



Review of Existing Premises

Division 3, Part V *Environmental Protection Act 1986*

Licence Holder:	Pilbara Iron Company (Services) Pty Ltd
ACN:	107 210 248
Licence Number:	L7340/1997/9
File Number:	DER2013/000903
Premises:	Yandicoogina Iron Ore Mine Part of Mining Lease M274SA; LGE L021123 As defined by the coordinates in Schedule 1 of the Revised Licence (Attachment 1)
Date of report:	Thursday, 7 September 2017
Status of Report	Final

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Definitions of terms and acronyms

Term	Definition
ANZECC/ARMCANZ	Australian and New Zealand Environment and Conservation Council and Agriculture and Resource Management Council of Australia and New Zealand
ARI	Average Recurrence Interval
Category	As used in Schedule 1 of the EP Regulations
CID	Channel iron deposit
Clean Fill	As defined in the Landfill Waste Classification and Waste Definitions 1996 (As amended December 2009)
Decision Report	This document
Delegated Officer	An officer under section 20 of the EP Act.
DER	Department of Environment Regulation
Dewater	Verb: to abstract water for the purposes of reducing groundwater levels Noun: Water abstracted for the above purpose
DWER	Department of Water and Environmental Regulation
EP Act	<i>Environmental Protection Act 1986</i>
EP Regulations	<i>Environmental Protection Regulations 1987</i>
EPCM	Engineering, Procurement and Construction Management Building
Existing Licence	The licence issued under Part V, Division 3 of the EP Act and in force prior to the commencement of this Review (last amended 2 June 2016)
GL	Gigalitres
GL/a	Gigalitres per annum
ha	Hectare
HVFF	Heavy vehicle fuel facility
ICMS	Incident and Complaints Management System
Inert Waste	As defined in the Landfill Waste Classification and Waste Definitions (As amended December 2009)
JC, JSW, JSE	Junction Central, Junction South-West, Junction South-East
Licence Holder	Pilbara Iron Company (Services) Pty Ltd (a subsidiary of Rio Tinto Limited)
mbgl	Metres below ground level
MS	Ministerial Statement

MCP	Mine Closure Plan
PEC	Priority Ecological Community
PER	Public Environmental Review
the Premises	The Yandicoogina Iron Ore Mine as defined by the coordinates in Schedule 1 of the Revised Licence
Prescribed Premises	Premises of the types listed in Schedule 1 of the EP Regulations.
Primary Activities	Refers to the activities on the front of the Licence and the description provided in Schedule 2 of the Licence
Review	This licence review
Revised Licence	The amended licence issued under Part V, Division 3 of the EP Act following the finalisation of this review
RiWI Act	means the <i>Rights in Water and Irrigation Act 1914</i>
Special Waste Type 1	As defined in the <i>Landfill Waste Classification and Waste Definitions (As amended December 2009)</i>
Special Waste Type 2	
TSS	Total Suspended Solids
WFC	Waste Fines Cell
WWTP	Wastewater treatment plant

1. Purpose and Scope of Assessment

This Licence Review (the Review) for Yandicoogina Iron Ore mine site (the Premises) was initiated by the Department of Environment Regulation (now Department of Water and Environmental Regulation, or DWER¹) under section 59(2) of the *Environmental Protection Act 1986* (the EP Act) following consultation with Pilbara Iron Company (Services) Pty Ltd (the Licence Holder). The purpose of the Review is to align the Licence with DWER's Regulatory Framework as described in the *Guidance Statement: Regulatory Principles* (DER, July 2015).

This Decision Report details the Delegated Officer's assessment of risks arising from emissions and discharges generated by the Prescribed Activities undertaken at the Premises.

The Revised Licence (L7340/1997/9) is set out in Attachment 1.

1.1 Application details

During the Review, the Licence Holder submitted two separate applications for amendment of the Existing Licence, signed 25 August 2016 and 25 January 2017 respectively.

The August 2016 amendment application requested the following:

- addition of a new dewatering discharge outlet (DO9A);
- reinstatement of the original location of DO5 (to now be referred to as DO5A); and
- expansion to the 'inert' Yandicoogina waste dump landfill

The January 2017 amendment application sought to transfer the approval for construction of stage 2 of Waste Fines Cell (WFC) 3 and the construction of WFC3A from the previously approved Works Approval W5630/2014/1 into the Revised Licence.

This amendment was requested to allow for the operation of WFC3A immediately upon completion of construction. The Licence Holder proposed no changes to the approval given through the amendment to W5630/2014/1 other than the conditions be transferred into the Revised Licence. The Licence Holder simultaneously applied for the surrender of W5630/2014/1.

Both amendment applications and the surrender of W5630/2014/1 are dealt with as part of this Review.

2. Background

The Premises is located approximately 90km north-west of Newman on tenement M274SA (Figure 1). Mining commenced at the Premises in 1998.

The project consists of several operational mining areas, respectively referred to as Junction Central (JC), Junction South-East (JSE), Junction South-West (JSW), Oxbow, and Oxbow East. Each stage of the project has been assessed and approved through Part IV of the EP Act. Mining at an additional location, referred to as the Pocket and Billiards deposit, has recently been approved under Part IV of the EP Act.

The Premises operates pursuant to the *Iron Ore (Yandicoogina) Agreement Act 1996*.

A Licence under Part V, Division 3 of the EP Act for the operation of the Premises was first issued on 27 September 2000. The Licence was most recently amended on 2 June 2016.

¹ DWER was formed on 1 July 2017, through the amalgamation of the Department of Water (DoW), Department of Environment Regulation (DER) and the Office of the Environmental Protection Authority (OEPA). DER is only referred to in this Decision Report when discussing correspondence or reference documents issued by, or to the former department.

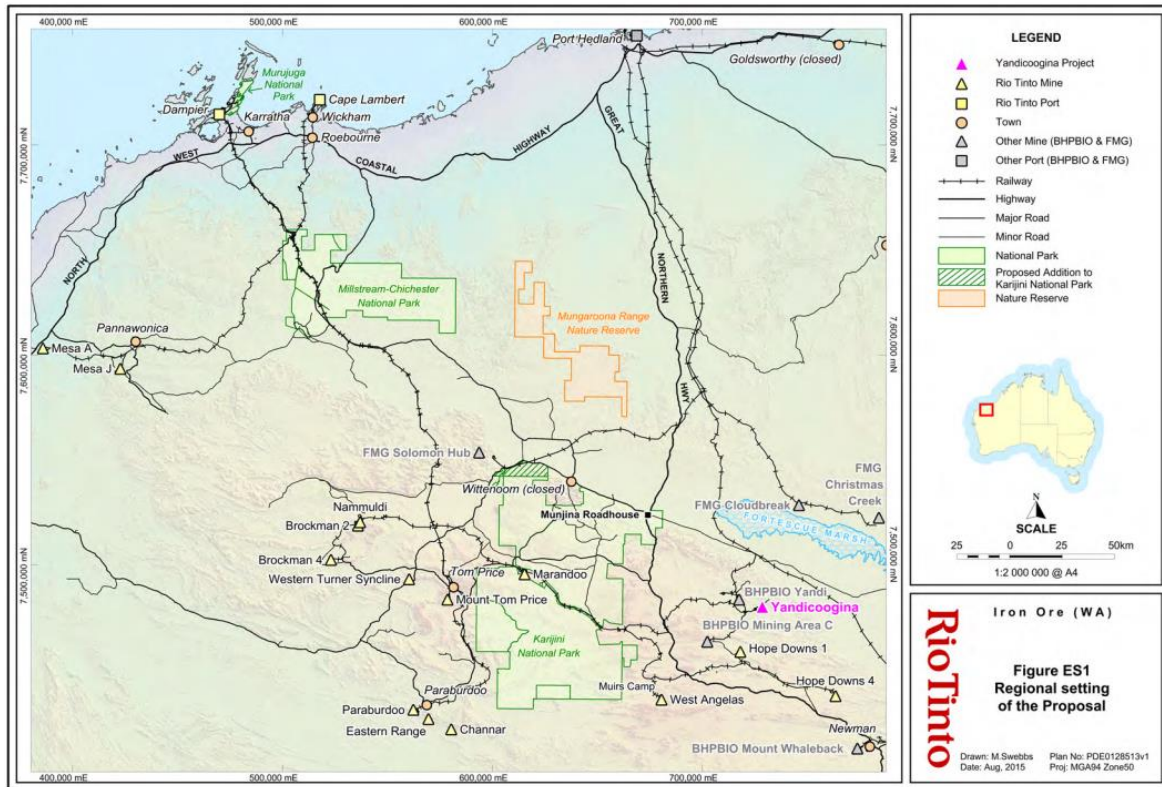


Figure 1: Premises location (RTIO, November 2015)

This Existing Licence relates to activities at the Premises for the prescribed premises categories under the *Environmental Protection Regulations 1987* (the EP Regulations) as listed in Table 1.

Table 1: Categories listed on the Existing Licence

Cat	Description	Approved Premises production or design capacity ¹	2016 Throughput ²
05	Processing or beneficiation of metallic or non-metallic ore: premises on which — (a) metallic or non-metallic ore is crushed, ground, milled or otherwise processed; or (b) tailings from metallic or non-metallic ore are reprocessed; or (c) tailings or residue from metallic or non-metallic ore are discharged into a containment cell or dam.	60,000,000 tonnes per annual period	57,968,086 tonnes
06	Mine dewatering: premises on which water is extracted and discharged into the environment to allow mining of ore.	53 gigalitres per annual period	35.87 GL
12	Screening etc. of material: premises (other than premises within category 5 or 8) on which material extracted from the ground is screened, washed, crushed, ground, milled, sized or separated.	10,000,000 tonnes per annual period	N/A ³
54	Sewage facility: premises — (a) on which sewage is treated (excluding septic tanks); or (b) from which treated sewage is discharged onto land or into waters.	1,192m ³ per day	216m ³ / day

Cat	Description	Approved Premises production or design capacity ¹	2016 Throughput ²
64	Class II or III putrescible landfill site: premises on which waste (as determined by reference to the waste type set out in the document entitled "Landfill Waste Classification and Waste Definitions 1996" published by the Chief Executive Officer and as amended from time to time) is accepted for burial.	7,500 tonnes per annual period	5,395 tonnes
73	Bulk storage of chemicals etc.: premises on which acids, alkalis or chemicals that — (a) contain at least one carbon to carbon bond; and (b) are liquid at STP (standard temperature and pressure), are stored.	1,770,600m ³ in aggregate ⁴	1,760m ³
77	Concrete batching or cement products manufacturing: premises on which cement products or concrete are manufactured for use at places or premises other than those premises.	2,400 tonnes per annual period	0 tonnes

Note 1: Authorised throughputs as per the Existing Licence.

Note 2: Taken from the 2016 Annual Audit Compliance Report (RTIO, April 2017b).

Note 3: Category 12 activities were not authorised at the time of reporting.

Note 4: The Category 73 approved production or design capacity authorised in the Existing Licence has been confirmed by the Licence Holder to be a typographical error. This Decision Report assumes the production or design capacity for Category 73 activities is 1,770m³ in aggregate.

3. Overview of Premises

3.1 Infrastructure and equipment

The Premises infrastructure related to the Primary Activities undertaken at the Premises are detailed in Table 2.

Table 2: Mine infrastructure

Category 5: Processing or beneficiation of metallic ore
<p>Mining operations at the Premises involve the extraction of iron ore from a channel iron deposit (CID) within a paleochannel adjacent to, and occasionally intersecting Marillana Creek. Mining is conducted using drill and blast methods from open cut pits. Following extraction, the ore is crushed and screened on-site to produce a final ore product. Primary and secondary crushing occurs at each of the three mining areas.</p> <p>Wet processing is undertaken on some of the ore via two wet processing plants located at JC and JSE areas. Wet processing produces a waste fines slurry, which is discharged into one of four in-pit waste fines cells (WFC) also located in the JC and JSE areas.</p> <p>The waste fines typically comprise a washed by-product finer than 500 microns and are classified as sandy silt with clay. Waste fines are contained within pit voids with constructed embankments or pit walls forming containment walls. Deposition of waste fines occurs via spigots placed around each cell. Water is recovered from the waste fines cells via decant pontoons and in-pit sumps which collect seepage passing through the WFC embankments.</p> <p>WFC 1 was commissioned in 2004 and WFC 2 was commissioned in September 2011. WFC 3 was commissioned in March 2015. The Licence Holder currently utilises WFC 1 and 2 to deposit waste fines from the wet processing plant located in the JC area, and WFC 3 for waste fines generated by the JSE wet plant (RTIO, July 2016). WFC3A is currently under construction and an increase in height</p>

of WFC 3 to 500m AHD (referred to as Stage 2) has been approved by DER.

The final ore product is stockpiled at the JSW stockyard prior to transport to the Cape Lambert Port facilities for export.

No.	Infrastructure	Plan reference
1	Dry processing plants (JC, JSW, JSE) including fixed crushers and screens	Figure 3: PC1, PC4
2	Wet processing plants (PC2 and PC3)	Figure 3: PC2, PC3
3	Stockyard, ore stackers and reclaimers, stockpiles and train loading facilities	Figure 3: Stockyards
4	Conveyors, transfer stations	Not shown
5	WFC 1, 2 (JC), 3 and 3A (JSE)	Figure 3: WFC 1, WFC 2, WFC 3, WFC 3A
6	Water storage/process water ponds	Not shown

Category 6: Mine dewatering

Approximately 80% of the orebody targeted by the mining operations occurs below the pre-mining water table (RTIO, 2015). As such, dewatering is undertaken to maintain dry mining conditions. Abstraction of up to 83 gigalitres per annum (GL/a) is approved through Ministerial Statement (MS) 1038, including the discharge of up to 78GL/a at controlled dewater discharge locations along Marillana and Weeli Wolli Creeks. Dewatering is undertaken predominantly by a number of borefields with a small amount extracted through in-pit sumps. Some dewater is utilised through the processing of ore, with the remainder discharged into the Marillana and Weeli Wolli creek systems. Reinjection of abstracted water occurred prior to June 2014 when the reinjection borefield was decommissioned.

The Licence Holder holds a number of groundwater licences issued by the Department of Water (DoW) under the *Rights in Water and Irrigation Act 1914* (RiWI Act).

No.	Infrastructure	Plan reference
7	Borefields (production and monitoring) (JSW-A, JSW-C, Rail loop, Phil's Creek Cutback, Marillana Replacement, Ridge North, JSE Northern, JSE Central, JSE Sacrificial, Southern)	Not shown
8	Dewater discharge outlets	Figure 4: (DO2, DO3, DO3A, DO5, DO5A, DO6, DO8, DO9, DO9A)
9	Dewatering pipelines	Not shown
10	In-pit sumps	Not shown
11	Transfer tanks, raw water tanks	Not shown
12	Turkey's nests (JC, JSW, JSE)	Not shown

Category 12: Screening etc. of material

Mobile crushing and screening plants are used on-site as required. This equipment may be utilised to undertake the screening of borrow material for construction works and to crush and screen stemming material for blasting purposes. While no mobile crushing and screening equipment is currently located on the Premises, the Licence Holder expects that a large plant will be required in 2017 to support construction and expansion works.

No.	Infrastructure	Plan reference
13	Crushing and screening equipment (various)	Within the prescribed premises boundary (Figure 2)

Category 54: Sewage facility

The Licence Holder operates four wastewater treatment plants (WWTPs) at the Premises with a combined design capacity of 1192m³ per day. The main WWTP servicing the accommodation village was approved in 2012 with a throughput-design capacity of 710m³ per day. This plant replaced a temporary plant with a throughput of 400m³ per day. The temporary WWTP remains on-site, but is currently not utilised.

A number of smaller WWTPs are positioned across the Premises to service work areas. These include the Mine WWTP located near administration buildings in the JC area, the fixed plant WWTP, located near the plant in the JC area and the EPCM WWTP located in the JSW area.

No.	Infrastructure	Plan reference
15	Permanent village WWTP (710 m ³ /d) and associated 17ha sprayfield	Figure 5: Village WWTP
16	Mine WWTP (20 m ³ /d) and associated 0.31ha sprayfield	Figure 5: Mine WWTP
17	Fixed plant WWTP (40 m ³ /d) and associated 1.27ha sprayfield	Figure 5: Fixed WWTP
18	EPCM WWTP (22 m ³ /d) and associated 3.5ha sprayfield	Figure 5: EPCM WWTP
19	Pipelines, wells, transfer points	Not shown

Category 64: Class II or III putrescible landfill site

The old putrescible landfill at the Premises, located to the east of the JC area, has been closed. A new putrescible landfill was approved in September 2015, through Works Approval W5875/2015/1. This landfill is located to the north-east of the JSE area.

As part of the Yandicoogina Sustaining Project another landfill (Waste Dump Landfill) was authorised through Works Approval W5630/2014/1 (issued 12 June 2014). This landfill is located in the JSW area near the EPCM WWTP. Another new landfill (the 'Waste Dump landfill') was approved through a licence amendment on 2 June 2016. Both Waste Dump landfills accept mostly inert waste, as well as minor amounts of putrescible waste (timber).

No.	Infrastructure	Plan reference
22	Old landfill (JC)	Figure 6: Putrescible Landfill
23	Waste Dump Landfill (JSW)	Figure 6: Waste Dump Landfill
24	New Putrescible Landfill (JSE)	Figure 6: Putrescible Landfill

25	Waste Dump Landfill (JC)	Figure 6: Waste Dump Landfill
Category 73: Bulk storage of chemicals etc.		
Chemicals, including bulk fuel, oils and lubricants are stored in and around workshop areas around the Premises.		
No.	Infrastructure	Plan reference
26	Heavy vehicle fuel facilities (HVFF)	Figure 3: Heavy Vehicle Fuel Facility
27	Permanent Hydrocarbon Storage Facility	Figure 3: Permanent Hydrocarbon Storage Facility
28	Refuelling Stations	Figure 3: Refuelling stations
Category 77: Concrete batching or cement products manufacturing		
Mobile concrete batching plants are used at the Premises as required to support construction and expansion activities. The mobile plants may be located on site for a number of weeks or, in large expansion scenarios, could be onsite for multiple years. Concrete produced from the plants is used only on Rio Tinto Ltd tenure, and is not a commercial product produced by the Licence Holder.		
No.	Infrastructure	Plan reference
29	Mobile concrete batching plants	Not shown
Other infrastructure		
30	Bioremediation Area	Not shown
31	Oily Water Treatment systems (OWS): Fixed Plant, JC, JSW, JSE	Not shown

3.2 Category review

This Review has considered the appropriateness of the Prescribed Premises categories from Schedule 1 to the EP Regulations that have been applied to the Existing Licence.

3.2.1 Category 6

As discussed further in section 4.1.5 of this Decision Report, dewatering activities are regulated through Part IV of the EP Act. However, at the request of the Licence Holder, Category 6 has been retained on the Revised Licence, pending the Environmental Protection Authority (the EPA) making a final determination as to which aspects of dewatering activities are covered by Part IV (refer to section 4.1.5).

3.2.2 Category 12

The Licence Holder periodically operates mobile crushing and screening equipment as part of construction and maintenance campaigns and drill and blasting activities. As the definition of Category 5 covers crushing and screening exclusively of material classified as “ore”, crushing and screening processes for other materials instead fall under the definition of Category 12.

3.2.3 Category 77

The wording of Category 77 limits its application to premises where concrete is manufactured for use at other premises. The Licence Holder advised DER that this Category had been applied to allow concrete to be produced for use at the accommodation village which previously sat outside of the Premises boundary. The Revised Licence adopts the Part IV assessment envelope, which includes the accommodation village, as the Premises boundary. Category 77 is therefore not applicable to the Revised Licence.

Key Finding: The Delegated Officer has reviewed the information regarding the activities occurring within the Premises and determined the following in relation to the Categories listed Schedule 1 of the EP Regulations:

1. To avoid duplication between Part IV and Part V regulation under the EP Act, any regulation of Category 6 activities that is not directly related to erosion caused by dewatering in close proximity to dewater discharge points is to be removed from the Revised Licence.
2. Category 12 will be retained in the Revised Licence to allow for the crushing and screening of material which is not ore.
3. Category 77 is to be removed from the Revised Licence as only premises on which cement or concrete is manufactured for use at other places or premises are prescribed.

