



Application for Licence Amendment

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

Licence Number	L7815/2001/12
Licence Holder	Northern Star (Thunderbox) Pty Ltd
ACN	107 154 727
File Number	DWERVT16137
Premises	North Eastern Goldfields Operations LEINSTER WA 6437 Legal description – Mining tenements L36/155, L36/157, L36/158, L37/61, L37/73, L37/142, L37/166, L37/199, L37/215, L37/216, M36/35, M36/177, M36/421, M36/462, M36/473, M36/494, M36/503, M36/504, M36/512, M36/516, M36/525, M36/527, M36/541, M36/542, M36/582, M36/584, M36/585, M36/586, M36/587, M36/589, M36/599, M36/600, M36/1148, M37/339, M37/340, M37/356, M37/357, M37/358, M37/359, M37/360, M37/361, M37/367, M37/368, M37/437, M37/465 and M37/1148 As defined by the Premises maps attached to the Revised Licence
Date of Report	29 January 2025
Decision	Revised licence granted

Fiona Westcott
MANAGER, RESOURCE INDUSTRIES
REGULATORY SERVICES
an officer delegated under section 20 of the *Environmental Protection Act 1986* (WA)

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1. Decision summary

Licence L7815/2001/12 is held by Northern Star (Thunderbox) Pty Ltd (Licence Holder) for the North Eastern Goldfields Operations (the Premises), located in Leinster WA 6437, part of mining tenements L36/155, L36/157, L36/158, L37/61, L37/73, L37/142, L37/166, L37/199, L37/215, L37/216, M36/35, M36/177, M36/421, M36/462, M36/473, M36/494, M36/503, M36/504, M36/512, M36/516, M36/525, M36/527, M36/541, M36/542, M36/582, M36/584, M36/585, M36/586, M36/587, M36/589, M36/599, M36/600, M36/1148, M37/339, M37/340, M37/356, M37/357, M37/358, M37/359, M37/360, M37/361, M37/367, M37/368, M37/437, M37/465 and M37/1148.

This Amendment Report documents the assessment of potential risks to the environment and public health from proposed changes to the emissions and discharges during the operation of the Premises. As a result of this assessment, Revised Licence L7815/2001/12 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://dwer.wa.gov.au/regulatory-documents>.

2.2 Application summary

On 17 June 2024, the Licence Holder submitted an application to the department to amend Licence L7815/2001/12 under section 59 and 59B of the *Environmental Protection Act 1986* (EP Act). The following amendments are being sought regarding the deposition of tailings into tailings storage facility (TSF) Cells C and D located on mining tenements M36/512 and M36/585. Tailings deposition proposed a production rate of up to 7,000,000 tonnes per annum (no change to licence). The TSF Cells C and D will have an estimated 11 years life of asset.

This amendment is limited only to changes to Category 5 activities from the Existing Licence. No changes to the aspects of the existing Licence relating to Category 6, 52, 54, 64 and 73 have been requested by the Licence Holder. No change to the throughputs are proposed.

2.2.1 Construction Context of TSF Cells C and D:

Due to the expansion of the Thunderbox Mill and Power station and increased throughput of production capacity, TSF Cells C and D were constructed to provide an additional 37.7 Mt of tailings storage to the current TSF storage capacity in cells A and B. This construction was assessed under works approval W6601/2021/1. See Table 1 for construction stages and Figure 1 for location of Cells C and D and associated pipelines. In a letter signed 7 May 2024, the department confirmed works approval compliance of Cell C and D Stage 1 to a maximum embankment height of RL 494.1 m and associated infrastructure.

Table 1: Proposed Construction Stages of TSF Cells C and D

Cell C and D Stage	Storage capacity			Embankment levels		
	Cell C (Mt)	Cell D (Mt)	Total (Mt)	Cell C (RL m)	Divider (RL m)	Cell D (RL m)
1	6.7	2.8	9.5	494.1	494.1	494.1
2	11.5	7.4	19	498.2	498.2	498.2

Cell C and D Stage	Storage capacity			Embankment levels		
	Cell C (Mt)	Cell D (Mt)	Total (Mt)	Cell C (RL m)	Divider (RL m)	Cell D (RL m)
3	14	9.9	23.9	500.2	500.2	500.2
4	17	12.7	29.7	502.6	502.6	502.6
5	20	15.7	35.7	505.0	505.0	505.0
6	21	16.7	37.7	505.8	505.8	505.8



Figure 1: TSF Cells C and D and associated pipelines

To manage seepage, 4 monitoring bores were constructed east of Cell C and D (TSFMB09D to TSFMB12D), as per Figure 2, along with a low permeability clay/soil liner of at least 6 x 10⁻⁷ m/s permeability and underdrainage system.

