Government of Western Australia
Department of Water and Environmental Regulation

Decision Report

Application for Works Approval

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

Works Approval Number	W6934/2024/1
Applicant	Golden Grove Operations Pty Ltd
ACN	114 868 325
File number	DER2024/000148
Premises	Golden Grove Mine M59/89, M59/90, M59/363 and part of M59/3 YALGOO WA 6635 As defined by the premises map attached to the issued works approval
Date of report	09 September 2024 (FINAL)
Decision	Works approval granted

Table of Contents

1. Decision summary

This decision report documents the assessment of potential risks to the environment and public health from emissions and discharges during the construction and operation of the Premises. As a result of this assessment, works approval W6934/2024/1 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

Golden Grove Operations Pty Ltd (applicant) mines a volcanic-hosted massive sulphide deposit to produce concentrate products of copper (Cu), zinc (Zn), gold (Au), silver (Ag) and lead (Pb) at the Golden Grove Mine (Premises) with underground operations at two separate underground portals, Scuddles and Gossan Hill. The Premises is located approximately 50 km south-east of Yalgoo.

Ore is processed at the Scuddles processing plant with tailings deposited into the active Tailings Storage Facility (TSF). TSF3 is currently the active TSF at the Premises and has limited storage capacity. The applicant requires an additional TSF for the continuation of mining operations at the Premises.

On 04 April 2024, the applicant submitted an application for a works approval to the department under section 54 of the *Environmental Protection Act 1986* (EP Act). The applicant is proposing to construct TSF4 to accommodate the life of mine (LoM) tailings.

Other infrastructure to be constructed and as shown in Figure 1 includes: Thickener Plant; Seepage Collection Pond; and Process Water Ponds 2 and 3.

The Premises relates to category 5 activities as defined under Schedule 1 of the *Environmental Protection Regulations 1987* (EP Regulations) and the assessed design capacity of 800,000 tonnes per annual period.

The infrastructure and equipment relating to the premises category and any associated activities which the department has considered in line with *Guideline: Risk Assessments* (DWER 2020) are outlined in works approval W6934/2024/1.

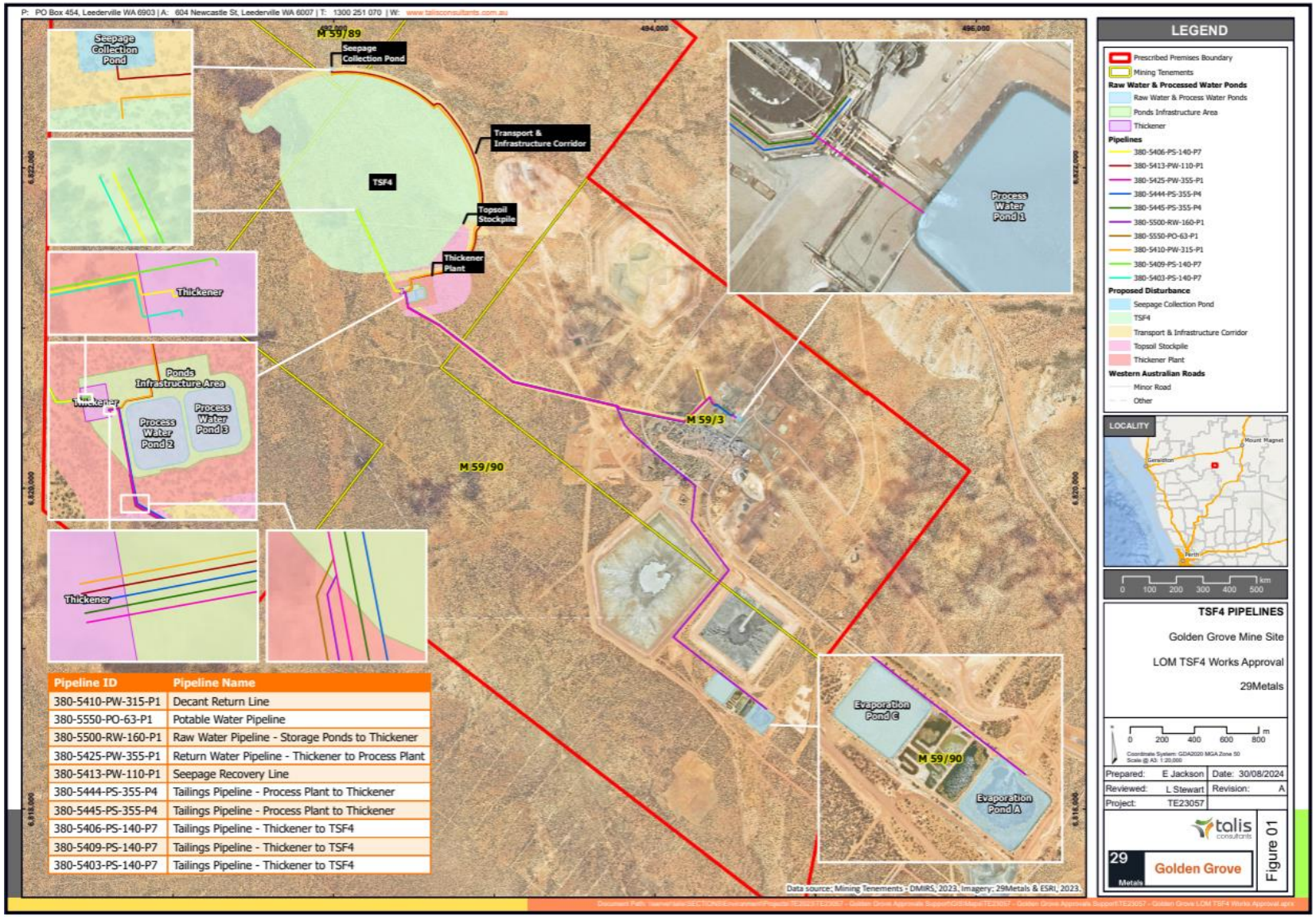

Figure 1: Infrastructure location

Works approval: W6934/2024/1

2.2.1 Overview of Premises ore process

Ore at the Premises is currently processed in two separate campaigns (in four combinations), with the primary combinations being copper; and copper-lead-zinc, as follows:

