



Application for Licence

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

Licence Number	L9450/2024/1
Applicant	LRL (AUST) Pty Ltd
ACN	610 981 194
File number	DER2024/000439
Premises	Kathleen Valley Lithium-Tantalum Project Mining tenements M36/265, M36/459, M36/460, M36/696, G36/52, L36/255, L36/256 As depicted in Schedule 1 of the licence
Date of report	23 June 2025
Decision	Licence granted

Alana Kidd Digitally signed by
Alana Kidd
Date: 2025.06.23
11:01:06 +08'00'

Alana Kidd
MANAGER, GREEN ENERGY

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 L9450/2024/1 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 6 August 2024, the applicant submitted an application for a licence to the department under section 57 of the *Environmental Protection Act 1986* (EP Act). The premises is approximately 50 km northwest of Leinster in the Northern Goldfields region.

The premises relates to the categories and assessed production and design capacity under Schedule 1 of the *Environmental Protection Regulations 1987* (EP Regulations) which are defined in licence L9450/2024/1. The infrastructure and equipment relating to the premises categories and any associated activities which the department has considered in line with *Guideline: Risk Assessments* (DWER 2020b) are outlined in licence L9450/2024/1.

The application is to seek a licence for the operation of infrastructure and equipment relating to prescribed premises categories 5, 52 and 54. The layout of infrastructure at the site is shown in Figure 1.

2.2.1 Summary of infrastructure included in this assessment

The applicant holds works approval W6687/2022/1 for the premises, which authorises the construction, commissioning and time limited operation of infrastructure and equipment relating to prescribed premises categories 5, 52, 54 and 89.

The applicant is not seeking to include all infrastructure authorised for construction under works approval W6687/2022/1 (i.e. Category 89 landfill) within this application for a licence. The department notes that there have been deviations from the approved design and construction requirements for some infrastructure included within this application.

Table 1 outlines which infrastructure from works approval W6687/2022/1 has been considered as part of this assessment, its compliance status, and any relevant deviations. The infrastructure included in this assessment is discussed in more detail in the following sections. It should be noted that compliance issues and variations were reviewed, and it was determined based on the environmental outcomes that amendments to W6687/2022/1 were not required.

In addition to the infrastructure outlined in Table 1, the applicant is seeking to include a wastewater treatment plant (WWTP) that was not previously approved under works approval W6687/2022/1 within this application. This is discussed further in section 2.2.5.

For clarity, the infrastructure from works approval W6687/2022/1 that has been excluded from this assessment, and the reason for its exclusion, has been outlined in Table 2.

Table 1: Summary of infrastructure included within this assessment

W6687/2022/1 reference	Infrastructure	Compliance status	Description of deviation(s)
Table 1, Item 1	Tailings Storage Facility 1: starter embankment 1A (cell 1)	Compliant DWER ref: A2276537	Only Tailings Storage Facility 1 (TSF1) Cell 1 is included in this assessment.
Table 1, Item 2	Tailings storage facility foundation preparation	Compliant DWER ref: A2300335	No deviations.
Table 1, Item 3	Tailings storage facility seepage control infrastructure		No deviations.
Table 1, Item 4	Pipelines carrying tailings and decant return water	Compliant DWER ref: A2300335	No deviations.
Table 1, Item 5	Vibrating wire piezometers (VWP) (Cell 1 VWPs only)	Compliant (Cell 1 VWPs only) DWER ref: A2300335	Only VWPs relating to TSF1 Cell 1 (a total of eight) are included in this assessment.
Table 1, Item 6	Tailings Storage Facility Surface water management controls	Non-compliant – to be reviewed as part of this assessment DWER ref: A2323531 DWER ref: DWERDT1055866	<p>Several deviations were noted during the compliance assessment, including:</p> <ul style="list-style-type: none"> construction of a dual-use flood levy/LV access road not included in the works approval; changes to the extent of the surface water diversion channel; and use of sediment attenuation approach instead of the approved sediment control dams. <p>A revised risk assessment for these deviations is to be carried out as part of this assessment of the application for a licence.</p>
Table 3, Item 1	Processing plant and associated infrastructure	Compliant with deviations DWER ref: A2294251 DWER ref: A2335795	<p>Several deviations were assessed and accepted as part of the compliance assessments, including:</p> <ul style="list-style-type: none"> changes to crushing plant layout; and changes to route of the facilities and conveyors.

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W6687/2022/1 reference	Infrastructure	Compliance status	Description of deviation(s)
Table 3, Item 3	LNG power station and storage tanks	Compliant with deviations DWER ref: A2276238	Several deviations were assessed and accepted as part of the compliance assessment, including: <ul style="list-style-type: none">• the width of the concrete culvert;• the coordinates of the gas generator exhaust stacks; and• bunding requirements for the diesel storage tank.
Table 3, Item 4	Accommodation Village wastewater treatment plant (WWTP)	Non-compliant – to be reviewed as part of this assessment DWER ref: A2316656	<p>Only the Accommodation Village WWTP is included in this assessment.</p> <p>Several deviations were noted during the compliance assessment, including:</p> <ul style="list-style-type: none">• change to the location of the infrastructure;• constructed WWTP systems differ from the specifications on the works approval; and• minimum effluent quality performance criteria unlikely to be met by the constructed infrastructure. <p>A revised risk assessment for these deviations is to be carried out as part of this assessment of the application for a licence.</p> <p>The applicant has also proposed changes to the minimum effluent quality criteria, which are being reviewed as part of this assessment.</p>

Table 2: Summary of W6687/2022/1 infrastructure excluded from this assessment

W6687/2022/1 reference	Infrastructure	Reason for exclusion
Table 1, Item 1	Tailings Storage Facility 1: starter embankment 1B (cell 2)	TSF1 Cell 2 has not yet been constructed and is not included in this assessment. The applicant has advised that TSF1 Cell 2 has not been constructed and that they intend to amend the existing design so that it avoids intersecting with a significant Aboriginal heritage site. The applicant will be required to submit a future licence amendment application for the operation of TSF1 Cell 2, at which time the amended design may be assessed by the department.
Table 1, Item 5	Vibrating wire piezometers (VWP) (Cell 2 VWPs only)	VWPs relating to TSF1 Cell 2 (a total of six VWPs) have not yet been constructed and are not included in this assessment.
Table 2, Items 1-4 (all items)	Tailings Storage Facility 1: lift stages 2-5	The applicant has constructed the outer embankment of the TSF1 up to the final full height (535 m RL) approved under works approval W6687/2022/1, the stage 5 lift. They have also stated that the TSF1 Cell 1 stage 2 lift is currently under construction. Under condition 9 of the works approval, the applicant is required to submit a Critical Containment Infrastructure Report (CCIR) for the construction of each lift, once complete. The department can only consider including the TSF1 lifts into the licence once construction is complete and the required CCIR is submitted. The lifts are therefore not included in this assessment. Until the TSF1 lifts are included in the licence, the applicant is limited to depositing tailings into TSF1 up to the level and capacity approved for the TSF1 Cell 1 starter embankments (1.85 million tonnes).
Table 3, Item 2	Paste plant	At the time of the application for a licence, construction of the paste plant had not been completed. The paste plant has since been constructed and an ECR was submitted to the department on 16 August 2024. Under condition 19(a) of the works approval, the applicant has commenced time limited operations for the paste plant. As part of the application for a licence, the applicant stated that the paste plant would be included in the licence through a future amendment. While construction of the paste plant has

W6687/2022/1 reference	Infrastructure	Reason for exclusion
		since been completed, it has since been operated under TLO and the applicant is subsequently required to submit a TLO report, as per condition 34 of the works approval. The paste plant has therefore not been included in this assessment but will need to be included via a future licence amendment.
Table 3, Item 4	Processing Plant WWTP	The processing plant WWTP has not yet been constructed and is not included in this assessment.
Table 3, Item 5	Putrescible landfill	<p>The applicant is no longer seeking to construct or operate a category 89 putrescible landfill at the premises in response to a request from the Tiwai Aboriginal Corporation (AC).</p> <p>The applicant has advised that the waste produced at the premises will be removed from the site by contractors and disposed of at the Leonora Shire Landfill Facility or another appropriately licensed facility.</p> <p>The applicant also advised that a waste transfer facility is being developed and that options to treat and process putrescible waste on site through the installation of an anaerobic digester are being investigated. The department notes that the construction and operation of waste infrastructure is regulated under Part V of the <i>Environmental Protection Act 1986</i> and that a works approval and/or a licence amendment may be required.</p>

2.2.2 Processing plant (category 5)

The processing plant will process spodumene ore at a rate of 4 million tonnes per annum (Mtpa). The plant will operate 24 hours a day to crush, wash and separate ore and waste materials. The processing plant operations are summarised in Appendix 1.

Process reagents will be stored adjacent to the processing plant within tanks or silos in an area with a bunded concrete pad that has been designed to contain at least 110% of the total volume of materials stored. Reagents will include soda ash, caustic soda, sodium silicate, frother, dewatering aid, coagulant, flocculant and anti-foam reagent. Chemical (and any hydrocarbons or fuels) transport and storage will be managed according to a Dangerous Goods Licence under the *Dangerous Goods Safety Act 2004*.

A process water tank is installed adjacent to the processing plant with a storage capacity sufficient for plant operations. The process water tank is supplied from the process thickener overflow and decant return and will be topped up with raw water as required.

Raw water will be stored in two interconnected tanks, which will contain water from the borefield. Water will be pumped from the tanks to a water treatment plant if required for removal of any deleterious salts prior to use in reagent mixing or flotation.

The applicant provided an Environmental Compliance Report (ECR) for the processing plant (dry plant) to the department on 22 May 2024, and an ECR for the wet plant on 17 July 2024. The department noted some deviations to the approved layout, however determined that they would not increase the assessed risks to the environment.

2.2.3 Tailings storage facility (category 5)

The tailings storage facility (TSF) is an above ground paddock style facility (TSF1) that will consist of two cells (Cell 1 and Cell 2) and an eventual total capacity of 14.72 million tonnes (Mt) of tailings. TSF1, including the basin area, will have an eventual total footprint of approximately 107.74 hectares (ha).

Only TSF1 Cell 1 and its starter embankments have been considered within this assessment. TSF1 Cell 1 and its starter embankments has a total capacity of 1.85 Mt and a footprint of approximately 60 ha.

As part of this application for a licence, the applicant is also seeking approval to use a portion of the decant water from the TSF for dust suppression at the Premises.

Embankments

In accordance with works approval W6687/2022/1, the TSF1 embankments will be constructed in stages, including the starter embankments and four embankment lifts, which are expected to be constructed approximately three years after tailings deposition commences. Only the TSF1 Cell 1 starter embankments are included within the scope of this assessment.

The applicant provided an ECR for the construction of TSF1 Cell 1 and the starter embankments to the department on 22 February 2024. Construction was deemed compliant with no deviations.

TSF1 Cell 2 has not yet been constructed due to the design intersecting with a significant Aboriginal heritage site. The applicant intends to amend the design of TSF1 Cell 2 and incorporate it into the licence through a future licence amendment. A second TSF (third cell) is also planned for construction approximately 12 years after project commencement and is not included as part of this approval.

Pipelines and vibrating wire piezometers

Pipelines have been constructed between the processing plant and TSF1 to transfer tailings slurry from the processing plant to the TSF, and transfer decant water back to the process plant

for reuse or to a turkeys nest for use in dust suppression.

All pipelines have been constructed within bunded areas and include electromagnetic flow meters and a pressure transmitter to allow constant monitoring and shutdown of the transfer system in the event of a pipeline failure.

A total of 14 vibrating wire piezometers (VWPs) will be installed around the perimeter of TSF1, eight of which have been constructed around TSF1 Cell 1 and are included within the scope of this assessment. Six VWPs are still to be constructed around TSF1 Cell 2 and are excluded from this assessment.

The applicant provided an ECR for the pipelines and vibrating wire piezometers to the department on 19 July 2024. The department determined that the construction and installation of the pipelines and the eight VWPs around TSF1 Cell 1 was compliant with the conditions of the works approval with no deviations.

Surface water management controls

The surface water management controls approved under works approval W6687/2022/1 include a diversion channel adjacent to TSF1 and the proposed waste dump location, as well as two sediment control dams along the northern and northwestern boundaries of TSF1.

An ECR for the surface water management controls was provided to the department on 16 August 2024, and the department noted several deviations in the design, including:

- construction of infrastructure, a dual-use flood levy/LV access road along the eastern boundary of TSF1, not approved under the works approval;
- changes to the extent and design of the diversion channel; and
- not constructing the sediment control dams and proposing a sediment attenuation approach instead.

The applicant advised that the changes to the surface water management controls occurred in response to concerns raised by the Tjiwarl Aboriginal Corporation (AC) in early 2023 regarding potential impacts to Jones Creek in the form of reduced surface water flow and sediment build up (Green Values Australia 2025). The applicant also considered potential cumulative impacts with nearby developments when reviewing the surface water management controls, and discussed the concerns raised by the Tjiwarl AC with the adjacent landowner.

The construction of the diversion channel was delayed due to the applicant encountering rock during its excavation, and the applicant was unable to continue with the excavation until appropriate excavation equipment had been procured. The dual-use flood levy/LV access road was constructed along the eastern boundary of TSF1 as a temporary control while construction of the diversion channel was delayed (LRL 2024a).

The department notes that the applicant has discussed the changes to the surface water management controls with the Department of Energy, Mines, Industry Regulation and Safety (DEMIRS). The applicant has advised that the changes to the diversion channel have been included in their Mining Proposal (RegID 128047), which was amended in August 2024 to include the changes.

The department acknowledges that the applicant has discussed the deviations with other stakeholders and has implemented them with the intention of improving environmental outcomes and minimising the risk of impacts. However, the changes to the surface water management controls are non-compliant with the requirements of works approval W6687/2022/1, and the non-compliance has been referred to the department's Assurance team for review.

The department has determined that the deviations can be assessed as part of this application for a licence. They are discussed further in the following sections.

Dual-use flood levy/LV access road

A dual-use flood levy/LV access road was constructed along the eastern boundary of TSF1 as a temporary measure to divert runoff from the upstream catchment until the surface water diversion channel had been constructed. Construction of the dual-use flood levy/LV access road was completed on 30 April 2023.

The applicant has stated that the dual-use flood levy/LV access road is intended to protect the embankments of TSF1 until the diversion channel was completed and that it will remain in perpetuity as part of the completed diversion channel. DEMIRS has advised that a short-term variation to the design of the drainage, the dual-use flood levy/LV access road, was endorsed by their geotechnical officer, provided the approved design is constructed as per the Mining Proposal (RegID 128047). Construction of the diversion channel was completed on 8 April 2025, which is discussed further in the following section.

The dual-use flood levy/LV access road is 1.5 kilometres (km) long and 8-10 metres (m) wide. It sits at an elevation of 1.5 m above the surrounding surface and is located between the toe of TSF1 and the diversion channel (Figure 2). It has been constructed from compacted waste rock, and DEMIRS has endorsed its construction from a geotechnical perspective, noting that it does not pose any structural integrity issues.

Given that the diversion channel has now been constructed, and construction of the dual-use flood levy/LV access road was deemed to not pose any structural integrity issues, its construction is not considered to increase the risks to the environment.

Diversion channel changes

The diversion channel is located along TSF1 and the waste dump location, and is used to divert stormwater around TSF1 and direct the water into Jones Creek. The design of the diversion channel has been amended and is now one continuous channel, compared to the original design that included three separate channels. The amended design extends further north towards Jones Creek instead of west along the northern edge of TSF1 Cell 1, and is no longer located along the southern edge of the waste dump location. The amended design considers a 1% AEP (1 in 100) event, consistent with the original design (MBS Environmental 2022). Construction of the diversion channel was completed on 8 April 2025.

The amended and original designs are shown in Figure 2 and Figure 3.

The changes to the design have previously been discussed with DEMIRS and were incorporated into the applicant's Mining Proposal (RegID 128047) in the most recent amendment, approved on 19 August 2024. DEMIRS has confirmed that the diversion channel was assessed as suitable for diverting stormwater from east of TSF1 to the north to prevent ponding and to ensure minimal impact on the natural stream flows in Jones Creek. DEMIRS also noted that the bunds were to be constructed of suitable non-dispersive material and that their geotechnical officer raised no concerns with the surface water management controls.

The changes to the design of the diversion channel are not considered to increase the risks to the environment.

Sediment attenuation approach

The applicant has proposed to use a sediment attenuation approach instead of constructing the sediment control dams that were approved under works approval W6687/2022/1. This approach was included in the applicant's Mining Proposal (RegID 128047) in the most recent amendment, approved on 19 August 2024.

Drainage channel outlets have been constructed with rock lined aprons and include a 50 m long, 1.2 m deep, excavation that flares out from approximately 15-50 m wide. The aprons spread out and slow the flow speed of captured stormwater prior to its entry into Jones Creek to minimise erosion.

DEMIRS has advised that they don't consider the risk of erosion to have changed as a result of these changes. They have also stated that annual audits of TSF1 are required under the applicant's Mining Proposal (RegID 128047) and that the audits will inform any requirement to re-assess the risk of erosion, noting that if issues arise, the applicant will be required to address them.

The department considers that the use of the proposed attenuation approach in place of the sediment control dams does not increase the risks to the environment, and notes that the conditions of the Mining Proposal (RegID 128047) provide a mechanism for implementing additional relevant controls, if required.

