



# Decision Document

## *Environmental Protection Act 1986, Part V*

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**Proponent:** Chichester Metals Pty Ltd

**Licence:** L8199/2007/2

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**Registered office:** 87 Adelaide Terrace  
EAST PERTH WA 6872

**ACN:** 109 264 262

**Premises address:** Cloudbreak Iron Ore Mine  
Mining Tenements M45/1126, M46/401, M46/404, M46/405, M46/356,  
M46/402, M46/410, M46/411, M46/357, M46/409, M46/453, M45/1128,  
M46/449, M46/452, M46/451, M46/454, M46/450, M45/1084, M45/1140,  
M45/1139, M45/1102, M45/1105, M45/1124, M45/1103, M45/1106,  
M45/1125, M45/1104, M45/1107, L46/48, L46/49, M45/1082, M45/1083,  
M45/1127, M45/1138, M45/1263, M46/403, M46/406, M46/407, M46/408,  
M46/409, M46/412, M46/413, M46/414, L46/52, L46/99, L46/46, L46/96,  
L46/64, L45/152, L46/47, L46/48, L46/51, L46/57, L46/62, L46/130 and  
Exploration Leases E45/2498, E46/590, E46/612, E45/2499, E45/2652,  
E45/2497  
MULGA DOWNS WA 6751

**Issue date:** Thursday, 2 February 2012

**Commencement date:** Saturday, 4 February 2012

**Expiry date:** Tuesday, 3 February 2032

### **Decision**

Based on the assessment detailed in this document the Department of Water and Environmental Regulation (DWER), has decided to issue an amended licence. DWER considers that in reaching this decision, it has taken into account all relevant considerations and its conditions will ensure that an appropriate level of environmental protection is provided.

Decision Document prepared by: Sonya Poor  
Licensing Officer

Decision Document authorised by: Alana Kidd  
Delegated Officer



# Contents

Decision Document	1
Contents	2
1 Purpose of this Document	2
2 Administrative summary	2
3 Executive summary of proposal and assessment	3
4 Decision table	12
5 Advertisement and consultation table	25
6 Risk Assessment	27
Appendix A	28
Appendix B	46
Appendix C	49
Appendix D	51
Appendix E	54
Appendix F	56
References	59

## 1 Purpose of this Document

This decision document explains how DWER has assessed and determined the application and provides a record of DWER’s decision-making process and how relevant factors have been taken into account. Stakeholders should note that this document is limited to DWER’s assessment and decision making under Part V of the *Environmental Protection Act 1986* (EP Act). Other approvals may be required for the proposal, and it is the proponent’s responsibility to ensure they have all relevant approvals for their Premises.

## 2 Administrative summary

Administrative details		
Application type	Works Approval <input type="checkbox"/> New Licence <input type="checkbox"/> Licence amendment <input checked="" type="checkbox"/> Works Approval amendment <input type="checkbox"/>	
Activities that cause the premises to become prescribed premises	<b>Category number(s)</b>	<b>Assessed design capacity</b>
	5	50,000,000 tonnes per annual period
	6	150,000,000 tonnes per year (reinjecte
	52	50.6 megawatts
	54	694.5 cubic metres per day
	57	2,000 tyres
	64	10,000 tonnes per annual period
	73	7,700.5 cubic metres in aggregate



Application verified	Date: 12/06/2018	
Application fee paid	Date: 31/07/2018	
Works Approval has been complied with	Yes <input type="checkbox"/>	No <input type="checkbox"/> N/A <input checked="" type="checkbox"/>
Compliance Certificate received	Yes <input type="checkbox"/>	No <input type="checkbox"/> N/A <input checked="" type="checkbox"/>
Commercial-in-confidence claim	Yes <input type="checkbox"/>	No <input checked="" type="checkbox"/>
Commercial-in-confidence claim outcome	N/A	
Is the proposal a Major Resource Project?	Yes <input checked="" type="checkbox"/>	No <input type="checkbox"/>
Was the proposal referred to the Environmental Protection Authority (EPA) under Part IV of the <i>Environmental Protection Act 1986</i> ?	Yes <input checked="" type="checkbox"/>	No <input type="checkbox"/> Referral decision No: 1848, 1980 and 2006 Managed under Part V <input type="checkbox"/> Assessed under Part IV <input checked="" type="checkbox"/>
Is the proposal subject to Ministerial Conditions?	Yes <input checked="" type="checkbox"/>	No <input type="checkbox"/> Ministerial statement No: 899, 962 and 1010 EPA Report No: 1429, 1498 and 1547
Does the proposal involve a discharge of waste into a designated area (as defined in section 57 of the <i>Environmental Protection Act 1986</i> )?	Yes <input type="checkbox"/>	No <input checked="" type="checkbox"/> Department of Water consulted Yes <input checked="" type="checkbox"/> No <input type="checkbox"/>
Is the Premises within an Environmental Protection Policy (EPP) Area Yes <input type="checkbox"/> No <input checked="" type="checkbox"/> If Yes include details of which EPP(s) here.		
Is the Premises subject to any EPP requirements? Yes <input type="checkbox"/> No <input checked="" type="checkbox"/> If Yes, include details here, eg Site is subject to SO <sub>2</sub> requirements of Kwinana EPP.		

### 3 Executive summary of proposal and assessment

The Cloudbreak Iron Ore Mine (Premises) is owned and operated by Chichester Metals Pty Ltd (Licensee), a wholly owned subsidiary of Fortescue Metals Group Limited (FMG). The Premises has been assessed as a "prescribed premises" as it meets the requirements of categories 5, 6, 52, 54, 57, 64 and 73 under Schedule 1 of the *Environmental Protection Regulations 1987* (EP Regulations).

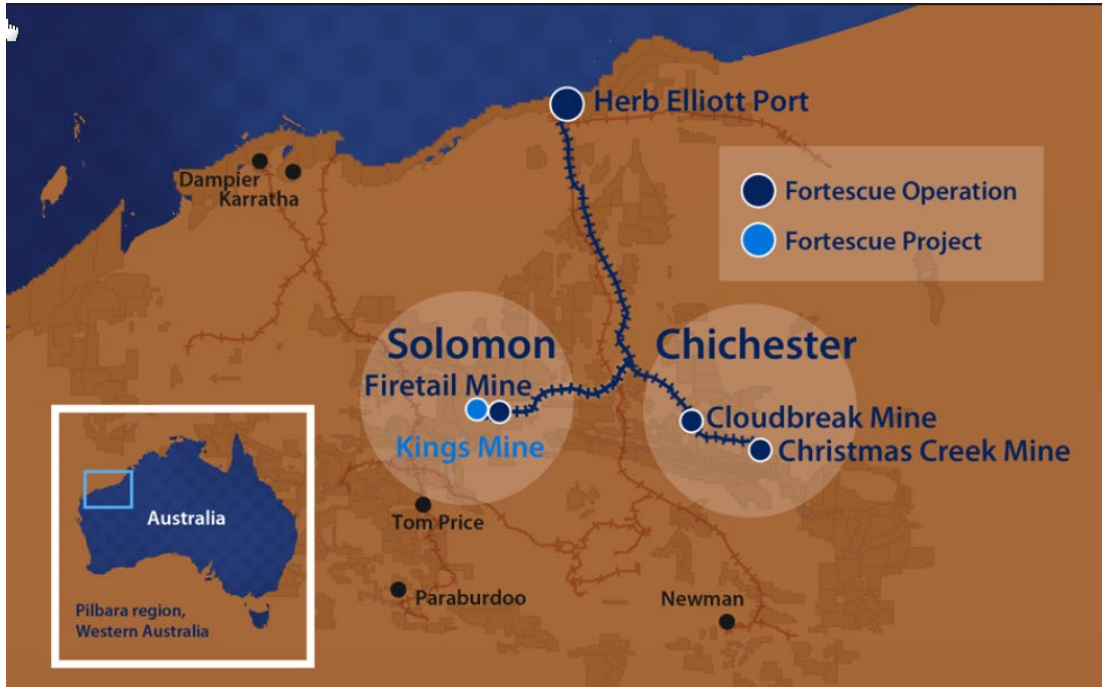
The Premises encompasses the following mine and infrastructure:

- Open pits;
- Run of mine (ROM) pads;
- Waste rock dumps;
- Permanent and mobile ore processing facilities (OPFs);
- Tailings storage facilities (TSFs);
- Mine dewatering and reinjection infrastructure;
- Diesel powered power station;
- Wastewater treatment plant (WWTP) and associated spray field;
- Putrescible and inert landfills;



- Bulk and satellite fuel storage;
- Bioremediation facility;
- Workshops and washdown bays; and
- Administration buildings.

The Premises is located approximately 120 kilometres (km) north-west of Newman and 89 km west-south-west of Nullagine in the Pilbara region of Western Australia (Figure 1). The Premises is within the Roy Hill, Mulga Downs and Hillside pastoral leases. The Premises is located directly west of the Christmas Creek Mine which is also owned and operated by the Licensee.



**Figure 1: Regional location**

Descriptions of the primary activities which fall within the description of the category of prescribed premises in Schedule 1 of the EP Regulations, and of related activities are described below.

### **Premises description**

#### Category 5 – Processing or beneficiation of metallic or non-metallic ore

The Licensee operates an OPF at the Premises which crushes and screens approximately 45 million tonnes per annum (mtpa) of iron ore. The OPF covers an area of approximately 221 hectares (ha) and consists of the following main processes:

- Plant feed system transports ROM ore from the pit to the screening plant;
- Screening separates the ore products (lump and fines);
- Secondary crushing;
- Tertiary crushing;
- Product stockpiling into three products; super value fines, high grade fines, and lump; and
- Train load-out consists of feed chutes to load train wagons.

To reduce silica and alumina content, low grade ore is subject to wet processing through the desand plant which produces approximately 1.4 mtpa of 'Rocket Fines' product. Approximately 6.2 mtpa of tailings residue, a by-project of the wet processing, is disposed of via deposition into in-pit (IP) TSFs.



The Licensee has four TSFs (Brampton TSF, Daydream TSF, Hamilton TSF and Hook TSF) at capacity and is currently operating its fifth (Brampton Phase 3 TSF).

During this amendment (November 2018), the construction and operation of the Brampton Southern Strips (Brampton) IPTSF, which will receive tailings both above and below the watertable has been assessed within Appendix A -TSFs.

A number of mobile crushing and screening facilities are also operated onsite to support the permanent OPF. No clearing of vegetation is undertaken for the mobile plants, which are generally located in cleared areas adjacent to the OPFs or pits, at remote ROMs or in existing laydown areas. The number of mobile plants on site varies in response to specific operational and construction requirements. In aggregate, the permanent OPF and mobile plants have a design capacity of 50 mtpa.

Iron ore is transported via rail to FMG's Anderson Point Materials Handling Facility in Port Hedland for export.

#### Category 6 - Mine dewatering

Groundwater abstraction is undertaken to enable the mining of ore below the water table and provide mine site water supply. Extracted groundwater is used onsite where possible for purposes such as dust suppression and ore processing. Abstracted water in excess of demand is disposed of via injection into the same interconnected aquifer from which the water was taken. The Licensee has approval under Ministerial Statement (MS) 1010 to abstract and reinject up to 150 gigalitres (GL) per annum (GLpa) of excess groundwater.

There is currently 64 brackish water injection bores installed at the Premises, located in areas east and west of the active mining area (Hillside West and Lefthanders injection borefields). ReInjection in this area typically targets the mineralised Marra Mamba Formation.

Saline injection is undertaken between the southern limit of the resource area and the northern limit of the Fortescue Marsh. The Oakover Formation is the target aquifer of the injection and has a salinity which is typically between 30,000 milligrams per litre (mg/L) to 150,000 mg/L total dissolved solids (TDS). There is currently 139 saline injection bores in operation at the Premises. Currently, only saline water is being extracted and reinjected at the Premises.

Injection systems consist of networks of injection bores and interconnected pipelines. Water is injected to the bore via a downhole flow control valve, which eliminates air from entering the hole. Transfer and settlement ponds facilitate the bulk flow transfer and/or settlement of suspended material in mine dewater. Separate facilities exist for the purpose of handling brackish and saline water. All ponds are lined with high density polyethylene (HDPE) and saline transfer ponds have telemetry infrastructure to monitor water level and water level trends. The information is displayed as live data, displayed remotely and SMS messages are sent for any breaches of pre-set levels.

Polyethylene pipe, which complies with Australian Standards, is used to convey water around site. Valves and booster pumps are regularly installed along bulk lines to allow for isolation of sections should damage occur or during maintenance activities. Flow meters located throughout the water delivery and distribution network are installed in accordance with the *Guidelines for water meter installation* for the purpose of recording flow volumes. Pressure gauges are installed on bulk pipelines approximately every kilometre.



Category 52 – Electric power generation

The Cloudbreak power station comprises of 22, 2.2 megawatt (MW) and one 2.8 MW, diesel powered generator sets (gensets), with a combined design capacity of 52 MW. Up to 80 kilolitres (kL) of diesel is stored adjacent to the power station to fuel the gensets

During this amendment (November 2018), the capacity for category 52 has been reduced from 52 MW to 50.6 MW, as the Licensee is proposing replace the 2.8 MW genset with a 2.2 MW G63 generator (refer to Appendix B).

The Cloudbreak power station will also comprise three, 1.6 MW emergency back-up diesel gensets to provide emergency redundancy in the event of genset failure (FMG, 2018c).

The key characteristics of the power station are described in Table 1.

<b>Table 1: Key characteristics table for the Cloudbreak Power Station (FMG, 2007)</b>	
<b>Aspect</b>	<b>Description</b>
<b>General</b>	
Facility description	Installation and operation of up to 23 diesel-fuelled power generators (up to 21 online with 2 dedicated to supplying power for standby/maintenance) to provide electricity for the Premises and camp
Location	Within approved development footprint of the Premises, approximately 120 km north west of Newman
Generating capacity	50.6 MW
Development footprint	140 x 80 metres (m) (1.12 ha) earth pad with concrete footings and slabs as required to support associated infrastructure
Project life	Approximately 12 years
<b>Plant Facility</b>	
Number of generators	23 x 2.2 MW diesel gensets
Number of stacks	23 stacks
Stack height	9.177 m (minimum)
Muffler and tailpipe diameter	Mufflers: 1,219 millimetres (mm); tailpipes: 457mm
Diesel fuel consumption	Up to 76,072 tonnes per year (based on generators operating at 100% capacity, which will not occur during hot summer months)
Diesel fuel storage	22 x 720 litre (L) surge tanks, one 10,000 L bunded intermediate service tank and one 20,000 L bunded service tank
Clean Oil Storage	15,000 L self bunded tank
<b>Gaseous and Other Emissions</b>	
Total greenhouse gases	279,600 tonnes per year (based on 40 MW)
NO <sub>x</sub>	3,053 tonnes per year (based on 40 MW)
CO	1,170 tonnes per year (based on 40 MW)
HC	229 tonnes per year (based on 40 MW)
Particulates	149.3 tonnes per year (based on 40 MW)
SO <sub>2</sub>	8.62 tonnes per year (based on 40 MW)
<b>Other Wastes</b>	
Waste oil storage	15,000L self bunded tank
Waste oil disposal	Recycled or disposed of at licensed facilities

Category 54 – Sewage facility

The Licensee operates a WWTP at the Premises (Cloudbreak Camp) which has a treatment capacity of up to 600 cubic metres (m<sup>3</sup>) per day (m<sup>3</sup>/day). Treated wastewater from the WWTP is discharged



via spray irrigation to an 18.3 ha irrigation area, consisting of native vegetation. There are also two WWTPs located within the mine area, known as Jacanas. The treatment capacity of the Jacanas is 94.5 m<sup>3</sup>/day. Partially treated wastewater from Jacanas is transported to the main Cloudbreak Camp WWTP for final treatment and disposal via irrigation.

#### Category 57 – Used tyre storage

The Licensee stores tyres on site prior to disposal.

#### Category 64 – Class II putrescible landfill

A Class II putrescible landfill is operated at the Premises. Waste is segregated on its arrival to the landfill facility with any potentially hazardous materials kept within appropriate lined areas to minimise discharges to the environment and ensure compliance with the *Environmental Protection (Unauthorised Discharges) Regulations 2004*. The landfill is operated in accordance with the *Landfill Waste Classification and Waste Definitions 1996* (as amended). Other wastes that don't reach the requirements of this are removed from the Premises.

Used tyres, untreated wood, disused pipelines and concrete are also disposed of in mining pits and waste rock dumps. Up to 10,000 tonnes per annum of waste is disposed of to the designated putrescible landfill, mining pits and waste rock dumps.

#### Category 73 – Bulk storage of chemicals, etc

The Licensee currently stores up to 7,700.5 m<sup>3</sup> in aggregate of chemicals at the main fuel farm and at a number of smaller facilities across the Premises.