3.3 Premises maps

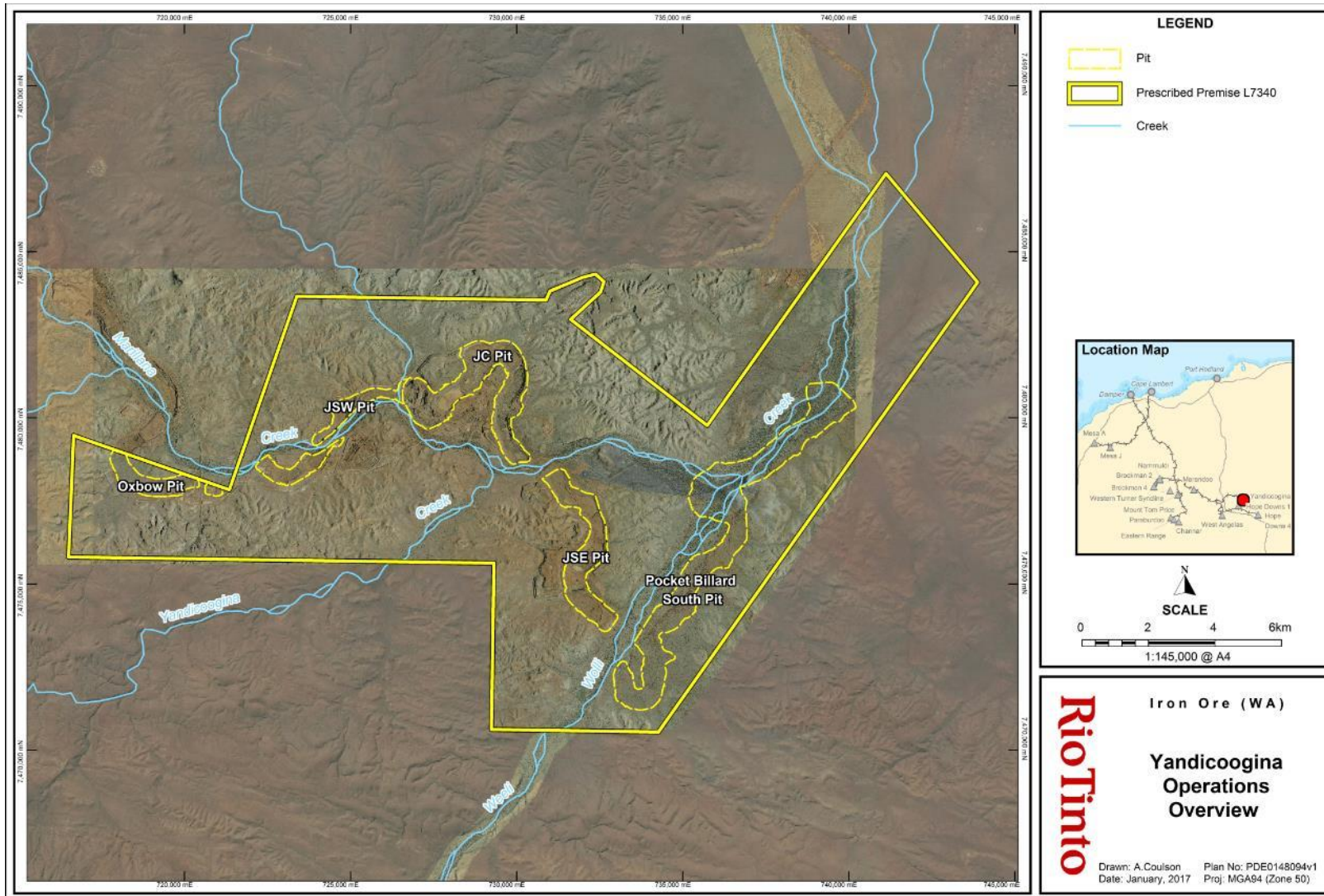


Figure 2: Premises overview map

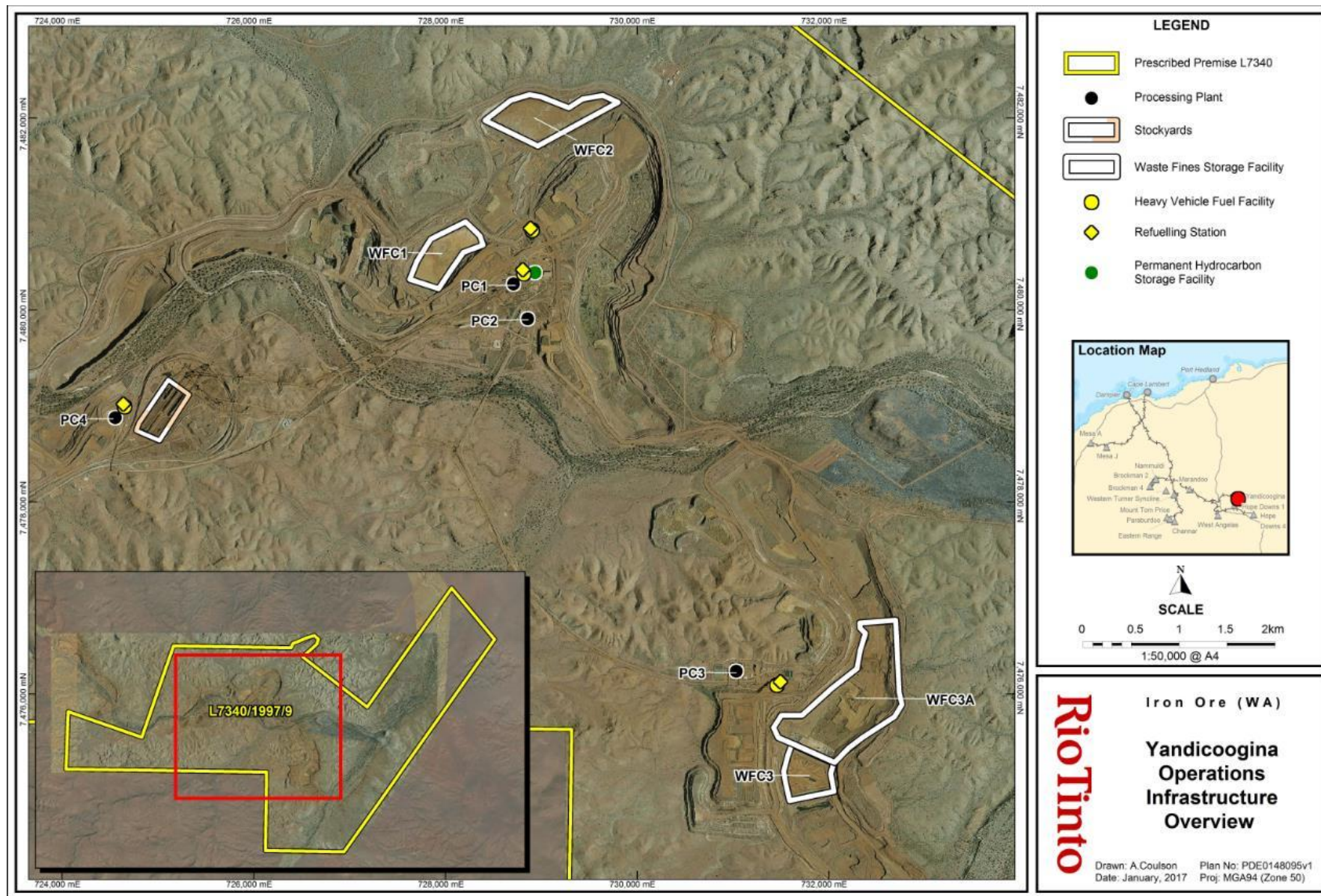


Figure 3: Premises infrastructure map

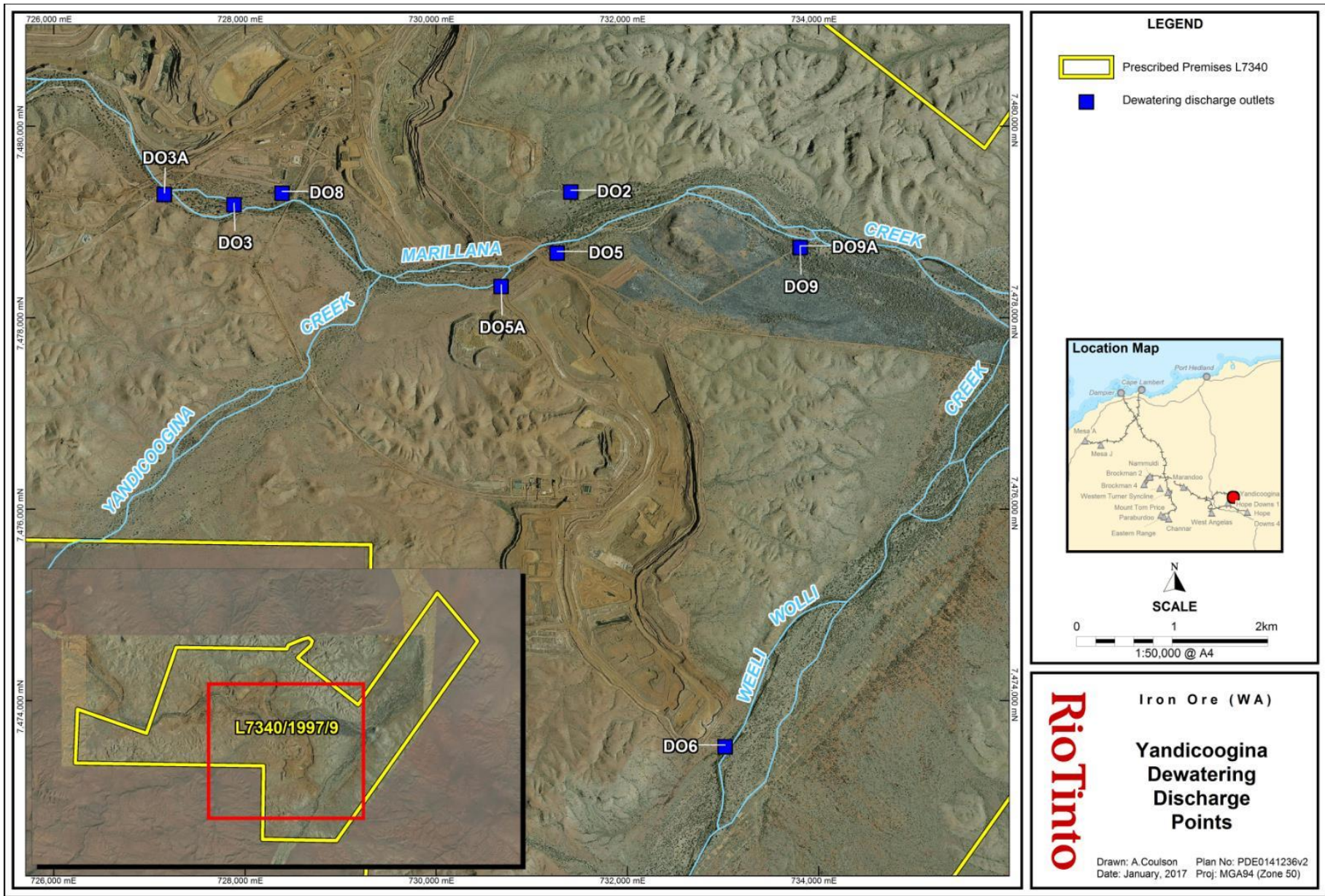


Figure 4: Dewatering outlet locations

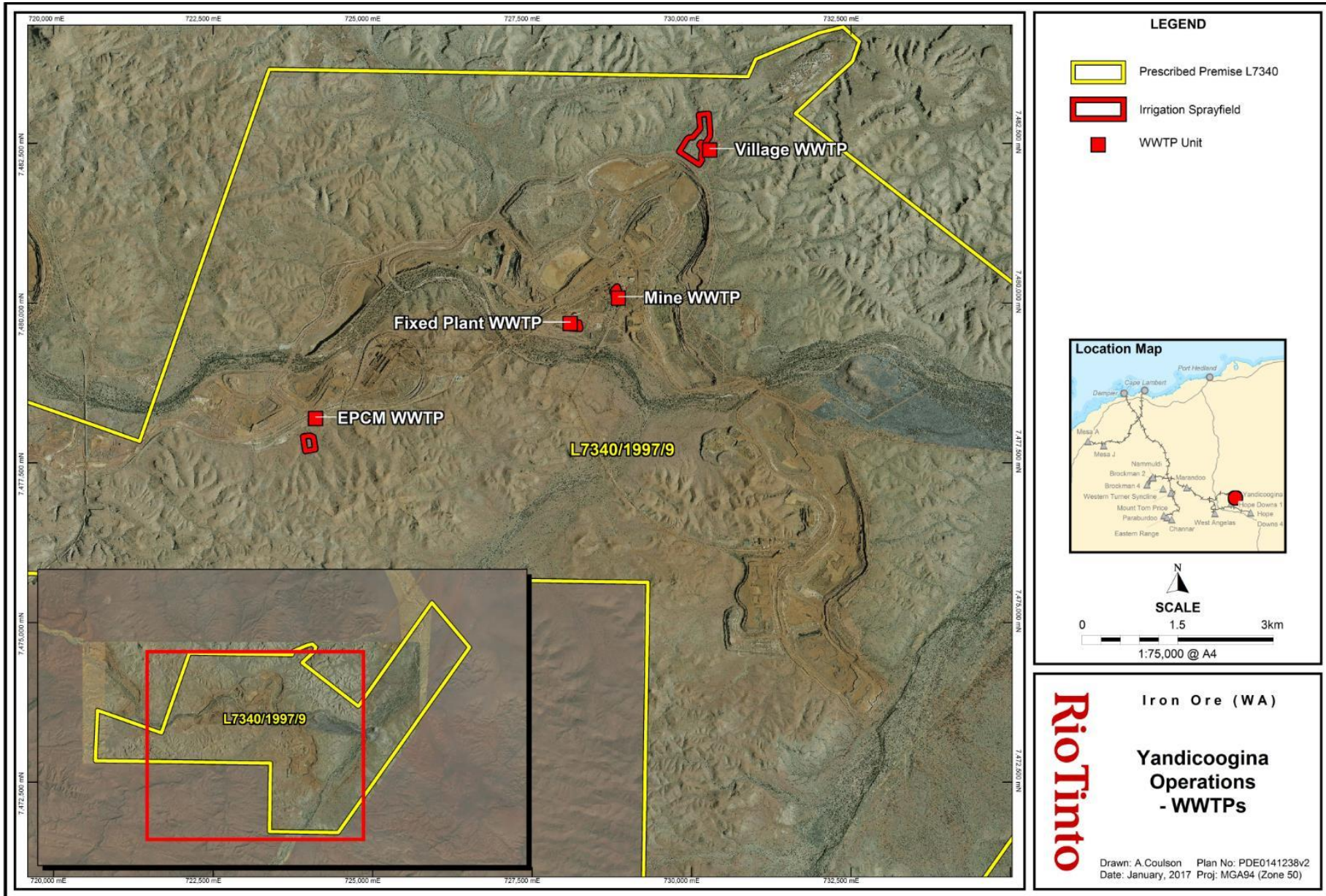


Figure 5: WWTP and sprayfield locations

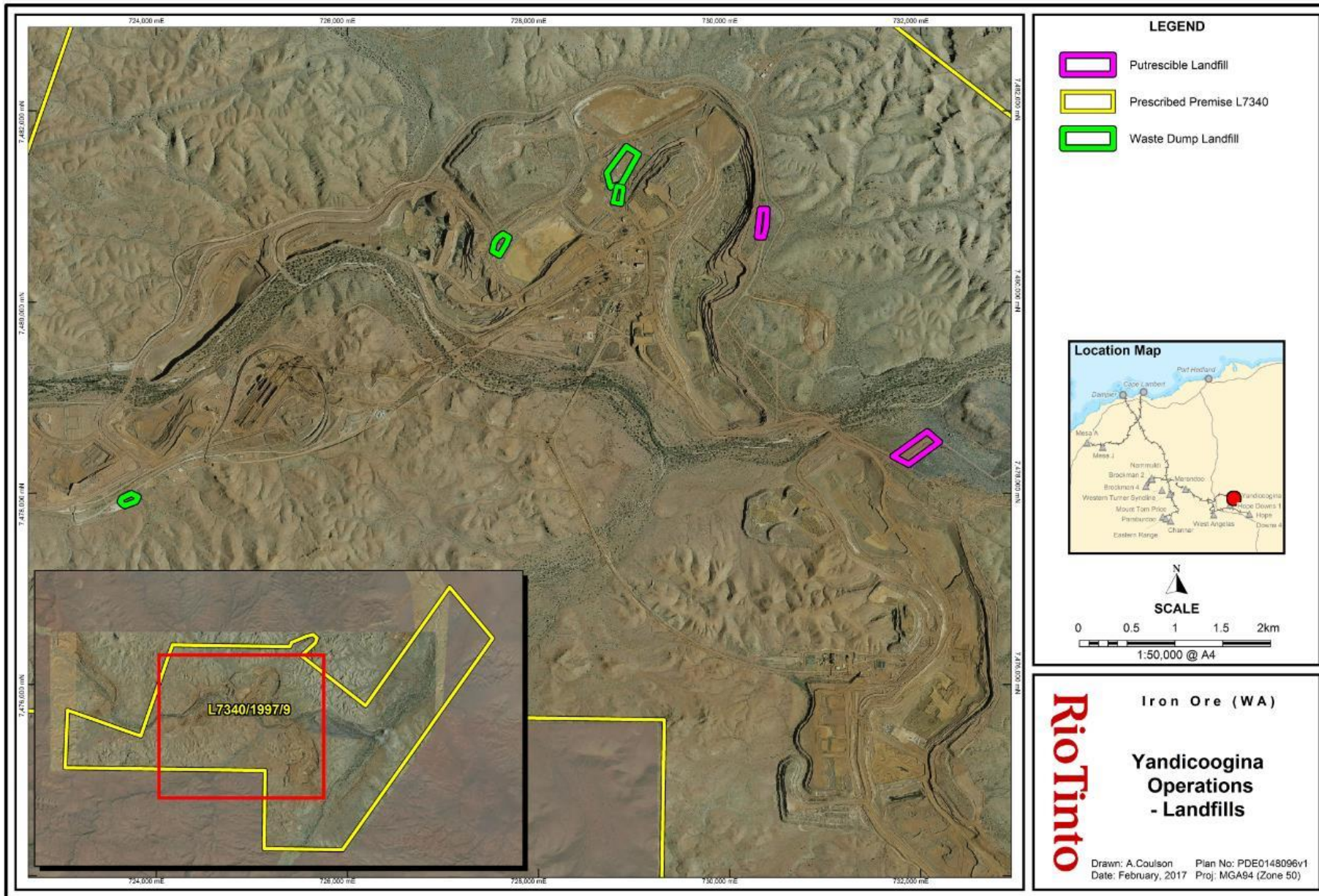


Figure 6: Landfill locations

4. Legislative Context

Relevant approvals and underlying tenure associated with the Premises which are held by Rio Tinto and subsidiaries and related companies are outlined in Table 3.

Table 3: Recent approvals and tenure

Legislation	Number	Subsidiary	Approval
<i>Environment Protection and Biodiversity Conservation Act 1999</i> (Cth)	Decision Notice 2011/5815	Hammersley Iron Pty Ltd	To develop new mine pits and supporting infrastructure, at Yandicoogina, central Pilbara region of WA
<i>Iron Ore (Yandicoogina) Agreement Act 1996</i> (WA)	M274SA or AM70/274	Hammersley Iron-Yandi Pty Limited	State Agreement Act
<i>Land Administration Act 1997</i> (WA)	General Lease L021123	Hammersley Iron Pty Ltd	Yandicoogina accommodation village lease
<i>Rights in Water and Irrigation Act 1914</i> (WA)	GWL158838	Pilbara Iron Company (Services) Pty Ltd	Taking 190,000kL of water for exploratory drilling operations
	GWL165652,		Taking 45,000kL of water for a range of activities, including exploration, construction and potable water supply purposes
	GWL166205,		Taking 45,000kL of water for range of activities, including dewatering, construction, industrial purposes and potable water supply purposes
	GWL172052		Taking 95,000kL of water for range of activities, including exploration, construction and potable water supply purposes
<i>Dangerous Goods Safety Act 2004</i> (WA)	DGS015733	Pilbara Iron Pty Ltd	Authorisation to store various dangerous goods at Yandicoogina mine site
Part IV of the EP Act (WA)	Ministerial Statement 417	Hammersley Iron Pty Ltd	Yandicoogina Iron Ore Mine & Railway, 90 kilometres north-west of Newman Hamersley Range (979)
	Ministerial Statement 523		Yandicoogina Iron Ore Mine & Railway, 90 kilometres north-west of Newman Hamersley Range
	Ministerial Statement 914		Yandicoogina Iron Ore Project – Expansion to include Junction South-West and Oxbow deposits
	Ministerial Statement 1038	Hammersley Iron – Yandi Pty Limited	Yandicoogina Iron Ore Project – Revised Proposal
Part V of the EP Act (WA)	W2006/1997/1	Pilbara Iron Company (Services) Pty Ltd	Limited information available on record
	W2981/1997/1		
	W3056/1997/1		
	W3781/1997/1		

	W3865/1997/1		
	W3917/1997/1		
	W4124/1997/1		
	W4464/2008/1		Stacker/stockyard
	W4677/2010/1		Heavy vehicle fuel facility (HVFF)
	W4776/2010/1		Concrete batching plant
	W5134/2012/1		Fixed plant workshop WWTP and oily water separator (OWS)
	W5218/2012/1		Temporary Village WWTP
	W5217/2012/1		Village WWTP
	W5344/2013/1		JSW processing facility
	W5419/2013/1		JSE wet processing plant
	W5382/2013/1		EPCM WWTP
	W5630/2014/1		WFC 3 and JSW Waste Dump Landfill
	W5875/2015/1		New putrescible landfill
	L7340/1997/9		Yandicoogina mine site licence

4.1 Part IV of the EP Act

4.1.1 Background

Approval under section 45(5) of the EP Act to implement the Yandicoogina mining operation was given by the Minister on 24 May 1996 through Ministerial Statement 417 (MS 417). This approval was subsequently amended in 1999 through MS 523. Mining at the JSE area gained Ministerial approval via MS 695 in 2005.

Ministerial Statement 914 (MS 914), published on 18 October 2012, amalgamated and updated the existing JC and JSE approvals, and approved an expansion into the Junction South-West (JSW) and Oxbow deposits. This statement and its implementation conditions superseded those issued before it.

A new proposal to mine the Pocket and Billiard deposits to the east of the JSE area has been assessed by the EPA through report number 1573, and MS 1038 was signed by the Minister for Environment on 30 September 2016. MS 1038 and its implementation conditions superseded MS 914. Implementation conditions 1-4 and 1-7 were changed under section 46C of the EP Act on 8 November 2016. The changes are not directly relevant to this Review.

4.1.2 Report Number 1448 (August 2012)

The Minister's decision that the proposal may be implemented subject to the conditions in MS 914 was informed by an EPA assessment (Assessment Number 1726) which produced EPA report number 1448 (EPA, August 2012). In its assessment the EPA determined that the following were key environmental factors relating to the proposal:

- Vegetation, flora and fauna

- Groundwater and surface water
- Mine closure and rehabilitation; and
- Residual impacts

The EPA's assessment considered direct impacts arising from the proposal for the clearing of an additional 2,200 hectares of vegetation (a total of 5,600ha, when including previous approvals). Report 1448 notes that the proposal will have an impact on locally significant riparian vegetation. The report acknowledges the loss of up to 150ha of riparian vegetation through clearing and the impacts of dewatering and discharge of dewater. The EPA assessment also determined that an additional 540ha of riparian vegetation may be subject to indirect impacts from dewatering and the discharge of dewater.

The EPA assessment considered cumulative impacts arising from numerous mining operations (BHPBIO Yandicoogina operations, the Premises and Hope Downs 1) discharging into the same creek systems. It noted that impacts were already apparent in the area of the JSW deposit, mainly consisting of fluctuations in vegetation growth and canopy cover in accordance with increases or decreases in dewater discharge.

The EPA assessment noted that monitoring of discharge water quality was already required under the Part V licence. Report 1448 includes a statement that the Office of the EPA (OEPA) would separately write to DEC recommending that the potential for hydrocarbon contaminants be reviewed in subsequent updates of the licence. No such correspondence has been located in DWER's records.

4.1.3 Ministerial Statement Number 914 (October 2012)

MS 914 was originally published on 18 October 2012. Minor changes to implementation condition 6-4, relating to the quality of dewater discharge, were made under section 46C of the EP Act on 9 April 2015. The MS was further amended (through section 45C of the EP Act) on 3 March 2016. These amendments authorised the mining of an additional satellite pit (Oxbow East Pitlet). Other amendments included the amalgamation of dewatering limits, amendments to clearing limitations and other minor alterations.

