



Application for Licence Amendment

Part V Division 3 of the *Environmental Protection Act 1986*

Licence Number	L7922/1989/5
Licence Holder	Fox Radio Hill Pty Ltd
ACN	092 493 653
File Number	DER2014/001066-1
Premises	Radio Hill Mine Site KARRATHA WA 6714 Legal description – Mining Lease M47/161 and M47/337 as depicted in Schedule 1.
Date of Report	19 September 2023
Decision	Revised licence granted

A/MANAGER, RESOURCE INDUSTRIES

an officer delegated under section 20 of the *Environmental Protection Act 1986* (WA)

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1. Decision summary

Licence L7922/1989/5 is held by Fox Radio Hill Pty Ltd (Licence Holder) for the Radio Hill Mine Site (the Premises), located at Mining Lease M47/161 and M47/337.

This Amendment Report documents the assessment of potential risks to the environment and public health from proposed changes to the emissions and discharges during operation of the Premises. As a result of this assessment, Revised Licence L7922/1989/5 has been granted.

2. Scope of assessment

2.1 Regulatory framework

In completing the assessment documented in this Amendment Report, the department has considered and given due regard to its Regulatory Framework and relevant policy documents which are available at <https://www.wa.gov.au/service/building-utilities-and-essential-services/integrated-essential-services/dwer-regulatory-documents>.

2.2 Amendment summary

On 5 July 2023, the Licence Holder submitted an application to the department to amend Licence L7922/1989/5 under section 59 and 59B of the *Environmental Protection Act 1986* (EP Act). The following amendments are being sought:

- Removal of category 85: Sewage facility and related monitoring conditions.
- Reduction of groundwater and process monitoring requirements as the premises has been in Care and Maintenance since 2008.

3. Risk assessment

The department assesses the risks of emissions from prescribed premises and identifies the potential source, pathway and impact to receptors in accordance with the *Guideline: Risk assessments* (DWER 2020).

To establish a Risk Event there must be an emission, a receptor which may be exposed to that emission through an identified actual or likely pathway, and a potential adverse effect to the receptor from exposure to that emission.

3.1 Category 85: Sewage facility premises

The Licence Holder requested to remove Category 85 from the licence. The wastewater treatment plant (WWTP) was decommissioned and removed from site in 2018.

The department confirms that the removal of Category 85 and related monitoring conditions do not constitute a risk as the WWTP is not on site, consequently the conditions will be removed from the licence.

3.2 Category 5: Processing or beneficiation of metallic or non-metallic ore

The Licence Holder requested to reduce the groundwater and process monitoring conditions related to Category 5 due the current risk profile of Care and Maintenance for the site.

3.2.1 Groundwater monitoring

The Licence Holder requested to change the groundwater monitoring frequency from quarterly

to annually. Additionally, the Licence Holder requested to remove two monitoring recommissioning bores from Tailings Storage Facility (TSF) 3, bores RHW56 and RHW57.

The Licence Holder provided a review of current groundwater quality where they have stated that the groundwater in the Mine Borefield has an overall good quality with a concentration lower than 1,000 mg/L Total Dissolved Solids (TDS). Trace metals have been registered in all bores with a low concentration overall.

A summary of the groundwater quality review from Artemis Resources (2023) is provided below:

Production/Observation monitoring bores:

The groundwater analysis has shown that there is a good quality on average.

- (i) RHW4, RHW5 and RHW6D monitoring bores have shown that the groundwater acidity stabilised to a pH 7.5 with a salinity below 1,000 mg/L since 2013.
- (ii) Bore RHW5 has shown a copper concentration spike of 0.003 mg/L in 2022, which is below the ANZECC guidelines (livestock water) of 1 mg/L.
- (iii) Bore RHW4 has shown historical concentrations higher than 1,200 mg/L TDS.