1. Zinc Campaign:
    - lead-zinc
    - copper-zinc
    - copper-lead-zinc
2. Copper Campaign: copper only.

Each processing campaign produces distinct tailings, with differing characteristics. A summary of the four primary tailings streams produced from the process and disposed of to the TSF is provided in Table 1, with the flow diagram of the tailings process shown in Figure 2.

Table 1: Summary of tailings streams

Name		Description
Copper Campaign	Cu all-in tailings	Tailings while the Cemented Hydraulic Fill (CHF) is offline
	Cu CHF tailings	Tailings while the CHF is online (cyclone overflow and partial all-in tailings flow)
Zinc Campaign	Zn all-in tailings	Tailings while the CHF is offline
	Zn CHF tailings	Tailings while the CHF is online (cyclone overflow and partial all-in tailings flow)

After the ore has gone through the milling and flotation process to separate out the concentrate, the remaining ground ore and process effluents that are generated (i.e. tailings) take one of two routes depending on whether underground backfilling (either at Scuddles or Gossan Hill) is required.

In the case of backfilling the underground voids, the tailings is cycloned in two stages. The coarse fraction is used for backfilling and the fine fraction is disposed of into the active TSF. If there is no demand for backfill, the all-in tailings are sent directly to the active TSF via a mixing hopper.

When backfilling is required, tailings are sent to the first stage of cyclones located at the processing plant (i.e., deslime cyclones). The overflow from the deslime cyclones gets sent to the mixing hopper to be deposited into the active TSF, while the underflow gets hydraulically transported to either Scuddles or Gossan Hill (as required) to be processed through secondary cyclones.

The overflow from the secondary cyclones (i.e., minefill cyclones) is hydraulically transported back to the mixing hopper to be combined with the primary cyclone overflow and excess all-in tailings to be deposited into the active TSF, whilst the underflow is processed as CHF for backfill operations.

Prior to the deposition of tails to TSF4, the final tailings pumps (PP 74 and PP 75) will transfer the tailings slurry from the mixing hopper (shown as tailings hopper in Figure 2) to the Thickener Plant via the tailings pipeline. The Thickener Plant will recover most of the slurry water; dose the tailings with flocculant (Solisep PS9649) to increase the solids concentration of the tailings; and pass a thickened tailings stream (via the tailings deposition pipeline) to the Central

Thickened Discharge (CTD) point (ring main system) in the centre of TSF4.

The expected underflow solids concentration for the tailings streams (identified in Table 1), from the Thickener Plant to TSF4 are:

- Cu all-in: 71 – 72%
- Cu CHF: 62 – 64%
- Zn all-in: 74 – 75%
- Zn CHF: 60 - 63%.

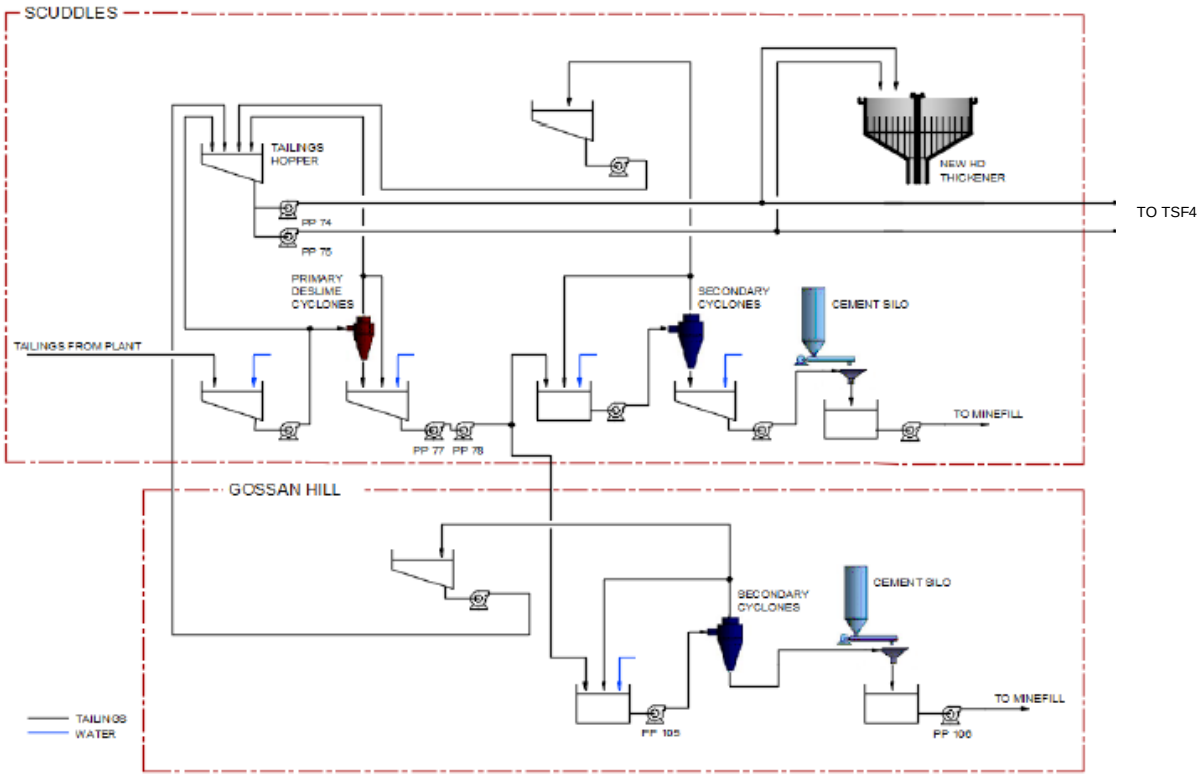

Figure 2: Flow diagram of the tailings process

A summary of the adopted process and production parameters over the LoM are shown in Table 2.

