Decision Report

Application for Licence

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

Licence Number	L9383/2023/1
Applicant	Abra Mining Pty Limited
ACN	110 233 577
File number	DER2023/000048
Premises	Abra Base Metals Project MEEKATHARRA WA 6642 Part of mining tenements L52/194, M52/776, G52/292 and L52/210 As defined by the premises map attached to the issued licence
Date of report	6 July 2023
Decision	Licence granted

Alana Kidd

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Alana Kidd
MANAGER, RESOURCE INDUSTRIES
an officer delegated under section 20 of the *Environmental Protection Act 1986* (WA)

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1. Decision summary

This decision report documents the assessment of potential risks to the environment and public health from emissions and discharges during the operation of the premises. As a result of this assessment, licence L9383/2023/1 has been granted.

2. Scope of assessment

2.1 Regulatory framework

In completing the assessment documented in this decision 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 https://dwer.wa.gov.au/regulatory-documents.

2.2 Application summary and overview of premises

On 21 January 2023, the applicant submitted an application for a licence to the department under section 57 of the *Environmental Protection Act 1986* (EP Act).

The application is to seek a licence to operate a Processing Plant and Tailings Storage Facility (TSF) at the Abra Base Metals Project (premises) located approximately 200 km north of Meekatharra and 190 km south of Newman. The Applicant is seeking approval for the operation of the following infrastructure constructed under Works Approval W6205/2018/1 (W6205):

- Three stage crushing with fine ore bin storage;
- Single stage ball mill with a flash flotation cell treating cyclone underflow;
- Flotation and concentrate regrind to produce a lead/silver concentrate;
- Concentrate dewatering utilising a thickener and a filter to produce a transportable concentrate;
- Tailings thickener; and
- Tailings Storage Facility Stage 1 Mini Cell (TSF Mini Cell)

A detailed description of the operational aspects for the recently constructed infrastructure at the premises is provided in the Decision Report for W6205 which can be found at:

https://www.der.wa.gov.au/images/documents/our-work/licences-and-works-approvals/Decisions_/W6205-2018-1d.pdf

Following the completion of the above infrastructure, the applicant submitted to the department on 21 January 2023 an Environmental Construction Report (ECR) as required by condition 3 of W6205. The ECR documented the applicant's compliance with conditions 1, 2, 3 and 4 of W6205 and noted any variations made during construction. The department has completed a desk top assessment of the submitted ECR and noted a few items of infrastructure still requiring completion. A description of the outstanding items along with any construction variations is provided below.

- **TSF Cells 1 and 2**

  The applicant has completed a Tailings Storage Facility Stage 1 Cell A starter embankment (TSF Mini Cell) as part of the initial construction of the facility (Figure 1). As a result of delays due to the Covid pandemic, the applicant requested approval from the department to construct an interim smaller tailings storage facility within the footprint of the approved design as detailed in W6205 (see Figure 1). The TSF Mini Cell is expected to provide 12 months capacity for the storage of tailings material while Stage

2 of the TSF (the remaining L shape area of Cell A) is under construction to be made ready for tailings deposition in early 2024. The design and construction of the TSF Mini Cell embankments and cell floor are as approved in W6205 except for the lining material. W6205 required the lining material at the TSF to consist of Geosynthetic Clay Liner (GCL) providing a hydraulic conductivity of 1x10-12 m/s. The applicant has replaced the use of GCL at the TSF Mini Cell with a 1.5 mm High Density Polyethylene (HDPE) liner instead providing an impervious barrier which will exceed the hydraulic conductivity requirement (less conductive) of the GCL material. The applicant provided to the department on 10 March 2023 a separate ECR for the TSF Mini Cell (CMW Geosciences, January 2023) to demonstrate the TSF Mini Cell meet the requirement of W6205 in regard to hydraulic conductivity of the lining material.

Therefore, only the use of the TSF Mini Cell for the storage of tailings is considered in this assessment as Cell 1 and Cell 2 of the TSF are still under construction. The applicant is still required to submit compliance documentation in accordance with conditions of W6205 when TSF Cell 1 and Cell 2 are completed. The applicant will then be required to submit an application to the department to have the Licence amendment to allow for the operation of the TSF Cell 1 and Cell 2.

The department notes, the applicant is considering replacing the W6205 approved GCL liner at the TSF Cell 1 and Cell 2 with a 1.0 mm HDPE liner instead. The applicant proposed this change at a meeting held with the department on the 7 June 2023. The department advised the applicant they would need to apply for an amendment to W6205 and include supporting documentation to support the proposed change. The department to date has not received an amendment application for a change to the TSF Cell 1 and Cell 2 liner material, and therefore has not been considered in this application assessment.

