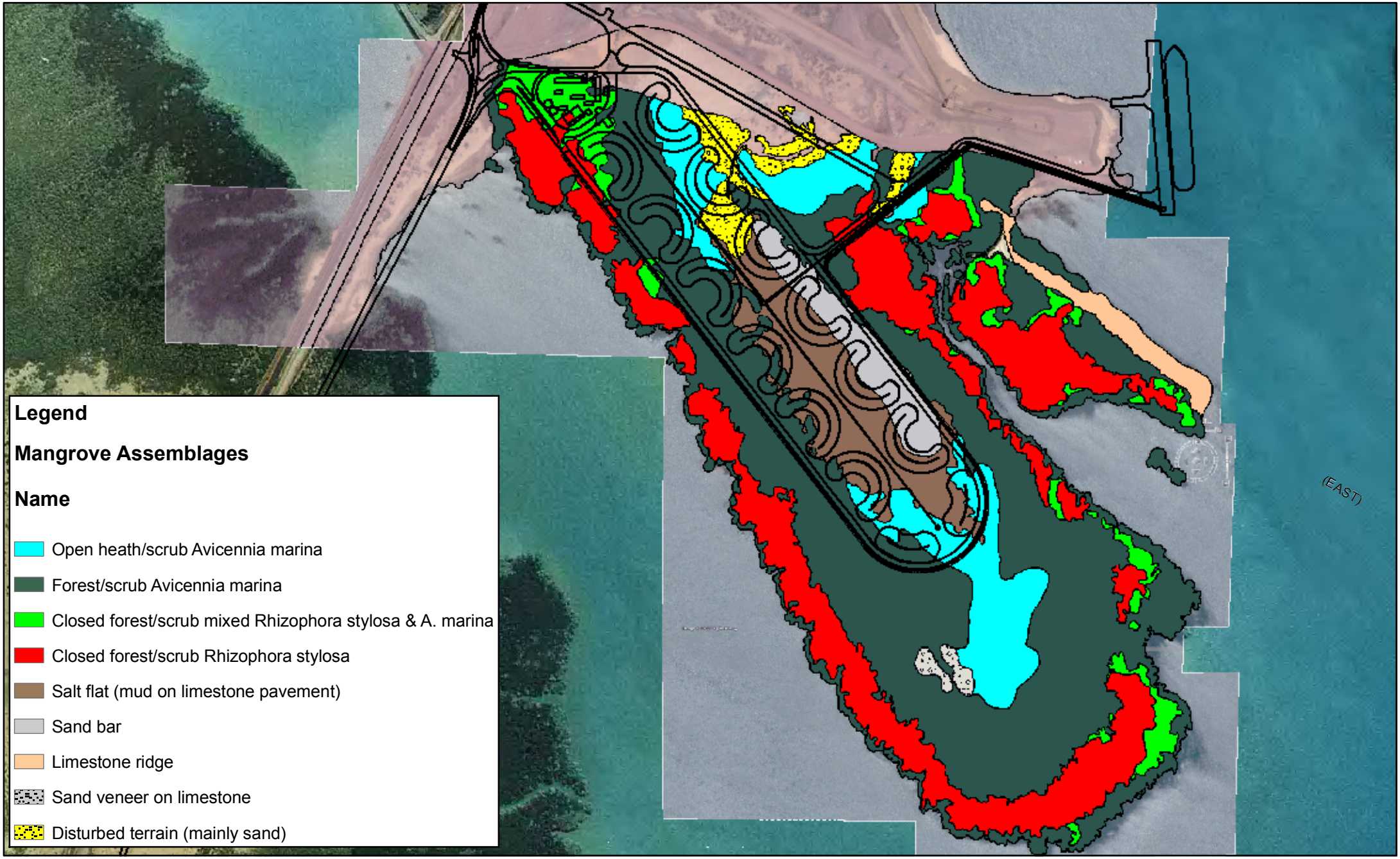

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Client

Port Hedland Port Authority

Drawing Title

Key Mangrove Assemblages
Data Source : VCSRG 2007

N W E S

0 20 40 80 120 160 200
metres

Scale 1:7,500 @ A4
Datum: GDA94
Map Grid: MGA94 Zone 50

Drawing No.

Figure 6-10

Revision No. A
Date: 28.11.2007
Project WV03278

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In general, the extant mangroves of the UPBP study area are in good condition. During site visits and inspections of the mangroves, the foliage and canopy of the various species was considered healthy and robust. Locally there was mortality, or limb debility, with the development of stag-horn tips and partial death of plants (limb deaths), particularly *Avicennia marina*. This is part of the natural dynamics of mangrove populations and none of these deaths or debility is related to industrial impacts.

The mangrove communities are not unique in terms of species and mangrove assemblages present and no longer exist in a tidal ecosystem wilderness, however these communities are regionally significant in terms of coastal productivity and the fauna they support (VSCRG 2007).

6.5.4 Marine Fauna

The Port Hedland area is rich in marine fauna including infauna, epifauna, reptiles, fish and a number of listed migratory and threatened species, namely the Flatback Turtle *Natador depressus*, Black-ringed Sea Snake *Hydrelaps darwiniensis* and White-Bellied Sea Eagle *Haliaeetus leucogaster* (PHPA 2006).

As discussed above, the mangrove communities support much of the marine fauna in the Port Hedland harbour. The mangroves typically provide nurseries for juvenile fish and crustaceans (CSIRO 2001). Nekton (mainly fish), reptiles, invertebrate benthos and avifauna invade the mangrove zone at high tide to feed (VSCRG 2007). Invertebrates that are strongly associated with the mangrove communities include mud whelks (*Terebralia spp.*), fiddler crabs (*Uca coactarta flammula*) and a variety of insects and spiders (Hutchings & Recher 1982). Mangrove sediment infauna include polychaete worms, annelid worms, flatworms and a range of molluscs (Hutchings & Recher 1982).

Previous studies have identified a total of 183 infauna species in the Port Hedland harbour of which approximately 55% are polychaete worms, 24% molluscs and 18% crustaceans (HGM 1997). However, the diversity of infauna species is greater at a distance from the existing wharfs where there are appreciable numbers of echinoderms, cnidarians, sipunculids, echiuroids and chordates in addition to molluscs, crustaceans and annelids (SKM 2002). In general, infauna species that are more tolerant of turbidity are located at sites closest to the wharfs (SKM 2002).

Similarly, previous sampling has shown a low diversity of phytoplankton and zooplankton in the Port Hedland harbour most likely due to the high turbidity of waters (DALSE 2004). Phytoplankton and zooplankton that are found in the harbour are characteristic of species located in tropical and subtropical marine waters elsewhere in Australia (Environ 2004). Phytoplankton identified in the harbour include chain forming planktonic diatoms such as *Rhizosolenia* and *Chaetoceras*. The dominant zooplankton that have been identified are *Calanoid copepods* (Environ 2004).

106 marine species have been identified from within the Port Hedland harbour (Ecoscape 2004) and the main species caught in the Port Hedland area are listed in **Table 6-4**.

- **Table 6-4 Main Marine Species Caught in the Port Hedland Area**

Species of Fish:		
Barramundi	Marlin	Spangled Emperor
Blue Swimmer Crab	Mud Crab	Spanish Flag
Bream, Yellowfin	Mullet, Sea	Spanish Mackerel, Narrow Barred
Bream, NW Black	Mullet, Yellow Eye	Spanish Mackerel, Broad Barred
Cobia	Northern Mulloway	Squid
Cod	NW Snapper	Swordfish
Coral Trout	Octopus	Threadfin Salmon
Cuttlefish	Queen Fish	Tropical Rock Lobster
Flathead	Red Emperor	Tuskfish
Garfish	Sailfish	Wahoo
Golden Trevally	Salmon, Black Finned	Whiting, School
Groper	Salmon, Gunther's	Whiting, Western Sand
Mahi Mahi	Samson Fish	Whiting, Yellowfin
Mangrove Jack	Sand Whiting	

Source: Ecoscape 2004

The DEWHA *EPBC Act 1999 Protected Matters Search Tool* (2007) identifies a range of migratory birds and other fauna that may be present in the UPBP study area and these are listed in **Table 6-5**.

- **Table 6-5 Species Identified in the UPBP Study Area using the EPBC Act Protected Matters Search Tool**

Threatened Species	Status	Type of Presence
Birds		
Barn Swallow *Hirundo rustica*	Migratory	Species or species habitat may occur within area
Little Curlew, Little Whimbrel *Numenius minutus*	Migratory	Species or species habitat may occur within area
Oriental Plover, Oriental Dotterel *Charadrius veredus*	Migratory	Species or species habitat may occur within area
Oriental Pratincole *Glareola maldivarum*	Migratory	Species or species habitat may occur within area
Rainbow Bee-eater *Merops ornatus*	Migratory	Species or species habitat may occur within area
Southern Giant-Petrel *Macronectes giganteus*	Endangered	Species or species habitat may occur within area
White-bellied Sea-Eagle	Migratory	Species or species habitat likely to occur

Threatened Species	Status	Type of Presence
Haliaeetus leucogaster		within area
Mammals		
Bryde's Whale *Balaenoptera edeni*	Migratory	Species or species habitat may occur within area
Dugong *Dugong dugon*	Migratory	Species or species habitat likely to occur within area
Humpback Whale *Megaptera novaeangliae*	Vulnerable	Species or species habitat known to occur within area
Indo-Pacific Humpback Dolphin *Sousa chinensis*	Migratory	Species or species habitat may occur within area
Killer Whale, Orca *Orcinus orca*	Migratory	Species or species habitat may occur within area
Northern Quoll *Dasyurus hallucatus*	Endangered	Species or species habitat may occur within area
Pilbara Leaf-nosed Bat *Rhinonicteris aurantius (Pilbara form)*	Vulnerable	Community likely to occur within area
Spotted Bottlenose Dolphin *Tursiops aduncus (Arafura/Timor Sea populations)*	Migratory	Species or species habitat likely to occur within area
Reptiles		
Flatback Turtle *Natator depressus*	Vulnerable	Breeding likely to occur within area
Green Turtle *Chelonia mydas*	Vulnerable	Species or species habitat may occur within area
Hawksbill Turtle *Eretmochelys imbricata*	Vulnerable	Species or species habitat may occur within area
Sharks		
Whale Shark *Rhincodon typus*	Vulnerable	Species or species habitat may occur within area

However, the *Protected Matters Search Tool* is designed to only to provide an indication of species that may be present in an area and it is advised that local knowledge and information should be used where possible. Many of the fauna listed are in reality unlikely to occur in the UPBP study area or are at the most only occasional visitors to the harbour. The presence of migratory birds in the UPBP study area is discussed in **Section 6.4**. Of the other species identified, the humpback whale, the dugong and the three species of turtles (flatback turtle, green turtle and hawksbill turtle) may occur in the general Port Hedland region.

Humpback whales migrate along the Pilbara coast offshore. The peak northern migration occurs between late July and early August, while the peak southern migration occurs between late August

and early September (Jenner *et al*. 2000). Little is known about the precise route between the Dampier Archipelago and the Kimberley coast although Jenner *et al* (2000) suggest that both the northern and southern migrations may be concentrated around the 30 m depth contour, which is outside the area of influence of this proposal. Similarly, the abundance of dugongs in the Port Hedland region is poorly known but there is no recognised significant habitat for dugongs located within the Port Hedland harbour region (Marsh *et al*. 2002).

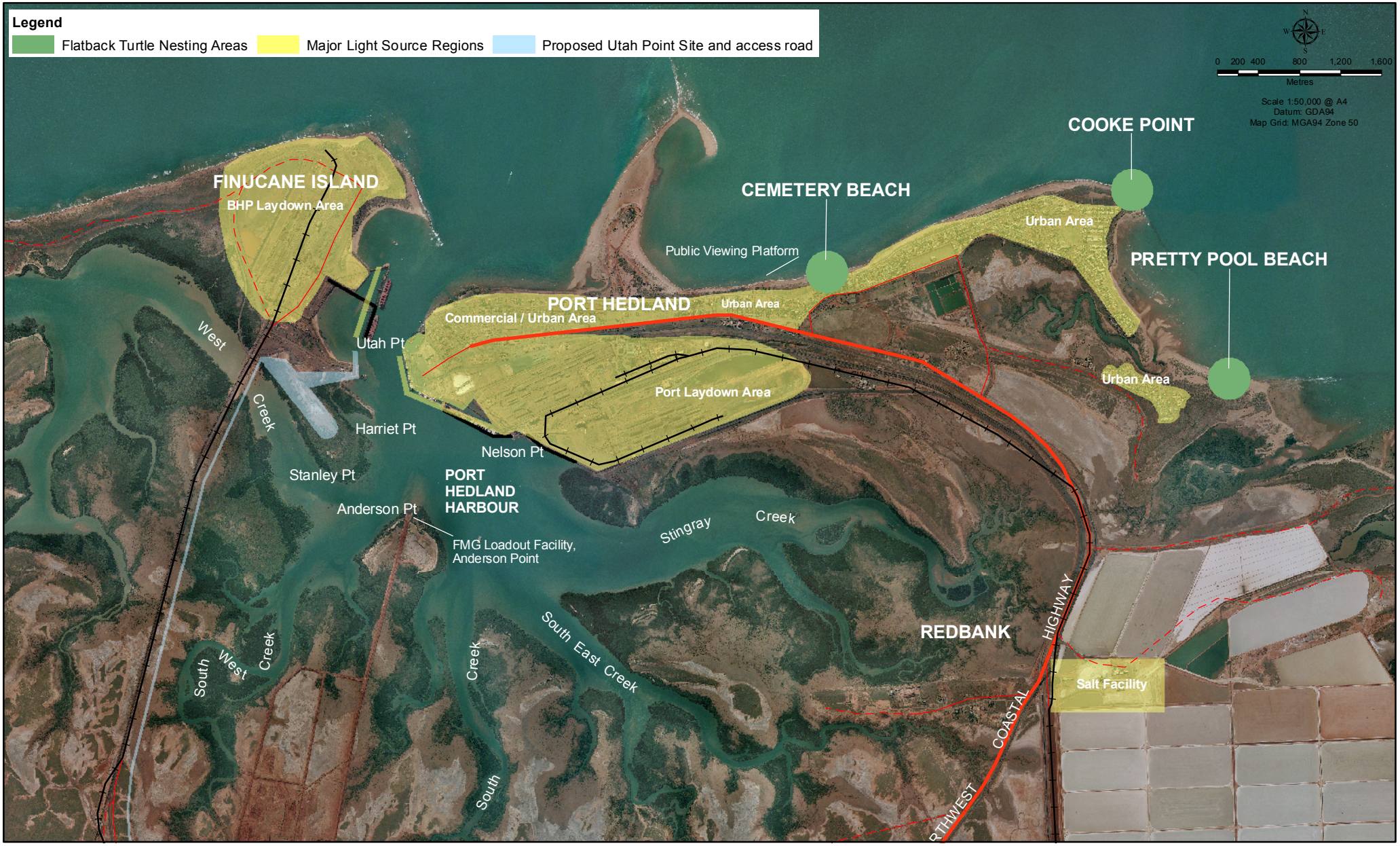
Recent investigation of turtles and turtle habitats within the Port Hedland undertaken by Pendoley Environmental Pty Ltd have identified Cemetery Beach, Pretty Pool and Cooke Point as flatback turtle nesting habitats (refer to **Appendix L**). Rookery size estimates for flatback turtles within these habitats suggest that they comprise a maximum 6% of the North West Shelf flatback turtle breeding unit, which is relatively small in comparison to other rookeries at 80 Mile Beach, Mundabullangana Station, Barrow Island, Dampier Archipelago and the Montebello Islands, each of which may comprise approximately 15% of the breeding unit (Pendoley Environmental 2008).

The Cemetery Beach, Pretty Pool and Cooke Point nesting habitats are located over 3 km away from the UPBP site (to the east of the Port Hedland harbour) and are separated from the proposed development by existing industrial and urban development and by the spoil bank (refer to **Figure 6-11**).

There are no sandy nesting habitats for flatback, green or hawksbill turtles located within the Port Hedland harbour and hatchlings do not actively swim into the harbour or use mangroves as nursery habitat. Green turtle hatchlings use offshore pelagic habitat as nursery habitat and flatback turtle hatchlings are not likely to use mangrove waters as nursery habitat due to the alternating inundation and exposure of these waters (Pendoley Environmental 2008).

Adult flatback, green and hawksbill turtles are also not known to occur within the harbour. Due to the lack of seagrass and algae beds within the harbour it is unlikely that adult green turtles to utilise harbour waters for foraging. Similarly, as harbour waters are unlikely to support the sea pen, hard and soft coral habitat (typically found in clear oceanic waters) favoured by flatback and hawksbill turtles, it is unlikely that adult flatback and hawksbill turtles would use the harbour for foraging (Pendoley Environmental 2008).

However, juvenile green turtles routinely use the waters of the harbour and the surrounding mangrove creeks for foraging. They utilise the seaward fringes of the mangrove habitat, remaining on the periphery of the root system, presumably to avoid the risk of entanglement and drowning in the densely tangled mangrove root systems (Pendoley Environmental 2008). Juvenile flatback turtles may also use these waters but anecdotal reports of this are yet to be confirmed by qualified scientists (Pendoley Environmental 2008). Juvenile hawksbill turtles are not expected to occur in the harbour as they typically use coral reef habitat which does not occur within the harbour.



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Client
Port Hedland Port Authority

Project
Utah Point Berth Project

Drawing Title
Flatback Turtle Nesting Areas and Major Sources of Light in the Port Hedland Region

Drawing No.
Figure 6-11

Revision No. 3
Date: 08/04/08
Project WV03278

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Further monitoring and investigation of turtle activities, their nesting rookeries, potential threats and/or disturbances to nesting turtles is being undertaken as part of the Northwest Community Turtle Project, by the Care for Hedland Environmental Association, West Pilbara Community Turtle Monitoring Group and Karratha DEC.

6.5.5 Marine Pest Species

Marine pest species can be transported within ballast water or through biofouling. Ballast water from coastal areas in other parts of Australia or overseas has the potential to introduce marine pest species that may impact upon the marine communities at Port Hedland. Large populations of marine pest species are capable of invading new ecosystems, disturbing the ecological balance of existing marine communities and potentially impacting on recreational and commercial fisheries and aquaculture.

Ballast water from shipping has been responsible for introducing more than 250 species, and possibly as many as 500 species, into Australian waters (ASoEC 2001). As a result, Australia now has mandatory ballast water management requirements to reduce the risk of the introduction of more unwanted marine species (discussed in **Section 7.6**).

Port Hedland as Australia's largest tonnage port, is subject to relatively high volumes of ballast water discharge due to the size and number of vessels entering the harbour (Environ 2004). However, a survey undertaken in 1998 by the Centre for Research on Introduced Marine Pests (CRIMP) has shown that although the port has been in operation for over 100 years no listed marine pest species have been identified within the harbour waters (PHPA 2006).

6.5.6 Water Quality

Turbidity is a key water quality concern for the Port Hedland harbour. The constant movement of ships, highly modified bathymetry, large tidal range and presence of large volumes of silt and mud in the harbour result in a high level of turbidity (Environ 2004). Turbidity in the harbour ranges from 10-100 Nephelometric Turbidity Unit (NTU) (HDMS 2002).

However, the harbour as a macro-tidal creek system is naturally turbid and subtidal communities within the harbour are tolerant of the turbid conditions (Environ 2004). As a consequence, there are few light sensitive communities, such as seagrass beds or coral reefs, recorded within the harbour area.

Other water quality concerns for the Port Hedland harbour include historic contamination and the ongoing potential risk of contamination from shipping and port activities. In addition, runoff from urbanised areas east of the harbour may also lead to contaminants entering the harbour following rainfall (Environ 2004). Investigations by the CSIRO and the DOE in 2003 showed that moderately elevated levels of copper and zinc occur in the inner Port Hedland harbour (DOE

2006$_c$), yet, no organic chemicals have been detected in the harbour and dissolved concentrations of other metals approach those found in the open ocean (DOE 2006$_c$).

6.6 Air Quality

6.6.1 Existing Air Quality in Port Hedland

The semi-arid landscape of the Pilbara is a naturally dusty environment with wind-blown dust a significant contributor to ambient dust levels within the region. This was highlighted by the aggregated emission study that was conducted by SKM in 2000 (SKM 2003). This study found that the Pilbara region emitted around 170,000 tonnes of windblown particulate matter in the 1998/1999 financial year. Other research has also shown that background levels of dust in the Pilbara region often exceed the NEPM standard level for PM_{10} of 50 µg/m^3 (DOE 2004$_a$).

However, despite the naturally high background levels of PM_{10} in the Pilbara region, most of the PM_{10} in the town of Port Hedland is locally generated (DOE 2004$_a$) with the primary sources of dust being port operations. Existing port operations include:

- BHPBIO Nelson Point operations;
- BHPBIO Finucane Island Operations; and
- PHPA Operations including the export of manganese and chromite ores from Berth 1.

Dust emissions from the manganese, chromite and iron ore exports vary with the moisture content of the ore; size distribution of the ore; ability of the ore to form crusts; and, the prevailing wind direction and speed. Observations made at similar ore handling facilities in the Pilbara indicate that wind generated dust emissions from stockpiles and open areas is typically low when wind speeds are below a certain threshold, and increase rapidly as wind speeds increase above the threshold (Pitts 2000). Annual meteorological data, recorded at Port Hedland Airport, indicates that the predominant winds in Port Hedland are east-south easterly winds, occurring primarily in winter, and north westerly winds, occurring primarily in the summer (refer to **Figure 6-3** and **Figure 6-4**).

Other sources of dust emissions include vehicle movements, diesel combustion and shipping movements. Management of dust is complicated by the range of dust sources and the lack of an adequate buffer between the port operations and sensitive premises. Extensive monitoring and characterisation of dust in Port Hedland (BHPBIO 2006) has identified a large proportion of the airborne particulate matter as being crustal in nature and larger than 10 µm.

6.6.2 Chromite Ore and Manganese Ore Dust

Dust emissions from chromite and manganese ores, in the form of chromite ($FeCr_2O_4$) and manganese oxide (MnO_2), has raised public health concerns due to the potential toxicological impacts of exposure to elevated concentrations of these metals. Chromium generally exists in two

forms in the environment: chromium (III) and chromium (VI). Chromium metal and chromium (III) compounds are not usually considered health hazards. In fact, chromium (III) is an essential nutrient that helps the body use sugar, protein, and fat. In contrast, hexavalent chromium (chromium (VI)) compounds can be toxic if orally ingested or inhaled. Most chromium (VI) compounds cause irritation to eyes, skin and mucous membranes. Chronic exposure to chromium (VI) compounds can cause permanent eye injury, unless properly treated.

In chromite ($FeCr_2O_4$) chromium exists as chromium (III) and in nature chromium predominantly exists as chromium (III) rather than chromium (VI).

Manganese is an essential trace element nutrient that plays a role in bone mineralization, protein and energy metabolism, metabolic regulation, cellular protection from damaging free radical species and the activation of enzymes (ATSDR 2000). However, exposure to manganese dust can impact on the respiratory system and long term exposure to manganese dust is known to be associated with neurological damage (Myers *et al*.2003_a, Myers *et al*.2003_b, Lucchini *et al.* 1999).

6.6.3 Iron Ore Dust on Mangroves

Other studies relating to elevated dust concentrations in Port Hedland have considered the environmental effects of dust deposition, in particular the impacts of iron ore dust deposition on mangrove health. BHPBIO has undertaken extensive research into the impacts of iron ore dust on the mangrove communities at Port Hedland, using a combination of scanning electron microscopy to look at stomata impacts and remote sensing to monitor impacts on vegetation condition. The results of the scanning electron microscopy study indicated that dust particles did not block mangrove leaf stomata, restrict transpiration or cause abrasion (Paling et al 2001).

6.7 Noise

6.7.1 Background Noise

The ambient noise environment in Port Hedland, particularly at the West End, is largely dominated by operational emissions. A large amount of industrial infrastructure is located immediately to the south of the township and includes iron ore, manganese and chromite shiploading and stockpiling operations, and iron ore transportation in the form of rail and road traffic. This infrastructure operates continuously (24/7) (VIPAC 2007).