Table 2: Tailings process and production parameters

Tailings Parameter (LoM Estimate)		Unit	Value
Tailings / Ore Ratio		% (w/w)	92
Total Dry Tailings Tonnage (Before Minefill Split)		Mt	13.1
Percentage to TSF		% (w/w)	Current: 55 Forecast: 65
Percentage (Cyclone Underflow) to Backfill		% (w/w)	Current: 45 Forecast: 35
Tonnage to Backfill		Mt	4.6
Storage and Backfill Dry Density		t/m^3	1.65
Total TSF4 Storage Requirement	Tonnage	Mt	8.5
	Volume	**Mm^3**	**5.2**

2.2.2 TSF4 design and associated infrastructure

TSF4 will be designed at an estimated storage requirement over the LoM of 8.5 million tonnes (Mt) (dry), which equates to a total storage volume of 5.2 million cubic metres (Mm^3) (assuming a dry density of 1.65 tonnes per cubic metre (t/m^3)).

TSF4 perimeter embankment

TSF4 includes the construction of a perimeter embankment which is proposed to be completed in two stages via downstream raise construction method. TSF4 will abut a dead ended natural valley and this location should reduce the volume of material required to construct the perimeter embankment as the arrangement is partially down valley.

The primary design parameters for the embankment are shown in Table 3 and Figure 3.

Table 3: Embankment design parameters

Design Parameter[1]	Design Input
Stage 1 crest's elevation (no wearing course)	RL 351.5 m
Stage 1 embankment height (to natural surface)	Maximum: 7 m
Stage 2 crest's elevation (no wearing course)	RL 354.4 m
Stage 2 embankment height (to natural surface)	Maximum: 10 m
Downstream slope	3H:1V
Upstream slope	2H:1V
Total crest width (excluding erosion protection)	10.0 m
Crest length	Approximately - Stage 1: 1,500 m Stage 2: 2,100 m

Note 1: Stage 2 is dependent on the beach angle formation and may not be required over the LoM.