Environmental Surface Water Dam monitoring bores:

These bores have detected elevated salinity with elevated concentration of sulphate, magnesium and metal concentrations. The groundwater maintained a neutral pH 7.5, and sulphate levels remained with higher levels than the ANZECC Livestock limit of 1,000 mg/L.

- (i) Historically, these bores have registered high salinities up to 6,000 mg/L, where the groundwater salinity baseline is 1,000 mg/L.
- (ii) Bore RHW36 has reached the peak of sulphate concentration of 9,700 mg/L on 15 June 2021, with the latest reading of 610 mg/L on 9 November 2022, bore RHW37 has a sulphate concentration of 3,700 mg/L on 9 November 2022 and in bore RHW35 was 2,300 mg/L on 4 February 2022.
- (iii) The bores have registered elevated magnesium concentration up to 9,200 mg/L in RHW36 on 15 June 2021 and 81 mg/L on 9 November 2022, RHW37 registered 590 mg/L and in RHW35 was 410 mg/L.
- (iv) The groundwater metal concentration for Copper, Selenium, Nickel, Zinc, TDS and Sulphate concentrations seems to increase with rainfall events.
- (v) There is an increase of anolytes concentration after rainfall which is related to the mobilisation of contaminants from the catchment of the Run of Mine and processing infrastructure.

TSF Embankment and Periphery Bores:

TSF Embankment Bores:

These bores have shown a declining groundwater quality. The water acidity had a pH 7 between 2006-2012 with an acidic pH 3 from 2012 onwards. The groundwater has elevated levels of Sulphate, dissolved metals and TDS as a result of the TSF pore water. These readings suggest that the TSF facilities are the source of contamination downstream. A summary of the readings below:

- (i) Monitoring bores RHW39 and RHW40 are located on the TSF embankment walls, where it supposes to be the TSF pore water.
- (ii) The last readings from bore RHW40 indicate that the water quality has deteriorated since the cessation of operation in 2008. The groundwater quality is the following:

- a. TDS concentrations of up to 50,000 mg/L in 2020
- b. Sulphate concentrations up to 29,000 mg/L in 2021
- c. Magnesium concentrations up to 770 mg/L in 2017
- d. Nickel concentrations up to 4.1 mg/L in 2021
- e. Zinc concentrations up to 1.4 mg/L in 2021; and
- f. Manganese concentrations up to 50 mg/L in 2021

TSF 1 & 2 Periphery Bores:

The periphery groundwater monitoring bores RHW22, RHW23, RHW24, RHW25, RHW26 and RHW27 have shown an increasing salinity trend and a pH neutral between 7 - 7.5. All analytes concentration has spiked following rainfall events, which indicates mobilisation of contaminants from the local mine and TSF. A summary of the readings is provided below:

- (i) The dissolved solid in the water include Sulphate and Magnesium, where the bores RHW24, RHW25 and RHW27 have shown a sulphate concentration of 4,500 mg/L, where the ANZECC Livestock limit is 1,000 mg/L.
- (ii) Down-gradient bores from TSF1 and TSF2 (from RHW24 to RHW27) have registered an historical increasing salinity trend from 4,000 to 8,000 mg/L. Bores RHW22 and RHW26 have shown a stabilised salinity between 2,000 mg/L to 5,000 mg/L.
- (iii) Bores RHW22, RHW23 and RHW26 have registered seasonal fluctuation of Sulphate and Magnesium concentrations. The sulphate concentration ranged between 1,000 - 4,000 mg/L and Magnesium concentration between 200 - 700 mg/L.
- (iv) Bores RHW24 and RHW26 have shown elevated Manganese concentrations up to 22 mg/L and 1.1 mg/L respectively.
- (v) Bores RHW25 and RHW26 have shown an elevated and spike concentrations of Nickel both up to 4.20 mg/L recorded in 2022.
- (vi) Bores RHW22 and RHW23 have shown a low concentration of copper, iron, lead, manganese, nickel and zinc, with values lower than 0.03 mg/L.