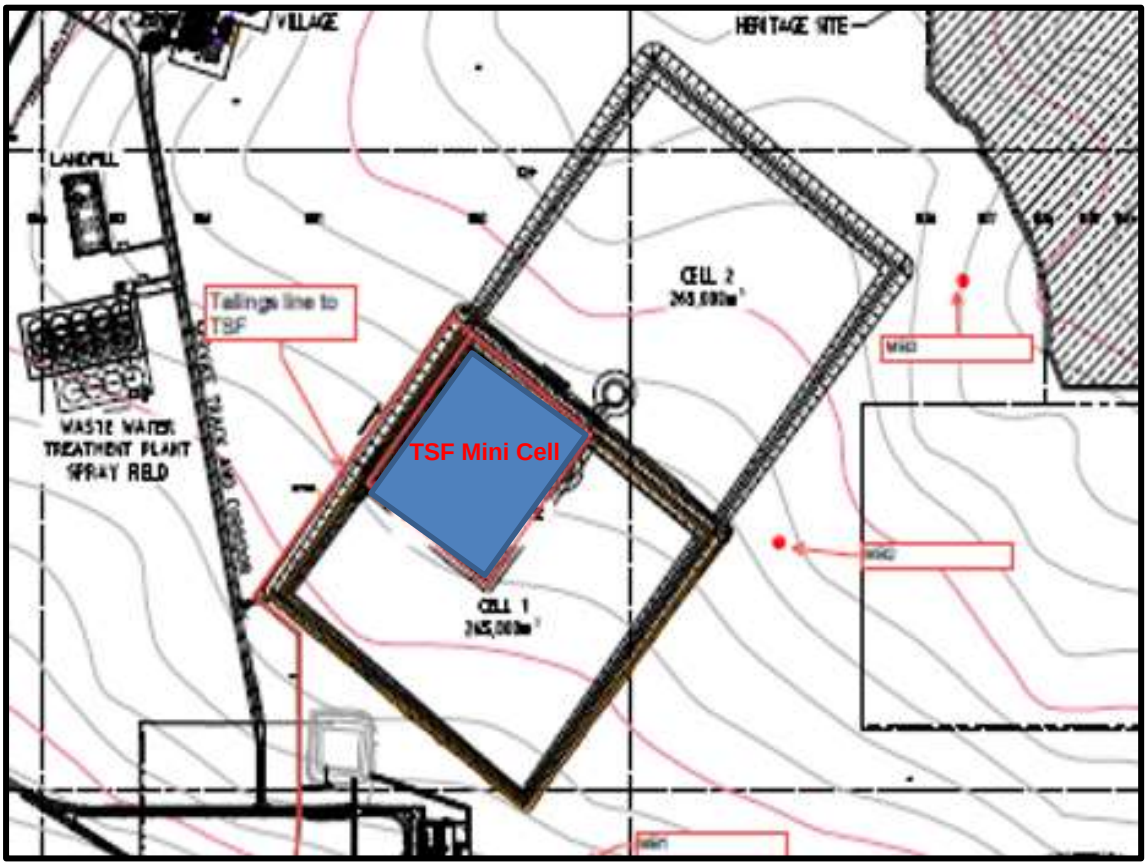

Figure 1: TSF Mini Cell

- **Event Pond**

  W6205 required a retention sump (event pond) sized to have a minimum capacity to contain runoff from the process plant area, ROM Pad and stockpiles areas so there is no discharge of contaminated stormwater to the environment.

  The applicant has recently identified an additional event pond is required as the constructed pond only has capacity to store run-off from the processing plant area and does not include capacity for the ROM pad and stockpile areas. The capacity of the constructed event pond is 33,700 m^3 which is sufficient to contain the calculated volumetric runoff of 30,290 m^3 from the processing plant area. The applicant identified an additional event pond with a capacity of 9,810 m^3 is likely required for the ROM pad and stockpile areas. The applicant has engaged Rockwater consulting hydrologist to assess and design the required additional storage capacity. The applicant will then submit to the department an addendum to the ECR once these changes have been completed which is expected by September 2023. The department understands the additional capacity will be either as an adjacent pond to the current event pond with an interconnecting pipe or spillway or an expansion of the current pond. The applicant anticipates these works will be completed in September 2023. As a result, the applicant has installed an alternative system to satisfy the requirements of condition 3 of W6205 regarding pond capacity while the second event pond is being designed and constructed. Departures from the requirements of W6205 are permitted if certain criteria are meet.

  The temporary alternative system will provide, if required, the additional 9,810 m^3 of capacity while the second event pond is being constructed and consists of installing a pump at the installed event pond that will transfer excess water to the lined TSF Mini Cell. This would only occur if the existing event pond reached its capacity. The recently constructed TSF Mini Cell has a storage capacity of approximately 300,000 m^3. As tailings has only just begun to be pumped to the TSF during the commissioning stage, 95 percent of this capacity is still available. The department understands there is more than sufficient storage capacity to contain the 9,810 m^3 (ROM and Stockpiles) if required.

  The department understands this temporary alternative system will not increase the risks to the environment and therefore accepts this temporary departure (additional risk assessment presented in Section 3 below). The applicant is still required to submit compliance documentation in accordance with conditions of W6205 when the second event pond is completed. The Licence will then require amending to reflect this change.

- **TSF groundwater monitoring bores**

  The applicant has currently only installed 4 of the 8 required groundwater monitoring bores at the TSF as only the smaller TSF Mini Cell has been constructed and will be operational at this stage. The 4 installed groundwater monitoring bores have been positioned to monitor for impacts from the operation of the TSF Mini Cell. The 4 additional groundwater monitoring bores will be installed during the construction of the TSF Cell 1 and Cell 2. The applicant is still required to submit compliance documentation in accordance with conditions of W6205 when the additional groundwater monitoring bores have been installed.

  The applicant was also required to install the groundwater monitoring bores to a depth of 80 mbgl, however, the observed depth to groundwater measured in the newly constructed bores showed depths ranged from approximately 20 to 25 mbgl. Therefore, the applicant only constructed the groundwater monitoring bores to a final depth of 40m which will provide a monitoring zone well within the pre-development standing water level.

Commissioning of the Processing Plant and TSF Mini Cell commenced following the submission of the ECR on 21 January 2023. Condition 5 of W6205 allows commissioning to continue for a period of up to 6 months following the submission of the ECR. The commissioning period will end 21 July 2023.

The department is satisfied the applicant has demonstrated adequate compliance with the requirements of conditions 1, 2, 3 and 4 of W6205 in order for the department to grant a licence to authorise the operation of the processing plant and the discharge of tailings material to the TSF Mini Cell post 21 July 2023.

Once the construction of the TSF Cells 1 and 2 are completed, including the additional four groundwater monitoring bores, and the applicant has submitted an ECR to the department that satisfies the requirement of W6205, the applicant can apply to have their licence amended to authorise the discharge of tailings into TSF Cells 1 and 2 at the Premises.