TSF decant water use for dust suppression

The total decant return capability at the premises is 50 litres per second (L/s), a total of 4,320 m³ per day, or 1,576,800 m³ per year (LRL 2024b). Under works approval W6687/2022/1, the applicant is approved to transfer decant water from the TSF to the process water tank for reuse at the processing plant. The pipeline has capacity to transfer 22 L/s (44%) of decant water to the process water tank, a total of 1,900 m³ per day, or 693,792 m³ per year (LRL 2024b). As part of this application for a licence, the applicant is seeking approval to use up to 4,320 m³ per day of the decant water for dust suppression at roads and active mining areas within the Premises.

Compliance assessments completed for the TSF pipelines, including pipelines carrying decant return water, found that construction was compliant with the conditions of works approval W6687/2022/1. The applicant has also advised that the use of decant water for dust suppression has been confirmed as part of their Mining Proposal (RegID 128047).

Decant water will be transferred by these pipelines into a turkeys nest prior to reuse for dust suppression. The turkeys nest is located south of TSF1 and the waste dump, as shown in Figure 1.

The turkeys nest has been designed and constructed in accordance with Figure 4 and Figure 5 and has a capacity of 50,000 m³. It consists of a HDPE liner with a permeability of 10⁻¹⁴ m/s and has a minimum freeboard of 0.5 m.

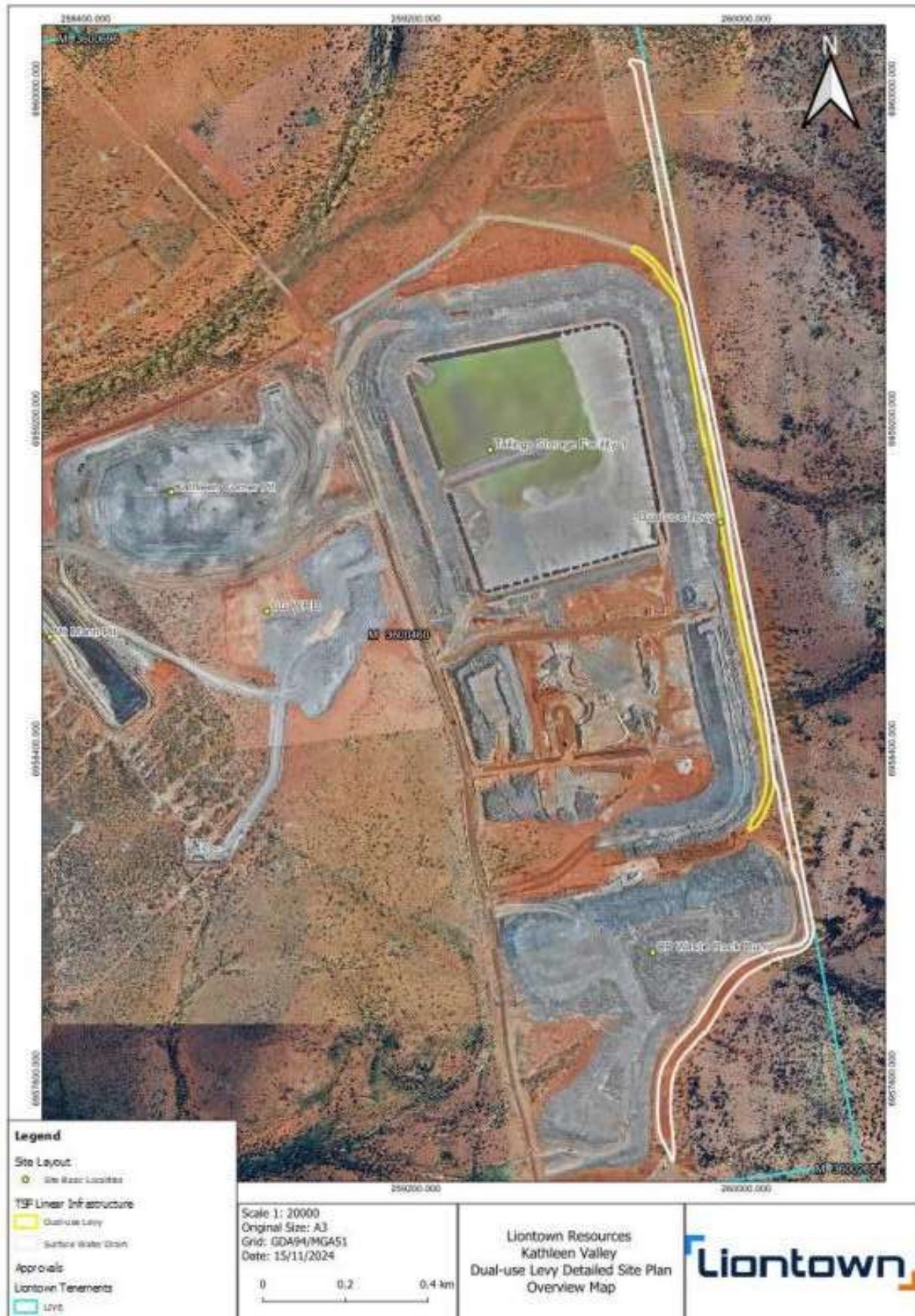


Figure 2: Locations of the dual-use flood levy/LV access road and amended diversion channel

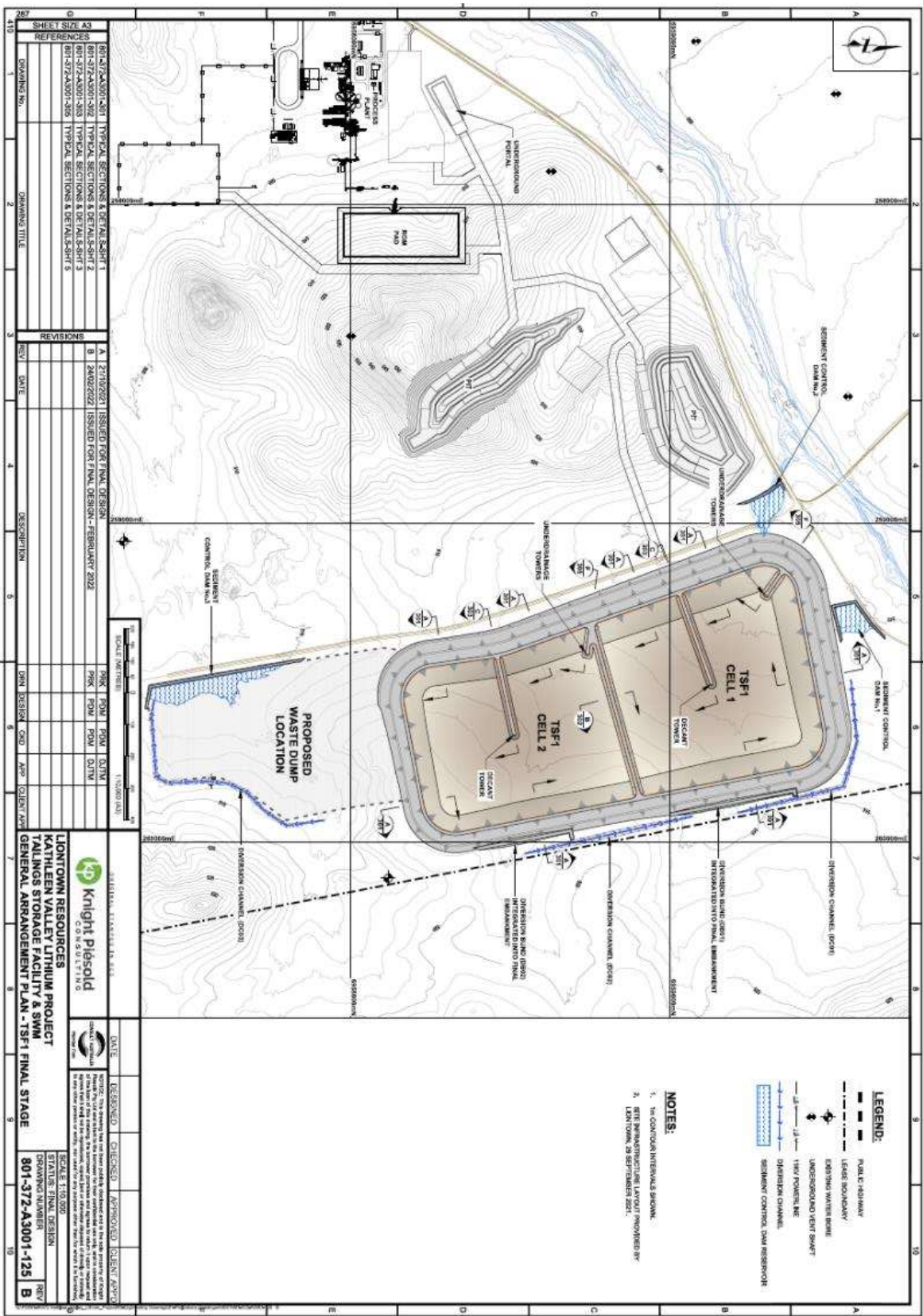


Figure 3: Original diversion channel design

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IR-T13 Decision report template (short) v3.0 (May 2021)

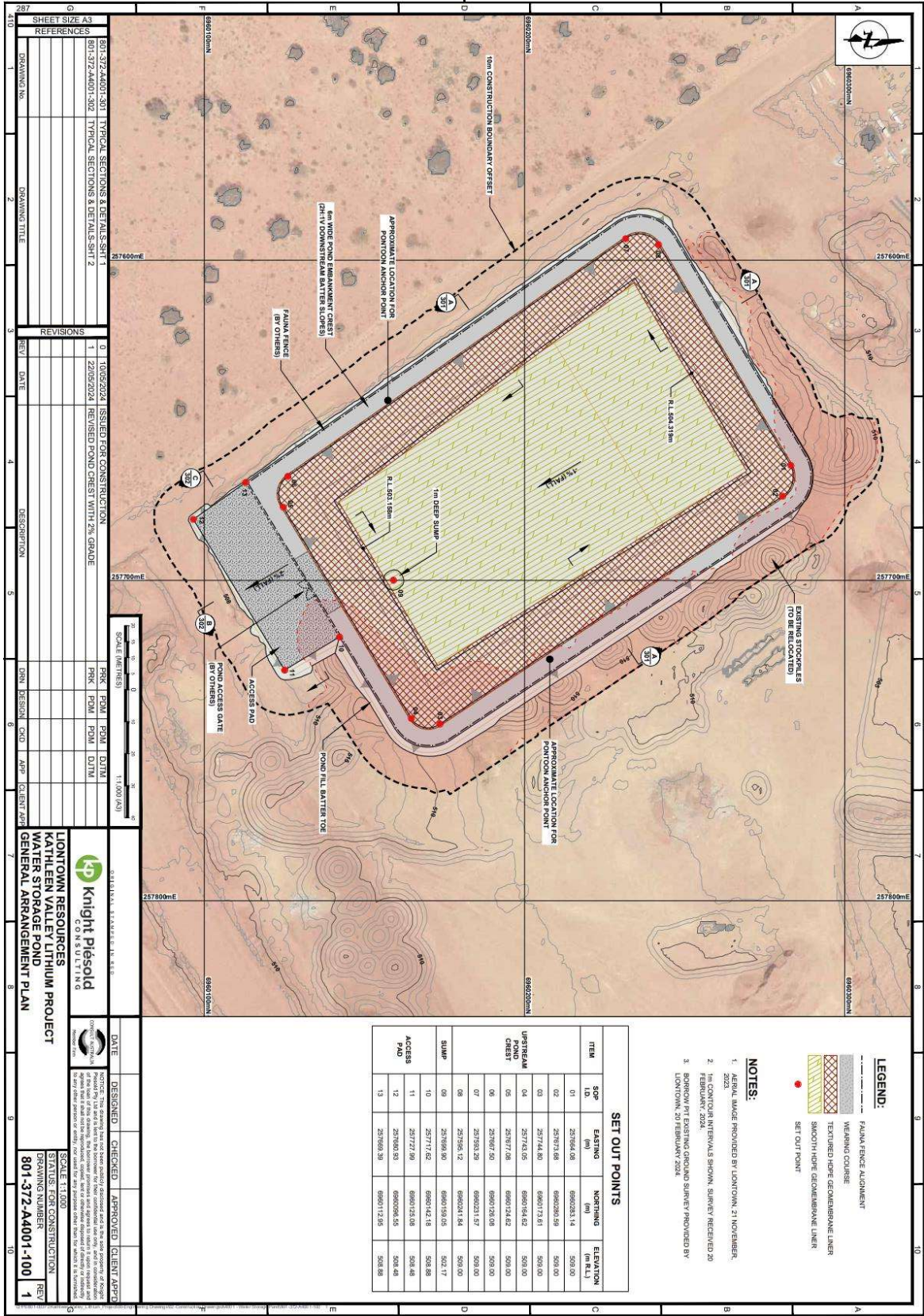


Figure 4: Turkeys nest general arrangement

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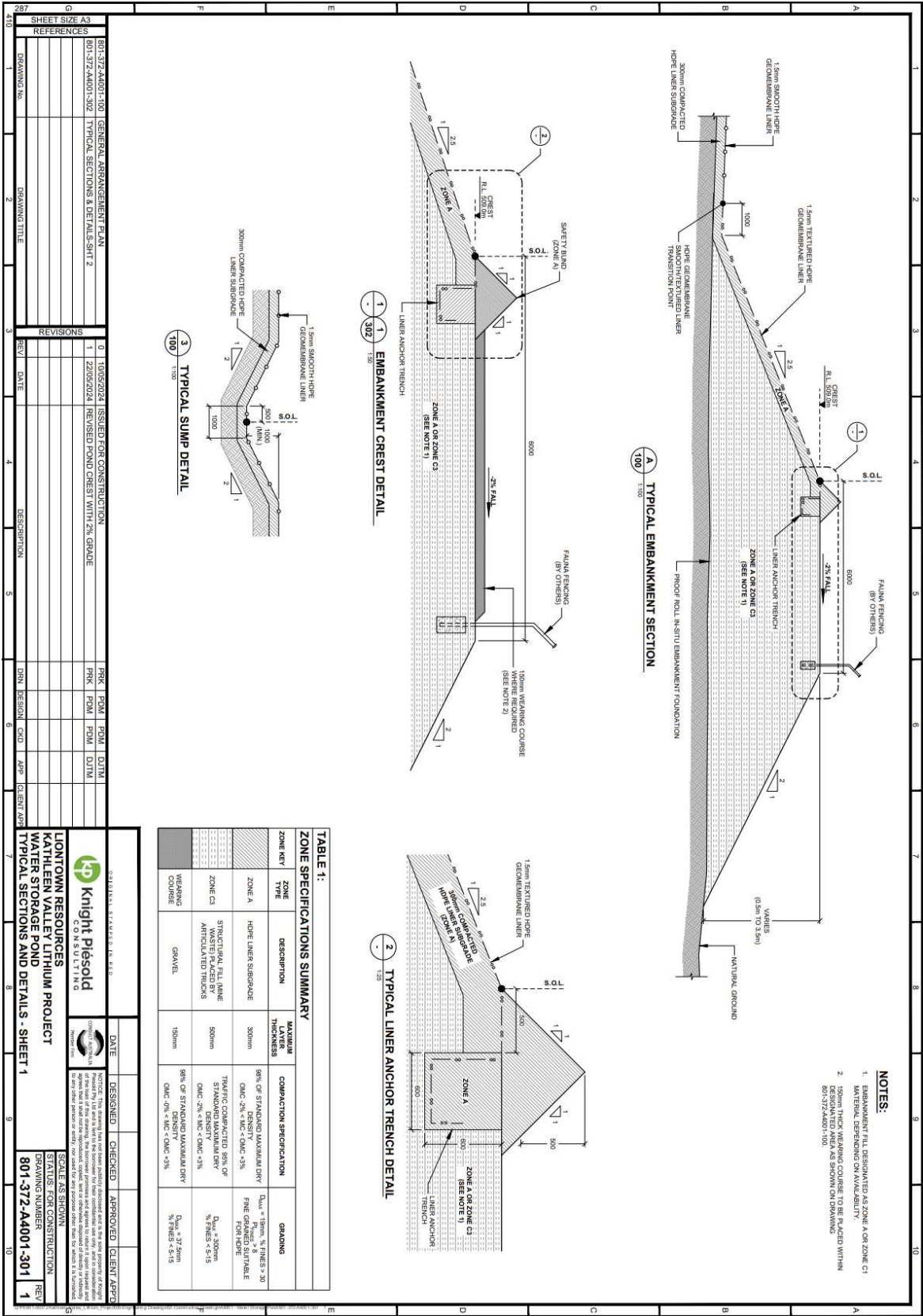


Figure 5: Turkeys nest cross sections

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2.2.4 Electric power generation (category 52)

A 27-megawatt (MW) Liquid Natural Gas (LNG) (gas) electric power plant and a 5 MW diesel backup power plant are located at the premises, allowing for up to 32 MW of power to be produced. The LNG electric power plant consists of six 4.5 MW, 11 kilovolt (kV) Jenbacher gas generators, and the diesel backup power plant consists of five 1,250 kVA diesel gensets.

Three LNG storage tanks, each with a capacity of 365 kilolitres (kL), are connected to two ambient air fin vaporisers provide a hard-piped natural gas supply to the LNG electric power plant. The storage tanks provide 8-10 days of storage for power generation.

