# **Amendment Report**

# **Application for Licence Amendment**

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

**Licence Number** L6498/1995/11

Licence Holder Northern Star Resources Ltd

**ACN** 092 832 892

**File Number** 2012/006868-1

**Premises** Jundee Operations

SHIRE OF WILUNA

WILUNA WA 6646

Mining tenements: G53/20, L53/52, L53/60, L53/68, L53/69, L53/70 - L53/73, L53/75, L53/99, L53/100, L53/102, L53/112, L53/113, L53/117, L53/136 - L53/138, L53/142, L53/143, L53/153, L53/169, L53/174, M53/155, M53/156, M53/182, M53/191, M53/192, M53/196 - M53/198, M53/199, M53/221, M53/226, M53/228 - M53/230, M53/235 - M53/237, M53/245

- M53/250, M53/326, M53/347, M53/372, M53/412 -

M53/414, M53/441, M53/446, M53/451, M53/452, M53/461, M53/477 - M53/480, M53/492, M53/535 - M53/541, M53/552, M53/588, M53/589, M53/611, M53/707, M53/708, M53/711, M53/712, M53/836, M53/874, M53/895, M53/911, M53/929,

M53/935, M53/940, M53/966, PL34 as depicted in

Schedule 1 of the issued licence

Date of Report 30 October 2023

**Decision** Revised licence granted

#### A/MANAGER, RESOURCE INDUSTRIES

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

# **Table of Contents**

1. Decision summary									
2.	Scope	e of as	sessment	1					
	2.1	Regula	atory framework	1					
	2.2	Application summary							
		2.2.1	Tailings storage facility 3 (TSF3)	1					
	dam	2.2.2	Treated sewage wastewater to TSF3 and R1D1 seepage return water 2						
		2.2.3	Category 52 – electric power generation	2					
		2.2.4	Reduced minimum freeboard in pits containing water	2					
	Pit and	2.2.5 d Coulth	New dewatering discharge points within Jundee mining area – Menzie nard Pit						
		2.2.6	New dewatering pit Ramon mining area – Coulthard Pit	3					
		2.2.7	DWER initiated amendments.	3					
		2.2.8	Administrative changes	4					
3.	Risk a	assess	sment	5					
	3.1	Source	e-pathways and receptors	5					
		3.1.1	Emissions and controls	5					
		3.1.2	Receptors	7					
	3.2	Risk ra	atings	8					
	3.3	Detaile	ed risk assessment – Seepage of contaminated water	12					
		3.3.1	Overview of risk assessment	12					
		3.3.2	Water balance and seepage modelling	12					
		3.3.3	Justification for additional regulatory requirements	12					
		3.3.4	Consideration of groundwater monitoring	12					
4.	Cons	ultatio	n	14					
<b>5</b> .	Conc	lusion		14					
	5.1	Summ	ary of amendments	14					
Refe	rence	s		17					
			nmary of Licence Holder's comments on risk assessment and						
App	endix 2	2: App	lication validation summary	21					
Table	e 1: Cha	anges r	ecommended	3					
Table	2: Adr	ninistra	tive changes requested	4					
Table	3: Lice	ence Ho	older controls	5					
Table	e 4: Ser	nsitive h	numan and environmental receptors and distance from prescribed activi	tv.7					

Table 5. Risk assessment of potential emissions and discharges from the Premises due t amendments proposed	
Table 6: Consideration of alternate analysis suites	13
Table 7: Consultation	14
Table 8: Summary of licence amendments	14

# 1. Decision summary

Licence L6498/1995/11 is held by Northern Star Resources Ltd (Licence Holder) for the Jundee Operations (the Premises), located within the Shire of Wiluna on the mining tenements listed on the licence.

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 L6498/1995/11 has been granted.

# 2. Scope of assessment

#### 2.1 Regulatory framework

In completing the assessment documented in this Amendment Report, the Department of Water and Environmental Regulation (the department; DWER) has considered and given due regard to its Regulatory Framework and relevant policy documents which are available at <a href="https://dwer.wa.gov.au/regulatory-documents">https://dwer.wa.gov.au/regulatory-documents</a>.

## 2.2 Application summary

On 16 February 2023, the Licence Holder submitted an application to the department to amend Licence L6498/1995/11 under section 59 and 59B of the *Environmental Protection Act* 1986 (EP Act). The following amendments are being sought:

- to allow operation of TSF3 after time limited operations (TLO) (category 5)
- Authorise discharge of treated sewage wastewater to TSF3 and R1D1 seepage return water dam (in addition to active TSF) (category 54)
- Increase the throughput of category 52 electric power generation add and remove emission points
- Reduce minimum freeboard in pits containing mine dewater from 10 to 5m (category 6)
- New dewatering effluent discharge points Menzies Pit and Coulthard Pit (Category 6)
- Other administrative amendments including the extension of the licence expiry date.

The only change to category production or design capacity covered by this amendment application is for category 52 – electric power generation. A slight increase from 42.21MW to 42.34MW is proposed, to capture peripheral generation.

#### 2.2.1 Tailings storage facility 3 (TSF3)

Construction, commissioning and TLO of the TSF3 Cell 1 starter embankment (to 566m RL) was authorised under works approval W6522/2021/1. A Critical Containment Infrastructure Report for the embankment was submitted on 4 November 2022, with additional information submitted on 22 November 2022. In combination, these documents were found to demonstrate compliance with the works approval, but it was noted that additional controls (committed to by email but not captured in the works approval) may be required for the return water dam. An environmental compliance report for the associated pipelines and piezometers was submitted on 26 May 2023 and found to be compliant with the relevant conditions. Time limited operation of TSF3 Cell 1 commenced on 26 May 2023.

The licence holder has applied to have TSF3 added to this licence as an approved discharge location. Once this amendment is granted, time limited operations for this cell will end under condition 12(b) of works approval W6522/2021/1.