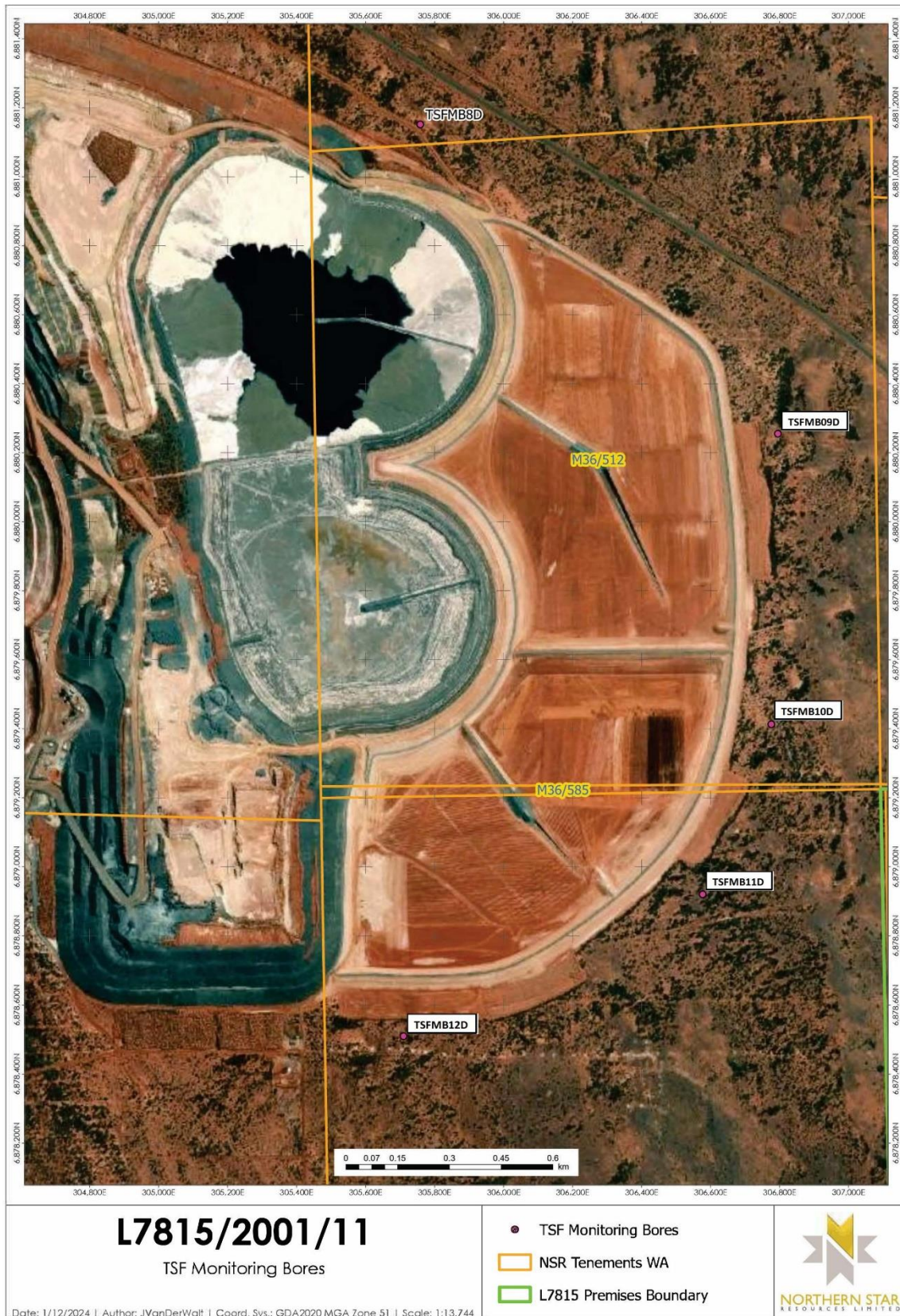


Figure 2: TSF Cells C and D monitoring bores

2.2.2 Proposed Operation

The Licence Holder is currently operating under time-limited-operations. This includes deposition of tailings into Cells C and D from the perimeter embankments towards the centre of the basin, where a supernatant pond will be maintained central to the facility. Tailings is produced at a rate of 6.0 Mtpa, and has slurry characteristics outlined in Table 2.