Noise emissions from the port are not continuous in nature and can vary considerably depending on the activities being undertaken. There can be overlap of noise emitted from a number of port users and from other activities in the Port Hedland area, and as a consequence noise emissions can be cumulative at their point of impact.

Prevailing weather conditions also have a significant effect on the extent to which noise emitted by port operations may impact on the community, particularly during the night-time where atmospheric conditions can enable noise to travel greater distances.

Background (L_{A90}) noise levels are generally no less than 50 dB(A),even during the quietest hours of 1–2 am in the central parts of Port Hedland township. Closer to the port, particularly in the Commercial District, noise levels can be up to 60 dB(A) during the same period.

6.7.2 Existing Sources

Sources of noise in the Port Hedland area include existing port operations within the western end of Port Hedland townsite and existing BHPBIO at Nelson Point and Finucane Island which primarily dictate the background noise levels in Port Hedland (VIPAC 2007).

Specific noise sources include;

- Construction noise;
- Road traffic;
- Trains;
- Front end loaders and dozers;
- Operational infrastructure, including conveyors and shiploaders; and
- Helicopter activities at the port.

Within the Port Hedland area, the EPA assigned noise levels are currently exceeded due to the close proximity of port operations to commercial and residential areas.

6.8 Traffic

6.8.1 Background

Existing traffic issues and potential traffic problems that may arise as a result of future developments in the Port Hedland area have been highlighted as a particular concern by the local community.

The Perth-Darwin Corridor Strategy (AusLink 2007) identified a number of existing traffic concerns for road networks in the Port Hedland area including:

- Traffic congestion between local urban traffic and heavy vehicles in Port Hedland where the local road network must cater for both triple road train access and for freight transport to the ports and other industrial areas;
- The current alignment and/or configuration of the main road network, which intersects with access roads for the South Hedland residential area, Wedgefield industrial zone, port areas and

railway crossings, exacerbating the conflict between heavy vehicles, ore trains and local traffic;

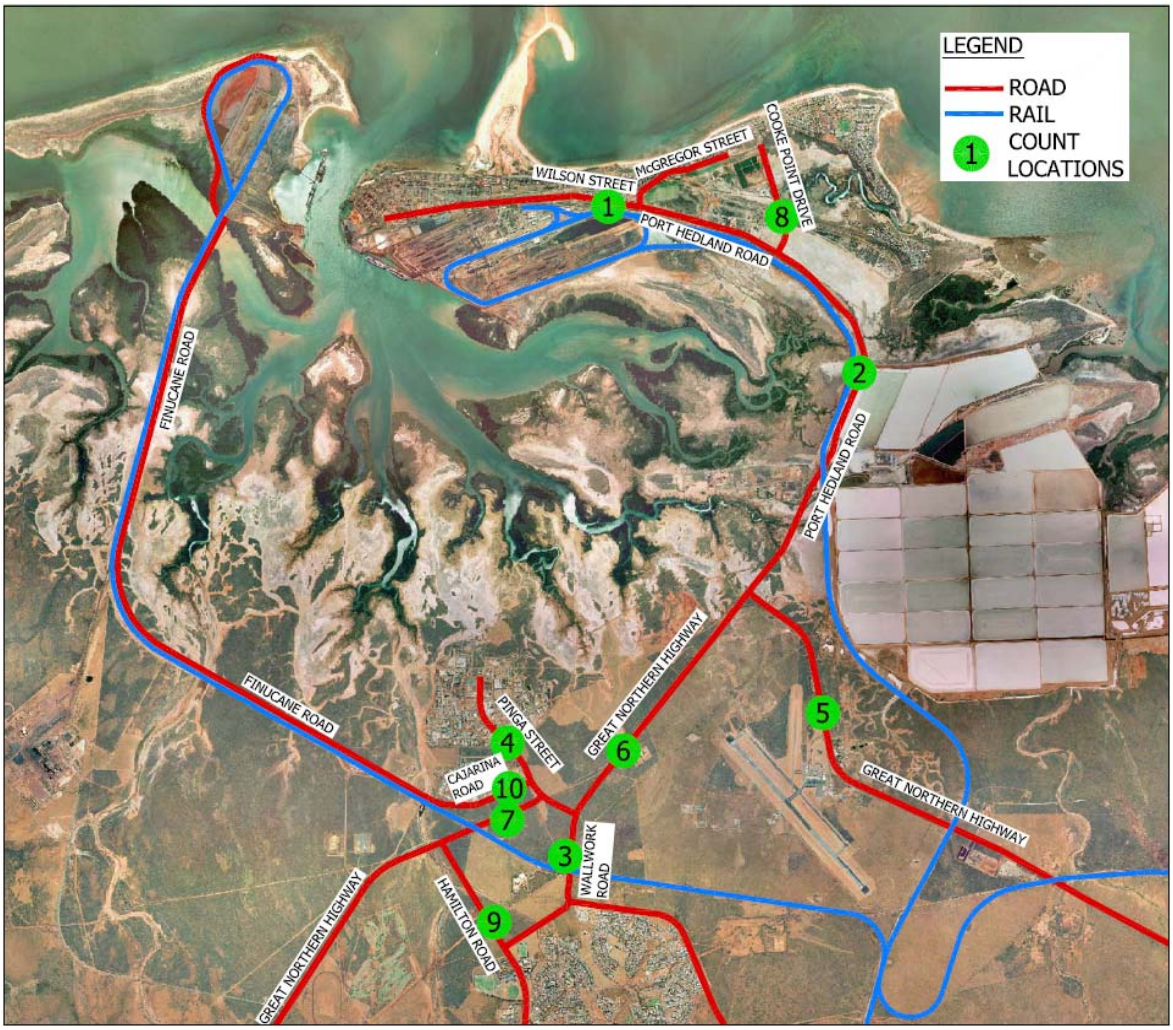
- Insufficient overtaking opportunities given the mix of heavy vehicles, passenger vehicles and tourist traffic;
- The need for some parts of the road network to be reconstructed in the longer term, due to poor pavement quality; and
- The quantity and quality of rest areas and/or lack of parking opportunities for road trains, which is not conducive to improving fatigue management outcomes.

To evaluate the potential impacts of UPBP, a detailed traffic assessment was completed which included an investigation of existing and future traffic conditions in Port Hedland. The findings of this report are in **Appendix G**.

6.8.2 Road Network

The proposed haulage routes to the UPBP site are along two main roads: Great Northern Highway and Port Hedland Road/Wilson Street; and three local roads: Pinga Street, Cajarina Road and Finucane Road (refer to **Figure 6-12**). These roads currently provide the only route access to Finucane Island that is approved for road train use by Main Roads Western Australia.

The proposed haulage routes to Utah Point are considered to have a number of deficiencies and impediments, with Great Northern Highway not having priority at the intersections of Port Hedland Road, Wallwork Road or Pinga Street, despite it forming the National Highway No 1 route through Port Hedland. There is also no dedicated industrial distributor type road connecting the Great Northern Highway to Wedgefield Industrial Area, Finucane Island and FMG's development at Anderson Point.



- **Figure 6-12 Existing Road Network and Traffic Count Locations**

*** Background mapping source: Department of Land Information. July 2004**

6.8.3 Rail Network

There are currently three railway level crossings on the proposed haulage routes to Utah Point, with another crossing currently under construction. The existing rail network is owned and operated by BHPBIO, which includes the Goldsworthy line that runs east-west to Finucane Island and the Mount Newman line that runs north-south to Nelson Point. In addition to the two existing rail lines, FMG is planning a 310 km rail line linking mining operations at Cloud Break to two new berths at Anderson Point, in Port Hedland (Environ 2004).

6.8.4 Traffic Volumes and Composition

A summary of the weekday volumes is shown in **Table 6-6**. Detailed examination of traffic count data shows that the peak hours of traffic volume occur between 6-7 am in the morning and 4-5 pm in the afternoon.

The majority of the traffic consists of light vehicles, with 3% of traffic on Port Hedland Road and Great Northern Highway composed of long vehicles or road trains such as double, triple and quadruple road trains.

Table 6-6 Average Weekday Traffic Volumes (Oct 2007)

Location	Volume (vehicles per day)
Wilson St (E of BHPBIO)	8 000
Port Hedland Rd (N of GNH)	11 400
Wallwork Rd	10 000
Pinga St (N of Cajarina Rd)	5 900
Great Northern Hwy	
E of Port Hedland Rd	3 600
Mid Port Hedland Rd & Wallwork Rd	12 000
S of Pinga Street	2 400
Cooke Point Dve	3 000
Hamilton Rd	3 400
Cajarina Rd	3 000

6.9 Social Setting

6.9.1 Communities

The Pilbara region is sparsely populated, with a total population of approximately 40,000 people. The majority of the population is located in the western third of the region, which includes the towns of Port Hedland, Karratha, Newman, Tom Price, Paraburdoo, Roebourne, Wickham, Dampier, Onslow and Marble Bar. The Town of Port Hedland is a one of the largest towns in the Pilbara region and is the main centre of population in the region.

The Town of Port Hedland includes both the original Port Hedland townsite and South Hedland, located 15 km inland. The original Port Hedland settlement was gazetted as a townsite in 1896 and South Hedland was established in 1966 in response to growing pressure on the existing townsite (WAPC 2003$_b$). South Hedland is now the larger of the two settlements, with close to 70% of the total population residing there (SMEC 2004).

Overall there are six districts in the Town of Port Hedland area: West End, Cooke Point, Pretty Pool, Redbank, Wedgefield and South Hedland. The West End district encompasses the original Port Hedland townsite and port infrastructure. Redbank and Wedgefield are classified as light industrial areas, although Wedgefield is understood to contain residential housing. Cooke Point,

Pretty Pool and South Hedland are all residential areas incorporating housing, social and commercial land uses.

6.9.2 Demographics

The combined township of Port Hedland has a total population of approximately 13,500 (ToPH 2006), with 55% of the population being male and 45% female (ABS 2004). The population fluctuates with the construction and operation of large resource projects, including related infrastructure projects (PDC 2003).

In comparison to Perth, the Town of Port Hedland population is a younger population with a median age of 30.8 years compared to 32.3 years in Perth (ABS 2004). A large proportion of the population is in the 0–14 years age group (26.4%), followed by the 25–34 years age group (19.4%) (ABS 2004).

6.9.3 Facilities and Infrastructure

The provision of facilities and infrastructure within the town of Port Hedland is closely linked to the historic development of the Port Hedland and South Hedland townsites and the development of the existing port berths.

Port Hedland's water supply is managed by the Water Corporation through the Port Hedland Regional Water Supply Scheme (ToPH 2006). Groundwater is extracted from well fields located within water reserves on the Yule and De Grey Rivers and pumped to Port Hedland for industrial and domestic use (WAPC 2003$_b$). The water is stored in tanks in South Hedland and then transferred to bulk storage tanks in the port area and on Finucane Island (ToPH 2006).

There are two sewage treatment facilities in Port Hedland: Spinifex Hill Waste Water Treatment Plant; and South Hedland Waste Water Treatment Plant (ToPH 2006). These treatment facilities have the capacity to serve a population of up to approximately 15,000 people (ToPH 2006).

Electricity is supplied to Port Hedland by Horizon Power from a gas-fired power plant in the Boodarie Industrial Estate which distributes electricity to sub-stations in Port Hedland, Wedgefield, South Hedland and Finucane Island (ToPH 2006). Gas is supplied by Alinta to the power plant in Boodarie but there is no reticulated gas service in Port Hedland (ToPH 2006).

The major shopping centre for the Town of Port Hedland is located in South Hedland (ToPH 2006). Government offices and public services are concentrated in South Hedland. Medical services will also be centred in South Hedland once construction of the new hospital is completed (ToPH 2006).

6.9.4 Health

The regional hospital for the Pilbara region is located in Port Hedland and, as discussed above, a new hospital is proposed for construction in South Hedland.

The improvement of indigenous health is an important issue for Port Hedland, given the proportionally higher number of Aboriginal residents in the area and current Aboriginal health statistics which compare poorly to the general WA population statistics. Other health issues of concern include levels of dust in the Port Hedland townsite and the perceived health effects of manganese ore and chromite ore dust (discussed in **Section 6.6** and **Section 6.2.4**).

Mosquito management and incidences of mosquito borne diseases in the area are also a key concern. Tidal creek mangrove swamplands which surround the Port Hedland area provide natural breeding grounds for mosquitoes. 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 (ToPH 2008).

These mosquito borne disease are notifiable diseases under the *Health Act 1911* and incidences of these diseases need to be reported to the DOH (DOH 2006_a, DOH 2006_b). Murray Valley Encephalitis (also known as Australian Encephalitis) can cause fever, irritability, drowsiness, floppiness, fits, bad headaches, nausea, vomiting, muscle tremors and dizziness (DOH 2006_a). Severe forms of the disease can lead to brain damage, paralysis and even death (DOH 2006_a). Ross River Virus and Barmah Forrest Virus are not fatal but can cause prolonged joint pains and swellings, aching tendons, sore muscles, skin rashes, fever, fatigue, headaches and swollen lymph nodes (DOH 2006_b).

The Town of Port Hedland conduct routine mosquito surveillance of breeding sites throughout the area and in conjunction with State Health Authorities maintain sentinel chicken flocks to provide a means for the early detection of mosquito borne diseases in the area (ToPH 2008). Trapping of adult mosquitoes in targeted breeding sites in Port Hedland, South Hedland and Wedgefield is also undertaken on a regular basis, especially following heavy rainfall (ToPH 2008).

6.9.5 Recreation, Tourism and Amenity

Coastal recreational pursuits including fishing, diving and other marine-based activities, are very popular in Port Hedland due to the close proximity to the coast.

Fishing from recreational craft is particularly important with limited access to coastal areas by vehicle (WAPC 2003_b). There are two major boat-launching areas in Port Hedland, one at Finucane Island and the other adjacent to the West End port (WAPC 2003_b). Port Hedland Port Authority (PHPA) also has a jetty near the existing port area which allows commercial fishing boats access to the coast when commercial wharves are unavailable (WAPC 2003_b).

There was previously a small boat landing at Finucane Island, near Utah Point, which was recently removed due to construction operations in the area. A new boat ramp for the public is planned to be constructed as part of the yacht club redevelopment on the spoil bank, located to the north of the Port Hedland townsite. PHPA will contribute funds to this development.

There are also a number of parks, sporting and recreational grounds in the Town of Port Hedland. Other recreational/cultural facilities include the Matt Dann Cultural Centre, which features theatre, music and movies, and the Courthouse Arts Centre and Gallery.

Tourism is an expanding industry in the Pilbara and north-west Western Australia, with ecotourism becoming increasingly popular. Port Hedland acts as a "gateway" to the Pilbara region, especially for people travelling to Karijini National Park, Karratha and the Kimberley region (WAPC 2003_b). However, there is limited tourism within Town of Port Hedland and its direct surrounds (WAPC 2003_b). Tourist attractions include coastal recreation activities such as fishing, whale watching, crabbing, bird watching and turtle nesting. Port operations are also a tourist attraction.

6.10 Heritage

6.10.1 Indigenous

The Pilbara region is home to a number of different indigenous tribes, and is rich in Aboriginal heritage sites. Aboriginal tribes indigenous to the Port Hedland area include the Kariyarra and Nyamal peoples, with these people maintaining a long standing association with the area. Port Hedland was originally known by the Kariyarra and Nyamal people as *Marapikurrinya*, which refers to the hand like formation of the tidal creeks coming off the harbour (mara - hand, pikurri - pointing straight and nya - a place name marker).

Within the port area of Port Hedland there are 36 known sites of Aboriginal heritage significance including rock engravings; stone artefacts that might have been engraving tools; and, middens containing baler and pearl shell (PHPA 2006).

Previous surveys identified an Aboriginal heritage site on Finucane Island, within the proposed footprint of the UPBP development area. The heritage site is believed to be a shell midden named "Sounness Drive Camp". In general, shell middens are usually located in coastal areas or in areas adjacent to creeks and contain the remains of shellfish and bone. These middens provide physical evidence of Indigenous campsites and long-term occupation of an area. Middens can vary in size and can contain artefacts such as stone tools. Middens are sometimes associated with past Aboriginal burial sites.

On behalf of PHPA further investigation of the UPBP study area and of other areas of Aboriginal heritage significance is being undertaken by representatives from the Kariyarra community and by

Pilbara Native Title Services (PNTS), a service division of the Yamatji Land and Sea Council and the authorised Native Title representative body for the Pilbara.

6.10.2 European

European Heritage in Port Hedland is closely linked to the establishment of the town's existing ports and to early European settlement.

Although the Western Australian coastline was visited by other European explorers prior to 1829, Port Hedland received its current European name after Captain Peter Hedland anchored his ship the "Mystery" in the mangrove inlet in 1863.

From 1896, the first Port Hedland jetty was built to service the pastoral industry and in 1908 the jetty was extended as a result of the discovery of gold at Mable Bar. From the early to mid 1900s the port was primarily used by the pastoral industry with additional exports of pearl shell, gold, tin, copper and later manganese.

In 1965, 1975/76 and 1986, Port Hedland underwent significant expansion with major dredging of the port channel to allow larger carriers to enter the port and to allow for the export of iron ore and salt.

Places of European heritage significance within the Port Hedland area are predominantly located within the West End district (ToPH 2006). This area encompasses the harbour and the original settlement along the coastline (ToPH 2006).

A global search of the Database of Heritage Places listed 32 places of European heritage significance existing within the Port Hedland local government area. However, only four places are listed on the Register of the National Estate (with no formal assessment) and only two places are registered on the State Register of Heritage Places: Dalgety House and the former District Medical Officer's Quarters.

Both Dalgety House and the former District Medical Officer's Quarters are located within the Port Hedland township, across the harbour approximately 1 km from the UPBP study area. No places of European heritage significance are located within or in close proximity to the UPBP study area.

7. Potential Impacts and Management

7.1 Overview

This section describes the potential environmental impacts of the UPBP and identifies the proposed management and mitigation measures to manage these impacts. In identifying potential impacts, cumulative impacts on the environment and Port Hedland community resulting from the UPBP and existing land uses are also assessed. It is anticipated that through the management and mitigation measures identified in this PER, the UPBP will satisfy the requirements of statutory authorities and key stakeholders (including the Port Hedland community).

7.2 Environmental Impact Assessment

An Environmental Impact Assessment (EIA), as defined by the EPA (EPA 2004$_b$), is "*an orderly and systematic process for evaluating a proposal, including its alternatives and its effect on the environment, and the mitigation and management of those effects*". The assessment of impacts for the UPBP has been undertaken using the following steps.

7.2.1 Identification of Environmental Impacts

The environmental impacts and factors of interest associated with the UPBP were identified during the scoping process, with the environmental scoping document (**Appendix A**) approved by the EPA under Section 6.1 of the *Environmental Impact Assessment (Part IV Division 1) Administrative Procedures 2002*.

The key environmental factors relative to the UPBP development proposal and requiring detailed investigation and assessment were identified as follows:

- terrestrial flora, vegetation and fauna;
- loss of mangrove communities;
- impacts on the marine environment and fauna;
- dust impacts;
- noise impacts;
- traffic impacts; and
- Aboriginal heritage.

7.2.2 Characterising Impacts

Environmental impacts may vary in magnitude from no change or only a slight discernable change, to a significant change in the status of the environment. The significance of an impact is

determined as a function of the importance or sensitivity of the receiving environment and the magnitude of the impact.

To assess environmental impacts for the UPBP the following measures were undertaken:

- Relevant legislation, standards and guidelines for each of the key environmental factors were identified and applied to the assessment of impacts where applicable;
- The receiving environment was fully described and understood and potential impacts to this environment were identified, as based on environmental assessments undertaken by experienced and qualified personnel;
- The five principles of environmental protection were taken into consideration when assessing the significance of impacts, including the precautionary principle, intergenerational equity, conservation of biological and ecological diversity, improved valuation, pricing and incentive and waste minimisation;
- Feedback received during community consultation was used to identify areas of concern for the local community and key stakeholders and to identify suitable management and mitigation methods; and
- Mitigation and management solutions were identified to minimise environmental impacts to "As Low As Reasonably Practical" and to aim for "Best Practice".

7.2.3 Management, Monitoring and Mitigation

PHPA has developed Environmental Management Standards and Guidelines that are applicable to all people, activities and operational aspects throughout the authority. The Standards are based upon the PHPA Environmental Policy and the broad requirement of ISO 14001. The Standards also include the general requirements of environmental codes of practice and charters to which PHPA subscribes and has committed to at an organisational level.

PHPA maintains an Environmental Policy to support their commitment to protecting the environment of the port area and to minimise the impact of the port activities on the environment. This environmental policy covers all PHPA operations, with PHPA committed to the following:

- Comply with all applicable legislation and regulations, and aim for best practice;
- Identify, assess and document aspects of its activities and services that have or may have an impact on the environment and minimise these impacts;
- Develop, document and achieve environmental objectives and targets;
- Integrate environmental consideration into all aspects of decision making, planning, design, construction and operational processes and aim for sustainability;
- Use resources efficiently and minimise waste;

- Ensure that all employees and other port users are made aware of the importance of achieving conformance with the environmental requirements of this policy;
- Hold all employees, contractors and other port users accountable for their implementation of this Environmental Policy;
- Develop and update an Environmental Management Plan and Incident Management Plan to be able to effectively protect the environment and respond to accidents and emergency situations associated with all activities and services;
- Monitor, measure and report its overall environmental management performance in an effective way to measure progress towards the achievement of environmental goals and objectives as well as to recognise deficiencies and take the opportunity to improve;
- Investigate non-conformances and take action to mitigate any impacts caused and initiate and complete corrective and preventive action;
- Annually review the environmental performance and act on results to ensure continuing suitability, adequacy and effectiveness; and
- Communicate openly and honestly on its environmental performance to port users, government and the general public.

Where possible, environmental control measures have been integrated into the design development of the UPBP with a particular focus on avoiding or minimising impacts to as low as reasonably practical, e.g. by avoiding disturbance to potential acid sulphate soils, minimising vegetation removal (especially mangroves) and minimising emissions (dust and noise).

Residual impacts associated with the construction and operation of UPBP will be addressed through the implementation of suitable Environmental Management Plans (EMPs) for construction and operations. These EMPs will be developed in agreement with regulatory authorities following receipt of relevant environmental approvals and together with this PER document will form the basis for environmental compliance that will be adopted by all personnel associated with the UPBP development.

Sub-plans to be included within the EMPs (refer to **Appendix K**) for construction and operations include:

- Aboriginal heritage;
- Acid sulfate soil management;
- Air quality (dust) management and monitoring;
- Contaminant management;
- Greenhouse gas emissions management;
- Mangrove management;

- Marine water quality management;
- Mosquito management;
- Noise management and monitoring;
- Surface and groundwater management and monitoring;
- Terrestrial fauna management;
- Terrestrial flora and vegetation management, including weed management;
- Traffic management;
- Turtle management and monitoring; and
- Waste management.

7.3 Landform, Geology and Soils

7.3.1 Management Objectives

The key objectives for the management of landforms, geology and soils for the UPBP are to:

- To maintain the integrity, ecological functions and environmental values of landforms, geology and soil.
- To minimise permanent landform alterations.
- To require that modifications to landforms are physically and environmentally stable and sustainable.

7.3.2 Applicable Standards and Legislation

Applicable State and Commonwealth legislation and guidelines for the management of landforms, geology and soils include:

- Acid Sulfate Soils Planning Bulletin No. 64 (WAPC 2003_a –updated 2007);
- *Contaminated Sites Act 2003*;
- DEC Policy Position - Acid Sulfate Soils and the Contaminated Sites Act 2003;
- DEC Identification and Investigation of Acid Sulfate Soils (Draft), Acid Sulfate Soils Guideline Series (DOE 2006_a) and references contained therein; and
- National Strategy for the Management of Coastal Acid Sulfate Soils (ANZECC/ ARMCANZ 2000).

