



Graham Burns
Jabiru Metals Limited
85 South Perth Esplanade
SOUTH PERTH WA 6151

Dear Graham

ENVIRONMENTAL PROTECTION ACT 1986 – AMENDMENT TO WORKS APPROVAL

Works approval: W5262/2012/1
Premises: Jaguar Base Metals

Further to my letter dated 2 July 2013, please find enclosed your amended *Environmental Protection Act 1986* works approval.

If you have any questions or objections relating to the works approval, please do not hesitate to contact the enquiries officer above on (08) 9080 5555 for clarification or discussion of any grievances you have.

If you are concerned about, or object to any aspect of the amendment you may lodge an appeal with the Minister for the Environment within 21 days from the date on which this works approval is received. The Office of the Appeals Convenor can be contacted on 6467 5190 to find out the procedure and fee.

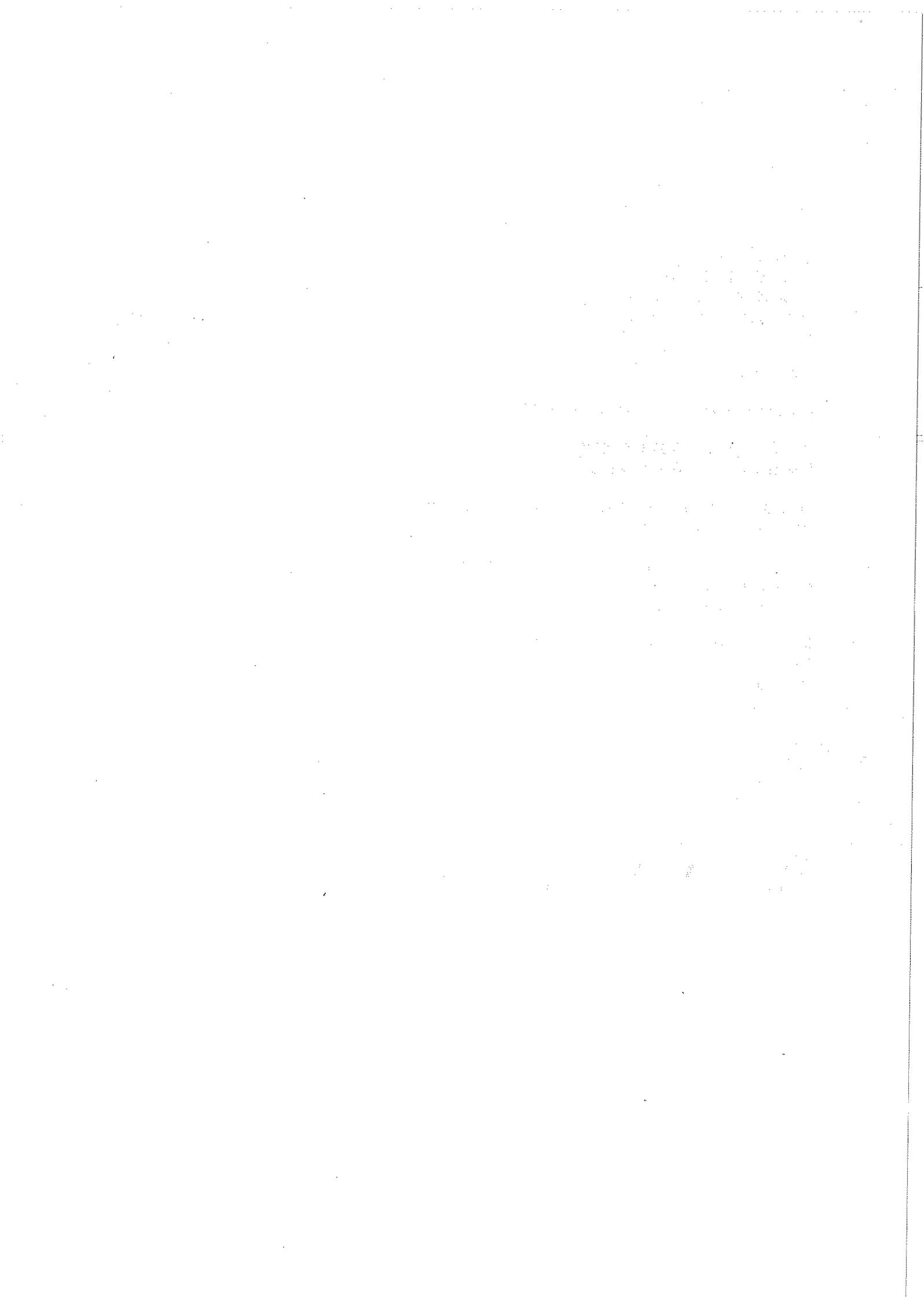
Members of the public may also appeal the amendments. The Appeals Registrar at the Office of the Appeals Convenor can be contacted after the closing date of appeals to check whether any appeals were received.

Yours sincerely,

Alan Sands
Officer delegated under Section 20
of the *Environmental Protection Act 1986*

Thursday, 25 July 2013

enc: Amended Works Approval
copy to: Local Government Authority: Shire of Leonora





WORKS APPROVAL

Environmental Protection Act 1986

AMENDED WORKS APPROVAL

WORKS APPROVAL NUMBER: W5262/2012/1

FILE NUMBER: 2012/004993

WORKS APPROVAL HOLDER

Jabiru Metals Limited
85 South Perth Esplanade
SOUTH PERTH WA 6151
ACN: 060 620 751

PREMISES

Jaguar Base Metals Project
Mining Tenements M37/44, and M37/1153.
LEONORA WA 6438
(as depicted in Attachment 1)

Environmental Protection Regulations 1987

PRESCRIBED PREMISES CATEGORY

Category 05 - Processing or beneficiation of metallic or non metallic ore

COMMENCEMENT DATE OF WORKS APPROVAL Thursday 21 March 2013

EXPIRY DATE OF WORKS APPROVAL Sunday 20 March 2016

CONDITIONS OF WORKS APPROVAL

Subject to the conditions of works approval set out in the attached pages.

DEFINITIONS (4)

GENERAL CONDITIONS (2)

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

Date of Issue: 21 March 2013

Date of Amendment: 25 July 2013

CONDITIONS OF WORKS APPROVAL

Environmental Protection Act 1986

AMENDED WORKS APPROVAL

WORKS APPROVAL NUMBER: W5262/2012/1

FILE NUMBER: 2012/004993

DEFINITIONS

In these conditions of Works Approval, unless inconsistent with the text or subject matter:

"Director" means Director, Environmental Regulation Division of the Department of Environment Regulation for and on behalf of the Chief Executive Officer as delegated under Section 20 of the *Environmental Protection Act 1986*;

"Director" for the purpose of correspondence means-

Regional Leader, Industry Regulation, Goldfields Region
Department of Environment Regulation
PO Box 10173
KALGOORLIE WA 6433

Telephone: (08) 9080 5555

Facsimile: (08) 9021 7831

"Premises" means Jaguar Base Metals Project. Mining Tenements M37/44 and M37/1153 (as depicted in Attachment 1)

"Works approval holder" means Jabiru Metals Limited

GENERAL CONDITIONS

GENERAL CONSTRUCTION AND OPERATIONAL DESCRIPTION

- 1 The Works Approval Holder shall construct the works in accordance with the works approval application form dated 16 July 2012 and the following documentation:
 - (i) Works Approval Application (Construction of 'TSF2' and Service Infrastructure Corridor). July 2012. Jabiru Metals Limited;
 - (ii) Tailings Storage Facility 2 Project Management Plan. February 2013. Independence Group NL – Jaguar Mine;
 - (iii) The written correspondence from Christian Parsons to the Department of Environment and Conservation entitled "*Re: Jaguar Operations – Further Information Requested by the DEC for Works Approval Application 'Construction of 'TSF 2' and Service Corridor'*", dated 15 August 2012;
 - (iv) The written correspondence from Christian Parsons to the Department of Environment and Conservation entitled "*Map of TSF2_Monitoring Bores*", dated 21 August 2012;
 - (v) The written correspondence from Christian Parsons to the Department of Environment and Conservation entitled "*Amendment to amount of Clearing for TSF 2*" dated 18 October 2012;
 - (vi) The written correspondence from Christian Parsons to the Department of Environment and Conservation entitled "*Re: Amendment to amount of Clearing for TSF 2*" dated 22 October 2012;
 - (vii) The written correspondence from Christian Parsons to the Department of Environment and Conservation entitled "*Additional Jaguar TSF details – Jabiru Metals Limited Responses*" dated 23 October 2012;

CONDITIONS OF WORKS APPROVAL

Environmental Protection Act 1986

AMENDED WORKS APPROVAL

WORKS APPROVAL NUMBER: W5262/2012/1

FILE NUMBER: 2012/004993

- (viii) The written correspondence from Christian Parsons to the Department of Environment and Conservation entitled "*DEC Queries February 2013*" dated 25 February 2013; and,
- (ix) Jaguar TSF 2 Works Approval Amendment Supporting Information. Independence Group. May 2013

Where the details and commitments of the documents listed in condition G1 above are inconsistent with any other condition of this Works Approval, the latter shall prevail.