Gas and diesel generator exhaust are directed to individual stacks within the prescribed premises boundary. Emission points are shown in Figure 6 and the coordinates are listed in licence L9450/2024/1.

An ECR for the construction of the LNG electric power plant and storage tanks was provided to the department on 12 April 2024. The department noted several deviations to the approved design and construction/installation requirements, including:

- the width of the concrete culvert;
- the coordinates for the gas generator exhaust stacks; and
- bunding requirements for diesel tank storage.

The department reviewed the risks associated with these deviations and determined that they would not increase the assessed risks to the environment.

The applicant undertook time limited operations (TLO) for both power plants and submitted a TLO report to the department on 24 April 2024. One non-compliance was noted by the department and related to the timing of the required monitoring event and submission of the TLO report, and the department determined that these non-compliances did not increase the assessed risks to the environment.

An *Emission Testing Report* (Ektimo 2024) that included the results of emission testing undertaken for the power plants was provided with the TLO report. These results are compared to the estimated emissions outlined in the decision report for works approval W6687/2022/1 in Table 3 and Table 4.

Table 3: LNG electric power plant emissions comparison

Emission component	Gas emissions flow (kg/hr) ¹	
	Estimated	Actual
Total unburned hydrocarbons	109.5	N/A ²
NOx (oxides of nitrogen as NO ₂)	36.5	27
Carbon monoxide	76.5	35.4
Particulate matter	0.5	N/A ²
Sulfur dioxide	1.5	<5.4 ³

1. Based on five of the six gas generators in operation at any time.
2. Not included in TLO testing results.
3. Sulfur dioxide emissions were reported as "<0.3 g/s" for each generator (1.08 kg/hr per generator).

Total unburned hydrocarbons and particulate matter emissions were not included in the *Emission Testing Report*. The *Emission Testing Report* also reported the sulfur dioxide emissions as “<0.3 g/s” for each generator within the LNG electric power plant, and actual sulfur dioxide emissions may appear higher than estimated as a result.

As stated in the decision report for works approval W6687/2022/1, “if power station generators are tuned for NOx emissions, other parameters will be as per the manufacturers stated emission values.” The actual NOx emissions from the LNG electric power plant were less than originally estimated and were within the manufacturer’s specifications (LRL 2025).

Table 4: Diesel backup power plant emissions comparison

Emission component	Gas emissions flow (kg/hr)				
	Continuous power 100% ¹	Continuous power 75%	Continuous power 50%	Actual (single generator)	Actual (five generators)
Carbon dioxide	653	599	148	N/A ²	N/A ²
Methane	0.93	0.85	0.61	N/A ²	N/A ²
NOx (oxides of nitrogen as NO ₂)	1.9	1.7	1.2	9.25	46.3
Sulfur dioxide	N/A ²	N/A ²	N/A ²	<0.16	<0.79
Carbon monoxide	N/A ²	N/A ²	N/A ²	3.27	16.3

1. 100% is based on full reliance on diesel power.
2. Not included in original estimates or TLO testing results.

Carbon dioxide and methane emissions were not included in the *Emission Testing Report*. Estimates for sulfur dioxide and carbon monoxide emissions from the diesel backup power plant were not provided with the application for works approval W6687/2022/1.

The actual NOx emissions from the diesel backup power plant were higher than originally estimated, however were still within the manufacturer's specifications (LRL 2025).



Figure 6: LNG power station emission points

2.2.5 Wastewater treatment plants (category 54)

As part of this application for a licence, the applicant is seeking approval to operate two WWTPs:

- accommodation village WWTP, approved for construction under works approval W6687/2022/1; and
- underground mine service area (UG MSA) WWTP, not previously approved for construction under any works approval.

The processing plant WWTP approved for construction under works approval W6687/2022/1 has not yet been constructed and is not included in this application or assessment. The locations of all three WWTPs are shown in Figure 1 and Figure 7.

Under works approval W6687/2022/1, the applicant is permitted to produce up to 240 cubic metres (m³) per day of treated effluent. As part of this application for a licence, the applicant is seeking to increase the maximum production limit to 365 m³ per day.

Treated effluent from the WWTPs will be pumped to the processing plant tails hopper, where it will ultimately be disposed of within the TSF. Under the works approval, treated effluent from the accommodation village WWTP is also permitted to be pumped to holding tanks where it will be used for limited construction purposes (dust suppression, condition of materials for foundation or TSF embankments). As part of this application for a licence, the applicant is seeking approval to re-use the treated effluent from all WWTPs at the Premises for use in dust suppression at the TSF, roads and foundations.

The department has only considered the re-use of treated effluent from the accommodation village WWTP and UG MSA WWTP within this assessment. The re-use of treated effluent from the processing plant WWTP will be considered in a future assessment when the applicant submits a licence amendment application to add the processing plant WWTP into the licence.

The applicant is also seeking to amend the treatment criteria limits for the treated effluent re-used for construction and dust suppression as part of this application for a licence. The department has considered this proposed change within this assessment in relation to the accommodation village WWTP and UG MSA WWTP only. DoH approval also is required.

Accommodation village WWTP

The accommodation village WWTP was designed to accommodate 510 people and process up to 170 kL per day of wastewater, based on an assumed production rate of 300 litres (L) of wastewater per person, per day.

An ECR for the accommodation village WWTP was provided to the department on 14 May 2024, and the department noted several deviations, including:

- the location of the accommodation village WWTP;
- the constructed WWTP systems differ from the specifications in the works approval; and
- the minimum effluent treatment criteria outlined in the works approval were unlikely to be met by the constructed infrastructure.

The department determined that a revised risk assessment would need to be carried out for these deviations as part of this assessment of the licence application. The deviations are discussed further in the following sections.

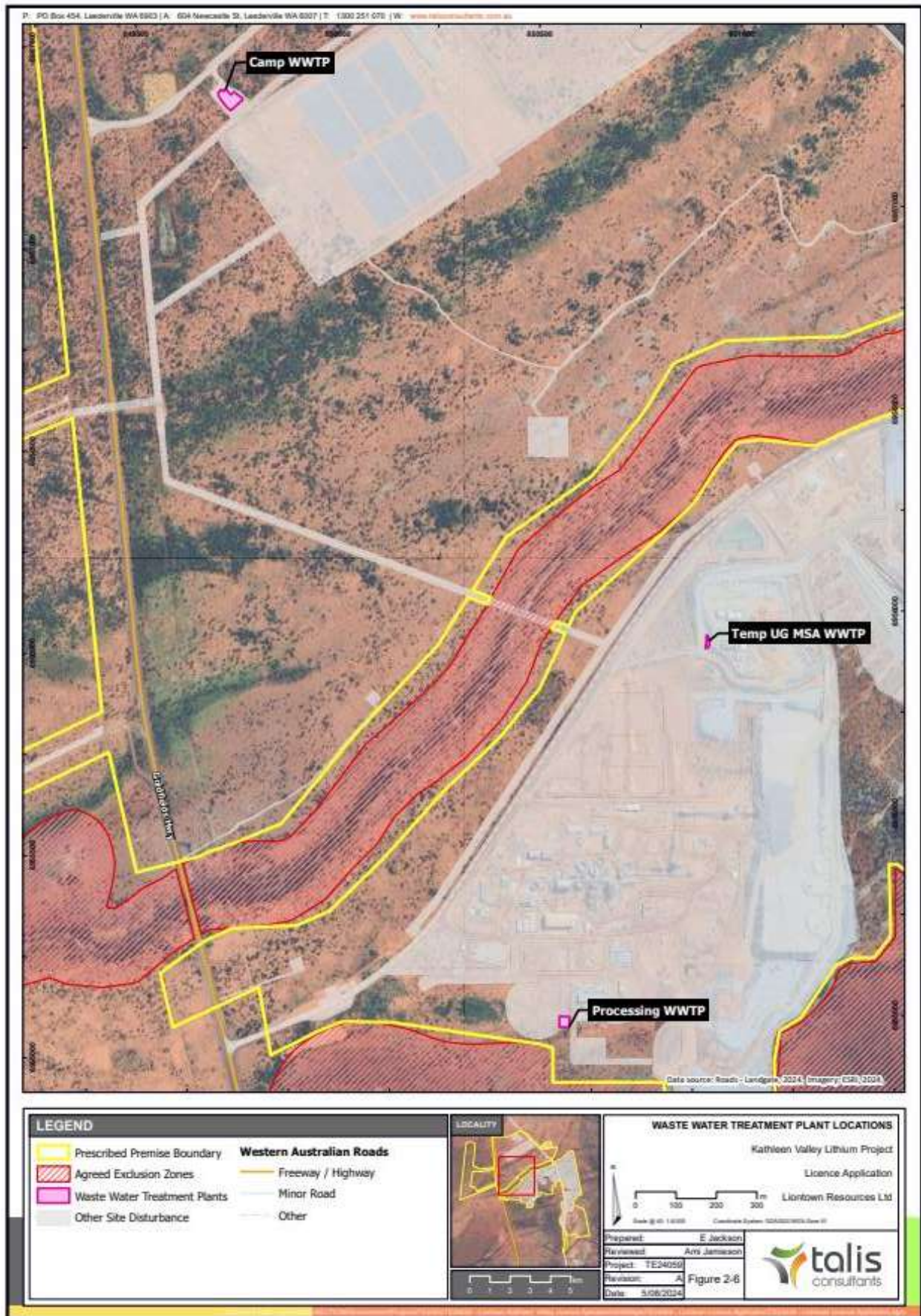


Figure 7: WWTP locations

Location of the accommodation village WWTP

The accommodation village WWTP was constructed approximately 1 km southwest of the accommodation village, noting that under works approval W6687/2022/1, it was required to be located directly adjacent to the accommodation village.

The applicant advised that additional people were required on site during construction to ensure that construction was completed within the applicant's targeted timeframes. This resulted in approximately 900 people staying at the accommodation village, compared to the 510 that were originally anticipated. The accommodation village WWTP was relocated further away from the accommodation village to decrease the risk of exposure, given the increased volume of people and wastewater produced.

As a result of the change in location, the accommodation village WWTP is now located closer to several environmental receptors. It is now located approximately 1.2 km away from Jones Creek (previously approximately 1.6 km) and 1.4 km away from the nearest recorded priority flora species (previously approximately 1.8 km).

As part of its compliance assessment, the department considered that the changes were not likely to increase the environmental risk profile that was documented in the original assessment for works approval W6687/2022/1.

Constructed WWTP systems

Under works approval W6687/2022/1, each WWTP is required to consist of a containerised Moving Bed Bioreactor (MBBR) system comprising of two anoxic and two aerobic tanks. The accommodation village WWTP, as it was constructed, consists of two Moving Bed Bioreactor (MBBR) units and one Membrane Bioreactor (MBR) unit:

- one 60 m³ MBBR unit (Tristar system);
- one 150 m³ MBBR unit; and
- one 125 m³ MBR unit.

The 125 m³ MBR unit was retrofitted onto the existing system as a temporary measure to manage an increased wastewater production rate that resulted from the additional people present on site during construction. The 125 m³ MBR unit is intended to be relocated to the UG MSA WWTP once construction is complete. The applicant has advised that a future licence amendment application will be submitted for the relocation of the 125 m³ MBR.

As part of its compliance assessment, the department considered that the changes were not likely to increase the environmental risk profile that was documented in the original assessment for works approval W6687/2022/1.

Minimum effluent treatment criteria

Under the works approval, the quality of the treated effluent is required to comply with the criteria for 'medium' exposure risk level outlined in the *Guidelines for the Non-potable uses of Recycled Water in Western Australia* (DoH 2024).

The applicant advised that the accommodation village WWTP, as constructed, would be unable to meet the treatment criteria specified in works approval W6687/2022/1 for Total Nitrogen (TN) and Total Phosphorous (TP).

TLO was undertaken for the accommodation village WWTP and the applicant submitted a TLO report to the department on 3 September 2024. The results of the testing undertaken during TLO are shown in Table 5.

Table 5: Accommodation village WWTP TLO testing results

Parameter	W6687/2022/1 performance criteria	Units	TLO testing results (average)
Total suspended solids (TSS)	<30	mg/L	<5
Total dissolved solids (TDS)	<1000		600
Biochemical oxygen demand (BOD)	<20		<2
Residual free chlorine	<2		0.26
Total nitrogen (TN)	<20 ¹		12.3
Total phosphorous (TP)	<2		4
E. coli	<10	Cfu/100mL	<1
pH	6.5-8.5	pH units	7.26

1. The performance criteria for the accommodation village WWTP for TN is stated to be <2 mg/L in Table 11 of works approval W6687/2022/1. Performance criteria for the accommodation village WWTP for TN should have been <20 mg/L in accordance with Table 3 of works approval W6687/2022/1.

The results indicate that the quality of the treated effluent complies with the criteria for 'high' exposure risk level outlined in the *Guidelines for the Non-potable uses of Recycled Water in Western Australia* (DoH 2024) and is therefore considered suitable for industrial use (with potential human exposure) and dust suppression under the guidelines.

The department notes that criteria limits for TDS, TN and TP are not included in the *Guidelines for the Non-potable uses of Recycled Water in Western Australia* (DoH 2024).

The applicant advised that the results for TN and TP obtained during TLO will be unable to be maintained or consistently replicated (LRL 2024c), and has requested that the treatment criteria for TSS, TN and TP are amended. The requested amendments to the treated effluent treatment criteria are discussed further in a following section.

UG MSA WWTP

More people than anticipated were present at the site during construction, resulting in an increase to the volume of wastewater generated on the Premises that the wastewater treatment infrastructure approved under works approval W6687/2022/1 was not designed to accommodate. The applicant has constructed the UG MSA WWTP to allow for the additional wastewater produced at the Premises to be treated to the criteria outlined in works approval W6687/2022/1. The applicant also operated the UG MSA WWTP temporarily to monitor and record its performance against the treated effluent quality criteria outlined in works approval W6687/2022/1. The location of the UG MSA WWTP is shown in Figure 1 and Figure 7.

The construction and operation of the UG MSA WWTP was not previously approved under works approval W6687/2022/1 or any other works approval, and has been referred to the department's Assurance team for review. The department has determined that the UG MSA WWTP can be assessed as part of this application for a licence.

The UG MSA WWTP currently consists of an activated sludge bioreactor unit (ASBR) capable

of processing up to 30 m³ of wastewater per day. Once construction is complete, the 125 m³ MBR unit currently retrofitted to the accommodation village WWTP will be relocated to the UG MSA WWTP through a future licence amendment application.

Construction

The applicant provided an ECR for the UG MSA WWTP to the department on 23 July 2024 to outline which aspects of the UG MSA WWTP align with the design and construction requirements for the two WWTPs that were approved under works approval W6687/2022/1.

The UG MSA WWTP is located approximately 400 m southeast of Jones Creek, between a road and several workshop buildings (as shown in Figure 1 and Figure 7). The area and buildings surrounding the UG MSA WWTP were approved for construction under works approval W6687/2022/1, so no expansion to the applicant's development footprint or additional clearing occurred during the construction of the UG MSA WWTP.

The current location of the UG MSA WWTP is temporary and that it is intended to be relocated in the future. The applicant has advised that approval for the relocation of the UG MSA WWTP will be sought through a future licence amendment application.

The department notes that the construction of the UG MSA WWTP is consistent with most of the design and construction requirements for WWTPs outlined in Table 3 of works approval W6687/2022/1:

- Item 4(c) – the applicant has advised that the effluent from the UG MSA WWTP can be treated to the minimum performance criteria for the processing plant WWTP;
- Item 4(d) – the UG MSA WWTP includes a volumetric flow meter installed on the discharge pipe outlet to monitor outgoing volume;
- Item 4(e) – the system includes an alarm beacon to notify the operator of all alarms, and the system can also be monitored remotely; and
- Item 4(f) – a 30-kL balance tank was installed, allowing for three days of storage assuming a typical flow of 5 kL per day.

Under Table 3, Item 4(g) of works approval W6687/2022/1, treatment chemicals are required to be stored in a bunded area to contain at least 110% of the total volume of materials stored and spill kits are to be kept at the premises. The applicant has advised that the chemicals are 'double skinned' with secondary containers, each of which has a capacity of 200 L, which will sufficiently hold all chemicals in the event of a puncture or rupture. The refills of chemicals used at the UG MSA WWTP are stored within a separate warehouse in a concrete bund. The ECR did not include information regarding the availability of spill kits at the UG MSA WWTP.

Operation

The applicant temporarily operated the UG MSA WWTP to monitor the quality of the treated effluent and provided a report outlining the results to the department on 13 November 2024. The results of the testing compared to the performance criteria outlined in works approval W6687/2022/1 and the accommodation village WWTP testing results are shown in Table 6.

The department acknowledges that at the time of testing, the treated effluent from the UG MSA WWTP was collected by a licenced contractor for disposal at an appropriate facility and was not discharged at the Premises.

Table 6: UG MSA WWTP testing results

Parameter	W6687/2022/1 performance criteria	Units	Testing results (average)	
			Accommodation village WWTP	UG MSA WWTP
Total suspended solids (TSS)	<30	mg/L	<5	<5
Total dissolved solids (TDS)	<1000		600	774
Biochemical oxygen demand (BOD)	<20		<2	4.6
Residual free chlorine	<2		0.26	0.37
Total nitrogen (TN)	<20 ¹		12.3	24.1
Total phosphorous (TP)	<2		4	7.6
E. coli	<10	Cfu/100mL	<1	<1
pH	6.5-8.5	pH units	7.26	7.55

1. The performance criteria for the accommodation village WWTP for TN is stated to be <2 mg/L in Table 11 of works approval W6687/2022/1. Performance criteria for the accommodation village WWTP for TN should have been <20 mg/L in accordance with Table 3 of works approval W6687/2022/1.