The applicant also currently operates a category 85 wastewater treatment plant and a category 89 putrescible landfill at the premises. These facilities operate under *Environmental Protection Regulations 1997* (EP Regulations) Registration R2503/2020/1 granted on 5 March 2020 and EP Regulations Registration R2513/2021/1 granted on 26 February 2021 respectively. Both of these facilities are located within the boundary of the premises and therefore the department will propose to include the category 85 and 89 prescribed activities as part of the licence at a later date through a licence amendment process. The department will then propose to cancel Registration R2503/2020/1 and R2513/2021/1.

The applicant also currently has a separate application with the department for a category 6 works approval to allow dewatering to occur at the premises.

Other infrastructures associated with the Premises includes an airstrip, power station, chemicals storage facilities, administration buildings and accommodation camp which are not included in this assessment.

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 decision report are detailed in Table 1 below. Table 1 also details the control measures the applicant has proposed to assist in controlling these emissions, where necessary.

Table 1: Proposed applicant controls

Emission	Sources	Potential pathways	Proposed controls
Operation			
Contaminated	Processing Plant, ROM pad, vehicle	Overland	Clean stormwater diversion bunds/drains

Emission	Sources	Potential pathways	Proposed controls
stormwater	washdown and workshop areas and stockpile areas.	runoff.	around processing plant. Contaminated stormwater and runoff from processing plant, ROM pad and stockpiles directed to the event pond for storage and reuse. Temporarily operate a pump designed to transfer any excess water to the HDPE lined TSF Mini Cell until 30 September 2023. The pump will only be operated if the event pond reaches capacity. Washdown bay fitted with a wedge pit to settle heavy sediment and then a triple interceptor before discharge to an infiltration /evaporation basin. Wastewater from the truck and tyre washdown points at the concentrate loadout facility will be returned to the process plant to recover any suspended lead
Dust	Processing plant, stockpiles and concentrate storage shed.	Air / wind dispersion.	Seven strategic dust collection points within the crusher area and five dust collections points within the screening area. A central dry filtration (baghouse) dust collector is located by the 'drive in sump' between the crushing and screening areas. An integrated duct system connects all dust collection points in crushing and screening to the baghouse. Routine wetting down of stockpiles. Concentrate storage shed fitted with dust extraction unit. A series of dust collection points will render the concentrate shed under light vacuum conditions. The concentrate shed will be fully enclosed, except when concentrate road trains enter or exit the loading area.
Direct discharge of process liquors, chemical reagents, and slurries	Processing plant	Direct discharge to surrounding soils from overtopping bunding resulting in overland flow to surface water and seepage to underlying groundwater.	Concrete hardstand with concrete bunding around the process plant area designed to contain 110% of the storage capacity of the largest storage vessel. Sump pumps fitted to collect any spills before returning to the process circuit. Storage tanks fitted with leak detection. All pipework located within the bunded areas. Routine inspection and maintenance program to ensure all equipment and storage is functioning as originally designed and constructed.
Product spillage from conveyor	Processing Plant and storage shed	Direct discharge to surrounding	Spillage and clean-up at the Processing Plant will be collected by sumps and subsequently

Emission	Sources	Potential pathways	Proposed controls
belts and storage shed		soils.	pumped to the cyclone feed hopper or to tails. The final product will be loaded into half height containers which will be fitted with removable lids to seal them for transport.
Hydrocarbons and chemicals	Accidental spills or leaks from vehicles, plant, equipment and from storage vessels.	Direct discharge to land. Overland flow to surface water and seepage to groundwater.	A double lined fuel facility comprising of two 110,000 litre storage tanks has been installed compliant with AS1940: 2004. Reagent storage tanks located in concrete bunded areas. Hydrocarbon refueling occurs on concrete hard sands graded to collection sumps. Spill kits positioned at strategic locations.
Tailings seepage water	Storage of tailings at the TSF Mini Cell	Seepage through soils to underlying groundwater and/or nearby drainage lines (ephemeral creek).	The starter embankments and TSF cell basin are lined with a 1.5 mm HDPE liner. Tailings will be discharged sub-aerially and cyclically into the TSF in thin discrete layers, not exceeding 300 mm thickness to allow optimum density and strength gain by subjecting each layer to a drying cycle. Deposition will take place via multiple spigots. Spigotting will be carried out such that the supernatant pond is maintained within and around the rock ring decant and away from the embankment wall. Decant water will be removed from the TSF by a decant pump located in the rock ring structure and pumped back to the process plant for reuse.
Tailings from overtopping the TSF embankment	Storage of tailings at the TSF Mini Cell	Direct discharge to land and drainage lines. Seepage to soil and groundwater	Operated to provide a minimum of 500 mm total freeboard plus allowance of the 1% AEP 72 hour event. Spigotting will be carried out such that the supernatant pond is maintained within and around the rock ring decant. Decant water will be removed from the TSF by a decant pump located in the rock ring structure and pumped back to the process plant for reuse.
Tailings and tailings return water due to pipeline failure	Tailings material from the Processing Plant and collected return water from the TSF Mini Cell.	Direct discharges to land and infiltration to soil and groundwater	Pipelines positioned within unlined V drains to contain spills or leaks. Pressure sensors on the pipelines to detect for any leaks.
TSF return water from	Storage of TSF return water at the	Direct discharge to	Fitted with an automated control systems so a minimum operating freeboard of 300 mm plus

Emission	Sources	Potential pathways	Proposed controls
overtopping of pond embankment	Process Water Pond	land and drainage lines.	allowance to store a 1 in 100 annual exceedance probability (AEP) storm event over 72 hours is maintained. Excess water discharge back to the Lined TSF Mini Cell.
Seepage of TSF return water		Seepage through soils to underlying groundwater and/or nearby drainage lines (ephemeral creek).	Process Water Pond lined with a 1.5 mm HDPE liner. Liner anchored at the embankment crest.

