



Rio Tinto

West Angelas – Revised Proposal

Deposit A west and Deposit F

Environmental Review Document

Robe River Mining Co. Pty. Ltd.

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1 INTRODUCTION

The West Angelas Iron Ore Mine (**West Angelas Project**) is located approximately 130 kilometres (**km**) northwest of Newman in the Pilbara region of Western Australia (Figure 1-1). Robe River Mining Co. Pty. Ltd. (hereafter **Robe**) is seeking approval to mine iron ore from above and below the water table at West Angelas Deposits A west and F (this **Proposal**), as satellite deposits to the existing West Angelas mining operations. The Referral Form for this Revised Proposal is provided in **Appendix 1**.

1.1 PROPONENT DETAILS

The Proponent for this Proposal is Robe River Mining Co. Pty. Ltd.

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GPO Box A42

Perth WA 6837

Robe (a wholly owned subsidiary of Rio Tinto) is the authorised manager of the West Angelas Iron Ore Mine on behalf of the Robe River Joint Venture Participants.

The contact person for this Proposal is:

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1.2 EXISTING OPERATIONS

The West Angelas Project, which included Deposits A and B, was referred to the Environmental Protection Authority (**EPA**) under Part IV of the *Environmental Protection Act 1986* (**EP Act**) in May 1997 and was assessed at the level of Environmental Review and Management Program (**ERMP**). The ERMP was submitted to the EPA for assessment in March 1998. The EPA published its Report and Recommendations (Bulletin 924) on 30 January 1999 and the Minister for the Environment approved implementation of the West Angelas Project, subject to the conditions of Ministerial Statement 514 (**MS 514**), on 28 June 1999.

Ministerial Statement 970 (**MS 970**), which completely supersedes MS 514 and includes Deposit E, was approved on 11 June 2014. A copy of MS 970 is provided in **Appendix 2**.

The West Angelas Project, as implemented, consists of:

- Open cut mining of iron ore from above and below the water table (**AWT** and **BWT**) by conventional drill, blast, load and haul techniques. Three deposits have been approved for mining (Deposits A, B and E). Production commenced in 2001 at Deposit A and in 2011 at Deposit E. Mining is scheduled to commence at Deposit B in 2015.
- Ore processing in central processing facilities at a current rate of approximately 35 Million tonnes per annum (**Mtpa**).

- Surface waste dumps which will be used in progressive backfilling of the mine pits as far as practicable.
- A mine dewatering borefield which dewateres the ore bodies to allow mining BWT. Dewatering water is used on-site in the first instance to supply water for operational purposes (processing and dust suppression).
- The Turee Creek B Borefield, located approximately 30 km west of the mine site, which is used to provide potable water to the mine and camp facilities and, when required, water for processing purposes and dust suppression.
- An accommodation village which is located approximately 9 km west of the mine site.
- A mine access road which is approximately 35 km long and links the mine site with the Great Northern Highway.
- A railway network which transports processed ore approximately 413 km to port facilities located at Cape Lambert and Dampier.

A summary of the Key Characteristics of the West Angelas Project (from MS 970) is provided below in Table 1-1 and Table 1-2.

Table 1-1: West Angelas Project Summary (MS 970)

Proposal title	West Angelas Iron Ore Project
Proponent name	Robe River Mining Co. Pty. Ltd.
Short description	<p>Development and operation of an open-cut iron ore mine and associated infrastructure at the West Angelas Iron Ore Mine, 130 kilometres west of Newman in the Pilbara region (Figure 1). Iron ore is to be mined from above and below the water table in Deposits A, B and E.</p> <p>The mining operations are supplied with water from the mine dewatering bores and water from the Turee Creek B Borefield, located approximately 30 kilometres west of the mine site.</p> <p>Railway infrastructure from West Angelas to the port facilities at Cape Lambert.</p>

Table 1-2: Location and Extent of Physical and Operational Elements (MS 970)

Element	Location	Authorised Extent
Mining Area (Deposits A, B and E)	Figure 2 (MS 970)	Clearing of no more than 2,260 hectares (ha) within a 19,853 ha development envelope.
Waste dumps	Figure 2 (MS 970)	Clearing of no more than 1,407 ha within a 19,853 ha development envelope.
Associated infrastructure, access and accommodation	Figure 2 (MS 970)	Clearing of no more than 1,000 ha within a 19,853 ha development envelope.

The current mine layout (as approved under MS 970) is shown in Figure 1-2.

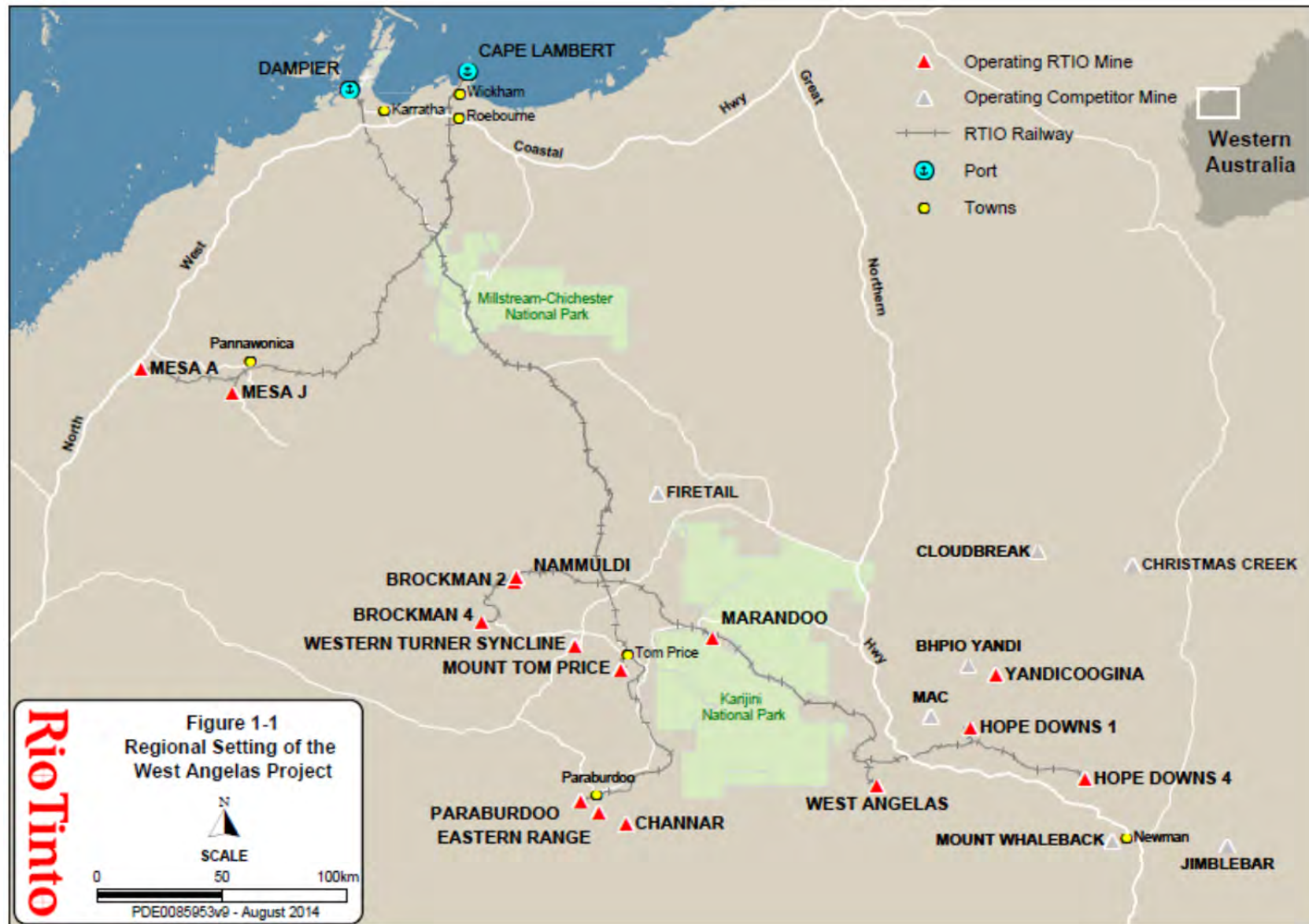


Figure 1-1: Regional Setting of the West Angelas Project

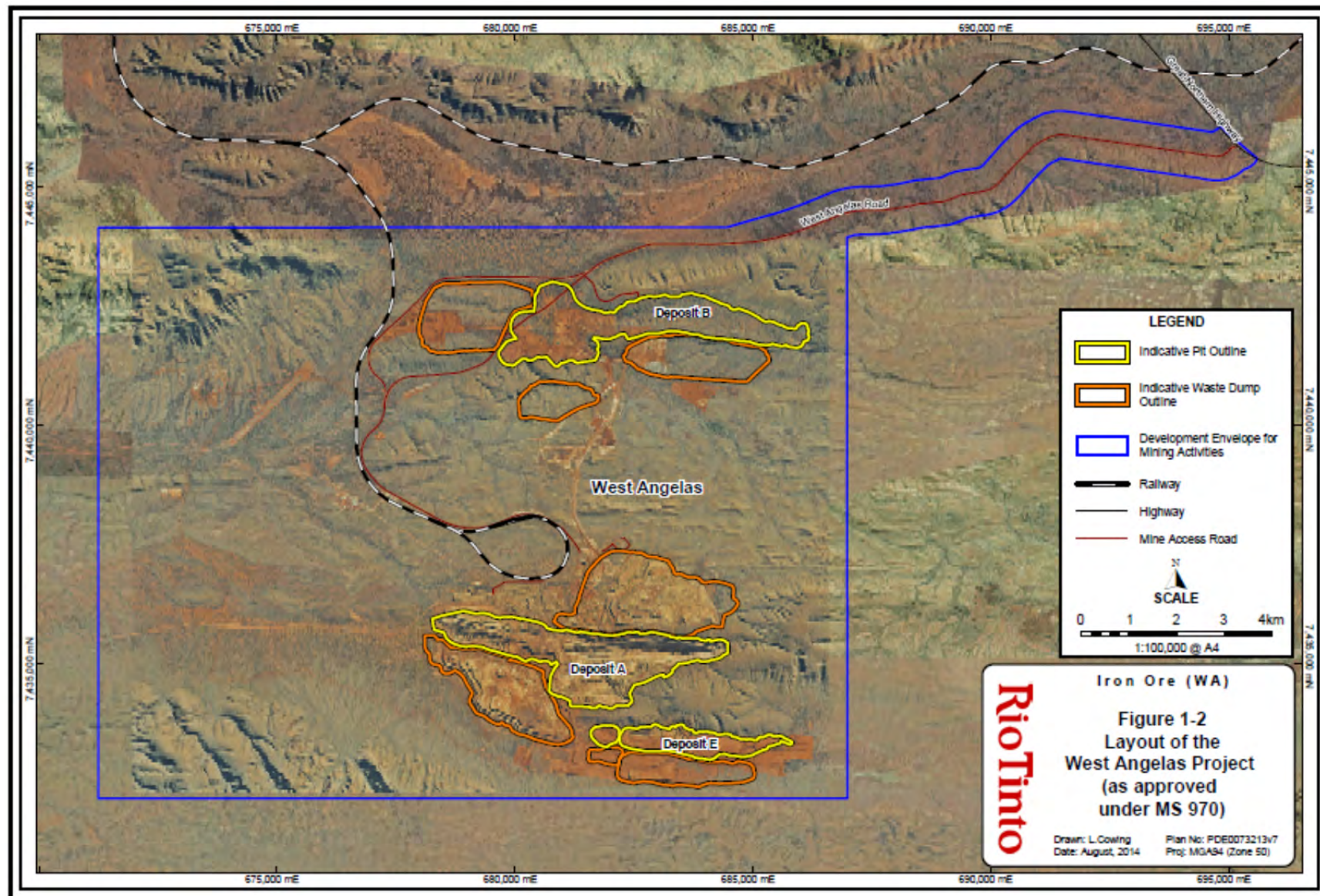


Figure 1-2: Layout of the West Angelas Project (as approved under MS 970)

1.3 TENURE

The West Angelas Project is located on Mineral Lease 248SA (**AML248SA**) which was granted in 1976 under the *Iron Ore (Robe River) Agreement Act 1964*. The infrastructure associated with the West Angelas mining operations is located on a number of Miscellaneous Licences and General Purpose Leases that were granted under the *Mining Act 1978* (refer to Figure 1-3) as follows:

- General purpose leases 47/1235 and 47/1236;
- Miscellaneous Licence L47/409 issued for the West Angelas gas pipeline and power station; and
- Miscellaneous Licences L47/52, L47/53, L47/54, L47/60, L47/61, and L47/62 issued for the purposes of roads and power lines, the repeater station and road, pipeline and power lines.

The leases are held under the Robe River Joint Venture (**RRJV**) which is managed on behalf of the partners by Robe. The current tenure is appropriate for all current and proposed mining activities and mining related infrastructure.

1.4 NATIVE TITLE AND AGREEMENTS

The West Angelas Project lies within two native title claims (refer to Figure 1-3).

The Yinhawangka People are the native title claimants and traditional custodians of the majority of the land within the West Angelas Project area. Negotiations with Yinhawangka for land access concluded in late 2012, resulting in the execution of the Rio Tinto – Yinhawangka Claim Wide Participation Agreement on 31 January 2013 and the subsequent execution of an Indigenous Land Use Agreement (**ILUA**), which was registered with the National Native Title Tribunal (**NNTT**) on 5 July 2013.

The Ngarlawangga People are the native title claimants for a portion of the Deposit F area. The Rio Tinto – Ngarlawangga Northern Claim Area Participation Agreement was fully executed on 22 March 2011. Confirmation of registration of the Ngarlawangga People Rio Tinto ILUA was received from the NNTT on 6 March 2013.

The ILUAs commit the RRJV and the Yinhawangka and Ngarlawangga People to work together on country to manage and maintain the areas in which the RRJV operates. The ILUAs set clear guidelines for processes such as land access, tenure, heritage and environmental approvals, mining benefits payments and reporting and communication requirements. The ILUAs replaces historical agreements including all prior Binding Initial Agreements with Yinhawangka and Ngarlawangga group members.

The Yinhawangka and Ngarlawangga People have also opted-in to the regional framework deed (**RFD**). The RFD establishes a clear and binding framework for effective program and partnerships between the RRJV and relevant Pilbara Traditional Owner groups, across areas including employment and training, cultural heritage management, business development and contracting, life of mine planning, environmental management and cultural awareness training.

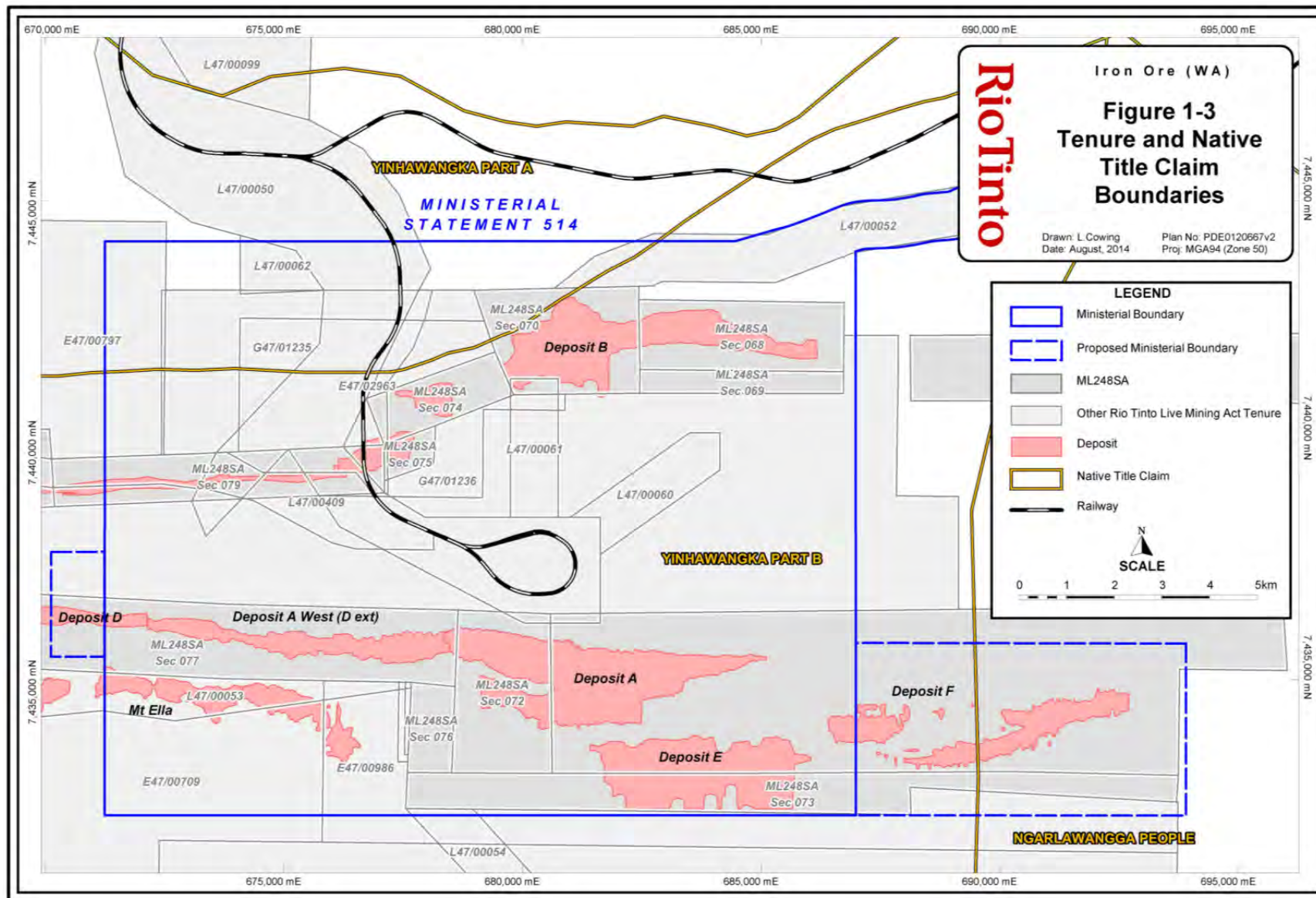


Figure 1-3: Tenure and Native Title Claim boundaries

1.5 LAND USE AND SOCIAL ENVIRONMENT

1.5.1 Historical Land Use

As of the early 1990s, much of the area in the vicinity of West Angelas Project was zoned as vacant Crown Land. The good condition of the vegetation at West Angelas has been attributed to the absence of historic cattle grazing, owing to the lack of water and palatable vegetation for cattle use. Pastoral activity in the region has historically been limited to grazing of cattle on Juna Downs Pastoral Station to the north (the most southern boundary of which is located approximately 20 km to the north) and Rocklea Pastoral Station approximately 75 km to the west.

1.5.2 Current land use

The Proposal is an extension to existing West Angelas operations. The location of the West Angelas Project is very remote with no neighbouring mining or pastoral activities, the dominant economic industries undertaken in the Pilbara.

Mining

Mining companies hold mining leases with iron ore resources adjacent to West Angelas Project, although no operations have been constructed in the immediate vicinity to date.

Mining Area C, an iron ore mine owned by BHP Billiton Iron Ore (**BHPBIO**) is located approximately 35 km north-north east of the West Angelas Project and is the closest development. Rio Tinto's Hope Downs 1 mine is located approximately 45 km north east of the West Angelas Project. Five other iron ore mines are located within a 100 km radius of the West Angelas Project (refer to Figure 1-1).

Communities

Inland regions of the Pilbara are sparsely populated, with the largest inland towns (Tom Price, Paraburdoo and Newman) established specifically to support the mining industry. The nearest town, Newman, is located approximately 130 km south-east of West Angelas (Figure 1-1). West Angelas operates solely as a Fly-In Fly-Out (**FIFO**) operation. The workforce is housed on site, in a fully serviced accommodation facility. As a result, there is little direct social interaction between the workforce and surrounding local communities.

Tourism

National Parks are the major tourism focus in the central Pilbara region. The West Angelas Project is located approximately 20 km from the nearest boundary of the Karijini National Park.

The area contains no significant features that warrant attention from the tourism sector. There are no public roads in the vicinity to facilitate access for tourists; therefore tourism is very limited in, or adjacent to, the West Angelas Project.

2 PROPOSAL DESCRIPTION

This Proposal is seeking a revision to the existing West Angelas Project, with the following proposed changes:

- Development of additional deposits: Deposits A west and F (refer to Section 2.1).
- Additional clearing of approximately 3,220 ha (refer to Section 2.2); and
- Extension of the Development Envelope (Refer to Section 2.4).

The Revised Proposal is shown in Figure 2-1.

Note that the following terminology is used throughout this document:

- **West Angelas Project** - existing West Angelas Iron Ore operation, as approved under MS 970.
- **Proposal** – the changes proposed in this document.
- **Revised Proposal** – all components of the West Angelas Project that are currently authorised under MS 970, plus the changes that are described in this Proposal that will be authorised by a new Ministerial Statement, in the event of acceptance by the Minister of the Proposal.

2.1 THE PROPOSAL

Production commenced in 2001 at Deposit A and in 2011 at Deposit E. Deposit A provides the primary ore source with Deposit E supplementing the production to maintain the current production rate. Deposit B is the next major ore source with mining scheduled to commence in 2015. Production from all existing deposits will decline from 2016. An additional ore source is therefore required to sustain current production from the West Angelas Project. Deposits A west and F have been identified as the next to be developed in the conceptual long term development strategy.

Robe proposes to commence mining of Deposits A west and / or Deposit F in 2016. The key components of the Proposal are as follows:

2.1.1 Mining and Transport

The Proposal involves conventional open pit mining of iron ore from above and below the water table in Deposits A west and F, as satellite deposits to the existing West Angelas mining operations. Approximately 85 million tonnes (**Mt**) of ore is estimated to be mined from these deposits (approximately 30 Mt and 55 Mt from Deposits A west and F, respectively). Once mined, ore will be transported by haul trucks approximately 5 km and 12 km respectively to existing processing facilities at West Angelas.

A number of transport and processing options have been investigated for both deposits. The transport of ore by haul trucks to existing processing facilities is preferred for both deposits. Haul route options are shown on Figure 2-1.

2.1.2 Waste

Waste rock will be transported by haul trucks to external waste dumps according to the material categorisation. Where practicable, waste may also be used in progressive backfilling of the pits to above groundwater levels to assist in achieving closure objectives for the site.

The likelihood of encountering potentially acid-forming (**PAF**) materials (e.g. black shale material) is considered low for both deposits. Further discussion about PAF materials and a broader assessment of Acid and Metalliferous Drainage (**AMD**) risk is discussed in Section 9.

2.1.3 Surface Water Management

A number of surface water management options have been considered for both deposits. The preferred option for Deposit A west is a diversion channel to redirect flows from the local catchment westwards, thereby maintaining natural flows. A passive surface water management strategy is proposed for pits F1 and F3 at Deposit F, whereby local catchments will be allowed to naturally terminate in the pits. The preferred option for pit F2 at Deposit F is a diversion channel to redirect flows eastwards into the adjacent Weeli Wolli catchment. The management of surface water is discussed in Section 7.

2.1.4 Dewatering, Water Use and Disposal of Surplus Water

Groundwater throughout the West Angelas region is naturally deep. Resources for both Deposits A west and F are mostly above water table. Approximately 6% of the Deposit A west resource and 1% of the Deposit F resource is below the water table. The Proposal therefore requires minimal dewatering ahead of mining to provide dry conditions for mining BWT (Table 9-1).

West Angelas is considered to be a water neutral (to small deficit) site; whereby operational water demand is roughly equivalent to dewatering requirements. While the site as a whole is water neutral in terms of water balance, the water management of each deposit is different with some in deficit and others in surplus. Dewatering at Deposit A west is likely to meet operational demand with a small surplus available for operational use elsewhere while a water deficit is predicted for Deposit F; additional water sources are likely to be required to meet operational demand. Water sources across West Angelas are integrated to ensure continuity of supply. This integrated water management strategy will continue to be implemented to address water supply and demand requirements for the Revised Proposal.

Groundwater abstraction (i.e. dewatering) is regulated by Department of Water (**DoW**) licensing and the *Rights in Water and Irrigation Act 1914 (RIWI Act)*. Existing abstraction is approximately 30% of the licence limit. Any surplus water, exceeding the operational water demand will continue to be discharged to the environment in accordance with existing licences issued by Department of Environmental Regulation (**DER**). Discharge is not expected as a result of this Proposal; abstracted water will be used to meet operational water demand. However, should discharge be required, amounts are expected to be minimal and within the existing licence limits. Existing discharge is less than 3% of the licence limit. This proposal is considered likely to reduce the surplus water discharge volumes associated with the existing operations.

The management of groundwater is discussed in Section 9.

2.2 CLEARING

The Proposal will require clearing of approximately 3,220 ha in addition to that approved under MS 970. The Revised Proposal clearing will reflect the following components:

- clearing for mining will be increased by 920 ha, from 2,260 ha to 3,180 ha;
- clearing for waste dumps will be increased by 1,853 ha, from 1,407 ha to 3,260 ha; and
- clearing for infrastructure will be increased by 450 ha, from 1,000 ha to 1,450 ha.

A small portion of the additional clearing will be allocated to minor changes to the existing West Angelas Project to support ongoing operations.

The proposed additional clearing is not expected to impact on any areas or species of elevated conservation significance. The management of vegetation and flora, fauna and fauna habitats is discussed in Sections 5 and 6 respectively.

2.3 SUMMARY OF KEY ASPECTS OF THE PROPOSAL

Table 2-1 provides a summary of the key aspects of the Proposal.

Table 2-1: Summary of key aspects of the Proposal

Element	Description
Mining	Open pit mining of iron ore from above and below the water table in Deposits A west and F.
Transport	Ore will be transported by haul trucks to existing processing facilities.
Waste	Waste rock will be transported by haul trucks to external waste dumps. Where practicable, waste may be used in progressive backfilling of the pits.
	Pits will be partially backfilled to above recovered groundwater levels to prevent post-closure exposure of the groundwater table.
Clearing	Mining Area - Clearing of no more than 920 hectares (ha). Waste dumps - Clearing of no more than 1,853 ha. Infrastructure - Clearing of no more than 450 ha.
Dewatering	Approximately 6% of the Deposit A west resource and 1% of the Deposit F resource is below the water table. The Proposal therefore requires minimal dewatering ahead of mining.
	Abstraction of no more than 1 Gigalitre per annum (GL/a).
Water supply	West Angelas is considered to be a water neutral (to small deficit) site; whereby operational water demand is roughly equivalent to dewatering requirements. Dewatering at Deposit A west is likely to meet operational demand with a small surplus available for operational use elsewhere while a water deficit is predicted for Deposit F; additional water sources are likely to be required to meet operational demand. Water sources across West Angelas are integrated to ensure continuity of supply.
Discharge	Discharge is not expected as a result of this Proposal; abstracted water will be used to meet operational water demand. Should discharge be required, amounts are expected to be minimal and within the existing licence limits.

2.4 KEY CHARACTERISTICS OF THE REVISED PROPOSAL

This Proposal will be implemented as a revision of the existing West Angelas Project. Table 2-2 provides a summary of the Revised Proposal and Table 2-3 provide details on the proposed location and authorised extent of physical and operational elements of the Revised Proposal. The new or modified factors are highlighted to assist with identification.

The proposed changes are included in the draft Ministerial Statement provided in **Appendix 3**. Robe proposes to maintain and adhere to the existing environmental conditions.

Table 2-2: Summary of the Revised Proposal

Proposal title	West Angelas Iron Ore Project – Revised Proposal
Proponent name	Robe River Mining Co. Pty. Ltd.
Short description	<p>Development and operation of an open-cut iron ore mine and associated infrastructure at the West Angelas Iron Ore Mine, 130 kilometres northwest of Newman in the Pilbara region (Figure 1). Iron ore is to be mined from above and below the water table in Deposits A, A west, B, E and F.</p> <p>The mining operations are supplied with water from the mine dewatering bores and water from the Turee Creek B Borefield, located approximately 30 kilometres west of the mine site.</p> <p>Surplus water, exceeding operational water demand is discharged to the environment.</p> <p>Railway infrastructure from West Angelas to the port facilities at Cape Lambert.</p>

Table 2-3: Location and Extent of Physical and Operational Elements of the Revised Proposal

Element	Location	Authorised Extent
Mining Area (Deposits A, A west , B, E and F)	Figure 2	<p>Clearing of no more than 3,180 hectares (ha) within a 22,600 ha development envelope.</p> <p><i>Clearing increased by 920 ha.</i></p>
Waste dumps	Figure 2	<p>Clearing of no more than 3,260 ha within a 22,600 ha development envelope.</p> <p><i>Clearing increased by 1,853 ha.</i></p>
Associated infrastructure, access and accommodation	Figure 2	<p>Clearing of no more than 1,450 ha within a 22,600 ha development envelope.</p> <p><i>Clearing increased by 450 ha.</i></p>
Dewatering		<p>*Dewatering of no more than 6 GL/a.</p> <p><i>Dewatering increased by 1 GL/a.</i></p>
Surplus water disposal		<p>**Surplus water, exceeding operational water demand, is discharged to an unnamed tributary at up to 6 GL/a.</p> <p><i>No change.</i></p>
Backfill		<p>***Pits will be partially backfilled to above recovered groundwater levels to prevent post-closure exposure of the groundwater table.</p> <p><i>No change.</i></p>

*Dewatering has been approved under the following existing licences issued under Part V of the EP Act and the RiWI Act; Licence L7774/2000, issued under Part V of the EP Act for dewatering of up to 6,000,000 tonnes per annum (6 GL/a) and Groundwater Licence GWL98740, issued under the RiWI Act for abstraction of 5,000,000 kL from the mine for dewatering and water supply purposes. It is anticipated that dewatering will decrease as production from existing mostly below water

table deposits declines and new, mostly above water table ore sources are developed. However, the abstraction volume of 6 GL/a covers peak operational abstraction of 5 GL/a and the additional 1 GL/a associated with the Proposal due to overlap of timing of development of the new deposits with existing operations. See Section 9.

**Discharge has been approved under Licence L7774/2000, issued under Part V of the EP Act for discharge through the existing discharge outlet (shown on Attachment 2 of Licence L7774/2000). The additional 1 GL/a of abstraction related to the Proposal is expected to be used to meet operational demand rather than discharged to the environment. See Section 9.

***Condition 9 of the Ministerial Statement requires the Proponent to prepare a Mine Closure Plan to the requirements of the CEO of the EPA on advice of the DMP. Based on the current Closure Plan, pits will be partially backfilled to above recovered groundwater levels to prevent post-closure exposure of the groundwater table. The Environmental Management Plan also includes a commitment to backfill. See Section 8.

The Proponent does not consider that elements which are regulated under other legislation are significant factors for the Ministerial Statement for the Revised Proposal.

2.5 DEVELOPMENT ENVELOPE OF THE REVISED PROPOSAL

The EPA's Environmental Assessment Guideline No. 1 (**EAG1**) (EPA 2012b) allows for the clearing footprint of a proposal to be defined within a broader development envelope provided that appropriate biological surveys and an environmental impact assessment have been conducted for the area.

The current development envelope is 19,853 ha. The spatial extent of the existing development envelope is shown in Figure 2, Schedule 1 of MS 970 (Appendix 2). A portion of the proposed additional clearing falls within the existing MS 970 development envelope. However, the Proposal will require an extension of approximately 2,747 ha to the extent of the Development Envelope to enable the development of Deposits A west and F. The spatial extent of the development envelope for the Revised Proposal is shown in Figure 2-1 and Figure 2, Schedule 1 of the Proposed MS (Appendix 3). This development envelope includes all elements of the existing Project approved under MS 970 together with this Proposal.

The western extension of the development envelope is proposed to allow for the design of any elements of the Proposal to the north of the Deposit A west (e.g. haul roads, pipelines, power or other supporting infrastructure) to preferentially avoid intersecting the West Angelas Cracking Clay Priority Ecological Community (**PEC**).

Biological surveys have been undertaken across the West Angelas region since 1979. The combined coverage of these surveys has enabled a detailed understanding of the existing vegetation and flora, fauna and fauna habitats in the region. Sections 5 and 6 describe the key biological surveys relevant to this Proposal.

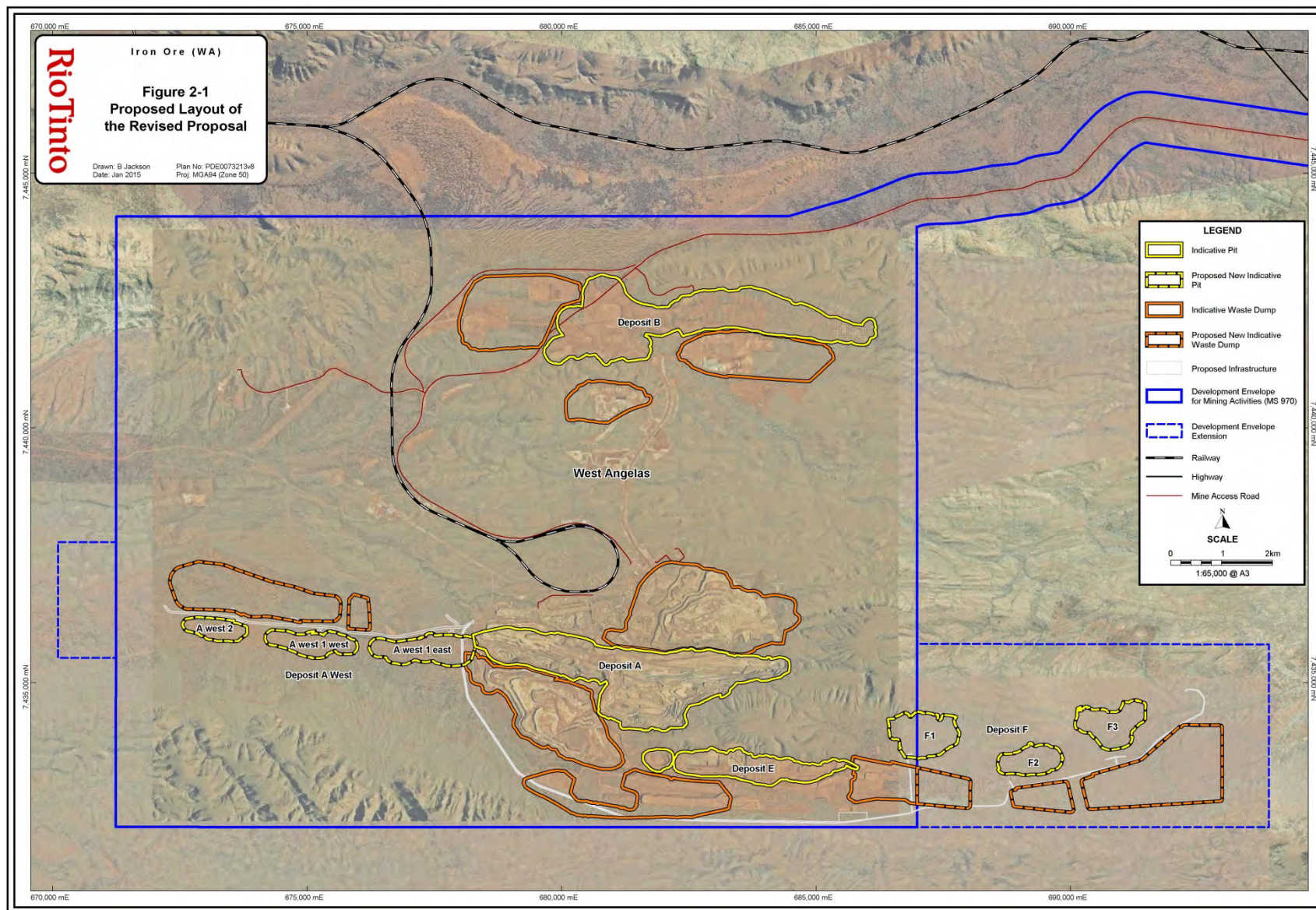


Figure 2-1: Proposed Layout of the Revised Proposal

3 STAKEHOLDER CONSULTATION

Identified key stakeholders for this Proposal include:

- Government agencies:
 - Office of the Environmental Protection Authority (**OEPA**);
 - Department of Parks and Wildlife (**Parks and Wildlife**);
 - Department of Environment and Regulation (**DER**);
 - Department of Water (**DoW**);
 - Department of Mines and Petroleum (**DMP**);
 - Department of State Development (**DSD**);
 - Department of Aboriginal Affairs (**DAA**); and
 - Shire of East Pilbara.
- Traditional Owners:
 - Yinhawangka Group; and
 - Ngarlawangga Group.

Stakeholder consultation undertaken to date, and Robe's response to issues raised, is detailed in Table 3-1. Robe will continue to consult with relevant stakeholders during the environmental approval process and during implementation of the Proposal.

Table 3-1: Stakeholder Consultation Relevant to this Proposal

Date	Topics/Issues Raised	Proponent Response
Office of the Environmental Protection Authority (OEPA)		
24/09/2014	<p>The Proponent provided an overview of the Proposal. OEPA advised that a Revised Proposal was appropriate.</p> <p>OEPA requested a formal pre-referral meeting prior to the submission of the Referral and Environmental Review document.</p>	The Proponent scheduled a pre-referral meeting with OEPA for 2 October 2014.
2/10/2014	<p>The Proponent scheduled a pre-referral meeting with OEPA for 2 October 2014 to present an overview of the Proposal and discuss the approvals pathway.</p> <p>The interaction between the Cracking Clay PEC and surface water flows in the area was discussed in some detail. OEPA were interested in understanding whether the Deposit A west waste dump could result in run-off water quality issues for the Cracking Clay PEC.</p> <p>OEPA also emphasised a focus on closure and rehabilitation. Given the recent update to the Ministerial Statement, OEPA advised that the exiting conditions were likely to be acceptable however; a revision to the Condition 9 of the Ministerial Statement was likely to be applied to address the requirement to submit revisions of the Closure Plan.</p> <p>Based on the information provided by the Proponent, OEPA advised that the Proposal is likely to be assessed via an API Category A. To verify this level of assessment is appropriate, the OEPA requested that the Proponent provide a draft copy of the Environmental Review document to OEPA prior to formally referring the Proposal.</p>	<p>The Proponent advised that waste dumps are designed to be internally draining such that runoff to the Cracking Clay PEC is expected to be negligible. The proponent also committed to review the Deposit A west waste dump design to minimise the reduction in the local catchment area contributing to the Cracking Clay PEC. Details are provided in Section 7 of this document.</p> <p>Closure and rehabilitation are addressed in this document. The Proponent also has incorporated a proposed change to Condition 9 to address the requirement to submit revisions of the Closure Plan. Details are provided in Section 9 of this document.</p> <p>The Proponent will provide a draft copy of the Environmental Review document to OEPA.</p> <p>The Proponent will continue to consult with OEPA throughout the environmental approvals process.</p>
3/10/2014	The Proponent provided the draft Environmental Review document to the OEPA on 3 October 2014.	