### **Location and siting**

#### Sensitive land uses

No significant communities are located in the vicinity of the Premises. The nearest sensitive land uses include Marillana Station and Bamboo Springs, located approximately 31.5 km and 34.8 km respectively from the Premises. There are five pastoral bores located within the premises boundary; these being Cooks bore, Moojarri bore, Muirs bore, Mulga bore and Nicks bore.

The workforce for the Premises operates on a fly-in/fly-out basis and is housed at the accommodation camps located within the prescribed premises boundary. As the accommodation camps are operated by the Licensee, they are not considered by DWER to be a sensitive land use or receptor for the purpose of assessing the risks of emissions and discharges associated with the operation of the prescribed activities.

Aboriginal heritage surveys have been undertaken across the site since 2003 which have identified 1,573 heritage sites across the Licensee's Cloudbreak and Christmas Creek mine sites. A Cultural Heritage Management Plan has been prepared for the site and the Licensee is required to comply with the requirements of the *Aboriginal Heritage Act 1972*.

#### Specified Ecosystems

The *Guidance Statement: Environmental Siting* describes specified ecosystems as areas of high conservation value and special significance that may be impacted as a result of activities upon or emissions and discharges from prescribed premises. The specified ecosystems relevant to the Premises are identified below.

The Premises lies between 1 km to 10 km north of the Fortescue Marsh, which is listed in *A Directory of Important Wetlands in Australia* and also as a Priority 1, Priority Ecological Community (PEC) (PEC, 2017).

The Fortescue Marsh occupies an area around 100 km long by typically 10 km wide.



Flora and vegetation surveys have identified seven priority flora species in and near the mining area, including *Eremophila spongiorcarpa* (Priority 1), *Nicotiana heterantha* (Priority 1), *Gymnanthera cunninghamii* (Priority 3), *Phyllanthus aridus* (Priority 3), *Rostellulaira adscendens* var. *latifolia* (Priority 3), *Themeda* asp. Hamersley Station (Priority 3), *Eremophila youngii* subsp. *Lepidota* (Priority 4) and *Goodenia nuda* (Priority 4).

There are no Threatened flora species pursuant to the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) or Declared Rare Flora (DRF) pursuant to the *Wildlife Conservation Act 1950* (WC Act) recorded with the survey area.

Twenty one vegetation communities have been mapped in the Cloudbreak survey area; none of these communities are considered to be Threatened Ecological Communities under the WC Act or the EPBC Act. Ecologically important vegetation communities have been identified within the survey area including Samphire (*Tecticornia* sp.), Mulga (*Acacia aneura*) and groundwater dependant vegetation Coolibah (*Eucalyptus victrix*) and River Red Gum (*Eucalyptus camaldulensis*).

Fauna studies conducted within and adjacent to the project area recorded 25 species of conservation significance, including the Night Parrot (*Pezoporus occidentalis*), Greater Bilby (*Macrotis lagotis*), Pilbara Leaf-Noise Bat (*Rhinonictis aurantia*) and Pilbara Olive Python (*Liasis olivacea barroni*) which are listed under the EPBC Act.

Stygofauna surveys conducted in the vicinity of the Cloudbreak area have identified 23 stygofauna species. Of these, two appear to be restricted to the vicinity of the proposal area.

#### Topography

The regional topography is dominated by the Hamersley Plateau in the south and the Chichester Ranges in the north, separated by the Fortescue Valley. The pre-mining topography of the area can be described as gently undulating, with a maximum relief from the Fortescue Valley to the Chichester Ranges of approximately 50-200 m.

#### Geology and soils

The Premises is located in the Hamersley Basin area of the Pilbara craton. The Chichester Ranges dominates the landscape, comprised of the south dipping Marra Mamba Formation which is overlain by a Quaternary/Tertiary sedimentary sequence, and underlain by the black shales of the Jeerinah Formation at the top of the Fortescue Group. The Oakover Formation comprises a sequence of lacustrine carbonate, silcrete and mudstone rocks that have been deposited in the paleodrainage of the Fortescue Valley (FMG, 2014). The ore body mined at the Premises occurs within the mineralised Marra Mamba Formation.

Superficial soils at the Premises comprise clayey gravels and silty gravels, and include fill, alluvium and/or detrital material.

#### Regional hydrology

The Premises is located in the upper Fortescue River catchment which is subject to localised thunderstorm and cyclonic rainfall events, which generally occur between December to April and can result in very large runoff events. Numerous creeks from the southern and northern flanks of the Fortescue Valley discharge to the Fortescue Marsh. From the Chichester Ranges, surface water flows in a southerly direction, through the project area, to the Fortescue Marsh.

Broad scale flooding of the Fortescue Marsh occurs on a frequency of about one year in ten, with inundation persisting for three to six months (EPA Report 1429). Yintas (semi-permanent pools) are located along the northern shoreline of the Fortescue Marsh, with two of these having part of their catchment area within the Cloudbreak project area. Channel flow occurs in the northern part of the



project area and sheet flow occurs over land in the broad shallow front within the southern portion of the project area.

Surface water runoff is generally of low salinity and turbidity, which increases during peak periods of flooding. Water stored on the Fortescue Marsh dissipates through evaporation and seepage. The evaporation process increases water salinity levels in the marsh, which is believed to seep into the valley floor alluvial deposits.

The primary mechanisms for groundwater recharge in the area are infiltration recharge from direct rainfall and local stream flow on Marra Mamba Formation and Tertiary detritals/alluvium, infiltration recharged associated with ponding on the Fortescue Marsh and inflow from aquifers located to the north of the project area. The groundwater system beneath the Fortescue Marsh is considered to be a closed system with limited outflow to the west beneath the Goodardarie Hills.

Groundwater in the project area is generally brackish (>500 mg/L TDS) and becomes increasingly saline towards the Fortescue Marsh and with depth (>100,000 mg/L TDS). Salinity increases with depth, with the upper tertiary detritals having a salinity of 1,000 to 2,000 mg/L TDS, Marra Mamba Formation reaching up to 6,000 mg/L TDS and the deeper Lower Marra Mamba and Wittenoom Formations having a salinity of 5,000 to 11,000 mg/L TDS. The Oakover Formation to the south of the resource area has monitored TDS of up to 150,000 mg/L (EPA Report 1429).

#### Meteorology

The climate of the Pilbara is arid tropical, characterised by low and variable rainfall, high daily temperatures, high diurnal temperatures and high evaporation rates. The estimated average rainfall at the Premises is 459 mm and the average annual evaporation is estimated at 3,300 mm. The 1 in 100 year Average Recurrence Interval (ARI), 72-hour storm event for the mine area is approximately 4.8 mm/hour, or a 345 mm event.

#### **Clearing**

MS 899 for the Cloudbreak Life of Mine approves a disturbance area of up to 13,633 ha within a 37,688 ha project area.

#### **Part IV of the EP Act**

The Pilbara Iron Ore and Infrastructure Project: Cloudbreak (non-beneficiation) was authorised by the Minister for Environment under Part IV of the EP Act upon issue of MS 721 on 24 April 2006.

The Cloudbreak Life of Mine project was referred to the Environmental Protection Authority (EPA) on 2 September 2010 and involved the expansion of mining, ore production, waste dumps, dewatering and water disposal options. MS 899 for the Cloudbreak Life of Mine project was issued 5 June 2012, superseding the conditions of MS 721.

#### MS 899

The Minister's decision that the Cloudbreak Life of Mine project may be implemented subject to conditions was informed by the EPA assessment (Assessment Number 1848), which produced *EPA Report 1429*. In its assessment the EPA determined that the following were key environmental factors relating to the proposal:

- Flora and Vegetation;
- Conservation significant fauna;
- Surface water flows;
- Groundwater quantity and quality;
- Rehabilitation and closure; and
- Residual impacts.



Changes to the proposal approved under section 45C of the EP Act for MS 899 include:

- Temporary presence of water in mining pits for a period of 2 years, approved on 9 June 2017; and
- Amendment to the Cloudbreak Project Area to remove overlap with adjacent Christmas Creek Project and to allow for below watertable tailings disposal, approved on 24 May 2018.

#### MS 962

On 18 March 2014, MS 962 was issued to amend MS 899 conditions 7-1 and 7-2 relating to water levels at the fringe of the Fortescue Marsh, relating to the key environmental factor of Flora and Vegetation.

#### MS 1010

MS 1010 was issued 4 August 2015 to approve an increase in groundwater abstraction from 100 GLpa to 150 GLpa and reinjection from 95 GLpa to 150 GLpa noting that the implementation conditions of MS 899, as amended by MS 962, apply to the revised proposal.

#### **Other Approvals**

##### Iron Ore (FMG Chichester Pty Ltd) Agreement Act 2006

The Premises is subject to the *Iron Ore (FMG Chichester Pty Ltd) Agreement Act 2006*, which ratifies and authorises the development of mining of iron ore by the Licensee within a defined area of the Chichester Ranges, and defines the assistance to be provided by the State government. The Department of Jobs, Tourism, Science and Innovation is the agency responsible for administering this Act.

##### EPBC Act

The Commonwealth of Australia considered the Cloudbreak Life of Mine project to be a controlled action under the EPBC Act because of potential significant impacts to listed threatened species and communities and listed migratory species. The proposal was assessed according to the Bilateral Agreement between the Commonwealth and State of Western Australia. The Cloudbreak Life of Mine project was approved under the EPBC Act on 29 November 2012 (EPBC No 2010/5696).

##### Rights in Water and Irrigation Act 1914 (RIWI Act)

Groundwater abstraction is undertaken to enable the mining of ore below the water table and provide mine site water supply. Groundwater is abstracted in accordance with Section 5C licences issued pursuant to the RIWI Act. In accordance with the requirements of the Section 5C Licence, the Licensee has developed *the Cloudbreak Groundwater Operating Strategy* (CB-PH-HY-0009, Revision 4, August 2016). This strategy documents the operation of dewatering, injection and process water supply systems and the management systems to be implemented to monitor and mitigate potential impacts.

#### **Licence amendment – February 2017**

On 7 September 2016, the Licensee submitted an application for an amendment to the Existing Licence under section 59B of the EP Act. The Licensee applied to make the following changes:

- Include the groundwater reinjection bores as specified emission points to groundwater as opposed to referencing the “*Cloudbreak Water Management Scheme*”;
- Update the ambient groundwater monitoring locations for the landfill, TSFs and mine dewater reinjection;
- Increase the category 5 production capacity;
- Allow for the reuse of bioremediated soils determined as fill; and
- Implement other minor updates to the Licence.



### **Amendment Notice 1**

On 13 December 2017 and 28 December 2018, the Licensee submitted an application for an amendment to the Existing Licence for the construction and operation of the Norfolk and Kangaroo transfer ponds and associated pipework as part of the re-injection infrastructure.

### **This amendment – November 2018**

A licence amendment application was submitted by the Licensee on 29 May 2018 (FMG, 2018a) for the following:

- Inclusion of construction and operational requirements for the Brompton IPTSF;
- Changes to conditions 1.2.8 and 2.1.1 relating to category 52; and
- Change to the prescribed premises boundary.

During this amendment the following changes have also been made to the Licence:

- Inclusion of tenements M45/1263, L46/130, E45/2497 and removal of tenements M46/423, M46/424, M46/415, L46/49, L46/60 and E46/724 from the Premises address;
- Design capacity change for category 52 from 52 MW to 50.6 MW;
- Administrative changes;
- Definitions updated;
- Condition 1.2.1 updated to include high risk saline pipelines and reference to the map of environmentally sensitive areas in Schedule 1;
- Condition 1.2.2 updated to include maximum operating level and maximum tailing elevation for the Brompton IPTSF;
- Construction requirements for the power station generators updated in Table 1.2.6;
- Construction requirements included for the Brompton IPTSF in Table 1.2.6;
- Construction requirements for the Norfolk and Kangaroo transfer ponds removed from Table 1.2.6;
- Previous condition 1.2.10 removed;
- Tables 1.2.5 and 2.1.1 updated in line with the category 52 requests;
- Condition 2.3.1 updated to list all the saline and brackish injection bores;
- Condition 3.6.1 updated to include additional parameters for the TSF ambient groundwater monitoring;
- Table 4.2.1 updated to include the annual water balance for condition 1.2.4;
- Table 4.3.1 updated for notification requirements; and
- Most of the Maps in Schedule 1 updated to depict the new premises boundary.

DWER's assessment and decision making with respect to emissions and discharges associated with the operation of the Premises are described in Section 4 of this document.



## 4 Decision table

All applications are assessed in line with the EP Act, the EP Regulations and *Guidance Statements: Decision Making and Risk Assessments*. Where other references have been used in making the decision they are detailed in the Decision Document.

<b>DECISION TABLE</b>			
<b>Works Approval / Licence section</b>	<b>Condition number</b>	<b>Justification (including risk description &amp; decision methodology where relevant)</b>	<b>Reference documents</b>
<b>General conditions</b>	Conditions 1.1.1 to 1.1.4.	<p>Definitions for terms used in the Licence are specified under condition 1.1.1 and 1.1.2. Conditions 1.1.3 and 1.1.4 refers to references made to Australian or other standards and codes of practice meaning the relevant parts and version of that standard, guideline or code of practice.</p> <p>During this amendment (November 2018) the definition for 'AS/NZS 5667.4' has been removed, definition for 'Landfill Definitions' updated and 'MW' included.</p>	<p>General provisions of the <i>Environmental Protection Act 1986</i>.</p> <p><i>Environmental Protection (Unauthorised Discharges) Regulations 2004</i>.</p>
<b>Premises operation</b>	Conditions 1.2.1-1.2.10.	<p>The OPFs and TSFs at the Premises meet the description and production or design capacity of a category 5 prescribed premises, as described in Schedule 1 of the EP Regulations. Dust and noise emissions associated with the OPFs have been assessed in the relevant sections of this document.</p> <p>The Licensee also operates a number of facilities, ancillary to the primary activity of mining and ore processing, that meet the description and production or design capacity of categories of prescribed premises, as described in Schedule 1 of the EP Regulations.</p> <p>The location of DWER's assessment and decision making on the operation of these facilities is shown below:</p> <ul style="list-style-type: none"> <li>Category 5: TSFs as detailed in Appendix A (Premises operation);</li> </ul>	<p>General provisions of the <i>Environmental Protection Act 1986</i>.</p> <p><i>Environmental Protection (Unauthorised Discharges) Regulations 2004</i>.</p> <p><i>Cloudbreak Life of Mine Surface Water Management Plan (FMG, Revision 0, March 2013)</i>.</p> <p>MS 899.</p>



<b>DECISION TABLE</b>			
<b>Works Approval / Licence section</b>	<b>Condition number</b>	<b>Justification (including risk description &amp; decision methodology where relevant)</b>	<b>Reference documents</b>
		<ul style="list-style-type: none"> <li>• Category 6: Mine dewatering as detailed in Appendix C (Point source emissions to surface water) and Appendix D (Point source emissions to groundwater);</li> <li>• Category 52: Cloudbreak power station as detailed in Appendix B (Point sources emissions to air);</li> <li>• Category 54: WWTPs as detailed in Appendix E (Emissions to land);</li> <li>• Category 64: Putrescible landfill as detailed in Appendix A (Premises operation); and</li> <li>• Category 73: Bulk and satellite fuel facilities as detailed in Appendix A (Premises operation).</li> </ul> <p>Stormwater management at the Premises, is detailed and assessed in Appendix A.</p>	
<b>Point source emissions to air including monitoring</b>	Condition 2.1.1.	DWER's assessment and decision making with respect to point source emissions to air associated with the Cloudbreak power station are detailed in Appendix B.	National Environmental Protection (Ambient Air Quality) Measure.  FMG, 2018a.
<b>Point source emissions to surface water including monitoring</b>	Conditions 2.2.1 and 3.2.1.	DWER's assessment and decision making with respect to the contingency discharge of dewatering water to creeklines are detailed in Appendix C.	General provisions of the <i>Environmental Protection Act 1986</i> .  <i>Environmental Protection (Unauthorised Discharges) Regulations 2004</i> .  <i>Dewatering Contingency Discharge Procedure</i> .



<b>DECISION TABLE</b>			
<b>Works Approval / Licence section</b>	<b>Condition number</b>	<b>Justification (including risk description &amp; decision methodology where relevant)</b>	<b>Reference documents</b>
			<p>Australian Standard AS/NZS 5667.1.</p> <p>Australian Standard AS/NZS 5667.6.</p>
<b>Point source emissions to groundwater including monitoring</b>	Conditions 2.3.1 and 3.3.1.	DWER's assessment and decision making with respect to the reinjection of dewatering water at the Premises are detailed in Appendix D.	<p><i>Cloudbreak Groundwater Operating Strategy</i> (CB-PH-HY-0009).</p> <p><i>Cloudbreak Water Management Scheme</i> (FMG, Rev 9, December 2015).</p> <p>General provisions of the <i>Environmental Protection Act 1986</i>.</p> <p><i>Environmental Protection (Unauthorised Discharges) Regulations 2004</i>.</p> <p>Australian Standard AS/NZS 5667.1.</p> <p>Australian Standard AS/NZS 5667.11.</p>
<b>Emissions to land including monitoring</b>	Conditions 2.4.1 and 3.4.1.	DWER's assessment and decision making with respect to the discharge of treated wastewater from the Cloudbreak WWTP are detailed in Appendix E.	General provisions of the <i>Environmental Protection Act 1986</i> .