7.3.3 Potential Impacts

The key potential impacts to landforms, geology and soils resulting from the UPBP include:

- Substantial landform modification of the proposed stockyard site;

- Alteration of the natural soil profile and drainage (refer to **Section 7.4**);
- Increased wind and water erosion; and
- Disturbance of acid sulfate soils.

Landform Modification

The development of the UPBP will require substantial modification of the proposed stockyard site. Construction activities will include the clearing of native vegetation (discussed in **Section 7.5** and **7.6**) and considerable earthworks including the import of fill material (approximately 1,000,000 m^3) to the site to elevate the stockyards a minimum of 2.0 m above the natural ground level. This will considerably change the landscape of Stanley Point, raising the site substantially above the fluctuating groundwater level and marine muds.

However, the proposed area for development is predominantly centred on an elevated natural limestone outcrop at Stanley Point which is sparsely covered with vegetation. Areas adjacent to the proposed UPBP development site have also previously been substantially altered, including the clearing and infilling of land for other operations. The overall modification of the proposed site for the UPBP stockyards is considered to be of low significance.

Wind and Water Erosion

Activities associated with the construction and operations of the UPBP, including the clearing of vegetation, earthworks and the use of water for dust suppression and other purposes, have the potential to result in increased wind and water erosion.

Clearing of vegetation will disturb the soil surface and expose the soil surface to wind and water erosion. Earthworks will also alter patterns of surface drainage due to the stockpiling and staged distribution of fill material, the imposed changes to the soil surface and permeability (refer to **Section 7.4**), and the elevation of the stockyard area above the surrounds. Each of these factors has the potential to result in increased surface runoff and erosion if not managed correctly.

However, due to the implementation of design solutions, management and mitigation methods (discussed below in **Section 7.3.4**), wind and water erosion is expected to have a minimal impact and is considered to be of low significance.

Disturbance of Acid Sulfate Soils

Preliminary results from geotechnical work undertaken by Coffey (2007) indicate that there are no AASS found at the UPBP development site although PASS were recorded across the northern portion of the proposed stockyard area.

If PASS are exposed to air as a result of drainage or disturbance, these soils can become AASS, producing sulfuric acid and increasing the mobility of iron, aluminium and other heavy metals within soil and groundwater. Potential impacts resulting from the disturbance of PASS include adverse changes to water quality and associated ecological communities; health impacts to construction and operational staff being exposed to sulfur dioxide emissions and/or coming into contact with acidic soils; and, increased risk of structural damage to buildings and other infrastructure as a result of the acidic corrosion of concrete and other structural materials.

No significant ground disturbance activities or groundwater extraction are planned for the proposed stockyard site within the vicinity of PASS. The design of the stockyard civil works is based on filling over the top of the natural ground level as opposed to "Cut to Fill" earthworks and only a very small amount of localised disturbance to the natural ground will occur for the installation of concrete foundations. These concrete foundations will extend to a maximum depth of 2.5 m to the underlying bedrock (calcarenite). The largest extent of these concrete foundations will be for the two conveyor transfer towers, which are not located in the areas of PASS.

Due to the low risk of disturbing PASS during construction and operation of the UPBP, potential impacts associated with the presence of PASS at the UPBP site are considered to be of low to moderate significance. If following detailed design, disturbance of PASS is deemed necessary further sampling and analysis will be undertaken in accordance with an Acid Sulfate Soil Management Plan (ASSMP) (refer to **Appendix K**).

7.3.4 Management and Mitigation

Key design, management and mitigation measures to minimise impacts to landforms, geology and soils to ALARP are discussed below.

Landform Modification

To minimise impacts to the overall layout and landform/ecosystem function of Stanley Point the designated location for the UPBP development is centred on the existing limestone outcrop and development outside this area has been limited to the minimum area necessary. For construction and operations, including clearing, infilling and delineation of road access, activities will be restricted to a defined development area, limiting impacts to surrounding areas.

Wind and Water Erosion

To minimise the potential for wind and water erosion, clearing of vegetation will be limited to that necessary for safe and efficient construction activities and operations. Areas not to be disturbed will be clearly identified and flagged.

Long and short-term scheduling of construction activities will take into consideration adverse meteorological conditions such as strong wind conditions and heavy rainfall that have the potential to exacerbate wind and water erosion processes to ensure that additional management measures to reduce erosion are implemented as necessary.

The temporary construction and final operational layout of the UPBP site will be designed to incorporate measures for reducing soil erosion including the restriction of vehicle access and/or equipment movement outside the designated areas, the compaction of soil and fill material as soon as practicable, and the careful design and implementation of site drainage systems. In particular, site drainage for operations is designed to limit surface runoff and erosion from occurring outside the UPBP site with all surface water runoff primarily contained within the stockyard area and managed through drainage of water into a series of sumps and into a recirculation pond and/or settlement ponds (refer to **Section 4.6**).

Ongoing water management measures will be implemented during construction and operations of the UPBP to limit the potential for wind and water erosion. These measures include water misting of exposed surfaces to limit wind erosion, restricting vehicle and equipment washdown to the appropriate areas, and limiting excessive water usage onsite.

Disturbance of Acid Sulfate Soils

No disturbance of PASS is expected within the stockyard area as part of construction or operations of the UPBP. Ongoing monitoring of activities carried out at the site during construction and operations will be undertaken to prevent unauthorised disturbance of these soils.

However, if disturbance and/or any significant excavation of soil are deemed necessary following detailed design, further investigations will be undertaken in accordance with an ASSMP to further define the extent and the physical and chemical properties of PASS.

The ASSMP will be prepared prior to disturbance of PASS and in agreement with the DEC. This plan will detail:

- the extent of the PASS;
- how disturbance of PASS will be avoided;
- relevant legislation;
- requirements for sampling and investigation of PASS; and
- on-going monitoring and management.

An outline ASS Management Plan is provided in **Appendix K** which details management tasks for avoiding the disturbance of PASS and for sampling, site management and monitoring requirements should disturbance of PASS be deemed necessary.

7.3.5 Predicted Outcome

It is expected that through careful construction and management of the UPBP, the objectives for the overall management of landforms, geology and soils can be achieved. To ascertain that the correct construction and operational activities are undertaken, specialist advice will be provided to the construction manager as applicable and the site manager will maintain a watching brief of all activities conducted at the UPBP site. Whilst disturbance of PASS is a key issue for the development of UPBP, disturbance of these soils will be avoided during construction activities as far as practicable. Should disturbance be unavoidable the appropriate management procedures will be employed through the development and implementation of an agreed ASSMP.

7.4 Catchment Hydrology and Groundwater

7.4.1 Management Objectives

The key objectives for the management of surface drainage, hydrogeology and groundwater are:

- To maintain surface and groundwater quality consistent with ANZECC Water Quality Guidelines and ensuring that existing environmental values are protected.
- To minimise the potential for surface and groundwater contamination.
- To minimise the potential for erosion resulting from construction, port operations and from stormwater flow.
- To minimise pressure on existing water resources.

7.4.2 Applicable Standards and Legislation

Applicable State and Commonwealth legislation and guidelines for water management include:

- ANZECC Guidelines for Fresh and Marine Water Quality 2000;
- DOW Stormwater Management Manual for Western Australia 2004-2007;
- National Health and Medical Research Council (NHMRC) Australian Drinking Water Guidelines 2004; and
- *Waterways Conservation Act 1976.*

7.4.3 Potential Impacts

The key potential impacts to surface and groundwater as a result of the UPBP include:

- Alteration of surface drainage and water flow pathways, including surface, ground and tidal water flow to mangroves;

- Limited (or no) infiltration of rainfall and surface water to groundwater within the UPBP site, restricting freshwater recharge of groundwater;
- Increased turbidity of surface waters due to soil erosion and/or the transport of ore particulates;
- Increased acidity and concentrations of heavy metals within surface and groundwater as a result of the disturbance of PASS (refer to **Section 7.3**);
- Contamination of surface and groundwater; and
- Increased pressure on water sources due to water requirements for the UPBP.

Alteration of Surface Drainage and Water Flow Pathways

The development of the UPBP, including the construction of the access road, stockyards and berth, will alter surface drainage and water flow pathways, including surface, ground and tidal water flow to mangroves.

The UPBP access road will traverse West Creek and the catchment areas for West Creek and South-West Creek, running parallel to the existing BHPBIO railway and access road. The BHPBIO railway embankment prevents the drainage of water to the south and west of Finucane Island Road. Water runoff from the UPBP access road will drain to the north and east.

To maintain drainage flow to either side of the UPBP access road shallow spoon drains and culverts will be installed. On the northern and eastern sides of the access road, shallow spoon drains at the toe of the road embankment will drain water from the road into natural depressions of formed drains. On the southern and western sides of the road, water will drain to shallow spoon drains which will drain under the road through small culverts at regular intervals.

Internal drainage within the UPBP site will be controlled through carefully designed drainage systems, including a series of sumps, recirculation pond and settlement ponds (refer to **Section 4.5**). Rainfall and surface runoff within the stockyards and from the perimeter road surrounding the stockyards will primarily be contained within the confines of the stockyard area within sumps in each of the discrete stockpile areas. No surface water runoff from the stockyards will flow directly into the surrounding mangrove areas at Stanley Point.

The sumps within each of the stockpile areas will allow for the primary settlement of particulates and water will be pumped from each of the sumps (one or more at a time) to the recirculation pond which has capacity to contain 50 000 m^3 of water. In the event, such as a greater than 1:10 year storm event, that the recirculation pond reaches capacity and it is not feasible from a safety or operational perspective to allow water to pond in one or more of the stockpile areas, stormwater will be pumped from the recirculation pond into the harbour. This will only occur under controlled discharge conditions and subject to discharge waters meeting specified water quality criteria (refer to **Section 4.5** and **Section 7.6**).

The alteration of surface drainage and water flow pathways is not anticipated to have any substantial impacts on the surrounding environment, including mangroves. Tidal water flow will be maintained to mangrove areas surrounding the access road through the provision of culverts and due to the development of the access road increased surface and tidal water flow will be retained in these areas supporting mangrove growth. Tidal flow will not be restricted to mangrove areas surrounding the UPBP stockyard site and, for this reason, the restriction of surface runoff from the UPBP site to surrounding mangrove areas is not expected to substantially impact on these areas.

Limited Infiltration of Rainfall to Groundwater

The stockyards will be purposely designed and constructed to restrict surface water infiltration to groundwater through the compaction of fill material and/or through geotechnical barrier lining of potential risk areas within the stockyards.

Preliminary groundwater and leaching investigations have shown that chromite stockpile areas could potentially pose a risk to groundwater. Therefore, the proposed stockpile area/s for chromite will be lined with a geotechnical barrier to prevent infiltration of surface water to groundwater in these areas. Should ongoing investigations determine that other stockpile areas potentially pose a risk to groundwater, such as manganese stockpile areas, these areas will also be lined.

Given that groundwater recharge is dominated by tidal regimes and not reliant on infiltration of rainfall to groundwater, reducing the permeability of the stockyard area is expected to have minimal impacts on groundwater.

Increased Surface Water Turbidity

Increased turbidity of surface waters may result from increased water runoff within the stockyard area, from soil erosion (refer to **Section 7.3**) and/or the transport of ore particulates. However, due to the initial containment of all surface water runoff within sumps in each of the discrete stockpile areas and the subsequent storage of surface water runoff within the recirculation pond and/or settlement ponds, surface water turbidity is not considered to be a significant issue. (Note: Increased turbidity of marine waters is discussed in **Section 7.6**).

Potential Contamination of Surface and Groundwater

The potential contamination of surface and groundwater could result from: (a) the accidental leakage and spillage of fuel, hazardous materials, ballast water and other contaminants such as sewage and grey water; or (b) the leaching of materials being temporarily stored at the stockyard. However, design and management solutions, including the primary containment and treatment of all surface runoff within the stockyard area and the restricted permeability of potential risk areas will substantially reduce the risk of contamination occurring (refer to **Section 7.4.4**).

Increased Pressure on Water Resources

Increased pressure may be placed on existing potable water supplies as a result of the UPBP. Currently, the UPBP site has no existing water services. It is proposed that water requirements for construction and operations will be met from the town's reticulated water supply. An estimated water requirement of 0.715 GL per year is expected when the port is in operation, with an average daily usage of 1,960 kL.

However, potable water demands for the UPBP will be reduced by the treatment and reuse of water onsite. As a result water usage requirements and demands are considered to be of low significance.

7.4.4 Management and Mitigation

Management methods and mitigation of the key factors which may potentially impact upon surface and groundwater are discussed below:

Alteration of Surface Drainage and Water Flow Pathways

Prior to the commencement of construction of the UPBP stockyards and access road, plans for temporary and permanent site water management, including the design of sumps, settlement ponds and the recirculation pond, will be finalised and marked out on location.

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. In particular, the designed drainage systems for the stockyard and access road will be monitored to verify that tidal water flows are not prevented from reaching any areas of mangrove adjacent to the disturbance footprint.

Scheduling of construction activities will also take into consideration avoiding activities which are likely to substantially impact on water flow pathways (and/or water quality) during periods of peak water flow. This will allow temporary management measures to be implemented as necessary to minimise potential impacts to the surrounding environment, such as the temporary construction of drains and/or the storage of water in the recirculation pond or settlement ponds.

Limited Infiltration of Rainfall to Groundwater

Limiting the infiltration of rainfall and/or surface water into groundwater is not expected to have any adverse impacts on groundwater, but beneficially prevent potential contaminants leaching into groundwater. However, to confirm there are no impacts on groundwater, ongoing monitoring of groundwater will be undertaken (detailed below in reference to management and mitigation methods for preventing contamination).

Increased Surface Water Turbidity

Increased surface water turbidity within the stockyard area is not expected to result in adverse impacts on water quality largely due to the primary containment and treatment of all surface water runoff within the UPBP stockyard area. The initial containment of water within sumps located within each stockpile area allows for the primary settlement of particulates and allows proponents to manage material collected within their sumps, such as to remove waste material offsite as part of periodic maintenance or pre and post-cyclone clean-up.

Once primary settlement of particulates within each of the sumps has occurred, water will be pumped to the recirculation pond where further settlement of particulates can occur. The design of the sumps and water pumping system allows water to be extracted from a height above the settled particulates so that the majority of sediments are contained within each of the proponents' stockpile areas rather than being pumped to the recirculation water pond. To ensure the ongoing effectiveness of the sumps and recirculation pond, regular monitoring and maintenance will be undertaken to clean out and remove soil and sediments.

To prevent erosion, the outer face of the constructed seawall will have either flexmat or riprap erosion protection in conjunction with appropriate geofabric. As a result, the movement of soil particles into surface water runoff and subsequently into surrounding waterways will be further limited, preventing increases in turbidity of waters and sedimentation of drainage lines.

In addition, sediment traps and vehicle washdown controls will be implemented to maximize the retention and treatment of sediment within the UPBP site.

Potential Contamination of Surface and Groundwater

To prevent contamination of surface and groundwater the UPBP site will be purposely designed to carefully control surface water runoff and to limit infiltration of surface water to groundwater in potential risk areas.

As discussed above and previously in **Section 4.5**, surface water or stormwater runoff will primarily be contained within the stockyards and within the other specified sub-catchment areas, including the wharf catchment, the proposed future stockyard area, the fuel storage area, and the office and amenities area.

Within the stockyards, primary settlement of particulates will occur within sumps in each of the proponent stockpile areas, with subsequent settlement and/or treatment of stormwater within the recirculation pond if required. The recirculation pond will have the capacity to contain stormwater runoff up to a 1:10 year rainfall event. If the capacity of the recirculation pond is exceeded, i.e. in a greater than 1:10 year rainfall event, stormwater can be stored within the stockyard area up to a

level which does not adversely impact on employee safety and operational electrics, or does not compromise operations for a prolonged period of time. In this event, excess water can be pumped from the recirculation pond into the harbour, subject to meeting specified water quality criteria (refer to **Appendix N**).

Prior to a cyclone, during the cyclone season (November-April) and on a regular basis throughout the year, site management protocols will require that all sumps and the recirculation pond are cleaned and waste material is disposed of appropriately. The amount of water stored in the recirculation pond will also be minimised prior to any forecasted cyclone event to maximise the storage capacity of the recirculation pond to receive stormwater runoff.

The wharf catchment area will feature a lined earth bund settlement pond capable of storing a minimum 1000 m^3 of water and capable of containing all first flush water runoff from the wharf and associated equipment. Subsequent runoff which is in excess of the capacity of the wharf settlement pond is unlikely to contain any contaminants due to the regular wash-down of the wharf between shipments and the fact that there is no stockpiled storage of bulk materials within this catchment. As part of cyclone management practices the wharf area will be washed down to be free of any potential contaminants prior to site lock-down.

The fuel storage area will function as a contained and controlled catchment area for fuel storage. To prevent contamination occurring, the area will feature bunding and specific protocols will be implemented as part of site management for the storage and use of fuel within this area.

The office and amenities area will feature a truck wash facility which will function as a separately contained system. Contaminated heavy and light vehicles will be required to utilise truck wash laydown areas prior to exiting the UPBP site. Water runoff from heavy and light vehicle bays will firstly drain into a sump located immediately adjacent to the truck wash facility. Water will then be pumped to a secondary sump in which solid materials will be separated from water runoff and collected in the basin of the sump. Remaining water runoff will then pass through an oil separator tank and into water storage tanks for reuse.

To prevent contamination of groundwater within the stockyards, potential risk areas will be lined with a geotechnical barrier layer constructed approximately 500-700 mm beneath the stockyard surface in conjunction with a sub-surface drainage system to collect water infiltrating through compacted fill above this layer. Investigations have shown that chromium has the potential to leach from chromite ore stockpiles in concentrations that exceed ANZECC Marine Water Quality Guildlines (refer to **Appendix N**). Therefore, it is proposed chromite stockpile areas within the UPBP site will be lined with a geotechnical barrier layer. If ongoing investigations determine that manganese leached from manganese ore stockpiles may also pose a risk to the marine environment, this geotechnical barrier layer will be extended to the manganese stockpile areas. (Note:

Ecotoxicology studies are currently being undertaken to determine manganese toxicity to marine fauna as no high reliability ANZECC marine trigger levels are currently available).

To ensure that groundwater quality is maintained in accordance with ANZECC Water Quality Guidelines and/or with reference to existing baseline water quality levels, ongoing monitoring of groundwater will continue (groundwater bores have been installed across the UPBP site and a groundwater monitoring programme has been implemented for the UPBP). Monitoring of groundwater will be undertaken prior to construction, on a monthly basis during construction and bi-annually during port operations. Groundwater monitoring data and subsequent reporting will be submitted to the DEC on completion of construction and on annual basis during port operations for the life of the UPBP. Procedures for monitoring of groundwater are addressed in **Appendix M**.

To further reduce the potential for contamination of surface and groundwater, a Contaminant Management Plan will be implemented for the UPBP (outlined in **Appendix K**). A key focus of the Contaminant Management Plan will be to maintain appropriate procedures for the use, storage, export and/or disposal of potential contaminants, and in the event of spillage, to have measures in place to limit the extent of contamination within the confines of the UPBP site and quickly cleanup the contaminated area.

Individual management plans, specific to materials being used and exported from the UPBP site, will be also developed prior to the commencement of operations to address management procedures and protocols for the transport, storage and export of these materials.

Increased Pressure on Water Resources

Site design, management procedures and protocols will emphasize efficient water usage at the UPBP site to minimise pressure placed on existing water resources. The improved design of the UPBP will reduce water usage requirements for port operations in comparison to existing operations. Water collected in the recirculation pond, wharf settlement pond, proposed future stockyard settlement pond and truck wash facility will be reused at onsite for activities such as dust suppression and equipment washdown. Importantly, management plans, such as the Air Quality Management Plan, and induction training for site employees will also detail management measures for reducing water wastage onsite (refer to **Appendix K**).

7.4.5 Predicted Outcome

With the implementation of appropriate design measures, such as the primary containment of stormwater runoff within contained catchments and the lining of potential risk areas, and with the implementation of a Contaminant Management Plan it is expected that surface and groundwater quality will be maintained and impacts on the surrounding ecosystems will be limited. Whilst there are risks that contamination of surface and groundwater may occur, measures are in place to reduce

the chance of contamination occurring and to contain and treat any contaminated waters quickly and effectively.

7.5 Terrestrial Ecology

7.5.1 Management Objectives

The key objectives for the management of flora and fauna for the UPBP are:

- To maintain the abundance, diversity, geographic distribution and productivity of flora and fauna species and ecosystem levels through the avoidance or management of adverse impacts on flora and fauna.
- To protect Rare and Priority flora and fauna species that may occur within the UPBP development area.

7.5.2 Applicable Standards and Legislation

Applicable standards and guidelines for the management of flora and fauna include:

- CALM Policy Statement No. 9: Conserving Threatened Species and Ecological Communities 2003;
- *Conservation and Land Management Act 1984*;
- *Environment Protection and Biodiversity Conservation Act 1999*;
- *Environmental Protection (Clearing of Native Vegetation) Regulations 2004*;
- EPA Position Statement No. 2: Environmental Protection of Native Vegetation in WA 2000;
- *Soil and Land Conservation Act 1945*; and
- *Wildlife Conservation Act 1950*.

7.5.3 Potential Impacts

Potential Impacts for Terrestrial Flora and Vegetation

The key potential impacts to terrestrial flora and vegetation resulting from the UPBP include:

- Clearing of native vegetation;
- Impacts on significant flora species;
- Introduction and/or spread of weeds;
- Dust deposition;
- Hydrological changes; and
- Waste management.

Clearing of Native Vegetation

Clearing of vegetation will affect small sections of two of the three vegetation types identified within the study area, including areas of hummock grassland and low shrubland of scattered samphire (refer to **Appendix E**).

The primary impact on terrestrial flora and vegetation will be the permanent clearing required for the access road, stockyard area and potentially fill borrow pit areas. A large majority of the clearing will occur parallel to the existing Finucane Island Road for the access road construction. The vegetation condition across the majority of the UPBP study area is poor to good (Biota 2007). Existing disturbance at the site is significant as a direct consequence of the high level of industrial development in the area. Infrastructure such as roads, powerlines, drains, buildings, lay down areas and tracks, and rubbish is evident across the area, which has led to reduced and degraded vegetation and flora values (Biota 2007). A high number of weed species were also recorded throughout the site, particularly along the existing BHPBIO access road.

Access Road

The proposed access road is 7 km in length (from the existing FMG construction access road) with a seal width of 9 m. It will have two 3.5 m lanes with a 1 m sealed shoulder and 1 m unsealed shoulder for a total width of 11 m. The alignment of the access road will be parallel to the BHPBIO Finucane Island access road and railway, and lie within a 50 m wide road and services corridor east of the existing overhead power supply line (refer to **Figure 4-3**). The maximum work area for construction of the road and installation of services is estimated at 40 m, however the majority of the construction footprint area will be restricted to 20 m (on average).

The construction corridor will result in the clearing of approximately 21.6 ha of terrestrial vegetation consisting of two vegetation types; *Triodia epactia*, *Triodia secunda* hummock grassland (4.6 ha) and *Halosarcia indica* subsp. *leiostachya*, *H. halocnemoides* subsp. *tenuis* (samphire), *Muellerolimon salicorniaceum* scattered low shrubs (17 ha) (**Appendix E**).

The *Triodia epactia*, *Triodia secunda* hummock grasslands are considered to be of moderate conservation significance, as *Triodia secunda* has a relatively limited distribution in the Pilbara. However, this vegetation type in general is relatively widespread with approximately 70.5 ha of *Trodia* hummock grasslands occurring in the immediate area surveyed for the UPBP and approximately 398.5 ha occurring in the Port Hedland region. Therefore, the loss of *Trodia* hummock grasslands equates to a loss of approximately 6.5 % in the immediate locality and 1.1 % within the Port Hedland region, which is considered to be of low significance.

The remaining *Halosarcia indica* subsp. *leiostachya*, *H. halocnemoides* subsp. *tenuis* (samphire), *Muellerolimon salicorniaceum* scattered low vegetation type is relatively widespread in the locality

and is considered to be of low conservation significance. Approximately 193.6 ha of this vegetation type occurs in the immediate area surveyed for the UPBP and approximately 570.4 ha occurs in the Port Hedland region. The loss of this vegetation type equates to a loss of approximately 9 % in the immediate locality and approximately 3 % within the Port Hedland region.