4.1.4 Report Number 1573 (August 2016)

The EPA assessed a proposal to extend mining into the Pocket and Billiard South deposits located on the opposite side of Weeli Wolli Creek. EPA report 1573 relating to this proposal was published on 1 August 2016. The key factors identified and assessed by the EPA were:

- Hydrological Processes and Inland Waters Environmental Quality
- Flora and Vegetation
- Subterranean Fauna
- Terrestrial Fauna
- Rehabilitation and Decommissioning
- Offsets

The EPA's assessment considered additional clearing of 1,800ha including 69ha of riparian vegetation for the establishment of a creek crossing and flood levee. In addition to direct clearing, the EPA also considered indirect impacts to riparian vegetation arising from changing water flow regimes on either side of the proposed flood levee, groundwater drawdown, and increased dewater discharge.

In terms of dewatering, the EPA considered, based on the Proponent's (Hamersley Iron Pty Limited as a subsidiary of Rio Tinto Limited) modelling, that the additional discharge volume (30GL/a) is unlikely to extend the existing approved wetting front (17km downstream of the Marillana and Weeli Wolli confluence) and therefore will not have a significant impact. While erosion caused by dewater discharges is considered in EPA report 1573, erosion to the areas

in the immediate vicinity of the dewater discharge outflow points were not examined.

Similarly to EPA report 1448, EPA report 1573 considered cumulative impacts from dewater discharges from the Premises combining with discharges from adjacent premises. The Public Environmental Review (PER) (RTIO, November 2015) notes that anticipated total cumulative dewater discharges would approximate 97GL/a on average, up to a potential maximum of 140GL/a. This includes the addition of 15GL/a from BHPBIO Yandicoogina Operations and 40GL/a from Hope Downs 1.

Further, EPA Report 1573 found that the potential impacts to subterranean fauna are anticipated to be a direct consequence of a decline in habitat through groundwater drawdown as opposed to discharges from Primary Activities. Elevated groundwater levels, the result of surface water discharges are expected to increase the areas of suitable habitat for stygofauna. Stygofauna surveys indicate a diverse range of species with half known from the wider region and that the majority of recordings found in the superficial floodplain aquifer that extends along the length of Weeli Wolli Creek. The EPA also assessed that the discharge of waste fines to pit voids (WFCs) would result in an increased groundwater flow of 0.1GL/a representing approximately 2.75% of the total annual aquifer flow and is therefore unlikely to impact on groundwater quality.

4.1.5 Ministerial Statement 1038 (September 2016)

Schedule 1 of MS 1038 includes a summary of the proposal which is authorised by the approval. It states that proposal involves the development of above and below water table iron ore deposits and associated infrastructure at JC, JSE, JSW, Oxbow, Oxbow East, and Pocket and Billiard South deposits. The summary also specifies that the proposal includes:

“the development of mine pits and associated infrastructure; processing facilities; temporary and permanent waste landforms; waste fines storage facilities; water management infrastructure for groundwater abstraction and discharge of surplus water; and flood protection structures and creek crossings.”

MS 1038 authorises the clearing of no more than 7,400ha of native vegetation within the development envelope, the abstraction of up to 83 GL/a of groundwater and the disposal of up to 78 GL/a of dewater through discharges to Marillana and Weeli Wolli creeks. The 5GL/a not discharged to the creeks is used for a number of on-site purposes, including ore processing and dust suppression. The JSE Wet Processing Plant is expected to utilise a further 5GL/a (RTIO, November 2015).

Condition 5 of MS 1038 relates to impacts from the proposal on hydrological processes, inland waters environmental quality, and flora and vegetation. It requires the proponent to develop and implement a plan to manage impacts arising from the implementation of the proposal on riparian vegetation, the Weeli Wolli creek ecosystem and Aboriginal heritage values.

Specifically, conditions 5-1(1) to 5-1(3) require the plan to demonstrate that groundwater abstraction and discharge of surplus dewater does not cause long term impacts to the environmental values of Weeli Wolli Creek or riparian vegetation outside of a specified disturbance area (management zone).

Condition 5-3 states that the plan must also include provisions to address impacts on riparian vegetation from changes to groundwater levels and quality, changes to surface water flows and quality and weeds.

Key Finding: The Delegated Officer considers that the potential impacts to groundwater dependent ecosystems, and downstream surface water ecosystems as a result of:

- changes to groundwater quality (including as a result of seepage from WFCs);

- the abstraction and discharge of dewater excluding erosion at the discharge point; and
- cumulative dewater discharge impacts resulting from dewater discharges from other operations,

are regulated through, and/or have been assessed under, Part IV of the EP Act. Therefore the Delegated Officer has determined that the Revised Licence will avoid unnecessary duplication with Part IV requirements in relation to the above, in accordance with *Guidance Statement: Setting Conditions*.

Condition 6 of MS 1038 relates to the rehabilitation and decommissioning of the project and requires the preparation, implementation and periodic revision of a Mine Closure Plan (MCP). Conditions 6-4 and 6-5 require the MCP to address potential impacts from the cessation of dewatering, the backfilling of pit voids and the creation of pit lakes upon groundwater and surface water systems and associated ecosystems.

During consultation, the Licence Holder raised concerns with the former DER (now DWER) regarding the regulatory scope of MS 1038, specifically as it pertained to erosion resulting from dewater discharges. As such, the Licence Holder expressed a preference that Category 6 be retained on the Revised Licence. DER sought and received advice from OEPA (both now DWER) regarding the extent to which erosion is regulated under the conditions of MS 1038 (EPA, 2017).

Key Findings: The Delegated Officer considers that, with the exception of erosion at the dewatering discharge points, MS 1038 is the primary regulatory instrument for regulating hydrological (including hydrogeological) impacts from mining activities.

In light of OEPA advice, and at the Licence Holder's request, the Delegated Officer has determined that erosion at the dewatering discharge points will be treated as though it were not regulated under Part IV for the purposes of risk assessment in this Licence Review.

4.1.6 Consideration

This Review has had regard to Ministerial Statements 914 and 1038 and to EPA reports 1448 (JSW and Oxbow) and 1573 (Pocket and Billiard South).

Information from the PER documentation produced by the Licence Holder for the Pocket and Billiard assessment has been reviewed as an up-to-date source of information about the Premises (RTIO, November 2015).

4.2 Contaminated Sites

No areas within the Premises have been classified under the *Contaminated Sites Act 2003*.

4.3 Department of State Development

The mining operations at the Premises are subject to the *Iron Ore (Yandicoogina) Agreement Act 1996* (the Agreement Act) and located on tenure (M274SA, also referred to as AM70/274) granted in accordance with that legislation. Clause 2(2) of Schedule 1 of the Agreement Act states that nothing in the agreement exempts the Company from compliance with requirements in connection with the protection for the environment made pursuant to the EP Act.

The Agreement Act requires submission to the responsible Minister of a detailed proposal relating to its proposed mining operations with variations approved as required. Clause 7(1) requires that any approval issued under the Agreement Act must be consistent with approvals and conditions applied under the EP Act.

The Agreement Act also requires the submission of annual reports by 30 June each year as

well as tri-annual comprehensive reports for each three year period.

4.4 Department of Mines and Petroleum

The Premises falls entirely within tenure granted pursuant to the *Iron Ore (Yandicoogina) Agreement Act 1996* and therefore is not subject to the approval requirements of the *Mining Act 1978*. A Mining Proposal (URS, 2012) was prepared in accordance with DMP's Mining Proposal guidelines for the construction of Waste Fines Cell 3. However the proposal document was used to support a section 45C application under Part IV of the EP Act, rather than being submitted to DMP for approval under the *Mining Act 1978*.

DMP regulates health and safety aspects of the mining operation under the *Mines Safety and Inspection Act 1994*.

DMP also licenses the storage and handling of Dangerous Goods at the Premises under the *Dangerous Goods Safety Act 2004*. Dangerous Goods Site Licence DGS015733 specifies the type and quantity of substances which can be stored at the Premises. The licence also includes some requirements in terms of storage (e.g. self bunded ground tank) but does not include specific spill containment or bunding requirements.

The Premises is allocated project code J00732 in DMP's systems.

4.5 Department of Water

The Department of Water (DoW) has approved four licences to take water under section 5c of the RiWI Act (refer to Table 3). Three of these licences (GWL 158838; GWL172052; GWL165652) relate to the abstraction of groundwater for dust suppression, potable water, construction, and exploration purposes. One of the licences (GWL 166205) provides for the abstraction of 53,000,000kL of groundwater for dewatering and use in industrial processes.

Groundwater licence GWL166205 requires compliance with the Yandicoogina Operations Groundwater Operating Strategy. The current version of the Groundwater Operating Strategy (RTIO, August 2012) was prepared by the Licence Holder and approved by DoW on 24 November 2014. The plan has since been updated in accordance with MS 1038 and is currently under assessment by DoW.

The Groundwater Operating Strategy (RTIO, August 2012) commits to managing dewatering discharges in accordance with Ministerial Statement 914 and the related management plans. Other commitments made in the Groundwater Operating Strategy relate to the monitoring of groundwater levels and borefield performance.

4.6 Commonwealth Government

Commonwealth approval under the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) was issued for mining at JSW and Oxbow via Decision Notice 2011/5815. The approval includes conditions relating to the protection of threatened fauna (specifically the Northern Quoll and Pilbara Olive Python), prevention of damage to rare flora (*Lepidium catapycnon*), and the prevention of fire and the spread of feral animals and weeds.

The Pocket and Billiard South deposits were referred to the Commonwealth under the EPBC Act, and determined in October 2014 not to be a Controlled Action via Decision Notice 2014/7343.

4.7 Applicable Regulations, Standards and Guidelines

The overarching legislative framework of this assessment is the EP Act and EP Regulations. DWER Guidance Statements that inform the assessment in accordance with this legislation are as follows:

- Guidance Statement: Regulatory Principles (July 2015)
- Guidance Statement: Decision Making (November 2016)
- Guidance Statement: Risk Assessment (November 2016)
- Guidance Statement: Setting Conditions (October 2015)
- Guidance Statement: Licence duration (November 2015)

The following regulations applicable to the regulation of the Premises under Part V, Division 3 of the EP Act were also considered:

- Environmental Protection (Noise) Regulations 1997
- Environmental Protection (Controlled Waste) Regulations 2004
- Environmental Protection (Unauthorised Discharges) Regulations 2004

5. Part V of the EP Act

5.1 Works Approvals

Since 2008, eleven Works Approvals have been issued under section 54(3)(a) of the EP Act. These are summarised in Table 4.

Table 4: Summary of Works Approvals issued in relation to the Premises since 2008

Number	Commenced	Cat.	Purpose
W5875/2015/1	28/09/2015	64	New putrescible landfill
W5630/2014/1	16/06/2014	5, 64	WFC 3 and JSW Waste Dump Landfill
	Amended 6/10/2016		Extension to WFC 3 (WFC 3A)
W5382/2013/1	08/07/2013	85	EPCM Wastewater Treatment Plant (WWTP)
	Amended- 3/10/2013		Changed design and capacity
W5419/2013/1	10/06/2013	5	JSE wet processing plant
W5344/2013/1	11/03/2013	5	JSW processing facility
W5217/2012/1	08/10/2012	54	Village WWTP
	Amended - 12/06/2014		Reduced irrigation area footprint and updated performance expectations of WWTP
W5218/2012/1	24/09/2012	54	Temporary Village WWTP
W5134/2012/1	30/04/2012	85	Fixed plant workshop WWTP and oily water separator (OWS)
W4776/2010/1	15/11/2010	77	Concrete batching plant
W4677/2010/1	16/08/2010	5	HVFF
W4464/2008/1	27/10/2008	5	Stacker/stockyard

Number	Commenced	Cat.	Purpose
	Amended-20/09/2012		Extended expiry date by 2 years.

An application to amend Works Approval W5630/2014/1 was submitted on 18 July 2016 seeking an extension to WFC 3 to include an additional area referred to as WFC 3A. The amendment was granted by the former Department of Environment Regulation through an Amendment Notice dated 6 October 2016.

The Licence Holder subsequently applied on 1 February 2017 to have all of the requirements of W5630/2014/1 incorporated into the Revised Licence and for the surrender of W5630/2014/1 (RTIO, February 2017), under section 59B(1) of the EP Act. This was to allow for the immediate transition of WFC3A from construction to operation without the requirement to undergo a Licence amendment process in between.

Key Finding: The Delegated Officer has considered the Licence Holder's request to incorporate the requirements of W5630/2014/1 into the Revised Licence as part of this Review.

DER accepted the Licence Holder's application to surrender W5630/2014/1 via letter on 17 February 2017 on the grounds that conditions would be transferred across to the Revised Licence. However, Works Approval W5630/2014/1 expired prior to the issue of the Revised Licence on 15 June 2017 and the application to surrender is now redundant. The Delegated Officer has elected to transfer stage 2 construction conditions to the Revised Licence and extend the authorised construction period on the grounds that there is no change to environmental risk.

5.2 Licence Amendments

The most recent amendment to the licence was completed on 2 June 2016. This amendment had the following effects:

- inclusion of the new putrescible landfill constructed under W5875/2015/1;
- inclusion of the EPCM Wastewater Treatment Plant (WWTP) constructed under W5382/2013/1;
- inclusion of the upgraded Village Permanent WWTP constructed under W5217/2011/1;
- inclusion of the Stacker and Stockyard constructed under W4464/2008/1;
- inclusion of Stage 1 of the Waste Fine Storage Facility 3 (WFSF) constructed under W5630/2014/1;
- updated plan depicting licensed dewatering discharge outlets (including DO5 relocated 600m downstream);
- addition of Category 12 with a nominal maximum design capacity of 10,000,000 tonnes per annum;
- addition of conditions related to the construction and operation of the new Waste Dump Landfill;
- addition of conditions related to the construction and operation of a new dewatering discharge outlet, DO3A; and
- removal of conditions specifying targets for water quality monitoring, due to duplication with the Part IV regulatory instrument.

On 25 August 2016 the Licence Holder submitted an application to amend the Licence to

authorise construction of a new dewatering outlet point (DO9A) and to reinstate DO5 (to now be referred to as DO5A), and to expand the Waste Dump Landfill. The requested amendments relating to dewatering discharges and the expansion of the Waste Dump Landfill have been included in the risk assessment (section 7.7 and section 7.10 respectively).

To date (not including this Review), the Licence has been amended ten times with amended licences issued each year from 2001 to 2005, and then in 2008, 2011, 2013, 2014, and 2016.

An additional amendment, dated 29 April 2016, was a DER-initiated amendment extending the expiry date of the Existing Licence from 31 May 2019 to 31 May 2036, in accordance with section 59(1)(k) of the EP Act. This amendment was made by notice as part of a DER initiative whereby a large number of licence holders in Western Australia had the expiry dates for their licences unilaterally extended (DER, April 2016).

5.3 Compliance history

There is no history of prosecution or formal statutory compliance/enforcement notices issued under the EP Act by DER/DWER to the Licence Holder in relation to the Premises.

DER's Incident and Complaints Management System (ICMS) is an internal DWER system used to record complaints received and potential non-compliances requiring investigation. A review of ICMS indicates that no complaints have been received from members of the public or surrounding operators in relation to the Premises.

Since 2009, a number of potential non-compliances have been entered into ICMS in relation to the Premises. Of note are a number of reported discharges of hydrocarbons or hydrocarbon contaminated waters to the environment between 2010 and 2011.

The most recent site inspection undertaken by DER compliance officers was on 14 May 2014. The only potential non-compliance observed during the inspection related to the reporting of discharge volumes at the Levee Bank discharge location.

5.4 Annual Audit Compliance Reports

Condition 31 of the Existing Licence requires the submission of an Annual Audit Compliance Report (AACR) by 30 April each year. These reports must cover the period of 1 January to 31 December of that year.

The most recent AACR, for the 2016 annual period, dated 30 April 2017 (RTIO, April 2017b), reported a number of non-compliances. These can be summarised as:

- Four incidents of discharges of effluent from WWTPs to locations other than those authorised by the Licence (condition 2), due to blockages causing overflows;
- Six exceedances of water quality monitoring targets (condition 5(c) before the June 2016 amendment) for discharges from the onsite WWTPs (three of which being of particular note); and
- One instance of not recording water quality of discharges from the ECPM WWTP, and ongoing/repeated non-compliances for dewater discharge monitoring (conditions 3, 7, and 13); and
- Several instances of not conducting groundwater monitoring (condition 19).

The incidents raised in the 2016 AACR have not yet been closed out, and a determination by DWER is still pending.

The preceding AACR (for the 2015 annual period), dated 13 April 2016, reports a number of additional minor non-compliances. A summary is provided below.

- Power outages causing minor spills of untreated sewage.

- Sewer blockages causing minor spills of untreated sewage.
- Failure to accurately record cumulative effluent volumes from WWTPs
- Failure to undertake all required sampling of effluent and dewater quality
- Uncontaminated stormwater entering the OWS at the heavy vehicle washpad.
- Rubbish dumped outside of landfill tipping areas with the result that it could not be covered on a weekly basis.

Power outages resulting in sewage spills have occurred previously at the Premises, with similar incidents in September and December 2013 (2014 AACR). DER officers determined at the time that the discharges had only impacted an access road and had not caused pollution. All effluent spilt in the 2015 events were exposed to aeration and UV radiation, and disinfected with chlorine powder.

Upgrades to the WWTP transfer station are under investigation by the Licence Holder to reduce the potential for sewage spills. The Licence Holder reported in a letter to DER dated 8 February 2016 (RTIO, February 2016) that three holding wells (wet wells) were replaced at the village. However, the Licence Holder consider that the most effective control to address sewage spills is to have reliability of power supply, and this issue is still under investigation.

5.5 Modelling and monitoring data

5.5.1 Annual Environmental Report

Condition 30 of the Existing Licence requires the submission of an Annual Environmental Report (AER). The AER must contain monitoring results and data collected as a requirement of other licence conditions.

5.5.2 WWTP effluent monitoring

A number of conditions on the Existing Licence require the Licence Holder to monitor discharges from the WWTPs. Through AERs, the Licence Holder has reported the following cumulative effluent discharges for the past two years (Table 5). A fault with the flow meter at the EPCM WWTP resulted in volumes not being reported for July-Dec 2015, prior to which the WWTP was not operational.

Table 5: Cumulative WWTP discharge volumes

WWTP name	Cumulative volume 2014 (kL)	Cumulative volume 2015 (kL)	Cumulative volume 2016 (kL)
Mine	4.462	22.97	3.21
Fixed Plant	1.494	8.52	1.14
Temporary Village	12,006	0	<i>Not listed in AER</i>
Permanent Village ("Village WWTP 1")	78,702	896,274	77,728
Village (old) ("Village WWTP 2")	39,614	54,752	247.5 ¹
EPCM	0	<i>Unknown</i>	748.86 ²

Note 1: Village WWTP 2 was placed in care and maintenance in February 2016 (RTIO, April 2017c).

Note 2: The EPCM WWTP was not sampled in January 2016 (RTIO, April 2017b).

Monitoring in 2015 (RTIO, April 2016), shows that effluent quality from all five WWTPs

remained largely within target levels. Biochemical oxygen demand (BOD) and E.coli values were consistently well below the target value. Total Suspended Solids (TSS), Total Nitrogen and Total Phosphorus occasionally exceeded the targets at the mine, village (old) and fixed plant WWTPs. These results are similar to those in 2014. While the main exceedances of the discharge quality targets relate to nutrients (nitrogen and phosphorus), data provided by the Licence Holder in the 2014 and 2015 AER's for nutrient loading rates (previously required under a licence condition) shows that nutrient loading at all WWTP irrigation areas remained significantly below the targets (480kg/ha/yr for nitrogen and 120kg/ha/yr for phosphorus).

The most recent AER, for the 2016 annual period (RTIO, April 2017c), largely followed the same trends as in 2014 and 2015. It should be noted that the June 2016 licence amendment removed the conditions pertaining to specific water quality targets. The following parameters were found to be elevated in the monitoring results, and are compared below against the targets since removed from the Existing Licence.

- The Mine WWTP in Q3 for Total Nitrogen at 59.3mg/L (target was 50mg/L);
- The Mine WWTP in Q4 for TSS at 136mg/L (target was 40mg/L); and
- The Fixed Plant WWTP for pH at 5.1 (target range was 6-9 pH units), and Total Nitrogen at 66.4mg/L (target was 50mg/L).

5.5.3 Levee Bank discharge

The Levee Bank discharge point releases water captured from across the JC plant and workshop areas into a depression (the Levee Bank) within the JC mining area. Potentially contaminated water discharged to this area is a combination of washdown water, stormwater and water treated through the oily water separators (OWS) located at the JC processing area.

The Levee Bank discharge area is a large, low lying area between the JC processing plants. Water pools within this area and passes through a set of culverts installed under a raised roadway. Water sampling is generally undertaken at the culverts as this is the easiest location to obtain a reliable sample. On the far side of the roadway, the area is enclosed by mine workings, and the water is unable to escape into the wider surface water drainage network.

Condition 7 of the existing licence requires the Licence Holder to record cumulative volumes of waters discharged to the Levee Bank. Condition 8 requires the quality of these discharges to be analysed and compared with the ANZECC/ARMCANZ 2000 guidelines and the previous year's monitoring results.

In the 2013, 2014, 2015, and 2016 AERs the Licence Holder compared total dissolved solids (TDS) and metal levels in the Levee Bank discharges against the ANZECC/ARMCANZ 2000 targets for livestock drinking water. The Licence Holder has also reported pH levels against the ANZECC/ARMCANZ 2000 targets for slightly disturbed aquatic ecosystems/lowland rivers.

For Total Recoverable Hydrocarbons (TRH), for which the ANZECC/ARMCANZ 2000 guidelines do not specify a target, the Licence Holder has applied the target of 30mg/L (consistent with the TRH limit specified in condition 6 of the Existing Licence).

The monitoring data reported for the 2013, 2014, 2015, and 2016 periods shows that all parameters measured were well within the targets levels. For TRH the highest value reported over the three years was 1.9mg/L in the third quarter of 2015 with most other measurements at less than 1mg/L.

The 2016 AACR notes there is no monitoring data regarding discharge quantities for May to December 2016, as the flow rate monitoring equipment had been damaged during maintenance (RTIO, April 2017b).