<b>DECISION TABLE</b>			
<b>Works Approval / Licence section</b>	<b>Condition number</b>	<b>Justification (including risk description &amp; decision methodology where relevant)</b>	<b>Reference documents</b>
			<i>Environmental Protection (Unauthorised Discharges) Regulations 2004.</i>  Australian Standard AS/NZS 5667.1.  Australian Standard AS/NZS 5667.10.
<b>Fugitive emissions</b>	N/A.	DWER's assessment and decision making with respect to fugitive dust and light emissions are detailed in Appendix F.	General provisions of the <i>Environmental Protection Act 1986.</i>  <i>Conservation Significant Fauna Management Plan (100-PL-EN-0022).</i>
<b>Odour</b>	N/A.	There are no significant odour emissions associated with the activities undertaken at the Premises and the closest sensitive receptor is located in excess of 30 km from the site. The Delegated Officer considers no further assessment of odour emissions to be required, and no specified conditions relating to odour are required on the Licence.	General provisions of the <i>Environmental Protection Act 1986.</i>
<b>Noise</b>	N/A.	DWER's assessment and decision making with respect to noise emissions are detailed below.  <u>Emission description</u> <i>Emission:</i> Noise and vibrations from operation of equipment and vehicles.  <i>Impact:</i> Impacts to amenity of sensitive receptors.	General provisions of the <i>Environmental Protection Act 1986.</i>  Guidance Statement <i>Risk Assessments.</i>



DECISION TABLE			
Works Approval / Licence section	Condition number	Justification (including risk description & decision methodology where relevant)	Reference documents
		<p>Noise and vibrations may force terrestrial fauna away from existing habitats into new areas increasing risk of predation or causing conflict with existing fauna assemblages. Twenty-five conservation significant fauna species have been identified within the project area.</p> <p><i>Controls:</i> The Premises is located approximately 31.5 km from the nearest pastoral homestead, which the Delegated Officer considers to be a sufficient buffer to prevent noise impacting the amenity of the homestead residents.</p> <p>Low-noise plant and equipment is used where practicable. Noise emissions from the mobile crushing and screening plants are minimised with the use of protection shields around motors, and rubber lines and protective barriers. Inspections and maintenance of exhaust and silencing systems on machinery, equipment and vehicles is conducted as required.</p> <p>The Licensee has developed and implements the <i>Conservation Significant Fauna Management Plan</i> (100-PL-EN-0022) to satisfy the requirements of condition 10-1 of MS 899 which specifies:  <i>“The proponent shall ensure that the following management plan is updated to the satisfaction of the CEO within ten months from the date of issue of this Statement to include the Cloudbreak Iron Ore Mine Expansion proposal:  Chichester Operations Fauna Management Plan (45-PL-EN-0007), Fortescue Metals Group Ltd, 13 March 2011.”</i></p> <p>Condition 10-2 (4) of MS 899 requires the plan to detail:</p>	<p><i>Environmental Protection (Noise) Regulations 1997.</i></p> <p><i>Conservation Significant Fauna Management Plan</i> (100-PL-EN-0022).</p> <p><i>Chichester Operations Noise and Vibration Management Plan</i> (CB-PL-EN-0007).</p> <p>MS 899.</p>



DECISION TABLE			
Works Approval / Licence section	Condition number	Justification (including risk description & decision methodology where relevant)	Reference documents
		<p><i>“measures to protect fauna from the effects of vegetation clearing, noise, vibration, light overspill, infrastructure, including trenching associated with the burial of pipelines, and resources, and any other impacts.”</i></p> <p><u>Risk Assessment:</u>  <i>Consequence:</i> The closest sensitive human receptor to the Premises is a pastoral homestead located approximately 31.5 km away. Impacts to the amenity of this receptor from noise and vibrations are not expected.</p> <p>Mid level on-site impacts and low level off-site impacts at a local scale to fauna could occur from noise and vibrations. Therefore, the consequence is moderate.</p> <p><i>Likelihood:</i> Based on the size and extent of the machinery in use (24 hours per day) an impact to fauna species from noise and vibration could occur at some time. Therefore, the likelihood of the consequence is possible.</p> <p><i>Risk Rating:</i> Comparison of the consequence and likelihood ratings described above with the risk rating matrix (Table 2) determines the overall rating of risk for noise emissions and vibrations to be <b>medium</b>.</p> <p><u>Regulatory Controls</u>            Noise and vibration impacts to conservation significant fauna species are addressed under the management plans currently implemented under MS 899, pursuant to Part IV of the EP Act. Conditions relating to the management of noise and vibration to minimise potential impacts to fauna have not been applied to the Licence as sufficient regulation is provided under Part IV of the EP Act.</p>	



<b>DECISION TABLE</b>			
<b>Works Approval / Licence section</b>	<b>Condition number</b>	<b>Justification (including risk description &amp; decision methodology where relevant)</b>	<b>Reference documents</b>
		<p>The Delegated Officer notes that the <i>Environmental Protection (Noise) Regulations 1997</i>, as well as the general provisions of the EP Act with respect to the causing of pollution and environmental harm apply.</p> <p><u>Residual Risk Assessment</u>  <i>Consequence:</i> Moderate  <i>Likelihood:</i> Possible  <i>Risk Rating:</i> Medium</p>	
<b>Monitoring general</b>	Conditions 3.1.1 to 3.1.4.	General monitoring conditions are included in this Licence to ensure monitoring is carried out in accordance with the relevant standards, at appropriate intervals and submitted to and tested by a NATA accredited laboratory for analysis; and that monitoring equipment is appropriately maintained and calibrated.	Australian Standard AS/NZS 5667.1.
<b>Process monitoring</b>	Condition 3.5.1.	<p>The Licensee has advised that there are three ponds used to treat wastewater from the heavy vehicle wash down facility. The first pond is used to settle out suspended material, which then feeds into the second pond. An OWS is located between the second and third ponds. Another OWS is located at the bulk fuel tanks. Water from this system runs through to the ponds described above for further treatment.</p> <p>Treated wastewater from the third pond is currently reused on site for dust suppression.</p> <p>The Licensee also sources bore water for use in dust suppression, with TDS concentrations exceeding 6,000 mg/L.</p> <p>DWER's assessment and decision making with respect to the use of treated wastewater and abstracted bore water for use in dust suppression is detailed below.</p>	<p>General provisions of the <i>Environmental Protection Act 1986</i>.</p> <p>2017 AER.</p> <p>EPA Report 1429.</p>



DECISION TABLE			
Works Approval / Licence section	Condition number	Justification (including risk description & decision methodology where relevant)	Reference documents
		<p><b>Emission description</b> <i>Emission:</i> Saline and potentially hydrocarbon contaminated treated wastewater discharged to land when used for dust suppression. In 2017, TDS in reuse water ranged from 6,200 mg/L to 14,300 mg/L (2017 AER), which is considered of saline quality (Understanding salinity).</p> <p>Overtopping of ponds discharging untreated and/or treated wastewater to the environment.</p> <p>Brackish/saline bore water is also used for dust suppression. In 2016, approximately 1,239,000 m<sup>3</sup> was used on an annual basis.</p> <p><i>Impact:</i> Treated wastewater is of saline quality and could contain elevated levels of hydrocarbons which could contaminate surface water and/or terrestrial environments, adversely impacting on flora and fauna.</p> <p>Overspray and runoff of saline water used for dust suppression may impact on the health of vegetation adjacent to mine access and haul roads. The Fortescue Marsh is known to be a saline ecosystem, although salt levels within the marsh are highly variable (Astron, 2012).</p> <p><b>Controls:</b> <i>Treated wastewater ponds</i> Monitoring of treated wastewater is undertaken from the final pond (pond 3) on a monthly basis for total recoverable hydrocarbons (TRH) and TDS.</p> <p>Results provided in the <i>2017 AER</i> submitted in accordance with the reporting requirements of this Licence, indicate the TRH in discharge water</p>	



DECISION TABLE			
Works Approval / Licence section	Condition number	Justification (including risk description & decision methodology where relevant)	Reference documents
		<p>was less than 4.66 mg/L. TDS in water ranged from 6,200 mg/L to 14,300 mg/L.</p> <p>The Licensee has advised that daily inspections are undertaken on the drains, wash pads, ponds and separator equipment. A 200 mm freeboard is maintained by the Licensee.</p> <p><i>Groundwater used for dust suppression</i> In the <i>EPA Report 1429</i>, the EPA acknowledged the potential impacts to vegetation associated with the use of saline water for dust suppression. The EPA noted that the proponent would contain the salt applied to roads through the control of runoff through road embankments and bunds and regular haul road re-graining and stockpiling of this material within the mining area.</p> <p>The EPA also noted that a study was undertaken to characterise the salt balance relating to dust suppression, the pathways by which salt may enter the surrounding environment and the sensitivity of environmental receptors of the salt loading.</p> <p>The Licensee has advised that two studies have been undertaken regarding the saline water used for dust suppression. The <i>Assessment of Salt Movement from Saline Water Dust Suppression Areas – Cloudbreak</i> (Astron, 2012) determined the baseline salt in the landscape. The study found that the natural level of salt present in the landscape is low in areas of mulga vegetation.</p> <p>Worley Parsons investigated the impacts to surface water and found that low rainfall events sufficient to induce small volumes of saline road runoff</p>	



DECISION TABLE			
Works Approval / Licence section	Condition number	Justification (including risk description & decision methodology where relevant)	Reference documents
		<p>(but not significant catchment runoff), are likely to pose the greatest risk to sheet-flow dependant on mulga, shallow rooted vegetation or ecological communities associated with creeks (Worley Parsons, 2011).</p> <p>Licensee's controls include use of higher salinity water in active mining pits, the roads accessing these mining pits and major haul roads accessed by heavy vehicles. These areas do not have surrounding or adjacent vegetation. The lower salinity water is used on access roads, which are commonly accessed by light vehicles. Spray contact with vegetation is minimised via the use of the windrows on the side of the major haul roads.</p> <p><u>Risk Assessment:</u>  <i>Consequence:</i> Considering the volume of water being used for dust suppression, low level on site impacts and minimal offsite impacts to vegetation could occur from the use of saline water for dust suppression. Therefore, the consequence is minor.</p> <p><i>Likelihood:</i> Based on the Licensee's controls in place to manage the overspray of saline water on mine access and haul roads, the consequence will not occur in most circumstances. Therefore, the likelihood of the consequence is unlikely.</p> <p><i>Risk Rating:</i> Comparison of the consequence and likelihood ratings described above with the risk rating matrix (Table 2) determines the overall rating of risk for treated wastewater and saline groundwater used for dust suppression to be <b>medium</b>.</p>	



<b>DECISION TABLE</b>			
<b>Works Approval / Licence section</b>	<b>Condition number</b>	<b>Justification (including risk description &amp; decision methodology where relevant)</b>	<b>Reference documents</b>
		<p><u>Regulatory Controls</u> The Delegated Officer notes that existing condition 3.5.1 requires the monthly monitoring of treated wastewater from the final treated wastewater pond. Volumetric flow rate, TRH and TDS is monitored, with results reported in the AER. A limit of 15 mg/L of TRH is specified.</p> <p>The Delegated Officer considers the infrastructure requirements (200 mm freeboard and maintenance of HDPE liner/concrete or similar impermeable layer) for the heavy vehicle washdown facility oily water storage ponds specified under condition 1.2.2 as appropriate to manage the risk associated with overtopping of the ponds.</p> <p><u>Residual Risk Assessment</u> <i>Consequence:</i> Minor <i>Likelihood:</i> Unlikely <i>Risk Rating:</i> Medium</p>	
<b>Ambient quality monitoring</b>	Condition 3.6.1.	<p>Condition 3.6.1 specifies the ambient environmental quality monitoring requirements for the Premises. Ambient groundwater monitoring is required to identify potential impacts to groundwater as a result of the operation of the landfill, TSFs and the reinjection of mine dewater.</p> <p>DWER's assessment and decision making with respect to the operation of the TSF and landfill is detailed in Appendix A (Premises Operation), which includes further discussion of the ambient groundwater monitoring requirements.</p> <p>DWER's assessment decision making with respect to the reinjection of mine dewater is detailed in Appendix C (Point source emissions to groundwater</p>	<p>Australian Standard AS/NZS 5667.1.</p> <p>Australian Standard AS/NZS 5667.11.</p>



<b>DECISION TABLE</b>			
<b>Works Approval / Licence section</b>	<b>Condition number</b>	<b>Justification (including risk description &amp; decision methodology where relevant)</b>	<b>Reference documents</b>
		including monitoring), which includes further discussion of the ambient groundwater monitoring requirements.	
<b>Meteorological monitoring</b>	N/A.	No specified conditions relating to meteorological monitoring are included in this Licence.	N/A.
<b>Improvements</b>	N/A.	No specified conditions relating to improvements are included in this Licence.	N/A.
<b>Information</b>	<p>Conditions 4.1.1 to 4.1.3.</p> <p>Conditions 4.2.1 and 4.2.2</p> <p>Conditions 4.3.1</p>	<p>Conditions 4.1.1, 4.1.2 and 4.1.3 have been applied to the Licence and require the appropriate management of records and information, submission of an Annual Audit Compliance Report and implementation of a complaints management system.</p> <p>Condition 4.2.1 has been applied to the Licence to require the submission of an AER, including the information specified in Table 4.2.1.</p> <p>During this amendment (November 2018) the requirement to provide the annual water balance for the TSFs in the AER associated with condition 1.2.4 has been added to Table 4.2.1.</p> <p>Condition 4.2.2 requires a comparison of results against previous monitoring results and Licence limits.</p> <p>Condition 4.3.1 specifies notification requirements, specifically relating to limit breaches, contingency discharge events and submission of compliance documentation for works approved and constructed under this Licence.</p> <p>During this amendment (November 2018) condition 4.3.1 has been updated to:</p>	<p>General provisions of the <i>Environmental Protection Act 1986</i>.</p> <p><i>Norfolk and Kangaroo Transfer Ponds Compliance Documents No. 1, No. 2 and No.3.</i></p> <p><i>Chichester Saline Water Leak Detection System Summary of Detailed Engineering Works.</i></p> <p><i>Chichester Saline Water Leak Detection System Summary of Commissioned Works.</i></p>



<b>DECISION TABLE</b>			
<b>Works Approval / Licence section</b>	<b>Condition number</b>	<b>Justification (including risk description &amp; decision methodology where relevant)</b>	<b>Reference documents</b>
		<ul style="list-style-type: none"><li>• Remove the requirement to report on the saline/hypersaline water pipeline telemetry installation associated with previous condition 1.2.10 as the reports for Phases 1 and 2 have been submitted to DWER;</li><li>• Include the requirement to submit a compliance document for the Brompton IPTSF as well as any departures listed; and</li><li>• Remove the requirement for compliance reporting for the Norfolk and Kangaroo transfer ponds, as compliance documentation was submitted to DWER on 12 April 2018, 18 April 2018 and 30 April 2018 (<i>Norfolk and Kangaroo Transfer Ponds Compliance Documents No. 1, No. 2 and No.3</i>).</li></ul>	
<b>Licence Duration</b>	N/A.	Licence L8199/2007/2 expires on 3 February 2032.	Notice of Amendment of Licence Expiry Dates, 29 April 2016.



## 5 Advertisement and consultation table

Date	Event	Comments received/Notes	How comments were taken into consideration
12/06/2018	Referral of a licence amendment – request for comment sent to the Department of Jobs, Tourism, Science and Innovation.	No comments received.	N/A.
12/06/2018	Referral of a licence amendment – request for advice sent to the Department of Mines, Industry Regulation and Safety.	<p>The Department of Mines, Industry Regulation and Safety responded on the 30 August 2018 (DMIRS, 2018) stating <i>“In summary, the proposed Brampton Southern Strips in-pit tailings storage facility has been designed to meet the geotechnical requirements outlined in the relevant DMIRS guidance notes and Code of Practice on tailings storage facilities. The construction and operation methods proposed for the in-pit tailings storage facility meet the DMIRS expectations.</i></p> <p><i>Currently, the groundwater level is maintained below the pit base by pumping water out through dewatering bores. If dewatering operation continues without the pumps being turned off the tailings deposition will entirely be subaerial. If the pumps are turned off, the groundwater level will rise to pre-mining level of RL 410 m. In that event the tailings deposition up to RL 410 m will be subaqueous and above RL 410 m will be subaerial. In either case, the geotechnical stability of the pit walls and the waste rock dump, which will contain tailings in the IPTSF, will be the same.</i></p> <p><i>Based on the information provided in the report, from a geotechnical point of view, I have no objection to this proposal”.</i></p>	Noted.



