



Mesa A Hub Proposal

Section 38 Referral

Environmental Review Document

November 2016

Final

RTIO-HSE-0296123

Robe River Mining Co. Pty. Ltd.

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Disclaimer and Limitation

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Document Status					
Rev	Author	Reviewer/s	Date	Approved for Issue	
				To Whom	Date
A	F. Bell	P. Royce, D. Doherty	22/8/16		
B	F. Bell	T. Savage G. O'Donoghue	5/9/16		
1	F. Bell		14/11/16	OEPA	

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1. INTRODUCTION

Robe River Mining Co. Pty. Ltd. (the **Proponent**) operates the existing Mesa A/Warramboe Iron Ore Mining Project (**Mesa A Operation**) located approximately 43 km west of Pannawonica in the Pilbara region of Western Australia (Figure 1-1). The Proponent is seeking to extend the life of the Mesa A Operation through development of nearby deposits: Warramboe below water table, Highway, Tod Bore, Mesa B, and Mesa C deposits, which will sustain the Mesa A Operation total ore feed at 25 Mt/annum.

The following terminology is used throughout this Environmental Review Document:

- **Proponent** – Robe River Mining Co. Pty. Ltd.
- **Mesa A Operation** – the Mesa A/Warramboe Iron Ore Project as approved under Ministerial Statement 756 (**MS 756**).
- **Mesa A Hub Proposal** (the **Proposal**) – the proposed activities (as detailed in Section 4) that are considered additional to those approved under MS 756, incorporating above water table (**AWT**) and below water table (**BWT**) extension of the Warramboe mine, extension of the mine pit and alteration of the Mining Exclusion Zone (**MEZ**) at the existing Mesa A mine and development of Highway, Tod Bore, Mesa B and Mesa C deposits.
- **Proposal Area** – the conceptual footprint of the Proposal as shown by the components in Figure 4-1.
- **Mesa A Hub Operation** – the existing Mesa A Operation plus the activities included in the Proposal.
- **Development Envelope** – the proposed development envelope for the Mesa A Hub Operation that is, the development envelope for the Proposal incorporating the existing approved mine footprint for the Mesa A Operation.

1.1 PURPOSE OF THIS DOCUMENT

This document has been prepared to support the referral of the Proposal under section 38 of the *Environmental Protection Act 1986* (**EP Act**). It provides information on the Proposal characteristics, existing environment, potential environmental impacts and proposed management commitments. This document has been prepared in accordance with the *Environmental Impact Assessment (Part IV Divisions 1 and 2) Administrative Procedures 2012*.

1.2 PROPONENT DETAILS

The Proponent for the Proposal is Robe River Mining Co. Pty. Ltd., which is the manager for the Robe River Iron Associates joint venture (**RRIA**). RRIA is an unincorporated joint venture comprising the following participants:

- Robe River Mining Co. Pty. Ltd. (30% share);
- North Mining Limited (35% share);
- Mitsui Iron Ore Development Pty Ltd (20% share);

- Cape Lambert Iron Associates, a partnership carried on by Nippon Steel & Sumitomo Metal Australia Pty Ltd, Nippon Steel & Sumikin Resources Australia Pty Ltd and Mitsui Iron Ore Development Pty Ltd (5% share); and
- Pannawonica Iron Associates, a partnership carried on by Nippon Steel & Sumitomo Metal Australia Pty Ltd, Nippon Steel & Sumikin Resources Australia Pty Ltd (10% share).

The Rio Tinto contact person in relation to the environmental approvals process for the Proposal is:

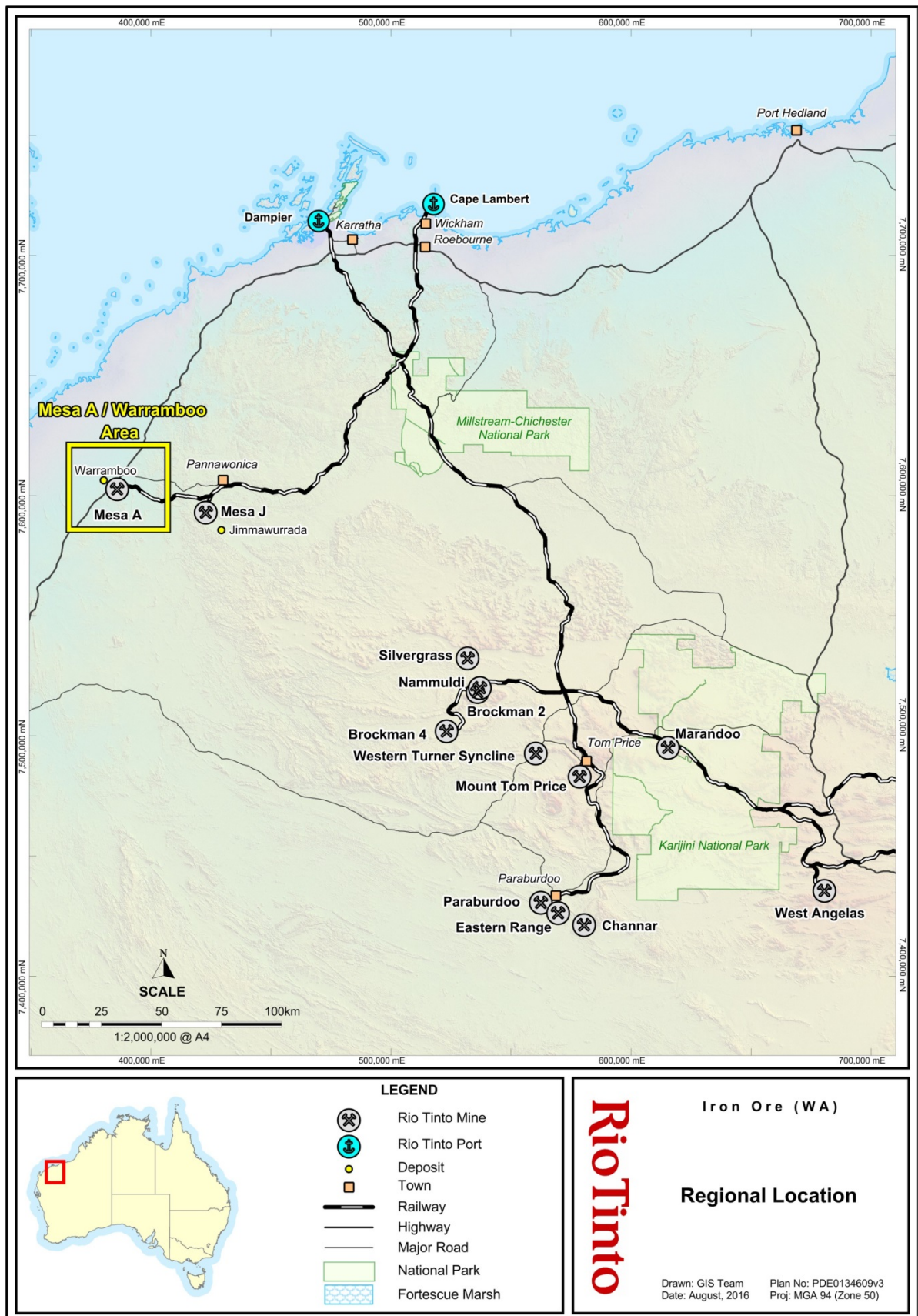
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Geospatial Information and Mapping

Figure 1-1: Regional location

2. LAND USE AND TENURE

2.1 TENURE

The Robe Valley mining operations, including the Mesa A Hub Operation, are supported by the State Agreement Mineral Lease ML248SA granted pursuant to the *Iron Ore (Robe River) Agreement Act 1964*. ML248SA is considered appropriate tenure for mining and mining related infrastructure.

Existing tenure in and near the proposed Development Envelope is shown in Figure 2-1. The deposits included in the Proposal are within ML248SA except for portions of the Mesa B and Mesa C deposits that extend into Exploration Licence E08/01148. Conversion of these areas into ML248SA will be required prior to development for mining.

The main co-existing *Land Administration Act 1997 (LAA)* tenure in the Proposal Area is the Yarraloola Pastoral Station (Lease N49500). This pastoral lease is held by the Yarraloola Station Partnership which comprises members of the RRIA. The main ancillary tenure is the RRIA LAA lease for the Mesa A railway (Lease K876559). This lease runs between Mesas B and C and forms a tenure connection to the Mesa A mining operation.

Grants of additional tenure and/or conversion of tenure will be required for bore field development, waste dumps, pipelines, haul roads and other infrastructure.

2.2 LAND USE

The Proposal is located in the Shire of Ashburton, approximately 43 km west of Pannawonica. Existing land uses in the Development Envelope include pastoral activities (Yarraloola Station and Yalleen Station), mineral exploration, mining activities and Traditional Owner activities such as camping, fishing and hunting. The mesa profiles are also used by Traditional Owners as landmarks when travelling through the countryside. The North West Coastal Highway runs between the Mesa A and Warramboos deposits and the Dampier to Bunbury natural gas pipeline runs to the north-west of the Warramboos deposit, within the Development Envelope.

2.3 NATIVE TITLE

The Proposal lies within the Kuruma Marthudunera (**K&M**) Native Title Claim (WC99/012). The Proponent has a Participation Agreement and Indigenous Land Use Agreement with the K&M that include an established consultation framework and ongoing engagement on relevant aspects of the Proponent's operations. These Agreements set obligations for processes such as land access, tenure acquisition, heritage surveys, environmental management, mining benefit payments and reporting and consultation and communication between the parties.

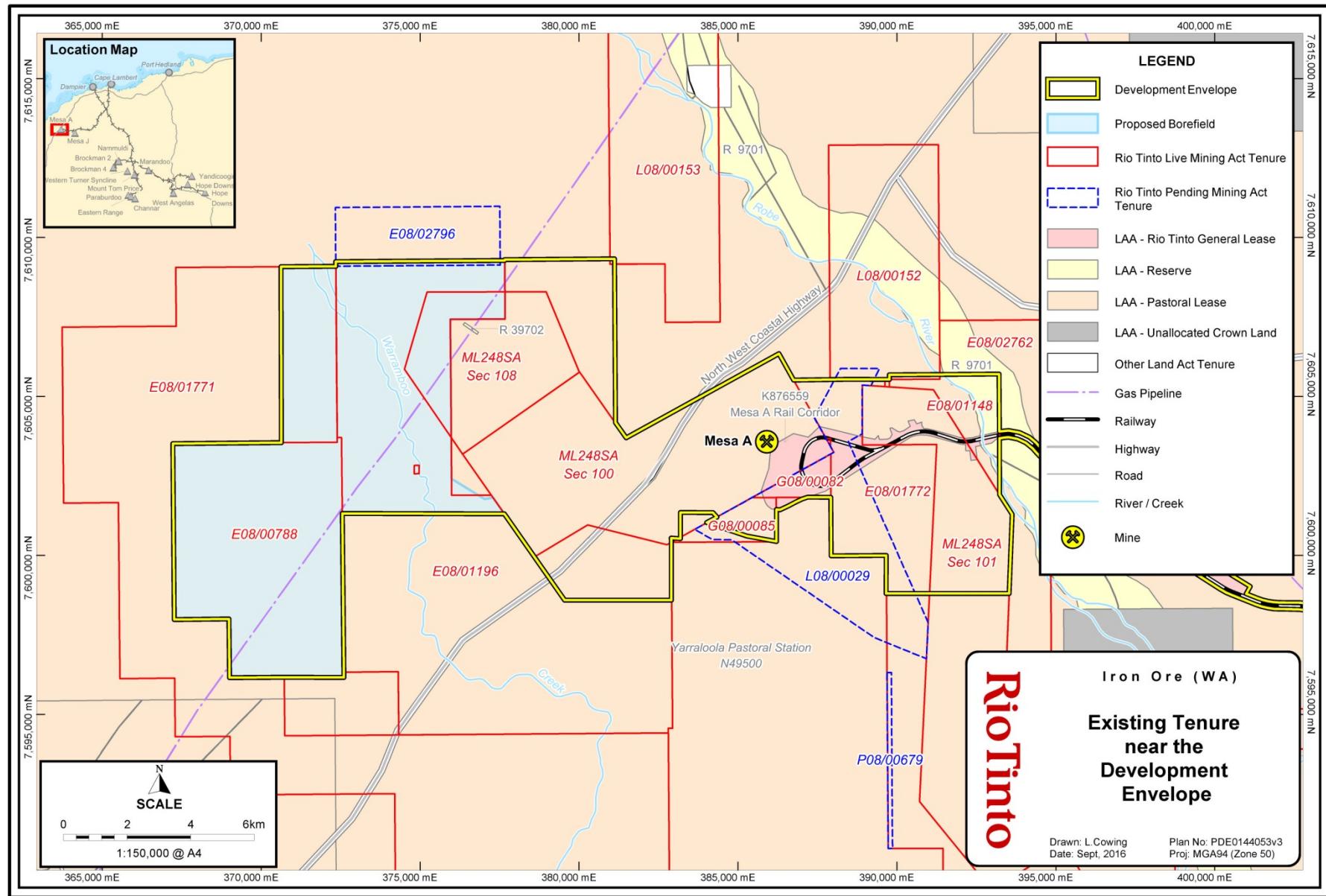


Figure 2-1: Existing tenure near the Development Envelope

3. MESA A OPERATION

The Mesa A Operation was assessed at the level of Public Environmental Review. The Environmental Protection Authority (EPA) reported on the Mesa A Operation in 2007 (EPA 2007a, EPA 2007b) and the Mesa A Operation was approved in November 2007 under MS 756.