Date	Topics/Issues Raised	Proponent Response
21/10/2014	<p>The Proponent met with OEPA on 21 October 2014 to discuss the OEPA review of the draft Environmental Review document.</p> <p>OEPA requested that the Proponent provide additional evaluation of potential Short Range Endemic fauna and subterranean fauna. Specifically:</p> <ul style="list-style-type: none"> • how the proposed management would enable the EPA's objectives to be met with regards to Short Range Endemic fauna; and • justification as to why subterranean fauna has not been identified as a key environmental factor <p>OEPA also requested additional evidence of consultation with DAA.</p> <p>The correspondence is included in Appendix 4 in the updated Environmental Review document (this document).</p>	<p>The Proponent provided additional evaluation of potential Short Range Endemic fauna and subterranean fauna in the updated Environmental Review document. Details are provided in Section 6 of this document.</p> <p>The Proponent also provided additional evidence of consult with the DAA in this table (Table 3-1).</p>
25/11/2014	<p>The Proponent provided a revised copy of the draft Environmental Review document to the OEPA on 25 November 2014.</p> <p>OEPA requested minor amendments to the final Environmental Review document. Specifically:</p> <ul style="list-style-type: none"> • The Proponent should distinguish between the approved Project under MS 970 and the additional areas under the Revised Proposal. • The Proponent should provide an explanation for the small extension to the western side of the development envelope. <p>The correspondence is included in Appendix 4 in the updated Environmental Review document (this document).</p>	<p>The Proponent included the minor amendments requested by the OEPA in the updated Environmental Review document.</p>
27/11/2014	<p>The OEPA Assessments and Compliance Division received feedback from DMP on the West Angelas Closure Plan and provided comments to the Proponent, as follows:</p> <ul style="list-style-type: none"> • It is unclear how potential post mining impacts have been determined and it is therefore difficult to determine whether all post mining impacts have been identified and addressed. The proponent is required to identify potential post mining impacts through a risk analysis process as outlined in the Guidelines for Mine Closure Plans (DMP/EPA 2011). 	<p>The Proponent will continue to consult with OEPA and DMP. The Closure Plan is being amended following consultation with OEPA and DMP to specifically address the concerns raised, and will be submitted to OEPA by the required compliance date, 14 December 2015.</p> <p>The approved Closure Plan will be implemented in accordance with the requirements of the Ministerial Statement.</p>

Date	Topics/Issues Raised	Proponent Response
	<ul style="list-style-type: none"> • The management and mitigation measures presented in this Closure Plan are from other Rio Tinto Management Plans and do not address how this particular site will be closed out. If mitigation measures used on other Rio Tinto mine sites are used in this Closure Plan, the Plan should include details on how those measures will be implemented at this site. • A rehabilitation plan should be developed for long term low grade stockpiles as these stockpiles are not in the life of mine schedule for processing and it is therefore assumed that they will be present at closure. • No consultation has been undertaken with DMP regarding closure of the site. The proponent needs to liaise with DMP prior to preparation of the next revision of the Closure Plan. • As the proposal is located on Vacant Crown Land and is in close proximity to Karijini National Park, the return of a native ecosystem is supported by DMP and OEPA. A decision to proceed with Pastoralism as the post mining land use would need to be reached through consultation with relevant stakeholders. • The closure objectives do not encompass all aspects of the site. The closure objectives should be revised in consultation with the Guidelines for Mine Closure Plans (DMP/EPA 2011) to ensure closure objectives link to closure criteria. • Pits at Deposits A, A west and E will be highly erodible and unstable post closure. No information has been provided regarding the zone of instability for these pits. If this information is unknown, investigations should be conducted as soon as practicable and all waste dumps should be located outside of the zone of instability at all pits. • A new hydrological regime will be established post closure. The proponent should consult with DoW prior to preparation of the next revision of the Plan. • The completion criteria and associated performance indicators presented in Table 24 are generic and unclear. While detailed completion criteria are not expected at this stage of mine life, it is expected that the completion criteria provided will include all aspects of the site and are specific towards final landforms that will be present at the site. The Guidelines for Mine Closure Plans (DMP/EPA 2011) outline the detail that is expected of indicative completion criteria. 	

Date	Topics/Issues Raised	Proponent Response
	<p>The OEPA considers the Closure Plan requires amendments (addressing the above comments) before it can be approved for implementation. The amended Closure Plan is required to be submitted to the OEPA by 14 December 2015.</p> <p>The correspondence is included in Appendix 4 in the updated Environmental Review document (this document).</p>	
5/12/2014	The Proponent formally referred the Proposal to the OEPA on 5 December 2014.	
22/12/2014	<p>The OEPA provided a Notice Requiring Further Information. The OEPA requested the following information to clarify aspects of the Proposal:</p> <ul style="list-style-type: none"> • Further evidence of consultation with key decision-making authorities in relation to the environmental factors for this Proposal. • Further clarification of the location of potential Short Range Endemic species to provide justification as to why Terrestrial Fauna would not be a key factor for this Proposal. • Clarification of the volume of water to be discharged and the location of the discharge, along with a summary of potential impacts. • Clarification of the significant flora and vegetation information presented. <p>The Notice is included in Appendix 4 in the updated Environmental Review document (this document).</p>	<p>The Proponent consulted with relevant decision making authorities (DMAs) prior to submission of the Environmental Review Document and will continue to consult with relevant DMAs throughout the environmental approvals process.</p> <p>The following additional consultation was undertaken in relation to the Revised Proposal:</p> <ul style="list-style-type: none"> • Office of the EPA; • Department of Environment and Regulation; and • Department of Mines and Petroleum. <p>The Proponent also provided a copy of the Environmental Review Document to the relevant DMAs: Department of Parks and Wildlife, Department of Environmental Regulation, Department of Water and Department of Mines and Petroleum in order to provide the DMAs with detailed information regarding the Proposal.</p> <p>The Proponent included the information requested by the OEPA in the updated Environmental Review document.</p> <p>The Proponent provided the updated Environmental Review document to the OEPA with a formal response on 16 January 2015. The correspondence is included in Appendix 4 in the updated Environmental Review document (this document).</p>

Date	Topics/Issues Raised	Proponent Response
3/02/2015	<p>The OEPA provided a Notice Requiring Further Information. The OEPA requested the following information to clarify aspects of the Proposal:</p> <ul style="list-style-type: none"> • further evidence of consultation with key decision-making authorities and outcomes of discussions in relation to the environmental factors for this proposal; • clarification of the volume of water to be discharged and the location of the discharge, along with a summary of the potential impacts; • a revised Offsets section. <p>The Notice is included in Appendix 4 in the updated Environmental Review document (this document).</p> <p>The OEPA also requested the following:</p> <ul style="list-style-type: none"> • that the Proponent amended the document to reflect the Revised (January 2015) EAG for Environmental principles, factors and objectives (EPA 2015); and • that the Proponent provide copies of the Groundwater Operating Strategy and 5C Licence to Take and include these documents as appendices to the updated Environmental Review document. 	<p>The following additional consultation was undertaken in relation to the Revised Proposal:</p> <ul style="list-style-type: none"> • Office of the EPA; • Department of Parks and Wildlife; • Department of Environment and Regulation; • Department of Water; and • Department of Mines and Petroleum. <p>The Proponent included the information requested by the OEPA in the updated Environmental Review document.</p> <p>The Proponent provided the updated Environmental Review document to the OEPA with a formal response on 27 February 2015. The correspondence is included in Appendix 4 in the updated Environmental Review document (this document).</p>
12/02/2015	<p>The Proponent discussed the Closure Plan with the OEPA Assessments and Compliance Division via a telephone discussion on 12 February 2015.</p> <p>The OEPA advised that it had received comments from the DMP which indicated there were improvements to be made to the Closure Plan when it was next reviewed, and that the OEPA had interpreted that the Closure Plan could not be approved until those changes were made.</p> <p>It was agreed that the Closure Plan would be amended to specifically address comments received from the DMP.</p>	<p>The Closure Plan was amended to specifically address the concerns raised, and was submitted to the OEPA Assessments and Compliance Division on 4 March 2015 (ahead of the required compliance date, 14 December 2015).</p> <p>The amended Closure Plan is included in Appendix 9 in the updated Environmental Review document (this document).</p> <p>The approved Closure Plan will be implemented in accordance with the requirements of the Ministerial Statement.</p>

Date	Topics/Issues Raised	Proponent Response
19/02/2015	<p>The OEPA reviewed the subterranean fauna appendix and requested that the Proponent provide the following information:</p> <ul style="list-style-type: none"> • Improved maps provided indicating survey locations, monitoring locations and species distribution; • A description of sub fauna habitat if available; • Greater detail regarding survey timing/dates and specimen information; and • Copies of all previous survey reports. 	<p>The Proponent provided a formal response to the OEPA on 27 February 2015. The correspondence is included in Appendix 4 in the updated Environmental Review document (this document).</p>
12/03/2015	<p>The Proponent met with OEPA on 12 March 2015 to develop a key list of actions to finalise the Environmental Review document.</p> <p>OEPA requested that the Proponent provide additional information relating to key technical aspects. Specifically:</p> <ul style="list-style-type: none"> • Water - The document should include current dewatering volumes, future predicted peak dewatering volumes for the deposits that form part of the Proposal, future predicted discharge volumes and a site water balance; • Subterranean fauna - The document should include total number of species found and locations of records. It should also include a habitat assessment; and • Closure - The document should confirm the approach of backfill to above the water table for the purpose of ensuring that closure will not result in significant environmental impacts. <p>Consultation - It was noted that consultation with key Decision Making Authorities (DMAs) has been completed and that DMA responses to the Proposal are included in the Stakeholder Consultation table and no significant issues have been raised to date.</p> <p>Timeframes - It was discussed that the DMA consult required for a Revised Proposal was more intensive than that generally required for a standard API and therefore, the Proponent may consider whether the Proposal should be approved under a new, separate Ministerial Statement.</p> <p>Records of this consultation are included in Appendix 4 in the updated Environmental Review document (this document).</p>	<p>The Proponents Water Strategy Specialist presented the updated dewatering volumes and outlined the water deficit encountered at the deposits that form part of the Proposal. The holistic water management strategy for West Angelas was also discussed.</p> <p>Given that the Ministerial Statement was recently updated to reflect contemporary presentation and outcomes based conditions, the Proponent proposes to continue with the Revised Proposal and a single, consolidated Statement, but this may be reviewed should the timeframe for approval become critical during the assessment process.</p> <p>The Proponent updated the Environmental Review document with changes relating to water, subterranean fauna and closure.</p>

Date	Topics/Issues Raised	Proponent Response
Department of Parks and Wildlife (Parks and Wildlife)		
30/09/2014	<p>The Proponent discussed the Proposal with Parks and Wildlife via a telephone discussion on 30 September 2014.</p> <p>Parks and Wildlife were interested in understanding the interaction between the Proposal and conservation significant areas and species (those protected under the <i>Wildlife Conservation Act 1950</i>). The Proponent discussed the presence of the Cracking Clay PEC, the known Ghost Bat roosting cave and Priority Flora species.</p> <p>Based on the information provided by the Proponent, Parks and Wildlife indicated that they did not require a formal pre-referral meeting. The Proponent will provide a copy of the Referral and Environmental Review document to Parks and Wildlife for their information and will meet with Parks and Wildlife to discuss any specific concerns on request.</p>	<p>The Proponent advised that the PEC is not expected to be detrimentally impacted by the Proposal.</p> <p>The Proponent discussed the proposed 100 m exclusion zone and committed to the ongoing implementation of blast management to protect the known Ghost Bat roosting cave.</p> <p>The Proponent also advised that some occurrences of Priority Flora will be cleared however; the Proposal will preferentially avoid known locations of Priority Flora as far as practicable.</p> <p>The Proponent will continue to consult with Parks and Wildlife throughout the environmental approvals process.</p>
7/01/2015	The Proponent provided Parks and Wildlife with a copy of the Referral and Environmental Review document in order to provide Parks and Wildlife with detailed information regarding the Proposal.	The Proponent will discuss any specific concerns once Parks and Wildlife have had an opportunity to review the Proposal and will provide a copy of any concerns raised and responses to the OEPA.
27/01/2015	The Proponent advised Parks and Wildlife of the OEPA's requirement for additional consultation with key decision-making authorities for this Proposal and requested review of the Referral and Environmental Review document by 27 February 2015.	
29/01/2015	<p>Parks and Wildlife requested the following information to assist in understanding the proposed impacts:</p> <ul style="list-style-type: none"> Impact tables (cumulative) for flora (Priority and threatened); and Impact tables (cumulative) and management measures for the PEC (including a map that shows the PEC in relation to the current and proposed footprint). <p>The correspondence is included in Appendix 4 in the updated Environmental Review document (this document).</p>	<p>The Proponent provided a formal response to Parks and Wildlife on 6 February 2015. The correspondence is included in Appendix 4 in the updated Environmental Review document (this document).</p> <p>The Proponent also provided additional evaluation of Priority Flora in the updated Environmental Review document (this document). Details are provided in Section 5 of this document.</p>

Date	Topics/Issues Raised	Proponent Response
Department of Environment Regulation (DER)		
12/01/2015	<p>The Proponent discussed the Proposal with DER via a telephone discussion on 12 January 2015. No specific concerns have been raised to date with the Proposal.</p> <p>The Proponent's Approvals Team consider that they have a good working relationship with the DER and will continue to liaise with DER on Works Approvals and Licences for relevant Proposals.</p> <p>Works approvals and licences have been granted for existing West Angelas operations. Given that detailed design that is required to support the Works Approval application is still being undertaken, there has been limited consultation with DER specifically regarding the Proposal to date. Once the detailed design work is complete, the Proponent will submit an enquiry form summarising the proposed activities, in accordance with established procedures.</p>	<p>The Proponent provided DER with a copy of the Referral and Environmental Review document in order to provide DER with an overview of the Proposal ahead of detailed discussions</p> <p>The Proponent will continue to consult with DER throughout the environmental approvals process and will apply for relevant approvals and licences as required under Part V of the <i>Environmental Protection Act 1986</i>.</p>
27/01/2015	The Proponent advised DER of the OEPA's requirement for additional consultation with key decision-making authorities for this Proposal and requested review of the Referral and Environmental Review document by 27 February 2015.	
5/02/2015	<p>Advice from DER on the Environmental Review document is that the activities may trigger approval(s) under Part V of the <i>Environmental Protection Act 1986</i>. Robe River Mining Co Pty Ltd should submit an Application Enquiry Form, which they may do at their convenience.</p> <p>The correspondence is included in Appendix 4 in the updated Environmental Review document (this document).</p>	<p>The Proponent will continue to consult with DER throughout the environmental approvals process and will apply for relevant approvals and licences as required under Part V of the <i>Environmental Protection Act 1986</i>.</p>

Date	Topics/Issues Raised	Proponent Response
Department of Water (DoW)		
23/09/2014	<p>The Proponent met with DoW on 23 September 2014 to present an overview of the Proposal and to discuss any concerns, specifically related to water.</p> <p>The interaction between the Cracking Clay PEC and surface water flows in the area was discussed in some detail. DoW were interested in understanding the overland flow contribution to the Cracking Clay PEC.</p>	<p>The proponent presented an overview of 2D hydraulic modelling that has been undertaken to understand the interactions between the Cracking Clay PEC and patterns of surface water flow in the area and committed to provide further detail in this document.</p> <p>The proponent also committed to review the Deposit A west waste dump design to minimise the reduction in the local catchment area contributing to the Cracking Clay PEC.</p> <p>The Proponent will continue to consult with DoW throughout the environmental approvals process and will apply for relevant approvals and licences as required under the <i>Rights in Water and Irrigation Act 1914</i>.</p>
7/01/2015	The Proponent provided DoW with a copy of the Referral and Environmental Review document in order to provide DoW with detailed information regarding the Proposal.	The Proponent will discuss any specific concerns once DoW have had an opportunity to review the Proposal and will provide a copy of any concerns raised and responses to the OEPA.
29/01/2015	The Proponent advised DoW of the OEPA's requirement for additional consultation with key decision-making authorities for this Proposal and requested review of the Referral and Environmental Review document by 27 February 2015.	
Department of Mines and Petroleum (DMP)		
27/08/2014	The Proponent requested guidance from DMP regarding stakeholder consultation for Proposals considered to be of API-A level of assessment. DMP indicated that it would be their preference for the Proponent to present an overview of the Proposal rather than providing a draft copy of the Environmental Review document and to discuss any specific concerns.	The Proponent committed to meet with DMP to provide an overview of the Proposal and discuss any specific concerns.

Date	Topics/Issues Raised	Proponent Response
2/10/2014	<p>The Proponent met with DMP on 2 October 2014 to present an overview of the Proposal and to discuss any concerns, specifically related to closure.</p> <p>Material types were discussed in some detail. DMP were interested in understanding the closure strategy given the generally highly erodible material present at West Angelas. The Proponent discussed backfill and capping strategies.</p> <p>DMP also queried whether PAF materials would be encountered. The Proponent discussed the low risk of encountering PAF materials based on assessments completed.</p> <p>The Proponent also discussed the proposed diversion of surface water flows. DMP were interested in the engineering of the diversion structures. Detailed engineering designs of the diversion structures have not yet been developed, however are proposed to be commissioned.</p>	<p>The Proponent committed to investigate opportunities to backfill.</p> <p>The Proponent will continue to consult with DMP throughout the environmental approvals process.</p>
27/11/2014	DMP provided technical advice to the OEPA on the West Angelas Closure Plan.	The Proponent will continue to consult with DMP and will amend the Closure Plan.
7/01/2015	The Proponent provided DMP with a copy of the Referral and Environmental Review document in order to provide DMP with detailed information regarding the Proposal.	The Proponent will discuss any specific concerns once DMP have had an opportunity to review the Proposal and will provide a copy of any concerns raised and responses to the OEPA.
21/01/2015	<p>The Proponent met with DMP on 21 January 2015 to discuss the DMP review of the West Angelas Closure Plan. Records of this consultation are included in Appendix 4 in the updated Environmental Review document (this document).</p> <p>DMP acknowledged that there are likely to be some gaps in closure knowledge but that this is acceptable given Ministerial conditions require regular Closure Plan updates.</p> <p>DMP were particularly interested in understanding the interaction between the waste dumps and the 'zone of instability'.</p> <p>The Proponent discussed that the required compliance date for submitting the amended the Closure Plan does not align with the Revised Proposal.</p> <p>Records of this consultation are included in Appendix 4 in the updated Environmental Review document (this document).</p>	The Proponent committed to meet with DMP to discuss specific concerns.

Date	Topics/Issues Raised	Proponent Response
11/02/2015	<p>The Proponent met with DMP on 11 February 2015 to discuss the West Angelas Closure Plan. The purpose of this meeting was to understand whether the DMP, as the primary regulator for closure in Western Australia, to determine:</p> <ul style="list-style-type: none"> • which of the nine concerns raised by the OEPA had originated from the DMP; • whether the OEPA's response accurately reflected the DMP's view of the closure plan; and • whether the response was indicative of dissatisfaction with the closure plans for Rio Tinto mine sites more broadly. <p>The DMP indicated that it had raised some concerns about the closure plan with the OEPA, but in the context of issues to be addressed in the next closure plan update. It had not recommended that the closure plan be rejected.</p> <p>The DMP indicated that whilst there are some improvements that need to be made to the closure plan, it considers the document to be generally acceptable. Clarification was provided on DMP expectations in relation to the closure plan improvements to be implemented in 2015.</p> <p>Records of this consultation are included in Appendix 4 in the updated Environmental Review document (this document).</p>	<p>The Closure Plan was amended to specifically address the concerns raised, and was submitted to the OEPA Assessments and Compliance Division on 4 March 2015 (ahead of the required compliance date, 14 December 2015).</p> <p>The amended Closure Plan is included in Appendix 9 in the updated Environmental Review document (this document).</p> <p>The approved Closure Plan will be implemented in accordance with the requirements of the Ministerial Statement.</p>
Department of State Development (DSD)		
Ongoing	<p>The Proponent provides updates on relevant projects at monthly meetings with DSD. No specific concerns have been raised to date with the Proposal.</p>	<p>The Proponent will continue consultation with DSD regarding any planned submissions for approval under the <i>Iron Ore (Robe River) Agreement Act 1964</i>.</p>

Date	Topics/Issues Raised	Proponent Response
Department of Aboriginal Affairs (DAA)		
Ongoing	<p>The Proponent's Heritage Team consider that they have a good working relationship with the DAA and provides ongoing updates on relevant Proposals and heritage matters at regular liaison meetings.</p> <p>Given that heritage surveys are still being undertaken and therefore, that the number, type and significance of heritage sites which may be impacted by the Proposal are not yet known, there has been limited consultation with DAA specifically regarding the Proposal to date. Heritage surveys are scheduled to continue in late 2014 and early 2015. Once this work is complete, the Proponent will consult DAA on Proposal specific heritage matters.</p> <p>Direct and indirect impacts to heritage sites will be avoided as far as practicable. The Proponent will seek section 18 (s18) consent under the <i>Aboriginal Heritage Act 1972 (AHA)</i> to disturb any heritage sites that cannot be avoided. The Proponent will consult DAA at regular liaison meetings regarding any planned submissions for s18 consent in advance of submission.</p>	<p>The Proponent will continue regular liaison meetings with DAA and will discuss Proposal specific matters as required.</p> <p>The Proponent will consult with DAA regarding any planned submissions for approval under s18 of the AHA to disturb any heritage sites that cannot be avoided.</p>
Shire of East Pilbara		
24/09/2014	The Proponent met with the Shire of East Pilbara on 24 September 2014 to present an overview of the Proposal and to discuss any concerns. No significant concerns were raised.	The Proponent will continue liaising with the Shire of East Pilbara and will discuss Proposal specific matters as required.
Yinhawangka Traditional Owners		
17/08/2006	<p>The Proponent informed the Yinhawangka Group of planned future development of Deposit F. It was discussed that there are no plans for significant dewatering of groundwater and that backfilling of the pits will be investigated.</p> <p>The Proponent mentioned that environmental approvals process requires protection of the environment, minimising clearing of the vegetation, backfill and rehabilitation.</p>	The Proponent committed to continue consultation with the Yinhawangka Group.

Date	Topics/Issues Raised	Proponent Response
29/04/2014 13/11/2014 Ongoing	<p>Issues relevant to the Yinhawangka Group are discussed at six monthly Local Implementation Committee (LIC) meetings, as agreed to in the Yinhawangka Claim Wide Participation Agreement. The first Yinhawangka LIC meeting was held on 14 March 2013.</p> <p>This Proposal was presented to the Yinhawangka LIC meeting on 29 April 2014 and again on 13 November 2014. No significant concerns have been raised, however; the cumulative impact of surface water diversions has been identified as a key issue for ongoing discussion. The Yinhawangka Group have requested to be consulted regarding surface water management.</p> <p>The Proposal will be discussed again at the next LIC meeting, scheduled for 8 April 2015.</p>	<p>The Proponent will continue with regular consultation with the Yinhawangka Group through the LIC meetings.</p> <p>Cumulative impacts of surface water diversions will be presented and discussed with the group during update meetings.</p>
Ngarlawangga Traditional Owners		
7/11/2014 Ongoing	<p>Issues relevant to the Ngarlawangga Group are discussed at six monthly Local Implementation Committee (LIC) meetings, as agreed to in the Ngarlawangga Northern Claim Area Participation Agreement. The first Ngarlawangga LIC meeting was held on 12 May 2013.</p> <p>This Proposal was presented at the Ngarlawangga LIC meeting on 7 November 2014 and again on 5 March 2015. No significant concerns have been raised.</p> <p>The Proposal will be discussed again at the next LIC meeting, scheduled for 2 September 2015.</p>	<p>The Proponent will continue with regular consultation with the Ngarlawangga Group through the LIC meetings.</p>

4 ENVIRONMENTAL IMPACTS AND MANAGEMENT

4.1 ENVIRONMENTAL APPROVALS PROCESS

This Proposal is a revision to the existing West Angelas Project (MS 970).

This Environmental Review document has been provided to the OEPA to support the referral of the Revised Proposal and has been prepared in accordance with the EPA's Environmental Assessment Guidelines (**EAGs**): specifically Defining the Key Characteristics of a Proposal *Environmental Protection Act 1986* (**EAG 1**) (EPA 2012b), EAG for Environmental factors and objectives (**EAG 8**) (EPA 2013a), the Revised EAG for Environmental principles, factors and objectives (**EAG 8**) (EPA 2015) and EAG for Application of a significance framework in the environmental impact assessment process (**EAG 9**) (EPA 2013b).

The Referral Form for this Revised Proposal has been prepared in accordance with Section 38(1) of the EP Act and is provided in Appendix 1.

It is expected that upon approval of this Proposal, Ministerial Statement 970 will be superseded and that a new Ministerial Statement will be issued for the Revised Proposal. It is intended that the Revised Proposal will be managed in accordance with the existing legislative controls and the Environmental Management Program (**EMP**), which has been updated to include all components of the Revised Proposal (Appendix 8).

4.2 ASSESSMENT OF ENVIRONMENTAL FACTORS

The environmental factors and objectives adopted by the EPA are listed in EAG 8. Robe has identified and assessed the Key Environmental Factors that are relevant to this Revised Proposal, based on EAG 8 and EAG 9. The outcome of the assessment is shown in Figure 4-1.

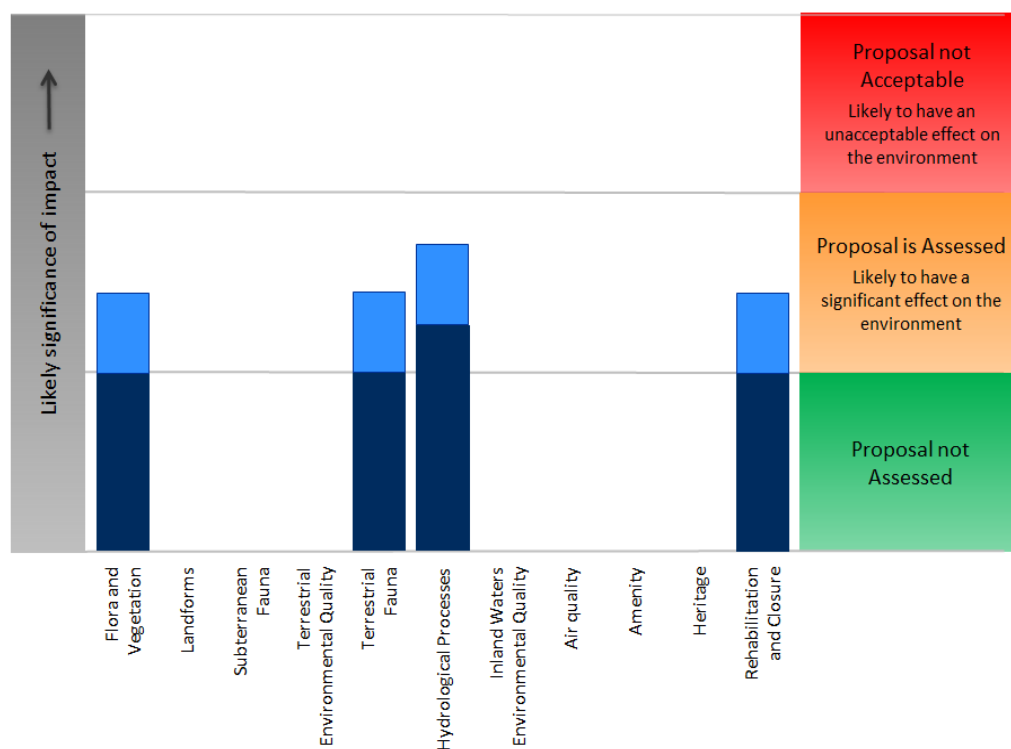


Figure 4-1: Significance Framework for Environmental Factors for the Revised Proposal (from EAG 8 and EAG 9).

The Key Environmental Factors relevant to this Revised Proposal are identified as follows:

- flora and vegetation (Section 5);
- terrestrial fauna (Section 6);
- hydrological processes (surface water) (Section 7); and
- rehabilitation and closure (Section 8).

The above assessment included consideration of existing legislative controls for each identified Key Environmental Factor (shown in Figure 4-1).

Robe considers that for the remaining environmental factors, the Revised Proposal will not result in any significant change in addition to, or different from, that originally assessed and approved under MS 970. Each of these factors has been addressed in Section 9.

As such, Robe has concluded that the Revised Proposal meets the EPA's Objectives and should be assessed at an Assessment on Proponent Information (**API**)-A level of assessment where the existing conditions of Ministerial Statement 970 are appropriate to continue managing the Proposal to meet the EPA's objectives.

4.3 ENVIRONMENTAL MANAGEMENT OVERVIEW

Rio Tinto has developed and refined environmental management objectives, systems and procedures over decades of operational mining experience in the Pilbara region that are successfully applied at multiple iron ore mine sites.

The key components of the environmental management approach that will continue to be implemented for the Revised Proposal include:

1. The Rio Tinto Iron Ore Group Health, Safety, Environment, Communities and Quality Policy (**HSECQ Policy**). The HSECQ Policy is the guiding document for environmental management and provides context and direction for continuous improvement.
2. Rio Tinto Iron Ore (WA) operates under an Environmental Management System (**EMS**), contained within the HSEQ Management System. The HSEQ Management System is a continuous improvement model covering:
 - systematic assessment of environmental risk and legal requirements; systems for training, operational control, communication, emergency response and corrective actions;
 - the development of objectives and targets for improvements; and
 - audits and review.
3. The existing conditions of Ministerial Statement 970, including but not limited to:
 - Condition 6 for Groundwater;
 - Condition 7 for Surface Water;
 - Condition 8 for Conservation Significant Communities and Species; and
 - Condition 9 for Rehabilitation and Closure.
4. The West Angelas Operations Environmental Management Program (**EMP**) prepared in November 2013 and approved by the Office of the EPA in June 2014.

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5. Existing licences issued under Part V of the EP Act and the RiWI Act:
- Licence L7774/2000, issued under Part V of the EP Act for processing, dewatering, discharge, landfill and sewage treatment facility;
 - Licence L7642/2000, issued under Part V of the EP Act for the village sewage treatment facility;
 - Groundwater Licence GWL98740, issued under the RiWI Act for abstraction of 5,000,000 kL from the mine for dewatering and water supply purposes; and
 - Groundwater Licence GWL103136, issued under the RiWI Act for abstraction of 3,102,500 kL from the Turee B Borefield for water supply purposes.
6. The Rio Tinto closure approach will continue to guide closure planning for the Revised Proposal. This approach governs:
- commencement of planning for closure prior to project commencement;
 - the development and content of closure plans;
 - stakeholder consultation regarding closure;
 - financial provisioning for closure;
 - the review of closure plans; and
 - the development of Decommissioning Plans five years prior to scheduled closure.

Consideration of existing legislative controls for each of the key environmental factors relevant to this Proposal is shown in Figure 4-1.

4.4 PROPOSED ENVIRONMENTAL CONDITIONS

Robe proposes to maintain and adhere to the existing environmental conditions of MS970 (refer to Appendix 2) to address the key environmental aspects of the Revised Proposal. It is proposed that these environmental conditions be applied to the Revised Proposal (i.e. the existing West Angelas Project approved under Ministerial Statement 970 and this Proposal).

These environmental conditions do not duplicate other regulatory controls that are, or will be, applied under other existing legislation (refer to Section 10). A condition has not been imposed if the environmental factor is already adequately addressed by other environmental control instruments (i.e. the existing West Angelas Operations EMP).

5 VEGETATION AND FLORA

This Section describes the vegetation and flora that occur within the Proposal area and provides details regarding the potential impacts to conservation significant vegetation communities and flora species from 3,220 ha of additional clearing that forms part of this Proposal.

The EPA applies the following objective from EAG 8 in its assessment of proposals that may affect vegetation and flora:

To maintain representation, diversity, viability and ecological function at the species, population and community level.

Table 5-4 describes how the Proposal meets the EPA's objectives in respect of vegetation and flora.

5.1 VEGETATION AND FLORA STUDIES

Vegetation and flora surveys have been undertaken across the West Angelas region since 1979, covering an area in excess of 61,600 ha. Table 5-1 summarises the key surveys relevant to this Proposal.

In addition, Robe has conducted a number of targeted searches for Declared Rare Flora (**DRF**) and Priority Flora in the area that provides a considerable reference for the distribution of these species.

The combined coverage of these surveys has enabled a detailed understanding of the existing vegetation and flora in the West Angelas region.

Table 5-1: Summary of Supporting Studies

Report Title, Author and Year	Summary of Studies
<p><i>An ecological appreciation of the West Angelas environment, Western Australia 1979.</i></p> <p>Integrated Environmental Services (1978)</p>	<p>Survey of vegetation conducted in all seasons of the years 1978 and 1979 across West Angelas. The vegetation of the West Angelas region was described in 1979 as:</p> <ul style="list-style-type: none"> • <i>Triodia</i> sp. Hummock Grassland (on ridges, steep slopes and lower slopes); • <i>Acacia aneura</i> Mulga Low Woodland (on valley floors); • <i>Acacia kempeana</i> Low Scrub (on ridges and lower slopes); • <i>Eucalyptus kinsmillii</i> Open Shrub Mallee (on ridges); • <i>Callitris columellaris</i> Stands (on fire protected slopes and gorges); and • Eucalyptus Fringing Woodland (riverine areas). <p>None of the vegetation was considered to be rare.</p>
<p><i>A flora survey of Orebody A near West Angela Hill, with description of vegetation of flora collecting sites</i></p> <p>M. Trudgen (1995)</p>	<p>Collection of flora species conducted at Deposit A following good rainfall.</p> <p>The vegetation of the West Angelas region was described in 1995 as:</p> <ul style="list-style-type: none"> • <i>Acacia aneura</i> low woodland on gentle slopes and plains; • <i>Eucalyptus leucophloia</i> low open woodland in gullies, flowlines and broad creeklines; <p>The survey recorded a total of 206 species. Three of these were species of interest; <i>Goodenia stellata</i>, <i>Eremophila phyllopoda</i> ssp. <i>oblique</i> and <i>Acacia</i> aff. <i>citrinoviridis</i>. None remain on the Priority Flora list.</p>
<p><i>Flora and vegetation surveys of Orebody A and Orebody B in the West Angela Hill area, an area surrounding them, and of rail corridor options considered to link them to the existing rail line</i></p> <p>M. Trudgen (1998)</p>	<p>Survey of the vegetation and flora present at Deposits A and B and surrounds, the access road and part of the rail conducted between 6 and 11 May 2004, covering a total area of approximately 42,000 ha.</p> <p>Seven broad vegetation associations were described in 1998, based on vegetation and landforms:</p> <ul style="list-style-type: none"> • Vegetation of major and moderate flowlines; • Vegetation of iron bearing formations; • Vegetation of valleys, plains, low foothills and escarpments; • Vegetation of volcanic formations; • Vegetation of the Lyre Creek Agglomerate Member;

Report Title, Author and Year	Summary of Studies
	<ul style="list-style-type: none"> • Vegetation of recent epoch flood deposits and travertine areas; and • Vegetation of the Wittenoom Formation; <p>The survey recorded a total of 635 species of flora. Twenty-one of these were Priority Flora, however, only five remain on the Priority Flora list:</p> <ul style="list-style-type: none"> • <i>Spartothamnella puberula</i> ((F.Muell.) Maiden & Betcher) (Parks and Wildlife Priority (P) 2); • <i>Olearia mucronata</i> (Lander) (P3); • <i>Dampiera metallorum</i> (Lepschi & Trudgen), previously <i>Dampiera</i> sp. Mt Meharry (M.E. Trudgen 1178) (P3); • <i>Indigofera gilesii</i> sp. <i>gilesii</i> (P3); and • <i>Eremophila magnifica</i>. <p>The DRF species <i>Lepidium catapycnon</i> was also recorded at the southern base of West Angela Hill. The total population recorded was in excess of 100 individuals in several patches, with populations extending upslope.</p>
<p><i>Vegetation and Flora Survey of West Angelas Deposits E and F.</i> Biota (2006)</p>	<p>Desktop review and single phase survey of the vegetation and flora present at Deposits E and F conducted between 6 and 11 May 2004, covering a total area of approximately 2,000 ha; rare flora searches conducted in June 2004 and between August and October 2005 in accordance with the following:</p> <ul style="list-style-type: none"> • EPA Position Statement No. 3: <i>Terrestrial Biological Surveys as an Element of Biodiversity Protection</i> (EPA 2002). • EPA Guidance Statement No. 51: <i>Terrestrial Flora and Vegetation Surveys for Environmental Impact Assessment in Western Australia</i> (EPA 2004a). <p>Twelve vegetation types were identified in 2006, broadly these vegetation types included:</p> <ul style="list-style-type: none"> • Hard Spinifex <i>Triodia wiseana</i> and Soft Spinifex <i>Triodia pungens</i> or <i>Triodia</i> sp. Mt. Ella hummock grasslands with a scattered to moderately dense shrub overstorey dominated by varying proportions of <i>Acacia maitlandii</i>, <i>A. bivenosa</i> and <i>A. hamersleyensis</i> on stony hills in the northern section of the study area; • Low woodlands to tall shrublands of <i>Acacia catenulata</i> in gorges; • Hummock grasslands of <i>Triodia</i> aff. <i>basedowii</i>, with some <i>T. pungens</i>, on stony baseslopes; • Woodlands to tall shrublands of various forms of Mulga <i>Acacia aneura</i> over open hummock grasslands, usually of <i>Triodia pungens</i>, on clayey soils of the broad valleys in the southern section of the study area; and • Creeklines supporting tall shrublands dominated by various combinations of <i>Acacia maitlandii</i>, <i>Gossypium robinsonii</i>, <i>Petalostylis</i>

Report Title, Author and Year	Summary of Studies
	<p><i>labicheoides</i> and <i>Rulingia luteiflora</i> over open hummock grasslands of <i>Triodia pungens</i>.</p> <p>None of the vegetation types identified were considered to be sufficiently rare or restricted to warrant designating them as being of high conservation significance. The following vegetation types were considered to have moderate conservation significance:</p> <ul style="list-style-type: none"> • Mulga vegetation types M1-M5: these mapping units include the vegetation unit 6adb213 of Trudgen and Casson (1998), which was considered to be relatively restricted in the area, and also comprise ecosystems at risk in the form of grove/intergrove and valley floor mulga. • Vegetation types Hi and H3 of stony hills and gorges respectively: these comprised the main mapping units from which the undescribed spinifex species <i>Triodia</i> sp. Mt Ella was recorded. This Priority 3 taxon is known only from the vicinity of West Angelas, and is apparently uncommon and restricted in distribution. It can therefore be surmised that any vegetation type in which this species is a significant component will also be uncommon and restricted. <p>The remainder of the vegetation types were considered to be of low conservation significance, representing units that are likely to be widely distributed and relatively well represented in the Hamersley Range subregion.</p> <p>The survey recorded a total of 429 species of flora. Eight of these were Priority Flora, however, only five remain on the Priority Flora list:</p> <ul style="list-style-type: none"> • <i>Josephinia</i> sp. Marandoo (M.E. Trudgen 1554) (P1); • <i>Spartothamnella puberula</i> (P2); • <i>Indigofera gilesii</i> subsp. <i>gilesii</i> (P3); • <i>Themeda</i> sp. Hamersley Station (M.E. Trudgen 11431) (P3); and • <i>Triodia</i> sp. Mt Ella (M.E. Trudgen 12739) (P3). <p>All of these Priority Flora have been recorded previously from West Angelas.</p>
<p><i>Greater West Angelas Vegetation and Flora Assessment.</i> ecologia Environment (2013) Appendix 5</p>	<p>Desktop review and two phase, Level 2 survey conducted; Phase 1 conducted between 9 and 18 July 2012, Phase 2 conducted between 21 and 26 August 2012, covering a total area of approximately 17,600 ha in accordance with the following:</p> <ul style="list-style-type: none"> • EPA Position Statement No. 3: Terrestrial Biological Surveys as an Element of Biodiversity Protection (EPA 2002). • EPA Guidance Statement No. 51: <i>Terrestrial Flora and Vegetation Surveys for Environmental Impact Assessment in Western Australia</i> (EPA 2004a). <p>The results of this survey are outlined below.</p>

Ecologia Environment (*ecologia*) most recently conducted a two phase vegetation and flora assessment in 2012, covering a survey area of approximately 17,600 ha. The survey area is considerably broader than the Proposal. The survey was undertaken to support an environmental impact assessment and was conducted in accordance with EPA Position Statement No. 3: *Terrestrial Biological Surveys as an Element of Biodiversity Protection* (2002) and EPA Guidance Statement No. 51 - *Terrestrial Flora and Vegetation Surveys for Environmental Impact Assessment in Western Australia* (2004a).