The results indicate that the quality of the treated effluent complies with the criteria for 'high' exposure risk level outlined in the *Guidelines for the Non-potable uses of Recycled Water in Western Australia* (DoH 2024) and is therefore considered suitable for industrial use (with potential human exposure) and dust suppression under the guidelines.

The department notes that criteria limits for TDS, TN and TP are not included in the *Guidelines for the Non-potable uses of Recycled Water in Western Australia* (DoH 2024).

The applicant advised that the results for TN and TP were caused by insufficient solid waste throughput and that the issue was rectified by recirculating and re-treating the effluent until enough biomass had accumulated.

The requested amendments to the treatment criteria for TSS, TN and TP outlined above are requested to be applied to the operation of the UG MSA WWTP, as well as the accommodation village WWTP. The requested amendments to the treated effluent treatment criteria are discussed further in a following section.

Increased maximum discharge limit

The approved production/design capacity for category 54 activities under works approval W6687/2022/1 is 240 m³ per day. The applicant is seeking approval to discharge up to 365 m³ per day of effluent from the WWTPs as part of the licence, consisting of:

- accommodation village WWTP – 335 m³ per day; and
- UG MSA WWTP – 30 m³ per day.

The processing plant WWTP is not considered as part of this assessment. Any further proposed changes to the approved production/design capacity for category 54 activities resulting from inclusion of the processing plant WWTP into the licence will need to be assessed as part of a future licence amendment application.

Effluent treatment criteria and re-use

Under works approval W6687/2022/1, only treated effluent from the accommodation village WWTP is approved to be used for both industrial purposes and dust suppression, in addition to disposal in the TSF. As part of this application for a licence, the applicant is seeking approval for treated effluent from all WWTPs at the Premises (up to 365 m³ per day) for use in dust suppression at the TSF, roads and foundations.

The applicant is also seeking an amendment to the treatment criteria limits. The applicant has requested that the treatment criteria for TSS, TN and TP are amended to align with the upper limits for treatment process category C in Appendix 6 of the *Australian Guidelines for Sewerage Systems – Effluent Management* (ARMCANZ and ANZECC 1997):

- TSS = <40 mg/L:
 - alternatively, TSS = <30 mg/L in accordance with the *Guidelines for the Non-potable uses of Recycled Water in Western Australia* (DoH 2024).
- TN = <50 mg/L; and
- TP = <12 mg/L.

Treatment process category C is the minimum level of treatment for effluent used for landscaping irrigation outlined in the *Australian Guidelines for Sewerage Systems – Effluent Management* (ARMCANZ and ANZECC 1997).

The department notes that the testing undertaken for both the accommodation village WWTP and UG MSA WWTP indicates that quality of the treated effluent complies with the criteria for 'high' exposure risk level outlined in the *Guidelines for the Non-potable uses of Recycled Water in Western Australia* (DoH 2024) and is therefore considered suitable for industrial use (with potential human exposure) and dust suppression under the guidelines. The applicant will need to have DoH approval prior to using this water for dust suppression.

2.3 Other relevant approvals

Table 7 provides a summary of other legislation and regulatory approvals relevant to the Kathleen Valley Lithium-Tantalum Project.

Table 7: Summary of other relevant approvals

Legislation	Reference Number	Summary
<i>Mining Act 1978</i>	ID 123664	<ul style="list-style-type: none"> a mining proposal for the activities was submitted to the Department of Energy, Mines, Industry Regulation and Safety (DEMIRS) and the most recent amendment was approved on 19 August 2024; the department notes that the applicant is required to meet all obligations under the <i>Mining Act 1978</i> (noting tailings storage facility design and stability) and <i>Work Health and Safety Act 2020</i> (noting radiation management); and the department notes that should alterations in tailings storage facility design be required under the mining proposal, which have not been assessed under this approval, the applicant would be required to apply for a licence amendment.
<i>Radiation Safety Act 1975</i>	N/A	<ul style="list-style-type: none"> the department sought advice from the Radiological Council regarding naturally occurring radioactive material (NORM) which may be present within tailings. Specifically, DWER requested confirmation on whether a radiation management plan would be required for tailings management. The Radiological Council responded on 5 August 2022 that, from the tailings characterisation information provided by the applicant, the tailings would not be considered radioactive under the <i>Radiation Safety Act 1975</i> and would consequently not require a radiation management plan; and the Radiological Council indicated DEMIRS also has requirements with respect to NORM under the legislation that it administers which may still require consideration of a radiation management plan for the spodumene/lithium operation.
<i>Aboriginal Heritage Act 1972</i>	N/A	<ul style="list-style-type: none"> the proposed premises overlaps with fourteen registered sites, and six lodged sites, under the <i>Aboriginal Heritage Act 1972</i>; DPLH has confirmed that the applicant submitted a notice under section 18, for which the Minister for Aboriginal Affairs granted consent on 30 May 2022; the premises is partly covered by the Tjiwarl Determined Native Title Claim (WC11/7). The department requested comment from the Tjiwarl Aboriginal Corporation (Tjiwarl AC) regarding the proposed activities. A response was received from the Tjiwarl AC on 15 July 2022 confirming that the applicant had engaged with Tjiwarl AC prior to lodging the works approval application and that a comprehensive native title agreement had been signed on 17 November 2021. In their response they indicated that "<i>Tjiwarl does not currently hold any objection to the works</i>

Legislation	Reference Number	Summary
		<p><i>approval the subject of this correspondence</i>"; and</p> <ul style="list-style-type: none"> a letter advising that works approval W6687/2022/1 had been granted was sent to the Tjiwarl AC on 29 September 2022. No response from the Tjiwarl AC was received by the department.
Part V Division 2 of the <i>Environmental Protection Act 1986</i>	CPS 9591/1 CPS 10259/1	<ul style="list-style-type: none"> clearing permit CPS 9591/1 to clear up to 348.2 hectares of native vegetation on mining tenements G36/52, M36/459, M36/460, M36/696, L36/255, and L36/256 was granted on 15 July 2022; and clearing permit CPS 10259/1 to clear up to 146.3 hectares of native vegetation on mining tenements G36/52, M36/265, M36/459, M36/460, and M36/696 was granted on 16 November 2023.
<i>Rights in Water and Irrigation Act 1914</i> (RiWI Act)	GWL 207807(1)	<ul style="list-style-type: none"> groundwater licence GWL 207807(1) currently authorises the abstraction of up to 1,200,000 kilolitres (kL) of groundwater per annum from the Lake Carey water area.

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 2020b).

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 8 below. Table 8 also details the control measures the applicant has proposed to assist in controlling these emissions, where necessary.

Table 8: Applicant controls

Emission	Sources	Potential pathways	Proposed controls
Operation			
Category 5 – processing plant			
<p>Spills/leaks of process water contaminated with environmentally hazardous materials (metalloids, processing plant reagents)</p> <p>Sediment laden stormwater</p>	Operation of the processing plant and associated pipelines	<p>Direct discharge to land causing poor vegetation health/death for adjacent priority flora, PEC vegetation complex and fauna, and impacts to quality of surface water</p> <p>Overland run off causing poor vegetation health/death for adjacent priority flora and PEC vegetation complex, impacts to quality of soils, surface water and potentially groundwater</p>	<p>Controls</p> <ul style="list-style-type: none"> Ore processing activities are to be conducted within bunded areas draining to sumps with recovery pumps. Diversion bunds constructed to separate clean water from potentially contaminated water. Regular inspection of infrastructure, pipelines. Flow sensors fitted along pipelines to allow detection of loss of contents. All chemical reagents stored within tanks or silos in appropriately bunded facilities whereby 110 % of the largest vessel is contained and 25 % of the total volume. Minor spills will be cleaned up immediately and reported through the incident report procedure. Process water stored in a 720 m³ tank with high level alarms. <p>Additional proposed controls</p> <ul style="list-style-type: none"> Liquid storage, use and containment areas are on a bunded concrete pad. Hydrocarbon and reagent storage areas have been designed and constructed to contain at least 110 % of the total volume of materials stored. Loss of containment alarms have been installed. Surface water diversions and sumps divert stormwater away from plant operational areas.
Dust		Air/windborne pathway causing poor vegetation health/death for adjacent priority flora and PEC vegetation complex	<p>Controls</p> <ul style="list-style-type: none"> Use of water cart on ROM pad. Use of fixed sprays as required. Crushing and screening activities restricted during high winds if dust can not be adequately controlled. Spilled ore and materials outside of the

Emission	Sources	Potential pathways	Proposed controls
			<p>ore processing areas regularly cleaned up.</p> <ul style="list-style-type: none"> Spodumene concentrate loaded into trucks within an enclosed shed. Tantalum concentrate placed in bags with an enclosed area. <p>Additional proposed controls</p> <ul style="list-style-type: none"> Water sprays installed at the ROM bin and at transfer points in the crushing circuit.
Category 5 – tailings storage facility			
Tailings and contaminated water (metals/ metalloids)	Operation of TSF1 and associated infrastructure (pipelines and pumps)	Seepage through base and embankments to soil and groundwater causing poor vegetation health/death for adjacent priority flora and PEC vegetation complex and groundwater contamination	<p>Controls</p> <ul style="list-style-type: none"> Where in-situ materials are unsuitable for subgrade a 200 mm thick layer of imported fine grained compacted material will be placed as the HDPE subgrade. 1.5 mm HDPE geomembrane liner: <ul style="list-style-type: none"> Heat welded seams. Carbon black content 2-3 %. Leak tested. Quality control testing undertaken by the contractor and quality control certificates provided. Upstream cut-off trench and toe drain. Basin underdrainage system and underdrainage collection sump. Slotted concrete decant tower at the centre of each cell, with decant return pipeline. Decant recycled to the process plant. Sub-aerial deposition using bank spigots to maintain the supernatant pond near the decant tower. <p>Monitoring</p> <ul style="list-style-type: none"> Installation of three “monitoring stations” to the west the TSF1 tailings storage facility, each with two groundwater bores, one shallow and one deep (i.e. six wells in total). No upgradient bores are proposed due to exclusion zones associated with cultural heritage requirements. Installation of 14 piezometers within the TSF embankments.

Emission	Sources	Potential pathways	Proposed controls
			Additional controls <ul style="list-style-type: none"> TSF1 design is consistent with Australian National Committee on Large Dams (ANCOLD) requirements, including seepage collection system. Additional monitoring <ul style="list-style-type: none"> TSF Operations Manual developed to provide direction on the appropriate operation and monitoring of TSF1 including daily inspections of the operational TSF1.
		Contaminated surface water run-off and spills and leaks/ruptures along pipelines causing impacts to health of vegetation and contamination of soil, surface water and potentially groundwater	Controls <ul style="list-style-type: none"> Pipelines incorporate isolation valves at appropriate intervals and period visual inspections undertaken once per 12 hour shift. Tailings and return water pipelines are fitted with flow and leak detection sensors. Scour pits or sumps constructed along the length of the above-ground pipeline corridors to ensure leaks or spillages are contained within bunded areas. Pipelines installed with instrumentation consisting of electromagnetic flow meters and pressure transmitter installed downstream of pump station and upstream TSF discharge providing constant monitoring of operation parameters of the tailings pipeline, and to provide shutdown of the system in the event of pipeline failure. Diversion of rainfall runoff from catchment areas around site infrastructure to discharge off site downstream of the project. The diversion will direct runoff from three catchments to the North and into Jones Creek. Precipitation onto each facility will be contained within the appropriate freeboard allowances. Surface water run-off collected at the downstream toe of the TSF1 embankments to prevent ponding and/or erosion. Additional monitoring <ul style="list-style-type: none"> Periodic visual inspections of pipelines as per TSF Operations Manual.

Emission	Sources	Potential pathways	Proposed controls
		Overtopping of TSF1 or embankment or foundation failure causing impacts to health of vegetation and contamination of soil, surface water and potentially groundwater	<p>Controls</p> <ul style="list-style-type: none"> Total freeboard allowance after a 1 % Annual Exceedance Probability (AEP) 72 hour rainfall event to be minimum 500 mm. Operation freeboard (for solids – distance between the perimeter embankment and the solid tailings beach) to be minimum 300 mm. Beach freeboard (height between pond level and exposed tailings beach extent) to be minimum 200 mm. <p>Additional controls</p> <ul style="list-style-type: none"> TSF designed to ANCOLD standards. The TSF will be operated according to engineering specifications and under the supervision of a suitably qualified engineer. The downstream slope of the TSF embankment will be surfaced with competent material to prevent embankment material erosion. Embankment upstream toe drains, with gravity flow to the underdrainage sump. High-density polyethylene (HDPE) liner will be placed on the basin floor and embankments. The TSF will undergo annual audits. Embankment upstream toe drains, with gravity flow to the underdrainage sump. High-density polyethylene (HDPE) liner will be placed on the basin floor and embankments. <p>Additional monitoring</p> <ul style="list-style-type: none"> A TSF Operations Manual developed to provide direction on the appropriate operation and monitoring of the TSF including daily inspections of the operational TSF. Monitoring bores installed around the TSF.
Dust		Particle lift off from TSF1 causing impacts to health of vegetation and contamination of soil and surface water	<p>Additional controls</p> <ul style="list-style-type: none"> Deposition plan will be designed with dust mitigation in mind to maintain continual flows on TSF surface that ensure no drying and minimise dust

Emission	Sources	Potential pathways	Proposed controls
			generation.
Category 52 – electric power generation plant			
Emissions to air – NOx, carbon monoxide, sulfur dioxide	Operation of LNG power plant	Air/windborne pathway causing impacts to amenity and adjacent threatened and priority fauna	Controls <ul style="list-style-type: none">Factory trained personnel tune the gas engines by sampling exhaust emissions to ensure the specified NOx values are achieved.Trained personnel will check and tune exhaust NOx values on completion and construction of the plant, every 2,000 running hours to ensure engine performance is maintained. Sampling will be from exhaust sampling points built into each stack. Typically sampling connections are installed in the muffler discharge pipe.Distribution transformers will be fully sealed and installed in a concrete bund. Monitoring <ul style="list-style-type: none">Annual air emissions monitoring to be conducted (required for licence annual fee).
Contaminated stormwater (hydrocarbons)		Overland flow causing contamination of nearby creeklines	Controls <ul style="list-style-type: none">Building pad is 100 mm concrete foundation to prevent ingress of stormwater.Building and genset foundations are constructed of concrete with the building floor drained to a 600 mm wide culvert running the full length of the building.Building designed so that hydrocarbon spills and contaminated stormwater are directed through to a spill containment pit.Regular inspections of containment infrastructure.
Category 54 – wastewater treatment plants			
Sewage, partially treated sewage, and wastewater	Containment loss from WWTP and associated pipelines	Overland flow causing contamination of nearby creek lines and infiltration through soil to groundwater causing contamination of groundwater	Controls <ul style="list-style-type: none">The balance tanks are fitted with low level and high-level alarms to commence and cease pumping. A ‘high high level’ alarm will activate a visual and sound alarm for abnormally high levels in the tank for immediate action.The WWTPs has contingency storage

Emission	Sources	Potential pathways	Proposed controls
			<p>for up to two days of normal flow if discharge is suspended.</p> <p>Additional controls</p> <ul style="list-style-type: none"> Pipelines are fitted with flow and leak detection sensors monitored in real time for the centrally located control room. Regular inspections of WWTP facilities and pipeline. Minor spills to be cleaned up immediately and reported through the incident report procedure. <p>Additional monitoring</p> <ul style="list-style-type: none"> Quarterly sampling of WWTP effluent water.
Treated wastewater	Discharge of wastewater to the tailings storage facility	Seepage through base and embankments of the tailings storage facility, causing contamination of groundwater	<p>Controls</p> <ul style="list-style-type: none"> Treated to “Medium” exposure risk standards for non-potable use category applications (DoH 2024). No more than 365 m³ per day of Treated effluent will be disposed of within TSF1.
	Use of treated wastewater from all WWTPs for dust suppression and for construction purposes	Direct discharge to land	<p>Controls</p> <ul style="list-style-type: none"> Treated to “Medium” exposure risk standards for non-potable use category applications (DoH 2024). Wastewater monitoring to be conducted monthly. Additional testing will be undertaken prior to use in dust suppression following any malfunction with the WWTP chlorination system.
Treatment chemicals	Storage of WWTP treatment chemicals – containment loss	Direct discharge to land causing contamination of nearby ephemeral creek lines and infiltration through soil to groundwater causing contamination of groundwater	<p>Controls</p> <ul style="list-style-type: none"> Chemicals are stored in a bunded area. Spill kits kept and maintained at the premises for immediate use.

3.1.2 Receptors

In accordance with the *Guideline: Risk Assessment* (DWER 2020b), 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 9 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 2020a)).

