OAKAJEE PORT & RAIL

OPR Terrestrial Port Development

Scoping Document

Rev 2

OPR Terrestrial Port Development Scoping Document

Prepared for:

Environmental Protection Authority

Prepared by

Oakajee Port & Rail
t +61 8 9486 0777 **f** +61 9486 0799 Level 3, 33 Richardson Street, West Perth, Western Australia 6005
e info@opandr.com **w** www.opandr.com PO Box 9031, Nicholson Road, Subiaco, Western Australia 6904

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Ref

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Prepared by Oakajee Port and Rail Pty Ltd

Reviewed by Oakajee Port and Rail Pty Ltd

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Revision	Revision Date	Details	Authorised	
			Name / Position	Signature
1	10/2/2010	C. Miller – update of Referral Document (Oct 2009)	Richard Jupp	
2	26/2/2010	E. Tomren / C. Miller – update following EPA Board Meeting of 18 Feb 2010	Phil Scott	

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EXECUTIVE SUMMARY

This Scoping Document has been developed for the proposed Oakajee Terrestrial Port Development Project (the Project), a component of the larger Oakajee Port and Rail Development, also consisting of:

- A deepwater port facility at Oakajee which was approved by the WA Government in 1998, with the release of Ministerial Statement 469 (Approved Port), and more recently the subject of approved section 45C and 46 processes; and
- The northern rail development project which will include the infrastructure necessary to link the rail from the mid-west iron ore mines east of Geraldton to the Oakajee Port and Oakajee Industrial Estate facilities. This proposal is the subject of a separate Public Environmental Review (PER) process in a project known as the Oakajee Rail Project.

The Approved Port at the Oakajee site included both marine and terrestrial works, with the key infrastructure items including a breakwater, harbour basin, three berths, approach channel, reclamation area, onshore storage area and services corridor linking to the Oakajee Industrial Estate.

In this Terrestrial Port Project proposal, Oakajee Port and Rail Pty Ltd (OPR) is proposing the development of additional infrastructure and services that were not previously included in the Approved Port. The facilities covered in the Project provide necessary supporting infrastructure to the Approved Port, and are located on the adjacent coastal land.

The proponent for the Terrestrial Port Project is OPR. OPR have commissioned a number of environmental studies to enable environmental impact assessment of the Project over a larger area than that required for the proposal. This larger area is known as the Study Area.

The Approved Port and the facilities covered in the Terrestrial Port Project are located at Oakajee, approximately 24km north of Geraldton, to the south of the Oakajee River mouth and to the north of the Buller River mouth.

The objective of the Project is to develop an integrated world-class iron ore receiving, handling and exporting facility for the State of Western Australia. The Project includes the following components:

- rail handling facilities (rail tracks including holding area);
- product handling systems (one car dumper, two stackers, one reclaimer and one ship loader);
- stockpile capacity of up 6.5 million tonnes (Mt), to handle up to 45Mt per annum (Mtpa) of iron ore and iron ore products;
- three conveyor circuits; being for product inflow from car dumper, outflow from stockpiles to ship loader and a series of conveyor belts for lump re-screening;
- lump re-screening plant;
- supporting infrastructure including:
    - administration offices;
    - maintenance workshops;
    - construction camp;

- utilities – including power facilities capable of producing up to 20MW and a desalination plant capable of producing up to 14ML/day for operational requirements;
- access roads – including a southern access and a railway access road; and
- services corridor.

Environmental factors relevant to the Project are considered to be:

- flora and vegetation – the footprint is expected to require approximately 850ha of ground disturbance, with approximately 40% (330ha) of this area hosting native vegetation. One Declared Rare Flora (DRF) and ten Priority Flora species have been recorded within the Oakajee Study Area.
- fauna – habitat will be impacted by the Project. Four migratory species listed under the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) have been recorded on site. An additional seven species listed under the EPBC Act, *Wildlife Conservation Act 1950* and/or listed as Priority Fauna by the DEC are considered to have a high to moderate likelihood of occurring at the site, including the EPBC-listed Endangered Carnaby's Black-Cockatoo.
- surface hydrology – the Project area is located between Oakajee and the Buller Rivers.
- groundwater – the Project area is within the Gascoyne Groundwater Management Area, proclaimed under the *Rights in Water and Irrigation Act 1914.*
- marine – potential water and habitat impact in relation to the proposed desalination plant intake and discharge only (otherwise covered by Approved Port, Ministerial Statement 469).
- noise, light and vibration – the Project will generate emissions.
- air quality – the Project will generate gaseous and dust emissions.
- soil quality – including potential acid sulfate soil risk.
- wastes – the Project will generate quarantine, industrial, hazardous, domestic and other wastes.
- greenhouse gases – the Project will generate greenhouse gas emissions.
- Aboriginal heritage – sites are known to exist in the Project area and there is the potential for additional unknown sites in the Project area.
- visual amenity – site facilities will be visible from nearby vantage points; and
- other social and economic factors – including nuisance issues, public risk and project benefits.

1 INTRODUCTION

Oakajee Port and Rail Pty Ltd (OPR) has referred the Oakajee Terrestrial Port Development Project (the Terrestrial Port Project) to the Environmental Protection Authority (EPA) for consideration under Section 38 of the *Environmental Protection Act* 1986 (EP Act). On the 9th November 2009 the EPA advertised that the Terrestrial Port Project would be subject to a Public Environmental Review (PER) level of assessment, including a four week public comment review period. No appeals were made to the level of assessment.

The Oakajee Terrestrial Port Development Project forms the port land-based infrastructure component of the overall Oakajee Port and Rail Development.

The objective of the Oakajee Terrestrial Port Development Project is to develop an ore handling and support facility that utilises the approved port-marine infrastructure at Oakajee to develop an integrated world-class open access port capable of exporting a minimum of 45Mtpa of iron ore products. The Project links to the proposed open-access rail line (Oakajee Rail Project) which will be open to all mines in the mid-west region that may potentially export through Oakajee.

The terrestrial port infrastructure layout mimics a typical Pilbara-type iron ore development. Ore is planned to be delivered to the port where by it will be offloaded by means of a rotary train unloader. There is no rail loop. From the train unloader, the ore is conveyed to the stockpile area where a stacker will place the ore in 200,000t stockpiles. The out-loading circuit commences at the reclaimer, loading ore onto a conveyor system. The out-loading conveyor system transports the ore via a sample station to the shiploader, which loads the ore onto the vessel for export.

The materials handling facilities proposed will cater for hematite direct shipping ore (DSO) and magnetite concentrate from mid-west mining customers.

A desalination plant is required to provide water for the Project operation.

1.1 PROJECT CONTEXT

On the 20th March 2009 the State Government of Western Australia and OPR entered into a State Development Agreement (SDA). This SDA provides OPR exclusive rights to build the Oakajee Port and a northern railway line.

This Terrestrial Port Project is a component of the larger Oakajee Port and Rail Development, which consists of:

- A deepwater port facility at Oakajee which was approved by the WA Government in 1998, with the release of Ministerial Statement 469 (Approved Port), and more recently the subject of an approved section 45C and 46 processes; and
- A rail development proposal which will include the infrastructure necessary to link the rail from the mid-west iron ore mines to the Oakajee Port and Oakajee Industrial Estate facilities. This proposal is the subject of a separate Public Environmental Review (PER) process and is known as the Oakajee Rail Project.

The Approved Port at the Oakajee site included both marine and terrestrial works, with the key infrastructure items including a breakwater, harbour basin, three berths, approach channel, reclamation area, onshore storage area and services corridor linking to the Oakajee Industrial Estate.

OPR is proposing the development of additional infrastructure and services that were not included in the Approved Port. The facilities covered by the Project will provide supporting infrastructure to the Approved Port and are located on the coastal land adjacent to the Approved Port.

The Project is adjacent to the Oakajee Industrial Estate, which is being developed by LandCorp and is unavailable to OPR as it is being preserved for industrial development other than bulk iron-ore export.

1.2 DEVELOPMENT BACKGROUND

Oakajee has been identified for approximately 30 years as a potential site for a deep water port and industrial estate. Successive studies undertaken by the State Government and Murchison Metals Limited (MML) have confirmed this view. The Oakajee Industrial Estate and a surrounding buffer zone has been acquired by the State Government as part of its long term strategic planning process.

These studies assessed a number of port locations along the WA coast, north of Perth, for the suitability for development of a deepwater port. As a result of this process, the Oakajee site was identified by government as the preferred location for development of a deepwater port to service the mid-west, due to its naturally occurring deepwater close to shore and because of earlier Government support for this locality as a strategic location for all mines in the mid-west.

The Department of Planning, Department of Transport and Department of State Development (and their predecessors) were responsible for co-ordinating the development of a new deepwater port at Oakajee that is capable of servicing the anticipated needs of miners in the mid-west Region of Western Australia. The Department of State Development (DSD), on behalf of the Minister for State Development, is the proponent for the Approved Port.

1.2.1 No Development Option

The consequences of not proceeding with the Project are that the strategic community and economic benefits of the Project, as outlined in Section 1.4, will not be achieved.

A “no development option” would result in either; more heavy industry and supporting activities within the Geraldton township, or the export products from mid-west mines (including Weld Range, Jack Hills and Karara) becoming stranded from the market place.

1.3 OVERVIEW OF THE PROJECT

The objective of the Project is to develop an integrated world-class iron ore receiving, handling and exporting facility for the State of Western Australia, including the following components:

- rail delivery of iron ore to an unloading station;
- workshop, refuelling and maintenance facilities to support locomotive and rolling stock equipment;
- ore handling systems (one car dumper, two stackers, one reclaimer and one ship loader);
- stockpile capacity of up 6.5Mt, to handle up to 45Mtpa of iron ore;
- three conveyor circuits; being for product inflow from car dumper, outflow from stockpiles to ship loader and a series of conveyor belts for lump re-screening;
- lump re-screening plant;
- supporting infrastructure including:
    - administration offices;
    - maintenance workshops;
    - sample station;
    - construction camp;

- utilities – including power facilities capable of producing up to 20MW and a desalination plant capable of producing up to 14ML/day for operational requirements;
- access roads – including a southern access and a railway access; and
- services corridor linking to the Oakajee Industrial Estate.

1.4 PROJECT RATIONALE

The Oakajee Port and Rail Development will result in financial and social benefits throughout the region through increases in employment opportunities, infrastructure and a flow-on effect to the non-mining sector.

The Premier of Western Australia, the Honourable Colin Barnett, has made the following statement in relation to the Oakajee Port and Rail Development, of which the Project is a vital component:

> *"The development of a deep sea port, associated rail infrastructure and a purpose built, world class industrial estate at Oakajee is the single most important project for WA's economic development over the next 50 years."*
>
> *"This project envisages a major new export port, industrial precinct and heavy freight transport access, near a major regional centre, but well away from residential areas and with significant capacity for future expansion."*

The key benefits of the Oakajee Port and Rail Development include:

- Investment of capital into the mid-west region and Western Australia.
- Integrated transport network – mine, rail and port – coordinated management and optimal infrastructure investment.
- Underpins the development of the regional iron ore industry through certainty of supply to market.
- Improved development and export opportunities.
- Allows for expansion of industry in a location buffered from sensitive receptors.
- Provision of foundation infrastructure for the Oakajee Industrial Estate, which will drive the States ambition of encouraging secondary processing facilities to the area.
- Approximately 600 jobs a year during port construction.
- Port operational workforce of over 200 people.
- Flow-on effects to other industries such as construction, materials, transport, retail and recreation.
- Increased population will lead to greater investment in amenities such as schools, housing and health care, and environmental management initiatives.
- Consolidation of industrial precinct away from the Geraldton township.
- Provision of local training opportunities (through TAFE and other private educational institutions).
- Opportunities for the indigenous community through the development of comprehensive agreements which will outline opportunities for indigenous involvement (e.g. employment, training and contracting arrangements).
- Community business development opportunities.
- The Project will facilitate other developments within the region, which will bring additional direct employment, support jobs and revenue to the State and Federal

Governments. Assuming development of those as per current plans, the economic benefits from the whole Oakajee Port development and the separate individual mining projects, have been estimated by Economic Consulting Services (2007) to be in the order of:

- 12,000 plus direct and indirect jobs a year in WA from increased economic activity;
- $7 billion in taxes and duties to the Federal Government; and
- $3.4 billion in royalties and other payments to the State Government.

1.5 PROPOSAL SCHEDULE

The implementation of the proposed development is contingent on the project meeting financial risk and return criteria, statutory requirements and the favourable determination of the Minister for the Environment.

The anticipated timeline for the major elements of the Project are summarised in Table 1.1.

Table 1.1 – OPR Terrestrial Port Proposal Timeframes

Activity	Timeframe
PROJECT APPROVALS	
Scoping Document Approval	February 2010
Submission of draft PER document	March 2010
Submission of final PER Document	May 2010
Public review period	June 2010
Response to Public comments	July 2010
Release of EPA Report	October 2010
Ministerial Approval (no appeals)	January 2011
PROJECT IMPLEMENTATION	
Commence Construction	January 2011
Complete Construction and Commissioning	April 2014

1.6 DOCUMENT PURPOSE AND STRUCTURE

Where the EPA decides that a proposal will be assessed at the level of PER, it requires the proponent to prepare an Environmental Scoping Document (*Environmental Impact Assessment (Part IV Division 1) Administrative Procedures 2002*).

The purpose of this document is to comply with the Administrative Procedures and outline the scope of investigations undertaken by OPR in order to ensure that all potentially significant environmental issues are addressed during the PER process for the Project. This document updates the "Draft Scope of Works – For Discussion" included in Attachment 1 of the OPR Terrestrial Port Development Referral Document (OPR, October 2009) and updates the details of the proposal outlined in that document.

This document has been prepared in accordance with the guidelines outlined in the *Guide to Preparing an Environmental Scoping Document* (EPA, 2009a).

1.7 PROPONENT DETAILS

OPR was established in September 2007 to pursue a joint venture between Murchison Metals Limited (MML), Mitsubishi Development Pty Ltd (MDP) and Crosslands Resources Limited (CRL). OPR was established as an infrastructure provider to develop and coordinate

the operation of an iron ore supply chain comprising rail and port infrastructure for iron ore sourced from the mid-west region of Western Australia.

MML is an ASX Listed company, with a 50% share holding in CRL. The remaining 50% of CRL is held by MDP, a subsidiary of Mitsubishi Corporation, Japan's largest general trading company.

CRL owns the Jack Hills Iron Ore Project, located in the mid-west region of Western Australia. Additionally, CRL currently has a 50% economic interest in the new independent infrastructure business, OPR, with MML and MDP also each owning a 25% direct share.

Refer to Figure 1.1 for a graphical summary of the structure.

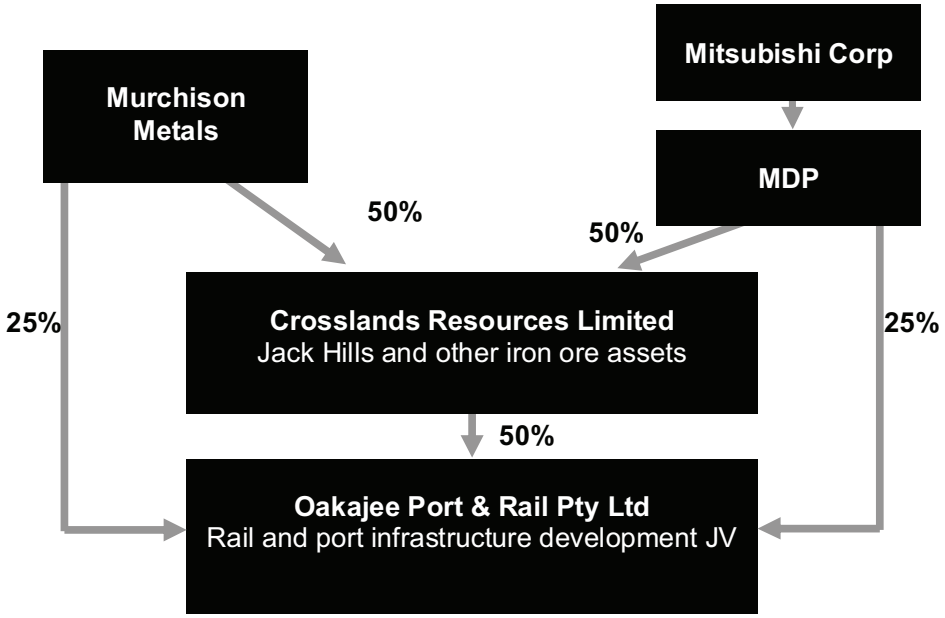


Figure 1.1 – Organisational Structure

Following a competitive tender process, OPR was appointed in July 2008 by the Government of Western Australia as the preferred developer of the Oakajee deepwater port.

On the 20th March 2009 the State of Western Australia and OPR entered into a State Development Agreement (SDA). This SDA provided OPR exclusive rights to build Oakajee Port and a northern railway line.

Federal and State Government funding have been announced to develop the Common Use Infrastructure associated with the Approved Port, comprising port infrastructure including the breakwater, dredged channel and other facilities including tugs and navigational aids. Funding does not extend to the private use infrastructure outlined in the Project scope.