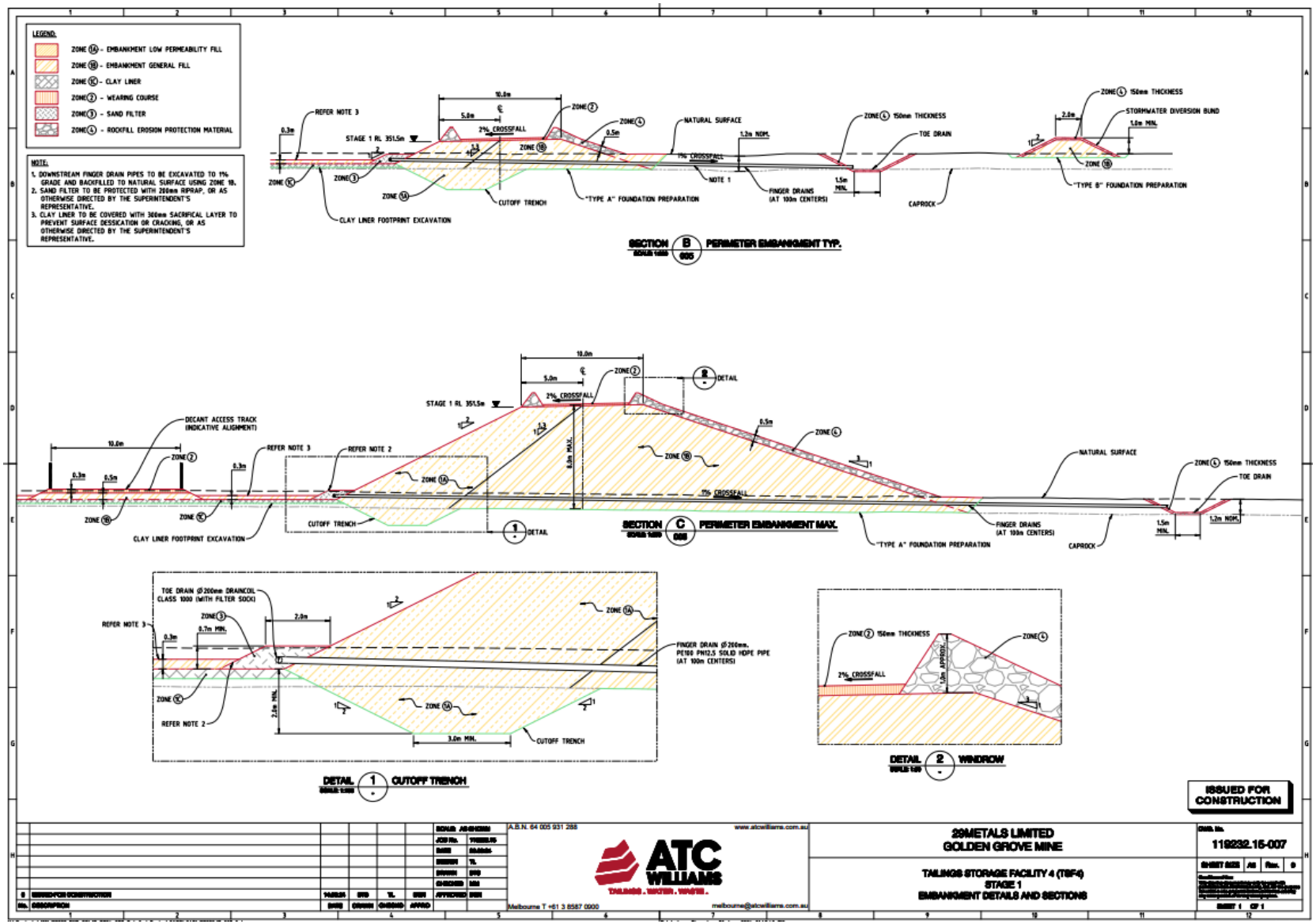

Figure 3: TSF4 perimeter embankment

Works approval: W6934/2024/1

The majority of embankment will comprise clayey silty sand (Zone 1A material) sourced from a combination of the excavation footprint for TSF4 and the clay borrow pit; and sandy gravels and laterite (Zone 1B material) sourced from the excavation footprint of TSF4. Table 4 shows the specified embankment characteristics.

Table 4: Embankment characteristics

Parameter	Unit	Material Type	
		Zone 1A Embankment	Zone 1B Embankment
Particle Density, P_{st}	t/m^3	2.65	2.65
Liquid Limit, LL	%	>20	10 to 20
Plastic Limit, PL	%	>15	5 to 15
Plasticity Index, PI	%	>7	2 to 7
Passing 75 µm	%	>30	10 to 30
Emerson Class	-	>5	>5
Saturated Permeability, k_{sat}	m/s	3 x 10^{-9}	6 x 10^{-9}
Optimum Moisture Content	%	12.5	9.0
Standard Max. Dry Density	t/m^3	1.89	2.11
Internal Friction Angle	º	30	

Five samples representative of Zone 1A, six samples representative of Zone 1B and two samples representative of fine sand toe drain material (Zone 3) were tested.

Acid Forming Characteristics

The following aspects are inferred in relation to embankment materials:

- Slightly acidic to moderately alkaline (pH 6.8 to 9.0) and low to high salinity (0.129 to 9.63 deciSiemens per metre (dS/m)) when subject to 1 part solid: 2 parts water extraction.
- Negligible total sulphur content ranging from below the reporting limit of 0.015 to 0.04%. This makes these materials geochemically benign in terms of potential acid forming attributes.
- Chromium reducible sulphur values were similarly negligible as above.
- Negligible to moderate acid neutral capacity (ANC) (0 to 28 sulphuric acid per tonne (H_2SO_4/t)).
- Non-Acid Forming (NAF) classification based on negligible total sulphur and single addition net acid generation pH (NAGpH) values.

Elemental Composition

Thirteen embankment samples were subjected to multi-element analysis. Significant elemental enrichment in embankment materials is limited to arsenic, chromium, antimony and selenium.

Leachate Characteristics

Thirteen embankment material samples were subjected to water extraction tests.. Embankment materials may produce short term contact drainage water that is slightly acidic to moderately alkaline, with low to high first flush salinity. slightly elevated concentrations of silver, boron, cobalt, chromium, copper, iron, lead and zinc.

TSF4 basin

The TSF4 basin (under the nominal operational pond area (wet beach)) will be lined with low-permeability clayey soils. Refer to Figure 4 for the location. The material will be ripped and watered to optimum moisture content, rolled and compacted in two equal layers of 150 mm compacted thickness each (minimum 300 mm total thickness).

Tailings deposition

After thickening of the tailings stream (at the Thickener Plant) the tailings will be transferred to the ring main system positioned at the head of the central causeway. Tailings will then be radially deposited (via 12 spigots / valved outlets) into TSF4 to form a conical tailings beach. One to two of the outlets will be in operation at any time in order to establish the design beach profile.

Underdrainage and seepage interception network

The TSF4 design incorporates an upstream toe drain which will extend the full length of the perimeter embankment to provide tailings underdrainage. The upstream toe drain will be connected to the downstream toe drain via finger drains constructed within the perimeter embankment at 100 m centres.

Any water or seepage water collected within the toe drains will report to a lined Seepage Collection Pond. The Seepage Collection Pond will also collect water from the seepage collection bores (through a network of pipes). The collected water will then be pumped via the return water pipeline to the Process Water Ponds 2 and 3. Supernatant water will also be removed off TSF4 by pumping (return water intake infrastructure) and returned to the process water ponds.

Process Water Ponds 2 and 3

Two process water ponds will be located next to the Thickener Plant. These two ponds will be used to store overflow water from the Thickener Plant; and seepage and supernatant water delivered via the return water pipelines.

The seepage, supernatant and overflow water within the process water ponds will either be reused in the process (i.e. for underflow pump flushing and flocculant dilution) or returned to the Scuddles Process Water Pond 1 for reuse in the processing plant.