Figure 6-9 shows the distribution of these vegetation types across the UPBP study area. Vegetation clearance for the construction of the access road is not considered to be significant. However, given the strong wind and heavy seasonal rains that fall in Port Hedland ground cover is important for dust attenuation and ground stability as well as providing opportunistic habitat and foraging areas for a variety of fauna.

Stockyard Area

As the majority of the proposed stockyard area is naturally devoid of terrestrial vegetation and/or has been significantly disturbed, impacts to terrestrial vegetation values within the stockyard area will be nominal.

Borrow Pit Areas

Whilst it is expected that the majority of imported fill material will be obtained from dredged spoil, borrow pit areas may be required on PHPA land but will only be needed if future dredge spoil material is unavailable at the time of construction. The construction of the borrow pit area will result in an additional 24.7 ha of *Triodia* hummock grassland clearance. If borrow pit areas are required, PHPA will undertake the necessary investigations (such as additional ASS assessments and subterranean fauna surveys (if required)) prior to any excavation activities. Refer to **Figure 1-1** for proposed borrow pit locations.

Impacts on Significant Flora

No Declared Rare Flora were recorded in the UPBP study area during the 2007 surveys (Biota 2007). Only one Priority flora, *Bulbostylis burbidgeae* (Priority 3), was recorded along the Finucane Island access road. This species forms dense stands of around 20 individuals within the sandy island vegetation close to the Finucane Island access road (Biota 2007). This species generally occurred in disturbed environments and suggests that the distribution of this species may be less restricted than previously documented. It is expected that these populations will not be impacted by access road construction, attributable to being outside proposed construction areas (refer to **Section 6.4**).

Introduction and/or Spread of Weeds

Five species of introduced flora were recorded in the UPBP study area, including, Birdwood Grass (*Cenchrus setiger*), Buffel Grass (*Cenchrus ciliaris*), Feathertop Rhodes Grass (*Chloris virgata*), Kapok (*Aerva javanica*) and Verano Stylo (*Stylosanthes hamata*). While none of these species are Declared Plants (according to the Department of Agriculture and Food), the *Cenchrus* species and *Stylosanthes hamata* are considered to be serious environmental weeds. The introduction and/or spread of these species have the potential to occur when moving vegetative material and topsoil (containing seed) from one site to another.

Without suitable management, these species can be aggressive and have the potential to further degrade the quality of adjacent vegetation. Whilst areas of saline mudflats are relatively resistant to weed invasion, the sandy island vegetation occurring within the flats provides suitable growing conditions for introduced species and is thus more susceptible to invasion. Consequently, further earthworks within these areas have the potential to spread existing populations and/or facilitate the introduction of weed species.

Dust Deposition

Dust deposition on vegetation, including mangroves, can affect transpiration and photosynthesis, which are essential processes for plant survival. Dust is only likely to be an issue where such populations are located close to roadside construction areas. Dust generated during construction, operation and maintenance of the UPBP is considered likely to be a minor impact provided dust suppression measures are implemented (Biota 2007), as outlined in **Section 7.4**.

Hydrological Changes

Changes to the quality and quantity of surface and groundwater flow regimes have the potential to impact the condition of surrounding flora and vegetation. The new access road will be located in close proximity to and runs parallel to the existing BHPBIO road and railway (refer to **Section 4.4**). The installation of culverts at suitable locations, similar to those which exist, will aid the maintenance of existing flows and rates (**Section 4.5**).

Waste Management

During construction, a variety of waste materials may be introduced to construction areas, or generated by the construction workforce. These may include sewage, hydrocarbons and general debris discarded by the workforce. Unless suitably disposed of, these waste products have the potential to pollute the soil, water and degrade existing native vegetation values and visual amenity of the immediate and surrounding area.

Potential Impacts for Terrestrial Fauna

Activities that impact on vegetation and flora typically extend to fauna that rely on this habitat for nesting, foraging and/or shelter. These impacts may take effect at a regional, local and or on an individual microhabitat level. The potential impacts to terrestrial fauna may include:

- Habitat disturbance and fragmentation as a result of construction;
- As a result of disturbance during construction (noise and clearing activities), there may be a short-term effect on the local abundance of fauna populations due to interruption to fauna behaviour, including displacement, injury or death;
- Inadvertent injury and/or mortality as a result of increased vehicle strikes from increased traffic;
- Impacts on significant fauna species; and
- Waste management.

Habitat Removal and/or Fragmentation

The permanent loss of natural vegetation for the construction of the access road and stockyard will reduce the local extent of available habitat for fauna such as reptiles and small mammals. The access road alignment will result in severance of both hummock grassland and samphire habitat which may impact some reptiles and small ground dwelling mammals. Severance of habitat may be significant for large species that occur at low population densities, such as larger snakes. However, given the degraded nature of existing habitats within in the area, construction of the access road is not considered to be a significant impact on fauna. The access road alignment lies parallel to the existing Finucane Island Road, which reduces the effect of severance.

Disturbance Resulting in Behavioural Responses

Loud and intermittent construction activities may result in temporary behavioural changes such as displacement, to some fauna at the site. Construction activities may also cause temporary disruption to foraging areas used by some species (mainly avifauna), particularly within samphire habitats at high tide. However, this disturbance to foraging areas is not expected to have long term detrimental impacts on fauna. It is expected that most species will generally become accustomed to any change in noise levels during both construction and operation of the UPBP.

Inadvertent Injury and/or Mortality

Increased traffic movements along the access road and within construction areas will invariably increase the potential for collision and therefore inadvertent injury or mortality. However, the

likelihood of collision is considered to be low and unlikely to cause significant long term impacts to existing fauna populations.

Impact on Significant Fauna Species

Of the ten Nationally Threatened Species that are known to occur within or adjacent to the UPBP area, only one species, the Pilbara Leaf-nosed Bat (*Rhinonicteris aurantius*) is considered likely to be affected. Potential impacts through habitat loss are considered medium to high, as roosting may occur within the mangrove habitat inside the proposed impact area (Biota 2007).

Three Priority species may be potentially impacted (Biota 2007) including;

- Little North-Western Mastiff Bat (*Mormopterus loriae cobourgensis*) (Priority 1);
- Australian Bustard (*Ardeotis australis*) (Priority 4); and
- Eastern Curlew (*Numenius madagascariensis*) (Priority 4 / Migratory).

The potential impacts to these species are outlined below.

Little North-Western Mastiff Bat (*Mormopterus loriae cobourgensis*) (Priority 1)

The Little-North-Western Mastiff Bat has been recorded within the UPBP study area and has a strong preference for mangal habitat and roosts in hollows of *Avicennia marina* (Churchill 1998). The clearing of mangroves for the construction of the stockyards, has the potential to remove habitat for this species. The significance of this impact is considered moderate, and likely to occur at the local population level, as roosting sites may occur within the mangroves inside the proposed stockyard area (Biota 2007). However, this species, while restricted to mangroves, is relatively widespread and well represented in mangroves along the Pilbara coast (Churchill 1998, Biota and Halpern Glick Maunsell 2000). No taxon level changes in conservation status would therefore be expected for this species as a consequence of this proposal (Biota 2007).

Australian Bustard (*Ardeotis australis*) (Priority 4)

The Australian Bustard has been previously recorded within 20 km of the UPBP study area (Biota 2007) and prefers open or lightly wooded grassy plains, including sandplains with spinifex *Triodia* (Johnstone and Storr 1998). The UPBP is unlikely to cause significant loss of spinifex *Triodia* habitat for this species.

Eastern Curlew (*Numenius madagascariensis*) (Priority 4 / Migratory)

The Eastern Curlew is a summer migrant to Australia and is considered moderately common along the tidal mudflats, reef flats and sandy beaches of the Pilbara coast. Tidal mudflats occur within

the UPBP study area, however, this habitat type is not expected to be disturbed as a result of the UPBP.

Impact on migratory fauna species

Of the 19 Migratory species that may occur within the UPBP area, three species are likely to be impacted. These include

- Little Curlew (*Numenius minutes*);
- Oriental Plover (*Charadrius veredus*); and
- Oriental Pratincole (*Glareola maldivarum*).

Potential impacts to these species are outlined below.

Little Curlew (*Numenius minutes*)

The abundance of Little Curlews in the Pilbara region is variable (Johnstone and Storr 1998). Johnstone and Storr (1998) found this species to be scarce south of Port Hedland, however the species has been sighted in the Port Hedland vicinity. The Little Curlew prefers short-grass plains as habitat, including sports grounds and tidal mud flats. The proposed project is unlikely to impact on the conservation status of the species (Biota 2007).

Oriental Plover (*Charadrius veredus*)

The Oriental Plover has been sighted within 60 km of the proposed project area, typically inhabiting sparsely vegetated plains, beaches and tidal flats. The Oriental Plover is relatively common, and as such, the proposed Utah Point development is unlikely to impact on the conservation status of the species (Biota 2007).

Oriental Pratincole (*Glareola maldivarum*)

Large flocks of Oriental Pratincoles have been sighted in the Port Hedland vicinity (Biota 2007). The species typically roosts on bare ground beside water and feeds at tidal flats and floodwaters (Johnstone and Storr 1998). Tidal mudflats occur within the UPBP study area, however, this habitat type is not expected to be disturbed as a result of the UPBP (Biota 2007).

Waste Management

During construction, a variety of waste materials may be introduced to the PHPA study area, or generated by the construction workforce. These may include sewage, hydrocarbons, and general debris discarded by the workforce. Unless suitably disposed of, these waste products have the

potential to pollute the soil and water of the immediate and surrounding area. Contaminated soil and water could lead to both direct and indirect impacts to native fauna.

7.5.4 Management and Mitigation

Management and Mitigation for Terrestrial Vegetation and Flora

Clearing of Native Vegetation

Access Road

Clearing of vegetation will be kept to the minimum necessary for the safe and efficient construction of the access road. Clearing will mainly take place in adjacent areas that have been previously cleared and/or disturbed. The agreed and approved clearing limits will be marked clearly on construction design plans and pegged in the field prior to any clearing taking place. The access road for the UPBP has been aligned parallel to the existing BHPBIO Finucane Island access road and railway as close as practicable, in an effort to minimise the disturbance footprint.

Stockyard Area

The level of disturbance and/or clearing of vegetation for the stockyard area will be kept to the minimum required for safe and efficient construction and operation. Construction of the stockyard area will commence in a central location and radiate in an outwards direction to the outer perimeter of the required development area, further minimising disturbance of the site. The design and orientation of the stockyard footprint and access road alignment has been developed on the basis of minimising ground disturbance by keeping as much of the footprint over the top of the limestone outcrop and non-vegetated areas as possible.

Borrow Pit Areas

Areas of vegetation that are disturbed and/or cleared for construction activities, including borrow pits areas, will be revegetated in accordance with the Terrestrial Flora and Vegetation Management Plan (**Appendix K**). Topsoil will be stockpiled and re-spread over disturbed areas to maximise germination of prominent species from the soil seedbank. Areas outside the construction footprint will be protected by temporary fencing and/or flagging.

Management of Significant Flora Species

No clearing activities are proposed to occur in the vicinity of *Bulbostylis burbidgeae* populations. The location and identification of this species will be clearly communicated to construction personnel prior to construction activity. Refer to **Appendix K** for an outline of protective management measures.

Weed Management

To prevent the spread and/or distribution of weeds within the UPBP development area and to surrounding areas a Weed Hygiene and Management Plan will be prepared in consultation with the statutory authority prior to the commencement of construction. This plan will outline weed hygiene and management procedures to be undertaken during construction and operation, particularly in reference to controlling the spread of *Stylosanthes hamata*. Appropriate eradication of problematic species will be employed within construction areas, so that weed control measures do not adversely affect adjacent vegetation.

All vehicle movements will be restricted to the construction boundary to prevent excessive disturbance and dispersal of weed species. Any imported soils and fill material will be obtained from weed free sources to prevent further spread of weeds. Machinery (including trucks) capable of carrying weed seed material will be cleaned as appropriate prior to entering and departing construction areas.

Ongoing weed monitoring will occur within the road reserve for new infestations following construction of the access road. Specific weed management is outlined in the Terrestrial Flora and Vegetation Management Plan (**Appendix K**).

Dust Deposition

To minimise the generation of dust from port operations, the access road for the UPBP will be sealed. Dust generation during access road construction will be managed by water cart spraying and reduced speed limits. Road areas within the stockyards will also be sealed and as necessary water cannons will be used to suppress dust generated at the site. To prevent the transport and distribution of dust off site, haulage vehicles will be required to utilise the truck-wash facilities prior to exiting the stockyard. It is expected that dust suppression activities outlined in **Section 7.7** and **Appendix K** will alleviate dust impacts on terrestrial vegetation and mangroves.

Waste Management

Management measures will be implemented to minimise the impacts of waste on native vegetation. Specific waste management activities are outlined in the Contaminant Management Plan and Waste Management Plan in **Appendix K.**

Management and Mitigation for Terrestrial Fauna

The management of any impacts on terrestrial fauna coincides with the mitigation measures put in place for the protection of native vegetation. Impacts on terrestrial fauna as part of the UPBP are

likely to be minimal and comprise removal of habitat that is widespread at both the local and regional scale.

Habitat Removal and Fragmentation

Management measures that will be implemented to reduce impacts of UPBP construction and operation are focused on the management of habitat reduction and disturbance, fauna movement and behaviour and the protection of significant species. Areas disturbed by construction activities will be revegetated in accordance with the Terrestrial Flora and Vegetation Management Plan (**Appendix K**). Construction machinery and vehicles will be restricted to the construction boundary which will be demarcated by temporary fencing and/or flagging. The clearing of vegetation will be kept to the minimum necessary for safe and efficient construction and operation. Refer to the management measures for vegetation clearance described in **Section 7.5.4** and in the Flora and Vegetation Management Plan **Appendix K**.

Behavioural Responses

Prior to clearing and during construction and operations, any fauna located within the UPBP development area will be relocated under the direction of suitably qualified personnel. PHPA will also engage with local community groups, including environmental and indigenous groups, to assist in relocating fauna and/or caring for fauna where necessary. Construction noise will be managed as per the requirements and commitments described in **Section 7.8.4** and **Appendix K**.

Inadvertent Injury and/or Mortality

Speed restrictions will be applied in roadside construction areas to reduce the risk of road kill. In the event of road kill, remains will be removed away from the road to avoid attracting other species (e.g. birds of prey). Road kills will be monitored with particular attention to the deaths of any significant species. Driver awareness training will also be conducted prior to and during construction. Further mitigative measures on road kill are outlined in the Terrestrial Fauna Management Plan in **Appendix K**.

Significant and Migratory Species

Due to the degraded nature of the terrestrial habitats within the UPBP study area, there are unlikely to be any significant occurrences of native fauna. The management measures outlined in the Terrestrial Fauna Management Plan (**Appendix K)**, aim to minimise the direct and indirect impacts on significant and migratory fauna and to promote the natural return of native vegetation in areas disturbed by construction.

7.5.5 Predicted Outcome

Terrestrial Vegetation and Flora

It is not expected that the construction or operation of the berth and associated infrastructure will significantly impact upon the conservation status of flora or vegetation communities recorded within the UPBP study area. Taking into account the management and mitigation commitments measures outlined above and within the EMP, it is considered that the environmental objectives for terrestrial vegetation and flora can be met by the UPBP. In consultation with DEC, PHPA commits to preparing an EMP for the project prior to the commencement of construction which will detail the management measures to minimise potential impacts on flora and vegetation including those outlined above.

Terrestrial Fauna

Taking into account the management and mitigation measures outlined above, impacts on terrestrial fauna and constituent habitats are likely to be minimal and affect habitat that is either widespread in the locality and the region and/or has been previously disturbed. It is considered that the environmental objectives for terrestrial fauna can be met by the UPBP. No impacts on threatened fauna taxa would be expected as a result of the construction and operation of the UPBP development.

7.6 Marine Environment

7.6.1 Management Objectives

The key objectives for the management of marine impacts for the UPBP are:

- To maintain the abundance, diversity, geographic distribution and productivity of marine flora and fauna species and ecosystem levels through the avoidance or management of adverse impacts and improvement in knowledge.
- To maintain ecosystem integrity, including the structure (variety and quantity of life forms) and function (the food chains and nutrient cycles) of marine ecosystems.
- To maintain and/or improve the quality of marine waters consistent with ANZECC Water Quality Guidelines and ensuring that environmental values, recreational values (swimming and fishing), aesthetic values, cultural and spiritual values of the marine environment are protected.
- To minimise the loss of Benthic Primary Producer Habitat (BPPH), namely mangrove communities, resulting from the UPBP.
- To minimise the risk of introducing unwanted marine pests into the Port Hedland harbour consistent with Australian Quarantine Inspection Services (AQIS) guidelines for ballast water

management and ANZECC Code of Practice for Anti-fouling and In-Water Hull Cleaning and Maintenance.

7.6.2 Applicable Standards and Legislation

Applicable legislation and guidelines for the management of marine impacts include:

- ANZECC Code of Practice for Anti-fouling and In-Water Hull Cleaning and Maintenance 2000;
- ANZECC Guidelines for Fresh and Marine Water Quality 2000;
- Australian Ballast Water Management Requirements 2001;
- *Environmental Protection (Sea Dumping) Act 1981*;
- Environmental Quality Criteria Reference Document (Cockburn Sound) (EPA 2003-2004);
- EPA Guidance Statement No. 29: Benthic Primary Producer Habitat Protection for Western Australia's Marine Environment 2004;
- International Convention for the Prevention of Pollution from Ships (MARPOL Convention) 1973 / 1978;
- *Marine and Harbours Act 1981*;
- Pilbara Coastal Water Quality Consultation: Environmental Values and Environmental Quality Objectives (DOE 2006_b);
- *Pollution of Waters by Oil and Noxious Substances Act 1987*;
- *Western Australian Marine Act 1982*;
- *Western Australian Marine (Sea Dumping) Act 1981*; and
- *Wildlife Conservation Act 1950*.

7.6.3 Potential Impacts

The key potential impacts to the marine environment resulting from the UPBP include:

- Loss of BPPH;
- Loss of habitat for mangrove dependent fauna (also refer to **Section 7.5**);
- Alteration of water flow, including surface, ground and tidal water flow to mangroves (refer to **Section 7.4**);
- Introduction of weed species into mangrove communities (refer to **Section 7.5**);
- Dust deposition on mangroves (refer to **Section 7.5**);
- Disturbance of marine fauna including from increased lighting;
- Introduction of marine pest species;

- Increased water turbidity and sedimentation; and
- Contamination of surface and marine waters due to accidental spillage, leakage and/or leaching of potentially hazardous materials.

Loss of BPPH

The construction of the UPBP will result in the clearance of approximately 18.7 ha of mangrove BPPH (Biota 2007) which includes approximately 1.8 ha of closed canopy mangroves.

In accordance with EPA Guidance Statement 29, the Port Hedland Industrial Area which encompasses an area of approximately 154 km^2, is used as the defined management area to assess the cumulative loss of mangroves in the Port Hedland area (refer to **Figure 7-1**). The Port Hedland Industrial Area is classified as a Category E development area and an estimated 2,676 ha of mangroves existed prior to European disturbance within this area (EPA 2005). To date, historical losses of mangroves within the Port Hedland Industrial Area are estimated at 267.8 ha which is equivalent to 10 % cumulative mangrove loss (excluding the HDJV, refer to **Section 3.5**).

The additional clearing of mangroves for the UPBP equates to a cumulative loss of approximately 286.5 ha or 10.7 % of mangroves within the Port Hedland Industrial Area. This additional clearing of mangroves exceeds the 10 % cumulative loss threshold for a Category E development area. Consequently, as a result of the UPBP, the Port Hedland Industrial Area will become a Category F area. A Category F area is defined as an "area where cumulative loss thresholds have been significantly exceeded" and additional clearing of BPPH within these areas requires losses to be offset to ensure net environmental benefit (refer to **Section 7.6.4**).

Table 7-1 presents the calculations of cumulative mangrove loss within the Port Hedland Industrial Area Management Unit with the additional loss of mangroves due to the UPBP.

Although, the loss of mangroves is considered to be of significance due to the existing high level of mangrove clearance within the Port Hedland harbour area, the level of mangrove clearance required as part of the UPBP is substantially less than the amount of mangrove clearance previously approved for the Hope Downs Iron Ore Project.

Similarly, whilst these mangroves are regionally significant in terms of coastal productivity and the fauna they support, they are not unique in terms of species and mangrove assemblages. The mangroves within the UPBP study area no longer exist in a tidal ecosystem wilderness due to substantial historical changes within the harbour, such as the reclamation of land to adjoin Finucane Island to the mainland. No cyanobacterial mat BPPH will be affected as a result of the UPBP proposal (refer to **Appendix E**).

- **Table 7-1 Cumulative Loss of Mangroves, as defined within the Port Hedland Industrial Area Management Unit**

Management Unit	Original Mangrove Extent (ha)	Historical & Proposed Loss of Mangroves (ha)	Remaining Area of Mangrove Coverage (ha)	Cumulative Loss of Mangroves (%)
Port Hedland Industrial Area – Current (EPA 2005)	2, 676	267.8 (including losses due to BHP East Creek, Cargill Salt ponds and FMG Port)	2 ,408	10.0%
Port Hedland Industrial Area – with the Proposed Implementation of the UPBP.	2 ,676	286.5 (including the additional loss of 18.7 ha for the UPBP)	2, 390	10.7%

Note: Table amended from EPA (2005) to adjust for the removal of the HDJV as discussed in **Section 3.5**.

Loss of Habitat for Mangrove Dependent Fauna

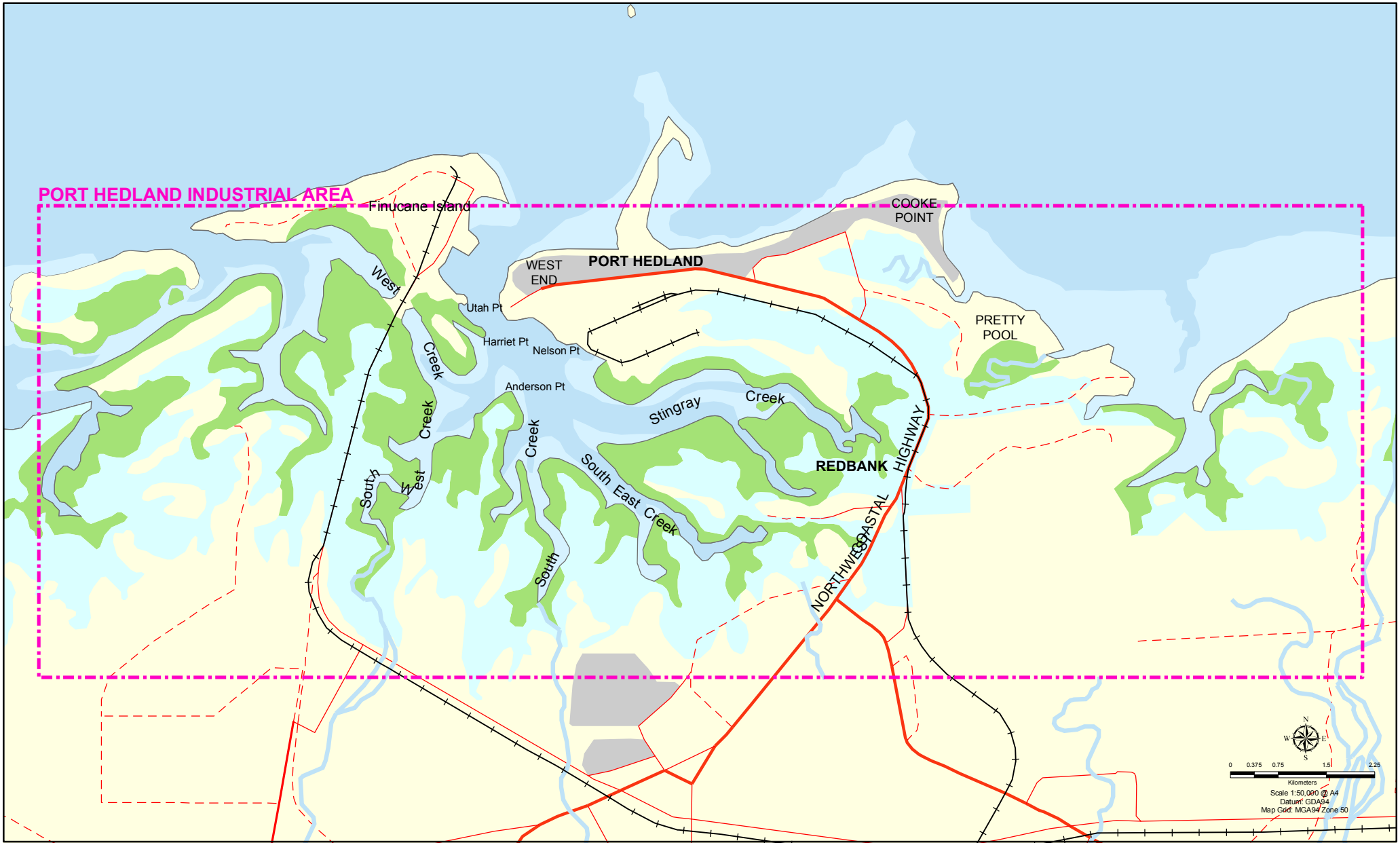
Clearing of the mangroves will potentially impact on fauna that inhabit mangroves within the UPBP development area. As discussed in **Sections 6.4** and **7.5**, the mangrove communities support the Little North-Western Mastiff Bat (*Mormopterus loriae cobourgensis*), a Priority 1 species, and provide habitat for a mangrove dependent bird species.