SUBMISSION OF COMPLIANCE DOCUMENT

- 2 Subject to condition (1), the Works Approval Holder shall submit a compliance document to the Director following the construction of the works outlined in the Works Approval application and supporting documentation, and prior to commissioning of the same. The Compliance Document shall certify that the works were constructed in accordance with the conditions of Works Approval and documentation supporting the application to construct the works, and shall be signed by an authorised officer of Jabiru Metals Limited, with the printed name and position of that person within the company, and preferably will contain the Company seal.

CONDITIONS OF WORKS APPROVAL

Environmental Protection Act 1986

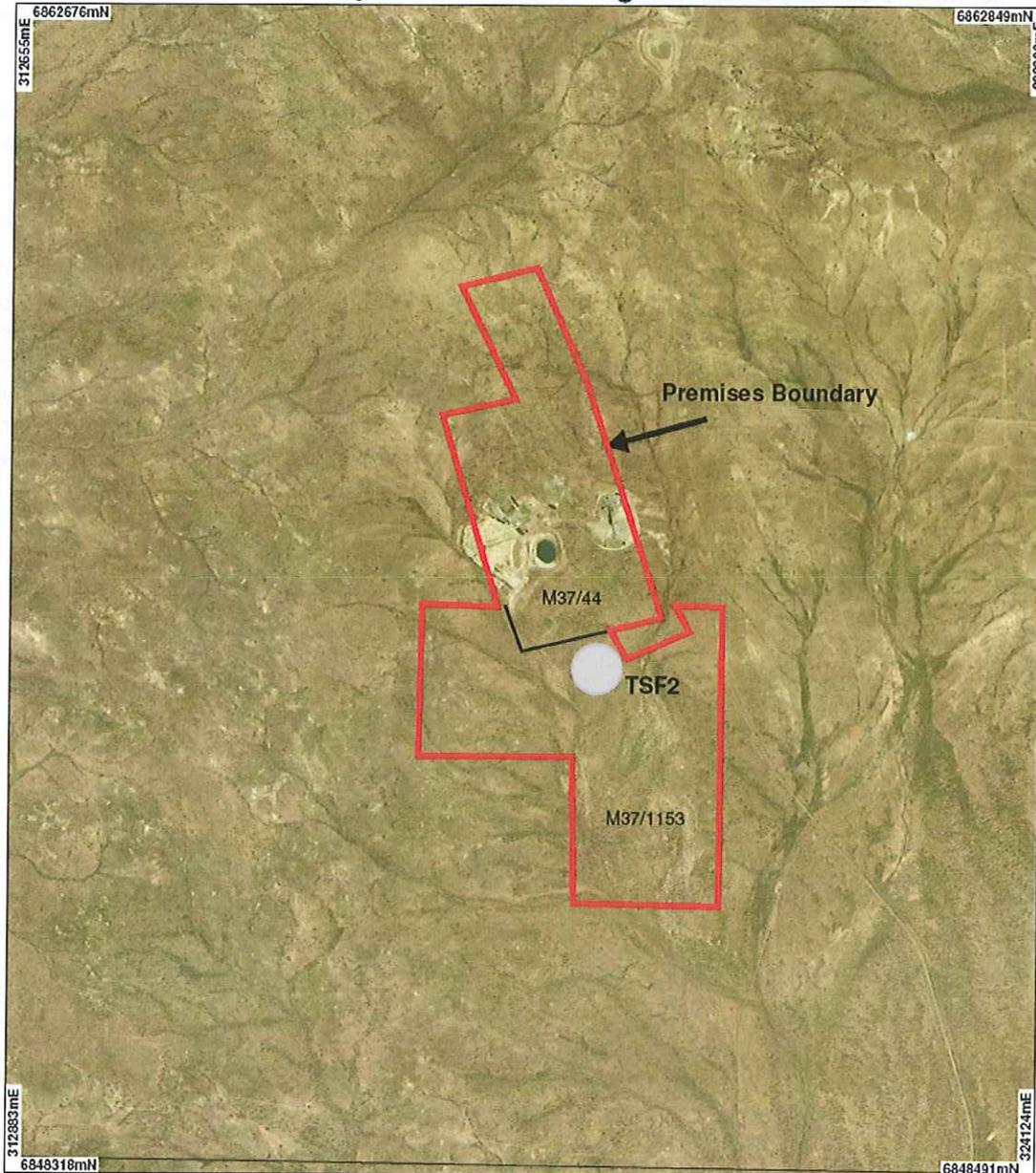
AMENDED WORKS APPROVAL

WORKS APPROVAL NUMBER: W5262/2012/1

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ATTACHMENT 1

Premise boundary for W5262 - Jaguar Base Metals TSF2



<p>LEGEND</p> <ul style="list-style-type: none"> Local Government Authorities Recently added Coverage Swan River Trust Development Control Area Weebo 1.4m Orthomosaic - Landgate 2003 Image Index (cont) 	<div style="text-align: center;"> <p>0 ——— 1.5 km</p> <p>Scale 1:61082 (Approximate when reproduced at Letter)</p> <p>Geocentric Datum Australia 1994</p> <p><small>Note: the data in this map have not been projected. This may result in geometric distortion or measurement inaccuracies.</small></p> <p>Prepared by: Jarrold Prepared for: Date: 26/02/2013 9:36:36 AM</p> </div> <p style="font-size: small;">Information derived from this map should be confirmed with the data custodian acknowledged by the agency acronym in the legend.</p> <div style="text-align: center;"> <p>Department of Environment and Conservation</p> <p style="font-size: x-small;">Our environment. our future WA Green Copyright 2002</p> </div>
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WORKS APPROVAL NUMBER: W5262/2012/1
WORKS APPROVAL FILE NUMBER: 2012/004993
APPLICATION DATE: 16/07/2012
AMENDMENT DATE: 25/07/2013
EXPIRY DATE: 20/03/2016

PREMISES DETAILS

WORKS APPROVAL HOLDER

Jabiru Metals Limited
85 South Perth Esplanade
SOUTH PERTH WA 6151
ACN: 060 620 751

PREMISES

Jaguar Base Metals Project
Mining Tenements M37/44, M37/515, M37/1132, M37/1153, M37/1228, M37/1230, M37/1231,
M37/1257, and M37/1290.
LEONORA WA 6438

PRESCRIBED PREMISES CATEGORY

Table 1: Prescribed Premises Category

Category number*	Category Description*	Category Production or Design Capacity*	Premises Production or Design Capacity#	Premises Fee Component**
5	Processing or beneficiation of metallic or non-metallic ore: premises on which – (a) metallic or non-metallic ore is crushed, ground, milled or otherwise is processed; (b) tailings from metallic or non-metallic ore are reprocessed; or (c) tailings or residue from metallic or non-metallic ore are discharged into a containment cell or dam.	50,000 tonnes or more per year	365,000 tonnes per year	More than 100,000 but not more than 500,000 tonnes per year

* From Schedule 1 of the Environmental Protection Regulations 1987

From application

** From Schedule 4 of the Environmental Protection Regulations 1987

This Environmental Assessment Report (EAR) has been drafted for the purposes of detailing information on the management and mitigation of emissions and discharges from the prescribed premises. The objective of the EAR is to provide a risk assessment of emissions and discharges, and information on the management of other activities occurring onsite which are not related to the control of emissions and discharges from the prescribed premises activity. This does not restrict the Department of Environment and Conservation (DEC) to assessing only those emissions and discharges generated from the activities that cause the premises to become prescribed premises.