5.1.1 IBRA Bioregions and Subregions

The survey area is situated within the Pilbara (**PIL**) Bioregion as defined in the Interim Biogeographic Regionalisation of Australia (**IBRA**) Report (Australian Government Department of Sustainability 2012). The Pilbara biogeographic region comprises four subregions: Chichester (PIL1); Fortescue Plains (PIL2); Hamersley (PIL3); and Roebourne (PIL4). The survey area is situated within the Hamersley subregion.

5.1.2 Beards Vegetation Mapping

The survey area lies entirely within the Pilbara region of the Eremaean Botanical Province as defined by Beard (1975). The vegetation of this province is typical of arid landscapes.

According to Beard the predominant vegetation associations in the survey area are:

- Low woodland; continuous Mulga *Acacia aneura* woodland communities over spinifex *Triodia basedowii* and *Triodia epactia* hummock grasslands on stony undulating plains; and
- Low scattered tree steppe; Snappy Gum *Eucalyptus leucophloia* over spinifex *Triodia wiseana* hummock grassland on stony undulating plains.

At a scale of 1: 1,000,000 the vegetation units described by Beard (1975) within the survey area are well represented elsewhere.

5.1.3 Land systems

Land systems comprise a series of 'land units' that occur on characteristic physiographic types within the land system. Land Systems mapping covers the survey area. The Study Area crosses the northern boundary of the area surveyed by Payne et al (1982) in the Regional Inventory of the Ashburton Rangelands and into the area surveyed by Van Vreeswyk et al. (2004) in the Regional Inventory of the Pilbara Rangelands.

Of the one hundred and seven Land Systems that have been identified in the Pilbara, seven occur within the survey area: Boolgeeda; Egerton; Elimunna; Newman; Platform; Rocklea; and Wannamunna, with the Newman and Boolgeeda land systems being the most extensive.

Regionally the majority of the area within each of these land systems was assessed to be in good or very good condition.

5.1.4 Vegetation

Twenty-two vegetation types were described within the survey area (*ecologia* 2012). Seventeen of these vegetation types are considered to be of relevance to this Proposal (Table 5-2).

Table 5-2: Vegetation types (*ecologia* 2012)

Vegetation Mapping Code	Vegetation Description (NVIS Level V)
Gravelly Plains	
ApTb	Acacia open woodland over Triodia open hummock grassland. <i>Acacia aptaneura</i> and <i>A. pruinocarpa</i> open woodland over <i>A. bivenosa</i> isolated shrubs <i>Triodia basedowii</i> and <i>T. pungens</i> open hummock grassland.
SggGrTp	Senna and Acacia open shrubland over Triodia hummock grassland. <i>Acacia pruinocarpa</i> and <i>Eucalyptus leucophloia</i> subsp. <i>leucophloia</i> or <i>Corymbia hamersleyana</i> isolated trees over <i>Senna glutinosa</i> subsp. <i>glutinosa</i> , <i>Acacia bivenosa</i> and <i>Gossypium robinsonii</i> open shrubland over <i>Triodia pungens</i> hummock grassland
Rocky Footslopes / Rises	
AaSggEp	Acacia open woodland over Triodia open hummock grassland. <i>Acacia aptaneura</i> and <i>A. pruinocarpa</i> open woodland over <i>A. tetragonophylla</i> , <i>Senna glutinosa</i> subsp. <i>glutinosa</i> and <i>S. artemisioides</i> subsp. <i>oligophylla</i> isolated shrubs over <i>Triodia wiseana</i> and <i>T. pungens</i> open hummock grassland.
Rocky Hilltops	
AiSggTw	Eucalyptus open woodland over Senna open shrubland over Triodia open hummock grassland. <i>Eucalyptus leucophloia</i> subsp. <i>leucophloia</i> and <i>Acacia aptaneura</i> open woodland over <i>Senna glutinosa</i> subsp. <i>glutinosa</i> and <i>S. artemisioides</i> subsp. <i>oligophylla</i> open shrubland over <i>Triodia wiseana</i> or <i>T. pungens</i> open hummock grassland.
AmGtTssp	Eucalyptus open woodland over Senna open shrubland over Triodia open hummock grassland. <i>Eucalyptus leucophloia</i> subsp. <i>leucophloia</i> and <i>E. gamophylla</i> open woodland over <i>Acacia maitlandii</i> , <i>A. hamersleyensis</i> , <i>Keraudrenia velutina</i> and <i>Senna glutinosa</i> subsp. <i>glutinosa</i> open shrubland over <i>Triodia wiseana</i> and/or <i>T. pungens</i> and/or <i>T. basedowii</i> open hummock grassland.
Rocky Midslope	
AaEffTp	Acacia open woodland over Eremophila sparse shrubland and Triodia sparse hummock grassland. <i>Acacia aptaneura</i> and <i>A. pruinocarpa</i> open woodland over sparse <i>Eremophila fraseri</i> subsp. <i>fraseri</i> and <i>Acacia marramamba</i> sparse shrubland over <i>Triodia pungens</i> sparse hummock grassland.
AbPrLa	Triodia hummock grassland. <i>Eucalyptus leucophloia</i> subsp. <i>leucophloia</i> and <i>Acacia pruinocarpa</i> isolated trees over <i>Senna glutinosa</i> subsp. <i>glutinosa</i> , <i>A. bivenosa</i> and <i>Ptilotus rotundifolius</i> isolated shrubs over <i>Triodia pungens</i> or <i>T. basedowii</i> or <i>T. sp.</i> Mt Ella hummock grassland.
ChDITt	Senna sparse shrubland over Triodia open hummock grassland. <i>Eucalyptus leucophloia</i> subsp. <i>leucophloia</i> and <i>Corymbia hamersleyana</i> isolated trees over <i>Senna glutinosa</i> subsp. <i>glutinosa</i> and <i>Acacia maitlandii</i> sparse shrubland over <i>Triodia pungens</i> open hummock grassland.
Sandy Floodplains / Dry Rivers	
AaPoEp	Acacia open woodland over Ptilotus sparse shrubland over Themeda open tussock grassland. <i>Acacia aptaneura</i> open woodland over <i>Ptilotus obovatus</i> sparse shrubland over <i>Themeda triandra</i> open tussock grassland.

Vegetation Mapping Code	Vegetation Description (NVIS Level V)
ExPnnTt	Acacia woodland over Themeda open tussock grassland. <i>Acacia aptaneura</i> and <i>Eucalyptus xerothermica</i> woodland over <i>Ptilotus obovatus</i> isolated shrubs over <i>Themeda triandra</i> open tussock grassland.
Floodplains / Drainage Lines	
AaAoAc	Acacia open woodland over Aristida sparse tussock grassland. <i>Acacia aptaneura</i> and <i>A. pruinocarpa</i> open woodland over <i>Aristida contorta</i> sparse tussock grassland over <i>Pterocaulon sphacelatum</i> and <i>Ptilotus nobilis</i> subsp. <i>nobilis</i> isolated forbs.
AaSaoTp	Acacia open woodland over Senna sparse shrubland over Triodia open hummock grassland. <i>Acacia aptaneura</i> and <i>A. ayersiana</i> open woodland over <i>Senna artemisioides</i> subsp. <i>oligophylla</i> , <i>S. glutinosa</i> subsp. <i>glutinosa</i> and <i>Eremophila forrestii</i> subsp. <i>forrestii</i> sparse shrubland over <i>Triodia pungens</i> open hummock grassland.
EgKvPm	Eucalyptus open woodland over Senna sparse shrubland over Triodia open hummock grassland. <i>Eucalyptus gamophylla</i> and <i>Corymbia deserticola</i> subsp. <i>deserticola</i> open woodland over <i>Senna artemisioides</i> subsp. <i>oligophylla</i> and <i>Indigofera monophylla</i> sparse shrubland over <i>Triodia basedowii</i> and <i>T. pungens</i> open hummock grassland.
Sandy Plain	
ApEcTp	Acacia open woodland over Eremophila isolated shrubs over Triodia open hummock grassland. <i>Acacia aptaneura</i> and <i>A. pruinocarpa</i> open woodland over <i>Eremophila caespitosa</i> and <i>Tribulus suberosus</i> isolated shrubs over <i>Triodia pungens</i> open hummock grassland.
PnnAp	Aristida and Astrebla tussock grassland. <i>Aristida latifolia</i> , <i>Astrebla pectinata</i> and <i>Brachyachne convergens</i> tussock grassland with isolated <i>Salsola australis</i> , <i>Boerhavia paludosa</i> and <i>Ptilotus nobilis</i> subsp. <i>nobilis</i> forbs.
PsAjs	Pterocaulon sparse forbland with Triodia open hummock grassland. <i>Acacia aptaneura</i> or <i>A. ayersiana</i> open woodland over <i>Pterocaulon sphacelatum</i> and <i>Dysphania kalparri</i> sparse forbland with <i>Triodia pungens</i> open hummock grassland.
Sandy Undulating Plain	
AaSITp	Acacia woodland over Triodia open hummock grassland. <i>Acacia pruinocarpa</i> , <i>A. aptaneura</i> and <i>A. ayersiana</i> woodland over <i>Triodia pungens</i> open hummock grassland.

The vegetation mapping is shown in Figure 5-1.

West Angelas is not located within a pastoral lease and, as a result, is not actively grazed. Subsequently, the vegetation condition was assessed to be in very good to excellent condition (ecologia 2012). The disturbance most commonly observed was the presence of weed species. Nine weeds were recorded, all of which have been assessed using an Environmental Threat Assessment for the Pilbara Bioregion (based on Parks and Wildlife's Environmental Weeds list). Three species are ranked as a high threat: *Cenchrus ciliaris* (buffel grass); *Cenchrus setiger* (birdwood grass); and *Vachellia farnesiana* (mimosa bush). *Biden's bipinnata* is by far the most abundant weed species recorded in the region.

A total of 441 species were recorded from the region. The pattern of representation is considered typical for the Pilbara. The most common families were: Poaceae (grass family) with 76 species recorded; Fabaceae (pea family) with 72 species recorded; Malvaceae with 46 species recorded; Asteraceae with 27 species recorded; Amaranthaceae with 23 species recorded; Chenopodiaceae with 20 species recorded; Scrophulariaceae with 17 species recorded; Goodeniaceae with 14 species recorded; and Myrtaceae with 14 species recorded. The large number of taxa within the family Scrophulariaceae reflects the abundance of mulga woodlands and shrublands, within which most of these species occur. The relatively high representation of Asteraceae, Amaranthaceae and Goodeniaceae is a reflection of the optimal timing of the survey when many ephemeral species were flowering.

5.2 CONSERVATION SIGNIFICANT VEGETATION

No Threatened Ecological Communities (TECs) are known to occur within the region. The single vegetation TEC that has been recorded from the Hamersley subregion (*Themeda* sp. Hamersley Station grasslands; listed as Vulnerable) has not been recorded within the Proposal area and is not considered likely to exist.

The P1 West Angelas Cracking Clay Priority Ecological Community (PEC) occurs extensively within the region. Figure 5-1 depicts the extent of recorded PEC's within the Proposal area. This community is defined as 'open tussock grasslands of *Astrebla pectinata*, *A. elymoides*, *Aristida latifolia* in combination with *Astrebla squarrosa* and low scattered shrubs of *Sida fibulifera*, on basalt derived cracking-clay loam depressions and flowlines'. The vegetation unit PnnAp (*Aristida* and *Astrebla* grassland) has been determined to be equivalent to the Cracking Clay PEC despite the lack of *A. elymoides* which was not recorded during the 2012 survey. It is thought that the survey timing for tussock grasses may not have been optimal with reproductive material often being absent and identifications problematic for this group.

The West Angelas Cracking Clays are significant because they are relatively uncommon in the region and because they are in very good condition, attributed to the absence of historic cattle grazing. Threats to this community include: clearing for mining expansion and future infrastructure development; weed invasion; and changes in fire regimes.

The West Angelas Cracking Clay PEC is not proposed to be detrimentally impacted by the Proposal. Deposit A west has been designed to avoid intersecting the PEC. Some reduction of catchment to the Cracking Clay PEC is expected; however, modelling indicates that the PEC is not dependant on this catchment. The hydrological interaction is further discussed in Section 7.

Numerous additional ecosystems are deemed to be "ecosystems at risk" (Kendrick 2003) and are therefore considered locally significant. Of these, the following ecosystems are relevant to the Proposal area:

- Grove/intergrove mulga communities: The grove/intergrove mulga in the region is in very good condition however, this vegetation is considered to be under threat from grazing and trampling, weed ingress (particularly by Ruby Dock **Acetosa vesicaria*), and changes to hydrological regimes. Grove/intergrove Mulga communities are widely recognised as being dependent on patterns of surface water flow. The diversion of sheet flow or concentration of sheet flow to particular areas is likely to cause shadowing impacts on these mulga communities.

- Valley floor mulga: “Valley floor mulga” is a very broad description of mulga communities (previously *Acacia aneura* but now including a number of species). Valley floor mulga is also recognised as being dependent on patterns of surface water flow and is considered to be under threat from the same factors listed above.

The Proposal intersects valley floor mulga identified as being of moderate conservation significance. The conservation status of valley floor mulga is not proposed to be detrimentally impacted by the Proposal given the wide distribution of this community in the region. Some reduction of catchment to valley floor mulga is also expected. The hydrological interaction is further discussed in Section 7.

Vegetation was also considered to be locally significant if it had “a role as a key habitat for threatened species”. The following vegetation units were all considered by *ecologia* (2012) to be locally significant due to the rarity of the species they support:

- *Aristida jerichoensis* var. *subspinulifera* (P1), although being present within 10 vegetation units, demonstrates a higher specificity to unit *AaTp* (sandy undulating plains).
- *Indigofera* sp. *Gilesii* (M.E. Trudgen 15869) demonstrates specificity for the vegetation unit *ChDITt*, rocky midslopes.
- *Sida* sp. Barlee Range (S. van Leeuwen 1642) favoured vegetation unit *AaEm*, which is only found in gullies and gorges.
- Vegetation units *SggIrTw* (rocky hilltops) and *ApEcTp* (sandy plains) support five individual threatened and/or Priority taxa.
- Collectively, these units account for eight out of the 13 Threatened and Priority Flora recorded in the survey: *Aristida jerichoensis* var. *subspinulifera*; *Brachyscome* sp. Wanna Munna Flats; *Brunonia* sp. long hairs; *Goodenia nuda*, *Indigofera* sp. *Gilesii* (M.E. Trudgen 15869); *Lepidium catapycnon*; *Rhagodia* sp. Hamersley; and *Sida* sp. Barlee Range.

The Proposal intersects some of the vegetation considered to be locally significant due to the presence of Priority Flora. Robe considers that the assessment of community significance based on the presence of Priority Flora could be considered valid for vegetation containing habitat restricted flora, however, this approach is considered questionable for vegetation containing Priority Flora that is not habitat restricted.

5.3 CONSERVATION SIGNIFICANT FLORA

No flora listed under the under the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999 (EPBC Act)*, or gazetted as DRF (Threatened) under the Western Australian *Wildlife Conservation Act 1950 (WC Act)* were recorded or are expected to occur within the Proposal area.

A total of 29 individuals of *Lepidium catapycnon* (EPBC Vulnerable and WC Act Vulnerable), were collected opportunistically from four locations where vegetation and landforms are consistent with this species' habitat. *L. catapycnon* is also known to occur more broadly in the region. The main threat to *L. catapycnon* is mining and exploration activities as the majority of recorded populations occur within mining and exploration tenements, although records are known from Karijini National Park. The spread of the introduced species *Acetosa vesicaria* (Ruby Dock, which was also recorded) has been suggested to prevent establishment of this species in some areas. However none of the records of this species were relevant to the Proposal.

The following Threatened and Priority Flora taxa were recorded during the *ecologia* (2012) survey:

- three P1 species (*Aristida jerichoensis* var. *subspinulifera*, *Brachyscome* sp. Wanna Munna Flats (S. van Leeuwen 4662) and *Brunonia* sp. long hairs (D.E. Symon 2440));
- two P2 species (*Aristida lazaridis* and *Eremophila forrestii* subsp. *Pingandy* (M.E. Trudgen 2662));
- six P3 species (*Acacia* aff. *subtiliformis*, *Indigofera* sp. *Gilesii* (M.E. Trudgen 15869), *Rhagodia* sp. *Hamersley* (M. Trudgen 17794), *Sida* sp. *Barlee Range* (S. van Leeuwen 1642), *Themeda* sp. *Hamersley Station* (M.E. Trudgen 11431) and *Triodia* sp. *Mt Ella* (M.E. Trudgen 12739); and
- one P4 species (*Goodenia nuda*).

Seven of these species have previously been recorded within the region.

Additionally, four Priority species were assessed as having a high likelihood of occurrence, based on previous records: *Tetratheca fordiana* (P1); *Dampiera metallorum* (P3); *Goodenia* sp. *East Pilbara* (A.A. Mitchell PRP 727) (P3); and *Oldenlandia* sp. *Hamersley Station* (A.A. Mitchell PRP 1479) (P3).

New clearing for the Proposal potentially intersects nine of the recorded Priority species, as follows:

- *Aristida jerichoensis* var. *subspinulifera* (P1);
- *Brachyscome* sp. *Wanna Munna Flats* (S. van Leeuwen 4662) (P1);
- *Brunonia* sp. *long hairs* (D.E. Symon 2440) (P1);
- *Aristida lazaridis* (P2);
- *Indigofera gilesii* subsp. *gilesii* (P3) ;
- *Rhagodia* sp. *Hamersley* (M. Trudgen 17794) (P3);
- *Themeda* sp. *Hamersley Station* (M.E. Trudgen 11431) (P3);
- *Triodia* sp. *Mt Ella* (M.E. Trudgen 12739) (P3); and
- *Goodenia nuda* (P4).

Figure 5-2 depicts recorded Priority Flora within the Proposal area.

The Proposal will preferentially avoid known locations of Priority Flora as far as practicable however; some occurrences of Priority Flora are expected to be disturbed by the proposed clearing.

***Aristida jerichoensis* var. *subspinulifera* (P1)**

The Priority 1 species, *Aristida jerichoensis* var. *subspinulifera* has a range of approximately 335 km within the Pilbara region on NatureMap (Parks and Wildlife 2014) and 280 km from the Rio Tinto Priority Flora database.

This species has a total population count of 2,725 plants, from 70 records, within the Rio Tinto Priority Flora database. This species has previously been recorded from West Angelas, Juna Downs, Giles, Rhodes Ridge, Hope Downs, Brockman 2 and Mt Farquhar within the Rio Tinto Priority Flora database and on NatureMap from Newman, Jumblebar, West Angelas, Hope Downs, Juna Downs and Neds Creek Station.

42 individuals of this species (representing up to 1.54% of the population recorded in the Rio Tinto Priority Flora database) will potentially be cleared for the Proposal. The Revised Proposal is therefore, not expected to adversely affect the representation of this species.

***Brachyscome* sp. Wanna Munna Flats (S. van Leeuwen 4662) (P1)**

The Priority 1 species, *Brachyscome* sp. Wanna Munna Flats (S. van Leeuwen 4662) has a range of approximately 340 km within the Pilbara region on NatureMap (Parks and Wildlife 2014) and 75 km from the Rio Tinto Priority Flora database.

This species has a total population count of 17,852 plants, from 183 records, within the Rio Tinto Priority Flora database. This species has previously been recorded from Juna Downs and West Angelas within the Rio Tinto Priority Flora database and on NatureMap from Nammuldi, Marandoo, Hope Downs 4, Newman and Jigalong (Parks and Wildlife, 2014).

Two individuals of this species (representing 0.01% of the population recorded in the Rio Tinto Priority Flora database) will potentially be cleared for the Proposal. The Revised Proposal is therefore, not expected to adversely affect the representation of this species.

***Brunonia* sp. long hairs (D.E. Symon 2440) (P1)**

The Priority 1 species, *Brunonia* sp. Long hairs (D.E. Symon 2440) is an erect herb to 7 cm that occurs on Mulga plains and along creeklines (WAH, 2015). *Brunonia* sp. Long hairs (D.E. Symon 2440) has a range of 90 km across the Pilbara region on NatureMap and is also known from the Central Ranges for a total range of 1061 km (Parks and Wildlife 2014) and 75 km from the Rio Tinto Priority Flora database.

This species has a total population count of 2,192 plants, from 144 records, within the Rio Tinto Priority Flora database. This species has previously been recorded from Juna Downs, West Angelas and Angelo River within the Rio Tinto Priority Flora database and on NatureMap from Juna Downs, West Angelas, Newman and a disjunct location from the Central Ranges.

Four individuals of this species (representing 0.18% of the population recorded in the Rio Tinto Priority Flora database) will potentially be cleared for the Proposal. Whilst this species is still listed on Florabase as Priority 1 taxa, a recent review into the *Brunonia* genera by Leigh Sage (taxonomic expert in Goodeniaceae) has earmarked this species to be merged back into the common *Brunonia australis* taxa. As a result of this pending change, this species is not regarded as being of conservation significance.

***Aristida lazaridis* (P2)**

The Priority 2 species, *Aristida lazaridis* has a range of 100 km across the Hamersley Ranges on NatureMap (Parks and Wildlife) and 25 km from the Rio Tinto Priority Flora database.

This species has a total population count of 242 plants, from 43 records, within the Rio Tinto Priority Flora database. This species has previously been recorded from the West Angelas locality from the Rio Tinto Priority Flora database, and on NatureMap from West Angelas, Karijini National Park, Lambs Creek and Rhodes Ridge.

Seven individuals of this species (representing 2.89% of the population recorded in the Rio Tinto Priority Flora database) will potentially be cleared for the Proposal. Given that this species has been recorded from Karijini National Park, the Proposal is not expected to adversely affect the representation of this species.

***Indigofera gilesii* subsp. *gilesii* (M.E. Trudgen 15869) (P3)**

The Priority 3 species, *Indigofera gilesii* subsp. *gilesii* (M.E. Trudgen 15869) has a range of 136 km across the Pilbara region on NatureMap and is also known from the Central Ranges and Gascoyne regions for a total range of 1,235 km (Parks and Wildlife 2014) and 221 km from the Rio Tinto Priority Flora database.

This species has a total population count of 806 plants from 155 records, within the Rio Tinto Priority Flora database. This species has previously been recorded from the West Angelas, Juna Downs, Brockman 2 and Rhodes Ridge localities from the Rio Tinto Priority Flora database, and on NatureMap from West Angelas, Ophthalmia Range, Juna Downs, Central Ranges and Tanami Desert.

59 individuals of this species (representing 7.32% of the population recorded in the Rio Tinto Priority Flora database) will potentially be cleared for the Proposal. Given that large populations of this species exist nearby that do not intersect with proposed clearing, the Revised Proposal is not expected to adversely affect the representation of this species.

***Rhagodia* sp. Hamersley (M. Trudgen 17794) (P3)**

The Priority 3 species, *Rhagodia* sp. Hamersley (M. Trudgen 17794) has a range of 260 km across the Pilbara region on NatureMap (Parks and Wildlife 2014) and 325 km from the Rio Tinto Priority Flora database.

This species has a total population count of 2,484 plants from 1,148 records, within the Rio Tinto Priority Flora database. This species has previously been recorded from West Angelas, Brockman, Marandoo, Juna Downs, Angelo River, Rhodes Ridge, Ophthalmia Range, Hope Downs, Shovelanna and Caramulla from the Rio Tinto Priority Flora database, and on NatureMap from West Angelas, Juna Downs, Angelo River, Hope Downs, Marandoo, Karijini National Park, Ophthalmia Range and Roy Hill Station.

44 individuals of this species (representing 1.77% of the population recorded in the Rio Tinto Priority Flora database) will potentially be cleared for the Proposal. The Proposal is therefore, not expected to adversely affect the representation of this species.

***Themeda* sp. Hamersley Station (M.E. Trudgen 11431) (P3)**

The Priority 3 species, *Themeda* sp. Hamersley Station (M.E. Trudgen 11431) has a range of 390 km across the Pilbara region on NatureMap (Parks and Wildlife 2014) and 320 km from the Rio Tinto Priority Flora database.

This species has a total population count of 96,434 plants from 1,388 records, within the Rio Tinto Priority Flora database. This species has previously been recorded in large numbers on Hamersley Station from the Themeda Grasslands TEC, West Angelas, Marandoo, Juna Downs and Brockman localities from the Rio Tinto Priority Flora database, and on NatureMap from the Hamersley Station Themeda Grasslands TEC, Karratha, West Angelas, Juna Downs, Hope Downs, Millstream Chichester National Park, Fortescue Marsh and Nullagine.

Six individuals of this species (representing less than 0.01% of the population recorded in the Rio Tinto Priority Flora database) will potentially be cleared for the Proposal. The Proposal is therefore, not expected to adversely affect the representation of this species.

***Triodia* sp. Mt Ella (M.E. Trudgen 12739) (P3)**

The Priority 3 species, *Triodia* sp. Mt Ella (M.E. Trudgen 12739) has a range of 78 km across the Pilbara region on NatureMap (Parks and Wildlife 2014) and 183 km from the Rio Tinto Priority Flora database.

This species has a total population count of 10,459 plants from 428 records, within the Rio Tinto Priority Flora database. This species has previously been recorded from West Angelas, Juna Downs, Capricorn Range, Angelo River, Hope Downs and Shovelanna from the Rio Tinto Priority Flora database, and on NatureMap from West Angelas, Mount Ella, Mount Robinson, Fork South and Jinidi.

61 individuals of this species (representing up to 0.58% of the population recorded in the Rio Tinto Priority Flora database) will potentially be cleared for the Proposal. The Proposal is therefore, not expected to adversely affect the representation of this species.

***Goodenia nuda* (P4).**

The Priority 4 species, *Goodenia nuda* has a range of 530 km across the Pilbara region on NatureMap and is also known from the Gascoyne region for a total range of 725 km (Parks and Wildlife 2014) and 523 km from the Rio Tinto Priority Flora database.

This species has a total population count of 5,687 plants from 534 records, within the Rio Tinto Priority Flora database. This species has previously been recorded from West Angelas, Juna Downs, Caramulla, Yandicoogina, Angelo River, Marandoo, Brockman, Western Turner Syncline, Koodaideri, Pannawonica and Mount Farquhar from the Rio Tinto Priority Flora database, and on NatureMap from West Angelas, Juna Downs, Hope Downs, Marandoo, Karijini National Park, Shovelanna, Pannawonica, Emu Creek Station, Nanutarra, Tom Price, Robe Headwaters and Christmas Creek.

Two individuals of this species will potentially be cleared for the Proposal. Given that this species is widely distributed across the Pilbara region, the Proposal is not expected to adversely affect the representation of this species.

Table 5-3 summarises the potential impact to Priority Flora species.

Table 5-3: Summary of potential impact to Priority Flora species

Species	Total Population (individuals)*	Potential Impact (individuals)	Percentage (%) Impact on Total Population
<i>Aristida jerichoensis</i> var. <i>subspinulifera</i> (P1)	2,725	42	1.54%
<i>Brachyscome</i> sp. Wanna Munna Flats (S. van Leeuwen 4662) (P1)	17,852	2	0.01%
<i>Brunonia</i> sp. long hairs (D.E. Symon 2440) (P1)	2,192	4	0.18%
<i>Aristida lazaridis</i> (P2)	242	7	2.89%
<i>Indigofera gilesii</i> subsp. <i>Gilesii</i> (P3)	806	59	7.32%
<i>Rhagodia</i> sp. Hamersley (M. Trudgen 17794) (P3)	2,484	44	1.77%
<i>Themeda</i> sp. Hamersley Station (M.E. Trudgen 11431) (P3)	96,434	6	<0.01%
<i>Triodia</i> sp. Mt Ella (M.E. Trudgen 12739) (P3)	10,459	61	0.58%
<i>Goodenia nuda</i> (P4)	5,687	2	0.04%

*Note data is limited to records from the Rio Tinto Priority Flora Database only and is therefore not entirely representative of the regional area that is unsurveyed.

Based on current records of the Western Australian Herbarium (Florabase), five of the Priority Flora species recorded are not represented within conservation estates (*Aristida jerichoensis* var. *subspinulifera*, *Brachyscome* sp. Wanna Munna Flats, *Brunonia* sp. long hairs, *Indigofera gilesii* subsp. *gilesii* and *Triodia* sp. Mt Ella). These taxa are considered to be of higher conservation significance, irrespective of the fact that they are locally common in preferred habitat, which is considered relatively widespread within the region.

Table 5-4: Flora and Vegetation: Description of Factor, Impact Assessment and Management

EPA Objective	Existing Environment	Potential Impacts (without mitigation)	Management and Outcome
<p><i>To maintain representation, diversity, viability and ecological function at the species population and community level.</i></p>	<p>Vegetation and flora surveys have been undertaken across the West Angelas region since 1979. <i>ecologia</i> recently completed a two-phase vegetation and flora assessment in 2012. A summary of the findings of the surveys that are relevant to the Proposal are provided below.</p> <p>Vegetation</p> <p>Twenty-two vegetation types were mapped in the area. Seventeen of these vegetation types are considered to be of relevance to the Proposal.</p> <p>The West Angelas Cracking Clay Priority Ecological Community (PEC) has been identified as occurring extensively throughout the area. This community is defined as ‘open tussock grasslands of <i>Astrebla pectinata</i>, <i>A. elymoides</i>, <i>Aristida latifolia</i> in combination with <i>Astrebla squarrosa</i> and low scattered shrubs of <i>Sida fibulifera</i>, on basalt derived cracking-clay loam depressions and flowlines’.</p> <p>None of the other vegetation types identified were considered to be of high conservation significance. The grove/intergrove and valley floor mulga communities were considered to have moderate conservation significance. The remainder of the vegetation types were considered to be of low conservation significance, representing units that are likely to be widely distributed and relatively well represented in the region. Vegetation communities were generally found to be in Very Good to Excellent condition despite evidence of weed invasion.</p> <p>Flora</p> <p>No flora listed under the under the Commonwealth <i>Environment Protection and Biodiversity Conservation Act 1999 (EPBC Act)</i>, or gazetted as Declared Rare Flora (Threatened) under the Western Australian <i>Wildlife Conservation Act 1950 (WC Act)</i> were recorded or are expected to occur within the Proposal area.</p> <p>New clearing for the Proposal potentially intersects nine of the recorded Priority species, as follows:</p> <ul style="list-style-type: none"> • <i>Aristida jerichoensis</i> var. <i>subspinulifera</i> (P1) • <i>Brachyscome</i> sp. Wanna Munna Flats (S. van Leeuwen 4662) (P1) • <i>Brunonia</i> sp. long hairs (D.E. Symon 2440) (P1) • <i>Aristida lazaridis</i> (P2) • <i>Indigofera gilesii</i> subsp. <i>gilesii</i> (P3) • <i>Rhagodia</i> sp. Hamersley (M. Trudgen 17794) (P3) • <i>Themeda</i> sp. Hamersley Station (M.E. Trudgen 11431) (P3) • <i>Triodia</i> sp. Mt Ella (M.E. Trudgen 12739) (P3) • <i>Goodenia nuda</i> (P4). <p>Five of these Priority species are not represented within conservation estates (<i>Aristida jerichoensis</i> var. <i>subspinulifera</i>, <i>Brachyscome</i> sp. Wanna Munna Flats, <i>Brunonia</i> sp. long hairs, <i>Indigofera gilesii</i> subsp. <i>gilesii</i> and <i>Triodia</i> sp. Mt Ella). These species are considered to be of higher conservation significance, irrespective of the fact that they are locally common in preferred habitat, which is considered relatively widespread within the region.</p> <p>The vegetation and flora assessment report relevant to the Proposal is provided as Appendix 5.</p>	<p>Clearing</p> <p>The Proposal will result in clearing of up to 3,220 ha of vegetation (in addition to that approved via MS 970), including vegetation communities which are considered to be of local conservation significance.</p> <p>The Proposal will preferentially avoid known locations of Priority Flora as far as practicable however; some occurrences of Priority Flora are expected to be disturbed by the proposed clearing.</p> <p>The effect of the proposed change to vegetation and flora values is not considered significantly different or additional to that of the approved West Angelas Project as the potential impacts to flora and vegetation values are considered to remain unchanged from that assessed given the proposed changes will:</p> <ul style="list-style-type: none"> • Not affect any new vegetation communities that have not been previously assessed. • Not affect any known PEC’s in the area. • Not affect any known occurrences of DRF and will minimise impacts to known locations of Priority Flora species where practicable. • Not affect the representation of Priority species. <p>Altered hydrological regime</p> <p>The West Angelas Cracking Clay PEC and valley floor mulga communities are recognised as being dependent on patterns of surface water flow. The hydrological interaction is further discussed in Section 7.</p>	<p>The key potential impact of the Proposal on vegetation and flora are loss through clearing.</p> <p>Condition 8 of the Ministerial Statement has been, and will continue to be, implemented to manage clearing activities to ensure minimal adverse impacts on conservation significant communities and species.</p> <p>In addition, the following key management measures from the Environmental Management Program (Appendix 8) have been, and will continue to be, implemented to manage potential impacts on vegetation and flora:</p> <ul style="list-style-type: none"> • Clearing will only occur within approval boundaries and limits. • Clearing has, and will continue to, avoid areas of elevated conservation significance as far as practicable. Conservation significant areas include the following: <ul style="list-style-type: none"> ○ West Angelas Cracking Clay Priority Ecological Community (PEC); ○ grove / intergrove Mulga communities, and ○ areas supporting Rare and / or Priority Flora. • Known locations of DRF and Priority Flora species have, and will continue to be, mapped to prevent disturbance as far as practicable. • Where clearing of vegetation is unavoidable, areas will be progressively rehabilitated with local native vegetation where possible. • Weed management has, and will continue to be undertaken as part of an annual weed control program and as otherwise required. • Fire restrictions have, and will continue to be implemented. <p>Vegetation degradation as a result of hydrological changes will be minimised via management measures to reduce potential impacts on natural hydrological regimes, as detailed in Table 7-1.</p> <p>Outcome:</p> <p>The Proponent considers that the Revised Proposal can be managed to meet the EPA objective for this factor, in summary:</p> <ul style="list-style-type: none"> • No new or potentially significant environmental features have been recorded. • Vegetation communities potentially impacted by the Proposal, including communities of local conservation significance, are well represented outside of the Proposal area on a local and regional scale. • Clearing will be restricted to the extent authorised. • Appropriate management measures to avoid, minimise and mitigate potential impacts of the Proposal on vegetation and flora have been, and will continue to be, implemented.