Compliance documents for the construction of cells 2 and 3 of TSF3 have not yet been provided, so operation of these cannot be authorised in this amendment. Cells 2 and 3 will undergo construction and time limited operations under W6522/2021/1. Further amendments to this licence will be required for ongoing operation of those cells.

Works approval W6522/2021/1 was issued for 5 years, expiring 19 September 2026. Raises of Cell 1 to 569m RL and 572m RL were authorised in W6522/2021/1, with the expectation that these authorisations will be transferred to this licence if required, prior to the expiry of the works approval. The licence holder has however advised that these raises will not be constructed until after the initial construction of cell 2. The department has therefore not authorised future lifts of TSF3 Cell 1 under this amendment, as there will be other amendments before the expiry of the works approval, through which authorisation to construct future raises may be considered.

#### 2.2.2 Treated sewage wastewater to TSF3 and R1D1 seepage return water dam

Deposition of tailings currently rotates between TSF1, TSF2 and TSF3 (in TLO under W6522/2021/1). The existing licence authorises discharge of treated sewage water into TSF1 or TSF2, whichever is the active TSF at the time. Discharge to inactive TSFs is not permitted. The licence holder has requested permission to discharge to TSF3 in the same manner, while it is the active TSF. The Delegated Officer considers that it is most appropriate for the treated wastewater to be discharged to an active TSF where it contributes a very small portion of the incoming liquid. The 2022 annual report for L6498/1995/11 reported discharge of 49,609 cubic meters (m³) of treated wastewater to TSFs, compared to 2,455,186 m³ of tailings deposition. The wastewater therefore represented around 2% of deposition. This amendment represents no increase in treated wastewater deposition, but transfers some of that deposition to the new TSF3 and away from TSF2 which has some existing seepage issues.

Discharge to R1D1 has a lower risk of seepage to the environment than deposition to an active tailings dam, as R1D1 is HDPE lined and the water then enters the same circuit. R1D1 is automatically pumped out based on a high water level sensor to minimise risk of overtopping. Health risks to employees are regulated under other legislation, and do not form part of this assessment.

#### 2.2.3 Category 52 – electric power generation

Ramone satellite underground mine is located 35km south-east of the Jundee mining area, within the existing boundary of the prescribed premises defined in L6498/1995/11. The Ramone underground mine had an original mine life of one year. Six temporary generators were installed to provide electricity to the operations, which are added as emission points in this amendment. No additional generators are proposed to be added under this amendment.

The Ramon temporary generators and existing Jundee Powerhouse generators combined have a capacity of 42.34MW (0.13MW above the current stated assessed design capacity). An incremental increase in the category 52 capacity to 42.34MW is therefore requested.

#### 2.2.4 Reduced minimum freeboard in pits containing water

Condition 1.2.4 requires a minimum vertical freeboard of 10m between the pit lake and the surrounding ground surface, for all unlined pits containing mine dewater. The licence holder has asked to reduce the minimum freeboard to 5m.

A root depth report (Warren 2012) indicates that vegetation near TSF2 likely has roots less than 1m deep. It cannot be assumed that this is the case across the whole premises, but it is likely that low woodlands will not have a root depth exceeding 5m.

# 2.2.5 New dewatering discharge points within Jundee mining area – Menzies Pit and Coulthard Pit

Mine dewatering is undertaken in the Jundee mining area. Water is pumped depending on location to underground holding sumps, and a series of turkey nest dams and open pits (shown in Figure 5 in Schedule 1 of the licence) to be used in mining, processing or dust suppression. There will be some losses to evaporation and seepage, but the intent is storage rather than disposal as the Jundee operation is net water negative, requiring additional water extraction to meet operational needs. The main central receiving pit is currently Cook pit (primary) or Keating Pit (if extra storage required).

The licence holder is proposing to add Menzies pit? as an additional authorised storage point in the above circuit, particularly as there is potential for mining of Cook and Keating Pit which would exclude its ongoing use as a storage pit. A new Figure 5 showing mine pits and turkey nest locations is provided.

Groundwater in the vicinity of the Jundee operations ranges from brackish to hypersaline, with no current use aside from mining.

New bunded pipelines will need to be constructed to discharge into Menzies Pit. Preliminary risk assessment identified potential noise and dust emissions, but there are no receptors nearby that are likely to be impacted by such minor construction within an active mining area, so these risk evens have been screened out. Formal risk assessment therefore only addresses risks during pipeline operation, not construction.

#### 2.2.6 New dewatering pit Ramon mining area – Coulthard Pit

There is an existing pipeline between the Coulthard Pit and the Ramon mining area, via the Ramone turkey nest which is HDPE lined. The license holder has applied to utilize this existing pipeline to transport mine dewater from Ramon to Coulthard Pit.

The water in Ramon Pit (to be removed) is fresh to brackish. This is less saline than the receiving Coulthard Pit.

#### 2.2.7 DWER initiated amendments.

Table 1: Amendments made.

Condition	DWER initiated amendment	Justification		
1.2.5 (Table 1.2.3)	Note added to Table 1.2.3, differentiating between active and inactive pipelines.  This relates to tailings, dewatering and return water pipelines.	The intent of the inspections in these table rows is for operational pipelines. For non-operational pipelines (when flushed in the case of tailings lines), the risk is negligible and regulatory controls not required.		
1.2.5 (Table 1.2.3)	Row added in Table 1.2.3 to require visual inspection of the toe drain bund and capacity of toe drains.	The Delegated Officer considers this to be justified following a reported incident involving a breech of the TSF2 toe drain protective bund, resulting in an overflow of R2D2 seepage return dam.		
		This additional inspection is required to maintain the effectiveness of existing controls including the TSF toe drains and seepage return dams.		
3.3.1 (Table 3.3.1)	Table note 3 in table 3.3.1 expanded to clarify that a bore being blocked or unsamplable does not count as a sampling	It was identified during review of annual reports that blocked or dry monitoring bores were being considered sampled, for the purposes of compliance with condition 3.3.1.		

	event.	The Delegated Officer considers that blocked bores should not count as monitored as they are not fulfilling their purpose. Dry bores may be counted as monitored only if it can be demonstrated that the groundwater level is genuinely below the level of the bore, rather than the bore not operating correctly. Such a demonstration may involve extrapolation from surrounding bores or data trends from previous monitoring.
		Bore maintenance matters are allowed for in the 90% sampling requirement (Table note 3 in table 3.3.1). The bores may need repair or alternative bores installed. It is the responsibility of the licence holder to ensure that at least 90% of bores are available for sampling. Replacement bores or requests to remove bores from the licence should be discussed with DWER and may require amendment of the licence.
4.3.1	Notification condition updated to the current form.	Condition updated to provide consistency with other licences. The only material change is a reduction in the notification period from 21 days to 7 days from becoming aware of a noncompliance (including with a limit) with condition 3.3.1.