Basis of Assessment

The Jaguar Base Metals Project (Jaguar) has been assessed as "prescribed premises" category (5), under Schedule 1 of the Environmental Protection Regulations 1987.

Jabiru Metals Limited (Jabiru) intends to construct a paddock style tailings storage facility (TSF) which will accept tailings from the nearby Jaguar processing facility – TSF 2. The infrastructure to be constructed to allow the storage of tailings will include:

1. Circular paddock style embankment and soil liner;
2. Herring bone and perimeter underdrainage system;
3. Causeway and return water pump;
4. Tails distribution pipeline and spigots;
5. Return water pipeline;
6. Monitoring bores; and,
7. Electricity distribution infrastructure.

This will require a works approval under section 53 of the *Environmental Protection Act 1986* (EP Act).

The intent of this EAR is to assess potential environmental impacts of emissions and discharges associated with construction works and the operational phase of the new TSF. Subsequent to construction works being completed, in accordance with section 56 of the EP Act, an amendment to the current licence (L8151/2005/1) will be required to enable operation of the new infrastructure.

This works approval is being amended to reflect design changes as detailed in Section 1.3.

a. BACKGROUND

1.1 GENERAL COMPANY DESCRIPTION

Jabiru is a fully owned subsidiary of Independence Group NL. Jabiru was first listed on the Australian Stock Exchange (ASX) in January 2000, as Pilbara Mines Limited.

The Jaguar (and Teutonic Bore) mining leases, currently managed by Jabiru, were acquired from Mount Isa Mines in 1997 for the intention of treating stockpiled surface resources and tailings. In 2001 Jabiru entered into a Joint Venture agreement with Inmet Mining (Australia) Pty Ltd to explore the Jaguar resource. In September 2004, Jabiru took 100% control of Jaguar and the Teutonic Bore Project Area.

Jabiru holds tenements north and south of the Jaguar and Teutonic Bore projects, covering a belt of 40 km strike, up to 5 km wide. Jaguar began as a copper, zinc, and silver mine in July 2007.

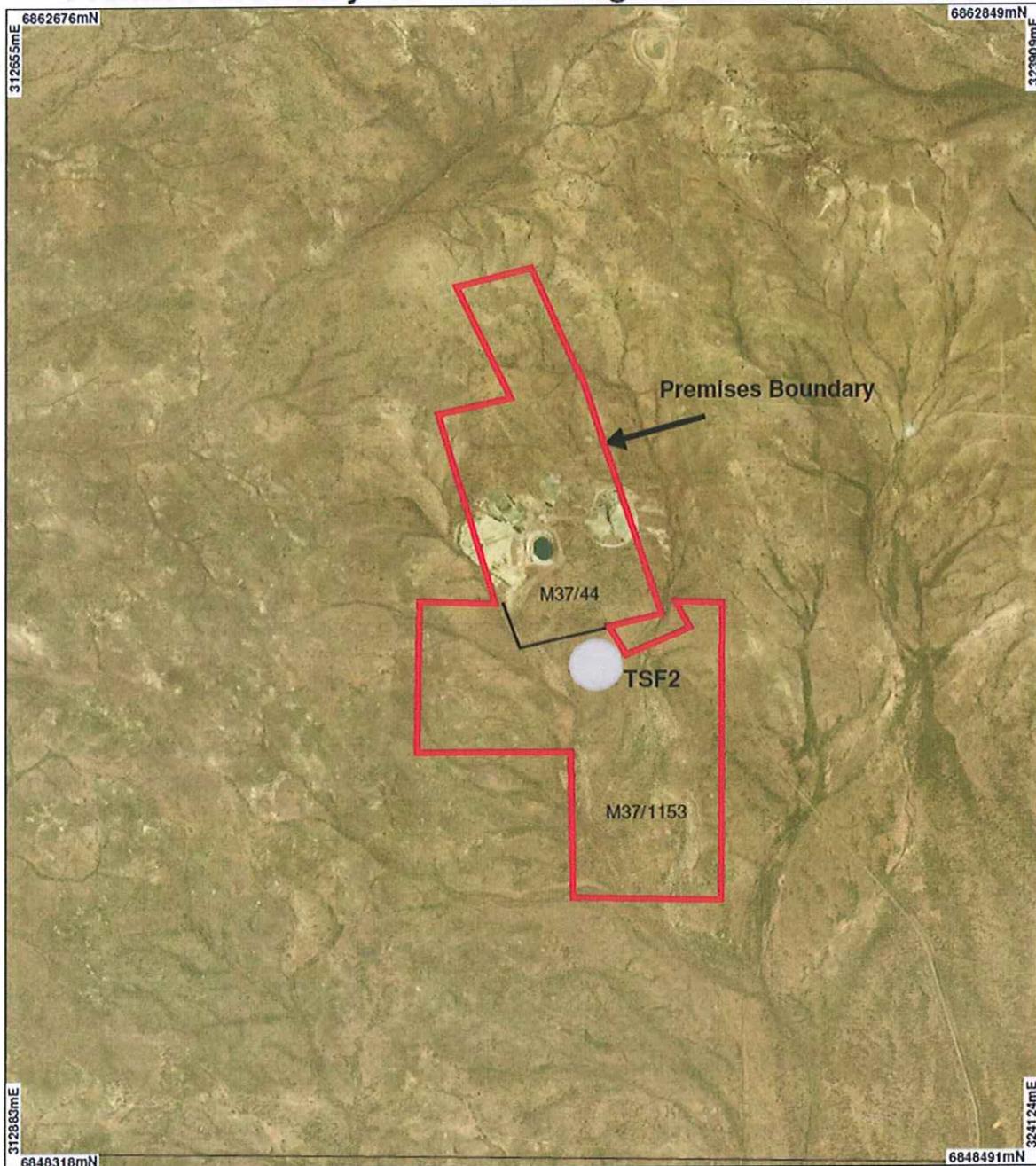
1.2 LOCATION OF PREMISES

Jaguar is located in the Leonora Mining District of the northeast Goldfields, approximately 670 kilometres northeast of Perth. The Jaguar premise boundary for the proposed TSF2 works approval is shown in Figure 1.

Overall, Jaguar operates across mining leases M37/44, M37/515, M37/1132, M37/1153, M37/1228, M37/1230, M37/1257 and M37/1290.



Premise boundary for W5262 - Jaguar Base Metals TSF2



LEGEND

- Local Government Authorities
- Recently added Coverage
- Swan River Trust Development Control Area
- Weebo 1.4m Orthomosaic - Landgate 2003
- Image Index (cont)

Scale 1:61062
 (Approximate when reproduced at 1:1000)
 Geocentric Datum Australia 1994
 Note: the data in this map have not been projected. This may result in geometric distortion or measurement inaccuracies.
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Figure 1: Premises boundary for W5262/2012/1 showing the location of the proposed TSF2



1.2.1 Soil, Geology, and Landforms

Topography is characterised by hills (to 60m relief) with stony mantles, low rises with occasional ferruginous crusts, and level to gently inclined lower stony plains incised with narrow drainage tracts. The lower plains consist of either shallow red earths and duplex soils or rocks associated with the greenstone domain. Drainage tracts are largely red clays or shallow red earths under mulga shrublands. The extensive stone mantle in this system contributes to its low susceptibility to erosion.

Drainage in the project area consists of braided channels running south to Sullivan Creek. These drainages are often wide with no strongly defined channel. There are no permanent or semi-permanent sources of surface water in the project area. The regional drainage direction is from north to south.

1.2.2 Climate

Data from the Leonora weather station is managed by the Bureau of Meteorology who describe the area as having a semi arid to arid climate. Temperatures vary from very hot in summer, with a mean maximum daily temperature of 37.1°C (January 2011), to cool during winter, with a mean minimum daily temperature of 6.1°C (July 2011).