Table 2: Tailings Characteristics

Parameter	Value
Maximum Air-Dried Density	1.62 t/m ³
Solids Particle Density	2.77 t/m ³
P80	72 µm
Beach Slope	1V: 100H (latest beach survey)
Solids Content	62%
Supernatant Release	28 – 35%
Underdrainage Release	3-8%
Vertical Permeability	4x10 ⁻⁷ m/s
Coeff. of Consolidation (Cv)	73 m ² /yr
Coeff. of Volume Decrease (Mv)	0.014m ² /kN
Compression Index (Cc)	0.226

The processing plant requires make-up water year-round due to a negative water balance, with demand varying slightly between wet and dry seasons. Limited rainfall means storing wet season runoff provides minimal benefit. As rainfall does not typically provide sufficient volume for processing purposes, the return water from the TSF used to makeup process water. Water returned from the TSF (13,000 to 83,000 m³/month) is consistently less than the plant's make-up requirement (30,000 to 131,000 m³/month). As a result, the supernatant pond is maintained at a minimum operating volume to ensure sufficient process water supply, as the plant's needs exceed TSF returns in all seasons.

2.3 Other approvals

No referral to the Environmental Protection Authority (Part IV of the EP Act) has been made regarding the proposed operation and it will only be assessed and managed under Part V of the EP Act.

The department has assessed construction of Cells C and D and associated infrastructure under works approval W6601/2021/1, granted 3 May 2022 and enabled time limited operations for tailings deposition. The department confirmed works approval compliance of Cell C and D Stage 1 in a letter signed 7 May 2024.

Additionally, the Department of Energy, Mines, Industry Regulation and Safety (DEMIRS) has approved the mining proposal (Reg. ID: 99935) on 4 November 2021. During works approval consultation, the department confirmed with DEMIRS that geotechnical aspects of the construction of Cells C and D had been sufficiently considered by the proponent.

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 Source-pathways and receptors

3.1.1 Emissions and controls

The key emissions and associated actual or likely pathway during premises operation which have been considered in this Amendment Report are detailed in Table 3 below. Table 3 also details the proposed control measures the Licence Holder has proposed to assist in controlling these emissions, where necessary.

Table 3: Licence Holder controls

Emission	Sources	Potential pathways	Proposed controls
Dust from dry tailings	Wind blow from TSF deposition	Air/windborne pathway	Operation: <ul style="list-style-type: none"> Daily inspections Use of water sprays, dribble bars to ensure no windblown dust (existing condition)
Decant water and/or tailings	Decant pipeline/tailings delivery pipeline	Direct discharge to soil from leaks and spills. Runoff from contaminated soil.	Construction controls (maintain): <ul style="list-style-type: none"> Stored in V-drains Fitted with telemetry Surface water drainage management: Diversion drain, bund and silt traps designed to ensure surface water is diverted before reporting to the TSF and natural surface water flow is not impeded. Operation: <ul style="list-style-type: none"> Inspection of pipelines at least twice per 12-hour shift.
Decant water and/or tailings	Deposition of tailings into TSF Cells C and D	Seepage through base of structure	Construction controls (maintain): <ul style="list-style-type: none"> Low permeability basin liner: 6 x 10⁻⁷ m/s Basin underdrainage collection system, collection tower Embankment upstream toe drain Cut off trench Operation controls: <ul style="list-style-type: none"> Maintain groundwater monitoring wells TSFMB08D to TSFMB12D Undertake annual water balance Trigger of when standing water levels (SWL) rise higher than 6 mbgl with actions taken (Existing on licence) 7 interception wells around the periphery of the TSF have been established but not activated as

Emission	Sources	Potential pathways	Proposed controls
			tailings deposition has only been recently commenced so that groundwater levels were not of concern at the time of application for the amendment. Groundwater modelling shows these bores will be an effective solution to mitigate water table mounding and contain leakage at a small distance from the TSF, without affecting the regional groundwater regime, both in terms of quality and quantity.
		Overtopping and stormwater runoff	<p>Construction (maintain):</p> <ul style="list-style-type: none"> • Diversion drain <p>Operational controls:</p> <ul style="list-style-type: none"> • Maintain a minimum freeboard of 500mm from top of embankment. • Inspection of TSF at least twice per 12-hour shift.

