STRATEGEN
environmental consultants

Cape Lambert to Emu Siding Rail Duplication

Assessment on Proponent Information

DRAFT

Prepared for
Rio Tinto
by Strategen

April 2011

Cape Lambert to Emu Siding Rail Duplication

Assessment on Proponent Information

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April 2011

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Client: Rio Tinto

Report	Version	Prepared by	Reviewed by	Submitted to Client	
				Copies	Date
Preliminary Draft Report	V2	CM	CW	Electronic	28/08/08
Draft Report	V3	CM	KO	Electronic	25/9/08
2nd Draft Report	V4	CM	CW	Electronic	22/05/09
3rd Draft Report	V5	CM	RG	Electronic	31/05/10
4th Draft Report	V6	CM	RG	Electronic	04/06/10
EPS Final Draft Report	V7	CM/RC	DN/KO	2 hard copies Electronic	4/2/11
API Final Draft Report	V10	CM	TS	4 hard copies Electronic	29/4/11

EXECUTIVE SUMMARY

1 INTRODUCTION

The Proponent proposes to duplicate the rail line between the port at Cape Lambert and Emu Siding, as part of enhancing the capacity of its existing rail network. The duplication of the rail line will be over a distance of approximately 70 km.

The proposed rail duplication (the Project) will be constructed adjacent to the original rail line that runs from Cape Lambert (situated approximately 38 km east of Karratha) to Emu Siding (situated in the northern section of Millstream-Chichester National Park [MCNP]).

1.1 ASSESSMENT PROCESS AND EPA ADVICE

The Project was originally referred to the EPA on 20 March 2008, following consultation with stakeholders. Based on the information contained in the referral, the EPA determined it appropriate to assess the proposal through the EPS process in accordance with the Environmental Impact Assessment Administrative Procedures 2002 prescribed under the EP Act. Following the release of the Environmental Impact Assessment Administrative Procedures 2010, the EPA advised Rio Tinto to re-refer the Project to the EPA to be assessed under the new procedures as an API.

2 PROJECT DESCRIPTION

The Project is contiguous with the rail works proposed for the Cape Lambert Port B Development. The Project starts at the 8.4 km point of the Cape Lambert rail line, at the finish of the Cape Lambert Port B rail work.

The key activities associated with the Project are:

- construction of approximately 70 km of duplicate rail line between Cape Lambert and Emu Siding
- construction and operation of a marshalling yard and associated infrastructure adjacent to Cape Lambert Port
- construction of a locomotive refuelling facility at Cape Lambert
- extension to the existing Emu Siding to service the Deepdale Line
- construction of a ballast load out facility adjacent to the existing 10 km quarry at Cape Lambert, construction of Arches Siding, modification of the existing Harding Siding and expansion of the existing 50 km quarry
- construction of crossovers between the existing and duplicate rail line at Arches, Harding, Green Pool and Emu Sidings to facilitate movement of trains between tracks
- installation of communication cabling, asset protection and signalling equipment, including works to support Automated Train Operation (ATO) facilities
- excavation of material from borrow pits and an existing quarry (all within the development envelope, but outside of MCNP) to construct rail formation and access roads
- extraction of water preferentially from the West Pilbara Water Supply Scheme (Harding Dam), with a contingency of existing and/or new bores, to supply an estimated 2.5 GL of water over the five year construction period.

Key physical components for the Project are outlined in Table ES1.

Table ES1 Key physical components for the Cape Lambert to Emu Siding rail duplication

Component	Description
Length	Approximately 70 km
Deviation from original rail line	5 to 500 m
Crossovers	Up to 9
Bridges	2
Drainage structures	Approximately 130
Volume of Fill	Approximately 2 400 000 m3
Volume of Cut	Approximately 1 640 000 m3
Volume of Borrow Required	Approximately 1 186 000 m3
Construction Land Clearing	Approximately 1750 ha

The Project will disturb up to 1750 ha of vegetation (some of which has been previously disturbed) including clearing for the rail line, laydown areas, communications cabling, access roads and borrow pits. The exact alignment of the duplication and the locations of other infrastructure will not be known until the detailed design phase is completed.

3 STAKEHOLDER CONSULTATION

The timing of the consultation program has enabled the topics raised to be taken into account during the design of the Project, determination of management measures and preparation of the API.

Key stakeholders consulted during the preparation of this API are:

- Department of Environment and Conservation (DEC)
- Environmental Protection Authority (EPA) and Office of the Environmental Protection Authority (OEPA)
- Department of Water (DoW)
- Conservation Commission of Western Australia
- Department of State Development
- Water Corporation
- Conservation Council of Western Australia
- Yindjibarndi Traditional Owners
- Ngarluma Traditional Owners
- Wong-Goo-Tt-Oo Traditional Owners
- China Metallurgical Group Corporation (MCC)
- Millstream Link Alliance/Main Roads WA.

4 ENVIRONMENTAL IMPACT ASSESSMENT AND MANAGEMENT

The approach taken in this API has been based on a risk assessment approach to characterise environmental factors, determine potential impacts and develop mitigation measures.

The Proponent has consulted with stakeholders (including government agencies) to scope the potential impacts of the Project and to determine the significance of environmental issues and the acceptability of mitigation. This process substantially improves the likelihood that all significant environmental issues have been identified, investigated and mitigated as far as practicable.

The following were identified as key relevant environmental factors:

- vegetation and flora
- fauna
- Millstream-Chichester National Park
- Aboriginal heritage.

Eight additional environmental factors were also identified. Given the remoteness of the location and existing management measures in place, these have been assessed as low risk and hence are addressed in less detail.

These factors are:

- dust
- noise and vibration
- greenhouse gases
- surface water
- groundwater
- soils and landform
- waste
- visual amenity.

4.1 FLORA AND VEGETATION

The flora and vegetation of the Project area have been surveyed consistent with EPA Position Statement No. 3 (EPA 2002b) and EPA Guidance Statement No. 51 (EPA 2004b). The Project will result in the progressive disturbance of up to approximately 1750 ha of native vegetation for the construction of the rail line and associated infrastructure, with the subsequent rehabilitation of up to 910 ha of native vegetation in areas no longer required for the operation of the rail.

The vegetation to be disturbed is well-represented in the Pilbara region, with no Threatened Ecological Communities (TECs) or Declared Rare Flora (DRF) recorded in the Project area. One Priority flora species and two Priority Ecological Communities (PECs) were recorded, along with several other communities of moderate to high conservation significance (Biota 2008a). Clearing of vegetation types of moderate and high conservation significance will be minimised and non-essential infrastructure will not be located in these communities. The maximum expected disturbance to any vegetation unit of moderate to high conservation significance will be approximately 12% in the Project area, but it most likely to be substantially less. Disturbance areas will be refined following detailed geotechnical investigations and finalisation of project design. The Project is not expected to have any significant effect on local or regional flora and vegetation values due to the relatively small area of clearing of each vegetation type within a particular area.

The Project is consistent with EPA Position Statement No. 2 *Environmental Protection of Native Vegetation in Western Australia* (EPA 2000), as all potential on-site and off-site impacts have been identified and management measures proposed. No species of flora or vegetation association will cease to exist or its conservation status affected as a result of the Project. Consistent with EPA objectives, the abundance, species diversity, geographic distribution and productivity of flora at species and ecosystem levels will be maintained, thereby conserving regional biological diversity. The implementation of vegetation protection measures will further ensure impacts are minimised.

4.2 FAUNA

The terrestrial fauna of the Project area have been surveyed consistent with EPA Position Statement No. 3 *Terrestrial Biological Surveys as an Element of Biodiversity Protection* (EPA 2002b) and EPA Guidance Statement No. 56 (EPA 2004c). The Project will result in the progressive disturbance of up to 1750 ha of native vegetation for the construction of the rail line and associated infrastructure, with the subsequent rehabilitation of up to 910 ha of native vegetation in areas no longer required for the operation of the rail.

The fauna habitat types identified by Biota (2008b) have been shown to support a range of fauna species, including conservation significant species. The available habitat data indicates that no restricted or uncommon geological units or land systems occur in the project area. In addition to this, the linear nature of the development and the presence of an existing disturbance corridor within the Project area indicates a low risk of significant impact to fauna habitat.

The Project will not conflict with the *Wildlife Conservation Act 1950* (WC Act) as no species of terrestrial vertebrate or invertebrate fauna will cease to exist as a result of the Project. Minimal habitat of high conservation significance will be affected by the Project, and there will be no significant impacts to terrestrial fauna of conservation significance at either a local or regional level.

Consistent with EPA objectives, the abundance, species diversity, geographic distribution and productivity of terrestrial fauna at species and ecosystem levels will be maintained, thereby conserving regional biological diversity. The zoological studies undertaken by the Proponent and implementation of the proposed management actions will ensure that direct disturbance to important fauna habitat is minimised and that fauna and fauna habitat are protected from indirect disturbance, as far as practicable.

4.3 MILLSTREAM-CHICHESTER NATIONAL PARK

Millstream-Chichester National Park (MCNP) contains a diverse and unique natural terrestrial and aquatic environment, supports significant Indigenous cultural values and provides recreation opportunities for Pilbara residents and tourists (DEC 2007). The proposed rail duplication traverses through the north-western part of MCNP (via the excised infrastructure corridor) and its construction may present a risk to the values of the MCNP, due to vegetation clearing, the potential introduction and spread of weeds, introduction of ignition sources, presence of the workforce, vehicle usage and alteration of surface flows to MCNP.

Construction of the rail line will be managed through implementation of weed control and hygiene measures in accordance with the Construction Environmental Management Plan (CEMP) to avoid impacts on values of MCNP.

The rail duplication will intersect Western Creek and several drainage lines within the infrastructure corridors of MCNP. As far as practicable, Rio Tinto will be replicating the existing culverts and bridges of the existing rail line to ensure that the current surface water drainage pattern is maintained; hence the alteration to existing surface hydrology will be minimal.

The existing rail track within the corridor has divided the landscape in such a way that the natural fire patterns will have adapted over time to the conditions present within the Project area. It is unlikely that the installation of a duplicate rail line within MCNP will significantly alter the current fire regime. There is potential that construction works may provide ignition sources (e.g. blasting and welding) resulting in an increase in the risk of fire due to the nature of the works involved. Fire prevention and suppression measures will be implemented to reduce the risk of fire to MCNP.

The Project will result in modifications to a landscape already disturbed by the existing rail line and access roads. As no borrow pits will be located within MCNP, the additional impacts on visual amenity from a duplicate line are not expected to be significant.

The construction workforce is expected to be working on the duplication for up to five years of which approximately two years will be within the MCNP. .The addition of a temporary workforce to MCNP may potentially decrease amenity (visual and recreational) and increase traffic and associated public safety risks within

the National Park. Workforce management measures within MCNP will be implemented to reduce amenity impacts and public safety risks.

The use of vehicles and other construction equipment within MCNP may result in hydrocarbon spills; however, the impacts are expected to be minor and unlikely to cause detrimental impacts to the environment. Spill response procedures will ensure spills are contained and cleaned up as soon as practicable.

4.4 ABORIGINAL HERITAGE

The Pilbara region has cultural value and includes many Aboriginal sites of significance. The Project area lies within the boundaries of two Aboriginal native title claims of the Ngarluma and Yindjibarndi communities. Approximately 55 Aboriginal heritage sites potentially occur within the Project area; however, further surveys are to be undertaken in early to mid-2011 to confirm their presence and assess their significance. This survey will be conducted with representatives from the relevant communities and results presented to the DIA in accordance with the *Aboriginal Heritage Act 1972*. The Project will only proceed once this has taken place.

An ethnographic inspection of the Project area with the Ngarluma community has identified locations of importance which will become Rights Reserved areas, forming part of a regional Agreement between Ngarluma and Rio Tinto. This agreement will be registered as an Indigenous Land Use Agreement (ILUA) in 2011. Rio Tinto has undertaken not to conduct future development activities in those areas. Internal approvals requests which cover any part of those areas have been withdrawn.

The Yindjibarndi claimant group have shared native title responsibilities over part of the Project area, from approximately Harding Dam to Emu Siding. Negotiations are under way with the Yindjibarndi claimant group regarding the preparation of a Binding Initial Agreement. Additionally, a heritage protocol was agreed between Rio Tinto and Yindjibarndi in December 2010. Consultation will be an ongoing requirement as the Project develops. Rio Tinto maintains ongoing communications with the Yindjibarndi group which will potentially be concluded in early 2011.

The Wong-Goo-Tt-Oo group have been consulted with in relation to Rio Tinto coastal works and the Proponent will maintain regular communication with this group with regards to this Project.

Consultation has been preliminary during the project design phase; however, consultation will continue throughout the approval process with all relevant Traditional Owners.

5 ENVIRONMENTAL MANAGEMENT

The environmental aspects of the Project will be primarily managed through the Proponent's Iron Environmental Management System (IEMS) and the Construction Environmental Management Plan (CEMP).

The Proponent has extensive experience in managing the construction of similar operations (including the existing rail tracks through the Pilbara region) and this experience is anticipated to lead to a greater certainty in achieving desirable environmental outcomes.

5.1 ENVIRONMENTAL MANAGEMENT SYSTEM

The Proponent operates under an externally certified ISO14001 framework through the Iron Environmental Management System (IEMS). ISO14001 is an internationally recognised continuous improvement model, the key elements of which include assessing environmental risk and legal requirements, developing objectives and targets for improvement, training, operational control, communication, emergency response, corrective actions, audits and review.

5.2 CONSTRUCTION ENVIRONMENTAL MANAGEMENT PLAN

A CEMP has been prepared (Appendix 1) and will be implemented during construction to manage specific environmental issues arising from the Project.

Detailed management, monitoring and contingency actions are included in the CEMP. These actions will be implemented to ensure that impacts are minimised. The CEMP will be regularly reviewed and revised as required to ensure ongoing effectiveness and achievement of actions.

5.3 PROPOSED OUTCOME-BASED CONDITIONS

The proponent proposes outcome-based conditions (detailed in Section 11.5) for the management of relevant key environmental issues that may arise from the implementation of the Project.

6 CONCLUSION

The potential environmental impacts of the Project and proposed management measures are as follows:

1. Disturbance of up to 1750 ha of native vegetation over the construction period, with rehabilitation of up to 910 ha following the completion of construction works.
2. Minimal clearing of vegetation of high conservation significance.
3. The risk of introducing and spreading weeds will be managed to levels as low as practicable through implementation of weed control and hygiene measures, in accordance with the CEMP.
4. Loss of terrestrial fauna habitat is not expected to have a significant effect on the representation of fauna at a local or regional level.
5. Aboriginal heritage will be managed under a Cultural Heritage Management Plan and relevant agreements with native title claimant groups.
6. Minimal alterations to surface drainage patterns within the Project area and along the infrastructure corridor will not significantly affect the local surface hydrological regime.
7. Generation of dust, greenhouse gases, waste, noise and vibration, as well as potential risks to surface water, groundwater, soils and landform, and visual amenity will have a relatively minor impact and will be mitigated by the implementation of the CEMP and through IEMS.
8. Disturbance of up to 150 ha within MCNP during construction works with rehabilitation of 50% of the disturbance following the completion of construction works.
9. Impacts to MCNP will be minimised through strict weed hygiene controls and consultation with DEC to ensure impacts on visual amenity are minimised. The permanent footprint will be limited to the rail duplication as borrow will not be sourced from within the MCNP for this Project.

Table ES2 provides more detail of potential impacts, proposed management actions and the environmental outcome for each of the environmental factors assessed.

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Table ES2 Summary of key environmental issues, potential impacts and management

Factor	EPA Objective	Existing Environment	Potential Impacts	Proposed Management	Predicted Outcomes
1. Vegetation and flora	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.	The Project area is located within the Fortescue Botanical District of the Eremaean Botanical Province, which typically contains open vegetation dominated by spinifex, wattles, and occasional eucalypts. All of the vegetation types recorded in the Project area occur more broadly in the locality and none are expected to be locally restricted. None of the observed vegetation types represent TECs. The cracking clay communities of the Chichester Range and Mungaroona Range, present in the Project area, are listed as a PEC by the DEC. Eragrostis xerophila tussock grasslands on clay were identified as the Horseflat land system of the Roebourne Plains PEC. The riparian vegetation that exists within the Project area is also considered to be of high conservation significance. No DRF were observed. One species of Priority Flora (*Nicotiana heterantha*, P1) was recorded.	Vegetation clearing for the rail line and associated infrastructure (primarily access roads and borrow pits) will directly disturb vegetation communities and potentially affect Priority flora species. Interruption of surface water flows through construction of infrastructure and drainage structures may affect local water availability for some plant species. Introduction and/or spread of weeds due to clearing and/or vehicle use may result in degradation to native vegetation communities. Fire (introduction of ignition sources) may alter the existing fire regime leading to changes in vegetation composition and/or flora casualties. Dust emissions could potentially smother vegetation, thereby retarding growth.	Implement measures to meet the objectives outlined in the CEMP (Appendix 1), including: • ensuring clearing is as approved and is kept within the Project area • minimising disturbance through planning and locating rail and borrow pits within already disturbed areas, where practicable • undertaking the progressive rehabilitation of up to 910 ha of cleared or disturbed areas (Section 6.5.5) • avoiding disturbance to vegetation communities of high and moderate conservation significance, where practicable • avoiding Priority flora locations and minimising clearing of the vegetation types that support them, wherever practicable • implementing weed control measures in line with existing weed management • duplicating culverts, drains and levees of existing rail line to minimise potential impact on surface water flow • implementing fire prevention and suppression measures • implementing standard dust suppression measures.	The progressive removal of up to 1750 ha of vegetation during construction and the subsequent progressive rehabilitation of up to 910 ha of native vegetation. Loss of vegetation as a result of the Project is not expected to have a significant effect on the representation of vegetation at a local or regional level. The Project will not affect the conservation status of any significant species (including Priority flora species). The occurrence of new weed species and the spread of existing weeds will be contained within the Project area and controlled through eradication measures. No TECs or DRF species will be affected by the Project as none have been recorded within the Project area. The implementation of vegetation protection measures will further ensure impacts are minimised.

Factor	EPA Objective	Existing Environment	Potential Impacts	Proposed Management	Predicted Outcomes
2. Fauna	To maintain the abundance, diversity, geographic distribution and productivity of fauna at species and ecosystem levels through the avoidance or management of adverse impacts and improvement in knowledge.	The Project area has the potential to support a range of terrestrial fauna species, including some that are endemic to the region and/or listed for protection under State and Federal conservation legislation. Two Priority 4 listed species were recorded within the Project area: the Star Finch (P4) and the Short-tailed Mouse (P4).	Vegetation clearing will directly disturb terrestrial fauna habitat and may result in the loss of individual terrestrial fauna. Vehicle movements in construction areas and on access roads could potentially result in the loss of individual terrestrial fauna, particularly less-mobile species. Fire arising from ignition sources associated with construction could potentially result in the loss of fauna habitat and/or individual terrestrial fauna, particularly less-mobile species.	Implement measures to meet the objectives in the CEMP (Appendix 1) including: • ensuring that clearing of potential fauna habitat is as approved and is kept within the proposed footprint • implementing and sign-posting appropriate speed limits for vehicles on access roads • designing and locating culverts so as to ensure existing drainage flows are maintained and to prevent ponding of water • implementing standard dust suppression measures across the Project area to mitigate effects on surrounding fauna habitat • undertaking progressive rehabilitation to re-establish fauna habitat • implementing fire prevention and suppression measures.	The Project will result in the progressive loss of up to 1750 ha and subsequent progressive rehabilitation of up to 910 ha of terrestrial fauna habitat. Areas temporarily disturbed will be progressively rehabilitated to restore original fauna habitat values. Loss of terrestrial fauna habitat is not expected to have a significant effect on the representation of fauna at a local or regional level. No documented habitat for *Lerista nevinae* will be disturbed. The conservation status of significant species will not be affected by the Project. The Project will not conflict with the Wildlife Conservation Act 1950 (WA) as no species of terrestrial vertebrate or invertebrate fauna will cease to exist as a result of the Project.

Factor	EPA Objective	Existing Environment	Potential Impacts	Proposed Management	Predicted Outcomes
3. Millstream-Chichester National Park (MCNP)	To protect the environmental values of areas identified as having significant environmental attributes.	MCNP contains a diverse and unique natural terrestrial and aquatic environment, supports significant Indigenous cultural values and provides recreation opportunities for tourists to the Pilbara region.	Site preparation and/or earthworks may introduce and/or spread weeds into adjoining areas of MCNP. Site preparation and/or earthworks may alter surface water flows. Fire (introduction of ignition sources) may alter the existing fire regime leading to changes in vegetation and/or vegetation and fauna casualties. Vehicle usage and refuelling may result in hydrocarbon spills. Dust emissions and altered landforms (including strategic borrow pits) may affect visual amenity. Temporary workforce access to MCNP may decrease amenity and increase traffic and associated public safety risks within MCNP.	Implement measures to meet the objectives in the CEMP (Appendix 1), including: • implementing weed control measures • duplicating culverts, drains and levees of the existing rail line to minimise impact on surface water flow • implementing fire prevention and suppression measures • implementing standard dust suppression measures • implementing hydrocarbon management measures to reduce the potential risk of spillage • no bulk storage of hydrocarbons in MCNP • implementing workforce management measures • sourcing borrow from outside MCNP to minimise impact on visual amenity.	There will be no significant additional modification of the current surface hydrological regime as a result of the Project. Weeds will be managed such that there will be no significant additional impact on values of MCNP as a result of the Project. There will be no significant impact on the values of MCNP as a result of hydrocarbon spills. Areas of change to the landscape will be restricted to locations in MCNP which have already been modified through historical construction activities and existing infrastructure and no borrow pits will be located within MCNP. Dust control measures will ensure that no significant impact on the values of MCNP will result from dust emissions. The presence of a temporary workforce in the Project area will not significantly affect MCNP values. The Project is consistent with EPA objectives, as the environmental values of the MCNP will be maintained.

Factor	EPA Objective	Existing Environment	Potential Impacts	Proposed Management	Predicted Outcomes
4. Aboriginal heritage	To ensure that changes to the biophysical environment do not adversely affect historical and cultural associations and comply with relevant heritage legislation.	The Project area is subject to two registered native title claims, the Ngarluma and the Yindjibarndi. Approximately 55 Aboriginal sites potentially occur within the Project area including engravings, scatters, mythological, quarries, camps, water sources and grinding patches. The number of actual sites that may be located within the Project area is unknown; however, heritage and ethnographic surveys in conjunction with Yindjibarndi participants are scheduled for early 2011.	Physical disturbance to the land surface during construction and development of the rail infrastructure has the potential to disturb heritage sites and affect creeks with ethnographic or cultural value. Disturbance to watercourses for rail crossings has the potential to lead to disturbance of cultural values and downstream ethnographic sites.	Implement measures to meet the objectives in the CEMP (Appendix 1), including: • marking all heritage sites on the Pilbara Iron Geographical Information System to inform planners to avoid where possible • undertaking additional survey work within the Project area as required to identify any additional heritage sites • continuing consultation with the relevant traditional owner groups including discussion regarding the possible salvage, display and storage of some of the cultural material from heritage sites, where ground disturbance is unavoidable • preventing unauthorised ground disturbance activities through implementation of the Proponent's Ground Disturbance Authorisation Procedure for all areas to be disturbed • including education regarding Aboriginal sites in inductions for contractors and personnel working on the development • stopping work and contacting the Rio Tinto Heritage Team and the Department of Indigenous Affairs where archaeological material is uncovered; then assessing the site using a heritage consultant and managing the site in accordance with the Proponent's internal Indigenous Heritage Management Procedure. The police will also be notified if the site contains human remains.	Ethnographic and heritage surveys will be undertaken prior to any ground disturbance to identify sites of Aboriginal significance. Significant Aboriginal sites will not be disturbed without authorisation. All aspects of the Project will be carried out in accordance with EPA Guidance Statement No. 41 (EPA 2004d) through the implementation of a Cultural Heritage Management Plan and relevant agreements with native title claimant groups, thereby avoiding impact to Aboriginal sites of significance.

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1. INTRODUCTION

1.1 BACKGROUND

Rio Tinto Iron Ore (Rio Tinto), in conjunction with its joint venture partners, owns and operates a rail network located within the Pilbara region of Western Australia that transports iron ore from its mine sites to its ports at Dampier and Cape Lambert. A part of this rail infrastructure includes a length of rail line between Cape Lambert and Emu Siding (located approximately 70 km south of Cape Lambert) (Figure 1).

The line was initially constructed pursuant to the *Iron Ore (Robe River) Agreement Act 1964* to construct a rail line from Cape Lambert to Pannawonica in the 1970s. Robe River Mining Co. Pty. Ltd. (Robe) solely operated the rail line between Cape Lambert and Pannawonica until sharing of infrastructure was approved by the Minister of State Development pursuant to the relevant State Agreements (Section 2.3.2). Following this agreement, the rail line is managed by Pilbara Iron Pty Ltd which oversees the daily operation of the Rio Tinto rail network.

Rio Tinto is currently investigating the opportunity to expand its iron ore operations in the Pilbara from a current capacity of 220 million tonnes per annum (Mtpa) to 333 Mtpa. This will involve the establishment of new mines, expansion of existing mines, expansion of its existing port facilities at Dampier and Cape Lambert and the upgrade of its existing rail network in order to accommodate this additional capacity.

1.2 JUSTIFICATION FOR THE PROJECT

Rio Tinto is growing as a result of market demand, primarily from Asia. Iron ore production from its mining operations in the Pilbara region has expanded from less than 100 Mtpa in 2003 to its current tonnage of approximately 220 Mtpa.

Iron ore is now the largest individual mineral sector by value in Western Australia, accounting for 30% of the value of Western Australian resources output for 2007 (DoIR 2008). Recent growth in world sea-borne trade in iron ore has been driven by China, whose iron ore imports have risen from 70 Mt in 2000 to over 600 Mt in 2009 (DMP 2010). Western Australian iron ore exports reached sales values of $33.7 billion in 2009-2010 (DMP 2010).

In order to keep pace with the rising worldwide demand for iron ore, Rio Tinto is assessing options to expand its production from its Pilbara iron ore operations to 320 Mtpa. The Cape Lambert to Emu Siding Rail Duplication Project (the Project) is a critical requirement for increasing Rio Tinto's rail capacity, as it will allow the transport of greater tonnages to Cape Lambert and Dampier for export purposes.

1.3 PROJECT OVERVIEW

The Project involves the duplication of the rail line between the port at Cape Lambert and Emu Siding. This rail duplication will take place adjacent to the existing rail line over a distance of approximately 70 km (Figure 1).

A marshalling yard is required at the Cape Lambert port in order to manage train movements. This will be located between the 6 and 10 km point of the rail alignment (Figure 5).

The Project will disturb up to 1750 ha of vegetation, which includes area for the rail line, borrow pits and laydown areas required for construction. Up to 910 ha will be progressively rehabilitated during and after construction of the rail line. During operations, clearing of regrowth vegetation will be required within the rail infrastructure corridor for both maintenance and safety reasons.

The duplicate line will run mostly parallel to the existing line at a distance ranging from 5 – 50 m away, except in five sections where separation will range from 100 – 500 m. A number of crossovers will also be constructed to allow train movements between the two lines.

The Project will be largely constructed adjacent to the existing rail line that runs from Cape Lambert (situated approximately 38 km east of Karratha), to Emu Siding (situated within an infrastructure corridor in the northern part of Millstream-Chichester National Park [MCNP]) (Figure 1).

Approximately 10 km of the rail corridor is within the boundary of MCNP in *Land Administration Act 1997* leases L123390, L195323 and *Mining Act 1978* Miscellaneous Licence ML47/228. Both leases are excised from the MCNP. Rio Tinto will submit Programs of Work and Mining Proposals to the Department of Mines and Petroleum (DMP) for assessment and approval for any proposed ground disturbing/construction works that are to be undertaken on a Miscellaneous Licence.

The duplicate rail line will cross Western Creek and Miller Creek (located south of North West Coastal Highway), which will require the construction of two bridges. Construction of a number of culverts will also be required as the route will cross several smaller creeks and drainage lines.

1.4 THE PROPONENT

The proponent for the Project is Rio Tinto Iron Ore (Australia), which owns 53% of Robe River Mining Company (Robe) and 100% of Hamersley Iron Pty Ltd (Hamersley).

The contact person at Rio Tinto for the Project is:

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7,680,000 mN
7,670,000 mN
7,660,000 mN
7,650,000 mN

Cape Lambert
Wickham
Roebourne
Arches Siding
Harding Siding
Harding Dam
Emu Siding
EPS Boundary
Millstream-Chichester National Park

North West Coastal Highway
Cherratta Road

LEGEND

- New EPS Boundary
- National Park
- Harding Dam Water Reserve
- Harding Dam Catchment Area
- Rail Siding
- Exisiting Railway
- Highway
- Major Road
- Minor Road
- Rail Access Road
- Town Roads

N

SCALE

0 1 2 3 4 5 6km

1:210 000 @ A3

RioTinto

Figure 1
Cape Lambert-Emu Siding Rail Duplication Location Overview

Drawn: M.Swebbs
Date: April, 2011

Plan No: PDE0062888v8
Proj: MGA94 Zone50

1.5 PURPOSE AND SCOPE OF THIS DOCUMENT

The purpose of this document is to describe the Project and the environment both within and adjacent to (where possible) the Project area; assess the potential environmental impacts of the Project; and outline management measures to mitigate these impacts.

This document, which is presented as an Assessment on Proponent Information (API), gives supporting information for referral of the Project under Part IV of the *Environmental Protection Act 1986* (EP Act).

1.6 STRUCTURE OF THIS DOCUMENT

This document is structured as follows:

- **Introduction and Background**
  - background to the Cape Lambert to Emu Siding Rail Duplication Project
  - environmental impact assessment process.
- **Overview of the Existing Environment**
- **Description of the Project**
- **Environmental Review of the Project**
  - stakeholder consultation
  - factor-by-factor environmental impact assessment and mitigation.
- **Environmental Management**
  - outline of the Cape Lambert to Emu Siding Rail Duplication Project Environmental Management Program
  - proposed environmental control instruments and conditions.
- **Construction Environmental Management Plan and Supporting Documents in Appendix 1**.

1.7 RELEVANT ENVIRONMENTAL LEGISLATION AND POLICY

State Legislation, Policy and Strategies

Western Australian legislation relevant to the environmental aspects of the Project includes the following:

- *Aboriginal Heritage Act 1972*
- *Agricultural and Related Resources Protection Act 1976*
- *Bush Fires Act 1954*
- *Conservation and Land Management Act 1984* (CALM Act)
- *Contaminated Sites Act 2003*
- *Country Areas Water Supply Act 1947*
- *Dangerous Goods and Safety Act 2004*
- *Environmental Protection Act 1986* (EP Act)
- *Health Act 1911*
- *Iron Ore (Hamersley Range) Agreement Act 1963*
- *Iron Ore (Robe River) Agreement Act 1964*
- *Land Administration Act 1997*
- *Local Government Act 1995*
- *Main Roads Act 1930*
- *Mining Act 1978*
- *Native Title (State Provisions) Act 1999*
- *Occupational Safety and Health Act 1984*
- *Rights in Water and Irrigation Act 1914*
- *Soil and Land Conservation Act 1945*
- *Transfer of Land Act 1893*
- *Waterways Conservation Act 1976*
- *Wildlife Conservation Act 1950* (WC Act).

In addition to existing legislation, Western Australian Government agency strategies and policies relevant to the environmental assessment and management of the Project includes the following:

- Government of Western Australia 2003, *Western Australian State Sustainability Strategy*
- Government of Western Australia 2004, *Draft Greenhouse Strategy for Western Australia*
- DEC 1987, *State Conservation Strategy*
- Water and Rivers Commission 1999, *Harding Dam Water Source Protection Plan - West Pilbara Water Supply Scheme*
- DEC 2007, *Millstream-Chichester National Park and Mungaroona Range Nature Reserve Draft Management Plan*
- Water and Rivers Commission 2001, State Water Quality Management Strategy
- EPA 2000 Position Statement No. 2 “Environmental Protection of Native Vegetation in Western Australia”
- EPA 2002, Position Statement No. 3 “Terrestrial Biological Surveys as an Element of Biodiversity Protection”
- EPA 2004, Position Statement No. 7 “Principles of Environmental Protection”.