Mean annual rainfall is 235 mm, with the highest recorded monthly total of 284mm (February 1995). The region has an average annual evaporation rate of 2990 mm.

1.2.3 Hydrogeology and hydrology

Groundwater at Jaguar forms part of the Goldfields Groundwater Area (Raeside Subarea). Generally water resources in the area are contained within fractured rock and alluvial sediments. Depth to ground water at the TSF2 site is 28 to 32 m below ground level (mBGL).

Monitoring of groundwater at the adjacent TSF1, shows total dissolved solids (TDS) levels of between 1200 mg/L and 38,000 mg/L (fresh to hypersaline).

Several known groundwater resources have been identified by Jabiru. Potable water which supplies Camp Bore and Teutonic Creek Bore (ex pastoral), both lie up gradient from the proposed TSF2. Wendy's borefield, a palaeochannel system of brackish nature, lies 5 km down gradient of TSF2. Jabiru does not expect seepage from TSF2 to interact with this resource. Wendy's borefield forms part of the Sullivan Creek palaeochannel system.

Sullivan Creek is the nearest surface water resource to the proposed TSF2, approximately 10km to the south. Drainage in the project area consists of braided channels running north to south. No other surface water bodies exist in the area. Considering its distance from TSF2, the hydrogeology of Sullivan Creek is not thought to be threatened by seepage.

1.2.4 Impacts to Flora

Jabiru engaged third party consultants in 2004 and 2007 to undertake flora surveys across the Jaguar and Teutonic bore leases. In May 2012, Jabiru conducted desktop and site surveys of the TSF2 location. Jabiru reported that none of the inspections of the TSF2 site identified any Declared Rare Flora (DRF) or Priority flora species.

Historically, no DRF has been recorded at the Jaguar site. Three Priority 3 flora species (*Phyllanthus baeckeoides*, *Calytrix uncinata*, and *Baeckea spp Melita station*) were identified



across the Jaguar site during earlier surveys. Jabiru obtained permission from DEC in 2005 to remove a population of *P. baeckeoides* for the construction of the mine site's accommodation village.

1.2.5 Impacts to Fauna

Fauna surveys of the Jaguar site were undertaken in 2004, 2006, and 2007. The peregrine falcon (*Falco peregrines*) was the only species of conservation significance recorded from these surveys.

This migratory raptor species was recorded in 2004, and has been observed twice since in opportunistic sightings (2005 and 2011).

Desktop searches using the *Environment Protection and Biodiversity Conservation Act 1999 Protected Matters*, and DEC's *NatureMap* search tools were undertaken for the TSF2 site. Eleven species were identified, though only two, the peregrine falcon, and woma python (*Aspidites ramsayi*) have been observed at Jaguar since the mining operation began.

1.2.6 Heritage

Jabiru reported that a review of WA Department of Indigenous Affairs' records showed no aboriginal heritage sites listed within the TSF2 construction footprint.

Jabiru also reported that no european heritage sites of significance were found at the TSF2 construction site.

1.3 PROPOSAL DESCRIPTION

1.3.1 TSF Design

Jabiru proposes to construct a single celled paddock style TSF at the Jaguar site (Figure 2). TSF2 will be the second circular paddock style TSF built at the Jaguar site, and will replace TSF1 in accepting waste generated by the nearby Jaguar base metals concentrator. Table 2 lists the design criteria for TSF2.

TSF2's design allows for future upstream embankment raising, though no lifts are planned under this works approval.

Jabiru have indicated that the compacted Zone A material intended for use as the basin liner material, produces a permeability rate between 1×10^{-8} m/s and 1×10^{-9} m/s. DEC is satisfied that proposed seepage recovery mechanisms, and more comprehensive licence operating conditions will minimise ground water rise beneath the facility. Further details are provided in section 1.3.2, 1.3.3, and Table 2.

DEC directs proponents to the following WA Department of Water guidelines for direction in the control of seepage:

1. *Water Quality Protection Note 27 – Liners for containing pollutants using engineered soils, 2010*; and,
2. *Water Quality Protection Guidelines No. 2 – Mining and Mineral Processing, 2000.*

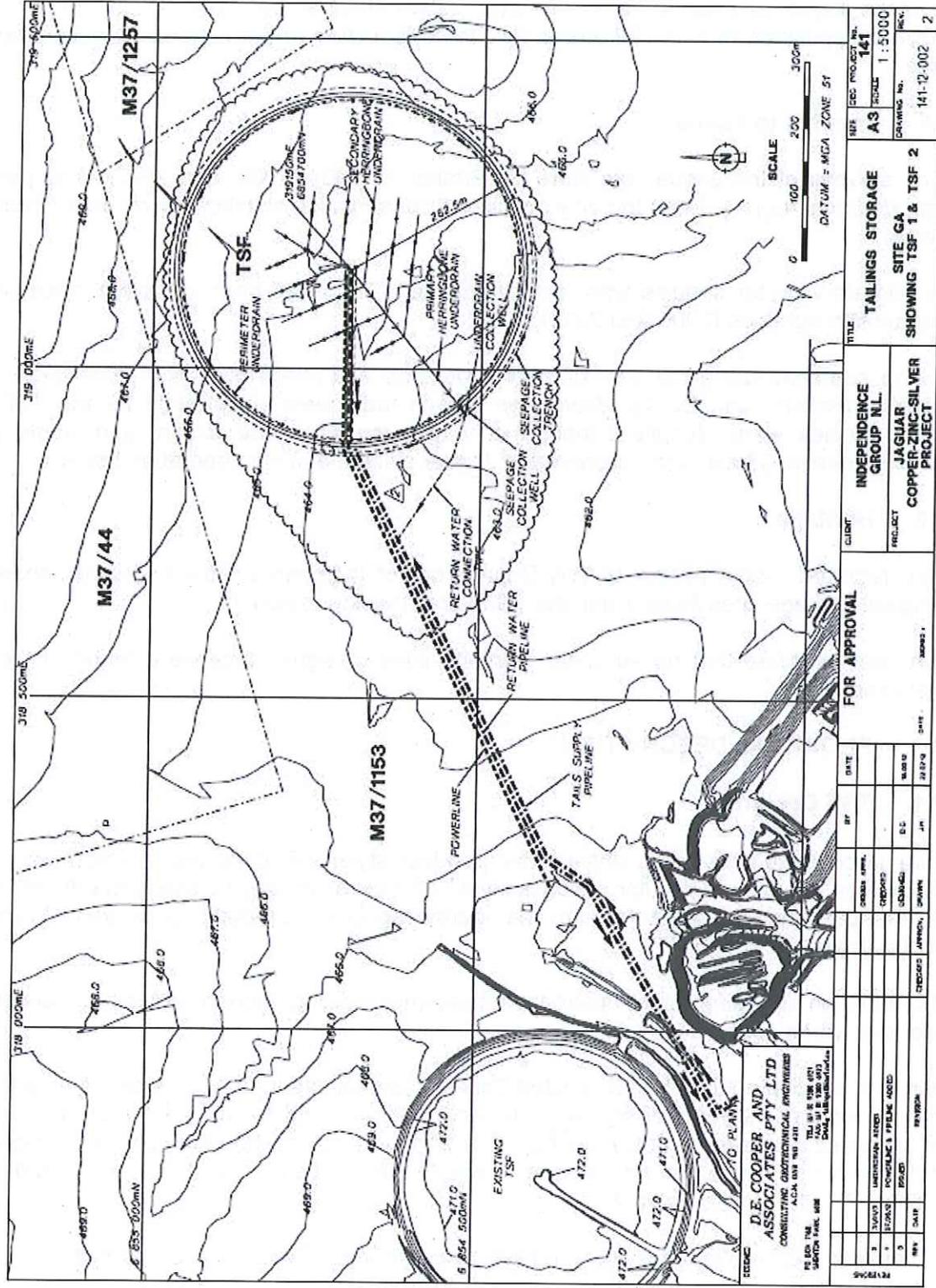


Figure 2: Map showing the location of the proposed TSF2 (right) in relation to the existing TSF1 (left). The tailings delivery, return water, and underdrainage networks for TSF2 are also depicted.