1.7.1 OPR Contacts

Government and External Affairs Director

Richard Jupp

rjupp@opandr.com

Environmental Approvals Manager

Cathee Miller

cmiller@opandr.com

Street Address:	Level 3, 33 Richardson Street
	WEST PERTH WA 6005
Postal Address:	P.O. Box 9031
	Nicholson Road, SUBIACO WA 6008
Office Phone:	08 9486 0777
ABN:	25 117 240 007
Website:	http://www.opandr.com

2 PRELIMINARY ENVIRONMENTAL IMPACT ASSESSMENT

2.1 RELEVANT ENVIRONMENTAL LEGISLATION, POLICIES AND GUIDELINES

The Project is subject to compliance with both Federal and State legislation during construction and operation phases. Legislation applicable to the Project includes, although not limited to, those described in Table 2.1 below.

Table 2.1 - Legislation Applicable to the Project

Legislation	Responsible Government Agency	Aspect
Commonwealth Legislation		
Environmental Protection & Biodiversity Conservation Act 1999	Department of Environment, Water, Heritage and the Arts	Environmental and heritage matters of national significance
National Greenhouse and Energy Reporting Act 2007	Department of Climate Change	Greenhouse gas emissions
Native Title Act 1993	National Native Title Tribunal	Community, group or individual rights and interests of Aboriginal people or Torres Strait Islanders in relation to land or waters
Protection of Moveable Cultural Heritage Act 1986	Department of Environment, Water, Heritage and the Arts	Protection of moveable cultural artefacts
State Government Legislation		
Aboriginal Heritage Act 1972	Department of Indigenous Affairs	Archaeological and ethnographic heritage
Agricultural and Related Resources Protection Act 1976	Department of Agriculture and Food	Weeds and pest animals
Bush Fires Act 1954	Fire and Emergency Services Authority	Wild fire control
Contaminated Sites Act 2003	Department of Environment and Conservation	Management of contaminated lands
Country Areas Water Supply Act 1947	Department of Water	Water supply
Dangerous Goods and Safety Act 2004	Department of Mines and Petroleum	Explosives and dangerous goods, transport and management
Environmental Protection Act 1986	Department of Environment and Conservation	Environmental impact assessment and management
Health Act 1911	Department of Health	Human health management
Heritage of Western Australia Act 1990	Heritage Council of Western Australia	European heritage management

Legislation	Responsible Government Agency	Aspect
Local Government Act 1995	Department of Local Government / Shire of Chapman Valley	Local Government approvals
Local Government (Miscellaneous Provisions) Act 1960	Department of Local Government / Shire of Chapman Valley	Community infrastructure, buildings, facilities
Occupational Safety and Health Act 1984	Department of Commerce	Occupational health and safety
Mines Safety and Inspection Act 1994	Department of Mines and Petroleum	Personnel safety on mine sites
Public Works Act 1902	Department of Treasury and Finance	Land access and operation of public work
Rail Safety Act 1998	Department of Transport	Rail safety and management
Rights in Water and Irrigation Act 1914	Department of Water	Access to and use of water resources
Soil and Land Conservation Act 1945	Department of Agriculture and Food	Protection of soil resources
Waterways Conservation Act 1976	Department of Water	Protection of defined surface water management areas
Wildlife Conservation Act 1950	Department of Environment and Conservation	Protection of indigenous wildlife, including items of state significance

2.2 ENVIRONMENTAL IMPACT ASSESSMENT (EIA) APPROVAL PROCESS

2.2.1 State Assessment Process

The *Environmental Protection Act 1986* (the Act) provides that where a development proposal is likely to have a significant effect on the environment, the proposal may be referred to the EPA for a decision on whether or not it requires formal assessment under the Act, and, if it is to be assessed, the level of assessment.

The Minister for Resources Development referred a proposal for a deepwater port facility at the Oakajee site in 1997. The proposal was assessed via a Public Environmental Review (PER) process and approved by the WA Government with the release of Ministerial Statement 469, dated 25 February 1998.

The Approved Port at the Oakajee site included both marine and terrestrial works, with the key infrastructure items including a breakwater, harbour basin, three berths, approach channel, reclamation area, onshore storage area and services corridor linking to the Oakajee Industrial Estate.

In view of the conceptual nature of the original plan, the Proponent undertook to develop a design to meet the requirements of Ministerial Statement 469. A submission under Section 45C of the *Environmental Protection Act 1986* was approved by the Chairman of the EPA, Dr Paul Vogel, on 2 September 2009, confirming the location of the Oakajee Port and defining the design arrangement to meet specified key characteristics.

On the 25 November 2009, the Minister for the Environment approved an extension to the date of substantial commencement for the Approved Port. Condition 9.1 was replaced by Ministerial Statement 815 to require substantial commencement prior to 25 February 2013.

Approvals for additional terrestrial works, to the largely marine facilities covered under the Approved Port, are now included in this Project to develop an integrated world-class iron ore receiving, handling and exporting facility. These additional facilities include:

- rail delivery of iron ore to an unloading station;
- workshop, refuelling and maintenance facilities to support locomotive and rolling stock equipment;
- ore handling systems (one car dumper, two stackers, one reclaimer and one ship loader);
- stockpile capacity of up 6.5Mt, to handle up to 45Mtpa of iron ore;
- three conveyor circuits; being for product inflow from car dumper, outflow from stockpiles to ship loader and a series of conveyor belts for lump re-screening;
- lump re-screening plant;
- supporting infrastructure including:
    - administration offices;
    - maintenance workshops;
    - sample station;
    - temporary construction camp;
    - utilities – including power facilities capable of producing up to 20MW and water sources from a desalination plant capable of producing up to 14ML/day for operational requirements;
    - access roads – including a southern access and a railway access; and
    - services corridor linking to the Oakajee Industrial Estate.

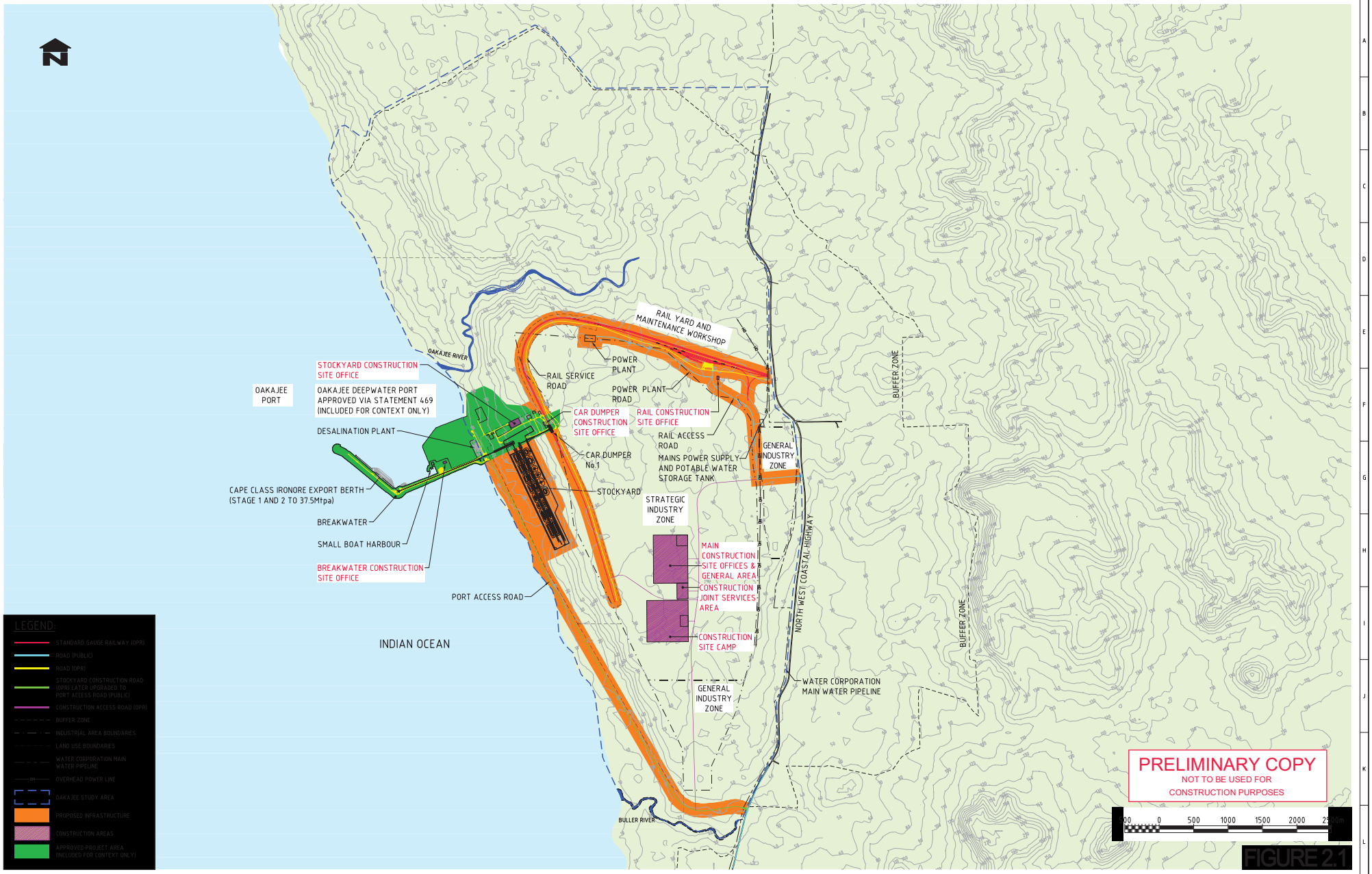
The Project was referred to the EPA in October 2009. On the 9 November 2009 the EPA advertised that the Project would be the subject of a PER level of assessment, including a four week public comment period. No appeals were made to the level of assessment.

The relationship between the Approved Port and the infrastructure required under this Project is presented in Figure 2.1.

2.2.2 Commonwealth Assessment Process

Matters of national environmental significance (MNES) may utilise habitat in the Project area, including the Carnaby's Black-Cockatoo (*Calyptorhynchus latirostris*) and four listed migratory birds. The Project is not anticipated to cause any significant impact to MNES (refer to Section 5.2.3), therefore, would not be considered a Controlled Action requiring approval under the *Environmental Protection and Biodiversity Conservation Act 1999* (EPBC Act).

However, the Project will be referred to the Department for Environment, Water, Heritage and the Arts (DEWHA) for their consideration.



REVISIONS					REFERENCE DRGS		
No.	BY	DATE	DESCRIPTION	APPD	DRG. No	TITLE
C	GT	2/02/10	CONSTRUCTION AREAS ADDED	PJR		
B	GT	1/02/10	LAYOUT UPDATED	PJR		
A	RB	8/10/09	APPROVAL AREA ADDED	PAB		

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Client: OPR oakajee port & rail

Crosslands Resources Ltd
Level 1 & 2
18 Richardson Street
West Perth WA 6005
Tel +61 8 9483 0500
Fax +61 8 9481 7966
ACN 078 257 799

DESIGNED	SJM	CHECKED	SJM
DRAWN	RB	CHECKED	SJM
APPROVED	PAB	DATE	18/05/09
Datum	A.H.D.	Survey	MGA 94 – ZONE 50

AECOM

Scale: 1:25000,A1 1:50000,A3

OAKAJEE PORT AND RAIL PROJECT

OAKAJEE ASSESSMENT AREA

Aecom Drg No.	Drg No.	Rev.
60021925	60021925-SK-9712	C

2.3 ADDITIONAL APPROVALS REQUIRED

Subsequent to the EIA approval process, various additional approvals will be required for various portions of the development covered by different legislation.

2.3.1 Part V Environmental Protection Act 1986

The following prescribed premises are proposed:

- screening of material (Category 12 – over 50, 000 tonnes per year);
- concrete batching plant (Category 77 – over 100 tonnes per year);
- bulk material loading (Category 58 – 100 tonnes or more per day);
- desalination plant (Category 54a – 10 gigalitres or more per year); and
- sewage treatment facilities (Category 54 – 100m^3 or more per day).

The following additional prescribed premises may also be required:

- bulk storage of chemicals (Category 73 – 1000m^3 in aggregate); and
- power generation (Category 52 – 20MW or more in aggregate using natural gas or 10MW or more in aggregate using a fuel other than natural gas).

These facilities will require a Works Approval and a licence / registration prior to construction and operation respectively.

A Native Vegetation Clearing Permit is not required as it is expected the Project will be assessed pursuant to Part IV of the *Environmental Protection Act 1986* (therefore subject to Section 6 exemptions).

2.3.2 Local Government Act 1995

Local Government approvals, as required, will be sourced from the Shire of Chapman Valley (refer to Section 3.1).

2.3.3 Dangerous Goods Safety Act 2004

The following approvals will be sourced from the Department of Mines and Petroleum (DMP):

- Application for Licences to Store Explosives (Magazine Licence) should blasting be required.
- Application for a Licence to Store Dangerous Goods.

2.3.4 Aboriginal Heritage Act 1972

Comprehensive ethnographic and archaeological surveys of the Project area will be undertaken to identify all Aboriginal sites that may be impacted by the construction of the Project.

The Project will avoid impacts where possible. For sites that cannot be avoided, approval for disturbance will be sought under Section 18 of the *Aboriginal Heritage Act 1972* in consultation with the relevant custodians.

All works will comply with the *Aboriginal Heritage Act 1972*.

2.3.5 Wildlife Conservation Act 1950

Should clearance of protected flora be required for the Project, a License to Take Protected Flora will be applied for through that Department of Environment and Conservation.

3 PROPOSAL OVERVIEW

3.1 LOCATION

The proposed Oakajee deepwater port and Oakajee Industrial Estate (OIE) are located 24km to the north of Geraldton at Oakajee, bounded by the Oakajee River to the north, the Buller River to the south, the North West Coastal Highway to the east and the Indian Ocean to the west (Figure 3.1).

The OIE and surrounding buffer zone has been acquired in freehold by the State Government as part of its long term strategic planning process. This area totals approximately 6,400 ha.

In June 2004, the area of the OIE was rezoned 'Industrial Investigation Zone' under the Shire of Chapman Valley Town Planning Scheme No 1 (SoCV TPS). The Industrial Investigation Zone has been divided into three separate areas, each with different permitted land uses and development controls. The areas comprise the following (as shown in Figure 3.2):

- Area A: General Industry (approximately 196 ha) will primarily provide for ancillary industries (such as manufacturing, fabrication and processing industries) which will not affect the locality through the emission of noise, odours, smoke or other waste,
- Area B: Coastal (approximately 1002 ha) is intended to accommodate a potential site for a port, transport and service corridors, port related land uses and low key recreation activities.
- Area C: Strategic Industry (approximately 1135 ha) is under investigation for development of a strategic industrial estate, adjacent to a port facility. The objective is to ensure that if development of strategic industry proceeds, it is contained within a strategic industrial core with appropriate buffer zones.

The Project will be developed primarily within Area B. However, some of the rail handling facilities and supporting infrastructure will be located within Area C Strategic Industry. The remainder of the Industrial Investigation Zone will be developed by the government and/or other industries at a later stage.

A significant industry buffer (approximately 4072 ha) has also been acquired by LandCorp and is designated as a Special Control Area under the SoCV TPS. The buffer is considered necessary to accommodate impacts from the potential industrial development within Area C (Figure 3.2).