Commonwealth Legislation, Policy and Strategies

Commonwealth legislation relevant to the environmental aspects of the Project includes the following:

- *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act)
- *Aboriginal and Torres Strait Islander Heritage Protection Act 1984* (which operates concurrently with any existing State laws in so far as those laws would not be consistent with this Act)
- *National Greenhouse and Energy Reporting Act 2007*
- *Native Title Act 1993*.

The following national environmental strategies are also relevant to the Project:

- *National Strategy for Ecologically Sustainable Development* (ESDSC1992) (Section 6.2)
- *Intergovernmental Agreement on the Environment* 1992
- *National Greenhouse Strategy* (Commonwealth of Australia 1998)
- *National Conservation Strategy for Australia* (DHAE 1982)
- *National Strategy for Conservation of Australia's Biological Diversity* (ANZECC 1996) (Section 6.2).

International Agreements

International agreements relevant to the environmental aspects of the Project include the following:

- Japan-Australia Migratory Bird Agreement (JAMBA), China-Australia Migratory Bird Agreement (CAMBA) and Republic of Korea-Australia Migratory Bird Agreement (ROKAMBA) – Australia is party to the JAMBA, CAMBA and ROKAMBA
- Convention on Biological Diversity (Rio Convention)
- Convention on Wetlands of International Importance (Ramsar Convention)
- Convention on the Conservation of Migratory Species of Wild Animals (Bonn Convention).

Other Obligations and Agreements

- National Wetlands Program
- National Wild Rivers Project
- The Australian International Council on Monuments and Sites Charter for the Conservation of Places of Cultural Significance (the Burra Charter).

1.8 ENVIRONMENTAL IMPACT ASSESSMENT PROCESS

The Project was originally referred to the EPA on 20 March 2008, following consultation with stakeholders. Based on the information contained in the referral, the EPA determined it appropriate to assess the proposal through the EPS process in accordance with the Environmental Impact Assessment Administrative Procedures 2002 prescribed under the EP Act.

Following the release of the Environmental Impact Assessment Administrative Procedures 2010, the EPA advised Rio Tinto to re-refer the Project to the EPA to be assessed under the new procedures as an API (Figure 2). The API level of assessment provides for assessment of a proposal where the environmental acceptability or unacceptability of the proposal is apparent at the referral stage.

A public review period is not considered necessary either because the proponent has appropriately and effectively consulted with the stakeholders during the preparation of the proposal, or further consultation through a public review process is unlikely to identify additional stakeholders or raise additional significant environmental issues.

The EPA applies an API level of assessment where the proponent has provided sufficient information about the proposal, its environmental impacts and proposed management, and the proposal is conformant with category A criteria listed below.

The proponent believes its proposal should be assessed at the API level and through this document demonstrate conformance with category A. The proponent has discussed the potential for the proposal to be assessed at this level with the Office of EPA prior to referring the proposal.

Category A

For a referred significant proposal to be assessed at an API level of assessment all of the following criteria must be met:

(a) the proposal raises a limited number of significant environmental factors that can be readily managed, and for which there is an established condition setting framework;

(b) the proposal is consistent with established environmental policy frameworks, guidelines and standards;

(c) the proponent can demonstrate that it has conducted appropriate and effective stakeholder consultation; and

(d) there is limited, or local, interest only in the proposal.

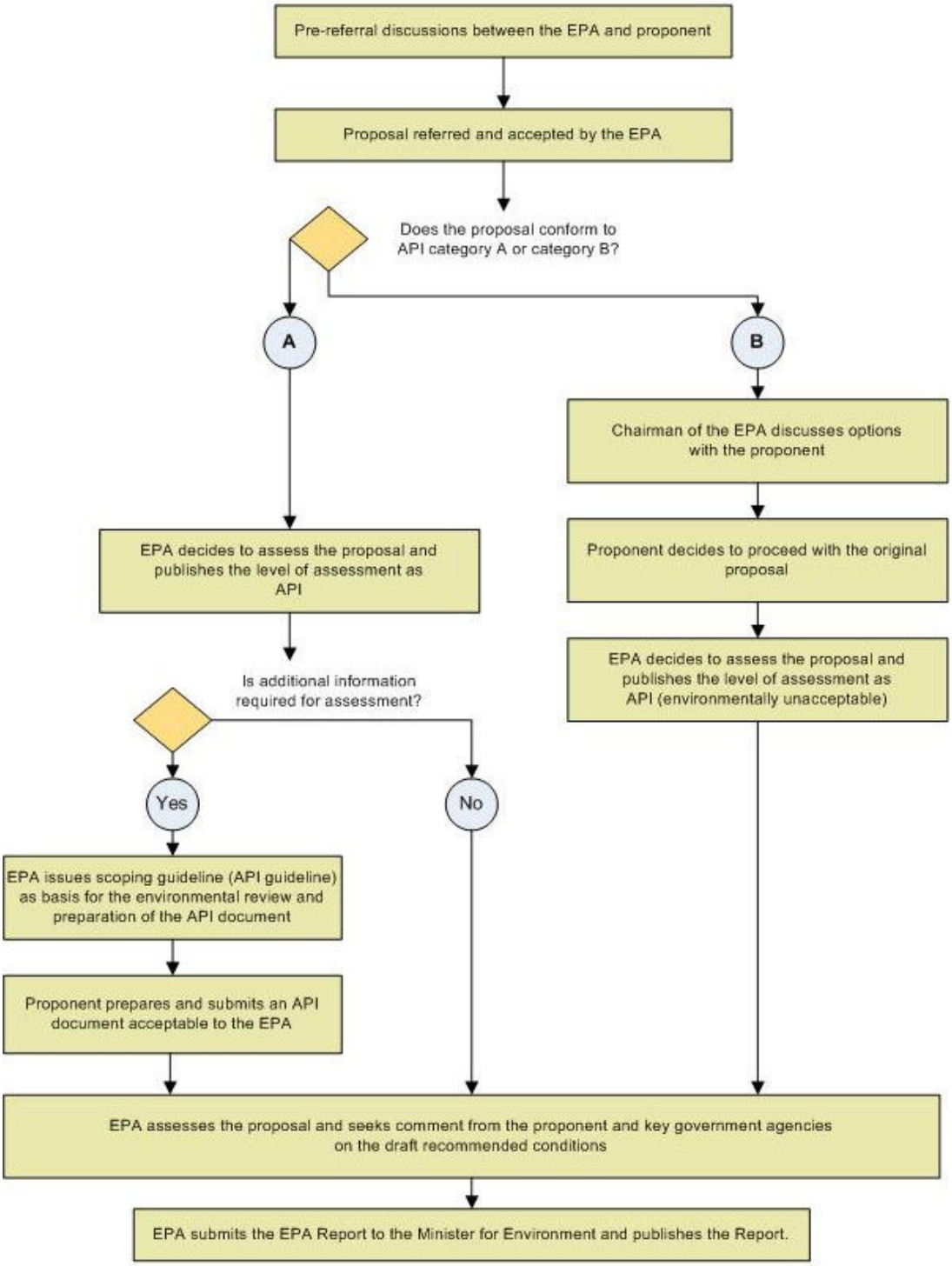


Figure 2 Flowchart of the Assessment on Proponent Information (API) Process

2. OVERVIEW OF EXISTING ENVIRONMENT

2.1 PHYSICAL ENVIRONMENT

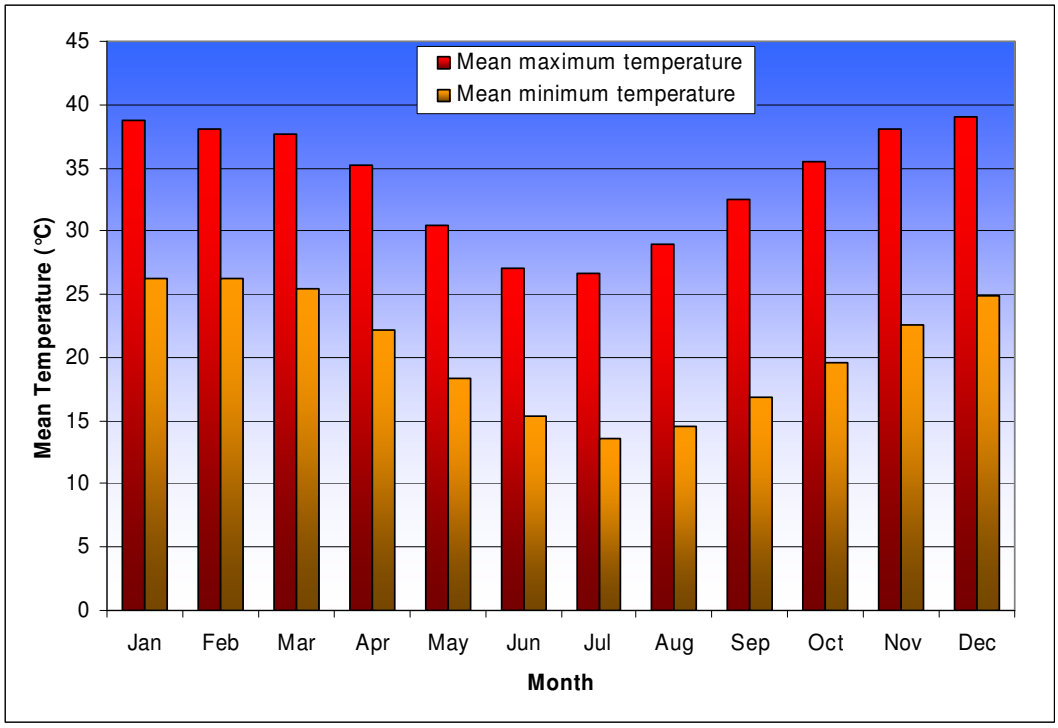
2.1.1 Climate

The Pilbara region has an arid tropical climate with two distinct seasons (Gentilli 1972). The region experiences very low rainfall, high evaporation and high daytime temperatures.

The summer months extend from November to April, with average monthly temperatures ranging from 22 to 39 °C. Winter months extend from May to October, with average monthly temperatures ranging from 13 to 36 °C (BOM 2008; Figure 3).

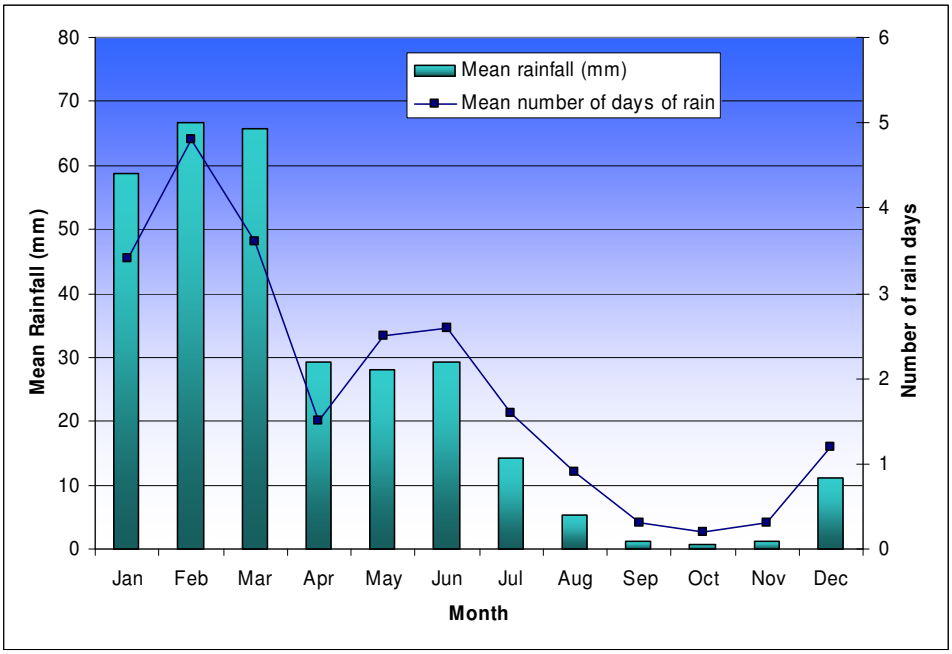
The average annual rainfall for Roebourne is approximately 300 mm but is very erratic. Average monthly rainfall ranges from almost zero from September to November, to around 66 mm in February and March (BOM 2008; Figure 4). Intense rainfall events occur occasionally as a result of cyclonic activity, usually during the months of January to March. Cyclones can result in more than 100 mm of rain falling within a 24-hour period. These intense rainfall events can cause sheet flooding, recharging of local superficial aquifers and extensive mechanical erosion.

Average annual evaporation in the vicinity of Roebourne is over 3200 mm, greatly exceeding the average annual rainfall and contributing to the arid environment of the region (BOM 2008).



Source: Bureau of Meteorology (2008)

Figure 3 Mean monthly maximum and minimum temperatures for Roebourne



Source: Bureau of Meteorology (2008)

Figure 4 Monthly rainfall data showing rainfall and number of rain days for Roebourne

2.1.2 Landform and Topography

Major Physiographic Unit

The Pilbara region is considered to contain eight physiographic subdivisions: Onslow Coastal Plain; Abydos Plain; Gorge Ranges; Oakover Valley; Chichester Plateau; Fortescue Valley; Hamersley Plateau; and Stuart Hills. The proposed rail line traverses both the Abydos Plain and Chichester Plateau physiographic units (Beard 1975) (Table 1).

Table 1 Physiographic Subdivisions of the Project Area

Physiographic unit	Topography	Vegetation
Abydos Plain	The plain extends from Cape Preston to the Chichester Range in the south. It is traversed by a number of north-flowing rivers, rising in the Chichester Plateau. The granite plain includes alluvial plains, pediplains, low stony hills, granite outcrops and dissected pediments. Soils largely comprise granitic soils with alluvial sands on the coastal portion.	The vegetation of the Abydos Plain includes shrub steppe, dwarf-shrub steppe, grass plains, and a coastal complex.
Chichester Plateau	Narrow long unit forms a watershed between the numerous rivers flowing north to the coast and the Fortescue River drainage on the southern side. The summit of the plateau, standing at approximately 400-500 m above sea level consists mainly of a high-level gently undulating plain and is only dissected at the eastern and western extremities. Dominant soils are hard alkaline and other red soils, with shallow loams related to rock outcrops. Substantial areas are without soil cover.	On the high plains, the vegetation is principally Acacia shrub steppe on the alkaline red soils, transitioning to grass savanna on the clay soils on the lower portions.

Source: Adapted from Ruprecht & Ivanescu (2000) and Beard (1975)

Land system (rangelands)

Eleven land systems, as mapped by the Department of Agriculture (van Vreeswyk *et al.* 2004) for the Pilbara region occur across the Project area. Table 2 summarises the extent of each land system within the Project area and the proportion this represents of their extent in the region.

Table 2 Land systems (Rangelands) within the Project Area and their wider representation in the Chichester and Roebourne Subregions

Land system	Description	Subregion	Extent within Subregion (ha)	Extent within Project Area (ha)	% of Total within Subregion
Boolgeeda (RGEBGD)	Stony lower slopes and plains below hill systems supporting hard and soft spinifex grasslands and mulga shrublands.	Chichester	167 663	872	0.52
		Roebourne	961 635	423	0.044
Calcrete (RGECAL)	Low calcrete platforms and plains supporting shrubby hard spinifex grasslands.	Chichester	47 936	136	0.28
Capricorn (RGECPN)	Rugged sandstone hills and ridges; hard spinifex or stony short grass forb pasture in fair to good condition; no erosion.	Chichester	482 692	463	0.1
Horseflat (RGEHOF)	Gilgaied clay plains supporting tussock grasslands and minor grassy snakewood shrublands.	Chichester	27 140	588	2.17
		Roebourne	328 122	208	0.06
Pyramid (RGEPYR)	Stony gilgai plains supporting hard spinifex grasslands and minor tussock grasslands.	Chichester	20 750	244	1.17
River (RGERIV)	Active flood plains and major rivers supporting grassy eucalypt woodlands.	Chichester	258 779	466	0.18
		Roebourne	107 322	72.2	0.07
Rocklea (RGEROC)	Basalt hills, plateaux, lower slopes and minor stony plains supporting hard spinifex grasslands.	Chichester	2 125 314	1338	0.06
		Roebourne	2 881 200	2	<0.0001
Littoral (RGELIT)	Bare coastal mudflats with mangroves on seaward fringes, samphire flats, sandy islands, coastal dunes and beaches.	Roebourne	210 733	54	0.026
Cheerawarra (RGECHE)	Sandy coastal plain and saline clay plains supporting salt and hard spinifex grasslands and minor tussock grasslands.	Roebourne	49 211	75	0.152
Ruth (RGERUT)	Hills and ridges of volcanic and other rocks supporting hard spinifex grasslands.	Roebourne	169 300	359	0.212
Uaroo (RGEUAR)	Broad sandy plains supporting shrubby hard and soft spinifex grasslands.	Roebourne	987 066	11	0.001

Source: van Vreeswyk *et al.* (2004)

2.1.3 Watercourses and Surface Hydrology

The duplicate rail line will cross Miller Creek (46 km from Cape Lambert), Western Creek (76 km from Cape Lambert), and several smaller creeks and drainage lines.

Rivers in the Pilbara region are ephemeral and flow only occasionally. They are dry most of the year, except for chains of pools in larger rivers that may last for several months. In some cases the pools are due to the occurrence of springs along the river courses. After heavy rains, the rivers flood and often overflow their banks and inundate the coastal plain (Ruprecht & Ivanescu 2000).

The Project will also traverse the Harding Dam catchment. The Harding River is formed by the junction of three main tributaries: Western Creek; Harding River; and Harding River East. These flow roughly parallel to each other and have their confluence about 12 km upstream of the Harding Dam. A fourth stream formed by the junction of Fish Creek and Springs Creek, drains the easternmost part of the catchment and flows into the Harding River 3 km upstream of Harding Dam. While the streams in the north and west tend to have well defined courses, streams in the lower reaches of the catchment are wide and braided, often with many parallel and interlinked branches (Ruprecht & Ivanescu 2000).

The Project area is located within the Pilbara Surface Water Area declared under the *Rights in Water and Irrigation Act 1914* (RIWI Act). The southern 39 km of the Project area is located within the Priority 1 Public Drinking Water Source Area (PDWSA) associated with the Harding Dam catchment area (WRC 1999).

Towards Emu Siding, the Project will be approximately 30 km from the Millstream Water Catchment Area. This catchment covers an area of approximately 13 300 km^2 and contains a Priority 2 PDWSA. No drainage from the Project area will flow into the Millstream Water Catchment Area.

2.1.4 Hydrogeology

There is substantial surface water to groundwater interaction in the Pilbara region. Where riverine vegetation has established (typically *Eucalyptus* or *Melaleuca* spp.), it is likely that the vegetation is supported by groundwater in the river alluvium (Ruprecht & Ivanescu 2000).

The Project area is underlain by fractured-igneous rock aquifers in the granite and greenstone rocks of the Pilbara Craton (Johnson 2004). The groundwater mainly occurs in the upper weathered zone and where it has been intruded by quartz and pegmatite veins. The granite aquifers are locally productive from intense fracturing, mostly around intrusive quartz veins. The greenstone forms local aquifers with the best prospects in the more brittle and resistant units (Banded Iron Formation, quartzite and felsic volcanics), particularly where they underlie or are adjacent to drainages. Groundwater salinity in the granite-greenstone aquifers ranges from less than 500 mg/L along drainages to greater than 10 000 mg/L TDS (Johnson 2004).

2.2 BIOLOGICAL ENVIRONMENT

2.2.1 Vegetation and Flora

Vegetation

The duplicated rail line will fall mostly within the Chichester subregion (PIL 1) of the Pilbara Interim Biogeographic Region of Australia1 (IBRA). A small section of the Project area is on the western boundary of the Roebourne subregion (PIL 4). The Pilbara region has been nominated by the Commonwealth as one of fifteen (15) national

[1] Australia has been divided into 85 Interim Biogeographic Regions, derived from information on climate, lithology, geology, landform, vegetation, flora and fauna (SEWPaC 2010). The Pilbara (IBRA) region is divided into four subregions: Hamersley, Chichester, Fortescue Plains, and Roebourne.

biodiversity 'hotspots', due to high species diversity and associated endemism observed in the area, and the human activity in this area that is putting its natural values at risk (DEWHA 2007).

Chichester Subregion

The PIL1 subregion is 9 044 560 ha in size and "comprises the northern section of the Pilbara Craton. Undulating Archaean granite and basalt plains include significant areas of basaltic ranges. Plains support a shrub steppe characterised by *Acacia inaequilatera* over *Triodia wiseana* (formerly *Triodia pungens*) hummock grasslands, while *Eucalyptus leucophloia* tree steppes occur on ranges" (Kendrick & McKenzie 2001).

There are no Threatened Ecological Communities (TECs) listed for the Chichester subregion.

Roebourne Subregion

The PIL 4 subregion is 2 008 983 ha in size and "comprises Quaternary alluvial and older colluvial coastal and sub-coastal plains with a grass savannah of mixed bunch and hummock grasses, and dwarf shrub steppe of *Acacia stellaticeps* or *A. pyrifolia* and *A. inaequilatera*. Uplands are dominated by *Triodia* hummock grasslands. Ephemeral drainage lines support *Eucalyptus victrix* or *Corymbia hamersleyana* woodlands. Samphire, *Sporobolus* and mangal occur on marine alluvial flats and river deltas" (Kendrick & Stanley 2001).

There are no TECs listed for the Roebourne subregion.

Vegetation of the Project area is discussed in more detail in Section 6.

Significant Flora

A database search of DEC records indicates that one Priority 1 species, one Priority 2 species and three Priority 3 species may potentially occur in the Project area (Biota 2008a, GHD 2008). Flora of the Project area is described further in Section 6.

2.2.2 Fauna

The Project area comprises a range of habitat units, distinguished on the basis of differences in substrate, landform and vegetation. These habitat types are described further in Section 7.1.1.

Biota (2008b, 2008e) conducted fauna surveys within and adjacent to the Project area during April and September 2008. A total of 131 terrestrial vertebrate fauna species were recorded during the Biota (2008b, 2008e) surveys.

Several species of conservation significance may occur within the Project area; these are discussed in Section 7.

2.3 SOCIAL ENVIRONMENT

2.3.1 Local Government and Towns

The Project area is partly within the Shires of Roebourne and Ashburton, and at its eastern-most extent, is approximately 1 km to the west of Wickham township. Other towns in proximity to the rail include Roebourne (approximately 4 km to the east), Cossack (approximately 6 km to the east) and Point Samson (approximately 6 km to the northeast).

The closest regional centre to the Project is Karratha, which is approximately 30 km west of the northern-most part of the Project area.

2.3.2 Tenure and Surrounding Land Use

Within the Project area, there are a number of different types of existing land ownership and tenure including various tenements under the *Mining Act 1978*, leases under the *Land Administration Act 1997* issued pursuant to the *Iron Ore (Robe River) Agreement Act 1964* and the *Iron Ore (Hamersley Range) Agreement Act 1963* and freehold land as administered by the Western Australian Land Information Authority (Landgate) (Table 3).

Approximately 10 km of the rail corridor is within the boundary of MCNP in *Land Administration Act 1997* leases L123390, L195323 and *Mining Act 1978* Miscellaneous Licence ML47/228. Both leases are excised from MCNP. Rio Tinto will submit Programs of Work and Mining Proposals to the DMP for assessment and approval for any proposed ground disturbing/construction works that are to be undertaken on a Miscellaneous Licence.

The Project area potentially extends beyond Robe's and Hamersley Iron's (HI) existing tenure into third party areas including the Water Corporation Reserves, the Karratha to Tom Price road reserve and the MCNP. Negotiations have commenced with the Water Corporation, Main Roads WA (MRWA), the Millstream Link Alliance, the Conservation Commission and DEC with regard to accessing and undertaking work within the reserves.

As discussed in Section 1, the Project area contains an existing rail line operated by Rio Tinto. Several access roads operated by the Rio Tinto or Water Corporation also occur within the Project area.

The southern 39 km of the Project area falls within the Harding Dam Catchment area, a Priority 1 PDWSA (Figure 1). The Project area is also in proximity to the Harding Dam itself, which is a popular tourist attraction and recreational area (Figure 1).

The southern 10 km of the Project area occurs within the MCNP (Figure 1). The Park is one of the primary tourist attractions in the Pilbara region, with several recreation areas located within the Park boundaries.

Table 3 Tenure for the Project Area

Type	Lease Number	Holder	Status	Description
Land Administration Act 1997 leases	L123390	Robe River Joint Venture Participants	Live	For existing Cape Lambert to Pannawonica rail line – 60 m wide; excised from MCNP.
	L123393	Robe River Joint Venture Participants	Live	Associated rail access road to above – 40 m wide; excised from MCNP.
	L195323	Hamersley Iron Pty Ltd	Live	For Dampier to Tom Price rail line – 80 m wide; excised from MCNP.
	L134607	Robe River Joint Venture Participants	Live	
	L126899	Robe River Joint Venture Participants	Live	
Mining Act 1978 miscellaneous licences	L47/47	Robe River Joint Venture Participants	Live	
	L47/102	Robe River Joint Venture Participants	Live	
	L47/103	Robe River Joint Venture Participants	Live	
	L47/224	Robe River Joint Venture Participants	Pending	Overlies various 3rd party tenements and Mt Welcome Pastoral Station.
	L47/225	Robe River Joint Venture Participants	Pending	Overlies various 3rd party tenements, Mt Welcome Pastoral Station and Reserve 18571.

Type	Lease Number	Holder	Status	Description
	L47/226	Robe River Joint Venture Participants	Pending	Overlies Water Corporation Reserve 35798, 42320, DOLA Reserve 9701, Mt Welcome Pastoral Station and various 3rd party tenements.
	L47/227	Robe River Joint Venture Participants	Pending	Overlies Water Corporation Reserve 35798, MCNP Reserve 30071 and various 3rd party tenements.
	L47/228	Robe River Joint Venture Participants	Pending	Overlies Water Corporation Reserve 35798, MCNP Reserve 30071, Vacant Crown Land and various 3rd party tenements.
	L47/303	Robe River Joint Venture Participants	Pending	Overlies Water Corporation Reserves 35798, 36991, Mt Welcome Pastoral Station, MCNP Reserve 30071, Vacant Crown Land and various 3rd party tenements.
	L47/304	Robe River Joint Venture Participants	Pending	Overlies various 3rd party tenements, Vacant Crown Land, Reserve 38009 and 36889.
	L47/306	Robe River Joint Venture Participants	Pending	Overlies Mt Welcome Pastoral Station, Reserve 18571 and various 3rd party tenements.
	L47/307	Robe River Joint Venture Participants	Pending	Mt Welcome Pastoral Station, Reserve 9701 and various 3rd party tenements.
	L47/308	Robe River Joint Venture Participants	Pending	Mt Welcome Pastoral Station, Reserve 35798 and various 3rd party tenements.
	L47/309	Robe River Joint Venture Participants	Pending	Mt Welcome Pastoral Station, Reserve 35798, 42320 and various 3rd party tenements.
Reserves vested in State entities	18571	Department of Regional Development and Lands (DRDL)		Stock route.
	9701	DRDL		De Grey – Mullewa Stock Route.
	42320	Water Corporation		Water supply
	36991	Water Corporation		Water supply and pipeline
	35798	Water Corporation		Water supply
	38009	Electricity Corporation		Government requirements – SEC
	30071	Department of Environment and Conservation		National Park

Millstream-Chichester National Park

MCNP contains a diverse and unique terrestrial and aquatic natural environment that includes ecologically significant wetlands of important natural value. These wetlands, supported by the Millstream Aquifer, provide habitat for a high diversity of flora and fauna (DEC 2007). Along with the Harding Dam, the Millstream aquifer is also important as a public drinking water supply for the Pilbara towns of Karratha, Dampier, Roebourne, Wickham and Point Samson (DEC 2007).

MCNP has very significant Indigenous cultural values and is one of the primary tourist attractions in the Pilbara region (DEC 2007). Recreation areas within MCNP are located at Millstream Homestead Precinct and Python Pool Precinct, which contain both walk trails and pools (DEC 2007).

The existing values of MCNP and the potential effects of the Project on these values are described in more detail in Section 8.

2.3.3 Aboriginal Heritage and Native Title

The Pilbara region has cultural value and includes many Aboriginal sites of significance. The Project area lies within the boundaries of two Aboriginal native title claims of the Ngarluma and Yindjibarndi claimant groups. Aboriginal heritage and the potential impacts of the Project are described further in Section 9.

A search of the DIA Register of Aboriginal Heritage sites found that approximately 55 Aboriginal sites potentially occur within the Project area (DIA 2008). However, as surveys have not yet been undertaken over the majority of the Project area, the number of actual sites located within the Project area is currently unknown.

2.3.4 European Heritage

Part of the Project area is within MCNP, which is an amalgamation of two parks listed in the Register of the National Estate – Chichester Range National Park and Millstream National Park.

Prior to amalgamation, the Chichester Range National Park was registered on the basis of significant panoramic scenery, including Python Pool and Pyramid Hill. The Millstream National Park was registered on the basis of significant and unique biology and scenery.

3. DESCRIPTION OF THE PROJECT

3.1 KEY COMPONENTS

The key components of the Project (Table 4) are:

- construction of approximately 70 km of duplicate rail line between Cape Lambert and Emu Siding
- construction and operation of a marshalling yard and associated infrastructure adjacent to Cape Lambert Port
- construction of a locomotive refuelling facility at Cape Lambert
- extension to the existing Emu Siding to service the Deepdale Line
- construction of a ballast load out facility adjacent to the existing 10 km quarry at Cape Lambert, construction of Arches Siding, modification of the existing Harding Siding and expansion of the existing 50 km quarry
- construction of crossovers between the existing and duplicate rail line at Arches, Harding, Green Pool and Emu Sidings to facilitate movement of trains between tracks
- installation of communication cabling, asset protection and signalling equipment including works to support Automated Train Operation (ATO) facilities
- excavation of material from borrow pits and an existing quarry (all within the development envelope, but outside of MCNP) to construct rail formation and access roads
- extraction of water preferentially from the West Pilbara Water Supply Scheme (Harding Dam), with a contingency of existing and/or new bores, to supply an estimated 2.5 GL of water over the five year construction period.

Table 4 Key Physical Components for the Project

Component	Description
Length	Approximately 70 km in total
Deviation from original rail line	5 – 500 m (Refer to Table 6 for detailed breakdown)
Crossovers	Up to 9
Bridges	2
Drainage structures	Approximately 130
Volume of Fill	Approximately 2 400 000 m^3
Volume of Cut	Approximately 1 640 000 m^3
Volume of Borrow Required	Approximately 1 186 000 m^3
Construction Land Clearing	Approximately 1750 ha

3.1.1 Footprint

The Project will disturb up to 1750 ha of vegetation (Table 5) of the total Project Area of 6000 ha (Figure 5 to Figure 9).

Table 5 Indicative Estimate of Footprint of the Project

Project Component	Footprint
Total Project Area	6000 ha
Rail construction (including water, communications cabling, access, and laydown and construction pads)	1150 ha
Borrow pits	400 ha
Marshalling yard and refuelling facility including realignment of gas pipeline	200 ha
Total Project clearing footprint	1750 ha
Total rehabilitation area (includes borrow pits, laydown areas, access roads)	910 ha
Permanent Project footprint	840 ha
Works within MCNP	
Rail construction	Up to 150 ha
Total MCNP rehabilitation area	50% of construction disturbance
Permanent footprint in MCNP	Up to 75 ha
Other	
Water usage	An estimated 2.5 GL of water over the 5 year construction period
Greenhouse gas emissions	72,550 tCO_2-e/y

All borrow pits will be rehabilitated after construction of the rail. Approximately 910 ha of the area disturbed by Project activities will be progressively rehabilitated following construction. Clearing of regrowth vegetation for maintenance and safety reasons will be required within the rail infrastructure corridor during operation.