Table 9: Sensitive human and environmental receptors and distance from prescribed activity

Human receptors	Distance from prescribed activity
N/A	No human receptors located in the vicinity.
Environmental receptors	Distance from prescribed activity
<u>Groundwater dependent ecosystems</u> Two vegetation communities (eucalypt woodlands and acacia open woodlands) were identified as being potential groundwater dependent ecosystems, located along Jones Creek and immediately outside the northern boundary	Part of the acacia open woodlands community is located within the prescribed premises boundary.
<u>Priority Ecological Community (PEC)</u> Priority 1 ¹ PEC, Violet Range (Perseverance Greenstone Belt) vegetation complexes (Banded Ironstone Formation) Refer Figure 9	Located within the southeastern half of the prescribed premises boundary.
<u>Threatened and priority flora</u> Two Priority 4 ² species - <i>Grevillea inconspicua</i> and <i>Hemigenia exilis</i> Refer Figure 10	Within the centre of the prescribed premises boundary.
<u>Threatened fauna</u> Priority 2 ³ species <i>Kwonkan moriartii</i> – Moriarty’s trapdoor spider	1.5 km west of the southern-most part of the premises. Within prescribed premises boundary (adjacent to south-west boundary).

¹ Priority one communities are “*Ecological communities that are known from very few occurrences with a very restricted distribution (generally ≤5 occurrences or a total area of ≤ 100ha). Occurrences are believed to be under threat either due to limited extent, or being on lands under immediate threat (e.g. active mineral leases)*”. (DEC 2003)

² Species that are adequately known, are rare but not threatened, or meet criteria for near threatened, or that have been recently removed from the threatened species or other specially protected fauna lists for other than taxonomic reasons, are placed in Priority 4. These species require regular monitoring (DBCA 2019).

³ Species that are known from one or a few locations, some of which are on lands managed primarily for nature conservation. Species may be included if they are comparatively well known from on or more locations but do not meet adequacy of survey requirements and appear to be under threat from known threatening processes. These species are in urgent need of further survey (DBCA 2019).

<p><u>Subterranean fauna</u></p>	<p>A subterranean fauna survey was conducted for the project area by Invertebrate Solutions on 26 November 2021. No stygofauna were identified during the survey. Invertebrate solutions indicate that there is a low likelihood of stygofauna being present within the project area. They indicated further investigation would be warranted for significant dewatering for potential impacts to the Carey Paleochannel and associated aquifer 10km to the south west of the project area (Invertebrate Solutions 2021).</p>
<p><u>Groundwater</u></p> <p>Goldfields Groundwater Area</p>	<p><u>Groundwater depth</u></p> <p>Groundwater levels were measured at approximately 8-12 m below ground level within the area of the proposed tailings storage facility footprint (AQ2 2019).</p> <p>A number of other hydrogeological studies have taken place across the site, whereby 35 monitoring and production bores have been advanced at the premises. Four wells recorded depths 5-10 mbgl (shallowest 5.55 mbgl), fifteen wells with groundwater depths between 10-15 mbgl, fifteen wells between 15-20 mbgl, thirteen wells between 15-25 mbgl. Only three wells returned groundwater depths >25 mbgl (H2 2022).</p> <p>Groundwater flow at site is predicted to flow east to west at a relatively steep groundwater gradient for the Goldfields (AQ2 2019).</p> <p><u>Groundwater quality</u></p> <p>Groundwater quality at Kathleen Valley is fresh (total dissolved solids concentrations (TDS) of 590-810 mg/L), alkaline (pH 8.0 to 8.6) and with no significant concentrations of dissolved metals (AQ2 2019).</p> <p><u>Nearby groundwater users</u></p> <p>There are several active mine sites using groundwater surrounding site. H2 (2022) indicates the closest significant borefield is ~6 km from the site.</p> <p>There are also multiple pastoral stations (with watering sites for cattle) surrounding the project area. H2 (2022) indicates that there is likely to be low connectivity between groundwater sourced by the applicant and adjacent pastoral stations due to the underlying fractured rock aquifer.</p>
<p><u>Surface Water</u></p> <p>Jones Creek and associated aquatic organisms and hyporheic fauna</p> <p>Ephemeral creek lines</p> <p>Refer Figure 11</p>	<p>Within prescribed premises boundary, approximately 150 m north of TSF1.</p> <p>The project falls within the surface water sub-catchment of Jones Creek, which extends about 14 km to the northeast and 8 km to the east of proposed infrastructure. It flows to the south-west</p>

	<p>into the Albion Downs valley and eventually to Lake Miranda. The expected flow frequency of Jones Creek is slightly more than once per year with flow duration of several hours. Continuous flow between 48 and 72 hours has a frequency of about 1:100 years (AQ2 2018).</p> <p>Several smaller drainage lines are present throughout the project area. All creeks are ephemeral in nature, only flowing briefly immediately following significant rainfall events (MBS Environmental 2021).</p>
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3.2 Risk ratings

Risk ratings have been assessed in accordance with the *Guideline: Risk Assessments* (DWER 2020b) for each identified emission source and taken 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 10.

Licence L9450/2024/1 that accompanies this decision report authorises emissions associated with the operation of the premises i.e. category 5, 52 and 54 activities.

The conditions in the issued licence, as outlined in Table 10 have been determined in accordance with *Guidance Statement: Setting Conditions* (DER 2015).

Table 10: Risk assessment of potential emissions and discharges from the premises during operation

Risk events					Risk rating ¹	Applicant controls sufficient?	Conditions ² of licence	Justification for additional regulatory controls
Sources / activities	Potential emission	Potential pathways and impact	Receptors	Applicant controls	C = consequence L = likelihood			
Operation								
Category 5 – processing plant								
Operation of the processing plant and associated pipelines	Spills/leaks of process water contaminated with environmentally hazardous materials (metalloids, processing plant reagents) Sediment laden stormwater	Direct discharge to land causing poor vegetation health/death for adjacent priority flora, PEC vegetation complex and fauna, and impacts to quality of surface water Overland run off causing poor vegetation health/death for adjacent priority flora and PEC vegetation complex, impacts to quality of soils, surface water and potentially groundwater	Adjacent priority flora, PEC vegetation complex and threatened fauna Soils, surface water bodies (Jones Creek) and groundwater (Goldfields Groundwater Area)	Refer to Section 3.1	C = Moderate L = Possible Medium Risk	N	Condition 1 <u>Condition 1</u>	<p>The applicant controls (including controls from the application for a works approval that were not included as conditions on works approval W6687/2022/1) have been included within the licence as regulatory controls. Relevant controls from works approval W6687/2022/1 have also been included within the licence as regulatory controls.</p> <p><u>Department controls</u></p> <p>The applicant has installed loss of containment alarms at the processing plant as a control. The department has added a control to specify that regular inspection of the alarms occurs to ensure they are operating correctly.</p> <p>The applicant has committed to immediately clean minor spills, therefore the department has added a requirement that spill kits are kept at the processing plant to ensure they are available at all times.</p>
Dust		Air/windborne pathway causing poor vegetation health/death for adjacent priority flora and PEC vegetation complex	Adjacent priority flora, PEC vegetation complex and threatened fauna		C = Minor L = Unlikely Medium Risk	Y	Condition 1	<p>The applicant controls (including controls from the application for a works approval that were not included as conditions on works approval W6687/2022/1) have been included within the licence as regulatory controls. Relevant controls from works approval W6687/2022/1 have also been included within the licence as regulatory controls.</p>

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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				
Category 5 – tailings storage facility								
Operation of TSF1 and associated infrastructure (pipelines and pumps)	Tailings and contaminated water (metals/ metalloids)	Seepage through base and embankments to soil and groundwater causing poor vegetation health/death for adjacent priority flora and PEC vegetation complex and groundwater contamination	Adjacent priority flora and PEC vegetation complex Groundwater (Goldfields Groundwater Area)	Refer to Section 3.1	C = Moderate L = Unlikely Medium Risk	Y	Condition 1, 8, 15-19	The applicant controls (including controls from the application for a works approval that were not included as conditions on works approval W6687/2022/1) have been included within the licence as regulatory controls. Relevant controls from works approval W6687/2022/1 have also been included within the licence as regulatory controls. Given that the construction of TSF1 was found to be compliant with the conditions of works approval W6687/2022/1, no additional controls to those from the works approval have been added.
		Seepage through base and embankments causing impacts to nearby surface water bodies	Surface water bodies (Jones Creek)		C = Moderate L = Unlikely Medium Risk	N	Condition 12-14	<u>Department controls</u> During consultation with the department, the applicant discussed the potential impacts of the premises on Jones Creek and identified the potential for impacts to be caused by existing upstream facilities. The flow frequency of Jones Creek is slightly more than once per year, so it is considered unlikely for impacts to occur. However, it is important to be able to identify the source of an impact if an impact occurs. The department has therefore specified monitoring requirements for surface water at Jones Creek during periods of flow within the licence as regulatory controls.
		Overtopping of TSF and direct discharge to land causing poor vegetation	Adjacent priority flora, PEC vegetation		C = Moderate L = Unlikely	Y	Condition 1	The applicant controls have been included within the licence as regulatory controls. Relevant controls

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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				
		health/death to adjacent priority flora and PEC vegetation complex	complex and threatened fauna		Medium Risk			from works approval W6687/2022/1 have also been included within the licence as regulatory controls. Given that the construction of TSF1 was found to be compliant with the conditions of works approval W6687/2022/1, no additional controls to those from the works approval have been added.
		Spills and leaks along pipelines causing impacts to health of vegetation and contamination of soil, surface water and potentially groundwater	Adjacent priority flora, PEC vegetation complex and threatened fauna		C = Moderate L = Possible Medium Risk	Y	Condition 1	The applicant controls have been included within the licence as regulatory controls. Relevant controls from works approval W6687/2022/1 have also been included within the licence as regulatory controls. Given that the construction of the pipelines was found to be compliant with the conditions of works approval W6687/2022/1, no additional controls to those from the works approval have been added.
		Contaminated surface water run-off causing contamination of soils and nearby surface water bodies	Soils and surface water bodies (Jones Creek)		C = Moderate L = Unlikely Medium Risk	N	<u>Condition 1</u>	<u>Department control</u> The changes to the surface water management controls from the approved design under works approval W6687/2022/1 have been assessed and are considered to be generally sufficient. To ensure the integrity of the dual-use flood levy/LV access road and diversion channel, the department has included a requirement for visual inspection of this prior to and following a significant rain event within the licence as a regulatory control.

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				
	Dust	Particle lift off from TSF1 causing impacts to health of vegetation and contamination of soil and surface water	Adjacent priority flora, PEC vegetation complex and threatened fauna Surface water bodies (Jones Creek)		C = Minor L = Unlikely Medium Risk	Y	Condition 1	The applicant controls have been included within the licence as regulatory controls.
Use of TSF decant water for dust suppression	Decant water	Use for dust suppression at the TSF, roads and foundations, causing impacts to vegetation health and soil and surface water quality	Adjacent priority flora, PEC vegetation complex, and soils Surface water bodies (Jones Creek)	Refer to Section 3.1	Refer to section 3.3	N	Refer to section 3.3	Refer to section 3.3
		Seepage through base and embankments of turkeys nest to soil and groundwater causing poor vegetation health for PEC vegetation complex, and groundwater contamination	Nearby PEC vegetation complex Groundwater (Goldfields Groundwater Area)		Refer to section 3.3	N	Refer to section 3.3	Refer to section 3.3
Category 52 – electric power generation								
Operation of LNG power station	Emissions to air – NOx, carbon monoxide, sulfur dioxide	Air/windborne pathway impacting amenity	Adjacent threatened fauna	Refer to Section 3.1	C = Minor L = Unlikely Medium Risk	N	Condition 1 <u>Condition 1</u>	<p>The applicant controls have been included within the licence as regulatory controls.</p> <p><u>Department controls</u></p> <p>The applicant has advised that if power station generators are tuned for NOx emissions, other parameters will be as per the manufacturers stated emission values.</p> <p>The department has specified that NOx emissions are not to exceed</p>

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Risk events					Risk rating ¹	Applicant controls sufficient?	Conditions ² of licence	Justification for additional regulatory controls
Sources / activities	Potential emission	Potential pathways and impact	Receptors	Applicant controls	C = consequence L = likelihood			
								manufacturer specifications within the licence as a regulatory control. Monitoring every 6 months has been applied to the licence but may be reviewed in future amendments.
	Contaminated stormwater (hydrocarbons)	Overland flow causing contamination of soils and nearby surface water bodies	Soils and surface water bodies (Jones Creek)		C = Moderate L = Unlikely Medium Risk	N	Condition ¹ <u>Condition 1</u>	The applicant controls have been included within the licence as regulatory controls. <u>Department controls</u> The LNG power station building has been designed so that hydrocarbon spills and contaminated stormwater are directed through to a spill containment pit. In the event that the integrity of containment infrastructure is compromised, the department has added a requirement that spill kits are kept at the LNG power station to the licence as a regulatory control.
Category 54 – wastewater treatment plants								
Containment loss from WWTP and associated pipelines	Sewage, partially treated sewage, and wastewater	Direct discharge to land causing contamination of nearby surface water bodies Infiltration through soil to groundwater causing contamination of groundwater	Soils, surface water bodies (Jones Creek) and groundwater (Goldfields Groundwater Area)	Refer to Section 3.1	C = Moderate L = Unlikely Medium Risk	N	Condition ¹	The applicant controls have been included within the licence as regulatory controls. Relevant controls from works approval W6687/2022/1 have also been included within the licence as regulatory controls. The changes to the location of and the WWTP systems installed at the accommodation village WWTP are not considered to increase the environmental risk profile. Given that the construction of the UG MSA WWTP aligned with the relevant design and construction requirements for WWTPs in works approval W6687/2022/1, the risk rating for this impact is considered to be consistent

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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				
								<p>with the previous assessment.</p> <p><u>Department controls</u></p> <p>The department has assessed the risks associated with the changes to effluent treatment criteria and has included additional conditions within the licence as regulator controls. DoH approval is also required.</p> <p>Refer to section 3.3.</p>
Discharge of treated effluent to the TSF		Seepage through base and embankments of the TSF, causing contamination of groundwater	Groundwater (Goldfields Groundwater Area)		C = Moderate L = Unlikely Medium Risk	N	Condition 1-3, 24-26 <u>Condition 3. 24, 27, 29, 30</u>	<p>Some of the applicant controls (including controls from the application for a works approval that were not included as conditions on works approval W6687/2022/1) have been included within the licence as regulatory controls. Relevant controls from works approval W6687/2022/1 have also been included within the licence as regulatory controls.</p> <p><u>Department controls</u></p> <p>Refer to section 3.3.</p>
Discharge of treated effluent to land for dust suppression	Treated wastewater	Direct discharge of treated effluent to land, causing impacts to the health of adjacent priority flora and PEC vegetation complex and surface water bodies	Adjacent priority flora, PEC vegetation complex and threatened fauna Soils and surface water bodies (Jones Creek)	Refer to Section 3.1	C = Moderate L = Possible Medium Risk	N	Condition 1-3, 24-26 <u>Condition 3. 24, 27-30</u>	<p>Some of the applicant controls (including controls from the application for a works approval that were not included as conditions on works approval W6687/2022/1) have been included within the licence as regulatory controls. Relevant controls from works approval W6687/2022/1 have also been included within the licence as regulatory controls.</p> <p><u>Department controls</u></p> <p>Refer to section 3.3.</p>
Storage of WWTP treatment chemicals –	Treatment chemicals	Direct discharge to land causing contamination of nearby surface water	Adjacent priority flora and PEC vegetation		C = Minor L = Unlikely	N	Condition 1 <u>Condition 1</u>	<p>The applicant controls have been included within the licence as regulatory controls. Relevant controls from works approval W6687/2022/1</p>

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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				
containment loss		bodies Infiltration through soil to groundwater causing contamination of groundwater	complex Soils, surface water bodies (Jones Creek) and groundwater (Goldfields Groundwater Area)		Medium Risk			have also been included within the licence as regulatory controls. <u>Department controls</u> The use of secondary containers to hold chemicals in the event of a puncture or rupture is considered an acceptable deviation from the requirements of works approval W6687/2022/1. However, ensuring that any secondary containers have sufficient capacity to contain at least 110% of the total volume of materials stored is required to minimise the risk of contamination of nearby surface water bodies, particularly given the proximity of the UG MSA WWTP to Jones Creek. The department has therefore specified that chemicals are to be stored in banded areas or containers with at least 110% capacity within the licence as a regulatory control.

Note 1: Consequence ratings, likelihood ratings and risk descriptions are detailed in the *Guideline: Risk Assessments* (DWER 2020b).
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 for the reuse of treated effluent from WWTPs and TSF decant water for dust suppression

3.3.1 Source

Treated effluent

Testing of the quality of the treated effluent from the accommodation village WWTP and UG MSA WWTP was undertaken by the applicant.

To be considered suitable for industrial use (with potential human exposure) and dust suppression under the *Guidelines for the Non-potable uses of Recycled Water in Western Australia* (DoH 2024), the quality of treated effluent must meet the criteria for ‘medium’ exposure risk level. The results (Table 5 and Table 6) indicate that the quality of the treated effluent from both WWTPs complies with the criteria for ‘high’ exposure risk level outlined in the guidelines and is therefore considered suitable for industrial use and dust suppression under the guidelines.

The applicant proposes to use up to 365 m³ per day of treated effluent for dust suppression.

Decant water

The applicant proposes to use up to 4,320 m³ per day of decant water for dust suppression at the Premises.