The Zones have been proclaimed under the SoCV TPS No. 1. No zoning amendments to regional or town planning schemes are required.

ecologia ENVIRONMENT

OPR oakajee port & rail

Location of Proposed Oakajee Port Terrestrial Facilities

Figure: 3.1
Project ID: 1071

Drawn: SG
Date: 04/06/09

Coordinate System
Name: GDA 1994 MGA Zone 50
Projection: Transverse Mercator
Datum: GDA 1994

Unique Map ID: M111

A4

Author: C. Miller ~ Drawn: CAD Resources ~ www.cadresources.com.au ~ Tel: (08) 9246 3242 ~ Fax: (08) 9246 3202 ~ A3 ~ Feb 2010 ~ Rev: A CAD Reference: g1660_CAD_Port_F009_01.DGN

3.2 PROPOSAL DESCRIPTION

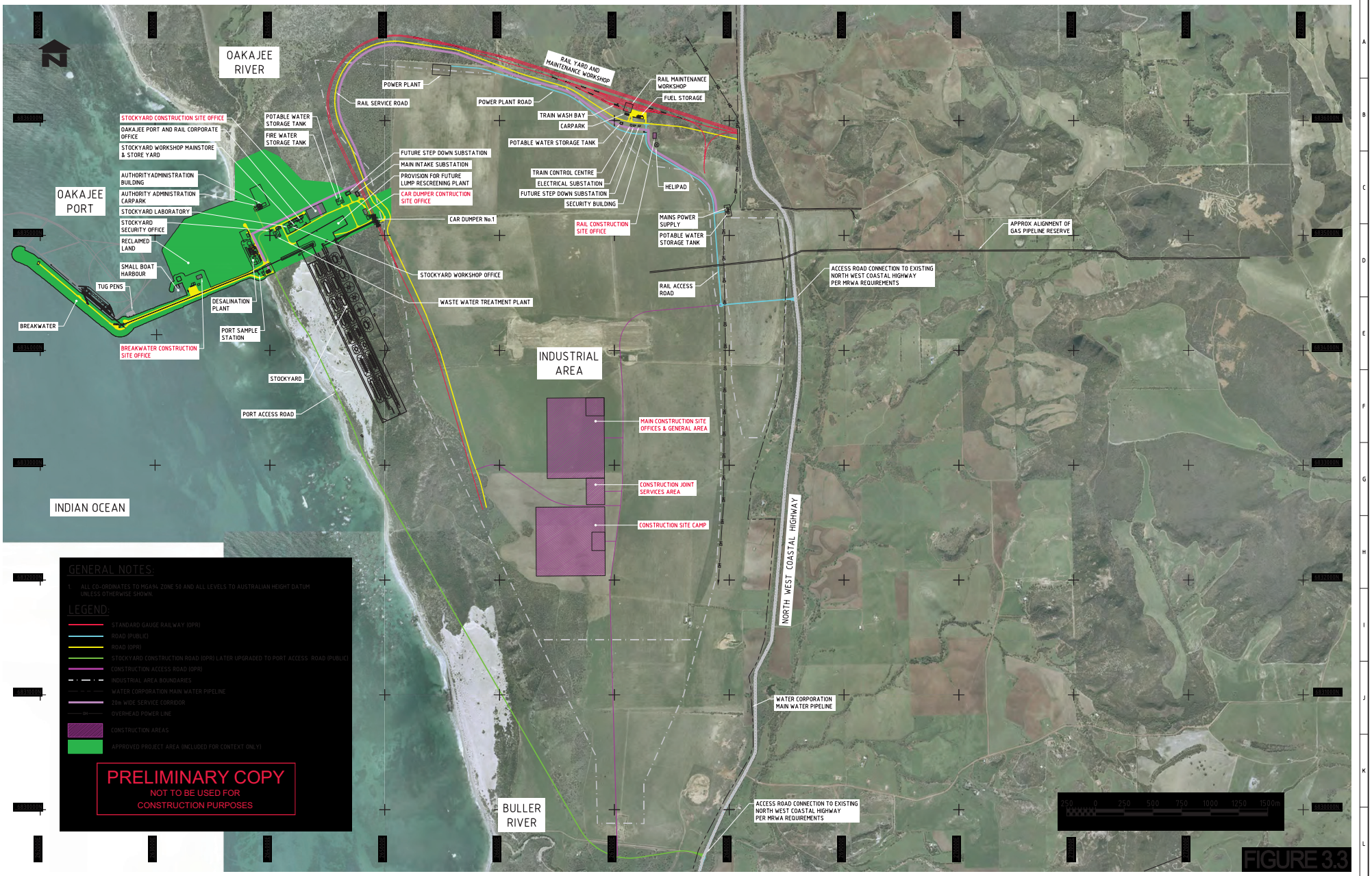
OPR is proposing the development of additional infrastructure and services that were not incorporated in the Approved Port. The Project is located adjacent to the Approved Port, and provides supporting infrastructure to the Approved Port, but is the subject of this separate environmental impact assessment process.

The Project includes those land based components supporting the Approved Port as illustrated in Figure 3.3. The key facilities of the Project are outlined in Table 3.1 and the key environmental characteristics are outlined in Table 3.2.

Table 3.1 – Key Features of the Project

Item	Description / Equipment Selection	Section Reference
Rail Handling Facilities	- Rail yard and service maintenance workshops - Rail formation and alignment	3.2.1
Ore handling system	Three ore handling circuits, consisting of: - Inloading system – consisting of car dumper, 2 stackers and inloading conveyor circuit; - Outloading system – consisting of one reclaimer, shiploader and outloading conveyor circuit; and - Lump re-screening circuit.	3.2.2
Stockpile facilities	A stockyard footprint of approximately 1.4km x 0.3km to allow for a total storage volume of 6.5Mt in 3 rows (one dead and two live rows).	3.2.2.3

Supporting infrastructure	Including:
	- port and materials handling administration offices;
	- maintenance workshops;
	- sample station;
	- waste facilities, including wastewater treatment facilities;
	- 1000 bed temporary construction camp;
	- Utilities:
	  ○ power: 20MW sourced from the grid and / or gas lateral, and
	  ○ water: via a Seawater Reverse Osmosis desalination plant of up to 14ML/day capacity
	- access roads from the North West Coastal Highway to service the port and rail facilities of the Oakajee Industrial Estate;
	- services corridor to accommodate power, communications, water and other services; and
	- Fuel storage for trains.
		3.2.3



REVISIONS	No.	BY	DATE	DESCRIPTION	APPD
	G	GT	2/02/10	CONSTRUCTION AREAS ADDED	PJR
	F	GT	1/02/10	LAYOUT UPDATED	PJR
	E	RB	10/9/2009	APPROVAL AREA ADDED	PAB
	D	GT	2/10/09	HAUL RAOAD REMOVED	PAB
	C	TR	2/06/09	ALTERATIONS TO LEGEND	PAB
	B	GT	27/05/09	RAIL & ROAD REMOVED, FIGURE 3.3 ADDED	PAB

REFERENCE DRGS: DRG. No | TITLE

R:\60021925-Oakajee_FS\4.0_CAD\21_Sketches\60021925-SK-9702.dwg 2 February 2010

Client: OPR oakajee port & rail

Crosslands Resources Ltd
Level 1 & 2
18 Richardson Street
West Perth WA 6005
Tel +61 8 9483 0500
Fax +61 8 9481 7966
ACN 078 257 799

DESIGNED	SJM	CHECKED	MG
DRAWN	GT	CHECKED	SJM
APPROVED	PAB	DATE	18/05/09
Datum	A.H.D.	Survey	MGA 94 - ZONE 50

AECOM

Scale: 1:15000,A1 1:30000,A3

OAKAJEE PORT AND RAIL PROJECT

GENERAL ARRANGEMENT
SITE PLAN 45Mtpa

Aecom Drg No.	Drg No.	Rev.
60021925	60021925-SK-9702	G

Table 3.2 – Project Key Environmental Characteristics

Item	Description
Project Life	50 years
Area of vegetation disturbance	Approximately 330 ha within the Project area. Locations (indicative) as shown in Figure 3.3.
Brine discharge	Construction: 22ML/day

Note: the key characteristics provided in Table 3.2 are preliminary only and subject to change in the PER.

The Project described in this document provides for an iron ore capacity of 45Mtpa. It is intended that the Project will be achieved following two ramp-up stages, as mines in the mid-west increase their rates and export tonnages. The stages to reach the final proposed infrastructure are described as follows:

Stage 1 (initial) – including:

- one car dumper;
- inflow and outflow conveyors;
- one stacker;
- one reclaimer;
- one ship loader;
- one berth (part of Approved Port); and
- administration, infrastructure and all necessary facilities to operate the port receiving, handling, stockpiling and ship loading operations.

Stage 2 (intermediate) – to include all infrastructure from Stage 1, plus an additional stacker.

Stage 3 (final) – to include all infrastructure from Stages 1 and 2, plus an additional berth (assuming a fully laden capacity of 180,000 dry weight tonne (dwt) Cape Class vessels, covered under Approved Port).

A Lump Re-screening Plant will be developed with staging to be determined, based on customer needs.

It is noted that OPR are yet to undertake detailed engineering design, therefore the infrastructure described below provides a likely scenario which will be developed.

3.2.1 Rail Handling Facilities

A standard gauge rail formation and embankment of approximately 8km within the Oakajee Industrial Estate will be required to and through the car dumper. Arrival and departure tracks will also be developed ahead of the dumping facilities.

The ancillary facilities associated with the rail within the Oakajee Industrial Estate are outlined in Section 3.2.4.3.

All facilities are within the Oakajee Industry buffer zone or marginally within the edge of the industry area, in accordance with Landcorp's requirements.

3.2.2 Ore Handling Systems

3.2.2.1 Overview

The ore handling system is expected to be conventional in design utilising equipment and systems used in other iron ore operations of similar scale throughout the Pilbara region of Western Australia.

The facility will handle the following iron ore products:

- Lump – approximately 6.3 mm to 32.0 mm, used directly in blast furnaces at integrated steel works;
- Fines – less than 6.3 mm, used primarily as a sinter plant feed; and
- Concentrate magnetite ore, primarily pelletised for use in blast furnaces.

The site topography for the location of the ore handling plant is characterised by an 80m high sloping escarpment separating the plateau level from the proposed port reclamation levels.

The general characteristics of the site levels to Australian Height Datum (AHD) are proposed as follows:

- train spur line level +73m;
- base of car dumper +60m;
- stock pile facilities base level, +15 to +26m, varies; and
- reclamation level to +9m along foreshore.

The plant comprises both inloading and outloading circuits with the product stockyard forming the buffer between the two. The inloading circuit comprises the car dumper through to the stacker and the outloading circuit comprises the reclaimer through to the ship loader.

Very little interaction occurs between the two circuits with the exception of the fines return stream from the Lump Re-screening Plant (LRP) back to the stockpile. The circuit has been designed to allow this stream to go to either of the two stackers while the other stacker is occupied with inloading duties.

3.2.2.2 Inloading System

Car dumper

One car dumper will be sufficient for a handling capacity of up to 45 Mtpa.

The two-cell rotary tippler car dumper has been sized to allow for heavy haulage locomotives to pass through and to index rakes of up to 200 gondola type cars. The rail cars will be tipped though a near 170 degree rotation to ensure that all material is discharged into the hoppers below.

The car dumper will be constructed largely above ground in a depression or in an open excavation and formed of reinforced concrete up to the rail level. The water table is not expected to be encountered during construction.

The walls of the vault will be poured in-situ to accommodate reinforced concrete floors. From this point it will be constructed from steel framing and will be clad in profiled steel wall and roof sheeting.

Rail approaches to the dumper will be bridged to allow for access to the stockyard area and to provide a clear drainage path for stormwater drainage from the existing catchments to the east.

The dumper to stockpile transfer conveyor will exit the car dumper from the western side of the dumper structure.

A total of four feeders will draw ore from the car dumper hoppers and empty into the main feed conveyor. The heavy duty feeders will be 1.5m wide x 9.5m long and will be fitted with an electro-mechanical drive that will allow variable pan speed using a Variable Voltage Variable Frequency (VVVF) controller.

An overhead crane will be installed in the building to provide access to the car dump liners and trunnion rollers. The dumper installation will be fitted with clean up and dust control

equipment. The dust extraction system proposed for the car dumper building will induce a draught over the dumping point, and clean the air through a bag house.

Stackers

Two stackers will be used to form the stockpiles from ore received by rail. The stackers will have a boom length in the order of 50m, to reach the full width of the piles, and a peak stacking rate in the order of 10,000tph.

The machines will be the travelling, luffing and slewing type. This provides the following benefits:

- reduced lump product degradation, by minimising the drop height;
- minimised dust generation; and
- maximised blending capability, through the formation of windrow piles.

3.2.2.3 Outloading System

Reclaimer

The proposed reclaimer is a boom bucket wheel machine. The reclaimer will be rail mounted with travelling, luffing and slewing facilities to allow it to operate on either of the live stockpile rows. Material cut from the stockpiles by the bucket wheel will be carried along the boom belt and delivered to the reclaim yard belt on a travelling impact table.

The reclaimer is sized to meet the following criteria:

- A near transverse reclaim of the product (for maximised blending).
- The ability to reclaim all product types from the same machine to meet ship product requirements.
- The ability to move the boom over successive piles as needed.
- The ability to achieve a peak reclaim rate of 10,000tph.

The reclaim yard belt will accept material from the reclaimer and deliver it to either the Lump Re-screening Plant (LRP) (for lump) or directly to the ship loader (for other products). This conveyor will handle the design average of 8,200tph and the peak rate of 10,000tph as needed to maintain the average loading rate. The conveyor will be 1,800mm wide with a belt velocity of 3.2m/s.

The reclaimer will be fitted with dust suppression equipment over the bucket wheel discharge.

Ship loader

The ship loader will be rail mounted with travelling, luffing and slewing facilities. The ship loader will have a boom in the order of 52.0m in length to reach the full range of ships up to 200,000dwt maximum.

The ship loader is expected to have a maximum load rate in the order of 12,000t/h.

The out-loading system (reclaiming, lump re-screening and ship loading) will be controlled from the ship loader control cabin.

3.2.2.4 Lump Re-screening System

The majority of screening will be undertaken at the minesite. However, an allowance has been made for such equipment at the port should the lump quantities and customer demands require it.

The proposed lump re-screening plant (LRP) will remove undersize material from lump ore that has degraded during transport and handling. The LRP will have five screening modules

fed from a shuttling conveyor head. Each module is likely to have a 290t surge bin, a vibrating feeder, a 3.6m x 7.3m banana screen and all the associated chute work.

Oversize material (>6.3mm) will discharge onto the conveyor for transport to the ship loader. Undersized material (<6.3mm) will fall through to the fines bin, for return to the fines product stockpiles.

The design will provide flexibility and versatility and will ensure that the lump ore delivered to ship has a fines content that is within specification.

3.2.3 Stockpile Facilities

The stockyard area will be located within the Iron Ore Industry Zone and will be constructed partly by cut to fill construction methods, where additional fill is required the remaining material will be sourced from materials dredged for the Port Marine works. It is anticipated that up to 3Mm^3 of dredged material (from the Approved Port) will be placed in the stockyard area.

The stockyard will comprise three rows of stockpiles. It is proposed the eastern row will be a 'dead' pile, with the remaining two rows to be 'live'. Dead stockpiles are those outside the reach of the one proposed reclaimer, and will be reclaimed by the use of front end loaders and trucks during those periods when the car dumper is not operating.

A footprint of approximately 1400m long x 300m wide will be required for the stockyard, to store flat top piles with cross sectional dimensions of approximately 18m high x 40m wide at the base.

The stockyard live capacity represents approximately 15% of annual throughput based on a 45Mtpa capacity. This has been confirmed to be adequate by simulation modelling on other projects and is similar to current industry practice.

The stockyard is designed to meet the following criteria:

- A dedicated footprint for each ore type in order to minimise mixing of products.
- Although dedicated once the contracts are defined, the pile configuration can be varied to meet the customers product shipping requirements.
- A minimum of five metres will be allowed between the toes of successive piles.
- Road access will be allowed beside each stacker, and road access up to the reclaimer from each end only for a wheeled 200t hydraulic crane.

3.2.4 Supporting Infrastructure

The following section outlines those ancillary facilities that are to be developed to support the Project.

3.2.4.1 Dedicated Port Zone Ancillary Facilities

The proposed Port Zone facilities include:

- OPR main administration building;
- port (GPA) administration office;
- port access control building / first aid room;
- sample preparation building;
- ablution and crib rooms;
- electrical substations;
- marine maintenance and storage area; and

- Australian Quarantine and Inspection Service (AQIS) quarantine waste storage area.

3.2.4.2 Dedicated Iron Ore Industry Zone Facilities

The proposed Iron Ore Industry Zone facilities include:

- materials handling administration office;
- access control building / first aid room;
- laboratory building;
- ablution and crib rooms;
- laydown area, ablution and crib rooms for maintenance contractors;
- potable water storage tank – 200,000L (incorporating fire fighting storage capacity);
- maintenance workshop and storage area; and
- process water storage tank – 2ML capacity.

3.2.4.3 Port Rail Facilities

The proposed rail facilities include:

- an administration area including offices, train control centre, ablutions and staff facilities and security access control;
- rolling stock workshop and stores;
- fuel storage depot / refuelling station;
- train wash bay facility;
- underfloor wheel lathe workshop;
- waste storage area;
- an effluent treatment facility;
- a Locomotive Load box or Test Cell (to test the operation and output of engine and electrical components); and
- a Locomotive Provisioning facility for minor servicing and repair, and the provisioning of locomotives whilst unloading trains.

3.2.4.4 Access Roads

The main port access road will be routed from the North West Coastal Highway near the Buller River along the coastline in order to sustain gradients suitable for construction and port use transportation.

A second access road will be routed from the North West Coastal Highway around the north-eastern boundary of the Strategic Industry Zone to access the rail maintenance yards and workshops.

These roads are identified in Figures 3.2 and 3.3.

3.2.4.5 Service Corridor

A services corridor is proposed to be located along the northern boundary of the Oakajee Industrial Estate Strategic Industry Zone.

The services corridor is planned to accommodate all utility services (e.g. roadways, water, electricity, gas and telecommunications) that may be required for the development of the port

and of the Oakajee Industrial Estate. It is envisaged that all of the required services would, as far as practicable, be co-located within the one corridor.

3.2.4.6 Utilities

Power

The power demand for the Project is estimated to be 20MW for development of up to Stage 3 (refer to Section 3.2). The power supply to the port facilities is yet to be confirmed, with two options currently being considered. These are:

- supply by Western Power from the South West Integrated System (SWIS); or
- supply from an independent power producer with the facility located within the Oakajee Industrial Estate or close to the Dampier to Bunbury Natural Gas Pipeline. The fuel type could be either natural gas or diesel. This option would require the development of a power station and transmission line.