3.1.2 Receptors

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

Table 2 and Figure 1 below provides a summary of potential 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 2: Environmental receptors and distance from prescribed activity

Environmental receptors	Distance from prescribed activity
Groundwater Groundwater is this area is good quality and is suitable for livestock drinking, potable or industrial use. Groundwater sampled from newly constructed groundwater monitoring bores at the TSF show water quality is fresh (<500 mg/L TDS) and slightly alkaline, with bicarbonate the dominant anion, although there was also a high sulphate concentration in one bore. There is no dominant cation in the water samples from the bores, with calcium, magnesium and sodium present in roughly equal proportions. See below for Groundwater characterisation.	Ranges from 16 mbgl to 54 mbgl at the premises. Constructed groundwater monitoring bores at the TSF indicate groundwater depths range from 20.12 to 25.67 mbgl.
Surface water There are two drainage lines that run past the TSF and Process Plant on the east and west sides (see Figure 1). The drainage lines provide surface drainage during heavy rainfall events and eventually discharge into 5 mile creek. 5 Mile Creek is an ephemeral creek which remains dry for long periods of time and only	The two drainage lines are located approximately 200 – 400 m away. 5 mile creek is located approximately 2 km away in an easterly direction.

flows during heavy rainfall events. 5 Mile Creek discharge into the Ethel River which is located over 6 km away and provides temporary aquatic environments for active and passive dispersers.	

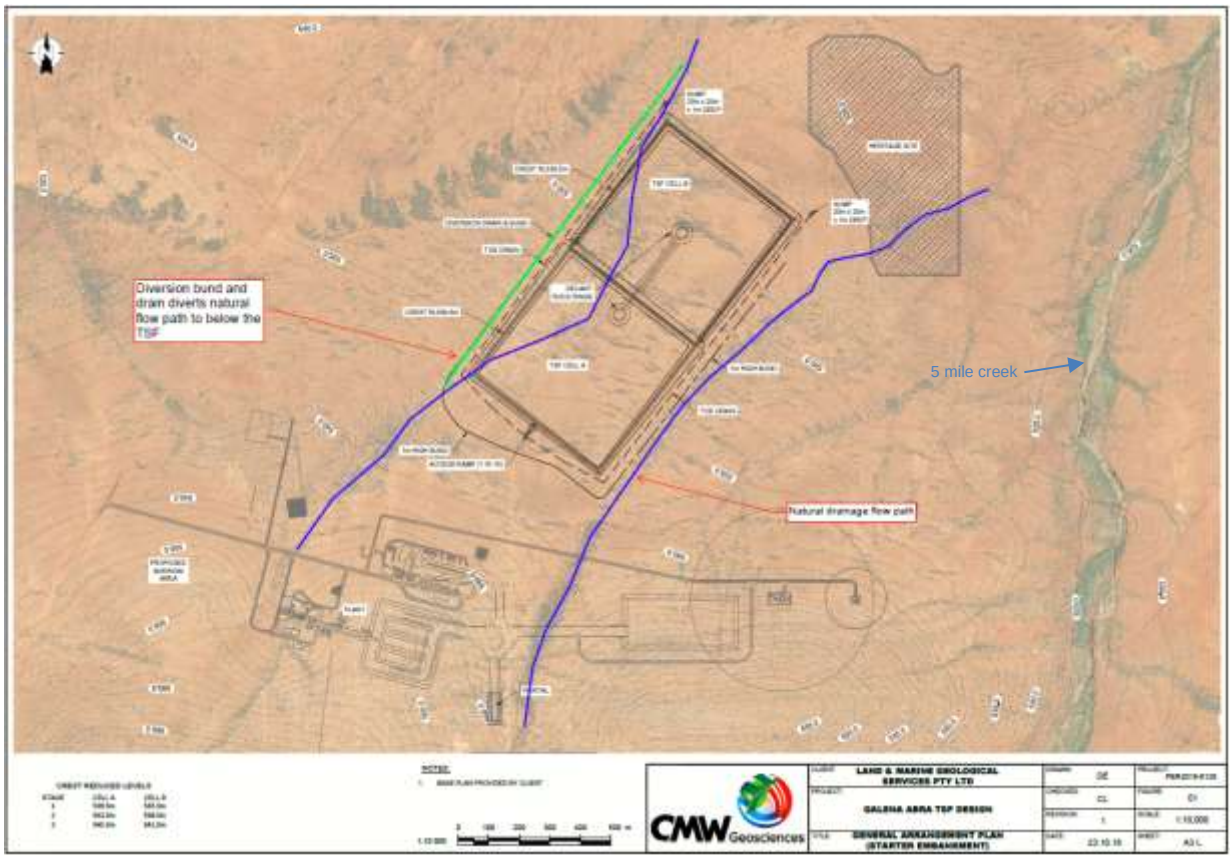

Figure 1: Distance to sensitive receptors – surface water.

3.2 Risk ratings

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

Where the applicant 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 applicant'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 applicant's controls are not deemed sufficient. Where this is the case the need for additional controls will be documented and justified in Table 3.

Licence L9383/2023/1 that accompanies this decision report authorises emissions associated with the operation of the premises i.e. Category 5 activities.

The conditions in the issued licence, as outlined in Table 3: have been determined in accordance with *Guidance Statement: Setting Conditions* (DER 2015).

Table 3: Risk assessment of potential emissions and discharges from the premises during operation

Risk events						Risk rating [1] C = consequence L = likelihood	Applicant controls sufficient?	Conditions [2] of licence	Justification for additional regulatory controls
Sources / activities		Potential emission	Potential pathways and impact	Receptors	Applicant controls				
Operation									
Category 5 Processing or beneficiation of metallic or non-metallic ore	**Processing Plant**	Dust	Air / wind dispersion directly impacting nearby soils and drainage lines. Stormwater runoff from soil contaminated areas causing contamination of nearby drainage lines.	Soils Nearby minor drainage lines	Refer to section 3.1	C = Minor L = Unlikely **Medium Risk**	Yes	Conditions 1, 2, 8, 9, 10,11 and 12	Applicant controls included as standard operational conditions. Standard recording and reporting conditions apply. The general provisions of the EP Act and *Environmental Protection (Unauthorised Discharges) Regulations 2004* apply.
		Process liquors, chemical reagents and slurries.	Pipeline failure or tank/bund overflow causing spill to ground and flow to drainage lines causing ecosystem disturbance. Seepage through soils to underlying potable groundwater causing contamination.	Soils Groundwater Nearby minor drainage lines and larger drainage line (Creek) 2 km away.	Refer to section 3.1	C = Moderate L = Possible **Medium Risk**	Yes	Conditions 1, 2, 8, 9, 10,11 and 12	Refer to section 3.3 for detailed risk assessment.
		Contaminated stormwater	Stormwater runoff from hardstands and stockpiles	Soils Nearby minor drainage lines	Refer to section 3.1	C = Moderate L = Possible	Yes	Conditions 1, 2, 3, 8, 9, 10,11 and 12	Refer to section 3.4 for detailed risk assessment.