Camp construction, pre-strip and rail construction commenced for the Mesa A Operation in 2008 and productive mining commenced at Mesa A in February 2010 and at Warramboos in 2012.

Three amendments to the Mesa A Operation have been approved under section 45C of the EP Act subsequent to grant of MS 756:

- Change to the orientation of the escarpment portal at Mesa A (approved July 2008 as Attachment 1 of MS 756);
- Alteration of the shape of the pit shell and the MEZ at Mesa A and an increase in groundwater abstraction rate from the Warramboos bore field (approved December 2010 as Attachment 2 of MS 756);
- Increase in the disturbance footprint and removal of items from the key characteristics table that were not key characteristics relevant to the environment (approved March 2013 as Attachment 3 to MS 756).

The Mesa A Operation (as amended) comprises:

- **Pits** – AWT at Mesa A and Warramboos;
- **Mineral waste management** – including but not limited to backfilling, ex-pit waste dumps, low grade ore dumps, topsoil and subsoil stockpiles;
- **Processing facilities** – including but not limited to Run of Mine (**ROM**) pads, crushing and screening plant, stackers, reclaimers, stockyards, train load-out and other materials handling infrastructure;
- **Support facilities** – including but not limited to workshops, power supply infrastructure, hydrocarbon storage, explosives storage, vehicle wash-down areas, laydown areas, offices, laboratories, warehouses, potable water supply from Warramboos and waste water treatment plants;
- **Linear infrastructure** – including but not limited to heavy vehicle and light vehicle access roads, rail-line and power and communications distribution networks;
- **Infrastructure for surface water management** – including but not limited to diversion drains, and culverts.

3.1 ENVIRONMENTAL FACTORS RELEVANT TO THE MESA A OPERATION

The key environmental factors considered by the Environmental Protection Authority (EPA) during assessment of the Mesa A Operation (EPA 2007a, EPA 2007b) were:

- Flora and Vegetation;
- Terrestrial Fauna;
- Subterranean Fauna; and

- Landforms, Closure Planning and Rehabilitation.

The EPA (2007a) recommended against approval of the original Mesa A Proposal on the basis that the proposal would not meet the EPA's objectives for Subterranean Fauna and Landforms, Closure Planning and Rehabilitation. The Minister for the Environment subsequently directed the EPA to re-assess a modified proposal under section 43 of the EP Act. The modified proposal included an increased MEZ and provided subterranean fauna data indicating troglafauna occur in deeper habitat below the proposed pit in addition to geotechnical data. The EPA (2007b) concluded that the modified proposal could be managed to meet the EPA's objectives.

4. MESA A HUB PROPOSAL

4.1 OVERVIEW

A summary of the Proposal is provided in Table 4-1.

Table 4-1: Summary of the Proposal

Project Title	Mesa A Hub Operation
Proponent Name	Robe River Mining Co. Pty Ltd.
Short description	<p>The Proposal is to revise the existing Mesa A / Warramboos Iron Ore Project located approximately 43 km west of Pannawonica in the Pilbara region of Western Australia.</p> <p>The Proposal includes development of additional mine pits and associated infrastructure, water treatment facilities, processing facilities and water management infrastructure as well as expansion of existing mine pits, waste dumps and associated infrastructure.</p>

The Proposal consists of the following additional items and activities:

- **Mine pits**
 - Extension of the mine pit and alteration of the MEZ at Mesa A;
 - Extension of mine pits at Warramboos to include BWT mining;
 - Development of AWT mine pits at Mesa B;
 - Development of AWT and BWT mine pits at Mesa C;
 - Development of AWT mine pits at Highway and Tod Bore.
- **Mineral waste management** – including but not limited to backfilling, new out of pit waste dumps and extensions to existing waste dumps, low grade ore dumps, topsoil and sub-soil stockpiles;
- **Processing facilities** – including but not limited to wet processing plant, waste fines storage facilities, reverse osmosis plant and evaporation pond (or alternative means of brine disposal);
- **Support facilities** – including but not limited to workshops, power supply infrastructure, hydrocarbon storage, laydown areas, offices and waste water treatment plants;
- **Infrastructure for surface water management** – including but not limited to diversion drains, levees and culverts;
- **Linear infrastructure** – including but not limited to heavy vehicle and light vehicle access roads, pipelines and power (including sub-stations) and communications distribution networks;
- **Water supply for processing** – including but not limited to bore field(s) at Warramboos and/or Jimmawurrada (refer Figure 1-1) and associated pipelines to Mesa A;
- **Dewatering and dewatering infrastructure** – including but not limited to bore field and pipelines at Warramboos and Mesa C; and

- **Surplus water management** – including but not limited to use in processing, on-site use, discharge to Warrambo Creek or alternative methods of disposal.

Mined and processed ore will be railed to Rio Tinto's port operations at Dampier and/or Cape Lambert via existing rail infrastructure.

The preliminary key characteristics for the Proposal and changes from the existing approval are provided in Table 4-2.

Table 4-2: Preliminary key characteristics of the Proposal

Element	Existing approval	Proposed change (preliminary)	Mesa A Hub Operation (preliminary)
Clearing of native vegetation	Not more than 3,680 ha (with the exception of clearing in the Mining Exclusion Zone, MEZ, other than the approved portal breakthrough and other infrastructure as per Figure 2 and Figure 4 [of MS 756])	Additional clearing of up to 2,500 ha ¹ within the Development Envelope of 20,184 ha. Of which up to 42 ha will be cleared in the current approved Mesa A MEZ (in addition to the approved portal breakthrough and other infrastructure approved under MS 756).	Clearing of up to 6,180 ha ¹ within the Development Envelope of 20,184 ha. Of which, up to 6 ha will be in the revised Mesa A MEZ (in addition to the approved portal breakthrough and other infrastructure approved under MS 756).
Mining depth	Above water table	Above water table at Mesa A, Mesa B, Highway and Tod Bore. Below water table at Warrambo Creek and Mesa C.	Above water table at Mesa A, Mesa B, Highway and Tod Bore. Below water table at Warrambo Creek and Mesa C.
Dewatering	-	Up to 5 GL/annum at Warrambo. Up to 5 GL/annum at Mesa C.	Up to 5 GL/annum at Warrambo. Up to 5 GL/annum at Mesa C.
Surplus water management	-	Surplus water management options include use on site, in processing and discharge to the environment or alternative means of disposal. Controlled surface discharge to extend along Warrambo Creek no further than 8 km downstream of the discharge point under natural no-flow conditions.	Surplus water management options include use on site, in processing and discharge to the environment or alternative means of disposal. Controlled surface discharge to extend along Warrambo Creek no further than 8 km downstream of the discharge point under natural no-flow conditions.
Water supply	-	Up to 11 GL/annum from a bore field to be developed at Warrambo and/or Jimmawurrada.	Up to 11 GL/annum from a bore field to be developed at Warrambo and/or Jimmawurrada.
Residue disposal	-	In-pit disposal of waste fines at Warrambo.	In-pit disposal of waste fines at Warrambo.
Backfilling	-	Backfill at Warrambo and Mesa C to prevent formation of permanent pit lakes.	Backfill at Warrambo and Mesa C to prevent formation of permanent pit lakes.

¹ assumes water is sourced from Warrambo

4.2 DETAILED DESCRIPTION

An indicative conceptual mine layout is shown in Figure 4-1. Note that planning for the Proposal is at a relatively early stage. More detailed planning will occur during the feasibility study which will be progressed in parallel with the environmental approvals process.

4.2.1 MINING

The deposits between Mesa C and Warramboos are believed to have formed as part of the Robe River palaeochannel in the late Mesozoic to early Tertiary period. The Warramboos, Highway and Tod Bore deposits form part of the buried downstream continuation of the Robe pisolite deposit present at Mesas A, B and C.

The Proposal includes development of new open cut mine pits at Mesa B, Mesa C, Highway and Tod Bore deposits. Pits at Mesa B, Highway and Tod Bore will be AWT while the pit at Mesa C will be approximately 10% BWT.

The Proposal also includes extension of the existing mine pits at Mesa A and Warramboos. The extension at Mesa A will be AWT. The additional mining would result in retention of approximately 52% of estimated total pre-disturbance troglofauna habitat, compared with 58% habitat retention under the current approved design. The additional mining would also result in a reduction of approximately 33 ha of MEZ (approximately 13% of the current MEZ by area). The extension at Warramboos will include minor spatial extensions as well as extending mining to approximately 10% BWT.

4.2.2 ORE HANDLING AND TRANSPORT

Ore from all deposits in the Proposal will be hauled to Mesa A to tie-in with existing operations. New haul roads will be established between Mesa A, Mesa B and Mesa C. Mesa escarpment cuttings will be required at Mesa B and Mesa C to allow ore to be hauled from the mine pits to Mesa A. Widening of the existing mesa escarpment cutting at Mesa A will be required to allow haul trucks from Mesa B and Mesa C to gain access to the primary crusher at Mesa A. Increasing the width of the cutting at Mesa A will result in a small reduction in the area of the MEZ and the volume of retained troglofauna habitat.

Ore will be crushed and screened and either directly transported to port or further processed in the Proposal Area using a wet beneficiation process (wet processing).

4.2.3 MINERAL WASTE

Overburden and mineral waste will be used to progressively backfill mine pits where sequencing and schedules allow. Where sequencing and scheduling do not allow waste to be used for backfilling, out of pit waste dumps will be utilised. Out of pit storage for low grade ore, sub-soil and topsoil will also be required.

Waste fines will be generated by the wet processing plant. The waste fines will be pumped from the wet processing plant located near Mesa A to an in-pit waste fines storage facility (**WFSF**) at Warramboos.