Water – Desalination Plant

A desalination plant is required to provide water for the operational phase. The largest quantity of water required for project activities will be for dust suppression of the iron ore stockpiles.

It is anticipated that the operational phase of the Project will require a total of 5.8ML/year of potable water and 5GL/year of process water. It is anticipated that process and potable water will be provided by a Seawater Reverse Osmosis (SWRO) desalination plant, which will be rated to treat a peak capacity of 14ML/day.

The SWRO plant will treat seawater to a standard of 500 to 1,000mg/L TDS and will comprise all required facilities and equipment for pre-treatment, filtration, back-washing, high pressure pumping, the reverse osmosis process, energy recovery, brine pumping, chemical dosing as required and treated water pumping to post-treatment storage.

The proposed seawater intake will be located on the north-west corner of the reclaimed land adjacent to the breakwater, infrastructure included in the Approved Port. The intake will be fitted with a specially graded section of rock filtering water into a pond. The pumps will be mounted on a raft floating in the pond with a flexible connection pumping to the desalination plant.

It is proposed to return the brine concentrate from the desalination plant to the sea on the southern side of the breakwater at a depth of approximately 8m, with the diffuser ideally located in a natural or excavated trench in the seabed to protect it from wave and current forces. This location will enable mixing of the brine stream in a high energy wave environment with good water exchange.

The SWRO diffuser will be designed to meet a dilution factor of 30:1, resulting in a salinity increase of less than 3%. Combined results of toxicity tests for the Perth, Adelaide and Victorian desalination plant studies indicates that such an initial dilution will have a negligible effect on dissolved oxygen, temperature and pH after mixing in the marine environment and be sufficient to minimise the toxic effects of the brine discharge.

The brine stream will also include traces of chemicals used in the desalination treatment process. These include:

- metal salts,
- biofouling control;
- antiscalants; and
- cleaning chemicals.

3.2.4.7 Construction Camp

A construction camp will be built to accommodate up to 1000 workers at the peak of the construction phase of the port marine and terrestrial infrastructure.

The camp location is still to be confirmed, but it will be located within close proximity to the Terrestrial Port infrastructure, likely on the Oakajee Industrial Estate (subject to discussions with stakeholders, including LandCorp). The likely position has been indicated on Figure 3.3.

The construction camp will comprise the following infrastructure:

- package sewerage treatment plant, constructed / operated under a Part V Works Approval / Licence;
- single person accommodation units with shared amenities;
- communication facilities;
- recreational facilities;
- wet and dry mess facilities;
- power generation (diesel generators)
- fuel storage area;
- waste storage area;
- water tanks;
- laundry facilities;
- first aid room;
- shower blocks; and
- office facilities.

4 BIOPHYSICAL ENVIRONMENT

4.1 CLIMATE

The Geraldton region experiences a Mediterranean-type climate, characterised by hot, dry summers and mild, wet winters. The average annual rainfall is 448.7mm, three quarters of which occurs during the winter months from May to August. Rain occurs on average 40.8 days annually, the wettest month being June. The summer months are characteristically dry, with December and January receiving an average of approximately 9.6mm of rain. These months are also influenced by the tropical cyclone period which occasionally brings heavy localised rainfall to the area. Geraldton is affected by cyclones approximately once every six to eight years (Bureau of Meteorology, 2009).

Average maximum temperatures range from 19.8°C in winter to 29.7°C in summer, and average minimum temperatures range from 10.5°C in winter to 18.8°C in summer (Figure 4.1). Seasonal extremes can occur from north-easterly winds moving across the arid-interior of the state bringing very hot summer days and cold fronts moving from the Southern Ocean bringing windy, winter days. The highest maximum temperatures reach 46.4°C in summer and 35.8°C in winter, while the lowest minimum temperatures are approximately 10.6°C in summer and 0.8°C in winter (Bureau of Meteorology, 2009).

The wind climatology at Geraldton is dominated by the effects of the land-sea interface where offshore breezes are common in the morning, whilst afternoon sea breezes are common in warmer months (Bureau of Meteorology, 2009).

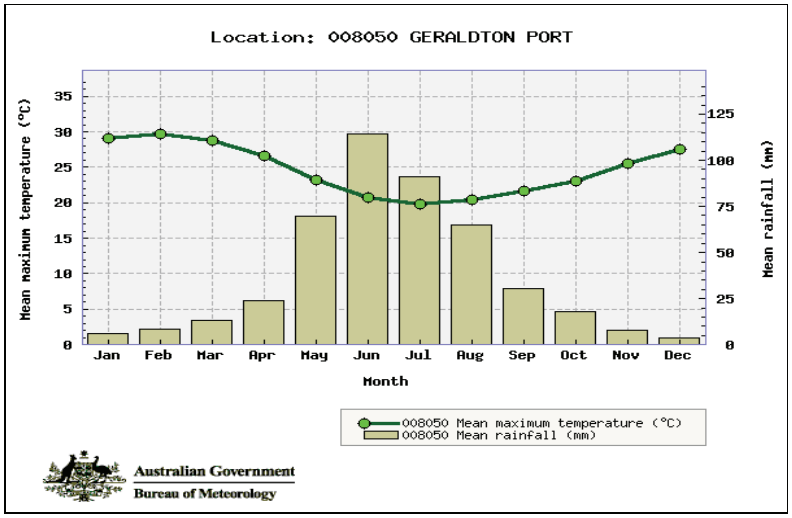


Figure 4.1 – Summary of climatic data for Geraldton Port

4.2 BIO-REGIONS

The Project lies in the Geraldton Hills subregion of the Geraldton Sandplains Biogeographic Region of the Interim Biogeographic Regionalisation for Australia (IBRA) (Environment Australia, 2000), refer to Figure 4.2.

The Geraldton Sandplains IBRA region incorporates the southern end of the Canarvon Basin and the northern end of the Perth Basin. This region is described by Kendrick and McKenzie (2001) as Permian/Silurian siltstone and Jurassic sandstones, mostly overlain by sandplains, alluvial plains, and coastal limestones. Typical vegetation of the area includes sand heaths with emergent *Banksia* and *Actinostrobus*, York Gum woodlands on alluvial plains,

proteaceous heath and *Acacia* scrubs on limestone, depending on the depth of the coastal-sand mantle (Kendrick & McKenzie, 2001).

Currently, 516 Priority Flora taxa are listed on FloraBase as occurring in the Geraldton Sandplains IBRA region (Western Australian Herbarium, February 2009).

Figure 4.2 – Geraldton Hills sub-region in WA IBRA 6.1 sub-regions context

4.3 GEOLOGY AND SOILS

The Geraldton region incorporates the southern end of the Carnarvon Basin and the northern end of the Perth Basin, with exposed areas of Permian/Silurian siltstone and Jurassic sandstones, mostly overlain by sandplains, alluvial plains and coastal limestones (Desmond and Chant, 2002). Sandy earths of an extensive, undulating, lateritic sandplain mantling Permian to Cretaceous strata, underlain by Phanerozoic sediments also occur in the region (Desmond and Chant, 2002).

The geology of the area has been described by Playford *et al*. (1970). Oakajee lies on the coastal belt of limestone and sand dunes which have developed along the coast north and south of Geraldton. The coastal limestone belt forms hills up to 130 m high, and extends up to 8 km inland.

The main formations in the Oakajee area are:

- dune and beach sands of white calcareous and quartzose sands; and
- coastal limestone and overlying podsolic sand of eolianite and leached quartz sands.

Smaller areas of laterite and associated sand and underlying highly weathered rocks also occur. The sand represents the eluvial soil horizon of the laterite profile.

Large areas of granulite, a unit of the Northampton Block which has the oldest rocks, are found in the area and the granulites are predominantly metasedimentary.

Jurassic sediments occur widely throughout the eastern side of the project area and form the Champion Bay Group, comprising Kojarena Sandstone, Newmarracarra Limestone, Bringo Shale and Colalura Sandstone.

5 PRELIMINARY ENVIRONMENTAL IMPACT ASSESSMENT AND POTENTIAL ENVIRONMENTAL FACTORS

5.1 FLORA AND VEGETATION

5.1.1 Current Status

Beard and Burns (1976) mapped the vegetation of the Geraldton region and grouped similar areas according to vegetation. The Project lies within an area of similar coastal vegetation known as the Greenough System.

The Greenough System is characterised by a coastal limestone belt extending from Kalbarri to Dongara. The limestone belt varies in width and elevation and also in topography. It includes abrupt rocky ridges, more gentle soil-covered areas, alluvial flats and lagoons. On the seaward side, the limestone is covered with a mantle of recent, poorly consolidated or still mobile dune sands (Beard and Burns 1976).

Beard and Burns (1976) mapped 5 main vegetation types as occurring at Oakajee:

1. sparsely vegetated Drift Sand;
2. Banksia woodland and Acacia scrub;
3. *Acacia xanthina* shrubland;
4. *Acacia rostellifera* (and other *Acacia* species) thicket; and
5. Jam scrub (*Acacia acuminata*) with York Gum (*Eucalyptus loxophleba*).

The Project comprises areas of disturbed grazing and farmland, as well as large areas of intact native vegetation. Most of the intact native vegetation at Oakajee occurs adjacent to the coastline and alongside the Oakajee and Buller Rivers. Smaller areas of fragmented native vegetation also occur amongst cleared farmland. The majority of the sandplain area has been cleared in the past and it is now used for pastoral purposes. The remaining areas with vegetation cover provide habitats for both vertebrate and invertebrate fauna.

A search of the DEC Threatened (Declared Rare) Flora database, the Western Australian Herbarium Specimen database and the DEC's DRF and Priority Flora List was undertaken. This database search indicated that 63 Priority Flora and 12 DRF species have been previously recorded in the vicinity of the study area (*ecologia*, 2006).

Database searches indicate that no Threatened Ecological Communities (TECs) or Priority Ecological Communities (PECs) occur in the area.

On a regional scale, the flora and vegetation of the coastal dunes found at Oakajee resemble those of the Holocene Quindalup Dunes to the south of the Project area.

There are no coastal conservation reserves near Geraldton. The closest coastal conservation reserves are the Kalbarri National Park approximately 100km to the north and the Beekeepers Nature Reserve approximately 170 km to the south.

A search was undertaken of the Department of Agriculture and Food Declared Plants List for any declared weed species that potentially could be found in the Northampton-Geraldton area. The search identified 82 Declared Plants in this region, 77 of which were Declared Plants state-wide.

5.1.2 Flora and Vegetation Surveys

Dames and Moore (1993)

Dames and Moore surveyed the area in 1993 on behalf of LandCorp. The survey identified six major plant associations at the 1:25,000 scale, and identified 165 vascular plant species (including 27 weeds). This survey identified no flora of conservation significance.

Muir Environmental (1997)

Muir Environmental surveyed the Oakajee Industrial Estate in August 1997 on behalf of LandCorp. Muir Environmental (1997) mapped six "terrain types" and found 217 species of vascular flora (including 37 weed species).

One DRF and one Priority Flora species were identified, as listed below:

- *Eucalyptus blaxellii* (DRF) was found on a breakaway near the southern branch of the Oakajee River. This species was recorded as a single plant in very poor condition.
- *Grevillea triloba* (P3) were identified on both sides of the Oakajee River valley, in Reserve 16200, and along roadsides.

The previously recorded locations of conservation significant species will not be impacted by the Project.

In addition, a single plant of a hybrid between *Caladenia hoffmannii* (DRF) and *Caladenia longicauda* was also collected on the *Banksia* Sandplain. This indicated that *Caladenia hoffmannii* may have also been present nearby at some stage. Based on records from the DEC, *Caladenia hoffmannii* is located on the eastern side of the project area within a different vegetation unit. Muir Environmental therefore determined that it is unlikely *Caladenia hoffmannii* will occur within the Oakajee Industrial Estate.

ecologia Environment (2006 / 2009)

ecologia undertook a baseline biological investigation of terrestrial flora and vegetation in August 2006 for the Project. The survey identified thirteen vegetation units at the sub-association level within the Project area, with areas of bare sand, disturbed agricultural land and revegetation areas additionally mapped (refer to Figure 5.1).

Much of the vegetation, particularly the sandplain, laterite vegetation and riparian units, has been cleared for agriculture or otherwise degraded. However, significant areas remain within the footprint that were identified as species-rich and in very good to excellent condition (*ecologia*, 2009a).

In March 2009, *ecologia* undertook a targeted threatened flora survey. A total of ten taxa of conservation significance were recorded during the field survey within the study area, with a DRF species (*Eucalyptus blaxellii*) opportunistically recorded to the south (outside) of the study area (refer to Figure 5.2).

The vegetation and flora survey conducted by *ecologia* recorded two weed species under the *Agriculture and Related Resources Protection Act* 1976, being:

- *Tamarix aphylla* (Athel Pine), and
- *Echium plantagineum* (Paterson's Curse).

5.1.3 Potential Impacts of the Project

Approximately 850ha of ground is to be disturbed for the Project (this excludes the land-based area under the Approved Port as presented in Figure 2.1). This area assumes a construction / laydown allowance.

Approximately 330ha of this total ground disturbance area hosts remnant native vegetation that will be required to be cleared for the Project.

The coastal vegetation of the Project area is poorly represented in the conservation estate in the Geraldton area and therefore they may be considered significant on a regional scale.

The Project will result in disturbance of up to seven Priority Flora species, being:

- *Melaleuca huttensis* (Priority 1);
- *Acanthocarpus parviflorus*, *Blackallia nudiflora*, *Grevillea triloba, Lasiopetalum oppositifolium* and *Verticordia densiflora* var. *roseostella* (Priority 3); and
- *Verticordia penicillaris* (Priority 4).

A complete description of survey methods and species lists will be provided as an Appendix to the PER.

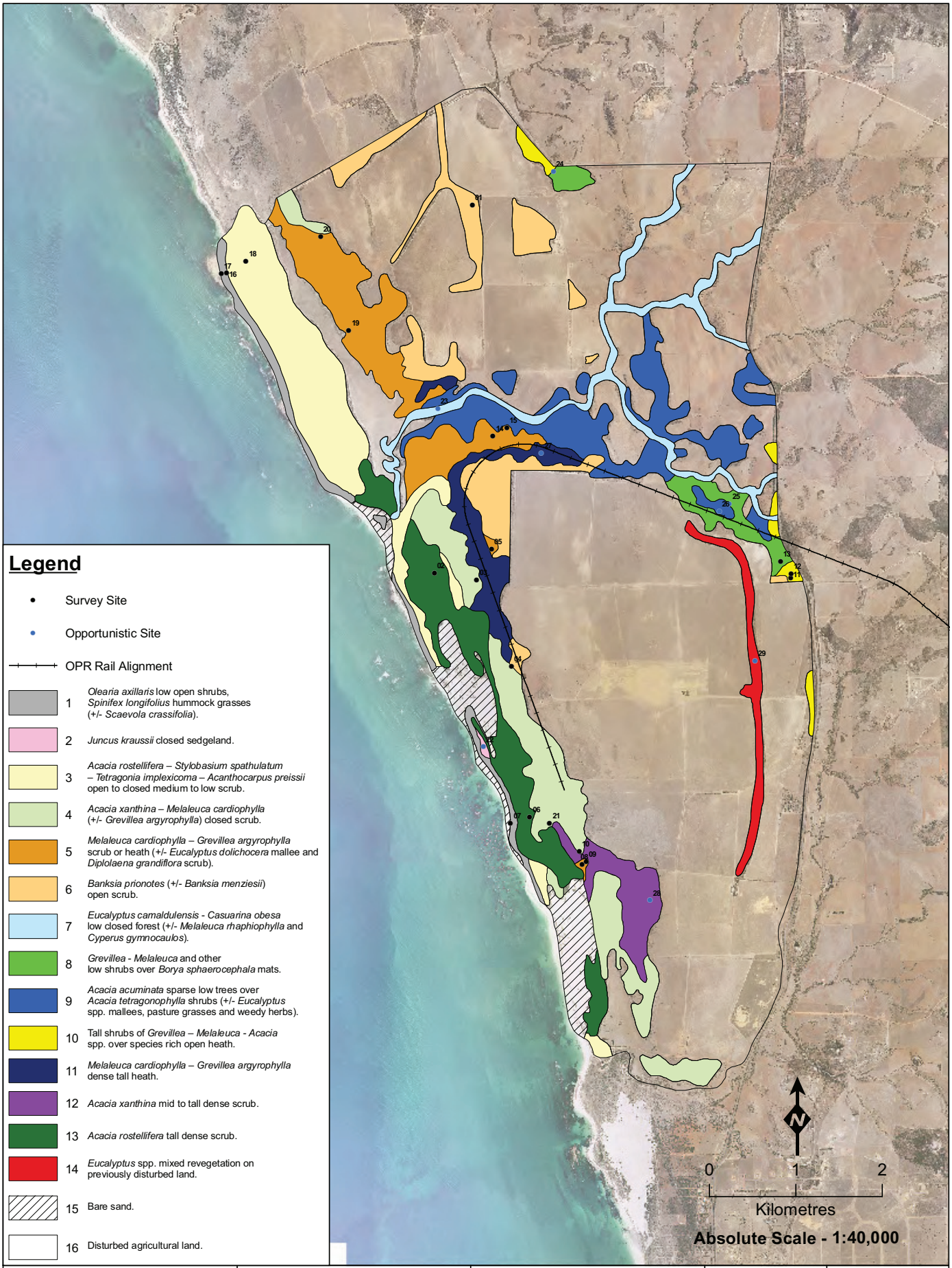
Impacts associated with clearing could include:

- habitat fragmentation;
- increased weed propagation;
- increased erosion;
- changes to surface water flows; and
- increased fire potential.