Ongoing minor works post construction such as upgrades to communications equipment to facilitate rail operations within the Project area will be undertaken as necessary.

A substantial proportion of the proposed area of disturbance has been previously disturbed through the construction of the original rail line.

Based on preliminary design of the rail, construction disturbance within MCNP has been conservatively estimated at approximately 150 ha. This estimate includes clearing for the rail line and associated infrastructure, laydown areas, construction pads and access tracks. Up to 50% of disturbance will be rehabilitated following construction. Clearing amounts within MCNP will be refined in the more detailed design stages.

3.1.2 Exclusions from the Project

The following activities will be undertaken as part of the feasibility study for the Project and are not considered to constitute part of the referred Project:

- geotechnical evaluations, such as selective centre line test pitting of the rail route and testing of borrow pits
- construction of bores, including clearing of vegetation, drilling, completion and test pumping
- biological surveys (e.g. additional flora or fauna surveys).

Approval for these activities will be sought under the appropriate section of the EP Act or other legislation as required.

3.2 DESCRIPTION OF NEW RAIL LINE

The alignment will run mostly parallel to the existing line at a distance ranging from 5 – 50 m, except in five sections along the rail where further distances are being considered (Table 6). This variation in distance results from meeting more stringent contemporary design criteria.

Table 6 Chainages along rail line where distance of duplicate rail from existing rail will be greater than 50 m

Chainage	Distance from Existing Rail
11 km to 14 km	Approximately 500 m west of existing centre of curve
36 km to 37 km	Approximately 120 m west of existing centre of curve
47 km to 48 km	Approximately 120 m west of existing centre of curve
53 km to 55 km	Approximately 130 m west of existing centre of curve
72 km to 77 km	Approximately 500 m east of the Dampier line

3.2.1 Crossover Construction

Up to nine crossover locations are being considered for construction. The crossovers will be constructed as part of the Project to allow rail movement between the two lines and are subject to final design of the duplication. The crossovers will be located as follows:

- two crossovers at Arches (25.4 – 25.6 kp and 28.2 - 28.4 kp)
- two crossovers at Harding (41.9 – 42.1 kp and 44.6 – 44.8 kp)
- two crossovers at Green Pool (61.3 – 61.5 kp and 63.9 – 64.1 kp)
- three crossovers at Emu (70.8 – 71.0 kp, 75.2 – 75.3 kp and 78.1 – 78.3 kp).

3.3 CONSTRUCTION OF OTHER INFRASTRUCTURE

3.3.1 Bridges and Culverts

The Project includes construction of up to three bridges. Existing bridges will be replicated for crossings at Miller Creek (Figure 7) and Western Creek (Figure 9). To maintain surface water flows along the rest of the alignment, existing drainage structures (culverts) will be duplicated on the new line.

Selection of the most appropriate location and structural options will be based on assessment of costs and environmental factors. A key objective will be to minimise drainage shadow and maintain existing surface water flows.

3.3.2 Borrow Pits

The Project will require sourcing of borrow material from within the development envelope of the Project area. The location of these borrow pits will be determined following further detailed geotechnical investigations.

Rio Tinto acknowledges DEC concerns regarding sourcing borrow in MCNP and that a significant amount of work (including geotechnical investigations and visual amenity assessments) is required in order to address DEC concerns. As a result sourcing borrow in the MCNP will be referred to the EPA as a separate proposal, should investigations identify suitable borrow in appropriate locations. This rail duplication project will source borrow from outside of the MCNP and will truck it into the MCNP.

An existing quarry at 50 km along the rail line will be used to supply materials for use in construction of the rail duplication. In addition, a ballast load out facility will be constructed adjacent to the existing 10 km quarry at Cape Lambert to load ballast provided by sources outside of the Project area. An existing rail spur will be extended to allow the ballast loading facility to be constructed.

3.3.3 Marshalling Yard

As part of the Project, additional locomotives and ore cars are required. A marshalling yard will be constructed to provide a staging area for trains before they enter the dumpers at Cape Lambert. The marshalling yard will incorporate signalling, communications, train control, warehouse, refuelling facilities, ancillary infrastructure and general administration buildings.

The additional rail lines for the marshalling yard will straddle the existing alignment between the 6 km and 10 km point (Figure 5). The indicative final footprint for the marshalling yard is 200 ha.

3.3.4 Locomotive Refuelling and Service Facility

A refuelling and service facility is proposed to be located close to Cape Lambert at approximately the 9 km point (Figure 5). The facility will provide a refuelling, lubrication and washing service for the locomotives. It will contain storage for approximately 880 kL of diesel, 32 kL of oil, 20 kL of waste oil and 32 kL of coolant in above ground bunded tanks. Fuel will be stored and handled in accordance with the appropriate Australian Standards and Dangerous Goods Regulations.

506,000 mE
508,000 mE
510,000 mE
512,000 mE
514,000 mE
516,000 mE
7,716,000 mN
7,714,000 mN
7,712,000 mN
7,710,000 mN
7,708,000 mN
7,706,000 mN
7,704,000 mN
5km
6km
7km
8km
9km
10km
11km
12km
13km
14km
15km
16km
17km
18km
19km
20km
21km
Extent of
Marshalling Yards
Refueling Facility
Wickham
West
Coastal
North
Hwy
MAP EXTENTS
Figure 5
Figure 6
Figure 7
Figure 8
Figure 9
LEGEND
Proposed Rail Route
Current Railway Route
Project Area
SCALE
0 0.5 1 1.5km
1:40,000 @ A3
N
RioTinto
Cape Lambert - Emu Siding
Rail Duplication
Proposed Alignment &
Development Envelope
Figure 5
Drawn: M.Swebbs
Date: January, 2010
Plan No: PDE0062888v8
Proj: MGA94 Zone50

506,000 mE
508,000 mE
510,000 mE
512,000 mE
514,000 mE
7,702,000 mN
7,700,000 mN
7,698,000 mN
7,696,000 mN
7,694,000 mN
7,692,000 mN
7,690,000 mN
21km
22km
23km
24km
25km
26km
27km
28km
29km
30km
31km
32km
33km
34km
35km
Arches Siding

MAP EXTENTS
Figure 5
Figure 6
Figure 7
Figure 8
Figure 9

LEGEND

Proposed Rail Route
Current Railway Route
Preferred Alignment Project Area

SCALE

0 0.5 1 1.5km

1:40,000 @ A3

N

RioTinto

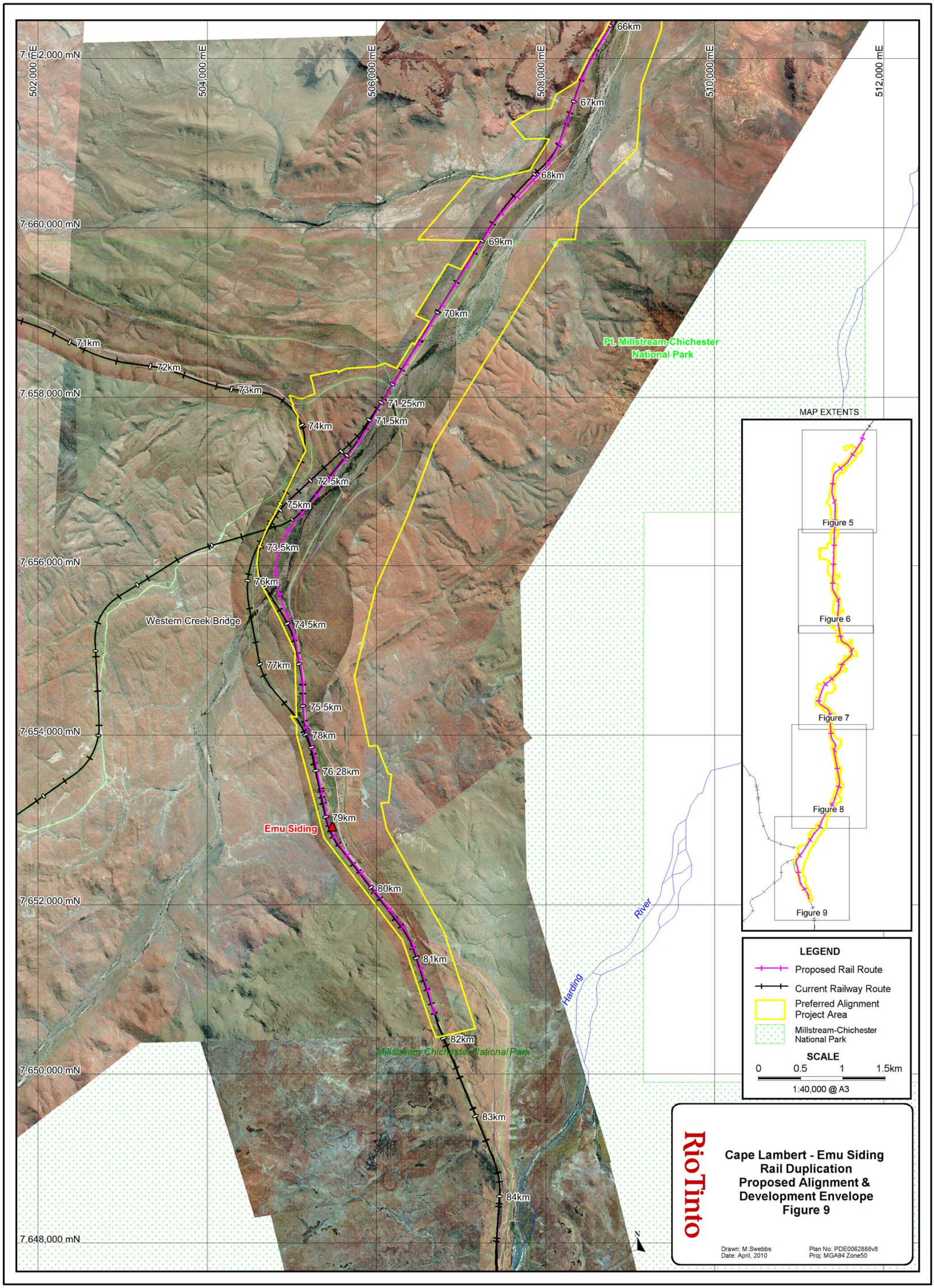
Cape Lambert - Emu Siding Rail Duplication Proposed Alignment & Development Envelope Figure 6

Drawn: M.Swebbs
Date: April, 2010

Plan No: PDE0062888v8
Proj: MGA94 Zone50

506,000 mE
508,000 mE
510,000 mE
512,000 mE
514,000 mE
7,688,000 mN
7,686,000 mN
7,684,000 mN
7,682,000 mN
7,680,000 mN
7,678,000 mN
7,676,000 mN
35km
36km
37km
38km
39km
40km
41km
42km
43km
44km
45km
46km
47km
48km
49km
50km
51km
52km
Harding Siding
Miller Creek Bridge
50km Quarry
Harding Dam Water Reserve
Harding
River
MAP EXTENTS
Figure 5
Figure 6
Figure 7
Figure 8
Figure 9
LEGEND
Proposed Rail Route
Current Railway Route
Preferred Alignment Project Area
Harding Dam Water Reserve
50km Quarry
SCALE
0 0.5 1 1.5km
1:40,000 @ A3
RioTinto
Cape Lambert - Emu Siding
Rail Duplication
Proposed Alignment &
Development Envelope
Figure 7
Drawn: M.Swebbs
Date: April, 2010
Plan No: PDE0062888v8
Proj: MGA94 Zone50
N

506,000 mE
508,000 mE
510,000 mE
512,000 mE
514,000 mE
7,674,000 mN
7,672,000 mN
7,670,000 mN
7,668,000 mN
7,666,000 mN
7,664,000 mN
7,662,000 mN
Harding
River
53km
54km
55km
56km
57km
58km
59km
60km
61km
62km
63km
64km
65km
66km
67km
MAP EXTENTS
Figure 5
Figure 6
Figure 7
Figure 8
Figure 9
LEGEND
Proposed Rail Route
Current Railway Route
Preferred Alignment Project Area
Preferred Borrow Pits
SCALE
0 0.5 1 1.5km
1:40,000 @ A3
N
RioTinto
Cape Lambert - Emu Siding Rail Duplication
Proposed Alignment & Development Envelope
Figure 8
Drawn: M.Swebbs
Date: April, 2010
Plan No: PDE0062888v8
Proj: MGA94 Zone50


502,000 mE
504,000 mE
506,000 mE
508,000 mE
510,000 mE
512,000 mE
7,662,000 mN
7,660,000 mN
7,658,000 mN
7,656,000 mN
7,654,000 mN
7,652,000 mN
7,650,000 mN
7,648,000 mN
66km
67km
68km
69km
70km
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72km
73km
74km
71.25km
71.5km
72.5km
75km
73.5km
76km
74.5km
77km
75.5km
78km
76.28km
79km
80km
81km
82km
83km
84km
Emu Siding
Western Creek Bridge
Pt. Millstream-Chichester National Park
Millstream-Chichester National Park
Harding River
MAP EXTENTS
Figure 5
Figure 6
Figure 7
Figure 8
Figure 9
LEGEND
Proposed Rail Route
Current Railway Route
Preferred Alignment Project Area
Millstream-Chichester National Park
SCALE
0 0.5 1 1.5km
1:40,000 @ A3
N
RioTinto
Cape Lambert - Emu Siding
Rail Duplication
Proposed Alignment &
Development Envelope
Figure 9
Drawn: M.Swebbs
Date: April, 2010
Plan No: PDE0062888v8
Proj: MGA94 Zone50

3.4 CONSTRUCTION PROCESS

3.4.1 Site Preparation

Clearing and Earthworks

Vegetation and approximately 100 mm depth of topsoil will be removed for construction of the rail duplication leading to the disturbance of up to approximately 1750 ha of land, of which about 910 ha will be rehabilitated.

Any topsoil removed will be either directly placed on areas undergoing rehabilitation, or stored in temporary stockpiles for later placement. All topsoil removed will be stored to achieve the following objectives:

- prevent compaction of the topsoil
- facilitate drainage
- reduce the risk of erosion and topsoil loss
- maintain an active population of soil microbes and seeds.

In areas of cut along the alignment, equipment such as excavators and dozers will be used to excavate material which will then be loaded into haul trucks. Water carts will be used to control dust emissions at these sites. The haul trucks will then transport the material along the haul road to areas requiring fill, or dispose of unsuitable material as appropriate.

Excavation of cut will aim to balance the ratio of cut excavated to fill required, such that minimal waste is produced. Where there is insufficient cut to meet fill requirements, borrow areas will be opened up to provide the required quantities to construct the embankments. Generally, as the rail duplication is occurring in areas where rail infrastructure exists, the suitability of existing materials can be estimated by examining the existing rail and road works in the areas adjacent to the proposed project area. This suitability will also be confirmed by an engineering geologist during the geotechnical investigation, ground breaking and earthworks phases of the Project. However, at times, excavated material may contain proportions of silt or clay that render it unsuitable as engineering material for use in either the railway embankment or railway embankment foundation, as it lacks the required strength for the embankment construction in the zone under the railway tracks. In these cases, unsuitable material will be used as fill in borrow pits or encapsulated within non load-bearing areas of the railway embankment. In both of these scenarios, the material will be used in such a way as to establish safe and stable landforms that are contoured to match the existing landscape and rehabilitated in accordance with the CEMP.

Visual examination of adjacent rail and road cuttings and geographic location, as well as the relatively small depths of the cuttings (no more than 1.5 m), indicate that geochemically adverse material is not expected to be intersected during the Project. Any activity undertaken during the construction and operation of the Project, that exposes or could potentially expose fibrous minerals, will be conducted in accordance with the CEMP and the Fibrous Material Management Procedure (Calibre 2011b; Appendix 1) to prevent exposure of personnel and the environment. Any material excavated from site, for fill or for the placement of infrastructure, shall be assessed (and documented) during geotechnical investigations for the likelihood of exposing fibrous minerals. Fibrous materials assessment will be undertaken by the Lead Geologist and/or Occupational Hygienist. Any fibrous waste identified during the Project will be disposed of at an appropriately licensed facility or in accordance with the Rio Tinto Fibrous Materials Management Plan (RTIO-PDE-0062061).

Borrow pits will be located along the existing alignment and haul roads will connect the borrow pits to the new alignment. Dozers will be used to rip the material in the borrow pit which will then be loaded into trucks for haulage to fill areas along the alignment.

Haul roads and borrow pits not required for ongoing operations will be progressively rehabilitated.

Drainage Structures

There are a number of tributaries that cross the existing rail alignment near the Harding Dam. During project design the existing drainage structures were checked and verified for capacity and the Project will duplicate the existing drainage structures and thereby maintain the existing surface drainage flows.

Diversion drains will typically be provided on the upstream side of the new alignment where the new alignment may affect an existing diversion drain or redistribution of approach flow is required between culverts. Similarly, a number of locations will require levees to control transverse flow between adjacent catchments and to develop headwater on sloping catchments.

3.4.2 Support Infrastructure and Consumables

The Project will require a number of minor support facilities and infrastructure for the duration of construction. These are described below.

Water Supply and Use

Water will be sourced preferentially from the Water Corporation's West Pilbara Water Supply Scheme (WPWSS). Rio Tinto is currently negotiating with the Water Corporation to access the WPWSS for the Project. The negotiations will also include a contingency plan to use new and existing bores in the vicinity of the Project, should it be decided that a supply risk be posed.

Separate to the Project, Rio Tinto will undertake hydrogeological investigations within the Project area. Bore construction licence applications have been submitted to the Department of Water (DoW) and an operating licence(s) will be sought under the RIWI Act.

During construction it is expected additional water requirements will be sourced from the WPWSS pipelines.

Power Supply

Electrical power requirements will be minimal and will be provided by transportable on-site diesel generators.

Fuel Supply

Fuel will be transported onto site and stored in either bunded above ground areas or within double skinned tanks. Designated refuelling areas will be established and implementation of refuelling procedures aimed at minimising the potential for spillage. Fuel will be stored and handled in accordance with the appropriate Australian Standards and Dangerous Goods Regulations. There will be no bulk storage of fuel within the MCNP or the Harding Dam catchment area.

Explosives Transport and Storage

Rock is present in some cutting locations and will therefore require blasting. Onsite storage and transport of explosives will be maintained in accordance with AS2187 – Explosives: Storage, Transport and Use. Explosives will not be stored within MCNP or the Harding Dam catchment area.

A specific Blast Management Plan will be prepared for the work, which will address transport and storage of the explosives.

Waste

Solid putrescible and inert waste will be collected and disposed off-site at an appropriately licensed facility. Sewage, wastewater from site buildings and other controlled waste (e.g. oily rags) will be appropriately stored until collection by a controlled waste contractor for disposal off-site to an appropriately licensed facility.

There will be no waste rock or soil stockpiles left at the end of construction as all excavated soil and rock will be used in construction of the rail line or in re-contouring the land for rehabilitation.

Communications

The fibre optic cable along the existing rail line where it intersects the Project area boundary will be relocated.

Construction accommodation

Accommodation for the construction workforce will be provided in the company's existing construction camps at Cape Lambert, Dampier and the proposed Northern Link camp.

Other Facilities

A transportable office, portable crib room, and toilets will be located at each of the Project work sites.

3.5 TIMING

Dependent on demand, market conditions and other relevant approvals, the construction for the Project is anticipated to commence in mid 2011 and to be completed by the end of 2015.

Once completed, ongoing minor works such as upgrades to communications equipment to facilitate rail operations within the Project area will be undertaken as necessary.

4. ENVIRONMENTAL PRINCIPLES AND SUSTAINABILITY

The Proponent recognises that environmental responsibilities go beyond those required under statutory regulation and encompass strong commitments to environmental management, leadership in sustainable development and social obligations.

4.1 PRINCIPLES OF ENVIRONMENTAL PROTECTION

The core set of Principles that are applied by the EPA in formal assessments (EPA 2004a), as listed in Section 4a of the EP Act, include:

- precautionary principle
- principle of intergenerational equity
- principle of the conservation of biological diversity and ecological integrity
- principles relating to improved valuation, pricing and incentive mechanisms
- principle of waste minimisation.

The Proponent has considered these principles in its assessment of the environmental impacts associated with the Project (Table 7).

Table 7 Principles of environmental protection

Principle	Consideration Given to the Project	Section Addressed in API
1. Precautionary Principle Where there are threats of serious or irreversible damage, lack of full scientific certainty should not be used as a reason for postponing measures to prevent environmental degradation. In the application of the precautionary principle, decisions should be guided by: a. careful evaluation to avoid, where practicable, serious or irreversible damage to the environment b. an assessment of the risk-weighted consequences of various options.	The Proponent includes a preliminary risk assessment process in the development of all new Projects with the intention of identifying issues early in the process, to identify investigations required and to enable planning for avoidance and/or mitigations. Part of assessment process includes undertaking detailed and comprehensive site investigations of the biological and physical environs consistent with EPA Guidelines, where applicable. Where these investigations identify significant conservation issues, measures are incorporated into the design of the Project and the management program to avoid, where practicable, and/or minimise any potential impacts.	Sections 6 to 9 (detailed assessment of major factors) and Section 10 (minor factors).
2. Intergenerational Equity The present generation should ensure that the health, diversity and productivity of the environment is maintained or enhanced for the benefit of future generations.	The Proponent integrates the principles of sustainable development (Section 11) into all aspects of their operations to contribute to sustainable development in Australia. These principles ensure that the Proponent's operations deliver more value with less impact, where: *Value* = long-term financial outcomes + social outcomes + environmental outcomes. *Impact* = financial cost + social impact + environmental impact. Integration of these sustainable development principles ensures the environment in which The Proponent operates is maintained and, where possible, enhanced for future generations.	Section 6.5.5 (rehabilitation) and Section 11 (management and conditions regarding conservation of biological diversity).

Principle	Consideration Given to the Project	Section Addressed in API
3. Conservation of Biological Diversity and Ecological Integrity Conservation of biological diversity and ecological integrity should be a fundamental consideration.	Conservation of biological diversity and ecological integrity is fundamental to the environmental management approach of The Proponent and is a major environmental consideration for the Project. This is reflected in the well-established approach by The Proponent to environmental management: '*Protect – Restore – Do it Better*'. Biological investigations consistent with EPA Guidelines have been undertaken by The Proponent early in the planning process to determine environmental factors of conservation significance that are required to be protected from significant disturbance. As well as designing Projects to ensure these aspects are not affected, management controls are put in place to ensure they are not unintentionally disturbed. The Proponent has well established rehabilitation guidelines for restoring disturbed environments, the aim of which is to '*establish sustainable endemic vegetation communities consistent with reconstructed landforms and surrounding vegetation'*. The Proponent also actively undertakes and/or contributes to biological research (e.g. stygofauna and Short-range Endemic (SRE) research; plant-water relationship studies along riparian systems) to improve the understanding and management of these biological aspects.	References in No. 1 above, *Precautionary Principle*, as well as Section 6.5.5 (rehabilitation) and Section 11 (management and conditions regarding conservation of biological diversity).
4. Improved Valuation, Pricing and Incentive Mechanisms a. Environmental factors should be included in the valuation of assets and services. b. The polluter pays principle – those who generate pollution and waste should bear the cost of containment, avoidance or abatement. c. The users of goods and services should pay prices based on the full life cycle costs of providing goods and services, including the use of natural resources and assets and the ultimate disposal of any wastes. d. Environmental goals, having been established, should be pursued in the most cost-effective way, by establishing incentives structures, including market mechanisms, which enable those best placed to maximise benefits and/or minimise costs to develop their own solutions and responses to environmental problems.	The Proponent acknowledges the need for improved valuation, pricing and incentives mechanisms and endeavours to pursue these principles when and wherever possible. For example: • environmental factors have played a major part in determining preferred options • the Proponent has designed the Project to ensure that pollution-type impacts are minimised as far as practicable and these are managed by the Proponent at its own cost • environmental goals will be pursued in the most cost-effective way.	Section 1.2 (justification of Project) and Section 6.5.5 (rehabilitation).

Principle	Consideration Given to the Project	Section Addressed in API
5. Waste Minimisation All reasonable and practicable measures should be taken to minimise the generation of waste and its discharge into the environment.	The approach of the Proponent to waste management is to (in order of priority): • avoid and reduce at source • reuse and recycle • treat and/or dispose. The Proponent operates or uses appropriately licensed landfills for the disposal of general domestic solid wastes and recycles scrap metal, rubber, waste oil and batteries. The Proponent continues to investigate other waste management opportunities with the aim of minimising waste generation and disposal requirements.	Section 3.4.2.

4.2 SUSTAINABILITY

Sustainable development may be defined as:

> *Development that meets the needs of the present without compromising the ability of future generations to meet their own needs.*

In the mining and metals sector, this means that investments should be financially profitable, technically appropriate, environmentally sound and socially responsible (Brundtland Commission 1987).

In September 2003, the Western Australian State Government released the State Sustainability Strategy (Government of Western Australia 2003). The strategy establishes a high-level approach to applying sustainability principles across government operations, including expectations for, and regulation of, the mining industry. The strategy recognises that '*the international minerals sector has been one of the most pro-active industries in embracing sustainable development'.*

4.2.1 Sustainability in the Mining Industry

The State Sustainability Strategy also recognises that a number of key sustainability innovations have been developed in the Western Australian resources sector, including land and water rehabilitation, eco-efficiency in mineral processing and, more recently, a range of social innovations. The training and employment of Aboriginal people is a recent example.

Rio Tinto undertakes all operations with consideration of *Rio Tinto: The Way We Work,* which outlines the Proponents Sustainable Development Policy:

> *Rio Tinto businesses, projects, operations and products should contribute constructively to the global transition to sustainable development.*
>
> *We contribute to sustainable development by helping to satisfy global and community needs and aspirations, whether economic, social or environmental. This means making sustainable development considerations an integral part of our business plans and decision making processes.*
>
> *By focusing on people, the environment, resource stewardship and management systems, we can better manage risk, create business options, reduce costs, attract the best employees, gain access to new markets and resources and deliver a better product to our customers.*
>
> *In practice, this depends on the active awareness of and support for Rio Tinto's principles and policies by each of us as individuals.*

The Proponent also applies sustainable development principles in the development (planning and decision-making) of all major projects. The Rio Tinto Iron Ore Sustainability Principles are:

- **Environment**
  - reduce water use
  - reduce net land disturbances and disruption of natural water bodies
  - reduce net biodiversity loss
  - reduce net emissions, particularly dust and greenhouse gases
- **Social**
  - reduce injury and illness incidents
  - improve equal employment opportunities
  - improve contribution to community capacity building
  - reduce impact to heritage
- **Economic**
  - optimise long-term economic value.

4.3 STAKEHOLDER CONSULTATION

Key stakeholders consulted during the preparation of the API are:

- Department of Environment and Conservation (DEC)
- Environmental Protection Authority (EPA) and Office of the Environmental Protection Authority Service Unit (OEPA)
- Department of Water (DoW)
- Conservation Commission of Western Australia
- Department of State Development
- Water Corporation
- Conservation Council of Western Australia
- Yindjibarndi Traditional Owners
- Ngarluma Traditional Owners
- Wong-Goo-Tt-Oo Traditional Owners
- China Metallurgical Group Corporation (MCC)
- Millstream Link Alliance/Main Roads WA (MRWA).

4.3.1 Consultation Details

Towards the end of 2007, the Proponent initiated a stakeholder consultation program for the Project. The timing of the consultation program has enabled the topics raised to be taken into account during the design of the Project, determination of management measures and preparation of the API.

A number of discussions and meetings have been held with the relevant government agencies (Table 8). Rio Tinto will carry out further consultation with relevant stakeholders during the environmental approval process.

A Community Advisory Group has been formed in Wickham and is utilised by the Proponent as a primary consultative mechanism with key community stakeholders. No specific engagement of this group in rail duplication discussions has taken place at this stage; however, consultation will occur prior to construction.

Consultation with Traditional Owners has only been preliminary during the project design phase; however, consultation will continue throughout the approval process with all relevant groups. This will ensure that:

- Traditional Owners are informed about potential environmental impacts of the proposed development
- Traditional Owners are provided an opportunity to make any concerns about environmental impacts known
- any concerns raised by Traditional Owners have been adequately considered.

Rio Tinto has initiated consultation with the DEC and Conservation Commission to determine their expectations in terms of offsets.

Table 8 Stakeholder consultation carried for the project

Stakeholder(s)	Purpose	Topics Raised	Proponent Response
Department of Environment and Conservation (DEC)	Rail project overview and briefing on the project to identify key environmental aspects	MCNP and the Harding Dam Catchment will be areas of focus.	Refer to Section 8 and 10.4.
		Importance of early engagement with the Conservation Commission.	Noted, Rio Tinto has initiated consultation.
		Key factors are vegetation, flora, fauna and possibly noise due to location of Wickham.	Refer to Sections 6, 7and 10.2.
		Location of borrow pits, especially in MCNP, Millstream Link Road and railway corridor.	Borrow will not be sourced within MCNP. Borrow will be trucked into MCNP. Refer to Section 8.4.4.
		Weed hygiene and management.	Weeds located in surveys have been recorded and appropriate treatment undertaken. The Construction EMP will address weed management during the construction period and during operations. Additional weed mapping has been conducted within MCNP and the results will be provided to Calibre and DEC prior to ground disturbance works in the MCNP. Refer to Section 6.5.2 and CEMP (Appendix 1).
		Avoidance of Priority species.	Priority species will be avoided where possible.
		Ensure no impact to existing hydrological regime.	Existing culverts/bridges will be replicated to avoid modifying the current hydrological regime.
		Water supply for Project.	Water will be sourced preferentially from the WPWSS and from new and existing bores as a contingency. Discussions are underway to utilise non-potable water from the Harding Dam for construction.
		Communication protocol.	Refer to Section 8.5.5.
OEPA	Discuss the preferred approach for referral of the project	Discussed referral of the Project.	Done.
		Agreed to refer sections of duplication (Cape Lambert to Emu) (Bell Bird to Juna Downs) as separate Projects.	
		Impacts on Threatened Ecological Communities (TEC)/Priority Ecological Communities (PEC).	Refer to Section 6.4.1.
		Risk of fauna entrapment in Fibre Optic Cable (FOC) trench.	It is proposed that the FOC will be laid in a rift created by a dozer tyne. The rift will be immediately backfilled preventing any opportunity for fauna entrapment.
		Assessment of options in the API not preferable. If required environmental values for each option to be tabulated.	Only one alignment option has been included in the Project.
		Amount of cut required.	The key physical components of the Project are outlined in Table 4.

Stakeholder(s)	Purpose	Topics Raised	Proponent Response
		Water sources for construction.	Refer to Section 3.4.2.
		Tenure.	Refer to Section 2.3.2.
	Discussion on proposed changes to scope of Project	OEPA confirmed their acceptance of the proposed changes to the scope of the Project on the provision that the Environmental Review document is changed as follows: • To reflect an API document • To clearly state that borrow within MCNP is not required for the development of this Project.	The following proposed changes to the scope of the Rail Duplication Project have been included in this API: • Rio Tinto is progressing with the central duplication, removing the western deviation from this scope • Rio Tinto will not source borrow within MCNP for the purposes of this Project • Rio Tinto will undertake the work required to address DEC concerns regarding sourcing of borrow in MCNP and will refer this as a separate proposal to the EPA to formally assess. This will form a strategic project to supply borrow to existing rail and future expansion projects in the vicinity. This Environmental Review document has been amended to reflect an API document.
Conservation Commission	Discuss the project in relation to the Millstream-Chichester National Park	Impacts to the values of MCNP should be minimised.	Refer to Section 8. Impacts on the conservation estate will be minimised through locating the duplication on previously disturbed ground and not sourcing borrow within MCNP for the purposes of this project. Of the 10 km within MCNP, 8 km will be located on previously disturbed areas. In total the clearing of native vegetation within MCNP will be approximately 150 ha, with up to 50% of total disturbance, rehabilitated at the completion of construction.
		Offsets package should be considered (independent of formal Part IV assessment).	Potential offsets (yet to be finalised in discussion with DEC) include: • support to treat weeds located in the vicinity of the rail system in the MCNP • rehabilitation of agreed historic Hamersley Iron and Robe borrow/disturbance areas during the construction period • assistance to DEC in updating the MCNP and Mungaroona Nature Reserve Draft Management Plan.
Department of Water (DoW)	Briefing on the project to identify key hydrological aspects	Construction water supply – consideration should be given to non-potable water from Harding Dam.	Rio Tinto will investigate this possibility with the Water Corporation.
		Construction/operation in water supply catchments (especially Harding Dam).	Rio Tinto will liaise with DoW in order to meet requirements of the Water Source Protection Plans.
		Construction aspects (concreting, hydrocarbons, inductions, incidents).	A CEMP will incorporate measures to deal with these aspects based on previous construction activities.
		Involving regulators in audits, incidents and close outs.	Rio Tinto will liaise with DEC regarding these aspects.
Conservation Council of Western Australia	Project Briefing	Will be dealing with all Projects on a strategic perspective. It will be the proponent's responsibility to engage local groups. Public consultation will be an important focus with proposed changes to the EP Act.	Rio Tinto will continue to engage the public through the Community Advisory Groups and other stakeholder consultation.
		Is there potential for GHG reduction measures such as electrification and regenerative	The potential for electrification of the rail system is being looked into. New locomotives are being selected to have higher fuel and GHG efficiency.