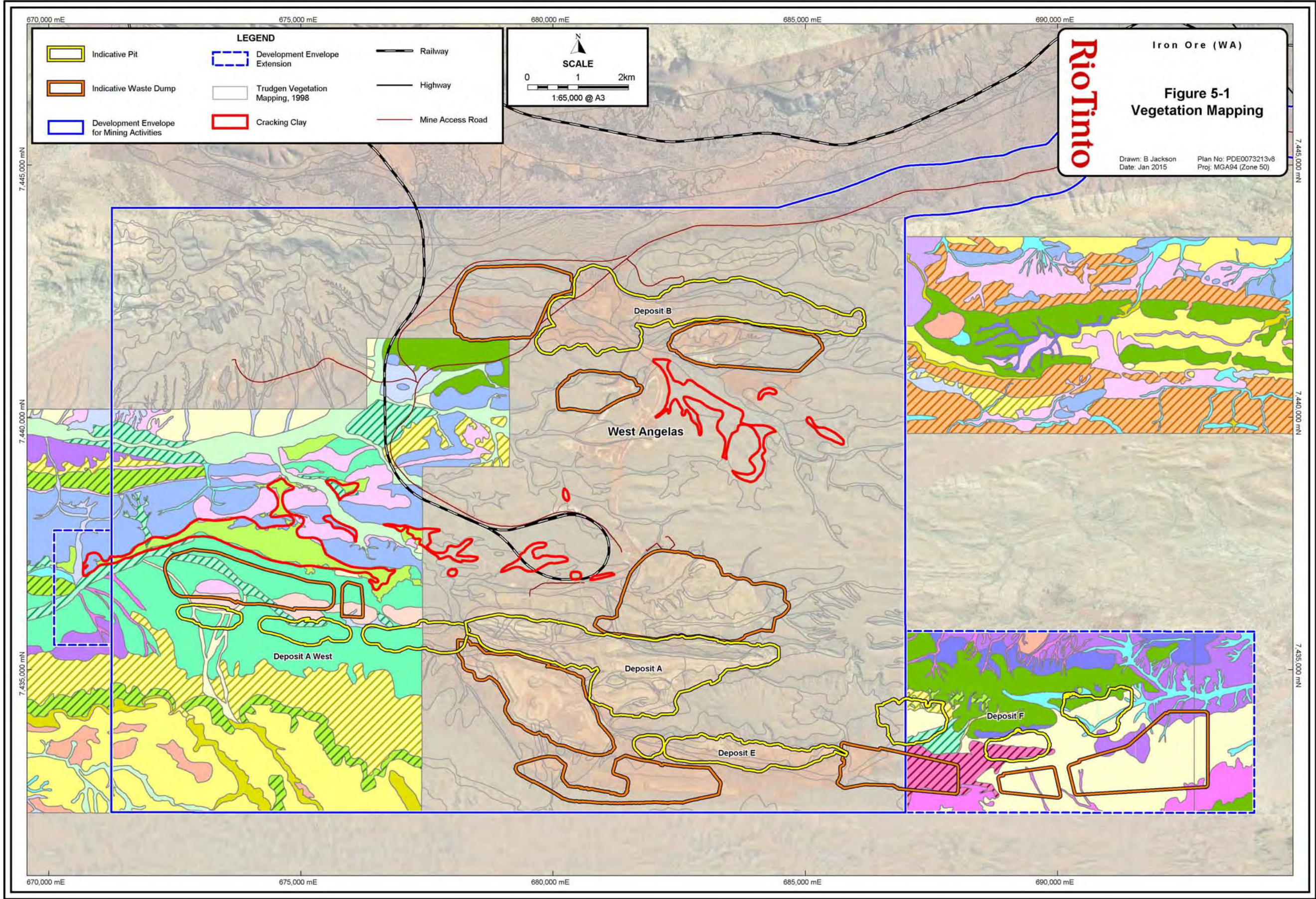























Figure 5-1: Vegetation Mapping

Rio Tinto	Vegetation Mapping Legend	
		AaEffTp - <i>Acacia aptaneura</i> open woodland over <i>Eremophila fraseri</i> subsp. <i>fraseri</i> sparse shrubland over <i>Triodia pungens</i> sparse hummock grassland
		AaPoEp - <i>Acacia aptaneura</i> open woodland over <i>Ptilotus obovatus</i> sparse shrubland over <i>Enneapogon polyphyllus</i> isolated tussock grasses
		AaSaoTp - <i>Acacia aptaneura</i> open woodland over <i>Senna artemisioides</i> subsp. <i>oligophylla</i> sparse shrubland over <i>Triodia pungens</i> open hummock grassland
		AaSggEp - <i>Acacia aptaneura</i> open woodland over <i>Senna glutinosa</i> subsp. <i>glutinosa</i> isolated shrubs over <i>Enneapogon polyphyllus</i> isolated tussock grasses
		AaSiTp - <i>Acacia aptaneura</i> open woodland over <i>Solanum lasiophyllum</i> isolated shrubs over <i>Triodia pungens</i> open hummock grassland
		AaAoAc - <i>Acacia aptaneura</i> sparse woodland over <i>Abutilon otocarpum</i> isolates shrubs over <i>Aristida contorta</i> sparse tussock grassland
		AaEm - <i>Acacia aptaneura</i> sparse woodland over <i>Eriachne mronata</i> sparse tussock grassland
		AbPrla - <i>Acacia bivenosa</i> isolated trees over <i>Ptilotus rotundifolius</i> isolated shrubs over <i>Ischaemum albobillosum</i> isolated tussock grasses
		AiSggTw - <i>Acacia inaequilatera</i> isolated trees over <i>Senna glutinosa</i> subsp. <i>glutinosa</i> open shrubland over <i>Triodia wiseana</i> or <i>Triodia pungens</i> open hummock grassland
		AmTw - <i>Acacia maitlandii</i> and/or <i>Acacia bivenosa</i> sparse woodland over <i>Triodia wiseana</i> hummock grassland
		AmGtTssp - <i>Acacia maitlandii</i> open woodland over <i>Goodenia triodiophilla</i> isolated herbs and <i>Triodia wiseana</i> and/or <i>T. basedowii</i> and/or <i>T. pungens</i> open hummock grassland
		ApTb - <i>Acacia prionocarpa</i> sparse woodland over <i>Triodia basedowii</i> and/or <i>T. pungens</i> open hummock grassland
		ApSgg - <i>Acacia pruinocarpa</i> and/or <i>A. maitlandii</i> sparse woodland over <i>Senna glutinosa</i> subsp. <i>glutinosa</i> isolated shrubs
		ApEcTp - <i>Acacia pruinocarpa</i> sparse woodland over <i>Eremophila caespitosa</i> sparse shrubland over <i>Triodia pungens</i> open hummock grassland
		ChDlIt - <i>Corymbia hamersleyana</i> sparse woodland over <i>Dodonaea lanceolata</i> var. <i>lanceolata</i> isolated shrubs over <i>Themeda triandra</i> open tussock grassland
		EgKvPm - <i>Eucalyptus gamophylla</i> sparse woodland over <i>Keraudrenia velutina</i> isolated shrubs over <i>Paraneurachne muellerii</i> isolated tussock grasses
		ElIEITp - <i>Eucalyptus leucophloia</i> subsp. <i>leucophloia</i> sparse woodland over <i>Eremophila latrobei</i> subsp. <i>latrobei</i> isolated shrubs over <i>Triodia pungens</i> open hummock grassland
		ExPnnTt - <i>Eucalyptus xerothermica</i> sparse woodland over <i>Ptilotus nobilis</i> subsp. <i>nobilis</i> sparse shrubland over <i>Themeda triandra</i> open tussock grassland
		PsAjs - <i>Pterocaulon sphacelatum</i> sparse herbland and <i>Aristida jerichoensis</i> var. <i>subspinulifera</i> isolated tussock grasses
		PnnAp - <i>Ptilotus nobilis</i> subsp. <i>nobilis</i> isolated shrubs over <i>Astrebla pectinata</i> open tussock grassland
		SggIrTw - <i>Senna glutinosa</i> subsp. <i>glutinosa</i> open woodland over <i>Indigofera rugosa</i> sparse shrubland over <i>Triodia wiseana</i> hummock grassland
		SggGrTp - <i>Senna glutinosa</i> subsp. <i>glutinosa</i> sparse woodland over <i>Gossypium robinsonii</i> sparse shrubland over <i>Triodia pungens</i> hummock grassland

Geospatial Information and Mapping

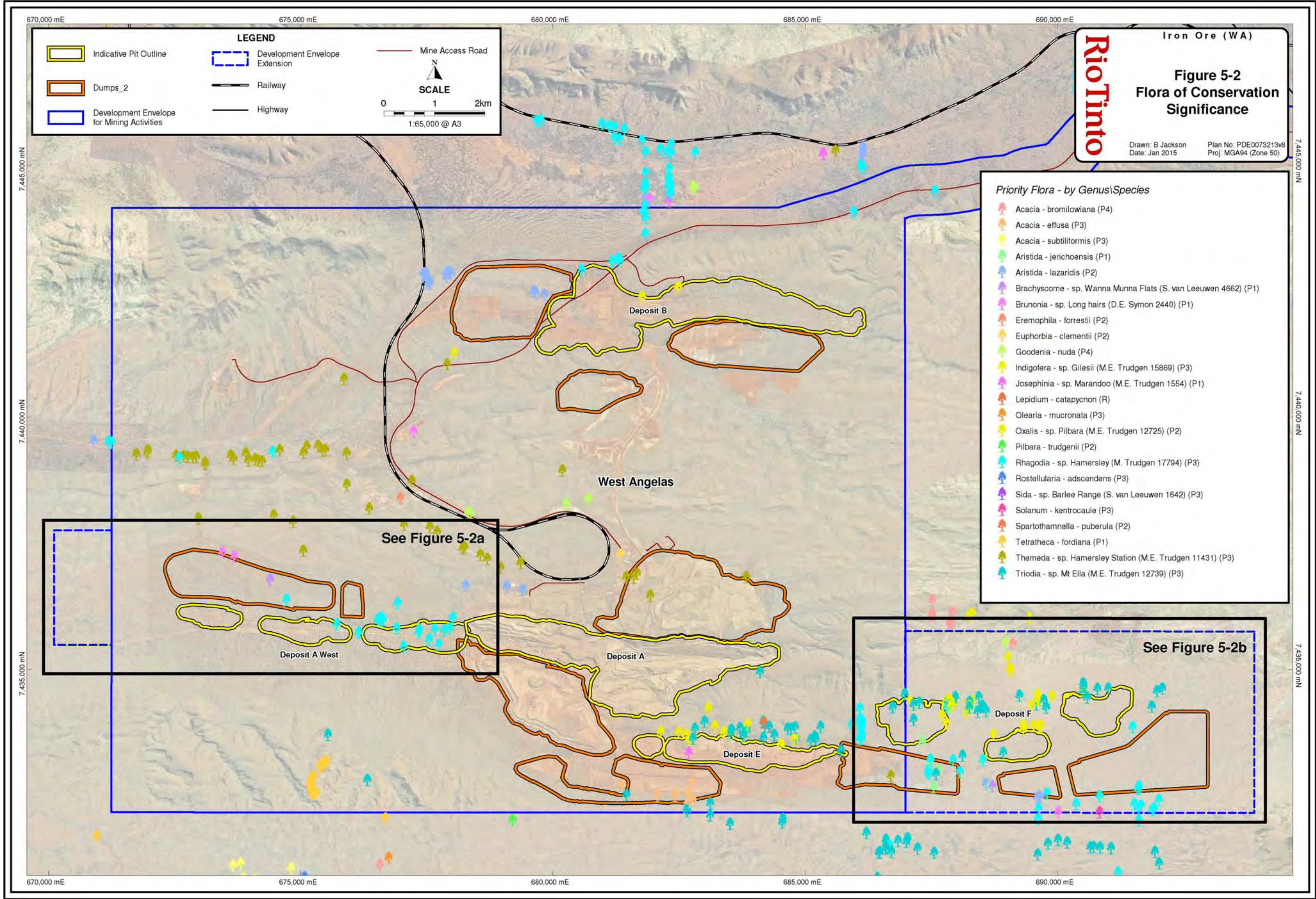


Figure 5-2: Flora of Conservation Significance

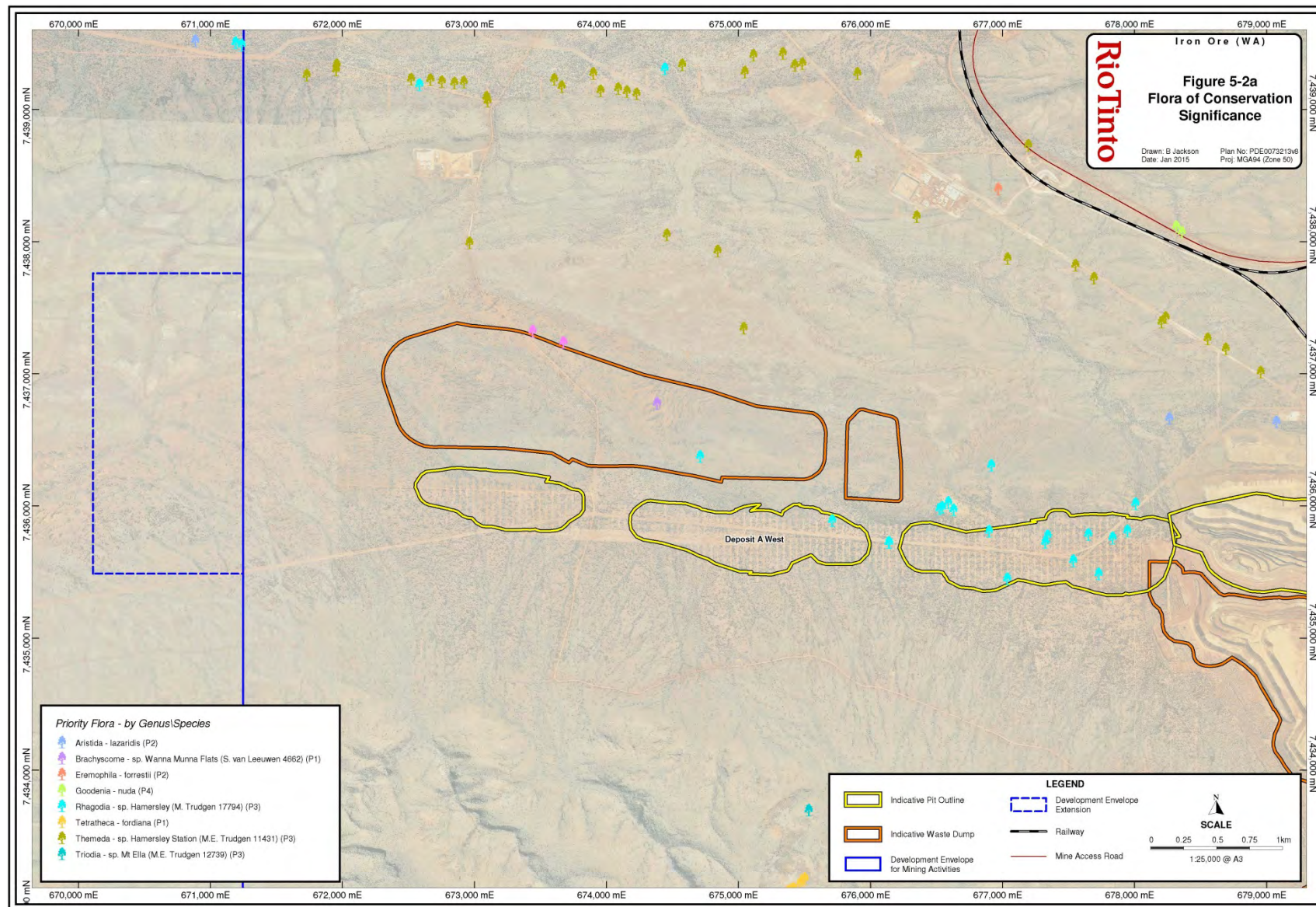


Figure 5-3a: Flora of Conservation Significance: Deposit A west

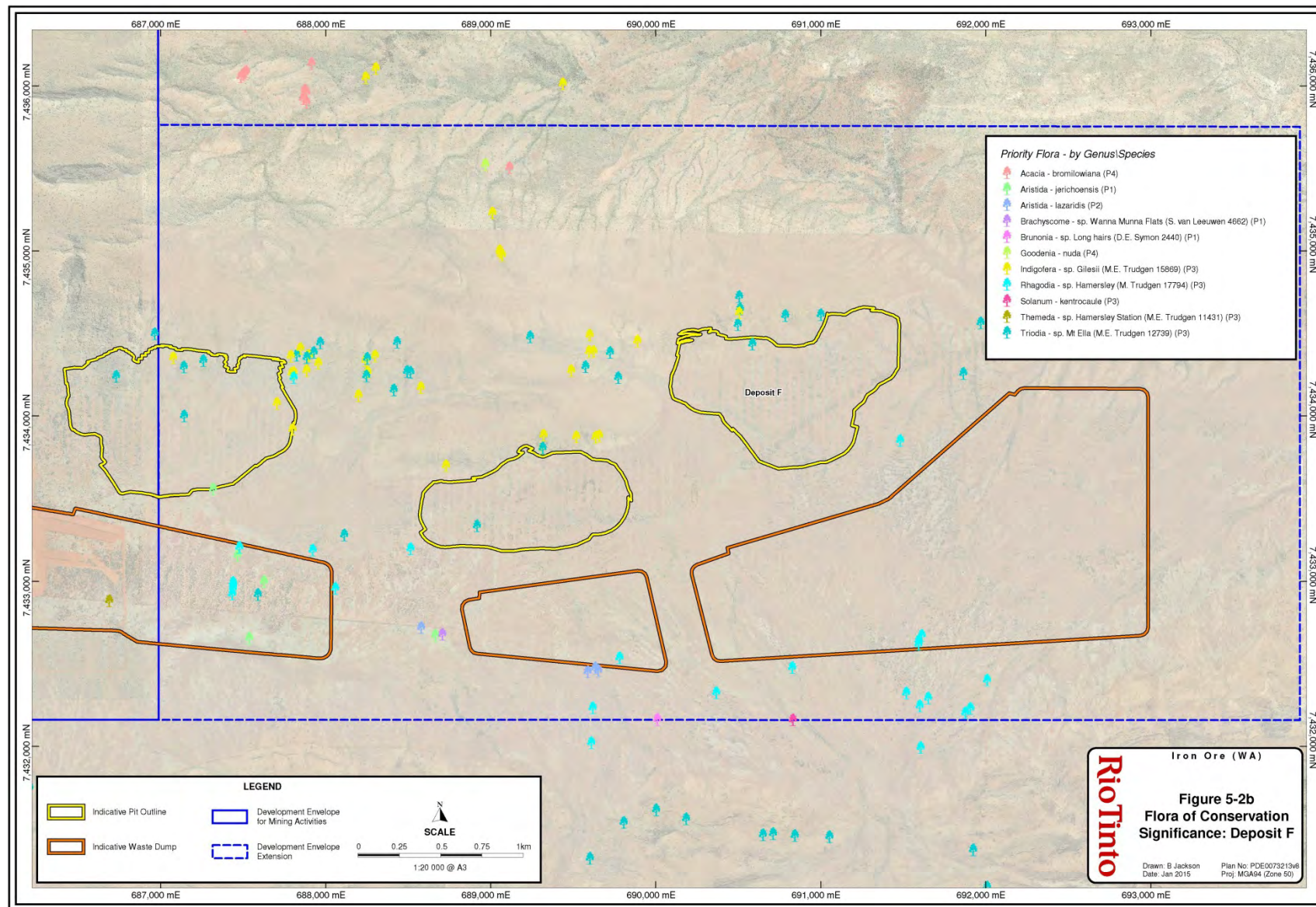


Figure 5-4b: Flora of Conservation Significance: Deposit F

6 TERRESTRIAL FAUNA

This Section describes the terrestrial fauna and fauna habitats that occur within the Proposal area and provides details regarding the potential impacts to conservation significant fauna and fauna habitats from 3,220 ha of additional clearing that forms part of this Proposal.

The EPA applies the following objective from EAG 8 in its assessment of proposals that may affect terrestrial fauna:

To maintain representation, diversity, viability and ecological function at the species, population and assemblage level.

Table 6-2 describes how the proposal meets the EPA's objectives in respect of terrestrial fauna and fauna habitats.

6.1 TERRESTRIAL FAUNA STUDIES

A number of fauna surveys have been undertaken across the West Angelas region since 1979. Table 6-1 summarises the key surveys relevant to this Proposal.

The combined coverage of these surveys has enabled a detailed understanding of the existing fauna and fauna habitats in the West Angelas region.

Table 6-1: Summary of Supporting Studies

Report Title, Author and Year	Summary of Studies
<p><i>An ecological appreciation of the West Angelas environment, Western Australia 1979.</i> Integrated Environmental Services (1978)</p>	<p>Strategic biological survey of vertebrate fauna conducted in all seasons of 1978 and 1979 across West Angelas. Survey of invertebrate fauna conducted December 1979. The fauna of the Pilbara was considered little known with few previous surveys in the region.</p> <p>The vertebrate fauna survey recorded 15 species of mammals (including potential Western Pebble-mound Mice <i>Pseudomys chapmani</i>), an additional three species of bats, 25 species of reptiles, two species of amphibians and 48 species of birds. The fauna was considered to consist of largely common and widespread species. However the following species were considered to be of importance: populations of Brush-tailed Rock Wallabies <i>Petrogale penicillata</i>; Ingram's Planigales <i>planigale</i> sp. (<i>ingrami</i>); Pebble Mound Mice <i>Pseudomys</i> sp.; Ghost Bats <i>Macroderma gigas</i>; the skink <i>Lerista neader</i>; Australian Bustard <i>Ardeotis australis</i>; and Grey Falcon <i>Falco hypoleucos</i>.</p> <p>The invertebrate fauna survey mostly recorded species that were considered relatively common in the Pilbara. However, some of the species had not been previously collected. It was not possible to make statements about the status of species given that little was known about the invertebrate fauna of the Pilbara.</p>
<p><i>West Angelas Project Vertebrate Fauna Assessment Survey. ecology</i> (1998)</p>	<p>Extensive vertebrate fauna and fauna habitat assessment conducted between June and October 1997, across West Angelas (including the rail corridor) in accordance with EPA requirements for biological inventory and assessment and CALM biological survey guidelines for the Pilbara.</p> <p>Eight primary habitats, largely based on vegetation and landforms, were identified:</p> <ul style="list-style-type: none"> • Mulga Woodland; • Rocky Gully; • Cracking Clay; • Creekline; • Hilltop; • Spinifex Plain; • Riverine; and • Boulder Hill. <p>Cracking Clay habitat was considered to be regionally significant, supporting specialist fauna. Mulga Woodland forms habitat for a diverse fauna assemblage and was also considered to be of regional significance. Other areas identified as being important for fauna included caves for Ghost Bats and Pebble-mound Mouse habitat.</p> <p>The survey recorded 119 species of terrestrial vertebrate fauna, comprising: 21 mammals; 27 reptiles; one amphibian; and 70 birds. An additional 12 mammals; 48 reptiles; one amphibian; and 47 birds were recorded in the rail corridor. Two Priority listed species were recorded from the survey area: the Ghost Bat <i>Macroderma gigas</i> (P4); and Western Pebble-mound Mouse <i>Pseudomys chapmani</i> (P4). Four additional Priority listed species: the Rainbow Bee-eater <i>Merops ornatus</i> (EPBC Migratory, WC Act Schedule 3); Grey Falcon <i>Falco hypoleucos</i> (P4); Bush Stone-curlew <i>Burhinus grallarius</i> (P4); and Lined Soil-crevice Skink <i>Notoscincus butleri</i> (P4) were recorded in the rail corridor.</p>

Report Title, Author and Year	Summary of Studies
<p><i>Fauna Habitats and Fauna Assemblage of Deposits E and F at West Angelas.</i> Biota (2005)</p>	<p>Desktop review and single phase survey of the fauna habitats and fauna assemblage present at Deposits E and F conducted between 4 and 12 May 2004 in accordance with the following:</p> <ul style="list-style-type: none"> • EPA Position Statement No. 3: <i>Terrestrial Biological Surveys as an Element of Biodiversity Protection</i> (EPA 2002). • EPA Guidance Statement No. 56: <i>Terrestrial Fauna Surveys for Environmental Impact Assessment in Western Australia</i> (EPA 2004b). <p>Four primary habitats, largely based on vegetation structure and landforms, were identified:</p> <ul style="list-style-type: none"> • Broad colluvial valleys dominated by <i>Acacia aneura</i>; • Lower stony footslopes at the interface between <i>Acacia</i> dominated and eucalypt dominated communities; • Stony hilltops and upper slopes dominated by eucalypts over <i>Triodia</i>; and • Incised gullies and creeks. <p>One fauna habitat is considered to have moderate conservation significance within the study area, based on the vegetation types to which it relates; Broad colluvial valleys dominated by <i>Acacia aneura</i> comprise ecosystems at risk in the form of grove/intergrove and valley floor mulga.</p> <p>The survey recorded 98 species of terrestrial vertebrate fauna, comprising 12 mammals including one bat, 37 reptiles and 47 birds. Two Priority listed species were recorded from the survey area: the Australian Bustard <i>Ardeotis australis</i> (P4) and Western Pebble-mound Mouse <i>Pseudomys chapmani</i> (P4). The survey also documented one key group of invertebrates, the Mygalomorphae (trapdoor spiders), potentially supporting narrow range taxa.</p>
<p><i>Greater West Angelas Terrestrial Fauna Assessment.</i> <i>ecologia</i> (2014) Appendix 6</p>	<p>Desktop review and two phase, Level 2 survey conducted; Phase 1 conducted between 26 September and 6 October 2012, Phase 2 conducted between 18 and 27 March 2013 in accordance with the following:</p> <ul style="list-style-type: none"> • EPA Position Statement No. 3: <i>Terrestrial Biological Surveys as an Element of Biodiversity Protection</i> (EPA 2002). • EPA Guidance Statement No. 56: <i>Terrestrial Fauna Surveys for Environmental Impact Assessment in Western Australia</i> (EPA 2004b). • Technical Guide – <i>Terrestrial Vertebrate Fauna Surveys for Environmental Impact Assessment</i>, Guidance Statement 20: <i>Sampling of Short Range Endemic Invertebrate Fauna for Environmental Impact Assessment in Western Australia</i> (EPA 2009). <p>The results of the survey are outlined below.</p>

Ecologia (2014) most recently conducted a terrestrial fauna assessment in 2012 and 2013. The survey was conducted in accordance with EPA Position Statement No. 3: *Terrestrial Biological Surveys as an Element of Biodiversity Protection* (EPA 2002), EPA Guidance Statement No. 56: *Terrestrial Fauna Surveys for Environmental Impact Assessment in Western Australia* (EPA 2004b) and EPA Guidance Statement No. 20: *Sampling of Short Range Endemic Invertebrate Fauna for Environmental Impact Assessment in Western Australia* (EPA 2009).

West Angelas is acknowledged to support diverse fauna for its size due to the variety of relief and geological types which combine to provide a great diversity of habitats. Nine broad-scale habitat types have been identified across the region, largely based on vegetation structure and landform: 'footslope or plain'; 'hilltop, hillslope, ridge or cliff'; 'mixed *Acacia* woodland'; 'mesa top'; 'cracking clay'; 'major gorge and gully'; 'major drainage'; 'mulga woodland'; and 'cleared area'.

Five of the broad-scale habitat types identified are considered to be of relevance to the Proposal:

- Footslope or plain – the vegetation cover on this habitat is typically comprised of *Eucalyptus leucophloia*, *E. gamophylla*, *Corymbia hamersleyana*, *A. pruinocarpa*, *A. inaequilatera* and species in the *A. aneura* complex open woodland to sparse trees over *Acacia* spp., *Eremophila* spp., *Ptilotus* spp., *Senna* spp. and *Solanum lasiophyllum* open shrubland over *Triodia* spp. open hummock grassland. This was the most abundant habitat type.
- Hilltop, hillslope, ridge or cliff – the vegetation of this fauna habitat typically includes *Eucalyptus leucophloia* and mulga (*Acacia aneura* complex) isolated trees over sparse shrubland of a combination or selection of *Senna artemisioides* subsp. *artemisioides*, *S. artemisioides* subsp. *filifolia*, *Ptilotus rotundifolius*, *Tribulus suberosus*, *Eremophila fraseri* and *Acacia ancistrocarpa* sparse shrubland to isolated shrubs over *Triodia pungens* hummock grassland. In general this habitat type has a predominantly open character with very little vegetation cover. The slope ranged from minor to very steep, with smaller vegetation cover in the steeper areas.
- Mixed *Acacia* woodland – the vegetation cover on this habitat is typically comprised of open to medium dense woodland with a tree stratum of mulga (*Acacia aneura* complex) and scattered *Acacia pruinocarpa*, over *Acacia maitlandii* and *Ptilotus* sp. sparse shrubland, over *Triodia wiseana* and *T. pungens* open hummock grassland. The habitat was mostly flat with no or very small drainage channels.
- Mulga woodland – this habitat type consists of both groved and banded mulga, where different species of the *Acacia aneura* complex were present in a closed woodland, over *Ptilotus obovatus* and juvenile mulga trees sparse shrubland, over *Maireana* sp. and *Salsola australis* isolated herbs and *Aristida* sp. and *Cymbopogon obtectus* isolated tussock grasses creating distinct micro-habitats that include dense leaf litter and shaded zones. The slope was negligible and this area of habitat was very consistent and with little variation.
- Cracking clay – the cracking clay habitat type supported very few trees and tall shrubs and is characterised by open and sparse low vegetation on clay with approximately half of its area being bare ground.

No habitats recorded were regarded by *ecologia* (2014) as rare or unique to the area.

A total of 23 species of native mammal, two species of introduced mammal, 80 species of bird and 64 species of reptile were recorded during this survey. No species of amphibian were recorded.

A total of 33 invertebrate species from six different Orders were submitted for identification and for Short Range Endemic (**SRE**) status assessment. Fifteen species were identified as potential SRE species. The results of potential SRE specimens submitted comprised the following: four species from two families of spiders (two potential SRE); six species from two families of scorpions (one potential SRE); ten species from two families of isopods (six potential SRE); five species from three families of snails (no SRE), five species from one family of pseudoscorpions (four potential SRE) and three species from three families of millipedes and centipedes (two potential SRE).

6.2 FAUNA AND FAUNA HABITATS OF CONSERVATION SIGNIFICANCE

6.2.1 Habitats

No habitats recorded were regarded by *ecologia* (2014) as rare or unique to the area. However, the Cracking Clay habitat is considered by Robe to be regionally significant. Mulga woodlands also support a diverse fauna assemblage and are also considered regionally significant. Sites that are likely to be utilised by Ghost Bats for roosting or foraging have moderate conservation significance. The remainder of the fauna habitats are considered to be of low conservation significance, representing units that are likely to be widely distributed and relatively well represented in the region.

6.2.2 Vertebrate Fauna

Twenty-one vertebrate fauna species of conservation significance have been identified as potentially occurring in the region: six mammal species; 12 bird species; and three reptile species. A total of six conservation significant species were recorded from the most recent fauna survey, additionally, four species were assessed as having a high likelihood of occurrence with a further four species assessed as having a medium likelihood of occurrence. The remaining seven species were considered to have a low likelihood of occurrence. All of the fauna recorded or assessed as having a high or medium likelihood of occurrence have been previously recorded in the area.

The six conservation significant species recorded in the region consisted of:

- Pilbara Leaf-nosed Bat (*Rhinonictis aurantius*) listed as 'Vulnerable' under the EPBC Act, as a Schedule 1 species under the state WC Act and as 'Vulnerable' by Parks and Wildlife;
- Fork-tailed Swift (*Apus pacificus*) listed as 'Migratory' under the EPBC Act and as a Schedule 3 species under the WC Act;
- Pilbara Barking Gecko (*Underwoodisaurus seorsus*) listed as P1 species by Parks and Wildlife;
- Australian Bustard (*Ardeotis australis*) listed as P4 species by Parks and Wildlife;
- Western Pebble-mound Mouse (*Pseudomys chapmani*) (secondary evidence only) listed as P4 species by Parks and Wildlife; and
- Bush Stone-curlew (*Burhinus grallarius*) (secondary evidence only), listed as P4 species by Parks and Wildlife.

Additionally, four species of conservation significance were assessed as having a high likelihood of occurrence in the region: Pilbara Olive Python (EPBC Vulnerable, WC Act Schedule 1, Parks and Wildlife Vulnerable); Rainbow Bee-eater (EPBC Migratory, WC Act Schedule 3); Ghost Bat (P4); and Short-tailed Mouse (P4).

The Australian Bustard (*Ardeotis australis*) (P4) was also recorded from the Biota 2005 fauna survey.

Six of the conservation significant species recorded, or assessed as having a high likelihood of occurrence, are considered to be of relevance to the Proposal:

- Fork-tailed Swift (EPBC M, WC Act S3);
- Western Pebble-mound Mouse (P4);
- Short-tailed Mouse (P4);
- Ghost Bat (P4);
- Bush Stone-curlew (P4); and
- Australian Bustard (P4).

The locations of the conservation significant fauna that have been recorded in the proposed Development Envelope extension are shown in Figure 6-1.

Fork-tailed Swift (EPBC M, WC Act S3)

Seven separate observations of this species were made from five different locations during the *ecologia* (2014) survey. A large flock of 400 birds recorded in conjunction with arriving thunderstorm cloud activity is of note, as this is a significant formation and consistent with the known behaviour of the species. Following the arrival of this large flock, subsequent observations over the coming days consisted of smaller, looser flocks of birds foraging over the landscape. Although this species does not directly utilise habitats, observations were made of Fork-tailed Swifts flying at canopy level, actively hunting aerial insects following the rainfall on the proceeding days. The locations of these further observations were all in low lying habitats (mixed acacia woodland, footslope and plain) within the broad valley floor, suggesting although not directly utilising the habitats within the study area, landform features are still important for foraging activity of this species.

Whilst this species uses the area as foraging habitat, it is highly unlikely that the additional clearing would have any impact on the conservation status of this species.

Western Pebble-mound Mouse (P4)

The Western Pebble-mound Mouse, *Pseudomys chapmani* inhabits gently sloping hills of rocky ranges where the ground is stony and vegetated by spinifex and is well known for its behaviour of constructing extensive mounds of small stones. In suitable habitats, pebble mounds of this species can be found in large numbers, although not all of these mounds are active and occupied.

Though listed as P4, the Western Pebble-mound Mouse is common throughout the Pilbara and has been recorded frequently in the region. Several individuals and numerous active mounds were recorded during the 1998 *ecologia* and 2005 Biota surveys in areas of Spinifex Steppe and Mulga Woodland habitat suggesting this species is widespread in the region and persisting despite operations.

Although not trapped during the recent survey, the presence of active mounds for this species suggests the Western Pebble-mound Mouse is likely present within the Proposal area.

The additional clearing is unlikely to impact the conservation status of this species, should it occur, given the occurrences of this species in the locality and the broader bioregion.

Short-tailed Mouse (P4)

The Short-tailed Mouse, *Leggadina lakedownensis* occupies a diverse range of habitats, including spinifex and tussock grasslands. The Cracking Clay habitat type is considered to represent ideal habitat for this species within the Pilbara region.

Although not trapped during the recent survey, three records of this species exist in the area from 1997. The previous records of this species within the area along with suitable habitat (Cracking Clay) suggest the Short-tailed Mouse is potentially present within the Proposal area.

The additional clearing is unlikely to impact the conservation status of this species, should it occur, given no impact to the Cracking Clay habitat type is expected.

Ghost Bat (P4)

The Ghost Bat, *Macroderma gigas* was not recorded in the recent survey despite the species being known from the locality. This species has been known from West Angelas since at least 1978 (Integrated Environmental Services 1979). The following surveys are applicable to the Proposal:

- a baseline fauna and habitat survey was conducted by *ecologia* during 1998 (*ecologia* 1998a);
- a targeted search for habitats was conducted by *ecologia* in 1998 (*ecologia* 1998c);
- a survey of known habitats was undertaken by *ecologia* in 2000 (*ecologia* 2000);
- a survey of known habitats was undertaken by *ecologia* (*ecologia* 2001);
- a review of survey data was undertaken by Biota in 2002 (Biota 2002);
- a monitoring survey of known habitats was undertaken by Biota in 2003 (Biota 2003);
- a survey of known habitats was undertaken by Biologic Environmental Survey Pty Ltd (Biologic) in 2001 (Biologic 2001);
- a survey of known habitats was undertaken by Biologic in 2012 (Biologic 2012); and
- Biologic most recently conducted a survey of known habitats in 2013 (Biologic 2013, Appendix 7).

Five caves have been identified as being of value to Ghost Bats: caves A1; A2; L2; and L3 near Deposit B; and a potential maternity cave AA1 near Deposit F. The presence of a potential maternity cave for the Ghost Bat represents the most significant record when considering the environmental significance of the Proposal. The presence of this potential maternity roost could be considered regionally significant, as there are no documented maternity roosts currently known in the area (based on publically available literature).

A Ghost Bat was recorded roosting at cave AA1 during the day and recent scats were also observed in the recent surveys (Biologic 2013).

When the West Angelas Project was assessed in 1997, this species was listed as 'Vulnerable' on the International Union for the Conservation of Nature (IUCN) Red List, 'Vulnerable' under Schedule 1 of the *Commonwealth Endangered Species Protection Act 1992* and a Priority Three species under the WC Act. Robe committed to maintain a 100 m barrier to known Ghost Bat roosting caves. The EPA agreed in its Report and Recommendations (EPA 1999) that the West Angelas Project was acceptable provided that the Proponent's commitments were implemented. A Ghost Bat Management Plan was also prepared and implemented in accordance with MS 514. The Plan recognised the potential

maternity cave (AA1) as having particularly high conservation significance and committed to a 200 m exclusion zone.

The Ghost Bat is currently listed as Priority 4 (taxa in need of monitoring) by Parks and Wildlife and remains as 'Vulnerable' on the IUCN Red List. The IUCN (2014) describes its listing as Vulnerable based on the following: small population (numbering less than 10,000 individuals) and in decline. Parks and Wildlife do not provide a justification for the Priority 4 listing, however it is likely attributed to the limited roosting and maternity caves available in the Pilbara, and that much of this habitat is considered to be under threat by mining activities.

Consistent with the current conservation status of this species, Robe proposes to amend the existing environmental management commitment to maintain a 100 m exclusion zone for the potential maternity cave (AA1). A distance of 100 m is considered adequate to protect the integrity of the cave. A 100 m exclusion zone also aligns with the distance proposed in the ERMP (1999), existing management of caves at West Angelas and other Rio Tinto managed operations throughout the Pilbara where caves are required to be protected.

Mining currently occurs close to other environmentally and culturally sensitive sites near Deposits B and E and as such, the operations have an established framework for management of blast vibration to protect the integrity of caves. This framework will continue to be applied to ensure the potential maternity cave (AA1) is not damaged by blast vibration.