The following management strategies will be employed to minimise impact to remnant vegetation:

- the extent of clearing for construction and operation activities is to be minimised;
- detailed design will consider the locations of Priority Flora and disturbance will be avoided where possible;
- clearing control procedures will be implemented during construction; and
- Rehabilitation of disturbed areas in excess of operational requirements will be undertaken, in a progressive manner, where possible.

The PER will specify recommendations to reduce possible impacts resulting from the Project.



ecologia ENVIRONMENT

OPR oakajee port & rail

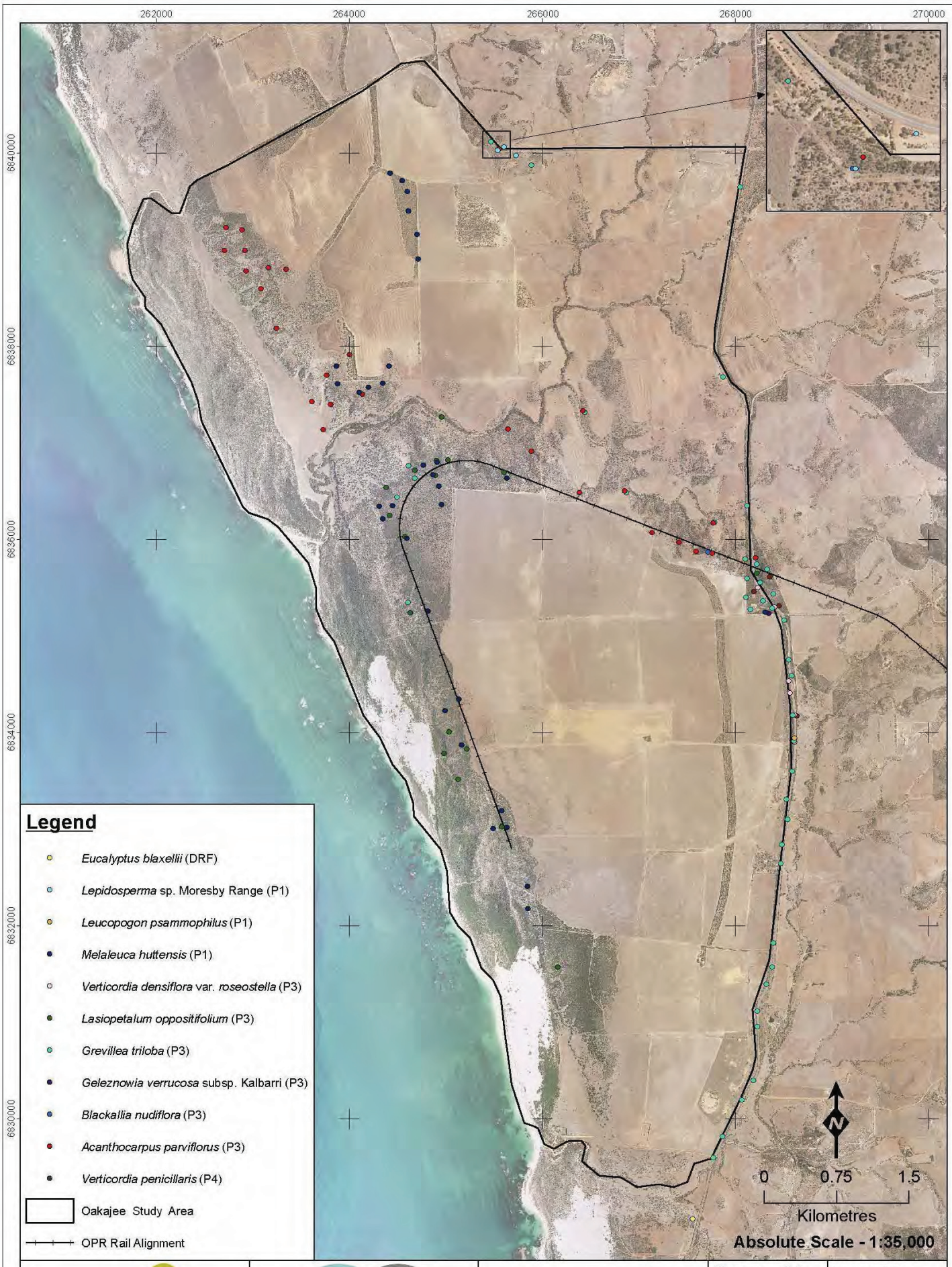
Vegetation of the Oakajee study area

Figure: 5-1
Project ID: 721
Drawn: SG
Date: 30/06/09

Coordinate System
Name: GDA 1994 MGA Zone 50
Projection: Transverse Mercator
Datum: GDA 1994

Unique Map ID: M140

A3



ecologia ENVIRONMENT

OPR oakajee port & rail

Oakajee priority species locations

Figure: 5-2
Project ID: 721

Drawn: SG
Date: 21/04/09

Coordinate System
Name: GDA 1994 MGA Zone 50
Projection: Transverse Mercator
Datum: GDA 1994

Unique Map ID: M104

A3

5.2 VERTEBRATE FAUNA

5.2.1 Current Status

The most significant habitats in the region are the coastal dunes systems and limestone ridge margins, sandplain vegetation and the more inland northern wheatbelt vegetation (Dames and Moore 1993).

The Oakajee area has previously been disturbed through activities such as grazing and agriculture. Fauna habitats at Oakajee are mostly restricted to the remnant vegetation adjacent to the coastline and riverine areas. The coastal strip of native vegetation is generally from 1.0 to 1.5km wide.

The coastal vegetation and habitats of the Oakajee study area (refer to Figure 5.1) are considered significant at the local level. Most coastal vegetation in the Geraldton area has been cleared or is highly degraded by grazing. The coastal vegetation immediately south of Oakajee has largely been cleared for residential development within the City of Geraldton-Greenough. The Pleistocene limestone vegetation present at Oakajee has been largely degraded elsewhere near Geraldton.

The locally uncommon and dense coastal limestone ridge vegetation and the dense vegetation of the sand dunes at Oakajee provide refuge and habitat for fauna. The vegetation amongst the Moresby Ranges to the east of the Project area is highly fragmented but includes species-rich mallee, heath and scrub assemblages floristically somewhat similar to that of the remnant vegetation in the eastern parts of the Project area.

The riparian habitats in the Oakajee Industrial Estate and buffer have a degraded understorey because of grazing by introduced herbivores. They do however, provide essential habitat for hollow dependant species (some bats, birds, and reptiles) and support a large number of bird species. The riparian vegetation along the Oakajee River also provides an important link from the coastal vegetation at Oakajee to the Moresby Ranges to the east.

The sandplain habitat within the Project area has been largely cleared for farmland and is generally restricted to small and isolated fragments. Some of these fragments support intact and healthy areas of Banksia woodland. This habitat may provide a feeding resource for Carnaby's Black-Cockatoo (EPBC Endangered, WC Act Schedule 1) (*ecologia*, 2009b).

Several databases were consulted in the formulation of potential fauna (and conservation significant fauna) lists (refer to Table 5.2).

Table 5.1 Fauna Databases Searched to Determine the Possible Vertebrate Fauna Assemblage of the Project Area

Database	Search Details
Western Australian Museum (WAM) FaunaBase	Records within 20 km of -28.61428°S, 114.60575°E (approx. centre of project area)
Department of Environment Conservation (DEC) NatureMap	Records within 20 km of -28.61428°S, 114.60575°E, and records within 20 km of -28.61428°S, 114.60575°E
Department of Environment Conservation (DEC) Threatened Fauna Database	Records within 40 km of -28.263°S, 114.226°E and 29.038°S, 114.975°E
Birds Australia Birdata (Atlas of Australian Birds)	Species list for the 1 degree grid cell containing the Oakajee project area: 28.61428°S, 114.60575°E
Department of the Environment, Water, Heritage and the Arts (DEWHA) Protected Matters Database	Records within 20 km of -28.61428°S, 114.60575° E

In addition to the above databases, five publications reporting on the vertebrate fauna of the Project area were consulted. In cases where field surveys were conducted, their location and approximate distance to the Project area is given in Table 5.2.

Table 5.2 Previous Surveys and Literature Consulted to Determine the Likely Vertebrate Fauna Assemblage of the Project Area

Location/Title	Author	Approx. Distance To Project Area (km)	Comments
Northwest Coastal Highway Geraldton Bypass: Fauna Assessment Survey.	*ecologia* (2002)	17 km south	Surveying of the Chapman River Regional Park
Fauna monitoring of the Chapman River Wildlife Corridor, Geraldton.	Desmond and Heriot (2002)	50 km south	No birds were surveyed in this study
Herpetofauna of the Geraldton Region, Western Australia.	Storr *et al*. (1983a)	Area surrounding project to 81 km north, 160 km south, 45 km east.	This paper provides a summary of previous records – no field surveying was conducted. Study includes reptiles and amphibians only.
Oakajee pipeline route flora and fauna study	Skull *et al*. (1998)	Closest site (Site 10) is 5 km south, furthest site considered (Site 8) is 22 km south	Only data from the sites closest to the current project area (sites 8-10) were considered.
Oakajee Proposed Industrial Site: Flora and Fauna Assessment.	Dames and Moore (1993)	Within current project area	Fauna survey was opportunistic only. This survey was conducted within the Oakajee Port terrestrial project area.

These databases identified the following as having been recorded in the vicinity of the Project area:

- 21 migratory birds and one listed Endangered bird (Carnaby's Black Cockatoo) under the *Environment Protection and Biodiversity Act 1999*;
- five species listed under the *Wildlife Conservation Act 1950* (2 birds and 3 reptiles); and
- six species identified as priority species by the Department of Environment and Conservation (3 birds and 3 reptiles).

5.2.2 Fauna Surveys

Several vertebrate fauna surveys have been conducted within the vicinity of the Project. The following section provides a summary of the findings of these investigations.

Desmond and Heriot (2002)

Desmond and Heriot undertook a fauna monitoring programme within the Chapman River Wildlife Corridor (CRWC), located 5km north-east of Geraldton, and approximately 20km south of the project area in 2002.

The CRWC study recorded 39 species of reptile, six species of frog, 11 species of mammal as well as eight introduced mammals in the area. One species of conservation significance, the Southwest Carpet Python (*Morelia spilota imbricata*), listed under the *Wildlife Conservation Act* (Schedule 4), was recorded from the north of the study area, at the foothills of the Moresby Range. The majority of the fauna species recorded from the CRWC are very similar to those expected from the similar vegetation communities at Oakajee.

Ecologia Environment (2006 / 2007)

ecologia undertook a baseline biological investigation of vertebrate fauna as part of the environmental impact assessment for the Project. The assessment comprised a two-phase field survey which was undertaken in December 2006 and May 2007 during which five major fauna habitats were observed; being:

- Coastal dunes – this habitat corresponds to vegetation sub-associations 1, 2, 3, 13 and 15 in Figure 5.1;
- Limestone associations – this habitat corresponds to vegetation sub-associations 4, 5 and 12 in Figure 5.1;
- Sandplain – this habitat corresponds to vegetation sub-associations 6, 9 and 10 in Figure 5.1;
- Riverine vegetation – this habitat corresponds to vegetation sub-association 7 in Figure 5.1; and
- Laterite hills and breakaways – this habitat corresponds to vegetation sub-association 8 in Figure 5.1.

During the *ecologia* survey the following species were recorded:

- ten native mammal species and eight introduced mammal species. The Common Brushtail Possum is a significant record as Oakajee represents the northern extent of the south-western distribution of this species.
- 78 bird species; including:
    - four bird species listed as Migratory under the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act). These were the Fork-tailed

Swift (*Apus pacificus*), Eastern Osprey (*Pandion haliaetus*), White-bellied Sea-eagle (*Haliaeetus leucogaster*) and Rainbow Bee-eater (*Merops ornatus*).

- White-browed Babblers (*Pomatostomus superciliosus*) were recorded, which may have been the Western Wheatbelt subspecies (*P. s. ashbyi*), listed as Priority 4 by the DEC, although it was not possible to identify to subspecies level in the field.
- Five bird species identified as significant records given they were recorded at the range limit known for these species, being; White-breasted Robin (*Eopsaltria georgiana*), Spotted Pardalote (*Pardalotus punctatus*), Fan-tailed Cuckoo (*Cacomantis flabelliformis*), Golden Whistler (*Pachycephala pectoralis*) and White-cheeked Honeyeater (*Phylidonyris niger*).

- 35 reptile species were recorded, including an undescribed species of worm-lizard (*Aprasia sp. nov (aff. fusca)*) currently awaiting taxonomic classification.
- two amphibian species were recorded.

Although not specifically recorded in the *ecologia* survey of the Oakajee area, the following species have been previously recorded in the vicinity and may be considered likely to utilise the Project area:

- Carnaby's Black-Cockatoo (*Calyptorhynchus latirostris*) – recorded near Oakajee, from Howatharra (10 km east of Oakajee in 1983) and was observed south of Geraldton during the 2006/07 *ecologia* survey. Other records for this species close to Oakajee come from Geraldton, Dongara and the Murchison River near Kalbarri (Birdata 2007).
- Two additional conservation species have been previously recorded from the Oakajee area:
  - Western Carpet Python (*Morelia spilota imbricata*) – Schedule 4 under the Wildlife Conservation Act 1950 and listed as Priority 4 by the DEC; and
  - Australian Bustard (*Ardeotis australis*) - listed as Priority 4 by the DEC.

5.2.3 Potential Impacts of the Project

The habitat clearing is as discussed in Section 5.1.3.

The fauna habitats of the Project area are poorly represented in the conservation estate and may be considered significant on a regional scale.

The Project will result in localised loss of fauna habitat primarily within the coastal sand dunes and limestone associations. Smaller areas of sandplain, riverine and lateritic habitat may also be affected.

The proposed disturbance will result in the loss of habitat and could result in direct loss of individuals of some species of conservation significance. The species of conservation significance known, or considered likely to utilise the area include the White-browed Babbler (Western Sub-species), Western Carpet Python, Eastern Osprey, Brushtail Possum, Carnaby's Black-Cockatoo and *Aprasia* sp. nov (aff. *fusca*).

The Carnaby's Black-Cockatoo may periodically utilise the Banksia and Eucalypt woodland in the Project area, however, these habitats are of generally low quality for feeding and the species is unlikely to breed within the Project area.

The impact on the four migratory birds listed under the EPBC Act is anticipated to be low, given similar habitats to the north and south.

For those species where Oakajee forms the northern limit of their range, the proposed disturbance may contribute to a further range reduction, in an area already highly threatened by human modification through farming, agriculture and urbanisation.

Indirect impacts to fauna resulting from clearing of vegetation could include:

- habitat fragmentation;
- increased competition from introduced fauna;
- indirect impacts to habitat outside the footprint eg. from changes to surface hydrology; and
- increased fire potential.

Fauna could also be impacted from the Project operational activities resulting in:

- noise and vibration; and
- light overspill.

Those management strategies proposed at Section 5.1.3 will also minimise impacts on vertebrate fauna. In addition to these management strategies, the detailed design will consider the locations of conservation significant fauna habitats and linkages and disturbance will be avoided where possible.

5.3 INVERTEBRATE FAUNA

5.3.1 Short Range Endemics (SRE)

5.3.1.1 Current Status

Due to historical clearing in the area, remnant vegetation associations on the sandplain plateau, the coastal limestone ridge, the river margins, the southern valley slopes and the stable dunes on the western slope of the Oakajee site, may function as refugia for invertebrates with restricted distributions and thus be extremely important for their long-term survival.

There is little published evidence of SRE fauna to date from the Geraldton Sandplains IBRA region. This is most likely due to the historical lack of invertebrate research, as common in most areas of Australia.

However, SRE members of groups such as millipedes (Diplopoda), centipedes (Chilopoda), land snails (Mollusca), native earthworms (Megascolecidae) and trapdoor spiders (Mygalomorpha) have been recorded (Abbott 1994; Harvey et al. 2000) or are considered likely to exist on the Geraldton Sandplains IBRA region (Mark Harvey pers. comm.).

5.3.1.2 SRE Survey

A Short Range Endemic (SRE) survey of the Project area was conducted by *ecologia* during August and September 2006.

Approximately 500 specimens were submitted to five external taxonomic experts for verification of identity and guidance concerning the conservation significance of each taxon. These individuals represented 11 orders, 21 families, 30 genera, and 35 species of invertebrates. Mygalomorphae (Trap-door spiders) spiders and Centipedes were the most speciose groups, being represented by nine and seven species respectively. The spiders included a number of previously undescribed and possibly restricted species. Isopods were the third most speciose and abundant order recorded, with six species being recorded. Five species of land snail (Mollusca), four species of Pseudoscorpion (Pseudoscorpiones), three species of millipede (Diplopoda) and two species of scorpion (Scorpiones) were recorded (*ecologia*, 2009d).