TSF3 Down-gradient Bores:

The downgradient bores RHW52B and RHW54 of TSF3 have shown a stable long-term pH between 7.5 – 8. A summary of the bores readings is provided below:

- (i) The salinity differed between bores. Bore RHW52B has shown an increasing level of salinity (TDS) since the mine activities ceased, raising from 1,000 mg/L up to 12,000 mg/L in 2022. Bore RHW54 groundwater salinity had stayed stable in 1,000 mg/L.
- (ii) The Sulphate and Magnesium concentration for bore RHW52 in 2021/2022 was 7,900 mg/L and 1,600 mg/L respectively. For bore RHW54 the groundwater concentration of Sulphate and Magnesium was 500 mg/L and 50 mg/L respectively in 2021/2022.

Regional Boundary Bores:

“Monitoring bores RHW31, RHW32 and RHW33 and RHW34 represent more regional downgradient bores and are located on the Artemis westerly lease boundary” (Artemis Resources, 2023). The pH has stabilised close to pH 7.0. The salinity has increased in all bores to concentrations up to 7,300 mg/L. A summary of the readings is provided below:

- (i) Bores RHW31, RHW32 and RHW33 have shown a decreasing trend of sulphate

concentrations between 2018-2022. For bore RHW31 the sulphate concentration was between 4,000 – 2,500 mg/L, for bore RHW32 was 3,900 – 2,400 mg/L and for RHW33 was 3,400 – 2,400 mg/L. Conversely, Bore RHW34 has shown an increasing sulphate concentration trend with a spike of 4,900 mg/L in 2022.

- (ii) Concentration of Zinc, Manganese, Nickel and Iron were increasing after rainfall events.
- (iii) “Following from observations made by AECOM, 2018 groundwater quality change has likely propagated beyond the lease boundary to the west of the mine site” (Artemis Resources, 2023).

3.2.2 DWER groundwater data review

Potential risks

The Senior Hydrogeologist of the department has reviewed the information provided by the Licence Holder regarding the groundwater historical monitoring.

The metalliferous drainage emitted at the Premises is expected to have a neutral pH, because pyrrhotite is the dominant sulphide mineral in the deposit. Moreover, the host rocks contain ferromagnesian minerals which helps to neutralise the excess of acidity.

Due the neutral pH in drainage emitted at the premises, there is concern of having elevated concentrations of nickel and cobalt in groundwater.

Magnesium silicate mineral olivine concentration is expected to be elevated because of the ultramafic rock deposits within the premises. Consequently, when this mineral interact with acid produced by sulphide oxidation, is expected that the magnesium ions concentration will rise in the groundwater.

Evidence of groundwater contamination at the premises

The department considers there remains groundwater contamination. This contamination is evident when reviewing the groundwater concentration readings from bores RHW35, RHW36 and RHW37. These bores have shown elevated and/or increasing concentrations of sulphate, magnesium and nickel. A clear evidence of this increasing concentration trend can be observed in Figure 1 from bore RHW35 and its sulphate concentration trend since 2017:

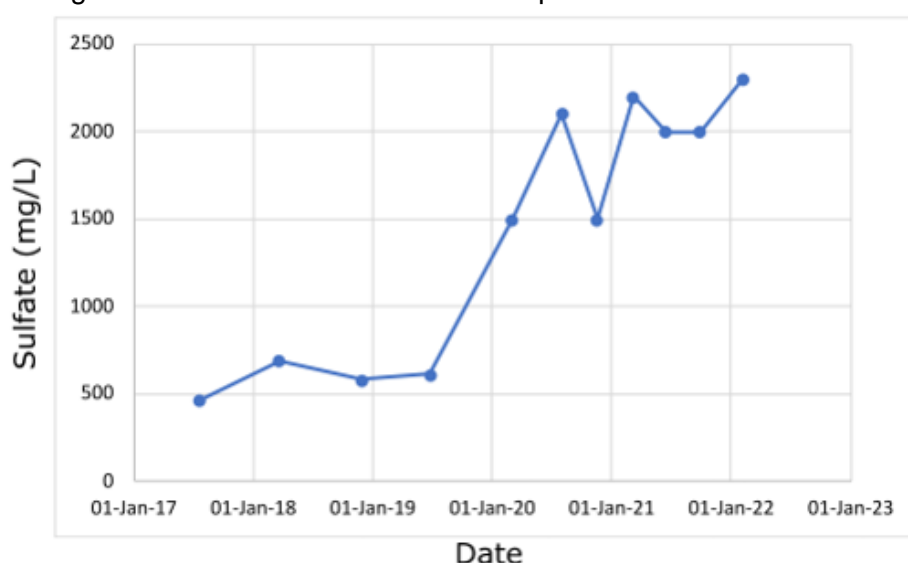


Figure 1: Change of sulphate concentrations over time in groundwater samples that have been collected from bore RHW35 (DWER, 2023).

Another example of the increased concentration overtime is for bore RHW 36 in Figure 2, where the nickel concentration spiked in 2018 and then in 2022, where the concentration reached 9600 µg/L.

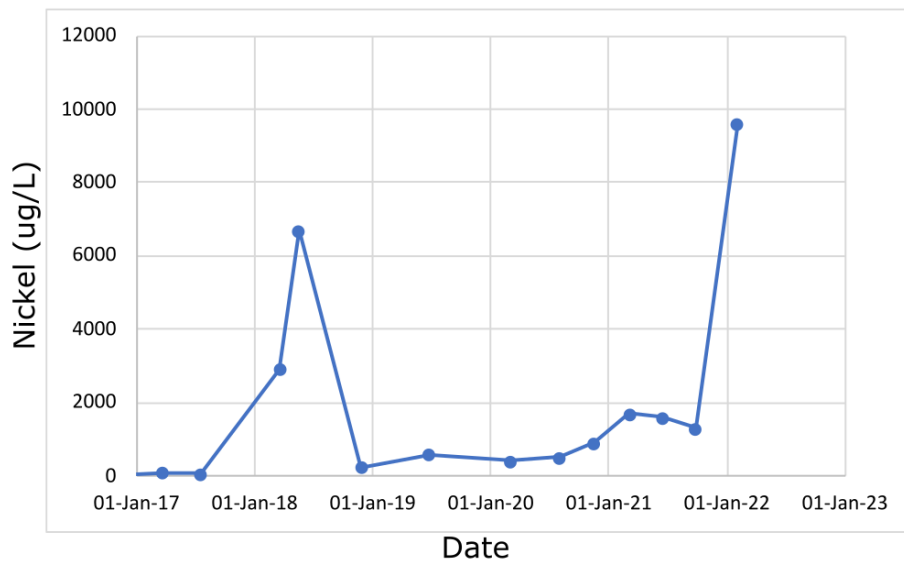


Figure 2: Change of nickel concentrations over time in groundwater samples that have been collected from monitoring bore RHW 36 (DWER, 2023).

There is a contamination plume at the site, which is likely caused by metalliferous drainage from mine waste materials near to the Environmental Dam. Moreover, it's suggested that the wastewater leakage from this pond could be the source of groundwater contamination in this area of the mine-site. An estimation of the groundwater contamination area is provided in Figure 3, showing the nearby creek channel.