# 2.2.8 Administrative changes

Administrative changes requested by the licence holder, and the department's response, are summarised in Table 2.

Table 2: Administrative changes requested

Administrative amendment requested	DWER's assessment	Outcome
Extend the licence duration from 2024 to 2029	The Guidance Statement: Licence duration (DER 2016) allows the issuing of a licence for up to 20 years. The licence may be reviewed by the department at any time.	Expiry extended to 21/11/2042.
	It is desirable to keep the expiry date aligned with the end of the annual fee period for the licence.	
Correct the Premises category for bulk storage of chemicals from cat 74 to cat 73.	Confirmed this is an error and should be corrected.	Table on page 1 corrected.
Remove construction conditions for the waste heat recovery system (no longer planned to be constructed)	Approval for construction is no longer required. The first line of condition 1.2.9 also refers to new gas generators. However this is in error as that infrastructure has been completed, documentation provided and the relevant lines removed from Table 1.2.6 in the amendment granted 30 July 2020.	Condition 1.2.9 deleted, and condition 1.2.10 renumbered to 1.2.9.
	4.2.4 and 4.2.5 required compliance documentation for the waste heat recovery system.	4.2.4 and 4.2.5 deleted.

	Update premises description	This introductory section will be removed in line with the current licence template.	'Introduction' removed, except for licence history.		
Additional minor administrative amendments – captured in Table 8.					

#### 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
Operation of TSF	3		
Tailings seepage water causing groundwater mounding	TSF3	Seepage through base and embankments of TSF3 to groundwater	<ul> <li>Decant pond to be kept away from TSF embankments.</li> <li>Decant system removes water from the TSF.</li> <li>Seepage recovered via         <ul> <li>underdrainage system; and</li> <li>perimeter seepage recovery trenches to intercept shallow seepage moving laterally.</li> </ul> </li> <li>Construction of TSF3 - roller compacted clayey mine waste of low permeability (1 x 10<sup>-7</sup> m/s).</li> <li>Monitoring of existing groundwater monitoring bores and piezometers</li> </ul>
Tailings slurry or process water	TSF3 associated pipelines	Direct discharge from pipeline rupture	The applicant will operate the TSF in line with the Jundee TSF'S Operating Manual. This includes two inspections to be undertaken during each shift by an operator or supervisor which cover:  • All pipelines to and from the TSF;  • Spigots and valves;  • Spigotting locations, deposition and beach formation;

Emission	Sources	Potential pathways	Proposed controls
			Location and size of the water pond;
			The decant and decant pump;
			The process water dam, tanks and return water pumps;
			Seepage from the embankment toe;
			The general integrity of the embankment i.e. any new cracking, any new seepage; and
			Access roads.
			All tailings and return water lines are bunded and any leaks or failures are to be reported immediately.
Decant (process) water	Return water dam	Overtopping	Water automatically pumps out (back to the process plant) when a high alarm is reached.
		Seepage	HDPE lined
Tailings slurry or water	TSF3	Overtopping	TSF3 will be operated such that the minimum freeboard set out in the DMIRS guidelines are satisfied at all times (not less than 300 mm).
			The facility is designed such that a 1 in 100- year AEP, 72-hour storm event of 235 mm of rainfall can be temporarily stored on top of the facility above the normal operating pond level.
Contaminated stormwater	TSF3 area	Stormwater runoff	No specified controls however the Delegated Officer notes that there are no surface water resources or permanent flowing drainage systems within or near the TSF3 footprint.
Deposition or tre	ated wastewater t	o TSF3 and R1D1	
Treated wastewater	Wastewater treatment plants,	Contained in seepage from TSF 3; overtopping of TSF3	R1D1 is HDPE lined, and operated automatically pumped out to keep the level below the TSF3 toe drain inflow.
	deposited to TSF3 and/or R1D1	or R1D1	TSF3 seepage and overtopping controls as above.
			Installation of aeration units within the wastewater treatment plant (as added to table 1.2.2 in December 2021 amendment)
Changes to mine	dewater discharg	ges	
Saline water	Mine dewater	Direct discharge to pits; seepage to groundwater	Freeboard of 5m maintained between pit lake and surrounding ground surface.
Additional electri	icity generation ar	nd emission points	
Hydrocarbon combustion products and unburned hydrocarbons	Gas and diesel electrical generators	Direct emissions via exhaust stacks or floor to ceiling vents	No controls specified. No receptors.