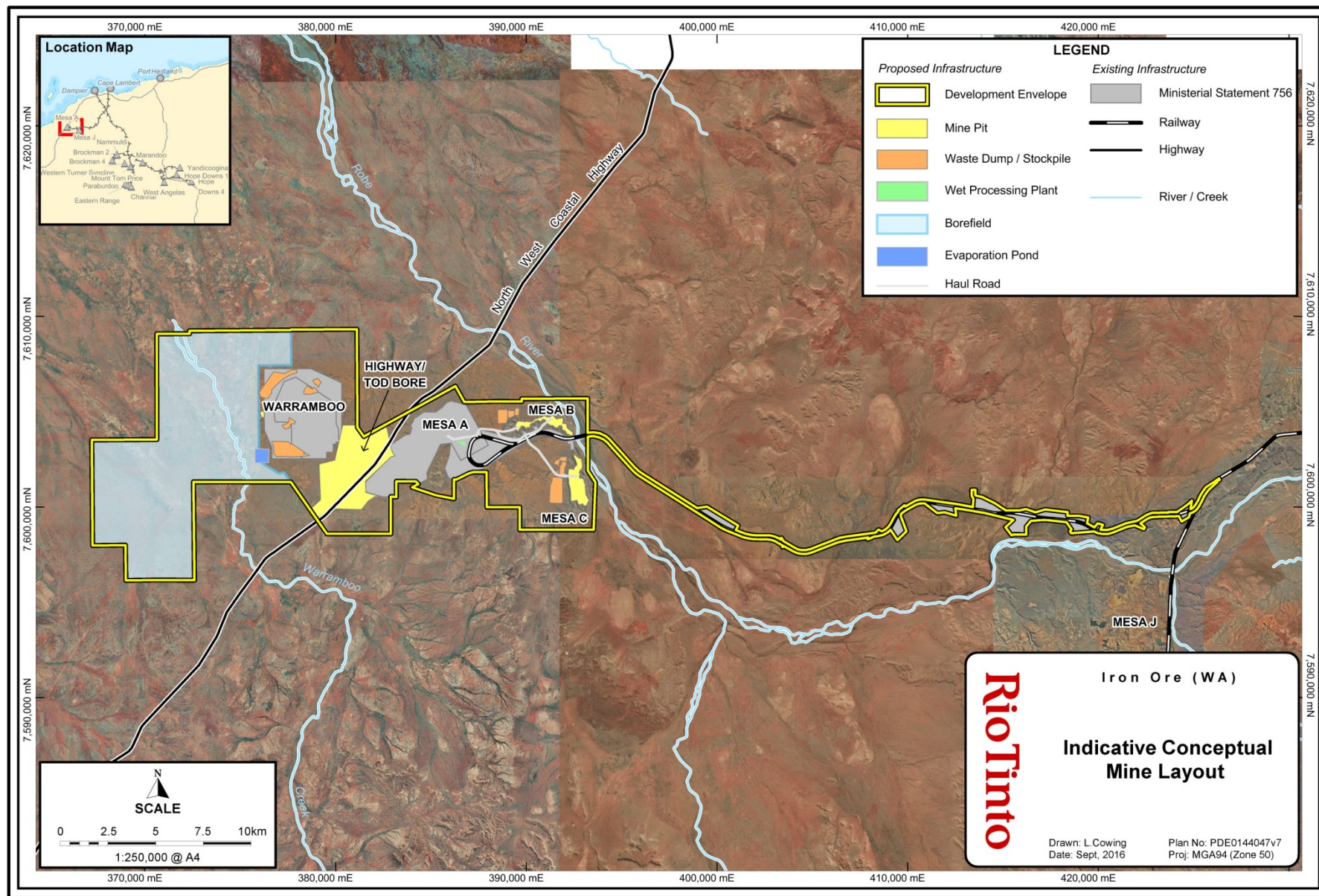


Figure 4-1: Indicative conceptual mine layout

4.2.4 WATER SUPPLY

Water is required at the new deposits under the Proposal for:

- Construction activities;
- General mining activities;
- Dust suppression on haul roads; and
- Potable water supply.

Water for the above activities will be sourced from local bores or reticulated from the existing Mesa A header tanks.

The current water supply for the Mesa A Operation is from the Warramboos mine bores which abstract water from the Robe Pisolite and Yarraloola Conglomerate. Annual abstraction in 2014 was 1.3 GL and the licensed abstraction rate is 3 GL/annum.

Peak water demand for site use and wet processing under the Proposal is estimated to be in the order of 11 GL/annum. Options currently under consideration for water supply for wet processing include:

- Expansion of the Warramboos bore field to abstract additional water from the Yarraloola Conglomerate.
- Development of a bore field at Jimmawurrada (approximately 40 km south-east of Mesa C (refer Figure 1-1)) and associated pipeline.

Chloride levels in iron ore may increase if chloride is present in the water used for wet processing. As chlorides in iron ore lead to the generation of dioxins during the sintering process it is important to ensure that chloride levels in the product are less than 150 mg/L by ensuring that the water used for wet processing has a low chloride content. A reverse osmosis plant and evaporation pond (or alternative means of brine disposal) may be required to ensure suitable water quality for wet processing should expansion of the Warramboos bore field be selected as the preferred water supply.

4.2.5 SURPLUS WATER MANAGEMENT

Dewatering of up to approximately 5 GL/annum is required at Warramboos to enable BWT mining. Where scheduling and water quality allow, surplus water generated from dewatering the Warramboos deposit will be used on site and for wet processing. Where scheduling does not allow use of this water on site or in processing, the surplus water will either be discharged to Warramboos Creek or will be disposed of via alternative means. It is estimated that discharge to Warramboos Creek would result in a maximum wetting front no further than 8 km from the discharge point under natural no-flow conditions.

Hydrogeological investigations are underway at Mesa C. Estimated dewatering volumes are in the order of 5 GL/annum. At this stage in the study it is anticipated that water abstracted to enable BWT mining at Mesa C will be used on site and for wet processing.

4.2.6 MINE SUPPORT FACILITIES AND INFRASTRUCTURE

Existing fly-in fly-out accommodation at Mesa A will be utilised for the ongoing operations workforce for the Proposal. Existing communications systems will be extended, including installation of fibre optic cables, to support each mining area. Other facilities such as waste water treatment plants,

explosive storage, fuel storage, diesel power generation units, laboratory, workshops, offices and laydown areas will also be required. The locations of these facilities have not yet been finalised. The Proposal does not require significant changes to existing rail infrastructure.

4.2.7 WORKFORCE

The Proposal will be operated as an extension to the existing Mesa A Operation. The workforce at Mesa A will transition as required from Mesa A/Warrambo to the deposits included in the Proposal. It is anticipated that with the development of the new deposits and the addition of the wet plant and laboratory that the operational workforce will increase by approximately 50 roles.

4.2.8 TIMING

Under the current project schedule, construction activities are planned to commence in Quarter 4, 2018 once all required internal and external approvals are granted.

4.2.9 EXCLUSIONS

The scope of the Proposal subject to assessment under Part IV of the EP Act excludes:

- Activities that are part of the existing Mesa A Operation as approved under MS 756.
- Low impact activities, including drilling and associated activities (such as upgrades to existing roads/tracks) for the purposes of resource evaluation, geotechnical assessment and hydrogeological investigation, to support the assessment and approval of the Proposal (to be subject to relevant provisions under Part V [Land Clearing] of the EP Act).
- Essential environmental, heritage and other studies/investigations involving fieldwork.
- Duplication of a 9 km section of overhead power line between the Pannawonica switchyard and the Mesa A/J tee-off (to be subject to relevant provisions under Part V [Land Clearing and Works Approval/Licensing] of the EP Act).
- Establishment of a construction camp to support the construction phase of the Proposal (to be subject to relevant provisions under Part V [Land Clearing and Works Approvals/Licensing] of the EP Act).
- Establishment of temporary services (communications, water supply, power), temporary concrete batch plant, site offices, access roads and laydown areas to support establishment of a construction camp (to be subject to relevant provisions under Part V [Land Clearing and Works Approval/Licensing] of the EP Act).
- Establishment of borrow pits/quarry to provide suitable material for construction of any items excluded from Part IV assessment (to be subject to relevant provisions under Part V [Land Clearing] of the EP Act).

5. ENVIRONMENTAL STUDIES

Environmental baseline studies and compliance monitoring have been completed in the vicinity of the Proposal Area as described in Table 5-1.

Table 5-1: Environmental studies completed in the vicinity of the Proposal Area

Study	Description
Flora and vegetation	
MWH (2016). <i>Level 2 Flora and Vegetation Survey: Mesa B-C, Warrambo BWT and Highway to Tod Bore - Phase 1 and Phase 2</i> . Unpublished report prepared for Rio Tinto Iron Ore, May 2016.	Surveys conducted in June and September 2015 documenting vegetation units and conservation listed flora in the Proposal Area. Monitoring transects established across riverine vegetation in Warrambo Creek in June 2015.
Biota Environmental Sciences (2011). <i>Baseline Flora and Vegetation Assessment of Robe Valley Mesas (Mesas B,C,D,E,F,H and I)</i> . Unpublished report prepared for Rio Tinto Iron Ore, April 2011.	Survey conducted in October 2010 documenting flora, vegetation units and conservation listed flora in or near the Development Envelope.
Biota Environmental Sciences (2006). <i>A Vegetation and Flora Survey of the Proposed Mesa A Transport Corridor, Warrambo Deposit and Yarraloola Borefield</i> . Unpublished report prepared for Robe River Iron Associates, January 2006.	Surveys conducted in March/April 2005, August 2005 and September 2005 documenting flora, vegetation units and conservation listed flora in or near the Development Envelope.
Biota Environmental Sciences (2005). <i>Vegetation and Flora Survey of Mesa A and Mesa G, near Pannawonica</i> . Unpublished report prepared for Robe River Iron Associates, July 2005.	Surveys conducted in August 2003 and May 2004 documenting flora, vegetation units and conservation listed flora in or near the Development Envelope.
Terrestrial fauna	
Bat Call WA (2016). <i>Mesa B and C Ghost bat roost cave assessment</i> . Unpublished report prepared for Rio Tinto, July 2016.	Extensive search for ghost bat presence at Mesa B and Mesa C conducted in July 2016, including assessment of the conservation value of caves associated with the presence of ghost bats.
MWH (2015). <i>Level 2 Terrestrial Fauna Surveys: Mesa B-C, Warrambo BWT and Highway to Tod Bore</i> . Unpublished report prepared for Rio Tinto Iron Ore, November 2015.	Surveys conducted in May and September 2015 documenting terrestrial fauna, fauna habitats, species of conservation significance and habitats that may require specific management.
Biota Environmental Sciences (2011). <i>Robe Valley Mesas Fauna Report</i> . Unpublished report prepared for Rio Tinto Iron Ore, March 2011.	Survey conducted in October 2010 documenting terrestrial fauna, fauna habitats, species of conservation significance and habitats that may require specific management.
Biota Environmental Sciences (2006). <i>Fauna Habitats and Fauna Assemblage of the Mesa A Transport Corridor and Warrambo</i> . Unpublished report prepared for Robe River Iron Associates, January 2006.	Surveys conducted in March 2005, April/May 2005 and August 2005 documenting terrestrial fauna, fauna habitats, species of conservation significance and habitats that may require specific management.
Biota Environmental Sciences (2005). <i>Fauna Habitats and Fauna Assemblage of Mesa A and G, near Pannawonica</i> . Unpublished report prepared for Robe River Iron Associates, July 2005.	Survey conducted in May 2004 documenting terrestrial fauna, fauna habitats, species of conservation significance and habitats that may require specific management.

Study	Description
Subterranean fauna	
Biota Environmental Sciences (2007). <i>Mesa A Troglobitic Fauna Studies Update</i> . Unpublished report prepared for Pilbara Iron, July 2007.	Consolidation of troglofauna data for six phases of surveys conducted mainly at Mesa A between 2004 and 2007.
Biota Environmental Sciences (2007). <i>Mesa A Troglobitic Fauna Species Accumulation Update</i> . Unpublished report prepared for Pilbara Iron, July 2007.	Analysis of troglofauna species accumulation for six phases of surveys conducted mainly at Mesa A between 2004 and 2007.
Biota Environmental Sciences (2006). <i>Mesa A and Robe Valley Mesas Troglobitic Fauna Survey</i> . Unpublished report prepared for Robe River Iron Associates, March 2006.	Surveys conducted November 2004 to January 2005, April to May 2005, July to September 2005 documenting subterranean fauna and assessing subterranean fauna habitat.
Other	
MWH (2015). <i>Mesa Façade Assessment – Mesas B and C</i> . Unpublished report prepared for Rio Tinto Iron Ore, August 2015.	Survey conducted in May 2015 assessing the ecological value of the mesa escarpments of Mesa B and Mesa C.
Various targeted surveys associated with Rio Tinto exploration and pastoral activities	Flora/vegetation and fauna surveys conducted in localised areas subject to Native Vegetation Clearing Permit applications.