Of the taxa expected to be SRE species, four were considered to be new species and three to be endemic species, possibly with restricted ranges. The majority of SRE specimens were located within habitats found on the coastal foredunes and the Oakajee River channel.

An additional regional survey was conducted in Spring 2009 which identified all previously identified SRE species outside the Oakajee Study area with the exception of two Mygalomorphae spiders (Aname sp. 1 and Aname sp. 2) and one isopod (*Hanoniscus tuberculatus*).

Snail identifications are still pending to confirm whether the identified Oakajee Study area SRE, *Bothriembryon* sp, was located in the regional surveys. It is possible that specimens of this species were also located as up to five different snail morphs were identified (*ecologia*, 2009d).

5.3.1.3 Potential Impacts of the Project

The habitat clearing is as discussed in Sections 5.1.3.

It is expected that despite a number of new species being recorded during the *ecologia* survey, some of them being known or suspected SRE species, the impact of the proposal will be minimal on these species. These species will likely experience a small contraction in their distributional ranges; however, given that vegetation of similar composition and quality can be found to the north (and to a lesser degree) the south of the Project area, it would appear that this contraction is acceptable.

It is possible that the *Aname* sp. 2 (Nemesiidae) recorded is restricted to the Oakajee River valley. However, as the Project does not impact upon this landscape unit the species is not expected to be impacted upon.

None of the SRE species or potential SRE species identified within the Project impact zone are restricted to it.

Those management strategies proposed at Section 5.2.3 will also minimise impacts on invertebrate fauna.

5.3.2 Stygofauna

5.3.2.1 Current Status

Despite the fact that the stygofauna of the Geraldton region is largely unknown and little published material exists to date, the geology of the region is relatively well documented, allowing for some predictions in regard to potential suitable habitats for stygal species.

The groundwater of lithified karstic eolianite on Swan Coastal Plain, the Tamala Limestone, is inhabited by the copepods *Metacyclops fiersi* and *Halicyclops eberhardi* (De Laurentiis et al. 2001). As a strip of these limestone outcrops continues along the coast to the Oakajee project area, the possibility exists that stygofauna inhabit bores situated within the limestone strip (*ecologia*, 2009d).

5.3.2.2 Stygofauna Survey

ecologia undertook a baseline stygofauna survey of bores within Oakajee Industrial Estate in order to ascertain the presence or absence of stygofauna in the area.

Numerous bores were constructed on the Oakajee lease from 1963 to 1999 to facilitate assessment of the groundwater resources of the project area. Of the 22 functional bores installed by Rockwater from 1995 to 1999, 17 bores were sampled for stygofauna and water-quality parameters during Phase 1 (August 2006) and Phase 2 (October to November 2006) of the survey.

Three species of stygofauna were found during the survey. The syncarid species was identified as new to science with two copepod species also considered likely to be new to science. The two copepod species were unable to be definitively identified as one was damaged and the other was of juvenile status.

5.3.2.3 Potential Impacts of the Project

Although no direct impact on the stygofauna species is expected, there are two potential impacts which may indirectly affect stygofauna species. These are:

- pollution; and
- reduced infiltration/recharge of the underlying aquifer(s) resulting in a reduction, or loss, of the available stygofauna habitat.

All impacts arising from the Project are considered to have a medium to low risk of detrimentally impacting stygofauna species and/or communities.

The detailed design will maintain site hydrology as close as possible to the natural condition, including ensuring all potentially contaminated wastes are minimised and contained to avoid degradation of the natural environment.

5.3.3 Troglofauna

5.3.3.1 Current Status

The presence of troglofauna in the region is poorly understood and documented and very little published or available data exists for troglofauna within the Project area.

5.3.3.2 Troglofauna Survey

No troglofauna surveys have been undertaken to date given no significant excavation is required for the Project.

5.3.3.3 Potential Impacts of the Project

Threats to troglofauna include:

- changes to hydrology leading to changes to subterranean microclimate;
- sub-surface and groundwater contamination;
- reduction in organic inputs; and
- habitat loss and alteration via excavation.

Troglofauna will not be impacted by the Project as no other areas of significant excavation are proposed.

5.4 SURFACE HYDROLOGY

5.4.1 Current Status

The project is bounded in the north and south by two significant water courses; being the Oakajee River and the Buller River respectively.

The rivers have quite small catchment areas and are ephemeral in nature, flowing from the east following extended rain periods.

During rains, water generally infiltrates the site, however, where surface water runoff does occur, this drains either to the Indian Ocean directly from the site, or via the Oakajee or Buller River.

5.4.2 Potential Impacts of the Project

The rail and southern access road formations are located within 200 m of the Oakajee and Buller Rivers respectively.

Infrastructure and the introduction of hard stand areas will potentially interrupt surface water drainage patterns, this could potentially lead to:

- changes in sheet flow and flooding characteristics;
- reduced infiltration / increase in runoff and velocity of runoff, resulting scour and erosion; and
- entrainment of sediments and other contaminants.

The design approach is to protect the downstream areas by intercepting and directing runoff flows to strategically placed basins sized according to their respective catchment areas where the water will permeate into the ground.

Lined basins will be provided for containment of any potentially contaminated run-off, with water disposed via evaporation and contaminates disposed to a licensed facility on an as-needs basis.

5.5 GROUNDWATER

5.5.1 Current Status

The Project area is located on an elevated plateau (70 to 100m Australian Height Datum) underlain by a westward-dipping surface of granulite bedrock and 40 to 50m of sedimentary strata.

Groundwater forms a veneer within and above the bedrock-sediment contact. This veneer is recharged by rainfall and it flows predominantly westward towards the coast. The unconfined groundwater aquifers comprise locally weathered bedrock and overlying siltstone (Chapman Group), Tamala Sand and superficial sand, capped by Tamala Limestone at the western escarpment. Generally, the strata are hydraulically connected and groundwater passes between them.

The Project area lies within the Gascoyne Groundwater Management Area, proclaimed under the *Rights in Water and Irrigation Act*.

The Project will not intersect any Public Drinking Water Supply Areas.

5.5.2 Potential Impacts of the Project

It is not expected groundwater abstraction or dewatering activities will be required as part of the Project. Groundwater is not expected to be intersected by the Project.

Potable and process water requirements for the Project operation will be supplied from the proposed desalination plant, as discussed in Section 3.2.4.6.

The Project could result in pollution of the underlying groundwater resource if contaminated wastes are not suitably controlled. Detailed design will ensure that potentially contaminated wastes are minimised and contained to avoid degradation of the natural environment.

In order to manage the quality of groundwater, monitoring bores will be maintained to monitor the quality of groundwater passing from the Project area to the nearest sensitive receptor (i.e. the Indian Ocean).

5.6 MARINE

5.6.1 Current Status

The project is bounded to the west by the Indian Ocean.

Currently there is no discharge to the Indian Ocean, except surface water runoff and groundwater flows.

5.6.2 Marine Surveys

Water quality data has been collected by Oceanica (2009a) in spring 2006, summer 2006/07, autumn, winter and spring 2007, summer 2007/08, autumn, winter and spring 2008. The data identifies considerable spatial and temporal variation over the majority of water quality parameters at Oakajee. Enhanced nutrient concentrations were generally observed at the inshore sites, which is most likely due to the accumulation of beach cast wrack along the coastline. Elevated nutrients in summer and reduced nutrients in winter, reflect natural seasonal cycles in water quality conditions.

The water quality conditions at Oakajee were compared to the ANZECC/ARMCANZ (2000) default water quality guidelines, specific for south-west Australian inshore and offshore marine waters. Results showed that background concentrations for some of the nutrient and physical parameters at Oakajee, appeared to be naturally above guideline levels. Potentially harmful and toxic algal species were observed in all seasons at the majority of transects, but did not exceed the WASQAP guidelines trigger levels (WASQAP 2007). Similarly, there were no exceedances of *Enterococci* counts or polycyclic aromatic hydrocarbon concentrations above the ANZECC/ARMCANZ (2000) guidelines.

Baseline marine habitat surveys have been conducted by Oceanica (2009b) to describe the existing marine habitats and health in the vicinity of the proposed Oakajee Port and the surrounding region (from Coronation Beach to Buller River out to the 20m depth contour, an area of approximately 80km^2) to support assessment of environmental impact following port development.

The following surveys have been undertaken subsequent to the existing approval:

- Broad-scale mapping (80km^2) of the Oakajee Region using aerial imagery and underwater video footage – October 2006 and February and March 2007;
- Seagrass and cover transects and seagrass health surveys were undertaken by divers in summer 2007, summer 2008 and summer 2009; and
- Algal cover transects and algal health surveys were undertaken by divers in summer 2008 and summer 2009.

The major seagrass types recorded at Oakajee were *Amphibolis antarctica* and *Thalassodendron pachyrhizum*, and the algal community was dominated by brown algae, exhibiting communities common to the lower west coast of Western Australia.

It is noted that the communities present at Oakajee were extremely heterogeneous. The dominant seagrass *Amphibolis antarctica* was distributed at low density across the whole study area, except for an area of high density *Amphibolis* on sand in the northern section of the survey area. The other dominant seagrass species *Thalassodendron pachyrhizum* was distributed across the whole study area, however the density was considerably lower than *Amphibolis*. Consequently, the distribution of *Thalassodendron* was difficult to map due to its patchy and low density distribution. *Thalassodendron* was rarely found in isolation, but rather occurred in mixed communities with algae and/or *Amphibolis.*

5.6.3 Potential Impacts of the Project

The desalination plant will generate up to approximately 22ML per day of hypersaline water that will be disposed of by return to the ocean. The desalination plant diffuser will be designed to meet a dilution factor of 30:1 with the outlet located to ensure mixing of the brine stream in a high energy wave environment with good water exchange.

Combined results of toxicity tests for the Perth, Adelaide and Victorian desalination plant studies indicates that such initial dilution will have a negligible effect on dissolved oxygen, temperature and pH after mixing in the marine environment and be sufficient to minimise the toxic effects of the brine discharge (refer to Section 3.2.4.6).

OPR will evaluate the effects of desalination discharge according to the EPA's Environmental Quality Management Framework (EMQF). This will include defining the Ecosystem Values (EV), outlining the Environmental Quality Objectives (EQOs) and defining the Environmental Quality Standards (EQS or targets). EQS will most likely be derived from local monitoring data to account for the unique physical parameters (largely turbidity) encountered in this region. The following parameters will be measured and compared to EQSs:

- Temperature (profiles);
- Salinity (profiles and continuous logging on the seabed approximately 50m from central diffuser);
- DO (profiles);
- Light Attenuation (LAC);
- Turbidity (profiles);
- Nutrients (5);
- Metals (14);
- Chemical Oxygen Demand (discrete samples);
- Total dissolved solids (discrete samples); and
- Total suspended solids (discrete samples).

An appropriate seasonal and spatial program will be designed to detect any significant changes in water quality relating to the hypersaline discharge.

The desalination discharge in not expected to impact Benthic Primary Producer Habitat (BPPH) for the following reasons:

- A diffuser will be attached to achieve 30:1 dilution of the hypersaline discharge water. This dilution ratio has been proven to provide high protection to the ecosystem, based on ecotoxicity testing at Perth, Adelaide and Wonthaggi plants;
- The diffuser will be located in approximately 8 m water to achieve maximum mixing and to prevent emergence on the ocean's surface.

OPRs baseline seagrass and algal monitoring study associated with the Approved Port will provide adequate detail to assess any potential damage. This work has been undertaken with due regard to the EPA (2009b) *Environmental Assessment Guidelines: Protection of BPPH in Western Australia's Marine Environment*.

No impact is expected upon coastal processes as the Project will not be utilising materials actively in exchange between ocean and land. No rock armour sea wall is proposed for the stockpile area.

5.7 SIGNIFICANT AREAS OR LAND FEATURES

5.7.1 Current Status

The Project will not impact upon any Environmentally Sensitive Area's (ESA), National Parks or Reserves. The Project site is not considered significant in terms of geomorphology, geology or soils.

The vegetation associations and fauna habitat of the area is representative of the original coastal dune system of the Geraldton region. Vegetation associations and fauna habitat may be considered of local and regional significance as little native vegetation of similar size and structure exists in the Geraldton area or regionally within conservation reserves.

5.7.2 Potential Impacts of the Project

Some clearing of vegetation considered of local, and potentially regional, significance will occur.

The extent of this impact is discussed in detail in Section 5.1.3.

5.8 POLLUTION

5.8.1 Noise

The Project will generate noise during the construction and operational phases.

A significant industry buffer has been set aside by Landcorp and zoned in the Shire of Chapman Valley Town Planning Scheme No. 1 (refer to Figure 3.2). The eastern-most extent of the Project area is located approximately 3km to the west of the nearest sensitive receptor. The nearest residential area is at Drummond Cove, approximately 6km south of the Project area. Due to the distance between port operations and the nearest residences noise emissions are not anticipated to be a concern to sensitive receptors.

However, the potential for construction and operational activities to generate noise will be assessed in relation to the OIE buffer and mitigation measures included in the PER.

5.8.2 Dust

An assessment of Bureau of Meteorology wind data from the Geraldton Port wind station over the past 40 years indicates that the predominant wind directions for the Geraldton coast are north-easterly, south and south-easterly for morning (9am recordings) and predominantly south-westerly and south in the afternoons (3pm).

Dust will be generated by the earthworks during the construction phase, including via stripping and stockpiling of topsoil, during cut and fill works and from haulage activities. The extent of clearing will be minimised, with progressive rehabilitation / stabilisation to occur where possible. Dedicated water truck will be on hand to suppress dust during construction.

Table 5.3 identifies the dust controls proposed for various port operational components.

Table 5.3 Dust Controls for Various Port Operations

Operation	Types of Control
Stacking and reclaiming	Variable Height Stacker (Stacking only)
Stockpiling	Water Sprays
Screening	Hooding and Scrubbers
Misc. transfers and conveying	Enclosures

The predominant dust generating source during the operational phase is from the proposed ore stockpiling area (refer to Section 3.2.3).

It is envisaged that stockpile dust suppression shall consist of an advanced, real-time water application system operated by a PLC-based control system. The specific system that will be used is yet to be determined, with the best system for the management of the conditions and operations at the site expected to be employed.

A remote weather station shall provide base data on wind speed and direction as well as wet and dry bulb temperatures. The system shall calculate evaporation of water from the ore surface utilising site/ore specific algorithms. From the evaporation rate the system shall calculate the re-water times required in order to suppress fugitive dust. The system shall therefore provide a real time assessment of the potential for dust generation and function proactively to suppress dust.

A dust suppression PLC (DSPLC) shall allocate watering times to each cannon in the stockyard and commence “firing” cannons as appropriate. The DSPLC shall keep track of the “time to re-water” for each cannon. It is expected that a maximum of five cannons shall be required to operate during peak demand periods. In order to minimise hydraulic losses, a maximum of three cannons at a time shall be allowed to operate on any one line. The DSPLC shall only activate cannons as and when required.

Cannon activation shall occur through a solenoid operated control valve fitted to each cannon installation. Each cannon shall operate for approximately 90s to provide a 1mm deposition to the stockpile surface. A key feature of this system is that it monitors the moisture content of the stockpiles in “real-time” in order to constantly manage the moisture content of the ore. This ensures that stockpiles are kept at optimal moisture content for dust minimisation and to also prevent over-watering.

Dust suppression water will be sourced from the proposed operations desalination plant (refer to Section 3.2.4.6).

A significant industry buffer has been set aside by Landcorp and zoned in the Shire of Chapman Valley Town Planning Scheme No. 1. Dust modelling undertaken for the 45Mtpa scenario has been assessed in relation to the OIE buffer and predicts no exceedences of any of the assessment criteria, with PM_{10} and TSP concentrations slightly above background levels and low levels of dust deposition at all identified receptors (SKM, 2009).

A dust mitigation design assessment will be completed prior to the final port design, with recommendations for dust containment and suppression measures to be incorporated into final design and discussed in the PER.

To ensure dust levels do not become a significant issue a Port Operations Environmental Management Plan will be implemented, including monitoring of dust levels to ensure identified thresholds are not exceeded.

5.8.3 Waste

Solid and liquid wastes will be generated during construction and operational phases of the Project. Waste may be generated in the form of:

- general domestic and office refuse;
- biological wastes (e.g. sewage);
- hazardous wastes (e.g. oils, grease, lubricants);
- industrial wastes (e.g. tyres, packaging, infrastructure and machinery components);
- quarantine waste; and
- hyper-saline waste water from desalination plant.

Waste materials if not managed appropriately may impact upon:

- surface and groundwater quality;
- land and soil contamination;
- visual amenity; and
- animal, plant and human health.

All waste will be handled, stored and disposed of in accordance with Australian Quarantine Inspection Services, the DEC and/or Local Government requirements.