#### 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
Jundee Homestead	2.6km from Jundee Processing Plant, and further from TSF3.  More than 20km from the Ramone mining area.
Environmental receptors	Distance from prescribed activity
Surface Water	There are no defined surface water lines within the premises.
Rights in Water and Irrigation Act 1914	The premises is located within the proclaimed East Murchison Groundwater Area.
Tjunti Soak	3km east north east from Jundee Processing Plant
Priority Ecological Community (P1)  Jundee Homestead calcrete groundwater assemblage type on Carnegie palaeodrainage on Jundee Station	2.4km from Jundee processing plant
Remnant native vegetation	Within and surrounding the premises, including adjacent to mine water receiving pits and TSF3.
Fauna	Record of the Priority 4 fauna species brush-tailed mulgara (Dasycercus blythi) located 6.7 kilometres north of the eastern side of the proposed activities boundary. Botanica Consulting's Flora, Vegetation and Fauna Survey (2020) identified suitable fauna habitat for this species adjoining the western boundary of the proposed activities boundary. No confirmed records were identified during the survey.
Groundwater around TSF 3	Monitoring bores within the TSF3 footprint since 2017 show results ranging from 330 – 11,000 mg/L total dissolved solids (TDS).
	Pre-mining groundwater levels under TSF 3 are estimated to be around 20 to 25 meters below ground level (mbgl). Following tailings deposition into the adjacent historic Nimary TSF, significant groundwater mounding occurred, with water levels rising up to 2 mbgl in some bores within the first four years of tailings deposition.
	Nimary TSF was decommissioned in 2007. The groundwater mound has since dissipated with levels in 2020 ranging from 14 mbgl to 34 mbgl in Nimary TSF bores.
Groundwater beneath proposed new mine water discharge points	Groundwater around the Jundee mining area is brackish to hypersaline.
	Groundwater in the Coulthard Pit ranges from brackish to saline

# 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 L6498/1995/11 that accompanies this Amendment Report authorises emissions associated with the operation of the Premises.

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 due to the amendments proposed

Risk Event					Risk rating <sup>1</sup>	Licence		
Source/Activities	Potential emission	Potential pathways and impact	Receptors	Licence Holder's controls	C = consequence L = likelihood	Holder's controls sufficient?	Conditions <sup>2</sup> of licence	Justification for additional regulatory controls
Operation								
	Seepage of tailings liquor	Seepage through base or embankments of TSF causing impacts of groundwater quality and health of native vegetation	Groundwater Surrounding native vegetation	Refer to section 3.1.1.	C = Moderate L = Possible <b>Medium Risk</b>	N	Existing condition 1.2.2 – TSF3 Cell 1 added as containment infrastructure for tailings and treated wastewater  Existing condition 3.3.1 - TSF3 Cell 1 monitoring bores added, with a limit of 4mbgl for SWL.  Condition 3.2.2 – monthly water balance for TSF3  Existing condition 4.2.1 requires reporting of monitoring results and water balance.	Refer to section 3.3 for detailed risk assessment of seepage.
TSF3 operation (category 5):  Piping of tailings to TSF3, deposition and storage of tailings in TSF3, storage of return water in the return water dam and piping back to the processing plant.	Tailings or process water	Overtopping of TSF cells causing impacts to surface water quality, health of native vegetation and soil contamination	Surface water Soil and vegetation	Refer to section 3.1.1.	C = Major L = Unlikely <b>Medium Risk</b>	Y	TSF3 and R4D4 freeboard added to condition 1.2.4.	All consistent with applicant's commitments
	Tailings or process water	Pipeline burst or leak causing impacts to surrounding soils and health of native vegetation	Soil and vegetation	Refer to section 3.1.1.	C = Moderate L = Possible Medium Risk	Y	Existing condition 1.2.1- pipeline requirements  Existing condition 1.2.5 – pipeline inspections	Existing controls sufficient.
	Process water	Overtopping of return water dam R4D4	Soil and vegetation	Refer to section 3.1.1.	C = Minor L = Possible	Y	Condition 1.2.4 – descriptive freeboard added for R4D4.	Freeboard has been conditioned. Current operation as described by the licence holder, which the

Risk Event				Risk rating <sup>1</sup> Licence	ce			
Source/Activities	Potential emission	Potential pathways and impact	Receptors	Licence Holder's controls	C = consequence L = likelihood	Holder's controls sufficient?	Conditions <sup>2</sup> of licence	Justification for additional regulatory controls
					Medium Risk			Delegated Officer considers to give necessary protection against overflow.
Discharge of treated wastewater (from sewage treatment plant) to TSF3 or R1D1 (category 54) In rotation with authorised discharges to TSF1 and TSF2 (when active)	Treated wastewater	Seepage or overtopping of TSF or R1D1	Soils and surface water contamination	Refer to section 3.1.1.	C = Minor L = Unlikely <b>Medium Risk</b>	Y	Existing condition 3.2.1 –monitoring of treated wastewater  Existing Condition 1.2.1 – HDPE lining on R1D1  Condition 1.2.4 – descriptive freeboard added for R1D1.	A disruptive freeboard has been added. Current operation as described by the licence holder, which the Delegated Officer considers to give necessary protection against overflow.
Reduction in freeboard requirement (category 6)  Discharge mine dewater to existing approved pits up to 5m below the surrounding ground (previous limit of 10m)	Seepage of saline water	Seepage into the root zone of vegetation, causing stress or death	Vegetation; particularly deeper rooted vegetation	Refer to section 3.1.1.	C = Minor L = Unlikely <b>Medium Risk</b>	Y	Existing condition 1.2.4 – freeboard requirements for all pits containing mine dewater (unlined) – updated to 5m.	It is expected that the root zone of vegetation in this region will not be more than 6m. If saline water remains at least 5m below the surrounding ground for all pits, mounding impacts to vegetation are unlikely.
	Seepage of saline water	Seepage into the root zone of vegetation, causing stress or death	Vegetation; particularly deeper rooted vegetation	Refer to section 3.1.1.	C = Minor L = Unlikely Medium Risk	Y	Existing condition 1.2.4 – freeboard requirements for all pits containing mine dewater (unlined)	N/A
New discharge point (category 6)  Discharge of mine dewater to Menzies Pit	Saline water	Pipeline burst or leak causing impacts to surrounding soils and health of native vegetation	Soil, vegetation	Refer to section 3.1.1.	C = Minor L = Possible <b>Medium Risk</b>	Y	Condition 1.2.10 – construction criteria for pipeline Condition 1.2.11 – construction compliance reporting Existing condition 1.2.1- pipeline requirements Existing condition 1.2.5 – pipeline inspections	N/A