Bush Stone-curlew (P4)

The Bush stone-curlew (*Burhinus grallarius*) was recorded from secondary evidence only in the most recent survey (*ecologia* 2014), with tracks recorded in Mulga Woodland, which represents suitable habitat for this species. In the region, three additional records exist. This species is likely to occur in low lying habitat areas within micro-habitats of denser grass and shrub vegetation which provides cover for this species to shelter in during the day.

Since Bush Stone-curlews are a ground-dwelling and non-migratory species, they are considered susceptible to local disturbances and to predation (Frith 1976; Johnstone and Storr 1998 in *ecologia* 2014). They are most common where land disturbance is minimal.

The additional clearing is unlikely to impact the conservation status of this species, should it occur, given the mobile nature of the species and the availability of habitat in the locality and the broader bioregion.

Australian Bustard (P4)

Though listed as P4, the Australian Bustard, *Ardeotis australis* is moderately common throughout the Pilbara in open or lightly wooded grassland. This species was recorded in the 2005 Biota fauna survey from Mulga communities, which represents suitable habitat for this species.

Although not trapped during the *ecologia* (2014) survey, the previous records of this species within the area along with suitable habitat (Mulga Woodland) suggest the Australian Bustard is potentially present within the Proposal area.

The additional clearing is unlikely to impact the conservation status of this species, should it occur, given the mobile nature of the species and the availability of habitat in the locality and the broader bioregion.

While the presence of other conservation significant species in the area suggests that there is some chance that populations of these species may exist in the area, previous records, combined with the lack of suitable habitat within the Proposal area suggest that their presence is unlikely. Consequently, it is considered highly unlikely that the additional clearing would have an impact on the conservation status of such species.

The additional clearing is not expected to alter the conservation significance of any of the above listed species at either the bioregion or subregion level.

6.2.3 Invertebrate Short Range Endemic (SRE) Fauna

Harvey (2002) noted that Short-Range Endemic (SRE) species generally possess a series of ecological and life-history traits, including:

- poor powers of dispersal;
- confinement to discontinuous habitats;
- usually highly seasonal, only active during cooler, wetter periods; and
- low levels of fecundity.

As a result, these species have a geographically restricted range, which makes them more vulnerable to changes in conservation status as a result of habitat loss or other threatening processes (EPA 2009). Harvey (2002) defined short range endemism as species having a naturally small range of less than 10,000 km². Within this distribution, the actual areas occupied may be small, discontinuous or fragmented (EPA 2009).

A total of 15 species from the in the most recent survey (*ecologia* 2014) were identified as potential SRE species, comprised of the following: two potential SRE trapdoor spiders; one potential SRE scorpion; four potential SRE pseudoscorpions; six potential SRE isopods; and two potential SRE millipedes / centipedes.

Four of the potential SRE species recorded are considered to be of relevance to the Proposal:

Isopod:

- *Buddelundia* sp. nov. '10 1458A;

Scorpion:

- *Urodacus* sp. indet;

Pseudoscorpion:

- Olpiidae Genus indet. sp. indet.; and
- *Euryolpium* sp. indet.

Several forms of Mygalomorph spiders (Araneae) were also recorded from the 2005 Biota fauna survey.

Isopods

There are currently more than 10,000 described species of isopod however, despite being highly abundant in soil and leaf litter, they are inadequately studied and relatively little is known about the distributions of each species in Australia (Judd et al. 2008). Several species of isopod identified in the Pilbara are known or potential SREs, including *Buddenlundia*, (Judd et al. 2008).

Buddelundia sp. Nov. '10 is a species complex and is common and widespread in the Pilbara. There were at least four morphologically different forms found during the *ecologia* (2014) survey. Further work on this group of species is required to understand better their true SRE status.

Buddelundia sp. nov. '10 1458A' was the most abundant, with a total of 70 individuals recorded from across the region in a variety of habitats during the *ecologia* (2014) survey.

Scorpions

Currently, 23 species of *Urodacus* are described; however, this may represent as little as 20% of the real diversity of this genus in Australia. *Urodacus* appears to be most diverse in Western Australia with few species recorded in eastern Australia. *Urodacus* contains both widespread and SRE species.

A total of 10 unidentifiable females and juveniles of *Urodacus* were collected from across the region in a variety of habitats during the *ecologia* (2014) survey. No adult male specimens were collected and therefore this species is unable to be morphologically identified to species level. Unidentifiable individuals have previously been recorded in the region and were assessed as potential SRE. As *Urodacus* includes range-restricted and widespread species, all unidentified specimens have been considered potential SRE.

Pseudoscorpions

The Western Australian pseudoscorpion fauna is fairly diverse with representatives of 17 different families. They are found in a variety of biotopes, but can be most commonly collected from the bark of trees, from the underside of rocks, or from leaf litter habitats (Burger *et al.* 2013)

Three juvenile olpiid pseudoscorpions, recorded from three separate sites across the region in a variety of habitat types during the *ecologia* (2014) survey, could not be identified to genus level because of juvenile life stages. This species has been considered potential SRE due to the taxonomic uncertainty.

A single juvenile from the genus *Euryolpium* was also collected from within the mulga woodland habitat type during the *ecologia* (2014) survey. Due to the juvenile life form of this individual, it cannot be identified to species level. Species of *Euryolpium* are commonly found under bark and under rocks throughout Australia. They can be locally abundant. This specimen has been considered potential SRE due to taxonomic uncertainty.

Mygalomorph Spiders

Traditionally, arid and semi-arid areas were considered poor potential habitat for invertebrate fauna given species are often moisture-dependent (Harvey *et al.* 2008 in *ecologia* 2013). Mygalomorphae (trapdoor spiders) are largely considered 'old world' spiders and, as such, are generally adapted to past climatic regimes making them vulnerable to desiccation in arid environments. However, these spiders are burrowing ground-dwellers which often have a trapdoor at the burrow entrance to avoid desiccation.

Due to their habitat specialisation and usually poor powers of dispersal, mygalomorph spiders are frequently identified as SREs despite being a relatively common component of the biota of the Pilbara region.

It is difficult to assess the diversity of mygalomorph species in the Pilbara since the majority of species have not been formally described in the scientific literature. It is also difficult to assess the distribution of mygalomorph species since most species are represented by only a relatively few

specimens. Assigning conservation status to species that are unnamed and poorly understood is problematic.

Several forms of mygalomorph spiders were recorded during the 2005 Biota fauna survey. Only mature male mygalomorph spiders can be reliably identified to species level using morphological techniques, and males comprise only approximately 5% of specimens collected, the remaining females and juveniles mostly lack the morphological features that identify species. Therefore, the conservation significance of the mygalomorph spiders that were recorded could not be inferred. The specimens were lodged with the WA Museum. It was intended these specimens would contribute to improved understanding of mygalomorph species found throughout the Pilbara region.

Individuals were recorded in the footslope and plain habitat type, which is the most extensive habitat type within the area.

SRE fauna are particularly vulnerable to potential impacts due to their restricted distributions. The likelihood of the invertebrate species to be considered a SRE was determined based on the current known distribution of each species. Where insufficient or no information was available to determine the SRE status, individuals were conservatively assessed as potential SRE. Further research is required to confirm the SRE status of individuals where current knowledge is very limited.

The locations of the Potential SRE Fauna that have been recorded within the Proposal area and the habitat types in which they were recorded are shown in Figure 6-2. The additional clearing is considered unlikely to impact the conservation status of any species, should it be SRE, given the broad availability of continuous habitat.

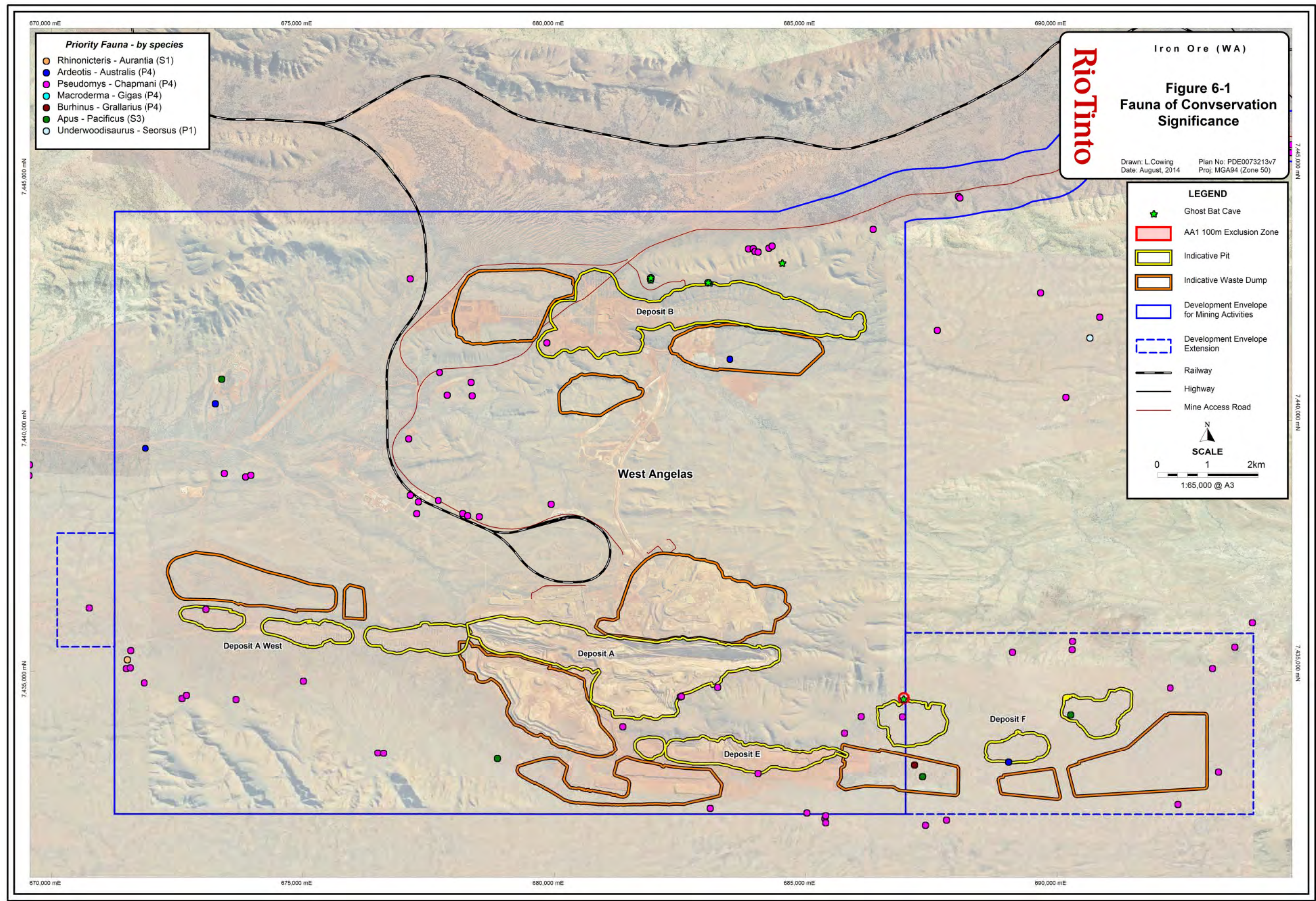


Figure 6-1: Fauna of Conservation Significance

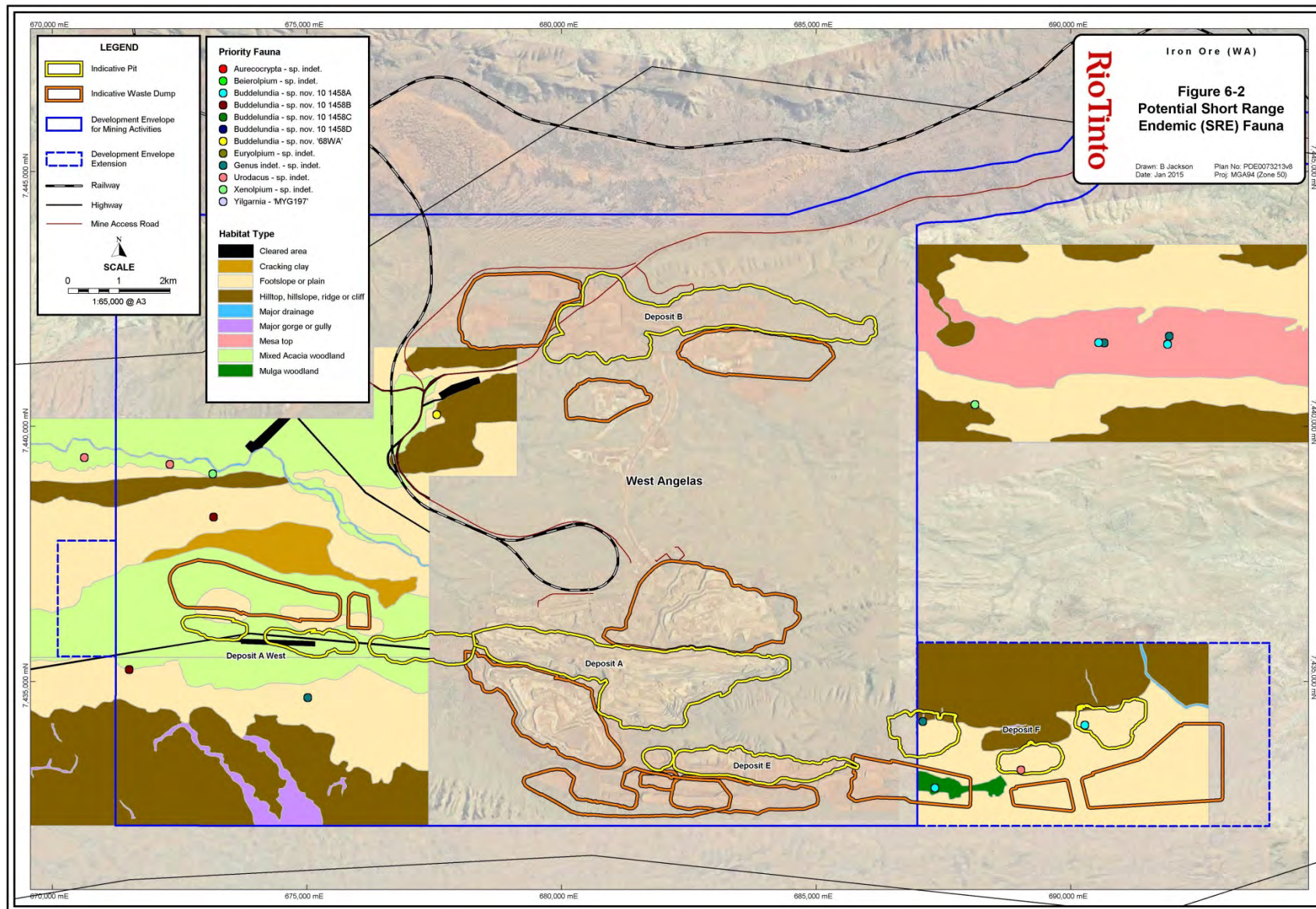


Figure 6-2: Potential Short Range Endemic (SRE) Fauna

Table 6-2: Terrestrial Fauna: Description of Factor, Impact Assessment and Management

EPA Objective	Existing Environment	Potential Impacts (without mitigation)	Management and Outcome
<p><i>To maintain representation, diversity, viability and ecological function at the species, population and assemblage level.</i></p>	<p>Fauna surveys have been undertaken across the West Angelas region since 1979. <i>ecologia</i> recently completed a two-phase vertebrate fauna and terrestrial invertebrate SRE assessment in 2013. A summary of the findings of the surveys that are relevant to the Proposal are provided below.</p> <p>Conservation Significant Fauna Habitats and Fauna Assemblage</p> <p>Five of the broad-scale habitat types identified are considered to be of relevance to the Proposal: ‘footslope or plain’, ‘hilltop, hillslope, ridge or cliff’, ‘mixed acacia woodland’, ‘mulga woodland’ and ‘cracking clay’. These habitats are all well represented throughout the subregion.</p> <p>Six conservation significant species recorded or assessed as having a high likelihood of occurrence are considered to be of relevance to the Proposal:</p> <ul style="list-style-type: none"> Fork-tailed Swift, <i>Apus pacificus</i> (EPBC M, WC Act S3); Western Pebble-mound Mouse, <i>Pseudomys chapmani</i> (P4); Short-tailed Mouse, <i>Leggadina lakedownensis</i> (P4); Ghost Bat, <i>Macroderma gigas</i> (P4); Bush Stone-curlew, <i>Burhinus grallarius</i> (P4); and Australian Bustard, <i>Ardeotis australis</i> (P4). <p>The location of conservation fauna that have been recorded are shown in Figure 6-1.</p> <p>Five of the potential SRE species recorded are also considered to be of relevance to the Proposal; one species of isopod, one species of scorpion, two species of pseudoscorpion and one species of spider.</p> <p>The two fauna assessment reports relevant to the Proposal are provided as Appendix 6 and Appendix 7.</p>	<p>Clearing of fauna habitat</p> <p>The Proposal will result in the clearing of up to 3,220 ha of potential fauna habitat (in addition to the 4,667 ha approved under MS 970), therefore habitat loss is likely to continue to be the biggest threat to fauna, including several conservation significant fauna species (namely: Fork-tailed Swift, the Western Pebble-mound Mouse, the Short-tailed Mouse, the Ghost Bat, the Bush Stone-curlew and the Australian Bustard) as well as five potential SRE species.</p> <p>Given their potential to be restricted at small spatial scales, SRE species are generally at greater risk of changes in conservation status or local population extinctions than other, more widely distributed fauna. This risk can be increased by threatening processes including clearing of habitat (EPA 2009). However, the additional clearing is unlikely to impact the conservation status of the potential SRE species given the broad availability of continuous habitat for these species.</p> <p>The presence of the Ghost Bat represents the most significant faunal finding to the overall environmental value of the Proposal area. Populations of this species are known from a series of roost caves in the region including the potential maternity cave (AA1 near Deposit F). Robe commits to maintain a 100 m exclusion zone for the potential maternity cave (AA1).</p> <p>Vibration</p> <p>A 100 m exclusion zone will be maintained for the potential Ghost Bat maternity cave (AA1); however, blasting at Deposit F has the potential to result in vibration which could damage the integrity of the potential maternity cave (AA1). Collapse could potentially be a significant loss to the regional Ghost Bat population.</p> <p>Robe commits to continue to apply the established framework for management of blast vibration to protect the integrity of cave.</p> <p>The potential impacts to fauna populations (including potential SRE species) from the Proposal are considered to remain unchanged from that assessed in the ERMP, given the proposed changes in this Proposal will:</p> <ul style="list-style-type: none"> Not affect regional population levels of any fauna species (including potential SRE species). Not affect any new fauna species (including potential SRE species) or habitat types that have not been previously assessed. Not contribute a new or additional threat to conservation significant fauna species (including potential SRE species). 	<p>The key potential impact of the Proposal on terrestrial fauna (including potential SRE species); clearing of fauna habitat will be minimised via management measures to reduce potential impacts on flora and vegetation, as detailed in Table 5-4.</p> <p>Habitat degradation as a result of hydrological changes will be minimised via management measures to reduce potential impacts on natural hydrological regimes, as detailed in Table 7-1.</p> <p>Condition 8 of the Ministerial Statement has been, and will continue to be, implemented to manage clearing activities to ensure minimal adverse impacts on conservation significant communities and species.</p> <p>In addition, the following key management measures from the Environmental Management Program (Appendix 8) have been, and will continue to be, implemented to manage potential impacts on fauna and fauna habitats:</p> <ul style="list-style-type: none"> Clearing has, and will continue to, avoid significant fauna habitats as far as practicable. Sites that are utilised by Ghost Bats have, and will continue to be, avoided as far as practicable. Buffers around sites that are utilised by Ghost Bats have, and will continue to be, demarcated and maintained, where practicable, to a minimum of 100 m. Cave AA1 is considered to be of high conservation significance and therefore this buffer will be a minimum of 100 m. Blast vibration control, including vibration risk assessment, controlled blasting and vibration monitoring has been, and will continue to be, implemented for blasts in proximity of sites that are utilised by Ghost Bats. Appropriate signage has, and will continue to be, put in place at sites that are utilised by Ghost Bats. The use of barbed wire fences is prohibited, unless a statutory requirement (e.g. Electricity (Licensing) Regulations 1991). Where barbed wire is necessary, reflectors will be installed to deter bats. Vehicles have, and will continue to be, restricted to designated tracks and drivers will abide by the allocated speed limit except in cases of emergency. Known native fauna ‘hot spots’ will be sign posted to notify drivers. The requirements of the Wildlife Interaction Policy will be communicated to, and implemented by, all personnel. Native animals encountered on-site will be given the opportunity to move on if there is no threat to personnel safety in doing so. Snakes will be relocated from work areas by appropriately trained snake-handlers.

EPA Objective	Existing Environment	Potential Impacts (without mitigation)	Management and Outcome
			<ul style="list-style-type: none">If sick or injured animals are encountered, a nominated carer will assess possible rescue and rehabilitation of the animal.Dead ghost bats will be lodged with the Western Australian Museum.Feral animal control Feral animal control measures will be implemented, including:<ul style="list-style-type: none">prohibiting the feeding of feral animals;trapping and eradication programs; andeffective management of domestic waste. <p>Outcome</p> <p>The Proponent considers that the Revised Proposal can be managed to meet the EPA objective for this factor, in summary:</p> <ul style="list-style-type: none">Fauna habitats potentially impacted by the Proposal, including habitat of higher value for conservation significant fauna species, are well represented outside of the Proposal area on a local and regional scale.Appropriate management measures to avoid, minimise and mitigate potential impacts of the Proposal on fauna and fauna habitats have been, and will continue to be implemented.

7 HYDROLOGICAL PROCESSES (SURFACE WATER)

This Section describes the hydrological systems that exist within the West Angelas region, provides details regarding the potential impacts to surface water regimes and the surface water management strategy that forms part of this Proposal.

The EPA applies the following objective from EAG 8 in its assessment of proposals that may affect hydrological processes:

To maintain the hydrological regimes of groundwater and surface water so that the existing and potential uses, including ecosystem maintenance, are protected

Table 7-1 describes how the proposal meets the EPA's objectives in respect of Hydrological Processes and Inland Water Environmental Quality (Surface Water).

7.1 REGIONAL HYDROLOGY

Deposits A, A west, B, E and the majority of Deposit F (pits F1 and F2) are located within the upper reaches of the Turee Creek East catchment which forms part of the regional Ashburton River Catchment. The upper catchment has a complex drainage pattern characterised by intermittent flow and infrequent wide-spread flooding, depending on the occurrence of high intensity rainfall events. Turee Creek East represents the most significant named watercourse in the area with a catchment area of approximately 2,050 km².

The F3 orebody, part of Deposit F, is located in the upper reaches of the Weeli Wolli Creek catchment, part of the regional Upper Fortescue River catchment, immediately west of the regional Ashburton River catchment. The Weeli Wolli Creek catchment covers an area of approximately 3,991 km². Weeli Wolli Creek flows in a north easterly direction and merges with Marillana Creek 60 km downstream from Deposit F.

7.2 LOCAL HYDROLOGY

The topography consists of a range of steep hills extending in an east – west direction to the south of both Deposit A west and Deposit F. The hills are characterised by steep incised drainage channels. However as the channels extend out from the hillside to the very flat valley floor, they transform into shallow, poorly defined drainage lines typical of overland flow depending on the occurrence of high rainfall events. The location and extent of these shallow drainage lines on the valley floor are often hard to define.

Deposit A west sits within the valley floor of a tributary of Turee Creek East. Figure 7-1 illustrates local catchments contributing to Deposit A west. All flows intercepted by the proposed pits naturally flow in a northerly direction. The total catchment area intercepted by the proposed A west pits is approximately 23 km².

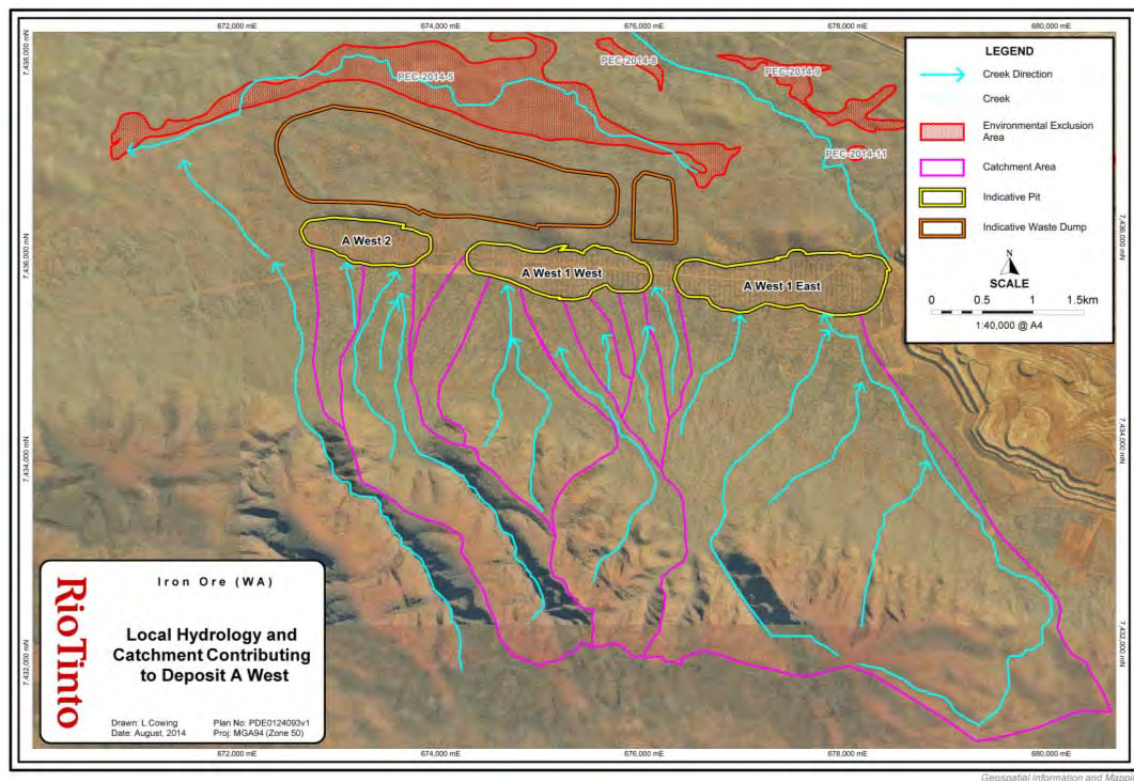


Figure 7-1: Local hydrology and catchment contributing to Deposit A west.

Deposit F is located on the Turee Creek East and Weeli Wolli Creek catchment divide. Pits F1 and F2 are situated within the same valley as Deposit E, extending from the valley floor into the hills to the north. An ephemeral unnamed tributary, hereafter referred to as central creek, rises in the hills to the southeast of Deposit F. Prior to any development at West Angelas, central creek naturally flowed to the west along the valley floor, naturally crossing Deposit F, pit F2 and Deposit E and then meandered north westerly across Deposit A. Currently, central creek is intercepted immediately upstream of Deposit E.

A large number of relatively small local catchments are intercepted by Deposit F. The total catchment area intercepted by the proposed Deposit F pits is approximately 15 km² (1 km², 13 km² and 1km² for pits F1, F2 and F3 respectively). Figure 7-2 illustrates local catchments contributing to Deposit F.

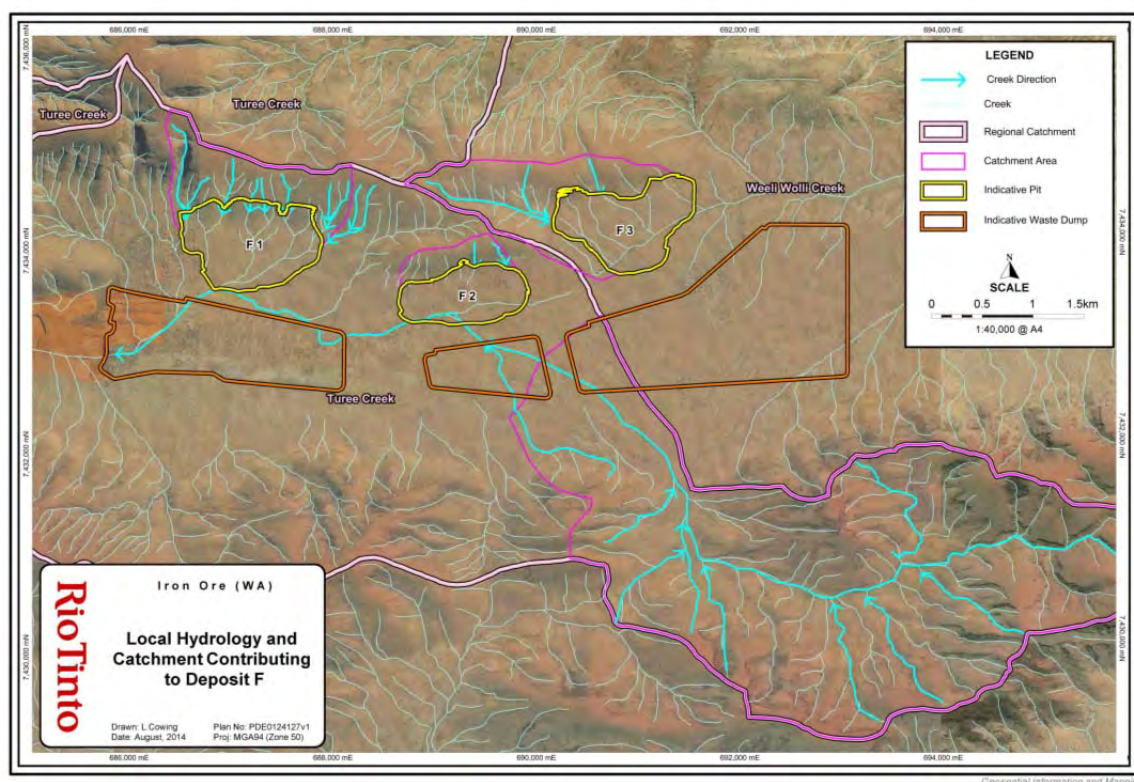


Figure 7-2: Local hydrology and catchment contributing to Deposit F

7.3 HYDRAULIC MODELLING

In order to assess the characteristics of the surface water flow regime across the valley floor in proximity of Deposit A west and Deposit F, a hydraulic model was developed. The model results replicate what has been observed in the field. The drainage channels are clearly defined in the hills. As the channels extend out from the hills into the valley floor they become very shallow and difficult to define. The flow in the valley floor is thought to be predominately overland flow rather than channelised flow, i.e. very wide in extent and shallow in depth. Flow of this type is sensitive to changes in the local topography.

7.4 SURFACE WATER MANGEMENT

MS 970 contains the following Conditions relevant to surface water management:

7 Surface Water Drainage

- 7-1 The proponent shall manage surface water drainage and discharge to ensure minimal adverse impacts on existing surface water drainage patterns or the water dependent ecosystems.
- 7-2 To verify that the requirements of condition 7-1 are met, the proponent shall undertake monitoring as outlined in the Surface Water Management Plan approved as part of the Environmental Management Program required by condition 5.
- 7-3 In the event that the monitoring required by condition 7-2 indicates that the requirements of condition 7-1 are not met, the proponent shall implement contingency actions as outlined in the Surface Water Management Plan.

- 7-4 The proponent shall submit annually the results of monitoring required by condition 7-2 to the CEO as part of the Compliance Assessment Reports required by condition 3-6.

It is intended that Deposits A west and F will be managed in accordance with these existing conditions. To meet the requirements of these conditions, several surface water management strategies have been investigated. The preferred strategies are outlined below.

Deposit A west

To manage the 23 km² of catchment intercepted by the proposed Deposit A west, a 5% Annual Exceedance Probability (AEP) capacity diversion channel is proposed to the south of the pits. The diversion channel will capture runoff from the local catchment and redirect it westwards, releasing the water into a local tributary that results in the continuation of flow along its natural path.

Three scenarios were modelled to assess changes to the hydrologic regime during rainfall events: Scenario 1 - current conditions; Scenario 2 - 5% AEP capacity diversion channel; and Scenario 3 - no diversion channel. Flows were assessed for all three scenarios at two locations approximately 7.5 km downstream (PO1) and 13 km downstream (PO2) of A west respectively (Figure 7-3 and Figure 7-4). Modelling indicates peak flows in both locations are unaffected under Scenario 2.

Scenario 2 results in a slightly higher secondary peak at PO1 as runoff from the A west catchment area is travelling a more direct path via the diversion channel rather than its natural meandering path. Fifteen percent volume is lost due to intercepted rainfall; however more volume is retained than in Scenario 3 where 30% volume is lost. This scenario results in the total loss of the secondary peak as all runoff is intercepted.

Limited hydrological impact is visible at PO2.

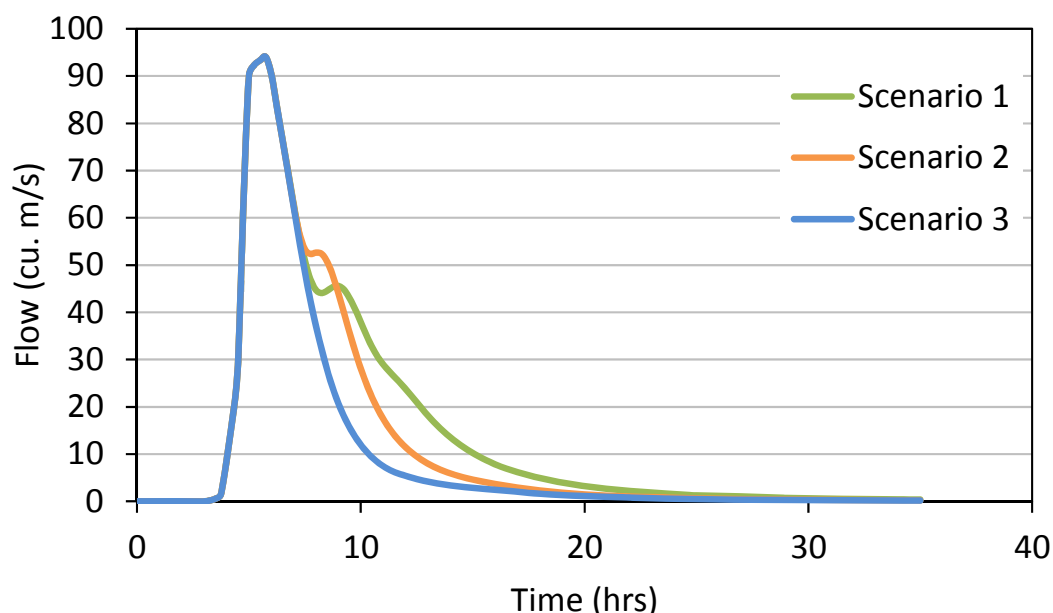


Figure 7-3: Hydrographs at PO1 approximately 7.5 km downstream of A west

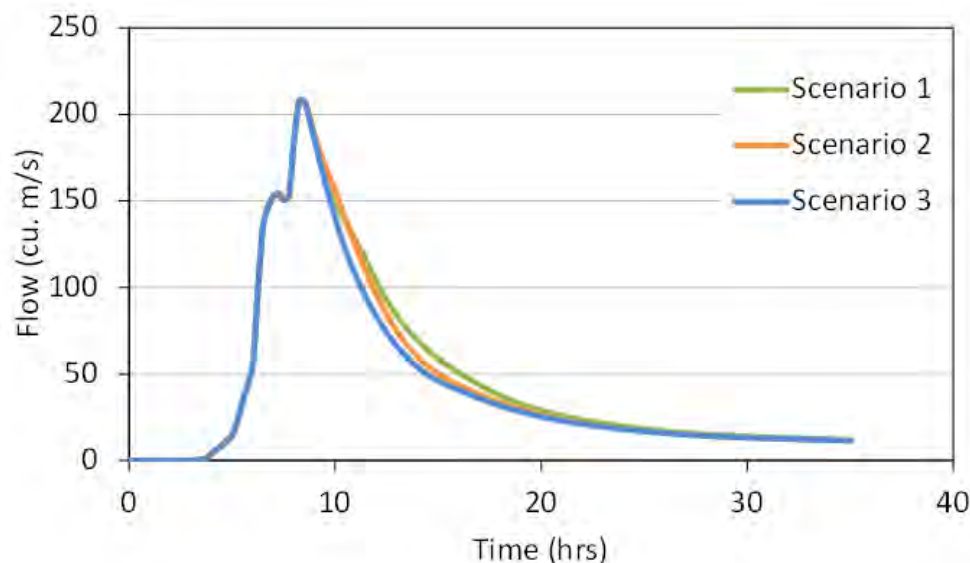


Figure 7-4: Hydrographs at PO2 approximately 13 km downstream of A west.

The proposed A west diversion results in the maintenance of natural flows.

Deposit F

Surface water management options around Deposit F are limited due to the valley topography. The surface water management options are being considered for Deposit F are as follows:

- **Passive** – Pits F1 and F3 intercept approximately 1 km² of local catchment each. A passive surface water management strategy is proposed for these deposits under which local runoff intercepted by the pits will be allowed to naturally terminate in the pits.
- **2% AEP Diversion** – The proposed development of pit F2 will intercept central creek. A 2% AEP capacity diversion channel is proposed to divert the creek upstream of pit F2 eastwards across the catchment divide to facilitate continued flow. No viable alternative option was identified that could continue the flow within its natural catchment.

The central creek catchment at this location is approximately 12 km². The receiving catchment, Weeli Wolli, has a total catchment area of 3,991 km². It is therefore considered that the proposed additional catchment contribution (0.3%) is negligible in the context of the total area of the receiving catchment.

Two scenarios were modelled to assess changes to the hydrologic regime within the receiving catchment during rainfall events: Scenario 1 - current conditions and Scenario 2 - diversion channel. Flows were assessed for both scenarios at three locations approximately 15 km downstream (**PO3**), 25 km downstream (**PO4**) and 30 km downstream (**PO5**) of pit F2 respectively. Modelling indicates peak flows, and therefore maximum extent of the flow is only marginally altered under Scenario 2 and this impact diminishes with increasing distance downstream. No increase in peak flow is expected at PO5, 30 km downstream, in events up to a 20% AEP.