However, the species which occur in the UPBP development area are known to occur more widely in other mangrove areas within the harbour and within the Pilbara region (Johnstone & Storr 1998, Paling *et al.* 2001, and Semeniuk 1999). These areas generally contain more suitable habitat and are less degraded. For the Little North-Western Mastiff Bat (*Mormopterus loriae cobourgensis*) at least 1 000 ha of mangrove habitat will remain in the Port Hedland harbour and this species occurs in mangrove habitats throughout the Pilbara coast, including within Guideline 1 mangrove areas (regionally significant mangroves outside designated industrial areas and associated port areas).

There appears to be a low risk of any changes to the conservation status of the mangrove dependent species present in Port Hedland harbour as a result of the UPBP proposal (Biota 2007) (refer to **Section 7.5.3** for details on specific impacts to identified priority species).

Disturbance of Marine Fauna

During construction and operation of the UPBP, marine fauna may be disturbed by increased underwater noise and the physical presence of ships within the harbour and berthed at Utah Point. Similarly, increased lighting at the UPBP and surrounds could impact on marine fauna. Fish, invertebrates, birds and insects maybe attracted towards lit areas. Increased lighting may confuse turtle hatchlings due to the fact that they head towards light (normally the horizon) after hatching.



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Utah Point Berth Project

Drawing Title
The Port Hedland Industrial Area Management Unit for Calculating Cumulative Mangrove Loss

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Figure 7-1

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Studies have shown that turtle hatchlings have a strong tendency to orient towards the brightest direction, which on natural beaches is typically towards the ocean where the horizon is open and unhindered by dune or vegetation shadows (Pendoley Environmental 2008). However, as noted, on nesting beaches which are exposed to artificial lighting, turtle hatchlings can become misorientated by this artificial lighting.

Cemetery Beach, Cooke Point and Pretty Pool have been identified as key flatback turtle nesting habitats in the Port Hedland area (refer to **Section 6.5.4** and **Appendix L**). These nesting areas are located over 3 km away from the proposed development site and are currently exposed to substantial artificial lighting from urban and industrial areas, which separate the development site from these nesting areas.

For this reason, lighting impacts on these habitats (and flatback turtle hatchlings) that can be attributed to the UPBP are considered to be minimal in comparison to the existing light environment. However, due to the fact that increased lighting for the UPBP may add to cumulative light emissions from all urban and industrial sources in the Port Hedland region, light management and mitigation measures will be incorporated into the design and operation of the proposed development (refer to **Section 7.6.4**).

In general, turtles and dugongs are unlikely to be adversely affected by the UPBP, due to the absence of suitable habitat and breeding areas within the Port Hedland harbour. Only juvenile green turtles are known to use the mangrove waters within the harbour (Pendoley Environmental 2008). However, they utilise the seaward fringes of the mangrove habitat, remaining on the periphery of the root system, presumably to avoid the risk of entanglement and drowning in the densely tangled mangrove root systems (refer to **Figure 7-2**). These areas of mangrove will not be cleared as part of the UPBP.

Introduction of Marine Pest Species

Shipping and dredging operations associated with the UPBP have the potential to introduce marine pest species to the Port Hedland harbour with resultant impacts on marine flora and fauna communities if not managed appropriately. Marine pest species can be transported within vessel ballast water, fouling on ship hulls and on other structures.

However, as a result of existing management procedures enforced by PHPA, no marine pest species have previously been identified in the Port Hedland harbour. The future management of the Utah Point Berth will continue to ensure Mandatory Ballast Water Management Requirements are complied with to prevent the introduction of the marine species. Hence, it is considered unlikely that marine pest species will be introduced to the harbour as a result of the UPBP.

- **Figure 7-2 The Interior of a *Rhizophora stylosa* Forest Formation Near its Seaward Edge**

Increased Water Turbidity and Sedimentation

Increased surface runoff from areas cleared of vegetation and from stockpiles has the potential to result in increased water turbidity and the subsequent siltation of mangrove communities. Piling during wharf construction, dredging for harbour maintenance and increased shipping movements may also result in increased turbidity due to finer sediments being dispersed into the water column.

Increased water turbidity can decrease light penetration and a subsequent decrease in phytoplankton productivity and standing stock. Zooplankton that rely on phytoplankton as a food source, may then in turn potentially suffer from a decline in grazing opportunities, with potential knock-on implications up through the food chain.

However, the existing phytoplankton and zooplankton within the Port Hedland harbour are of a low diversity and include species which are resistant to the already highly turbid conditions of the harbour (HDMS 2002). Potential impacts on phytoplankton are therefore likely to be slight and impacts on zooplankton are considered insignificant. Similarly, increased water turbidity and sedimentation is considered to have little or no impact on mangroves (VSCRG 2007).

Contamination of Marine Waters

Contamination of marine waters and associated marine habitats (mangroves) could potentially result from the accidental leakage and spillage of materials, including fuel, hydrocarbons and/or products handled through the port. The release of contaminants can have significant impact on marine flora and fauna.

Hydrocarbons can smother aerial roots of mangroves, restricting air exchange and/or interfering with salt balance causing leaves to drop and trees to die (Environ 2004). In the event of spillage of hydrocarbons within marine waters and/or to mangrove communities, the subsequent removal of these hydrocarbons from the mangroves is extremely difficult (Environ 2004).

Oil spills can heavily impact on marine mammals and reptiles because of their need to surface to breathe or to leave the water to breed. Juvenile and adult fish living in nearshore and shallow water nursery grounds are at greater risk to dispersed or dissolved hydrocarbons (Environ 2004). Subsequently, coastal dwelling birds feeding on fish are also at high risk from hydrocarbon spills (Environ 2004).

The accumulation of chromium and manganese in water (and/or soils) as a result of leaching can impact plant growth, by altering the germination process and causing oxidative stress and the breakdown of photosynthetic pigments, leading to a decline in growth (Shanker *et al.* 2005). Manganese can be highly toxic to plants, particularly in shoots where accumulation occurs and may result in reduced iron uptake by roots and distortion of expanding leaves (Atwell *et al.* 1999). Yet, manganese toxicity levels vary widely between plant species with toxic manganese concentrations in crop plant tissues ranging from 100 to 5000 mg/kg. Chromium (chromium (III) and chromium (VI)) and manganese are also considered to have moderate to high toxicity to aquatic life (DEWHA 2004, DEWHA 2005).

However, the UPBP is specifically designed to incorporate measures to reduce the risk of contamination and to minimise impacts on the marine environment. In particular, the UPBP will feature improved facilities for stockpiling and materials handling; will contain, treat and control all surface water within the stockyards; and will prevent the leaching of materials to groundwater in potential risk areas (refer **Section 7.4**).

7.6.4 Management and Mitigation

The management and mitigation methods addressing potential impacts on the marine environment are discussed below.

Loss of BPPH

Clearing and disturbance of mangroves will be kept to the minimum necessary for construction and operations of the UPBP. Construction of the stockyard area will commence in a central location and radiate outwards to the outer perimeter of the required development area. Mangrove areas cleared for construction will be rehabilitated as soon as possible following construction activities.

The Mangrove Management Plan will detail mitigation and management methods for the clearing of mangroves; for protection of remaining mangroves; and for the rehabilitation of mangrove

communities following construction (refer to **Appendix K**). Mangroves that are removed will be harvested for commercial use, used to stabilise areas at the UPBP site, and/or mulched and used on embankments.

PHPA are committed to offsetting mangrove losses attributed to the UPBP and within the Port Hedland harbour in general. As part of the PHPA Ultimate Development Plan (UDP), offsets for past and future degradation and/or loss of mangrove habitat within the Port Hedland harbour are currently being investigated. In determining offsets at a strategic level it is expected that PHPA can better co-ordinate stakeholder support and contribution from the various proponents with a focus on implementing measures that are not only consistent with the UDP but are in the interest of achieving 'greater environmental good' for the region.

Offset options being considered include the creation and/or regeneration of a tidal creek habitat towards the south east region of the harbour near Redbank. Other potential offsets may include the allocation of funding for mangrove research, the reservation of other mangrove habitats and/or the construction of an educational/nature boardwalk through a mangrove conservation area. Further discussions with the DEC and specialist mangrove advisors are planned to determine suitable offset options to be undertaken.

Loss of Habitat for Mangrove Dependent Fauna

As detailed above, the clearing and disturbance of mangroves will be kept to the minimum necessary for safe and efficient construction and operation of the UPBP. Areas outside and immediately adjacent to the construction boundary will be protected by flagging and fencing where practicable. Construction traffic will be limited to the construction boundary.

Disturbance of Marine Fauna

Studies have shown that turtle hatchlings are more responsive to shorter wavelengths (<400 nm to 590 nm) than to longer wavelengths of light (590 nm to >700 nm) (Pendoley Environmental 2008). For this reason, high and low pressure sodium lights are preferred over metal halide, fluorescent or halogen lights because they emit light at longer wavelengths. Therefore, where practical with respect to maintaining safe working conditions onsite, high and low pressure sodium lights will be used in preference to other types of lights for the UPBP.

Similarly, low wattage lights will be used in preference to high wattage lights where practical to minimise the intensity of light emitted. All lights will be kept as low to the ground as possible and will direct all light downwards or directly onto work areas. All lights will also be designed and/or shielded to prevent upward light spillage and additional glow. Where lighting is not essential at all times motion sensors and/or timers will be used and when areas, such as offices, are not being used lights will be switched off.

Each of these measures will be incorporated in the final detailed design of the UPBP and a Turtle Management Plan will include other management measures for minimising impacts to turtles (and other marine fauna). Other management measures for minimising impacts to turtles and marine fauna include restricting clearing and construction activities to the minimum area necessary; covering pits and equipment when not in use to reduce the chance of fauna entrapment; and, managing waste appropriately so that no litter enters the surrounding mangroves and marine environment.

PHPA will monitor the behaviour of turtles and other marine fauna in areas adjacent to the UPBP site during construction and operations. PHPA will also implement and/or support further research and monitoring programmes of turtle behaviour, nesting and habitats such as:

- A turtle monitoring programme to identify the number and species of juvenile turtles that utilise the Port Hedland harbour as habitat;
- A long-term flatback turtle flipper tagging monitoring programme to assist in gathering information about nesting beaches, population sizes, migrations, growth rates and movement between nesting beaches;
- A hatchling orientation research project to assist in establishing baseline information on hatchling emergence behaviour and movement from nests to the ocean;
- Research and monitoring of turtle nesting areas within the Port Hedland area, including Cemetery Beach, Cooke Point and Pretty Pool; and
- Research and monitoring of turtle nesting areas within the wider region, including nesting sites between Port Hedland and 80 Mile Beach and Mundabullangan Station (refer to **Appendix L**).

Introduction of Marine Pest Species

Operations for the UPBP will comply with Mandatory Ballast Water Management Requirements endorsed by PHPA. These requirements are administered by the Australian Quarantine and Inspection Service (AQIS) and necessitate accurate reporting of ballast water arrangements; mandatory access to safe onboard ballast sampling points; official permission to release ballast water in Australian waters; exchange and/or treatment of ballast water as required prior to release; and completion of an 'audit and advice procedure' to ensure ballast water exchange has followed appropriate procedure.

As manager of the Utah Point berth, PHPA will blacklist any vessels found to be in contravention of AQIS requirements; will prevent hull cleaning and scraping at the berth; and will monitor the harbour in an effort to ensure no marine pests are introduced.

Increased Water Turbidity and Sedimentation

To minimise the potential for turbid waters reaching the harbour, the design and treatment measures for surface water and erosion management outlined in **Sections 7.3** and **7.4** will be implemented. These measures include limiting surface disturbance; scheduling construction activities to avoid periods of heavy rainfall, strong winds or peak water flow; primary containment of all surface water within the stockyard area and settlement pond; and, the settlement and/or treatment of surface runoff.

To minimise potential impacts on water turbidity caused by maintenance dredging, the scheduling of dredging will be co-ordinated with other dredge activities occurring in the harbour as detailed in the general maintenance dredge program for the harbour. This will limit the frequency of sediment disturbance and/or the potential cumulative affects activities which may increase water turbidity.

Contamination of Marine Waters

Management procedures and protocols for preventing contamination and to contain and minimise the impacts in the event of accidental spillage or release of contaminants, will be detailed in Contaminant and Marine Water Quality Management Plans to be prepared in agreement with the regulatory authority prior to the commencement of construction and operation of the UPBP.

Ongoing monitoring and assessment of marine water quality in areas surrounding the UPBP site, and within the Port Hedland harbour in general, will be undertaken using ANZECC Water Quality Guidelines as appropriate.

PHPA Compliance with Environmental Quality Objectives

As part of the UPBP, PHPA will also comply with Environmental Quality Objectives (EQOs) identified in the *Pilbara Coastal Water Quality Consultation Outcomes* (DOE 2006$_b$) for areas of moderate and high level of ecological protection (MLEP and HLEP) as outlined in **Table 7-2**.

Table 7-2 PHPA Compliance with Environmental Quality Objectives

Environmental Values	Environmental Quality Objectives	PHPA Compliance with Objectives
Ecosystem Health (ecological value)	**Maintain ecosystem integrity** This means maintaining the structure (e.g. the variety and quantity of life forms) and functions (e.g. the food chains and nutrient cycles) of marine ecosystems.	**For areas of MLEP** – there will be no or only moderate changes (in comparison to natural variation) to ecosystem integrity as a result of the UPBP. **For areas of HLEP** – there will be no detectable changes (in comparison to natural variation) to ecosystem integrity as a result of the UPBP.
Recreation and Aesthetics (social use value)	**Water quality is safe for recreational activities in the water** (e.g. swimming). **Water quality is safe for recreational activities on the water** (e.g. boating). **Aesthetic values of the marine environment are protected.**	**For areas of MLEP and HLEP** – there will be no impacts on water quality for recreational uses in and on the water as a result of the UPBP. Ongoing monitoring of water quality will be undertaken. The UPBP is not expected to significantly impact on the aesthetic values of the Port Hedland harbour and ongoing consultation with the community will be undertaken so that aesthetic values of the marine environment are protected.
Cultural and Spiritual (social use value)	**Cultural and spiritual values of the marine environment are protected.**	**For areas of MLEP and HLEP** – PHPA will continue to liaise with the Kariyarra community, other local indigenous and community groups so that cultural and spiritual values of the marine environment are protected.
Fishing and Aquaculture (social use value)	**Seafood (caught or grown) is of a quality safe for eating.** **Water quality is suitable for aquaculture purposes.**	**For areas of MLEP and HLEP** – no impacts on water quality and subsequently the suitability of seafood caught within the Port Hedland harbour for eating. Ongoing monitoring of water quality by PHPA will be undertaken.
Industrial Water Supply (social use value)	**Water quality is suitable for industrial supply purposes.**	**For areas of MLEP and HLEP** – there will be no impacts on water quality for industrial water supply purposes as a result of the UPBP.

7.6.5 Predicted Outcome

It is expected the objectives for managing the marine environment can be achieved, minimising impacts on marine flora and fauna. Although the UPBP will result in the loss of approximately 18.7 ha of mangroves, the total loss for the project will be kept to the minimum necessary for safe and efficient construction and operations. The creation of tidal creek habitats in the south east region of the harbour and other potential offset strategies are being developed as part of a harbour-wide

strategy to be included in UDP. Whilst there are risks of contaminating the marine environment as a result of the UPBP, these risks are considered minimal with the implementation of appropriate management procedures and plans.

7.7 Air Quality

7.7.1 Management Objectives

The key objectives for the management of air quality include:

- To ensure that atmospheric emissions (dust) do not impact on environmental values, or the health, welfare and amenity of the population and land uses.
- To use all reasonable and practicable measures to minimise airborne dust.

7.7.2 Applicable Standards and Legislation

Applicable legislation and guidelines for the management of air quality include:

- EPA Guidance Statement No. 18: Prevention of Air Quality Impacts from Land Development Sites 2000;
- EPA Environmental Protection (Kwinana) (Atmospheric Wastes) Policy and Regulations 1999;
- National Environment Protection Measure (NEPM) for Ambient Air Quality 1998;
- *Occupational Safety & Health Act 1984*; and
- Occupational Safety Regulations 1996.

Regulatory instruments for the management of dust impacts include:

- The National Environment Protection Measure (NEPM) PM_{10} standard – 50 $\mu g/m^3$ (24hr average), as the criteria to assess potential health impacts at sensitive receptors; and
- The Kwinana EPP Area C TSP limit – 150 $\mu g/m^3$ (24hr average), as the criteria to assess potential amenity impacts.

Assessment Strategy

Dust emissions from existing and future port operations have been modelled to demonstrate the relative changes in dust impacts due to operational activities at the port and in particular changes due to the UPBP development. With a focus on relative changes in dust impacts, background dust and other emissions not directly related to the port have not been included in the modelling. As such, direct comparison of model results with ambient monitoring data or air quality standards has not been undertaken.

The relative changes between the future scenarios with and without the UPBP development can, however, be clearly identified and serve to demonstrate that a relative improvement in cumulative dust impact is achieved with the UPBP development.

7.7.3 Potential Impacts

The key impact to air quality during the construction and operation of UPBP is fugitive dust (particles up to 75 microns in diameter) emissions caused by the transport and handling of soil and ore product. Fugitive dust emissions have the potential to cause:

- Nuisance through deposition and reduced visual amenity;
- Risk to human health; and
- Smothering of surrounding vegetation.

Nuisance and Reduced Visual Amenity

Existing dust emissions present a nuisance concern for residents in Port Hedland. These concerns include the build up of dust on property and personal affects such as cars, boats, outdoor furniture and laundry. Other concerns on visual amenity include the staining of stone and other materials, such as those used in the construction of buildings, walls and fences.

Risk to Human Health

Dust or particulate matter (PM) is generally referenced according to size, and the smaller the particle, the deeper it can be inhaled into the lungs. In general, PM_{10} is the measurement of particulate matter used to assess health impacts of dust, as particles of 10 microns in diameter or less can penetrate the lungs and enter the bloodstream. The resulting health issues include respiratory irritation, decreased lung function, irregular heartbeat and premature death in people with heart or lung disease (USEPA 2006_b).

Dust emissions from chromite and manganese ores, in the form of chromite ($FeCr_2O_4$) and manganese oxide (MnO_2), have historically raised public health concerns due to the potential toxicological effects of exposure to elevated concentrations of these metals (refer to **Sections 6.2.4 and 6.6.2**).

Smothering of Surrounding Vegetation

The limited vegetation cover in the Port Hedland region, exposed stockpiles and the arid environment results in the generation of dust under high wind conditions. Vegetation in close proximity to areas where dust generation is high may be adversely affected by repeated deposition of dust on foliage reducing the plant's ability for photosynthesis and transpiration. Notably, previous research has shown that it is the physical nature of dust coating vegetation, rather than the

chemical composition or specific mineralogy of the dust (although acidic or alkaline materials can directly damage leaf surfaces) (Farmer 1993, Grantz *et al*. 2003).

For mangroves, research has been undertaken by BHPBIO into the impacts of iron ore dust on health and physiology of mangrove communities at Port Hedland. This research concluded that dust particles did not block mangrove leaf stomata, restrict transpiration or cause abrasion and therefore did not significantly impact on the condition of the mangrove vegetation (Paling *et al* 2001).

Construction Phase

Any construction site has the potential to generate dust. Dust emissions during the construction of UPBP could arise from various sources including:

- Suspension of dusty construction materials (aggregate, soil, fill etc)
- Re-suspension of dust from moving vehicles, construction plant and from material transported by the haulage vehicles to the site.
- Fugitive dust emissions of construction materials as a result of direct mechanical handling operations.

However, not all areas or activities contribute dust to the same degree. Specific construction activities and the prevailing meteorology are important factors in dust generation on construction sites. Additional factors include; the geometry of the construction site, the presence of physical barriers, and the proximity of the nearby sensitive receptors and the mitigation measures employed. For UPBP, fugitive dust emissions associated with construction are temporary and will be substantially reduced through targeted mitigation techniques and implementation of a suitable Air Quality Management Plan (**Appendix K**). Fugitive dust emissions associated with construction has therefore not been modelled as part of this assessment.

Operation Phase

The primary source of dust associated with UPBP operations are detailed in **Appendix I**, and include:

- Unloading from road trains;
- Stacking and reclaiming of stockpiles;
- Mechanical handling and loading of hoppers (using front end loaders, dozers, etc);
- Conveyor transfers;
- Screening and ship loading;
- Vehicular movements on unpaved surfaces;

- Wind action on stockpiles.

The significance of the impact on air quality (dust) attributed to operating UPBP is detailed in **Appendix I** and was based on detailed modelling using the Victorian EPA's AUSPLUME computer dispersion model (Version 6). Modelling and assessment of air quality was considered for three scenarios:

1) Current operations – based on operations for the 2004/05 fiscal year and includes the PHPA activities through Berth 1 (Manganese (0.7 Mtpa) and Chromite (0.28 Mtpa)) and the BHPBIO Finucane Island and Nelson Point operations (103.3 Mtpa);
2) Future operations without the UPBP development – which includes BHPBIO's current and approved RGP4 volume estimate (152 Mtpa), FMG's Anderson Point development (45 Mtpa), and allows for increased throughput at PHPA Berth 1 to accommodate the export of 0.5 Mtpa iron ore, and Berth 1 operating at full capacity; and
3) Future operations including the proposed UPBP development – which allows for 9 Mtpa bulk tonnage to be exported with all bulk products transported to the UPBP site by road train.

Modelling of dust emissions was limited to existing and future port operational activities only. Dust emissions arising from construction sites and road train haulage were not included in the modelling assessment.

Sensitive Receptors

For the purpose of assessing air quality under current and future scenarios, dust concentrations were modelled at five sensitive receptor locations. Locations have been selected as representative of surrounding properties where the effects of dust deposition would be similar. The names and locations of the receptors are presented in **Table 7-3** and **Figure 7-3.**

- **Table 7-3 Sensitive Receptor Locations**

Receptor Location	Easting (m)	Northing (m)
Harbour Monitor	664350	7753240
Hospital Monitor	665870	7753420
Port Hedland Primary School (PH Primary School)	670631	7754008
Wedgefield	665526	7747107
Hedland Senior High School (HSHS)	666600	7743439

* Eastings and Northings are in MGA Zone 50.