Additional studies that are in progress relevant to the Proposal are described in Table 5-2.

Table 5-2: Environmental studies in progress relevant to the Proposal

Study	Description
Flora and vegetation	
MWH (in prep)	Surveys conducted May 2016 documenting vegetation units and conservation listed flora in the Proposal Area. Monitoring transects established across riverine vegetation in the Robe River in May 2016.
Subterranean fauna	
Biota Environmental Sciences (in prep)	Surveys conducted June to August 2015, August to October 2015 and January to March 2016 documenting subterranean fauna and assessing subterranean fauna habitat.
Aquatic fauna	
WRM (in prep)	Survey conducted May 2016 documenting aquatic fauna and water quality in pools in the Robe River and documenting aquatic fauna in sediments in Warrambo Creek.
Visual impact assessment	
Rio Tinto (in prep)	Visual impact assessment considering vantage points along the North West Coastal Highway, Pannawonica Road and the Robe River.

6. ASSESSMENT OF PRELIMINARY KEY ENVIRONMENTAL FACTORS

The environmental factors and objectives adopted by the EPA are listed in EAG 8 (EPA 2015). The Proponent has identified the following preliminary key environmental factors that are relevant to the Proposal:

- Hydrological Processes;
- Flora and Vegetation;
- Terrestrial Fauna;
- Subterranean Fauna;
- Offsets; and
- Rehabilitation and Decommissioning.

The above factors are discussed in sections 6.1 to 6.6. The Proponent considers that the remaining environmental factors identified in EAG 8 are either not relevant to the Proposal or will not result in a significant impact (refer Section 7).

6.1 HYDROLOGICAL PROCESSES

6.1.1 EPA OBJECTIVE

The EPA objective for Hydrological Processes as per EAG 8 (EPA 2015) is, 'To maintain the hydrological regimes of groundwater and surface water so that existing and potential uses, including ecosystem maintenance, are protected'.

6.1.2 EXISTING ENVIRONMENT

Surface hydrology

The Warramboo deposit and most of the Highway and Tod Bore deposits lie within the Warramboo Creek catchment which has a catchment area of approximately 685 km². Warramboo Creek is ephemeral and drains generally from south to north. It is well-defined for much of its course before it discharges into the poorly defined scrubland of the coastal plain. It is likely that during large floods the poorly defined lower reaches of the Warramboo Creek merge in the coastal plain with the Robe River floodplain (Aquaterra 2005).

Mesa B and Mesa C lie within the Robe River catchment which has a catchment area of approximately 7100 km². The Robe River drains generally from east to west through the high relief areas of the Hamersley Ranges onto the more gently sloping areas in the coastal plain before discharging into the ocean. For the majority of its course, the Robe River is ephemeral with a wide, shallow flood plain. During the dry season water is often restricted to a series of permanent pools that are maintained by sub-surface flow (Bowman *et al* 1991).

Hydrogeology – Warramboo area

The stratigraphic sequence in the Warramboo area from youngest to oldest comprises:

- Quaternary Alluvium: A surficial deposit comprising silts and gravels covering the flat to undulating plains in the Warramboo area.

- Tertiary Robe Pisolite: A channel-fill deposit within a palaeochannel that has incised into the Cretaceous rocks of the Robe Valley; iron ore mineralisation occurs within this unit.
- The Yarraloola Conglomerate: Pebbles of chert, banded iron formation and quartz in oxidized (limonitic) sandy clays.
- The Ashburton Formation: Mudstone, siltstone and immature sandstone interbedded with minor amounts of conglomerate, dolomite, mafic volcanic rock and banded iron formation.

The Warrambo deposit is associated with the Robe Pisolite and is approximately 90% above the water table. The Robe Pisolite varies between 8 m and 20 m thick and is underlain by up to 70 m of saturated Yarraloola Conglomerate.

The Yarraloola Conglomerate is the main aquifer in the area and is generally regarded as an aquifer with the potential for significant yields. Groundwater flow is inferred to be from south-east to north-west with a gradient of 0.005. The water table in the Warrambo area is between 15 m and 20 m below ground level. Recharge to the Yarraloola aquifer is predominantly via direct infiltration from rainfall and indirectly during high stream-flow events. Groundwater discharge is via outflow to the ocean approximately 35 km down gradient.

Hydrogeology – Mesa C

The local hydrogeology in the Mesa C area consists of an unconfined aquifer defined by the Tertiary Robe Pisolite. The basement beneath the Robe Pisolite forms an uneven surface with numerous basement highs, possibly bounding the local aquifer to the east and west. Groundwater flow in this area is to the north-west, parallel to the Robe River. The water table is approximately 50 m below the surface of Mesa C and a low hydraulic gradient suggests a highly transmissive aquifer. Preliminary geological data indicate that the Ashburton Formation underlies the Mesa C Deposit so there is likely to be limited to no hydraulic connectivity between the Mesa C deposit and the Robe River alluviums. Surface run-off flow is minimal suggesting aquifer recharge is mostly from through-flow from the Red Hill Creek valley. Groundwater discharge is via groundwater through-flow.

Hydrogeology – Jimmawurrada

The groundwater in Jimmawurrada valley occurs in the valley floor alluvium, tertiary pisolites, basal gravels and weathered/fractured basement rock (Wittenoom Formation and Marra Mamba Iron Formation). The valley floor alluvium covers the entire valley floor between the Proterozoic bedrock outcrops to the north, south and at the eastern end of the valley. The thickness of the valley floor alluvium and tertiary sediments progressively decreases as the valley becomes wider towards Mesa J with an increase in clay matrix.

A shallow groundwater table exists in much of the Jimmawurrada flood plain area where the water table is about 3 m below ground level in low lying areas. Concentration of salts due to evaporation is observed in some parts of the Jimmawurrada area.

Recharge to the aquifers in the area occurs as a result of leakage from stream flow events and to a lesser extent by direct infiltration of rainfall over the ground surface. The regional groundwater flow direction is generally to the west however locally it may mimic the general topography and overland flow path.

The valley floor alluvial aquifer is connected with the underlying Robe pisolite. Water quality results and pumping test assessment suggests the aquifers are well connected despite minor confining layers within the stratigraphic sequence. Even though different hydrogeological units (such as valley

floor alluvium, tertiary pisolite, basal gravels/conglomerates and fractured basement) are hydraulically connected observations indicate considerable heterogeneity; lateral movement of water is not uniform across the horizon.

6.1.3 POTENTIAL IMPACTS

The following aspects of the Proposal may affect hydrological processes:

- Abstracting groundwater from the Yarraloola aquifer at Warramboos and/or from Jimmawurrada for water supply and from Warramboos for BWT mining will result in groundwater drawdown. Groundwater drawdown in these areas may result in:
 - stress to or loss of groundwater dependent vegetation;
 - temporary reduction in stygofauna habitat.
- Dewatering at Mesa C will result in groundwater drawdown. If there is hydraulic connectivity between the Mesa C deposit and the Robe River alluviums, drawdown in this area may result in:
 - temporary, seasonal reduction to water levels in semi-permanent pools in the Robe River;
 - limited impacts to riparian vegetation, including stress to or loss of vegetation;
 - limited impacts to terrestrial and aquatic fauna habitats associated with the Robe River and potential loss of individuals;
 - impacts to heritage sites associated with the Robe River.
- Discharging surplus water to Warramboos Creek will result in surface flow no further than 8 km downstream of the discharge point under natural no-flow conditions. Surface flow in this area may result in temporary:
 - changes to riparian vegetation (including stress/loss) from species adapted to an ephemeral system to those adapted to more permanent water bodies;
 - changes to aquatic fauna assemblages from species adapted to an ephemeral system to those adapted to more permanent water bodies;
 - erosion of the creek bank.

6.1.4 MANAGEMENT STRATEGIES

Strategies to minimise the impacts to hydrological processes include:

- Undertaking hydrogeological and hydrological investigations and development of numerical models to estimate the potential impacts of groundwater abstraction and discharge.
- Undertaking aquatic fauna surveys in the Robe River and Warramboos Creek.
- Monitoring water levels and abstraction rates during dewatering with ongoing validation of the hydrogeological modelling.
- Monitoring the extent of surface flow generated by discharge of surplus water.
- Designing the discharge outfall to reduce the velocity of the water at discharge and thereby minimise erosion.

Management strategies for potential impacts to flora and vegetation, terrestrial fauna, subterranean fauna and heritage arising from hydrological processes are discussed in sections 6.2.4, 6.3.4, 6.4.4 and 7 respectively.

6.1.5 ANTICIPATED RESIDUAL IMPACTS

The Proposal will result in groundwater drawdown in the vicinity of Warrambo, Mesa C and Jimmawurrada (should this option be selected). Recovery of the groundwater table will occur once water abstraction ceases.

Preliminary hydrogeological data indicate limited to no hydraulic connectivity exists between the Mesa C deposit and the Robe River alluviums and therefore it is unlikely that semi-permanent pools in the Robe River will be affected by mine dewatering at Mesa C. Further hydrogeological investigations are underway to confirm this.

The Proposal will also generate surface water flow in Warrambo Creek no further than 8 km from the discharge point under natural no-flow conditions. Surface water flow will cease once BWT mining at Warrambo is complete.

Anticipated residual impacts to flora and vegetation, terrestrial fauna, subterranean fauna and heritage arising from hydrological processes are discussed in sections 6.2.5, 6.3.5, 6.4.5 and 7 respectively.

The Proponent considers that the Proposal is likely to meet the EPA objective for Hydrological Processes.

6.2 FLORA AND VEGETATION

6.2.1 EPA OBJECTIVE

The EPA objective for Flora and Vegetation as per EAG 8 (EPA 2015) is, 'To maintain representation, diversity, viability and ecological function at the species, population and community level'.

6.2.2 EXISTING ENVIRONMENT

MWH undertook a two-phase flora and vegetation survey in 2015 covering most of the Development Envelope. Thirty-six vegetation units were mapped in the survey area, nineteen of which were recorded on the stony plains, five on mesa plateaus and rocky slopes, three in mesa gullies, six on floodplains or in drainage lines, three in riverine habitat, and one on hardpan. No Threatened Ecological Communities (**TECs**) or Priority Ecological Communities (**PECs**) directly related to vegetation were recorded in the survey area (MWH 2016). The Proposal Area is, however, adjacent to the Priority 3 PEC Sand Sheet Vegetation (Robe Valley) located at the base of the south-eastern side of Mesa A.

No vegetation units within the survey area are considered to be of regional significance. Two vegetation units are considered to be of high local significance as described in Table 6-1 (MWH 2016).

Table 6-1: Vegetation units considered to be of high local significance

Code	Description	Reason
ChAbAtrTw	<i>Corymbia hamersleyana</i> low isolated trees over <i>Acacia ivenosa</i> and <i>Acacia trachycarpa</i> mid sparse to open shrubland over <i>Triodia wiseana</i> hummock grassland to open hummock grassland.	Supports riparian habitat and associated phreatophytic vegetation of a major drainage system for the region, the Robe River.
EcEvMgAtrCv	<i>Eucalyptus camaldulensis</i> subsp. <i>refulgens</i> and <i>Eucalyptus victrix</i> low open woodland over <i>Melaleuca glomerata</i> and <i>Acacia trachycarpa</i> tall to mid open shrubland over <i>Cyperus vaginatus</i> sparse sedgeland.	Supports riparian habitat and associated phreatophytic taxa, of a regional drainage system, the Robe River. Also, supports Priority flora taxon <i>Rhynchosia bungarensis</i> (P4).

The vegetation condition of vegetation in the survey area was assessed as Excellent (63%), Very Good (29%) or Good (5%) with the condition in the remaining areas assessed as Poor or Completely Degraded (MWH 2016).

No Declared Rare Flora (**DRF**) were recorded or expected to occur in the survey area. MWH (2016) recorded three Priority Flora taxa in the survey area:

- *Triodia* sp. Robe River (M.E. Trudgen et al. MET 12367) (Priority 3);
- *Rhynchosia bungarensis* (Priority 4); and
- *Goodenia nuda* (Priority 4).