6. Location and Siting

6.1 Siting Context

The Premises is situated in the Pilbara region of Western Australia, approximately 90km north-west of the town of Newman. The surrounding land use is predominantly pastoral with a number of neighbouring iron ore mines.

BHP Billiton's Yandicoogina mine site is located immediately to the west of the Premises. Tenure for the two projects adjoins and both companies mine the same orebody. Currently, the mining operations are separated by approximately 4km.

The Phil's Creek mine site is situated approximately 3km to the north-west of the Premises with the Phil's Creek accommodation village located approximately 2km north-west of WFC2. This mine is located on the edge of Phil's Creek, which is a tributary of Marillana Creek. Currently, Phil's Creek has been diverted by the Licence Holder's operations across a land-bridge to the west of its original alignment. The Licence Holder advises that mine scheduling will require another re-alignment of Phil's Creek, which will occur once pits have been sufficiently backfilled. The future realignment of the creek will be more closely aligned to its original/natural alignment.

6.2 Residential and Sensitive Premises

The distances to residential and sensitive receptors are detailed in Table 6. All identified sensitive receptors are sufficiently distanced from the Premises to infer that there will be no impact on health and amenity for people residing at these locations.

The Premises accommodation village is not considered to be a receptor for the purpose of this Review. The health and comfort of the mine site workforce are the responsibility of the Licence Holder.

Table 6: Receptors and distance from prescribed activity

Residential and Sensitive Premises	Distance from Prescribed Activity
Phil's Creek accommodation village	Approx. 2.2km north-west of WFC 2.
BHP Yandicoogina accommodation village	Approx. 11km north-west of the stockyards.
Marillana Pastoral Station Homestead (Pastoral Lease L3114984, held by BHP Billiton)	Approx. 21km north-east of the village WWTP.

6.3 Specified Ecosystems

The Premises is located within the Pilbara Interim Biogeographic Regionalisation for Australia (IBRA) region and the Fortescue and Hamersley subregions, which are under cumulative pressure from multiple developments and proposals (EPA, 2014).

EPA Report 1448 states that the vegetation communities within the proposal area (and the fauna habitats that they support) are widespread and well represented regionally. Report 1448 and Report 1573 focus on the riparian vegetation around the Marillana and Weeli Wolli creek systems which is considered to have local significance. This significance is based upon the potential for riparian vegetation to provide ecological services such as fauna habitat, erosion protection, and nutrient stripping and cycling (EPA, 2016).

Individuals of the plant *Lepidium catapycnon* are known to occur in the area of the Premises. This species was previously considered Declared Rare Flora under the *Wildlife Conservation Act 1950* (WA), but was downgraded to Priority 4 in November 2015 (DPAW, 2015).

EPA report 1448 summarises that four fauna species with conservation significance have been recorded around the JSW and Oxbow areas. Of these, the most significant was determined to be the Northern Quoll which is also listed as Threatened Fauna under the EPBC Act. The EPA assessment concluded that, given the widespread nature of these species' habitats throughout the region, impacts to these species are unlikely to be significant.

The distances to specified ecosystems, as defined by the *Guidance Statement: Environmental Siting* (DER, November 2016b), are displayed in Table 7.

Table 7: Specified ecosystems

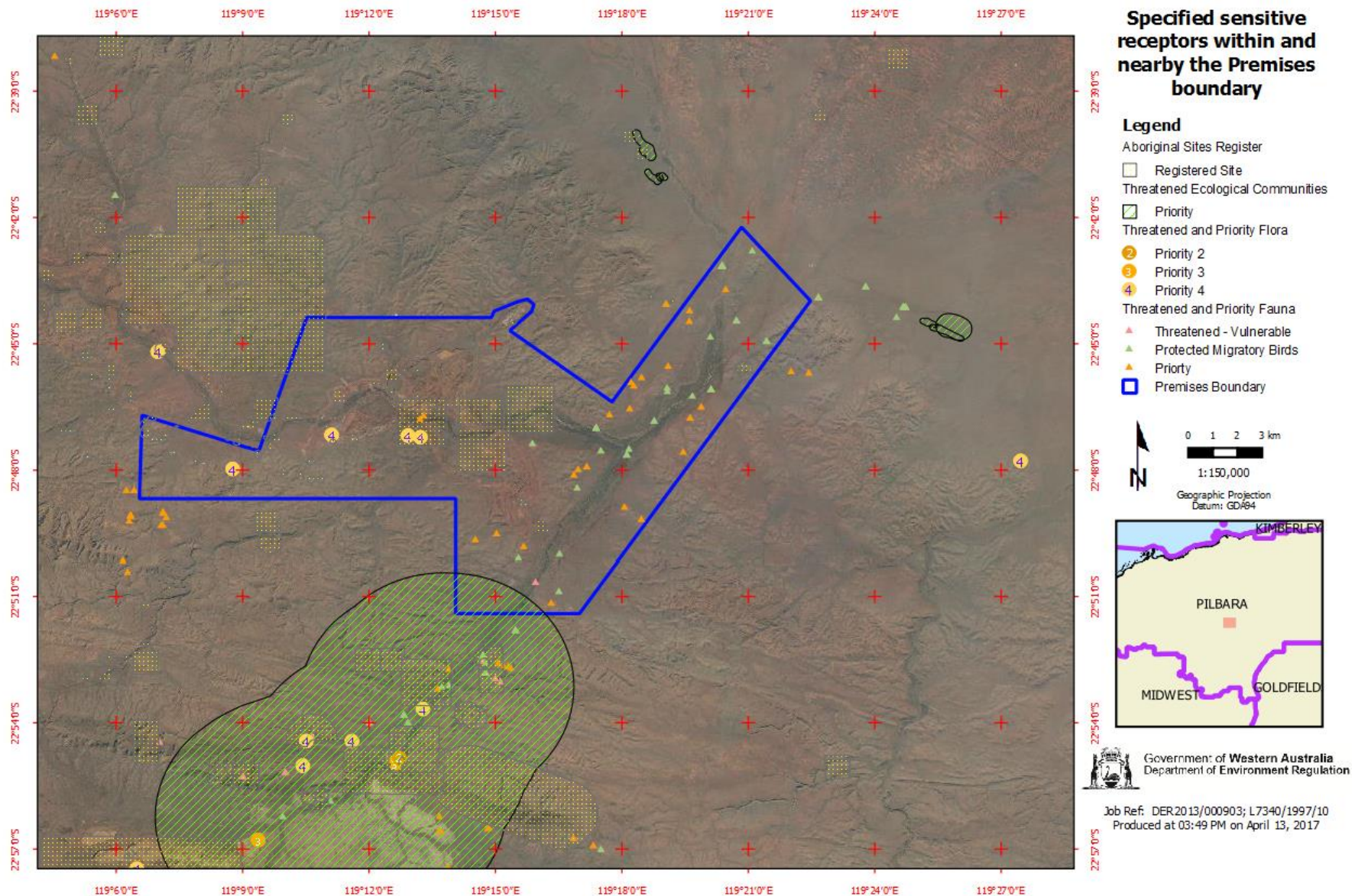
Specified ecosystems	Distance from Prescribed Premises
Parks and Wildlife tenure	No Parks and Wildlife tenure are located within a 30km radius of the Premises. Karijini National Park is located approximately 65km to the west of the Premises.
Public Drinking Water Source Area (PDWSA)	No PDWSA are located within a 30km radius of the Premises.
RAMSAR wetland – Fortescue Marsh	Fortescue Marsh is located approximately 30km north of the Premises Boundary.
Geomorphic Wetlands	No geomorphic wetlands are located within a 30km radius of the Premises.
Threatened Ecological Communities (TEC) and Priority Ecological Communities (PEC)	There are no Threatened Ecological Communities within a 30km radius of the process plant Weeli Wolli Spring (a PEC) is located approximately 16.5km south (upstream) within Weeli Wolli Creek. The buffer zone of the PEC extends approximately 5km upstream of the JSE mining area.
Declared Rare Flora	There are no Declared Rare Flora within the Premises. <i>Lepidium catapycnon</i> (previously a Declared Rare Flora, now a Priority 4 Flora) is located within the Premises.

Other environmental values (that are not specified ecosystems) are listed below in Table 8.

Table 8: Environmental values

Specified ecosystems	Distance from Prescribed Premises
Pilbara Olive Python (Vulnerable)	Recorded in and around the Premises
Western Pebble-mound Mouse (P4)	Recorded in and around the Premises
Northern Quoll	Likely to be present in the vicinity of the Premises
Chocolate Wattle Bat (<i>Chalinobolus morio</i>)	Recorded near the Premises
Migratory birds	Recorded in and around the Premises
Registered Aboriginal Heritage sites	Recorded in and around the Premises

The ecosystems identified in Table 7 and Table 8 are depicted in Figure 7.



The Department of Environment Regulation does not guarantee that this map is without flaw of any kind and disclaims all liability for any errors, loss or other consequence which may arise from relying on any information depicted. Roads and tracks on land managed by DER may contain unmarked hazards and their surface condition is variable. Exercise caution and drive to conditions on all roads.

Figure 7: Specified ecosystems within and nearby the Premises boundary

6.3.1 Weeli Wolli Creek

Weeli Wolli Creek discharges into the Fortescue Marsh, a PEC, located approximately 40km downgradient of the Premises. The lower reaches of Weeli Wolli Creek are located within Fortescue Marsh management zone 2b (Poonda Plains), which has a medium environmental significance (EPA 2013). This management zone does not extend as far south as the Premises however it may still be relevant where emissions from the Premises have the potential to directly or indirectly affect the Fortescue Marsh.

The Environmental Values Statement prepared by Rio Tinto (RTIO, May 2016) defines the values of the Weeli Wolli Creek catchment and the potential sensitivities are summarised below:

Key Values:

- *Fortescue Marsh* –The Fortescue Marsh supports a diverse ecosystem including endemic flora and fauna such as a number of restricted aquatic and terrestrial invertebrate species.
- *Flora and vegetation* – Five broad riparian woodland vegetation communities exist along the Weeli Wolli and Marillana creekline areas within the Yandicoogina Development Envelope.
- *Stygofauna* – A relatively high diversity of subterranean fauna species have been identified in the Marillana-Weeli Wolli Catchment.

Other Noted Values:

- *Fauna* – A number of Threatened Fauna species have been identified in the area surrounding the Weeli Wolli Creek catchment including the Pilbara Olive Python (*Liasis olivaceus barroni*), Northern Quoll (*Dasyurus hallucatus*), and a number of listed migratory birds (Department of Environment and Energy, 2016). Priority Fauna species and a significant assemblage of microbats have also been recorded in the area.
- *Heritage and social* – Weeli Wolli Creek holds important spiritual and physical value for local Aboriginal culture.

6.4 Groundwater and water sources

Groundwater in the region of the Premises is broadly divided into three groups being an impermeable basement layer, a highly fractured CID and a semi-permeable floodplain alluvium (RTIO, November 2015). The CID and alluvium aquifers are relatively transmissive and connected and both are recharged by direct infiltration from creeklines and from rainfall.

Groundwater quality in the alluvium and CID aquifers is dominated by bicarbonate (HCO_3^-) anions and sodium (Na), calcium (Ca) and magnesium (Mg) cations. Chloride concentration ranges from 15mg/L in the CID to 280 mg/L in the alluvium.

Table 9 provides a description of the groundwater resource.

6.5 Soil Type

The CID targeted by mining operations is overlain by unconsolidated alluvium/colluvium comprised of Banded Iron Formation (BIF), chert, shale, minor dolerite and occasional CID clasts in a red-brown sandy to clay rich matrix (URS, 2012).

The basement rocks comprise BIF, chert, shale and volcanic rocks. The thin alluvium and colluviums cover consists of valley fill and drainage deposits, which are restricted to areas close to present day drainages. These deposits include the CID, which has formed in the palaeochannel of the ancestral equivalents of the Marillana and Yandicoogina creek systems (RTIO, June 2015).

Table 9: Groundwater and water sources (EPA Report 1448)

Groundwater and water sources	Distance from Premises	Environmental Value
Groundwater – Fresh (150-600mg/L TDS)	<p>The natural depth to groundwater (pre-mining) in the vicinity of the JSW and Oxbow deposit varies between 2m and 25m below ground level.</p> <p>In the vicinity of the JSE mining area groundwater is typically around 15m below ground level.</p> <p>Drawdown is predicted to range from 0 to 50m near to abstraction bores.</p> <p>Groundwater rises are predicted to range between 0 to 30m near dewatering discharge locations and along creeklines.</p>	<p>Water is fresh and meets drinking water standards for inorganic chemicals.</p> <p>Groundwater may be abstracted for stock watering in areas of the Premises which are overlain by the pastoral lease.</p> <p>Groundwater dependent ecosystems exist on the fringe of major drainage lines (i.e. Marillana and Weeli Wolli Creeks).</p>

6.6 Meteorology

6.6.1 Wind direction and strength

The nearest weather station is at the Newman Airport (“Newman Aero”), located approximately 84kms southeast of the Premises. As shown in Figure 8, the prevailing wind direction for Newman is easterly to south-easterly, approximately 28% of the time (WillyWeather, May 2017). Approximately 85% of wind speeds are considered to be “gentle” or less (i.e. under 19.8km/h), and are “light” or less (i.e. under 12.6km/h) over 50% of the time.

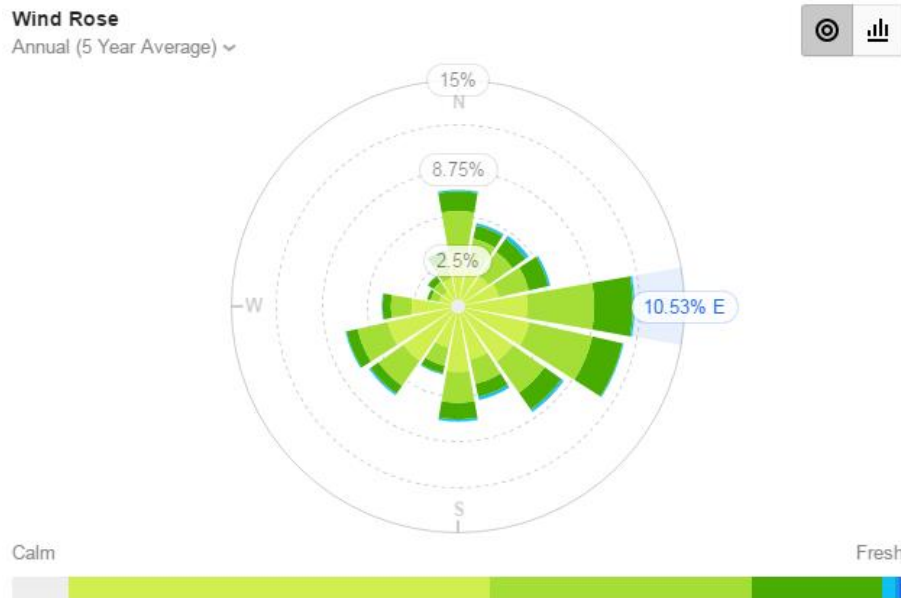


Figure 8: Five-year average wind roses for Newman Aero (WillyWeather, May 2017)

6.6.2 Regional climatic aspects

The Pilbara region is a semi-arid to arid environment with typically hot wet summers and cold dry winters.

6.6.3 Rainfall and temperature

Average annual rainfall for the region is estimated to be 402mm (URS, 2012) with the majority falling in short-duration, high-intensity storms. Rainfall is highly seasonal and variable year on year (Figure 9), with the area sometimes recording no rain at all for an annual period. When there is any rainfall, it tends to be focused around the December to March period of the year. Maximum summer temperatures frequently exceed 40°C (see Figure 10), with long-term average maximum temperatures being above 35° from approximately October through to March (Weatherzone, May 2017). Evaporation potentials typically exceed rainfall.

A 72 hour 100 year average recurrence interval (ARI) rainfall event has been assessed at 4.2mm per hour (304 mm total) while a 1 hour 100 year (ARI) rainfall event has been assessed at 65.8mm (URS, 2012).

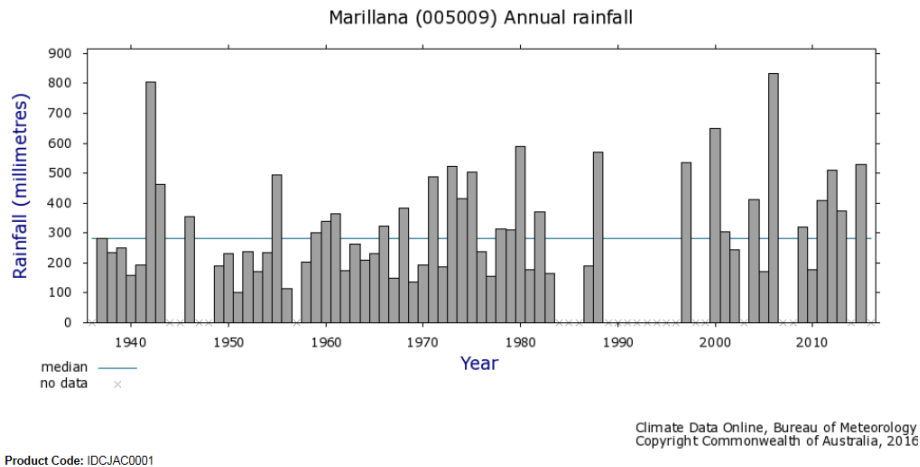


Figure 9: Annual rainfall figures at Marillana, 1937 to 2015 (BoM, 2016)

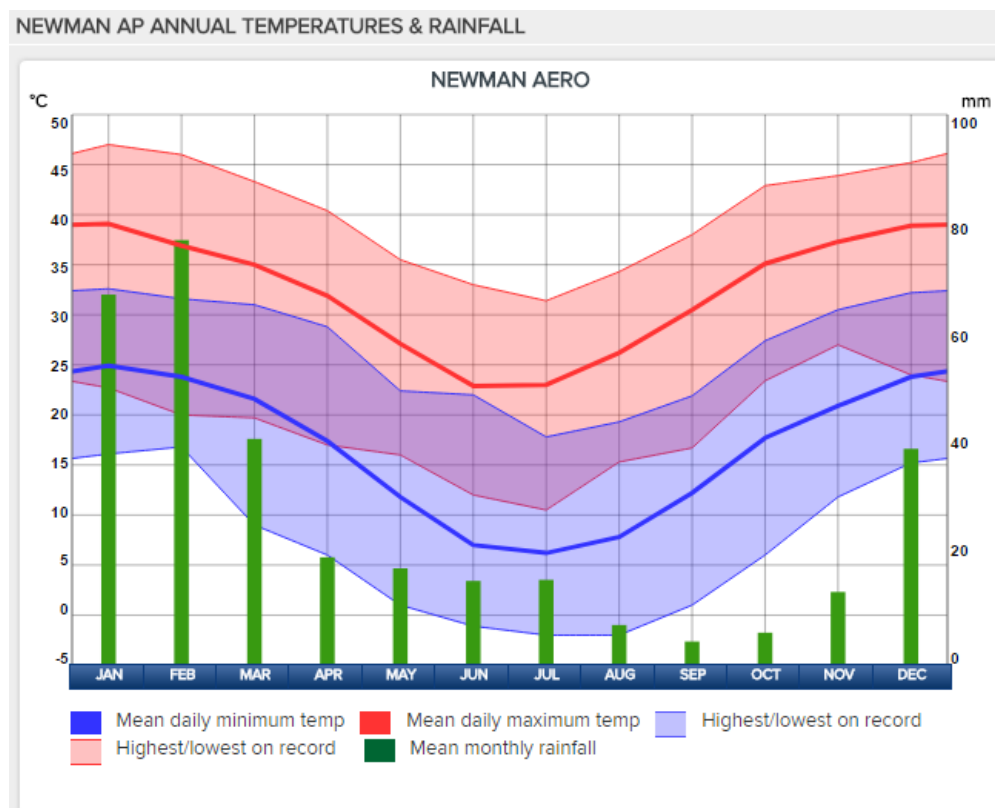


Figure 10: Annual temperatures and rainfall, Newman Aero (Weatherzone, May 2017)

7. Risk Assessment

7.1 Emission, pathway, and receptor identification

Table 10 below provides a summary of the emissions arising from the activities occurring at the Premises as well as related receptors, pathways for emissions to reach receptors and potential impacts if/when they do reach receptors. Some of the emissions have been excluded from further consideration in this risk assessment, due to a lack of receptors within reasonable separation distances from the source of the emission. Some emissions have also been excluded from a detailed risk assessment to avoid duplication with other regulatory requirements.