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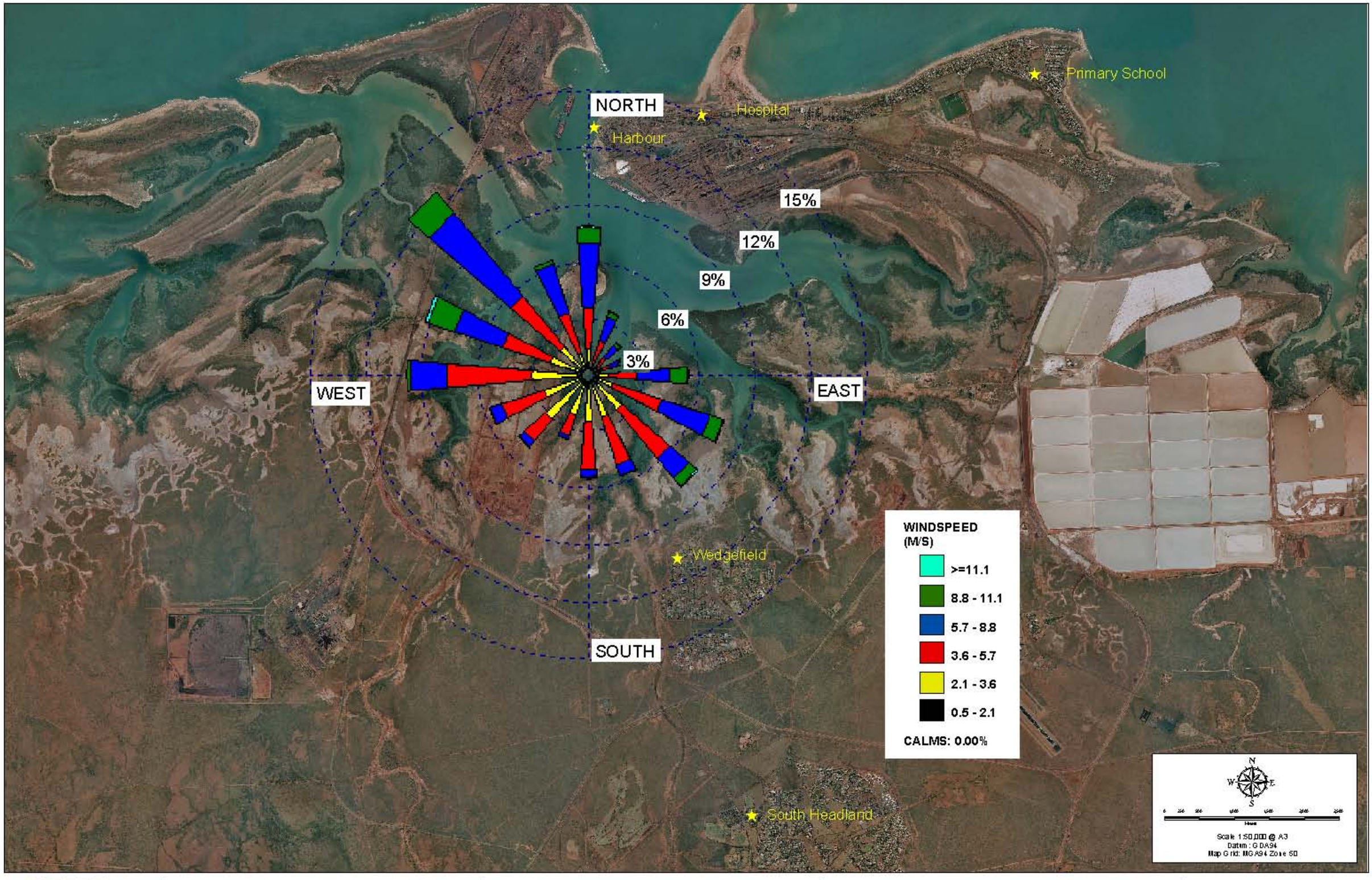

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Client
Port Hedland Port Authority

Project
Utah Point Berth Project

Drawing Title
Sensitive Receptor Locations and Annual Wind Rose

Drawing No.
Figure 7-3
Revision No. 1
Date: 03.03.08
Project WV03278

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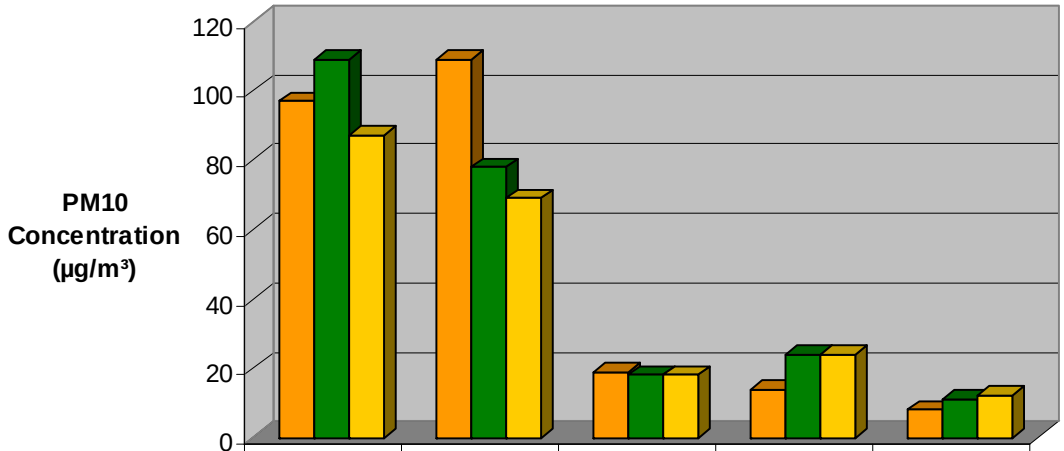
Particulate Matter (PM_{10}) Concentrations

Figure 7-4 presents the maximum 24 hr average particulate matter (PM_{10}) concentrations at the selected receptor locations for each of the three scenarios modelled. Isopleths of PM_{10} concentrations for future operations with and without the UPBP development are presented in **Figure 7-5** and **Figure 7-6**.



	Harbour	Hospital	PH Primary	Wedgefield	HSHS
Current Operations	97	109	19	14	8
Future - without UPBP	109	78	18	24	11
Future - with UPBP	87	69	18	24	12

Receptor Location

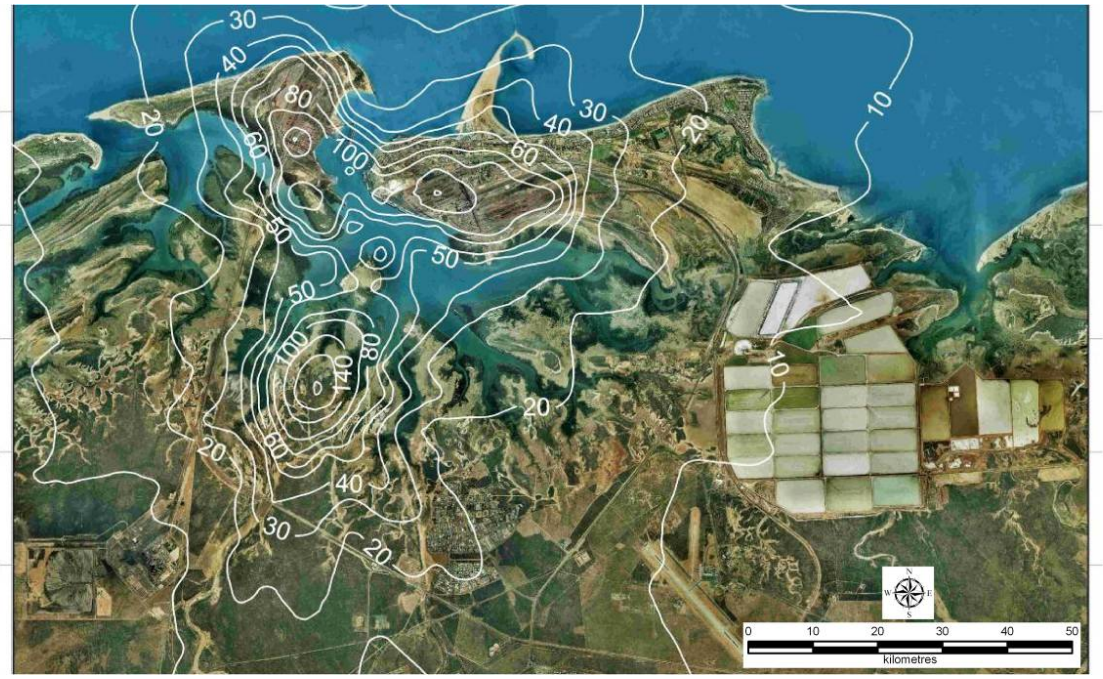
- **Figure 7-4 Comparison of Predicted PM_{10} Concentrations in Port Hedland**

Existing dust concentrations (PM_{10}) are currently highest at the Harbour and Hospital receptor locations. In the absence of the UPBP development proceeding, dust concentrations are expected to increase at the Harbour, Wedgefield and HSHS locations. Increases at the Harbour location are attributed largely to forecast increases in throughput at existing Berths (i.e. Berth 1). Increases at Wedgefield and HSHS can be attributed to the location and proximity of future development at Anderson Point (not related to UPBP). Dust concentrations at the Hospital and PH Primary School are expected to decrease and can be attributed primarily to improvements in BHPBIO's dust management strategies and changes in operations e.g. the cessation of crushing and screening activities and the decommissioning of certain stackers/reclaimers and transfer stations at Nelson Point (BHPBIO 2006).

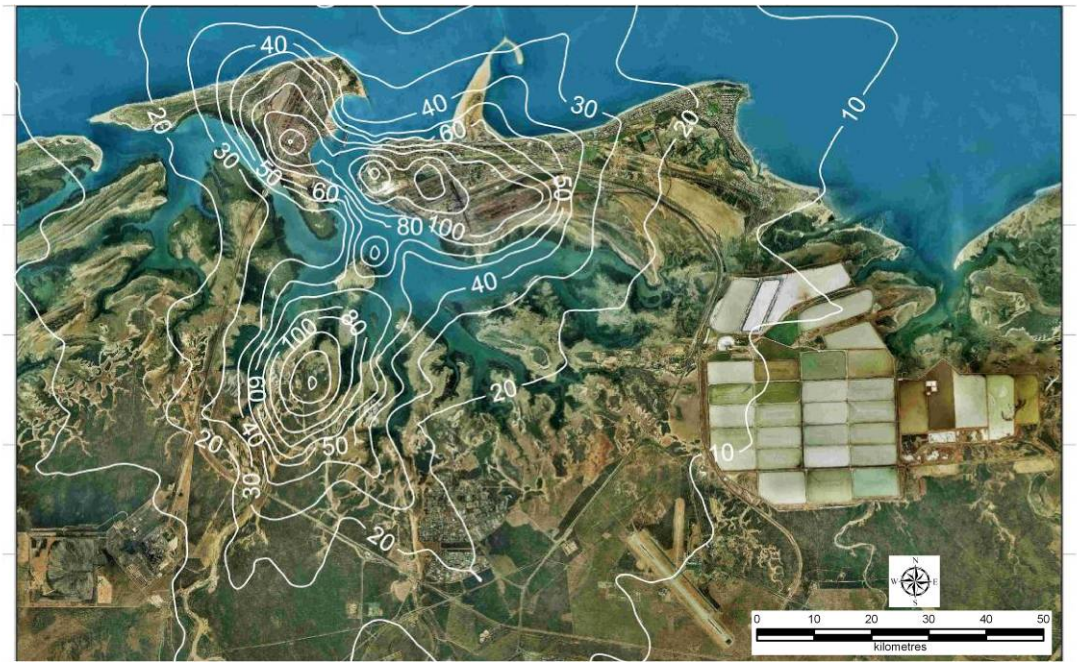
The development of UPBP generally results in a reduction in dust and therefore improvement in air quality for the Port Hedland township immediately adjacent the port. In contrast to the future scenario without UPBP, dust levels at the Harbour are expected to decrease to below current levels.

At the Hospital, dust levels are observed to decrease even further. This decrease at the Harbour and Hospital locations can be largely attributed to the relocation of manganese and chromite ore operations to UPBP - a purpose built facility with dust attenuating design enhancements located away from the township and out of the prevailing winds that disperse dust toward sensitive receptors.

Slight increases observed at Wedgefield and HSHS with and without UPBP can be largely attributed to the location and proximity of approved future development at Anderson Pt (not related to UPBP). Dust concentrations observed at PH Primary School are expected to decrease for both future scenarios.



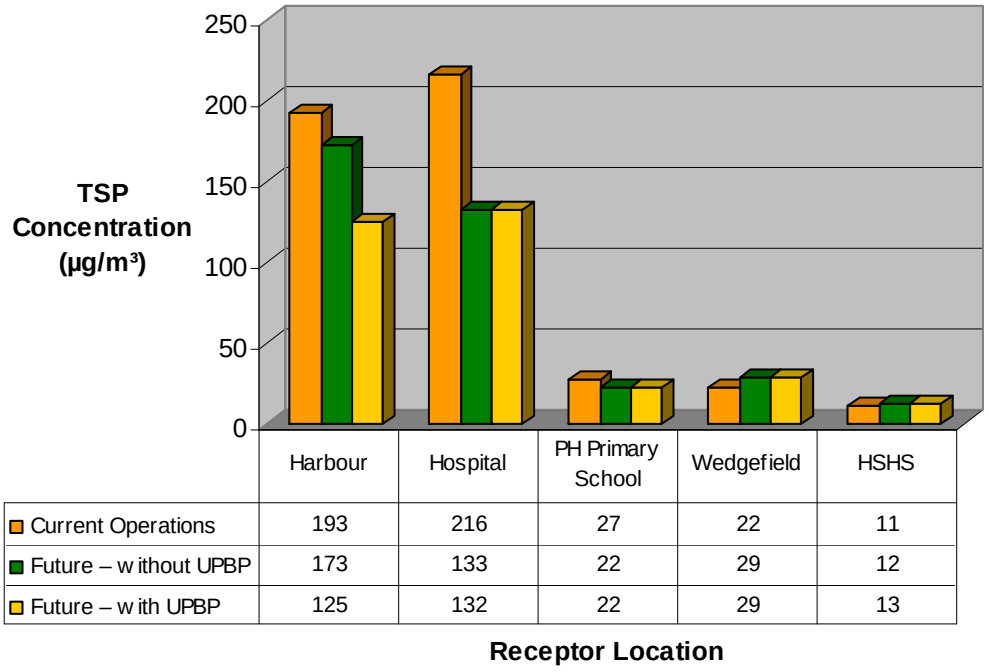
- **Figure 7-5 Modelled PM_{10} (24 hour Average) Concentrations in the Port Hedland Region without UPBP Development**



- **Figure 7-6 Modelled PM_{10} (24 hour average) Concentrations in the Port Hedland Region for the UPBP Development**

Total Suspended Particulate (TSP)

Figure 7-7 presents the maximum 24 hr average total suspended particulate (TSP) concentrations at the selected receptor locations for each of the three scenarios modelled. Isopleths of TSP concentrations for future operations with and without the UPBP development are also presented in **Figure 7-8** and **Figure 7-9**.

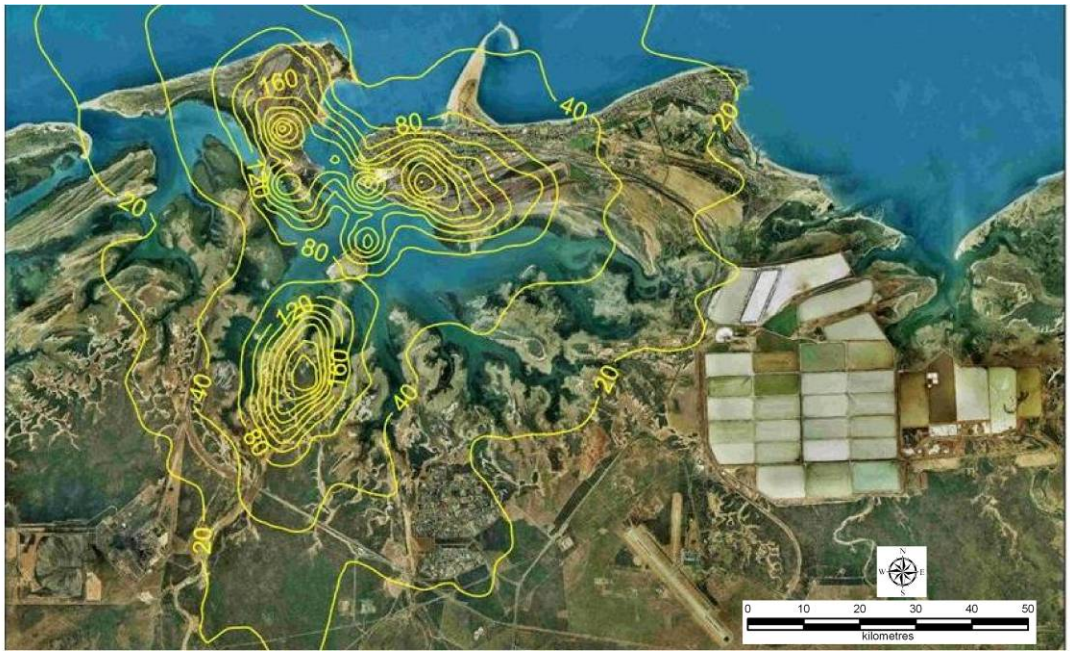


- **Figure 7-7 Comparison of Predicted TSP Concentrations in Port Hedland**

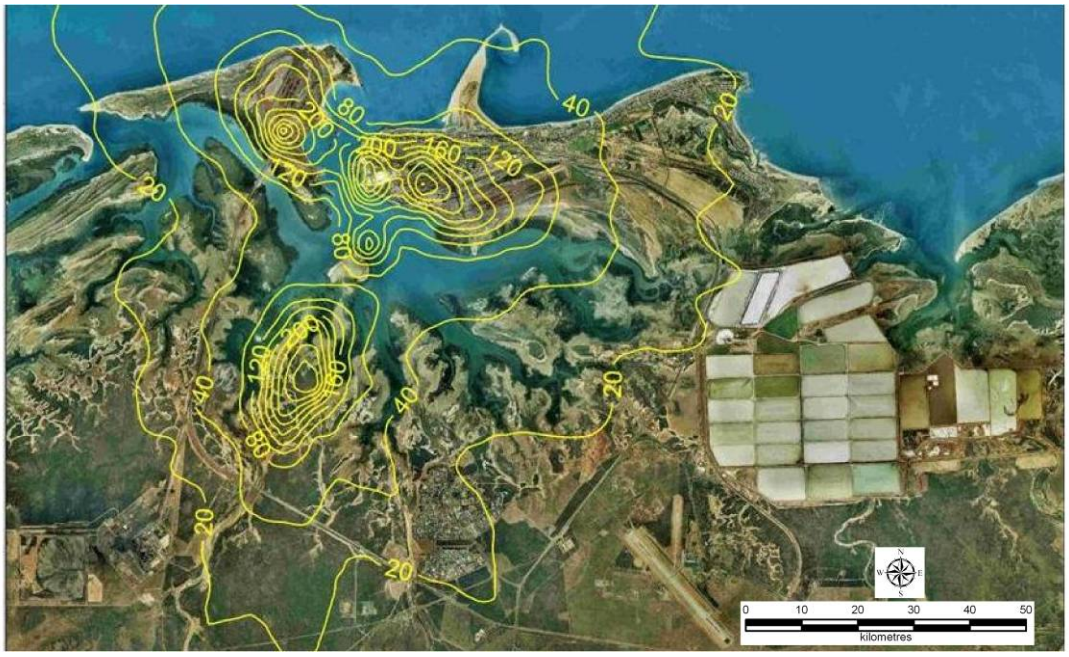
As with particulate matter (PM_{10}), existing TSP concentrations at the Harbour and Hospital receptor locations currently exceed the Kwinana EPP Area C amenity standard (150 µg/m^3). All other receptor locations are currently below this standard.

For future operations with and without the UPBP development, TSP concentrations are expected to decrease at the Harbour, Hospital and PH Primary School receptor locations with substantial reductions in TSP observed at the Harbour following the UPBP development. Decreases in TSP concentrations at these locations can be attributed primarily to improvements in BHPBIO's dust management strategies and changes in operations e.g. the cessation of crushing and screening activities and the decommissioning of certain stackers/reclaimers and transfer stations at Nelson Point (BHPBIO 2006).

Increases at Wedgefield and HSHS can be attributed to the location and proximity of future development at Anderson Pt (not related to UPBP).



- **Figure 7-8 Modelled TSP (24 hour Average) Concentrations in the Port Hedland Region without the UPBP Development**



- **Figure 7-9 Modelled TSP (24 hour Average) Concentrations in the Port Hedland Region for the UPBP Development**

Other Potential Impacts

Increased dust emissions may also result from the UPBP due to the increased number of vehicle movements associated with port operations. This impact is not considered significant and has not been included in the modelling of cumulative dust emissions.

For the purposes of modelling it has been assumed other new and existing operations with reduced dust emissions, such as the import and export of container materials and copper concentrate, will continue at Berth 1. In association with the UPBP, it is also assumed that facilities at Berth 1 will be improved, through the construction of a new multi-user concentrate shed and upgrades to the materials handling infrastructure.

Lastly, additional greenhouse gas emissions could result from the development of the UPBP due to land clearing for the project; combustion of fuel by machinery, vehicles and other equipment; use of electricity; sewage produced; and, solid waste produced. During both construction and operation of the UPBP, PHPA will monitor and continue to employ energy efficient methods to minimise greenhouse emissions wherever practicable.

7.7.4 Management and Mitigation

Fugitive dust emissions can be substantially reduced through targeted mitigation techniques and effective management. Dust must be controlled at source as once particles are airborne, it is much more difficult to prevent them from dispersing.

Prior to construction an Air Quality Management Plan (outlined in **Appendix K**) will be prepared and include detail on methods of dust prevention and suppression for those potential sources identified. These methods of control will involve proactive management as well as in response to local conditions, i.e. during dry periods or when there would be extensive clearing or haulage.

Typical measures used on construction sites to control dust include:

- Measures for controlling dust during earthworks and on-site haulage:
  - Limiting vegetation clearing to the minimum required for construction purposes;
  - Minimising exposed surfaces;
  - Rehabilitating disturbed areas as soon as practicable;
  - Damping down of dry surfaces with water carts and/or sprays - especially for high traffic areas such as access roads, the stockyard construction area, temporary camps and laydown areas;
  - Use of environmentally safe dust suppressants in unsealed traffic areas;
  - Avoiding unnecessary machinery movement;

- Strict enforcement of vehicle speeds to a practicable minimum;
- Use of paved haul roads where possible;
- Minimisation of drop heights;
- Regular grading/compaction of unpaved surfaces;
- Regular sweeping of paved surfaces; and
- Screening by temporary windbreaks.

- Measures for controlling dust emissions from stockpiles:
  - Location of stockpiles furthest from sensitive receptors;
  - Damping down (avoid over-wetting);
  - Seeding or use of chemical surface crusting agents;
  - Minimisation of stockpile heights; and
  - Screening by temporary windbreaks.
- Measures for controlling dust emissions from vehicles:
  - Ensure that all vehicles are in good mechanical order;
  - Sheeting of loose materials;
  - Regular cleansing of vehicles (wheel washing); and
  - Regular cleansing of public roads in the vicinity of the site access point(s).

Since many techniques involve the use of water for washing or damping down, it is important to ensure that run-off water does not become a source of pollution i.e. silt in water courses.

The design of UPBP has included a number of dust attenuating enhancements to reduce dust emissions during operation. These include:

- Access Restrictions and Sealed Access: the design of the stockyard with its elevated and sealed perimeter road ensures that trucks do not travel on unsealed roads through the facility and are not required to travel over the stockpiled ore material (as currently exists with the existing operations at the Public Berth).
- Stockyards: water cannons will be installed in the stockyards (along the central conveyor and around the perimeter road) for dust suppression and conveyors will be designed as close to ground level as practical. The sunken design of the stockyard area also provides some wind break protection.
- Hoppers: bulking in-feed hoppers and FEL hoppers will be enclosed where practicable with the use of retractable covers and fitted with misting sprays.
- Stackers: luff and slew stackers will be used to minimise drop height to the stockpile and will be fitted with water spray heads.