A tailings characterisation study was undertaken by MBS Environmental (2021), wherein a representative tailings sample was prepared using 39 samples of pegmatite ore collected from 18 drill holes. The bulk sample was then subjected to processing conditions reflective of the proposed process plant operation.

Samples underwent both water leachate tests (simulating short term leaching by rainwater over a period of several years) and kinetic leachate tests (simulating whether elements have the potential to enter solution following oxidation of tailings). Water leachates were found to be alkaline, non-saline and with low concentrations of major ions, metals and metalloids (Appendix 4 - Water Leachate Test). Under highly oxidizing conditions, tailings leachates are likely to be neutral, non-saline and contain low concentrations of fluoride, major ions, metals and metalloids (Appendix 4 – Kinetic Leachate test).

Under different pH conditions, exceedances of non-potable ground water use criteria outlined in the *Guidelines for the Non-potable uses of Recycled Water in Western Australia* (DoH 2024) and livestock drinking water criteria outlined in the ANZECC/ARMCANZ Guidelines (ANZECC/ARMCANZ 2000) were found only for extreme pH values 2.2 or 13.1.

Supernatant collected from the tailings sample was circum-neutral to slightly alkaline but had salinity and concentrations of major ions, and soluble alkalinity levels that were an order of magnitude higher than those in the leachate tests (Appendix 4 – Supernatant). MBS Environmental (2021) attributed this to differences in dilutions between the measurements.

MBS Environmental (2021) found that overall, the tailings samples were “relatively benign” and the risk of tailings producing environmentally hazardous leachates to be “very low”.

3.3.2 Pathway

Priority flora and PECs

Two Priority 4 flora species have been recorded within the Premises, *Grevillea inconspicua* and *Hemigenia exilis* (Figure 10). They have been recorded in locations surrounded by key infrastructure and roads that may require dust suppression.

A Priority 1 PEC, Violet Range (Perseverance Greenstone Belt) vegetation complexes (Banded Ironstone Formation), is also located within the Premises close to areas that may require dust suppression (Figure 9).

Baseline surface water information

As shown in Figure 11, the Premises is located within the surface water sub-catchment of Jones Creek, which extends about 14 km to the northeast and 8 km to the east. Jones Creek intersects the prescribed premises boundary, and several roads are located in close proximity to it (Figure 1). It flows to the southwest into the Albion Downs Valley, and eventually to Lake Miranda. The expected flow frequency of Jones Creek is slightly more than once per year with flow duration of several hours. Continuous flow between 48 and 72 hours has a frequency of about 1:100 years (AQ2, 2018).

Several smaller drainage lines are present throughout the project area. All creeks are stated by the applicant to be ephemeral in nature, generally flowing immediately following significant rainfall events.

3.3.3 Proposed treatment criteria

The applicant proposes that the WWTP effluent is treated to the standards outlined in Table 11.

Table 11: Proposed WWTP effluent treatment criteria

Parameter	Treatment criteria	Units	Relevant guidelines
Total suspended solids (TSS)	<30 ¹ ; or	mg/L	<i>Guidelines for the Non-potable uses of Recycled Water in Western Australia</i> (DoH 2024)
	<40		<i>Australian Guidelines for Sewerage Systems – Effluent Management</i> (ARMCANZ and ANZECC 1997)
Total dissolved solids (TDS)	<1000 ¹		<i>Guidelines for the Non-potable uses of Recycled Water in Western Australia</i> (DoH 2024)
Biochemical oxygen demand (BOD)	<20 ¹		
Residual free chlorine	<2 ¹		
Total nitrogen (TN)	<50		<i>Australian Guidelines for Sewerage Systems – Effluent Management</i> (ARMCANZ and ANZECC 1997)
Total phosphorous (TP)	<12		
E. coli	<10 ¹	Cfu/100mL	<i>Guidelines for the Non-potable uses of Recycled Water in Western Australia</i> (DoH 2024)
pH	6.5-8.5 ¹	pH units	

1. Consistent with the treatment criteria for the accommodation village WWTP outlined in Table 8 of works approval W6687/2022/1.

3.3.4 Department assessment and regulatory controls

Treated effluent

The closest receptors which may be sensitive to impacts from the use of the treated effluent for

dust suppression are the priority flora and PEC present within the Premises, and Jones Creek, which is located approximately 150 m north of TSF1 and adjacent to some roads where the treated effluent may be used to suppress dust.

As these receptors are located in close proximity to areas where the treated effluent may be used to suppress dust, the consequence rating for impacts is considered “moderate” and the likelihood for impacts is considered “possible”. The overall risk rating is therefore considered to be “medium”.

Given the risk rating, the department regulatory controls outlined in Table 12 will consequently be placed on the licence.

Table 12: Regulatory controls for treated effluent reuse

Condition	Justification
3	<p>The applicant proposed treatment criteria for TN and TP aligns with the upper limits for treatment process category C in Appendix 6 of the <i>Australian Guidelines for Sewerage Systems – Effluent Management</i> (ARMCANZ and ANZECC 1997). The department notes that the <i>Water Quality Protection Note 22 – Irrigation with Nutrient-rich Wastewater</i> (DWER 2008) (WQPN 22) is a more recent guideline published by the department that outlines recommended concentration limits for TN and TP.</p> <p>Testing results for the accommodation village WWTP and UG MSA WWTP indicate that the effluent from each WWTP can be treated to the criteria outlined in WQPN 22 for TN and TP. However, the department is currently reviewing WQPN 22 as of September 2024 and has advised that in the interim, recommended concentration limits within WQPN 22 should not be used.</p> <p>In the absence of more recent guidelines, the department considers aligning the treatment criteria for TN and TP with the upper limits for treatment process category C in Appendix 6 of the <i>Australian Guidelines for Sewerage Systems – Effluent Management</i> (ARMCANZ and ANZECC 1997) to be acceptable and has included this within the licence as a regulatory control.</p> <p>The applicant has proposed that the treatment criteria for TSS aligns with either the <i>Australian Guidelines for Sewerage Systems – Effluent Management</i> (ARMCANZ and ANZECC 1997) or the <i>Guidelines for the Non-potable uses of Recycled Water in Western Australia</i> (DoH 2024). As the <i>Guidelines for the Non-potable uses of Recycled Water in Western Australia</i> (DoH 2024) are more recent, and other parameters are aligned to the treatment criteria within that guideline, the department has included the corresponding treatment criteria for TSS within the licence as a regulatory control.</p>
20	<p>In addition to the quality of treated effluent, assessing a potential impact caused by the discharge of treated effluent to the TSF or to land for dust suppression will require information on the volume of treated effluent used for this purpose.</p> <p>The department has therefore included a requirement to monitor the volume of treated effluent discharged from each WWTP to each approved discharge point as a regulatory control (also required for the licence annual fee component).</p>
23, 25 and 26	<p>To protect nearby receptors, the department has specified that the licence holder must not discharge treated effluent in the event of an exceedance within the licence as a regulatory control. Requirements as to when discharge may recommence have also been included.</p> <p>The department has specified actions to be taken following an exceedance before discharge may recommence.</p>
24	<p>The applicant proposed additional testing prior to the use of the treated effluent in dust suppression following any malfunction with the chlorination system has been included within the licence as a regulatory control.</p>

Condition	Justification
	The department has specified actions to be taken following any malfunction before discharge for dust suppression may recommence.

Decant water

The closest receptors which may be sensitive to impacts from the use of the decant for dust suppression are the priority flora and PEC present within the Premises, and Jones Creek, which is located approximately 150 m north of TSF1 and adjacent to some roads where the decant water may be used to suppress dust. The applicant is proposing to use up to 4,320 m³ per day of decant water for dust suppression, and the quality of the decant water is expected to align with the *Guidelines for the Non-potable uses of Recycled Water in Western Australia* (DoH 2024) and livestock drinking water criteria outlined in the ANZECC/ARMCANZ Guidelines (ANZECC/ARMCANZ 2000), therefore the consequence rating for impacts is considered “moderate”. As the closest receptors are located in close proximity to areas where the decant water may be used to suppress dust, the likelihood for impacts is considered “possible”. The overall risk rating is therefore considered to be “medium”.

The closest receptors which may be sensitive to impacts from the seepage of decant water from the turkeys nest are the PEC present within the Premises and nearby groundwater. The consequence rating for impacts is considered “moderate” due to the anticipated quality of the decant water, noting that on-site testing has not yet been undertaken. Given the permeability of the turkeys nest liner, the likelihood for impacts is considered “unlikely.” The overall risk rating is therefore considered to be “medium”.

Given the risk ratings, the regulatory controls outlined in Table 12 will consequently be placed on the licence.

Table 13: Regulatory controls for decant water reuse

Condition	Justification
1	<p>The department has included the turkeys nest and corresponding operating requirements in Table 1 to ensure risks associated with the storage of decant water in the turkeys nest are managed appropriately.</p> <p>The applicant proposed controls, including maintaining a 500 mm freeboard and discharging up to 4,320 m³ per day of decant water (the maximum decant return water capability at the premises, as advised by the applicant) to the turkeys nest have been added as regulatory controls.</p> <p>The department has also included a requirement for daily visual inspections, plus inspections prior to and following significant rainfall events, of the turkeys nest to ensure that the 500 mm freeboard is maintained and allow for the early detection of any potential leaks or seepage.</p>
2	<p>Condition 2, Table 2 has been amended to allow for decant return water from the turkeys nest to be used for dust suppression at roads and active mining areas within the premises, as requested by the applicant.</p> <p>The department has also allowed for decant return water from the turkeys nest to be used for dust suppression or disposed of at TSF1 Cell1. This will allow for excess water to be removed and the 500 mm freeboard to be maintained at the turkeys nest if a significant rainfall event occurs.</p>
4, 9, 10 and 11	The quality of the decant water is reported to align with the <i>Guidelines for the Non-potable uses of Recycled Water in Western Australia</i> (DoH 2024) and livestock drinking water criteria outlined in the ANZECC/ARMCANZ Guidelines (ANZECC/ARMCANZ 2000) (MBS Environmental 2021).

Condition	Justification
	<p>The department notes that under works approval W6687/2022/1, decant return water was not authorised to be applied to land, including for use in dust suppression. Samples of the decant water produced at the premises during the TLO period were therefore not required to be taken or analysed as part of the works approval conditions. As the applicant is now proposing to apply the decant return water to land for dust suppression purposes, confirmation of the decant water quality is required so that potential impacts can be identified and addressed.</p> <p>The applicant has proposed to monitor decant return water monthly for pH, EC and TDS as part of the applicant's monthly groundwater licence monitoring program. Additional parameters have been added to the monitoring regime, these can be revisited once data is available.</p> <p>The department has therefore added conditions 4 and 9-11 for the monitoring of the decant return water quality. A singular monitoring event must be undertaken prior to discharging the decant return water from the turkeys nest for use in dust suppression, and on a monthly basis after discharge commences. The applicant is seeking approval to use a large volume (up to 4,320 m³ per day) of decant return water for dust suppression, so regular and ongoing monitoring is required to ensure that the risk of environmental impacts is managed appropriately, and that any impacts are detected quickly.</p> <p>To validate the quality of the decant return water and allow for a comparison against relevant guidelines, the department has specified that sample analysis must be undertaken for key parameters outlined in the <i>Guidelines for the Non-potable uses of Recycled Water in Western Australia</i> (DoH 2024) and the livestock drinking water criteria outlined in the ANZECC/ARMCANZ Guidelines (ANZECC/ARMCANZ 2000).</p> <p>The department may consider amendments to these conditions, including the frequency of monitoring and specified parameters, if the applicant submits an application for a licence amendment specifying any requested changes. The applicant will be required to provide justification and supporting information for any requested changes. The department notes that the results of any monitoring undertaken prior to the amendment application will be considered to allow the department to conduct a full risk assessment of any proposed changes.</p>
35 Table 9	The department has specified the environmental reporting requirements relating to the monitoring of decant return water. A requirement to compare decant return water monitoring results against the livestock drinking water quality values from the ANZECC/ARMCANZ Guidelines has been included.

4. Consultation

Table 14 provides a summary of the consultation undertaken by the department.

Table 14: Consultation

Consultation method	Comments received	Department response
Application advertised on the department's website on 7 January 2025.	None received	N/A
Shire of Leonora advised of proposal on 15 January 2025	The Shire of Leonora replied on 17 January, and had no comments on the application.	N/A

Consultation method	Comments received	Department response
Department of Mines, Energy, Industry Regulation and Safety (DEMIRS) advised of proposal on 15 January 2025	DEMIRS replied on 22 January, advising that the proposed activities were consistent with the applicant's Mining Proposal (Reg ID 128047). They noted that the Mining Proposal includes provision for five LNG storage tanks, whereas this application for a licence refers to three.	The applicant is advised that only three LNG storage tanks may be installed. To construct/install additional LNG storage tanks beyond the three that are approved the applicant is required to apply for an amendment.
Department of Planning, Lands and Heritage (DPLH) advised of proposal on 15 January 2025	DPLH replied on 24 January, advising that no further approvals from DPLH were required.	N/A
Tjiwarl Aboriginal Corporation advised of proposal on 15 January 2025	Tjiwarl Aboriginal Corporation replied on 7 February, advising that they had no comments on the application.	N/A
Department of Health (DoH) advised of proposal on 15 January 2025	DoH replied on 20 February, and raised the following: 1. DoH has not yet approved the 60 m ³ and 150 m ³ MBBR WWTPs: a. DoH is waiting for additional documentation from the applicant before the 150 m ³ MBBR WWTP is approved; and b. a validation report for the WWTP must be submitted before DoH can approve the use of treated effluent for dust suppression. 2. DoH considers that dust impacts and management measures have not been adequately considered. 3. Public health considerations for workers accommodation: a. the applicant should consider public health factors at the accommodation camp; and b. the applicant may have obligations under the <i>Food Act 2008</i> , <i>Food Regulations 2009</i> , and <i>Australia New Zealand Food Standards Code</i> .	In response to the advice received from DoH: 1. the applicant is required to obtain all relevant approvals prior to discharging the treated effluent for dust suppression. The department recommends that the applicant contacts DoH to discuss its applications and reporting requirements in relation to the proposed use of treated effluent for dust suppression. 2. DoH comments have been considered in the department's assessment, and the department notes that additional controls relating to dust management (as compared to the works approval) have been added to the licence. 3. The department recommends that the applicant contacts DoH if it is unsure about its obligations.
Advice requested from DEMIRS regarding deviations to surface water management	DEMIRS replied on 4 April 2025, advising that they had no concerns regarding the deviations and that the	Advice received from DEMIRS was considered in the department's

Consultation method	Comments received	Department response
controls on 26 March 2025	risk of erosion was considered unchanged.	assessment of this application for a licence. Refer to section 2.2.3.
Applicant was provided with draft documents on 23 May 2025	Refer to Appendix 3.	Refer to Appendix 3.

5. Conclusion

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

References

1. Agriculture and Resource Management Council of Australia and New Zealand (ARMCANZ) and Australian and New Zealand Environment and Conservation Council (ANZECC) 1997, *Australian Guidelines for Sewerage Systems – Effluent Management*, Canberra, Australian Capital Territory.
2. Australian and New Zealand Environment and Conservation Council (ANZECC) 2000, *Australian and New Zealand Guidelines for Fresh and Marine Water Quality*, Canberra, Australian Capital Territory.
3. AQ2, 2018. *Scoping Study – Water Management. Kathleen Valley Lithium Deposit*
4. AQ2, 2019. *Water Management Study, as Input to the Kathleen Valley Lithium Deposit, Pre-Feasibility Study*
5. Department of Biodiversity, Conservation and Attractions (DBCA), 2019. *Conservation Codes for Western Australian Flora and Fauna*.
6. Department of Environment Regulation (DER) 2015, *Guidance Statement: Setting Conditions*, Perth, Western Australia.
7. Department of Health (DoH) 2024, *Guidelines for the Non-potable uses of Recycled Water in Western Australia*, Perth, Western Australia.
8. Department of Water and Environmental Regulation (DWER) 2008, *Water Quality Protection Note 22 – Irrigation with Nutrient-rich Wastewater*, Perth, Western Australia.
9. DWER 2020a, *Guideline: Environmental Siting*, Perth, Western Australia.
10. DWER 2020b, *Guideline: Risk Assessments*, Perth, Western Australia.
11. AQ2 2018, *Scoping Study – Water Management. Kathleen Valley Lithium Deposit*.
12. AQ2 2019 *Water Management Study, as Input to the Kathleen Valley Lithium Deposit, Pre-Feasibility Study*.
13. Department of Biodiversity, Conservation and Attractions (DBCA) 2019, *Conservation Codes for Western Australian Flora and Fauna*.
14. Department of Environment and Conservation (DEC) 2003, *Definitions, Categories and Criteria for Threatened and Priority Ecological Communities*.
15. Green Values Australia 2025, *Technical Memorandum – 7th March 2025*.
16. H2 2022, *H2 Hydrogeological Assessment – Kathleen Valley Lithium-Tantalum Project*.