Date	Event	Comments received/Notes	How comments were taken into consideration
25/09/2018	Licensee provided with draft licence and decision document for comment.	<p>The Licensee provided comments on the draft licence and decision document on 17 October 2018 (FMG, 2018b).</p> <p><b>Table 1.2.6 for Tailings Delivery Pipelines</b> The Licensee requested that where it is stated constructed of HDPE that “and/or steel” be added as the Licensee is proposing to adjust the construction material of the tailings delivery pipeline to allow for HDPE or steel.</p> <p><b>Table 2.3.1</b> The Licensee has requested that all brackish and saline injection bores be listed out individually within the table, rather than grouping the bores together.</p> <p><b>Table 3.6.1</b> The Licensee does not support the addition of perchlorate ions for groundwater monitoring at the TSF. The Licensee has stated that they have <i>“confirmed with Orica who supply the explosives that ‘Perchlorate’ is not used in any of the bulk products for blasting and therefore there is no source and requirement for monitoring of ‘perchlorate ions’”</i>.</p>	<p>DWER has updated Table 1.2.6 for the Tailings Delivery Pipelines to include “and/or steel”.</p> <p>DWER has updated Table 2.3.1 to list all the brackish and saline injection bores.</p> <p>While DWER acknowledges that perchlorate may not be present in the groundwater at the Premises, no data has been collected by the Licensee to ensure this is the case.</p> <p>Based on this and that there is the probability that historic explosive use on the Premises may have contained perchlorate, DWER has retained perchlorate ions as a parameter to have analysed six-monthly.</p> <p>Perchlorate is extremely toxic in groundwater. If after a couple of samples it is shown that perchlorate ions are not present, DWER will consider removing this parameter.</p>



## 6 Risk Assessment

Note: This matrix is taken from the Guidance Statement Risk Assessments

Table 2: Risk rating matrix

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



## Appendix A

### Premises operation

#### Stormwater management

##### Emission Description

*Emission:* Potentially contaminated and sediment laden stormwater from operational areas (landfill, bioremediation facility, treated wastewater irrigation areas, works areas (ROM, OPFs, workshops, mobile crushing and screening facilities) and fuel storage areas).

*Impact:* Contamination of surrounding land and surface water drainage systems. Potential impacts on ecology of surface water from the addition of nutrients, heavy metals and/or hydrocarbons. Increased turbidity and downstream sedimentation impacting aquatic biota and ecosystems.

Stormwater drainage from the Premises flows south to the Fortescue Marsh, a highly conservation significant wetland. The Fortescue Marsh is a listed Priority 1, PEC by the Department of Biodiversity, Conservation and Attractions. This means that the Marsh is currently poorly surveyed and is a Priority 1 (with 1 being the highest priority from 1-4) for biological survey, given the community is ecologically significant and possibly threatened.

The Premises is subject to high seasonal rainfall, particularly during the January – March cyclone season, where significant amounts of stormwater will flow through the ephemeral creeks as channel flow and overland as sheet flow, resulting in inundation of the Marsh. During periods of lower rainfall, runoff migrates towards the Marsh via the ephemeral creeks.

The vegetation most likely to be affected by contaminated stormwater is the Samphire species, which relies on surface water flows in the Marsh. Secondary impacts to bird and other fauna species that utilise the Marsh may result.

##### *Controls:*

At the OPF/Desand Plant and crushing and screening facilities; culverts, trestles and drainage sumps have been implemented to remove sedimentation and contain and treat contaminated stormwater prior to release. Drainage is directed around the plants via a swale and into a settling pond, minimising suspended solids discharged to the environment.

Mobile crushing facilities are located on graded sites to ensure stormwater is contained and directed to a collection and settling sump, where sediment is settled out prior to reuse or disposal.

The OPFs, including the mobile crushing facilities, are located away from natural creeks and waterways and are located at least 0.5 m above the 100 year ARI flood level for the area.

The Licensee has advised that there are three ponds used to treat wastewater from the heavy vehicle wash down facility. The first pond is used to settle out suspended material, which then feeds into the second pond. An oily water separator (OWS) is located between the second and third ponds. Another OWS is located at the bulk fuel tanks. Water from this system runs through to the ponds described above for further treatment. As described in the process monitoring section, treated water is extracted from the third treatment pond and used for dust suppression. There are also four sumps located at the bulk fuel tanks used to collect potentially contaminated hydrocarbon runoff. This runoff is extracted from the sumps and transported offsite for treatment.



Stormwater contamination is minimised through the appropriate storage of hydrocarbons, lubricants and greases in bunded compounds, in accordance with Australian Standard (AS) 1940:2004 *The Storage and Handling of Flammable and Combustible Liquids*.

The *Cloudbreak Life of Mine Surface Water Management Plan* (FMG, Revision 0, March 2013) was developed to meet the requirements of conditions 11-1 and 11-2 of MS 899. This plan identifies potential impacts to surface water quality and quantity, associated management measures to minimise environmental consequences, the monitoring strategies and procedures for assessing direct and indirect impacts to surface water and describes adaptive management actions in response to breaches in trigger values.

The *Cloudbreak Life of Mine Surface Water Monitoring Plan* (FMG, Revision 0, 2 November 2012) has been developed under the *Cloudbreak Life of Mine Surface Water Management Plan* to monitor potential impacts from mining activities to determine if mitigation management measures are required.

#### Risk Assessment

*Consequence:* The Fortescue Marsh is located between 1 to 10 km from the Premises. The impact from discharges of contaminated and/or sediment laden stormwater could result in short term impacts to the Fortescue Marsh; an area of high conservation value. Therefore, the consequence is major.

*Likelihood:* Based on the Licensee controls (infrastructure located above the 100 ARI flood level, stormwater diversion infrastructure and water treatment systems) an impact to sensitive receptors from the discharge of contaminated and/or sediment laden stormwater will probably not occur in most circumstances. Therefore, the likelihood of the consequence is unlikely.

*Risk Rating:* Comparison of the consequence and likelihood ratings described above with the risk rating matrix (Table 2) determines the overall rating of risk for discharges of contaminated and/or sediment laden stormwater to the environment to be **medium**.

#### Regulatory Controls

The Delegated Officer notes that surface water, including stormwater runoff, is managed in accordance with the *Cloudbreak Life of Mine Surface Water Monitoring Plan* required under condition 11-1 and 11-2 of MS 899.

The Delegated Officer notes the general provisions of the EP Act, with respect to the causing of pollution and environmental harm apply, as will the provisions of relevant subsidiary legislation, including the *Environmental Protection (Unauthorised Discharges) Regulations 2004*.

#### Residual Risk Assessment

*Consequence:* Major

*Likelihood:* Unlikely

*Risk Rating:* Medium

#### **Bulk and satellite fuel facilities**

##### Emission Description

*Emission:* Seepage of hydrocarbons to soil or groundwater from leaking bulk and satellite fuel facilities. Hydrocarbon spills outside of containment infrastructure during refuelling and fuel transfer activities.

*Impact:* Contamination of soil and/or groundwater, impacting the health of ecosystems receiving groundwater in the area.



**Controls:** Spills and leaks are attended to immediately at the fuel facilities and regular visual inspections are conducted to ensure storage containers are not leaking. The Licensee has committed to complying with the Water Quality Protection Guideline No. 10 *Mining and Mineral Processing, Above-ground Fuel and Chemical Storage* and relevant standards and guidelines, including AS 1940:2004 for all tanks over 5,000 litres in capacity and the *Dangerous Goods (Storage and Handling of Non-explosives) Regulations 2007*.

The existing two tanks at the main fuel farm have a leak detection system built into the concrete pad underlying the tanks. Frequent inspections are undertaken to identify leaks. Both bulk fuel tanks have six outlet pipes that run under the tank floor and drain into a bunded area if a leak occurred. The capacity of the bunded area is sufficient to contain the volume of fuel released from one of the two bulk fuel storage tanks.

Spill trays and other containment mechanisms are used during maintenance activities to prevent spills and self bunded diesel gensets and drip trays are used when refuelling.

#### Risk Assessment

**Consequence:** The impact from spills/leaks of hydrocarbons from bulk and satellite storage areas could result in mid-level onsite impacts and low level offsite impacts at a local scale. Therefore, the consequence is moderate.

**Likelihood:** Based on the existing Licensee controls (regular inspections of storage areas, leak detection on main fuel tank) an environmental impact from spills/leaks from hydrocarbon storage areas will probably not occur in most circumstances. Therefore, the likelihood of the consequence is unlikely.

**Risk Rating:** Comparison of the consequence and likelihood ratings described above with the risk rating matrix (Table 2) determines the overall rating of risk for leaks/spills of hydrocarbons to the environment from fuel storage areas to be **medium**.

#### Regulatory Controls

The leak detection system built into the main fuel farm will identify leaks which may impact on the environment. Condition 1.2.3 requires the Licensee to undertake daily inspections of the bulk fuel facility leak detection system to ensure leaks are identified and attended to. Sumps and storage ponds at the Premises that could potentially contain hydrocarbon contaminated waters are also required to maintain a vertical freeboard of 200 mm in accordance with condition 1.2.2.

Regulatory controls are also imposed through the *Dangerous Goods Safety Act 2004*, general provisions of the EP Act and *Environmental Protection (Unauthorised Discharges) Regulations 2004*.

#### Residual Risk Assessment

**Consequence:** Moderate

**Likelihood:** Unlikely

**Risk Rating:** Medium

#### **TSFs**

Approximately 6.2 mtpa of tailings residue, a by-product of the wet processing, is disposed of via deposition into IPTSFs. The Licensee has four TSFs (Brampton TSF, Daydream TSF, Hamilton TSF and Hook TSF) at capacity and is currently operating its fifth (Brampton Phase 3 TSF).

The Brampton Phase 3 TSF is an above ground facility, which overlies the Brampton Phase 1 and 2 below ground (but above watertable) TSFs. The Brampton Phase 3 TSF is expected to reach full capacity by the end of 2019.



**This amendment – November 2018**

**Brampton IPTSF**

The Licensee currently dewateres the Brampton Southern Strips pit to allow mining below the pre-mining ground water level. This pit has been excavated to a Reduced Level (RL) of approximately 360 m Australian Height Datum (AHD) at its lowest point. The mined out pit void walls forms the southern eastern and western boundaries of the IPTSF and an existing waste rock dump forms the northern boundary of the IPTSF. Decommissioning of the dewatering boreholes will result in groundwater inflow into the pit.

The Licensee is proposing to construct and operate the Brampton IPTSF at the Premises, with tailings deposited subaqueously i.e. groundwater allowed to partly rebound (temporary standing water) before tailings deposition commences. The design capacity of the Brampton IPTSF is 77 to 85 million tonnes.

The Brampton IPTSF will be filled in two stages:

- Stage 1 will involve filling to approximately RL 410 m (subaqueous), based on the pre-mining water table at approximately RL 410 m; and
- Stage 2 will involve filling to RL 423 m (at the deposition point) (subaerial) without the need for additional containment.

The *TSF Design Report* states “The maximum tailings elevation for the IPTSF is limited to RL 423 m at the discharge location. In order to provide an operational freeboard of 0.3 m and a contingency freeboard of 0.5 m below the lowest point of the pit rim, assuming a 0.3% beach slope, the lowest final tailings elevation (in the western end) is RL 416.3 m”.

The maximum operating level to safely contain the extreme storm and the wet season allowance has been calculated as RL 418.1 m (calculated for a 0.3% beach slope, which is the expected slope above RL 410 m) as shown in Table 3.

<b>Table 3: Brampton IPTSF water operating levels</b>	
<b>Volume/Level</b>	<b>Base case (0.3%)</b>
Lowest pit wall elevation RL (m)	421.0
Maximum operating level (MOL) RL (m)	418.1
Normal operating level (NOL) RL (m)	417.4
Maximum tailings elevation at deposition point RL (m)	423.0

The Brampton IPTSF will provide approximately 11 years of tailings storage capacity and a capacity of approximately 85.4 million tonnes. The general layout of the Brampton IPTSF is shown in Figure 2.

Tailings Deposition Strategy

Tailings slurry will be discharged from a single open-ended disposal point, located at the north-east end of the IPTSF. The *TSF Design Report* recommends that there be “a sufficient distance between the deposition point and the northern boundary wall at any given time, so as to minimise erosion of the waste dump and/or pit embankment face”. The deposition pipeline will be shortened/retracted up the ramp as the tailings level increases.

The tailings deposition pipeline has been added to condition 1.2.9 of the Licence for construction requirements.

Tailings Delivery Pipelines

Tailings material will be conveyed to the Brampton IPTSF from the OPF via one of four pipeline options shown in Figure 3.



All pipeline routes follow existing road networks and pipeline corridors, where possible. No disturbance of native vegetation is expected for the construction of the pipelines.

Flow meters will be installed at the start and near the end of the deposition pipelines (or as close to the end as operationally possible). Pressure sensors will be installed along deposition pipelines. This will provide a leak detection capability to the OPF control room.

The tailings delivery pipelines have been added to condition 1.2.9 of the Licence for construction requirements.

#### Decant Return Water Pipeline

The supernatant pool will be located against the western end of the pit. Once the tailings level reaches the natural watertable, the supernatant water will be reclaimed from the south-western side of the IPTSF. Given that the tailings will be deposited subaqueously, the decant return infrastructure will likely not be installed for several years following the commencement of deposition. The decant water will be returned to the OPF for reuse, should the water quality be suitable for use for processing.

A water pump may be used to recover water from the IPTSF. The pump and suction line will be located on an existing ramp within the IPTSF and relocated as the decant pond forms and moves as the IPTSF fills with tailings material.

The decant pipeline route may travel from the western end of the pit and returned to the OPF for reuse. Where possible the decant water line may utilise the existing pipeline installed for the Bampton Phase 3 TSF decant water return pipeline.

Decant return water pipeline construction requirements have been added to condition 1.2.9.

#### Access Ramp

Safe access for water decant return will be provided by means of the existing pit ramp in the south-western corner. Safety bunds are required on the boundaries of the IPTSF to prevent access.