Stakeholder(s)	Purpose	Topics Raised	Proponent Response
		breaking?	
Water Corporation	Water supply from Harding Dam	Water supply for the project. Harding Dam allocation and management.	Rio Tinto and the Water Corporation will enter into a commercial agreement to access water, based on projected demands.
Department of State Development	Project Briefing	Location of the alternative alignment.	The alternative alignment is no longer included in the Project.
		Interaction with the proposed Anketell Industrial Estate.	The alternative alignment is no longer included in the Project and the chosen alignment will not affect the proposed Anketell Industrial Estate.
Millstream Link Alliance/Main Roads WA	Liaison to determine suitable borrow locations	To widen a number of existing road cuttings previously constructed by the Millstream Link Alliance as a source of fill for the rail embankment works. Main Roads raised concerns that machinery and equipment widening the cuttings would have an impact on traffic flow and safety along the Millstream Link Road.	Sourcing borrow within MCNP is not included in this Project. However should borrow in the road cuttings be sort as a separate process, Rio Tinto would undertake the following: • Construction barriers will be installed to maintain a safe working distance to the road. A specific management plan for each site would be developed to manage the traffic interface with the public. • Widening of cuttings to occur only if it is physically safe and logistically possible. • Where haulage is required along the Millstream Link Road, access onto the road will occur at points where appropriate site distance in both directions is maintained. • Rio Tinto will submit to Millstream Link Alliance/MRWA a preliminary proposal and a timeline for the proposed rail expansion project. • Rio Tinto will continue consultation with the Alliance/MRWA and address the topics raised. In principle agreement with MRWA and Millstream Link Alliance has been obtained to widen road cuttings at 78.2 km and 81.0 km, and to access a rock spoil area at 78.7 km.

5. ASSESSMENT OF THE ENVIRONMENTAL IMPACT OF THE PROJECT AND KEY MANAGEMENT MEASURES

5.1 SCOPING OF RELEVANT ENVIRONMENTAL ASPECTS AND FACTORS

To identify key environmental aspects and factors potentially relevant to the Project, the scoping process utilised existing knowledge of the local environment and the Project, proponent experience and preliminary stakeholder consultation. During this process, potential impacts on environmental factors were determined by identifying activities or environmental aspects associated with the Project. These environmental aspects (activities) included:

- vegetation clearing
- blasting, cutting and filling
- installation of infrastructure
- groundwater abstraction
- vehicle usage
- waste disposal
- rehabilitation.

Following the identification of environmental aspects, the potential impacts arising from each aspect were established. A qualitative risk analysis matrix of likelihood and consequences of impact was used to identify the inherent and residual risk (following potential mitigation) associated with each environmental factor, and used to determine whether further investigations were required to address uncertainty and refine risk levels.

Those environmental factors that may be subject to a moderate or higher residual risk rating from one or more environmental aspects have been addressed in detail in this API. Detailed or specific management actions to mitigate these risks were also addressed.

Where there was a substantial uncertainty in determining the risk levels, there was a reconsideration of these levels following the receipt of investigation results to resolve uncertainties.

Environmental factors not associated with moderate or higher risk levels have been addressed but not in detail, as existing or proposed environmental management measures are expected to adequately manage any impact.

5.2 KEY ENVIRONMENTAL FACTORS ADDRESSED

The key environmental factors relevant to this Project that were identified as requiring detailed assessment were:

- vegetation and flora
- fauna
- Millstream-Chichester National Park
- Aboriginal heritage.

These factors have been addressed in detail in Sections 6, 7, 8 and 9, respectively.

5.3 OTHER MANAGEMENT CONSIDERATIONS (OTHER ENVIRONMENTAL FACTORS)

A number of environmental factors have not been addressed in detail as they are considered to be at low risk from the Project given the remoteness of the location and existing management measures that the Proponent has in place. These factors are addressed in Section 10 and include:

- dust
- noise and vibration
- greenhouse gases
- surface water
- groundwater
- soils and landform
- visual amenity.

6. FLORA AND VEGETATION

6.1 DESCRIPTION OF FACTOR

The Project area lies entirely within the Fortescue Botanical District of the Eremaean Botanical Province as defined by Beard (1975). The vegetation of this province is typically open, and frequently dominated by spinifex, wattles and occasional eucalypts. The Project area intersects six of Beard's mapping units (Table 9).

Table 9 Beard mapping units within the Project Area

Beard mapping unit	Description
Abydos 157	Hard Spinifex (*Triodia wiseana*) hummock grassland
Abydos 589	A mixture of Knotty-butt Neverfail (*Eragrostis xerophila*) tussock grassland and Soft Spinifex (Triodia pungens) hummock grassland
Abydos 152	Mixed hummock grasslands of Triodia pungens and Triodia wiseana
Abydos 619	River Gum (*Eucalyptus camaldulensis*) woodland
Abydos 93	Ranji Bush (*Acacia pyrifolia*) scattered shrubs over Triodia pungens hummock grasslands
Chichester 587	Snappy Gum (*Eucalyptus leucophloia*) scattered low trees over Triodia wiseana hummock grasslands in a mosaic with Acacia pyrifolia scattered shrubs over Triodia pungens hummock grasslands

Given the broad nature of Beard's mapping units, these units are only broadly applicable to the vegetation types occurring within the Project area.

6.1.1 Vegetation

Biota (2008a) and GHD (2008) conducted vegetation and flora surveys of the alignment development envelope in April 2008 and August 2008 respectively. The surveys were planned and implemented as far as practicable according to the EPA Position Statement No. 3 (EPA 2002b) and EPA Guidance Statement No. 51 (EPA 2004b). The following description of the vegetation and flora of the Project area is adapted from Biota (2008a) unless otherwise stated. An asterisk indicates an introduced species. The reports are included in Appendix 1.

Vegetation Types

Forty-seven (47) vegetation types were identified and mapped within the Project area (Figure 10 to Figure 14). Broadly these comprised:

- small stands of mangal dominated by White Mangrove (*Avicennia marina*) interspersed with low open heaths dominated by Samphires and *Frankenia* spp. on mudflats along the northwestern edge of the corridor
- tussock grasslands of Marine Couch (*Sporobolus virginicus*) on sluggishly drained coastal plains
- open shrublands of *Acacia ampliceps*, *A. bivenosa* and/or *A. coriacea* subsp. *coriacea* over hummock grasslands of *Triodia epactia* and tussock grasslands of **Cenchrus* species on coastal dune habitats
- *Acacia colei* var. *colei, Grevillea pyramidalis* tall open shrubland over *Triodia epactia, T. schinzii* hummock grassland on sandplains at the northern end of the corridor
- open shrublands of various combinations of *Acacia arida, A. bivenosa, A. inaequilatera, A. pyrifolia* over hummock grasslands of *Triodia wiseana* and/or *T. epactia* on stony hills and plains throughout the corridor
- *Triodia angusta* hummock grasslands on plains with a calcareous clay-loam substrate
- woodlands to tall shrublands dominated by Joolal (*Terminalia canescens*) or *Acacia coriacea* subsp. *coriacea, Dichrostachys spicata* and *Ehretia saligna* over open hummock grasslands of *Triodia wiseana* on rockpiles

- *Eragrostis xerophila* tussock grasslands, annual grasslands and/or *Triodia wiseana* hummock grasslands interspersed with herblands, sometimes with an overstorey of Snakewood (*Acacia xiphophylla*) on heavy clay soils
- various vegetation types including low shrublands dominated by samphires or *Stemodia grossa* and grasslands dominated by *Eragrostis falcata*, often with scattered trees of River Red Gum (*Eucalyptus camaldulensis*) and Coolibahs (*E. victrix*), on the floodout areas from the Harding Dam
- riverine woodlands dominated by *Eucalyptus camaldulensis, E. victrix* and/or *Terminalia canescens* over various shrubs including *Acacia ampliceps, A. pyrifolia, A. trachycarpa* and *Melaleuca glomerata* over sedgelands, *Triodia* hummock grasslands and/or **Cenchrus* tussock grasslands in major drainage features
- low open woodlands of Hamersley Bloodwood (*Corymbia hamersleyana*) over dense tall shrublands of various species such as *Acacia ancistrocarpa, A. bivenosa, A. coriacea* subsp. *pendens, A. pyrifolia* and *A. trachycarpa* over *Triodia* hummock grasslands and/or tussock grasslands of **Cenchrus* or native species in minor flowlines.

Vegetation Condition

Given the location of the Cape Lambert to Emu Siding development envelope (encompassing existing rail structures and access roads), the Project area already contains significant areas of disturbance (areas historically cleared for the existing infrastructure as well as for borrow pits, laydown areas, camp sites, access tracks etc). These areas typically supported regenerating shrublands of species from the surrounding areas over a very open cover of spinifex which was frequently invaded by large amounts of **Cenchrus* grasses.

Overall, the condition of vegetation in the Project area was considered to be Excellent to Very Good for areas of stony hills, stony plains and clayey plains removed from existing infrastructure; Good to Poor for creek lines infested with **Cenchrus* species; and Poor to Completely Degraded for areas "disturbed" by previous activity. Vegetation condition was assessed according to the scale of Trudgen (1988).

Large portions of the northern section of the Project area had been recently burnt. By itself this was not considered to further degrade the condition of the vegetation; however, the areas in the vicinity of Wickham appeared to have been subject to repeated fires coupled with historic clearing, which have resulted in considerable invasion of the loamy plains by Buffel Grass (**Cenchrus ciliaris*) and Birdwood Grass (**C. setiger*).

There were often substantial infestations of **Cenchrus* species in proximity to the existing rail and, in this northern section, often penetrated into the surrounding undisturbed areas. These species were also prevalent along many of the creek lines dissecting the Project area.

The southern section of the alignment can be described similarly to the northern section; however, infestations of **Cenchrus* species in proximity to the existing rail did not typically penetrate far into the surrounding undisturbed areas unlike in the northern section. These species were also prevalent along many of the creek lines dissecting the Project area, as well as on the broad loamy floodplains of the Harding River.

Conservation Significance of Vegetation Types

Most vegetation types within the Project area comprise good quality examples of intact native vegetation and are therefore inherently valuable. However, the majority of vegetation units are considered to be of Low conservation significance as they are likely to be more widely distributed and relatively well represented in the Chichester subregion.

Vegetation of High Conservation Significance

Three vegetation types recorded in the Project area were considered to be of high conservation significance.

Cracking clay communities of the Chichester Range and Mungaroona Range (units H/G and Tw/H)

Cracking clay communities of the Chichester Range and Mungaroona Range are listed as a Priority 1 PEC, and are considered to be under threat from grazing (Kendrick & McKenzie 2001). The area mapped as vegetation

units H/G and Tw/H on the broad cracking clay upland, along the southern section of the existing rail line between approximately the 53.5 and 59.7 km chainages and the 63.6 and the 64.6 km chainages, is considered to comprise this PEC (Figure 13). The vegetation in these areas is generally in Excellent condition.

***Eragrostis xerophila* tussock grasslands on clay (units ERAx, TG)**

Eragrostis xerophila grassland vegetation on clay substrates (units ERAx, TG) occurs within the Project area at a number of points, including:

- approximately 500 m west of the 12 km chainage (a very small stand between 7712600 mN and 7712350 mN) (Figure 10)
- between the 19.2 km and 27.5 km chainages (several large swathes between 7704950 mN and 7696250 mN) (Figure 10 and Figure 11)
- between the 33 km and 36.5 km chainages (one large swathe between 7691500 mN and 7688050 mN) (Figure 11 and Figure 12).

This type of vegetation is widespread over the cracking clay plains in the Dampier to Roebourne locality but is typically in a degraded condition from historic grazing, physical disturbance and/or weed invasion. The communities were initially thought to be broadly equivalent to the Priority 1 PECs, mapped as the Roebourne Plains coastal grasslands on cracking clay, that exist near Dampier (~25 km to the west of the northern-most part of the Project area). Subsequent advice from DEC (Anthea Jones pers. comm., 11 August 2010) is that this vegetation unit has been identified as forming part of the 'Horseflat land system of the Roebourne Plains' Priority 3 PEC.

Riparian vegetation of the Harding River and its tributaries (principally units EcAamCv, EvMg and EvApyTwTeCE; also EvAtrTeCEc, EvTERcApyTwTeCE and MgTlCEEaCv)

The Harding River comprises the main drainage feature for this locality and supports dense riparian forest of River Red Gum (*Eucalyptus camaldulensis*), with patches of Cadjeput (*Melaleuca argentea*) in places. Although there is considerable invasion by weeds (mainly **Cenchrus* grasses) along the floodplains of this river system, it is still considered to have high conservation value. The additional creek line units dominated by *E. victrix* are also of significance as they comprise major drainages for these areas. Vegetation unit MgTlCEEaCv, described by Rio Tinto (2010), is floristically similar to the EvMg vegetation type described by Biota (2008a), despite lacking a Coolibah (*Eucalyptus victrix*) overstorey.

Vegetation Communities of Moderate Conservation Significance

Two vegetation types recorded in or near the Project area were considered to be of moderate conservation significance.

Mangrove vegetation (unit AVm)

The small stands of mangal dominated by *Avicennia marina,* occurring in the north-western corner of the development envelope (Figure 10), are considered to be of moderate conservation value.

Management for mangrove vegetation within the Project Area is covered by Guideline 4 of EPA Guidance Statement No. 1, *Guidance Statement for the protection of tropical arid zone mangroves along the Pilbara coastline* (EPA 2001). The EPA's objective for Guideline 4 areas is that impacts of development on habitat and ecological function should be reduced to the minimum practicable level. The EPA expects that a high priority is placed on protecting, and minimising the impact on tropical arid zone mangroves, habitat and dependent habitats.

Rockpile vegetation (units TERcTw,AcDIsEHsTwCEc)

The numerous rockpiles throughout the Project area support species restricted to such habitats.

506,000 mE
508,000 mE
510,000 mE
512,000 mE
514,000 mE
516,000 mE
7,716,000 mN
7,714,000 mN
7,712,000 mN
7,710,000 mN
7,708,000 mN
7,706,000 mN
7,704,000 mN
AVm
AcDlsEHsTwCEc
AcoGpTeTs
MlAcoTeTsc
AbAstTe
AamSPOv
AcCEc
SPOv / FRaHA
Disturbed
AbTw
HD
HG2
FRaHA
SPOv
HD
Disturbed
AamAbTeCE
AamAbTeCE
AamAbTeCE
Disturbed
HD
Disturbed
ApyAarTeTw
ChApyAbTwTe
ERAx
ApyTe
ChAtuTe
Disturbed
ApyAarTeTw
Disturbed
ChApyAbTwTe
ChAtuTeCE
ChAtuTeCE
ApyAsyTe
ChApyAbTwTe
ApyAsyTe
AxTe
ChApyAbTwTe
ChApyAaAbEUaTHt
ApyAsyTe
ERAx
ApyTe
ApyTe
ChAbTw
TERcTw
ApyTe
West
North
Coastal
Hwy
Wickham
MAP EXTENTS
Figure 10
Figure 11
Figure 12
Figure 13
Figure 14
LEGEND
Proposed Rail Route
Current Railway Route
Rail Access Road
Preferred Alignment Project Area
Fauna Trapping Sites
Priority Flora
Weeds
SCALE
0 0.5 1 1.5km
1:40,000 @ A3
N
RioTinto
Vegetation Mapping for Cape Lambert - Emu Siding Rail Duplication with Fauna Trapping Sites
Figure 10
Drawn: M.Swebbs
Date: April, 2011
Plan No: PDE0062888v8
Proj: MGA94 Zone50

506,000 mE
508,000 mE
510,000 mE
512,000 mE
514,000 mE
7,702,000 mN
7,700,000 mN
7,698,000 mN
7,696,000 mN
7,694,000 mN
7,692,000 mN
7,690,000 mN
ChAhTw
TERcTw
Disturbed
ERAx
TG, A
Disturbed
TG
ERAx
ApyAsyTe
TG, HG
ApyAsyTe
ERAx
AaTw
ERAx
ERAx
AaTw
AsyAarTeTw
ApyAarTeTw
AxTe
ApyAarTeTw
HD
Disturbed
ERAx
Disturbed
AaTw
ChAtrEUaCHf
AaTw
AxTwERAxCEc
AxTwERAxCEc
AtrAcAbApyCE
ERAx
ChApyAbTwTe
AtrAcAbApyCE
ChApyAbTwTe
Arches Siding
TwERAxCEc
HG2
ERAx
AxTwERAxCEc
AxTwERAxCEc
EvApyTwTeCE
AcDlsEHsTwCEc
ApyAarTeTw
ChApyAbTwTe
ChAbTeTw
Disturbed
ChApyAbTwTe
ChApyAbTwTe
ApyAarTeTw
ApyAarTeTw
ChApyAbTwTe
ERAx
EvAtrTeCEc
ERAx
MAP EXTENTS
Figure 10
Figure 11
Figure 12
Figure 13
Figure 14
LEGEND
Proposed Rail Route
Current Railway Route
Rail Access Road
Project Area
Fauna Trapping Sites
Priority Flora
Weeds
SCALE
0 0.5 1 1.5km
1:40,000 @ A3
N
RioTinto
Vegetation Mapping for
Cape Lambert - Emu Siding
Rail Duplication
with Fauna Trapping Sites
Figure 11
Drawn: M.Swebbs
Date: April, 2011
Plan No: PDE0062888v8
Proj: MGA94 Zone50

506,000 mE
508,000 mE
510,000 mE
512,000 mE
514,000 mE
7,688,000 mN
7,686,000 mN
7,684,000 mN
7,682,000 mN
7,680,000 mN
7,678,000 mN
7,676,000 mN
AxTe
AxTwERAxCEc
TG, A
TERcTw
EvAtrTeCEc
EvApyTwTeCE
EvAtrTeCEc
ApyTw
RB
Creek channel
Creek channel
EvApyTwTeCE
EcAamCv
EvTERcApyTwTeCE
ApyAaTw
TERcAarTw
Disturbed
EvApyTwTeCE
Harding Siding
EvApyTwTeCE
EvAtrTeCEc
ApyTe
EvMg
Creek channel
ApyAarTeTw
ApyAarTeTw
Tw/H
EvMg
EvMg
EvMg
EvMg
EvMg
EcAamCv
Disturbed
Creek channel
EvMg
ApyAarTeTw
EcAamCv
ApyAbTw
ApyAbTw
ApyAbTw
EvAtrTeCE
ApyAbTw
EvAtrTeCE
Creek channel
ApyAarTe
ApyAarTeTw
ApyTw
TERcTw
HG2
HG1
HD
HG1
HG2
HG1
ApyTw
HG2
RP
floodout mosaic
HG, C, MA
Disturbed
AcDIsEHsTwCEc
floodout mosaic
ApyAarTeTw
EcEvHAi
Creek channel
EcEvERAf
N

MAP EXTENTS

Figure 10
Figure 11
Figure 12
Figure 13
Figure 14

LEGEND

- Proposed Rail Route
- Current Railway Route
- Rail Access Road
- Project Area
- Fauna Trapping Sites
- Priority Flora
- Weeds

SCALE

0 0.5 1 1.5km

1:40,000 @ A3

RioTinto

Vegetation Mapping for Cape Lambert - Emu Siding Rail Duplication with Fauna Trapping Sites

Figure 12

Drawn: M.Swebbs
Date: April, 2011

Plan No: PDE0062888v8
Proj: MGA94 Zone50

506,000 mE
508,000 mE
510,000 mE
512,000 mE
514,000 mE
7,674,000 mN
7,672,000 mN
7,670,000 mN
7,668,000 mN
7,666,000 mN
7,664,000 mN
7,662,000 mN
floodout/mosaic
EcEvERAf
AxTwERAxCEc
AcDlsEHsTwCEc
EvApyTwTeCE
EvAtrTeCEc
Tw/H
Disturbed
ApyAarTeTw
ApyAarTeTw
H/G
AcDlsEHsTwCEc
ChAiTw
TERcTw
Ta
EcEvAtrAbTloCE
HG, A
Ta
ChAbTw
EcEvAtrAbTloCE
EcEvAtrAbTloCE
EvApyTwTeCE
EvMg
EvApyTwTeCE
ChApyAbTwTe
EvMg
EvApyTwTeCE
ChAbTw
MAP EXTENTS
Figure 10
Figure 11
Figure 12
Figure 13
Figure 14
LEGEND
Proposed Rail Route
Current Railway Route
Rail Access Road
Project Area
Preferred Borrow Pits
Fauna Trapping Sites
Priority Flora
Weeds
SCALE
0 0.5 1 1.5km
1:40,000 @ A3
N
RioTinto
Vegetation Mapping for Cape Lambert - Emu Siding Rail Duplication with Fauna Trapping Sites
Figure 13
Drawn: M.Swebbs
Date: April, 2011
Plan No: PDE0062888v8
Proj: MGA94 Zone50

7,662,000 mN
502,000 mE
504,000 mE
506,000 mE
508,000 mE
510,000 mE
512,000 mE
7,660,000 mN
7,658,000 mN
7,656,000 mN
7,654,000 mN
7,652,000 mN
7,650,000 mN
7,648,000 mN
EvApyTwTeCE
HG2
HG, A
TERcTw
ApyAarTeTw
ChApyAbTwTe
ApyAarTeTw
EvApyTwTeCE
ChAbTw
EvApyTwTeCE
EvApyTwTeCE
ChAbTw
ChApyAbTwTe
ChApyAbTwTe
EvMg
ApyAarTeTw
ChApyAbTwTe
ChApyAbTwTe
EvTERcApyTwTeCE
EvMg
ChApyAbTwTe
EvMg
EvApyTwTeCE
TERcAtrTwCE
ChApyAbTwTe
EvAtrTeCEc
EvMg
Karratha
AcDlsEHsTwCEc
EvAtrTeCEc
Disturbed
Emu Siding
Tom Price
Road
AmGwTw
ChAtrAmTw
ChAtrAmTw
ChApyAbTw
AtrTwCEEt
MgTlCEEaCv
HD
AbTlTw
AtrTwCEEt
TERcAtrTwCE
CHAiTw
ChApyAbTw
GwGpAtCpHclrTwTe
HD
GwGpAtCpHclrTwTe
Millstream-Chichester
National Park
MAP EXTENTS
Figure 10
Figure 11
Figure 12
Figure 13
Figure 14
N
LEGEND
Proposed Rail Route
Current Railway Route
Rail Access Road
Project Area
National Park
Fauna Trapping Sites
Priority Flora
Weeds
SCALE
0 0.5 1 1.5km
1:40,000 @ A3
RioTinto
Vegetation Mapping for
Cape Lambert - Emu Siding
Rail Duplication
with Fauna Trapping Sites
Figure 14
Drawn: M.Swebbs
Date: April, 2011
Plan No: PDE0062888v8
Proj: MGA94 Zone50

AamAbTeCE	Acacia ampliceps, A. bivenosa open shrubland over Triodia epactia open hummock grassland and *Cenchrus species tussock grassland
AamSPOv	Acacia ampliceps tall shrubland over Sporobolus virginicus closed tussockgrassland
AaTw	Acacia ancistrocarpa open shrubland over Triodia wiseana hummock grassland
AbAstTe	Acacia bivenosa scattered shrubs over A. stellaticeps low open shrubland over Triodia epactia hummock grassland
AbTw	Acacia bivenosa scattered shrubs over Triodia wiseana hummock grassland
AcCEc	Acacia coriacea subsp. coriacea tall shrubland over *Cenchrus ciliaris tussock grassland
AcDIsEHsTwCEc	Acacia coriacea subsp. coriacea, Dichrostachys spicata, Ehretia saligna tall open shrubland over Triodia wiseana very open hummock grassland and/or *Cenchrus ciliaris very open tussock grassland
AcoGpTeTs	Acacia colei var. colei, Grevillea pyramidalis tall open shrubland over Triodia epactia, T. schinzii closed hummock grassland
ApyAarTeTw	Acacia pyrifolia scattered tall shrubs over A. arida open shrubland over Triodia epactia, T. wiseana hummock grassland
ApyAaTw	Acacia pyrifolia tall open shrubland over A. ancistrocarpa open heath over Triodia wiseana open hummock grassland
ApyAsyTe	Acacia pyrifolia, A. synchronicia open shrubland over Triodia epactia hummock grassland
ApyTe	Acacia pyrifolia scattered tall shrubs over Triodia epactia hummock grassland
ChAtuTe	Corymbia hamersleyana low open woodland over Acacia tumida var. pilbarensis tall open scrub over Triodia epactia open hummock grassland
ChAtuTeCE	Corymbia hamersleyana low open woodland over Acacia tumida var. pilbarensis tall open scrub over Triodia epactia open hummock grassland and *Cenchrus ciliaris, *C. setiger tussock grassland
EcAamCv	Eucalyptus camaldulensis low open forest over Acacia ampliceps tall shrubland over Cyperus vaginatus open sedgeland
EcEvAtrAbTloCE	Eucalyptus camaldulensis, E. victrix low open forest over Acacia trachycarpa, A. bivenosa tall open scrub over Triodia longiceps hummock grassland and *Cenchrus tussock grassland
EcEvERAf	Eucalyptus camaldulensis, E. victrix scattered low trees over Eragrostis falcate tussock grassland
EcEvHAi	Eucalyptus camaldulensis, E. victrix low woodland to scattered trees over Halosarcia indica subsp. leiostachya low open heath
ERAx	Eragrostis xerophila open tussock grassland
EvApyTwTeCE	Eucalyptus victrix scattered low trees over Acacia pyrifolia tall open scrub to tall open shrubland over Triodia wiseana, T. epactia hummock grassland and *Cenchrus ciliaris, *C. setiger open tussock grassland
EvAtrTeCEc	Eucalyptus victrix low open woodland over Acacia trachycarpa tall open shrubland over Triodia epactia open hummock grassland and *Cenchrus ciliaris tussock grassland
EvMg	Eucalyptus victrix low open woodland over Melaleuca glomerata tall shrubland

Rio Tinto

Figure 15
Legend Biota Vegetation Mapping
Cape Lambert to Emu Siding Rail Duplication

ApyTw

Acacia pyrifolia scattered tall shrubs over Triodia wiseana hummock grassland

AtrAcAbApyCE

Acacia trachycarpa, A. coriacea subsp. pendens A. bivenosa, A. pyrifolia tall open scrub over *Cenchrus ciliaris, *C. setiger tussock grassland

AVm

Avicennia marina tall open scrub

AxTe

Acacia xiphophylla low open woodland over Triodia epactia very open hummock grassland

AxTwERAxCEc

Acacia xiphophylla low open woodland over Triodia wiseana scattered hummock grasses and Eragrostis xerophila, *Cenchrus ciliaris open tussock grassland

ChAbTeTw

Corymbia hamersleyana low open woodland over Acacia bivenosa tall shrubland over Triodia epactia (T. wiseana) hummock grassland

ChAbTw

Corymbia hamersleyana scattered low trees over Acacia bivenosa tall open shrubland over Triodia wiseana hummock grassland

ChAiTw

Corymbia hamersleyana scattered low trees over Acacia inaequilatera tall open shrubland over Triodia wiseana open hummock grassland

ChApyAaAbEUaTHt

Corymbia hamersleyana low open woodland over Acacia pyrifolia tall shrubland over A. ancistrocarpa, A. bivenosa open shrubland over Eulalia aurea, Themeda triandra closed tussock grassland

ChApyAbTwTe

Corymbia hamersleyana scattered low trees over Acacia pyrifolia scattered tall shrubs over A. bivenosa open shrubland over Triodia wiseana, T. epactia hummock grassland

ChAtrAmTw

Corymbia hamersleyana low open woodland over Acacia trachycarpa, A. maitlandii tall open shrubland over Triodia wiseana hummock grassland

ChAtrEUaCHf

Corymbia hamersleyana low open woodland over Acacia trachycarpa scattered tall shrubs over Eulalia aurea, Chrysopogon fallax closed tussock grassland

EvTERcApyTwTeCE

Eucalyptus victrix, Terminalia canescens low woodland over Acacia pyrifolia tall open scrub over Triodia wiseana, T. epactia hummock grassland and *Cenchrus ciliaris, *C. setiger open tussock grassland

FRaHA

Frankenia ambita, Halosarcia species low open heath

H/G

Herbland/annual grassland

MlAcoTeTsc

Melaleuca lasiandra, Acacia colei var. colei tall shrubland over Triodia epactia, T. schinzii closed hummock grassland

SPOv

Sporobolus virginicus tussock grassland

SPOv / FRaHA

Sporobolus virginicus tussock grassland / Frankenia ambita, Halosarcia species low open heath

Ta

Triodia angusta hummock grassland

TERcAarTw

Terminalia canescens low open forest over Acacia arida open shrubland over Triodia wiseana hummock grassland

TERcAtrTwCE

Terminalia canescens low open woodland over Acacia trachycarpa tall open shrubland over Triodia wiseana open hummock grassland and *Cenchrus ciliaris, *C. setiger tussock grassland

TERcTw

Terminalia canescens low open woodland over Triodia wiseana open hummock grassland

Tw/H

Triodia wiseana hummock grassland, with patches of herbs on clay

floodout mosaic

Creek channel

Disturbed

Figure 16
Legend Biota Vegetation Mapping
Cape Lambert to Emu Siding Rail Duplication

Rio Tinto

H, TG	Samphires and Halophytes with *Cenchrus ciliaris
HD	Heavily Disturbed
HG, TG	(Typically) Mixed Hummock Grassland and Tussock Grassland
HG1	Hummock Grassland; Triodia epactia, herbs (variable) may have scattered shrubs and emergent tree species
HG2	Hummock Grassland; Triodia pungens (may have scattered shrubs) LW1, HG, S Low Woodland (variable), Shrubland (variable), Hummock Grassland (variable); Acacia colei and or C.hamerslyana, Acacia species, over Mixed Herbs, Grasses and Triodia pungens
LW1, HG, S	Low Woodland (variable), Shrubland (variable), Hummock Grassland (variable); Acacia colei and or C.hamerslyana, Acacia species, over Mixed Herbs, Grasses and Triodia pungens
LW2, H	Avicennia marina, Spinifex longifolia, Cajunus cinereus and Carnivalea rosea on beaches
LW2, H, TG	Low Woodland Avicennia marina, samphires and halophytes with *Cenchrus ciliaris
TG	Tussock grassland (variable), herbs (variable) may have scattered shrubs
RB	Eucalyptus victrx, Melaleuca argentea and Sesbania formosa over couch and Cyperus vaginalis
HG, C, MA	Chenopods including Sclerolaena bicornis, Salsola tragus and Atriplex bunburyana mixed with Triodia species with scattered Melaleuca
RP	Devoid of species with the exception of some Capparis and Ficus
TG, ET	Mixed grasses with scattered Eucalyptus species
TG, A	Mixed grasses with scattered Acacia species
HG, A	Triodia species with a shrub layer of either single or mixed Acacia species

Rio Tinto

Figure 17
Legend GHD Vegetation Mapping
Cape Lambert to Emu Rail

6.1.2 Flora

Overall Species Richness

A total of 369 taxa of native vascular flora from 145 genera belonging to 57 families have been recorded from the Cape Lambert to Emu Siding Project area (including the results from the 2008 survey, together with the quadrats previously sampled in the area during the Cape Lambert Port B Expansion survey (Biota 2008c) and the Dampier Power Station Transmission Line study (Biota 2008d)). Seventeen (17) introduced species were also recorded.