3.1.2 Receptors

In accordance with the *Guideline: Risk assessments* (DWER 2020), the Delegated Officer has excluded employees, visitors and contractors of the Licence Holder's from its assessment. Protection of these parties often involves different exposure risks and prevention strategies, and is provided for under other state legislation.

Table 4 below provides a summary of potential human and environmental receptors that may be impacted as a result of activities upon or emission and discharges from the prescribed premises (*Guideline: Environmental siting* (DWER 2020)).

Table 4: Sensitive human and environmental receptors and distance from prescribed activity

Human receptors	Distance from prescribed activity
Goldfields Highway	Within 250m of tailings pipeline and the border of Cell D
Aboriginal sites and heritage places 64 sites located within the prescribed premises. Key site that may be impacted: ACH-00002552 – Leonora-leinster 23 – Artefacts/scatter – not restricted	ACH-00002552 1.5km southeast of Cell D. Other sites are greater than 2km away from Cells C and D.
Environmental receptors	Distance from prescribed activity
Native vegetation	Surrounding Cells C and D
Surface water	No major surface water features located within 5km of the Thunderbox mill operations area.

	<p>Minor surface water drainage lines exist to the west of the Thunderbox mill operations area. The flow is to the south towards the TSF. This has been diverted around the northern boundary of the new TSF cells via a diversion channel to prevent inundation of the nearby Goldfields Highway.</p> <p>The catchment above the diversion, the Northwestern Subcatchment, has a surface area of 420 ha.</p>
<p>Groundwater</p>	<p>Groundwater within the project area is generally within 28m of the natural ground level and typically flows south east across the site. Existing monitoring bore data indicates that cyclic trend can be seen where ground water levels peak during the wet season before reducing over the subsequent dry season. Groundwater within the project area is saline and will be suitable for livestock use.</p>