In addition two taxa representing range extensions and two taxa with anomalous features were identified in the survey area (MWH 2016):

- *Olearia stuartii* (range extension);
- *Phyllanthus exilis* (range extension);
- *Abutilon* aff. *hannii* (anomalous features); and
- *Tephrosia* aff. *remotiflora* (Peedamulla form) (anomalous features).

Thirteen introduced flora taxa were recorded in the survey area (MWH 2016). None of these taxa are Declared Plants listed under the *Biosecurity and Agriculture Management Act 2007* for the Shire of Ashburton.

6.2.3 POTENTIAL IMPACTS

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

- Clearing of vegetation in mining and infrastructure development areas including vegetation communities of local significance and Priority Flora species.
- If there is connectivity between the Mesa C deposit and the Robe River alluviums, dewatering at Mesa C may reduce water levels in pools on the Robe River, potentially resulting in stress to or loss of riparian vegetation.
- Discharge of surplus water to Warrambo Creek may result in stress to or loss of riparian vegetation.

- Disruption of natural surface drainage lines has the potential to affect downstream vegetation that is dependent on surface flows.
- Mining and ore transportation may increase dust emissions causing stress or loss of adjacent vegetation.
- Vehicle and earth movements may result in spread of existing weeds and/or introduction of new weeds.

6.2.4 MANAGEMENT STRATEGIES

Strategies to minimise the impacts to vegetation include:

- Minimising the disturbance footprint during the mine planning phase.
- Preferentially avoiding flora and vegetation of elevated conservation significance.
- Conducting additional flora and vegetation surveys in parts of the Development Envelope that have not yet been surveyed.
- Monitoring riparian vegetation in Warrambo Creek and the Robe River for the duration of abstraction and discharge.
- Implementing vehicle hygiene procedures to prevent the introduction and spread of weeds.
- Mapping and controlling weed species as necessary to protect conservation values.
- Undertaking progressive rehabilitation.

6.2.5 ANTICIPATED RESIDUAL IMPACTS

As a preliminary estimate, the Proposal is expected to result in the progressive clearing of up to 2,500 ha of native vegetation, of which up to 42 ha would occur in the current Mesa A MEZ. This is in addition to the 3,680 ha approved for clearing under MS 756 (including the current approved disturbance in the Mesa A MEZ).

The Proposal is not expected to alter the conservation status or viability of any Priority Flora species or have a significant effect on the representation of vegetation at a local or regional level. No TECs, Environmentally Sensitive Areas or DRF will be affected by the Proposal as none have been recorded in the Development Envelope.

The Priority 3 PEC Sand Sheet Vegetation (Robe Valley) adjacent to the Proposal Area will not be directly impacted by the Proposal, nor will any changes be made to the Sand Sheet catchment as it is located well outside the potential areas of impact of dewatering and discharge. Management of dust, weeds and fire in relation to the Sand Sheet Vegetation is undertaken for the Mesa A Operation and would continue under the current Proposal.

Two vegetation units of high local significance, associated with riparian habitat and phreatophytic vegetation, are present along the Robe River. If there is connectivity between the Mesa C deposit and the Robe River alluviums, dewatering at Mesa C may result in temporary, seasonal stress to these vegetation units within the extent of drawdown. Vegetation similar to one of the vegetation units (EcEvMgAtrCv) is known to occur outside the Development Envelope at Mesa G, Mesa I, Mesa H and Mesa J (Biota 2006), therefore it is unlikely to be locally restricted. The other vegetation unit (ChAbAtrTw) extends outside the survey area but does not align closely with any vegetation units in the contextual data analysis suggesting that it may be locally restricted (MWH 2016). The

results of hydrogeological modelling will provide greater certainty regarding the extent of potential impacts.

Discharge of surplus water to Warrambo Creek may have a temporary, seasonal impact on riparian vegetation and aquatic fauna in the vicinity of Warrambo Creek for the duration of discharge. Both vegetation units associated with Warrambo Creek in the Proposal Area (EcAanAtrAbAtuTe and EcCcAanTe) are considered to be of low local significance (MWH 2015).

The Proponent considers that the Proposal is likely to meet the EPA objective for Flora and Vegetation.

6.3 TERRESTRIAL FAUNA

6.3.1 EPA OBJECTIVE

The EPA objective for Terrestrial Fauna as per EAG 8 (EPA 2015) is, 'To maintain representation, diversity, viability and ecological function at the species, population and assemblage level'.

6.3.2 EXISTING ENVIRONMENT

MWH undertook a two-phase terrestrial fauna survey in 2015 incorporating vertebrate fauna and terrestrial short-range endemic (SRE) invertebrate fauna. Nine fauna habitat types were identified, grouped within three broad landform categories of Rocky Ranges, Plains and Watercourses. The most significant habitat features in the survey area are deep gullies on the escarpments of Mesa B and Mesa C and semi-permanent pools of the Robe River and riparian vegetation of the Robe River and Warrambo Creek. The nine fauna habitat types identified within the survey area are typical of the Pilbara bioregion and all habitats identified extend well beyond the survey area (MWH 2016).

Seven conservation listed species were recorded during the surveys (refer Table 6-2). In addition, eleven conservation listed species that were not recorded during the surveys were considered very likely or likely to occur in the area (MWH 2016).

Table 6-2: Conservation listed species recorded or likely to occur in the survey area

Common name	Scientific name	Conservation status		Likelihood of occurrence
		WC Act	EPBC Act	
Northern quoll	<i>Dasyurus hallucatus</i>	Schedule 2	Endangered	Confirmed
Pilbara leaf-nosed bat	<i>Rhinonicteris aurantia</i> (Pilbara form)	Schedule 3	Vulnerable	Confirmed
Pilbara olive python	<i>Liasis olivaceus barroni</i>	Schedule 3	Vulnerable	Confirmed
Ghost bat	<i>Macroderma gigas</i>	Schedule 3	Vulnerable	Confirmed
Western pebble-mound mouse	<i>Pseudomys chapmani</i>	Priority 4	-	Confirmed
Rainbow bee-eater	<i>Merops ornatus</i>	Schedule 5	Migratory	Confirmed
Cattle egret	<i>Ardea ibis</i>	Schedule 5	Migratory	Confirmed
Eastern great egret	<i>Ardea modesta</i>	Schedule 5	Migratory	Very likely

Common name	Scientific name	Conservation status		Likelihood of occurrence
		WC Act	EPBC Act	
Oriental pratincole	<i>Glareola maldivarum</i>	Schedule 5	Migratory	Very likely
Peregrine falcon	<i>Falco peregrinus</i>)	Schedule 7	-	Very likely
Grey falcon	<i>Falco hypoleucos</i>	Schedule 3	-	Likely
Common sandpiper	<i>Actitis hypoleucos</i>	Schedule 5	Migratory	Likely
Wood sandpiper	<i>Tringa glareola</i>	Schedule 5	Migratory	Likely
Common greenshank	<i>Tringa nebularia</i>	Schedule 5	Migratory	Likely
Little curlew	<i>Numenius minutus</i>	Schedule 5	Migratory	Likely
Eastern osprey	<i>Pandion cristatus</i>	Schedule 5	Migratory	Likely
Long-tailed dunnart	<i>Sminthopsis longicaudata</i>	Priority 4	-	Likely
Lined soil-crevice skink	<i>Notoscincus butleri</i>	Priority 4	-	Likely

Caves are present on the escarpments of Mesa B and Mesa C. Detailed characterisation of the caves on Mesa B and Mesa C was undertaken by Bat Call WA (2016). Bat call data and detailed cave assessment indicate that no permanent Pilbara leaf-nosed bat roosts are present on Mesa B or Mesa C. Detailed cave assessment recorded eleven caves on Mesa B and nine caves on Mesa C that are considered to be in current use by ghost bats. Of the eleven caves in current use at Mesa B, one is considered to be a diurnal/maternal ghost bat roost and ten are nocturnal ghost bat roost caves. Of the nine caves in current use on Mesa C, one is considered to be a diurnal ghost bat roost and eight are nocturnal ghost bat roost caves (Bat Call WA 2016).

The invertebrate fauna section of the 2015 MWH survey (MWH 2016) yielded a total of 353 invertebrate specimens from at least 22 species or morphospecies. None of the specimens collected were identified by experts as known or likely SRE species (MWH 2016). However, limited taxonomic resolution and a lack of regional collection records means that uncertainty exists regarding the potential for some taxa to exhibit short range endemism. Twenty-one taxa were identified with uncertain potential for short range endemism. For these taxa, habitat is a useful indicator of whether a species is likely to have a restricted distribution; habitats that are restricted and/or isolated in the landscape and/or possess mesic microhabitats are considered to have a medium to high potential to support SRE species. Of the 21 taxa identified with uncertain potential for short range endemism, five were collected from habitats with a medium to high potential to support SRE species:

- ?*Karaops* 'indet';
- *Lychas* 'multipunctatus';
- *Urodacus* sp. indet.;

- Philosciidae sp. Indet; and
- *Rhagada convicta* group (Lineage 2).

All other invertebrate specimens either do not have potential to exhibit short range endemism and/or were collected in habitats that are widespread, well-connected and lacking microhabitats.

6.3.3 POTENTIAL IMPACTS

The following aspects of the Proposal may affect terrestrial fauna values:

- Clearing of vegetation in mining and infrastructure development areas will directly disturb fauna habitat and may result in the loss of individuals.
- If there is connectivity between the Mesa C deposit and the Robe River alluviums, dewatering at Mesa C may impact fauna habitats and may result in the loss of individuals.
- Discharging surplus water to Warrambo Creek may impact fauna habitat.
- Vibration from mining operations may damage the integrity of ghost bat roosts on Mesa B and Mesa C.
- Noise and dust from mining and ore transportation may disturb ghost bat roosts on Mesa B and Mesa C.
- Vehicle movements may result in the loss of individuals.

6.3.4 MANAGEMENT STRATEGIES

Strategies to minimise the impacts to terrestrial fauna include:

- Minimising the disturbance footprint during the mine planning phase.
- Altering the Mesa B haul road route to avoid the diurnal/maternal ghost bat roost.
- Retaining the mesa escarpments at Mesa B and Mesa C (except where cuts are required for access).
- Maintaining appropriate speed limits for vehicles.

6.3.5 ANTICIPATED RESIDUAL IMPACTS

As a preliminary estimate, the Proposal is expected to result in the progressive clearing of up to 2,500 ha of native vegetation (incorporating fauna habitat) over the life of the Proposal. This is in addition to the 3,680 ha already approved for clearing under MS 756.

It is recognised that the deep gullies on the escarpments of Mesa B and Mesa C are some of the most significant habitat features in the survey area for both vertebrates and SREs. Retention of the mesa escarpments (except where cuts are required to provide access) will ensure that these habitats continue to be available to fauna.

Semi-permanent pools and riparian vegetation of the Robe River adjacent to Mesa B and Mesa C and riparian vegetation of Warrambo Creek are considered significant habitat features. Dewatering and discharge may impact seasonally on these features in the vicinity of the Proposal Area for the duration of dewatering and discharge. The area of potential impact is, however, a small proportion of the habitat available and dewatering and discharge will be undertaken for a relatively short time period.

Given that mesa escarpments will be retained and that impacts of dewatering and discharge will be seasonal and limited to a small area of the available habitat, it is considered unlikely that the Proposal will significantly affect the regional distribution of terrestrial fauna habitat or the conservation status of any fauna species.

The Proponent considers that the Proposal is likely to meet the EPA objective for Terrestrial Fauna.

6.4 SUBTERRANEAN FAUNA

6.4.1 EPA OBJECTIVE

The EPA objective for Subterranean Fauna as per EAG 8 (EPA 2015) is, 'To maintain representation, diversity, viability and ecological function at the species, population and assemblage level'.

6.4.2 EXISTING ENVIRONMENT

Two Priority 1 PECs relevant to troglofauna are present in the Development Envelope namely, 'Subterranean invertebrate communities of mesas in the Robe Valley region' and 'Subterranean invertebrate community of pisolitic hills in the Pilbara'. Six listed troglofauna species have been recorded in the Development Envelope:

- *Paradraculoides anachoretus* (Vulnerable);
- *Paradraculoides bythius* (Vulnerable);
- *Lagynochthonius asema* (Edward & Harvey, 2008) (P1);
- *Ideoblothrus* sp. 'Mesa A' (P1);
- *Ideoblothrus linnaei* (Harvey & Leng, 2008) (P1); and
- *Tyrannochthonius* sp. 'Mesa A' (P1).