The number of species recorded from the Project area appears to be within the range expected for a corridor of this size and for this location in the Pilbara. The number of species would be expected to increase with repeated sampling over a range of seasons.

Conservation Significant Flora

No Declared Rare Flora listed under the Commonwealth EPBC Act or listed by the WA DEC were recorded from the Project area, and none would be expected to occur.

A search of the WA Herbarium and DEC databases identified several Priority flora species previously recorded within 15 km of the Project area (Table 10).

Table 10 Priority flora species potentially occurring in the Project Area (Biota 2008a)

Species	Ranking	Distribution	Likelihood of Presence in Project Area
Helichrysum oligochaetum	P1	Broad distribution across the Pilbara and into the northern Gascoyne bioregion, but is rarely collected (probably in part due to its small size and annual growth form). It is typically recorded on clayey plains.	Possible – could potentially occur on the clay plains.
Ischaemum albovillosum	P2	Relatively widespread through the Pilbara, occurring in both the Chichester and Hamersley subregions, but is restricted to heavy clay substrates.	Possible – could potentially occur on the clay plains.
Acacia glaucocaesia	P3	Relatively broad distribution through the northern Pilbara, extending into the Dampierland bioregion.	Possible – particularly on the broad near-coastal plains.
Terminalia supranitifolia	P3	Distributed in the Pilbara among basalt rocks.	Possible – may occur on the basalt rockpiles scattered through the Project area.
Goodenia pascua	P3	Known to occur on red sandy soils on basaltic plains.	Possible.

Of those species listed in Table 11, one Priority species was recorded within the Project area (Table 11). At the time of the survey the perennial herb, *Hibiscus brachysiphonius*, was ranked by the DEC as a Priority 3 species. This species is no longer Priority-listed and has subsequently been removed from Table 11.

Table 11 Summary of priority flora species recorded in the Project Area

Species	Ranking	Locations	Vegetation Type
Nicotiana heterantha	Priority 1	509527 mE, 7675320 mN (Figure 12), 52 km chainage	EcEvHAi (also potentially EcEvERAf and floodout mosaic)

Nicotiana heterantha (Priority 1)

This annual herb is described on FloraBase as occurring on heavy clays on seasonally wet flats. A single specimen was collected from vegetation unit EcEvHAi at the southern edge of the Harding Dam floodout area (Figure 12). Given the annual growth form and slender habit of this species, it may well be more broadly distributed through the Project area. This record represents a substantial range extension to the northwest within the Pilbara; this species is also known from the western Kimberley. The specimen from which this identification was made was submitted to the WA Herbarium for confirmation. Rio Tinto has been advised of the current backlog experienced at WA Herbarium, due to relocation of offices in late 2010. Rio Tinto will confirm the identification with the WA Herbarium as soon as it becomes available.

Other flora of Conservation Significance

Undescribed Species

A number of undescribed species were recorded in the Project Area. Undescribed species are those in which considerable variation occurs and thus identification to species level is problematic. As a result, specimens of particular genera may be considered to be undescribed taxa.

Malvaceae family

The Malvaceae family has high species diversity in the Pilbara bioregion, with a large number of undescribed taxa; in particular the identifications of *Abutilon, Hibiscus* and *Sida* specimens are often difficult to resolve, and frequently appear to represent undescribed or new taxa. All of the undescribed taxa recorded within the Project area have been previously recorded from other study areas in the region.

Papilionaceae family

The genera *Indigofera* and *Tephrosia* within the Papilionaceae family contain numerous distinct taxa in the Pilbara, particularly within the *I. "monophylla", T. "clementii," T. "densa," T. "rosea,"* and *T. "supina"* complexes. All of the undescribed taxa recorded within the Project area have been recorded previously from other study areas in the region.

***Euphorbia* spp.**

The genus *Euphorbia* is similarly diverse within the Pilbara and contains a large number of undescribed species. The undescribed taxa recorded from the current study area have all been recorded from other survey areas in the region.

***Triodia* spp.**

Within the Pilbara, there is considerable variation within the named spinifex species, particularly within *Triodia angusta, T. epactia* and *T. wiseana*. These are likely to represent groups of species rather than single entities; however, a complete revision of this genus would be required to verify this.

Range Extensions

On the basis of comparison with species' distributions presented on the WA Herbarium's FloraBase, the following records from the Cape Lambert to Emu Siding rail duplication corridor appear to represent range extensions:

- the record of *Nicotiana heterantha* represents a considerable north-western range extension in the Pilbara
- the record of *Acacia pachyacra* represents a northern range extension in the Pilbara
- the record of *Swainsona canescens* is a northern extension in the Pilbara, and appears to be the first record for the Chichester subregion
- the records of *Bulbostylis turbinata* and *Phyllanthus erwinii* represent northern range extensions in the Pilbara based on vouchered specimens; however, these species have been collected previously from the northern coastal areas
- the record of *Tephrosia rosea* var. *venulosa* ms. is a slight western extension for the Pilbara; however, this species has been collected previously from this locality (e.g. the Cape Lambert Port B Expansion area north of the Project area [Biota 2008c])
- the record of *Polygala linariifolia* represents a considerable western extension in the Pilbara; however, this species has been collected previously from the locality (e.g. the Dampier Power Station transmission line corridor[Biota 2008d])
- although there are no vouchered specimens of *Tephrosia simplicifolia* from the Pilbara, this species has been recorded on other surveys in the region, including the recent surveys of the Cape Lambert Port B Expansion area north of the Project area (Biota 2008c) and the Dampier Power Station Transmission Line corridor (Biota 2008d)
- *Vitex trifolia* var. *subtrisecta* has only been vouchered to date from the Kimberley; however, a specimen was also recently recorded in the Cape Lambert Port B Expansion area north of the Project area (Biota 2008c).

Introduced Flora

Seventeen (17) weed species were recorded within the Project area (Table 12).

Table 12 Weed species recorded in the Project Area

Weed Species	No. Recorded	Distribution in the Project Area
**Aerva javanica* (Kapok Bush)	89+	Widespread, mainly close to existing disturbance areas.
**Sigesbeckia orientalis* (Indian Weed)	1	Southern end of the corridor, in Western Creek.
**Cylindropuntia fulgida* var. *mamillata* (Coral Cactus)	1 (2 plants)	Single record at northern end.
**Citrullus colocynthis* (Pie Melon)	7	Central section of corridor in Harding Dam floodout area.
**Cucumis melo* subsp. a*grestis* (Ulcardo Melon)	17	Central section of corridor in Harding Dam floodout area, Harding River itself and a tributary.
**Cucumis* sp.	52	Between the 16 km and 64 km chainages, mainly on clay or in creeklines.
**Vitex trifolia* var. *subtrisecta* (Beach Vitex, Chaste Tree)	1 (1 plant)	Single record at northern end.
**Malvastrum americanum* (Spiked Malvastrum)	6	Scattered in creeklines between the 25 and 51 km chainages.
**Vachellia farnesiana* (Mimosa Bush)	13	Between 18 km and 40 km chainages, mainly on clayey plains.
**Passiflora foetida* var. *hispida* (Stinking Passion Flower)	2	Northern third of corridor.

Weed Species	No. Recorded	Distribution in the Project Area
**Cenchrus ciliaris* (Buffel Grass)	263+	Widespread; particularly abundant near existing disturbance areas, on coastal dunes and along creeklines.
**Cenchrus setiger* (Birdwood Grass)	120+	Widespread; particularly abundant near existing disturbance areas, on coastal dunes and along creeklines.
**Cynodon dactylon* (Couch)	19	Along creeklines and floodplains in southern half of corridor.
**Echinochloa colona* (Awnless Barnyard Grass)	2	Central section of corridor associated with Harding River system.
**Setaria verticillata* (Whorled Pigeon Grass)	1	Central section of corridor in Harding River.
**Portulaca oleracea* (Purslane)	87	Widespread throughout the corridor, including in apparently undisturbed areas.
**Phyla nodiflora* (Lippia)	1	Central section of corridor in Harding River.

Most species recorded are common and widespread weeds of the Pilbara; however, some are only infrequently recorded in the region (e.g. **Cylindropuntia fulgida* var. *mamillata*, **Vitex trifolia* var. *subtrisecta* and **Phyla nodiflora*).

While not listed as Declared Plants, a number of the remaining species are considered to be serious environmental weeds, particularly Kapok Bush (**Aerva javanica*) and the two **Cenchrus* species (Buffel Grass and Birdwood Grass). Buffel Grass and Birdwood Grass were widespread and often abundant immediately adjacent to the existing rail line, and in areas of historic disturbance (e.g. borrow pits, old laydown and camp areas, etc). Kapok Bush generally only occurred as scattered individuals through the same areas. The remaining species were scattered through the Project area.

6.1.3 Limitations of Flora and Vegetation Survey

The main limitations of the vegetation and flora survey conducted in April (Biota 2008a) are:

- Fungi and nonvascular flora (e.g. algae, mosses and liverworts) were not sampled.
- No quadrats were established in the southern 10 km of the study area as this section was inaccessible during the field survey due to construction of the Millstream Link Road. This area was traversed at slow speed by vehicle in July 2008 to extend the vegetation mapping boundaries and spot-sampled only.
- Although the field work was done at an appropriate time for detecting most ephemeral flora, some species (e.g. annual daisies that would germinate mostly after late winter rains) would not have been present or identifiable at the time of survey. In addition, the entire study area was not systematically searched for rare flora. The species lists should therefore be taken as indicative rather than exhaustive.
- The vegetation units for this study were defined based on interpretation of aerial photography signatures combined with the site data and field mapping notes recorded during the field survey. As it was not possible to map areas outside the study area in this way, the distribution of these units outside the study area can only be inferred by their correlation with the land systems mapping prepared by the Department of Agriculture. This means that there is a level of uncertainty regarding the distribution of these vegetation types outside the current study area.
- Mapping was based on the latest available orthophotography; however, this may not show recently constructed infrastructure. Delineation of currently disturbed areas may therefore be inaccurate for some areas.
- No floristic analysis has been conducted using the data from the quadrats and relevés from this study.

Despite these limitations, the field study and the subsequent analyses are believed to give a reasonable representation of the flora and vegetation values of the Cape Lambert to Emu Siding rail corridor.

6.2 KEY STATUTORY REQUIREMENTS, ENVIRONMENTAL POLICY AND GUIDANCE

EPA Objectives

The EPA applies the following objective to the assessment of projects that may affect vegetation and flora:

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

The following overriding EPA objective addressing biodiversity is also relevant to this factor:

- *maintain biological diversity where that represents the different plants, animals and micro-organisms, the genes they contain and the ecosystems they form, at the levels of genetic diversity, species diversity and ecosystem diversity.*

National Strategies

The State and Commonwealth Governments have endorsed the *National Strategy for the Conservation of Australia's Biological Diversity* (ANZECC 1996) and the *National Strategy for Ecologically Sustainable Development* (ESDSC1992). The strategies address the conservation of Australia's biological diversity by defining several guiding principles.

National Strategy for the Conservation of Australia's Biological Diversity

The principles of this Strategy are:

- biological diversity is best conserved in situ
- although all levels of government have clear responsibility, the cooperation of conservation groups, resource users, indigenous peoples, and the community in general is critical to the conservation of biological diversity
- it is vital to anticipate, prevent and attack at source the causes of significant reduction or loss of biological diversity
- processes for, and decisions about, the allocation and use of Australia's resources should be efficient, equitable and transparent
- lack of full knowledge should not be an excuse for postponing action to conserve biological diversity
- the conservation of Australia's biological diversity is affected by international activities and requires actions extending beyond Australia's national jurisdiction
- Australians operating beyond our national jurisdiction should respect the principles of conservation and ecologically sustainable use of biological diversity and act in accordance with any relevant national or international laws
- central to the conservation of Australia's biological diversity is the establishment of a comprehensive, representative and adequate system of ecologically viable protected areas integrated with the sympathetic management of all other areas, including agricultural and other resource production systems
- the close, traditional association of Australia's indigenous peoples with components of biological diversity should be recognised, as should the desirability of sharing equitably benefits arising from the innovative use of traditional knowledge of biological diversity.

National Strategy for Ecologically Sustainable Development

The principles of this Strategy are:

- decision-making processes should effectively integrate both short-term and long-term economic, environmental, social and equity considerations
- where there are threats of serious or irreversible environmental damage, lack of full scientific certainty should not be used as a reason for postponing measures to prevent environmental degradation
- the global dimension of environmental impacts of actions and policies should be recognised and considered

- the need to develop a strong, growing and diversified economy which can enhance the capacity for environmental protection should be recognised
- the need to maintain and enhance international competitiveness in an environmentally-sound manner should be recognised
- cost-effective and flexible policy instruments should be adopted, such as improved valuation, pricing and incentive mechanisms
- decisions and actions should provide for broad community involvement on issues which affect them.

EPA Position Statement No. 2

EPA Position Statement No. 2 (EPA 2000) provides an overview of the EPA position on the clearing of native vegetation in Western Australia. Principles and related objectives and actions have been adopted from the above-mentioned national strategies in the development of this Position Statement. In assessing a project, the EPA will include the following basic elements in consideration of biological diversity:

- comparison of development scenarios, or options, to evaluate protection of biodiversity at the species and ecosystems levels, and demonstration that all reasonable steps have been taken to avoid disturbing native vegetation
- no known species of plant or animal is caused to become extinct as a consequence of the development and the risks to threatened species are considered to be acceptable
- no association or community of indigenous plants or animals ceases to exist as a result of the Project
- there is a comprehensive, adequate and secure representation of scarce or endangered habitats within the project area and/or in areas which are biologically comparable to the Project area, protected in secure reserves
- if the Project is large (in the order of 10 – 100 ha or more, depending on where in the State) the project area itself should include a comprehensive and adequate network of conservation areas and linking corridors whose integrity and biodiversity are secure and protected
- the on-site and off-site impacts of the Project are identified and Rio Tinto demonstrates that these impacts can be managed.

EPA Position Statement No. 3

EPA Position Statement No. 3 (EPA 2002b) discusses the principles that the EPA would apply when assessing projects that may have an effect on biodiversity values in Western Australia. The outcomes sought by this Position Statement are intended to:

- promote and encourage all proponents and their consultants to focus their attention on the significance of biodiversity and therefore the need to develop and implement best practice in terrestrial biological surveys
- enable greater certainty for proponents in the Environmental Impact Assessment (EIA) process by defining the principles the EPA will use when assessing projects that may have an effect on biodiversity values.

EPA Position Statement No. 9

EPA Position Statement No. 9 (EPA, 2006a) recognises environmental offsets as one tool that can provide alternative beneficial environmental outcomes in situations where social and economic growth is sought at some detriment to the environment. The EPA stresses though, that offsets are not intended to make otherwise 'unacceptable' environmental impacts 'acceptable', but rather to achieve a 'net environmental benefit' to counterbalance 'acceptable' environmental impacts only. The EPA position is that environmental offsets represent a "last line of defence" for the environment and should only be used when all other options to avoid and mitigate environmental impacts have been considered and exhausted.

The EPA does not consider it appropriate to validate or endorse the use of environmental offsets where Projects are predicted to have significant adverse impacts to critical assets[2]. EPA Position Statement No. 9 recognises native vegetation (with some further clarification) as a critical asset and usually considers adverse impacts to this asset to be "significant" where:

- impacts are seriously at variance to the principles to protect native vegetation listed under Schedule 5 of the EP Act or associated Regulations
- impacts would result in a 30% or less representation of the pre-clearing extent of that vegetation complex in a bioregion, or 10% or less where the vegetation complex occurs in constrained areas on the Swan Coastal Plain
- the affected vegetation is part of a Bush Forever reserve.

The EPA also recognises biodiversity as a critical asset and, in relation to this, will have regard to the significance of any potential impacts to Priority flora.

EPA Guidance Statement No. 51

EPA Guidance Statement No. 51 (EPA 2004b) provides guidance on standards and protocols for terrestrial flora and vegetation surveys, particularly those undertaken for the environmental impact assessment of Projects.

6.3 POTENTIAL SOURCES OF IMPACT

The following environmental aspects of the Project may affect vegetation and flora values:

- **vegetation clearing and vehicle use** for the construction of the rail line and associated infrastructure (primarily access roads, borrow pits and laydown areas) will directly disturb vegetation communities and potentially Priority flora species, and lead to the introduction of weeds resulting in the degradation of vegetation communities
- **interception of surface water flows** through construction of drainage structures and infrastructure may affect local water availability for some plant species
- **fire (introduction of ignition sources)** may alter the existing fire regime leading to changes in vegetation and/or flora casualties
- **dust emissions** could potentially smother vegetation, thereby retarding growth.

6.4 ASSESSMENT OF POTENTIAL IMPACT

6.4.1 Vegetation Clearing – Impacts on Vegetation and Flora

Direct Impacts

The Project will disturb up to 1750 ha of vegetation (some of which has been previously disturbed), including clearing for the rail line, laydown areas, communications cabling, access roads and borrow pits. The exact alignment of the duplication and the location of other infrastructure including borrow pits will not be known until the detailed design phase is completed. Without a detailed alignment it is not possible to provide a breakdown of the areas of each vegetation community affected; however, conservative indicative estimates of disturbance to conservation significant vegetation have been made (Table 13).

The majority of vegetation types within the Project area are not considered to be of conservation significance and are likely to be widely distributed and well represented in the wider region. Taking this into consideration along with the linear nature of disturbance, the Project is expected to only result in local disturbance to all vegetation

[2] *Critical assets* represent the most important environmental assets in the State that must be fully protected and conserved.

types, and is unlikely to have any regional implications. Approximately 480 ha of the Project area have been previously disturbed.

The Priority 1 Cracking Clay Communities of the Chichester Range and Mungaroona Range present within the Project area (units Tw/H and H/G), adjacent to two sections of the existing rail line, are considered to be of high conservation significance. Some clearing of this vegetation type will be unavoidable as they transect the southern section of the alignment (Figure 13). A preliminary estimate of up to 29 ha will be disturbed from a combined coverage of 293 ha (approximately 10%) for these two units in the Project area (Table 13). As both of these vegetation units are likely to extend beyond the boundaries of the Project area and the clearing of this vegetation is dispersed over two areas spanning approximately 11 km, impact on this PEC is not expected to be significant.

The vegetation of the cracking clays (units ERAx and TG) are also considered to be of high conservation significance. Clearing of vegetation units ERAx and TG will be unavoidable as this vegetation transects the Project area in several locations (Figure 10 and Figure 11). However, the community covers a relatively large area (approximately 688 ha of the Project area), and continues outside the boundaries of the Project area. The amount of clearing that will occur within the Project area (approximately 3%) should not affect the local representation of this community (Table 13).

The riparian vegetation of the Harding River and its tributaries present within the southern section of the Project area (principally units EcAamCv, EvMg and EvApyTwTeCE; also EvAtrTeCEc and EvTERcApyTwTeCE) are also considered to be of high conservation significance. Some clearing within these vegetation units will be necessary as these vegetation units transect the Project area in several locations (Figure 13) and cover approximately 635 ha of the Project area (Table 13). However, clearing will be strictly controlled, kept to a minimum, kept close to the existing rail line and, where possible, previously disturbed areas will be used. No non-essential infrastructure shall be located within these vegetation units. It is estimated up to 10% (up to 65 ha) of these vegetation units will be cleared within the Project area (Table 13).

Vegetation of moderate significance was considered to include mangal (unit AVm) and rockpile vegetation (units TERcTw and AcDIsEHsTwCEc). The mangrove vegetation shall be avoided by this Project. Up to 3% of the rockpile vegetation mapped within the Project area will be disturbed as a result of construction (Table 13).

Clearing of all vegetation types of moderate and high conservation significance will be minimised and non-essential infrastructure will not be located in these communities. The maximum expected disturbance to any vegetation unit of moderate to high conservation significance will be approximately 12% in the Project area, but it most likely to be substantially less (Table 13). The Project is not expected to have any significant effect on local or regional flora and vegetation values due to the relatively small area of clearing of each vegetation type within a particular area. The estimated disturbances are indicative and further refinement of the amount of disturbance for each vegetation type will occur during the detailed design stage along with the consideration of opportunities to further reduce the footprint.

No DRF will be affected by the Project as none have been recorded or are expected to occur within the Project area. The Priority 1 species recorded (*Nicotiana heterantha*) may be affected by clearing as this species may be supported by two vegetation units within the Project Area (Table 11). However, this species is more widely distributed throughout and outside the Project area, with records from the Western Australian Herbarium indicating that this species has previously been recorded in the Pilbara region and that its distribution extends into the Kimberley, as far north as Broome. Disturbance to known locations of this Priority flora will be minimised in the design and construction of the rail duplication; however, approximately 7% of the vegetation supporting this species in the Project area will be required to be cleared (Table 13). The vegetation unit 'floodout mosaic' potentially supports this Priority flora but was not included in Table 13 as the unit is a result of the presence of the man-made Harding Dam and therefore not a naturally occurring ecosystem.

Table 13 Area of conservation significant vegetation types to be cleared for the Project

Code: Vegetation Type	Approximate Area Mapped in Project Area (ha)	Preliminary Estimate of Area to be Cleared (ha) [% Disturbance within Project Area]
High Conservation Significance		
H/G	33	0
Tw/H	260	29.3 [11%]
ERAx, TG	688	20.4 [3%]
EcAamCv	13	0
EvMg,	201	25.0 [12%]
EvApyTwTeCE	349	34.7 [3%]
EvAtrTeCEc	69	4.9 [10%]
EvTERcApyTwTeCE	2	<0.1 [<1%]
Moderate Conservation Significance		
AVm	0.5	0
TERcTw	115	2.2 [2%]
AcDIsEHsTwCEc	33	2.8 [8%]
Units Associated with Priority Flora (*Nicotiana heterantha*)		
EcEvHAi	7	1.1 [15%]
EcEvERAf	20	0.8 [4%]

Introduction and/or Spread of Weeds

Biota (2008a) identified 17 weed species within the Project area. None of the species are listed as Declared Plants under the *Agriculture and Related Resources Protection Act 1976.* Whilst not listed as Declared Plants, Kapok Bush, Buffel Grass and Birdwood Grass are considered to be serious environmental weeds.

The majority of weeds were widespread throughout the proposed disturbance area and typically occurred as scattered individuals. The vast majority of weeds were associated with drainage areas, creek lines, and previously disturbed areas. By increasing the disturbance in the Project area through clearing or through vehicle usage, there is a risk that the weeds present will spread into new areas and/or new species will be introduced. Of particular concern is the riparian vegetation communities along major drainage lines, which are of high conservation significance but appear to be quite susceptible to weed infestations. Disturbance of these communities will be avoided wherever practicable.

The occurrence of weeds, particularly Kapok Bush, Buffel Grass and Birdwood Grass would be expected in areas of disturbance occurring within the Project area; however, broader occurrences of weeds in, and around the Project area will be controlled to minimise the risk of spreading the weed infestation beyond the Project area. Weeds can dominate locations if they lack natural competitors, herbivores and pathogens that would otherwise regulate them in their natural environment.

6.4.2 Interception of Surface Water Flows

Activities in the Project area will not compromise any significant communities of surface water-dependent vegetation. Vegetation types that may be affected by surface flow alteration are mostly limited to the riparian vegetation communities along main drainage lines such as Western Creek and Miller Creek. Where these watercourses and other minor creeks and drainage lines are intersected by the rail line, the flow regime will be maintained through the construction of appropriate bridges and culverts.

The proponent will be replicating the existing culverts and bridges of the existing rail line to ensure that the current surface water drainage pattern is maintained within and adjacent to the Project area.

Sheet flows within the Project area will be locally concentrated by the culverts which will result in localised increases in flow velocity and potentially soil erosion. This may affect some flora individuals within the immediate vicinity of the culverts.

6.4.3 Fire

The existing rail line within the Project area has divided the landscape in such a way that the natural fire patterns will have adapted over time to the conditions present within the Project area. Given the presence of this existing rail infrastructure, it is unlikely that the installation of a duplicate rail line will significantly alter the current fire regime.

Construction works may provide ignition sources (i.e. welding, grinding etc) resulting in an increase in the risk of fire. Increased vehicular traffic and personnel movement during the construction will also increase the risk of accidental outbreaks of fire in adjacent vegetated areas. This may lead to an increase in fire frequency and/or intensity in these areas, which can favour the establishment of weeds and prevent the regeneration of (or destroy) native vegetation.

The proposed control measures (Section 6.5.4) should reduce the risk of fire. Additionally, the short duration of the construction period in each area should reduce the likelihood of exposure to ignition sources and ensure fire-related impacts are minimal.

6.4.4 Dust Generation

Dust generated during earthworks and vehicle movements may potentially have physical effects on plants, such as blockage and damage to stomata, shading, abrasion of leaf surface/cuticle, as well as cumulative effects (e.g. drought stress on already stressed species). Vegetation located close to roads and other sources of dust is more likely to be subject to such impacts. Areas of clay substrate have the potential to generate large amounts of dust even from light vehicle movement. As a result of the implementation of the Project, areas adjacent to roads and earthworks will be temporarily affected. The Proponent will implement appropriate dust management strategies throughout the Project area to minimise dust generation resulting from the Project.

The proposed control measures and the intermittent and short duration of dust emissions should ensure that the impact of dust emissions on vegetation and flora is minimal.

The impact of dust along with its proposed management actions are addressed in more detail in Section 10.1.

6.5 PROPOSED MITIGATION AND MANAGEMENT MEASURES

6.5.1 Vegetation and Flora Protection Measures

Impacts on flora and vegetation will be managed in accordance with the CEMP (Appendix 1) and Rio Tinto procedures. Management measures include:

- identifying environmentally sensitive areas, including the locations of sensitive vegetation communities and Priority flora
- keeping clearing within authorised areas through internal control clearing approval procedures
- reducing disturbance through planning and locating infrastructure, temporary construction areas, and borrow pits within already disturbed areas, wherever practicable
- avoiding disturbance to vegetation communities of high conservation significance (the PEC [units H/G and Tw/H] and riparian vegetation communities), wherever practicable
- avoiding disturbance to vegetation communities of moderate conservation significance (units AVm, ERAx, TERcTw, AcDIsEHsTwCEc), wherever practicable
- undertaking progressive rehabilitation of disturbed areas using local native species (Section 6.5.5).

Rio Tinto will continue to consult with DEC and the Conservation Commission to determine a suitable offset package for residual impacts on flora and vegetation.

6.5.2 Weed Control Measures

Weed management will be undertaken in accordance with IEMS procedures RTIOHSE-0013504 (Weed Management) and RTIOHSE-0014273 (Weed Hygiene) and the CEMP (Appendix 1). Management measures include:

- undertaking baseline weed mapping and routine weed inspections of the Project area
- treating weed species (Section 6.1.2) along road and railway corridors as part of Rio Tinto's existing weed management program
- where present in areas to be disturbed, *Cylindropuntia fulgida* var. *mamillata* (Coral Cactus) and *Vitex trifolia* var. *subtrisecta* (Three Leaved Chaste Tree) infestations are to be treated under the existing weed management program
- treating new and emerging weeds detected during routine weed inspections under the existing weed management program
- environmental induction training of the workforce to include identification of weed species, reporting of infestations and hygiene procedures to prevent the introduction and spread of weeds
- ensuring vehicles and machinery on site adhere to weed hygiene requirements
- minimising site disturbance by preventing unnecessary clearing of vegetation, particularly in areas adjacent to creeklines and drainage lines.

Specific weed control measures for the MCNP are addressed in Section 8.

6.5.3 Surface Water and Drainage Management

Vegetation will be protected through the implementation of surface water management measures to meet the objectives outlined in the CEMP (Appendix 1) and Rio Tinto standard specifications and design. These measures include:

- culvert design and undertaking stabilisation including:
  - maintaining existing drainage patterns
  - identifying drainage requirements and sizing culverts prior to construction
  - culverts to accommodate seasonal flows and flood events in line with Rio Tinto standards
- designing final landforms in rehabilitation areas to be self-draining
- undertaking works in accordance with approvals and permits under section 17 of the RIWI Act, where required
- implementing erosion control measures at disturbed areas (e.g. borrow pits) to ensure surface runoff water does not lead to erosion or sedimentation.

6.5.4 Fire Management

The risk of fire and the subsequent impacts from fire will be reduced through measures that achieve the objectives outlined in the CEMP (Appendix 1). The management measures will include:

- undertaking basic fire awareness and fire fighting training for appropriate personnel prior to commencing work in the Project area
- providing appropriate fire fighting equipment (e.g. fire extinguishers) on site and in all vehicles at all times
- maintaining fire fighting equipment to comply with relevant fire safety standards
- maintaining adequate fire breaks across the Project area and around working areas, where appropriate
- checking vehicle undersides for any material stuck around exhaust manifolds and removing it as part of normal vehicle check routines
- conducting hot work activities (e.g. welding, grinding, flame cutting) in areas clear of flammable material
- paying particular attention to fire risks associated with the use of earthmoving equipment that can result in sparks
- prohibiting the burning of rubbish or open fires anywhere in the Project area.

6.5.5 Rehabilitation

Rio Tinto will be rehabilitating up to 910 ha of the total area required to be disturbed for rail line construction purposes and associated borrow pits. Rehabilitation will follow specific management strategies set out in *The Construction Environmental Management Guidance Notes and Specification* (Rio Tinto Iron Ore Expansion Projects 2007). Borrow pits required for ongoing operations will be managed in accordance with this Guidance.

Rehabilitation Objectives

The management objective for rehabilitation of all operations is to rehabilitate all disturbed areas to a standard that achieves safe and stable landforms that are free-draining and non-polluting, and contain self-sustaining endemic plant communities that approximate those that existed prior to disturbance (Rio Tinto Iron Ore Expansion Projects 2007).

Monitoring of rehabilitation will identify any need to alter management techniques and determine whether the standard to which the area has been rehabilitated is acceptable. Rehabilitation performance criteria will include post-closure land use objectives, closure objectives, landform stability targets, revegetation targets and groundwater protection targets.

The Rehabilitation Process

Minimising environmental impacts and maximising rehabilitation success of all operations is achieved by integrating the environmental aspects of each operation into all stages of planning and through the implementation of Rio Tinto environmental management tools.

Progressive rehabilitation will be implemented as part of the Project and will be based on the following Rio Tinto management tools to ensure effective environmental and rehabilitation outcomes for the Project:

- Approvals Request System – requires review by relevant professionals of all areas to be disturbed, prior to disturbance
- Biological Survey Protocol – specifies required level of survey detail for areas to be disturbed
- Landform Design Guidelines – specifies appropriate design criteria for landforms
- Soil Resource Management Plan – identifies key soil resources for recovery and rehabilitation
- Borrow Pit Specification and Management Procedure – specifies the appropriate management of borrow pits.

The rehabilitation program will address key environmental aspects such as vegetation clearing and topsoil recovery and volumes required, borrow pit development strategies and rehabilitation areas. Monitoring and regular review of the Program will provide a feedback loop to ensure completion criteria are achieved.

Rehabilitation of disturbed areas (up to 50% of total disturbance) within the MCNP will be undertaken to meet the requirements of the DEC, with the objective of restoring ecosystems consistent within MCNP objectives. Rio Tinto is committed to preparing and implementing a specific MCNP rehabilitation plan in consultation with the DEC that outlines the specific objectives, procedures and completion criteria for rehabilitation areas in the MCNP.