- Conveyors and Transfer Stations: will be kept as low to the ground as practicable and partially enclosed and fitted with water sprays and belt wash stations. Transfer stations will be enclosed with dust suppression sprays installed. All conveyors, where operationally capable, will be fitted with covers. Transfer towers will have complete wash-down capability between shipments.
- Shiploading: a cascading chute will also be used for shiploading fine material to further reduce dust emissions and water sprays otherwise adopted.
- Washdown Facility: all trucks to be cleaned at the washdown facility prior to exiting the stockyards.

Other management controls for residual dust impacts during construction and operation include:

- Haulage Trucks: will be covered if required (depends on material type and optimum moisture content) to prevent dust emissions and loss of ore during transport.
- Daily inspection of construction areas will be undertaken to ensure dust control measures are being implemented are effective.
- Daily monitoring of weather forecasts from the Bureau of Meteorology for Port Hedland will be undertaken to optimise the effectiveness of water sprays, i.e. applying water to stockpiles in advance when strong winds have been forecast to occur.
- PHPA will consult and co-ordinate activities for the UPBP with other industries and/or developers in the area with the aim of minimising cumulative impacts on the local community.
- A register to record community dust complaints will also be established and maintained to address community dust concerns as appropriate and in a timely manner.

Concerns about the potential impact of manganese and chromite on community health are a primary driver in PHPA seeking to move these products away from the general population to the new facility at Utah Point. PHPA has taken into account the recent toxicological studies undertaken by the DOH, and will consider any recommendations from further studies to be undertaken, and will publicly report the outcomes of its deliberations. PHPA will at all times adhere to health regulations.

7.7.5 Predicted Outcome

Ambient dust levels at Port Hedland are high and are known to exceed the NEPM criteria for Air Quality. Compared to the existing situation and the future scenario without UPBP, the proposed UPBP development demonstrates a general reduction in the dust concentration in areas immediately adjacent PHPA operations at Berth 1 and negligible impact on receptors at Wedgefield, PH Primary School and HSHS. This benefit is largely attributed to UPBP being a purpose built facility with dust attenuating design enhancements located away from the township

and out of the prevailing winds that otherwise disperse dust toward sensitive receptors. Development and implementation of a suitable Air Quality Management Plan will aide in managing dust emissions to a minimum.

7.8 Noise

7.8.1 Management Objectives

The key objectives for the management of noise for the UPBP are:

- To ensure that noise emissions do not impact on environmental values, or the health, welfare and amenity of the population and land uses.
- To ensure that noise emissions, both individually and cumulatively, comply with the appropriate statutory requirements.
- To ensure design and procurement activities incorporate measures for minimising noise emissions during construction and operations.
- To ensure that all reasonable and practicable measures are undertaken during construction and operations to minimise noise emissions.

7.8.2 Applicable Standards and Legislation

Applicable legislation, regulations and guidelines for the management of noise emissions include:

- Australian Standard AS 2436-1981: Guide to Noise Control on Construction, Maintenance and Demolition Sites 1981;
- Environmental Protection (Noise) Regulations 1997;
- EPA Guidance Statement No. 8: Environmental Noise (Draft) 2007; and
- EPA Guidance Statement No. 14: Road and Rail Transportation Noise (Preliminary Draft - Version 3) 2000.

7.8.3 Potential Impacts

Noise emissions from the port are not continuous in nature and can vary considerably depending on the activities being undertaken. There can be overlap of noise emitted from a number of port users and from other activities in the Port Hedland area, and as a consequence noise emissions can be cumulative at their point of impact.

Prevailing weather conditions also have a significant effect on the extent to which noise emitted by port operations may impact on the community, particularly during the night-time when atmospheric conditions can enable noise to travel greater distances.

Noise impacts from the UPBP may result from:

- Construction noise;
- Traffic noise; and
- Operational (Industrial) noise.

Construction Noise

Construction activities associated with the development of the UPBP have the potential to impact on the local community. Noisy construction activities may include:

- Construction traffic;
- Earthworks;
- The creation of temporary laydown areas;
- Piling; and
- The laying of site drainage and internal roads.

Construction noise is not anticipated to have a significant impact on the local community due to high existing background noise levels and the implementation of suitable administrative and engineering control methods (discussed in further detail below).

Traffic Noise

Traffic noise may be generated by vehicle movement onsite and on-route to the UPBP site, including from road trains transporting materials for construction and materials for export during operations. Sources of noise generated by vehicle movement include:

- Light vehicles;
- Heavy vehicles – engine noise and exhaust noise; and
- Road trains – engine noise and exhaust noise

Noise increases may occur at South Hedland and Wedgefield due to the proposed UPBP, primarily as a direct result of additional traffic volumes associated with haulage to the UPBP site.

To investigate the potential traffic noise impacts the UPBP may have, traffic noise impact modelling was undertaken by VIPAC Engineers and Scientists Ltd (VIPAC) as detailed in **Appendix J**.

Within the Port Hedland area there is only a small increase in traffic noise due to noise propagating across from the UPBP access road. However, the increase in traffic noise is immeasurable as background noise levels are well above the predicted traffic noise levels (up to 20 dB(A)).

In South Hedland, the maximum increase in traffic noise levels due to the UPBP is 1.5 dB during the day and night. This is primarily due to an increase in road train traffic on the Great Northern Highway to the north of South Hedland. The L_{Aeq} night-time predicted traffic noise levels in South Hedland are <40 dB(A), which equates to a Noise Amenity Rating of N0. The daytime NAR is N2, therefore the increase satisfies the traffic noise criteria.

The maximum increase in traffic noise in Wedgefield is predicted to be >4dB. This is primarily due to an increase in road train traffic on the Great Northern Highway, to the south of Wedgefield. In 2009, any residences closer to the highway are predicted to have noise amenity ratings of up to N2 in the daytime and N3 at night. On this basis, only a 0.5 dB(A) increase in traffic noise levels is allowed due to traffic noise from a specific industrial development proposal. Therefore, the increase in traffic noise in Wedgefield does not comply with traffic noise assessment criteria. However, noise objectives detailed by the EPA (EPA Draft Guidance Statement no. 14, 2000) can be readily achieved by assessing indoor noise levels at any affected noise sensitive receivers and treating as required.

Notably, as part of the recently announced state road funding allocation to Port Hedland, MRWA has proposed the construction of a new access route to Finucane Island that will divert road trains away from Cajarina Road and Pinga Street. This is expected to result in less road train traffic and associated impacts in Wedgefield.

Traffic noise impacts for the UPBP remain approximately the same regardless of whether triple or quad road trains are used. This is because the reduction in traffic volume achieved by using quad road trains is countered by the slight increase in the vehicle pass by noise levels generated by quad road trains in comparison with triple road trains.

Operational (Industrial) Noise

Key sources of noise from UPBP operations will include:

- Front end loaders;
- Hoppers;
- Conveyors and drives;
- Shiploaders; and
- Low speed truck movements.

Noise from UPBP operations is not anticipated to have a significant impact on the local community due to the high existing background noise levels in Port Hedland. Additionally, noise attenuates with increasing distance from the source and consequently the impacts from noise emissions are diminished further away from the source. Noise attenuation measures and engineering control methods, an indicative sample of which is outlined in **Section 7.8.4** and **Appendix K**, will also reduce noise levels and impacts.

Similarly to the assessment of traffic noise impacts, operational noise impact modelling was undertaken by VIPAC (as detailed in **Appendix J**) to determine operational noise impacts.

Operational noise impacts were assessed by comparing noise levels for three scenarios, including:

- Estimated existing (2006) scenario;
- Predicted (2009) scenario, without UPBP; and
- Predicted (2009) scenario, with UPBP.

Predicted noise levels for the above scenarios were compared to each other and to the applicable criteria to determine the potential operational noise impacts of UPBC.

Due to the location of the UPBP and the attenuation of noise with distance, only the Port Hedland township (to the west of the Hospital) is likely to be affected by operational noise impacts. To assess industrial noise impacts, noise levels were calculated at four locations representative of sensitive receptors in the Port Hedland township, including the Pier Hotel, Esplanade Hotel, Backpackers Hostel and Port Hedland Hospital (**Figure 7-10** and **Table 7-4**). The night-time assigned noise levels for each of these noise sensitive receptors in Port Hedland are outlined in **Table 7-5**.

- **Table 7-4 Night-Time Assigned Noise Levels for Representative Noise Sensitive Receptors in Port Hedland**

Sensitive Receptors	Influencing Factor dB(A)	L_{A10} dB(A)	L_{A1} dB(A)	L_{Amax} dB(A)
Pier Hotel	11	46	56	66
Esplanade Hotel	11	46	56	66
Backpackers' Hostel	7	42	52	62
Port Hedland Hospital	2	37	47	57

Previous noise measurements by VIPAC indicate the assigned noise levels at these receptors are already exceeded. Consequently, according to Environmental Protection (Noise) Regulations 1997, additional noise from the UPBP must not significantly contribute to the noise exceedence and noise levels from the UPBP are required to be no higher than 5dB below the assigned noise

levels. Hence, noise criteria for the UPBP at each of the nominated sensitive receptors are outlined in **Table 7-5**.

Table 7-5 Noise Criteria for Representative Noise Sensitive Receptors in Port Hedland

Sensitive Receptors	L_{A10} dB(A)	L_{A1} dB(A)	L_{Amax} dB(A)
Pier Hotel	41	51	61
Esplanade Hotel	41	51	61
Backpackers' Hostel	37	47	57
Port Hedland Hospital	32	42	52

Note: Noise criteria represent maximum night-time noise levels for UPBP operations and do not consider background noise levels.

As part of operational noise impact assessment, noise levels for the UPBP were modelled for four scenarios, including:

1. Future PHPA operations without UPBP – neutral weather conditions (day time).
2. Future PHPA operations without UPBP – worst case weather conditions (night time).
3. Future PHPA operations including UPBP – neutral weather conditions (day time).
4. Future PHPA operations including UPBP – worst case weather conditions (night time).

Modelling of future PHPA operations including the UPBP incorporates both the reduction of noise emissions from Berth 1 as well as new noise emissions from the UPBP facility.

For the UPBP facility, the key noise sources that have been identified include:

- Stackers (a maximum of five stackers is assumed o be operating at a time);
- Three front end loaders (modelled on WA 1200 / CAT 994);
- Three hoppers (a maximum of two hoppers will operate at a time);
- Conveyors and drives for five conveyors – two stockpile conveyors (only 1 will operate at a time), two conveyors on route to the shiploader, and one wharf conveyor;
- One shiploader; and
- Low speed truck movements.

For the UPBP, modelled operational noise levels at noise sensitive receptors in Port Hedland are presented in **Table 7-6**. For all receptors, noise levels do not meet noise criteria without the implementation of engineering controls. However, there will be no significant increase in noise overall as noise emissions from the UPBP are below the existing background noise levels.

- **Table 7-6 Modelled Operational Noise Levels from the UPBP at Noise Sensitive Receptors (L_{A10} dB(A))**

	Pier Hotel	Esplanade Hotel	Backpackers Hostel	Port Hedland Hospital
Noise criteria	41	41	37	32
UPBP noise levels – worst case (day)	49	48	46	33
UPBP noise levels – worst case (night)	49	48	46	34

Comparing worst case night future scenarios with and without the UPBP, modelled noise levels generally remain the same or are reduced as a result of the UPBP development, including the associated improvement of facilities at Berth 1 (refer to **Table 7-7**). Hence, there is no overall operational noise impact on the Port Hedland community.

- **Table 7-7 Modelled Operational Noise Levels with and without the UPBP at Noise Sensitive Receptors (L_{A10} dB(A))**

	Pier Hotel	Esplanade Hotel	Backpackers Hostel	Port Hedland Hospital
Noise levels with the UPBP	56	58	51	36
Noise levels without the UPBP	56	61	49	43

7.8.4 Management and Mitigation

Management and mitigation methods specific to construction, traffic and industrial noise are discussed separately below.

Construction Noise

Prior to construction, an overall noise management plan will be prepared detailing noise management procedures and protocols (refer to **Appendix K**).

Construction work will be carried out in accordance with the recommendations for control of environmental noise practices outlined in Australian Standard AS 2436-1981: Guide to Noise Control on Construction, Maintenance and Demolition Sites.

As per the EP(N)R, construction noise should be *carried out in accordance with good noise control practice as defined in Section 6 of AS 2436 – 1981*. Section 6 of this Standard addresses *Control of noise*, and identifies ways of controlling noise at the source:

- Substitution – Where reasonably practicable, noisy plant or processes should be replaced by less noisy alternatives.
- Modification of existing equipment – A variety of engineering controls may be applied to excessively noisy equipment to reduce noise impact, including enclosing equipment, inserting silencers and damping of noise radiating panels etc.
- Use and siting of equipment – Care should be taken to site noisy equipment away from noise-sensitive areas.
- In the case of UPBP construction, this will involve the minimising of noisy activities on the wharf, which is the closest construction location to the township of Port Hedland. Where possible, pre-fabrication should be conducted away from the wharf.
- Maintenance – Regular and effective maintenance of stationary and mobile equipment including off-site vehicles is essential and will do much to keep noise levels near to that of new machinery.
- Regulation 13(2) of the EP(N)R also states that the equipment used should be the quietest reasonably achievable.

These management strategies for minimising noise impact should be taken into account when planning construction works.

Construction noise impacts from the UPBP on the local community will be minimised by:

- Limiting construction activities during the evening and night-time (1900 – 0700) and on Sundays and public holidays. If construction work needs to take place during these times, advance notice will be given to residents likely to be impacted by noise emissions (at least 24 hr prior to work taking place);
- Using the quietest reasonably available equipment for construction activities; and
- Through the development and implementation of a Noise Management Plan to reduce noise emissions using design and operational controls (refer to **Appendix K**).

Traffic Noise

Traffic noise impacts will be minimised by ensuring road trains and other operational vehicles that utilise the road network on route to the UPBP site are properly maintained in good working order and are regularly serviced.

PHPA will also encourage proponents to comply with best practice principles for reducing traffic noise emissions. Procedures and protocols for the management of traffic noise will be incorporated in an overall Noise Management Plan for the UPBP (refer to **Appendix K**).

Operational (Industrial) Noise

Noise control measures will be implemented where necessary with consideration of economical feasibility in relation to the effectiveness of the level of noise reduction. Specific noise control treatments will be designed at the time depending on the overall noise reduction requirement and the various noise sources and their ranking and contribution to the overall noise level.

Significant engineering design and controls will be implemented both at Berth 1 and for the UPBP to reduce noise emissions. Indicative engineering controls that may be implemented to reduce noise emissions as part of the UPBP include the use of the following methods:

- Partial or full closure of equipment;
- Upgrade of building elements;
- Lining of building elements with acoustic absorption; and
- Use of vibration isolation and damping.

The construction of the new multi-user concentrate shed will provide significant shielding of noise emissions from operations at Berth 1 as well as from the UPBP site.

An acoustic consultant will participate in the final design stages of the project and during construction, as necessary, so that noise mitigation controls are correctly implemented and the desired acoustic performance is achieved.

Regular and effective monitoring and maintenance of all equipment, vehicles and other materials, will be undertaken to ensure the ongoing effectiveness of equipment at reducing noise emissions. The quietest available equipment practical to operations will be used for the UPBP and PHPA will also implement a "buy quiet" policy whereby if equipment needs to be replaced, the quietest reasonably available equipment will be purchased.

PHPA will continue to liaise with the Port Hedland community regarding noise impacts and any concerns raised will be promptly addressed.

7.8.5 Predicted Outcome

Noise levels at the Port Hedland township currently exceed levels permitted in WA noise regulations. With the implementation of the UPBP, the following outcomes with respect to noise can be expected:

Construction noise

During construction, the most noticeable source of noise will be piling. With the implementation of suitable administrative and engineering control measures as outlined in **Section 7.8.4** and in the

Noise Management Plan (**Appendix K**), construction activities will satisfy the construction noise requirements of the EP(N)R.

Traffic noise

Operation of the port facility will result in increased traffic volumes along access roads. Noise emissions will be higher than the current ambient/recorded levels. However, predicted traffic noise levels at Port Hedland will satisfy traffic noise criteria. The traffic noise criteria in Wedgefield and South Hedland will be exceeded, with the change in noise levels for some properties in South Hedland and for approximately 20 caretaker properties in the Wedgefield area predicted to be up to 3.5 dB, which may be considered to be barely perceptible. Affected residences could counter any increased noise levels by implementing simple architectural treatments. However, with the development of a new access route to Finucane Island by MRWA away from Cajarina Road and Pinga Street, traffic noise impacts are expected to be further reduced in Wedgefield.

Operational (Industrial) Noise

The existing high background noise levels in Port Hedland have resulted in relatively strict noise criteria, with the regulations requiring that for new industrial plants, noise emissions during operation are to be no higher than 5 dB below the otherwise Assigned Noise Levels for a residential area adjacent to a port.

For the UPBP noise levels do not meet noise criteria without the implementation of engineering controls. However, with the implementation of the UPBP, future noise levels will generally be lower than if the facility is not constructed and as such, there will be no noise impact associated with the UPBP.

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Client
Port Hedland Port Authority

Project
Utah Point Berth Project

Drawing Title
Location of Noise Sensitive Receptors - Pier Hotel, Esplanade Hotel, Former Backpacker's Hostel and Port Hedland Hospital

Drawing No.
Figure 7-10

Revision No. B
Date: 28.02.08
Project WV03278

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7.9 Traffic

7.9.1 Management Objectives

The key objectives for the management of traffic for the UPBP are:

- To provide safe and efficient access along key transport networks for the UPBP.
- To minimise adverse impacts on surrounding transport networks and the users of those networks.
- To minimise impacts on the community, surrounding land uses and sensitive habitats.

7.9.2 Applicable Standards, Policies, and Legislation

Applicable policies and legislation for traffic management include:

- WAPC Development Control Policy 1.7: General Road Planning 1998;
- WAPC Development Control Policy 5.1: Regional Roads (Vehicular Access) 1998;
- Road Traffic Act 1974; and
- Road Traffic Code 2000.

Austroads guidelines are also applicable to road design, safety and traffic management.

7.9.3 Potential Impacts

Potential traffic impacts as a result of the UPBP development include traffic delays and road closures during construction, and increased traffic congestion during operations.

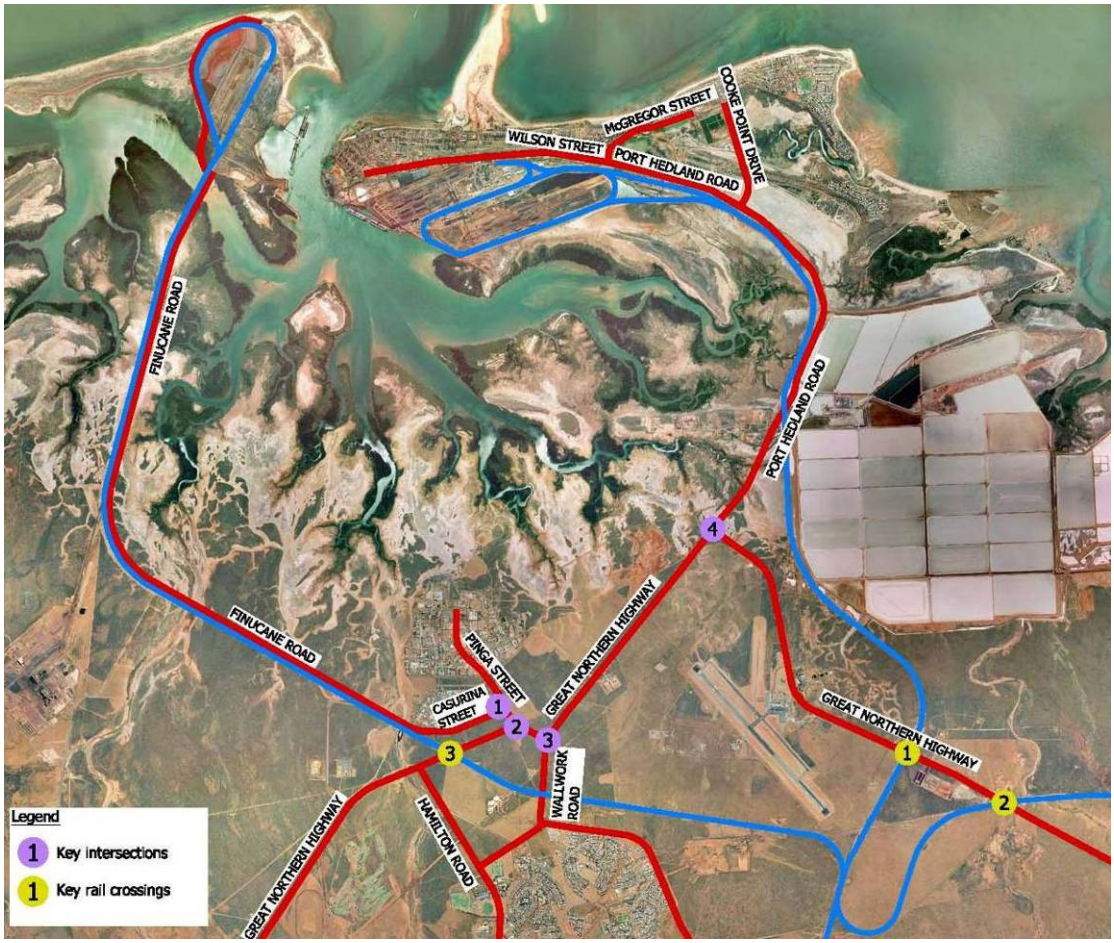
Traffic modelling for the UPBP shows that traffic generated by the UPBP (whether triple road trains or quad road trains) is not expected to have a major impact on the operation of current intersections and sections of roads along the proposed haul route during the AM peak hour and off-peak times. However, during the PM peak, traffic generated may have a major impact on the Great Northern Highway /Port Hedland Road, Great Northern Highway/Wallwork Road, and, Cajarina Road/ Pinga Street intersections (refer to **Figure 7-11**).

The critical movements affected at these intersections are:

- Right turns for road trains from Cajarina Road onto Pinga Street;
- Right turns for all general traffic from Great Northern Highway onto Wallwork Road; and
- Right turns for all general traffic from Great Northern Highway onto Port Hedland Road.

The UPBP is not expected to have any significant impacts on pedestrian, cycling or public transport, primarily because the proposed haul route is on an established route for road trains. However, structural damage to municipal roads could result from increased heavy vehicle

movements. In addition, other impacts that may result from the UPBP include reduced ambient air quality, amenity and severance issues for the local community. Furthermore, traffic delays and road closures could arise during construction of the UPBP.



- **Figure 7-11 Key Intersections and Rail Crossings for the UPBP**

(Background mapping source: Department of Land Information. July 2004)

7.9.4 Management and Mitigation

To reduce traffic demands on the existing road network for operation of the UPBP, quad road trains rather than triple road trains will be encouraged where possible. This should help reduce the degree of saturation of the proposed road network for haulage and limit impacts to the level of service of selected roads and intersections.

If deemed necessary, operational restrictions will also be implemented for road trains accessing the Utah Point facility from the north via Great Northern Highway as an interim measure to prevent traffic congestion and help ensure the operational capacity of the existing road network. Such

restrictions may include the application of a self imposed curfew to ensure that road trains avoid the key intersections, Cajarina Road/ Pinga Street, Great Northern Highway/Wallwork Road and Great Northern Highway/Port Hedland Road, during the afternoon peak period.

Importantly, PHPA will continue to liaise with MRWA and other parties to co-ordinate and improve traffic management for the detailed design and construction of the UPBP access road and along the proposed haulage route, in general, to reduce potential impacts on the existing road network and the local community. Prior to undertaking road closures and/ or other events that may impact on the local community, PHPA will inform and keep the local community updated of these occurrences.

Management and mitigation methods for traffic management during construction and operation will also be detailed in a Traffic Management Plan, outlined in **Appendix K**.