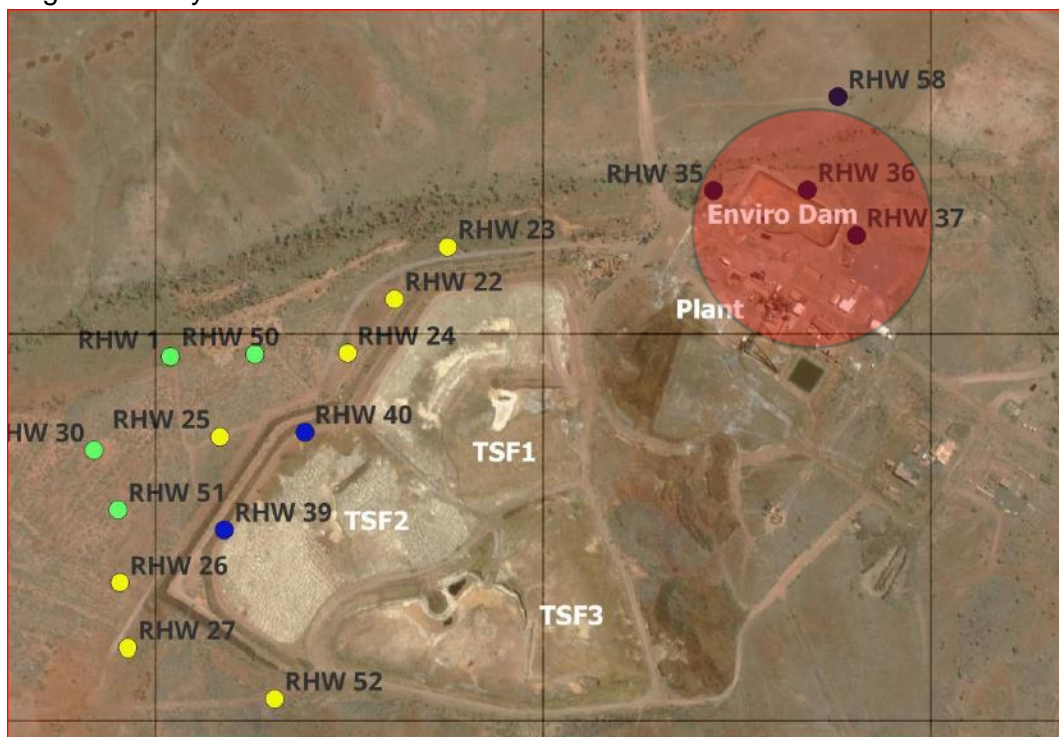


Figure 3: Possible extent of groundwater contamination (shown as a red circle) near the Environmental Dam at the Premises (DWER, 2023; adapted from Artemis Resources, 2023).

Based on this review, the department has determined that there is a need to maintain a monitoring program that continues to capture the seasonal variability of groundwater composition and any discharges from the Premises – this will be valuable should the Premises also resume operation at some point.

While the Licence Holder proposed to reduce monitoring from quarterly to annually, the department considers biannual groundwater sampling to be required.

The Pilbara has cyclonic weather that varies from dry season to rainy season, therefore the monitoring frequency will be reduced to six-monthly.

The department will remove the recommissioned bores from the licence, as requested.

3.2.3 Processing monitoring

The Licence Holder requested to reduce the TSFs inspection frequency from daily to monthly, or after a significant rainfall.

The TSFs had not been operation since 2008. Based on the low environmental risk, the department has reduced the monitoring frequency requirements to monthly during the Care and Maintenance phase as requested.

4. Consultation

Table 1 provides a summary of the consultation undertaken by the department.

Table 1: Consultation

Consultation method	Comments received	Department response
Licence Holder was provided with draft amendment on 25/08/2023	<p>The Licence Holder comments were received on 08 September 2023.</p> <p>They confirmed there isn't currently any discharges to land.</p> <p>The Licence Holder requested clarification regarding the notification when the project comes out of care and maintenance.</p>	The department confirms that the notification has to be submitted 90 days prior bringing the project out of care and maintenance.

5. Conclusion

Based on the assessment in this Amendment Report, the Delegated Officer has determined that a Revised Licence will be granted, subject to conditions commensurate with the determined controls and necessary for administration and reporting requirements.

5.1 Summary of amendments

Table 2 provides a summary of the proposed amendments and will act as record of implemented changes. All proposed changes have been incorporated into the Licence as part of the amendment process.