Risk Event	Risk Event							
Source/Activities	Potential pathways and Receptors		Licence Holder's controls	C = consequence L = likelihood	Holder's controls sufficient?	Conditions <sup>2</sup> of licence	Justification for additional regulatory controls	
New discharge point	Seepage of brackish water from Coulthard Pit	Seepage into the root zone of vegetation, causing stress or death	Vegetation; particularly deeper rooted vegetation	Refer to section 3.1.1.	C = Slight L = Unlikely Low Risk	Y	Existing condition 1.2.4 – freeboard requirements for all pits containing mine dewater (unlined)	Ramon Pit (source) is less saline than Coulthard Pit.
(category 6)  Discharge of mine dewater to Coulthard Pit	Brackish water	Pipeline burst or leak causing impacts to surrounding soils and health of native vegetation	Soil, vegetation	Refer to section 3.1.1.	C = Slight L = Possible Low Risk	Y	Existing condition 1.2.1- pipeline requirements  Existing condition 1.2.5 – pipeline inspections	Use of the existing pipeline is authorised subject to condition 1.2.1 and 1.2.5, based on the low risk as the water is brackish not saline
Changes to category 52 Increase the assessed electric power generation capacity of the premises (including existing temporary generators) Reducing the height of the authorised emission points A3 to A16 from 8m or 10m to 6m or 8.5m; emission of temporary diesel generator exhaust via floor-to-ceiling vents.	Emission of combustion products	Airborne	No residences within 10km.	Refer to section 3.1.1.	C = Minor L = Rare <b>Low Risk</b>	Y	N/A	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.

#### 3.3 Detailed risk assessment – Seepage of contaminated water

#### 3.3.1 Overview of risk assessment

Seepage of contaminated water through the base and embankments of TSF3 may contain constituents such as arsenic and cyanide and has the potential to adversely impact groundwater, soil/sediment and native vegetation. The addition of treated wastewater slightly adds to the fluid volume, but not significantly.

#### 3.3.2 Water balance and seepage modelling

The application for W6522/2021/1 included a water balance and seepage model. Results of the seepage analysis indicated that total seepage flow through the embankment are in the range of approximately 0.14 to 9.1 m<sup>3</sup>/d (Stage 5) under normal operating conditions.

The water balance outlines that during Stage 1, seepage will be 1,138,375 m<sup>3</sup>/year with a total inflow of 7,670.900 and a total outflow of 3,409,475 m<sup>3</sup>/year. Seepage therefore equates to around 20%.

Water quantity available for return to plant will also depend on whether there are changes in slurry densities from the processing plant, which means that tailings properties will also vary. This can affect the solid/liquid separation time and hence the water recovery from the decant.

DWER notes the geochemistry tailings properties was not included in the works approval application. The applicant has stated that their processing department undertakes regular monitoring and review of tailings slurry through assays and analysis to determine the constituents of the slurry and whether it is considered non-acid forming. A detailed material characterisation assessment has not been undertaken of available data, but can be collated with some time.

#### 3.3.3 Justification for additional regulatory requirements

The modelled seepage rate for TSF3 is considered to be quite high, and given the quality of the groundwater and the fact that slurry densities from the processing plant appear to fluctuate, the risk of seepage occurring is rated as *possible*. The consequence of seepage is rated as *moderate* giving an overall risk assessment rating of *medium*.

A licence condition requiring the licence holder to undertake a monthly water balance will therefore be required, as recommended in W6522/2021/1.

A geophysical assessment will also be required to investigate the requirement of further monitoring bores further afield from TSF3. This was a commitment by the licence holder in their application for works approval W6522/2021/1.

#### 3.3.4 Consideration of groundwater monitoring

W6522/2021/1 required the installation of groundwater monitoring bores NMB16 to NMB23, of which the first four relate to Cell 1. An additional two bores (NMB20 and NMB21) were also installed. Additional monitoring bores will be required for Cells 2 and 3, in accordance with W6522/2021/1. In the current licence amendment, NMB16 to NMB23 will be added to the licence as they target seepage from Cell 1.

The licence holder has proposed quarterly monitoring, and the same suite of parameters that are required for Jundee TSF2 compliance monitoring bores. These do not entirely match the monitoring parameters required during time limited operations under W6522/2021/1, which were recommended in the *Jundee Tailings Storage Facility 3 Hydrogeological Assessment phase 1 desktop study* (Saprolite Environmental 2020). As monitoring for TLO period has not yet been submitted, continued monitoring of several parameters is required pending analysis of TLO data. This may be reviewed in a later amendment. A full comparison of requested

parameters and those required for TLO is provided in Table 6.

Table 6: Consideration of alternate analysis suites

Parameter	Required in W6522/2021/1	Proposed by licence holder	Comments	
SWL <sup>1</sup>	monthly	quarterly	The Delegated Office considers that quarterly monitoring is sufficient after the en	
pH <sup>2</sup>	monthly	quarterly	of the time limited operations period.	
Total dissolved solids <sup>2</sup>	monthly	quarterly		
EC	monthly	-	The Delegated Officer considers that TDS measurement is sufficient, EC is not required.	
Weak Acid Dissociable Cyanide (WAD CN)	quarterly	quarterly	Identical. Will be included.	
Total cyanide	Quarterly	-	WAD CN comprises the most mobile fraction. WAD CN analysis is sufficient at this stage.	
	Quarterly	Quarterly	Quarterly sampling is acceptable.	
	Same as proposed     - As, Cd, Cu, Zn, Pb	Same as W6522/2021/1     (but specifies dissolved rather than total) – dissolved metals As, Cd, Cu, Zn, Pb	As monitoring for TLO period under W6522/2021/1 has not yet been submitted, continued monitoring of these parameters is required pending analysis of TLO data. This may be reviewed in a later amendment.	
	Other - Ca, Mg, Na, K, CO3, CI, SO4, AI, Cr, Fe, Mn, Ni and Co	Other  Dissolved metals –  Hg, Ni  Selenium	Required list will be those suggested by the applicant (as per TSF2) plus additional species monitored during TLO.	