Risk events						Risk rating [1] C = consequence L = likelihood	Applicant controls sufficient?	Conditions [2] of licence	Justification for additional regulatory controls
Sources / activities		Potential emission	Potential pathways and impact	Receptors	Applicant controls				
			causing contamination of drainage lines with sediment and metals in sediment.	and larger drainage line (Creek) 2 km away.		**Medium Risk**			
		Processed ore containing high concentration of lead	Direct discharge causing localised soil contamination causing ecosystem disturbance. Stormwater runoff from soil contaminated areas causing contamination of nearby drainage lines with metals in sediment.	Soils Nearby minor drainage lines and larger drainage line (Creek) 2 km away.	Refer to section 3.1	C = Moderate L = Unlikely **Medium Risk**	Yes	Conditions 1, 2, 8, 9, 10,11 and 12	Refer to section 3.5 for detailed risk assessment.
	TSF	Seepage from stored tailings	Seepage through soils to the underlying groundwater, nearby drainage lines and surrounding soils. Contamination of underlying potable groundwater source. Contamination of soils and nearby drainage lines causing ecosystem disturbance.	Soils Groundwater Nearby minor drainage lines and larger drainage line (Creek) 2 km away.	Refer to section 3.1	C = Major L = Unlikely **Medium Risk**	Yes	Conditions 1, 2, 3, **4**, 5, 6, **7**, 8, 9, 10,11 and 12	Refer to the detailed risk assessment in section 3.6
		Direct discharge of	Direct discharge to surrounding soils	Soils	Refer to	C = Moderate	Yes	Conditions 1, 2, 3, **7**, 8, 9,	Refer to the detailed risk assessment in

Risk events						Risk rating [1] C = consequence L = likelihood	Applicant controls sufficient?	Conditions [2] of licence	Justification for additional regulatory controls
Sources / activities		Potential emission	Potential pathways and impact	Receptors	Applicant controls				
		tailings due to overtopping	and overland flow to nearby drainage lines. Contamination of soils causing ecosystem disturbance. Contamination of surface water with sediment and metals in sediment causing ecosystem disturbance.	Nearby minor drainage lines and larger drainage line (Creek) 2 km away.	section 3.1	L = Unlikely **Medium Risk**		10,11 and 12	section 3.7
		Spillage of tailings and decant return water through leaks, pipeline ruptures or failure	Direct discharge to surrounding soils and overland flow to nearby drainage lines. Contamination of soils causing ecosystem disturbance. Contamination of surface water with sediment and metals in sediment causing ecosystem disturbance.	Soils Nearby minor drainage lines and larger drainage line (Creek) 2 km away.	Refer to section 3.1	C = Moderate L = Possible **Medium Risk**	Yes	Conditions 1, 2, 8, 9, 10, 11 and 12	Applicant controls included as standard operational conditions. Standard recording and reporting conditions apply. The general provisions of the EP Act and *Environmental Protection (Unauthorised Discharges) Regulations 2004* apply.
	Wash down bays & truck/vehicle wheel wash	Release of contaminated water outside of bunded areas	Overland flow to nearby drainage lines resulting in contamination with sediment, metals in sediment and hydrocarbons causing ecosystem	Soils Nearby minor drainage lines and larger drainage line (Creek) 2 km away.	Refer to section 3.1	C = Moderate L = Unlikely **Medium Risk**	Yes	Conditions 1, 8, 9, 10, 11 and 12	Applicant controls included as standard operational conditions. Standard recording and reporting conditions apply. The general

Risk events						Risk rating [1] C = consequence L = likelihood	Applicant controls sufficient?	Conditions [2] of licence	Justification for additional regulatory controls
Sources / activities		Potential emission	Potential pathways and impact	Receptors	Applicant controls				
			disturbance or impacting surface water quality.						provisions of the EP Act and *Environmental Protection (Unauthorised Discharges) Regulations 2004* apply.

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

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

3.3 Detailed risk assessment – Spills of processing reagents and slurries during operations at the processing plant

3.3.1 Description of spills of processing reagents and slurries during operations

During the ore processing, reagents released to ground may occur from overflowing tanks (poor or faulty process control), pipeline failures, failures of bunding or sump pumps, or catastrophic mechanical failures of tanks.

3.3.2 Identification and general characterisation of emission

Alkaline liquors with metals and cyanide in solution, and flammable liquids (frother).

3.3.3 Description of potential adverse impact from the emission

The release of processing slurries or reagents may cause localised soil contamination. Large spills may result in impacts to water quality and aquatic biota in nearby tributaries and drainage lines due to overland flow.

3.3.4 Applicant controls

See section 3.1 above for proposed applicant controls.

3.3.5 Consequence

If a spill occurs and impacts on soil and nearby tributaries, this could result in mid level on-site impacts. Therefore, the consequence is ***Moderate***.

3.3.6 Likelihood of Risk Event

The likelihood of a spill resulting in impact to soil and nearby tributaries is **Possible.**

3.3.7 Overall rating of spills of processing reagents during operations

Comparison of consequence and likelihood ratings described above with the risk rating matrix determines the overall rating of risk for processing reagent spills impacting on soils and nearby creek lines to be **Medium**.