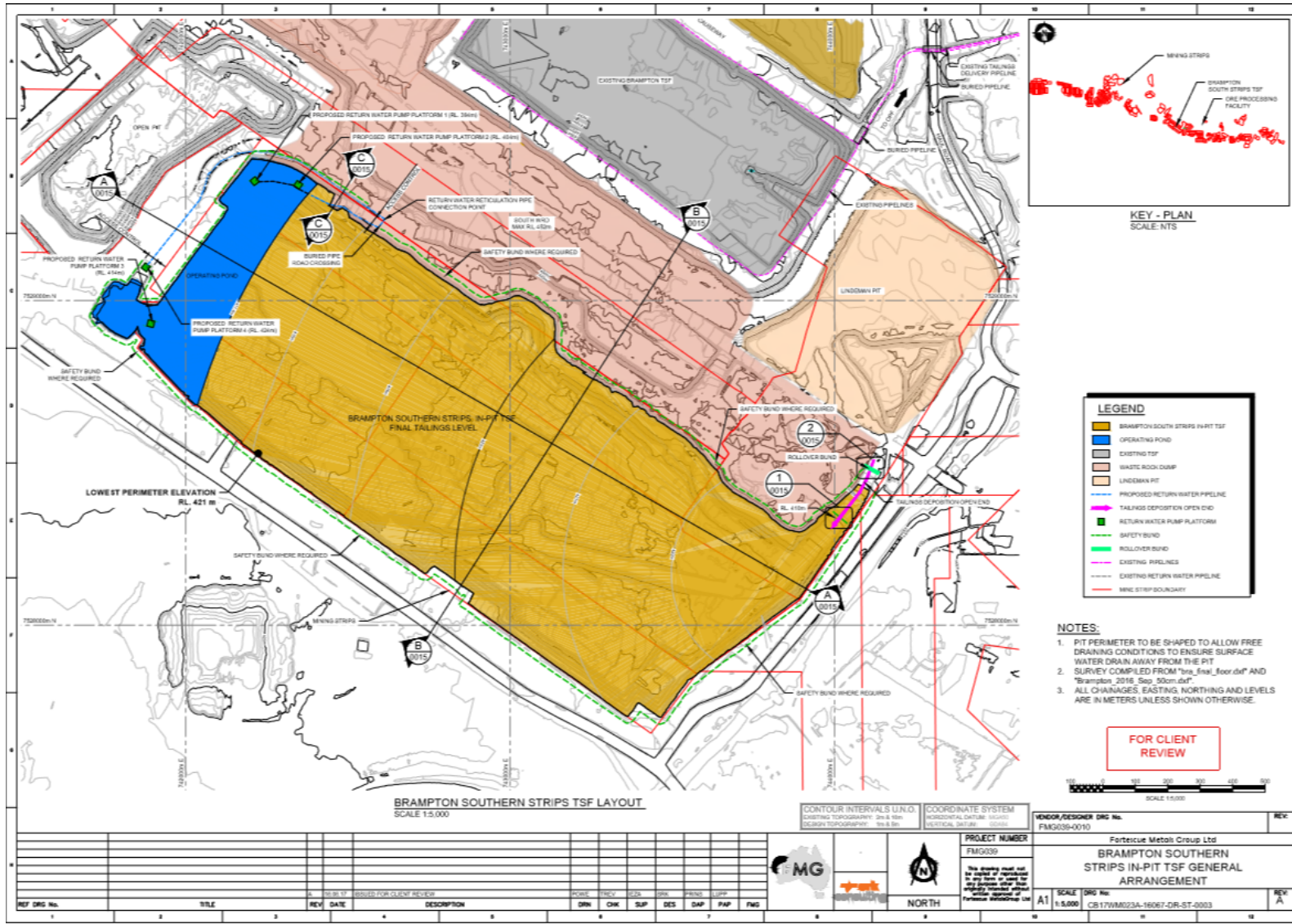


Figure 2: Brampton IPTSF layout

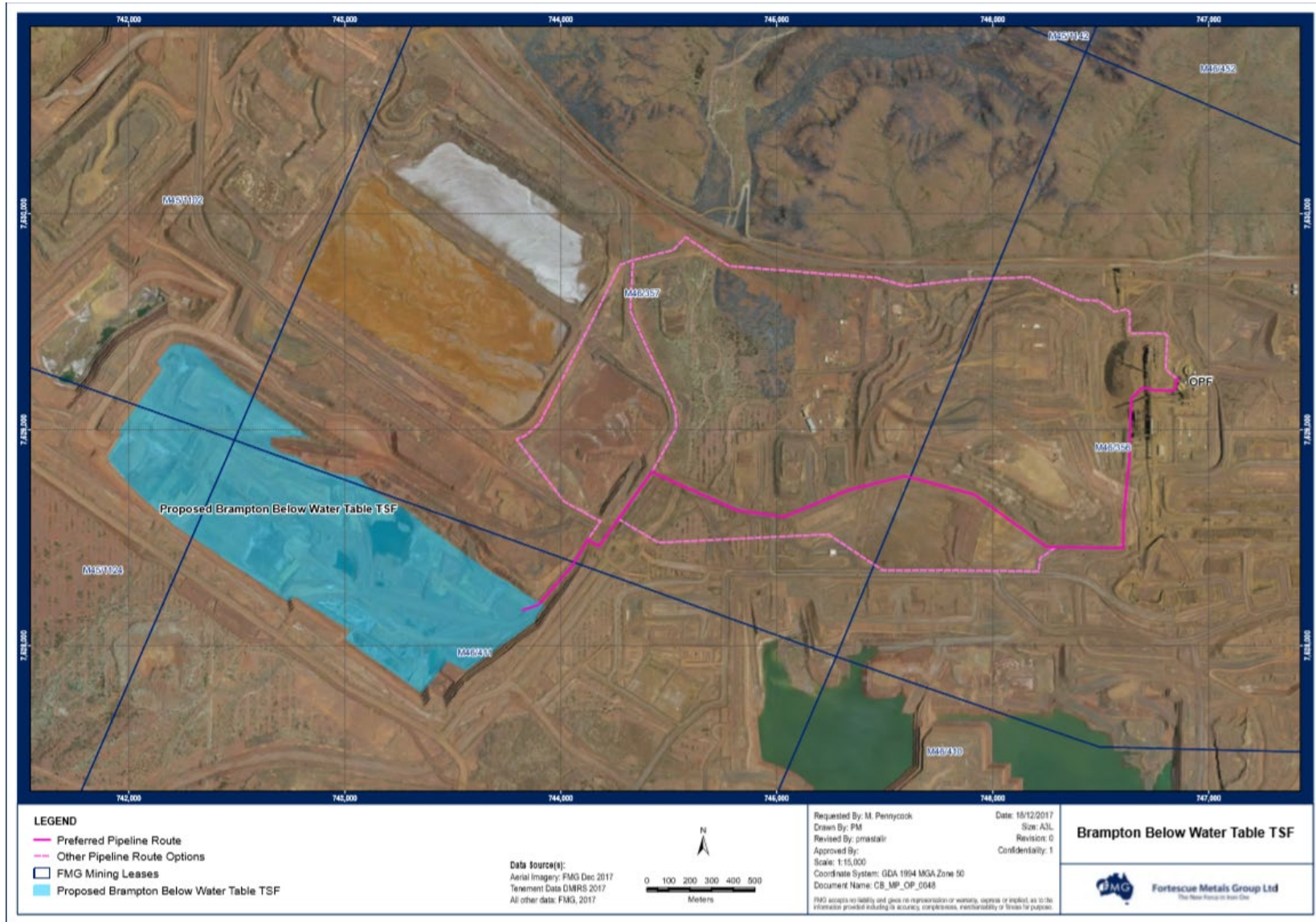


Figure 3: Brampton IPTSF and pipeline routes



### **Normal Operation**

#### Emission Description

*Emission:* Tailings produced through the beneficiation of iron ore deposited into the Brampton IPTSF. Seepage from the Brampton IPTSF into surrounding groundwater. Acidic and/or metalliferous drainage from embankment construction materials and tailings could occur.

The fresh groundwater that rides over the diffuse saline water interface near the Fortescue Marsh discharges to the surface, which is a potential groundwater pathway to transmit chemical constituents into the Fortescue Marsh. It is acknowledged that the water is lost by evaporation so a distinct seepage face will not appear at the surface. Similarly, brine beneath the marsh area is also recirculating and also discharges to the surface near the edge of the marsh, bringing nutrients and other chemical constituents to the surface within the wetland.

While there is a potential pathway to the Fortescue Marsh, the rate of transmission is likely to be very slow due to the low permeability of the sediments that underlie the marsh and the very slow rate of groundwater flow and hypersaline water recirculation.

*Impact:* Increasing the water table from seepage may impact on local vegetation, if it results in the growth medium becoming water logged. Mulga (*Acacia aneura*) is widespread in the surrounding mine site area and particularly prone to impacts from groundwater mounding. Seepage may impact on groundwater quality by changing the salinity of the aquifer or increasing metals' concentration in underlying soils or groundwater.

*Controls:* The periodic removal of supernatant water will encourage consolidation of tailings to minimise seepage. Supernatant water has a neutral pH and brackish salinity which is comparable to the local groundwater quality.

The Licensee requested SRK Consulting (Australasia) Pty Ltd (SRK) to undertake the design of the Brampton IPTSF and to update the Groundwater Impact Assessment (GIA) for tailings deposition below the pre-mining water table.

The GIA states the following:

- *“Given the high anticipated groundwater inflow into the pit, tailings would be deposited subaqueously in the pit until such time as the tailings elevations exceed the rebounding water table. As a result, water quality in the pit would represent a mixture of the inflowing groundwater and the tailings water. Initially, inflows from groundwater would be high relative to the tailings water and the water quality would approximate the groundwater quality. As the tailings (and water level) rises, hydraulic gradients toward the void would decrease and the rate of groundwater inflow would slow so that porewater quality in the void would become increasingly more similar to the tailings water quality. Once the pre-mining water table elevation is reached, the hydraulic gradients would reverse and water would be discharged from the tailings locally to groundwater system”.*
- TDS in groundwater initially decreases as a result of dilution of groundwater inflow by the lower TDS tailings supernatant water. The TDS concentrations then stabilises at approximately 15,300 mg/L, which is below the local groundwater TDS concentration of approximately 21,000 mg/L.
- Groundwater flows through the tailings below RL 410 m (pre-mining elevation) would occur at a limited rate (11,200 m<sup>3</sup>/year) due to the low permeability of the tailings (K~10<sup>-9</sup> m/s).
- *“At a regional scale, the groundwater flow would not be affected detrimentally and no change in water quality (i.e. TDS concentration) of the local and regional groundwater flow system is expected to occur in the future. No impact on the downgradient Fortescue Marsh is therefore expected”.*



Tailings material and tailings supernatant representative of the material proposed for deposition below the watertable in the Brampton IPTSF has been analysed with the finding detailed below (Application, 2018):

- Tailings material characterisation indicates no likelihood of acid generation;
- Tailings material characterisation indicates a low likelihood of aluminium, barium, chromium, copper and zinc available to leach;
- Tailings supernatant analyses indicate a high likelihood of cadmium, chromium, mercury, rubidium, uranium and zinc, with a low likelihood of boron and fluoride being detected in any seepage. All these metals are detected above limits of reporting frequently but occur at low concentrations.

The Delegated Officer acknowledges that under geochemically reducing conditions; cadmium, zinc, cobalt, mercury, nickel, antimony, selenium and thallium are elements of potential environmental concern that could have elevated concentrations in leachate after a prolonged period of leaching. Solubility is likely to be enhanced under hypersaline conditions due to the formation of highly soluble metal/metalloid chloride complexes. The Delegated Officer understands that the potential leaching of these elements has been tested, with the exception of thallium. Thallium is known to be highly toxic to a range of environmental receptors, including livestock, and is included in the analytical suite monitored in groundwater at the TSFs.

The Delegated Officer accepts that locally elevated concentrations of selenium and mercury in groundwater at the Premises are unlikely to cause environmental impacts as there is not a substantial groundwater pathway to transmit these contaminants to environmental receptors.

*DWER, 2018* states that as iron-ore tailings contain no sulfide minerals, it is often assumed that these materials will produce leachate that is environmentally benign. However, this is not necessarily the case because of chemical reactions that can take place on the surfaces of many iron oxide mineral particles, particularly when these surfaces are relatively fresh having been subject to crushing associated with mining processes.

*“Many iron oxide minerals have a large specific surface area and are capable of adsorbing a wide range of metals, metalloids and inorganic anions under a range of pH and oxidation-reduction conditions. If these conditions change through processes such as through the deposition of tailings sub-aerially from materials excavated from below the water table (or vice versa), some adsorbed chemical constituents can be released into leachate from tailings materials, potentially causing adverse impacts on groundwater or soil pore-water quality, even under near-neutral pH conditions (Wong and Tam, 1977; Wilken, 2012).*

*Freshly-exposed surfaces of many iron-ore minerals are also powerful catalysts that react with water to form highly toxic reactive oxygen species (particularly the hydroxyl free-radical) which can produce runoff that is harmful to many aquatic organisms (Payne et al., 1998; Hamoutene et al., 2000; Payne et al., 2001; Fåhreus-Van Ree and Payne, 2005; Veronez et al., 2016). Although this issue is unlikely to affect groundwater quality because reactive oxygen species will decompose in the subsurface, there is the potential for significant offsite environmental impacts to occur if surface runoff from iron ore tailings materials is allowed to discharge into sensitive receiving environments.*

*A third potential source of chemical constituents that have the potential to cause groundwater contamination near iron-ore waste rock dumps and TSFs are residues of explosives that are used in mining, particularly nitrate and ammonium ions (Morin and Hutt, 2009) and, to a lesser extent, perchlorates (Bailey et al., 2012). At some sites, perchlorate concentrations in groundwater from explosives residues have the potential to reach levels that are unsuitable for livestock water supplies. Therefore this chemical constituent should generally be included in analytical suites for groundwater monitoring near iron-ore waste rock dumps and TSFs in the Pilbara region”.*



### Risk Assessment

**Consequence:** The Delegated Officer has considered the findings of the *GIA* and determined that low level onsite impacts and minimal offsite impacts at a local scale will occur from TSF seepage. Therefore the consequence is minor.

Studies conducted by the Licensee have demonstrated a low risk of generation of acidic and/or metalliferous drainage from the embankment construction materials and tailings.

The Delegated Officer notes that the Licensee is currently implementing the *Acid and/or Metalliferous Drainage Management Plan* (100-PL-EN-1016), under MS 899 which assesses the risk to the environment from the disturbance and exposure of the earth through mining activities, including the TSFs.

**Likelihood:** An environmental impact due to TSF seepage will probably not occur in most circumstances. Therefore, the likelihood of the consequence is unlikely.

**Risk Rating:** Comparison of the consequence and likelihood ratings described above with the risk rating matrix (Table 2) determines the overall rating of risk for TSF seepage to the environment to be **medium**.

### Regulatory Controls

The Delegated Officer has applied ambient environmental monitoring requirements under condition 3.6.1 to determine if seepage from the deposition of tailings is impacting on groundwater levels and water quality in the vicinity of the TSFs. The results of this monitoring will be reported via the Annual Environmental Report (AER) (condition 4.2.1) and the Licensee is required to compare these results against background water levels and quality and/or triggers to determine if impacts are occurring to groundwater.

The Licensee is proposing to continue the existing groundwater monitoring regime initiated for the Brampton Phase 3 TSF for the Brampton IPTSF, which is located immediately downgradient of the existing Brampton Phase 3 TSF.

During this amendment (November 2018) the existing ambient groundwater quality monitoring (condition 3.6.1) has been updated to include ammonium and percholate ions to ensure that the potential for contamination by explosive residues is adequately assessed at the Premises.

The Delegated Officer also notes that the environmental risks associated with acid and/or metalliferous drainage is managed under MS 899, approved under Part IV of the EP Act.

### Residual Risk Assessment

**Consequence:** Minor

**Likelihood:** Unlikely

**Risk Rating:** Medium

### ***Abnormal Operation/Emergency Situation***

#### Emission Description

**Emission:** Overtopping of the TSF, rupture of the tailings and return water pipelines, releasing tailings or return water into the surrounding environment.

**Impact:** Deterioration of surface water, soil and groundwater quality. A spill of tailings may impact on surrounding vegetation, dependant on location and volume of waste discharged.



*Controls:* A number of design and operating controls have been implemented at the Premises to prevent the release of surface water and tailings from the TSFs. These measures include:

- TSF designed to accommodate rainfall from a 1 in 100 year ARI, 72-hour duration storm event;
- Maintenance of a minimum 0.3 m operational freeboard;
- Contingency freeboard of 0.5 m below the lowest point of the pit rim;
- Daily inspections to ensure that the freeboard is being maintained;
- TSFs and associated pipelines are located in already disturbed areas; and
- Tailings decant water is of brackish quality which does not represent a significant risk to the environment.

#### Risk Assessment

*Consequence:* Based on the geochemical characterisation of the tailings/return water and location of infrastructure in already disturbed areas an environmental impact from discharge of tailings or return water could result in low level onsite impacts and minimal off site impacts at a local scale. Therefore, the consequence is minor.

*Likelihood:* Based on the Licensee controls in place (freeboard, daily inspections) an environmental impact due to tailings and return water discharges will probably not occur in most circumstances. Therefore, the likelihood of the consequence is unlikely.

*Risk Rating:* Comparison of the consequence and likelihood ratings described above with the risk rating matrix (Table 2) determines the overall rating of risk for tailings and return water discharging to the environment to be **medium**.

#### Regulatory Controls

The Delegated Officer has applied condition 1.2.1 to ensure that systems are in place to monitor and isolate pipelines transferring tailings and return water. Conditions 1.2.2 and 1.2.3 specify the Licensee's controls with respect to maintaining adequate freeboard on the TSFs and conducting daily visual integrity inspections of tailings, water return lines and the TSFs embankment freeboard.

Condition 1.2.4 requires the Licensee to undertake an annual water balance for the TSFs. During this amendment (November 2018) condition 4.2.1 has been updated to ensure the annual water balance is reported as part of the AER.

Also, during this amendment (November 2018) condition 1.2.2 has been updated to specify the maximum operating level and maximum tailings elevation for the Brampton IPTSF.

#### Residual Risk Assessment

*Consequence:* Minor

*Likelihood:* Unlikely

*Risk Rating:* Medium

#### **Saline Water Pipelines**

##### Emission Description

Groundwater abstracted to facilitate mining below the water table is transferred to the bore reinjection system via a network of pipelines, which are raised or buried at regular intervals to allow the flow of the surface water and aid in the movement of fauna.

*Emission:* Spill of saline water from above ground pipelines.

*Impact:* A spill of saline water may impact on conservation significant Mulga vegetation health dependant on location.



**Controls:** All water conveyance infrastructure is inspected daily by maintenance personnel, checking for water leaks, controls and condition of containment dams.

The Licensee has undertaken improvements to the saline conveyance infrastructure at the Premises to improve the management of the potential risks associated with the uncontrolled release of saline water to the environment. The Licensee has identified environmentally sensitive areas (Figure 4) where telemetry infrastructure has been installed on existing water pipelines, with the aim of improving the detection of uncontrolled releases to accelerate the Licensee's response, thereby minimising environmental impacts.

Flow meters and pressure gauges are located at key locations on transfer pipelines, approximately every 1 km, to allow the Licensee to undertake water balance calculations and identify if there are any losses from the system. A notification message (SMS) is sent when the flow meters detect any unplanned reduction in flow so corrective management actions can be implemented. If leaks are detected, the location is isolated and repaired. Flow meters on all bores are tested for accuracy and calibrated by in-situ validation, twice a year or as per manufacturer specifications. Valves are regularly installed along bulk lines to allow for isolation of sections should damage occur, or for maintenance activities.