Table 2: Design criteria for the new TSF2 at the Jaguar Base Metals Project.

Characteristic	Description
Tenements	M37/44 and M37/1153
Tenement holder	Jabiru Metals Limited
Operational life	Approximately 5 years
Mine operation	24 hours per day, 365 days per year
TSF	
Footprint	28 hectares
Design	Circular Paddock
Embankment length	1650m
Embankment height	Stage 1 varies from 4m to 8m as dictated by topography.
Basin liner material	Oxide (clayey) waste rock (Zone A), compacted to a total thickness of 300mm. Permeability 1×10^{-8} m/s to 1×10^{-9} m/s.
Embankment wall	Key trench lined with 300mm compacted Zone A material at the base of the upstream embankment. Upstream embankment built from Zone A material, downstream embankment constructed from Zone B material. Zone A materials will comprise of low permeability oxide (clayey) waste rock to minimise seepage, while Zone B materials will comprise of the coarser waste rock from the Teutonic Bore stockpiles. A sediment trench will be excavated at base of downstream embankment. The embankment width will be 5m.
Underdrainage design	Herring bone under-drainage flowing to a downstream collection well. Upstream perimeter under-drainage constructed along the embankment toe, draining to a downstream collection well. Seepage trench along the downstream embankment of the southwest corner draining to a collection well. Liquor from all collection wells will be pumped directly to the processing plant unless operational constraints require recirculation via the TSF decant pond (i.e. during plant shutdown).
Storage capacity (Stage 1)	1,000,000m ³
Tailings deposit rate	213,000m ³ per year (equivalent to 340,000tpa)
Tailings density	14 - 30% solids
TSF Water recovery	90%
Monitoring	12 groundwater monitoring bores and 13 vibrating wire piezometers.
Infrastructure corridor	
Pipeline and electricity network footprint	2.1 hectares
Tailings delivery pipeline	1.8 km of 280 mm diameter HDPE pipe. Welding standards supported by certification documents.
Spigot design	Sub aerial deposition of tailings from 2 m rubber hoses. Each hose is connected via a tee junction at 10 m intervals along the tails distribution pipeline that runs along the upstream perimeter of the top of the embankment. Manual clamp shutoffs control discharge location.
Beach	1% fall to the centre of the TSF's central decant pond.
Decant causeway	Zone B fill, 6 m wide, 260 m long, embankment slope 1:1.5
Decant and return water pump	Centralised pond with pontoon pump.
Electricity network	Above ground lines along the causeway to the return water pump.
Construction haul road	
Haul road footprint	2.5 hectares, 1.2 km long, 20 m wide
Route	Connecting the TSF2 construction site and Teutonic bore waste dump (materials stockpile).
Topsoil stockpile	
Stockpile footprint	1.3 hectares
Purpose	Temporary storage of the 100 mm of topsoil removed from TSF2 footprint for use in rehabilitation.
Design	Approximately 23,000 m ³ , piled to 2 m



1.3.2 Tailings Characteristics

TSF2 will accept tailings primarily from the processing of Bentley ore. These tailings have comparable properties to those produced from Jaguar ore, and are expected to behave in TSF2 in a similar fashion as the Jaguar tails in TSF1.

Static testing by Jabiru found Bentley tailings to be potentially acid forming (PAF) due to the nature of the fresh sulphide ore. DEC is concerned that PAF seepage could acidify soils in the surrounding environment, and cause mobilisation of damaging metals.

1.3.3 Seepage recovery mechanisms

The low solids content of Jaguar tailings is the primary concern for TSF2 operators. Jabiru will be required to manage the high water volumes being circulated between TSF2 and the plant in a manner which minimises hydrostatic pressure on the basin liner. Due to previous seepage and standing water level (SWL) non compliances at TSF 1, specific seepage recovery mechanisms are required for TSF2.

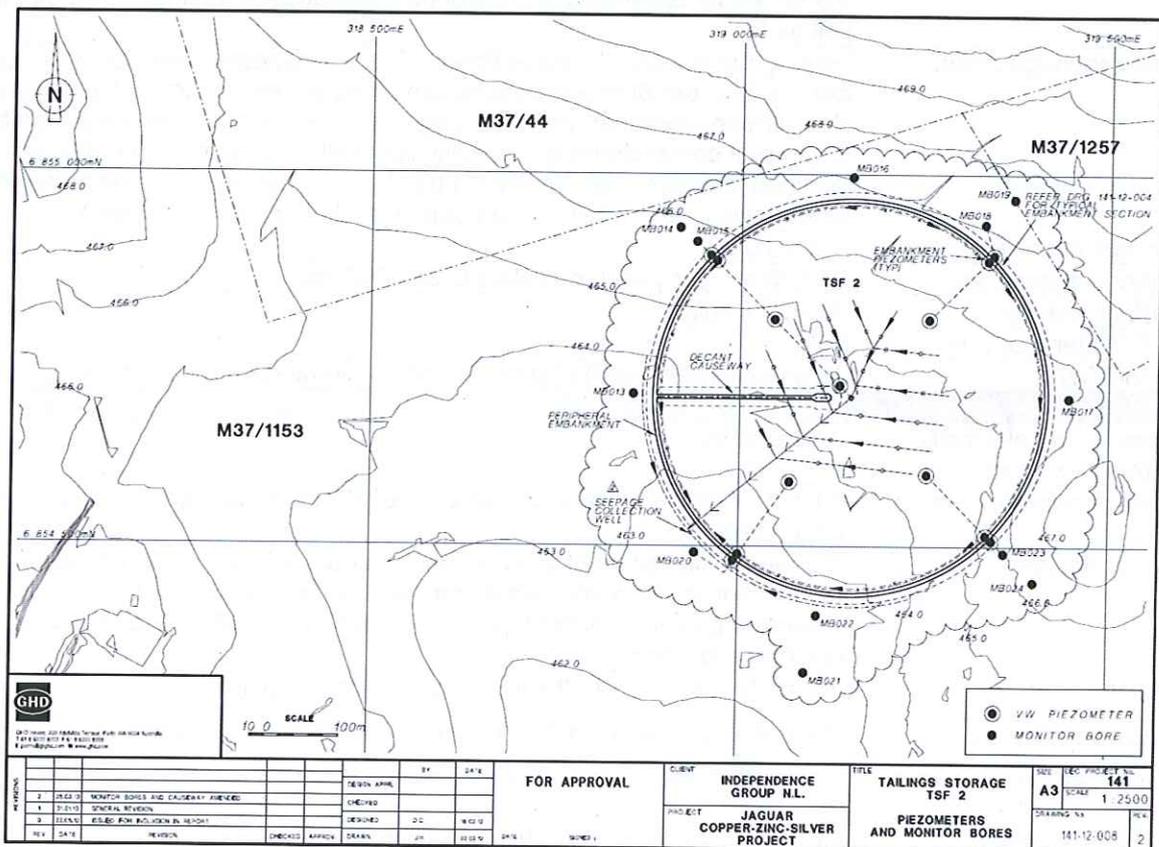


Figure 3: Jaguar's TSF2 showing herring bone and perimeter underdrainage, along with the corresponding collection wells. Monitoring bore locations are shown surrounding the embankment.



Part of this system is a downstream trench to intercept shallow subsurface seepage and to prevent ground water mounding. The recovered water will be discharged via drain pipes into a collection well then pumped back to TSF 2.

In addition, Jaguar has responded to DEC's seepage concerns through the inclusion of an improved underdrainage system (refer to specifications as detailed in Table 2).

1.4 REGULATORY CONTEXT

1.4.1 Part IV *Environmental Protection Act 1986*, Environmental Impact Assessment

Jaguar was assessed by the Office of Environmental Protection Authority (OEPA) in July 2005. Jaguar is not subject to conditions set by the Minister for Environment under Part IV of the *Environmental Protection Act 1986*. Jaguar is managed by Part V of the *Environmental Protection Act 1986*.