3.4 Detailed risk assessment – Contaminated stormwater runoff

3.4.1 Description of stormwater runoff

Extreme rainfall events can cause runoff (stormwater) from hardstands, product stockpiles and disturbed areas around the processing plant to be discharged into the environment.

3.4.2 Identification and general characterisation of emission

Stormwater runoff from hardstands, product stockpiles and disturbed areas around the processing plant may contain process reagents (residual), spilt reagents, sediments and metals.

3.4.3 Description of potential adverse impact from the emission

Contaminated stormwater runoff released to the surrounding soils and nearby creek lines could result in poor surface water quality, increased sedimentation in the creeks and soil contamination resulting in ecosystem disturbance.

3.4.4 Applicant controls

See section 3.1 above for proposed applicant controls.

3.4.5 Consequence

Mid-level on-site impacts with low level off site impacts could be expected if contaminated stormwater is allowed to release into the surrounding soil and nearby tributaries. Therefore, the consequence is considered ***Moderate***.

3.4.6 Likelihood of Risk Event

The likelihood of a contaminated stormwater causing impacts to soil and nearby tributaries is **Possible.**

3.4.7 Overall rating of spills of processing reagents during operations

A comparison of the consequence and likelihood ratings described above with the risk rating matrix determines the overall rating of risk for contaminated stormwater impacting on soils and nearby tributaries to be **Medium**.

3.5 Detailed risk assessment – Processed ore containing high concentration of lead

3.5.1 Description of processed ore containing high concentration of lead

The final product from the processing of mined ore at the premises contains a high concentration of lead. During the processing of mined ore, processed material can drop onto the ground from conveyors and during loading of containers at the product storage shed.

3.5.2 Identification and general characterisation of emission

Mined ore at the premises is processed onsite to produce a lead-silver concentrate for transport to port for export. Metallurgical test-work indicated that the concentrate produced on site will have 60-70% lead content.

3.5.3 Description of potential adverse impact from the emission

Product containing high concentrations of lead being accidental discharged to land may cause localised soil contamination resulting in ecosystem disturbance. Additionally, stormwater runoff from lead contaminated areas may impact nearby tributaries.

3.5.4 Applicant controls

See section 3.1 above for proposed applicant controls.

3.5.5 Consequence

Moderate level on-site impacts with low level off site impacts could be expected if product containing high lead level concentrations is allowed to release to the surrounding soil which could also result in discharge into the nearby tributaries through stormwater movement. Therefore, the consequence is considered ***Moderate***.

3.5.6 Likelihood of Risk Event

The likelihood of a spill resulting in impact to soil and nearby tributaries is **Unlikely**.

3.5.7 Overall rating of spills of processing reagents during operations

Comparison of consequence and likelihood ratings described above with the risk rating matrix determines the overall rating of risk for spills of product containing high levels of lead impacting

on soils and nearby tributaries to be **Medium**.

3.6 Risk Assessment – TSF Mini Cell seepage during operations

3.6.1 Description of TSF Mini Cell seepage during operations

Seepage from tailings stored in the TSF Mini Cell impacting on groundwater quality in the surficial aquifer and nearby drainage lines.

3.6.2 Identification and general characterisation of emission

Condition 11 of W6205 requires the applicant during the commissioning stage to collect 10 tailings samples for geochemical analysis. To date the applicant has only collected 8 samples for geochemical analysis with the results presented in Figure 2 below. The applicant advised the department the additional two samples would be collected once the processing plant fires up again which was likely in April/May 2023. Geochemical test results are expected approximately 28 days after the submission of samples.

The results to date from undertaking the geochemical analysis of the 8 tailings samples indicate that there are 8 elements with a GAI index above 3 (see Figure 2). The elevated levels are for Arsenic, Cadmium, Copper, Lead, Manganese, Silver, Sulfur and Zinc. The applicant has stated they will now proceed with conducting LEAF analysis on these elements identified as exceeding the GAI index 3.

Element	Unit	GAI > 3 Trigger Value (mg/kg)	Tails Sample 1	Tails Sample 2	Tails Sample 3	Tails Sample 4	Tails Sample 5	Tails Sample 6	Tails Sample 7	Tails Sample 8	LEAF Analysis Required
Arsenic	mg/kg	21.6	290	480	140	150	140	140	440	180	**Yes**
Barium	mg/kg	5100	3	<1	6	4	8	10	<1	9	
Calcium	mg/kg	498000	15000	16000	26000	24000	22000	23000	14000	25000	
Cadmium	mg/kg	1.8	1.9	9.2	4.7	8.9	11	4.6	7.4	1.4	**Yes**
Cobalt	mg/kg	300	21	28	15	16	16	18	34	20	
Chromium	mg/kg	1224	92	67	78	67	60	76	64	62	
Copper	mg/kg	720	950	1200	740	810	740	760	1300	690	**Yes**
Lead	mg/kg	168	8900	6800	8600	8600	5600	4500	8400	4000	**Yes**
Mercury	mg/kg	1.02	0.8	1	0.3	0.4	0.5	0.3	1.6	0.6	**Yes**
Magnesium	mg/kg	279600	26000	22000	28000	27000	28000	24000	15000	21000	
Manganese	mg/kg	11400	25000	20000	23000	23000	31000	21000	14000	16000	**Yes**
Nickel	mg/kg	1008	26	35	19	20	19	22	44	26	
Silver	mg/kg	0.9	17	23	9	8	8	6	29	8	**Yes**
Sulphur	mg/kg	4200	48000	83000	33000	38000	37000	29000	52000	33000	**Yes**
Zinc	mg/kg	840	510	2700	1600	2500	3000	1600	2500	430	**Yes**
Uranium	mg/kg	32.4	<1	<1	<1	<1	<1	<1	<1	<1	

Figure 2: Geochemical analysis of tailings samples in accordance with condition 11 of W6205

3.6.3 Description of potential adverse impact from the emission

Seepage from the TSF has the potential to contaminate the underlying groundwater which is considered fresh and suitable for livestock drinking and cause contamination of nearby drainage lines (ephemeral creeks).