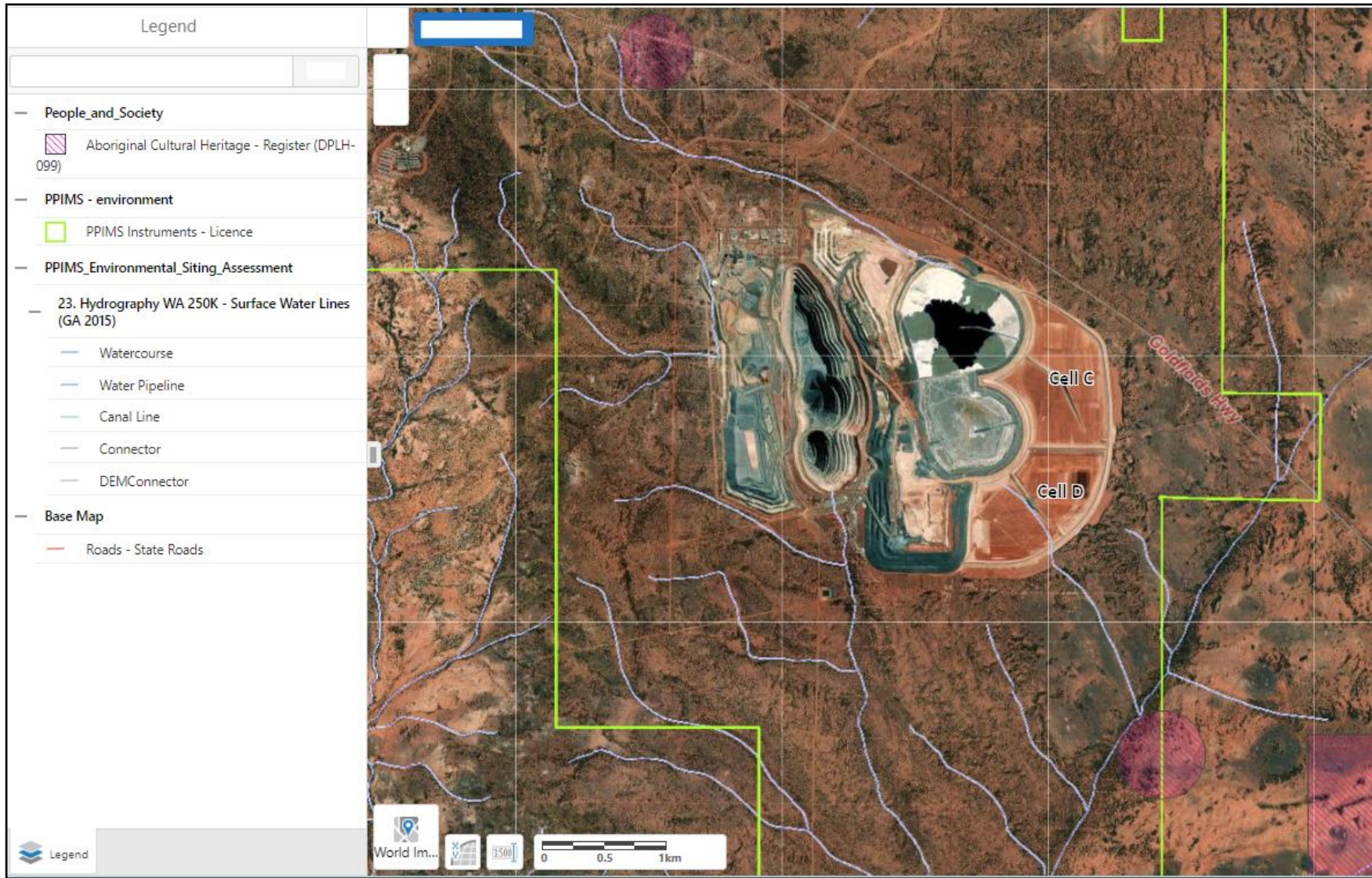


Figure 3: Distance to sensitive receptors

Licence: L7815/2001/12

IR-T15 Amendment report template v3.0 (May 2021)

3.2 Risk ratings

Risk ratings have been assessed in accordance with the *Guideline: Risk Assessments* (DWER 2020) for those emission sources which are proposed to change and takes into account potential source-pathway and receptor linkages as identified in Section 3.1. Where linkages are incomplete they have not been considered further in the risk assessment.

Where the Licence Holder has proposed mitigation measures/controls (as detailed in Section 3.1), these have been considered when determining the final risk rating. Where the Delegated Officer considers the Licence Holder's proposed controls to be critical to maintaining an acceptable level of risk, these will be incorporated into the licence as regulatory controls.

Additional regulatory controls may be imposed where the Licence Holder's controls are not deemed sufficient. Where this is the case the need for additional controls will be documented and justified in Table 5.

The Revised Licence L7815/2001/12 that accompanies this Amendment Report authorises emissions associated with the operation of the Premises i.e. category 5 activities.

The conditions in the Revised Licence have been determined in accordance with *Guidance Statement: Setting Conditions* (DER 2015).

Table 5. Risk assessment of potential emissions and discharges from the Premises operation

Risk Event					Risk rating ¹ C = consequence L = likelihood	Licence Holder's controls sufficient ?	Conditions ² of licence	Justification for additional regulatory controls
Source/Activities	Potential emission	Potential pathways and impact	Receptors	Licence Holder's controls				
Operation								
Operation failure of decant pipeline and/or tailings delivery pipeline (spills/leaks)	Decant water and/or Tailings	Direct discharge/runoff causing contamination/erosion	Goldfields highway Native vegetation Aboriginal site - ACH-00002552 Surface water	Refer to Section 4.1	C = Major L = Unlikely Medium Risk	No	Condition 2 - stored in v drains, fitted with telemetry & <u>equipped with automatic shutoff systems</u> Condition 6 – visual inspection	Due to the proximity of the tailings pipeline to the goldfields highway, automatic shutoff systems should also be required to further minimize risk.
Discharge of tailings to TSF Cells C and D	Dust	Air/windborne pathway causing impacts to health and amenity	Goldfields highway Native vegetation	Refer to Section 4.1	C = Moderate L = Unlikely Medium Risk	Y	Condition 16 – dust mitigation (existing)	N/A