6.6 PREDICTED OUTCOME

After management and mitigation measures have been applied, it is expected that the Project will result in the following outcomes in relation to flora and vegetation:

1. The progressive removal of up to 1750 ha of vegetation during construction and the subsequent progressive rehabilitation of up to 910 ha by ripping compacted areas and respreading topsoil to allow natural regrowth of the disturbed area.
2. Vegetation required to be cleared as a result of the Project is not expected to have a significant effect on the representation of vegetation at a local or regional level.
3. The Project will not affect the conservation status of any significant species (including Priority Flora species).
4. The introduction of new weed species and spread of existing weeds will be contained within the Project area and will be managed as set out in Rio Tinto's Weed Management Program.
5. No Threatened Ecological Communities or Declared Rare Flora species will be affected by the Project as none have been recorded within the Project area.
6. The implementation of Rio Tinto clearing procedures will control the risks to vegetation and flora.

Consistent with EPA objectives, the abundance, species diversity, geographic distribution and productivity of flora at species and ecosystem levels will be maintained, thereby conserving regional biological diversity.

7. TERRESTRIAL FAUNA

7.1 DESCRIPTION OF FACTOR

The habitats found over the Project area have the potential to support a range of terrestrial fauna species, including some endemic to the region and/or listed for protection under State and Federal conservation legislation.

Targeted fauna surveys, consistent with EPA Position Statement No. 3 (EPA 2002b) and EPA Guidance Statement No. 56 (EPA 2004c), were undertaken in the Project area during early April by Biota (2008b). The surveys included systematic terrestrial fauna sampling, systematic avifauna censusing, bat sampling and echolocation call recordings, as well as non-systematic collecting at locations likely to support fauna of conservation significance, including SRE invertebrate taxa. Sampling locations for the surveys are shown in Figure 10 to Figure 14.

The following description of the terrestrial fauna of the Project area is adapted from Biota (2008b) unless otherwise stated. The full Biota (2008b) report is included in Appendix 1.

7.1.1 Fauna Habitat

The Project area comprised a range of habitat units, distinguished on the basis of differences in substrate, landform and vegetation.

Twenty (20) trapping sites utilised for the fauna survey were established in seven primary habitat types. These primary habitat types comprised:

- native tussock grasslands on cracking clays
- scattered to open *Acacia* sp. shrublands over *Triodia* sp. on clayey loam
- samphires on heavy clay
- rocky hill slopes with *Triodia* sp., sometimes with scattered *Acacia* sp.
- small drainage line with *Acacia* sp. over *Triodia* sp.
- boulder piles with *Triodia* sp.
- major drainage lines with *Eucalyptus* sp. over Buffel grass.

Significant Fauna Identified as Potentially Occurring within the Project Area

A search of the DEC Threatened Fauna Database and the Western Australian Museum (WAM) Faunabase indicated 28 Threatened and/or Priority fauna species may potentially occur within the Project area. Five of these species are also listed as 'Vulnerable' or 'Endangered' under the EPBC Act (Table 14).

Table 14 Threatened terrestrial fauna species potentially occurring in the Project Area

Species	State Level	Federal Level	Distribution	Likely Presence in Project Area
Macronectes giganteus (Southern Giant Petrel)	Schedule 1	Endangered	Found in southern and western seas north to 22ºS.	Any individuals occurring within the study area are likely to be immature individuals dispersing.
Dasycercus blythi (Brush-tailed Mulgara)	Schedule 1	Vulnerable	Occurs in spinifex sandplain habitat across the arid zone of Western Australia, the Northern Territory and Queensland.	May potentially occur where undisturbed spinifex grassland occurs.

Species	State Level	Federal Level	Distribution	Likely Presence in Project Area
Dasyurus hallucatus (Northern Quoll)	Schedule 1	Endangered	Occurs in the Pilbara and Kimberley regions of Western Australia and in the Northern Territory and Queensland.	Likely to occur, particularly near major creek lines and rivers, open, rocky habitat and gorges.
Rhinonicteris aurantius (Orange Leaf-nosed Bat)	Schedule 1	Vulnerable	Occurs in the Pilbara region of Western Australia, through the Kimberley and across the Top End into northwestern Queensland.	Not recorded. Foraging may potentially occur within the area, but the lack of suitable habitat indicates this species is unlikely to roost within the project area.
Liasis olivaceus barroni (Pilbara Olive Python)	Schedule 1	Vulnerable	Endemic to the Pilbara region.	May potentially occur.
Falco peregrinus (Peregrine Falcon)	Schedule 4	NL	Cosmopolitan distribution, but is absent from most deserts and the Nullarbor Plain.	Not recorded, but likely that the proposed rail duplication falls within the home range of one or more individual birds.
Lerista nevinae	Priority 1	NL	Currently only known from an approximately 15 km stretch of coastline in the general vicinity of Cape Lambert	One individual recorded adjacent to Project area.
Lerista quadrivincula	Priority 1	NL	Known from a single specimen at Maitland River on the arid coastal plain near Karratha.	Could potentially occur; however, very little is known about its distribution and habitat requirements.
Ramphotyphlops ganei	Priority 1	NL	Poorly collected species known to occur in the Pilbara region.	May potentially occur.
Mormopterus loriae cobourgiana (Little Northern Freetail Bat)	Priority 1	NL	Distribution encompasses the Western Australian coastal areas from Derby to the Exmouth Gulf.	Several individuals recorded adjacent to Project area.
Antipodogomphus hodgkini (Pilbara Dragonfly)	Priority 2	NL	Holotype collected from Millstream Spring, Millstream Station. Limited published information available for this species.	May potentially occur around the Harding River.
Nososticta pilbara (Pilbara Damselfly)	Priority 2	NL	Holotype collected from Millstream Spring, Millstream Station. Limited published information available for this species.	May potentially occur around the Harding River.
Lagorchestes conspicillatus leichardti (Spectacled Hare Wallaby- Mainland)	Priority 3	NL	Occurs in the Pilbara and Kimberley and remains widespread and locally common through a broad swathe of the Northern Territory and northern Queensland.	Potential habitat for this species exists; however, much of the habitat has been fire affected in the past and is unlikely to support this species.
Sminthopsis longicaudata (Long tailed Dunnart)	Priority 3	NL	Inhabits rocky, rugged habitat in the Pilbara and adjacent upper Gascoyne region to the central Northern Territory and South Australia.	Although possible, it is unlikely that significant populations occur within the Project area.
Neochmia ruficauda subclarescens (Star Finch)	Priority 4	NL	Endemic to Australia. Found from the Pilbara to south-eastern Australia. Most common in the tropics and is typically patchy and highly variable in abundance.	Recorded during a recent survey.

Species	State Level	Federal Level	Distribution	Likely Presence in Project Area
Falco hypoleucos (Grey Falcon)	Priority 4	NL	Endemic to Australia. Widespread but rare throughout the arid zone. Occurs in the northern half of Western Australia.	Not recorded but may potentially occur.
Macroderma gigas (Ghost Bat)	Priority 4	NL	Restricted to the tropical north of the continent. Fragmented distribution.	Not recorded but likely to occur while foraging; however, suitable roosting caves were not observed.
Pseudomys chapmani (Western Pebble-mound Mouse)	Priority 4	NL	Common to very common in suitable habitat within the Hamersley and Chichester subregions of the Pilbara bioregion.	Not recorded, but Project area contains some suitable habitat to support species.
Leggadina lakedownensis (Short-tailed Mouse)	Priority 4	NL	Distribution in Western Australia includes the Pilbara and Kimberley regions.	One individual recorded.
Ardeotis australis (Australian Bustard)	Priority 4	NL	Occurs over much of Western Australia.	Not recorded, but likely to occur.
Burhinus grallarius (Bush Stone-curlew)	Priority 4	NL	Widespread throughout much of Australia but declining in some areas. Populations appear secure in the Pilbara.	Not recorded, but likely to occur.
Phaps histrionica (Flock Bronzewing)	Priority 4	NL	Inhabits coastal riverine plains of northwest Western Australia, south to Carnarvon.	Has potential to occur within the Project area, but given its rarity in the Pilbara, this is unlikely.
Notoscincus butleri	Priority 4	NL	Endemic to Western Australia and restricted to the arid northwest of the Pilbara bioregion.	One individual recorded in dune habitat adjacent to the Project area.
Leiopotherapon aheneus (Fortescue Grunter)	Priority 4	NL	Endemic to the Pilbara. Previously thought to be restricted to the Fortescue catchment until specimens were recorded from the Ashburton and Robe Rivers.	Although not recorded from the Harding River, may potentially occur there, given that it has been recorded from three nearby rivers.
Numenius madagascariensis (Eastern Curlew)	Priority 4	Migratory	Occurs throughout coastal Western Australia, south to Bunbury.	Recorded during recent survey at Cape Lambert. Not likely to occur in Project area due to lack of suitable habitat.

Abbreviations

NL Not listed under the Commonwealth EPBC Act

Avifauna species, listed as Migratory under the EPBC Act 1999 that could potentially occur in or near the study area include: White-bellied Sea-Eagle *Haliaeetus leucogaster*; Barn Swallow *Hirundo rustica*; Rainbow Bee-eater *Merops ornatus*; Great Egret *Ardea alba*; Cattle Egret *Ardea ibis*; Oriental Plover *Charadrius veredus*; Oriental Pratincole *Glareola maldivarum*; Little Curlew *Numenius minutus*; Fork-tailed Swift *Apus pacificus*; Southern Giant-Petrel *Macronectes giganteus*; Wedge-tailed Shearwater *Puffinus pacificus*; and Caspian Tern *Sterna caspia*.

Avifauna species listed as Marine species under the EPBC Act 1999 that could potentially occur within the Project area include: Fork-tailed Swift *Apus pacificus*; Great Egret *Ardea alba*; Cattle Egret *Ardea ibis*; Oriental Plover *Charadrius veredus*; Oriental Pratincole *Glareola maldivarum*; White-bellied Sea-Eagle *Haliaeetus leucogaster*; Barn Swallow *Hirundo rustica*; Silver Gull *Larus novaehollandiae*; Southern Giant-Petrel *Macronectes giganteus*; Rainbow Bee-eater *Merops ornatus*; Little Curlew *Numenius minutus*; Osprey *Pandion haliaetus*; Wedge-tailed Shearwater *Puffinus pacificus*; Crested Tern *Sterna bergii*; and Caspian Tern *Sterna caspia*.

7.1.2 Results of Fauna Survey

No Threatened species listed under the *Wildlife Protection Act 1950* were recorded during the Biota (2008b) survey. Two Priority 4 listed species were recorded within the Project area.

Ground mammals

A total of 12 species of ground mammals were recorded during the Biota (2008b) survey, representing six families. This total includes nine native mammal species and three non-native species. The most commonly recorded native species was the Stripe-faced Dunnart *Sminthopsis macroura* with a total of 15 records, representing 23.8% of all ground mammal records.

Species of Conservation Significance

One species of elevated conservation significance was recorded in the southern section of the alignment; this was the State-listed Priority 4 species the Short-tailed Mouse *Leggadina lakedownensis*. Regional records suggest that the primary mainland habitat comprises areas of cracking clay and adjacent habitats, although this species has also been recorded in other habitats.

A further five species of ground mammals of elevated conservation significance could occur within the Project area, but were not recorded. These are the Brush-tailed Mulgara *Dasycercus blythi*, Northern Quoll *Dasyurus hallucatus*, Spectacled Hare-wallaby *Lagorchestes conspicillatus leichardti*, Long-tailed Dunnart *Sminthopsis longicaudata*, and Western Pebble-mound Mouse *Pseudomys chapmani.*

Bats

No bats were captured in the harp traps deployed during the survey. However, based on analysis of recorded call sequences, a total of seven bat species were found to occur within the Project area. These include four evening bats (Vespertilionidae), one free-tail bat (Molossidae), and two sheathtail bats (Emballonuridae) (Biota 2008b).

Species of Conservation Significance

The Little Northern Freetail Bat *Mormopterus loriae cobourgiana* is listed as a Priority 1 species in the DEC Priority Fauna Listing. This species was recorded adjacent to the Project area (Biota 2008e) and in three locations at Cape Lambert (Biota 2008c) in recent surveys.

A further two species of bats of conservation significance could occur within the Project area but were not recorded, these are the Pilbara Orange Leaf-nosed Bat *Rhinonicteris aurantius*, and the Ghost Bat *Macroderma gigas*.

Avifauna

A total of 53 bird species were recorded during the Biota (2008b) survey, comprising 26 passerine (perching) and 27 non-passerine species. The most abundant species recorded were the Zebra Finch *Taeniopygia guttata* and Little Corella *Cacatua sanguinea*. The most abundant family recorded was the Psittacidae and the most speciose family of birds was the Meliphagidae (Honeyeaters), with five species of Honeyeater recorded at most of the census sites. Sites adjacent to drainage lines exhibited the highest avifauna diversity within the Project area. Twenty-four (24) species were recorded at a site on the Harding River, representing 45.3% of the total recorded species in the Project area.

Species of Conservation Significance

One avifauna species of elevated conservation significance was recorded during the survey (Biota 2008b); this was the State-listed Priority 4 species the Star Finch *Neochmia ruficauda subclarescens.* The record came from typical habitat for the species, with two individuals at a site adjacent to dense drainage habitat.

A further 10 avifauna species of elevated conservation significance could potentially occur within the Project area but were not recorded. These are the Southern Giant Petrel *Macronectes giganteus*, Peregrine Falcon *Falco peregrinus*, Grey Falcon *Falco hypoleucos*, Australian Bustard *Ardeotis australis* Bush Stone-curlew *Burhinus grallarius*, Flock Pigeon *Phaps histrionica*, Eastern Curlew *Numenius madagascariensis*, Rainbow Bee-eater *Merops ornatus*, Fork-tailed Swift *Apus pacificus* and Oriental Plover *Charadrius veredus.*

Herpetofauna

A total of 46 herpetofauna species were recorded during the Biota (2008b) survey. This comprised two tree frogs (Hylidae); one ground frog (Myobatrachidae); six geckos (Gekkonidae); three legless lizards (Pygopodidae); 21 skinks (Scincidae); seven dragons (Agamidae); three monitors (Varanidae); two blind snakes (Typhlopidae) and one front-fanged snake (Elapidae). Main's frog *Cyclorana maini* was particularly abundant, with 296 individuals being recorded, representing 47.3% of all herpetofauna recorded during the survey.

Species of Conservation Significance

No herpetofauna species of elevated conservation significance were recorded during the Biota (2008b) survey. However, two herpetofauna species of elevated conservation significance were recorded near the Project area during the Biota (2008e) survey of a previous alignment option; the skink *Lerista nevinae* (Priority 1) and state-listed Priority 4 species *Notoscincus butleri.*

The distribution of *Lerista nevinae* appears to be restricted to the Cape Lambert area. The skink is currently only known from an approximately 15 km stretch of coastline in the general vicinity of Cape Lambert. A single specimen of this species was recorded within dune habitat during a survey of an area adjacent to the Project area (Biota 2008e). This area seems likely to be on the most inland extent of the species' local habitat, with a further 25 specimens having been recorded from coastal dunes at Cape Lambert Port B Development (Biota 2008f).

Three other herpetofauna species of elevated conservation significance may occur within the Project area but were not recorded. These are the Pilbara Olive Python *Liasis olivaceus barroni*, *Lerista quadrivincula* and *Ramphotyphlops ganei*.

Potential short-range endemic (SRE) invertebrates

Mygalomorph spiders, pseudoscorpions and pulmonate snails that may include potential SRE taxa were recorded within the survey area. While the conservation significance of these species is not currently known, the specimens have been lodged with the Western Australian Museum.

Mygalomorph spiders

Four species of mygalomorph spiders were recorded within the survey area during the Biota (2008b) survey. These represented the Nemesiidae, Barychelidae and Idiopidae families.

Pseudoscorpions

Two pseudoscorpion species were recorded within the survey area during the Biota (2008b) survey. These were *Haplochernes* sp. of the family Chernetidae, and *Synsphyronus* sp. of the family Garypidae. Both species were collected opportunistically under the bark of *Eucalyptus* sp. and *Corymbia* sp. trees.

Terrestrial snails

Live specimens of *Rhagada convicta* were collected within the Project area during the Biota (2008b) survey. As currently described, *Rhagada convicta* has an extensive coastal distribution and as a result is not considered to be a SRE. Furthermore, molecular investigations of the species to date show no evidence of distinct populations or populations restricted to small geographical areas.

Additional *Rhagada* snails were also collected but could not be assigned to a known species.

Live snails of an undetermined species from the genus *Succinea* were recorded from a single location within the Project area. These specimens have been lodged with the Western Australian Museum.

Dead shells of *Pupoides* aff. *beltianus* were collected from a single location within the Project area.

Freshwater snails

Live planorbid snails (n >20) belonging to the genus *Glyptophysa* were collected from a temporary rock pool in the gorge located within the development envelope. Specimens have been lodged with the Western Australian Museum. No taxonomic research has been carried out within this genus; however, the specimens collected here may be *Glyptophysa egregia*.

A number of unidentified snail shells from a number of species were collected from Harding River. These shells are awaiting identification.

Millipedes

No millipedes were recorded during the Biota (2008b) survey.

Introduced fauna

House mice *Mus musculus*, cats *Felis catus* and horses *Equus caballus* were recorded within the Project area during the Biota (2008b) survey.

7.1.3 Limitations of the Fauna Survey

Not all sections of the Project area were ground-truthed or equally sampled for fauna; however, systematic fauna sampling, the primary component of the study, was completed on the basis of trapping grid installation in habitats considered to be representative of the range of units present within the Project area.

Terrestrial invertebrate sampling was targeted at a small number of specific groups and collection of other taxa was largely opportunistic.

7.2 KEY STATUTORY REQUIREMENTS, ENVIRONMENTAL POLICY AND GUIDANCE

EPA Objectives

The EPA applies the following objective in its assessment of projects that may affect fauna:

- *maintain the abundance, diversity, geographic distribution and productivity of fauna at species and ecosystems levels through the avoidance or management of adverse impacts and improvement of knowledge.*

The following overriding EPA objective addressing biodiversity is also relevant to this factor:

- *maintain biological diversity where that represents the different plants, animals and micro-organisms, the genes they contain and the ecosystems they form, at the levels of genetic diversity, species diversity and ecosystem diversity.*

National Strategies

The State and Commonwealth Governments have endorsed the *National Strategy for the Conservation of Australia's Biological Diversity* (1996) and the *National Strategy for Ecologically Sustainable Development* (1992). The two strategies address the conservation of Australia's biological diversity by defining several guiding principles.

National Strategy for the Conservation of Australia's Biological Diversity

The principles of this Strategy are:

- biological diversity is best conserved in situ
- although all levels of government have clear responsibility, the cooperation of conservation groups, resource users, indigenous peoples, and the community in general is critical to the conservation of biological diversity
- it is vital to anticipate, prevent and attack at source the causes of significant reduction or loss of biological diversity
- processes for, and decisions about, the allocation and use of Australia's resources should be efficient, equitable and transparent
- lack of full knowledge should not be an excuse for postponing action to conserve biological diversity
- the conservation of Australia's biological diversity is affected by international activities and requires actions extending beyond Australia's national jurisdiction
- Australians operating beyond our national jurisdiction should respect the principles of conservation and ecologically sustainable use of biological diversity and act in accordance with any relevant national or international laws
- central to the conservation of Australia's biological diversity is the establishment of a comprehensive, representative and adequate system of ecologically viable protected areas integrated with the sympathetic management of all other areas, including agricultural and other resource production systems
- the close, traditional association of Australia's indigenous peoples with components of biological diversity should be recognised, as should the desirability of sharing equitably benefits arising from the innovative use of traditional knowledge of biological diversity.

National Strategy for Ecologically Sustainable Development

The principles of this Strategy are:

- decision-making processes should effectively integrate both short-term and long-term economic, environmental, social and equity considerations
- where there are threats of serious or irreversible environmental damage, lack of full scientific certainty should not be used as a reason for postponing measures to prevent environmental degradation
- the global dimension of environmental impacts of actions and policies should be recognised and considered
- the need to develop a strong, growing and diversified economy which can enhance the capacity for environmental protection should be recognised
- the need to maintain and enhance international competitiveness in an environmentally-sound manner should be recognised
- cost-effective and flexible policy instruments should be adopted, such as improved valuation, pricing and incentive mechanisms
- decisions and actions should provide for broad community involvement on issues which affect them.

EPA Position Statement No. 2

EPA Position Statement No. 2 (EPA, 2000) provides an overview of the EPA position on the clearing of native vegetation in Western Australia. Principles and related objectives and actions have been adopted from the above-mentioned national strategies in the development of this Position Statement. In assessing a project, the EPA will include the following basic elements in consideration of biological diversity:

- comparison of development scenarios, or options, to evaluate protection of biodiversity at the species and ecosystems levels, and demonstration that all reasonable steps have been taken to avoid disturbing native vegetation
- no known species of plant or animal is caused to become extinct as a consequence of the development and the risks to threatened species are considered to be acceptable
- no association or community of indigenous plants or animals ceases to exist as a result of the Project
- there is a comprehensive, adequate and secure representation of scarce or endangered habitats within the project area and/or in areas which are biologically comparable to the project area, protected in secure reserves
- if the Project is large (in the order of 10 – 100 ha or more, depending on where in the State) the project area itself should include a comprehensive and adequate network of conservation areas and linking corridors whose integrity and biodiversity are secure and protected
- the on-site and off-site impacts of the Project are identified and Rio Tinto demonstrates that these impacts can be managed.

EPA Position Statement No. 3

EPA Position Statement No. 3 (EPA 2002b) discusses the principles that the EPA would apply when assessing projects that may have an effect on biodiversity values in Western Australia. The Position Statement intends to provide the following outcomes:

- promote and encourage all proponents and their consultants to focus their attention on the significance of biodiversity and, therefore, the need to develop and implement best practice in terrestrial biological surveys
- enable greater certainty for proponents in the EIA process by defining the principles the EPA will use when assessing projects that may have an effect on biodiversity values.

EPA Guidance Statement No. 56

As described in the EPA Position Statement No. 3 (EPA 2002b), the EPA determined that a series of guidance statements were warranted to provide an easy-to-use decision-making guide to the level of biological survey required. EPA Guidance Statement No. 56 (EPA 2004c), provides guidance on standards and protocols for terrestrial fauna surveys, particularly those undertaken for the environmental impact assessment of projects.

State Protection

In a legislative context, the preservation and conservation of fauna is covered primarily by the following Western Australian legislation:

- *Wildlife Conservation Act 1950*
- *Conservation and Land Management Act 1984.*

In Western Australia, rare or endangered species are protected by the Wildlife Conservation (Specially Protected Fauna) Notice 2008*,* under the *Wildlife Conservation Act 1950*.

The DEC (Nature Conservation Division) Priority Fauna List also nominates conservation species from Priority One to Five. It is expected that the potential impacts of a project to these Priority listed species should be managed such that the species do not meet the International Union for the Conservation of Nature (IUCN) criteria for threatened species.

Commonwealth Protection

The EPBC Act protects species listed under Schedule 1 of the Act. In 1974, Australia signed the Convention on International Trade in Endangered Species of Wild Fauna and Flora. As a result, an official list of endangered species was prepared and is regularly updated. This listing is administered through the EPBC Act.

The Project has not been referred to the Commonwealth Department of the Sustainability, Environment, Water, Populations and Community (SEWPaC) under the EPBC Act, as the Project is unlikely to have any significant impact on a Matter of National Environmental Significance[3].

Five nationally-listed threatened fauna species have been identified as potentially occurring near the Project area (Section 7.1.2). These species include the Southern Giant Petrel *Macronectes giganteus*, the Orange Leaf-nosed Bat *Rhinonicteris aurantius*, the Northern Quoll *Dasyurus hallucatus*, the Brush-tailed Mulgara *Dasycercus blythi* and the Pilbara Olive Python *Liasis olivaceus barroni*. None of the species were recorded during the Biota surveys (2008b, 2008e), but are considered to potentially occur where suitable habitat exists. None of these habitats are likely to be significantly affected by the Project.

International Agreements

International agreements relevant to the environmental aspects of the Project include the following:

- Japan-Australia Migratory Bird Agreement (JAMBA), China-Australia Migratory Bird Agreement (CAMBA) and Republic of Korea-Australia Migratory Bird Agreement (ROKAMBA) - Australia is party to the JAMBA, CAMBA and ROKAMBA. (Most of the birds listed in these Agreements are associated with saline wetlands or coastal shorelines and have little relevance to the Project area. However, some migratory birds not associated with water are also listed on these international treaties.)
- Convention on Biological Diversity (Rio Convention)
- Convention on the Conservation of Migratory Species of Wild Animals (Bonn Convention).

7.3 POTENTIAL SOURCES OF IMPACT

Activities or aspects of the Project that may affect terrestrial fauna values include:

- **vegetation clearing** will directly disturb terrestrial fauna habitat and may result in the loss of individual terrestrial fauna
- **vehicle and equipment movements** in construction areas and on access roads could potentially result in the loss of individual terrestrial fauna, especially less-mobile species
- **fire** introduced during construction could potentially result in the loss of fauna habitat and/or individual terrestrial fauna, especially less-mobile species.

Minor potential sources of impact include noise emissions from the construction, which may cause habitats close by to become unsuitable for foraging and general habitation; however, this is not anticipated to be a significant impact, as disturbance will be temporary. Construction activities will generally take place between 6am and 6pm, limiting the potential impact on nocturnal fauna. Dust and the introduction and/or spread of weed species are also not anticipated to significantly affect terrestrial fauna species as a result of the proposed construction.

[3] Matters of National Environmental Significance include World Heritage Properties, Ramsar wetlands, nationally threatened species and ecological communities, migratory species, Commonwealth marine areas and nuclear actions.

7.4 ASSESSMENT OF POTENTIAL IMPACT

7.4.1 Vegetation Clearing

Terrestrial fauna rely on native vegetation and physical aspects of the landscape to provide food, shelter and breeding sites. The loss or degradation of native vegetation and physical disturbance to the landscape may reduce the capacity of the habitat to support the range of species it would in an undisturbed state.

The fauna habitat types identified by Biota (2008b) have been shown to support a range of fauna species, including conservation significant species. The available habitat data indicates that no restricted or uncommon geological units or land systems occur in the Project area. In addition to this, the relatively linear nature of the development and the presence of an existing disturbance corridor within the Project area indicate a low probability of significant impact to fauna habitat.

The invertebrate groups recorded inside the Project area and in adjacent areas are not considered to be SRE species. A risk-based assessment was adopted using defined habitat units as a surrogate for inferring distributional boundaries of potential SREs. Based on the broad distribution of habitat types and vegetation units from which the potential SREs were recorded in the Project area, it was concluded that the taxa are likely to be more widely distributed beyond the confines of the Project area (refer to Section 7.4.4 for more detail).

Vegetation will be progressively removed from sections of the Project area, during construction of the rail line and subsequently rehabilitated. The distribution of the majority of the vegetation types in the Project area do not appear to be restricted within the locality, suggesting that the fauna habitats are likewise probably more widely distributed.

7.4.2 Vehicle and Equipment Movement

The site preparation process and vehicle movements around the Project area have the potential to cause the loss of some individuals of terrestrial fauna through direct mortality. Less-mobile species, such as reptiles, are most likely to be affected. The appropriate speeds for various sections of the route will be determined through a risk assessment process.

The conservation status and distribution of any species is unlikely to be affected by the degree of impact associated with vehicle movement within and adjacent to the Project area.

7.4.3 Fire

There is potential that construction works may result in an increase in the risk of fires due to the increase in ignition sources due to the nature of works involved (e.g. vehicle usage, welding). This may lead to an increase in fire frequency and/or intensity in these areas, which can result in increased loss of fauna individuals and prevent the regeneration of (or destroy) fauna habitat.

7.4.4 Impacts to Fauna of Conservation Significance

No Schedule 1 listed fauna, or fauna species listed under the EPBC Act, were recorded during the survey. Analysis of habitats present and known distributions suggested that five Schedule 1 fauna species may occur in the Project area. The relatively linear nature of the development, which is also consolidated with an existing disturbance corridor, indicates a low risk of significant impact to these Schedule 1 species in the event that they are present.

- The likelihood of impacts to species of conservation significance recorded by Biota (2008b) is discussed below:Short-tailed Mouse *Leggadina lakedownensis*– Priority 4: while the Project is likely to result in clearing of some habitat inhabited by *L. lakedownensis*, given the large areas of clay habitat and the relatively small areas that may be cleared, it is unlikely to affect the conservation status but may have a very localised impact on this species.
- Star Finch (western) *Neochmia ruficauda subclarescens* – Priority 4: clearing of habitat is likely to be the main potential impact on this species. The Project will not significantly affect riparian vegetation communities, the core habitat of the Star Finch, and as a result is unlikely to affect the conservation status but may have very localised effects on this species.

The likelihood of impacts to species recorded adjacent to the Project area in other surveys (Biota 2008e) are discussed below:

- Little Northern Freetail Bat *Mormopterus loriae cobourgiana* – Priority 1: impacts through habitat loss are considered unlikely as roosting occurs within the mangrove habitat and in locations outside the Project area. The conservation status of this species is unlikely to be altered by the Project.
- *Notoscincus butleri* (skink) – Priority 4: it is highly unlikely there will be major impacts on this species from the Project as it has been previously recorded in the Cape Lambert area. Habitat supporting this species is widespread in the area (arid, rocky and near-coastal) and the Project will only affect a narrow corridor of habitat, therefore the conservation status of this species is unlikely to be affected by the Project.
- *Lerista nevinae* (skink) – Priority 1: this fossorial skink is currently only known from the general vicinity of Cape Lambert and was recorded within dune habitat during a survey of an area adjacent to the Project area (Biota 2008e). The Project will not impact on coastal dunes therefore the species is unlikely to be disturbed by the proposed development.

Potential Short-Range Endemic (SRE) Invertebrates

Consistent with EPA Guidance Statement No. 20 *Sampling of Short Range Endemic Invertebrate Fauna for Environmental Impact Assessment in Western Australia* (EPA 2009), potential SRE habitat was inferred using a risk-based assessment using defined vegetation mapping units as a surrogate for inferring distributional boundaries, as this reflects changes in geology, landform, soil type and hydrology, all of which are likely factors governing the distribution of SRE taxa.

Eight of the potential SRE invertebrate taxa recorded in the Project area were recorded at only one site during the Biota (2008b) surveys. The assessment of impact on these species is discussed below. The remaining species are not restricted to the proposed disturbance area and the viability of these species will not be placed at risk by the Project.

The freshwater snail species found within the Project area were recorded in areas that will not be affected by the Project (i.e. a rock pool in a gorge on the edge of the Project area and the Harding River). In addition, given the location of the snails collected in the Harding River, it is unlikely that they will be restricted to the immediate area of the Project; therefore no taxon level impacts would be expected.

The mygalomorph spider, *Barychelidae* sp. A, was only found in one location in the vegetation unit ChApyAbTwTe. This vegetation unit comprises1884 ha of the Project area and is particularly abundant in both the southern and northern ends of the Project area and appears to extend beyond the area surveyed. Based on the extent of the vegetation associated with this species, it is likely that *Barychelidae* sp. A is more widely distributed beyond the disturbance area of the Project.

An individual of *Idiopidae* sp., another mygalomorph spider was found in one location within the vegetation unit ERAx. The Project area includes 472 ha of this vegetation unit and it appears to extend outside of the Project area. It is likely that this species of spider has a wider distribution beyond the Project's area of impact.

Of the terrestrial snail species found:

- The *Rhagada* species that could not be identified to species level were found in two locations; however, the vegetation units they were recorded in (ApyAarTeTw and EvMg) have a wider distribution than the Project area, hence taxon level impacts are unlikely
- *Pupoides* sp. was found in only one location; however, this location is not being disturbed by the Project. The vegetation unit the species were recorded in also extends east and west outside of the Project area; hence taxon level impacts are unlikely
- *Succinea* sp. was found in one location in the vegetation unit EvMg, which constitutes 201 ha of the Project area and extends beyond the Project area, hence taxon level impacts are unlikely.