Recent bore logs from the construction of the 4 groundwater monitoring bores at the TSF Mini

Cell indicate the depth to ground water ranges from 15.93 to 27.23 mbgl (see Table 4 below).

mbgl	June 2022	Sept 2022	Dec 2022
MB1	25.53	26.53	27.23
MB2	21.41	20.40	19.87
MB3	20.20	17.49	15.93
MB4	20.60	20.55	20.00

Table 4: Depth to groundwater at the TSF

The applicant engaged Rockwater to collect water samples from the groundwater monitoring bores during construction in June 2022 and analysed for a drinking water suite of parameters (see Figure 3 below). The applicant also collected samples in December 2022 and analysed for inorganics and dissolved metals (see Figure 4 andFigure 5 below). The results indicate the groundwater is fresh with salinities of 420 to 490 mg/L TDS, a neutral pH and metals mostly below Limits of Reporting.

Analyte	Unit	LOR	BORE			
			ABTSFMB001	ABTSFMB002	ABTSFMB003	ABTSFMB004
pH	pH Unit	0.01	7.81	7.69	7.73	7.70
Electrical Conductivity @ 25°C	µS/cm	1	733	654	620	732
Total Dissolved Solids @180°C	mg/L	10	487	390	394	482
Total Hardness as CaCO3	mg/L	1	328	276	251	286
Hydroxide Alkalinity as $CaCO_3$	mg/L	1	<1	<1	<1	<1
Carbonate Alkalinity as $CaCO_3$	mg/L	1	<1	<1	<1	<1
Bicarbonate Alkalinity as $CaCO_3$	mg/L	1	193	262	163	154
Total Alkalinity as $CaCO_3$	mg/L	1	193	262	163	154
Sulphate as SO_4 - Turbidimetric	mg/L	1	135	25	37	43
Chloride	mg/L	1	72	66	64	100
Calcium	mg/L	1	72	56	51	57
Magnesium	mg/L	1	36	33	30	35
Sodium	mg/L	1	42	43	38	46
Potassium	mg/L	1	13	15	10	13
Aluminium	mg/L	0.01	<0.01	<0.01	<0.01	0.01
Manganese	mg/L	0.001	0.683	1.44	<0.001	0.006
Iron	mg/L	0.05	<0.05	0.06	<0.05	<0.05
Reactive Silica	mg/L	0.05	34.7	29.1	41.4	50.4
Ammonia as N	mg/L	0.01	0.25	0.92	<0.01	0.03
Nitrite as N	mg/L	0.01	0.06	0.03	<0.01	<0.01
Nitrate as N	mg/L	0.01	0.57	0.36	14.1	18.7
Nitrite + Nitrate as N	mg/L	0.01	0.63	0.39	14.1	18.7
Reactive Phosphorus as P	mg/L	0.01	0.03	0.28	0.04	0.04
Total Anions	meq/L	0.01	8.70	7.62	6.84	8.13
Total Cations	meq/L	0.01	8.72	7.76	6.92	8.06
Ionic Balance	%	0.01	0.10	0.96	0.58	0.46

Figure 3: Monitoring bore water quality results

Inorganics (Water)

Envirolab ID Your Reference Date Sampled	Units	PQL	PDL0162-01 MB1 01/12/2022	PDL0162-02 MB2 01/12/2022	PDL0162-03 MB3 01/12/2022	PDL0162-04 MB4 01/12/2022
Chloride	mg/L	1.0	77	83	76	100
Electrical Conductivity	µS/cm	2.0	760	680	530	780
Nitrate as N	mg/L	0.0050	7.0	19	20	19
pH	pH units		7.9	7.7	7.2	7.4
Sulfate	mg/L	1.0	61	40	25	45
Total Dissolved Solids	mg/L	5.0	430	420	420	490
Total Suspended Solids	mg/L	5.0	12	30	27	26
Nitrate as NO3 by calculation	mg/L	0.020	31	86	87	85
Ionic Balance	%		-8.6	-14 [1]	-16 [1]	-13 [1]
Carbonate Alkalinity as CaCO3	mg/L as CaCO3	5.0	<5.0	<5.0	<5.0	<5.0
Bicarbonate Alkalinity as CaCO3	mg/L as CaCO3	5.0	220	120	47	140
Hydroxide OH- as CaCO3	mg/L as CaCO3	5.0	<5.0	<5.0	<5.0	<5.0
Total Alkalinity as CaCO3	mg/L as CaCO3	5.0	220	120	47	140

Figure 4: Monitoring bore water quality results - Inorganics (water)

Dissolved Low Level Metals (Water)

Envirolab ID Your Reference Date Sampled	Units	PQL	PDL0162-01 MB1 01/12/2022	PDL0162-02 MB2 01/12/2022	PDL0162-03 MB3 01/12/2022	PDL0162-04 MB4 01/12/2022
Aluminium	µg/L	10	<10	<10	<10	<10
Arsenic	µg/L	1.0	1.2	1.1	<1.0	<1.0
Boron	µg/L	20	300	310	300	310
Barium	µg/L	1.0	140	150	68	110
Beryllium	µg/L	0.50	<0.50	<0.50	<0.50	<0.50
Cadmium	µg/L	0.10	<0.10	<0.10	<0.10	<0.10
Cobalt	µg/L	1.0	<1.0	<1.0	<1.0	<1.0
Chromium	µg/L	1.0	<1.0	1.3	<1.0	1.5
Copper	µg/L	1.0	<1.0	<1.0	<1.0	<1.0
Iron	µg/L	10	<10	<10	<10	<10
Mercury	µg/L	0.050	<0.050	<0.050	<0.050	<0.050
Manganese	µg/L	1.0	370	<1.0	<1.0	<1.0
Molybdenum	µg/L	1.0	6.8	2.7	<1.0	<1.0
Nickel	µg/L	1.0	<1.0	<1.0	<1.0	<1.0
Lead	µg/L	1.0	<1.0	<1.0	<1.0	<1.0
Selenium	µg/L	1.0	<1.0	1.0	<1.0	<1.0
Strontium	µg/L	1.0	260	150	110	210
Titanium	µg/L	1.0	<1.0	<1.0	<1.0	<1.0
Vanadium	µg/L	1.0	4.4	10	1.7	5.5
Zinc	µg/L	1.0	6.4	2.0	4.4	4.4