Subterranean fauna assessments have identified troglofauna from the proposed mining area. Some species recorded at Mesa B and Mesa C appear to be restricted to those mesas.

Stygofauna have been recorded in the Development Envelope and the surrounding area. Most of the stygofauna taxa recorded are known to occur outside the potential impact area.

6.4.3 POTENTIAL IMPACTS

The following aspects of the Proposal may affect subterranean fauna values:

- Mining will result in loss of troglofauna habitat and loss of individuals.
- Seepage from placement of waste fines in-pit at Warramboos will result in loss of troglofauna habitat.
- Groundwater abstraction will temporarily reduce stygofauna habitat.
- Spills of hydrocarbons or waste water may degrade the subterranean environment.

6.4.4 MANAGEMENT STRATEGIES

Strategies to minimise the impacts to subterranean fauna include:

- Characterising the troglofauna habitat present in the Proposal Area.

- Characterising the local and regional conservation significance of troglofauna in the Proposal Area.
- Establishing troglofauna habitat retention zones at Mesa B and Mesa C.
- Undertaking troglofauna sampling throughout the life of the mine.
- Undertaking backfilling of mine pits to assist in protecting troglofauna habitat retention zones.

6.4.5 ANTICIPATED RESIDUAL IMPACTS

Loss of troglofauna habitat will occur as a consequence of mining and seepage from waste fines.

Troglofauna habitat at Warrambo, Highway and Tod Bore is part of a contiguous system that extends beyond the Proposal Area. Troglofauna in these areas are, therefore, unlikely to be restricted to the proposed mining areas.

Many troglofauna recorded at Mesa A, Mesa B and Mesa C appear to be restricted to those mesas and are unlikely to occur more widely. A significant volume of troglofauna habitat at Mesa A is excluded from mining. Significant volumes of troglofauna habitat at Mesa B and Mesa C will also be excluded from mining and retained as troglofauna habitat. Ongoing sampling at Mesa A indicates that this is a suitable approach and that the MEZ is providing a suitable volume of habitat to maintain troglofauna representation.

Water abstraction will reduce stygofauna habitat until the water table recovers following cessation of groundwater abstraction. Most of the stygofauna taxa recorded are known to occur outside the Proposal Area. The results of hydrogeological modelling will provide greater certainty regarding the extent of potential impacts.

Based on the proposed management approach and the anticipated residual impacts, the Proponent considers that the Proposal is likely to meet the EPA objective for Subterranean Fauna.

6.5 OFFSETS

6.5.1 EPA OBJECTIVE

The EPA objective for Offsets as per EAG 8 (EPA 2015) is, 'To counterbalance any significant residual environmental impacts or uncertainty through the application of offsets'.

6.5.2 DETERMINATION OF SIGNIFICANT RESIDUAL IMPACT

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

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

- As a preliminary estimate, the Proposal is expected to result in clearing of up to 2,500 ha of native vegetation.
- The majority of the vegetation is in Good to Excellent condition despite evidence of weeds.
- None of the vegetation units in the Development Envelope qualify for specific legislative protection (e.g. TECs). No disturbance is proposed to the Priority 3 PEC Sand Sheet Vegetation (Robe Valley) adjacent to the Proposal Area and within the Development Envelope.

- None of the vegetation units within the Development Envelope are considered to be sufficiently rare or restricted to warrant designating them as being of regional significance.
- The Development Envelope does not lie within a reserve or protected area.

6.5.3 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 fire, is likely to result in a significant impact on environmental values. As a result, offsets for clearing of native vegetation considered in Good to Excellent condition have been consistently applied to the Pilbara Bioregion. Where there is an additional level of environmental value, a higher offset has previously been applied to account for this greater value.

It is expected that an offset will be required for native vegetation in Good to Excellent condition that is cleared as part of the Proposal and any riparian vegetation that is likely to be impacted by the Proposal.

MS 756 does not specify the need for an offset. The Proponent, therefore, considers that the clearing approved under MS 756 is exempt from the requirement to offset under any new Ministerial Statement. The Proponent proposes that any new Condition relating to offsets should reflect that the clearing of 3,680 ha (as approved under MS 756) is exempt from the requirements of an offset and that the additional 2,500 ha of clearing requested via this Proposal will be subject to an offset where that vegetation is in good to excellent condition or is riparian vegetation. This approach is consistent with recent Ministerial Statements, such as MS 1000 for the Brockman Syncline Project and MS 1031 for the Western Turner Syncline Project.

The Proponent considers that the Proposal is likely to meet the EPA objective for Offsets.

6.6 REHABILITATION AND DECOMMISSIONING

The EPA objective for Rehabilitation and Decommissioning as per EAG 8 (EPA 2015) is, 'To ensure that premises are decommissioned and rehabilitated in an ecologically sustainable manner'.

Establishment of infrastructure and mining activities will require clearing of vegetation, and disturbance to the land surface. Mining activities will result in an altered landform remaining upon closure of the site.

The Proponent will prepare a Mine Closure Plan (**MCP**) for the Mesa A Hub Operation in accordance with the Department of Mines and Petroleum (**DMP**) and EPA *Guidelines for Preparing Mine Closure Plans* (2015). The MCP will be regularly updated over the life of the project in consultation with relevant government agencies. Closure activities will also conform to the global Rio Tinto Closure Standard.

The Proponent considers that the Proposal is likely to meet the EPA objective for Rehabilitation and Decommissioning.

7. OTHER ENVIRONMENTAL FACTORS

As previously discussed the preliminary key environmental factors relevant to the Proposal are considered to be: Hydrological Processes, Flora and Vegetation, Terrestrial Fauna, Subterranean Fauna, Offsets and Rehabilitation and Decommissioning. The following factors, although not considered key, are relevant to the Proposal:

- Inland Waters Environmental Quality;
- Air Quality and Atmospheric Gases;
- Visual Amenity;
- Landforms; and
- Heritage.

Table 7-1 outlines the consideration of the above factors relevant to the Proposal.

All other factors (Benthic Communities and Habitat, Coastal Processes, Marine Environmental Quality, Marine Fauna, Terrestrial Environmental Quality and Human Health) are not considered to be relevant to the Proposal.

Table 7-1: Consideration of factors unlikely to be key environmental factors

Potential impact	Management	Anticipated residual impact
Inland Waters Environmental Quality EPA Objective: <i>To maintain the quality of groundwater and surface water, sediment and biota so that environmental values, both ecological and social, are protected.</i>		
<ul style="list-style-type: none"> Discharge of surplus water to Warrambo Creek may reduce water quality. Surface water flows through the Proposal Area may become contaminated with sediment and hydrocarbons. 	<ul style="list-style-type: none"> Groundwater to be discharged to Warrambo Creek is generally of good quality; additional water samples will be collected to confirm water quality. Surface water management structures will be installed to prevent erosion and sediment transport. Hydrocarbon bunding and hydrocarbon treatment facilities will be installed to prevent hydrocarbons contaminating surface water and groundwater. 	No significant impacts are anticipated.
Air Quality and Atmospheric Gases EPA Objective: <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>		
<ul style="list-style-type: none"> Dust will be generated by construction, mining, processing, ore handling and transportation and vehicle movements Greenhouse gas emissions will be generated by the Proposal. A preliminary estimate is that the proposed mining operation will generate in the order of 150,000 t CO_{2-e}/annum. 	<ul style="list-style-type: none"> Use of dust extraction, water sprays and dust suppressants as applicable. Clearing work areas only where required. Rehabilitation of disturbed areas, especially following construction activities, to reduce potential dust lift-off from open areas. Designing and operating the Proposal to maximise energy efficiency and minimise greenhouse gas emissions. 	<p>No significant dust impacts are anticipated due to the proposed management controls and remote location of the Proposal.</p> <p>Greenhouse gas emissions are not considered to be significant and will partly replace the current greenhouse gas emissions from the Mesa A/ Warrambo mine as mining transitions from Mesa A/Warrambo to Mesa B and Mesa C.</p>
Amenity EPA Objective: <i>To ensure that impacts to amenity are reduced as low as reasonably practicable.</i>		
Visual amenity from the North West Coastal Highway, Pannawonica Road the Robe River and Warrambo Creek may be impacted by the Proposal.	<ul style="list-style-type: none"> Retention of the Mesa B and Mesa C escarpments (except where cuts are required for access). Designing the Proposal so that waste dumps and other infrastructure are shielded from view from key viewpoints by natural topography. Continuing to locate infrastructure in previously disturbed areas where possible. 	The Proposal Area is adjacent to an existing mining operation with similar components to those of the Proposal. No significant additional impacts are anticipated.

Potential impact	Management	Anticipated residual impact
Heritage EPA Objective: <i>To ensure that historical and cultural associations, and natural heritage, are not adversely affected.</i>		
<ul style="list-style-type: none"> Heritage sites of high significance in the vicinity of the Proposal Area are ethnographic sites (including mythological locations, named springs and pools and places of importance due to current use), as well as the mesa profiles. Some archaeological sites will be disturbed by the Proposal. There may be temporary, seasonal changes to Warrambo Creek and semi-permanent pools in the Robe River (that can be utilised by Traditional Owners) due to surplus water discharge and dewatering respectively. 	<ul style="list-style-type: none"> The Proposal falls within the K&M native title claim (WC99/012). The K&M People have a Claim Wide Participation Agreement and Indigenous Land Use Agreement with Rio Tinto. The agreements commit Rio Tinto and the K&M People to work together to manage and maintain the areas in which Rio Tinto operates. The agreements set clear requirements for processes such as land access, tenure, heritage and environmental approvals, mining benefit payments and reporting and communication requirements. The Proponent is committed to consulting with the K&M regarding the Proposal through Local Implementation Committee (LIC) meetings and heritage survey processes. Environmental matters (e.g. biological surveys, outcomes of environmental monitoring, new approvals) are regularly included on LIC meeting agendas. Whilst the K&M People have been consulted through regular meetings, they were not provided with a copy of this Environmental Review Document before it was lodged. The Proponent will provide a copy of this document as soon as practicable. Biological survey work for the Proposal, and more generally in the Robe Valley, has included K&M involvement. Heritage surveys will be completed in consultation with the K&M. Heritage sites will be avoided where practicable. Where heritage sites cannot practically be avoided, the Proponent will consult with the K&M and seek appropriate approval under the <i>Aboriginal Heritage Act 1972</i>. The Proponent has an established internal system for managing all ground disturbing activities to ensure compliance with heritage commitments and regulatory requirements. Preliminary geological information indicates that the Ashburton formation underlies the Mesa C deposit and therefore there is likely to be limited to no hydraulic connectivity between Mesa C and the Robe River alluviums. The Proponent will complete additional hydrogeological investigation and modelling to confirm the degree of connectivity and thus any potential impacts to pools requiring management. The Proponent will complete additional hydrogeological 	<p>It is anticipated that potential impacts will be managed through the processes contained within the Participation Agreement and under the <i>Aboriginal Heritage Act 1972</i>.</p> <p>Disturbance to heritage sites will be avoided where practicable.</p> <p>Preliminary data indicate limited to no hydraulic connectivity exists between the Mesa C deposit and the Robe River alluviums and therefore it is unlikely that semi-permanent pools in the Robe River will be affected by mine dewatering at Mesa C.</p> <p>Further hydrogeological investigations are underway.</p>

Potential impact	Management	Anticipated residual impact
	<p>investigation and modelling for water abstraction for water supply and mine dewatering at Warramboos and/or at Jimmawurrada if that water supply option is selected.</p> <ul style="list-style-type: none"> The Proponent will provide information to the K&M regarding the modelling and management of potential changes to water courses. 	
Landforms EPA Objective: <i>To maintain the variety, integrity, ecological functions and environmental values of landforms.</i>		
There is limited potential for impact to the mesa landforms as the Mesa B and Mesa C escarpments will be retained (except where cuts are required for access).	Retention of the Mesa B and Mesa C escarpments (except where cuts are required for access).	No significant impacts are anticipated.