A standing water level (SWL) limit of 1mbgl is proposed by the licence holder. This is likely proposed to correlate with the 1mbgl SWL limit for the TSF2 monitoring bores. However, the root depth report provided (Warren 2012) relates only to species present around TSF 2. Many species mapped as present in the TSF3 area (Botanica Consulting Pty Ltd 2020) have not been considered in the former report, and therefore it has not been demonstrated that vegetation around the TSF3 is also likely to be very shallow rooted. Botanica Consulting Pty Ltd (2020) identifies that the TSF3 area contains low woodland of *Acacia incurvaneura*, Acacia *ayersiana* and *Acacia caesaneura*, with assorted understory species. The root depths of the species have not been demonstrated. A more conservative limit of 4mbgl for TSF3 monitoring bores is therefore stipulated. Given the current groundwater level exceeds 14 mbgl, there would be significant mounding before the 4m limit is approached and trending in this direction would give ample opportunity for remedial actions.

# 4. Consultation

Table 7 provides a summary of the consultation undertaken by the department.

**Table 7: Consultation** 

Consultation method	Comments received	Department response
Department of Mines, Industry Regulation and Safety (DMIRS) advised of proposal (20 June 2023)	<ul> <li>Relevant Mining Proposals are identified, and comments made as to relevant requirements.</li> <li>Use of the Cook, Keating and Menzies open pits for the purposes of water storage has been acknowledged by DMIRS through approval of the Jundee Mine Closure Plan.</li> <li>An inspection was performed by DMIRS in May 2023, which identified seepage issues around TSF2. Inspection report provided, which includes actions for vegetation monitoring and a hydrological assessment of TSF2.</li> </ul>	<ul> <li>Relevant Mining Proposals considered in this assessment.</li> <li>Noted that DMIRS has no concerns about water storage in these pits.</li> <li>TSF2 concerns noted. There are no changes to TSF2 this amendment. Requested DMIRS provide DWER with copies of reports submitted in fulfillment of TSF2 seepage actions. Any action will be considered separate to this amendment.</li> </ul>
Licence Holder was provided with draft amendment on 11 September 2023	Refer to Appendix 1.	Refer to Appendix 1.

### 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 8 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 8: Summary of licence amendments** 

Condition no.	Proposed amendments	
Cover page	Expiry date extended to 21/11/2042.	
	Category 52 assessed production increased to 45 MW	
	Category 74 (error) corrected to category 73: Bulk storage of chemicals	
Introduction	Introduction removed except for licence history, which is updated.	
1.2.1	Administrative changes to point (c) for consistent tense and remove repetition.	

Added TSF3 Cell 1, and R4D4 seepage return water dam.			
'Bulk diesel storage facility (BDSF) Turkey's Nest' removed – this infrastructure no longer exists so is not an authorised discharge point.			
'TSF1 & 2 Processing Water Dam' renamed 'Processing Water Dam'			
R1D1 authorised to receive treated sewage water			
Decommissioned pits removed from table. This is an administrate correction as these are discharge points authorised under condition 2.3.1, not containment infrastructure so do not belong in this table.			
Added freeboard requirements for TSF3 Cell 1, and R4D4 seepage return water dam			
R1D1 and R2D2 did not have listed freeboard requirements. A descriptive freeboard has been added as per R4D4. This is an administrative change as it is only capturing existing practice as described by the Licence Holder.			
'TSF1 & 2 Processing Water Dam' renamed 'Processing Water Dam'			
'Bulk diesel storage facility (BDSF) Turkey's Nest' removed – this infrastructure no longer exists so is not an authorised discharge point.			
Freeboard for mine pits reduced from 10m to 5m.			
Added inspection of TSF3 toe drains.			
Deleted – infrastructure not required.			
renumbered			
Construction criteria for Menzies Pit pipeline, and proposed diesel generators.			
Construction compliance reporting for infrastructure approved under condition 1.2.10.			
Emission points A17, A18, A25 removed.			
Stack emission height for A3 to A16 changed from 8-10m to 6m or 8.5m			
Emission points with the same columns 2 to 4 combined to simplify table. Reference to specific brands of generator removed for consistency. References to 'standby only' removed, as these are still authorised emission points.			
Ramone temporary diesel generators A26-A31 added.			
'as soon as practical' added to this condition; this was previously required by condition 4.3.1 which has been removed.			
Tailings volume monitoring required for TSF1 and TSF3			
Same analysis suit required for Menzies Pit and Coulthard Pit as other mine dewater pits.			
Condition added to require monthly water balance calculation			
TSF3 cell 1 monitoring bores added to monitoring condition			
Additions to footnote to clarify what the 90% availability requirement covers.			
TSF3 cell 1 and R1D1 added.			
Requirement for reporting of stack testing removed – the testing requirement was removed in the amendment dated 31 July 2020.			

	Reporting of monthly water balance (condition 3.2.2) added
	Table note added referring licence holder to the DWER website for the current AACR form
4.2.4 – 4.2.5	Deleted – authorisation for construction removed therefore reporting conditions redundant.
4.2.4	Condition added to require a geophysical assessment for TSF3 future monitoring locations.
4.3.1 (Table 4.3.1)	Historic condition updated to the current notification condition. Calibration reports are no longer included in this condition, but in condition 3.1.4.
Schedule 1, Figure 1	Updated premises map. Note that tenements for the gas pipeline had previously been added to the premises description but were not included in Figure 1. This is now corrected.
Schedule 1, Figure 2	Updated map of storage locations
Schedule 1, Former Figure 3	Deleted to remove duplication. Points are shown on Figure 2.
Schedule 1,	Renumbered – formerly Figure 3
Figure 3	Figure updated to remove redundant emission points.
Schedule 1, Figure 4	New figure – Ramon emission points
Schedule 1, Figure 5	Figure updated.
Schedule 1, Figure 6	Figure updated to improve legibility.
Schedule 1, Figure 8	Updated Nimary groundwater monitoring bores map to include TSF3 bores. It is noted that many bores on the previous figure are not included on this new figure. However all bores for which monitoring is required under condition 3.3.1 are shown on this figure.
Schedule 1, former Figure 10	Deleted; landfill shown on Figure 4.