Dissolved Metals (Water)

Envirolab ID Your Reference Date Sampled	Units	PQL	PDL0162-01 MB1 01/12/2022	PDL0162-02 MB2 01/12/2022	PDL0162-03 MB3 01/12/2022	PDL0162-04 MB4 01/12/2022
Silicon	mg/L	0.10	15	19	36	26
Calcium	mg/L	0.50	54	40	27	44
Magnesium	mg/L	0.50	32	28	20	32
Potassium	mg/L	0.50	10	8.7	7.1	9.6
Sodium	mg/L	0.50	41	39	34	50
Hardness as CaCO3	mg/L	3.0	270	210	150	240

Figure 5: Monitoring bore water quality results – Dissolved Metals

Results of materials classification tests on the hardpan materials from the TSF area (depth 2-4m) indicated these materials were non-plastic silty gravel with a fines content (passing 75 micron) between 14% and 23%. Therefore, any seepage from the TSF Mini Cell which is likely to contain elevated metals and salinity as can be seen from the geochemical work undertaken so far (see Figure 2 above), has the potential to contaminate the underlying fresh groundwater.

A seepage analyses undertaken during the assessment for W6205 indicated a very low seepage flow could be expected from the TSF Cell 1 and Cell 2. The department as part of the assessment for W6205 concluded a Geosynethic Clay Liner (GCL) would be required to line the TSF Cell 1 and Cell 2 to ensure negligible seepage from the TSF. The use of an impervious HDPE liner at the TSF Mini Cell would exceed the requirement to ensure negligible seepage occurs.

3.6.4 Applicant controls

See section 3.1 above for proposed applicant controls.

3.6.5 Consequence

Based on the information provided for this assessment and the absence of final tailings geochemical analysis results, DWER will adopt the precautionary approach. If seepage containing elevates metals alters local groundwater quality then the consequence is considered **Major**. Additionally, the TSF Mini Cell is located between two ephemeral creeks (drainage lines). The impact of seepage during operations could result in long term impacts to the drainage lines and the associated catchment area. Therefore, the consequence is ***Moderate***.

3.6.6 Likelihood of Risk Event

Based on the installation of an impervious 1.5 mm HDPE liner, depth to groundwater at least 15.93 mbgl and the applicant's ambient groundwater monitoring program, an environmental impact from seepage during the first 12 months of operations will probably not occur in most circumstances. Therefore, the likelihood of the consequence is ***Unlikely***.

3.6.7 Overall rating of TSF Mini Cell seepage during operations

Comparison of consequence and likelihood ratings described above with the risk rating matrix determines the overall rating of risk for seepage from tailings stored in the TSF Mini Cell impacting on groundwater quality in the surficial aquifer and the nearby drainage lines to be ***Medium***.

4. Consultation

Table 5 provides a summary of the consultation undertaken by the department.

Table 5: Consultation

Consultation method	Comments received	Department response
Jidi Jidi Aboriginal Corporation	No comments received. Phone call follow up was attempted 3.30pm 5 July 2023 however number for the Jidi Jidi corporation was no longer connected.	Decision to grant letter to be sent advising a licence has been granted.
Stakeholder letter provided to the Shire of Meekatharra on 19/6/23.	No comments received.	N/A
DMIRS	Response provided 3 July 2023. DMIRS had no further comments.	N/A
Applicant was provided with draft documents on 16 June 2023	Refer to Appendix 1	Refer to Appendix 1

5. Conclusion

Based on the assessment in this decision report, the delegated officer has determined that a licence will be granted for the operation of the processing plant and the TSF Mini Cell only, subject to conditions commensurate with the determined controls and necessary for administration and reporting requirements.

Following the construction of the TSF Cells 1 and 2 and the additional four groundwater monitoring bores, and the submission of an ECR that satisfies the requirement of W6205, the applicant can apply to have their licence amended to authorise the discharge of tailings into TSF Cells 1 and 2 at the Premises.

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. Abra Mining, *Environmental Construction Report, Works Approval W6205/2018/1 Process Plant and Tailings Storage Facility*, *20 January 2023.*
5. CMW Geosciences, *Tailings Storage Facility (TSF) Mini Cell Construction Report,* Abra Base Metals Project, 17 January 2023
6. Abra Mining Pty Limited, '*Response to DWER correspondence on Works Approval and Licence,* 23 February 2023, Email to Department of Water and Environmental Regulation dated 10 March 2023.
7. Abra Base Metals Project, *TSF Permeability Testing*, Report for Abra Mining Pty Ltd, Rockwater Hydrogeological and Environmental Consultants, September 2022.

Appendix 1: Summary of applicant's comments on risk assessment and draft conditions

Condition	Summary of applicant's comment	Department's response
Page 1	Amend the assessed production capacity to 1,350,000 tonnes per annual period.	Supported. Not considered a significant increase from 1.2 mtpa to 1.35 mtpa. No changes are required to accommodate the increase in throughput as the infrastructure was designed and built to process the increased amount.
Condition 1, Table 1	Amend the processing plant design capacity to 1,350,000 tonnes per annual period.	Supported. See comment above.
Condition 2, Table 2	Amend the frequency of inspection to 24 hours.	Applicant has now withdrawn this request.
Condition 3	Table link error in document.	Amended.
Condition 4, Table 4	Amend monitor bore labels to MB1, MB2, MB3 & MB4	Supported. Licence updated.
Figures 1, 4 and 5	Updated figures provided	Supported. Licence updated.