1.4.2 Part V *Environmental Protection Act 1986*, Environmental Management

In addition to this approval, the following works have been managed under Part V of the *Environmental Protection Act 1986*:

1. Jaguar holds the operating licence L8151/2005/1. This licence was issued on 3 July 2007 to allow for;
 - i) Category 5 - processing or beneficiation of ore.
2. Jaguar holds the respective registrations R1980/2008/1 and R1983/2008/1 for;
 - i) Category 89 - putrescible landfill; and,
 - ii) Category 85 - sewage facility.
3. A licence reissue is currently under assessment. The reissue is set for approval in April 2013. The reissue will include;
 - i) Category 6 - mine dewatering.
4. W4969/2011/1 was issued in August 2011 to allow for an embankment raise to TSF1. These works were commissioned on 5 October 2011.
5. W4753/2010/1 was issued in October 2010 for the construction of a heavy media separation plant. This facility was commissioned in 2011.
6. W4268/2006/1 was issued in September 2006 for the construction of TSF1. This facility was commissioned on 16 February 2007.
7. W4134/2005/1 was issued in October 2005 for the construction on the processing plant. This facility was commissioned on 16 February 2007.
8. Clearing for TSF2 has been assessed by DER's Native Vegetation Protection Branch and is authorised by clearing permit CPS 4841/1.



DER also administers the following legislation and codes of practice to guide and regulate the various activities associated with Jaguar:

- *Contaminated Sites Act 2003*;
- Environmental Protection (Controlled Waste) Regulations 2004;
- Environmental Protection (Unauthorised Discharge) Regulations 2004;
- Environmental Protection (Clearing of Native Vegetation) Regulations 2004; and,
- Environmental Protection (Rural Landfill) Regulations 2002;

1.4.3 Other Decision Making Authorities' Legislation which applies

Jabiru must also comply with the following legislation:

- *Aboriginal Heritage Act 1972*;
- *Bush Fires Act 1954*;
- *Health Act 1911*;
- *Land Administration Act 1997*;
- *Local Government Act 1995*;
- *Mines Safety and Inspection Act 1994*;
- *Mining Act 1978*;
- *Mining Amendment Act 2004*;
- *Water Resources Legislation Amendment Act 2007*;
- *Water Supply Sewage and Drainage Act 1912*; and,
- *Wildlife Conservation Act 1950*.

1.4.4 Rights in Water Irrigation Act 1914

Jabiru holds ground water licence GWL159028 at the Jaguar site. This licence allows for the abstraction of 2,200,000 kL per year from the Raeside groundwater subarea. The aquifer type is a Combined Fractured Rock West – Fractured Rock. Water is used in mineral processing, dust suppression, and for the mining camp.

1.4.5 Local Government Authority

Jaguar is located in the Shire of Leonora. The Shire has made no comment on the TSF2 application.

2.0 STAKEHOLDER AND COMMUNITY CONSULTATION

SUBMISSIONS RECEIVED DURING 21 DAY PUBLIC COMMENT PERIOD

The Application for works approval details for this facility was advertised in the West Australian newspaper on 1 October 2012 as a means of advising stakeholders and to seek public comments. No submissions were received.



3.0 EMISSIONS AND DISCHARGES RISK ASSESSMENT

DER considers that conditions should focus on regulating emissions and discharges of significance. Where appropriate, emissions and discharges which are not significant should be managed and regulated by other legislative tools or management mechanisms.

The following section assesses the environmental risk of potential emissions from Jaguar's TSF2. In order to determine the site's appropriate environmental regulation, an emissions and discharges risk assessment was conducted of Jaguar TSF2 using the environmental risk matrix outlined in Appendix A. The results of this are summarised in Table 3.



Table 3: Risk assessment and regulatory response summary table

Risk factor	Significance of emissions	Socio-Political Context of Each Regulated Emission	Risk Assessment	DER Regulation (EP Act - Part V)	EAR Reference	Other management (legislation, tools, agencies)
Air emissions (point source)	<p><u>Construction</u> <i>Significance rating N/A.</i> Air emissions during the construction phase will be negligible; no regulation required.</p> <p><u>Operation</u> <i>Significance rating of N/A.</i> Air emissions during the operation phase have been assessed as negligible and do not require regulation.</p>	No. The nearest sensitive receptor is the town of Leonora, 48 km south of the Jaguar site.	E. No regulation required.	<p>WA – no conditions LIC – no conditions</p>	N/A	<p>General provisions of the <i>Environmental Protection Act 1986</i></p> <p>Environmental Protection (Unauthorised Discharge) Regulations 2004</p> <p>Jaguar Base Metals Project – Works Approval Application (Construction of TSF2 and Service Infrastructure Corridor). July 2012</p>
Dust emissions	<p><u>Construction</u> <i>Significance rating 2</i> Significant amounts of dust may be generated during clearing and earthworks. Dust has the potential to impede the growth of vegetation by blocking the respiration process. Dust can also reduce general air quality to humans and wildlife.</p> <p>Dust emissions during construction will be controlled by:</p> <p>a) Clearing areas only as immediately needed to reduce the area of unconsolidated disturbed land;</p>	No. The nearest sensitive receptor is the town of Leonora, 48 km south of the Jaguar site.	D. General licence conditions.	<p>WA – no conditions (existing licence conditions will suffice) LIC – Operating licence L8151 includes dust mitigation conditions.</p>	N/A	<p>General provisions of the <i>Environmental Protection Act 1986</i></p> <p>Jaguar Base Metals Project – Works Approval Application (Construction of TSF2 and Service Infrastructure Corridor). July 2012</p>



Risk factor	Significance of emissions	Socio-Political Context of Each Regulated Emission	Risk Assessment	DER Regulation (EP Act - Part V)	EAR Reference	Other management (legislation, tools, agencies)
Dust emissions (cont)	<ul style="list-style-type: none"> b) Use of water carts on roads and disturbed areas; c) Controlled vehicle speeds; d) Postponement of earthworks when weather conditions generate amounts of dust beyond control; and, e) Rehabilitating disturbed areas progressively to reduce the overall area of unconsolidated disturbance. 					
	<p>Operation</p> <p><i>Significance rating of 2.</i></p> <p>During operation dust may be generated from the TSF surface or embankment road surfaces. Jabiru propose to:</p> <ul style="list-style-type: none"> a) Manage tails deposition/spigots to ensure the conditions of the TSF beach minimises dust (i.e. optimal moisture conditions); b) Cover road surfaces with dust mitigation material to combat dust generation from vehicle movement; and, c) Manage vehicle speeds. 					



Risk factor	Significance of emissions	Socio-Political Context of Each Regulated Emission	Risk Assessment	DER Regulation (EP Act - Part V)	EAR Reference	Other management (legislation, tools, agencies)
Odour emissions	<p><u>Construction</u> Significance rating N/A. Odour emissions during the construction phase have been assessed as negligible and will not require regulation.</p> <p><u>Operation</u> Significance rating of N/A. Odour emissions during the operational phase have been assessed as negligible and will not require regulation.</p>	No. The nearest sensitive receptor is the town of Leonora, 48 km south of the Jaguar site.	E. No regulation required.	WA- no conditions LIC- no conditions	N/A	General provisions of the <i>Environmental Protection Act 1986</i> Jaguar Base Metals Project – Works Approval Application (Construction of TSF2 and Service Infrastructure Corridor). July 2012
Noise emissions	<p><u>Construction</u> Significance rating N/A. Noise emissions will be generated from mobile plants during the construction of the TSF. Noise emissions may impact fauna behaviour, though the degree of impact will be limited to the area directly adjacent to the TSF. The relatively low emission volumes, and remoteness of the site, reduce the risks posed by noise. Jabiru will minimise impacts from noise emissions by fitting noise attenuating devices to all mobile plants.</p> <p><u>Operation</u> Significance rating of N/A. Noise emissions associated with tails discharge and the pumping of return water are benign. No regulation is required.</p>	No. The nearest sensitive receptor is the town of Leonora, 48 km south of the Jaguar site.	E. No regulation required.	WA- no conditions LIC- no conditions	N/A	General provisions of the <i>Environmental Protection Act 1986</i> Environmental Protection (Noise) Regulations 1997. Jaguar Base Metals Project – Works Approval Application (Construction of TSF2 and Service Infrastructure Corridor). July 2012