Water depth difference mapping was also undertaken to understand the change in expected water depth from current condition. From approximately 8 km downstream of the diversion channel there is a negligible change in depth. It is therefore considered that the proposed

additional catchment contribution will have a negligible effect on the natural hydrological regime of the receiving Weeli Wolli catchment.

Additionally, surface water runoff in the region is only associated with high intensity rainfall events. As is common across the Pilbara region, annual rainfall at West Angelas is highly variable and rainfall events resulting in surface water flows are uncommon. Based on rainfall data for the area and flow analysis in the Weeli Wolli catchment, rainfall events that result in flow have a less than 1% probability of occurrence annually.

The catchment contributing to central creek has been progressively reduced due to mining at Deposits A and E and would continue to be reduced by mining at Deposit F. The proposed diversion of central creek upstream of pit F2 eastwards across the catchment divide will terminate the flow of this creek in its original catchment, facilitating management of surface water flows for all deposits that intercept central creek. Flows in central creek are expected to continue to be artificially maintained downstream of operations by the continued discharge of surplus water.

7.5 KEY ENVIRONMENTAL RECEPTORS

West Angelas Cracking Clay PEC

The West Angelas Cracking Clay PEC occurs extensively within the area on relatively flat valley floors. Three small hills separate the Cracking Clay PEC from Deposit A west.

Under existing conditions, flow from rainfall events spreads across the valley floor in shallow, broad channels. These shallow channels do not cover the entire extent of the Cracking Clay PEC. 2D hydraulic modelling was undertaken to understand the interactions between the Cracking Clay PEC and patterns of surface water flow in the area.

Based on the modelling, three inflow paths from the southern catchments cross the Cracking Clay PEC (CC1, CC2 and CC3) (Figure 7-5). These flow paths will be intercepted by Deposit A west so they were examined to further understand the interaction between the Cracking Clay PEC and the southern catchment.

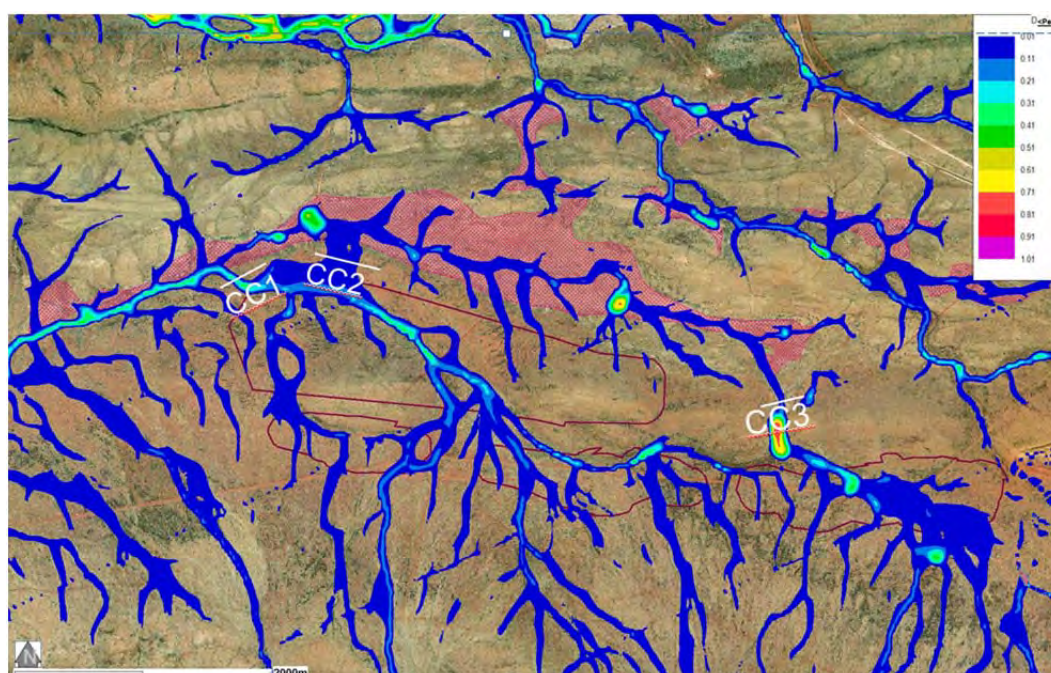


Figure 7-5: Peak flow depths in the Cracking Clay PEC during a 20% AEP event.

It is evident from the 20% AEP hydrographs that inflows at two of the three channels, CC2 and CC3, are insignificant (Figure 7-6). CC1 is the main channelised inflow source in contact with the Cracking Clay PEC. This inflow channel only interacts with the small western portion of the Cracking Clay PEC, representing less than 1% of the total extent of the community. The 20% AEP event is examined as events greater than a 20% AEP are considered too infrequent to sustain vegetation. The modelling therefore indicates that channelised flow only interacts with the Cracking Clay PEC during large, infrequent flow events. Incident rainfall and overland flow from local catchments are considered to be the significant hydrological factors in sustaining the Cracking Clay PEC.

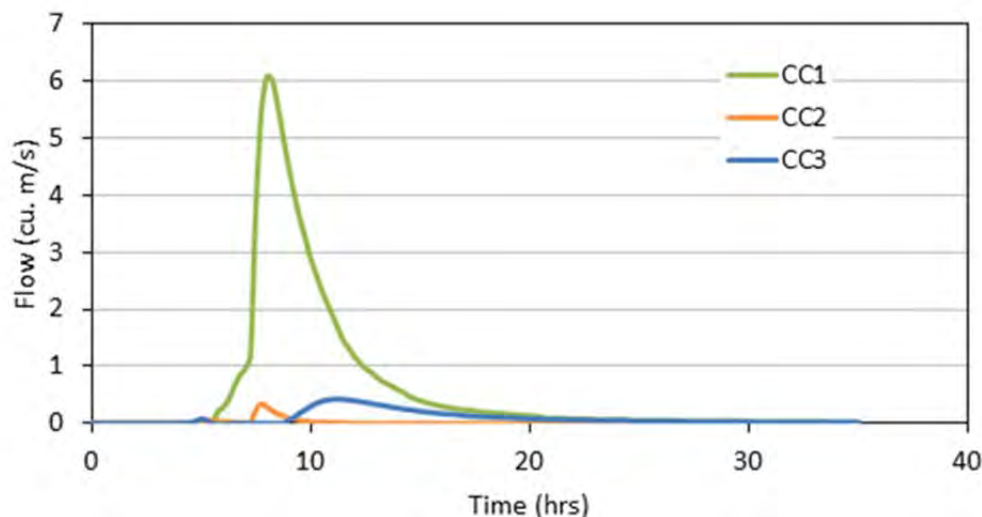


Figure 7-6: Hydrographs at inflow channels CC1, CC2 and CC3.

The condition of the Cracking Clay PEC has previously been described as poor following a number of years of below average rainfall. The Cracking Clay PEC appears to be sustained by incident rainfall and local catchment runoff from the surrounding hills and therefore, it is considered that the Cracking Clay PEC would not be detrimentally impacted by the Proposal.

Valley floor mulga

Valley floor mulga (previously *Acacia aneura* but now including a number of species) are widely recognised as being dependent on patterns of surface water flow.

Deposits A west and F intercept a number of flow paths from the surrounding catchments. However, valley floor mulga is dependent upon shallow overland flow rather than channelised flow.

Valley floor mulga communities will continue to be sustained by incident rainfall and overland flow following rainfall events and therefore, it is considered that the valley floor mulga would not be detrimentally impacted by the Proposal.

Table 7-1: Hydrological Processes (Surface Water): Description of Factor, Impact Assessment and Management

EPA Objective	Existing Environment	Potential Impacts (without mitigation)	Management and Outcome
<p><i>To maintain hydrological regimes of surface water so that existing and potential uses, including ecosystem maintenance, are protected.</i></p>	<p>Surface water flows</p> <p>Deposits A, A west, B, E and the majority of Deposit F (pits F1 and F2) are located within the Turee Creek East catchment. The F3 orebody is located within the upper reaches of the Weeli Wolli Creek catchment.</p> <p>Deposit A west intercepts approximately 23 km² of local catchment. A 5% AEP capacity diversion channel is proposed to the south of the pits to capture the runoff from the local catchment and redirect it westwards maintaining natural flows.</p> <p>Deposit F, Pits F1 and F3 intercept approximately 1 km² of local catchment each. A passive surface water management strategy is proposed for pits F1 and F3 under which local runoff intercepted by the pits will be allowed to naturally terminate in these pits.</p> <p>Deposit F, Pit F2 naturally intercepts an unnamed tributary with a 12 km² catchment. A 2% AEP capacity diversion channel is proposed to divert the creek upstream of the F2 pit eastwards across the catchment divide into the adjacent Weeli Wolli catchment. No viable alternative option exists to continue the flow of this creek within its natural catchment.</p> <p>Flows in central creek are expected to continue to be artificially maintained downstream of operations by the continued discharge of surplus water.</p> <p>Key environmental receptors</p> <p>The West Angelas Cracking Clay PEC and valley floor mulga communities occur extensively throughout the area. Both of these communities are recognised as being dependent on patterns of surface water flow.</p>	<p>Diversion of surface water flows</p> <p>The Proposal will result in the diversion of natural surface water flows, however; no potential impacts are expected given that:</p> <ul style="list-style-type: none"> The Deposit A west diversion will result in the maintenance of natural flows. The Deposit F diversion will result in the maintenance of flows in the adjacent catchment. It is considered that the proposed additional catchment contribution from the Deposit F diversion will have a negligible effect on the natural hydrological regime of the receiving catchment. <p>Altered hydrological regime</p> <p>Some changes to the hydrologic regime are expected however; modelling indicates that the Cracking Clay PEC and valley floor mulga communities would not be detrimentally impacted by altered hydrological regimes.</p>	<p>Condition 7 of the Ministerial Statement has been, and will continue to be, implemented to manage surface water drainage to ensure minimal adverse impacts on existing surface water drainage patterns or water dependent ecosystems.</p> <p>In addition, the following key management measure from the Environmental Management Program (Appendix 8) has been, and will continue to be, implemented to manage potential impacts on hydrological processes and inland water environmental quality of surface water:</p> <ul style="list-style-type: none"> Surface water flows that are intercepted by operations have, and will continue to be diverted to maintain natural flows as far as practicable. <p>Where it is not possible to continue flow within its natural catchment, surface water flows will be diverted to facilitate continued flow in the adjacent catchment. The proposed diversion will have a negligible effect on the natural hydrological regime of the receiving catchment.</p> <p>Surface water quality management is included within the Environmental Management Program which will continue to be implemented.</p> <p>Outcome:</p> <p>The Proponent considers that the Revised Proposal can be managed to meet the EPA objective for this factor, in summary:</p> <ul style="list-style-type: none"> Appropriate management measures to avoid, minimise and mitigate potential impacts of the Proposal on surface water flows have been, and will continue to be, implemented. Impacts to surface water flows will be localised, there will be no significant impacts on regional surface water and no impacts on key environmental receptors.

8 REHABILITATION AND CLOSURE

The EPA applies the following objective from EAG 8 in its assessment of proposals:

To ensure that premises are decommissioned and rehabilitated in an ecologically sustainable manner.

MS 970, which was issued for the West Angelas Iron Ore Project in June 2014, contains the following Conditions relevant to closure:

9 Rehabilitation and Closure

- 9-1 The proponent shall ensure that the mine is closed, decommissioned and rehabilitated in an ecologically sustainable manner, consistent with agreed post-mining outcomes and land uses, and without unacceptable liability to the State of Western Australia.
- 9-2 The proponent shall prepare a Mine Closure Plan for the West Angelas Iron Ore Project.
- 9-3 The Mine Closure Plan required by condition 9-2 shall:
 - (1) when implemented, manage the implementation of the proposal to meet the requirements of condition 9-1;
 - (2) be prepared in accordance with the *Guidelines for Preparing Mine Closure Plans, June 2011* (Department of Mines and Petroleum and Environmental Protection Authority) or its revisions; and
 - (3) be to the requirements of the CEO on advice of the Department of Mines and Petroleum.
- 9-4 Within 12 months of commissioning of additional mine pits or as otherwise agreed by the CEO the proponent shall implement the approved Mine Closure Plan and continue implementation until otherwise agreed by the CEO.
- 9-5 Revisions to the Mine Closure Plan may be approved by the CEO on the advice of the Department of Mines and Petroleum.
- 9-6 The proponent shall implement revisions of the Mine Closure Plan required by condition 9-5.

Additionally, the EPA expects closure plans to be submitted with the approvals documentation to facilitate the incorporation of closure issues into its environmental impact assessment.

The West Angelas Closure Plan has been developed to address closure of existing Deposits A, B and E as well as Deposits A west and F, the subject of this Proposal (Appendix 9). This Closure Plan follows the format and content requirements for mine closure plans as recommended by the Office of the Environmental Protection Authority / Department of Mines and Petroleum (**DMP**) *Guidelines for Preparing Mine Closure Plans*.

The OEPA and DMP provided comments on the West Angelas Closure Plan, as follows:

1. It is unclear how potential post mining impacts have been determined and it is therefore difficult to determine whether all post mining impacts have been identified and addressed. The proponent is required to identify potential post mining impacts through a risk analysis process as outlined in the *Guidelines for Mine Closure Plans* (DMP/EPA 2011).

2. The management and mitigation measures presented in this Closure Plan are from other Rio Tinto Management Plans and do not address how this particular site will be closed out. If mitigation measures used on other Rio Tinto mine sites are used in this Closure Plan, the Plan should include details on how those measures will be implemented at this site.
3. A rehabilitation plan should be developed for the Deposit B long term low grade stockpile as this stockpile is not in the life of mine processing schedule.
4. No consultation has been undertaken with DMP regarding closure of the site. The proponent needs to liaise with DMP prior to preparation of the next revision of the Plan.
5. As the proposal is located on Vacant Crown Land and is in close proximity to Karijini National Park, the return of a native ecosystem is supported by DMP and OEPA. A decision to proceed with Pastoralism as the post mining land use would need to be reached through consultation with relevant stakeholders.
6. The closure objectives outlined in section 22.2 and Table 21 do not encompass all aspects of the site. The closure objectives should be revised in consultation with the Guidelines for Mine Closure Plans (DMP/EPA 2011) to ensure closure objectives link to closure criteria.
7. Pits at Deposits A, A west and E will be highly erodible and unstable post closure. No information has been provided regarding the zone of instability for these pits. If this information is unknown, investigations should be conducted as soon as practicable and all waste dumps should be located outside of the zone of instability at all pits.
8. A new hydrological regime will be established post closure. The proponent should consult with DoW prior to preparation of the next revision of the Plan.
9. The completion criteria and associated performance indicators presented in Table 24 are generic and unclear. While detailed completion criteria are not expected at this stage of mine life, it is expected that the completion criteria provided will include all aspects of the site and are specific towards final landforms that will be present at the site. The Guidelines for Mine Closure Plans (DMP/EPA 2011) outline the detail that is expected of indicative completion criteria.

The Closure Plan was amended to address the concerns raised, following consultation with OEPA and DMP and was submitted to the OEPA Assessments and Compliance Division on 4 March 2015, ahead of the required compliance date, 14 December 2015.

The amended Closure Plan is included in Appendix 9.

8.1 CLOSURE OBJECTIVES AND COMPLETION CRITERIA

The ultimate goal of mine closure at West Angelas is to relinquish the site to the Government. This goal will be achieved once the government and community agree that the condition of the site is compatible with an agreed post-mining land use. Closure objectives reflect the aspects of the closure plan that the government and community agree are key to evaluating the site condition. The following closure objectives have been proposed for West Angelas:

- Rehabilitated landforms are stable;
- Final landforms are rehabilitated to be compatible with the final land use;
- Changes to surface water flows or groundwater quality are within acceptable limits;

- Public safety hazards have been addressed.

These objectives do not represent the full range of issues that need to be addressed upon closure of West Angelas: rather they represent the key objectives against which the ability to relinquish will be assessed.

Indicative completion criteria have been proposed within the Closure Plan (Appendix 9). These criteria are subject to ongoing review and update, and have yet to be extensively discussed with stakeholders.

8.2 ANTICIPATED CLOSURE OUTCOMES

Land

The shape of the landscape at West Angelas is still evolving, with the final mine void areas and waste dump locations and dimensions still in development across all of the deposits.

Based on the current Closure Plan, the post mining landform will consist of nine separate voids which will be partially backfilled to above recovered groundwater levels (to prevent post-closure exposure of the groundwater table).

In general, pit walls are not designed to be stable in perpetuity. The area around the pits will be unstable, and the pit walls are expected to collapse over time.

Several waste dumps will remain external to the voids, as well as one in pit waste dump at the western end of Deposit A that will extend above the pit crest.

Rehabilitation and revegetation will be undertaken across waste dumps and other disturbance areas across the site (other than voids). To date, in areas where rehabilitation has been undertaken, the vegetation is well established, and in most cases sites compare favourably with one or more reference sites.

Surface water

Local hydrological regimes have been and will continue to be substantially altered. On closure, the landscape will be rehabilitated with consideration given to the changed topography and associated hydrological regimes that topography will generate. However, it is not intended that the original hydrological regimes be reinstated as part of the closure strategy. Surface water management structures that have been or will be built are expected to be retained on closure and the areas surrounding the diversions rehabilitated to function as a natural drainage line. The structures to be retained on closure include:

- the diversion berm and drainage channel used to divert surface water flows from an unnamed tributary to protect Deposit B;
- the proposed diversion berm that will re-direct sheet flow from Deposit A west; and
- the proposed diversion berm and drainage channel used to divert surface water flows from an unnamed tributary to the adjacent catchment to protect Deposit F.

Groundwater

It is expected that the groundwater levels will begin recovering immediately after cessation of mine dewatering. On closure of the mine, groundwater levels are expected to recover to slightly lower than pre-mining levels, without affecting local or regional groundwater quality. A backfill strategy has

been adopted; pits will be partially backfilled to above recovered groundwater levels to prevent post-closure exposure of the groundwater table or the formation of permanent pit lakes.

It is recognised that ephemeral lakes may form at the base of the voids following rainfall events and higher than average rainfall years. It is expected that these will dissipate naturally during the following dry season. Although the quality of these lakes may deteriorate, they are not expected to affect local or regional groundwater quality.

Table 8-1: Rehabilitation and Decommissioning: Description of Factor, Impact Assessment and Management

EPA Objective	Existing Environment	Potential Impacts (without mitigation)	Management and Outcome
<p><i>To ensure that premises are decommissioned and rehabilitated in an ecologically sustainable manner.</i></p>	<p>The West Angelas Closure Plan has been developed to address closure of existing Deposits A, B and E as well as A west and F.</p> <p>Based on the current plan, the post mining landform will consist of nine separate mine voids which have been partially backfilled to prevent post-closure exposure of the groundwater table.</p> <p>Several waste dumps will remain external to the voids, as well as one in pit waste dump at the western end of Deposit A that will extend above the pit crest.</p> <p>Rehabilitation and revegetation will be undertaken across waste dumps and other disturbance areas across the site (other than voids).</p> <p>It is not intended that the original hydrological regimes be reinstated as part of the closure strategy. Surface water management structures that have been or will be built are expected to be retained on closure and the areas surrounding the diversions rehabilitated to function as a natural drainage line. The structures to be retained on closure include:</p> <ul style="list-style-type: none"> the diversion berm and drainage channel used to divert surface water flows from an unnamed tributary to protect Deposit B; the proposed diversion berm that will re-direct sheet flow from Deposit A west; and the proposed diversion berm and drainage channel used to divert surface water flows from an unnamed tributary to the adjacent catchment to protect Deposit F. 	<p>On closure of the mine, groundwater levels are expected to recover to slightly lower than pre-mining levels, without affecting local or regional groundwater quality. A backfill strategy has been adopted; pits will be partially backfilled to above recovered groundwater levels to prevent post-closure exposure of the groundwater table.</p> <p>It is recognised that ephemeral lakes may form at the base of the voids following rainfall events and higher than average rainfall years. It is expected that these will dissipate naturally during the following dry season. Although the quality of these lakes may deteriorate, they are not expected to affecting local or regional groundwater quality.</p> <p>The Acid and Metalliferous Drainage (AMD) assessment concluded that the risk of AMD being generated from all deposits is low. A broader assessment of AMD is discussed in Section 9.</p>	<p>West Angelas is subject to Condition 9 of MS 970 which requires the Proponent to prepare a Mine Closure Plan to ‘ensure that the mine is closed, decommissioned and rehabilitated in an ecologically sustainable manner, consistent with agreed post-mining outcomes and land uses, and without unacceptable liability to the State of Western Australia’.</p> <p>The West Angelas Closure Plan has been developed to address closure of existing Deposits A, B and E as well as A west and F (Appendix 9) in accordance with Condition 9 of MS 970.</p> <p>The Closure Plan documents the current closure knowledge base for West Angelas. It outlines the objectives that need to be met at closure, the strategies and plans to be employed to achieve them, and provides an indication of the criteria that will be used to assess closure success.</p> <p>The Closure Plan is not a static document. Robe will continue to revisit the Closure Plan on a regular basis to ensure that the objectives to which it is working towards remain relevant and aligned to stakeholder expectations, and to revise its strategies and plans where appropriate to achieve improved closure outcomes.</p> <p>In addition, the following key management measure from the Environmental Management Program (Appendix 8) has been, and will continue to be, implemented:</p> <ul style="list-style-type: none"> Pits will be backfilled to above the natural groundwater level as far as practicable to minimise the deterioration of groundwater quality. <p>Outcome</p> <p>The Proponent considers that the Revised Proposal can be managed to meet the EPA objective for this factor, in summary:</p> <ul style="list-style-type: none"> Closure planning has been, and will continue to be, implemented to ensure that the West Angelas Revised Proposal can be closed in an ecologically sustainable manner, consistent with agreed outcomes and land uses. Pits will be partially backfilled to above recovered groundwater levels to prevent post-closure exposure of the groundwater table.

9 OTHER ENVIRONMENTAL FACTORS

As discussed in Section 4 the Key Environmental Factors of this Proposal are Flora and Vegetation (refer to Section 5); Terrestrial Fauna (refer to Section 6); Hydrological Processes and Inland Water Environmental Quality (Surface Water) (refer to Section 7); and Rehabilitation and Closure (refer to Section 8).

Table 9-1 outlines environmental factors that were not considered in this Environmental Review as the Proposal, if implemented, will not result in any significant change in addition to or different from that originally assessed and approved under MS 970.

Table 9-1: Factors Considered Not Relevant to this Proposal

Factor	EPA Objective	Description of Factor	Impacts	Existing Management and Mitigation Measures
Subterranean Fauna	<i>To maintain representation, diversity, viability and ecological function at the species, population and assemblage level.</i>	<p>Subterranean fauna surveys have been undertaken over the entire West Angelas area since 1979. The following surveys are applicable to the Proposal;</p> <ul style="list-style-type: none"> a baseline survey was conducted by ecologia during 1998 (<i>ecologia</i> 1998b); a monitoring survey was undertaken by ecologia in 2002 (<i>ecologia</i> 2002); a monitoring survey was undertaken by Biota in 2003 (Biota 2003); a baseline survey of Deposits E and F was conducted by Biota in 2004 (Biota 2004b); a monitoring survey was undertaken by Biota in 2008 (Biota 2008); a monitoring survey was undertaken by Biota in 2012 (Biota 2012); and a subterranean fauna assessment survey was undertaken by <i>ecologia</i> in 2013. <p>The occurrence and distribution of subterranean fauna is influenced or limited by the geological formation in which they occur. Such dispersal limitations result in extremely small, fragmented species ranges and thus high levels of endemism (EPA 2003). In order to assess the potential for subterranean fauna to occur, it is also necessary to identify likely habitats and the extent of those habitats.</p> <p>A summary of surveys and assessment of habitats relevant to the Proposal is provided as Appendix 10.</p> <p>Troglofauna</p> <p>Over the span of the historical surveys, troglofauna were only recovered in the most recent survey. The recent survey yielded ten potentially troglobitic species across the region. The location of potentially troglobitic species that have been recorded are shown in Figure 9-1. The majority of potentially troglobitic species recorded were collected as singletons, i.e. known only from a single individual at a single location. Most of the species are therefore known only from within the West Angelas area.</p> <p>Only one of the recorded potentially troglobitic species, <i>Embioptera</i> sp. indet is associated with the Proposal. A single juvenile specimen was collected from a bore near Deposit A west. Classification to family level was not possible because only adult males can be taxonomically identified. Little is known about troglobitic <i>Embioptera</i>. Generally they have limited distribution due to the flightless nature of the females, and morphologically distinct groups appear to be geographically restricted. This species is thus considered to represent a potential SRE.</p> <p>The location at which this specimen was collected was outside the proposed pit and waste dump footprints of the Proposal. Refer to Figure 9-1.</p>	<p>Higher levels of endemism have been found to be characteristic of subterranean taxa, and endemic species tend to be concentrated in habitats that support relatively diverse communities, rather than being distributed randomly (Biota 2004b).</p> <p>The high levels of endemism that this fauna can exhibit may be due in part to poor dispersal capabilities. The dispersal of fauna inhabiting subterranean environs may be extremely slow and may be limited by the geological formation in which they occur. Many species have not been able to disperse a significant distance from their place of origin. Physical variables such as temperature and humidity may also influence the distribution of some subterranean species on a local and microhabitat scale (Danielopol <i>et al.</i> 1994 in Biota 2004b).</p> <p>Recent surveys and research have suggested that relatively localised impacts such as mining have the potential to significantly change the conservation status of locally endemic species (Eberhard and Humphreys 1999; Biota 2001 in Biota 2004b). However, no new or additional impacts to subterranean fauna are expected to result from implementation of this Proposal.</p> <p>Recent surveys and research have suggested that relatively localised impacts such as mining have the potential to significantly change the conservation status of locally endemic subterranean fauna species through the following impacts:</p> <ul style="list-style-type: none"> Excavation reducing subterranean habitat availability; Clearing reducing organic inputs to subterranean ecosystems; Dewatering, groundwater abstraction and other aquifer impacts reducing habitat availability for stygofauna and habitat quality for troglofauna; Changes to surface hydrology reducing rainfall recharge and the associated input of dissolved organic matter and nutrients to subterranean habitats; Vibration effects on subterranean habitats from blasting activities; and Contamination (e.g. pollutant spills) reducing the quality of subterranean fauna habitat. <p>However, subterranean fauna are not expected to be impacted by the Proposal given the following:</p> <ul style="list-style-type: none"> No species listed under the EPBC Act, WC Act or by Parks and Wildlife as critical, endangered or vulnerable have been recorded during the surveys. Stygofauna have not historically been recorded from, and are not expected to be recorded from, within the confined (i.e. low hydraulic connectivity) aquifers associated with the deposits. The Proposal has the potential to impact the potentially locally endemic troglofauna <i>Embioptera</i> sp. indet which was collected from a bore in Deposit A west however, the known 	<p>The Proponent considers that the Proposal meets the EPA's objective for this factor and it is therefore not considered a key environmental factor.</p> <p>The subterranean fauna sampling and habitat characterisation conducted within the Proposal area provides evidence to support that the Proposal will not have a significant impact on subterranean fauna biodiversity values at local or regional scales.</p> <p>Dewatering will continue to be managed under the existing RIWI Act (5C Licence to Take) and associated Groundwater Operating Strategy and any amendments as required.</p> <p>In addition, the following key management measures from the Environmental Management Program (Appendix 8) have been, and will continue to be, implemented to manage potential impacts on subterranean fauna:</p> <ul style="list-style-type: none"> Water supply will be sourced from dewatering bores wherever practicable to reduce potential for drawdown in the Jeerinah Formation. Where stygofauna are known to be present in an aquifer, that aquifer will be monitored for subterranean habitat parameters (water levels and water quality). In the event that new bores are to be installed within an aquifer that has not yet been monitored for stygofauna, a stygofauna assemblage baseline survey should be undertaken. If sampling indicates that stygofauna species of significant conservation value are present, bores will be added to the monitoring schedule for subterranean habitat parameters.

Factor	EPA Objective	Description of Factor	Impacts	Existing Management and Mitigation Measures
		<p>The occurrence of the apparently endemic species <i>Embioptera</i> sp. indet, likely reflects a sampling artefact rather than a true reflection of a potentially restricted range. It is considered probable that the distribution of this species extends in continuous habitat.</p> <p>The recent OEPA (2012) review of subterranean fauna assessment in Western Australia highlights the inherent difficulty in conclusively demonstrating that the likely distribution of species extends outside of recorded locations however, it acknowledges that species are unlikely to be confined to single recorded locations where there is habitat continuity. The assumptions made on the likely wider distribution of the potentially troglobitic species, <i>Embioptera</i> sp. indet associated with the Proposal are consistent with the review:</p> <p>The Marra Mamba Iron Formation is not considered core habitat for the persistence of significant populations of troglofauna. Deposits A west and F are considered 'typical' of Marra Mamba Iron Formation. The massive-textured geology of these deposits does not provide suitable interconnected cavities or void spaces, suggesting that the distribution of subterranean fauna is likely to be limited in this formation.</p> <p>Moreover, this geological formation is well-represented in the region. Even if the sedimentary rocks of the Marra Mamba Iron Formation hosted some troglofauna, the proposed area of Marra Mamba Iron Formation affected by mining is negligible is comparison to the overall area of the formation present in the wider region.</p> <p>Local fracture systems and weathered zones associated with regional lineaments are one of the only parts of the Marra Mamba Iron Formation which represent potential troglofauna habitat. It is likely that these fractured and weathered zones extend vertically and horizontally outside of the deposits suggesting there is habitat continuity through areas where the species was not recorded. It may be reasonably expected that if troglofauna were present within local fracture systems and weathered zones, then they would be well represented across the entire area.</p> <p>Hydrated, vuggy-textured material has also previously been identified as potential troglofauna habitat elsewhere in the Pilbara. The widespread regolith of hydrated material, which is commonly intersected in the Mount Newman Member close to the surface, is the only other part of the formation which potentially can exhibit micro-vughy textures. Hydrated zones extend beyond the deposits (i.e. they occur both locally and regionally). It is therefore likely that troglofauna habitat extends into continuous habitat in the surrounding strata.</p> <p>The deeper geological units that are saturated (below the water table) do not support troglofauna communities.</p> <p>Stygofauna</p> <p>Over the span of the historical surveys stygofauna were recovered from bores within both the Turee Creek B borefield and the West Angelas borefield. The majority of potentially stygobitic species were collected in low abundance, with 21 records in total. No stygobitic records were recorded from bores sampled at Deposit A West and F to date, however sample bores available to water table</p>	<p>range of 'restricted' species, particularly those represented by a single specimen, is likely to be an underestimate. It is considered probable that the range of this 'restricted' species will extend in continuous habitat.</p> <ul style="list-style-type: none"> Adequate sampling (as per EPA (2013) has occurred. Low capture rates mean Rio Tinto is using habitat as a surrogate for the distribution of subterranean fauna taxa, as per the approach outlines in EPA (2013). The Marra Mamba Iron Formation is not considered core habitat for the persistence of significant populations of troglofauna. Moreover, even if the Marra Mamba Iron Formation hosted some troglofauna, the proposed area of Marra Mamba Iron Formation affected by mining is negligible is comparison to the continuous extent of Marra Mamba formation within the syncline and overall area of the formation present in the wider region. Local fracture systems and weathered zones as well as hydrated material, which represent potential troglofauna habitats both connect and extend outside of the deposits suggesting there is habitat continuity through areas where species were not recorded. It may be reasonably expected that if troglofauna were present, then they would be well represented within the local area. <p>For these reasons, subterranean fauna is not considered a key environmental factor relevant to this Proposal.</p>	

Factor	EPA Objective	Description of Factor	Impacts	Existing Management and Mitigation Measures
		<p>were limited. Refer to Figure 9-1.</p> <p>Distribution patterns of stygofauna in aquifers are considered to be determined by hydraulic connectivity rather than associated with particular geologies. Stygofauna require adequate hydraulic connectivity to allow food and oxygen to be distributed from the surface to the groundwater.</p> <p>Open (porous, fractured and karstic) aquifers have abundant interstitial space and at least moderate hydraulic conductivity. There is continuous exchange with surface water for food and oxygen supply, which is why stygofauna communities are often found in this aquifer type (Hahn and Fuchs 2009). Historically, the Turee Creek B borefield, which is located within an open aquifer, has yielded stygofauna (<i>ecologia</i> 2013).</p> <p>Confined and / or compact aquifers have low hydraulic conductivity and are not considered overly prospective habitat for stygofauna according to classifications by the EPA (2013). These types of aquifers have minimal interstitial space and reduced food and oxygen supply, which is why these aquifer types are usually either devoid of stygofauna or have depleted taxonomic richness and abundance (Hahn and Fuchs 2009 in <i>ecologia</i> 2013). Historically, the Deposit A aquifer, which is a confined aquifer has returned no stygofauna (Biota 2003, 2008).</p> <p>Given the depth and hydraulically confined nature of the Deposits A west and F aquifers, these aquifers are considered unlikely to support significant populations of stygofauna. This does not preclude the potential occurrence of stygofauna if the aquifers have secondary hydraulic conductivity in the form of local fractures. However, the historic sampling of the Deposit A, which failed to detect stygofauna, suggests there is a low likelihood of a diverse and abundant stygofauna community being present in these analogous aquifers.</p>		

Geology Legend

- Czc - Colluvium - partly consolidated valley-fill deposits. Detritals
- Czr - Hematite and goethite - LATERITE
- Fd - Metadolerite sills intruded into Fortescue Group; medium to coarse-grained, usually foliated. Massive grey - green rock
- Fj - Shale, chert, jaspilite, mudstone, quartzite and dolomite. Intruded by dolerite sills
- Fjb - Metabasalt; pillows locally well developed
- Hb - Banded jaspilite and chert with some shale dolomitic with riebeckite and crocidolite at Wittenoom Gorge and Dales Gorge. Contains stromatolites
- Hd - Thin to medium-bedded grey crystalline dolomite, intercalations of chert, dolomitic shale, and metatuff in upper part.
- Hm - Chert, ferruginous chert and banded iron with minor shale; jaspilite with pronounced 'pinch and swell' structures, small occurrences of manganese
- Hs - Pelite, chert and banded iron formation
- Qa - Alluvium - unconsolidated silt, sand, aeolian sand, red loamy sand in drifts and fixed self dunes and gravel.
- Qc - Colluvium - unconsolidated quartz and rock fragments in soil.
- Qw - Alluvium and colluvium - red-brown sandy and clayey soil.

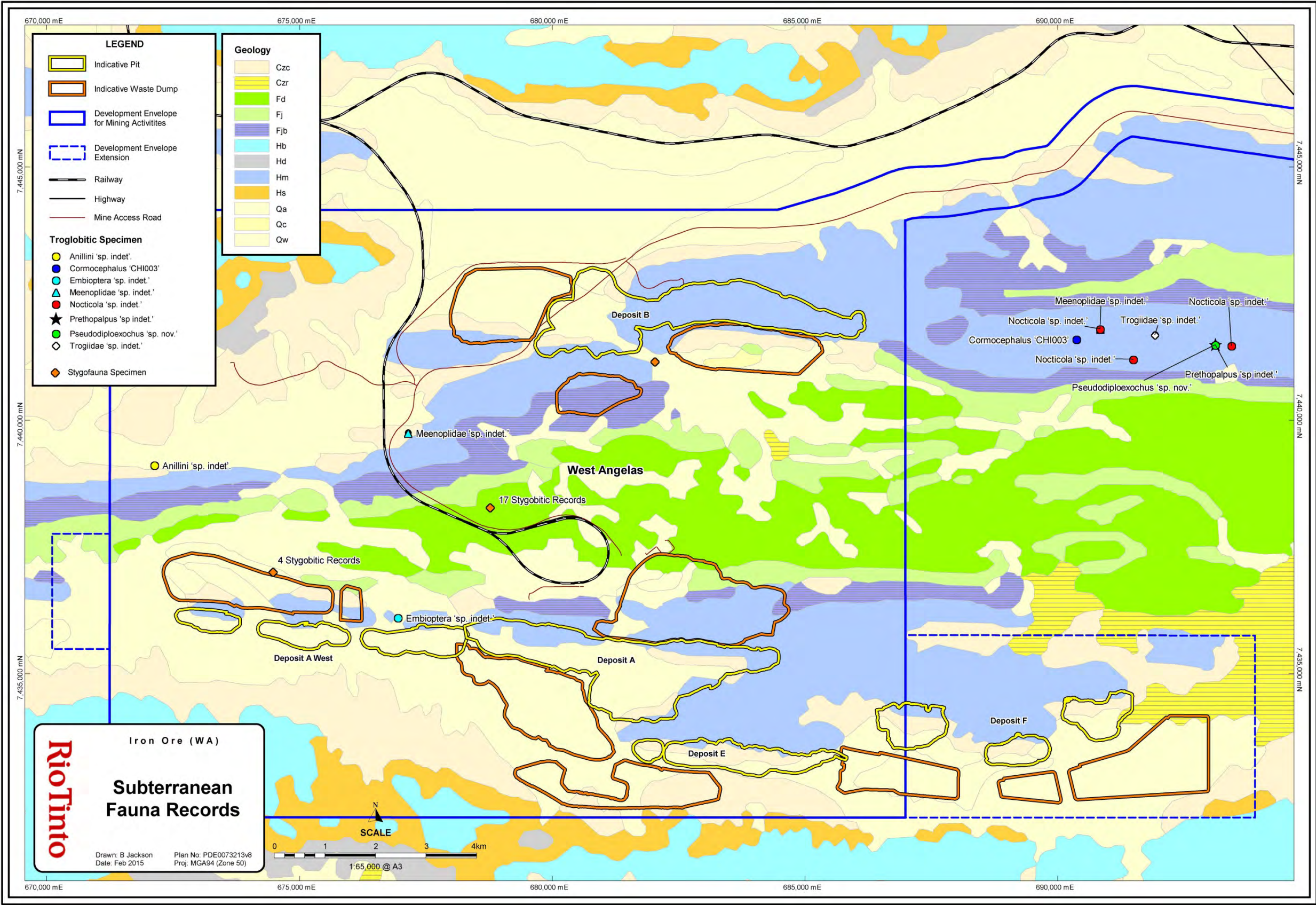


Figure 9-1: Subterranean Fauna Records

Factor	EPA Objective	Description of Factor	Impacts	Existing Management and Mitigation Measures
Terrestrial Environmental Quality	<i>To maintain the quality of land and soils so that the environment values, both ecological and social, are protected.</i>	<p>The Proposal will generate approximately 130 Mm³ of mineral waste rock. Waste rock will be transported by haul trucks to external waste dumps according to the material categorisation. Where practicable, waste may also be used in progressive backfilling of the pits to assist in achieving closure objectives for the site.</p> <p>Other wastes generated by the proposal will include:</p> <ul style="list-style-type: none"> inert and putrescible domestic and industrial wastes; liquid wastes including ablution effluent; hazardous waste including hydrocarbons, chemicals, used oils and greases <p>Inert and putrescible domestic and industrial wastes associated with the Proposal will continue to be disposed of to the existing on-site landfill facility.</p> <p>Bulk quantities of fuel required for ongoing operations will continue to be stored in on-site bulk fuel storage facilities. Fuel storage and handling will be in accordance with Australian Standard (AS) 1940 “The storage and handling of flammable and combustible liquids” and/or the <i>Dangerous Goods Safety (Explosives) Regulations 2007</i> and their updates.</p>	<p>Wastes, if inappropriately managed, have the potential to contaminate soils.</p> <p>Waste generation is not expected to be significantly greater than or different to existing operations. Wastes will continue to be handled, stored, treated and / or disposed of in a manner that minimises the risk to both ecological and social values.</p>	<p>The Proponent considers that the Proposal meets the EPA’s objective for this factor and it is therefore not considered a key environmental factor.</p> <p>Wastes associated with the Proposal will be managed using existing facilities, in accordance with relevant approvals and legislation. Operating licence L7774/2000, issued under Part V of the EP Act, contains specific requirements for the management of wastes within the prescribed premise boundary. The licensee will consult DER if additional approvals are required.</p> <p>In addition, Rio Tinto has well established management strategies for the management of waste materials at its Pilbara operations. The Waste Management Plan (Appendix 8) has been, and will continue to be implemented to ensure waste materials are adequately managed in accordance with the waste management hierarchy of elimination, reduction, reuse, recycling, treatment and disposal. The following key management measures from the Waste Management Plan have been, and will continue to be, implemented to manage potential impacts of waste:</p> <ul style="list-style-type: none"> An inventory of wastes generated, handled and disposed of on-site and off-site will be developed and maintained. Assessment of the environmental risks associated with wastes generated and disposed of on-site will be developed and maintained. On-site waste storage, treatment and disposal facilities will be inspected on a regular basis to ensure compliance. <p>Mineral Waste</p> <ul style="list-style-type: none"> Mineral waste will be used in progressive backfilling of mine pit voids to above the natural ground water level as far as practicable. <p>Domestic and Industrial Waste</p> <ul style="list-style-type: none"> Waste generation will be minimised through the adoption of the waste management hierarchy (reduce, reuse, recycle) where practicable. Management of domestic and industrial waste will include: <ul style="list-style-type: none"> waste segregation, burning of waste will be prohibited, and sufficient number and appropriate placement of bins. The following will be disposed of at landfill facilities, which will be managed in accordance with licences and appropriate landfill guidelines: <ul style="list-style-type: none"> putrescibles (food scraps); biodegradables (e.g. paper, cardboard); inert materials (e.g. concrete, steel, wood); and other general rubbish (e.g. plastics).