7.5 PROPOSED MITIGATION AND MANAGEMENT MEASURES

Terrestrial fauna within, and adjacent to, the Project area will be protected through addressing the objectives outlined in the CEMP (Appendix 1) by implementing the following management measures:

- ensuring that clearing of potential fauna habitat complies with that approved to be cleared and is kept within the proposed footprint
- implementing and sign-posting appropriate speed limits for vehicles on access roads
- replicating existing drainage structures so as to ensure current drainage flows are maintained and to prevent ponding of water (Section 6.5.2)
- implementing standard dust suppression measures across the project area to mitigate effects on surrounding fauna habitat (Section 10.1.1)
- undertaking progressive rehabilitation to re-establish fauna habitat (6.5.5)
- implementing fire prevention and suppression measures (Section 6.5.4).

7.6 PREDICTED OUTCOME

After management and mitigation measures have been applied, it is expected that the Project will result in the following outcomes in relation to the terrestrial fauna:

1. Loss of terrestrial fauna habitat as a result of the Project may have a very localised impact on habitat but is not expected to have a significant effect on the representation of fauna at a local or regional level.
2. The Project will have a very localised effect on some species but will not affect the conservation status of any significant species.
3. The Project will not conflict with the WC Act as no species of terrestrial vertebrate or invertebrate fauna will cease to exist as a result of the Project.

Consistent with EPA objectives, the abundance, species diversity, geographic distribution and productivity of terrestrial fauna at species and ecosystem levels will be maintained, thereby conserving regional biological diversity. The zoological studies undertaken by the Proponent and the implementation of the proposed management measures will ensure that direct disturbance to important fauna habitat is kept to that which is necessary, and that fauna and fauna habitat adjoining areas of disturbance are protected from indirect disturbance, as far as practicable.

8. MILLSTREAM-CHICHESTER NATIONAL PARK

8.1 DESCRIPTION OF FACTOR

MCNP provides for the conservation of approximately 0.6% of the Fortescue Plains subregion and 2.7% of the Chichester subregion (of which 0.9% and 3.9% is contained within conservation reserves respectively) (DEC 2007).

MCNP contains a diverse and unique natural terrestrial and aquatic natural environment, supports significant Indigenous cultural values and provides recreation opportunities for tourists to the Pilbara region (Section 8.1.1).

The southern end of the Project area (approximately 10 km) occurs in the north-western part of MCNP, in a section that has been excised from the National Park (Figure 1). This part of MCNP is within the Karratha Coastal Plain and consists of a gently undulating coastal plain. The vegetation on the Karratha Coastal Plain is predominantly sparse grassland with shrubs and heath and isolated low trees. Larger rivers form estuaries and floodplains on the coast (DEC 2007).

The presence of rail, road and power corridors through MCNP increases the risk of impact to the Park from weeds and fire, and reduces visual amenity. These potential threats must therefore be carefully managed when constructing and operating infrastructure within the Park.

8.1.1 Key Values of Millstream-Chichester National Park

Values of MCNP relate to nature, culture, recreation, commercial and community interests (Table 15).

Table 15 Key Values of Millstream–Chichester National Park

Interest	Value
Nature	Significant wetland ecosystem, providing habitat for unique flora and fauna species
	Subterranean aquifer, providing habitat for significant aquatic stygofauna
	Ancient geological landforms including stromatolite fossils near Mount Herbert
	Remoteness of the area
	The Fortescue River
Culture	Significant Indigenous cultural and mythological sites
	Important site for use by Traditional Owners for cultural activities and ceremonies
	Important site for non-Indigenous cultural heritage comprising old buildings, stockyards, wells and stock routes
Recreation	Landscape of high scenic quality ranging from arid rangelands to large open pools on the Fortescue River
	Environment that provides opportunities for swimming, camping, canoeing, sightseeing, bushwalking, wildflower viewing, bird-watching and photography
Community	Joint management of MCNP with Indigenous people
	Involvement of community and stakeholders to encourage greater involvement in the management of the MCNP
Commercial	Nature and cultural-based tourism
	Millstream aquifer is an important source of drinking and industrial water in the Pilbara

Source: Adapted from DEC (2007)

Management of Millstream-Chichester National Park

All National Parks in Western Australia are vested in the Conservation Commission. Everyday management of these Parks is carried out by the DEC in accordance with the CALM Act. However, DEC also recognises that partnerships with the community, in particular with the Traditional Owners, are integral to undertaking this management.

The Millstream Park Council (The Council) was established in early 2003 to provide input into the management of MCNP. The Council represents the interests of the Traditional Owners of the lands within MCNP and the general community, respectively. The Council was established to assist the joint management of MCNP between DEC and the Yindjibarndi and Ngarluma community. The Council facilitates the involvement of the Yindjibarndi and Ngarluma community in all aspects of management of MCNP (DEC 2007).

The key statutory requirements, environmental policy and guidance used for managing MCNP are outlined in Section 8.2.

8.2 KEY STATUTORY REQUIREMENTS, ENVIRONMENTAL POLICY AND GUIDANCE

EPA Objective

In most circumstances, including this assessment, the EPA applies the following objective in its assessment of projects that may affect conservation areas:

- *protect the environmental values of areas identified as having significant environmental attributes.*

8.2.1 State Legislation

In a legislative context, the management of National Parks and preservation/conservation of flora and fauna and is covered primarily by the CALM Act and WC Act.

Management for National Parks must also comply with the following legislation:

- *Environmental Protection Act 1986*
- *Bush Fires Act 1954*
- *Aboriginal Heritage Act 1972*
- *Mining Act 1978* and the *Petroleum Act 1967* (The CALM Act defers to the Mining Act and the Petroleum Act where these conflict).

Conservation and Land Management Act 1984

The CALM Act provides the legislative base for the management of National Parks in Western Australia. The Act includes a number of statutory requirements for the management of land and wildlife, including:

- the Conservation Commission is responsible for the preparation of management plans for lands vested in it
- a management plan must contain a statement of policies or guidelines to be adhered to when managing the area, and a summary of the operations proposed to be taken over the life of the plan
- a management plan for a National Park shall be designed to *"…fulfil so much of the demand for recreation by members of the public as is consistent with the proper maintenance and restoration of the natural environment, the protection of indigenous flora and fauna and the preservation of any feature of archaeological, historic or scientific interest*".

Wildlife Conservation Act 1950

In Western Australia, rare or threatened flora and fauna species are protected under the WC Act. The DEC (Nature Conservation Division) also identifies Priority flora and fauna species of conservation significance.

8.2.2 Commonwealth Legislation

The EPBC Act protects flora and fauna species listed under Schedule 1 of the Act. In 1974, Australia became a signatory to the Convention on International Trade in Endangered Species of Wild Fauna and Flora. As a result, an official list of endangered species was prepared and is regularly updated. This listing is administered through the EPBC Act. The current list differs from the various State lists; however, some species are common to both.

8.2.3 Other Obligations and Agreements

- Japan-Australia Migratory Bird Agreement (JAMBA), China-Australia Migratory Bird Agreement (CAMBA) and Republic of Korea-Australia Migratory Bird Agreements (ROKAMBA)
- Convention on Biological Diversity (Rio Convention)
- Convention on Wetlands of International Importance (Ramsar Convention)
- Convention on the Conservation of Migratory Species of Wild Animals (Bonn Convention)
- National Wetlands Program
- National Wild Rivers Project
- The Australian International Council on Monuments and Sites Charter for the Conservation of Places of Cultural Significance (the Burra Charter).

8.2.4 Millstream-Chichester National Park and Mungaroona Nature Reserve Draft Management Plan

The Millstream-Chichester National Park and Mungaroona Nature Reserve Draft Management Plan (the Draft MCNP Plan) was released in 2007, and is the latest draft management plan for MCNP (DEC 2007). The Plan describes in detail the environmental, cultural and social values of MCNP, as well as management objectives, strategies and responsibilities.

8.3 POTENTIAL SOURCES OF IMPACT

Potential sources of impact (environmental aspects) to the ecological, physical, cultural and/or landscape values of MCNP arising as a result of the implementation of the Project include:

- **site preparation and/or earthworks (including transportation of borrow into MCNP)**:
  - may introduce and/or spread weeds into MCNP
  - may intercept or alter surface water flows
- **fire (introduction of ignition sources)** may alter the existing fire regime leading to changes in vegetation composition and/or result in vegetation and fauna casualties
- **vehicle usage and refuelling** may result in hydrocarbon spills
- **dust emissions and altered landforms** may affect visual amenity
- **temporary construction workforce access** to MCNP may decrease amenity and increase traffic and associated public safety risks within MCNP.

8.4 ASSESSMENT OF POTENTIAL IMPACT

8.4.1 Site Preparation/Earthworks

Introduction and Spread of Weeds

Over the last 135 years, 31 different weed species have been introduced into MCNP (DEC 2007). The most significant are discussed below.

- Ruby Dock (**Acetosa vesicaria*) was first recorded from the Pilbara in the 1890s, and has since spread throughout the region. It is an annual whose full ecological effects are unknown (DEC 2007). While Ruby Dock was not recorded in the Project area (Biota 2008b), the Project has the potential to introduce this weed into the Project area due to increased traffic, human activity and ground disturbance. Results from the additional weed surveys recently conducted within MCNP will confirm the absence/presence of this species within the development envelope in MCNP. This information will be provided to the DEC and Calibre prior to any ground disturbance works within MCNP to inform management of this species
- Buffel Grass (**Cenchrus ciliaris*) was planted at Millstream for its value as stock fodder during the 1880s and is now established along almost every watercourse (DEC 2007). Disturbance of riparian vegetation during construction of the Western Creek rail bridge may result in the further spread of Buffel Grass into this area
- The Date Palm (**Phoenix dactylifera*) and Parkinsonia (**Parkinsonia* spp.) are significant problems in MCNP. However, populations of these weeds are mostly found along the Fortescue River, which is not affected by the Project
- Kapok Bush (**Aerva javanica*) has spread throughout the Pilbara, favouring areas of soil disturbance. Within MCNP, Kapok Bush infestations are believed to have followed road and rail construction (DEC 2007); however, its direct effects on native flora are unknown. Kapok Bush was recorded in the Project area (Biota 2008b) and may potentially be spread by the Project, but is not a priority weed species for management in the MCNP (DEC 2007).

Borrow will be sourced from outside MCNP and transported into the Park via trucks and this has the potential to introduce new weeds into MCNP. Weed hygiene management measures consistent with the Draft MCNP Plan have been included in the CEMP to minimise the risk of this occurring (Section 8.5; Appendix 1). All trucks transporting borrow from borrow areas into MCNP will remain on sealed or cleared and graded areas (vegetation and topsoil removed) hence will not be exposed to weed infected areas. In addition, all borrow pits will be inspected for weeds prior to disturbance, following rainfall events and periodically during the weed season. If material from borrow pits contain weeds or are likely to contain weed propagules they will not be used at construction sites within MCNP unless appropriate containment and quarantine measures are in place.

Interception of Surface Water Flows

The Project will intersect Western Creek and several drainage lines located adjacent to existing rail infrastructure in MCNP. Potential impacts arising from these intersections are related to the change in landform created from the installation of infrastructure. The proposed change in landform may potentially affect surface water flow paths and drainage in the Project area.

Rail design will focus on maintaining stream flow regimes as near as practicable to those found prior to the Project being implemented. Culverts will be installed in areas where rail construction works intersect ephemeral creeks and drainage lines. A rail bridge will be constructed over Western Creek to reduce any impact on the flow of this waterway. Rio Tinto will replicate the existing culverts and bridges associated with the current rail line to ensure that surface water drainage patterns are maintained. The Project is therefore expected to have no significant effect on surface hydrology in MCNP within or beyond the Project area.

8.4.2 Fire

The existing rail and road infrastructure through MCNP has divided the landscape in such a way that the natural fire patterns will have adapted over time to the conditions present within the Project area. Given the presence of this existing infrastructure, it is considered unlikely that the installation of a duplicate rail line within MCNP will significantly alter the current fire regime.

There is potential that construction works may provide ignition sources (i.e. welding, grinding etc) resulting in increased risk of fire. Increased vehicular traffic and personnel movement during the construction phase of the Project may also increase the probability of accidental outbreaks of fire in adjacent areas. This may lead to an increase in fire frequency and/or intensity in these areas, which can favour the establishment of weeds and prevent the regeneration of (or destroy) native vegetation. The loss of fauna habitat as a result of fire can result in fauna relocation or casualties.

8.4.3 Vehicle Usage and Refuelling

Diesel and other hydrocarbons will be used routinely by light and heavy vehicles during construction. This will present minor operational risks of spillage during re-fuelling of trucks and other machinery. Groundwater quality could potentially be affected by spills of hydrocarbons; however, these risks are easily minimised by standard management controls.

Designated refuelling areas will be established and procedures to minimise the risk of spillage will be implemented on site. Some fuel will be stored within MCNP; however, there will be no bulk storage of fuel within the National Park.

8.4.4 Landscape Modifications

For this Proposal, borrow pits will not be located within MCNP, hence the Project will result only in modifications of a landscape that has already been disturbed by the existing rail line and access roads and are not expected significantly affect visual amenity. Sourcing of borrow from within MCNP maybe considered later under a separate Proposal once geotechnical and visual amenity investigations have been completed to DEC requirements.

Visual amenity may also be affected by dust generated from the Project, hence, dust control measures will be implemented throughout the construction period to minimise the effect of dust on the amenity of MCNP. Visual amenity and its management in the Project area are addressed in more detail in Section 10.7.

8.4.5 Construction Workforce

The Project will require a number of personnel to be employed during construction. The location of the Project within a 10 km section of the MCNP offers significant benefits for the project workforce but also potential threats to aspects of the National Park. Benefits include the provision of high amenity rest and recreation areas for project workers, as well as providing an opportunity for Rio Tinto to improve community relations through supporting the values and goals of the National Park. Conversely, construction worker use of the park may result in unwanted impacts to the environment and community. Depending on the location of construction, it is anticipated that construction and the associated workforce maybe present in MCNP for approximately two years.

Potential workforce related impact to MCNP include:

- Use of National Park facilities: the presence of the construction workforce is likely to see increased usage of existing park infrastructure and facilities. In turn, this may contribute to impacts such as accelerated wear and tear on facilities, reduced visitor enjoyment of the park and increased park management costs.
- Biodiversity impacts: vehicles entering the MCNP may increase the risk of introduction and/or spread of weed species and increase dust impacts from roads. Additionally, impacts to vegetation, flora and heritage sites may result if vehicles venture off existing roads and tracks within the MCNP. Inappropriate disposal of waste, including inappropriate toileting has the potential to impact on the amenity of the park.
- Increase in bushfire frequency: visitors may increase bushfire frequency within the park through incorrect use of cooking facilities, incorrect disposal of some items (e.g. glass bottles), disposal of cigarette butts and vehicle travel across grass or other vegetation areas. An increase in bushfire frequency has the potential to change species composition and density within MCNP and increases the demand on DEC staff in the park.
- Disorderly and nuisance behaviour: construction workers utilising the MCNP may interact with members of the public from time to time. Potential areas of concern from worker behaviour include: drunken behaviour within the MCNP; disregard for park rules and requirements; general disorderly and nuisance behaviour; and violent or abusive actions to others or within groups of workers.
- Waste disposal: park visitors are likely to generate rubbish during their visit to the park. Incorrect disposal of rubbish my create environment impacts through attraction of pests/vermin, injury to native fauna, increase in fire risk and the introduction of non-biodegradable materials into the environment. Additionally, incorrect rubbish disposal may create visual and amenity impacts affecting other park users.

8.5 PROPOSED MITIGATION AND MANAGEMENT MEASURES

The existing ecological, physical, cultural and landscape values of MCNP will be protected primarily through the implementation of the CEMP. As part of development of the CEMP, consultation has been undertaken with the DoW and DEC. The CEMP is based on Rio Tinto procedures and standards and reflects the Draft MCNP Plan (DEC 2007). Key management measures within the CEMP that will relate to protection of MCNP values (e.g. fauna, vegetation and flora) include weed control, surface water and drainage management, fire management, hydrocarbon management and temporary workforce management.

8.5.1 Weed Control Measures

Rio Tinto have been engaged in ongoing formal consultation with the DEC regarding weed management. A Weed Committee has been established and regular scheduled meetings have been held between Rio Tinto and DEC. DEC has provided a weed layer for use in conjunction with mapping software to facilitate the recording of weed locations amongst Project infrastructure. Additionally, Rio Tinto is currently developing a Strategic Weed Management Plan with input from DEC and it is expected that this will be implemented in 2011.

Targeted post-wet season weed surveys of the Project area have recently been undertaken (April 2011). Where weeds are identified, a control program will be developed in consultation with DEC and Rio Tinto.

Rail operations, in consultation with DEC, have been conducting weed spraying throughout 2010. Over 70 days of spraying have been conducted in 2010 with the most recent spraying program conducted in September 2010. The spraying program has focused on hotspots in MCNP and has been undertaken in consultation with DEC. The new rail guidelines are not expected to influence weed spraying programs. All weed sprayers are trained to work along the rail tracks and are familiar with the required procedures when the white flag system changes. The new guidelines will require the weed sprayers to fill out a form detailing the required works and via radio communication take possession of the track. This can occur between trains as and when required and is expected to provide little interruption to the rail network or spraying. Weed sprayers currently have access to a rail vehicle they use to target weeds on the tracks and elevated areas they cannot access from the road. This will not change with the new rail guidelines coming into effect. Rio Tinto is planning to improve the timing of this to align with ruby dock outbreaks. This management measure is also being undertaken in consultation with DEC through the Weed Committee.

The introduction and/or spread of weeds adjacent to and within MCNP will be minimised through management measures consistent with actions outlined in the Draft MCNP Plan (DEC 2007).

In addition to the weed control measures outlined in Section 6.1.2, specific weed control measures to be implemented within MCNP include:

- undertaking a comprehensive weed survey along the 10 km section of rail corridor within MCNP in order to determine the presence/absence of weeds in this area
- developing and implementing targeted weed control programs, in consultation with DEC, that involve the spraying of serious environmental weeds along the alignment both during and post-construction
- implementing strict weed hygiene controls for all ground engaging equipment working within or immediately adjacent to MCNP including:
    - presenting weed hygiene certificates prior to mobilisation of all ground engaging equipment
    - washing down of ground engaging equipment prior to demobilisation from weed infested areas within MCNP
    - ensuring sumps used for the wash down of equipment will be designed to prevent run off and will be covered with clean fill material to reduce the likelihood of weeds originating within sumps
- All borrow pits will be surveyed and inspected for weeds. If material from borrow pits contain weeds or are likely to contain weed propagules they will not be used at construction sites within MCNP unless appropriate containment and quarantine measures are in place.

In particular, measures will address Ruby Dock to prevent new infestations and further spread through MCNP. These measures will be developed in consultation with DEC.

Although Buffel Grass and Kapok Bush are not priority weed species for management in MCNP, they will be controlled as appropriate. In regards to Buffel Grass, no single control method is effective, particularly in light of the landscape scale of control required in the Project area.

Rio Tinto will continue to consult and work proactively with DEC on weed management within MCNP both during and post-construction.

8.5.2 Surface Water and Drainage Management

Surface water values within MCNP will be maintained through meeting the objectives outlined in the CEMP (Appendix 1) and Rio Tinto standard specifications and design. These measures include:

- culvert design and undertaking stabilisation including:
    - maintaining existing drainage patterns to reduce potential erosion and sedimentation
    - identifying drainage requirements and culvert sizes prior to construction
    - culverts will be capable of accommodating seasonal flows and flood events to Rio Tinto standards
- designing final landforms in rehabilitation areas to be self-draining
- undertaking works in accordance with approvals and permits under section 17 of the RIWI Act where required
- implementing erosion control measures at sites subject to disturbance to ensure surface runoff water does not lead to erosion or sedimentation.

8.5.3 Fire Management

The risk of fire and the associated impacts of fire to MCNP will be reduced through the implementation of management measures consistent with those outlined in the Draft MCNP Plan (DEC 2007). These measures include:

- undertaking basic fire awareness and fire fighting training for appropriate personnel prior to commencing work in the Project area
- providing appropriate fire fighting equipment (e.g. fire extinguishers) on site and in all vehicles at all times
- maintaining fire fighting equipment to comply with relevant fire safety standards
- maintaining adequate fire breaks across the Project area and around working areas where required
- ensuring ongoing consultation and provision of assistance to the DEC and other MCNP management bodies with regard to fire management practices/buffers in adjoining pastoral leases, including spotting, reporting and fighting fires in MCNP in proximity to the rail works
- checking vehicle undersides for any material stuck around exhaust manifolds and removing it as part of normal vehicle check routines
- conducting hot work activities (e.g. welding, grinding, flame cutting) in areas clear of flammable material
- paying particular attention to fire risks associated with the use of earthmoving equipment that can result in sparks (metal blade on rock surface)
- prohibiting the burning of rubbish or open fires anywhere in the Project area
- develop a communications protocol with DEC to manage impacts to MCNP in relation to fire, construction staff within MCNP, and incidents related to Rio Tinto operations
- provision of firefighting resources including water, equipment and trained staff.

8.5.4 Hydrocarbon Management

The impacts from potential hydrocarbon spills to MCNP will be minimised through measures that meet the objectives outlined in the CEMP and are consistent with the Rio Tinto IEMS. These measures include:

- controlling hydrocarbon transport, storage, handling and waste disposal in accordance with relevant hydrocarbon standards including AS 1940
- re-fuelling being undertaken in designated areas that are appropriately sealed, bunded/contained and are attended by personnel at all times
- locating minimal fuel storage areas within MCNP to that required to facilitate ongoing construction works
- undertaking hydrocarbon spill response training for appropriate personnel (including contractors) prior to commencing work in the Project area
- managing hydrocarbon spill clean-up procedures in accordance with the IEMS Procedure – Spill Response
- providing hydrocarbon spill response equipment on site at all times
- obtaining Dangerous Goods Licences where required and making copies available on site.

8.5.5 Construction Workforce Management

To reduce amenity impacts and public safety risks within MCNP, key workforce management measures will be implemented, in accordance with the CEMP (Appendix 1) and the Rio Tinto IEMS. These measures include:

- inductions: information on requirements for use of MCNP, expectations regarding behaviour and the penalties associated with breaches of requirements will be included in the Project induction
- education: environmental and community awareness will be enhanced through the delivery of targeted toolbox topics to the workforce and through posters and information sheets displayed on HSE notice boards
- firearms and alcohol will be prohibited within the Project area
- organised activities and supervision: to reduce uncontrolled use of MCNP, organised activities will be scheduled with the presence of an appropriate Supervisor. These activities may include organised and controlled trips or tours to scenic and recreation locations within the Park on Rostered Days Off. The consumption of alcohol will not be permitted within the Park. Additionally, environmental and supervisory staff will conduct occasional inspections of popular areas within MCNP to monitor usage
- vehicles: will not be permitted to leave the work site without permission. Regular inspections will be conducted on light vehicles through daily pre-start checks, which include an assessment of vehicle cleanliness and weed hygiene. Excessively muddy vehicles will be cleaned prior to leaving site. Speed limits will be enforced on all construction roads throughout the Project area
- communication with DEC: regular consultation will take place between Rio Tinto Project personnel and DEC park management in the form of a monthly phone hook-up or similar measure (developed as a protocol). DEC are welcome to visit the construction site during and after construction in order to review the measures undertaken to minimise impacts to MCNP
- incidents: any complaints or incidents involving Rio Tinto employees and contractors in MCNP will be reported via the Rio Tinto incident reporting process and as soon as possible thereafter to DEC, to determine suitable corrective actions and measures to avoid the recurrence of similar incidents.

8.6 PREDICTED OUTCOME

After mitigation and management measures have been applied, it is expected that the Project will result in the following environmental outcomes:

1. Some very localised effect on drainage within the Project area but no significant additional modification of the surface hydrological regime within MCNP.
2. Strict weed control measures to ensure that no additional impact on the values of MCNP from the spread of weeds during construction.
3. No impact on the values of MCNP as a result of hydrocarbon spills.
4. Changes to the landscape of the MCNP will be restricted to areas which have already been modified as a result of historical construction activities and existing infrastructure.
5. No impact on the values of MCNP as a result of dust emissions.
6. The presence of a temporary workforce in the Project area will not significantly affect MCNP values.

The Project is consistent with EPA objectives, as the environmental values of MCNP will be maintained. This will be achieved through the short duration of the Project and implementation of management measures consistent with the Draft MCNP Plan objectives.

9. ABORIGINAL HERITAGE

9.1 DESCRIPTION OF FACTOR

9.1.1 Native Title

The Project area is subject to two registered native title claims including:

- Ngarluma: a determination which extends well east of Roebourne, west of Dampier and into offshore areas. It also extends south into the MCNP, at which point it has an area of overlap with the Yindjibarndi claim
- Yindjibarndi: a determination which shares an overlap with Ngarluma in the north, and extends south to the Fortescue River, west to the headwaters of the Maitland River and east of the Sherlock River. Yindjibarndi also have an undetermined claim area which lies in a band immediately south of and across the width of their determination area (WC03/3).

9.1.2 Aboriginal heritage data base search

A search of the DIA Register of Aboriginal Heritage sites found that approximately 55 Aboriginal sites potentially occur within the Project area (DIA 2008). The site types recorded range from engravings, scatters, mythological, quarries, camps, water sources and grinding patches.

Surveys have not yet been undertaken over the majority of the Project area and the number of actual sites that may be located within the Project area is unknown.

9.2 KEY STATUTORY REQUIREMENTS, ENVIRONMENTAL POLICY AND GUIDANCE

EPA Objective

In most circumstances, including this assessment, the EPA applies the following objective to the assessment of Proposals that may affect Aboriginal heritage:

- *to ensure that changes to the biophysical environment do not adversely affect historical and cultural associations and comply with relevant heritage legislation.*

9.2.1 State Legislation

EPA Guidance Statement No. 41 (EPA 2004d) provides guidance on the process for the assessment of Aboriginal heritage as an environmental factor. In its assessment of Proposals, the EPA will expect proponents to:

- report on the likelihood of the presence of matters of heritage significance to Aboriginal people
- determine whether the proposed changes to the biophysical environment will result in an impact to these matters of heritage significance to Aboriginal people.

The EPA will, based on this information, make a determination on whether Aboriginal heritage is a relevant environmental factor to the Proposal. Where Aboriginal heritage is determined to be a relevant factor, the EPA will expect Rio Tinto to properly consider how to minimise any impact to heritage values resulting from the Proposal.

EPA Guidance Statement No. 41 (EPA 2004d) details actions that may be pertinent to the factor of Aboriginal heritage, including:

- consulting with DIA staff and conducting a desktop review of sites
- undertaking an Aboriginal heritage, ethnographic and/or archaeological survey in consultation with relevant Aboriginal representatives
- informing relevant Aboriginal people of the Proposal and conducting appropriate consultation
- demonstrating that any concerns raised by the Aboriginal people have been considered in the environmental management of the factor and that this is made known to the relevant Aboriginal people.

9.2.2 Regulatory framework

The Minister for Indigenous Affairs is responsible for the administration of the *Aboriginal Heritage Act 1972* (WA). The Minister's responsibility is to ensure that all places that are of traditional or current sacred, ritual or ceremonial significance to Aboriginal people should be recorded and their importance evaluated on behalf of the community. Consent from the Aboriginal Cultural Material Committee (ACMC) and the Minister is required under Section 18 of the *Aboriginal Heritage Act 1972* for disturbing Aboriginal sites.

9.3 POTENTIAL SOURCES OF IMPACT

Activities or aspects of the Project that may potentially affect Aboriginal heritage values, without considering mitigation efforts, include:

- **physical disturbance to the land surface** during construction and development of the rail infrastructure, which has the potential to disturb heritage sites and affect creeks that may have ethnographic or cultural value
- **disturbance to watercourses** for rail crossings, which has the potential to lead to disturbance of cultural values and downstream ethnographic sites.

9.4 ASSESSMENT OF POTENTIAL IMPACT

9.4.1 Native Title

A regional Agreement has been signed between Ngarluma and Rio Tinto and this will be registered in 2011as an Indigenous Land Use Agreement (ILUA). Rio Tinto has entered into a commercial agreement with Ngarluma which included the identification of Rights Reserved Areas which are areas of importance to Ngarluma in which Rio Tinto has undertaken not to conduct future development activities. Locations were identified as part of an ethnographic inspection encompassing Rio Tinto's perceived future area of operation. Internal approvals requests which cover any part of those areas have been withdrawn. Heritage and ethnographic surveys, in conjunction with Ngarluma participants, are scheduled for early to mid-2011.

The Yindjibarndi claimant group have shared native title responsibilities with Ngarluma over part of the Project area, from approximately Harding Dam to Emu Siding. Negotiations are under way with the Yindjibarndi claimant group regarding the preparation of a Binding Initial Agreement (BIA). The Proponent maintains a regular communications schedule with the Yindjibarndi claimant group and will seek to organise surveys as soon as the Yindjibarndi indicate they are willing to undertake them. Heritage and ethnographic surveys in conjunction with Yindjibarndi participants are scheduled for early 2011. A heritage protocol was recently agreed between Rio Tinto and Yindjibarndi in December 2010.

The Wong-Goo-Tt-Oo group have also been consulted in relation to Rio Tinto coastal works and the Proponent will maintain regular communication with this group with regards to this Project.

Consultation has been preliminary during the project design phase; however, consultation will continue throughout the approval process with all relevant Traditional Owners.

This will ensure that:

- Traditional Owners are informed about potential environmental impacts of the proposed development
- Traditional Owners are provided an opportunity to make any concerns about known environmental impacts
- any concerns raised by Traditional Owners have been adequately considered.

9.4.2 Disturbance of Aboriginal heritage sites

The clearing and development of land within the Project area is likely to disturb identified archaeological sites and affect the general cultural values of watercourses (but no known ethnographic sites). The extent and nature of the impact on these sites will not be known until further surveys are undertaken. Any action forming part of this Project will be considered for its impact on heritage sites, and Rio Tinto procedures require that the Project cannot proceed until the area has been examined for heritage sites with the relevant Traditional Owner group. Aboriginal heritage surveys will be conducted along the rail route and where practicable, infrastructure will be located to avoid significant heritage sites. If the impact to sites is unavoidable, consent will be sought from the relevant group and appropriate applications under section 18 of *The Aboriginal Heritage Act 1972* will be lodged if sites are found within the Project footprint. Enacting Section 18 of the *Aboriginal Heritage Act 1972* involves notification of disturbance and consultation with the Traditional Owners prior to disturbance of an Aboriginal heritage site.

Rio Tinto will also develop a Cultural Heritage Management Plan (CHMP) in consultation with the relevant Traditional Owners as part of its Cultural Heritage Management framework.

9.5 PROPOSED MITIGATION AND MANAGEMENT MEASURES

Aboriginal heritage issues in the Project area will be managed in accordance with Rio Tinto IEMS and the CEMP (Appendix 1). Key measures from this plan include:

- marking all heritage sites on the Pilbara Iron Geographical Information System to inform planners to avoid where possible
- undertaking additional survey work within the Project area as required to identify and manage any additional heritage sites
- continuing consultation with the relevant traditional owner groups including discussion regarding the possible salvage, display and storage of some of the cultural material from heritage sites where ground disturbance is unavoidable
- preventing unauthorised ground disturbance activities through implementation of the Proponent's Ground Disturbance Authorisation Procedure for all areas to be disturbed
- including education regarding Aboriginal sites in inductions for contractors and personnel working on the development
- stopping work and contacting the Rio Tinto Heritage Team, traditional owners, and the DIA where archaeological material is uncovered; then assessing the site using a heritage consultant and managing the site in accordance with the Proponent's internal Indigenous Heritage Management Procedure (RTIO Aboriginal Heritage Policy 2001). The police will also be notified if the site contains human remains.

Rio Tinto manages cultural heritage through the Approvals Coordination System which regulates ground disturbance activities and ensures that significant Aboriginal or environmental sites are not disturbed without authorisation (Rio Tinto 2008).

9.6 PREDICTED OUTCOME

Rio Tinto has committed to undertake ethnographic and archaeological surveys and investigations in consultation with the native claim groups to meet DIA statutory compliance prior to any ground disturbance. This will undertake to identify, manage and mitigate disturbance to any potential sites of Aboriginal significance wherever practicable. The Project will be carried out in accordance with EPA Guidance Statement No. 41 (EPA 2004d) through the implementation of a Cultural Heritage Management Plan and relevant agreements with native title claimant groups.