Risk factor	Significance of emissions	Socio-Political Context of Each Regulated Emission	Risk Assessment	DER Regulation (EP Act - Part V)	EAR Reference	Other management (legislation, tools, agencies)
Light emissions	<p>Construction <i>Significance rating N/A.</i> Light emissions associated with the construction of TSF2 do not require regulation due to the lack of sensitive receptors in the area.</p> <p>Operation <i>Significance rating of N/A.</i> There are no significant light emissions associated with tails discharge or the pumping of return water. No regulation is required.</p>	No. The nearest sensitive receptor is the town of Leonora, 48 km south of the Jaguar site.	E. No regulation required.	WA- no conditions LIC- no conditions	N/A	General provisions of the <i>Environmental Protection Act 1986</i>
Discharges to water.	<p>Construction <i>Significance rating N/A.</i> There is no direct discharge of emissions to water sources as a result of the construction of the Jaguar TSF2. No regulation required.</p> <p>Operation <i>Significance rating of N/A.</i> There is no direct discharge of emissions to water sources as a result of the operation of the Jaguar TSF2. No regulation required.</p>	No. The nearest sensitive receptor is the town of Leonora, 48 km south of the Jaguar site.	E. No regulation required.	WA - no conditions LIC - no conditions	N/A	<p>General provisions of the <i>Environmental Protection Act 1986</i></p> <p>Environmental Protection (Unauthorised Discharge) Regulations 2004</p> <p>Jaguar Base Metals Project - Works Approval Application (Construction of TSF2 and Service Infrastructure Corridor). July 2012</p> <p>Independence Group NL - Jaguar Mine Tails Storage Facility 2 Project Management Plan February 2013</p>



Risk factor	Significance of emissions	Socio-Political Context of Each Regulated Emission	Risk Assessment	DER Regulation (EP Act - Part V)	EAR Reference	Other management (legislation, tools, agencies)
Discharges to land	<p><u>Construction</u> <i>Significance rating 2.</i> There are minor risks of contamination to land during the construction phase.</p> <p>Groundwater depth of approximately 30 mbgl significantly reduces the risk of unauthorised discharge to groundwater during the construction phase.</p> <p>Jabiru will minimise opportunities for discharges to land during TSF construction by:</p> <p>a) Limiting topsoil stockpile heights and positioning stockpiles away from drainage lines to ensure minimal runoff during rain events;</p> <p>b) Maintaining mobile plants to standards which minimise the probability of hydrocarbon leaks; and,</p> <p>c) Refuelling of mobile plants by staff who have an understanding of Jabiru's hydrocarbon spill response procedures.</p> <p><u>Operation</u> <i>Significance rating 2.</i> Discharges to land during TSF2 operation may be caused by:</p>	<p>No. The nearest sensitive receptor is the town of Leonora, 48 km south of the Jaguar site.</p>	<p>D. General licence conditions</p>	<p>WA – no conditions LIC – L8151 includes the standard Goldfield's operating and monitoring conditions for paddock style TSF's. A licence amendment will include monitoring requirements for the new groundwater monitoring network surrounding TSF2. A seepage management plan is to be submitted as part of licence amendment supporting documents. amend</p>	<p>N/A</p>	<p>General provisions of the <i>Environmental Protection Act 1986</i> Environmental Protection (Unauthorised Discharge) Regulations 2004 Jaguar Base Metals Project – Works Approval Application (Construction of TSF2 and Service Infrastructure Corridor). July 2012 Independence Group NL – Jaguar Mine Tails Storage Facility 2 Project Management Plan February 2013 Independence Group Jaguar TSF 2 Works Approval Amendment Supporting Information. May 2013</p>



Risk factor	Significance of emissions	Socio-Political Context of Each Regulated Emission	Risk Assessment	DER Regulation (EP Act - Part V)	EAR Reference	Other management (legislation, tools, agencies)
Discharges to land (cont)	<p>to a) Seepage of leachate into the underlying groundwater; subsequent contamination of groundwater and groundwater mounding around the TSF;</p> <p>b) Pipeline spills from tails delivery lines and decant return lines; or,</p> <p>c) Embankment breaches.</p>					
	<p>The large area of disturbance will also continuously threaten to contaminate stormwater. Jabiru will utilise the following strategies to minimise these sources of pollution:</p> <p><u>Waste management</u></p> <p>a) TSF2 basin construction will achieve a permeability of between 1×10^{-8} m/s and 1×10^{-9} m/s. The clay liner material will be laid to a final thickness of 300mm. Jaguar's engineering consultants have reassured DER that seepage mitigation capabilities will match the standard accepted by the Department of Water, and DER to minimise seepage;</p> <p>b) Jabiru anticipates the future installation of production bores to maintain groundwater levels to less</p>					



Risk factor	Significance of emissions	Socio-Political Context of Each Regulated Emission	Risk Assessment	DER Regulation (EP Act - Part V)	EAR Reference	Other management (legislation, tools, agencies)
Discharges to land (cont)	<p>to than 6 mbgl as per EP Act licence conditions. Mounding has the potential to saturate subsurface soils, introduce salts, generate acids, and mobilise metals. Seepage rates in breach of EP Act licence conditions have been reported by Jabiru during 2011 and 2012 for TSF1. Jabiru is actively recovering seepage water from these production bores.</p> <p>c) Jabiru engaged RPS Aquaterra to develop a seepage management plan for TSF1. This plan was submitted as part of the TSF2 project, and is a further step towards achieving SWL compliance;</p> <p>d) TSF2 will include a network of underdrainage pipelines to direct tails liquor to wells on the downstream side of the TSF embankments. The liquor will then be recirculated back to the processing plant;</p> <p>Removing tailings liquor from TSF2 will decrease the hydrostatic pressure on the basin liner. Reduced pressure results in less seepage into the groundwater. The underdrainage design features a centrally located herring bone pattern, and an upstream perimeter line;</p>					



Risk factor	Significance of emissions	Socio-Political Context of Each Regulated Emission	Risk Assessment	DER Regulation (EP Act - Part V)	EAR Reference	Other management (legislation, tools, agencies)
<p>Discharges to land (cont)</p>	<p>toe) A two metre deep seepage recovery trench will be excavated downstream of the embankment which lies lowest in the landscape (south west corner). This trench will capture seepage at the embankment toe, and drain to a well for return to the process plant;</p> <p>f) The tailings delivery and return water pipelines will be banded to capture spills;</p> <p>g) Tailings pipelines will be contained within culverts where they pass under road infrastructure;</p> <p>h) Tailings delivery and return water pipelines will be 'double piped' and raised where they cross braided drainage lines;</p> <p>i) Emergency discharge sumps will be constructed on each side of drainage crossing points to capture tailings should the pipeline rupture at a crossing;</p> <p>j) Isolation valves will be installed at the tailings discharge pump and return water pump;</p> <p>k) Telemetry systems will be installed on the tailings delivery, and return water pipelines to alert plant control</p>					



Risk factor	Significance of emissions	Socio-Political Context of Each Regulated Emission	Risk Assessment	DER Regulation (EP Act - Part V)	EAR Reference	Other management (legislation, tools, agencies)
Discharges land (cont)	<p>to of leaks;</p> <p>l) A bund on the downstream side of the embankment crest will capture any spills from the spigot distribution pipeline; and,</p> <p>m) Surface hydrology modelling indicates that natural topographic features will divert uncontaminated surface water flow around the TSF.</p> <p><u>Monitoring</u></p> <p>a) Jabiru will establish a groundwater monitoring regime around the perimeter of TSF2. Sampled quarterly, the twelve (12) bores will measure a suite of physical and chemical parameters indicative of seepage recognition;</p> <p>b) Baseline data will be used as an indicator of the influence of TSF2 on groundwater;</p> <p>c) Vibrating wire piezometers will be installed within the embankment walls to detect the presence of water;</p> <p>d) Vibrating wire piezometers will be installed within the storage basin to measure the moisture content of the deposited tails;</p>					