Factor	EPA Objective	Description of Factor	Impacts	Existing Management and Mitigation Measures
				<ul style="list-style-type: none"> The landfill will be fenced and backfilled on a regular basis to prevent wind-blown litter and feral animal foraging. <p>Ablution effluent</p> <ul style="list-style-type: none"> Ablution effluent will be managed via appropriately licenced wastewater treatment facilities. Wastewater treatment facilities will be routinely maintained. Effluent from the wastewater treatment plant (WWTP) will be discharged within designated irrigation area. <p>Hazardous Waste</p> <ul style="list-style-type: none"> An inventory of hazardous materials on-site will be maintained. Hazardous waste materials will be segregated from the general waste stream. Hazardous waste materials will be collected as required by appropriately licenced controlled waste contractors for offsite disposal. Assessments of contractors and facilities will be undertaken to ensure that wastes sent off site for disposal or treatment are appropriately dealt with. Appropriate spill response equipment will be located nearby to work areas where hazardous materials are frequently used, such that it is available for immediate use. <p>Hydrocarbons</p> <ul style="list-style-type: none"> Hydrocarbons will be handled, stored and disposed of in accordance with all legal requirements. Hydrocarbon storage facilities and all associated connections will be within appropriately bunded areas. Hydrocarbon storage facilities and bunds will be inspected on a regular basis to identify any leaks or maintenance requirements. Any hydrocarbon contaminated soil will be remediated and/or disposed of as appropriate. Hydrocarbon waste materials not suitable for onsite disposal will be collected as required by appropriately licenced controlled waste contractors for offsite disposal or recycling. <p>Spill Response</p> <ul style="list-style-type: none"> All spills will be managed in accordance with the requirements of spill response procedures. Significant spills will be managed in accordance with emergency response procedures. Appropriate spill response equipment will be located nearby to work areas such that it is available for immediate use.

Factor	EPA Objective	Description of Factor	Impacts	Existing Management and Mitigation Measures
Inland Waters Environmental Quality	<i>To maintain the quality of surface water, sediment and biota so that the environmental values, both ecological and social, are protected.</i>	<p>Rio Tinto has undertaken an extensive program of geochemical testing, over several years, to understand the potential for acidification and / or metal enrichment to occur as a result of the various waste types common to mining operations in the Pilbara.</p> <p>The most significant geochemical risk in Pilbara iron ore bodies is associated with sulphides, such as pyrite (FeS₂), which can form sulphuric acid when exposed to oxygen and water. Mt McRae Shale, the geological unit most commonly associated with pyrite and acid mine drainage in the Pilbara, is not present at West Angelas. However, pyrite can also occur in Banded Iron Formations.</p> <p>Two hundred samples from the West Angelas deposits (ore and waste samples) have been submitted for Acid Base Accounting (ABA) and geochemical characterisation. For lithologies such as banded iron formation and detrital rock types, a value of 0.3% total sulphur concentration has been adopted as the boundary value to denote potentially acid forming (PAF) material from inert/non-acid forming (NAF) material. Samples associated with elevated-sulphate (where sulphur values may range from 0.1% to greater than 1%) have been classified as PAF.</p> <p>Deposits A west, B and D</p> <p>Overall, 92% of the samples submitted for ABA were classified as NAF. The remaining 8% of samples were classified as PAF or PAF in a low capacity (PAF-LC).</p> <p>The PAF samples are predominately from the Newman Member of the Marra Mamba Iron Formation. These samples are banded iron formation waste samples and the majority had visible pyrite logged. The PAF-LC samples are expected to have few sulphides present with the majority of the acid produced from the precipitation of metallic ions as hydroxides between pH 4.5 and 7. It is expected that material and water encountered on site will provide sufficient neutralisation capacity to offset the low levels of acid produced.</p> <p>Further analysis of sulphur values was undertaken on those rock types identified with acid-forming potential (and any related metaliferous drainage). The risk posed by the high sulphur values is determined by comparing the occurrence of sulphur levels greater than 0.1% and 0.3% against the total number of recorded drill samples for all in-pit (waste and ore) samples. These results suggest the risk of acid drainage being generated during the operation and / or from mineral waste materials from all deposits is low.</p> <p>Deposit F</p> <p>Overall, 41 samples (98%) were classified as NAF and one sample (2%) was classified as PAF. The PAF sample was taken from a depth that is below the current available pit designs, and is unlikely to be exposed during mining.</p> <p>A multi-element analysis was also undertaken for all drillhole samples taken from Deposits A, A west, B, E and F. In general, whilst concentrations of some trace elements of potential environmental concern (e.g. Fe, As, Sb, Se and S) were enriched or elevated in some of the sampled ore and waste materials, these elements will not necessarily mobilise into groundwater. Although As, Sb and Se were determined to be enriched in samples, the leach tests</p>	<p>AMD is produced by the exposure of sulphide minerals such as pyrite to atmospheric oxygen and water. PAF material has the potential to generate AMD if not appropriately characterised and managed.</p> <p>The AMD assessment concluded that the risk of AMD being generated from all deposits is low.</p>	<p>The Proponent considers that the Proposal meets the EPA's objective for this factor and it is therefore not considered a key environmental factor.</p> <p>Rio Tinto has well established management strategies for the management of PAF materials at its Pilbara operations. The Rio Tinto Iron Ore (WA) Mineral Waste Management Plan, and the Spontaneous Combustion and ARD (SCARD) Management Plan have been, and will continue to be implemented to ensure waste material is adequately geochemically characterised, and PAF material that poses an AMD risk is appropriately managed.</p>

Factor	EPA Objective	Description of Factor	Impacts	Existing Management and Mitigation Measures
		indicated that these elements did not leach at levels exceeding the detection limit. Arsenic in particular is commonly enriched in ore and waste for many Hamersley Group deposits. Iron oxy-hydroxides such as hematite and magnetite have high sorption capacities for arsenic. Groundwater contamination with arsenic is considered to be unlikely, based on historical groundwater assessments at West Angelas and experience from similar deposits in the Pilbara. Lead is similarly unlikely to mobilise into the groundwater and cause any environmental concern.		
Factor	EPA Objective	Description of Factor	Impacts	Existing Management and Mitigation Measures
Hydrological Processes and Inland Waters Environmental Quality (Groundwater)	<p><i>To maintain hydrological regimes of groundwater and surface water so that existing and potential uses, including ecosystem maintenance, are protected.</i></p> <p><i>To maintain the quality of groundwater and surface water, sediment and biota so that the environmental values, both ecological and social, are protected.</i></p>	<p>Groundwater throughout the West Angelas region is naturally deep. Groundwater is not expected to support phreatophytic species given the existing natural depth to the water table.</p> <p>Resources for both Deposits A west and F are mostly above water table. Approximately 6% of the Deposit A west resource and 1% of the Deposit F resource occurs below the water table.</p> <p>Deposit A west</p> <p>The aquifer at Deposit A west is associated with a mineralised section of the Mount Neman Member of the Marra Mamba Iron Formation and the overlying Wittenoom Formation (Figure 9-2).</p> <p>The water table elevation at Deposit A west is nominally 625 m RL, or approximately 90 m below ground level (m bgl). Dewatering between 1.5-2.6ML/day is expected to enable mining to a depth of approximately 40m below the water table. Based on observed differences in groundwater elevation and the “bathtub” type nature of the Deposit A aquifer, it is likely that Deposit A west is hydraulically separated from Deposit A.</p> <p>Dewatering the Deposit A west pits is expected to yield approximately between 1.5-2.6ML/day, which will be used to meet demand of up to 2.3 ML/day with a small surplus available for use elsewhere.</p> <p>Deposit F</p> <p>The aquifer at Deposit F is also associated with a mineralised section of the Mount Neman Member of the Marra Mamba Iron Formation and the overlying Wittenoom Formation (Figure 9-3).</p> <p>The water table elevation at Deposit F varies from approximately 686 m RL, or approximately 95 m bgl in pit F1 to 670 m RL, or approximately 118 m bgl in pits F2 and F3. Dewatering between 0.6-1.8ML/day is expected to enable mining to a depth of approximately 25 m below the water table. Based on observed differences in groundwater elevation, it is thought that pit F1 is hydraulically separated from pits F2 and F3, as well as the nearby Deposit E.</p> <p>A water deficit is predicted for Deposit F; dewatering the Deposit F pits is expected to yield approximately between 0.6-1.8 ML/day, which is unlikely to meet demand of up to 2.1 ML/day and therefore, additional water sources are likely to be required (as</p>	<p>Abstraction of groundwater for the Proposal is expected to have minimal impact on groundwater levels in the area due to the minor volumes extracted. Additionally, studies undertaken to date indicate any impacts on groundwater levels will be localised, there will be no significant impacts on regional groundwater levels.</p> <p>Analysis of water quality indicates that the groundwater is of good quality therefore, no impact is expected as a result of discharge to the environment.</p>	<p>The Proponent considers that the Proposal meets the EPA’s objective for this factor and it is therefore not considered a key environmental factor.</p> <p>Abstraction of groundwater at West Angelas has been approved under Groundwater Licence GWL98740, under the RIWI Act. Groundwater abstraction will continue to be managed under the existing RIWI Act Licence and associated Groundwater Operating Strategy, and any amendments as required.</p> <p>Discharge to the environment has been approved under operating licence L7774/2000, issued under Part V of the EP Act. The licensee will consult DER if additional dewatering discharge approvals are required.</p> <p>Condition 6 of the Ministerial Statement has been, and will continue to be, implemented to manage groundwater abstraction and dewatering activities to ensure minimal adverse impacts on the availability of groundwater resources or water dependent ecosystems.</p> <p>Condition 7 of the Ministerial Statement has been, and will continue to be, implemented to manage surface water drainage and discharge to ensure minimal adverse impacts on existing surface water drainage patterns or water dependent ecosystems.</p> <p>In addition, the following key management measures from the Environmental Management Program (Appendix 8) have been, and will continue to be, implemented to manage potential impacts on groundwater:</p> <ul style="list-style-type: none"> • A ‘site water balance’ will be developed and maintained to facilitate site’s understanding of current and future water demands. • Water will be used on-site wherever practicable. Only water exceeding on-site requirements will be discharged to the environment. • The volume of groundwater abstracted has been, and will continue to be, recorded, reconciled regularly against the licence limit and will not exceed the licence limit. • A water level elevation monitoring program has been, and will continue to be, implemented for groundwater.

Factor	EPA Objective	Description of Factor	Impacts	Existing Management and Mitigation Measures
		<p>discussed in the next section).</p> <p>Water Balance</p> <p>West Angelas is considered to be a water neutral (to small deficit) site in terms of overall water balance; operational water demand is roughly equivalent to dewatering requirements (Figure 9-4). While the site as a whole is water neutral, the water management of each deposit is different with some in deficit and others in surplus. Water sources across West Angelas are integrated to ensure continuity of supply. This integrated water management strategy will continue to be implemented to address water supply and demand requirements for the Revised Proposal.</p> <p>Any surplus water, exceeding operational water demand is discharged to the environment in accordance with existing licences. Discharge is not expected as a result of this Proposal; abstracted water will be used to meet operational water demand. However, should discharge be required, amounts are expected to be minimal and within the existing licence limits. Existing discharge is less than 3% of the licence limit. This proposal is considered likely to reduce the surplus water discharge volumes associated with the existing operations.</p> <p>Existing Licences</p> <p>Abstraction of groundwater at West Angelas has been approved under Licence L7774/2000, issued under Part V of the EP Act for dewatering of up to 6,000,000 tonnes per annum (6 GL/a) and Groundwater Licence GWL98740, issued under the RiWI Act for abstraction of 5,000,000 kL (5 GL/a) from the mine for dewatering and water supply purposes. Existing abstraction is approximately 30% of the licence limit (approximately 1.6 GL/a).</p> <p>Groundwater abstraction will continue to be managed under the existing RiWI Act Licences and the associated Groundwater Operating Strategy, and any amendments as required.</p> <p>Discharge at West Angelas has been approved under Licence L7774/2000, issued under Part V of the EP Act for discharge through the existing discharge outlet (shown on Attachment 2 of Licence L7774/2000). Existing discharge is less than 3% of the licence limit (approximately 0.2 GL/a).</p> <p>Discharge will continue to be managed under the existing Part V Licences, and any amendments as required.</p> <p>Quality</p> <p>Groundwater sampling and analysis of water quality indicates that the groundwater is of good quality.</p>		<ul style="list-style-type: none"> • A water quality monitoring program has been, and will continue to be, implemented for groundwater. • Pits will be backfilled to above the natural ground water level as far as practicable to minimise the deterioration of groundwater quality. • Monitoring to assess the impacts of drawdown on phreatophytic vegetation (<i>Eucalyptus</i> sp.) has been, and will continue to be, undertaken.

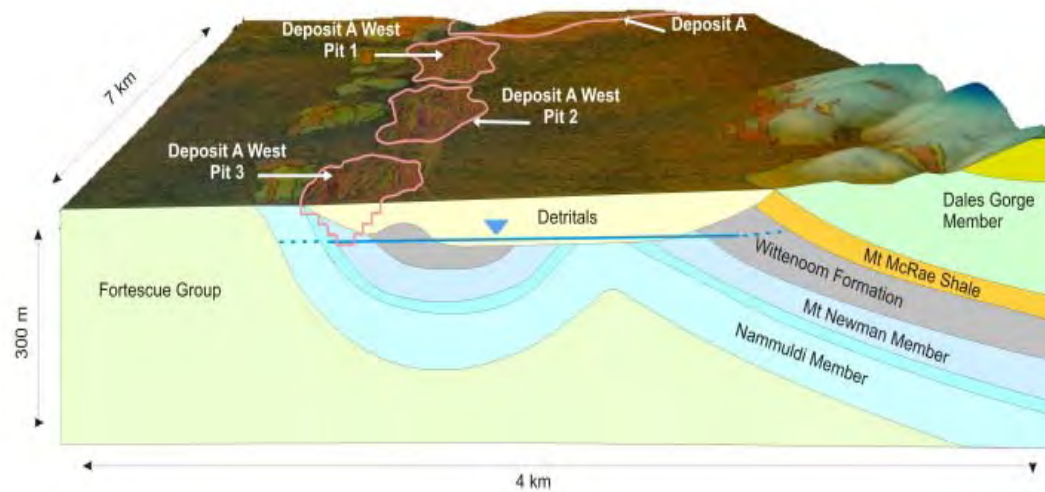


Figure 9-2: Conceptual Cross-Section of Deposit A west

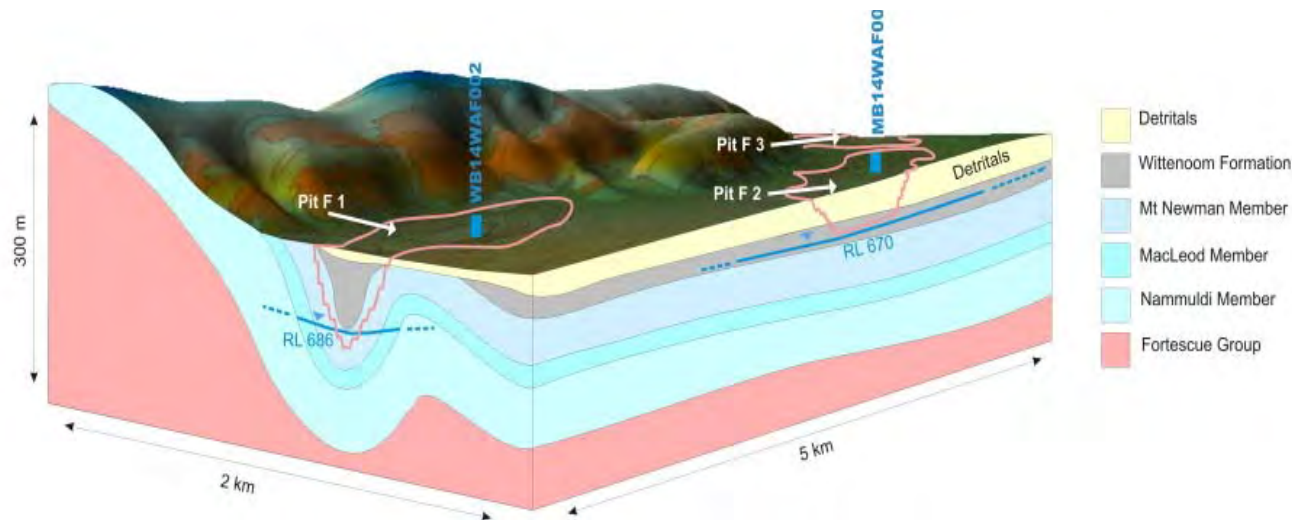


Figure 9-3: Conceptual Cross-Section of Deposit F

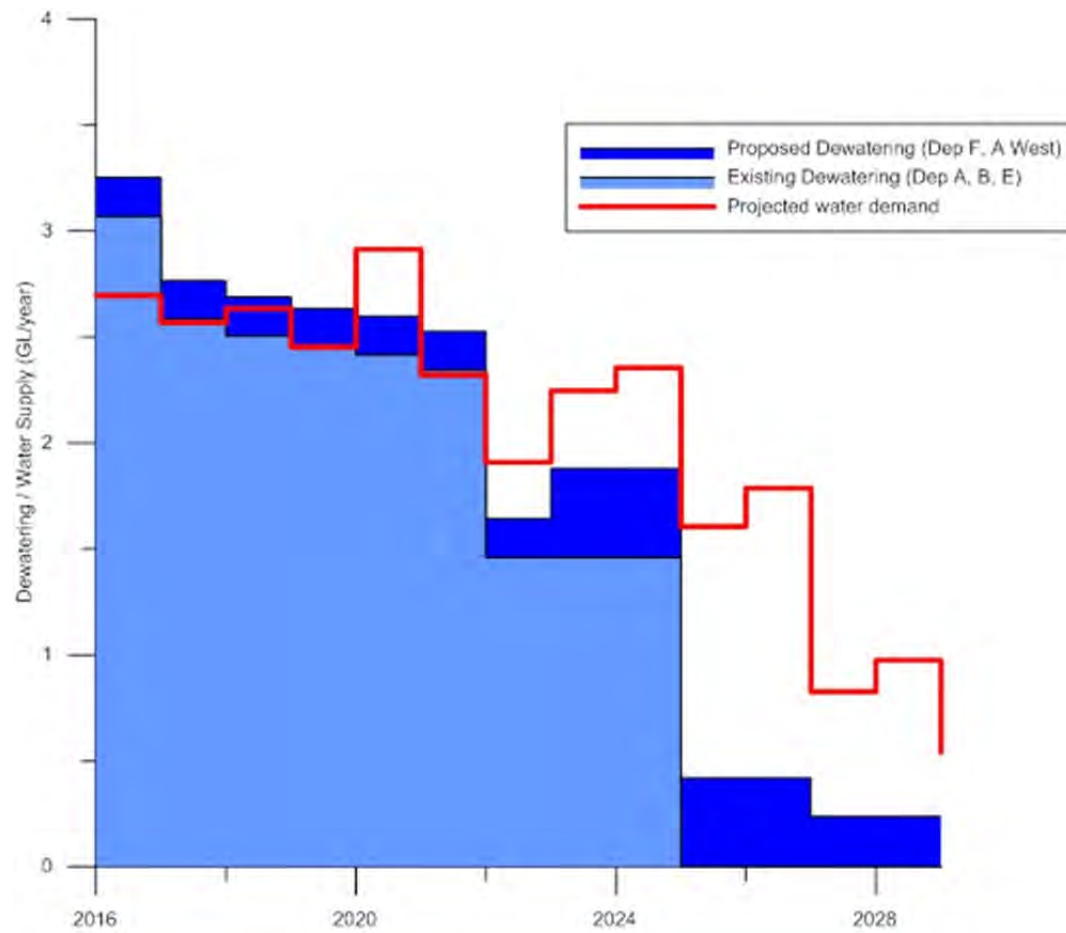


Figure 9-4: Cumulative dewatering and water supply predictions for West Angelas

Factor	EPA Objective	Description of Factor	Impacts	Existing Management and Mitigation Measures
Air Quality and Atmospheric Gases	<i>To maintain air quality for the protection of the environment and human health and amenity, and to minimise the emission of greenhouse and other atmospheric gases through the application of best practice.</i>	<p>The Proposal will generate dust and Greenhouse Gas (GHG) emissions.</p> <p>Dust</p> <p>Particulate emissions resulting from this Proposal are associated with:</p> <ul style="list-style-type: none"> vehicle activity – heavy mining equipment and light vehicles on unsealed surfaces; mining and processing – blasting, loading, hauling, crushing, conveying, screening and stockpiling material; and wind erosion – in dry, windy conditions, particles can be lifted from disturbed areas. <p>No modelling of projected cumulative particulate emissions was undertaken as dust emissions generated by the Proposal are not expected to be greater than or different to those from existing operations.</p> <p>GHG</p> <p>No GHG emissions assessment was undertaken as it is considered that the emissions generated by the Proposal will essentially be similar to those of existing operations.</p> <p>West Angelas is seen as a relatively small emitter of GHG. The key energy demand for the Proposal is diesel consumption. Diesel consumption estimates for the Proposal (i.e. considering only the consumption associated with Deposits A west and F, and not the total impact for the Revised Proposal) is approximately 135 ML for Deposit A west and approximately 195 ML for Deposit F.</p>	<p>Dust emissions will continue to be mitigated as far as reasonably practicable such that potential health and safety issues at the only nearby sensitive receptor, the village, are not expected to be significantly greater than or different to those of existing operations.</p> <p>GHG emissions are not expected to be significantly greater than or different to those of existing operations. Greenhouse gas emissions will be mitigated as far as reasonable practicable and will be managed in to meet environmental greenhouse gas emission standards.</p>	<p>The Proponent considers that the Proposal meets the EPA's objective for this factor and it is therefore not considered a key environmental factor.</p> <p>Emissions are not expected to be significantly greater than or different to those of the existing operations.</p> <p>Emissions and discharges are primarily regulated under Part V of the EP Act, unless the environmental impact is significant and warrants EIA by the EPA under Part IV of the Act (EPA 2012). Emissions from the existing operations have been, and will continue to be, managed under the existing operating licence. The licensee will consult the DER if additional approvals are required.</p> <p>Additionally, GHG emissions have been, and will continue to be managed under the <i>Clean Energy Act 2011</i> (Cwth) and reported under the <i>National Greenhouse and Energy Reporting Act 2007</i> (Cwth).</p> <p>Impacts on community receptors from nuisance dust is expected to be limited, and therefore no specific management strategy is required. However, the following key management measures from the Environmental Management Program (Appendix 8) have been, and will continue to be, implemented to manage the potential impacts of dust:</p> <p>Dust</p> <ul style="list-style-type: none"> Clearing has been, and will continue to be planned such that vegetated areas are retained until required ahead of mine development. Disturbed areas have been, and will continue to be progressively rehabilitated, where possible. Watering from water tankers and / or other appropriate dust suppression methods have been, and will continue to be undertaken at areas prone to dust generation, including: <ul style="list-style-type: none"> access road; haul roads; active pit areas; mineral waste and topsoil stockpiles, and cleared areas, as required. Crushing and screening facilities have been, and will continue to be operated with suitable dust suppression and extraction systems, screens and / or sprays. The train loadout facility has, and will continue to use water sprays to reduce dust generation. Regular housekeeping has been, and will continue to be undertaken to prevent an accumulation of material in or around plant facilities that may result in dust. Dust suppression equipment will be maintained in an efficient operating condition. Vehicle access has been, and will continue to be restricted to designated tracks and roads as far as practicable. Vehicle speed limits have been, and will continue to be prescribed to reduce dust lift-off from unsealed roads. High use roads have been, and will continue to be sealed where practicable.

Factor	EPA Objective	Description of Factor	Impacts	Existing Management and Mitigation Measures
Amenity (Visual)	<i>To ensure that impacts to amenity are reduced as low as reasonably practicable.</i>	<p>The location of West Angelas is very remote, with no neighbouring mining or pastoral activities. The nearest town, Newman, is located approximately 130 km south-east of West Angelas.</p> <p>The visual landscape in the region is predominantly natural in appearance, with localised areas of highly modified landscapes due to mining.</p>	<p>Visual impact of the Proposal is not expected to be different or additional to that of the existing West Angelas Project, in consideration of the following:</p> <ul style="list-style-type: none"> • The Proposal is an extension to the existing operation. • The Proposal is remote from communities or other sensitive areas such as scenic outlooks or National Parks. • There are no public roads in the vicinity to facilitate access. 	<p>The Proponent considers that the Proposal meets the EPA's objective for this factor and it is therefore not considered a key environmental factor.</p> <p>Impacts on the visual amenity of community receptors are expected to be limited, and therefore no specific management strategy is required.</p> <p>The following key management measures from the Environmental Management Program (Appendix 8) have been, and will continue to be, implemented to manage potential impacts on visual amenity:</p> <ul style="list-style-type: none"> • The design (height and slope) of mineral waste dumps will consider: <ul style="list-style-type: none"> ○ minimisation of dump height; ○ shaping of dumps to blend in with the surrounding natural topography; ○ construction to meet the requirements of the final rehabilitation design; and ○ drainage and erosion management features. • Progressive backfilling will be implemented as far as practicable. • Progressive rehabilitation with local native vegetation has been, and will continue to be, undertaken where possible. <p>The following closure objectives will also ensure that impacts to amenity are reduced as low as reasonably practicable at closure:</p> <ul style="list-style-type: none"> • Minimise the long term visual impact by reshaping the land so it is compatible with the adjacent landscapes; and • Re-establish self-sustaining ecosystems.
Factor	EPA Objective	Description of Factor	Impacts	Existing Management and Mitigation Measures
Heritage	<i>To ensure that historical and cultural associations, and natural heritage, are not adversely affected.</i>	<p>This Proposal is located within the traditional lands of the Yinhawangka and Ngarlawangga people. The Yinhawangka People are the native title claimants and traditional custodians of the majority of the land. The Ngarlawangga People are the native title claimants for a portion of the Deposit F area.</p> <p>West Angelas has an existing Section 18 consent under the <i>Aboriginal Heritage Act 1972 (AHA)</i> that was granted by the Minister for Aboriginal Affairs in January 2000. Sites that will be impacted by pits will require additional Section 18 AHA consent.</p> <p>Archaeological and ethnographic surveys have been undertaken over the majority of the Proposal area. To date no ethnographic sites have been identified. A number of heritage sites have been identified at both Deposits A west and F.</p> <p>At Deposit A west the majority of the heritage sites include artefact scatters. Based on the current design for A west, three artefact scatters will be impacted. Section 18 consent will need to be sought for impact to these sites.</p> <p>At Deposit F the sites identified include rock shelters, scarred trees and artefact scatters. A significant rock shelter containing rock art is</p>	<p>Surveys undertaken to date indicate the Proposal is unlikely to have significant impact on Aboriginal heritage, in addition to or different from the existing West Angelas Project:</p> <ul style="list-style-type: none"> • No ethnographic sites have been identified to date. • Archaeological sites identified include rockshelters, scarred trees and artefact scatters. Some of the archaeological sites identified may be impacted by the Proposal; however, these sites are of low to moderate significance. • If sites cannot otherwise be avoided, the impacts will be managed in accordance with the AHA Section 18, and in consultation with Traditional Owners. • The significant rockshelter containing rock art, located approximately 500 m to the north of pit F2 is not at risk of impact from current mine plans, however monitoring of the site will be required. 	<p>The Proponent considers that the Proposal meets the EPA's objective for this factor and it is therefore not considered a key environmental factor.</p> <p>It is not expected that Aboriginal Heritage values will be impacted by this Proposal.</p> <p>Ongoing engagement with Traditional Owners is managed and maintained through engagement frameworks established through our agreements. This ensures all activities occur with ongoing engagement with both groups.</p> <p>Management strategies from the existing West Angelas Cultural Heritage Management Plan have been, and will continue to be, implemented for the protection and conservation of cultural heritage at the site.</p>

Factor	EPA Objective	Description of Factor	Impacts	Existing Management and Mitigation Measures
		<p>located approximately 500 m to the north of pit F2.</p> <p>Based on the current design for Deposit F, one artefact scatter will be directly impacted in pit F2. Three rock shelters within immediate proximity of pit F1 may be affected by indirect impacts as a result of blasting. Additionally, a rock shelter and scarred tree located within vicinity of pit F2 may also be affected by indirect impacts. Section 18 consent for these sites will need to be sought and the rock shelters may require archaeological excavation.</p>		

10 CUMULATIVE IMPACTS

Cumulative impacts can arise where operation level impacts act synergistically, cause indirect impacts or combine to exacerbate impacts spatially and/or through time. In the case of Pilbara mining projects, a principal concern is the potential for multiple mining projects to incrementally diminish and degrade environmental values that would otherwise not be significantly affected by each project in isolation.

Robe's knowledge of current and potential mining projects in the region, in addition to the Revised Proposal, is limited to the following seven iron ore mines (refer to Figure 1-1):

- Mining Area C is located approximately 35 km north-north east of West Angelas;
- Hope Downs is located approximately 45 km north east of West Angelas;
- Yandi (Marillana Creek) is located approximately 60 km north-north east of West Angelas;
- Yandicoogina is located approximately 65 km north east of West Angelas;
- Hope Downs 4 is located approximately 85 km east of West Angelas;
- Marandoo is located approximately 90 km north west of West Angelas; and
- Mount Whaleback is located approximately 95 km north east south-east of West Angelas.

Given its distance from the nearest existing operations, absence of unique or unusual ecological features, and the relatively small scale of clearing proposed, Robe does not consider that the Revised Proposal will contribute to significant cumulative impacts. An assessment of the potential for cumulative impacts in relation to the Revised Proposal is summarised in Table 10-1.

Table 10-1: Assessment of potential for cumulative impacts

Possible cumulative impact	Description and assessment of significance
Disturbance to landforms	The Revised Proposal does not intersect landforms with elevated conservation significance or other special interest. Whilst existing and potential future operations may affect the same land systems, all of the land systems mapped are widely distributed across the Pilbara. Therefore no significant cumulative impacts are predicted.
Disturbance to vegetation and flora	<p>The Revised Proposal is an extension to existing West Angelas operations. The location is very remote with no neighbouring mining or pastoral activities.</p> <p>The Revised Proposal does not intersect vegetation of high conservation significance. All vegetation units and Priority Flora species that will be disturbed by this Revised Proposal are well represented in the Pilbara bioregion. Therefore no significant cumulative impacts are predicted.</p>
Disturbance to habitat for fauna species	The Revised Proposal does not intersect habitats of regional significance for rare and endangered fauna species. All of the habitat types that will be disturbed by this Revised Proposal are well represented in the Pilbara bioregion. Therefore no significant cumulative impacts are predicted.

Possible cumulative impact	Description and assessment of significance
Disturbance to hydrological processes	<p>The Revised Proposal involves the continuation discharge of surplus water to a nearby unnamed tributary of Turee Creek East. It is anticipated that discharge will decrease as production from existing mostly below water table deposits declines and new, mostly above water table ore sources are developed. No other known current or potential mining projects in the region thereby avoiding the potential for cumulative impacts to occur within Turee Creek East as a result of discharge from multiple operations.</p> <p>The Revised Proposal also involves the diversion of surface water to the adjacent Weeli Wolli catchment. The additional catchment contribution will have a negligible effect on the natural hydrological regime of the receiving catchment, with no increase in flow expected 30 km downstream, in events up to a 20% AEP. Given that the nearest operation which contributes additional water to Weeli Wolli is located approximately 45 km downstream, the diversion does not contribute to cumulative impacts in the local catchment.</p>

11 RESIDUAL IMPACTS: IMPACT ASSESSMENT AND MANAGEMENT

11.1 DETERMINATION OF SIGNIFICANT RESIDUAL IMPACT

The WA Environmental Offsets Policy (Government of Western Australia 2011) and WA Environmental Offsets Guideline (Government of Western Australia 2014) provide guidance to proponents on the approach needed to determine offset requirements for proposals.

The Environmental Offsets Guideline (2014) states that:

“In general, significant residual impacts include those that affect rare and endangered plants and animals (such as declared rare flora and threatened species that are protected by statute), areas within the formal conservation reserve system, important environmental systems and species that are protected under international agreements (such as Ramsar listed wetlands) and areas that are already defined as being critically impacted in a cumulative context. Impacts may also be significant if, for example, they could cause plants or animals to become rare or endangered, or they affect vegetation which provides important ecological functions”.

Environmental aspects of the Revised Proposal were assessed for potential significant residual impacts.

The Revised Proposal does not lie within a reserve or protected area. Vegetation mapping has been completed and does not indicate the presence of any vegetation types that qualify for specific legislative protection (i.e. TECs). The Priority 1 West Angelas Cracking-Clay PEC occurs extensively within the area. None of the other vegetation types identified were considered to be sufficiently rare or restricted to warrant designating them as being of high conservation significance. The grove/intergrove and valley floor mulga were considered to have moderate conservation significance. The remainder of the vegetation types were considered to be of low conservation significance, representing units that are likely to be widely distributed and relatively well represented in the region.

Vegetation communities were generally found to be in Very Good to Excellent condition despite evidence of weed invasion.

Whilst some occurrences of Priority listed species (flora and fauna) have been recorded, none of these were found to be restricted to the Proposal area.

11.2 OFFSET REQUIREMENTS FOR THE PROPOSAL

The EPA considers that the increased amount of clearing of native vegetation in the Pilbara Bioregion, combined with the predicted future activities requiring clearing and other impacts from pastoralism and fires, is likely to result in a significant impact on environmental values. Subsequently the EPA has determined that a proactive approach to limiting these impacts is required and that a possible solution is the establishment of a strategic regional conservation initiative for pooling of offset funds for the Pilbara.

As a result, offsets for clearing of native vegetation considered in Good to Excellent condition have consistently been applied for in the Pilbara Bioregion. Where there is an additional level of environmental value, a higher offset has been applied to account for this greater value. This approach has generally applied for all proposals within the Fortescue subregion, as well as some that are in the Hamersley subregion.

An assessment of potential impacts of the Proposal was undertaken in accordance with the WA Environmental Offsets Guidelines (EPA 2014). It is expected that an offset will be required for clearing of native vegetation in Good to Excellent condition.

The Hamersley subregion is fairly well represented (12.6%) within the conservation reserve system. Lower offset rates for clearing of native vegetation in Good to Excellent condition have therefore been applied in recognition of this fair representation (i.e. this below the target of 15%). It is therefore expected that this lower offset rate will be applied to this Revised Proposal.

Additionally, given that MS 970 does not specify the need for an offset, Rio Tinto considers that it is reasonable that the offset should only apply to the proposed additional clearing that forms part of this Revised Proposal. This approach is consistent with other recent Ministerial Statements.

The Residual Impact Table is included in Table 11-1.