# References

- 1. Botanica Consulting Pty Ltd 2020, Reconnaissance flora/ vegetation & fauna survey Jundee TSF alternative locations prepared for Northern Star Resources Limited, Bounder, Western Australia. In DWER document A1970588.
- 2. Department of Environment Regulation (DER) 2015, *Guidance Statement: Setting Conditions*, Perth, Western Australia.
- 3. DER 2016, Guidance Statement: Licence duration, Perth, Western Australia.
- 4. Department of Water and Environmental Regulation (DWER) 2020, *Guideline: Environmental Siting*, Joondalup, Western Australia.
- 5. DWER 2020, Guideline: Risk Assessments, Joondalup, Western Australia.
- 6. Saprolite Environmental 2020, *Jundee Tailings Storage Facility 3 hydrogeological assessment phase 1 desktop study*, Ellenbrook WA. In DWER document A1970587.
- 7. Warren 2012, Root depth survey of vegetation around Tailings Storage Facility 2 at Newmont Jundee Operations, Newmont Jundee Operations, Western Australia. In DWER Document A2157254.

# Appendix 1: Summary of Licence Holder's comments on risk assessment and draft conditions

Section of decision report	Summary of Licence Holder's comment	Department's response
2.2.1	Clarification of return water dam controls committed to by email	Acknowledge that clarification is useful rather than just referring to emails. Modified text to summarise the controls.
2.2.3	Additional generators A29 & A30 are no longer proposed	New map requested with these generators removed. Provided 25/10/23 (A2211525) with cross referencing of generator numbers used, renumbered to avoid confusion with previous generators which have been removed. New numbering system results in numbers up to A31 with gaps for missing generators. No new generators proposed. Acceptable.
2.2.5	New Figures provided.	<ul> <li>Figures provided are discussed under comments on the licence below.</li> <li>No change to this section of the decision report as no additional monitoring points are authorised this amendment beyond those assessed in the draft amendment report.</li> </ul>
2.2.6	Confirmed Ramone turkey nest is HDPE lined.	Acknowledged. Query removed. Draft assessment assumed this was likely the case.
5.1 (Table 8)	The BDSF Turkey's Nest did exist at one point but has since been decommissioned and removed. Northern Star requests the removal of the BDSF Turkeys Nest from the existing operational licence	Removed from condition 1.2.2 and 1.2.4.
Condition	Summary of Licence Holder's comment	Department's response
1.2.6 (Table 1.2.4)	'Western Australian guidelines for direct land application of biosolids and biosolid products, February 2002' appears to have been superseded by 'WA Guidelines for biosolids management 2012'	Agreed. Reference updated to Western Australian guidelines for biosolids management, December 2012.  The Delegated Officer notes that condition 1.1.3 states that the most recent guideline at any time is applicable. This is therefore an administrative amendment.

Section of decision report	Summary of Licence Holder's comment	Department's response
3.3.1 (Table 3.3.1) – table	By email 18/9/23 - dry bores; if the depth of the "DRY" measurement is the same meterage as the bottom of bore, could this be considered as monitored?	Yes this is acceptable for calculating the 90%, as it does provide data. No change to the table note required.
note	We will be changing our field sheets to ensure there is a meterage for dry bores. This will basically be the dip value to where we hit dirt. We will compare these values with the recorded depth to bottom of bore. Any "Dry Depth" that is not in the same ball park as "Depth to Bottom" will not be considered monitored	
4.3.1	Requesting 14 days instead of 7 days to report non-compliance with condition 3.3.1. Reason is to allow investigation including access to relevant personnel.	Acceptable. Changed.
Figure 5	Updated Figure 5 provided	Inserted. New Figure 5 Provided lists the same pits as in the existing licence, plus Menzies Pit which is added this amendment. R4D4 and the processing water dam are also labelled, but Condition 1.2.2 makes it clear that these are not authorised to receive mine dewater. One additional turkey nest (Gateway) is included on this map. This is acceptable. However the DO notes that it is only authorised to receive mine dewater if it is HDPE lined as per condition 1.2.2.
Additional Figures	Additional Figures provided for Ramone, Julius and Southern Pits areas (proposed Figures 6, 7, 8)	<ul> <li>Ramone figure is not suitable as appears that Ramone Pit and Moon Pit are authorised discharge points, which they are not. Requested from Licence Holder subsequently updates to Figure 4 of the draft licence to use instead. Received 25/10/23 (A2211525). Inserted as Figure 4. Note that the department modified the Figure to show Ramone Pit and Moon Pit as white circles (not green) since they are not assessed containment infrastructure or emission points.</li> <li>Julius and Southern Pits figures not inserted as these facilities have not been assessed. Dewater discharge is not authorised to the pits in these areas. The Turkey nests do not trigger category 6 if they are HDPE lined with no discharge to the environment. The licence holder could apply to have these added as containment infrastructure in a later amendment.</li> </ul>

Section of decision report	Summary of Licence Holder's comment	Department's response
Draft Figure 6	Replacement for TSF 1/2 monitoring points Figure provided (proposed Figure 9)	Replacement provided did not include sufficient spatial data for bioremediation facility location and monitoring, as per the figure it proposed to replace. Requested new figure which was subsequently provided on 27/19/23. The Delegated Officer notes that the groundwater monitoring bores for the bioremediation facility differ in location to that shown on the existing licence, but considers that the location is not likely to significantly change the risk and has elected to update so that the actual bore locations are shown.