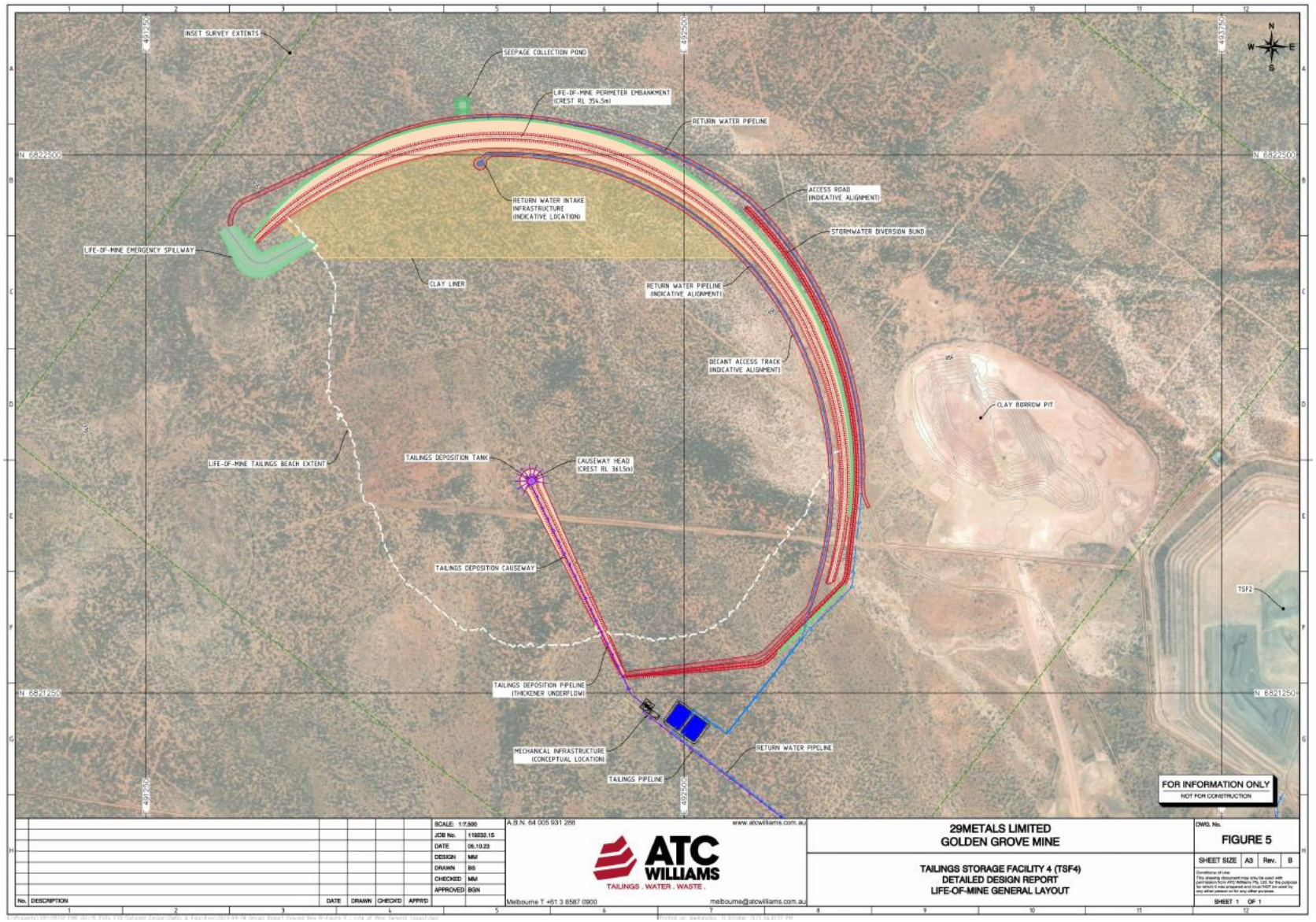

Figure 4: TSF4 layout

2.2.3 Tailings Characterisation

Tailings characterisation conducted between 2004 and 2023 showed that the tailing produced from the underground ore is very high in sulphide (12-30% Sulphur) and contains very little acid-neutralising capacity, although the discharge is buffered between pH 5.5 and 6.9 due to the alkaline process water.

The tailings material generated are consider Potential Acid Forming (PAF) with the capacity to generate high net acidity. The deposit type, occurrence and historical geochemical test work indicate a high potential for acid formation from the oxidising ores and tailings produced from processing.

Acid Forming Characteristics

Tailings materials are expected to have the following aspects regarding acid forming characteristics:

- Overall, there are similar acid-forming characteristic across zinc and copper tailings material that are typical of potentially acid forming high Sulphur (PAF-HS) tailings. These are associated with the production of a sulphide flotation metal concentrate from a very high sulphur content ore stream that also contains negligible carbonate mineral ANC;
- Acid-forming characteristics are similar throughout for the **copper** full tailings and cyclone overflow and part all-in tailings streams.
    - Solids fractions exhibit the following attributes:
        - Slight alkalinity generated (pH of 7.3 to 7.7) and high salinity (3.67 to 4.64 dS/m) when subject to 1 part solid: 2 parts water extraction;
        - Very high sulphur content (5.91 to 9.77%); which is equivalent to a maximum potential acidity (MPA) ranging from 181 to 299 kg H_2SO_4/t;
        - Chromium Reducible Sulphur values of 70 to 80% of total sulphur values;
        - Moderate ANC between 65 and 96 H_2SO_4/t. ANC is most likely attributed to lime pH adjustment use for sulphide flotation within the process circuit; and
        - PAF-HS classification based on single addition NAGpH, net acid producing potential (NAPP) and ANC/MPA ratio values.
- Very similar acid-forming characteristics are present for the **zinc** full tailings and cyclone overflow and part tailings streams. This includes:
    - A decant water fraction that is slightly acidic to slightly alkaline (pH 6.45 to 7.11) and highly saline (10.69 to 12.81 dS/m);
    - Solids fraction with the following attributes:
        - Generating slight acidity or slight alkalinity (pH 6.7 to 7.8) and high salinity (3.54 to 4.12 dS/m) when subject to 1 part solid: 2 parts water extraction;
        - Very high total sulphur content (6.64 to 14.65%), which is equivalent to a MPA ranging from 203 to 448 kg H_2SO_4/t;
        - Chromium Reducible Sulphur values of 75 to 85% of total sulphur values;
        - Low to moderate ANC, ranging from 23 to 49 H_2SO_4/t. The source of ANC is most likely associated with lime pH adjustment used for sulphide flotation within the process circuit; and
        - PAF-HS classification based on NAGpH, NAPP and ANC/MPA ratio values.