	Decant water and/or tailings	Seepage through base of pit causing groundwater mounding and adverse impacts to groundwater dependent vegetation	Groundwater Native vegetation	Refer to Section 4.1	C = Moderate L = Unlikely Medium Risk	Y	Condition 2 - Monitoring bores required & interception wells Condition 8 – water balance Condition 21 – monitoring bores parameters (existing) Condition 22 – monitoring bore trigger of SWL (existing)	Groundwater results were provided in RFI response given on the 06/12/2024. A spot sample prior to discharge in April 2024 was compared alongside to a sample taken during TLO in October 2024 after deposition. The SWL remains the closest to ground level at bore TSFMB8D and saw levels rise from 7.92 to 7.4mbgl. While the SWL at other bores remains greater than 12mbgl. Modelling simulations for the Works Approval showed that by the time the TSF reaches its full height, the SWL may rise up to 5mbgl (180 mAHD). The licence holder states through proper management and utilization of interception wells, the trigger of 6mbgl is adequate for management of seepage. All parameter results remained below existing licence limits in condition 21, except for TDS, seeing exceedances above the limit of 1,500mg/L at 3 out of 5 bores. Due to the minimal receptors and deep SWL, vegetation root zones are unlikely to be impacted. Therefore, the limit has been changed from 1,500 to 5,000mg/L.
	Decant water and/or tailings	Overtopping of pit and stormwater runoff, causing contamination/erosion	Goldfields highway Aboriginal heritage sites Native vegetation Surface water	Refer to Section 4.1	C = Major L = Unlikely Medium Risk	Y	Condition 1 - diversion drain and berm & freeboard Condition 6 - inspection Condition 8 – water balance	N/A

Note 1: Consequence ratings, likelihood ratings and risk descriptions are detailed in the *Guideline: Risk assessments* (DWER 2020).

Note 2: Proposed Licence Holder's controls are depicted by standard text. **Bold and underline text** depicts additional regulatory controls imposed by department.

4. Consultation

Table 6 provides a summary of the consultation undertaken by the department.

Table 6: Consultation

Consultation method	Comments received	Department response
Traditional Owners advised of amendment application on 09/10/2024	No comments received.	N/A
Licence Holder was provided with draft amendment on 14/01/2025.	<p>Comments received;</p> <ol style="list-style-type: none"> 1. Updated figure 4 to include revised monitoring bore numbering 2. Confirmation of infrastructure already constructed and yet to be constructed. 3. Request removal of secondary crushing circuit infrastructure as it has not and will not be installed, along with associated figures. 4. Addition of TSFMB08D to be added to Table 2 and monitoring table (Table 11). 5. Clarification of 7 interception wells that have not been constructed yet. Figure not provided with locations due to more data needed to inform designs by a hydrogeologist. 6. Remove row of treated effluent from the Thunderbox WWTP in condition 17 with the discharge point of Eastern Waste Dump as this feature is no longer in use. Only discharge point is the TSF. 7. Request to increase the limit of TDS from <1,500mg/L to <5,000mg/L as current data has some monitoring bores recording a TDS of 4,200mg/L as the baseline. 	<ol style="list-style-type: none"> 1. Updated 2. Table 2 has been divided into table 2 (operational conditions for constructed infrastructure) and table 3 (to be constructed infrastructure) for clarity. 3. Removed 4. Added 5. Interception wells have been added to the table 3, rather than table 2. 6. Removed 7. The department has changed the limit to 5,000mg/L due to the minimal receptors - vegetation and groundwater. Considering the SWL currently ranges from 7.4 to 16.84mbgl, and a potential max SWL of 5mbgl when the TSF reaches its full height, the vegetation root zones are unlikely to be impacted.

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

Table 7: Summary of licence amendments

Condition no.	Proposed amendments
Throughout	<ul style="list-style-type: none"> Condition, table, and figure numbering updated.
Condition 1 Table 1	<ul style="list-style-type: none"> Inclusion of TSF Cells C and D and infrastructure requirements and location
Condition 2, Table 2	<ul style="list-style-type: none"> Table 2 has been divided into table 2 (operational conditions for constructed infrastructure) and table 3 (to be constructed infrastructure). Addition of TSF Cells C and D return water and tailings pipelines and their associated requirements and location Change of groundwater monitoring bore naming conventions to be aligned with the Knight Piesold report.
Condition 3, Table 3	<ul style="list-style-type: none"> Table 2 has been divided into table 2 (operational conditions for constructed infrastructure) and table 3 (to be constructed infrastructure) Addition of 7 interception wells and their associated requirements and location
Condition 7, Table 4	<ul style="list-style-type: none"> Addition of TSF Cells C and D and associated pipelines frequency of inspection.
Condition 9	<ul style="list-style-type: none"> Addition of water balance required for TSF Cells C and D
Condition 22 Table 11	<ul style="list-style-type: none"> Change of groundwater monitoring bore naming conventions TDS limit changed from <1,500mg/L to <5,000mg/L.
Schedule 1, Figure 4	<ul style="list-style-type: none"> Updated figure to include changed groundwater monitoring bore names
Schedule 1, Figures 20 to 22	<ul style="list-style-type: none"> Added figures associated with TSF Cells C and D

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.