Risk factor	Significance of emissions	Socio-Political Context of Each Regulated Emission	Risk Assessment	DER Regulation (EP Act - Part V)	EAR Reference	Other management (legislation, tools, agencies)
Discharges land (cont)	<p>to e) Tailings beaches will be surveyed regularly to assess discharge planning; and,</p> <p>f) Photo monitoring of vegetation around TSF2 will be undertaken as a tool to identify seepage impacts.</p> <p><u>Operating Strategies</u></p> <p>a) Strategic spigot operation (cycle time) will control supernatant pond location, beach design, and tails consolidation and drying;</p> <p>b) Management of total freeboard capacity will contain runoff following a 1 in 100 year, 72 hour duration event;</p> <p>c) A Tailings Operating Manual has been produced containing information on operating practices, maintenance requirements, and reporting procedures;</p> <p>d) TSF2 will be managed in accordance with the document <i>Guidelines on the Safe Design and Operating Standards for Tailings Storages (DMP 1999)</i>;</p> <p>e) Scheduled inspections are to be undertaken twice every 12 hours by TSF management to ensure the</p>					



Risk factor	Significance of emissions	Socio-Political Context of Each Regulated Emission	Risk Assessment	DER Regulation (EP Act - Part V)	EAR Reference	Other management (legislation, tools, agencies)
	<p>facility is being run as per the TSF standard operating procedures;</p> <p>f) A TSF inspection log will be completed for each inspection and be available to regulators for auditing purposes; and,</p> <p>g) Geotechnical assessment of TSF2 by a third party auditor will be undertaken annually.</p>					
Solid / liquid wastes	<p><u>Construction and Operation</u> <i>Significance rating 2</i> The assessment of solid waste (tailings) has been covered above under Discharges to Land, and carries the same risk rating.</p>	No. The nearest sensitive receptor is the town of Leonora, 48 km south of the Jaguar site.	See Discharges to Land	<p>WA – See Discharges to Land</p> <p>LIC – See Discharges to Land</p>	N/A	See Discharges to Land
Hydrocarbon chemical storage	<p><u>Construction</u> <i>Significance rating 2.</i> Mobile plant contractors will be responsible for the management of hydrocarbons during the construction phase. Contractors must adhere to the chemical and hydrocarbon use and disposal procedures approved by Jabiru.</p> <p>Jabiru have proposed the following measures to manage hydrocarbon and chemical storage associated with TSF2's construction:</p>	No. The nearest sensitive receptor is the town of Leonora, 48km south of the Jaguar site.	D. General Licence Conditions	<p>WA – no conditions</p> <p>LIC – L8151 includes the standard Goldfield's operating conditions for chemical and hydrocarbon management.</p>	N/A	<p>General provisions of the <i>Environmental Protection Act 1986</i></p> <p>Environmental Protection (Unauthorised Discharge) Regulations 2004</p> <p>Jaguar Base Metals Project – Works Approval Application (Construction of TSF2 and Service Infrastructure Corridor). July 2012</p> <p>Dangerous Goods Licence</p>



Risk factor	Significance of emissions	Socio-Political Context of Each Regulated Emission	Risk Assessment	DER Regulation (EP Act - Part V)	EAR Reference	Other management (legislation, tools, agencies)
Hydrocarbon/chemical storage (cont)	<p>a) Refuelling of mobile plants will be undertaken at the existing fuel distribution site reducing spill risk. Hydrocarbon distribution will be undertaken by staff who have an understanding of Jabiru's hydrocarbon spill response procedures;</p> <p>b) Hydrocarbon waste will be stored in marked vessels, and removed by controlled waste carriers;</p> <p>c) Hydrocarbons and chemicals will be stored in double skinned tanks or low permeability banded compounds as per Australian Standards (AS) 1940- 2004, and Jabiru's Dangerous Goods licence conditions.</p> <p><u>Operation</u> <i>Significance rating 2</i> There is no use of hydrocarbons as part of the TSF2 operation. Management of TSF2 process liquor has been addressed in the <i>discharges to land</i> assessment.</p>					(DMP)
Native vegetation clearing	<p><u>Construction</u> <i>Significance rating N/A.</i> A total of 33.9 ha will be cleared for the project. Twenty eight (28) ha will be cleared under clearing permit CPS 4841/1, with the remaining 5.9 ha managed by DMP under the EP</p>	No. The nearest sensitive receptor is the town of Leonora, 48 km south of the Jaguar site.	E. No regulation required as part of this works approval	WA – N/A LIC – N/A	N/A	General provisions of the <i>Environmental Protection Act 1986</i> Environmental Protection (Clearing of Native Vegetation) Regulations



Risk factor	Significance of emissions	Socio-Political Context of Each Regulated Emission	Risk Assessment	DER Regulation (EP Act - Part V)	EAR Reference	Other management (legislation, tools, agencies)
Native vegetation clearing (cont)	(Clearing Native Vegetation) Regulations 2004. Assessment of possible impacts to flora caused by clearing was discussed in Section 1.2.4. <u>Operation</u> <i>Significance rating of N/A</i> There will be no further clearing once the commissioning of TSF2 begins.					2004 Jaguar Base Metals Project – Works Approval Application (Construction of TSF2 and Service Infrastructure Corridor). July 2012
Contaminated site identification	Jaguar was classified as <i>Possibly contaminated – investigation required</i> on 7 November 2008 (CSSID 3298).	No. The nearest sensitive receptor is the town of Leonora, 48km south of the Jaguar site.	N/A	WA – no conditions LIC – no conditions	N/A	General Provisions of the Contaminated Sites Act 2003



4.0 GENERAL SUMMARY AND COMMENTS

This EAR outlines the construction proposal and control mechanisms for emissions caused by a new tailings storage facility (TSF2) at the Jaguar Base Metals Project.

TSF2 will hold tailings produced from Jabiru's adjacent 365,000 tonne per annum copper and zinc processing plant. TSF2 has been designed to limit the rate of seepage and the concentration of polluting contaminants to levels acceptable by regulatory bodies including DEC. Primary discharge into TSF1 will cease once commissioning of TSF2 is undertaken.

Commitments made by Jabiru in W5262/2012/1 reduce the inherent operating risks to an acceptable level.

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APPENDIX A: EMISSIONS AND DISCHARGES RISK ASSESSMENT MATRIX

Table 4: Measures of Significance of Emissions

Emissions as a percentage of the relevant emission or ambient standard		Worst Case Operating Conditions (95 th Percentile)			
		>100%	50 – 100%	20 – 50%	<20%*
Normal Operating Conditions (50 th Percentile)	>100%	5	N/A	N/A	N/A
	50 – 100%	4	3	N/A	N/A
	20 – 50%	4	3	2	N/A
	<20%*	3	3	2	1

*For reliable technology, this figure could increase to 30%

Table 5: Socio-Political Context of Each Regulated Emission

		Relative proximity of the interested party with regards to the emission				
		Immediately Adjacent	Adjacent	Nearby	Distant	Isolated
Level of Community Interest or Concern*	5	High	High	Medium High	Medium	Low
	4	High	High	Medium High	Medium	Low
	3	Medium High	Medium High	Medium	Low	No
	2	Low	Low	Low	Low	No
	1	No	No	No	No	No

Note: These examples are not exclusive and professional judgement is needed to evaluate each specific case

*This is determined by DER using the DER "Officer's Guide to Emissions and Discharges Risk Assessment" May 2006.

Table 6: Emissions Risk Reduction Matrix

		Significance of Emissions				
		5	4	3	2	1
Socio-Political Context	High	A	A	B	C	D
	Medium High	A	A	B	C	D
	Medium	A	B	B	D	E
	Low	A	B	C	D	E
	No	B	C	D	E	E

PRIORITY MATRIX ACTION DESCRIPTORS

A = Do not allow (fix)

B = licence condition (setting limits + EMPs - short timeframes)(setting targets optional)

C = licence condition (setting targets + EMPs - longer timeframes)

D= EIPs, other management mechanisms/licence conditions (monitoring/reporting)/other regulatory tools

E = No regulation, other management mechanisms