Elemental Composition

A total of four full tailings and four cyclone underflow and part tailings streams (eight samples in total) were subjected to multi-element analysis.

The following aspects are inferred:

- The **copper** full tailings and cyclone overflow and part tailings materials are significantly enriched in relation to silver, arsenic, bismuth, cadmium, cobalt, copper, molybdenum, sulphur, selenium and zinc.
- The **zinc** full tailings and cyclone overflow and part tailings materials are significantly enriched in relation to silver, arsenic, bismuth, cadmium, cobalt, copper, lead, sulphur, antimony, selenium, thallium and zinc.

Leachate Characteristics

Leachate characteristics are broadly divided into water extracts, peroxide extracts and tailings decant water quality.

Water Extracts

Water extraction tests were used to provide indication on probable drainage water quality resulting from short-term contact with an unbuffered water source such as rainfall run-off. The following aspects were inferred:

- **Copper** in full tailings and cyclone overflow and part tailings materials may produce short term contact drainage water that is slightly alkaline, with high first flush salinity, slightly elevated concentrations of silver, cobalt, copper, manganese, lead, thallium and zinc; and elevated concentrations of cadmium, selenium and sulphate.
- **Zinc** in full tailings and cyclone overflow and part tailings materials may produce short term contact drainage water that is slightly alkaline with high first flush salinity, slightly elevated concentrations of silver, beryllium, cobalt, copper, manganese, nickel and selenium; and elevated concentrations of cadmium, lead, thallium, zinc and sulphate.

Peroxide Extracts

The peroxide extract results for full tailings and four cyclone overflow and part tailings streams are summarised below:

- **Copper** full tailings and cyclone overflow and part tailings materials may produce drainage with the following attributes when exposed to strongly oxidising conditions: strongly acidic with slightly elevated arsenic and beryllium concentrations; and elevated concentrations of aluminium, cadmium, cobalt, chromium, copper, iron, manganese, nickel, lead, selenium, thallium, zinc and sulphate.
- **Zinc** full tailings and cyclone overflow and part tailings materials may produce drainage with the following attributes when exposed to strongly oxidising conditions: strongly acidic with slightly elevated beryllium, antimony and uranium concentrations; and elevated concentrations of silver, aluminium, arsenic, cadmium, cobalt, chromium, copper, iron, manganese, nickel, lead, selenium, thallium, zinc and sulphate.

Tailings Decant Water Quality

The following attributes have been attributed to the decant water associated with the **copper** full tailings and cyclone overflow and part tailings materials:

- Slightly acidic to slightly alkaline, highly saline;
- Slightly elevated concentrations of cobalt, copper, molybdenum and zinc; and
- Elevated concentrations of sulphate.

The following attributes have been attributed to the decant waster associated with the **zinc** full tailings and cyclone overflow and part tailings materials:

- Slightly acidic, highly saline;
- Slightly elevated concentrations of cobalt, copper, manganese and antimony; and
- Elevated concentrations of zinc and sulphate.

2.2.4 Hydrogeology, seepage and associated collection bores

Seven monitoring bores (MB86, MB87, MB88, MB89, MB90, MB91 and MB92) were installed between 21 February and 9 March 2023 at the locations shown in Figure 5.