Table 10: Identification of key emissions and the potential for impacts

		Emissions	Receptors	Pathway	Impacts	Continued to detailed risk assessment?	Reasoning
<u>Category 5:</u> <i>Crushing and processing and materials, including ore</i>	Crushing and processing of ore	Dust	No residences in proximity. Vegetation including riparian vegetation adjacent to mine areas	Air / wind dispersion	Impacts to vegetation health	Yes	Refer to section 7.4
	Crushing and screening of non-ore materials by mobile equipment	Noise	No residences or other sensitive receptors in proximity		None	No	No receptor present.
	Movement and handling of ore through conveyors, train loadouts and at stockyards	Process and dust suppression water	Vegetation located adjacent to process plant infrastructure areas	Overtopping of containment sumps	Impacts to vegetation health	Yes	Refer to section 7.5 Note: The use of treated oily water for the purpose of dust suppression on haul roads has not been risk assessed as it does not directly relate to the Primary Activity.
<u>Category 6:</u> <i>Dewatering</i>	Abstraction resulting in drawdown of groundwater levels	None	Groundwater dependent ecosystems	Abstraction of groundwater	Reduction in groundwater availability for dependent vegetation	No	Changes to groundwater depth and quality, and discharges of surplus water are regulated under Part IV

	Discharges to the Marillana and Weeli Wolli Creeks	Dewater discharges to surface water	Riparian ecosystems along the Marillana and Weeli Wolli Creeks	Direct discharge	Disruption of normal ecosystem function	No	of the EP Act via MS 1038 (except for in relation to erosion at the dewater discharge points – see section 4.1.5).
		Dewater discharges to surface water	Riparian ecosystems in the immediate vicinity of the dewater discharge outflow points	Direct discharge	Erosion	Yes	Advice from the OEPA to DER (EPA, 2017) suggests that ambiguity in MS 1038 may mean erosion caused by dewater discharge is not managed under Part IV of the EP Act. Refer to section 7.7.
	Dewater pipelines	Rupture of pipeline causing dewater to be discharges to land	Terrestrial ecosystems	Discharges to land	Physical damage of vegetation	No	Impacts from the inundation of vegetation are expected to be negligible due to the fresh nature of abstracted groundwater.
	Construction of Dewatering Outlet 'DO9A' and associated pipeline infrastructure	Dust	No residences in proximity. Vegetation including riparian vegetation adjacent to mine areas	Air / wind dispersion	Impacts to vegetation health	Yes	Refer to section 7.4
Category 5: Waste Fines Cells	Surface of waste fines cells	Dust	No residences in proximity, vegetation including riparian vegetation adjacent to mine areas	Air / wind dispersion	Impacts to vegetation health	Yes	Refer to section 7.4
	Tailings pipelines	Rupture of pipeline causing tailings discharges to land	Terrestrial and freshwater ecosystems	Discharges to land	Physical damage or smothering of vegetation by tailings or sedimentation of watercourse	Yes	Refer to section 7.6
	Waste fines cells	Deposition of waste fines and seepage to groundwater	Groundwater dependent ecosystems and riparian vegetation within Marillana	Groundwater mounding and seepage	Groundwater mounding	No	Impacts to subterranean fauna and nearby creek ecosystems as a result of changes to groundwater

			and Weeli Wolli Creek		Groundwater contamination impacting upon groundwater dependent ecosystems and/or livestock	No	depth and quality have been assessed and are regulated under Part IV of the EP Act, via MS 1038 (see sections 4.1.4 and 4.1.5).
					Deposition of waste fines within pit void altering hydrogeological systems	No	Rehabilitation and closure are regulated under Part IV of the EP Act.
<u>Category 73:</u> Bulk storage of chemicals	Bulk fuel storage	Breach of containment causing hydrocarbon discharge to land	Ecosystems adjacent to storage area	Direct discharge	Soil contamination inhibiting vegetation growth and survival and health impacts to fauna	Yes	Refer to section 7.8
<u>Category 54:</u> Wastewater Treatment Plants	Treatment of sewage	Odour	No residences or other sensitive receptors in proximity	Air / wind dispersion	None	No	No receptor present.
	Irrigation of treated effluent	Treated effluent to land	Vegetation adjacent to discharge area	Direct discharge	Soil contamination inhibiting vegetation growth and survival	Yes	Refer to section 7.9
	Discharge of effluent as a result of a spill	Untreated/partially treated effluent to land	Vegetation adjacent to discharge area	Direct discharge	Soil contamination inhibiting vegetation growth and survival	Yes	Refer to section 7.9
<u>Category 64:</u> Landfills	Disposal of inert and putrescible waste	Odour	No residences or other sensitive receptors in proximity	Air / wind dispersion	None	No	No receptor present.
		Windblown rubbish					
	Disposal of inert and putrescible waste	Leachate to groundwater	Groundwater dependent ecosystems	Direct discharge	Groundwater contamination impacting upon groundwater dependent ecosystems and/or livestock	Yes	Refer to section 7.10
		Gaseous emissions	No residences or other sensitive receptors in proximity	Air / wind dispersion	None	No	No receptor present.
	Storage and disposal of tyres	Fire risk, smoke	No residences or other sensitive receptors in proximity	Air / wind dispersion	None	No	No receptor present.

7.2 Risk Criteria

During the assessment the risk criteria in Table 11 below will be applied to determine a risk rating set out in section 7.11.

Table 11: Risk Criteria

Likelihood	Consequence				
	Slight	Minor	Moderate	Major	Severe
Almost Certain	Medium	High	High	Extreme	Extreme
Likely	Medium	Medium	High	High	Extreme
Possible	Low	Medium	Medium	High	Extreme
Unlikely	Low	Medium	Medium	Medium	High
Rare	Low	Low	Medium	Medium	High

Likelihood		Consequence		
The following criteria has been used to determine the likelihood of the risk / opportunity occurring.		The following criteria has been used to determine the consequences of a risk occurring:		
		Environment	Public Health and Amenity (such as air and water quality, noise, and odour)	
Almost Certain	The risk event is expected to occur in most circumstances	Severe	<ul style="list-style-type: none"> on-site impacts: catastrophic off-site impacts local scale: high level or above off-site impacts wider scale: mid-level or above Mid to long term or permanent impact to an area of high conservation value or special significance[^] Specific Consequence Criteria (for environment) are significantly exceeded 	<ul style="list-style-type: none"> Loss of life Adverse health effects: high level or ongoing medical treatment Specific Consequence Criteria (for public health) are significantly exceeded Local scale impacts: permanent loss of amenity
Likely	The risk event will probably occur in most circumstances	Major	<ul style="list-style-type: none"> on-site impacts: high level off-site impacts local scale: mid-level off-site impacts wider scale: low level Short term impact to an area of high conservation value or special significance[^] Specific Consequence Criteria (for environment) are exceeded 	<ul style="list-style-type: none"> Adverse health effects: mid-level or frequent medical treatment Specific Consequence Criteria (for public health) are exceeded Local scale impacts: high level impact to amenity
Possible	The risk event could occur at some time	Moderate	<ul style="list-style-type: none"> on-site impacts: mid-level off-site impacts local scale: low level off-site impacts wider scale: minimal Specific Consequence Criteria (for environment) are at risk of not being met 	<ul style="list-style-type: none"> Adverse health effects: low level or occasional medical treatment Specific Consequence Criteria (for public health) are at risk of not being met Local scale impacts: mid-level impact to amenity
Unlikely	The risk event will probably not occur in most circumstances	Minor	<ul style="list-style-type: none"> on-site impacts: low level off-site impacts local scale: minimal off-site impacts wider scale: not detectable Specific Consequence Criteria (for environment) likely to be met 	<ul style="list-style-type: none"> Specific Consequence Criteria (for public health) are likely to be met Local scale impacts: low level impact to amenity
Rare	The risk event may only occur in exceptional circumstances	Slight	<ul style="list-style-type: none"> on-site impact: minimal Specific Consequence Criteria (for environment) met 	<ul style="list-style-type: none"> Local scale: minimal to amenity Specific Consequence Criteria (for public health) met

[^] Determination of areas of high conservation value or special significance should be informed by the *Guidance Statement: Environmental Siting* (DER, November 2016b).

* In applying public health criteria, DWER may have regard to the Department of Health's, *Health Risk Assessment (Scoping) Guidelines*

“on-site” means within the prescribed premises boundary.

7.3 Risk Treatment

DER will treat risks in accordance with the Risk Treatment matrix (Table 12) below:

Table 12: Risk Treatment

Rating of Risk Event	Acceptability	Treatment
Extreme	Unacceptable.	Risk event will not be tolerated. DWER may refuse application.
High	May be acceptable. Subject to multiple regulatory controls.	Risk event may be tolerated and may be subject to multiple regulatory controls. This may include both outcome-based and management conditions.
Medium	Acceptable, generally subject to regulatory controls.	Risk event is tolerable and is likely to be subject to some regulatory controls. A preference for outcome-based conditions where practical and appropriate will be applied.
Low	Acceptable, generally not controlled.	Risk event is acceptable and will generally not be subject to regulatory controls.

7.4 Risk Assessment – Dust Emissions

7.4.1 Description of risk event

Dust emissions from construction of infrastructure, mobile crushing and screening, movement and handling of ore and from the surface of WFCs depositing upon adjacent vegetation, and inhibiting its growth and survival.

Only impacts upon vegetation are considered by this risk assessment. The only human receptors in close proximity to the Premises are the Licence Holder's workforce. The safety and health of this group is regulated through the *Mines Safety and Inspection Act 1994* which is administered by DMP. There are no other human receptors in the vicinity of the Premises which require consideration in relation to dust impacts.

7.4.2 Identification and general characterisation of emissions

Dust may arise from a wide range of sources and activities undertaken within the Premises. Mobile crushing and screening activities for the production of blasting, construction and maintenance materials are likely to be a source of dust generation. Dust emissions may also arise from mining and construction activities, ore handling and vehicle movements on site. The surface of waste fines storage facilities can also become a source of fugitive dust, if allowed to dry and left without capping or rehabilitation.

Although some crushing of dry ore occurs at the Premises, the majority of ore is mined from below the water table and contains moisture which will help to reduce dust generation.

7.4.3 Description of potential adverse impact from the emission

Dust emissions can vary in impact depending upon composition, volume and particle size. Dust generated at the Premises is likely to be composed primarily of iron oxide from ore handling, as well as soils and surface materials which have become airborne.

The potential for fibrous materials to be present within the mined material means that there is a chance that these will be present in dust emissions. However, as human health impacts at the Premises are regulated under occupational health and safety legislation, the impact of

fibrous materials within the dust has not been considered further through this risk assessment.

Vegetation adjacent to the WFC's, trafficable areas, mobile screening equipment and ore handling areas are likely to experience increased dust deposition. Other than immediately adjacent to highly trafficked roads, it is unlikely dust deposition will occur at volumes sufficient to cause observable impacts on vegetation. Even in areas most impacted by dust, the natural dust tolerance of Pilbara vegetation species is likely to prevent prolonged health impacts.

7.4.4 Criteria for Assessment

There are no applicable standards or criteria relating to dust impacts on vegetation.

7.4.5 Licence Holder controls

The Licence Holder has the controls listed in Table 13 in place to manage dust emissions.

Table 13: Licence Holder dust controls*

Objective	Site Infrastructure*	Reference to Revised Licence Plan (Attachment 1)
Dust suppression	Water trucks	N/A
	Stockpile water cannons	Stockyard
	Booms sprays on reclaimers	Stockyard
Dust collection	Bag house filters on primary/secondary crushers	PC 1, 2, 3, 4
Dust prevention	Covering on conveyors	Not shown
	Rehabilitation of disturbed areas	N/A

*as observed during DWER inspection – 14 May 2014

7.4.6 Consequence

In the absence of any known Declared Rare Flora or Priority 1 flora species in the vicinity of the Premises (refer to section 6.3), the Delegated Officer considers that dust deposition may result in minimal, localised impacts to vegetation. The Delegated Officer has therefore determined that the consequence of dust impacts is *slight*.

7.4.7 Likelihood of consequence

It is likely that dust will be generated under certain conditions and deposit on nearby vegetation. The Delegated Officer considers that this deposition is unlikely to result in health impacts to vegetation. The Delegated Officer has therefore determined that the likelihood of dust emissions resulting in adverse impacts to vegetation is *unlikely*.

7.4.8 Overall risk rating

The Delegated Officer has compared the consequence and likelihood ratings described above for the Risk Criteria (Table 11) and determined that the overall rating for the risk of dust impacts on vegetation or sensitive receptors during operation as **Low**.

7.5 Risk Assessment – Process and dust suppression water

7.5.1 Description of risk event

Overflow of dust suppression water from containment infrastructure (sumps) beneath processing plants and transfer stations to areas of fringing vegetation adjacent to infrastructure at times of high water usage.

7.5.2 Identification and general characterisation of emissions

During the Review, the Licence Holder advised that some water used in ore processing (process water) may at times be discharged to the environment (RTIO, February 2017). This water is understood by the Delegated Officer to consist of dust suppression water from sprays attached to ore processing infrastructure such as crushing and screening plants and at transfer stations.

This is incidental dust suppression water which runs off infrastructure into sumps and does not consist of process water applied during the beneficiation of ore which should only be discharged as waste fines slurry to the WFCs. The discharge of waste fines is considered through a separate risk assessment below.

The Licence Holder's advice notes that sumps and other containment structures are in place at the base of the infrastructure to collect dust suppression water. However the Licence Holder considers that these are insufficient to contain all of the water discharged during periods of high usage. The Licence Holder advised that this water is not expected to be contaminated with hydrocarbons.

The Delegated Officer also notes the Licence Holder's advice that the process water is dewater and therefore is of the same quality as local groundwater. The Delegated Officer notes the potential for seepage to occur from the ponds storing process water. However, as this is abstracted groundwater which has not yet been used or come into contact with potential contaminants the Delegated Officer does not consider that this potential discharge requires further risk assessment.

Note: this risk assessment relates only to dust suppression water applied directly to ore as part of the Primary Activities (i.e. dust suppression around ore handling and processing infrastructure). This risk assessment has not considered the use of treated oily water or dewater for dust suppression on haul roads or other areas of the mine site.

7.5.3 Description of potential adverse impact from the emission

The Delegated Officer notes the Licence Holder's advice that dust suppression water in question is unlikely to have been contaminated by hydrocarbons.

The Delegated Officer considers that there is some potential for the water to collect small concentrations of sediment and lubricants through contact with the ore and infrastructure. However the Delegated Officer does not consider that these contaminants are likely to be present in sufficient concentrations to cause observable impacts to vegetation.

7.5.4 Criteria for Assessment

There are published standards and guidelines for investigation of hydrocarbon contamination in soil (e.g. *National Environment Protection (Assessment of Site Contamination) Measure 1999*). The ANZECC/ARMCANZ 2000 guidelines also contain trigger values for aromatic hydrocarbon concentrations in freshwater. There are no applicable criteria relating to acceptable concentrations of hydrocarbons or sediment in water discharged to land and vegetation.

7.5.5 Licence Holder controls

The Licence Holder's advice indicates that containment infrastructure is in place to capture dust suppression water from infrastructure, but that it is inadequate to contain all of the water produced during periods of high usage.

7.5.6 Consequence

Considering the absence of an opportunity for the dust suppression water to become significantly contaminated, the Delegated Officer has determined that the consequence is *slight*.

7.5.7 Likelihood of consequence

The Delegated Officer notes that overtopping of containment infrastructure may only occur during periods of high use or as the result of incidental significant rainfall.

The Delegated Officer considers that, even if a discharge occurs, the low concentrations of sediment and hydrocarbons in the water means that impacts to vegetation may only occur in exceptional circumstances. On this basis the Delegated Officer has determined the likelihood to be *rare*.

7.5.8 Overall risk rating

The Delegated Officer has compared the consequence and likelihood ratings described above through the Risk Matrix (Table 11) and determined that the overall rating for the risk of adverse impacts to vegetation is **Low**.

7.6 Risk Assessment – Tailings Pipelines

7.6.1 Description of risk event

Discharge of waste fines outside of WFC's as a result of tailings pipeline rupture causing physical smothering of vegetation.

As discussed in section 5 above, the requirements of Works Approval W5630/2014/1 relating to the locations and layout of WFC3A and Stage 2 of WFC3 have been transferred into the Revised Licence as part of this Review.

As the WFC's are located within pit voids and below the natural ground level, the Delegated Officer does not consider that the risk of embankment failure requires further consideration through this risk assessment. Any discharge from the WFC's themselves will be contained within the wider pit void. The risk of harm to the mine's workforce as a result of a WFC embankment breach is regulated by DMP under the *Mines Safety and Inspection Act 1994*.

7.6.2 Identification and general characterisation of emissions

The Licence Holder has commissioned a number of studies into the geochemical characteristics of waste rock and waste fines produced at the Premises. The Mining Proposal prepared in relation to WFC 3 (URS, 2012) summarises previous studies by Graham Campbell and Associates and SRK Consulting.

The URS report notes that the waste rock and waste fines materials have a low to negligible potential for oxidation and acid generation (classified as non-acid forming (NAF)) and limited neutralising capacity (classified as 'barren'). While the URS report also notes that certain elements (arsenic (As), gold (Au), selenium (Se) and mercury (Hg)) were found to be enriched in the tested samples, none of these were found to be readily leachable. Static leach tests showed higher than expected levels of aluminium and iron in leachate.

An updated acid and metalliferous drainage (AMD) risk assessment (RTIO, June 2014) was

included in the PER documentation submitted by the Licence Holder for the EPA's assessment of the Pocket and Billiard proposal. This detailed the geochemical analysis of 90 waste rock samples and 13 waste fines samples from across the Premises (JC, JSE, and JSW). The result of static and kinetic leach tests on these samples support the findings of the previous studies discussed above.

7.6.3 Description of potential adverse impact from the emission

Considering the mostly benign nature of the waste fines, the main impact from the release of waste fines to the environment would be from physical smothering of vegetation and sedimentation of freshwater ecosystems.

The waste fines pipelines are mainly located above ground, within disturbed areas of the mine and with short sections buried at crossings. Impacts are therefore likely to be limited to the immediate vicinity of the waste fines pipeline breach. Discharged waste fines would generally be confined to the roadway on which the pipeline sat and fringing vegetation.

7.6.4 Criteria for Assessment

There are no applicable guidelines or standards relating to the deposition of material on native vegetation. The ANZECC/ARMCANZ 2000 guidelines provide criteria relating to turbidity in aquatic environments.

7.6.5 Licence Holder controls

The Licence Holder has the following controls in place to reduce and manage discharges to land from waste fines disposal infrastructure as outlined in Table 14.

Table 14: Licence Holder controls for the waste fines storage infrastructure

Controls for the waste fines storage facilities	
Site Infrastructure	Control
Pipeline infrastructure	<ul style="list-style-type: none"> Pipelines equipped with telemetry systems and/or pressure sensors along pipelines to allow the detection of leaks and failures. Pipelines are located within pit, with any potential leakage being captured within the pit void. Vacuum breaks located at high spots along the waste fines delivery pipeline.

7.6.6 Consequence

Considering the localised impact of any waste fines pipeline breach and the absence of priority flora or sensitive ecosystems, the Delegated Officer has determined that the consequence is **slight**.

7.6.7 Likelihood of consequence

The Delegated Officer considers that the likelihood of a waste fines pipeline breach occurring and impacting upon vegetation or freshwater ecosystems is **unlikely**.

7.6.8 Overall risk rating

The Delegated Officer has compared the consequence and likelihood ratings described above through the Risk Matrix (Table 11) and determined that the overall rating for the risk of adverse groundwater impacts is **Low**.

7.7 Risk Assessment – Dewater discharges to surface water

7.7.1 Description of Risk Event

Discharges of dewater from discharge outflow points causing erosion and impacting upon riparian ecosystems in the vicinity of the outflow points.

7.7.2 Identification and general characterisation of emission

There are multiple discharge points throughout the Premises located on the fringes of Marillana and Weeli Wolli creeks (see Figure 4). Dewater discharges from the Premises occur continuously (RTIO, November 2015). During the 2015 annual period dewater was discharged at an average rate of approximately 77,900m³ per day.

7.7.3 Description of potential adverse impact from the emission

The large quantities of dewater discharges are likely to significantly increase the regular water levels and flow rates of creeks at the discharge points above background levels. Greater flow rates and dewatering volumes can increase the erosion potential downstream from the discharge points, with consequent adverse impacts to riparian ecosystems along Marillana and Weeli Wolli Creeks. However, erosion risks are expected to be greatest in the immediate vicinity of the individual dewater discharge outlets.

Key finding: The Delegated Officer has reviewed the information regarding dewatering discharges to surface waters and has found:

1. Total dewater discharge volumes and cumulative impacts to surface water quality are regulated under Part IV of the EP Act, via MS 1038.
2. The protection of riparian ecosystems along Marillana and Weeli Wolli Creeks is regulated under Part IV, via MS 1038.
3. Erosion in the immediate vicinity of the dewater discharge outlets does not appear to be regulated under Part IV of the EP Act.

The Delegated Officer has determined that to avoid unnecessary duplication with Part IV requirements in accordance with *Guidance Statement: Setting Conditions*, there will be no conditions placed on the Revised Licence in relation to surface water quality monitoring and downstream impacts to riparian ecosystems. However, erosion in the immediate vicinity of dewater discharge outlets requires further assessment.

7.7.4 Criteria for assessment

The Licence Holder has developed a monitoring regime based on site-specific trigger values derived from baseline water quality data for the creek systems, in accordance with ANZECC/ARMCANZ 2000 Guidelines (ANZECC/ARMCANZ, 2000), for assessing inland surface waters for water quality and turbidity levels associated with increased sedimentation.

However, the Delegated Officer has determined that water quality monitoring is already regulated under Part IV, particularly through condition 5-2 of MS 1038. As such, it will not be considered for the purposes of this risk assessment.

There are no applicable criteria relating to acceptable levels of erosion of creek banks in the Pilbara, though the Licence Holder does record some erosion data (see section 7.7.5).

7.7.5 Licence Holder controls

The Licence Holder has developed a detailed Monitoring and Management Plan (MMP) (RTIO, May 2016) to comply with MS 914 that relates to dewatering discharges. The MMP

requires a number of specified actions, including biannual visual inspections and photographic recording of operational discharge points and major floodway crossings. Where medium-level or greater erosion is observed and confirmed to be caused by the dewatering discharges, specified management actions are enacted to reduce impacts, such as modification of the discharge regime and/or undertaking rehabilitation measures if necessary.

In terms of infrastructure, the principle Licence Holder controls pertain to reducing flow rates at the dewater outflow discharge points. There are four types of controlled discharge points presently used at the Premises:

- **‘Gabion-style drop structure’**, – metallic mesh cages that are filled with rocks, concrete, or other similar materials and are commonly used for landscaping. The drop structure allows dewater discharges to follow the natural gradient of the surrounding landscape for an extended distance without there being a waterfall/cascade at the end of the discharge outlet (Figure 11).
- **‘T-piece and rip-rap’** – water pressure at the discharge is reduced by forcing the abstracted water into a pipe wall before being redirected at a 90° degree angle to the left or right to two outlet points (T-piece). Rip-rap is a type of rock armouring that is then used to cover the area that the dewater discharges to. Its primary function is to disrupt the water flow, reducing flow rates before it reaches natural watercourses (Figure 12).
- **‘Rip-rap only’** – Rip-rap is placed at the outflow point of the dewater pipe to slow the water velocity and reduce the impact of water discharged from the pipe.
- **‘Upwelling’** – dewater is conveyed via buried pipeline to the discharge point where, rather than exiting the pipe as a cascade, it is pushed up through a grate in the roof of the discharge pipe to a rip-rap armoured channel that directs the water into the creek system (Figure 13).



Figure 11: Example of a ‘gabion-style drop structure’ type discharge outlet at Yandicoogina DO9 (RTIO, March 2017a)



Figure 12: Example of a ‘T-piece and rip-rap’ type discharge outlet at Yandicoogina DO8 (RTIO, March 2017a)



Figure 13: Example of an ‘upwelling’ type discharge outlet at Yandicoogina DO6 (RTIO, March 2017a)

The specific types of controls used at each discharge point are listed in Table 15 (below), with their locations being as depicted in Figure 4 (see section 3.3).