On 30 June 2016, the Licensee submitted the *Saline Water Infrastructure Environmental Improvement Assessment* which identified environmentally sensitive areas containing Mulga (*Acacia aneura*) or Phreatophytic (*Eucalyptus camaldulensis* and *Eucalyptus victrix*) dominated vegetation units in areas that are not scheduled for mining or other ground disturbing activities within the current five year mine plan. A leak detection system has been implemented at the Premises using telemetry infrastructure on the pipelines in the environmentally sensitive areas potentially at risk of being impacted by unplanned discharges of saline/hypersaline water.

The method for leak identification is via automated Volume Flow Balance (VFB) analysis using data based algorithms and rules. The *Chichester Saline Water Leak Detection System Summary of Commissioned Works* states "This solution provides for a combination of optimal leak detection capabilities with practical engineering incorporation into existing operations and will facilitate a basis for effective response in the event of a detected leak".

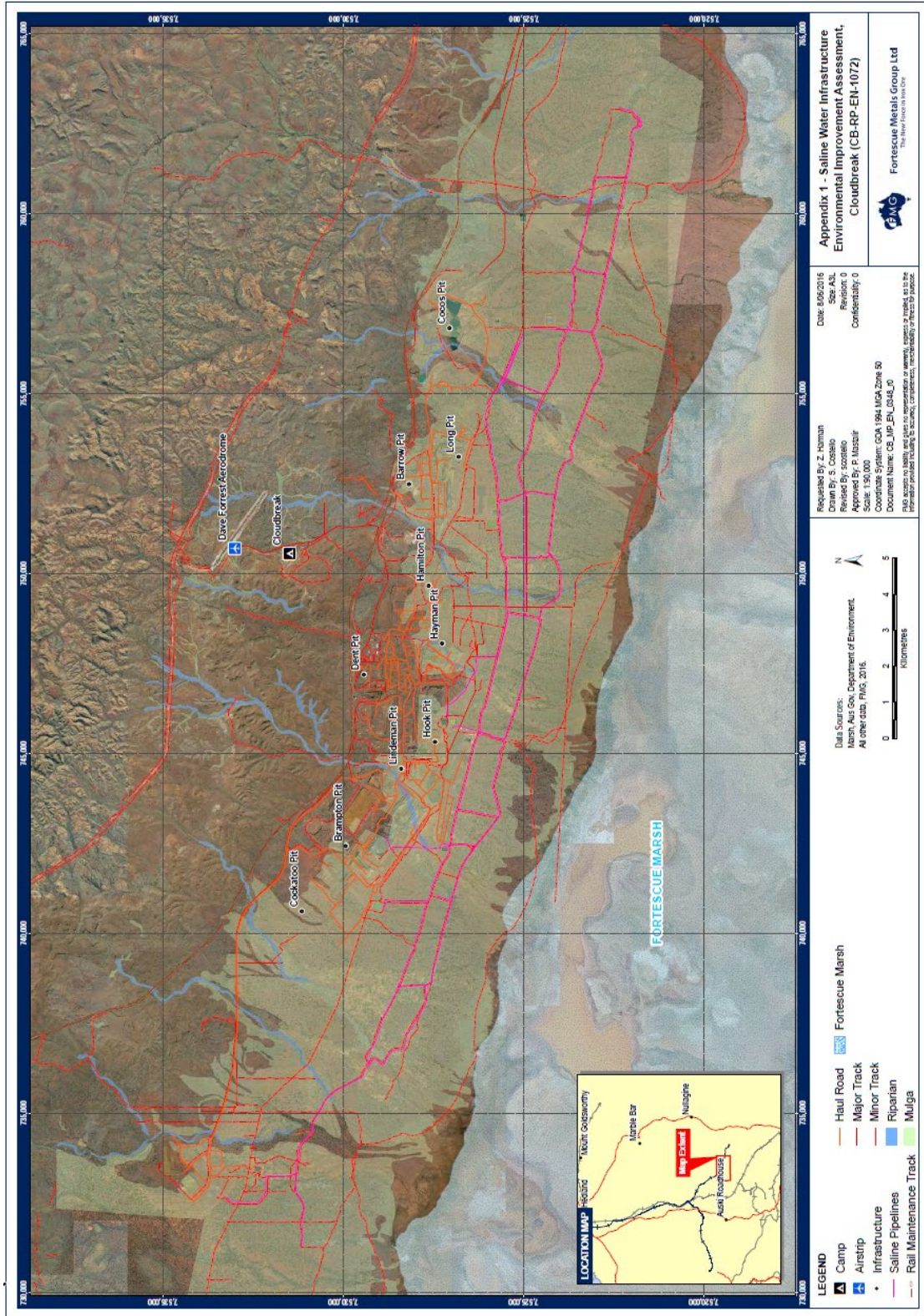


Figure 4: Map of environmentally sensitive areas



Risk Assessment

**Consequence:** Based on previous incidents involving unplanned discharges of saline water at the Premises and that significant volumes of saline/hypersaline water is conveyed across the Premises (150 GLpa). Discharges of saline/hypersaline water could result in midlevel onsite impacts to Mulga and/or Phreatophytic vegetation exposed. Therefore, the consequence is moderate.

**Likelihood:** Based on the Licensee’s controls (daily visual inspections and telemetry system on pipelines in environmentally sensitive areas) and previous incidents, an impact to vegetation from the discharge of saline/hypersaline water could occur at some time. Therefore, the likelihood of the consequence is possible.

**Risk Rating:** Comparison of the consequence and likelihood ratings described above with the risk rating matrix (Table 2) determines the overall rating of risk for discharges of saline water from pipelines during operation to be **medium**.

Regulatory Controls

To ensure that pipeline leaks, ruptures and/or spills are identified and responded to quickly, condition 1.2.3 requires daily visual inspections of saline water infrastructure, including saline pipelines; consistent with the Licensee’s existing controls.

On 10 October 2017 and 10 July 2018, the Licensee submitted the *Chichester Saline Water Leak Detection System Summary of Detailed Engineering Works* and *Chichester Saline Water Leak Detection System Summary of Commissioned Works* respectively, to satisfy conditions 1.2.11 and 4.3.1 (for condition 1.2.11) for Phases 1 and 2 works.

During this amendment (November 2018) condition 1.2.1 has been updated to include the high risk saline pipelines to ensure systems are in place to monitor and isolate pipelines transferring this water.

Previous conditions 1.2.10 and 4.3.1 (for condition 1.2.10) as shown below have been removed.

1.2.10 *The Licensee shall implement a leak detection system on the saline/hypersaline pipelines, as identified on the map of environmentally sensitive areas depicted in Schedule 1, in accordance with the following implementation schedule:*

- (a) *Phase 2 – Installation, testing and commissioning of the leak detection system to be completed by quarter 4 of the 2018 financial year.*

<b>Table 4.3.1: Notification requirements</b>			
<b>Condition or table (if relevant)</b>	<b>Parameter</b>	<b>Notification requirement<sup>1</sup></b>	<b>Format or form<sup>2</sup></b>
1.2.10	Saline/hypersaline water pipeline telemetry installation	Within 14 days of the completion of works, notify the CEO in writing on the completion of Phase 2 of the saline/hypersaline leak detection system, and provide a report to the CEO which describes the work undertaken and outcome of implementation.	None specified

Residual Risk Assessment

**Consequence:** Moderate

**Likelihood:** Possible

**Risk Rating:** Medium



**Transfer and settlement ponds**

Emission Description

*Emission:* Spill of saline water from overtopping of transfer and settlement ponds.

*Impact:* A spill of saline water may impact on vegetation health dependant on location.

*Controls:* Leak detection is undertaken via regular visual inspections of pipework, ponds and fittings. Information collected on the saline transfer ponds, via telemetry includes water level, distance to overflow and water level trends. This information is displayed as live data, displayed remotely and SMS messages are sent for any breaches in pre-set levels. There is also the ability to control pumps remotely. A 200 mm vertical freeboard is maintained on all transfer and settlement ponds.

Risk Assessment

*Consequence:* The environmental impact from discharges of saline/hypersaline water from ponds to the environment could result in low level onsite impacts. Therefore, the consequence is minor.

*Likelihood:* Based on the Licensee’s controls (daily visual inspections and telemetry systems) an impact to vegetation from the discharge of saline/hypersaline water from the overtopping of saline ponds will not occur in most circumstances. Therefore, the likelihood of the consequence is unlikely.

*Risk Rating:* Comparison of the consequence and likelihood ratings described above with the risk rating matrix (Table 2) determines the overall rating of risk for discharges of saline water from the overtopping of saline ponds during operation to be **medium**.

Regulatory Controls

The Delegated Officer has given regard to the Licensee’s controls and considers that daily visual inspections and the use of telemetry infrastructure lower the likelihood of an environmental impact occurring.

Condition 1.2.2 specifies waste containment infrastructure utilised at the Premises, including the saline water ponds, and the requirements to be maintained on this infrastructure to ensure a sufficient level of environmental protection is achieved, including the maintenance of a minimum vertical freeboard to prevent overtopping and a HDPE liner.

Residual Risk Assessment

*Consequence:* Minor

*Likelihood:* Unlikely

*Risk Rating:* Medium

During this amendment (November 2018) the construction requirements in Table 1.2.6 of Amendment Notice 1 (as shown below) for the Norfolk and Kangaroo transfer ponds have been removed. The *Norfolk and Kangaroo Transfer Ponds Compliance Documents No. 1, No. 2 and No.3* were submitted to DWER on 12 April 2018, 18 April 2018 and 30 April 2018.

<b>Table 1.2.6: Infrastructure requirements <sup>1</sup></b>	
<b>Infrastructure</b>	<b>Specifications (design and construction)</b>
Norfolk and Kangaroo transfer ponds	<p><i>Transfer ponds</i></p> <ul style="list-style-type: none"> <li>• HDPE liner/concrete or similar impermeable layer; and</li> <li>• Minimum vertical freeboard of 200 mm</li> </ul> <p><i>Pipework</i></p> <ul style="list-style-type: none"> <li>• HDPE; and</li> <li>• Flow meters and pressure gauges installed</li> </ul>



## Landfill

### Emission Description

The Licensee operates a landfill for disposal of up to 10,000 tonnes of putrescible and inert waste per annum. Inert materials (tyres, disused pipelines and concrete) and untreated wood is disposed of in mining pits and waste rock dumps.

*Emission:* Potential leachate generation from inert and putrescible landfills.

*Impact:* Contamination of soil and groundwater, impacts to ecosystems receiving groundwater discharge from the addition of hydrocarbons, nutrients and heavy metals.

*Controls:* Depth to groundwater is currently 25 m below ground level (mbgl) and generally flows in a southerly direction towards the Fortescue Marsh, located approximately 4 km from the landfill. There is no potable drinking water supply bores located down gradient of the landfill. The nearest minor water course is 80 m from the landfill and the nearest major water course is 220 m from the landfill.

Waste is segregated on its arrival to the landfill facility with any potentially hazardous materials kept within appropriately lined areas. Waste is assessed to ensure it meets the *Landfill Waste Classification and Waste Definitions 1996*, prior to disposal.

Excavated material is stockpiled to act as bunds on three sides of each trench and a windrow of 1 m at the perimeter of each trench prevents surface water runoff. Runoff drains to a sump.

The Licensee undertakes groundwater monitoring at the landfill to identify potential impacts to groundwater from leachate.

Trenches are rehabilitated with topsoil and revegetation in accordance with the *Revegetation Management Plan* required by condition 14 of MS 899.

### Risk Assessment

*Consequence:* The environmental impact associated with landfill leachate could result in midlevel onsite impacts and low level offsite impacts at a local scale. Therefore, the consequence is moderate.

*Likelihood:* Based on the depth to groundwater (25 m), surface water management and distance to the closest water course (80 m) an impact to groundwater and aquatic ecosystems is unlikely to occur. The *2017 AER Appendix 15* for the landfill groundwater monitoring states “*organic fractions do not indicate any risk of contamination from petroleum hydrocarbons*”. Therefore, the likelihood of the consequence is unlikely.

*Risk Rating:* Comparison of the consequence and likelihood ratings described above with the risk rating matrix (Table 2) determines the overall rating of risk for leachate from the landfill during operation to be **medium**.

### Regulatory Controls

The Delegated Officer has specified waste management requirements under condition 1.2.5 and landfill cover requirements under condition 1.2.6. These conditions ensure appropriate waste acceptance and management is implemented on site, consistent with the assessed design capacity of the landfill.

Ambient groundwater monitoring requirements for the landfill are specified under condition 3.6.1 to determine if leachate is impacting on groundwater, consistent with the Licensee's controls. Monitoring results are reported annually for review in the AER required under condition 4.2.1.



### Residual Risk Assessment

*Consequence:* Moderate

*Likelihood:* Unlikely

*Risk Rating:* Medium

### **Bioremediation facility**

#### Emission Description

*Emission:* Runoff contaminated with hydrocarbons and heavy metals discharged to the environment. Bioremediated soils are reused onsite for landfill cover, disposed of to the landfill or reused generally around the Premises as required.

*Impact:* Contamination of soil and groundwater from hydrocarbons and heavy metals. Potential for migration to surface water drainage systems in times of high rainfall. Potential impacts to the Fortescue Marsh, which receives groundwater and surface water from the project area.

*Controls:* The Licensee has developed and implements the *Bioremediation Facility Management Procedure* to manage the bioremediation facility at the Premises. This procedure outlines the design and construction, construction, operation and maintenance requirements for bioremediation facilities operated at the Premises.

The site is generally flat and there are no surface bodies within at least 50 m of the facility. The underlying alluvium (largely clays) is of low permeability and depth to groundwater is anticipated to be in excess of 10 mbgl.

The bioremediation facilities are lined and include a collection sump for the collection of leachate. Material is spread evenly to a thickness of no more than 300 mm and a log is kept of the date and approximate volume of soil deposited at the facility. Moisture is added weekly via a sprinkler system or water carts. The contaminated soil layer is aerated at least monthly using a tilled grader and nutrients are added as required based on results of soil samples. Moisture concentration is monitored fortnightly and results are recorded. Soil sampling is undertaken at 3 month intervals for beds undergoing treatment and recorded in the inspection register. The Licensee has advised that soil is determined suitable for reuse in accordance with the *Assessment and management of contaminated sites*.

With respect to the reuse of bioremediation soils, the Licensee will need to ensure that the Soil Ecological Screening Levels and Health Screening Levels outlined in the *Assessment of Site Contamination NEPM* are met; and will also need to develop site-specific Ecological Investigation Levels that protect groundwater quality and aquatic ecosystems from potential soil leachate in accordance with Appendix B of Schedule B5b of the *Assessment of Site Contamination NEPM*. The Delegated Officer notes the Licensee's responsibility under the *Contaminated Sites Act 2003* to report known or suspected contaminated sites to DWER.

### Risk Assessment

*Consequence:* Based on the distance to the nearest drainage line (over 50 m) and depth to groundwater (approximately 10 mbgl) contaminated runoff will result in minimal onsite impacts. Therefore, the consequence is slight.

*Likelihood:* Based on the Licensee's controls (lined cells over low permeability alluvium clays, with collection sump) an impact to groundwater and aquatic ecosystems may occur in exceptional circumstances. Therefore, the likelihood of the consequence is rare.



*Risk Rating:* Comparison of the consequence and likelihood ratings described above with the risk rating matrix (Table 2) determines the overall rating of risk for contaminated runoff from the bioremediation facility during operation to be **low**.

#### Regulatory Controls

The Delegated Officer notes the general provisions of the EP Act, with respect to the causing of pollution and environmental harm apply, as will the provisions of relevant subsidiary legislation, including the *Environmental Protection (Unauthorised Discharges) Regulations 2004*.

The Delegated Officer also notes that the provisions of the *Contaminated Sites Act 2003* also apply.

#### Residual Risk Assessment

*Consequence:* Slight

*Likelihood:* Rare

*Risk Rating:* Low



## Appendix B

### Point source emissions to air including monitoring

Point source emissions to air are generated from the Cloudbreak Power Station, which provides power for the Premises and comprises of 22 x 2.2 MW and one 2.8 MW diesel powered generators with a combined designed capacity of 52 MW.

The Existing Licence allowed for the replacement of existing G62 gensets at the Power Station with newer G63 gensets (FMG, 2015). With the new generators producing lower emissions, which should achieve the same or likely better level of protection for public health.

A comparison of emissions from the new G63 generators with the existing G62 generators is presented in Table 4 below:

<b>Table 4: Comparison of emissions from old G62 to new G63 generators</b>		
<b>Analytes</b>	<b>Emissions (mg/m<sup>3</sup>) Previous generators (G62)</b>	<b>Emissions (mg/m<sup>3</sup>) Proposed generators (G63)</b>
NO <sub>x</sub>	3758.5	2605
CO	46.5	200
SO <sub>x</sub>	<2.9	<2.9

The increase in carbon monoxide levels is not considered an issue given the low levels recorded.