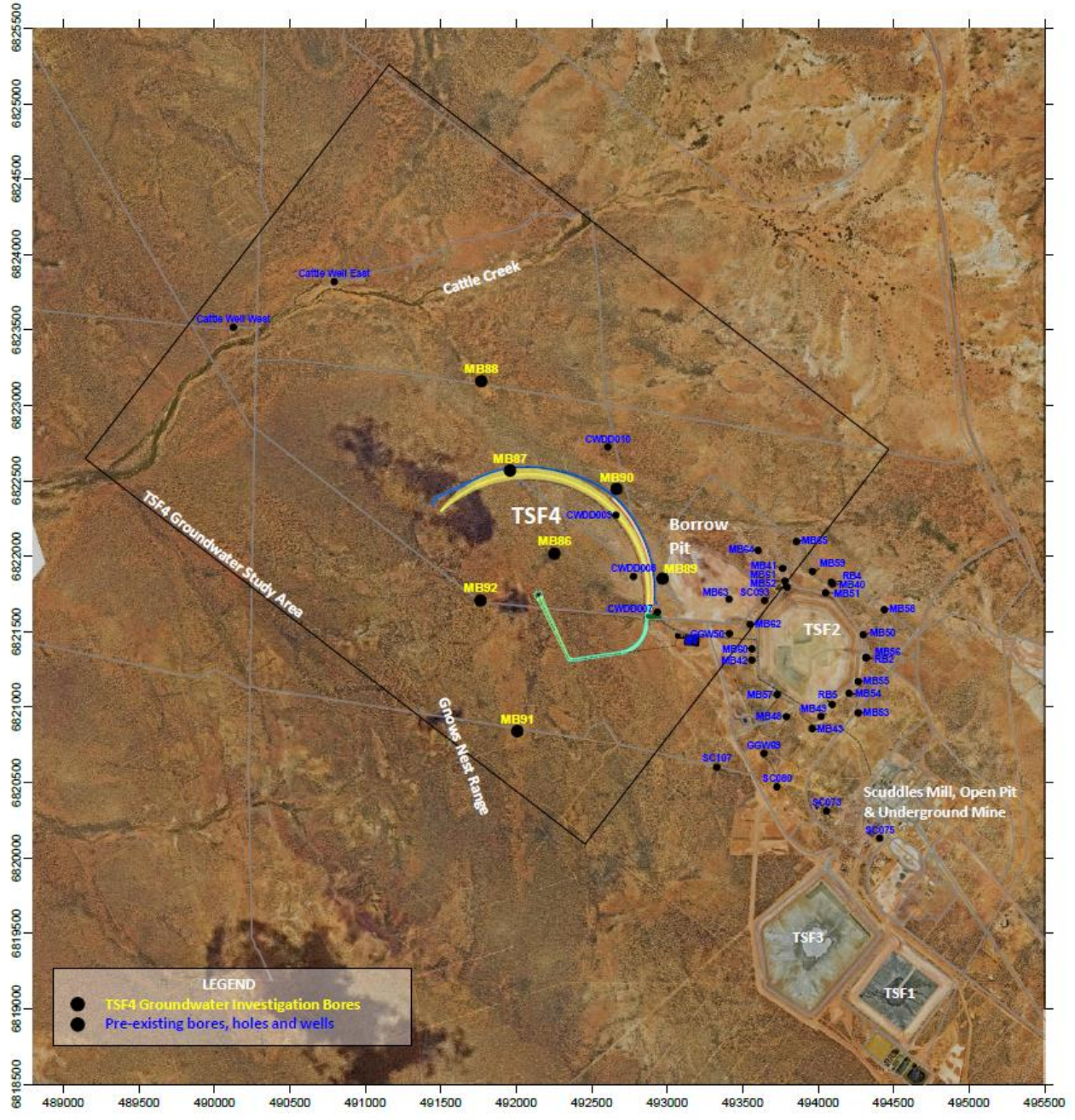

Figure 5: TSF4 groundwater bore locations

The field results are summarised in Table 5, with the laboratory results shown in Table 6.

Table 5: Field groundwater quality results

Borehole Name	Date	Standing Water Level (SWL) (mAHD)	Dissolved Oxygen (mg/L)	Electrical Conductivity (µS/cm)	pH (pH units)	Redox Potential (Field) (mV)	Total Dissolved Solids (TDS) (mg/L)
MB86	01/05/2023	332.12	42.0	2,056	7.07	133	1,254
MB87	01/05/2023	332.78	12.5	3,029	7.48	134	1,755
MB88	01/05/2023	333.18	12.1	2,915	7.29	90	1,785
MB89	02/05/2023	330.74	35.8	1,682	7.80	98	991
MB90	01/05/2023	332.28	29.9	3,252	7.26	95	1,932
MB91	02/05/2023	333.19	34.2	2,256	7.14	136	1,306
MB92	02/05/2023	333.21	57.4	1,948	7.01	112	1,440

Table 6: Summary of laboratory groundwater quality results

Bore ID	Date Sampled	Major Ions (Cations & Anions)										Alkalinity and Hardness				
		Chloride	Calcium	Magnesium	Potassium	Sodium	Sulfate (as SO_4) (Filtered)	Total Anions	Total Cations	Ionic Balance	Nitrate as Nitrogen	Bicarbonate Alkalinity (as $CaCO_3$)	Carbonate Alkalinity (as $CaCO_3$)	Hydroxide Alkalinity (as $CaCO_3$)	Hardness as $CaCO_3$ (Filtered)	Total Alkalinity as $CaCO_3$
	Unit	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	meq/L	meq/L	%	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
	LOR	1	1	1	1	1	1	0.01	0.01	0.01	0.005	1	1	1	1	1
MB86	1/05/2023	457	44	35	19	260	96	16.8	16.9	0.07	13.40	98	<1	<1	254	98
MB87	1/05/2023	582	59	44	18	402	221	25.7	24.5	2.36	<0.01	234	<1	<1	328	234
MB88	1/05/2023	604	87	50	18	377	245	26.1	25.3	1.56	0.07	199	<1	<1	423	199
MB89	2/05/2023	631	55	49	13	458	278	28.0	27.0	1.73	<0.01	220	<1	<1	339	220
MB90	1/05/2023	494	36	36	20	323	177	19.6	19.3	0.87	3.15	137	<1	<1	238	102
MB91	2/05/2023	338	36	45	11	185	99	14.6	13.8	2.69	2.09	102	<1	<1	275	150
MB92	2/05/2023	458	36	40	17	291	182	18.9	18.2	1.90	1.79	150	<1	<1	255	109

Legend: mg/L = milligrams per litre. meq/L = milliequivalents per litre. LOR = laboratory limit of reporting.

Bore ID	Date Sampled	Other Parameters					Dissolved Metals									
		Bromide	Fluoride	Silicon	Total Dissolved Solids	Total Phosphate	Arsenic (Filtered)	Cadmium (Filtered)	Chromium (Filtered)	Copper (Filtered)	Iron (Filtered)	Lead (Filtered)	Manganese (Filtered)	Nickel (Filtered)	Selenium (Filtered)	Zinc (Filtered)
	Unit	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
	LOR	0.01	0.1	0.05	1	0.1	0.001	0.0001	0.001	0.001	0.05	0.001	0.001	0.001	0.01	0.005
MB86	1/05/2023	1.17	0.3	24.8	1,160	<0.1	<0.001	<0.0001	<0.001	<0.001	<0.05	<0.001	0.006	<0.001	<0.01	0.04
MB87	1/05/2023	1.24	0.6	7.21	1,600	<0.1	0.002	<0.0001	<0.001	<0.001	0.08	<0.001	0.224	<0.001	<0.01	0.008
MB88	1/05/2023	1.20	0.5	8.28	1,620	<0.1	0.011	<0.0001	<0.001	<0.001	<0.05	<0.001	0.287	<0.001	<0.01	0.035
MB89	2/05/2023	1.29	0.4	10.1	1,760	<0.1	0.003	<0.0001	<0.001	<0.001	0.79	<0.001	2.060	<0.001	<0.01	0.02
MB90	1/05/2023	1.64	0.7	17.6	1,350	<0.1	0.005	<0.0001	0.017	<0.001	<0.05	<0.001	0.011	<0.001	<0.01	0.08
MB91	2/05/2023	0.96	0.3	9.19	962	<0.1	<0.001	<0.0001	<0.001	<0.001	<0.05	<0.001	0.218	<0.001	<0.01	0.011
MB92	2/05/2023	1.34	0.4	14.4	1,260	0.14	0.004	<0.0001	0.008	<0.001	<0.05	<0.001	0.027	<0.001	<0.01	0.03

Legend: mg/L = milligrams per litre. meq/L = milliequivalents per litre. LOR = laboratory limit of reporting.