Table 15: Licence Holder’s existing controls for dewater discharges to surface water

Site Infrastructure	Description	Operation details – flow rates for 2015 (m ³ /year) ¹	Maximum indicative flow rates (L/s)	Reference on the Revised Licence Plan
Dewater Outlet 2	Discharge pipeline with rip-rap only	856	400	DO2
Dewater Outlet 3		818,805	200	DO3
Dewater Outlet 3A ²		N/A	500	DO3A
Dewater Outlet 5		3,588,498	500	DO5
Dewater Outlet 5A ³		N/A	500	DO5A

Site Infrastructure	Description	Operation details – flow rates for 2015 (m ³ /year) ¹	Maximum indicative flow rates (L/s)	Reference on the Revised Licence Plan
Dewater Outlet 6	Upwelling type buried discharge pipeline	13,683,500	600	DO6
Dewater Outlet 8	T-piece and rip-rap dewater outflow discharge point	2,344,411	600	DO8
Dewater Outlet 9	Gabion-style drop structure dewater outflow discharge point	7,987,964	>1,000	DO9
Dewater Outlet 9A ⁴	Gabion-style drop structure dewater outflow discharge point	N/A	>1,000	DO9A

Note 1: Sourced from the 2015 Annual Environmental Report (RTIO, April 2016).

Note 2: DWER received compliance documents regarding completion of construction on DO3A on 12 April 2017 (RTIO, April 2017a).

Note 3: DO5A used to be DO5 before it was moved to its current location; as noted above, the Licence Holder has applied for authorisation to recommission the old discharge point under the new designation DO5A.

Note 4: DO9A has not been commissioned and is not yet operational.

On 25 August 2016, the Licence Holder submitted an application to amend the Existing Licence to include authorisation for the construction of a new dewatering discharge point (DO9A). The Licence Holder proposes to construct DO9A to the same specifications as those used at DO9, which is ‘armoured’ with gabions to force the dewater flow in a particular direction (RTIO, August 2016a). The amendment also sought to recommission a previously used discharge point DO5 (under the new designation DO5A, with the location currently designated as DO5 remaining) (RTIO, August 2016b).

7.7.6 Consequence

The Delegated Officer notes that the immediate area adjacent to dewater discharge outflow points does not contain any specified ecosystems such as Threatened or Priority Ecological Communities. In addition, vegetation surveys note that the condition of riparian vegetation near the dewater discharge outlets tends to be rated as “good”, “poor”, or “very poor” (RTIO, November 2015). Therefore any on-site impacts to riparian ecosystems will likely be only at a low level. The Delegated Officer also notes that no significant erosion impacts have been identified by DWER or the Licence Holder at current dewatering discharge rates or volumes.

As such, the Delegated Officer considers the consequence of dewater discharges to surface water to be **minor**.

7.7.7 Likelihood of consequence

Based on current Licence Holder controls the Delegated Officer has determined that where dewater is discharged via upwelling; t-piece and rip-rap; and gabion-style drop structures, the likelihood of erosion beyond the anticipated creek lines will probably not occur except in exceptional circumstances. Although erosion beyond anticipated creek lines will still probably not occur in most circumstances, the Delegated Officer has determined that the likelihood of the risk event occurring increases where only rip-rap is used for erosion control at the

discharge outlet. Therefore, the Delegated Officer considers the overall likelihood of the risk event occurring to be **unlikely**.

7.7.8 Overall rating of dewater discharges to surface water

The Delegated Officer has compared the consequence and likelihood ratings described above with the Risk Rating Matrix (Table 11) and determined that the overall rating for the risk of dewater discharges to surface water is **Medium**, requiring Licence Holder controls to be conditioned. Further regulatory controls will also be required at dewatering discharge outlets where only rip-rap is used to reduce the risk of erosion.

7.8 Risk Assessment – Bulk chemical storage

7.8.1 Description of risk event

Failure of containment infrastructure around bulk fuel storages such that hydrocarbons are released into and cause adverse impacts to riparian vegetation and freshwater ecosystems.

7.8.2 Identification and general characterisation of emissions

Hydrocarbons may be spilt or discharged from a number of sources at the Premises including small fuel, oil and lubricant storages, in-pit maintenance activities, bulk fuel stores, stormwater discharge points and oily water separator discharges.

As Category 73 is limited to bulk fuel stores, this risk assessment focuses on large fuel storages that store more than 10% of the 1,000m³ Category 73 threshold (i.e. 100,000L) specified in Schedule 1, Part 2 of the EP Regulations. There are five locations within the Premises which store these volumes (refer to Table 16). A total volume of 1,770m³ or 1,770,000L, is stored at the Premises (including fuel, oil and lubricants).

Key Finding: The Delegated Officer notes that Category 73 is limited to bulk fuel stores and therefore has not included consideration in the risk assessment of the potential for minor spills from other hydrocarbon storage areas around the Premises. The potential for hydrocarbon contamination resulting from the use of treated oily water for dust suppression purposes has also been excluded from the risk assessment as it does not form part of the Primary Activities.

The Delegated Officer expects that hydrocarbon contamination arising from sources other than bulk hydrocarbon stores will be regulated on a risk basis using alternative mechanisms under the EP Act and/or the *Contaminated Sites Act 2003*.

7.8.3 Description of potential adverse impact from the emission

Hydrocarbon contaminated discharges could lead to the contamination of soil and groundwater with the potential for significant discharges to be transported beyond disturbed areas of the mine site and into sensitive freshwater ecosystems.

7.8.4 Criteria for Assessment

Australian Standard AS1940:2004 relates to the storage and handling of flammable or combustible materials, including hydrocarbons.

There are published standards and guidelines for investigation of hydrocarbon contamination in soil (e.g. National Environment Protection (Assessment of Site Contamination) Measure 1999). The ANZECC/ARMCANZ 2000 guidelines also contain trigger values for aromatic hydrocarbon concentrations in freshwater.

Under the *Contaminated Sites Act 2003*, the Licence Holder has an obligation to report soil contamination within Premises.

7.8.5 Licence Holder controls

The Licence Holder has the following controls in place to contain and manage discharges to land from hydrocarbon storage infrastructure as outlined in Table 16.

Table 16: Licence Holder controls for hydrocarbons and hydrocarbon contaminated stormwater/wash water

Infrastructure	Description	Controls
Permanent Hydrocarbon Storage Facility	880,000 L (8 x 110kL) diesel tanks located within the JC Area.	Bunded concrete pad and sump to contain spills. Tanks are stored in low permeability containment facilities capable of storing at least 100% of the volume of the largest tank, and in accordance with Australian Standard AS 1940:2004.
JC Workshop	220,000L oil storage to service the Heavy Vehicle Workshop.	
JSE Refuelling Station (HVFF)	220,000L diesel tanks	
JSW Refuelling Station (HVFF)	220,000L (2 x 110kL) diesel tanks	
JSW Train Load-out	220,000L diesel tanks	
Bioremediation Area	Landfarm to treat hydrocarbon contaminated soils.	Contaminated soils are aerated and wetted to facilitate microbial remediation.
Fixed Plant OWS ¹	Hydrocyclone Oily Water Separator	Capable of producing effluent quality with less than 15mg/L TRH. Discharges to a lined evaporation pond with holding capacity for a 1:10 year annual rainfall event. Potentially used for dust suppression ² .
JC Plant OWS	Collects washdown water from the plant and workshop areas and directs it to the OWS via a sump. Discharged to the Levee Bank discharge point.	Treated effluent capable of achieving a water quality of less than 15 mg/L TRH. Potentially used for dust suppression ² .
JSW OWS	Drive in sumps report washdown water from concrete slabs to sumps. Drains and levees have been installed around the mine pits, conveyors, plant and other infrastructure.	Treated effluent used for dust suppression ² or evaporates.
JSE OWS		Treated effluent discharged to the Levee Bank discharge point.

¹ Information sourced from RTIO, June 2013.

² Treated water from oily water separators is used for dust suppression on haul roads, access roads and within mining areas.

7.8.6 Consequence

The Delegated Officer considers that a failure of containment infrastructure could result in a large hydrocarbon spill which has the potential to be transported to and contaminate freshwater ecosystems. At sufficient volume, hydrocarbon contamination could lead to localised fauna deaths. The Delegated Officer therefore considers the consequence of a significant hydrocarbon spill to be **moderate**.

7.8.7 Likelihood of consequence

The Delegated Officer considers that the likelihood of a significant spill occurring and impacting upon fauna is **rare** when the proponent's controls are implemented.

7.8.8 Overall risk rating

The Delegated Officer has compared the consequence and likelihood ratings described above through the Risk Criteria matrix (Table 11) and determined that the overall rating for the risk of adverse groundwater impacts is **Medium**.

7.9 Risk Assessment – Irrigation of Treated Wastewater

7.9.1 Description of risk event

Discharge of inadequately treated effluent from WWTPs to native vegetation.

7.9.2 Identification and general characterisation of emissions

A number of WWTP's operate within the Premises, treating effluent received from accommodation and administration buildings and discharging it to irrigation sprayfields. The largest WWTP within the Premises services the village with a maximum daily effluent throughput of 710m³ and sprayfield area of 17ha. The Licence Holder has indicated to DWER that there are also a number of small septic tanks operating onsite (RTIO, May 2017). However, as sewage from septic tanks does not fall under the scope of Category 54, septic tanks have not been risk assessed in this Review.

As mentioned in section 5.4, on occasions in 2013 and 2015 wet wells involved in the pumping of sewage to WWTPs have overflowed as a result of power outages and blockages. In February 2016, the Licence Holder notified DWER that the wet wells had been replaced to improve capacity, although the risk of a power outage remains a potential cause for future spills. The Delegated Officer has considered through the risk assessment the potential for untreated sewage to be discharged to the environment as a result of the failure of sewage containment and transmission infrastructure.

7.9.3 Description of potential adverse impact from the emission

The discharge of effluent (treated or untreated) to land has the potential to contaminate soil and impact upon vegetation growth and survival.

The sprayfields associated with the mine and fixed plant WWTPs are within the disturbed JC infrastructure areas and unlikely to have any interaction with local drainage systems. The EPCM and Village sprayfields are located adjacent to small ephemeral creeklines which ultimately drain (via engineered diversions around and through mine infrastructure) into Marillana creek.

The high value ecosystems associated with the Marillana and Weeli Wolli Creeks are 1km to 4kms downstream of these two sprayfields. Considering the high evaporation rates and the diluting factor of any rainfall event sufficient to transport effluent runoff into Marillana creek drainage systems, the Delegated Officer does not consider it necessary to further assess the risk to freshwater ecosystems.

The overflowing of wet wells has typically resulted in effluent being discharged to unsealed roads. In each instance, effluent did not move beyond the haul road and disturbed mine infrastructure areas. Nonetheless, the Delegated Officer considers that there is the potential for similar failures to result in untreated sewage to impact upon nearby native vegetation.

As discussed in section 6.3, the value of floristic communities in the region of the Premises is limited, with only Priority 4 species thought to be present. The Delegated Officer therefore

considers that the impact of the discharge of treated effluent within the sprayfields is limited. Treated effluent is unlikely to cause the death of vegetation within the sprayfield providing application rates remain within the range which can be contained and utilised by the sprayfield area. Impacts beyond the sprayfields will only occur as a result of a spill or discharge of untreated effluent.

7.9.4 Criteria for Assessment

The ANZECC/ARMCANZ *Australian Guidelines for Sewerage Systems – Effluent Management* (ANZECC/ARMCANZ, 1997) recommend a minimum of secondary treatment for the irrigation of treated effluent to land. Secondary treatment is defined by the guidelines to involve “a level of treatment that removes 85 per cent of BOD and suspended solids”. In terms of sampling frequencies, for small plants (0.5-3 megalitres per day) the guidelines recommend a minimum of quarterly sampling.

The ANZECC/ARMCANZ 1997 guidelines provide a list of typical effluent qualities following various levels of treatment. These are provided in Table 17 below against the expected effluent qualities from the EPCM and Village (Permanent) WWTPs at the Premises.

Table 17: Typical effluent qualities (expected performance) of WWTPs against Effluent Management Guidelines

Water Quality Discharge Design Criteria Outputs	Expected Performance			Effluent Management Guidelines ⁴	
	Fixed Plant WWTP ¹	EPCM WWTP ²	Upgraded Village WWTP ² (Permanent) ³	Secondary Treatment	Primary Treatment
Maximum daily throughput (m ³)	40	22	710	N/A	N/A
Biochemical Oxygen Demand (mg/L)	<20	<20	25	20-30	120-250
Total Suspended Solids (mg/L)	<30	<30	30	25-40	80-200
Nitrogen (mg/L)	<20	20	25	20-50	30-55
Phosphorus (mg/L)	<8	8	7.5	6-12	6-14
Residual free chlorine (mg/L)	<0.5	>0.5	0.2 -2.0	N/A	N/A
<i>Escherichia coli</i> (cfu/100mL)	<10	<1000	<10	10 ⁵ -10 ⁶	10 ⁶ -10 ⁷
pH (pH units)	6.5 – 8.5	6.5 – 8.5	6.5 – 8.5	N/A	N/A

¹ Information sourced from RTIO, June 2013

² Information sourced from Calibre, May 2014

³ Information sourced from Calibre, April 2015

⁴ ANZECC/ARMCANZ, 1997

Water Quality Protection Note Number 22 (DoW, 2008) provides guidance on nutrient application rates for different soil conditions. Using the criteria provided in this document, the Premises sprayfields can be assigned a eutrophication risk category of “D” based on:

- Fine grained soils (e.g. loam, clays or peat); and
- Low nutrient concentrations leaching from other nearby land uses.

For Risk Category “D”, the *Water Quality Protection Note* recommends nutrient application rates as follows:

- 480 Kg inorganic nitrogen / hectare / year
- 120 Kg reactive phosphorus / hectare / year

7.9.5 Licence Holder controls

The Licence Holder has the following controls in place to treat and manage effluent as outlined in Table 18.

Table 18: Licence Holder wastewater controls

Controls for the discharge of wastewater		
WWTPs	Treatment process	Maximum throughput reported in Works Approval (m ³ /d)
Mine (details of original approval not found)	Five treatment chambers for anaerobic and aerobic treatment, sludge settlement and removal and a chlorine disinfection chamber. Final effluent discharged to a 0.31ha irrigation field.	20
Fixed Plant (W5134/2012/1)	Anaerobic and aerobic bioreactors, sludge settlement and removal within a clarification chamber, chlorine disinfection and the pump out chamber. Six concrete tanks plus an additional two tanks for backup storage capacity for treated effluent. Treated effluent is then irrigated to a 1.27ha irrigation field.	40
Village WWTP1 (W5218/2012/1)	Containerised Sequence Batch Reactors that treat wastewater using sludge from the Clarifier Tank (used later in the process) under anaerobic environments for denitrification to occur. Wastewater is then aerated and pumped to the Clarifier Tank where it is alum dosed to remove further sludge. Treated wastewater is then chlorinated prior to discharge at 17ha sprayfield that is shared with the Village WWTP2. The Village WWTP1 has been replaced by the Village WWTP2 and is no longer operational. However, the plant remains onsite.	400
Village WWTP2 (W5217/2012/1)	A Sequencing Batch Reactor that screens inflows and treats wastewater using a Decant Aeration Tank to promote bacteria growth for the denitrification of the liquor. Suspended solids are continuously flowed back to the Balance Tank to prevent filamentation. Waste sludge is stored in a thickening tank before being dosed with a flocculent and mechanically dewatered for disposal to landfill. Liquor is pumped to a Clarifier Tank before passing through a filtration system to reduce turbidity. Wastewater that does not meet turbidity target specifications after passing through the ultra-filtration membrane units is diverted to the Offspec Tank. Here it is redirected to a carbon scrubber and the Clarification Tank. All other liquor is pumped to the Treated Storage Tank where it is disinfected with chlorine prior to discharge at 17ha sprayfield that is shared with the Village WWTP1.	710
EPCM (W5382/2013/1)	Five treatment chambers for anaerobic and aerobic treatment, sludge settlement and removal and a chlorine disinfection chamber. Final effluent is pumped to a final chamber for discharge at a 3.5ha sprayfield.	22

7.9.6 Consequence

Based upon the lack of sensitive receptors within the vicinity of the sprayfields and the limited value of any vegetation which may be impacted by spills of untreated sewage, the Delegated Officer has determined that the impact of discharges to land will be low level, localised impacts, limited to possible declines in individual plants.

Therefore, the Delegated Officer considers the consequence of irrigating treated effluent to designated sprayfields, the discharge of effluent as a result of a spill to be **minor**.

7.9.7 Likelihood of consequence

Based upon the treatment applied to the wastewater prior to discharge and the observation that previous spills of untreated effluent have been confined within disturbed areas of the mine the Delegated Officer has determined that adverse impacts to vegetation are unlikely to occur. Therefore, the Delegated Officer considers the likelihood to be **unlikely**.

7.9.8 Overall rating

The Delegated Officer has compared the consequence and likelihood ratings described above through the Risk Matrix (Table 11) and determined that the overall rating for the risk of irrigation of treated wastewater on sensitive receptors during operation is **Medium**.

7.10 Risk Assessment – Putrescible Landfills

7.10.1 Description of risk event

Contaminated leachate from the putrescible landfills entering groundwater and impacting upon groundwater dependent ecosystems. There is also potential for impacts to livestock which consume the groundwater.

Air emissions from the landfills, including gaseous and dust emissions, do not warrant further consideration as, apart from the on-site workforce, no receptors exist for these kinds of emissions. Surface water is diverted around the landfill facilities and will not be contaminated by wastes. These types of emissions are not considered further in this risk assessment.

7.10.2 Identification and general characterisation of emissions

Under the *Landfill Waste Classification and Waste Definitions 1996* (As amended December 2009) all landfills at the Premises must be classified as Class II Putrescible Landfills due to the presence of putrescible wastes. In the case of the Waste Dump landfills this consists only of wood products (pallets). These landfills have an anticipated disposal rate of 1,000 to 1,500 tonnes per annum each.

The new putrescible landfill (approved under W5875/2015/1) will receive kitchen wastes from the village and administration areas. It has a design capacity of 5,000 tonnes per annum and an expected life of over 10 years (RTIO, June 2015). It may also receive personal protective equipment and clothing which has potentially been contaminated by asbestos (Type 1 special waste). Small amounts of biomedical wastes (Type 2 special waste) may be received at this landfill from the medical facilities on-site, although volumes are anticipated to be very small. Type 1 and 2 special wastes are permitted for disposal at either Class II or Class III landfill facilities.

The old putrescible landfill to the east of the JC area is nearing capacity and will be closed and rehabilitated in line with the Premises MCP.

On 25 August 2016, the Licence Holder submitted an application to amend the Licence to allow for an expansion of the Waste Dump Landfill. The Application states that the expansion will not alter the existing approved capacity (aggregated) for Category 64 of 7,500 tonnes per annum. The expanded Waste Dump Landfill will continue to accept only inert wastes and wooden pallets.

Key Finding: The Delegated Officer considers that the proposed expansion of the Waste Dump Landfill, with continued disposal of mostly inert materials at previously approved volumes, does not alter the risk of the existing landfill.

The design of the landfill trenches do not preclude the ingress of water and are not lined to prevent seepage of leachate. Depth to groundwater in the area of the new putrescible landfill is around 15 metres below ground level (mbgl). The Licence Holder expects this to rise to 10mbgl once groundwater levels recover following the cessation of dewatering activities (RTIO, June 2015).

Considering the volumes of waste disposed, the sandy-clay soils, depth to groundwater and high evaporation rates the Delegated Officer considers that, if any leachate is produced and reaches groundwater, it is likely to be in small volumes only.

7.10.3 Description of potential adverse impact from the emission

Should contaminated leachate reach groundwater, there is the potential that it will be transported to groundwater dependent ecosystems, or be extracted for the watering of livestock.

Considering the dilution factors likely to be applied to leachate which reaches groundwater, the Delegated Officer considers that concentrations of contaminants within groundwater will be insufficient to result in observable impacts to vegetation or livestock.

7.10.4 Criteria for Assessment

The *Landfill Waste Classification and Waste Definitions 1996* (As amended December 2009) (DEC, 2009) are used to classify waste types and identify appropriate landfill types for their disposal.

The *Assessment and management of contaminated sites: Contaminated sites guidelines* (DER, December 2014) provide a list of criteria for assessing groundwater contamination.

7.10.5 Licence Holder controls

The Licence Holder has the following controls in place to manage landfill facilities at the Premises as outlined in Table 19.

Table 19: Putrescible landfill controls

Type of control	Description
Construction and design controls	Construction of an earthen bund around the perimeter of the facility to redirect stormwater away from the landfill.
	Drive-in trenches to minimise windblown rubbish.
	Fencing of the perimeter of the landfill to prevent fauna access and contain windblown rubbish.
Management/operational controls	Recording of all waste disposed in the landfill.
	Special wastes will be disposed of in sealed bags and within a dedicated trench.
	The location of disposed special wastes to be recorded.
	Covering of special wastes as soon as possible, weekly covering of all wastes and compacting with inert fill.
	Regular inspection of fences to identify damage and clear windblown waste.

7.10.6 Consequence

Considering the dilution factors likely to be applied to leachate reaching groundwater, the Delegated Officer has determined that the consequence of the risk event is **slight**.

7.10.7 Likelihood of consequence

Based upon the limited volume of putrescible waste to be disposed into the putrescible landfill, high evaporation rates, the moderate depth to groundwater and dilution factors for any leachate which enters groundwater systems the Delegated Officer has determined that the likelihood of leachate contaminated groundwater impacting upon sensitive receptors is **rare**.

7.10.8 Overall rating

The Delegated Officer has compared the consequence and likelihood ratings described above through the Risk Matrix (Table 11), and determined that the overall rating for the risk of adverse groundwater impacts is **Low**.

7.11 Summary of Risk Assessment and Acceptability

The risk items identified in section 7, including the application of risk criteria (Table 11) and the acceptability with treatment (Table 12), are summarised in Table 20 below.

Table 20: Risk rating of emissions

	Emission		Pathway and Receptor	Licence Holder controls	Impact	Risk Rating	Acceptability with treatment (conditions on instrument)
	Type	Source					
1.	Dust	WFCs, ore handling areas, trafficable areas, construction of infrastructure	Wind	Bag house filters, water sprays	Potential impacts on vegetation at very high deposition rates	Slight consequence Unlikely Low risk	Acceptable
2.	Process and dust suppression water	Crushing and ore handling infrastructure	Direct discharge in the event of sump overflow	Sumps and other containment infrastructure	Potential impacts to vegetation health if water becomes contaminated	Slight consequence Rare Low risk	Acceptable
3.	Waste fines	Waste fines pipeline	Direct discharge in the event of pipeline rupture	Vacuum breaks, containment ponds	Physical smothering of vegetation and sedimentation of freshwater ecosystems	Slight consequence Unlikely Low risk	Acceptable.