8. STAKEHOLDER CONSULTATION

The Proponent has commenced initial consultation on the Proposal as summarised in Table 8-1.

Table 8-1: Stakeholder consultation relevant to the Proposal

Stakeholder	Date	Topics/issues raised	Proponent response/outcome
Office of the Environmental Protection Authority (OEPA)	10 May 2016	The Proponent provided an overview of the scope of the Proposal and a summary of the biological survey results and likely key environmental factors for assessment. The OEPA advised that the Proponent would need to show that the Proposal will meet the EPA objective for subterranean fauna. The OEPA recommended a meeting with the Terrestrial Ecosystems Branch (TEB) to discuss the proposed troglofauna habitat retention zones.	The Proponent is undertaking additional troglofauna studies to demonstrate that the Proposal will meet the EPA objective for subterranean fauna. The Proponent will meet with the TEB once results from current troglofauna sampling and identification and preliminary mine designs are available.
Department of Mines and Petroleum (DMP)	30 June 2016	The Proponent provided an overview of the scope of the Proposal, the tenure context and tenure requirements and a summary of the likely key environmental factors for assessment. The DMP advised that abandonment bund placement and installation need to be considered early in mine planning and mine development to ensure they are not precluded from being installed at closure. The DMP sought clarification whether different subterranean fauna species are recorded on each mesa and whether contextual work had been undertaken on remaining mesas.	The Proponent acknowledged that the Closure Plan will reflect current closure requirements. The Proponent confirmed that different troglofauna species are generally recorded on different mesas and that some contextual subterranean fauna survey work has been undertaken on other mesas in the Robe Valley.
Department of State Development (DSD)	25 August 2016	The Proponent provided an overview of the scope of the Proposal.	The Proponent confirmed a Proposal requesting approval for the development will be submitted to the DSD following funding approval and approval under Part IV of the EP Act.
Kuruma Marthudunera (K&M)	24 March 2015	The Proponent provided an overview of the scope of the Proposal. The Proponent advised K&M that biological surveys were scheduled and provided maps of the proposed survey locations. The Proponent requested heritage surveys. K&M sought clarification regarding current access to Warramboo outstation and the proposed mine development schedule.	The Proponent confirmed that access to Warramboo outstation is available provided the Drill and Blast team are contacted prior to any visits.

Stakeholder	Date	Topics/issues raised	Proponent response/outcome
	2 September 2015	The Proponent provided an update on the status of biological surveys and provided preliminary results from biological surveys. K&M discussed mining near the Warramboe outstation.	The Proponent confirmed that the Warramboe outstation will be excluded from mining and that access to the site will be maintained subject to safety constraints. A procedure is in place to allow safe access.
	4 April 2016	The Proponent provided a summary of results from biological surveys and provided information regarding the planned 2016 biological survey work.	No specific response/further action required for the Proponent from this summary of the biological surveys.

9. PRINCIPLES OF ENVIRONMENTAL PROTECTION

The principles of environmentally sustainable development are incorporated into Section 4A of the EP Act. These principles have been considered for the Proposal as summarised in Table 9-1.

Table 9-1: Environmental principles of the EP Act

Principle	Consideration given in the Proposal
<p>1. Precautionary principle</p> <p>Where there are threats of serious or irreversible damage, lack of full scientific certainty should not be used as a reason for postponing measures to prevent environmental degradation.</p> <p>In the application of the precautionary principle, decisions should be guided by:</p> <ul style="list-style-type: none"> (a) Careful evaluation to avoid, where practicable, serious or irreversible damage to the environment; and (b) An assessment of the risk-weighted consequences of various options. 	<p>Comprehensive biological surveys have already been undertaken and others are well underway. The results of the biological surveys are being used to guide the design phase of the Proposal. Where significant potential environmental impacts are identified measures have been, and will continue to be, incorporated into the Proposal design and management to avoid or minimise these impacts where practical.</p>
<p>2. 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 Proposal will make a long-term contribution to the economic prosperity of Western Australia.</p> <p>The Proposal will not compromise current or foreseeable future land use options in the area.</p> <p>The Proposal can be effectively managed through avoidance, management and mitigation measures to ensure that the health, diversity and productivity of the environment is maintained or enhanced for the benefit of future generations.</p>
<p>3. Conservation of biological diversity and ecological integrity.</p> <p>Conservation of biological diversity and ecological integrity should be a fundamental consideration.</p>	<p>Comprehensive biological surveys have already been undertaken and others are other are underway 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 the Proposal design and management to avoid or minimise these impacts where practical.</p> <p>The Proponent's HSECQ Management System has established rehabilitation procedures for restoring disturbed environments.</p>
<p>4. Improved valuation, pricing and incentive mechanisms</p> <ul style="list-style-type: none"> (a) Environmental factors should be included in the valuation of assets and services. (b) The polluter pays principle – those who generate pollution and waste should bear the cost of containment, avoidance or abatement. (c) The users of goods and services should pay prices based on the full life cycle costs of providing goods and services, including the use of natural resources and assets and the ultimate disposal of 	<p>The Proposal will be subject to a Mine Closure Plan prepared in accordance with the DMP and EPA <i>Guidelines for Preparing Mine Closure Plans</i> (2015) and the Rio Tinto Closure Standard. This will provide the basis for ensuring that post-mining land use objectives are identified (through a consultative process) and can be met. The Proponent will undertake land rehabilitation activities to underpin the mine closure process.</p>

Principle	Consideration given in the Proposal
<p>any wastes.</p> <p>(d) Environmental goals, having been established, should be pursued in the most cost-effective way, by establishing incentives structures, including market mechanisms, which enable those best placed to maximise benefits and/or minimise costs to develop their own solutions and responses to environmental problems.</p>	
<p>5. 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>Application of the Proponent's management policies, systems and procedures, in combination with the Mine Closure Plan, will provide the basis for minimising the generation of waste and its discharge into the environment. Mine planning objectives to minimise stripping ratios, thereby reducing mineral waste materials volumes, will assist in meeting the aims of this principle.</p>

10. REFERENCES

- Aquaterra (2005). *Mesa A/Warrambo Development*. Memorandum Doc 039a. March 2005.
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- Biota Environmental Sciences (2006). *A Vegetation and Flora Survey of the Proposed Mesa A Transport Corridor, Warrambo Deposit and Yarraloola Borefield*. Unpublished report prepared for Robe River Iron Associates.
- Bowman, Bishaw and Gorham (1991). *Consultative Environmental Review: Proposed Iron Ore Mining at Mesa J, Deepdale*. June 1991.
- Department of Mines and Petroleum (DMP) and Environmental Protection Authority (EPA) (2015). *Guidelines for Preparing Mine Closure Plans*. May 2015.
- Environmental Protection Authority (EPA) (2007a). *Mesa A / Warrambo Iron Ore Project*. Report and Recommendations of the Environmental Protection Authority. Bulletin 1251. March 2007.
- Environmental Protection Authority (EPA) (2007b). *Mesa A / Warrambo Iron Ore Project*. Report and Recommendations of the Environmental Protection Authority. Bulletin 1264. September 2007.
- Environmental Protection Authority (EPA) (2015). *Environmental Assessment Guideline for Environmental principles, factors and objectives (EAG 8)*. January 2015.
- Government of Western Australia (2011). *WA Environmental Offsets Policy*. September 2011.
- Government of Western Australia (2014). *WA Environmental Offsets Guidelines*. August 2014.
- MWH (2015). *Level 2 Terrestrial Fauna Surveys: Mesa B-C, Warrambo BWT and Highway to Tod Bore*. Unpublished report prepared for Rio Tinto Iron Ore. November 2015.
- MWH (2016). *Level 2 Flora and Vegetation Survey: Mesa B-C, Warrambo BWT and Highway to Tod Bore - Phase 1 and Phase 2*. Unpublished report prepared for Rio Tinto Iron Ore. May 2016.

APPENDICES

Appendix 1: Consideration of EPA Policies

Table A1: Consideration of EPA policies for process steps

EIA Process Step	Policy	Is the policy relevant to the Proposal? If yes, what are the relevant considerations for the Proposal?
Referral	EPA (2012). <i>Environmental Assessment Guideline No. 1 (EAG1): Defining the Key Characteristics of a Proposal.</i>	The summary of the Proposal and the preliminary Key Characteristics of the Proposal are provided in Table 4-1 and Table 4-2 respectively. The regional location and proposal elements are shown in Figure 1-1 and Figure 4-1 respectively.
Referral	EPA (2015). <i>Environmental Assessment Guideline No. 8 (EAG8): Environmental principles, factors and objectives.</i>	<p>Consideration of environmental principles for the Proposal is provided in Table 9-1.</p> <p>The following preliminary key environmental factors have been addressed in sections 6.1 to 6.6 in the context of relevant EPA objectives:</p> <ul style="list-style-type: none"> • Flora and Vegetation; • Terrestrial Fauna; • Subterranean Fauna; • Hydrological Processes; • Offsets; • Rehabilitation and Decommissioning.
Referral	EPA (2015). <i>Environmental Assessment Guideline No. 9 (EAG9): Application of a significance framework in the environmental impact assessment process.</i>	The significance framework has been applied through consideration of factors in sections 6.1 to 6.6 that are likely to be considered by the EPA to be preliminary key environmental factors. The preliminary application of the mitigation hierarchy and consideration of anticipated residual impacts is also discussed in sections 6.1 to 6.6.
Referral	EPA (2015). <i>Environmental Assessment Guideline No. 16 (EAG16): Referral of a proposal under s38 of the Environmental Protection Act 1986.</i>	The referral form and current document have been prepared in accordance with EAG16 for the purpose of referring the Proposal under s38 of the EP Act.
Referral	EPA (2006). <i>Guidance Statement No. 10 (GS10): Level of assessment for proposals affecting natural areas within the System 6 region and Swan Coastal plain portion of the System 1 region.</i>	Not relevant. The Proposal is not in the System 6 region or the Swan Coastal Plain portion of the System 1 region.

Table A2: Consideration of EPA policies and Section 16(e) advice for preliminary key environmental factors

Environmental factor	Policy	Is the policy relevant to the Proposal? If yes, what are the relevant considerations for the Proposal?
Flora and vegetation	EPA (2000). <i>Position Statement No. 2: Protection of Native Vegetation in Western Australia.</i>	<p>The following elements relevant to biological diversity have been considered:</p> <ul style="list-style-type: none"> No known species of plant or animal will become extinct as a consequence of the Proposal. No association or community of indigenous plants or animals will cease to exist as a result of the Proposal. No vegetation type will be taken below the 'threshold level' of 30% of the pre-clearing extent of the vegetation type as a result of the Proposal. <p>Potential impacts of the Proposal to native vegetation are identified in Section 6.2.3 and preliminary information regarding management of potential impacts is provided in Section 6.2.4. Discussion of alternative development scenarios will be included in the Environmental Impact Assessment (EIA) document.</p>
Flora and vegetation	EPA (2002). <i>Position Statement No. 3: Terrestrial Biological Surveys as an Element of Biodiversity Protection.</i>	Comprehensive flora and vegetation surveys have been, and will continue to be, undertaken consistent with Guidance Statement No. 51 (GS51). Any survey limitations relative to GS51 will be noted in the flora and vegetation survey report.
Flora and vegetation	EPA (2004). <i>Guidance Statement No. 51 (GS51): Terrestrial Flora and Vegetation Surveys for Environmental Impact Assessment in Western Australia.</i>	Flora and vegetation surveys have been, and will continue to be, undertaken consistent with GS51. Any survey limitations relative to GS51 will be noted in the flora and vegetation survey report.
Flora and vegetation	EPA and Parks and Wildlife (2015). <i>Technical Guide – Terrestrial Flora and Vegetation Surveys for Environmental Impact Assessment.</i>	Flora and vegetation surveys have been, and will continue to be, undertaken consistent with this technical guide. Any survey limitations relative to this guide will be noted in the flora and vegetation survey report.
Flora and vegetation	EPA (2013). <i>Environmental Protection Bulletin No. 20 (EPB20): Protection of naturally vegetated areas through planning and development.</i>	Not relevant. This bulletin applies to strategic planning, structure plans, new schemes and scheme amendments, subdivision and development proposals, in urban and peri-urban areas of Western Australia. The Proposal is not located within an urban or peri-urban area.
Flora and vegetation	EPA (2014). <i>Environmental Protection Bulletin No. 21 (EPB21): Guidance for wind farm developments.</i>	Not relevant. The Proposal does not include a wind farm.
Terrestrial fauna	EPA (2002). <i>Position Statement No. 3: Terrestrial Biological Surveys as an Element of Biodiversity Protection.</i>	Comprehensive terrestrial fauna surveys have been undertaken consistent with Guidance Statement No. 20 (GS20) and Guidance Statement No. 56 (GS56). Any survey limitations relative to GS20 and GS56 will be noted in the terrestrial fauna survey report.
Terrestrial fauna	EPA (2004). <i>Guidance Statement No. 56 (GS56): Terrestrial Fauna Surveys for Environmental Impact</i>	Terrestrial fauna surveys have been undertaken consistent with GS56. Any survey limitations relative to GS56 will be noted in the terrestrial fauna survey report.