17. Invertebrate Solutions, 2022. *Pilot Survey and Desktop Assessment of Subterranean Fauna for the Kathleen Valley Lithium and Tantalum Project, Western Australia*
18. Knight Piesold Consulting 2020, *Kathleen Valley – Monitoring Bore Completion and Aquifer Testing Report*.
19. LRL (AUST) Pty Ltd (LRL) 2024a, *Kathleen Valley Environmental Compliance Report – Tailings Storage Facility 1 – Surface Water Management*.
20. LRL 2024b, *Kathleen Valley TSF Water Balance – May-August 2024*.
21. LRL 2024c, *Kathleen Valley – Village Wastewater Treatment Plant – Time Limited Operations Report*.
22. LRL 2025, *Kathleen Valley Works Approval (W6687/2022/1) – LNG Power Station Compliance Report – Compliance not Demonstrated – Response*.
23. MBS Environmental 2021, *Kathleen Valley Lithium-Tantalum Project Spodumene Concentrator Tailings Geochemical Characterisation*.
24. MBS Environmental 2022, *Works Approval Application – Attachment 3B – Proposed Activities*.

Appendix 1: Process plant operation

The Processing Plant will include the following operations to produce spodumene concentrate as summarised in Table 15 and Figure 8 below.

Table 15 Process plant operation

Stage	Description summary
Feed preparation	Two-stage ore crushing, whereby primary crushed ore will be discharged to the secondary crusher which will operate as an open circuit. Excess ore from the secondary crusher will overflow for deposition into a stockpile.
Ore grinding	Ore from the secondary crusher will be transferred for grinding in a Semi Autogenous Grinding (SAG) mill.
Magnetic separation	Cyclone overflow from the SAG mill will feed into two Low Intensity Magnet Separators (LIMS) for removal of any ferrous materials before transfer to the Wet High Magnetic Separators (WHIMS)
Tantalum recovery	The combined LIMS/WHIMS magnetic streams will be processed through a tantalum recovery circuit via gravity separation. The dried tantalum concentrate will initially discharge into a bin ahead of loading into bulk bags. Tantalum concentrate will be stored in bulk bags in dedicated shipping containers adjacent to the reagents shed.
Desliming and caustic conditioning	The combined LIMS/WHIMS non-magnetic stream will be pumped to a deslime feed tank from which it will then overflow into caustic scrubbing tank. The cyclone underflow will be dosed with caustic soda and agitated. Any overflows will be fed to the process tailings thickener for water recovery.
Flotation	Involves three-stage flotation, including a roughing stage followed by two stages of cleaning to produce an upgraded spodumene concentrate and barren tailings stream.
Concentrate thickening and filtration	The final spodumene concentrate will be pumped to a concentrate thickener prior to filtration. The feed will be mixed with a flocculant and coagulant prior to discharge into the thickener.
Concentration storage	Spodumene concentrate (nominal moisture 8 – 10%) will be conveyed to a radial stacker, stacking into the covered concentrate storage shed. The storage shed will have a maximum capacity of 15,600 tonnes.
Tails thickening and disposal	Approximately 50% of the tailings will be pumped to the tailings storage facility and 50% to the paste plant.

Licence: L9450/2024/1

IR-T13 Decision report template (short) v3.0 (May 2021)

Appendix 2: Receptor figures

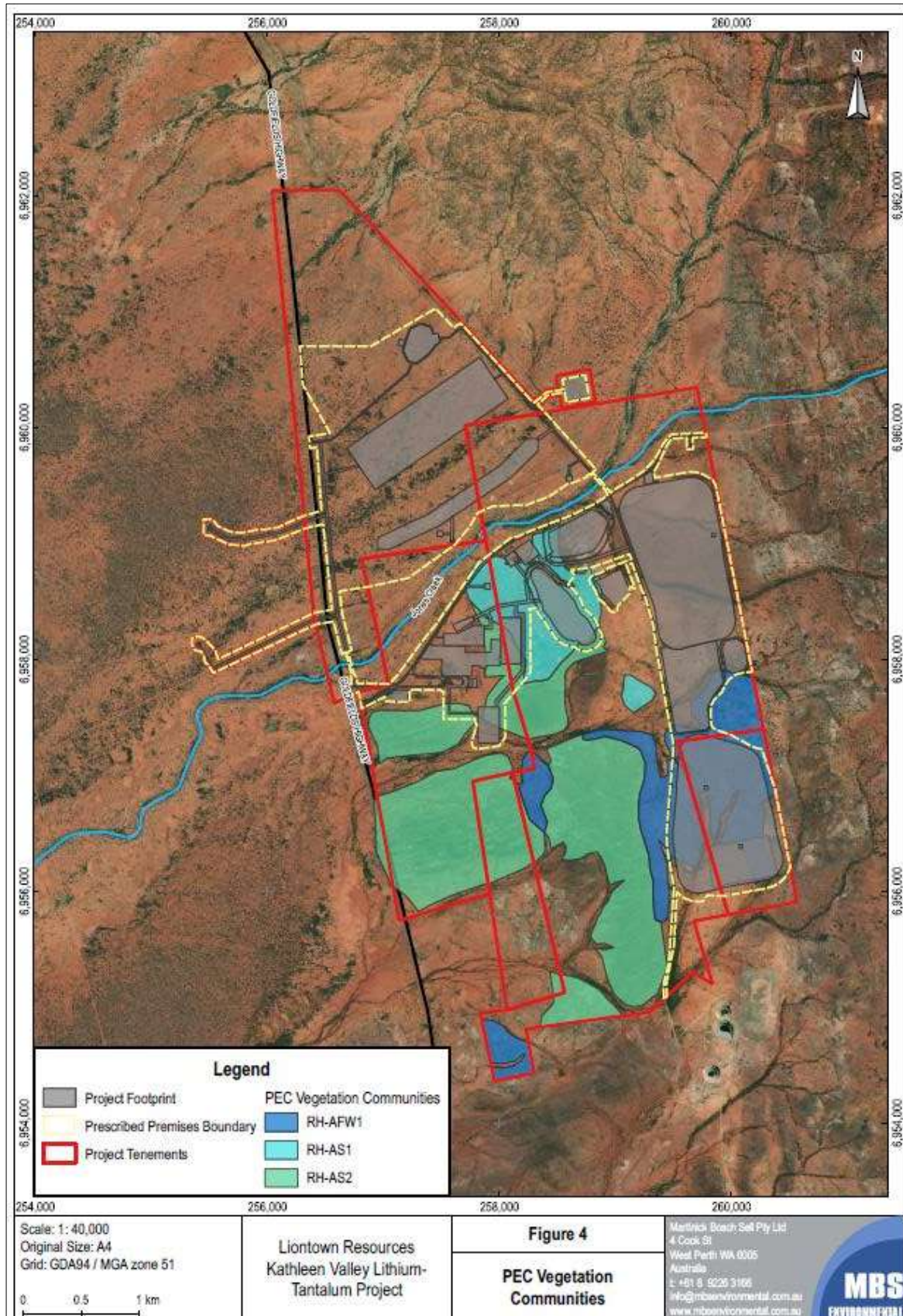


Figure 9: Priority ecological communities - vegetation complexes

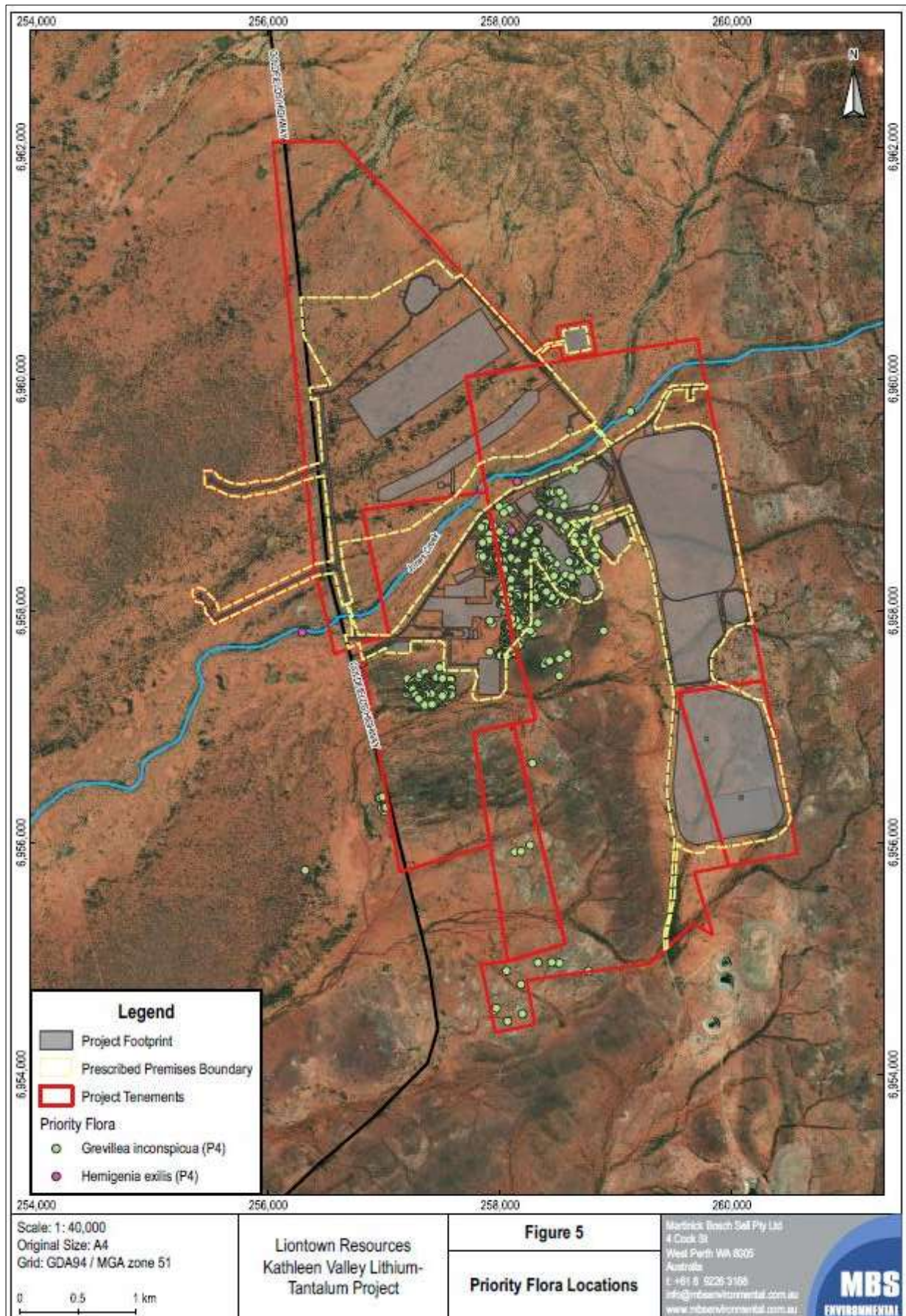


Figure 10: Priority flora locations

Licence: L9450/2024/1

IR-T13 Decision report template (short) v3.0 (May 2021)

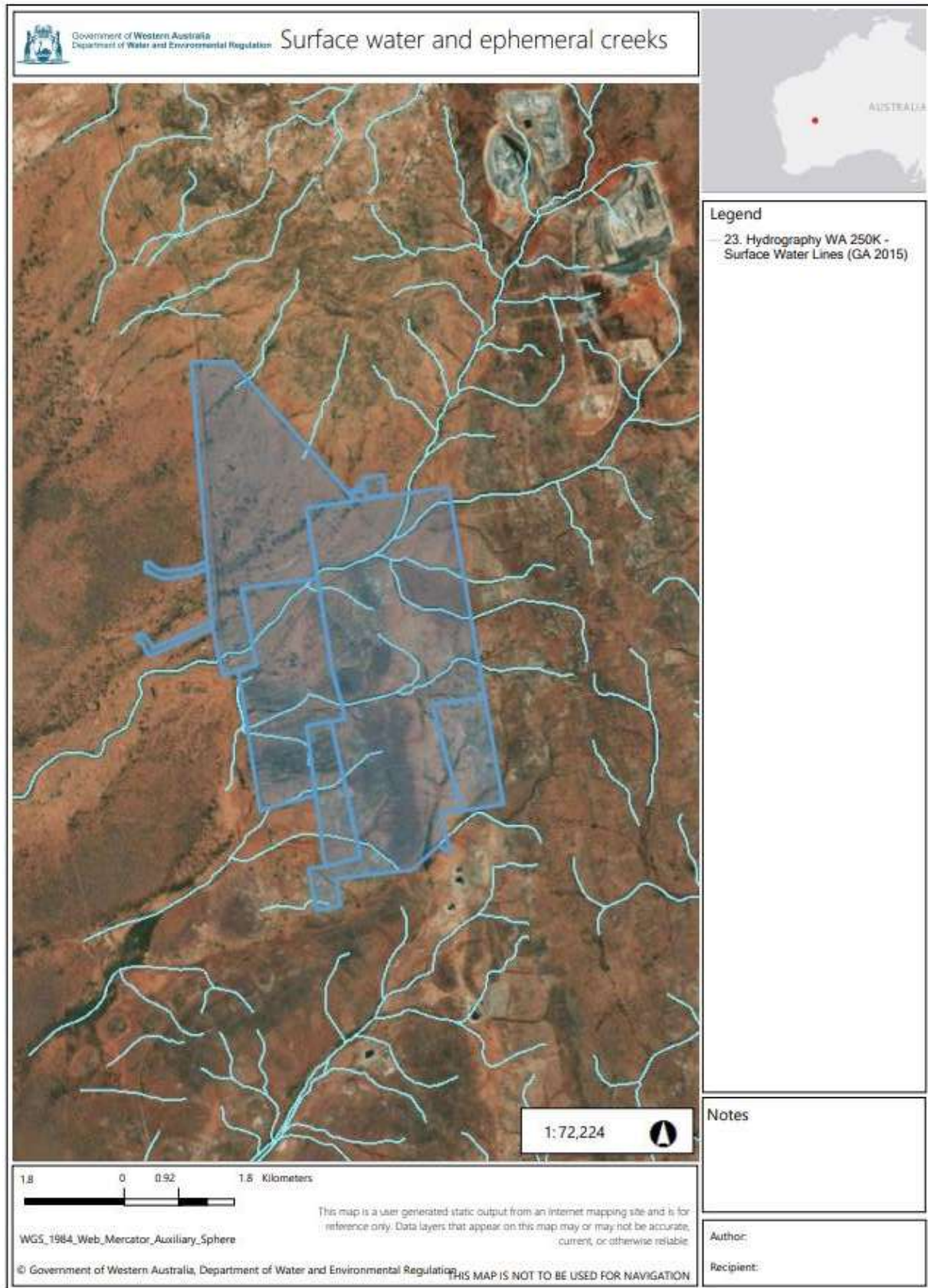


Figure 11: Surface water and ephemeral creeks

Appendix 3: Summary of applicant's comments on risk assessment and draft conditions

Condition	Summary of applicant's comment	Department's response
Applicant request for information		
Decision Report Section 2.2.1, Table 2	The applicant notes that an ECR for the Paste Plant was submitted to the department on 16 August 2024. The applicant proposes that the construction compliance report has been submitted as required, resulting in entering TLO period as per Condition 19 of works approval W6687/2022/1.	As per Condition 19(a) of works approval W6687/2022/1, the applicant is authorised to commence TLO for the Paste Plant once the ECR for the Paste Plant has been submitted to the department. The department confirms that the submission of the Paste Plant ECR on 16 August 2024 meets the requirements of this condition and that TLO for the Paste Plant may have commenced on 16 August 2024.
	The applicant is seeking clarification regarding compliance with Condition 19 of works approval W6687/2022/1 and the ability to commence TLO.	The supporting document provided by the applicant as part of the application for this licence stated that the paste plant had not been constructed. The department notes that the Paste Plant ECR was submitted after the application for a licence and has therefore updated the decision report to reflect the current status of the Paste Plant.
Response to department RFI		
Decision Report Section 2.2.3	The applicant provided additional information that was requested by the department in the draft decision report relating to the size of TSF1, construction of the diversion channel, and the proposed use of decant water for dust suppression.	The decision report has been amended to include the additional information provided by the applicant.
Decision Report Section 2.2.5	The applicant provided additional information that was requested by the department in the draft decision report relating to the 125 m ³ MBR unit and the proposed relocation of the UG MSA WWTP.	The decision report has been amended to include the additional information provided by the applicant.
Decision Report Section 3.1.1, Table 8	The applicant provided additional information that was requested by the department in the draft decision report relating to the volume of treated effluent to be disposed of at TSF1.	The decision report has been amended to include the additional information provided by the applicant.
Decision Report Section 3.3.1	The applicant provided additional information that was requested by the department in the draft decision report relating to the proposed use of treated effluent and decant water for dust suppression.	The decision report has been amended to include the additional information provided by the applicant.