	Emission		Pathway and Receptor	Licence Holder controls	Impact	Risk Rating	Acceptability with treatment (conditions on instrument)
	Type	Source					
4.	Dewater discharges to surface water	Dewater discharge outflow points	Continuous direct discharge of dewater to surface water	Various controls to limit water flow velocity (t-pipe, rip-rap, gabions, upwelling)	Erosion potentially harming the health of nearby sensitive ecosystems	Minor consequence Unlikely Medium risk	Acceptable, subject to infrastructure controls and dewater flow rates conditioned
5.	Hydrocarbon discharge	Bulk fuel stores	Direct discharge in the event of containment failure	Containment infrastructure	Hydrocarbon contamination of soil and aquatic ecosystems inhibiting vegetation growth and survival	Moderate consequence Rare Medium risk	Acceptable subject to infrastructure controls conditioned
6.	Effluent	WWTP sprayfields	Direct irrigation of treated effluent Wet well overflow of untreated effluent	WWTP	Contamination of soil and impacts upon vegetation growth and survival	Minor consequence Unlikely Medium risk	Acceptable subject to conditioning of discharge points and effluent quality limits
7.	Seepage of contaminated water	Putrescible landfills	Seepage through soil	Fencing, regular covering of waste	Contamination of groundwater, adverse impacts on groundwater dependent ecosystems	Slight consequence Rare Low risk	Acceptable Waste acceptance criteria to be conditioned

8. Determined Regulatory Controls

8.1 Summary of Controls

Table 21: Summary of controls

		Controls			
		8.2 Infrastructure and Equipment	8.3 Limits	8.4 Specified Action	8.5 Monitoring
Risk Items (see section 8)	1. Dust	Low risk. Therefore dust conditions of the Existing Licence have not been transferred to the Revised Licence.			
	2. Process and dust suppression water	Low risk. Therefore stormwater, process water and wash water conditions have not been transferred from the Existing Licence.			
	3. Waste Fines Cell construction	•		•	
	4. Waste fines discharge			•	
	5. Dewater discharges	•	•		
	6. Hydrocarbon discharge	•			
	7. Discharge of effluent from WWTP		•	•	•
	8. Putrescible landfill leachate			•	

8.2 Infrastructure and Equipment Controls

8.2.1 Hydrocarbon storage

Bulk fuel stores must consist of tanks placed within a spillage containment compound. The spillage containment compound must:

- be sufficiently impervious to retain spillage and to enable recovery of any such spillage; and
- have capacity of at least 110% of the volume of the largest tank plus 25% of the total volume of substances stored in the compound.

Note: Spillage containment infrastructure requirements have been adapted from Australian Standard AS1940:2004.

Grounds: In accordance with DWER's *Guidance Statement: Risk Assessments* (DER,

November 2016c) the Licence Holder's controls in relation to hydrocarbon storage will be conditioned as they lower the assessed likelihood of the risk event.

8.2.2 Waste Fines Cell construction requirements

Following a request from the Licence Holder, approval for the construction and operation of WFC 3 (including stage 2) and WFC3A have been transferred to the Revised Licence.

As discussed in section 8.6.1, the Delegated Officer does not consider that the risk of embankment failure of the WFC's requires risk assessment as any discharges of waste fines from the WFC's are likely to be retained within the wider pit void. Therefore, the conditions applied to the Revised Licence in respect of WFC3A and stage 2 of WFC3 only require the Licence Holder to construct these facilities in accordance with the locations and layouts contained within the original approvals (W5630/2014/1 and subsequent amendment).

Note: The location maps and diagrams referenced in the Revised Licence have been provided by the Licence Holder.

Grounds: These conditions are necessary to ensure that WFC3 and WFC3A are constructed generally in accordance with the description provided to, and approved by DER. The Delegated Officer does not consider that further prescriptive construction requirements are necessary as these factors are not material to the environmental risk posed by the WFCs.

8.2.3 Dewater discharge outflow point infrastructure requirements

Construction conditions for the new discharge point at DO9A have been added to the Revised Licence. Discharge outlet DO5A will also be incorporated into the Revised Licence.

In addition to these conditions, the Licence Holder will be required to discharge to one of three erosion control structure types, described in section 7.7, at each discharge outlet.

Note: Dewatering volumes are not restricted through the Revised Licence. Conditions on the Revised Licence are derived from the existing Licence Holder infrastructure controls.

Grounds: Dewatering volumes are regulated under Part IV of the EP Act, via MS 1038.

Existing and proposed infrastructure at the dewater discharge outlets minimise the potential risks of erosion and scouring occurring in the vicinity of the dewater discharge outflow points. Conditioning the maintenance of these infrastructure controls is consistent with DWER's *Guidance Statement: Risk Assessments* (DER, November 2016c), as they lower the likelihood of the risk event.

8.3 Limits

8.3.1 Wastewater irrigation

Wastewater irrigated to sprayfields must be treated to achieve the nutrient loading rates specified in the Revised Licence.

Note: The maximum nutrient loading rates included in the Revised Licence are based upon the values provided in *Water Quality Protection Note No. 22* (DoW, 2008). The Delegated Officer considers that these rates are applicable as they represent nutrient loadings which can reasonably be expected to be contained and managed by the sprayfields.

Grounds: In accordance with DWER's *Guidance Statement: Risk Assessments* (DER, November 2016c), the Licence Holder's treatment of effluent will be conditioned, as it lowers the assessed likelihood of the risk event.

8.3.2 Dewatering discharges

Dewater discharge flow rate limits have been applied at discharge outlets where the only

erosion control infrastructure applied is rip-rap (no T-piece).

Note: Limits applied to the Licence offer a 10% buffer to indicative maximum dewatering discharge flow rates at discharge outlets where there is rip-rap only. The Licence Holder has identified that rip-rap is a suitable erosion control where smaller volumes of dewatering discharges are occurring and each of these discharge points has a lower indicative maximum flow rate than discharge points where greater controls for erosion are applied (refer to Table 15).

The Delegated Officer has determined that limits are not required at discharge outlets where additional or more effective Licence Holder controls have been applied to reduce erosion.

Grounds: As dewatering flow rates increase, the potential for erosion also increases. The Delegated Officer has determined that rip-rap as a sole control for the prevention of erosion is sufficient only where dewatering flow rates are limited.

Compliance inspections have not identified significant erosion impacts at the point of discharges at current dewatering discharge rates. Therefore any increase in flow rates at rip-rap only discharge points would require a review of an updated hydrological assessment and a reassessment of erosion risks.

8.4 Specified Actions

8.4.1 Waste fines discharge location

Waste fines generated at the Premises must be discharged into one of the approved WFCs.

Grounds: The risk assessment for waste fines discharges to the environment has assumed that a discharge would only occur in the event of a pipeline rupture. This condition is applied to ensure that, in the absence of a pipeline rupture, all waste fines are deposited within the WFCs.

8.4.2 Treated effluent irrigation areas

Treated effluent from the WWTPs within the Premises must be discharged within the designated irrigation areas.

Grounds: The WWTP discharge locations (sprayfields) have been specified in the Revised Licence to ensure that any impacts from the discharge of effluent are confined to designated areas.

8.4.3 Waste acceptance criteria

At the 'inert' landfills only materials meeting the definition of Inert Waste Type 1 and Inert Waste Type 2 may be disposed, with the exception of wooden pallets.

At the putrescible landfills, materials meeting the definition of Inert Waste Type 1, Inert Waste Type 2, Putrescible Waste, Type 1 Special Wastes and Type 2 Special Wastes may be disposed.

Grounds: The limited volumes and waste types being disposed of within the Premises landfills are material to the risk assessment. In accordance with DWER's *Guidance Statement: Risk Assessments* (DER, November 2016c) these factors will be conditioned as they lower the assessed likelihood of the risk event.

8.5 Monitoring Requirements

8.5.1 Monitoring Reports

The results of monitoring undertaken in relation to the quality of treated effluent discharged to the WWTP sprayfields must be submitted to DWER in annual reports.

Note: The Licence Holder is no longer required by the licence to monitor TSS, BOD and E.coli in discharged sewage. Nutrient and volume monitoring will continue under the Revised Licence.

Grounds: Monitoring data is required by DWER to confirm that effluent quality is meeting expected levels and to inform future risk assessments. The reduction in parameters monitored under the Revised Licence compared to the Existing Licence, namely TSS, BOD and E.coli, reflects the low risk to terrestrial ecosystems within the vicinity of irrigation fields. In addition, BOD and E.coli values have been consistently observed through monitoring to be below previous target values.

9. Setting Conditions

The conditions in the Revised Licence have been determined in accordance with DWER's *Guidance Statement: Decision Making* (DER, November 2016a) and *Guidance Statement: Risk Assessment* (DER, November 2016c).

Table 22: Condition summary

Condition Reference	Grounds
Emissions 1	This condition is valid, risk-based and consistent with the EP Act.
Infrastructure and Equipment 2, 3, 4, 5, 6, and 7	These conditions are valid and contain appropriate controls to ensure that Stage 2 of WFC3 and WFC3A are constructed in accordance with the description provided to DWER by the Licence Holder.
Waste disposal restrictions 8	This condition is valid and necessary to ensure that waste disposed to landfills is limited to the volumes and waste types considered through the risk assessment.
Treated wastewater irrigation limits 9, 10, 11, and 12	These conditions are valid, risk-based and necessary to ensure that effluent is treated prior to discharge to the environment.
Waste fines discharge 13	This condition is valid and necessary to ensure that waste fines are discharged to the approved containment facilities.
Mine dewatering discharges 14, 15	These conditions are valid and necessary to ensure that erosion from discharged dewater is minimised at the dewatering discharge outlets.
Information 16, 17, 18, 19, 20 and 21	These conditions are valid and are necessary administration and reporting requirements to ensure compliance.

10. Consultation

This Review and amendment process does not involve a public comment period. Drafts of the Decision Report and Revised Licence were transmitted to the Licence Holder for comment on 4 January 2017. Comments were received from Rio Tinto on behalf of the Licence Holder on 3

February 2017. These comments and DWER's responses are summarised in Appendix 2.

Updated drafts of the Decision Report and Revised Licence were provided to the Licence Holder for further comment on 5 May 2017. Comments were received from Rio Tinto on behalf of the Licence Holder on 17 May 2017. These comments and DWER's responses are summarised in Appendix 3.

11. Conclusion

This assessment of the risks of activities on the Premises has been undertaken with due consideration of a number of factors, including the documents and policies specified in this Decision Report (summarised in Appendix 1). This assessment was also informed by a site inspection by DWER officers on 29 April 2016.

Based on this assessment, it has been determined that the Revised Licence will be granted, subject to conditions commensurate with the determined controls and necessary for administration and reporting requirements.

Danielle Eyre

Senior Manager, Licensing and Approvals

delegated Officer under section 20 of the *Environmental Protection Act 1986*

7 September 2017

Appendix 1: Key Documents

	Document Title	In text ref	Availability
1.	ANZECC/ARMCANZ, 1997, <i>National Water Quality Management Strategy – Australian Guidelines for Sewerage Systems – Effluent Management</i> . Australian and New Zealand Environment and Conservation Council & Agriculture and Resources Management Council of Australia and New Zealand. Canberra.	ANZECC/ARMC ANZ, 1997	https://www.environment.gov.au/.../sewerage-systems-effluent-man-paper11.pdf
2.	ANZECC/ARMCANZ, 2000, <i>National Water Quality Management Strategy – Paper No. 4: Australian and New Zealand Guidelines for Fresh and Marine Water Quality, Volume 1, The Guidelines</i> . Australian and New Zealand Environment and Conservation Council & Agriculture and Resources Management Council of Australia and New Zealand. Canberra.	ANZECC/ARMC ANZ, 2000	https://www.environment.gov.au/system/files/resources/53cda9ea-7ec2-49d4-af29-d1dde09e96ef/files/nwqms-guidelines-4-vol1.pdf
3.	Bureau of Meteorology, 2016, <i>Climate statistics for Australian locations – Newman Aero</i> .	BoM, 2016	http://www.bom.gov.au/climate/averages/tables/cw_007176.shtml
4.	Calibre, May 2014, <i>Yandicoogina Sustaining Project, Works Approval W5382/2013/1, Compliance report for Yandicoogina Wastewater Treatment Plant</i> . Calibre Consulting, Perth.	Calibre, May 2014	DER Records (A849377)
5.	Calibre, April 2015, <i>Yandicoogina, Sustaining Project, Works Approval W5217/2012/1, Final Compliance Document for Yandicoogina Camp Wastewater Treatment Plant</i> . Calibre Consulting, Perth.	Calibre, April 2015	DER Records (A897124)
6.	Department of Environment and Energy (2016) Species Profile and Threats Database: EPBC Act List of Threatened Fauna.	DoEE, 2016	http://www.environment.gov.au/cgi-bin/sprat/public/publicthreatenedlist.pl
7.	Department of Environment and Conservation, 2009, <i>Landfill Waste Classification and Waste Definitions (As amended December 2009)</i> . Department of Environment and Conservation, Perth	DEC, 2009	http://www.wasteauthority.wa.gov.au/media/files/documents/landfill_waste_classification.pdf
8.	Department of Environment Regulation, <i>Guidance Statement: Regulatory Principles</i> (July 2015)	DER, July 2015	Accessed via: https://www.der.wa.gov.au/our-work/regulatory-framework
9.	Department of Environment Regulation, <i>Guidance Statement: Setting Conditions</i> (October 2015)	DER, October 2015	
10.	Department of Environment Regulation, <i>Guidance Statement: Licence Duration</i> (November 2015)	DER, November 2015	
11.	Department of Environment Regulation, <i>Notice of amendment and schedule of licences with amended expiry dates</i>	DER, April 2016	
12.	Department of Environment Regulation,	DER, November	

	Document Title	In text ref	Availability
	<i>Guidance Statement: Decision Making</i> (November 2016)	2016a	
13.	Department of Environment Regulation, <i>Guidance Statement: Environmental Siting</i> (November 2016)	DER, November 2016b	
14.	Department of Environment Regulation, <i>Guidance Statement: Risk Assessment</i> (November 2016)	DER, November 2016c	
15.	Department of Environment Regulation, <i>Email – RE: Yandicoogina L7340 Amendment Application and Application to Revoke W5630</i> . Sent by Mr Adrian Wiley, Department of Environment Regulation, Perth.	DER, February 2017	DER Records (A1378627)
16.	Department of Environment Regulation (June 2016), <i>Licence L7340/1997/9</i>	L7340/1997/9; “the Existing Licence”	DER Records (A1108885)
17.	DER Works Approval – W5217/2012/1	W5217/2012/1	DER records (A770350)
18.	DER Works Approval – W5218/2012/1	W5218/2012/1	DER records (A548838)
19.	DER Works Approval – W5134/2012/1	W5134/2012/1	DER records (A497778)
20.	DER Works Approval – W5382/2013/1	W5382/2013/1	DER records (A689972)
21.	Department of Parks and Wildlife, <i>Summary of additions, deletions and changes to the Wildlife Conservation (Rare Flora) Notice as of 3 November 2015</i> .	DPaW, 2015	No longer available from DPaW website
22.	Department of Water, July 2008. <i>Water Quality Protection Note No.22: Irrigation with nutrient-rich wastewater</i> . Department of Water, Perth.	DoW, 2008	https://www.water.wa.gov.au/_data/assets/pdf_file/0013/4045/82324.pdf
23.	Environmental Protection Authority (August 2012), <i>Yandicoogina Iron Ore Project – Expansion to include Junction South West and Oxbow Deposits. Report 1448</i> .	EPA, 2012	http://www.epa.wa.gov.au/EIA/EPAREports/Pages/1448-YandicooginaIronOreProject.aspx
24.	Environmental Protection Authority (July 2013), <i>Environmental and water assessments relating to mining and mining-related activities in the Fortescue Marsh management area. Report 1484</i> .	EPA, 2013	http://www.epa.wa.gov.au/EIA/EPAREports/Pages/1484-FortescueMarshs16e.aspx
25.	Environmental Protection Authority (August 2014), <i>Cumulative environmental impacts of development in the Pilbara region – Advice of the Environmental Protection Authority to the Minister for Environment under Section 16(e) of the Environmental Protection Act (August 2014)</i> .	EPA, 2014	http://www.epa.wa.gov.au/EIA/EPAREports/Pages/1448-YandicooginaIronOreProject.aspx
26.	Environmental Protection Authority (August 2016), <i>Yandicoogina Iron Ore Project – Pocket and Billiards South Deposits: Report 1573</i> . Environmental Protection Authority, Perth.	EPA, 2016	http://www.epa.wa.gov.au/EIA/EPAREports/Pages/YandicooginaIronOreProject-PocketandBilliardSouthdeposits.aspx?pageID=3362&url=EIA/EPAREports
27.	Environmental Protection Authority (March 2017). <i>Correspondence – OEPA to DER – Yandicoogina Iron Ore Project – Regulation of</i>	EPA, 2017	DER records (A1403397)

	Document Title	In text ref	Availability
	<i>Dewatering</i>		
28.	Environmental Protection Authority (October 2012), <i>Ministerial Statement 914</i>	MS 914	http://www.epa.wa.gov.au/peia/approvalstatements/Pages/default.aspx?cat=Ministerial%20Approval%20Statements&url=peia/approvalstatements
29.	Environmental Protection Authority (September 2016), <i>Ministerial Statement 1038</i>	MS 1038	
30.	<i>Hamersley Iron – Yandi Pty Limited, Yandicoogina mine closure plan</i> (August 2015), RTIO-HSE-0208486	MCP	http://www.riotinto.com/documents/Yandi%20LoM%20Closure%20Plan%202015.pdf
31.	RTIO, December 2011, <i>Works Approval Application – Yandicoogina Fixed Plant Workshop WWTP</i> . Rio Tinto Iron Ore, Perth.	RTIO, December 2011	DER Records (A460100)
32.	RTIO, August 2012, <i>Yandicoogina Operations: Groundwater Operating Strategy</i> . Rio Tinto Iron Ore, Perth.	RTIO, August 2012	DER Records (A1335303)
33.	RTIO, June 2013, <i>Works Approval Compliance Statement – W5134/2012/1: Yandicoogina Fixed Plant Workshop WWTP</i> . Rio Tinto Iron Ore, Perth	RTIO, June 2013.	DER Records (A645500)
34.	RTIO, April 2014, <i>Works Approval Application, Yandicoogina – Category 5c – Waste Fines Storage Facility (WFSF)</i> . Rio Tinto Iron Ore, Perth	RTIO, April 2014	DER Records (A748502)
35.	RTIO, June 2014, <i>Yandicoogina Pocket and Billiards South Proposal – Billiards Acid and Metalliferous Drainage Risk (RTIO-PDE-0122966) – Final Draft</i> . Rio Tinto Iron Ore, Perth.	RTIO, June 2014	DER Records (A830754)
36.	RTIO, April 2015, <i>Environmental Protection Act 1986 (WA) Part V Operating Licence Annual Audit Compliance Report – Report Period: 1 January 2014 – 31 December 2014</i> . Rio Tinto Iron Ore, Perth.	RTIO, April 2015	DER Records (A1085574)
37.	RTIO, June 2015, <i>Works Approval Application: Yandicoogina Site Putrescible Landfill (RTIO-HSE-0258467)</i> . Rio Tinto Iron Ore, Perth	RTIO, June 2015	DER Records (A954704)
38.	RTIO, November 2015, <i>Yandicoogina Iron Ore Project – Revised Proposal Public Environmental Review</i> . Rio Tinto Iron Ore, Perth	RTIO, November 2015	http://www.riotinto.com/australia/pilbara/documents-9622.aspx (multiple documents)
39.	RTIO, February 2016, Letter to DER, <i>DER Compliance Assessment of Yandicoogina Iron Ore Mine against conditions 4 and 12 Part V Licence L7430/1997/9</i> . Rio Tinto Iron Ore, Perth.	RTIO, February 2016	DER Records (A1067915)
40.	RTIO, April 2016, <i>2015 Annual Environmental Report for L7340/1997/9 (RTIO-HSE-0267309) – Yandicoogina Iron Ore Mine</i> , Rio Tinto Iron Ore, Perth	RTIO, April 2016	DER Records (A1085573)
41.	RTIO, May 2016, <i>Yandicoogina Monitoring and Management Plan: Water discharge and vegetation and groundwater dependent ecosystems (RTIO-HSE-0171024)</i> Rio Tinto Iron	RTIO, May 2016	DER Records (A1349052)

	Document Title	In text ref	Availability
	Ore, Perth.		
42.	RTIO, July 2016, <i>Licence Amendment Supporting Documentation. Yandicoogina Operation – L7340/1997/9. Works Approval W5630/2014/1 Amendment Request WFC 3 expansion to include WFC 3A. RTIO-HSE-0289258.</i> Rio Tinto Iron Ore, Perth.	RTIO, July 2016.	DER Records (A1149709)
43.	RTIO, August 2016, <i>Email – Yandicoogina L7340 Amendment Application – Supporting Documentation – Yandicoogina DO9A 2016.</i> Rio Tinto Iron Ore, Perth.	RTIO, August 2016a	DER Records (A1154313)
44.	RTIO, August 2016, <i>Email – Yandicoogina L7340 Amendment Application – Supporting Documentation – Yandicoogina Waste Dump Landfill Extension & DO5 Reinstatement.</i> Rio Tinto Iron Ore, Perth.	RTIO, August 2016b	DER Records (A1154313)
45.	RTIO, 1 February 2017, <i>Email – Yandicoogina L7340 Amendment Application and Application to Revoke W5630.</i> Sent by Mr Sean Savage, Rio Tinto Iron Ore, Perth.	RTIO, February 2017a	DER Records (A1369111)
46.	RTIO, 14 February 2017, <i>Email – RE: Yandi Part V licence response.</i> Sent by Mr Sean Savage, Rio Tinto Iron Ore, Perth.	RTIO, February 2017b	DER Records (A1377486)
47.	RTIO, 1 March 2017, <i>Email – Yandicoogina Dewatering Discharge Outlets (attachment: RTIO Example Dewatering Discharge Outlets).</i> Sent by Mr Sean Savage, Rio Tinto Iron Ore, Perth	RTIO, March 2017a	DER Records (A1392165)
48.	RTIO, 3 March 2017, <i>Email – Compliance Statement – W5630/2014/1 and L7340/1997/9.</i> Sent by Ms Jenny Major, Rio Tinto Iron Ore, Perth.	RTIO, March 2017b	DER Records (A1387502)
49.	RTIO, 12 April 2017, <i>Compliance Statement – L7340/1997/9 – Yandicoogina Operation – Yandicoogina Dewatering Discharge Outlet 3A.</i> Rio Tinto Iron Ore, Perth.	RTIO, April 2017a	DER Records (A1411940)
50.	RTIO, 30 April 2017, <i>2016 Annual Audit Compliance Report for L7340/1997/9 – Yandicoogina Iron Ore Mine.</i> Rio Tinto Iron Ore, Perth.	RTIO, April 2017b	DER Records (A1419516)
51.	RTIO, 30 April 2017, <i>2016 Annual Environmental Report for L7340/1997/9 – Yandicoogina Iron Ore Mine.</i> Rio Tinto Iron Ore, Perth.	RTIO, April 2017c	DER Records (A1419512)
52.	RTIO, 17 May 2017, <i>Email – RE: RTIO Yandicoogina (L7340) – Notice of Amendment letter + final drafts for RTIO comment.</i> Sent by Mr Sean Savage, Rio Tinto Iron Ore, Perth.	RTIO, May 2017	DER Records (A1433351)
53.	Weatherzone (May 2017), <i>Newman Ap Climate</i>	Weatherzone, May 2017	Accessed 1 May 2017, http://www.weatherzone.com.au/climate/station.jsp?lt=site&lc=7176