In general, all wastes will be disposed of off-site with the exception of the following liquid wastes:

- sewage treatment facilities – package plant wastewater systems are proposed (eg. biomax system), with treated wastewater disposed of via sub-surface irrigation in gardens around offices. Solids from these facilities will be disposed offsite as required.
- oil-water treatment facilities – package plant wastewater systems are proposed with collected oil to be stored separately and disposed off-site, with treated wastewater pumped to a lined pond for on-site disposal via evaporation (with any contaminants entering the pond disposed to a licensed facility on an as-needs basis).
- saline water from desalination plant – this water will be diluted 30:1 and discharged to enable mixing of the brine stream in a high energy wave environment with good water exchange. Diffusers will be installed to ensure appropriate plume dispersion (refer to Section 3.2.4.6 for additional details).

5.8.4 Greenhouse Gas Emissions

The Project will generate GHG emissions through the construction (including via clearing of remnant vegetation) and operational phases.

Greenhouse gas emissions resulting from construction and operation will be reduced where possible, including via appropriate maintenance of energy-dependant equipment and energy efficiency initiatives to be described in the Construction and Operational Management Plans.

Reporting may be required under the *National Greenhouse and Energy Reporting Act 2007*.

An assessment of greenhouse gas emissions will be conducted as part of the PER process.

5.8.5 Contaminated Sites

The historical use of the land has been native vegetation and agricultural / pastoral. No contaminated sites are registered on the site (DEC, 2009).

Unexploded Ordnance (UXO) is known to be an issue in the general Geraldton locality. Surveys in accordance with the Fire and Emergency Services (FESA) requirements will be undertaken prior to any ground disturbance activities.

5.8.6 Acid Sulfate Soils

The CSIRO (2009) Australian Soil Resource Information System (ASRIS) Acid Sulfate Soil Risk Map indicates one area in the vicinity of the Project, associated with the Oakajee River mouth, may pose a high risk in terms of Acid Sulfate Soil (ASS) generation.

The facilities described by the Project are generally greater than 1km from the Oakajee River. No impact is proposed in the river mouth area map as high risk by the CSIRO, otherwise the area are mapped as having an extremely low risk of ASS occurrence.

The geology of the proposed port area comprises coastal limestone and overlying podsolised sand/eolionite with leached quartz sands. Podsolised sand may contain some acidity however underlying limestone and dune sands have a neutralising capacity which means that in terms of ASS the port area may be regarded as low risk.

A desktop risk assessment on the potential to generate ASS from the Project has been undertaken (GHD, 2010). The risk assessment considered the presence of ASS unlikely, and in addition suggested management strategies to further reduce the risk.

6 SOCIAL CONTEXT

6.1 SOCIAL PROFILE

The Terrestrial Port facilities are within the Shire of Chapman Valley, but will also have some impact on the City of Geraldton-Greenough as the nearest regional centre.

The Project could result in:

- Nuisance to surrounding residents i.e. noise, dust, visual amenity, traffic (refer to discussions at Section 5.8 and 6.5);
- Loss of recreational opportunities (refer to discussions at Section 6.6); and
- Public risk (eg. UXO, as discussed in Section 5.8.5).

However, the Project will provide employment, economic growth (refer to Sections 6.2 and 6.3) and community development benefits, as discussed in Section 1.4 of this document.

6.2 POPULATION

Table 6.1 outlines the estimated workforce numbers for the Terrestrial Port infrastructure construction and operations phase. The duration of the construction period is likely to be approximately 18 months, depending on availability of machines and long-lead items.

Table 6.1 – Anticipated Workforce Numbers for Terrestrial Port Construction and Operation Phases

Workforce	Anticipated Peak Numbers
Construction Workforce	600
Operations Workforce (45Mtpa)	210

One main purpose built construction camp located within close proximity to the worksite will accommodate up to 1000 personnel. The campsites will be fully self-contained, with supplies required by the workers (e.g. food, personal amenities etc) transported to the campsites via road or air. The campsites will be equipped with occupation health and safety facilities.

6.3 ECONOMY

The economy of the mid-west region is driven largely by climate, in the coastal regions agriculture takes place, and further inland, mining activities, including; iron ore, gold, nickel and other mineral resources dominate. The main activities which drive the economy in the mid-west are:

- agriculture along the coastal strip where sufficient rainfall exists;
- mining within the mineral rich inland areas; and
- various fishing industries.

The social and economic benefits of the Project for the mid-west and Western Australia are outlined in Section 1.4.

6.4 NATIVE TITLE

The Project area intersects a total of three registered native title claims. A summary of these claims is provided in Table 6.2.

Table 6.2 – Native Title Claims

Claim Name	Claim No
Naaguja Peoples	WC97/73
Amangu People	WC04/02
Mullewa Wadjari Community	WC96/93

OPR intends to negotiate a Comprehensive Agreement with each group to outline opportunities for indigenous involvement in the Project and the wider OPR Project, including employment, training and contract arrangements.

6.5 VISUAL AMENITY

6.5.1 Current Status

The Project area is in an area designated for a port, surrounded by a large land buffer. The Project is approximately 6km north of the nearest coastal community being Drummonds Cove, and 20km north of the town of Geraldton.

A number of community members, particular those at Drummonds Cove have identified potential visual amenity impacts as of concern to them.

6.5.2 Potential Impacts of the Project

The infrastructure will be located adjacent to the proposed Oakajee Industrial Estate, which includes a significant buffer area. The stockpiles will be constructed on the low lying dunal swale, with the nearest viewsheds from the proposed Moresby Range Regional Park and Drummonds Beach.

OPR conducted a preliminary visual amenity assessment which indicated the level of impact, including to the Drummonds Cove residential area approximately 6km south of the Project area. This assessment indicated visual impact impacts were not significant, with the breakwater of the Approved Port having the greatest visual impact from this locality.

6.6 RECREATION AND TOURISM

6.6.1 Current Status

Buller River to Coronation Beach is a popular area for a number of recreational activities. The most popular area along the coast is Coronation Beach which is 3kms north of the Project and accessed via a bitumen road from the North-West Coastal Highway.

Coronation Beach is popular as it is a safe and protected section of the coast, used for activities such as windsurfing, swimming, snorkelling, beach fishing and reef harvesting.

Informal short-term camping has led to the establishment of an eco-style designated camping area at Coronation Beach by the Chapman Valley Shire Council to kerb undesirable use of other areas.

The beaches south of Coronation Beach are more difficult to access, with four-wheel drives required to traverse either the Buller or Oakajee River mouths in order to access the beach.

6.6.2 Potential Impacts of the Project

Development of the Project will not prevent access to Coronation Beach for recreational use, including camping.

Some recreational activities between the Oakajee and Buller Rivers will be impacted by the Project. A Rehabilitation and Coastal Management Plan and Recreation Plan will be developed and implemented in accordance with Ministerial Statement 469 to ensure the management of coastal areas.

The Project area itself may present industrial tourism opportunities to the Geraldton area and this will be further developed in the Recreation Plan.

6.7 ABORIGINAL HERITAGE

6.7.1 Current Status

Ethnographic and archaeological surveys of the Oakajee were carried out as part of the assessment for the proposed Oakajee Industrial Estate. Further specific surveys of the coastal dune areas were made in association with the Oakajee Deepwater Port Public Environmental Review 1997 (Tingay, 1997).

These historic surveys identified a number of sites along the Oakajee and Buller Rivers, coastal dunes and sites on the fringes of the Oakajee Industrial Estate.

OPR have developed Heritage Protocols with each of the groups listed in Table 6.2 to guide upcoming heritage survey work.

6.7.2 Potential Impacts of the Project

Development of the Project has the potential to impact upon known and unknown sites of Aboriginal significance.

OPR will undertake further survey work to seek clearances for the Project, and if required, seek approval under Section 18 of the *Aboriginal Heritage Act, 1972* prior to disturbing any Aboriginal heritage sites.

OPR will develop an Aboriginal Heritage Management Plan and also implement procedures (as identified in the Heritage Protocol) for the identification and management of any additional sites located during the construction phase of the Project.

6.8 EUROPEAN HERITAGE

6.8.1 Current Status

A search of the Heritage Council of Western Australia 'Places' database indicated that there are no European Heritage Sites located within the Project area (Heritage Council of Western Australia, 2009).

However, it is understood that there may be additional sites not currently listed.

6.8.2 Potential Impacts of the Project

It is anticipated the Project will not impact upon any European heritage values, however, OPR will liaise with the Heritage Council of Western Australia.

7 STAKEHOLDER ENGAGEMENT

OPR is committed to ongoing stakeholder and community engagement, including open and transparent communication, and recognises the importance of genuine stakeholder involvement in the identification of potential issues and concerns, as well as appropriate management of impacts.

7.1 COMMUNITY RELATIONS AND ENGAGEMENT STRATEGY

OPR takes a proactive approach to liaising with the stakeholders and interested parties. OPR's understanding of local attitudes and community issues has been primarily guided by an ongoing program of research, communication and consultations with key stakeholders and the broader community.

In order to ensure a local presence and be responsive to local community interest in the Project, OPR opened a Mid-west Community Office at 260 Foreshore Drive, Geraldton. Local community and stakeholders are able to visit or speak to an OPR staff member during office hours from Monday to Friday.

Other mechanisms for engagement and providing information to the community to date have included:

- meetings including Council meetings;
- personal stakeholder meetings and visits;
- briefings, including presentations;
- hosting hospitality events, including luncheons, sundowners and office open days;
- community consultation and interviews;
- social and environmental impact assessment workshops;
- direct mail via letterbox drops (e.g. OPR newsletter 'Oakajee Quarter');
- information resources including OPR Project Updates, Fact Sheets and media releases;
- sponsorship and partnership projects;
- display and information at local agricultural shows; and
- presentations at industry and business conferences and events.

7.2 ENGAGEMENT TO DATE

OPR has worked closely with the Western Australian Government's Oakajee Policy Team regarding the development of the Project, as well as relevant government agencies and the Geraldton Iron Ore Alliance and mid-west stakeholders.

In addition to the meetings with individuals, Table 7.1 outlines general presentations and consultation provided to groups on the preliminary engineering contained in the initial scoping and pre-feasibility works of the Approved Port and the Project.

Table 7.1 – Summary of Stakeholder Consultation

Stakeholder Group	Organisation
Govt – Local	- City of Geraldton – Greenough - Shire of Chapman Valley
Govt – State	- Environmental Protection Authority - Department for Planning and Infrastructure - Department of Environment and Conservation - Department of State Development - Department of Water - Landcorp - Members for Geraldton, Greenough and Agricultural Region - Public Transport Authority - Main Roads Western Australia - Water Corporation - Western Power
Govt – Regional Office	- Department of Environment and Conservation - Department of Water - Geraldton Port Authority - Mid West Development Commission - Mid West Strategic Infrastructure Group - Yamatji Land and Sea Council.
Govt - Federal	Member for O'Connor
Community	- Community Groups including Drummond Cove progress Association and Geraldton Windsurfing Club - Amangu, Naaguja and Wajarri Yamatji Native Title Groups. - Residents of Shire of Chapman Valley and City of Geraldton - Greenough
Professional / Industry	- Mid West Chamber of Commerce and Industry - Geraldton Iron Ore Alliance - Regional Service Providers including training and employment providers
Media	- Main-stream Western Australian and mid-west media
Others	- Farmers, - Pastoralists, - Fishing and Cray Fishing Industry.

7.3 PROPOSED ENGAGEMENT STRATEGY

OPR will continue to consult with those stakeholders identified in Table 7.1 and other relevant stakeholders, including regulatory authorities, throughout the development of the Project, on a range of social and environmental issues.

OPR is currently developing a Community Stakeholder Engagement Plan, to ensure that future communication and consultation will take place with key stakeholders through informal and formal briefings, personal meetings and community presentations and the preparation of stakeholder letters and media releases as described in Table 7.2.

Table 7.2 – Future Stakeholder Engagement and Consultation

Mechanism	Frequency of Use
Council meetings	As per project milestones / approvals-based
Stakeholder meetings and briefings	As per project milestones / approvals-based
Briefings, including presentations	As needs for relevant stakeholders
OPR luncheons and sundowners	Up to four per year
OPR Mid-West Community Office	Open five days per week
OPR Mid-West Community Office Open Days	Two per year
Community Informational Sundowner	Annual
Community consultation and interviews	As needs, up to three consultations per primary stakeholder group
Direct mail via letterbox drops, e.g. OPR newsletter and project update	Monthly/quarterly
OPR Newsletter 'Oakajee Quarter'	Quarterly
Media advertorials, OPR Project Updates	Monthly
OPR Media releases	3 – 6 media releases per year
Media relations including briefings and media site visits	Briefings as needs, one media site visit per year
OPR Fact Sheets	Update as per project milestones
'OakajeeQuarter' Newsletter	Quarterly
Sponsorship and partnership projects	Ongoing
Information resources – displays, posters and websites;	Ongoing
Attendance mid-west functions	Ongoing
Display and information both at local agricultural shows	Annual
Presentations at industry and business conferences and events	Ongoing

8 MANAGEMENT COMMITMENTS

8.1 PRINCIPLES OF ENVIRONMENTAL PROTECTION

OPR has considered the *Principles of Environmental Protection* developed by the EPA in response to the State Sustainability Strategy (Government of Western Australia 2003) set out in Position Statement 7 as follows:

1. *The Precautionary Principle*: the Proponent has conducted a risk assessment with the intention of identifying issues early in the process to enable planning for avoidance or mitigation. Part of this process includes undertaking detailed site investigations of the biological and physical environs. Where these investigations identify significant conservation issues, management measures will be incorporated into the project design to avoid where practicable and / or minimise any potential remaining impacts.

2. *Intergenerational Equity:* the Proponent recognises the responsibility it has to ensure that all land within its sphere of influence is preserved for future generations. This includes prompt and effective rehabilitation of disturbed land. OPR is committed to the principles of minimum resource use and emissions minimisation and will incorporate sustainability into project design wherever possible. The development of a multi-user infrastructure will also be an economic and social benefit for future generations.

3. *Conservation of Biological Diversity and Ecological Integrity:* the Proponent will seek to minimise its footprint to avoid disturbance as far as practicable. OPR has designed the Project as far as possible to avoid impacting recognised areas of conservation significance and is undertaking biological investigations to identify other aspects of potential environmental significance of high preservation value.

4. *Improved Valuation, Pricing and Incentive Mechanisms:* the Proponent acknowledges the need for improved valuation, pricing and incentive mechanisms and endeavours to pursue these principles though out the feasibility phases. To date environmental factors have played a major role determining the project design to avoid significant environmental values and equipment specifications to reduce operational pollution.

5. *Waste Minimisation:* the Proponents approach to waste management is to, in order of priority: avoid and reduce at source, reuse and recycle and treat and/or dispose across all phases and components of the Project. The strategies for waste minimisation will be outlined within the project Environmental Management System (EMS).

8.2 MANAGEMENT STRATEGIES

Section 9 of this document, provides a range of preliminary management strategies for the Project against each of the identified significant environmental factors.

These strategies will be further refined and documented in the PER, based on further engineering information to come out of the Bankable Feasibility Study (BFS), findings of further environmental studies and preparation of management systems and plans, as discussed at Section 8.3.

8.3 ENVIRONMENTAL MANAGEMENT SYSTEMS (EMS)

Two overarching Environmental Management Plans (EMPs) and an ISO 14001 based EMS will be finalised prior to commencement of construction, as follows:

1. Construction Environmental Management Plan, including management strategies relevant to:
    - terrestrial flora and fauna;
    - marine habitat and water quality – desalination plant construction only (marine port construction impacts covered by EMPs required under Ministerial Statement 469);
    - surface and groundwater management;
    - hazardous materials and contamination;
    - air quality;
    - recreational access;
    - noise and vibration;
    - acid sulfate soils;
    - Aboriginal heritage; and
    - resource efficiency – including management strategies relevant to water and fuel usage and waste management.
2. Operations Environmental Management Plan, including management strategies relevant to:
    - terrestrial flora and vegetation;
    - marine habitat and water quality – desalination discharge only (marine port operation impacts covered by EMPs required under Ministerial Statement 469);
    - fauna and habitat;
    - surface and groundwater management;
    - hazardous materials and contamination;
    - air quality;
    - recreational access;
    - noise, vibration and light; and
    - resource efficiency – including management strategies relevant to water and fuel usage and waste management.

The preparation of these EMPs has commenced and a consolidated set of management actions from the EMPs will be provided with the PER document for assessment. The EMPs will continue to be developed through the assessment process.

The EMS will provide the fundamental tools of risk identification and control through the guiding principles of the OPR Corporate Environmental Policy. Continuous improvement in the EMS will be achieved through regular review of the EMS, routine audits of the system and a management review process.

A Safety Management System based on AS/NZS 4801 will be developed separately but will be aligned to the EMS framework, including emergency response procedures.

The results of future risk assessment works will be used to develop any additional EMP's that are not considered to be covered by the EMP's listed above.

9 SCOPE OF WORKS

OPR has undertaken extensive site investigations of the Project area, including engineering, aboriginal heritage, hydrology, noise, fauna and flora and vegetation assessments.