# **Appendix 2: Application validation summary**

SECTION 1: APPLICATION SUMMARY					
Application type					
		Current licence number:	L6498/1995/11		
Amendment to licence		Relevant works approval number:	W6522/2021/1	N/A	
Date application received		16/2/23			
Applicant and Premises details	;				
Applicant name/s (full legal name	e/s)	Northern Star Res	sources Ltd		
Premises name		Jundee Operation	S		
Premises location		Mining tenements: G53/20, L53/52, L53/60, L53/68, L53/69, L53/70 - L53/73, L53/75, L53/99, L53/100, L53/102, L53/112, L53/113, L53/117, L53/136 - L53/138, L53/142, L53/143, L53/153, L53/169, L53/174, M53/155, M53/156, M53/182, M53/191, M53/192, M53/196 - M53/198, M53/199, M53/221, M53/226, M53/228 - M53/230, M53/235 - M53/237, M53/245 - M53/250, M53/326, M53/347, M53/372, M53/412 - M53/414, M53/441, M53/446, M53/451, M53/452, M53/461, M53/477 - M53/480, M53/492, M53/535 - M53/541, M53/552, M53/588, M53/589, M53/611, M53/707, M53/708, M53/711, M53/712, M53/836, M53/874, M53/895, M53/911, M53/929, M53/935, M53/940, M53/966, PL34 as depicted in Schedule 1 of the licence.			
Local Government Authority		SHIRE OF WILUNA			
Application documents					
HPCM file reference number:		DWERDT733070			
Key application documents (additional to application form):		<ul> <li>Updated maps</li> <li>TSF3 Mining Proposal</li> <li>Email train from DoH regarding health approvals for treated wastewater discharge to TSF</li> <li>ASIC relational company extract</li> <li>Map of interpreted groundwater levels</li> <li>Root depth report</li> <li>PDF of existing licence with proposed changes written in.</li> </ul>			
Scope of application/assessme	1	1			

#### Changes to Jundee licence

- to allow operation of TSF3 after TLO.
- To extend the licence duration from 2024 to 2029
- Correct the Premises category for bulk storage of chemicals from cat 74 to cat 73 (typo)
- Authorise discharge of treated sewage wastewater to R1D1 seepage return water dam (in addition to active TSF)
- Increase the throughput of category 52 electric power generation –add and remove emission points
- Update premises description (LO comment: propose to remove this section consistent with current template)
- Minor admin amendments
- Reduce minimum freeboard in pits containing water from 10 to 5m
- Remove construction conditions for the waste heat recovery system (no longer planned to be constructed)
- New dewatering pits Menzies Pit and Coulthard Pit

Note: Changes in will be considered but to don't require formal risk assessment.

#### Category number/s (activities that cause the premises to become prescribed premises)

#### **Table 1: Prescribed premises categories**

Summary of proposed activities or

changes to existing operations.

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	3,500,000 tonnes per annual period	N/A
Category 6: Mine dewatering	3 000 000 tonnes per annual period	N/A
Category 52: Electric power generation	42.21 MW	42.34 MW
Category 54: Sewage Facility	350m³ per day	N/A
Category 64: Class II or III Putrescible Landfill	820 tonnes per annual period	N/A
Category 73 (current licence incorrectly states 74 in error): Bulk storage of chemicals	10 000m <sup>3</sup>	No change in capacity. Correct category number to 73.

#### Legislative context and other approvals

	Has the applicant referred, or do they intend to refer, their proposal to the	Yes □ No ⊠	Referral decision No:
--	---	------------	-----------------------

EPA under Part IV of the EP Act as a significant proposal?		Managed under Part V □
significant proposar:		Assessed under Part IV □
Does the applicant hold any existing Part IV Ministerial Statements relevant to the application?	Yes □ No ⊠	Ministerial statement No: EPA Report No:
Has the proposal been referred and/or assessed under the EPBC Act?	Yes □ No ⊠	
Has the applicant demonstrated	Yes ⊠ No □	No change to premises. LO checked all tenements on licence, and confirmed all active and held by LH.
occupancy (proof of occupier status)?		Mining Act tenements checked in Mineral Titles online, PL34 details at PGR - PL 34 (dmp.wa.gov.au).
Has the applicant obtained all relevant planning approvals?	Yes □ No □ N/A ⊠	If N/A explain why? Mining tenements
Has the applicant applied for, or have an existing EP Act clearing permit in relation to this proposal?	Yes □ No ⊠	No clearing is proposed in this amendment
Has the applicant applied for, or have an existing CAWS Act clearing licence in relation to this proposal?	Yes □ No ⊠	No clearing is proposed.
Has the applicant applied for, or have an existing RIWI Act licence or permit in relation to this proposal?	Yes □ No ⊠	Licence/permit No: GWL 107143
		Name: East Murchison
Does the proposal involve a discharge		Type: Proclaimed Groundwater Area
of waste into a designated area (as defined in section 57 of the EP Act)?	Yes □ No □	Has Regulatory Services (Water) been consulted?
		Yes □ No □ N/A ⊠
		Regional office:
Is the Premises situated in a Public Drinking Water Source Area (PDWSA)?	Yes □ No ⊠	

Is the Premises subject to any other Acts or subsidiary regulations (e.g. Dangerous Goods Safety Act 2004, Environmental Protection (Controlled Waste) Regulations 2004, State Agreement Act xxxx)	Yes ⊠ No □	Mining Act 1978  TSF3 approved in Reg ID 93048  RFI identified that Mining Proposal updates are required for changes to dewatering.
Is the Premises within an Environmental Protection Policy (EPP) Area?	Yes □ No ⊠	
Is the Premises subject to any EPP requirements?	Yes □ No ⊠	
Is the Premises a known or suspected contaminated site under the Contaminated Sites Act 2003?	Yes ⊠ No □	Classification: contaminated – remediation required (C–RR)
		Date of classification: 06/09/2019
		Newmont Jundee Nimary Bulk Fuel Facility 55km of Wiluna (Jundee Mine Site)
		The summary of records notes that the site is contaminated from hydrocarbons (diesel, oil).