Environmental factor	Policy	Is the policy relevant to the Proposal? If yes, what are the relevant considerations for the Proposal?
	<i>Assessment in Western Australia.</i>	
Terrestrial fauna	EPA (2009). <i>Guidance Statement No. 20 (GS20): Sampling of Short Range Endemic Invertebrate Fauna for Environmental Impact Assessment in Western Australia</i>	Sampling of short range endemic invertebrate fauna has been undertaken consistent with GS20. Any survey limitations relative to GS20 will be noted in the terrestrial fauna survey report.
Terrestrial fauna	EPA and Department of Environment and Conservation (2010). <i>Technical Guide – Terrestrial Vertebrate Fauna Surveys for Environmental Impact Assessment.</i>	Terrestrial fauna surveys have been undertaken consistent with this technical guide. Any survey limitations relative to this guide will be noted in the terrestrial fauna survey report.
Terrestrial fauna	EPA (2013). <i>Environmental Protection Bulletin No. 20 (EPB20): Protection of naturally vegetated areas through planning and development.</i>	Not relevant. This bulletin applies to strategic planning, structure plans, new schemes and scheme amendments, subdivision and development proposals, in urban and peri-urban areas of Western Australia. The Proposal is not located within an urban or peri-urban area.
Terrestrial fauna	EPA (2014). <i>Environmental Protection Bulletin No. 21 (EPB21): Guidance for wind farm developments.</i>	Not relevant. The Proposal does not include a wind farm.
Subterranean fauna	EPA (2013). <i>Environmental Assessment Guideline No. 12 (EAG12): Consideration of subterranean fauna in environmental impact assessment in Western Australia.</i>	Subterranean fauna surveys are being undertaken consistent with EAG12. The design of the subterranean fauna surveys is consistent with the requirements of EAG12 and the level of survey is consistent with that described in Table 2 of EAG12. Vouchering and lodgement of specimens is underway consistent with EAG12. Any limitations relative to this guide will be noted in the subterranean fauna survey report.
Subterranean fauna	EPA (2007). <i>Draft Guidance Statement No. 54A (GS54A): Sampling Methods and Survey Considerations for Subterranean Fauna in Western Australia.</i>	Subterranean fauna surveys are being undertaken consistent with GS54A. Survey design, sampling methods and identification are consistent with those described in GS54A. Any limitations relative to this guide will be noted in the subterranean fauna survey report.
Hydrological processes	EPA (2004). <i>Position Statement No. 4: Environmental Protection of Wetlands.</i>	Not relevant. Position Statement No. 4 applies to areas of marsh, fen, peatland or water but specifically excludes rivers and creeks. There are no wetlands, as defined in Position Statement No. 4, in or near the Development Envelope.
Hydrological processes	EPA (2014). <i>Environmental Protection Bulletin No. 22 (EPB22): Hydraulic fracturing for onshore natural gas from shale and tight rocks.</i>	Not relevant. The Proposal does not include hydraulic fracturing.
Offsets	EPA (2014). <i>Environmental Protection Bulletin No. 1 (EPB1): Environmental offsets.</i>	Potential impacts of the Proposal, preliminary mitigation and anticipated residual impacts to flora and vegetation, terrestrial fauna, subterranean fauna and hydrological processes are discussed in sections 6.1 to 6.4. Mitigation for these factors has been, and will continue to be, developed in accordance with the mitigation hierarchy in EPB1. Preliminary consideration of an offset requirement for the Proposal is provided in Section 6.5.3.

Environmental factor	Policy	Is the policy relevant to the Proposal? If yes, what are the relevant considerations for the Proposal?
Offsets	Government of Western Australia (2011). <i>WA Environmental Offsets Policy</i> .	Consistent with the WA Environmental Offsets Policy, the Proposal has been, and will continue to be, designed using the mitigation hierarchy with offsets used to compensate for residual environmental impacts.
Offsets	Government of Western Australia (2014). <i>WA Environmental Offsets Guidelines</i> .	Consistent with the WA Environmental Offsets Guidelines, the Proposal has been, and will continue to be, designed using the mitigation hierarchy with offsets used to compensate for significant residual environmental impacts. It is anticipated that an offset will be required for native vegetation in Good to Excellent condition that is cleared as part of the Proposal and any riparian vegetation that is likely to be impacted by the Proposal.
Rehabilitation and decommissioning	EPA (2015). <i>Environmental Protection Bulletin No. 19 (EPB19): EPA involvement in mine closure</i> .	The Proponent acknowledges the EPA will assess the Mine Closure Plan that will be provided as part of the EIA document.
Rehabilitation and decommissioning	Department of Mines and Petroleum and EPA (2015). <i>Guidelines for Preparing Mine Closure Plans</i> .	The Proponent will prepare a Mine Closure Plan for the Proposal in accordance with these Guidelines. The Closure Plan will be provided with the EIA document.
Rehabilitation and decommissioning	EPA (2006). <i>Guidance Statement No. 6 (GS6): Rehabilitation of Terrestrial Ecosystems</i> .	The Closure Plan provided with the EIA document will contain indicative completion criteria that will evolve throughout the life of the mine and will meet the intent of GS6 at the time of closure.
Rehabilitation and decommissioning	EPA (2014). <i>Environmental Protection Bulletin No. 22 (EPB22): Hydraulic fracturing for onshore natural gas from shale and tight rocks</i> .	Not relevant. The Proposal does not include hydraulic fracturing.
All	EPA (2013). <i>Environmental and water assessments relating to mining and mining-related activities in the Fortescue Marsh management area</i> .	Not relevant. The Proposal is not located in the Fortescue Marsh Management Zone.
All	EPA (2014). <i>Cumulative environmental impacts of development in the Pilbara region</i> .	The Proposal is in the Pilbara. The Proponent will include consideration of cumulative environmental impacts as part of the EIA document.
All	EPA (2001). <i>Dampier to Bunbury Natural Gas Pipeline Land Corridor Expansion Project</i> .	The existing tenure for the approved Mesa A Operation co-incides with the easement for the Dampier to Bunbury Natural Gas Pipeline (DBNGP) corridor. The Proposal includes additional areas that cross the DBNGP corridor. The Proponent will undertake consultation with the DBNGP Land Access Minister and seek relevant Section 41 licences where works are required within the DBNGP corridor and any proposed expansion of the DBNGP corridor.

Table A3: Consideration of EPA policies for other environmental factors

Environmental factor	Policy	Is the policy relevant to the Proposal? If yes, what are the relevant considerations for the Proposal?
Landforms	EPA (2015). <i>Environmental Protection Bulletin No. 23 (EPB23): Guidance on the EPA Landforms factor.</i>	The Proponent acknowledges that the EPA will include consideration of the 'Landform' factor in assessment of the Proposal. The Proponent recognises the significance of the mesa landforms in terms of the criteria in EPB23.
Landforms	EPA (2006). <i>Guidance Statement No. 6 (GS6): Rehabilitation of Terrestrial Ecosystems.</i>	The Closure Plan provided with the EIA document will contain indicative completion criteria that will evolve throughout the life of the mine and will meet the intent of GS6 at the time of closure.
Terrestrial environmental quality	EPA (2006). <i>Guidance Statement No. 6 (GS6): Rehabilitation of Terrestrial Ecosystems.</i>	The Closure Plan provided with the EIA document will contain indicative completion criteria that will evolve throughout the life of the mine and will meet the intent of GS6 at the time of closure.
Terrestrial environmental quality	EPA (2014). <i>Environmental Protection Bulletin No. 22 (EPB22): Hydraulic fracturing for onshore natural gas from shale and tight rocks.</i>	Not relevant. The Proposal does not include hydraulic fracturing.
Inland waters environmental quality	EPA (2004). <i>Position Statement No. 4: Environmental Protection of Wetlands.</i>	Not relevant. Position Statement No. 4 applies to areas of marsh, fen, peatland or water but specifically excludes rivers and creeks. There are no wetlands, as defined in Position Statement No. 4, in or near the Development Envelope.
Inland waters environmental quality	EPA (2014). <i>Environmental Protection Bulletin No. 22 (EPB22): Hydraulic fracturing for onshore natural gas from shale and tight rocks.</i>	Not relevant. The Proposal does not include hydraulic fracturing.
Air quality	EPA (2005). <i>Guidance Statement No. 3 (GS3): Separation distances between industrial and sensitive land uses.</i>	Not relevant. The Proposal is remote from sensitive receptors.
Air quality	EPA (2015). <i>Environmental Protection Bulletin No. 24 (EPB24): Greenhouse gas emissions and consideration of projected climate change impacts in the EIA process.</i>	The Proponent acknowledges that the EPA may decide to assess greenhouse gas emissions within the EIA process if the expected greenhouse gas emissions from a proposal are deemed to be significant. An estimate of greenhouse gas emissions for the Proposal is provided in Section 7. Consistent with EPB24, the Proposal has been, and will continue to be, designed in a manner which maximises energy efficiency and minimises greenhouse gas emissions.

Environmental factor	Policy	Is the policy relevant to the Proposal? If yes, what are the relevant considerations for the Proposal?
Air quality	EPA (2014). <i>Environmental Protection Bulletin No. 22 (EPB22): Hydraulic fracturing for onshore natural gas from shale and tight rocks.</i>	Not relevant. The Proposal does not include hydraulic fracturing.
Amenity	EPA (2014). <i>Environmental Assessment Guideline No. 13 (EAG13): Consideration of environmental impacts from noise.</i>	Not relevant. The Proposal is remote from sensitive receptors.
Amenity	EPA (2005). <i>Guidance Statement No. 3 (GS3): Separation distances between industrial and sensitive land uses.</i>	Not relevant. The Proposal is remote from sensitive receptors.
Amenity	EPA (2014). <i>Environmental Protection Bulletin No. 21 (EPB21): Guidance for wind farm developments.</i>	Not relevant. The Proposal does not include a wind farm.
Heritage	EPA (2004). <i>Guidance Statement No. 41 (GS41): Guidance Statement for the Assessment of Aboriginal Heritage.</i>	<p>The Proposal falls within the K&M native title claim (WC99/012). The K&M People have a Claim Wide Participation Agreement with Rio Tinto. The agreement commits Rio Tinto and the K&M People to work together to manage and maintain the areas in which Rio Tinto operates. The agreement sets clear guidelines for processes such as land access, tenure, heritage and environmental approvals, mining benefits payments and reporting and communication requirements. It is anticipated that potential impacts will be managed through the processes contained within the Participation Agreement and under the <i>Aboriginal Heritage Act 1972</i>.</p> <p>The Proponent is committed to consulting with the K&M regarding the Proposal through Local Implementation Committee meetings and heritage survey processes. Heritage surveys will be completed in consultation with the K&M and disturbance to heritage sites will be avoided where practicable.</p> <p>Further details are provided in Section 7.</p>