10. OTHER MANAGEMENT CONSIDERATIONS

10.1 DUST

Dust may be generated during the construction of the duplicate rail line mainly by mechanical disturbances. In dry, windy conditions, particles can also be lifted from open or disturbed areas, resulting in visible dust emissions. In the assessment of environmental impacts, dust is more conventionally referred to as 'particulates' or 'airborne particulates'.

Most airborne particles likely to originate from the proposed construction are larger than PM_{10} and are more associated with nuisance than public health problems. The larger particles tend to settle back to the ground within a short range (<300 m) from the source.

The generation of dust from rail construction will depend on:

- the frequency at which a dust generating activity takes place
- meteorological conditions, such as wind speed and rain
- composition of dust, including particle size distribution, particle density and moisture content
- the condition of the source (dry or otherwise).

Activities or aspects of the construction operations that may result in dust emissions include:

- physical disturbance to the land surface during construction of infrastructure (removal of vegetation, blasting, cutting and filling)
- haulage and light traffic on unsealed roads
- dust lift-off from dry, cleared areas and soil stockpiles.

Dust may have physical effects on plants, although this is likely to be restricted to immediate peripheral vegetation and will be of a short duration as construction works move along the alignment. Intermittent rainfall events are expected to remove dust deposited on leaves.

Dust can also adversely affect human health where there are nearby residences. At its nearest point, the township of Wickham is approximately 660 m from the rail alignment; therefore some residents may be affected by dust emissions during construction of the rail line. The most effective way to control fugitive dust is to prevent dust generation through appropriate prevention measures.

10.1.1 Proposed Management Actions

The generation of dust during construction will be minimised and controlled through measures that meet the objectives outlined in the CEMP (Appendix 1). Management measures to control dust will include:

- application of water to dry surfaces including the rail formation, access roads, working surfaces and stockpiles
- minimising the amount of vegetation cleared
- clearing of work areas only as they are required to limit the extent of soil surfaces exposed at any time
- progressive rehabilitation of disturbed areas to minimise total exposed area
- reducing vehicle speeds on unsealed roads and tracks.

Through implementation of the above existing and proposed control measures together with the short duration of exposure and emissions during construction, it is expected that dust emissions will not give rise to significant impacts on the community or vegetation.

10.2 NOISE AND VIBRATION

Noise and vibration will be generated during construction of the Project through blasting, cutting and filling operations, and movement and operation of vehicles. Vibration and ambient noise levels in the immediate vicinity of the Project will increase as a result of construction works, as rail operations on the existing line will continue throughout the construction phase. Increased noise levels may continue after construction with the operation of the marshalling yards.

The closest noise-sensitive area to the Project is the Town of Wickham, where the closest noise sensitive premises are approximately 660 m from the existing rail line proposed alignment and marshalling yards (SVT 2010a). Construction noise through this area will be temporary and management measures will be implemented to ensure construction noise complies with the requirements of the Environmental Protection (Noise) Regulations 1997; therefore no significant noise impacts are predicted for construction. Due to the remoteness of the majority of the proposed rail, noise and vibration are not expected to affect any other noise-sensitive premises.

For assessment purposes, noise emissions from the operation of the rail and marshalling yards is considered to be noise associated with rail transport and the appropriate noise criteria is the same as for general rail noise as outlined in *State Planning Policy 5.4: Road and Rail Transport Noise and Freight Considerations in Land Use Planning* (WAPC 2009). The strictest applicable criterion for new rail developments is the night time noise target of $L_{Aeq,night}$=50 dB.

Operational noise emissions from the marshalling yard are considered to be generated by two types of sources:

- regular train movements (loaded and unloaded, moderate speed, on straight or curved track)
- shunting or slow transit across the yard (including coupling noise, brakes, horns and pressure release).

Both sources were considered in the noise assessment undertaken by SVT (2010a; Appendix 1). Noise levels were measured at the 7-Mile Marshalling Yards, a similar facility to that proposed, and results were used in a predictive noise model to determine predicted noise levels for the proposed marshalling yard. Single point noise predictions were made at three locations, representative of noise-sensitive receptors around Wickham (Table 16), together with the development of predicted operational noise contours (Figure 18). No exceedance of noise criteria was predicted at the noise sensitive receptors and noise impacts from operation of the Rail Marshalling Yard will be below the appropriate rail noise criteria.

A Cumulative noise impact assessment was conducted taking into account noise from the Cape Lambert export capacity expansion developments. No significant noise impacts were predicted from the cumulative noise levels.

Table 16 Summary of predicted noise levels and assessment criteria

Location	Assessment Criterion ($L_{Aeq\ night}$ dB)	Predicted levels (L_{Aeq} dB)
Wickham North 1	50	48
Wickham North 2	50	37.1
Wickham North 3	50	31.6
Wickham South	50	n/a
Wilson Way	50	n/a

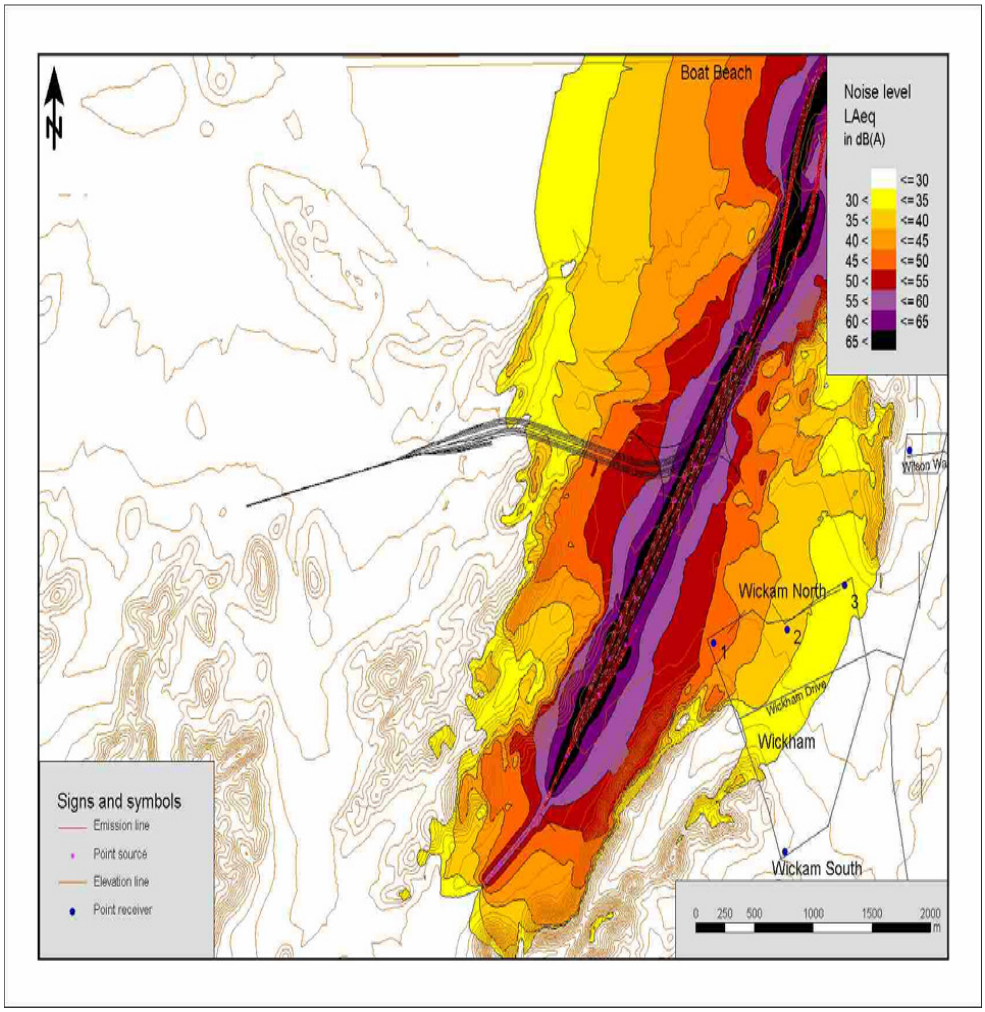

Figure 18 Predicted noise contours for operation of the rail and marshalling yard

Noise emissions from the Project may cause localised displacement of fauna in areas of the Project that have not already been disturbed; however, it is likely that fauna would only temporarily be disrupted by noise emissions from the construction works.

10.2.1 Proposed Management Actions

In accordance with current management practices, Rio Tinto will ensure that noise and vibration from construction of the Project comply with the requirements of the Environmental Protection (Noise) Regulations 1997 and operation of the Project complies with the *State Planning Policy 5.4: Road and Rail Transport Noise and Freight Considerations in Land Use Planning* (WAPC 2009).

The generation of noise and vibration at the Project will be controlled through implementation of the following management actions:

- preparing and implementing blasting management plans for each blasting project
- maintenance of equipment to generate minimal noise levels.

10.3 GREENHOUSE GASES

In most circumstances, including this assessment, the EPA applies the following objective to the assessment of Projects where greenhouse gas (GHG) emissions are a relevant factor:

- *to minimise emissions to levels as low as practicable on an ongoing basis and consider offsets to further reduce cumulative emissions.*

The construction of the rail duplication will result in the greenhouse gas emissions from vegetation clearing and diesel consumption from vehicles and machinery (Table 17). Emission factors used are consistent with those used by the Proponent for reporting under the Australian Greenhouse Challenge Plus Program.

Table 17 Estimated greenhouse gas emissions from the Project

Emission source	Predicted emissions (t CO_2-e)
Vegetation clearance	128 700
Diesel consumption	31 240
Total emissions	**159 940**

The total emissions for construction were estimated to be 39 985 tonnes of CO_2-e/year for the construction period. The total emissions for Rio Tinto Iron Ore operations in 2008 was 4.2 million tonnes of CO_2-e.

The emissions from the Project are not considered significant but are addressed more broadly through annual reporting by the Proponent and the Proponent's greenhouse and energy reduction plans.

Greenhouse gas emissions from the operation of the rail and marshalling yard are captured in the specific mine assessments and associated Ministerial Statements and hence are excluded from the above estimate to avoid double counting.

10.3.1 Proposed Management Actions

Greenhouse gas emissions will be minimised during the construction of the rail duplication through implementation of the following management actions:

- ensure appropriate monitoring systems (flow meters and construction power usage, calibration records) are established for the recording and reporting of GHG emissions
- all personnel must be made aware of any project-specific GHG reduction or energy efficiency programs in place and their associated targets
- GHG records to be recorded and provided monthly to the Rio Tinto Iron Ore Environmental Protection (RTIOEP) Site Environmental Advisor as per the Rio Tinto environmental monthly report template. Both National Greenhouse and Energy Reporting (NGERS) and non-NGERS data is required
- to ensure energy efficient design and identify improvement opportunities, energy efficiency to be included as part of environmental design review
- minimising the amount of vegetation cleared
- regular maintenance and servicing of equipment.

Rio Tinto will maintain an inventory of GHG emissions and will continue to report greenhouse gas emissions and greenhouse intensity in its annual Social and Environment Report, and as required under the *National Greenhouse and Energy Reporting Act 2007.*

10.4 SURFACE WATER

The rail duplication will intersect Western Creek, Miller Creek and several ephemeral creeks and drainage lines. Potential impacts arising from these intersections are related to the change in landform created by the installation of infrastructure. The proposed change in landform may potentially affect surface water flow paths and drainage in the Project area.

10.4.1 Proposed Management Actions

Rail design will maintain stream flow regimes as near as practicable to those found prior to the rail duplication. Culverts will be installed in areas where rail construction works intersect ephemeral creek and drainage lines. The purpose of these culverts will be to direct drainage beneath the rail line and to maintain surface drainage flows throughout the Project area. Culverts maintain natural drainage flows, reduce erosion and minimise ponding of water. Sheet flows within the Project area will be locally concentrated by the culverts, which will result in localised increases in flow velocity and soil erosion.

Rail bridges will be constructed over Western Creek and Miller Creek to reduce any impact on the flow of these waterways.

Some excavation of stream banks may be necessary where bridge or culvert features are required. The final extent of stream bank excavation is still to be determined during project design. The proponent will be replicating the existing culverts and bridges of the existing rail line to ensure that the current surface water drainage pattern is maintained.

Surface water values within the Project area will be maintained by meeting the objectives outlined in the CEMP (Appendix 1) and Rio Tinto standard specifications and design. Management measures will include:

- constructing culverts and drains to maintain existing drainage patterns, and reduce erosion and associated water quality impacts
- constructing levees to control transverse flow between adjacent catchments and to develop headwater on sloping catchments
- designing final landforms of rehabilitation areas to be self-draining
- undertaking works in accordance with approvals and permits under section 17 of RIWI Act where required.

Culverts will be managed in accordance with Rio Tinto Design Standards.

10.5 GROUNDWATER

The Project has the potential to affect groundwater resources through groundwater abstraction and contamination of the resource. Excessive drawdown of the groundwater levels in the area immediately around the bore fields may affect local groundwater supply capacity and groundwater-dependent ecosystems that may be present.

Water supply for the Project is likely to be sourced from a combination of bores and scheme water, pending negotiations and approval with the DoW and Water Corporation.

Construction of the rail line is expected to require approximately 2.5 GL. After construction, bores will still be required to be serviceable for incidental water usage.

The locomotive refuelling and service facility located at Cape Lambert will provide storage for approximately 880 kL of diesel, 32 kL of lubricating oil, 20 kL of waste oil and 32 kL of coolant. The hydrocarbons will be stored in above-ground bunded tanks. Fuel will be stored and handled in accordance with the appropriate Australian Standards and Dangerous Goods Regulations.

Part of the Project area falls within the Harding Dam Catchment area, a Priority 1 Public Drinking Water Supply Area (WRC 1999). Possible contamination risks exist with the use of diesel in vehicles and equipment within the PDSWA during the construction.

10.5.1 Proposed Management Actions

Given the location of the southern section of the Project is within a Priority 1 PDWSA (Section 2.1.3), conditions will apply to the use of the land within the Project area and any groundwater abstraction will require a licence from the DoW. The combination of conditions of water licences and the application of by-laws in Priority areas will address the storage of fuels and chemicals, the depth of excavation related to the watertable and rehabilitation criteria within the Project area. Underground fuel and chemical storage tanks are prohibited by DoW by-laws in Priority 1 and 2 areas (DoW 2004). The groundwater licence will require groundwater quality parameters and volume to be monitored and reported to DoW to ensure compliance with the issued licence.

For the purposes of this API, the duplication work only interacts with the Harding Dam PDWSA. Management actions within the CEMP will ensure that risk to the catchment is minimised and consideration is given to working in PDWSA.

The Project is approximately 30 km from the Millstream water reserve and project activities will be managed in accordance with the Project CEMP which has been updated to include management practices covered in the DoW's Water Quality Protection Guidelines (WQPN). These include:

- WQPN 10 – *Contaminated spills - emergency response* (DoW 2006a)
- WQPN 25 – *Land use compatibility in Public Drinking Water Source Areas* (DoW 2004)
- WQPN 28 – *Mechanical servicing and workshops* (DoW 2005)
- WQPN 36 – *Protecting public drinking water source areas* (DoW 2009)
- WQPN 60 – *Tanks for mobile fuel storage in public drinking water source areas* (DoW 2008)
- WQPN 65 – *Toxic and hazardous substances – storage and use* (DoW 2006b)
- WQPN 84 – *Rehabilitation of disturbed land in public drinking water source areas* (DoW 2006c)

Groundwater quality will be protected through controls applied by DoW within priority catchments by DoW and by implementation of the following actions:

- environmentally acceptable methods of hydrocarbon transport, handling and disposal
- hydrocarbon spill clean-up procedures
- appropriate waste management practices.

10.6 SOILS AND LANDFORM

As a result of the existing rail lines, a large proportion of the Project area has been previously disturbed. The degree of disturbance ranges from surface disturbance only (i.e. clearing of vegetation) through to removal of the soil and sub-soil to aid in construction of the rail line. Disturbance to previously undisturbed areas will be avoided as far as practicable.

Topsoil will be retained for rehabilitation purposes following the completion of crossover construction. In areas where soil is removed, the land surface will be reworked to blend in with the existing topography, and then ripped and respread with topsoil to facilitate natural re-growth of the area (Section 6.5.5).

10.6.1 Proposed Management Actions

Soils and landforms in the Project area will be protected through meeting the objectives outlined in the CEMP (Appendix 1). Management measures will include:

- minimising disturbance to areas along the banks of Western Creek, Miller Creek and other drainage lines
- educating construction personnel regarding the value and importance of the natural landscape, as well as directives to prevent degradation of the landscape
- rehabilitation of temporarily disturbed areas.

10.7 VISUAL AMENITY

The township of Wickham and the recreational areas of Harding Dam and MCNP are in proximity to sections of the Project. Visual amenity in these areas may be temporarily reduced during construction with the production of dust, disturbance of the natural landscape and the presence of construction equipment. However, as a rail line already exists in these areas, this suggests that visual amenity will not be affected to a substantially greater extent than the existing rail line.

10.7.1 Proposed Management Measures

Visual amenity relating to the MCNP is described in further detail in Section 8. Visual amenity within the Project area will be protected through the implementation of the following management actions:

- dust minimisation strategies during construction (Section 10.1)
- rail alignment will be constructed as close as practicable to the existing line.

11. ENVIRONMENTAL MANAGEMENT AND PROPOSED ENVIRONMENTAL CONDITIONS

Rio Tinto will minimise environmental impacts through the implementation of ongoing management actions, which include:

- ensuring that community views are sought, respected and considered
- maintaining the Iron Environmental Management System (IEMS) and Rio Tinto business systems
- preparing and implementing a CEMP for the Project (Appendix 1)
- training staff and contractors in environmental requirements of their work
- reporting regularly to stakeholders on performance through the Annual and Triennial Environmental Reviews
- aligning with Rio Tinto's Health, Safety and Environmental Policies and Rio Tinto: *The Way We Work*.

Rio Tinto acknowledges the environmental protection principles listed in Section 4a of the EP Act through its strong commitment to sustainable development and environmental management at its operations (Section 4). These principles are clearly reflected in the Rio Tinto Environmental Policy (Section 11.1), Iron Environmental Management System (Section 11.2) and the Rio Tinto corporate Environmental Standards that are being implemented across the Rio Tinto Group.

11.1 RIO TINTO IRON ORE HEALTH, SAFETY ENVIRONMENT AND QUALITY POLICY

The Rio Tinto Iron Ore Health Safety, Environment and Quality Policy (HSEQ Policy) is the guiding document for environmental management and provides context and specific direction for continuous improvement.

Rio Tinto's Iron Ore Group, of which the Proponent is a member, considers excellence in health, safety and environmental performance, as well as product quality, an essential component to long-term success. Through effective leadership and management practices, Rio Tinto strives to continuously improve HSEQ performance for the benefit of employees, contractors, suppliers, customers, shareholders and local communities. This policy has been communicated to all Rio Tinto Group employees and is available to the public.

Rio Tinto also recognises that environmental responsibilities go beyond those required under statutory regulations to encompass social obligations, leadership in sustainable development and minimising environmental impacts.

11.2 IRON ENVIRONMENTAL MANAGEMENT SYSTEM (IEMS)

Rio Tinto operates under an ISO14001 framework using the Iron Environmental Management System (IEMS). The IEMS was certified to AS/NZS ISO14001 in 2003.

The *Construction Environmental Management Guidance Notes and Specifications* (Rio Tinto Expansion Projects 2007) is a key requirement of the IEMS with the purpose of facilitating sound environmental performance through control of impacts on the environment, consistent with the business Environmental Policy and objectives. It details the requirements that Rio Tinto and their contractors must comply with on any expansion project and includes requirements on the following relevant areas:

- ground disturbance and land use management
- soil management
- flora and fauna management
- weed management
- heritage management
- borrow pit management
- air quality and dust management
- water management and drainage
- hydrocarbon management
- noise and vibration management
- greenhouse gas emissions management
- demobilisation, rehabilitation and handover
- waste management.

The *Borrow Pit Specifications and Management Procedure* (RTIO 2007) details procedures in place to minimise the impact associated with developing, operating and rehabilitating borrow pits.

11.3 CONSTRUCTION ENVIRONMENTAL MANAGEMENT PLAN (CEMP)

A CEMP for the Project has been prepared (Appendix 1), and will be implemented to manage specific environmental issues arising from the Project. The CEMP outlines detailed management actions, monitoring and contingency actions that will be implemented to ensure that impacts are minimised. The CEMP will be regularly reviewed and revised as required to ensure ongoing effectiveness and achievement of actions.

11.4 SUMMARY OF LIKELY ENVIRONMENTAL CONTROL INSTRUMENTS

Table 18 outlines the controls that either exist currently or will be put in place to ensure appropriate management of the Project for each relevant environmental factor. The controls include:

- implementation of conditions including Schedule 1 in any Statement issued by the Minister for the Environment
- conditions of the Licences to Take Water (under RIWI Act)
- the Rio Tinto Heath, Safety and Environmental policy, procedures and standards
- implementation of the CEMP.

Rio Tinto management controls will be regularly reviewed and comprise those that will apply to the Project include measures and/or actions contained within the CEMP.

Table 18 Statutory and environmental management controls for the Project

Factor	Topic	Environmental Conditions	CEMP	Relevant Controls Under Other Legislation and Regulations
Key Relevant Environmental Factors				
Vegetation and flora	Protection of areas outside the footprint prescribed by conditions under Part IV of the EP Act		✓	Native Vegetation Clearing Permit
	Protection of significant vegetation	✓	✓	
	Protection of Declared Rare Flora and Priority flora		✓	*Wildlife Conservation Act 1950*
	Weed management		✓	
	Fire management		✓	
	Rehabilitation	✓	✓	
Fauna	Protection of areas outside the footprint prescribed by conditions under Part IV of the EP Act		✓	Native Vegetation Clearing Permit
	Protection of significant habitat	✓	✓	
	Protection of rare and endangered fauna species		✓	*Wildlife Conservation Act 1950*
	Feral fauna management		✓	
MCNP	Drainage management		✓	
	Rehabilitation	✓	✓	
	Prevention of surface water contamination	✓	✓	Licence under the RIWI Act
	Prevention of groundwater contamination		✓	Licence under the RIWI Act
	Weed management		✓	
	Feral fauna management		✓	
	Fire management		✓	
	Dust management		✓	
Other relevant environmental factors				
Dust	Dust management		✓	
Noise and vibration	Noise and vibration management		✓	Environmental Protection (Noise) Regulations 1997 State Planning Policy 5.4: Road and Rail Transport Noise and Freight Considerations in Land Use Planning
Greenhouse gases	Emissions reduction		✓	
	Reporting		✓	
Surface water	Drainage management		✓	
	Prevention of surface water contamination		✓	Dangerous Goods Safety (Storage and Handling of Non-Explosives) Regulations 2007

Factor	Topic	Environmental Conditions	CEMP	Relevant Controls Under Other Legislation and Regulations
Groundwater	Prevention of groundwater contamination		✓	Dangerous Goods Safety (Storage and Handling of Non-Explosives) Regulations 2007
	Prevention of groundwater drawdown affecting groundwater-dependent ecosystems and other users		✓	Licence under the RIWI Act
Soils and landform	Protection of areas outside the footprint prescribed by conditions under Part IV of the EP Act		✓	Native Vegetation Clearing Permit
	Rehabilitation	✓	✓	
Visual amenity	Dust management		✓	
Aboriginal heritage	Protection of Aboriginal heritage sites		✓	Aboriginal Heritage Act 1972

11.5 PROPOSED CONDITIONS

These conditions have been proposed so as not to duplicate other regulatory controls that are capable and likely to be applied under other legislation. A condition has not been specified if the environmental impact has been adequately covered in other environmental control instruments (Section 11.4) or the CEMP. The proposed conditions have been developed to be outcome-based.

The proponent proposes the following conditions presented in Table 19 for incorporation into any Statement issued to apply to this Project.

Table 19 Proposed environmental conditions

Condition No.	Proposed Condition
Project Implementation	
1-1	The proponent shall implement the Project subject to the conditions of this statement and within the footprint defined in Schedule 1 of this statement.
Proponent Nomination and Contact Details	
2-1	The proponent nominated by the Minister for the Environment under section 38(6) or 38(7) of the *Environmental Protection Act 1986* (WA) is responsible for the implementation of the Project.
2-2	The proponent shall notify the Chief Executive Officer (CEO) of the OEPA of any change of the name and address of the proponent for the serving of notices or other correspondence within 30 days of such change.
Time Limit of Authorisation	
3-1	The authorisation to implement the Project provided for in this statement shall lapse and be void within five years after the date of this statement if the Project to which this statement relates is not substantially commenced.
3-2	The proponent shall provide the CEO of the Office of the EPA with written evidence which demonstrates that the Project has substantially commenced, on or before the expiration of five years from the date of this statement.
Compliance Reporting	
4-1	The proponent shall prepare and maintain a compliance assessment plan and will submit it to the CEO of the DEC.

Condition No.	Proposed Condition
4-2	The proponent shall submit to the CEO of the Office of the EPA the compliance assessment plan required by condition 4-1 at least six months prior to the first compliance report required by condition 4-6. The compliance assessment plan shall indicate: • frequency of compliance reporting • approach and timing of compliance assessments • retention of compliance assessments • reporting of potential non-compliances and corrective actions taken • table of contents of compliance reports • public availability of compliance reports.
4-3	The proponent shall assess compliance with conditions in accordance with the compliance assessment plan required by condition 4-1.
4-4	The proponent shall retain reports of all compliance assessments described in the compliance assessment plan required by condition 4-1 and shall make those reports available when requested by the CEO.
4-5	The proponent shall advise the CEO of the DEC of any potential non-compliance as soon as practicable.
4-6	The proponent shall submit a compliance assessment report annually as part of the Annual Environmental Report and every three years as part of the Triennial Environmental Report commencing from the first year following issue of the Statement and addressing the previous calendar year(s) performance and submitted on the 31st of March each year unless otherwise agreed by the CEO of the Office of the EPA. The compliance assessment report shall: • be endorsed by the proponent's Managing Director or a person, approved in writing by the DEC, delegated to sign on the Managing Director's behalf • include a statement as to whether the proponent has complied with the conditions • identify all potential non-compliances and describe corrective and preventative actions taken • be made publicly available in accordance with the approved compliance assessment plan • indicate any proposed changes to the compliance assessment plan required by condition 4-1.
Performance Review, Monitoring and Reporting	
5-1	The proponent shall prepare and maintain a Performance Review Program and submit it to the CEO of the Office of the EPA.
5-2	The proponent shall submit to the CEO of the Office of the EPA, the Performance Review Program required by condition 5-1 at least six months prior to the first Performance Review Program report required by condition 5-3. The Performance Review Program shall be prepared in consultation with the DEC and include: • key performance indicators and targets for key environmental factors • monitoring program to confirm (or otherwise) outcomes for key environmental factors described in the Environmental Protection Statement submitted to EPA • monitoring program to assess the effectiveness of weed control measures and any weed incursion into MCNP • provision of assistance to the DEC in relation to fire and weed management programs in areas of MCNP adjacent to the Project • results of a rehabilitation monitoring program.
5-3	Following the commencement of construction, the proponent shall submit to the CEO of the OEPA a report on the Performance Review Program as a part of the Annual and Triennial Environmental reports which addresses: • results and trends of monitoring programs described in the Performance Review Program in condition 5-2 • achievement (or otherwise) of outcomes predicted in the Project, the success (or otherwise) of mitigation measures in achieving these outcomes and rehabilitation criteria • proposed or implemented changes to mitigation measures to ensure original outcomes are achieved • progress, results and modification to the investigations program described in the Performance Review Program.

Condition No.	Proposed Condition
Millstream Chichester National Park (MCNP)	
6-1	The proponent shall not disturb any vegetation outside their leases within MCNP.
6-2	The proponent shall undertake construction and on-going management of Project in accordance with the CEMP that has been prepared to the satisfaction of the Conservation Commission and DEC.
6-3	During construction, the proponent shall limit the area of native vegetation disturbed within MCNP to not more than 150 ha.
6-4	During or following construction, the proponent shall rehabilitate up to 50% of land disturbed within MCNP during construction that is no longer required for ongoing operations and maintenance.
Aboriginal Heritage	
7-1	Prior to commencement of any works for the Project, and on completion of relevant ethnographic and archaeological surveys, the proponent will develop and implement a Cultural Heritage Management Plan in consultation with the relevant Aboriginal people and to the satisfaction of the registrar of Aboriginal Sites.
Rehabilitation and Closure	
8-1	The proponent will rehabilitate areas disturbed during the Project that are not required for ongoing operations and maintenance.
8-2	A rehabilitation program shall be prepared in consultation with the DEC, the Department of State Development and Department of Mines and Petroleum. This program shall be developed prior to the commencement of ground disturbance and shall address rehabilitation procedures, timing, objectives and performance criteria.
8-3	The proponent shall conduct progressive rehabilitation as areas become available, in accordance with condition 8-2.
8-4	The proponent shall monitor the performance of rehabilitation as required by condition 8-3 and report on performance as per condition 5-3 performance review, monitoring and reporting.

12. CONCLUSION

The key relevant environmental factors identified through process involving the Proponent, and consultation with Government Agencies and other stakeholders in regard to the design and construction of the Project were:

- flora and vegetation: conservation of regional biodiversity
- fauna: conservation of regional biodiversity
- potential impacts on Millstream-Chichester National Park
- Aboriginal heritage.

12.1 ENVIRONMENTAL IMPACTS AND MITIGATION

The potential environmental impacts of the Project and proposed management measures are as follows:

1. Disturbance of up to 1750 ha of native vegetation over the construction period, with rehabilitation of approximately 910 ha during and following construction works. Clearing will be controlled through the application of internal controls under the IEMS and as described in the CEMP.
2. Minimal clearing of vegetation of high conservation significance.
3. The risk of introducing and spreading weeds will be managed through implementation of weed control and hygiene measures, in accordance with the CEMP.
4. Loss of terrestrial fauna habitat is not expected to have a significant effect on the representation of fauna at a local or regional level.
5. Aboriginal heritage will be managed under the Cultural Heritage Management Plan and relevant agreements with native title claimant groups.
6. Alterations to surface drainage patterns within the Project area and along the infrastructure corridor will not significantly alter the local surface hydrological regime as culverts will be aligned with the existing culverts.
7. Generation of dust, greenhouse gases, waste, noise and vibration, as well as potential risks to surface water, groundwater, soils and landform, and visual amenity will have a relatively minor impact and will be managed under IEMS and the CEMP.
8. Disturbance of up to 150 ha within MCNP during construction works with rehabilitation of up to 50% of the total disturbance area, following the completion of construction works.
9. Impacts to MCNP will be minimised through strict weed hygiene controls and consultation with DEC to ensure impacts on visual amenity are minimised. The permanent footprint will be limited to the rail duplication as borrow will not be sourced from within the MCNP for this Project.

12.2 ENVIRONMENTAL RISKS AND MANAGEABILITY

Rio Tinto has extensive experience in managing the construction of similar operations (including the existing rail tracks through the Pilbara region) and this experience is anticipated to lead to a greater certainty in achieving desirable environmental outcomes.

The approach taken in this environmental review has been based on a risk assessment approach to characterise environmental factors, determine potential impacts and develop mitigation measures. The environmental aspects of the Project will be further managed through the CEMP and the site Environmental Management System.

Rio Tinto has consulted with stakeholders (including government agencies) to scope the potential impacts of the Project and to determine the significance of environmental issues and the acceptability of mitigation. This process substantially improves the likelihood that all significant environmental issues have been identified, investigated and mitigated as far as practicable.

13. REFERENCES

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Appendix 1
Supporting Documents

APPENDIX 1 SUPPORTING DOCUMENTS

The following supporting documents are contained on CD-ROM inside the back cover of the Environmental Protection Statement:

Biota 2008a, *A Vegetation and Flora Survey of the Rio Tinto Rail Duplication Project – Cape Lambert to Emu Siding*. Prepared for Rio Tinto, Biota, Leederville, August 2008.

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