Each generator has an exhaust duct, which emits to air. Key emissions are products of diesel combustion; particulates, carbon monoxide, sulphur dioxide and oxides of nitrogen (NO<sub>x</sub>).

SLR Consulting Australia Pty Ltd conducted a monitoring programme at the Cloudbreak Power Station on 21 and 22 November 2016, with Table 5 showing a summary of average results for five emission points (Emission Test Report 675.11141.00000 TR1R0).

**Table 5: Summary of Average Results – Diesel Turbine Engine A1, A2, A8, A18 and A22**

Average Parameter	Unit	Reporting Conditions	Diesel Turbine Engine A-1	Diesel Turbine Engine A-2	Diesel Turbine Engine A-8	Diesel Turbine Engine A-18	Diesel Turbine Engine A-22
Date Tested	--	--	21-Nov-16	21-Nov-16	21-Nov-16	22-Nov-16	22-Nov-16
Sample Start Time	hh:mm	WST	11:48	10:28	15:08	10:15	11:33
Sample Finish Time	hh:mm	WST	12:48	11:28	16:08	11:15	12:33
Average Stack Temperature	°C	actual	526.7	530.0	542.0	512.0	532.0
Oxygen (O <sub>2</sub> )	%	Dry, 0°C, 101.3 kPa	8.6	9.0	9.2	9.9	8.6
Nitrogen oxides (NO <sub>x</sub> as NO <sub>2</sub> )	ppm	Dry, 0°C, 101.3 kPa	1446.1	1498.7	1318.7	1777.2	1510.5
	mg/N.m <sup>3</sup>	Dry, 0°C, 101.3 kPa, 10% O <sub>2</sub>	2,624	2,825	2,521	3,609	2,752
	g/s	Dry, 0°C, 101.3 kPa	6.4	5.5	6.0	8.2	5.5
Carbon monoxide (CO)	ppm	Dry, 0°C, 101.3 kPa	140.6	146.9	135.7	167.2	118.2
	mg/N.m <sup>3</sup>	Dry, 0°C, 101.3 kPa	176	184	170	209	148
	g/s	Dry, 0°C, 101.3 kPa	0.4	0.3	0.4	0.5	0.3

FMG, 2018a states that “A total of 19 of these 22 gensets at the power station have been replaced, with three remaining”.



During this amendment (November 2018) the Licensee proposes to replace the 2.8 MW genset with a 2.2 MW G63 generator, which has resulted in a change in the category 52 design capacity from 52 MW to 50.6 MW.

The Licensee is also proposing to install three, 1.6 MW emergency back-up diesel gensets at the Cloudbreak power station to provide emergency redundancy in the event of genset failure. The Licensee has stated (FMG, 2018c) that "*there is a high expectation load demand for the upcoming summer period that will exceed peaks of 35 MW which leaves the power station with little to no redundancy. In addition to this, should any existing gensets become unavailable due to failure, there is a high risk of operational outages or production restrictions*". "*The existing generation units at the power station de-rate to approximately 1.6 MW per unit due to the high temperatures during the summer period*". Therefore, given this reduced capacity and requirement for the three gensets as emergency back-up, no change is proposed to the 50.6 MW design capacity for category 52.

#### Emission Description

*Emission:* Combustion gases (CO, NO<sub>x</sub>, SO<sub>x</sub>, BTEX (benzene, ethyl benzene and xylene) and particulates) from diesel generators (normal operation).

*Impact:* Reduced local air quality at the nearest sensitive receptors, being Marillana Station (approximately 31.5 km away) and Bamboo Springs (approximately 34.8 km away).

*Controls:* The Licensee has employed technologies to ensure air emissions from the power station comply with the European and USEPA Tier 1 emission standards.

The Licensee has advised that greenhouse gas emissions are managed in accordance with the relevant sections of FMG's *Carbon Acquittal Management Plan* (August, 2012) and the *Greenhouse Gas Emissions and Energy Reporting Management Plan* (June, 2011). Greenhouse gas emissions are also reported to the National Pollutant Inventory (NPI).

The diesel fuel used in the engines is BP G10, which has a low sulphur specification and meets the ASTM 2D diesel fuel standard of the United States of America.

#### Risk Assessment

*Consequence:* The nearest human receptor is Marillana Station, located approximately 31.5 km from the Premises. The Delegated Officer considers this is a sufficient buffer, and there will be minimal impacts to the health and amenity of this receptor. Therefore, the consequence is slight.

*Likelihood:* An impact to sensitive receptors would only occur in exceptional circumstances. Abatement and maintenance procedures are in place. Therefore, the likelihood of the consequence is rare.

*Risk Rating:* Comparison of the consequence and likelihood ratings described above with the risk rating matrix (Table 2) determines the overall rating of risk for air emissions during operation to be **low**.

#### Regulatory Controls

The Delegated Officer has specified the point source air emission locations under condition 2.1.1. The risk associated with point source air emissions has been assessed as low, therefore no further regulatory controls are being applied to the Licence.

During this amendment (November 2018) the following changes have been made to the Licence in relation to category 52 and the Power Station:



- Condition 1.2.8 updated to change the design capacity of category 52 from 52 MW to 50.6 MW;
- Condition 1.2.9 for the construction requirements for the power station generators has been changed to remove reference to eight (8) x G62s gensets and replaced with four (4) – “Replacement of 4 x G62s gensets with G63s gensets”; and
- Condition 2.1.1 has been updated to remove reference to the 1 x 2.8 MW Cummins diesel genset; updated to read 23 (rather than 22) x 2.2 MW diesel gensets; and inclusion of 3 x 1.6 MW emergency back-up diesel gensets.

The Licensee will be required to report air emissions to DWER annually through the annual fee application process. The Licensee will be required to include the air emission calculations as part of the annual fee submission, based on an appropriate emission estimation technique, for example monitoring data, NPI guides or emission factors.

Residual Risk Assessment

*Consequence:* Slight

*Likelihood:* Rare

*Residual Risk Rating:* Low



## Appendix C

### Point source emissions to surface water including monitoring

#### Emission Description

*Emission:* In the event that it is not able to be managed through reuse, bore reinjection or in pit disposal or temporary storage, excess mine dewater may be discharged via three discharge points to ephemeral creeks, draining south towards the Fortescue Marsh.

*Impact:* Impacts to the riparian vegetation communities in the ephemeral creeks.

Discharges of excess mine dewater has the potential to impact on the natural surface flow regime of the Fortescue Marsh, impact on vegetation (in particular Samphire) and habitat for species of national significance.

The Fortescue Marsh is the largest ephemeral wetland in the Pilbara and is of high conservation value with species of national significance and is part of a complex array of alluvial aquifers and groundwater systems. The Marsh has been divided into six zones with two each of high environmental significance, medium environmental significance and low environmental significance. Zone 1a, of high environmental significance, is located on the northern side of the Marsh, closest to the contingency discharge points.

*Controls:* The Licensee has developed the *Dewatering Contingency Discharge Procedure* (CH-PR-EN-0003\_Rev4, FMG December 2014) to ensure that the contingency discharge of groundwater is appropriately managed at the Premises.

Dewatering discharge at designated discharge points is only undertaken as a contingency measure, where levels of Electrical Conductivity (EC) in the water to be discharged is less than 15,000  $\mu\text{S}/\text{cm}$  and where turbidity level in the water to be discharged is less than 100 nephelometric turbidity units (NTU). Water quality is monitored prior to, during and at the cessation of discharge.

#### Risk Assessment

*Consequence:* Based on the Licensee's controls which include discharge limits for EC and turbidity; low level onsite impacts and minimal offsite impacts at a local scale could occur from the contingency discharge of mine dewater. Therefore, the consequence is minor.

*Likelihood:* The impact to sensitive receptors will not occur in most circumstances, as the contingency discharge is used infrequently, only in the event that reuse, reinjection, in pit disposal and temporary storage are not available or been exhausted. Therefore, the likelihood of the consequence is unlikely.

*Risk Rating:* Comparison of the consequence and likelihood ratings described above with the risk rating matrix (Table 2) determines the overall rating of risk for the contingency discharge of mine dewater to creek lines to be **medium**.

#### Regulatory Controls

Condition 2.2.1 specifies the three emissions points from which the contingency discharge of mine dewater may occur in the event that reuse, reinjection, in pit disposal and temporary storage are not available or have been exhausted.

Condition 3.2.1 specifies limits for EC and NTU, consistent with the Licensee's controls specified in the *Dewatering Contingency Discharge Procedure*, which were considered by the Delegated Officer



in assessing the consequence of the contingency discharge. The Licensee will also be required to monitor the cumulative volume of discharge during contingency discharge events.

Condition 4.3.1 requires the Licensee to report to DWER following a contingency discharge, including the results of the monitoring undertaken during the event.

Residual Risk Assessment

*Consequence:* Minor

*Likelihood:* Unlikely

*Risk Rating:* Medium



## Appendix D

### Point source emissions to groundwater including monitoring

The Delegated Officer notes that environmental impacts associated with changes to groundwater levels as a result of the reinjection of mine dewater have been assessed and are regulated under Part IV of the EP Act.

Condition 6 of MS 899 was recommended by the EPA to minimise the indirect impacts from mounding, drawdown, ponding and shadowing and monitor the vegetation to ensure the indirect impacts are not greater than those predicted. Condition 6-1 of MS 899 specifies:

*“The proponent shall manage the proposal in a manner that ensure there is no adverse impact to conservation significant vegetation as a result of implementing this proposal, greater than:*

- 1. 315 hectares of Mulga vegetation;*
- 2. 763 hectares to Samphire vegetation; and*
- 3. 3 hectares to Coolibah/river Red Gum creekline vegetation, outside the Mine Envelope.”*

Condition 6-2 of MS 899 specifies:

*“Within ten months from the date of issue of this Statement, the proponent shall prepare a Vegetation Health Monitoring and Management Plan for the Project Area to verify and ensure that the requirements of 6-1 shall be met”.*

Trigger levels for management actions to prevent further impacts have been established under the Plan and in the event that a trigger is exceeded, the Licensee is required to report such findings to the Chief Executive Officer (CEO) of the EPA.

Condition 7 of MS 899 was recommended by the EPA to restrict groundwater mounding and drawdown at the fringe of the Fortescue Marsh to one metre to prevent impacts to groundwater dependant vegetation.

MS 962 amended Condition 7-1 of MS 899, specifying:

*“The proponent shall manage the injection of surplus water to ensure that groundwater levels do not rise or drop by more than one metre at the fringe and within the Fortescue Marsh, from the baseline groundwater level, using a suitable network of bores at the fringe of the Fortescue Marsh as shown in Figure 2 and delineated by co-ordinates in Schedule 2, having regard for climatic trends and seasonal variation, unless prior written authorisation of the CEO has been received.”*

MS 962 amended Condition 7-2 of MS 899, specifying:

*“To verify that the requirements of Condition 7-1 are being met the proponent shall, to the requirements of the CEO:*

- 1. undertake baseline monitoring at groundwater monitoring bores located on the fringe of the Fortescue Marsh and a control bore outside impacts areas within one month of the date of issue of this Statement for currently installed bores and as soon as is practicable for the new fringe bores and the control bore...”*
- 2. establish trigger groundwater levels at locations identified in Condition 7-2(1) having regard for climatic trends and seasonal variation; and*
- 3. monitor groundwater levels monthly at a minimum at locations identified in Condition 7-2(1).*



MS 1010, which approved the increase in mine dewatering and reinjection to 150 GLpa, requires the Licensee to implement the increased rate of abstraction and reinjection subject to the implementation conditions in MS 899, as amended by the implementation agreement set out in MS 962.

The Delegated Officer has considered the requirements of Part IV of the EP Act, and with respect to the reinjection of mine dewater has restricted DWERs assessment to potential environmental impacts to changes to groundwater quality.

#### Emission Description

*Emission:* Groundwater is abstracted from dewatering borefields to enable below water table mining. Water is used for dust suppression, ore processing, earthworks and construction. Excess groundwater abstracted from the dewatering operation is reinjected into suitable aquifers.

Groundwater injection is undertaken with brackish water in areas west of the active mining area and typically targets the Marra Mamba Formation. There is currently no active brackish injection occurring at the Premises.

Saline injection is undertaken between the southern limit of the resource area and the northern limit of the Fortescue Marsh. The Oakover Formation is the target aquifer of the injection. It has a salinity which is typically between 30,000 mg/L and 150,000 mg/L. At each injection location there is generally a flow meter and a down-hole water level sensor. The down-hole and flow sensors are complemented by regular visual inspections of the pipework and fittings and manual recordings of meter readings. Saline reinjection accounts for all water reinjected at the Premises.

*Impact:* Changes in groundwater quality as a result of the discharge of higher salinity water into fresh water zones of the aquifer. Changes to groundwater quality may impact the health of groundwater dependant vegetation. Impacts to other groundwater users in the area (pastoral bores). Saline water injected into areas with fresh or brackish water quality (less than 6,000 mg/L TDS) has the potential to increase salinity. Salinity above 6,000 mg/L TDS could limit the potential use of the water for stock watering and other beneficial uses.

*Controls:* Reinjection is carried out in accordance with the *Operational policy 1.01 - Managed aquifer recharge in Western Australia*.

Saline and brackish dewatering and injection is undertaken separately to minimise impacts to groundwater quality. The Licensee has indicated that impacts to groundwater salinity due to saline injection are expected to be minimal as the receiving aquifer for saline mine dewater is saline and confined. Brackish reinjection is not currently being undertaken at the Premises.

In the *Cloudbreak Life of Mine PER*, a commitment was made to set a goal for water management that the salinity of groundwater with high beneficial use will be maintained below 6,000 mg/L.

Saline water is injected into the Oakover formation at depths well below the water table. As the Oakover calccrete aquifer has much higher permeability than the overlying tertiary detritals, the flow will be lateral as opposed to upwards meaning that salt transport to the surface unconfined aquifer will not occur.

The Licensee monitors groundwater levels and field EC monthly at pastoral bores to ensure the water resource is being maintained.

Groundwater abstraction at the Premises is currently regulated pursuant to the RIWI Act. The *Cloudbreak Groundwater Operating Strategy*, prepared as a condition of the 5C licence, outlines the planned operation of dewatering, injection and process water supply systems at the Premises and the management systems that will be employed to monitor and mitigate potential impacts.



Monthly monitoring of the standing water level and EC in pastoral bores is undertaken by the Licensee, in accordance with the *Cloudbreak Groundwater Operating Strategy*. Data is reported quarterly in accordance with conditions of the 5C licence.

The Licensee has implemented an extensive monitoring bore network to measure impacts of groundwater dewatering, reinjection and borefield operations on water resources, the environment and other users. Ambient groundwater monitoring is undertaken twice yearly from a number of locations across the brackish and saline injection areas.

#### Risk Assessment

*Consequence:* Low level offsite impacts could occur to sensitive receptors from changes to groundwater quality as a result of reinjection of mine dewater. Therefore, the consequence is moderate.

*Likelihood:* An impact to sensitive receptors could occur at some time. Therefore, the likelihood of the consequence is possible.

*Risk Rating:* Comparison of the consequence and likelihood ratings described above with the risk rating matrix (Table 2) determines the overall rating of risk for the reinjection of mine dewater to be **medium**.

#### Regulatory Controls

Condition 2.3.1 specifies the groundwater emissions points, comprising of reinjection bores located in the saline and brackish injection zones.

During this amendment (November 2018) the reference to “As shown on the maps of brackish and saline injection bores in Schedule 1” has been removed from Table 2.3.1 and replaced with the actual saline and brackish injection bore names.

Condition 3.3.1 specifies four points along the water conveyance infrastructure from which reinjection water is monitored, one location for the sampling of brackish water and three locations for the sampling of saline water.

Condition 3.6.1 includes ambient groundwater monitoring requirements to identify potential impacts to groundwater quality and levels as a result of reinjection of mine dewater. The monitoring of pastoral bores has not been included as the monthly monitoring of standing water levels and EC is undertaken by the Licensee in accordance with the approved *Cloudbreak Groundwater Operating Strategy*.

Under condition 4.2.1, the Licensee will be required to report the results of monitoring to DWER in the AER for review.

The Delegated Officer is not proposing conditions relating to the monitoring of vegetation health to determine impacts associated with mounding of groundwater as a result of reinjection as sufficient regulatory control is provided under Part IV of the EP Act, as described above.

#### Residual Risk Assessment

*Consequence:* Moderate

*Likelihood:* Possible

*Risk Rating:* Medium



## Appendix E

### Emissions to land including monitoring

There is one main WWTP at the Cloudbreak Camp. The design capacity of this WWTP is 600 m<sup>3</sup>/day and treated wastewater is disposed of via irrigation to a designated spray field. There are two WWTPs within the mine area, known as Jacanas. The design capacities of these plants are 63 m<sup>3</sup>/day and 31.5 m<sup>3</sup>/day. Processing is commenced at the Jacanas WWTP to start bacterial breakdown. The partially treated wastewater is then transported to the Cloudbreak Camp WWTP for final processing and disposal via irrigation.