Table 11-1: Environmental Offsets Reporting Form

Existing environment/ Impact	Mitigation			Significant Residual Impact	Offset Calculation Methodology				
	Avoid and minimise	Rehabilitation Type	Likely Rehab Success		Type	Risk	Likely offset success	Time Lag	Offset Quantification
<p>The Proposal will result in clearing of up to 3,220 ha of vegetation, including vegetation communities which are considered to be of local conservation significance.</p> <p>The vegetation was assessed to be in Very good to Excellent condition.</p>	<p>Avoid:</p> <p>Deposit A west has been designed to avoid the Priority 1; West Angelas Cracking Clay Priority Ecological Community (PEC). Therefore the Cracking Clay PEC is not proposed to be detrimentally impacted by the Proposal.</p> <p>Deposit F has been designed to avoid the potential Ghost Bat maternity cave (AA1). Robe has also committed to maintain a 100 m exclusion zone to protect the integrity of the cave.</p> <p>Minimise:</p> <p>Use of existing facilities will minimise clearing of undisturbed native vegetation.</p> <p>Additional clearing will be minimised as far as practicable and will avoid areas of elevated conservation significance as far as practicable.</p> <p>Rectify and Reduce:</p> <p>Where clearing is unavoidable, areas will be progressively rehabilitated with local native vegetation where possible.</p> <p>The Environmental Management Plan will be implemented to manage potential impacts of the Proposal on Key Environmental Factors.</p> <p>The Closure Plan will be implemented to ensure that the Proposal can be closed in an ecologically sustainable manner, consistent with agreed outcomes and land uses.</p>	<p>Areas will be progressively rehabilitated with local native vegetation where possible.</p>	<p><u>Can the environmental values be rehabilitated/Evidence? Operator experience in undertaking rehabilitation?</u></p> <p>Yes – Rio Tinto has undertaken successful rehabilitation in the Pilbara.</p> <p><u>What is the type of vegetation being rehabilitated?</u></p> <p>Mulga (<i>Acacia aneura</i>) woodland over a <i>Triodia pungens</i>, <i>T.basedowii</i> hummock grassland.</p> <p><u>Time lag?</u></p> <p>Progressive rehabilitation where possible.</p> <p><u>Credibility of the rehabilitation proposed (evidence of demonstrated success)</u></p> <p>See previous rehabilitation from Rio Tinto.</p>	<p><u>Extent</u></p> <p>3,220 ha</p> <p><u>Quality</u></p> <p>Vegetation is in Good to Excellent condition</p> <p><u>Conservation Significance</u></p> <p>Conservation significant environmental assets include:</p> <ul style="list-style-type: none">The Priority 1; West Angelas Cracking Clay Priority Ecological Community (PEC).Valley floor mulga communities are deemed to be “ecosystems at risk” (Kendrick 2001) and are therefore considered to be of local conservation significance.The potential maternity cave AA1 for the Priority 4 listed species, the Ghost Bat (<i>Macroderma gigas</i>). <p>None of these conservation significant environmental assets are proposed to be detrimentally impacted by the Proposal.</p> <p><u>Land Tenure:</u> N/A</p> <p><u>Time Scale:</u> N/A</p> <p>According to the agreed significance framework, residual impact from clearing of native vegetation is considered to be significant because of concerns regarding cumulative impacts in the Pilbara.</p>	<p>Provision of funds to a Pilbara Strategic Conservation Initiative.</p>	<p>Low - Pilbara Strategic Conservation Initiative not established or not governed appropriately.</p>	<p><u>Can the values be defined and measured?</u></p> <p>Unknown as Fund not yet established.</p> <p><u>Operator experience/Evidence?</u></p> <p>Unknown as governance of Fund not yet established.</p> <p><u>What is the type of vegetation being revegetated?</u></p> <p>Unknown as use of Fund not yet determined.</p> <p><u>Is there evidence the environmental values can be re-created (evidence of demonstrated success)?</u></p> <p>Unknown.</p>	<p>Unknown</p>	<p>Offset of \$750 / ha for clearing of up to 3,220 ha of vegetation in Good to Excellent condition.</p>
<p>Some occurrences of Priority Flora species will potentially be cleared.</p>									
<p>The Proposal will result in the clearing of up to 3,220 ha of potential fauna habitat, including several conservation significant fauna species (namely: Fork-tailed Swift, the Western Pebble-mound Mouse, the Short-tailed Mouse, the Ghost Bat, the Bush Stone-curlew and the Australian Bustard).</p>									

Existing environment/ Impact	Mitigation			Significant Residual Impact	Offset Calculation Methodology				
	Avoid and minimise	Rehabilitation Type	Likely Rehab Success		Type	Risk	Likely offset success	Time Lag	Offset Quantification
The Proposal includes diversion surface water flows. The resultant changes in the hydrological regime have the potential to impact on the receiving catchments and vegetation, including the Priority 1; West Angelas Cracking Clay Priority Ecological Community (PEC) and valley floor Mulga communities considered to be of local conservation significance.	<p>Avoid:</p> <p>Deposit A west has been designed such that changes to hydrological regime are considered negligible. Therefore the Priority 1; West Angelas Cracking Clay Priority Ecological Community (PEC) is not proposed to be detrimentally impacted by the Proposal.</p> <p>Diversions have been designed to maintain natural surface water flows as far as practicable. Where it is not possible to continue flow within its natural catchment, surface water flows will be diverted to facilitate continued flow in the adjacent catchment.</p> <p>Minimise:</p> <p>Diversions will be designed to protect receiving environments.</p> <p>Rectify and Reduce:</p> <p>The Environmental Management Plan will be implemented to manage potential impacts of the Proposal on Key Environmental Factors.</p>	Rehabilitation is not proposed, local hydrological regimes will remain altered post closure.	N/A	None					

12 OTHER LEGISLATION AND APPROVALS

Other legislation applicable to regulation of the potential environmental impacts of the Proposal, and approvals required, are outlined in Table 12-1. Robe will comply with all relevant legislation (including obtaining specific approvals where required) prior to, and during implementation of the Proposal.

Table 12-1: Other Legislation and Approvals

Environmental factor	Secondary Approval	Responsible Agency	Statute
Flora and Vegetation	Native Vegetation Clearing Permit.	DMP	Part V of the <i>Environmental Protection Act 1986</i>
	Licence to take rare flora.	Parks and Wildlife	<i>Wildlife Conservation Act 1950</i>
Fauna	Licence to take protected fauna.	Parks and Wildlife	<i>Wildlife Conservation Act 1950</i>
Interference with watercourses	26D Permit to obstruct or interfere with bed/banks.	DoW	<i>Rights in Water and Irrigation Act 1914</i>
Groundwater abstraction	5C Licence to construct or alter wells. Licence to take groundwater / amendment to existing groundwater licences.	DoW	
Emissions	Works Approval. Amendment to existing Operating Licence.	DER	Part V of the <i>Environmental Protection Act 1986</i>
	National Greenhouse and Energy Reporting	DoE	<i>National Greenhouse and Energy Reporting Act 2007</i>
Rehabilitation and closure	Mining proposal and mine Closure Plan – required for infrastructure on Mining Act tenure.	DMP	<i>Mining Act 1978</i>
Heritage	Section 18 Consent to use land	DAA	<i>Aboriginal Heritage Act 1972</i>

13 PRINCIPLES OF ENVIRONMENTAL PROTECTION AND EIA

This section describes how the objectives of the EP Act and the principles of Environmental Impact Assessment (EIA) have been addressed and how the Proposal meets the criteria for an Assessment of Proponent Information (API) (Category A) assessment as described in the *Environmental Impact Assessment (Part IV Divisions 1 and 2) Administrative Procedures 2012 (2012 Administrative Procedures)* (EPA 2012a).

13.1 PRINCIPLES OF ENVIRONMENTAL PROTECTION

The concept of sustainable development came to prominence at the World Commission on Environment and Development (1987), in the report entitled *Our Common Future*, which defined sustainable development as; *development that meets the needs of the present without compromising the ability of future generations to meet their own needs.*

In recognition of the importance of sustainable development, the Commonwealth Government developed a National Strategy for Ecologically Sustainable Development (Commonwealth of Australia 1992) that defines Ecologically Sustainable Development (ESD) as “...using, conserving and enhancing the community’s resources so that ecological processes, on which life depends, are maintained, and the total quality of life, now and in the future, can be increased.

The principles of ESD are incorporated into the EP Act and the EPA’s Position Statement No. 7 - Principles of Environmental Protection (EPA 2004c). These principles are listed below:

- The Precautionary Principle;
- The Principle of Intergenerational Equity;
- The Principle of the Conservation of Biological Diversity and Ecological Integrity;
- Principles in relation to Improved Valuation, Pricing and Incentive Mechanisms; and
- The Principle of Waste Minimisation.

These principles have been considered for the Proposal and are summarised in Table 13-1.

Table 13-1: Principles of Environmental Protection

Principle	Consideration Given in Proposal
<p>1. The precautionary principle</p> <p>Where there are threats of serious or irreversible damage, lack of scientific certainty should not be used as a reason for postponing measures to prevent environmental degradation.</p> <p>In the application of the precautionary principle, decisions should be guided by:</p> <ul style="list-style-type: none"> • Careful evaluation to avoid, where practicable, serious or irreversible damage to the environment; and • An assessment of the risk-weighted consequences of various options. 	<p>The Proponent has undertaken comprehensive baseline studies and modelling of aspects of the Proposal that may affect the environment.</p> <p>Where significant potential environmental impacts were identified, measures have been, and will continue to be, incorporated into Proposal design and management to avoid or minimise these potential environmental impacts.</p>

Principle	Consideration Given in Proposal
<p>2. The principle of intergenerational equity</p> <p>The present generation should ensure that the health, diversity and productivity of the environment is maintained or enhanced for the benefit of future generations.</p>	<p>The Rio Tinto Iron Ore HSECQ Policy incorporates the principle of sustainable development and includes the following commitments:</p> <ul style="list-style-type: none"> • Prioritising research and implementation programs through technology to reduce impacts to land, enhancing our contribution to biodiversity and improving our efficiency in water and energy use. • Identifying climate change improvement solutions through dedicated optimisation work programs. • Contributing to the health and well-being of local communities.
<p>3. The principle of conservation of biological diversity and ecological integrity.</p> <p>Conservation of biological diversity and ecological integrity.</p>	<p>Biological investigations are undertaken by the Proponent during the Proposal planning process to identify aspects of the environment that are of conservation significance. Where significant potential environmental impacts are identified, measures have been, and will continue to be, incorporated into Proposal design and management to avoid or minimise these impacts where practical.</p> <p>The Rio Tinto HSEQ Management System has well established rehabilitation procedures for restoring disturbed environments.</p>
<p>4. Principles relating to improved valuation, pricing and incentive mechanisms</p> <ul style="list-style-type: none"> • Environmental factors should be included in the valuation of assets and services. • The polluter pays principle – those who generate pollution and waste should bear the cost of containment, avoidance or abatement. • 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. • 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. 	<p>Environmental factors have been considered during the design phase of the Proposal, and will continue to be considered during the operational and closure phases of the Proposal.</p> <p>Proposal design and operational management will continue to investigate and implement opportunities to reduce impact to land, and improve efficiency in water and energy use, in accordance with the Rio Tinto Iron Ore Group HSECQ Policy.</p>
<p>5. The principle of waste minimisation</p> <p>All reasonable and practicable measures should be taken to minimise the generation of waste and its discharge into the environment.</p>	<p>All reasonable and practicable measures are taken to minimise the generation of waste and its discharge into the environment through the existing EMP and procedures.</p>

13.2 PRINCIPLES OF EIA FOR THE PROPONENT

Table 13-2 outlines the principles of EIA as described in clause 5 of the 2012 Administrative Procedures.

Table 13-2: Principles of EIA for the Proponent

The principles of EIA for the Proponent		Discussed in the Document
1.	Consult with all stakeholders, including the EPA, DMAs, other relevant government agencies and the local community as early as possible in the planning of their proposal, during the environmental review and assessment of their proposal, and where necessary during the life of the project.	Table 3-1 details the stakeholder consultation undertaken to date. The Proponent will continue to consult with relevant stakeholders throughout the environmental approval process.
2.	Ensure the public is provided with sufficient information relevant to the EIA of a proposal to be able to make informed comment, prior to the EPA completing the assessment report.	This EIA has been prepared to provide sufficient information about the Proposal, its potential environmental impacts and proposed management measures.
3.	Use best practicable measures and genuine evaluation of options or alternatives in locating, planning and designing their proposal to mitigate detrimental environmental impacts and to facilitate positive environmental outcomes and a continuous improvement approach to environmental management.	Avoiding and minimising impacts to the environment where practical is a key management commitment for the Proposal, and has been implemented during Proposal design. For example, the Proposal has been designed to avoid extensive areas of conservation significant vegetation (PEC) and significant fauna habitat (potential Ghost Bat maternity cave AA1). As detailed in Section 4.3, continuous improvement is a key aspect of the Rio Tinto Iron Ore (WA) HSEQ Management System.
4.	Identify the environmental factors likely to be impacted and the aspects likely to cause impacts in the early stages of planning for their proposal. The onus is on the proponent through the EIA process to demonstrate that the unavoidable impacts will meet the EPA objectives for environmental factors and therefore their proposal is environmentally acceptable.	Table 5-4, Table 6-2, Table 7-1 and Table 8-1 identify the key environmental factors relevant to the Proposal, potential environmental impacts, proposed management measures, and how the EPA objectives relevant to each environmental factor can be met. Table 9-1 provides a brief EIA of the Proposal for other environmental factors.
5.	Consider the following, during project planning and discussions with the EPA, regarding the form, content and timing of their environmental review: <ul style="list-style-type: none"> a. The activities, investigations (and consequent authorisations) required to undertake the environmental review. b. The efficacy of the investigations to produce sound scientific baseline data about the receiving environment. c. The documentation and reporting of investigations. d. The likely timeframes in which to complete the environmental review; e. Use best endeavours to meet assessment timelines. 	The Proponent plans to discuss any concerns once OEPA have had an opportunity to review the Proposal. The content of this environmental review will incorporate advice provided by the OEPA. Comprehensive studies have been undertaken to support the environmental review, and are provided as appendices. Project design has considered the expected timeframes for completion of supporting studies, environmental review preparation and assessment, and timings for key milestones are regularly discussed with the OEPA.

The principles of EIA for the Proponent		Discussed in the Document
6.	<p>Identify in their environmental review, subject to EPA guidance:</p> <ol style="list-style-type: none"> Best practicable measures to avoid, where possible, and otherwise minimise, rectify, reduce, monitor and manage impacts on the environment. Responsible corporate environmental policies, strategies and management practices, which demonstrate how the proposal can be implemented to meet the EPA environmental objectives for environmental factors. 	<p>Table 5-4, Table 6-2, Table 7-1 and Table 8-1 identify key management measures to avoid where possible, and otherwise minimise impacts on the environment.</p> <p>These tables also provide an assessment of how the Proposal meets EPA environmental objectives for relevant environmental factors, based on implementation of key management measures, and corporate environmental policies.</p>

13.3 CRITERIA FOR API CATEGORY A

Clause 10.1.1 in the 2012 Administrative Procedures states that the OEPA applies an API-A level of assessment where the proponent has provided sufficient information about the proposal, its environmental impacts, proposed management, and it appears that the proposal is consistent with Category A criteria. Consistency of the Proposal with these criteria is addressed in Table 13-3.

Table 13-3: Criteria for API Category A

Category A Criteria	Discussion
The proposal raises a limited number of key environmental factors that can be readily managed and for which there is an established condition-setting framework.	<p>The Proposal raises four key environmental factors:</p> <ul style="list-style-type: none"> flora and vegetation; terrestrial fauna; hydrological processes (surface water); and rehabilitation and closure. <p>These are assessed in Table 5-4, Table 6-2, Table 7-1 and Table 8-1 respectively.</p> <p>These factors are typical of iron ore mining in the Pilbara and can be readily managed under the existing conditions of the MS 970, the existing EMP and other regulatory approvals.</p>
The proposal is consistent with established environmental policies, guidelines and standards.	The Proposal is consistent with established environmental policies, guidelines and standards.
The proponent can demonstrate that it has conducted appropriate and effective stakeholder consultation, in particular with DMAs.	<p>Stakeholder consultation has been, and will continue to be undertaken throughout the approvals process.</p> <p>Section 3 details the stakeholder consultation that has been undertaken to date, issues raised, and Proponent response to issues raised.</p>
There is limited or local concern only about the likely effect of the proposal, if implemented, on the environment.	The location of West Angelas is very remote, with no neighbouring mining or pastoral activities. The nearest town, Newman, is located approximately 130 km south-east of West Angelas.

14 REFERENCES

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15 APPENDICES

The following supporting documents are attached to this Environmental Review Document:

- Appendix 1 S38 Referral Form
- Appendix 2 Ministerial Statement 970
- Appendix 3 Proposed New Ministerial Statement

The following supporting documents are contained on CD_ROM inside the back cover of this Environmental Review Document:

- Appendix 4 Records of Consultation
- Appendix 5 Greater West Angelas Vegetation and Flora Assessment (*ecologia* 2013)
- Appendix 6 Greater West Angelas Terrestrial Fauna Assessment (*ecologia* 2014)
- Appendix 7 West Angelas Deposit B and F Ghost Bat Assessment (Biologic 2014)
- Appendix 8 Environmental Management Program 2014
- Appendix 9 West Angelas Closure Plan 2015
- Appendix 10 West Angelas Deposit A west and Deposit F Subterranean Fauna Assessment, Revised February 2015

Appendix 1
Section 38 Referral Form

Appendix 2

Ministerial Statement 970

Appendix 3

Proposed New Ministerial Statement

RECOMMENDED ENVIRONMENTAL CONDITIONS

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

West Angelas Iron Ore Project – Revised Proposal

Proposal: The development of iron ore mines at Deposits 'A', 'A west', 'B', 'E' and 'F' waste dumps, ore processing operation and associated infrastructure at West Angelas, 130 kilometres (km) west of Newman, and rail infrastructure, as documented in schedule 1 of this Ministerial Statement.

Proponent: Robe River Mining Company Pty. Ltd.

Proponent Address: 152-158 St Georges Terrace
PERTH WA 6000
GPO BoxA42, PERTH WA 6001

Assessment Number:

Previous Assessment Number: 1914

Report of the Environmental Protection Authority:

Previous Report of the Environmental Protection Authority: 1508

Previous Ministerial Statement Number: 970

The implementation conditions of this Statement supersede the implementation conditions of Statement 970 in accordance with section 45B of the *Environmental Protection Act 1986*. Pursuant to section 45, read with section 45B of the *Environmental Protection Act 1986*, it has been agreed that:

1. the Proposal described and documented in Table 2 of Schedule 1 may be implemented; and
2. the implementation of the Revised Proposal, being the Brockman Syncline 4 Iron Ore Project as amended by this Proposal, is subject to the following revised implementation conditions:

1 Proposal Implementation

- 1-1 When implementing the proposal, the proponent shall not exceed the authorised extent of the proposal as defined in Column 3 of Table 2 in Schedule 1, unless
-

amendments to the proposal and the authorised extent of the proposal have been approved under the *Environmental Protection Act 1986*.

2 Contact Details

- 2-1 The proponent shall notify the Chief Executive Officer (CEO) of the Office of the Environmental Protection Authority of any change of its name, physical address or postal address for the serving of notices or other correspondence within 28 days of such change. Where the proponent is a corporation or an association of persons, whether incorporated or not, the postal address is that of the principal place of business or of the principal office in the State.

3 Compliance Reporting

- 3-1 The proponent shall prepare and maintain a Compliance Assessment Plan to the satisfaction of the CEO.
- 3-2 The proponent shall submit to the CEO the Compliance Assessment Plan required by condition 3-1 prior to the first Compliance Assessment Report required by condition 3-6.

The compliance assessment plan shall indicate:

- (1) the frequency of compliance reporting;
 - (2) the approach and timing of compliance assessment;
 - (3) the retention of compliance assessments;
 - (4) the method of reporting of potential non-compliance and corrective actions to take;
 - (5) the table of contents of Compliance Assessment reports; and
 - (6) public availability of Compliance Assessment Reports.
- 3-3 The proponent shall assess compliance with conditions in accordance with the Compliance Assessment Plan required by condition 3-1.
- 3-4 The proponent shall retain reports of all compliance assessments described in the Compliance Assessment Plan required by condition 3-1 and shall make those reports available when requested by the CEO.
- 3-5 The proponent shall advise the CEO of any potential non-compliance within seven days of that non-compliance being known.
- 3-6 The proponent shall submit to the CEO compliance assessment reports addressing compliance in the previous calendar year. Compliance Assessment Reports shall be submitted by the submission date defined in the Compliance Assessment Plan required by condition 3-1.

The compliance Assessment Report shall:

-
- (1) be endorsed by the proponent's Managing Director/ General Manager/ Chief Executive Officer or a person delegated to sign on the Managing Director's/ General Manager's/ Chief Executive Officer's behalf;
 - (2) include a statement as to whether the proponent has complied with the conditions;
 - (3) identify all potential non-compliances and describe corrective and preventive actions taken;
 - (4) be made publicly available in accordance with the approved Compliance Assessment Plan; and
 - (5) indicate any proposed charges to the Compliance Assessment Plan required by condition 3-1.

4 Public Availability of Data

4-1 Subject to condition 4-2, within a reasonable time period, approved by the CEO, of the issue of this statement and for the remainder of the life of the proposal, the proponent shall make publicly available, in a manner approved by the CEO, all validated environmental data (including sampling design, sampling methodologies, empirical data and derived information products (e.g. maps)) relevant to the assessment of this proposal and implementation of this statement..

4-2 If any data referred to in condition 4-1 contains particulars of:

- (1) a secret formula or process; or;
- (2) confidential commercially sensitive information;

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

5 Environmental Management Program

5-1 The proponent shall implement the proposal in accordance with the "*Environmental Management Program*", dated September 2014, or subsequent revisions approved by the CEO.

The Environmental Management Program consists of the following Management Plans:

- (1) Groundwater Management Plan;
 - (2) Surface Water Management Plan;
 - (3) Vegetation and Flora Management Plan;
 - (4) Fauna Management Plan;
 - (5) Dust Management Plan;
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(6) Waste Management Plan; and

(7) Rail Management Plan.

Each Management Plan includes:

- i. the specific environmental objectives and targets for each environmental factor;
- ii. the management measures to be applied to avoid and minimise the environmental impact of the proposal;
- iii. monitoring measures to measure the performance of management against targets; and
- iv. contingency measures to mitigate impacts.

5-2 The proponent shall make the Environmental Management Program required by condition 5-1 publicly available, in a manner approved by the CEO.

6 Groundwater

6-1 The proponent shall manage groundwater abstraction and dewatering activities to ensure minimal adverse impacts on the availability and quality of groundwater resources and the dependent ecology.

6-2 To verify that the requirements of condition 6-1 are met the proponent shall undertake monitoring of groundwater levels and quality as outlined in the Groundwater Management Plan approved as part of Environmental Management Program, required by condition 5.

6-3 In the event that the monitoring required by condition 6-2 indicates that the requirements of condition 6-1 are not being met, the proponent shall implement contingency actions as outlined in the Groundwater Management Plan.

6-4 The proponent shall submit annually the results of monitoring required by condition 6-2 to the CEO as part of the Compliance Assessment Reports required by condition 3-6.

7 Surface Water

7-1 The proponent shall manage surface water drainage and discharge to ensure minimal adverse impacts on existing surface water drainage patterns or the water dependent ecosystems.

7-2 To verify that the requirements of condition 7-1 are met, the proponent shall undertake monitoring of the quality and quantity of water discharge and riparian vegetation health as outlined in the Surface Water Management Plan approved as part of the Environmental Management Program required by condition 5.

7-3 In the event that the monitoring required by condition 7-2 indicates that the requirements of condition 7-1 are not met, the proponent shall implement contingency actions as outlined in the Surface Water Management Plan.

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- 7-4 The proponent shall submit annually the results of monitoring required by condition 7-2 to the CEO as part of the Compliance Assessment Reports required by condition 3-6.

8 Conservation Significant Communities and Species

- 8-1 The proponent shall manage clearing activities to ensure minimal adverse impacts on conservation significant communities and species.
- 8-2 To verify that the requirements of condition 8-1 are met, the proponent shall implement the proposal in accordance with the Vegetation and Flora Management Plan and Fauna Management Plan approved as part of the Environmental Management Program required by condition 5.
- 8-3 In the event that monitoring required by the Management Plans detailed in condition 8-2 indicates that the specific environmental objectives and targets, identified for each environmental factor, have been exceeded, the proponent shall:
- (1) within 7 days of becoming aware of the exceedance, implement contingency measures as outlined in the management plans and continue implementation until environmental objectives and targets are being met, or as otherwise agreed by the CEO; and
 - (2) within 14 days of becoming aware of the exceedance, submit details of contingency measures implemented to the CEO.

9 Rehabilitation and closure

- 9-1 The proponent shall ensure that the Proposal is closed, decommissioned and rehabilitated in an ecologically sustainable manner, consistent with agreed post-mining outcomes and land uses, through the implementation of the Mine Closure Plan required by condition 9-2.
- 9-2 The proponent shall prepare a Mine Closure Plan for the West Angelas Iron Ore Project in accordance with the *Guidelines for Preparing Mine Closure Plans*, June 2011 and any updates, to the requirements of the CEO on advice of the Department of Mines and Petroleum.
- 9-3 The proponent shall review and revise the Mine Closure Plan required by Condition 9-2 at intervals not exceeding three years, or as otherwise specified by the CEO.
- 9-4 The proponent shall implement the latest revision of the Mine Closure Plan, which the CEO has confirmed by notice in writing, satisfies the requirements of condition 9-2.

10 Residual Impacts and Risk Management Measures

- 10-1 In view of the significant residual impacts and risks as a result of implementation of the Proposal, the proponent shall contribute funds to offset the clearing of
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native vegetation of 'good to excellent' condition in the Hamersley IBRA subregion, and calculated pursuant to condition 10-2. This funding shall be provided to a government-established conservation offset fund or an alternative offset arrangement providing an equivalent outcome as determined by the Minister.

- 10-2 The proponent's contribution to the conservation offset fund or alternative offset arrangement identified in condition 10-1 shall be paid biennially, the first payment due two years after the commencement of the additional ground disturbance approved under this Statement. The amount of funding will be \$750 AUD (excluding GST) per hectare of 'good to excellent' condition native vegetation cleared within the development envelope (delineated in Figure 2 and defined by the geographic coordinates in Schedule 2) within the Hamersley IBRA subregion.
- 10-3 The 4,667 ha of clearing of native vegetation previously approved under Ministerial Statement 970 is exempt from the requirement to offset under condition 10-2.
- 10-4 The real value of contributions described in condition 10-2 will be maintained through indexation to the Perth Consumer Price Index (CPI), with the first adjustment to be applied to the first contribution.
- 10-5 The proponent shall prepare and submit an Impact Reconciliation Procedure to the satisfaction of the CEO.
- 10-6 The Impact Reconciliation Procedure required pursuant to condition 10-5 shall:
- (1) include a methodology to identify clearing of 'good to excellent' condition native vegetation in the Hamersley IBRA subregion;
 - (2) require the proponent to submit spatial data identifying areas of 'good to excellent' condition native vegetation that has been cleared;
 - (3) include a methodology for calculating the amount of clearing undertaken during each biennial time period; and
 - (4) state dates for the commencement of the biennial time period and for the submission of results of the Impact Reconciliation Procedure, to the satisfaction of the CEO.

[signed]

Table 1: Summary of the Revised Proposal

Proposal title	West Angelas Iron Ore Mine – Revised Proposal
Proponent name	Robe River Mining Co. Pty. Ltd.
Short description	<p>Development and operation of an open-cut iron ore mine and associated infrastructure at the West Angelas Iron Ore Mine, 130 kilometres northwest of Newman in the Pilbara region (Figure 1). Iron ore is to be mined from above and below the water table in Deposits A, A west, B, E and F. The general layout of the mine and facilities are documented in Figure 2.</p> <p>The mining operations are supplied with water from the mine dewatering bores and water from the Turee Creek B Borefield, located approximately 30 kilometres west of the mine site.</p> <p>Surplus water, exceeding operational water demand is discharged to the environment.</p> <p>Railway infrastructure from West Angelas to the port facilities at Cape Lambert (Figure 3).</p>

Table 2: Location and authorised extent of physical and operational elements

Element	Location	Authorised Extent
Mining Area	Figure 2	Clearing of no more than 3,180 hectares (ha) within a 22,600 ha development envelope.
Waste Dumps	Figure 2	Clearing of no more than 3,260 ha within a 22,600 ha development envelope.
Associated infrastructure, access and accommodation	Figure 2	Clearing of no more than 1,450 ha within a 22,600 ha development envelope.
Railway and associated infrastructure	Figure 3	Not specified

Table 3: Abbreviations

Abbreviation	Term
CEO	The Chief Executive Officer of the Department of the Public Service of the State responsible for the administration of section 48 of the <i>Environmental Protection Act 1986</i> , or his delegate.
km	kilometre
ha	hectare
CPI	Consumer Price Index

Figures (attached)

Figure 1 – Regional Location of West Angelas

Figure 2 – West Angelas Iron Ore Mine Indicative Layout and Approval Outline

Figure 3 – West Angelas Railway



Geospatial Information and Mapping

Figure 1: Regional Location of West Angelas

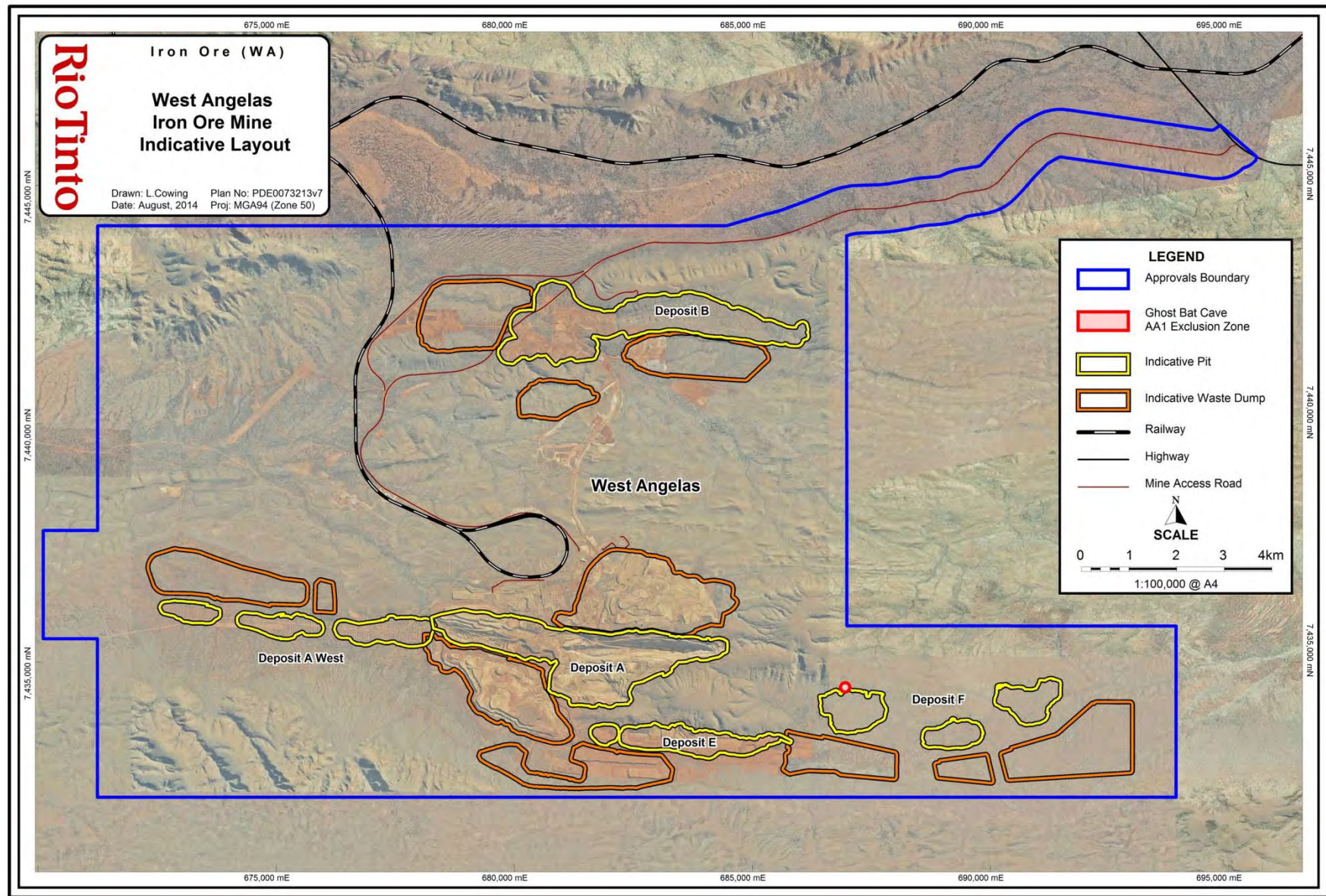


Figure 2: West Angelas Iron Ore Mine Indicative Layout

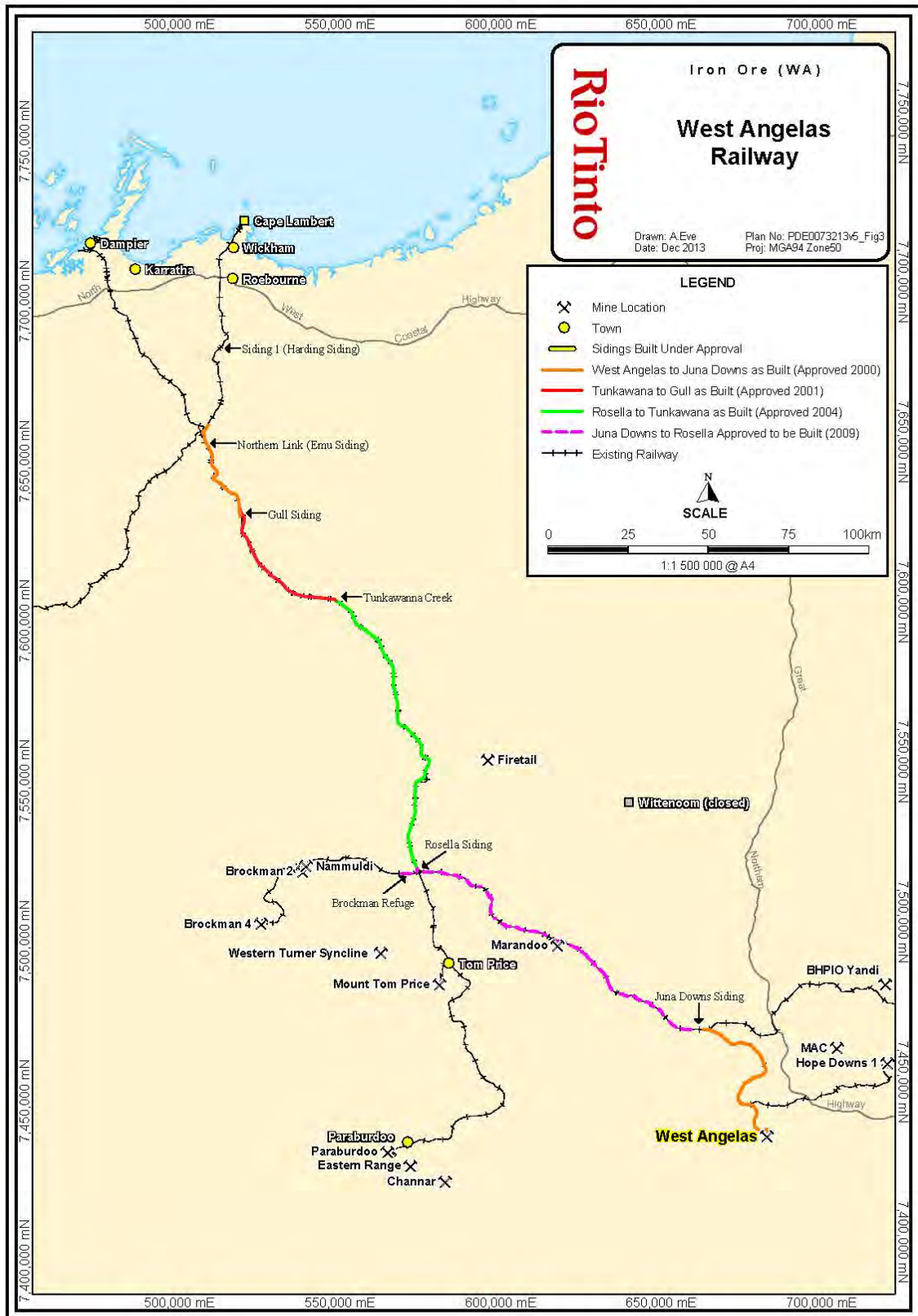


Figure 3: West Angelas Railway

Schedule 2

West Angelas Iron Ore Project – Revised Proposal

Coordinates defining the development envelope are held by the Office of the Environmental Protection Authority, dated 30 September 2014

Notes

The following notes are provided for information and do not form a part of the implementation conditions of the Statement:

- The proponent for the time being nominated by the Minister for Environment under section 38(6) of the *Environmental Protection Act 1986* is responsible for the implementation of the proposal unless and until that nomination has been revoked and another person is nominated.
 - If the person nominated by the Minister, ceases to have responsibility for the proposal, that person is required to provide written notice to the Environmental Protection Authority of its intention to relinquish responsibility for the proposal and the name of the person to whom responsibility for the proposal will pass or has passed. The Minister for Environment may revoke a nomination made under section 38(6) of the *Environmental Protection Act 1986* and nominate another person.
 - To initiate a change of proponent, the nominated proponent and proposed proponent are required to complete and submit Post Assessment Form 1 – Application to Change Nominated Proponent.
 - The General Manager of the Office of the Environmental Protection Authority was the Chief Executive Officer of the Department of the Public Service of the State responsible for the administration of section 48 of the *Environmental Protection Act 1986* at the time the Statement was signed by the Minister for Environment.
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Appendix 4

Records of Consultation

Appendix 5

Greater West Angelas
Vegetation and Flora
Assessment (*ecologia* 2013)

Appendix 6

Greater West Angelas
Terrestrial Fauna Assessment
(*ecologia* 2014)

Appendix 7

West Angelas Deposit B and
F Ghost Bat Assessment
(Biologic 2014)

Appendix 8

West Angelas Operations
Environmental Management
Program 2014

Appendix 9

West Angelas Closure Plan
2015

Appendix 10

West Angelas Deposit A west
and Deposit F Subterranean
Fauna Assessment,
Revised February 2015