Table 2: Summary of licence amendments

Condition no.	Proposed amendments
First page	Corrected DWER file number and removed Category 85
Content	Removed as per new licence format
Licence History	Current amendment added it, removed works approvals as per new licence format
1, 1.1, 1.1.2, 1.1.3, 1.1.4 and 1.1.5	Removed as per new licence format
Definitions	Moved to Table 14 in page 13 as per new licence format
1.3.2	Removed because of redundancy
Table 1	Add the restriction of no tailing deposition during Care and Maintenance
Table 2	WWTP management removed
Table 6	WWTP monitoring removed
Table 7	Frequency changed during care and maintenance to monthly
Table 9	Re-commissioning bores RHW56 and RHW57 were removed. The monitoring frequency was reduced to six-monthly during care and maintenance
4.1.1, 4.1.2 and 4.1.3	Replaced by conditions 24, 25, 28 and 29 as per new licence format
Table 11	Annual Audit Compliance Report removed
Table 12	Groundwater data and summary requirement was removed as was an old condition
Table 13	Added as per new licence format, changed the notification of recommencing operations from 60 days to 90 days
Figure 5	Monitoring bores map added

References

1. Department of Environment Regulation (DER) 2015, *Guidance Statement: Setting Conditions*, Perth, Western Australia.
2. Department of Water and Environmental Regulation (DWER) 2020, *Guideline: Environmental Siting*, Perth, Western Australia.
3. DWER 2020, *Guideline: Risk Assessments*, Perth, Western Australia.
4. DWER 2023, Memorandum (REF: DEC2300, DEC1881)
5. Artemis Resources 2022, *Annual Environmental Report DWER, L7922-1989-5, Radio Hill Minesite Fox Radio Hill Pty Ltd / Artemis Resources Ltd* (REF: DWERDT665917).
6. Artemis Resources 2023, *Licence Amendment Application Supporting Document* (Reference: DWERDT803432)

Appendix 1: Application validation summary

SECTION 1: APPLICATION SUMMARY				
Application type				
Works approval	<input type="checkbox"/>			
Licence	<input type="checkbox"/>	Relevant works approval number:		None <input type="checkbox"/>
		Has the works approval been complied with?	Yes <input type="checkbox"/> No <input type="checkbox"/>	
		Has time limited operations under the works approval demonstrated acceptable operations?	Yes <input type="checkbox"/> No <input type="checkbox"/> N/A <input type="checkbox"/>	
		Environmental Compliance Report / Critical Containment Infrastructure Report submitted?	Yes <input type="checkbox"/> No <input type="checkbox"/>	
		Date Report received:		
Renewal	<input type="checkbox"/>	Current licence number:		
Amendment to works approval	<input type="checkbox"/>	Current works approval number:		
Amendment to licence	<input checked="" type="checkbox"/>	Current licence number:	L7922/1989/5	
		Relevant works approval number:		N/A <input type="checkbox"/>
Registration	<input type="checkbox"/>	Current works approval number:		None <input type="checkbox"/>
Date application received	5 July 2023			
Applicant and Premises details				
Applicant name/s (full legal name/s)	Fox Radio Hill Pty Ltd			
Premises name	Radio Hill Mine Site			
Premises location	Mining Lease M47/161 and M47/337			
Local Government Authority	City of Karratha			
Application documents				
HPCM file reference number:	DWERDT803432			
Key application documents (additional to application form):	1- Licence Amendment Application Supporting Document: -Attachment 3A - Groundwater Chemistry Tabulated Results -Attachment 3B - Scope, Size and Scale of Proposed Activities -Attachment 6A -Emissions and Wastes -Attachment 7 -Siting and Location -Attachment 10 - Amendment Fee calculation 2- Water Chemistry Results (Electronic Excel Spreadsheet) 3- Letter of authority			