Table 9.1 summarises key environmental factors likely to influence the Project and the investigations that have been undertaken to date in order to assess the impacts of the Project and develop strategies for minimising them.

OPR has a policy for open, transparent and interactive consultation with the States Decision Making Authorities (DMAs) and has invited their representatives to be actively involved in providing methodology and technical advice and in the review of environmental investigative reports.

9.1 ENVIRONMENTAL MANAGEMENT SYSTEMS

An Environmental Management System will be developed as outlined in Section 8.3, including a construction and operations Environmental Management Plans (EMPs).

The EMS will provide the fundamental tools of risk identification and control through the guiding principles of the OPR Corporate Environmental Policy. Continuous improvement in the EMS will be achieved through regular review of the EMS, routine audits of the system and a management review process.

9.2 STUDY TEAM

OPR has selected a team of specialist consulting firms and individuals with knowledge and familiarity of the Project area to assist them in undertaking the identified work and optimising the Project.

The study team include:

OPR Projects Team – Engineering, Environment, Heritage, Government Liaison and Approvals

Worley Parsons – Project Manager Study Consultants

ecologia Environment – Terrestrial Biological / EIA Consultants

Oceanica Consulting Pty Ltd – Marine Consultants

Preston Consulting – Environmental Consultants

AECOM – Terrestrial Port Consulting Engineers

Calibre Engenium Joint Venture – Rail Consulting Engineers

Aquaterra Consulting Pty Ltd – Water Consultants

Lloyd George Acoustics – Noise Consultants

SKM Pty Ltd – Dust Consultants

GHD Pty Ltd – Acid Sulfate Soil Consultants

Environmental Resource Management (ERM) – Stakeholder Engagement

CAD Resources – Project Mapping / GIS Data

DLA Phillips Fox – Legal advisors

Table 9.1 – Scope of Work Summary

Factors	EPA Objective	Aspects	Investigations Undertaken	PER Documentation To Include	Preliminary Management Strategies
Vegetation and Flora					
Flora and vegetation of the Geraldton Sandplains bioregion. Approximately 850ha of ground will be disturbed, with approximately 40% (330ha) hosting native vegetation. NOTE: figures assume a construction / laydown allowance. Declared Rare Flora (DRF) and Priority Flora (PF) species have been recorded.	To maintain the abundance, diversity, geographic distribution and productivity of flora at species and ecosystem levels through the avoidance or management of adverse impacts and improvement in knowledge.	• Vegetation clearing / fragmentation. • Potential uncontrolled or unintentional fire. • Potential introduction or spread of environmental weeds. • Soil erosion from disturbed areas. • Changes to surface water flows.	• Previous investigations in the area include Dames and Moore, 1993 and Muir Environmental, 1997. • Level 2 survey (single phase – *ecologia*, August 2006) of the Oakajee Study Area (4743ha) conducted, consistent with EPA Position Statement No. 3 and Guidance Statement No. 51. • Threatened flora survey – *ecologia*, March 2009, including the Oakajee Study Area, plus an additional 267ha to the south.	• Survey findings, including vegetation and conservation significant flora mapping; • General impact assessment, including risk of fire; • Impact assessment, including local and regional assessment of impacts (with reference to the Geraldton Regional Vegetation Survey findings, pending availability), locally significant communities, fragmentation of the coastal vegetation and dunal systems; and • Management measures to reduce impacts on vegetation.	• The extent of clearing for construction and operation activities is to be minimised. • Clearing control procedures will be implemented during construction. • Progressive rehabilitation of disturbed areas will be undertaken where possible. • Rehabilitation techniques specific to the coastal environment. • Detailed design will consider the locations of Priority Flora and disturbance will be avoided where possible. • Implementation of vegetation and flora management protocols outlined above under the OPR EMS, Port Construction and Operations Management Plans.
Fauna					
Fauna habitat in the Geraldton Sandplains bioregion.	To maintain the abundance, diversity, geographic distribution and productivity of fauna at species and ecosystem levels through the avoidance or management of adverse impacts and	• Direct mortalities. • Habitat loss / fragmentation. • Indirect impacts from noise, vibration or light spill. • Potential spread of feral	• Two-season Level 2 vertebrate fauna survey (*ecologia,* December 2006 and May 2007) of the Oakajee Study Area has been conducted, consistent with EPA Position Statement No. 3 and Guidance Statement No. 56. • A two-phase stygofauna survey (*ecologia*, August 2006 and Oct/Nov 2006) of the Oakajee	• Survey findings, including vertebrate and invertebrate fauna (subterranean fauna and SREs); • Impact assessment in regard to local and regional context; and • Management measures to reduce impact on fauna and fauna habitat.	• The extent of clearing for construction and operation activities is to be minimised. • Clearing control procedures will be implemented during construction. • Progressive rehabilitation of disturbed areas will be undertaken where possible. • Significant fauna linkages will be

Factors	EPA Objective	Aspects	Investigations Undertaken	PER Documentation To Include	Preliminary Management Strategies
	improvement in knowledge.	animals. • Potential uncontrolled or unintentional fire. • Potential impacts on stygofauna through groundwater contamination.	Study Area has been conducted, consistent with EPA Position Statement No. 3 and Guidance Statement No. 54 and 54a. • A one-phase Short Range Endemic (SRE) (*ecologia*, August / September 2006) survey of the Oakajee Study Area has been conducted, consistent with EPA Position Statement No. 3 and Guidance Statement No. 20 and 56. • A further regional SRE survey has been undertaken, comprising two sampling rounds (*ecologia*, July 2009 and August 2009).		maintained where possible. • Site hydrology will be maintained as close as possible to the natural condition. • Detailed design will consider significant fauna habitats and disturbance will be avoided where possible. • Implementation of fauna and habitat protocols outlined above under the OPR EMS, Port Construction and Operations Management Plans.
Surface Hydrology					
Development occurs on generally sandy terrain between the Oakajee and Buller Rivers.	To maintain the quantity of water so that existing and potential environmental values, including ecosystem maintenance, are protected. To ensure that emissions do not adversely affect environment values or the health, welfare and amenity of people and land uses by meeting statutory requirements and acceptable standards.	• Potential to alter runoff patterns influencing surface water quantity • Potential to impact on surface water quality. • Potential increase in erosion and sedimentation. • Potential for spillages.	• Assessment of surface water flows, based on desktop review and field visit (Aquaterra, 2009). • Drainage design criteria.	• Desktop assessment of surface water flows; • Impact assessment; and • Management measures to reduce impact on natural surface water flows and surface water quality.	• Downstream areas to be protected by intercepting and directing runoff flows to strategically placed basins where water will be allowed to infiltrate. • Lined basins will be provided for containment of any potentially contaminated run-off, with water disposed via evaporation and contaminates disposed to a licensed facility on an as-needs basis. • Implementation of surface water management protocols under the OPR EMS, Port Construction and Operations Management Plans.

Factors	EPA Objective	Aspects	Investigations Undertaken	PER Documentation To Include	Preliminary Management Strategies
Groundwater					
Project occurs within the Gascoyne Groundwater Management Area proclaimed under the *Rights in Water and Irrigation Act 1914*.	To maintain the quantity of water so that existing and potential environmental values, including ecosystem maintenance, are protected. To ensure that emissions do not adversely affect environment values or the health, welfare and amenity of people and land uses by meeting statutory requirements and acceptable standards.	• Potential reduction in groundwater quality. • Potential for spillages. • No significant impact on groundwater quantity anticipated.	• Previous investigations undertaken by Rockwater (1996) for the existing port approval. • Project design to protect groundwater from potential contamination sources.	• Review previous work; • Impact assessment; and • Management measures to reduce impacts on groundwater.	• Detailed design will ensure that potentially contaminated wastes are minimised and contained away from the natural environment. • Groundwater quality will be monitored on an ongoing basis. • Implementation of groundwater management protocols under the OPR EMS, Port Construction and Operations Management Plans.
Marine					
Release of desalination plant wastewater to the Indian Ocean from a 14 ML/day (5GL/year).	To maintain the integrity, ecological functions and environmental values of the seabed and the coast. To ensure that emissions do not adversely affect environment values or the health, welfare and amenity of people and land uses by meeting	• Location of infrastructure within Approved Port impact area. • Brine and waste dispersion could impact marine water quality, and marine habitat.	• Habitat assessment by Oceanica Consulting Pty Ltd (2006 to 2009). • Assessment of desalination plant and brine diffuser requirements, based on engineering information and desktop review of other desalination plant projects (Consulting Environmental Engineers, 2009).	• Review habitat work; • Impact assessment with reference to EPA's Environmental Quality Framework (EQMF) in relation to water quality and EPA (2009b) in relation to Benthic Primary Producer Habitat; and • Management measures to reduce impact on marine waters and habitat.	• The desalination plant diffuser will be designed to meet a dilution factor of 30:1 with the outlet located to ensure mixing of the brine stream in a high energy wave environment with good water exchange. • Implementation of marine water quality and habitat protocols under the OPR EMS, Port Construction and Operations Management Plans.

Factors	EPA Objective	Aspects	Investigations Undertaken	PER Documentation To Include	Preliminary Management Strategies
	statutory requirements and acceptable standards.				
Noise, Light and Vibration					
Increase in ambient noise, light and vibration as a consequence of construction and operations.	To protect the amenity of nearby residents from noise impacts resulting from activities associated with the proposal by ensuring the noise levels meet statutory requirements and acceptable standards. To avoid or manage potential impacts from light overspill and comply with acceptable standards.	• No significant impact on households or other public sensitive receptors anticipated given Oakajee Industrial Estate buffer. • Potential impacts on fauna.	• Baseline noise assessment undertaken by Lloyd George Acoustics (2009). • Noise modelling undertaken by Lloyd George Acoustics (2009), including comparison against relevant criteria (*Environmental Protection (Noise) Regulations 1997*).	• Baseline noise modelling results; • Impact assessment, with regard to the Oakajee Industrial Estate buffer; and • Management measures to reduce impacts on sensitive receptors.	• A significant industry buffer has been set aside by Landcorp and zoned in the Shire of Chapman Valley Town Planning Scheme No. 1. • Consideration will be given to lighting standards. • Implementation of noise, light and vibration management protocols under the OPR EMS, Rail Construction and Operations Management Plans.
Air Quality					
Increase in ambient dust levels as a consequence of construction and operations.	To ensure that emissions do not adversely affect environmental values or the health, welfare and amenity of people and land uses by meeting statutory requirements and acceptable standards.	• Dust generation from earthworks during construction. • Dust generation from stockpiles and ore handling during operations.	• Dust modelling for the 45Mtpa scenario (SKM, 2009), based on EPA (2006) *Air Quality Modelling Guidance Notes.*	• Dust modelling results; • Power station emission modelling for a range of scenarios; • Impact assessment, with regard to the Oakajee Industrial Estate buffer and including consideration of impacts of dust on vegetation; and • Management measures to reduce impacts on sensitive receptors. Also including dust monitoring strategies.	• A significant industry buffer has been set aside by Landcorp and zoned in the Shire of Chapman Valley Town Planning Scheme No. 1. • Detailed design will include containment at transfer points and suppression equipment at the stockpiles. • The extent of clearing for construction activities is to be minimised with progressive rehabilitation of disturbed areas, outside operational requirements,

Factors	EPA Objective	Aspects	Investigations Undertaken	PER Documentation To Include	Preliminary Management Strategies
					undertaken where practicable. • Water trucks and/or cannons will be available for dust suppression. • Dust levels will be monitored throughout the port construction and operations. • In combination with other monitoring equipment, OPR will investigate the use of High Volume Air Samplers during operations. • Implementation of dust management protocols under the OPR EMS, Port Construction and Operations Management Plans.
Soil Quality					
Potential for acid sulfate soils to occur within Proposal area.	To ensure that emissions do not adversely affect environment values or the health, welfare and amenity of people and land uses by meeting statutory requirements and acceptable standards.	• Acid sulfate soils, if present, could lead to the generation of acidic or saline materials.	• An acid sulfate soils risk assessment for the Study Area has been conducted (GHD, 2010).	• Impact assessment based on risk assessment review; and • Management measures, including sampling and analysis strategies, as required.	• Implementation of acid sulphate soil management protocols under the OPR EMS, Port Construction and Operations Management Plans.
Waste					
Construction and operations of the project will generate various waste streams.	To ensure that project wastes do not adversely affect environmental values or the health, welfare and amenity of people and land uses by meeting statutory	Disposal of quarantine, industrial, hazardous, domestic and other wastes.	Identification of the types of waste likely to be generated by the Project.	• Impact assessment; and • Management measures, including waste minimisation, disposal and emergency response protocols.	• Implementation of waste management protocols (with regard to the waste management hierarchy and applicable standards) under the OPR EMS, Port Construction and Operations Management Plans. • Implementation of Emergency

Factors	EPA Objective	Aspects	Investigations Undertaken	PER Documentation To Include	Preliminary Management Strategies
	requirements and acceptable standards.				Response protocols, including in relation to hydrocarbon spillage, under the Emergency Response Plan.
Greenhouse Gases					
Greenhouse gas emissions as a consequence of construction and operations.	To minimise emissions to levels as low as practicable on an ongoing basis and consider offsets to further reduce cumulative emissions.	Greenhouse gas emissions from construction and operations.	Identification of greenhouse emitting facilities / activities.	• Impact assessment - quantify expected greenhouse gas emissions from construction and operation; and • Management measures – including addressing the requirements of EPA Guidance Statement No. 12.	• Regular maintenance of mobile plant. • Energy efficiency opportunities will be investigated over the life of the Proposal. • Implementation of energy / fuel management protocols under the OPR EMS, Port Construction and Operations Management Plans.
Aboriginal Heritage					
Sites of Aboriginal heritage significance occur in the Project area.	To ensure that changes to the biophysical environment do not adversely affect historical and cultural associations and comply with relevant heritage legislation.	Potential disturbance of known (registered) or unknown Aboriginal cultural and heritage sites.	Surveys with all affected Native Title claimants have commenced and are ongoing.	• Identification of registered sites; • Discussion of the heritage assessment / consultation process; • Discussion of disturbance approach – i.e. preference to avoid, however, where this is not possible seek approvals to disturb under the *Aboriginal Heritage Act 1972*; and • Management measures, including use of exclusion zones and Aboriginal heritage monitors.	OPR will develop an Aboriginal Heritage Management Plan which includes: • Protection of sites in situ. • Consultation and Section 18 processes, if required, for those sites that cannot be avoided. • Earthworks management. • Salvage and storage management. OPR will also implement procedures (as identified in the Heritage Protocol) for the identification and management of any additional sites located during the construction phase of the Proposal. OPR intends to negotiate a Comprehensive Agreements with each of the registered Native Title Claimant Groups. Such agreements would outline opportunities for indigenous

Factors	EPA Objective	Aspects	Investigations Undertaken	PER Documentation To Include	Preliminary Management Strategies
					involvement eg. employment, training and contracting arrangements.
Visual Amenity					
Development of an industrial facility in an area zoned for industry, currently hosting agricultural land use and remnant vegetation. Stockpiles will be constructed on dunal swales, rail facilities on Oakajee Plateau.	To ensure that aesthetic values are considered and measures are adopted to reduce visual impacts on the landscape as low as reasonably practicable.	Potential visual impacts on the landscape, particularly from coastal vantage points.	Visual amenity modelling undertaken (AECOM 2009/2010).	• Identification of sensitive viewsheds; • Impact assessment; and • Management measures with reference to the *Visual Landscape Planning in Western Australia* (WAPC, 2008).	Visual amenity from sensitive viewsheds will be considered in the design of the terrestrial port facilities.
Other social and economic					
Development occurs 24km to the north of the City of Geraldton, and within the vicinity of other smaller localities (eg. approximately 6km north of Drummonds Cove locality). Potential impacts on recreational activities and risks to public safety.	To ensure that emissions do not adversely affect environment values or the health, welfare and amenity of people and land uses by meeting statutory requirements and acceptable standards. To ensure that existing and planned recreational uses are not compromised. To ensure that risk from the proposal is as low as reasonably achievable and	• Potential for nuisance impacts. • Loss of recreational opportunities. • Potential risks to the public.	• Stakeholder and community consultations in relation to the port development have been undertaken since May 2005, with significant consultations undertaken since signing the State Development Agreement in March 2009.	• Summary outcomes of community consultation; • Consideration of risks to the public; • Impact assessment; and • Management measures, including Oakajee Industrial Estate buffer.	- Continued implementation of the OPR Stakeholder Consultation Strategy. - Employment of local people and use of local suppliers. - Support of local community development projects, including recreational projects. - Public risks considered in engineering design and preliminary works (eg. UXO clearances prior to ground disturbing works, in line with FESA requirements). - Nuisance issues largely resolved by Oakajee Industrial Estate buffer, however, OPR will implement further dust and noise and vibration management measures as identified in the OPR EMS, Port Construction and Operations Management Plans. - Implementation of Rehabilitation

Factors	EPA Objective	Aspects	Investigations Undertaken	PER Documentation To Include	Preliminary Management Strategies
	complies with acceptable standards and EPA criteria.				and Coastal Management and Recreation Strategies under the OPR EMS and Ports Operations Management Plan.

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