Notably, it is anticipated that many of the issues identified in traffic modelling undertaken as part of this UPBP will be alleviated with the upgrading of the Great Northern Highway by MRWA, associated with the recent announcement of state funding to be provided to MRWA. The approved works will re-align the Great Northern Highway, reducing traffic noise and congestion in the vicinity of Wedgefield and providing a safer and more direct route for trucks travelling to the UPBP site.

7.9.5 Predicted Outcome

The UPBP has the potential to significantly impact on traffic in the Port Hedland area, If managed appropriately (such as the implementation of a self imposed PM peak curfew and maximising the use of quad road trains) these impacts could be limited. PHPA will continue to liaise with MRWA, other parties and the local community to improve traffic management in the Port Hedland area and to reduce potential impacts on the road network that may result from the UPBP.

7.10 Social Impacts

7.10.1 Management Objectives

The key objectives for the management of social impacts include:

- To minimise potential impacts on the local community including impacts on social dynamics, health, services and facilities, and, housing and accommodation.
- To minimise potential impacts on recreation resulting from the UPBP.
- To minimise potential impacts on visual amenity values.

By achieving these objectives PHPA aims to ensure a net benefit to the community results from the UPBP.

7.10.2 Applicable Standards and Legislation

Applicable legislation and guidelines for the management of social impacts include:

- Australian Standard AS 4282-1997: Control of the Obtrusive Effects of Outdoor Lighting 1997;
- EPA Guidance Statement No. 2: Risk Assessment and Management: Offsite Individual Risk from Hazardous Industrial Plant 2000;
- EPA Guidance Statement No. 3: Separation Distances between Industrial and Sensitive Land Uses 2005;
- EPA Guidance Statement No. 33: Environmental Guidance for Planning and Development (Draft) 2006; and
- EPA Position Statement No. 6: Towards Sustainability 2004.

7.10.3 Potential Impacts

Impacts on the Local Community

Potential impacts on the community are both positive and negative.

Positive impacts include:

- Job creation in the Port Hedland area for the construction and operation of UPBP and for associated industries and services;
- Increased standard of living for households of people employed during construction and operation of the UPBP;
- Increased human capital from training and/or employment opportunities including indigenous employment;
- Increased investment in the local economy;
- Reduced levels of dust, noise and vibration near the Port Hedland township; and
- Location of chromite and manganese ores away from the Port Hedland township.

Potential negative impacts include:

- The outsourcing of labour from other areas through Fly-In Fly-Out (FIFO) operations;
- Increased transient population during construction;
- Wage inflation and local price inflation (including housing) due to increased demand for housing and employment attraction schemes;
- Reduced quality of affordable housing;

- Increased relative poverty of the indigenous community in comparison to industry employees and contractors;
- Increased dependency on port operations and the resource sector for economic development and sustainability of the local Port Hedland economy;
- Increased demand on local community services, including social and medical services;
- Increased use of local infrastructure including telecommunication, power and water usage;
- Traffic congestion and reduced traffic safety due to increased road usage;
- Increased annoyance factors such as dust, noise and vibration, near the UPBP site;
- Increased litter at the UPBP site and in associated areas; and
- Increased incidence of mosquito-borne diseases due to the proximity of the UPBP site to natural mosquito breeding areas.

Recreation

The UPBP could impact on coastal recreation including recreational fishing near the stockyard area and within the harbour area. During construction and port operations access to coastal areas around Utah Point and Stanley Point is likely to be reduced, restricting recreational activities.

Visual Amenity

The UPBP may affect visual amenity values of the Port Hedland area. In particular, the sea wall surrounding the stockyards and increased lighting during the night-time at the UPBP site may have impacts on visual amenity values of the coast and surrounding areas.

The stockyards and berth will be visible from within the harbour and from the adjacent berth facilities within the West End area of Port Hedland. However, from these locations the UPBP is in keeping with existing port landscape, in which the presence of port infrastructure and shipping vessels dominate the visual landscape in both the foreground and background of the site (refer to **Figure 7-12** and **Figure 7-13**). The UPBP will not be visible from the South Hedland and Cooke Point residential areas and would be difficult to see from the Wedgefield Industrial area.

The proposed area for the UPBP stockyards is centred on the limestone plateau of Stanley Point with minimal clearing of the closed canopy mangroves, thereby limiting impacts on visual amenity values of these mangroves which surround the site and tidal creek inner harbour mangrove landscape.

As a consequence, the UPBP is unlikely to be considered unacceptable to the community. The UPBP is consistent with PHPA Ultimate Development Plan and Land Use Master Plan for the harbour region, for which there has been widespread public consultation and input.

7.10.4 Management and Mitigation

Impacts on the Local Community

To effectively manage and mitigate potential social impacts, PHPA have consulted with the government and the local Port Hedland community to identify any potential impacts the UPBP may have. As part of this consultation process, PHPA has encouraged community involvement in discussions concerning the development of the UPBP and investigated any suggested options for reducing any impacts to as low as practicable. Refer to **Section 2** for PHPA community consultation and outcomes to date.

The construction and operation workforce is estimated at 100-150 and 20-25 people respectively (excluding truck drivers). PHPA is arranging to provide accommodation for the construction workforce in consultation with new and existing service providers and with other industry parties (such as FMG and BHPBIO) utilising temporary housing facilities in the Port Hedland area.

As much as is feasible, workers will be sourced from the Port Hedland community and surrounding areas in preference to FIFO operations. PHPA will encourage site operators to utilise the employment of local people who are undertaking or have graduated from training courses offered by Pilbara TAFE and/or to offer traineeships and apprenticeships where suitable. South Hedland and Pundulmurra Pilbara TAFE campuses offer courses, apprenticeships and/or traineeships in the areas listed below which are relevant to the construction, operational and environmental management of the UPBP:

- Occupational Health & Safety;
- Conservation & Land Management;
- Civil Construction;
- General Construction;
- Automotive Vehicle Servicing;
- Automotive Mechanical Technology;
- Engineering – Mechanical Trade;
- Engineering – Fabrication Trade; and
- Engineering – Electrical / Electronic Trade.

Where practicable, PHPA will encourage local and/or indigenous businesses to provide services for the UPBP where appropriate. These businesses may include:

- Bloodwood Tree;
- Indigenous Mining Services;
- Marapikurrinya Pty Ltd;

- Ngarda Civil and Mining;
- Pilbara Logistics; and
- Pilbara Meta Maya.

PHPA will advertise and/or inform local and indigenous businesses of service and employment opportunities which may arise for the UPBP. PHPA will also continue to liaise with the representatives from Kariyarra and Marapikurrinya communities regarding Aboriginal Heritage issues (refer to **Section 7.11**) and in offering employment opportunities for members of these communities.

These attempts to source people locally, will help limit the growth in transient population and employment and training opportunities made available through the UPBP will benefit the local community, especially in assisting Aboriginal youth to gain new skills and find employment.

Nuisance factors including dust, noise and vibration will be reduced within the Port Hedland township as a result of relocating port facilities to Utah Point and these factors will be carefully managed at the UPBP site to ensure there are no adverse outcomes for the local community. The management of these factors is discussed separately in **Sections 7.7** and **7.8**.

Similarly, the removal of chromite and manganese ores from the Port Hedland township is expected to reduce the risk of potential related health affects for the general population. Whilst current studies show there are unlikely to be any negative impacts on the areas surrounding the UPBP site as a result of the relocation of chromite and manganese ores, ongoing monitoring will be undertaken to ensure there are no adverse outcomes on the local community.

Traffic congestion and reduced traffic safety as a result of the UPBP, has been raised as a key concern by the local community. A Traffic Assessment (refer to **Appendix G**) has been undertaken for the UPBP and the management of traffic is discussed separately in **Section 7.9** and **Appendix K**.

PHPA will continue to work in co-operation with the Australian Quarantine and Inspection Service (AQIS), Town of Port Hedland (ToPH) and the Department of Health (DOH) to manage mosquitoes and reduce the incidence of mosquito-borne diseases. Prior to the annual wet season, joint inspections of the port facilities will undertaken with the assistance of AQIS to identify potential breeding sites for mosquitoes and to identify improvement and/or treatment measures that can be implemented onsite.

PHPA will undertake larval and adult mosquito control measures including fogging and residual surface spraying as deemed necessary onsite and in consultation with AQIS, ToPH and DOH. If any offsite chemical control measures are to be undertaken, this will be done in consultation with

AQIS, ToPH, DOH and the DEC to prevent adverse impacts on the surrounding environment, including mangroves.

To protect contactors and employees at the UPBP site, health and safety requirements will specify that persons onsite are required to wear long, loose fitting, preferably light-coloured clothing and to apply repellent as necessary to prevent mosquito bites. Regular monitoring and maintenance of site facilities will also be undertaken to ensure that buildings and equipment are kept in a good state of repair and to prevent the establishment mosquito breeding areas onsite. For example, to ensure that fly screens on buildings are maintained and that there is no prolonged ponding of water in equipment.

Various management plans, including Air Quality, Noise, Mosquito, Contaminant and Waste Management Plans, will be implemented for the UPBP which will assist in minimising impacts on the local community (**Appendix K**).

Recreation

For public safety, access to the coast near the UPBP will need to be limited to using the existing BHPBIO access road during construction and port operations. The small boat landing that previously existed at Finucane Island near Utah Point has been removed as a result of recent construction and the site will no longer be available to the public for recreational fishing.

However, a new boat ramp for the public will be constructed as part of the yacht club redevelopment on the spoil bank, located to the north of the Port Hedland township. As outlined in **Section 6.9**, PHPA are proposing to contribute substantial funding for the development. In addition, the construction of the new access road for the UPBP will also allow for improved public access to the Finucane Island boat ramp, located on the western end of Finucane Island. PHPA will further investigate options for maintaining coastal access for recreational use. One such example is providing boardwalk facilities to provide improved access to fishing and crabbing areas.

- **Figure 7-12 Aerial View of Existing Landscape at Utah Point and Surrounds**

- **Figure 7-13 Photomontage of Utah Point Berth and Stockyards**

Visual Amenity

Potential impacts resulting from increased lighting at the site will be minimised by the careful placement and direction of lighting used, in accordance with Australian Standards (AS 4282-1997). Detailed design and construction of facilities onsite will also take into consideration the use of materials and colouring of buildings that is in keeping with the existing landscape to reduce potential visual impacts.

7.10.5 Predicted Outcome

Whilst the UPBP has the potential to have impacts on the local community, management procedures and plans are in place to help ensure that the UPBP results in a net community benefit for the Town of Port Hedland. Ongoing community consultation will also help ensure that any potential impacts are addressed and will enable further improvements to be made for the benefit of the local community.

7.11 Heritage

7.11.1 Management Objectives

The two key heritage management objectives for the UPBP are:

- To require that the project complies with the requirements of the *Aboriginal Heritage Act 1972*, *Heritage of Western Australia Act 1990* and other relevant legislative requirements.
- To require that changes to the biological and physical environment resulting from the Project do not adversely affect cultural associations with the area.

7.11.2 Applicable Standards and Legislation

Applicable State and Commonwealth legislation and guidelines for heritage management include:

- *Aboriginal and Torres Strait Islander Heritage Protection Act 1984*;
- *Aboriginal Heritage Act 1972*;
- Aboriginal Heritage Regulations 1974;
- EPA Guidance Statement No. 41: Assessment of Aboriginal Heritage 2004;
- *Heritage of Western Australia Act 1990*; and
- Heritage of Western Australia Regulations 1991.

7.11.3 Potential Impacts

Aboriginal Heritage

Potential impacts on Aboriginal heritage as a result of the UPBP include:

- Disturbance of culturally significant sites;
- Excavation of material of cultural significance during construction; and
- Impacts on cultural associations to the UPBP site and surrounding areas.

Disturbance of Culturally Significant Sites

Within the development area, one site of aboriginal heritage significance to the Kariyarra people has been identified, known as "Sounness Drive Camp" (refer to **Section 6.10**). Further investigations are currently being undertaken by the Marapikurrinya people to provide information on the location and significance of this site and other culturally important sites within and/or nearby the UPBP development area.

Excavation of Material of Cultural Significance During Construction

Earth moving and excavation during construction could also potentially uncover other subsurface archaeological material of cultural significance such as middens, stone artefacts or skeletal material.

Impacts on Cultural Associations to the UPBP Site and Surrounding Areas

The UPBP may potentially impact on Aboriginal cultural associations within the Port Hedland harbour region such as by restricting access to fishing areas near the UPBP site and in surrounding areas. Discussions are currently being undertaken with the Marapikurrinya people to identify and assess impacts the UPBP may have on cultural associations to the UPBP site and surrounding areas.

European Heritage

The UPBP is unlikely to impact upon European Heritage as no places of heritage significance are located within or in close proximity to the UPBP development area. Dalgety House and the former District Medical Officer's Quarters, which are registered on the State Register of Heritage Places, are both located within the Port Hedland township, across the harbour approximately 1 km from the UPBP site.

7.11.4 Management and Mitigation

Management and mitigation measures to minimise potential impacts on Aboriginal and European heritage are detailed below.

Aboriginal Heritage

Disturbance of Culturally Significant Sites

Efforts will be made to avoid the disturbance of culturally significant sites as far as practicable. Where disturbance is unavoidable PHPA will seek permission under Section 18 of the Aboriginal Heritage Act to retrieve, relocate or, where this is not possible, to disturb Aboriginal heritage material. Aboriginal heritage material that needs to be moved from the site will be relocated in designated conservation areas with the assistance of the Marapikurrinya community.

All sites where material or artefacts of Aboriginal heritage significance are located (or relocated to) as part of the UPBP, will be recorded and protected. PHPA will endeavour to ensure that there is no disturbance or inadvertent intrusion of Aboriginal heritage sites, materials and artefacts outside the UPBP development area.

Prior to construction and operations, an Aboriginal Heritage Management Plan will be developed (refer to **Appendix K**). The Aboriginal Heritage Management Plan will include procedures for the protection, management and mitigation of Aboriginal heritage sites, materials and artefacts, including the fencing and signposting of Aboriginal sites as necessary.

Excavation of Material of Cultural Significance During Construction

Any archaeological material that is discovered during construction of the UPBP will be reported as required by statutory regulations and assessed appropriately with the assistance of the Marapikurrinya community and/or other local indigenous groups.

Impacts on Cultural Associations to the UPBP Site and Surrounding Areas

PHPA will continue to liaise with the Marapikurrinya people regarding Aboriginal heritage management. Representatives from the Marapikurrinya community will be invited to meet with PHPA on a regular basis to discuss Aboriginal heritage and other culturally significant issues.

For the UPBP in particular, initial site preparation works will be monitored by representatives from the Marapikurrinya community and members of the Marapikurrinya community will be involved in providing cultural awareness training to employees and contractors involved in construction and port operations.

PHPA will restrict access to the UPBP site as necessary for the health and safety of the local community and for safe port operations. This will limit access to fishing areas near Utah Point. However, as part of the UPBP development, PHPA will provide alternative access to fishing areas on PHPA land to compensate for the loss of fishing access at Utah Point. Further consultation will be undertaken with the Marapikurrinya people and with other community members to identify acceptable alternative fishing access areas.

During community consultation, representatives from the Marapikurrinya community were particularly interested in being able to access tidal creeks for fishing. Alternative access to tidal creek areas for fishing could be incorporated in the development of a tidal creek mangrove revegetation area, which the Kariyarra community could be involved in (refer to **Section 7.6**).

European Heritage

Given that there are no sites of European Heritage significance located near the UPBP site, specific measures to manage European Heritage are not required. However, should concerns about European Heritage be raised in the future, for example, if any artefacts of European Heritage significance are discovered during construction, these concerns will be suitable addressed in accordance with regulations and community expectations.

7.11.5 Predicted Outcome

The disturbance of one culturally significant site within the UPBP development area is likely to be unavoidable. However, efforts will be made to minimise the level of disturbance required and the potential impacts. The Aboriginal Heritage Management Plan will be used to ensure that all statutory requirements are followed as appropriate. Furthermore, careful management of other factors in the area will ensure that no other heritage sites, material or artefacts are disturbed as a result of the UPBP.

8. Environmental Management

8.1 Overview

Specific environmental aspects of the construction and operation of the UPBP will be appropriately managed through the development and implementation of Environmental Management Plans (EMPs). Theses EMPs will include details of monitoring that will be undertaken and will be regularly reviewed and updated as appropriate and where relevant.

A Framework EMP is shown in **Appendix K**.

8.1.1 Purpose Scope and Objectives

The purpose of an EMP is to establish procedures for the management of potential environmental impacts that may occur during construction or operation of a proposed development.

The activities of any person employed by, or company contracted to the UPBP will be have to comply with the objectives and performance standards set by the specific EMPs.

The EMPs will be subject to review and amendment in line with design developments, revised and agreed plans and methodologies, and confirmation of regulatory conditions associated with agreements, permission, licences and approvals. The 'Working' and 'Final' EMPs will seek input and approval from PHPA's Environmental Department, as appropriate, integrating the Port's environmental policy and where possible the Port's environmental management principles.

The EMPs will be designed to satisfy the requirements of AS/NZS ISO 14001 Environmental Management Systems for both construction and operations of the UPBP.

8.1.2 Supporting Plans

A Framework EMP (as shown in **Appendix K**) has been prepared to provide an overview of the environmental management commitments, objectives and targets for the UPBP. The EMP outlines management plans for the following areas:

- Aboriginal heritage;
- Acid sulfate soil;
- Air quality;
- Contaminant management;
- Greenhouse gas emissions;
- Mangrove management;
- Marine water quality;

- Mosquito management;
- Noise;
- Surface and groundwater management;
- Terrestrial fauna;
- Terrestrial flora and vegetation management, including weed management;
- Traffic;
- Turtle management and monitoring; and
- Waste management.

8.2 Environmental Management Commitments

PHPA aims to minimise all environmental impacts that may result from the UPBP and achieve an overall net community benefit from the development. The key commitments for the UPBP are presented in **Table 8-1**.

Table 8-1 Environmental Management Commitments

Key Commitments	Topic	Objective	Action	Timing	Advice
1	Landform, Geology and Soils	To minimise the disturbance of PASS.	No disturbance of PASS is planned. Should disturbance be deemed necessary, PHPA will develop an ASS Management Plan in consultation with the DEC.	Construction	DEC
2	Groundwater and Hydrology	To prevent groundwater contamination.	The design of the stockyards will prevent infiltration of contaminants to groundwater within potential risk areas. PHPA will undertake ongoing groundwater monitoring and reporting. PHPA will implement a Groundwater Management Plan.	Ongoing	DOW & DEC
3	Terrestrial Vegetation, Flora and Fauna	To limit the clearance of terrestrial vegetation (and faunal habitat) and minimise impacts on significant species.	No clearing activities are planned to occur within the vicinity of significant flora species (*Bulbostylis burbidgeae*) (Priority 3). PHPA require that clearing of vegetation will be kept to the minimum area necessary for safe and efficient construction and operations of the UPBP. PHPA will implement Terrestrial Vegetation and Flora and Terrestrial Fauna Management Plans.	Construction	DEC & CALM
4	Marine Environment (Mangroves)	To limit mangrove clearance.	PHPA will limit mangrove clearance to the minimum area necessary. PHPA will continue to investigate offset options to compensate for past and future loss of mangroves within the Port Hedland harbour at a strategic level and in consultation with mangrove specialists and the DEC. PHPA will implement a Mangrove Management Plan.	Ongoing	DEC
5	Air Quality (Dust)	To minimise dust	PHPA will continue to monitor dust emissions.	Construction	DEC

Key Commitments	Topic	Objective	Action	Timing	Advice
		emissions.	PHPA will implement an Air Quality Management Plan to further reduce dust emissions.	& Operations	
6	Noise	To minimise noise emissions.	PHPA will continue in its attempts to reduce noise impacts on sensitive receptors. PHPA will implement a Noise Management Plan to reduce noise impacts during construction and operations.	Construction & Operations	DEC
7	Traffic	To limit traffic impacts on the local community.	PHPA will inform the community of any expected road closures or traffic delays that may occur during construction. PHPA will continue to liaise with MRWA and other parties in aim of improving future traffic management. PHPA will implement a Traffic Management Plan.	Construction & Operations	MRWA, DEC
8	Social Impacts	To limit impacts on local social dynamics.	PHPA will encourage site operators to employ local people and to utilise local and/or indigenous businesses for construction and operations of the UPBP.	Construction & Operations	DEC
9	Aboriginal Heritage	To minimise impacts Aboriginal heritage.	PHPA will continue to liaise with the Kariyarra people regarding Aboriginal heritage management and other culturally significant issues. PHPA will implement an Aboriginal Heritage Management Plan.	Ongoing	DEC, DIA

10. List of Acronyms

AADT	Average Annual Daily Traffic
AASS	Actual Acid Sulfate Soils
ABS	Australian Bureau of Statistics
AHD	Australian Height Datum
ALARP	As Low As Reasonably Practicable
ANZECC	Australian and New Zealand Environment Conservation Council
AQIS	Australian Quarantine Inspection Services
ARMCANZ	Agricultural and Resource Management Council of Australia and New Zealand
ASoEC	Australian State of the Environment Committee
ASS	Acid Sulfate Soils
Atlas	Atlas Iron Ltd
Aurox	Aurox Resources Ltd
BHPBIO	BHP Billiton Iron Ore Ltd
Biota	Biota Environmental Services Pty Ltd
BOM	Bureau of Meteorology
BPPH	Benthic Primary Producer Habitat
CAMBA	China-Australia Migratory Bird Agreement
CD	Chart Datum
ConsMin	Consolidated Minerals Ltd
Cr	Chromium
CRIMP	Centre for Research on Introduced Marine Pests
CSIRO	Commonwealth Scientific and Industrial Research Organisation
DC Policies	Development Control Policies
DEC	Department of Environment and Conservation
DEH	former Department of Environment and Heritage now the Department of Environment, Water, Heritage and the Arts (DEWHA)
DEP	former Department of Environmental Protection now the Department of Environment and Conservation (DEC)
DEWHA	Department of the Environment, Water, Heritage and the Arts
DIA	Department of Indigenous Affairs
DOE	Department of Environment
DOH	Department of Health
DOIR	Department of Industry and Resources
DOW	Department of Water
DPI	Department for Planning and Infrastructure
DWT	Dead Weight Tonnes
EIA	Environmental Impact Assessment
EMP	Environmental Management Plan
EPA	Environmental Protection Authority
EP Act	*Environmental Protection Act 1986*

EPBC Act	*Environment Protection and Biodiversity Conservation Act 1999*
FESA	Fire and Emergency Services Authority
FIFO Mining Operations	Fly-In Fly-Out Mining Operations
FMG	Fortescue Metals Group Limited
IBRA	Interim Biogeographic Regionalisation for Australia
JAMBA	Japan-Australia Migratory Bird Agreement
Mn	Manganese
MRWA	Main Roads Western Australia
Mtpa	Million Tonnes per Annum
NAR	Noise Amenity Rating
NEPC	National Environmental Protection Council
NEPM	National Environmental Protection Measures
NHMRC	National Health and Medical Research Council
NO_x	Oxides of Nitrogen
NTU	Nephelometric Turbidity Unit
PASS	Potential Acid Sulfate Soils
PER	Public Environmental Review
PDC	Pilbara Development Commission
PHPA	Port Hedland Port Authority
PM	Particulate Matter
PMI	Process Minerals International Ltd
PNTS	Pilbara Native Title Services
Polaris	Polaris Metals Ltd
PSI	Preliminary Site Investigation
SKM	Sinclair Knight Merz
SPP	State Planning Policy
TEC	Threatened Ecological Communities
TA	Traffic Assessment
ToPH	Town of Port Hedland
tpa	Tonnes per Annum
tph	Tonnes per Hour
TPS	Town Planning Scheme
TSP	Total Suspended Particulate
UCL	Unallocated Crown Land
UDP	Ultimate Development Plan (PHPA Planning Study)
UPBP	Utah Point Berth Project
VCSRG	V & C Semeniuk Research Group Ltd
VIPAC	VIPAC Engineers and Scientists Ltd.
WAPC	Western Australian Planning Commission

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