Scope of application/assessment		
Summary of proposed activities or changes to existing operations.	Licence amendment -Removal "Category 85: Sewage facility premises" as the Waste Water Treatment Plan was decommissioned and removed in 2018 -Removal of condition associated to monitoring requirements associated with category 85 -Amend monitoring requirements related to category 6, to align with current site infrastructure and a Care and Maintenance risk profile -Amend the sites groundwater monitoring requirements to align with current site infrastructure and to adequately monitor groundwater changes in the Care and Maintenance phase	
Category number/s (activities that cause the premises to become prescribed premises)		
Table 1: Prescribed premises categories		
Prescribed premises category and description	Assessed production or design capacity	Proposed changes to the production or design capacity (amendments only)
Category 5: Processing or beneficiation of metallic or non-metallic ore	500 000 tonnes per annual period	NA
Category 6: Mine dewatering	50,000 tonnes per annual period	NA
Category 85: Sewage facility premises	45 cubic metres per day	To be removed
Legislative context and other approvals		
Has the applicant referred, or do they intend to refer, their proposal to the EPA under Part IV of the EP Act as a significant proposal?	Yes <input type="checkbox"/> No <input checked="" type="checkbox"/>	Referral decision No: NA
Does the applicant hold any existing Part IV Ministerial Statements relevant to the application?	Yes <input type="checkbox"/> No <input checked="" type="checkbox"/>	NA
Has the proposal been referred and/or assessed under the EPBC Act?	Yes <input type="checkbox"/> No <input checked="" type="checkbox"/>	Reference No: NA
Has the applicant demonstrated occupancy (proof of occupier status)?	Yes <input checked="" type="checkbox"/> No <input type="checkbox"/>	Mining lease / tenement <input checked="" type="checkbox"/> Expiry: M47/161 - 23 February 2031 M47/337 - 21 March 2036
Has the applicant obtained all relevant planning approvals?	Yes <input type="checkbox"/> No <input type="checkbox"/> N/A <input checked="" type="checkbox"/>	Approval: Expiry date: If N/A explain why?

Has the applicant applied for, or have an existing EP Act clearing permit in relation to this proposal?	Yes <input type="checkbox"/> No <input checked="" type="checkbox"/>	No clearing is proposed.
Has the applicant applied for, or have an existing CAWS Act clearing licence in relation to this proposal?	Yes <input type="checkbox"/> No <input checked="" type="checkbox"/>	No clearing is proposed.
Has the applicant applied for, or have an existing RIWI Act licence or permit in relation to this proposal?	Yes <input checked="" type="checkbox"/> No <input type="checkbox"/>	Licence/permit No: GWL 155914/7
Does the proposal involve a discharge of waste into a designated area (as defined in section 57 of the EP Act)?	Yes <input checked="" type="checkbox"/> No <input type="checkbox"/>	Name: Pilbara Groundwater Area Type: Proclaimed Groundwater Area Has Regulatory Services (Water) been consulted? Yes <input type="checkbox"/> No <input type="checkbox"/> N/A <input checked="" type="checkbox"/> as there are not new emissions. Regional office: Karratha
Is the Premises situated in a Public Drinking Water Source Area (PDWSA)?	Yes <input type="checkbox"/> No <input checked="" type="checkbox"/>	N/A
Is the Premises subject to any other Acts or subsidiary regulations (e.g. <i>Dangerous Goods Safety Act 2004, Environmental Protection (Controlled Waste) Regulations 2004, State Agreement Act xxxx</i>)	Yes <input checked="" type="checkbox"/> No <input type="checkbox"/>	Rights in Water and Irrigation Act 1914 Contaminated Sites Act 2003 (WA)
Is the Premises within an Environmental Protection Policy (EPP) Area?	Yes <input type="checkbox"/> No <input checked="" type="checkbox"/>	N/A
Is the Premises subject to any EPP requirements?	Yes <input type="checkbox"/> No <input checked="" type="checkbox"/>	N/A
Is the Premises a known or suspected contaminated site under the <i>Contaminated Sites Act 2003</i> ?	Yes <input checked="" type="checkbox"/> No <input type="checkbox"/>	Site ID: 1351 Classification: possibly contaminated Date of classification: 2008