Licence: L9450/2024/1

Condition	Summary of applicant's comment	Department's response
Licence Cover Page	The applicant clarified that the natural gas and diesel generators may run together for short periods to allow the gas generators to start operating, and that the diesel generators are turned off once the gas generators are running.	Using the diesel generators to start the gas generators will result in short periods of time where all generators are operating simultaneously. To allow for this, the department has set a maximum production capacity limit for Category 52 activities of 32 MW. As the diesel generators are intended to be turned off once the gas generators are running, Condition 1, Table 1 (Item 5) has been amended to specify this.
Licence Condition 1 Table 1 (Item 1)	The applicant confirmed the volume of treated wastewater that will be disposed of within TSF1 Cell 1.	The volume of treated wastewater approved to be disposed of within TSF1 Cell 1 has been amended to 365 m ³ per day to allow for all treated wastewater to be disposed of in the event that dust suppression activities are halted.
Licence Condition 1 Table 1 (Item 2)	The applicant confirmed the location of the 125 m ³ MBR unit.	The draft licence reflected the information provided by the applicant and no changes have been made.
Proposed changes to draft licence		
Condition 1 Table 1 (Item 1)	The applicant requested the following amendment: "No more than 70,445 m ³ 133,225 m ³ per year of treated wastewater to be disposed of within TSF1 cell 4."	The department has amended the volume to state "365 m ³ per day" to align with the approved production capacity for Category 54 activities, as discussed above. The department has not removed "cell 1" from the wording as currently only TSF1 Cell 1 is included in the licence. The applicant is advised to include a request to amend this requirement in a future licence amendment application, once the construction of TSF 1 Cell 2 is complete and the applicant is seeking to include it in the licence. Should impacts start to be observed, the volume may be reduced.
Condition 3 Table 3	The applicant understands that the specified treatment criteria parameters for wastewater are a standard condition relating to the discharge of treated effluent to an irrigation field that comprises undisturbed native vegetation. The applicant notes that they do not operate a standard irrigation field and instead will use the treated wastewater for dust suppression. The applicant notes that Residual free chlorine is regulated under the <i>Public Health Act 2016</i> and requests that Residual free chlorine, BOD and TSS are	Annual licence fees include a discharge component, outlined in Schedule 4 (Part 3) of the Environmental Protection Regulations 1997. The kind of waste that may attract a fee under the regulations includes total residual chlorine. Applicants are therefore required to monitor concentration of total residual chlorine in relevant discharges, which includes treated wastewater. BOD and TSS, depending on the concentrations, have the potential to impact soils, surface water and groundwater at the site, which may cause impacts to the health of vegetation. The department considers that it is important to monitor these parameters in the treated wastewater to be able to identify potential impacts and possible causes, should impacts occur.

Condition	Summary of applicant's comment	Department's response
	removed from the required monitoring parameters.	<p>Under the <i>Guidelines for the Non-potable uses of Recycled Water in Western Australia</i> (DoH 2024), the use of treated wastewater for dust suppression is considered to have a medium exposure risk level. This is higher than the exposure risk levels outlined in the guidelines for irrigation for non-edible (low) or non-food crops (extra low), and is the same exposure risk level as urban irrigation with some restricted access.</p> <p>The department considers that the treatment criteria parameters, and the corresponding limits and monitoring in the licence are therefore appropriate given the exposure risk levels outlined in the <i>Guidelines for the Non-potable uses of Recycled Water in Western Australia</i> (DoH 2024).</p> <p>The department also notes that the results provided by the applicant on treated effluent quality from both WWTPs indicate that residual free chlorine, BOD and TSS can be treated to the limits outlined in the <i>Guidelines for the Non-potable uses of Recycled Water in Western Australia</i> (DoH 2024), therefore the existing infrastructure and equipment is sufficient to allow these treatment criteria limits to be achieved.</p>
	<p>The applicant has requested that TDS treatment criteria limit is increased to <5000, being in the lower range of saline water as described within <i>Australian drinking water guidelines 6: National Water Quality Management Strategy</i>.</p>	<p>Groundwater quality at Kathleen Valley is described as fresh (TDS of 590-810 mg/L) (AQ2 2019). The discharge of treated effluent with a TDS of up to 5,000 mg/L has the potential to significantly impact the salinity of groundwater in the area, which may have impacts on other receptors, including the acacia woodlands community (a groundwater dependent ecosystem) that is present within the prescribed premises boundary.</p> <p>Additionally, TDS is included as a kind of waste that may attract a fee under the Environmental Protection Regulations 1997, and is therefore required to be monitored.</p> <p>Given this, the department has not changed the treatment criteria limit for TDS.</p> <p>The department also notes that the results provided by the applicant on treated effluent quality from both WWTPs indicate that TDS can be treated to <1,000 mg/L, therefore the existing infrastructure and equipment is sufficient to allow this treatment criteria limit to be achieved.</p>
Condition 24 (formerly 20) Table 8 (formerly 7)	As per above comment, the applicant requests that Residual free chlorine, BOD and TSS are removed from the required monitoring parameters.	As per the department's above response, the required monitoring parameters have not been changed.

Appendix 4: Leachate tests

Water Leachate test

Sample ID	pH	EC	TDS	Ca	K	Mg	Na	Sulfate	Fluoride	Chloride	OH
		µS/cm	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	
A218198 Combined Tailings	9.60	46	29	4	0.7	<0.5	2	<1	0.1	2	<5
Livestock Drinking Water DGV (ANZECC 2000/ANZG 2018)	6.5-8.5	6,250	4,000	1,000	N/G	No limit	N/G	1,000	2	N/G	N/G
NPUG (DER 2014)	N/G	N/G	N/G	N/G	N/G	N/G	N/G	1,000.00	15.00	250.00	N/G
Freshwater Ecosystem Protection 95% DGV (ANZECC 2000/ANZG 2018)	6.5-8.5	N/G	N/G	N/G	N/G	N/G	N/G	N/G	N/G	N/G	N/G

Sample ID	Alkalinity (mg CaCO ₃ /L)		
	HCO ₃ ⁻	CO ₃ ²⁻	Total
A218198 Combined Tailings	24	12	36
Livestock Drinking Water DGV (ANZECC 2000/ANZG 2018)	N/G	N/G	N/G
NPUG (DER 2014)	N/G	N/G	N/G
Freshwater Ecosystem Protection 95% DGV (ANZECC 2000/ANZG 2018)	N/G	N/G	N/G

Sample ID	pH	Ag	Al	As	B	Ba	Be	Bi	Cd	Ce	Co	Cr
	su	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
A218198 Combined Tailings	9.6	<0.001	0.7	0.002	<0.02	0.002	<0.0005	0.001	<0.0001	<0.001	<0.001	0.001
Livestock Drinking Water DGV (ANZECC 2000/ANZG 2018)	6.5-8.5	N/G	5	0.5	5	N/G	N/G	N/G	0.01	N/G	1	1
NPUG (DER 2014)	N/G	1	0.2	0.1	40	20	0.6	N/G	0.02	N/G	N/G	0.5
Freshwater Ecosystem Protection 95% DGV (ANZECC 2000/ANZG 2018)	6.5-8.5	0.00005	0.055	0.013	0.37	N/G	N/G	N/G	0.0002	N/G	0.0014	0.00033

Sample ID	Cs	Cu	Fe	Ga	Ge	Hf	Hg	In	La	Li	Mn	Mo
	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
A218198 Combined Tailings	<0.001	0.003	<0.01	<0.001	<0.001	<0.001	<0.00005	<0.001	<0.0005	0.05	<0.005	0.002
Livestock Drinking Water DGV (ANZECC 2000/ANZG 2018)	N/G	1	No limit	N/G	N/G	N/G	0.002	N/G	N/G	N/G	N/G	0.15
NPUG (DER 2014)	N/G	20	0.3	N/G	N/G	N/G	0.01	N/G	N/G	N/G	5	0.5
Freshwater Ecosystem Protection 95% DGV (ANZECC 2000/ANZG 2018)	N/G	0.0014	0.3	N/G	N/G	N/G	0.0006	N/G	N/G	N/G	1.9	0.034

Sample ID	Ni	Nb	Phosphate	Pb	Rb	Re	S	Sb	Sc	Se	Sn	Sr
	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
A218198 Combined Tailings	<0.001	<0.0001	<0.5	<0.001	0.04	<0.001	<0.5	<0.001	<0.001	<0.001	<0.001	0.01
Livestock Drinking Water DGV (ANZECC 2000/ANZG 2018)	1	N/G	N/G	0.1	N/G	N/G	333	N/G	N/G	0.02	N/G	N/G
NPUG (DER 2014)	0.2	N/G	N/G	0.1	N/G	N/G	333	0.03	N/G	0.1	N/G	N/G
Freshwater Ecosystem Protection 95% DGV (ANZECC 2000/ANZG 2018)	0.011	N/G	Refer to guideline	0.0034	N/G	N/G	N/G	0.009	N/G	0.011	N/G	N/G

Sample ID	Ta	Te	Th	Ti	Tl	U	V	W	Y	Zn	Zr
	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
A218198 Combined Tailings	<0.001	<0.001	<0.0005	<0.001	<0.001	0.004	<0.001	<0.001	<0.001	<0.001	<0.01
Livestock Drinking Water DGV (ANZECC 2000/ANZG 2018)	N/G	N/G	N/G	N/G	N/G	0.2	N/G	N/G	N/G	20	N/G
NPUG (DER 2014)	N/G	N/G	N/G	N/G	N/G	0.17	N/G	N/G	N/G	3	N/G
Freshwater Ecosystem Protection 95% DGV (ANZECC 2000/ANZG 2018)	N/G	N/G	N/G	0.00003	N/G	0.0005	0.006	N/G	N/G	0.008	N/G

Kinetic Leachate test

Sample ID		pH	EC	TDS	Ca	K	Mg	Na	Sulfate	Fluoride	Chloride	OH	
			µscm	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L		
A218198 Combined Tailings		6.4	110	70	3.2	13	<2.5	20	N/D	N/D	N/D	N/D	
Livestock Drinking Water DGV / ANZECC 2000/ANZG 2018)		6.5-8.5	6,250	4,000	1,000	N/G	No limit	N/G	1,000	2	N/G	N/G	
NPUG (DER 2014)		N/G	N/G	N/G	N/G	N/G	N/G	N/G	1,000	15	250	N/G	
Freshwater Ecosystem Protection 95% DGV / ANZECC 2000/ANZG 2018)		6.5-8.5	N/G	N/G	N/G	N/G	N/G	N/G	N/G	N/G	N/G	N/G	
Sample ID		pH	Ag	Al	As	B	Ba	Be	Bi	Cd	Ce	Co	Cr
		µg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
A218198 Combined Tailings		6.4	<0.001	0.2	0.003	0.06	0.001	0.001	<0.001	<0.0001	<0.001	<0.001	0.046
Livestock Drinking Water DGV / ANZECC 2000/ANZG 2018)		6.5-8.5	N/G	5	0.5	5	N/G	N/G	N/G	0.01	N/G	1	1
NPUG (DER 2014)		N/G	1	0.2	0.1	40	20	0.6	N/G	0.02	N/G	N/G	0.5
Freshwater Ecosystem Protection 95% DGV / ANZECC 2000/ANZG 2018)		6.5-8.5	0.00005	0.055	0.013	0.37	N/G	N/G	N/G	0.0002	N/G	0.0014	0.0033
Sample ID		Cs	Cu	Fe	Ga	Ge	Hf	Hg	In	La	Li	Mn	Mo
		mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
A218198 Combined Tailings		0.01	0.002	0.02	<0.001	<0.001	<0.001	<0.00005	<0.001	<0.001	0.27	0.07	0.001
Livestock Drinking Water DGV / ANZECC 2000/ANZG 2018)		N/G	1	No limit	N/G	N/G	N/G	0.002	N/G	N/G	N/G	N/G	0.15
NPUG (DER 2014)		N/G	20	0.3	N/G	N/G	N/G	0.01	N/G	N/G	N/G	5	0.5
Freshwater Ecosystem Protection 95% DGV / ANZECC 2000/ANZG 2018)		N/G	0.0014	0.3	N/G	N/G	N/G	0.0006	N/G	N/G	N/G	1.9	0.034
Sample ID		Ni	Nb	Phosphate	Pb	Rb	Re	S	Sb	Sc	Se	Sn	Sr
		mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
A218198 Combined Tailings		0.01	0.01	1.0	<0.001	0.51	<0.001	<2.5	<0.001	<0.001	<0.001	<0.001	0.01
Livestock Drinking Water DGV / ANZECC 2000/ANZG 2018)		1	N/G	N/G	0.1	N/G	N/G	333	N/G	N/G	0.02	N/G	N/G
NPUG (DER 2014)		0.2	N/G	N/G	0.1	N/G	N/G	333	0.03	N/G	0.1	N/G	N/G
Freshwater Ecosystem Protection 95% DGV / ANZECC 2000/ANZG 2018)		0.011	N/G	Refer to guideline	0.0034	N/G	N/G	N/G	0.009	N/G	0.011	N/G	N/G
Sample ID		Ta	Te	Th	Ti	Tl	U	V	W	Y	Zn	Zr	
		mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
A218198 Combined Tailings		0.02	<0.001	<0.005	0.001	0.005	0.016	<0.001	<0.001	<0.001	0.01	<0.01	
Livestock Drinking Water DGV / ANZECC 2000/ANZG 2018)		N/G	N/G	N/G	N/G	N/G	0.2	N/G	N/G	N/G	20	N/G	
NPUG (DER 2014)		N/G	N/G	N/G	N/G	N/G	0.17	N/G	N/G	N/G	3	N/G	
Freshwater Ecosystem Protection 95% DGV / ANZECC 2000/ANZG 2018)		N/G	N/G	N/G	0.00003	N/G	0.0005	0.006	N/G	N/G	0.008	N/G	

Supernatant

Sample ID	pH	EC		TDS	Ca	K	Mg	Na	Sulfate	Fluoride	Chloride	OH ⁻
		µS/cm	mg/L									
A218198 Combined Tailings - Supernatant	7.6	1,300	832	21	16	0.5	200	36	1	220	<5	
Livestock Drinking Water DGV (ANZECC 2000/ANZG 2018)	6.5-8.5	6,250	4,000	1,000	N/G	No limit	N/G	1,000	2	N/G	N/G	
NPUG (DER 2014)	N/G	N/G	N/G	N/G	N/G	N/G	N/G	1,000	15	250	N/G	
Freshwater Ecosystem Protection 95% DGV (ANZECC 2000/ANZG 2018)	6.5-8.5	N/G	N/G	N/G	N/G	N/G	N/G	N/G	N/G	N/G	N/G	

Sample ID	Alkalinity (mg CaCO ₃ /L)		
	HCO ₃ ⁻	CO ₃ ²⁻	Total
A218198 Combined Tailings - Supernatant	370	<5	370
Livestock Drinking Water DGV (ANZECC 2000/ANZG 2018)	N/G	N/G	N/G
NPUG (DER 2014)	N/G	N/G	N/G
Freshwater Ecosystem Protection 95% DGV (ANZECC 2000/ANZG 2018)	N/G	N/G	N/G

Sample ID	pH	Ag	Al	As	B	Ba	Be	Bi	Cd	Ce	Co	Cr
		mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
A218198 Combined Tailings - Supernatant	7.6	<0.001	0.9	0.01	0.08	0.1	0.1	0.001	<0.0001	<0.001	<0.001	0.06
Livestock Drinking Water DGV (ANZECC 2000/ANZG 2018)	6.5-8.5	N/G	5	0.5	5	N/G	N/G	N/G	0.01	N/G	1	1
NPUG (DER 2014)	N/G	1	0.2	0.1	40	20	0.6	N/G	0.02	N/G	N/G	0.5
Freshwater Ecosystem Protection 95% DGV (ANZECC 2000/ANZG 2018)	6.5-8.5	0.0005	0.055	0.013	0.37	N/G	N/G	N/G	0.0002	N/G	0.0014	0.0033

Sample ID	Cs	Cu	Fe	Ga	Ge	Hf	Hg	La	Li	Mn	Mo	Ni
	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
A218198 Combined Tailings - Supernatant	0.01	0.004	0.63	<0.001	<0.001	<0.001	<0.0005	<0.001	1.0	0.3	0.10	0.01
Livestock Drinking Water DGV (ANZECC 2000/ANZG 2018)	N/G	1	No limit	N/G	N/G	N/G	0.002	N/G	N/G	N/G	0.15	1
NPUG (DER 2014)	N/G	20	0.3	N/G	N/G	N/G	0.01	N/G	N/G	5	0.5	0.2
Freshwater Ecosystem Protection 95% DGV (ANZECC 2000/ANZG 2018)	N/G	0.0014	0.3	N/G	N/G	N/G	0.0006	N/G	N/G	1.9	0.034	0.011

Sample ID	Nb	Phosphate	Pb	Rb	Sb	Sc	Se	Sn	Sr	Ta	Te	Th
	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
A218198 Combined Tailings - Supernatant	0.001	<0.05	0.01	0.5	0.01	<0.001	<0.001	0.001	0.15	<0.002	<0.001	0.001
Livestock Drinking Water DGV (ANZECC 2000/ANZG 2018)	N/G	N/G	0.1	N/G	N/G	N/G	0.02	N/G	N/G	N/G	N/G	N/G
NPUG (DER 2014)	N/G	N/G	0.1	N/G	0.03	N/G	0.1	N/G	N/G	N/G	N/G	N/G
Freshwater Ecosystem Protection 95% DGV (ANZECC 2000/ANZG 2018)	N/G	Refer to guideline	0.0034	N/G	0.009	N/G	0.011	N/G	N/G	N/G	N/G	N/G

Sample ID	Ti	Ti	U	V	W	Y	Zn
	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
A218198 Combined Tailings - Supernatant	0.001	<0.001	0.26	<0.001	0.01	<0.001	0.01
Livestock Drinking Water DGV (ANZECC 2000/ANZG 2018)	N/G	N/G	0.2	N/G	N/G	N/G	20
NPUG (DER 2014)	N/G	N/G	0.17	N/G	N/G	N/G	3
Freshwater Ecosystem Protection 95% DGV (ANZECC 2000/ANZG 2018)	0.0003	N/G	0.0005	0.006	N/G	N/G	0.008