#### **Normal operation**

##### Emission Description

*Emission:* Treated effluent from the Cloudbreak Camp WWTP discharged to land via irrigation to an 18.3 ha spray field.

*Impact:* Effluent discharged as irrigation to land has the potential to result in degraded or waterlogged land, with soil or groundwater contamination arising where the effluent is either saline, turbid, nutrient enriched, and/or contaminated with metals. Secondary impacts to vegetation may also result from effluent discharge that is of poor quality or in quantities such that offsite impacts may occur.

*Controls:* The WWTP and associated irrigation area is located above the 100 year ARI flood level for the area and are enclosed with an approved fence. The depth to groundwater within the WWTP location is greater than 10 m.

The irrigation area is located on a relatively flat area to ensure that erosion or waterlogging does not occur. High evaporation rates mean that waterlogging is unlikely. All effluent is passed through a water meter prior to discharge to the spray irrigation area and the rate of discharge is limited to minimise the potential for impacts to the environment.

Table 6 shows the WWTP sampling results for 2016, with all results below the plant specifications.

**Table 6: WWTP Sampling Results (2017 AER)**

Parameter	Biological Oxygen Demand (mg/L)	Total Suspended Solids (mg/L)	pH (Lab)	Total Nitrogen (mg/L)	Total Phosphorus (mg/L)	<i>E.coli</i> (cfu/100ml)
Plant specifications	20	30	6.5 – 8.5	30	12	1000
Q1 2016	<5	21	7.85	10.46	1.68	<1
Q2 2016	<5	<5	7.80	17.00	2.80	<1
Q3 2016	<5	<5	8.00	9.20	1.50	<1
Q4 2016	<5	<5	7.79	11.00	5.10	<1



The Licensee undertakes daily and weekly inspections of the WWTP and irrigation area, which are reported in a log sheet. Tanks are fitted with overflow alarms so that an immediate response can be initiated.

The Licensee has developed the *Cloudbreak Life of Mine Surface Water Management Plan* (CB-PL-EN-0023, 2013), required under MS 899, for the management and mitigation of potential impacts to surface water.

#### Risk Assessment

*Consequence:* Based on the siting of the WWTP (above the 100 year ARI flood level), the high evaporation rates in the Pilbara region, depth to groundwater (approximately 10 m) and local hydrology (surface and groundwater flows towards the Fortescue Marsh); low level onsite impacts and minimal offsite impacts at a local scale could occur as a result of the irrigation of treated wastewater or tank overflow. Therefore, the consequence is minor.

*Likelihood:* Based on the Licensee's controls (frequent inspections, appropriately sized irrigate area) an environmental impact will not occur in most circumstances. Therefore, the likelihood of the consequence is unlikely.

*Risk Rating:* Comparison of the consequence and likelihood ratings described above with the risk rating matrix (Table 2) determines the overall rating of risk for the irrigation of treated wastewater to be **medium**.

#### Regulatory Controls

Condition 2.4.1 is imposed to specify the emission point to land.

Condition 3.4.1, requires the Licensee to monitor water quality on a quarterly basis. Limits for wastewater quality have not been included in the Licence, however the Licensee will be required to report the quarterly monitoring results in the AER and provide an interpretation of the results against the design specifications of the WWTP.

The general provisions of the EP Act, with respect to the causing of pollution and environmental harm will apply, as will the provisions of relevant subsidiary legislation, including the *Environmental Protection (Unauthorised Discharges) Regulations 2004*.

#### Residual Risk Assessment

*Consequence:* Minor

*Likelihood:* Unlikely

*Risk Rating:* Medium



## Appendix F

### Fugitive Dust

#### Emission Description

*Emission:* There is the potential for dust to be generated from mining related activities such as crushing and screening, stockpiling, machinery loading, train loading and vehicle movement. Dust is also generated during periods of high winds, low rainfall and high evaporation rates. The dust emissions should be relatively inert being predominantly iron ore.

*Impact:* Dust containing particles of less than 10 micrometres in diameter have been associated with diminishing lung function and dust in high volumes does interfere with comfort and amenity for the public.

The Premises is between 1 km to 10 km from the Fortescue Marsh and is partially located within the Northern Flank Management Zone 1a, which is regarded as having high conservation value, and also in Zone 3b which has a low level of conservation significance (EPA Report 1484).

Localised impacts on vegetation from dust deposition can occur due to dust forming a physical barrier, restricting photosynthesis and respiration. Dust can also be abrasive to the leaf surface which may result in decreased productivity and changes to the vegetation structure. Fauna can also be expected to be impacted upon by dust emissions either directly or indirectly as the vegetation is used for habitat or a source of food. Any impact to flora is likely to be reversed during rainfall events during the wet season, thus long term impacts are not likely.

*Controls:* The closest human receptor is located over 30 km from the Premises.

The following management measures are implemented at the Premises to minimise fugitive dust emissions:

- Dust scrubbers and/or water sprays at each load and discharge point and every transfer point with extraction from secondary crushers, sizers and screeners, conveyor and feeder transfer points;
- Water sprays are used on stackers; and
- Water carts are used on roadways.

Dust emissions from the mobile crushing and screening plants is minimised through the use of water sprays and/or water trucks to suppress dust from crushed product stockpiles, dust suppression sprays fitted to screens, transfer points and crushing units and the enforcement of speed limits in work areas.

The Licensee has developed and implements the *Mine and Rail Dust Management Plan* (August 2011, 45-PL-EN-00300), required under MS 707, which sets out the key management actions for the management of dust emissions from the Licensee's mine and rail activities, including this Premises.

#### Risk Assessment

*Consequence:* Based on the distance to the nearest sensitive receptor (over 30 km) minimal impacts to the amenity of this receptor will occur. The Delegated Officer has determined that minimal onsite impacts to vegetation will occur. Even in areas most impacted by dust it is likely that the natural dust tolerance of Pilbara vegetation species will prevent widespread vegetation impacts. Therefore, the consequence is slight.



*Likelihood:* Based on the Licensee's controls to manage dust (dust scrubbers, water sprays, water carts) adverse impacts to the environment from fugitive dust emissions will not occur in most circumstances. Therefore, the likelihood of the consequence is unlikely.

*Risk Rating:* Comparison of the consequence and likelihood ratings described above with the risk rating matrix (Table 2) determines the overall rating of risk for fugitive dust emissions to be **low**.

#### Regulatory Controls

The Delegated Officer is not applying any specified conditions relating to fugitive dust emissions as the risk has been assessed as low given the location of the Premises relative to the nearest sensitive receptor (over 30 km from the Premises).

The general provisions of the EP Act, with respect to the causing of pollution and environmental harm will apply.

#### Residual Risk Assessment

*Consequence:* Slight

*Likelihood:* Unlikely

*Risk Rating:* Low

#### **Fugitive light**

##### Emission description

*Emission:* Light spillage from operational areas.

*Impact:* Potential impacts on sensitive fauna species.

*Controls:* The Licensee has developed and implements the *Conservation Significant Fauna Management Plan* (100-PL-EN-0022) to satisfy the requirements of approvals issued under Part IV of the Act.

A key management action specified in this plan is the direction of lighting onto active construction and operational areas to minimise the potential for light overspill resulting in fauna disturbance, injuries or death.

#### Risk Assessment

*Consequence:* Low level onsite impacts and minimal offsite impacts at a local scale will occur to sensitive fauna. Therefore, the consequence is minor.

*Likelihood:* The impact to sensitive receptors could occur at some time; the Premises operates 24 hours a day and light spillage from operational areas during night operations is possible. Therefore, the likelihood of the consequence is possible.

*Risk Rating:* Comparison of the consequence and likelihood ratings described above with the risk rating matrix (Table 2) determines the overall rating of risk for fugitive light emissions to be **medium**.

#### Regulatory Controls

The Delegated Officer is not applying specific regulatory controls relating to light emissions at this time as the *Conservation Significant Fauna Management Plan* includes provisions relating to the protection of sensitive fauna species from light spillage.

The general provisions of the EP Act, with respect to the causing of pollution and environmental harm will apply.



Residual Risk Assessment

*Consequence:* Minor

*Likelihood:* Possible

*Risk Rating:* Medium



## References

	Document title	In text ref	Availability
1	A Directory of Important Wetlands in Australia (Third Edition), Environment Australia, 2001	A Directory of Important Wetlands in Australia	accessed at <a href="http://www.environment.gov.au">www.environment.gov.au</a>
2	Additional change to Proposed Draft Amendment of Cloudbreak Licence L8199/2007/2 (UID-85155), FMG, 8 November 2018	FMG, 2018c	DWER records (A1737503)
3	Amendment Notice 1 – Licence L8199/2007/2 Cloudbreak Iron Ore Mine, amended 27 February 2018	Amendment Notice 1	accessed at <a href="http://www.dwer.wa.gov.au">www.dwer.wa.gov.au</a>
4	Annual Environmental Monitoring Report – 2017 (100-RE-EN-9675), FMG, March 2018	2017 AER	DWER records (A1654681)
5	Application to Amend Licence L8199/2007/2 Cloudbreak Mine (UID-80413. ELP 96), FMG, 29 May 2018	FMG, 2018a	DWER records (A1683045)
6	Are metal mining effluent regulations adequate: identification of a novel bleached fish syndrome in association with iron-ore mining effluents in Labrador, Newfoundland? <i>Aquat. Toxicol</i> , 52, 311-317, Payne, J.F., French B., Hamoutene D., Yeats, P., Rahimtula, A., Scruton, D., and Andrews, C. 2001	Payne et al., 2001	DWER records (A1697300)
7	Assessment and management of contaminated sites, Contaminated sites guidelines, Department of Environment Regulation, December 2014	Assessment and management of contaminated site	accessed at <a href="http://www.dwer.wa.gov.au">www.dwer.wa.gov.au</a>
8	Bioremediation Facility Management Procedure – Cloudbreak (CB-PR-EN-0043)	Bioremediation Facility Management Procedure	FMG internal
9	Brampton In-pit TSF Groundwater Impact Assessment (FMG039), prepared by SRK Consulting (Australasia) Pty Ltd for Fortescue Metals Group Ltd, July 2017	GIA	DWER records (A1683045)
10	Brampton Southern Strips In-Pit Tailings Storage Facility Detailed Design, FMG Document Number: CB17WM023A-16067-RP-EG-0003, prepared by SRK Consulting (Australasia Pty Ltd) for Fortescue Metals Group Ltd, July 2017	TSF Design Report	DWER records (A1683045)
11	Chichester Saline Water Leak Detection System Summary of Detailed Engineering Works – Chichester Water Management Telemetry and Controls Project (CH-00000-RP-EG-0001, FMG Engineering, 29	Chichester Saline Water Leak Detection System Summary of Detailed Engineering Works	DWER records (A1702259)



	Document title	In text ref	Availability
	September 2017		
12	Chichester Saline Water Leak Detection System Summary of Commissioned Works – Chichester Water Management Telemetry and Controls Project (CH-00000-RP-EG-0002, FMG Engineering, 28 June 2018	Chichester Saline Water Leak Detection System Summary of Commissioned Works	DWER records (A1702053)
13	Cloudbreak Groundwater Operating Strategy (CB-PH-HY-0009, Rev 1), Water Management, FMG, 30 June 2013	Cloudbreak Groundwater Operating Strategy	accessed at <a href="http://epa.wa.gov.au">http://epa.wa.gov.au</a>
14	Cloudbreak Life of Mine Public Environmental Review, FMG, April 2011	Cloudbreak PER	accessed at <a href="http://www.fmgl.com.au">www.fmgl.com.au</a>
15	Cloudbreak Notification Requirements – Norfolk and Kangaroo Transfer Ponds – Partial Compliance Document #1 (CB-EN-0260), FMG, 12 April 2018  Cloudbreak Notification Requirements – Norfolk and Kangaroo Transfer Ponds – Partial Compliance Document #2 (CB-EN-0260.01), FMG, 18 April 2018  Cloudbreak Notification Requirements – Norfolk and Kangaroo Transfer Ponds – Partial Compliance Document #3 (CB-EN-0260.02), FMG, 27 April 2018	Norfolk and Kangaroo Transfer Ponds Compliance Documents No. 1, No. 2 and No. 3	DWER records (A1652477, A1657373 and A1664427)
16	Cloudbreak Part V Licence Monitoring, 2017 Results Summary Memorandum (CB-RP-EN-1084_Rev0), FMG, 22 March 2018	2017 AER, Appendix 15	DWER records A1648813
17	Cloudbreak Power Station Environmental Impact Assessment, produced by Strategen for Fortescue Metals Group Limited, March, 2007	FMG, 2007	FMG internal
18	DNA oxidative damage and vitamin A reduction in fish from a large lake system in Labrador, Newfoundland, contaminated with iron-ore mine tailings. <i>Mar. Environ. Res</i> , 46(5), 289-294, Payne, J.F., Malins, D.C., Gonselman, S., Rahimtula, A. and Yeats, P.A. 1998	Payne <i>et al.</i> , 1998	DWER records (A1697300)
19	Emission Test Report 675.11141.00000.TR1R0, SLR Consulting Australia Pty Ltd, 9 March 2017	Emission Test Report 675.11141.00000.TR1R0	DWER records (A1405043)
20	Endocrine disruption in the pituitary of white sucker ( <i>Carostomus commersoni</i> ) caged in a lake contaminated with iron ore tailings. <i>Hydrobiologica</i> , 532, 221-224, Fåhreus-Van Ree, G. and Payne, J.F.	Fåhreus-Van Ree and Payne, 2005	DWER records (A1697300)



	Document title	In text ref	Availability
	2005		
21	Environmental and water assessments relating to mining and mining-related activities in the Fortescue Marsh management area: Advice of the Environmental Protection Authority to the Minister of the Environment under Section 16(e) of the <i>Environmental Protection Act 1986</i> , Environmental Protection Authority, Report 1484, July 2013	EPA Report 1484	accessed at <a href="http://www.epa.wa.gov.au">www.epa.wa.gov.au</a>
22	FW: Stakeholder Notification – L8199/2007/2 – Referral of a Licence Amendment – Request for Advice, Department of Mines, Industry Regulation and Safety, 30 August 2018	DMIRS, 2018	DWER records (A1715497)
23	Genetic and biochemical effects induced by iron ore, Fe and Mn exposure in tadpoles of the bullfrog <i>Lithobates catesbeianus</i> . <i>Aquatic Toxicology</i> , 174, 101-108, Veronez, A.C., Salla, R.V., Baroni, V.D., Bacarolli, I.F., Biachini, A., Martinez, C.B. and Chippari-Gomes, A.R., 2016. The paper is available from web site <a href="https://pdfs.semanticscholar.org/d7f0/66678a8477a8da44bcb940d0d30acab86593.pdf">https://pdfs.semanticscholar.org/d7f0/66678a8477a8da44bcb940d0d30acab86593.pdf</a>	Veronez et al., 2016	DWER records (A1697300)
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32	Licence L8199/2007/2 Cloudbreak Iron Ore Mine, amended 1 March 2017	Existing Licence	accessed at <a href="http://www.dwer.wa.gov.au">www.dwer.wa.gov.au</a>
33	Licence Amendment Application for the Power Station at the Cloudbreak Mine (L8199/2007/2), UID-53752 ELP98, FMG, dated 11 November 2015	FMG, 2015	DWER records (A1006431)
34	Mine-water leaching of nitrogen species from explosives residues. <i>Proceedings of GeoHalifax 2009</i> , Morin, K.A. and Hutt, N.M., 2009. The paper is available from web site <a href="http://citeseerx.ist.psu.edu/viewdoc/download?doi=10.1.1.520.5390&amp;rep=rep1&amp;type=pdf">http://citeseerx.ist.psu.edu/viewdoc/download?doi=10.1.1.520.5390&amp;rep=rep1&amp;type=pdf</a>	Morin and Hutt, 2009	DWER records (A1697300)
35	Ministerial Statement 899	MS 1033	accessed at
36	Ministerial Statement 962	MS 962	<a href="http://www.epa.wa.gov.au">www.epa.wa.gov.au</a>
37	Ministerial Statement 1010	MS 1010	
38	<i>National Environmental Protection (Ambient Air Quality) Measure</i>	Ambient Air NEPM	accessed at <a href="http://www.nepc.gov.au">www.nepc.gov.au</a>
39	<i>National Environment Protection (Assessment of Site Contamination) Measure 1999</i>	<i>Assessment of Site Contamination NEPM</i>	accessed at <a href="http://www.legislation.gov.au">www.legislation.gov.au</a>
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47	Salinity status classification. Understanding salinity – salinity status classification, by total salt concentration, Department of Water and Environmental Regulation	Understanding salinity	accessed at <a href="http://www.water.wa.gov.au">www.water.wa.gov.au</a>
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