	Document Title	In text ref	Availability
54.	WillyWeather (May 2017), <i>Newman Airport Wind Forecast</i>	WillyWeather, May 2017	Accessed 1 May 2017, http://wind.willyweather.com.au/wa/pilbara/newman-airport.html
55.	URS, October 2012, <i>Mining Proposal: Waste Fines Storage Cell 3 – IMA Pit JSE Yandicoogina Mine</i> . URS Australia Pty Ltd, East Perth.	URS, 2012	DER Records (A733703)

Appendix 2: Summary of Licence Holder's Comments (First Draft)

Condition	Summary of Licence Holder Comment	DER Response
Cover page - Prescribed Premises	<p>With regard to dewatering discharge (Category 6) being removed from the licence, we believe that there are aspects of this emission that are not sufficiently covered by MS1038, such as localised erosion impacts caused by dewatering discharge points and emissions potentially created during the construction of those points.</p> <p>It is our view that it is more appropriate for these potential emissions to be licensed under Part V of the EP Act. The management of dewatering discharge impacts covered by MS1038 (i.e. water quality and vegetation health) could be referenced in the decision report and not require conditioning under the Part V licence.</p> <p>We therefore request that Category 6 is reintroduced to the licence to cover potential impacts of dewatering discharge not managed by MS1038.</p>	<p>The Delegated Officer notes that the EPA considered the impacts associated with dewatering activities, through its assessment of the Pocket and Billiards South proposal (EPA report 1573 and MS 1038) and previous assessments relating to the Yandicoogina mine site.</p> <p>However, in light of the points raised in section 4.1.5 of the Decision Report, the Delegated Officer has elected to retain Category 6 on the Revised Licence, specifically as it relates to erosion in the immediate vicinity of the dewater discharge outflow points.</p>
	<p>With regard to Category 6: Dewatering being removed from the this licence, the licence holder agrees that certain potential impacts to surface water and groundwater dependent ecosystems as a result of the abstraction and discharge of dewater are regulated through Part IV of the Environmental Protection Act 1986 (EP Act). The decision report states "The Delegated Officer notes that, as dewatering impacts are managed under Part IV of the EP Act, approval of dewatering discharge locations is not required through the Part V licence".</p> <p>It is our view that there are certain localised potential impacts to the environment that are not sufficiently covered by the Part IV approval (MS1038) given its aim to protect broader environmental outcomes like vegetation health. Impacts not seen to be covered by MS1038 include potential erosion associated with new discharge locations and associated construction works. It is our view that local impacts such as these should be regulated under Part V of the EP Act.</p> <p>The license holder requests that:</p> <ul style="list-style-type: none"> • Category 6 be listed; • dewatering discharge be included as a specified emission 	

	<ul style="list-style-type: none"> • a condition added stating that dewatering discharge must only occur through approved locations, • inclusion of a map showing approved locations provided in Schedule 1. <p>The management of other impacts (i.e. water quality, vegetation health) should be referenced in the decision report as being covered by the Part IV approval.</p>	
	<p>Also, if Category 6 were not to be listed as a Category, would the licence holder still be required to pay for Part 2 waste component “water to allow mining of ore” in its annual licence fee?</p>	<p>The Delegated Officer confirms that Category 6 will be retained on the Revised Licence.</p>
<p>Emissions Condition 1 Table 1 Specified Emissions</p>	<p>The licensee requests that additional emissions and associated conditions be listed as Specified Emissions in the licence. These are:</p> <ul style="list-style-type: none"> • Minor Spillage of hydrocarbons related to the Primary Activities • Discharge of waste fines related to the Primary Activities • Discharge of dewatering water related to the Primary Activities • Process water, Wash water and Stormwater related to the Primary Activities 	<p>The regulation of hydrocarbons and dewatering discharge is discussed in response to separate comments above and below. In line with the decision noted above, the Delegated Officer agrees with the request to add dewater to the Specified Emissions section of the Revised Licence. The Delegated Officer does not agree with the addition of hydrocarbons as a Specified Emission.</p> <p>The Delegated Officer agrees that the discharge of Waste Fines fits within the definition of Category 5 and is therefore a Primary Activity. The Discharge of Waste Fines has been added as a Specified Emission, subject to compliance with Condition 14 requiring that all waste fines material is deposited within one of the designated waste fines cells.</p> <p>The Delegated Officer understands that process water used at the Premises is dewater which is diverted for use in ore processing and for dust suppression. These activities can be considered to be directly related to the Primary Activities and the Delegated Officer has therefore added a risk assessment relating to these emissions. As the risk associated with these discharges is determined through the risk assessment to be low, no conditions have been applied in relation to these emissions in the Revised Licence.</p> <p>The Delegated Officer understands the Licence Holder’s comment regarding washwater to refer to water runoff from the washing down of vehicles and other equipment. The Delegated Officer considers that these activities are not directly related to the Primary Activities and therefore disagrees with the requirement to insert additional Specified Emissions. Similarly general stormwater runoff and dust suppression using treated oily water are not considered to be related to the Primary Activities.</p>
<p>Emissions Condition 1 Table 1 General Emissions</p>	<p>The licensee requests that the material change condition and all references to it are removed from the licence as per previous discussions with the DER.</p>	<p>Noted. The material change condition and related references have been removed from the Revised Licence.</p>

Notification of Material Change Condition 2 to 4	As per the above, it is requested that the material change condition and all references to it are removed from the licence			
Infrastructure and Equipment Condition 3 Table 2	<p>The licensee conducts maintenance works and refuelling activities in areas in addition to the bulk fuel facilities. It is requested that minor fuel storage / equipment maintenance facilities are included in Table 2 to cover these operational requirements.</p> <p><i>Proposed wording of additions to Table 2:</i></p>			<p>The Delegated Officer's consideration of the risk posed by hydrocarbons stored at the Premises is due to the application of Prescribed Premises Category 73 as a Primary Activity. Category 73 is defined in Schedule 1 of the EP Regulations as the bulk storage of chemical at volumes not less than 1 million litres (1,000m³) in aggregate.</p>
	<i>Other minor fuel storage / equipment maintenance facilities</i>	<i>Workshops, Fixed Plant and mobile equipment maintenance areas</i>	<i>Concrete hardstand areas, sumps and drains to contain spills where possible, and spill kits available.</i>	<p>Consistent with this definition, the Delegated Officer has limited the risk assessment to bulk fuel stores at the Premises which contribute to the calculation of the total volume of stored hydrocarbons (as listed in the Existing Licence). The five bulk fuel stores listed in Table 15 of the Decision Report have a combined capacity of 1,760,000L and the total approved design capacity for Category 73 on the Existing Licence is 1,770m³ (1,770,000L).</p> <p>The Delegated Officer considers that the risk to the environment is also greatest from a failure of containment infrastructure at locations where significant volumes of hydrocarbons are stored. The Delegated Officer therefore considers that this is both consistent with the intention of the EP Regulations and a risk-based regulatory approach.</p>
Waste Disposal Restrictions Condition 7 Table 3	As per the original works approval, small volumes of inert waste types are also disposed of at the putrescible landfills. It is requested that inert waste type 1 and 2 are added.			Noted. Inert waste types 1 and 2 have been added to the waste acceptance criteria in Condition 6 of the Revised Licence.
Waste Disposal Restrictions Condition 8	The licensee requests the limit for waste disposed to landfill be removed as it is not appropriate for the design capacity of the landfills to be a hard limit. If a design capacity was breached it would not result in any additional impact to the environment other than what has been assessed during the works approval / licence application.			<p>The small volume of waste disposed to the landfills at the Premises was a key factor in the Delegated Officers consideration of the risk posed by these facilities. Therefore, the Delegated Officer considers that it is appropriate to reference this consideration in the Licence.</p> <p>On reflection, the Delegated Officer has determined that a more appropriate location for a reference to the assessed landfill capacity is Schedule 2 of the licence as part of the description of Primary Activities. The limit on landfill disposal volumes has been removed as a licence condition.</p>
Treated Wastewater Irrigation Condition 10	<p>The licensee does not agree that the risk to environment outlined in the decision report should be classified 'medium'. Given the location of sprayfields away from any sensitive receptor (and previously disturbed vegetation within the sprayfield area), the licensee requests the consequence rating be changed from 'minor' to 'slight', hence rendering the risk to low.</p> <p>The licensee does not believe water quality concentration targets (manufacturer's specifications at time of installation) for treated</p>			<p>The Delegated Officer disagrees with the Licence Holder's assessment of risk. In arriving at the medium risk rating, the Delegated Officer has considered the previous discharges of untreated effluent as a result of pump failures at the wet wells. The risk assessment relating to the WWTPs has been amended to make this consideration clearer.</p> <p>The discharge of untreated or inadequately treated effluent to the environment has the potential to cause low level on-site impacts. Referring to the risk criteria in Table 11 of the Decision Report, the Delegated Officer considers that a</p>

	<p>effluent should be included as limits. This change is a retrospective approval which results in an increase in regulation, without the risk to the environment changing.</p> <p>If a limit on effluent quality remains based on the risk assessment, the impact to environment is better represented by contaminant loadings to land. Due to a variety of issues (e.g. camp occupancy); concentrations may spike briefly and exceed a proposed limit at numerous times, yet over the course of the discharge period be within the contaminant loadings guidelines and present no risk to the environment. For example, a limit of 480kg/ha/year for Total Nitrogen and 120kg/ha/year for Total Phosphorus is a better way to manage risk to the soil profile and down gradient eutrophication risk. Total Suspended Solids (and BOD) are used as performance indicators, as they pose no environmental risk when discharged to a sprayfield that is not located near surface waters. pH should also not require a limit when impact on the sprayfield area is concerned.</p> <p>The daily design capacity for a WWTP should not be included as a limit. The maximum design capacity for each WWTP should be listed in the decision report, but for various reasons (e.g. short term increase in camp occupancy) inflow can potentially exceed the max design capacity without increasing contaminant loadings to land over the averaging period.</p> <p>It is therefore requested Condition 10 be amended to only apply limits to contaminant loadings to land for Total Nitrogen and Total Phosphorus.</p>	<p>'minor' rating is therefore more appropriate than a consequence rating of 'slight'.</p> <p>Regardless of the final risk rating, the quality of the discharged effluent is a key factor in reducing the risk determined for this risk event. Therefore, controls around the quality of effluent discharge are an appropriate inclusion in the Revised Licence.</p> <p>The Delegated Officer does not object to changing the effluent quality limits to loading rates as both approaches ensure that a sufficient level of effluent treatment occurs prior to discharge.</p> <p>The Decision Report and Licence have also been revised to clarify that the quarterly sampling requirement is a minimum and that the Licence Holder may sample more frequently in order to reduce the impact of short term fluctuations on monitoring results.</p> <p>The Delegated Officer agrees with the removal of the WWTP discharge volume as a limit as the volume of wastewater discharged to the environment was not a material consideration in the risk assessment.</p>
<p>Waste Fines Discharge Condition 13</p>	<p>It is requested the operation of WFC3A is included in this licence amendment as current waste fines storage at WFC3 is reaching capacity. It is requested operation is approved via the decision report and condition 13 [<i>now condition 12</i>], or that text be added to allow for the operation of WFC3A following submission of a compliance document, as referred to in amended works approval W5630/2014/1.</p> <p>Condition 13 to be amended to read: All Waste fines generated at the Premises as a result of ore processing must be Discharged into and contained by one of the approved Waste Fines Cells shown in Schedule 1, Figure 2, (with the map showing WFC3A).</p>	<p>The construction and operation of WFC3A and the operation of WFC3 has been provided for within the Revised Licence as per the application submitted by the Licence Holder.</p>
<p>Information Condition 14</p>	<p>The licensee requests that the material change condition and all references to it are removed from the licence as per previous discussions with the DER.</p>	<p>All references to the Material Change condition have been removed from the Revised Licence.</p>

Information Condition 15	The licensee requests this condition is reworded to align with the recently amended Cape Lambert Part V licence. Consistency with licence condition wording is preferred.	Noted. The wording of the relevant condition has been aligned with the Cape Lambert licence (L5278/1973/13).
Definitions	<p>It is requested this [<i>Anniversary Date</i>] be changed to 31 January to align with Rio Tinto's requested annual reporting date of 30 April of each year for all licenses.</p> <p>It is requested the annual period be a calendar year for all Rio Tinto licences.</p> <p>Anniversary Date means 31 January of each year.</p> <p>Annual Period means a 12 month period commencing from 1 January until 31 December of each year.</p>	<p>The Delegated Officer has determined that a more appropriate change, which also meets Licence Holder's objective, is to amend Condition 14 to require reporting by 30 April each year for the previous annual period.</p> <p>This change has been made to the Revised Licence.</p>

Appendix 3: Summary of Licence Holder's Comments (Second Draft)

Condition	Summary of Licence Holder Comment	DER Response
<u>Revised Licence – Emissions:</u> Condition 1 Table 1: General Emissions	<p><i>It is noted that process water emissions have been included in the risk assessment in the decision report, but washwater, stormwater and small volume hydrocarbon storage have not.</i></p> <p><i>It is requested that further detail be included in the decision report that discharge of treated oily water (from LV washdown etc) for dust suppression purposes and the discharge of stormwater do occur onsite, but that they are not seen as requiring inclusion in the emissions risk assessment.</i></p> <p><i>Comments as per the above have been included in the decision report.</i></p>	<p>The Delegated Officer considers that the risks associated with the discharge of treated oily water have been addressed in the Risk Assessment Table (Table 10).</p> <p>Text has been added to the risk assessment to clarify that the discharge of dust suppression water haul roads and within pits is not considered to be a Primary Activity.</p>
<u>Decision Report, section 7:</u> Risk Assessment Table (Table 10)	<p><i>As per comments in the draft licence, it is suggested washwater (treated oily water used for dust suppression) and stormwater could be added here similar to how tyre storage has been included.</i></p>	
<u>Decision Report, Appendix 2:</u> Summary of Licence Holder's Comments (First Draft)	<p><i>It is requested this text be revised to include acknowledgement that washwater also incorporates water used for dust suppression from oily water treatment facilities onsite. It is our view that this treated water presents a low risk to the environment (given distance from sensitive receptors) and any residual hydrocarbons bioremediates itself where irrigated (on haul roads/within pits). The licensee views recycling of this water as a better outcome compared to abstracting additional groundwater for dust suppression purposes.</i></p>	
<u>Revised Licence – Infrastructure and Equipment</u> Condition 6 Table 3: Works requirements for Dewater Discharge point construction	<p><i>It is requested an additional outlet type be added, as site does have discharge outlets managing small volumes of dewatering discharge where only rip-rap is used to control erosion.</i></p>	<p>The Delegated Officer agrees to the inclusion of the proposed fourth type of dewater discharge outlet for discharge points of smaller volumes. Dewater discharge volume controls have been added to the Revised Licence to reduce the risk of erosion at discharge outlets where only rip-rap is assembled and no further erosion controls are applied. Refer to the final row of this table for response to comment received 15 June 2017.</p>
<u>Decision Report, section 7.5:</u> Risk Assessment – Dewater discharges to surface water	<p>Regarding the Licence Holder controls (section 7.5.5): <i>As outlined in the draft licence, an outlet type 'rip-rap' is required.</i></p>	

<p>Revised Licence – <u>Treated wastewater irrigation</u> Condition 9</p>	<p><i>Some small septic systems occur onsite and are not included in the prescribed activity Category 54 amount, given they don't meet the threshold for licensing.</i></p> <p><i>Suggest wording be included to relate the effluent to that conditioned under the prescribed activity (eg to those WWTPs referenced in Table 5), or make mention of septic systems not requiring licensing within the decision report.</i></p>	<p>The Delegated Officer agrees with the latter proposed approach. Text has been added into the risk assessment regarding septic systems not being included as a prescribed activity under Category 54, and therefore not requiring risk assessment.</p>
<p>Revised Licence – <u>Mine Dewatering Discharges</u> Condition 14 Table 6: Infrastructure related to Dewatering operations</p>	<p><i>Existing outlets DO2 and DO8 shown in the maps were missing. They have discharged intermittently in the past but it is preferred they be listed in the licence.</i></p> <p><i>As per [the comment relating to condition 6], the addition of 'rip-rap' as a separate dot point is requested.</i></p>	<p>As these dewater discharge outlets are still intermittently operational, the Delegated Officer agrees with this proposed change.</p>
<p>Revised Licence – <u>Information</u> Condition 19</p>	<p><i>Both WFC3 Stage 2 and WFC3A have already commenced deposition of waste fines following compliance documents being submitted. This was necessary given the progressive nature of waste fines deposition required at Yandicoogina, and has been outlined in the compliance documentation submitted.</i></p> <p><i>It is therefore requested the commissioning text be removed. RT will provide compliance documents once the construction of WFC3 Stage 2 and WFC3A has been completed.</i></p>	<p>The Delegated Officer agrees with this change. Text has been added to the decision report to reflect that the deposition of waste fines to WFC3 (Stage 2) and WFC3A has already commenced.</p>
<p>Revised Licence – <u>Information</u> Condition 20</p>	<p><i>It is requested that this 14 day notification requirement be removed.</i></p> <p><i>RT does not believe the environmental risk warrants a project waiting 14 days from finishing construction before commissioning/operating the DO. It is our view the risk to environment would've been assessed during the licence amendment process and there are other means available to ensure license holders comply with conditions of their licence.</i></p>	<p>The Delegated Officer agrees with the proposed change.</p>
<p>Revised Licence – <u>Mine Dewatering Discharges</u> Condition 15</p>	<p><i>This information [dewatering discharge flow rates] is provided for information purposes, as we believe that there should not be any limit (volume or specific limit based on hydrological assessment) placed on the outlets for the below reasons:</i></p> <p>Design of outlets <i>A riprap revetment dissipates energy over a greater distance than other options, as it functions as a rough channel, as opposed to absorbing a large quantity of energy at a single location as occurs in a bubble-up. There are some advantages of riprap revetments:</i></p>	<p>Noted.</p> <p>The Delegated Officer disagrees with the Licence Holder's position that additional limits placed on the Licence represent "retrospective approval". The intent of the Licence review is to determine the adequacy of existing controls using a risk-based decision making framework and update as necessary based on currently available information.</p> <p>Based on correspondence with the Licence Holder it is evident that rip-rap is used as a control where lower volumes of surplus water are discharged. This is</p>

	<p>1. It necessarily requires the erodibility of the natural ground to be considered in combination with the dissipation of energy. 2. It is a flexible protection that allows it to be self-healing if any scour initiated and if damage was noted it can be easily repaired.</p> <p><i>Each of the dewatering outlet types in place have experienced their design flow rates and velocities and so have effectively been proof-tested. Therefore, unless unacceptable scour is observed they can be inferred to have met the design intent of preventing scour.</i></p> <p><i>In short, the different approaches to energy dissipation at dewatering outlets are different engineering solutions that have been adopted on a case-by-case basis to provide scour protection to the natural ground/stream-bed.</i></p> <p>Retrospective approval <i>DER have assessed each of the rip-rap only discharge outlets through the works approval / licence amendment process (and as recently as April 2017 via a compliance documentation for DO3A), with each one being deemed acceptable from an erosion control standpoint.</i></p> <p>Past DER inspections <i>DER have viewed all dewatering outlets at Yandicoogina multiple times during on-site inspections with no concern raised over erosion or scour.</i></p> <p>Environmental risk <i>It is our view that the installed energy dissipation structures are appropriate to manage any environmental risk associated with erosion or scour from the dewatering discharge activity.</i></p> <p>If a limit on these type of outlets were to remain, we would request that:</p> <ul style="list-style-type: none"> • A 10% buffer be applied to the L/s figures provided below. • Our comments that a limit on these outlets is seen as unnecessary, is already covered by s53 of the EP Act and would add administrative burden without providing additional protection to the environment be included in the decision report. 	<p>supported by the lower “indicative maximum flow rates” assigned by the Licence Holder for each discharge point where only rip-rap is used compared to other erosion controls. In section 7.7 of this document the Delegated Officer considers that the likelihood of erosion is greater at these outlets when compared to others that have additional or alternative controls.</p> <p>Note that DWER’s response to the compliance document DO3A does not represent a risk assessment but is rather an assessment of compliance against licence or works approval conditions. Further the Delegated Officer notes that the Decision Document associated with the Licence amendment authorising the construction of DO3A does not assess discharge volumes as it was considered that environmental impacts from dewatering were managed under Part IV. Following clarification received from OEPA on 29 March 2017, DER now understands this not to be the case for erosion at the discharge outlet. Therefore dewatering volumes have been considered in the section 7.7 risk assessment.</p> <p>The Delegated Officer has determined that an increase to flow rates at rip-rap only discharge outlets would present a material change to operations that have the potential to result in increased erosion. On this basis an additional control in the form of a discharge volume limit has been applied to dewatering outlets where only rip-rap is used.</p> <p>Noted. Limits have been applied to the discharge flow rates at rip-rap only discharge points, offering a 10% buffer on indicative maximum flow rates provided by the Licence Holder. Grounds for applying these limits are provided in sections 7.7 and 8.3.2.</p>
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Attachment 1: Revised Licence L7340/1997/9