AECOM 2023 states that based on these results, groundwater in the TSF4 area is similar to the chemistry at background sites, and bores near TSF2 that have not been affected by seepage. Seepage is typically identified by higher ionic proportions of magnesium and sulphate compared to the dominant sodium and chloride ions.

Groundwater level monitoring results indicate (Refer to Figure 6):

- The groundwater divide that was originally southeast of TSF2 has migrated to the north of TSF4 due to long-term dewatering and resulting drawdown from the Scuddles Mine.
- Groundwater elevations are high under the TSF2 footprint because of hydraulic mounding due to seepage.
- The inferred groundwater divide and flow directions suggest groundwater under the TSF4 footprint is within the capture zone of the Scuddles Mine dewatering cone of depression.

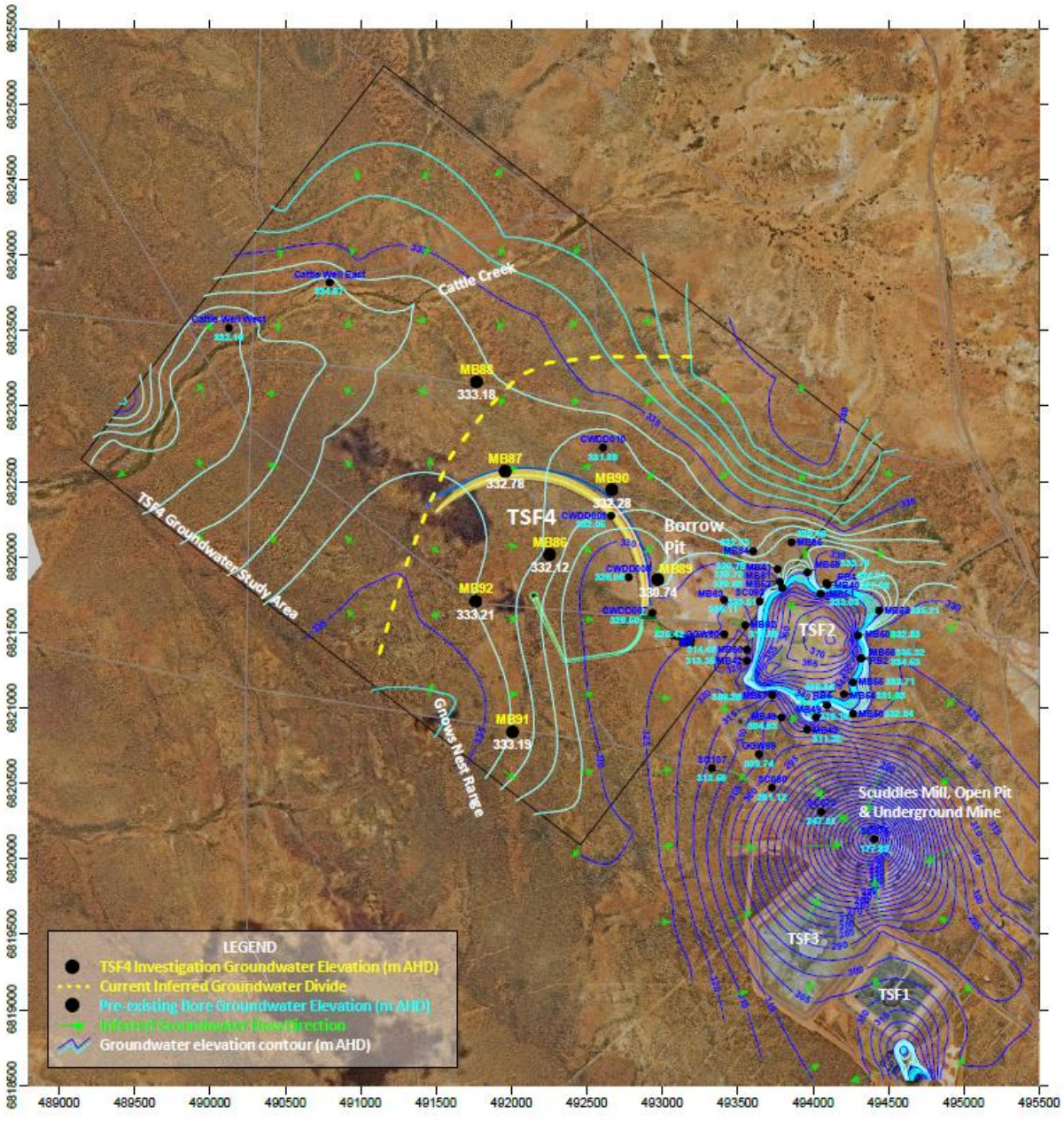

Figure 6: Groundwater level elevations and inferred flow direction

Figure 7 illustrates:

- How the water table and direction of groundwater flow has been affected by dewatering abstraction since 1988
- How seepage from TSF2 is being captured by the cone of depression surrounding the Scuddles Mine
- How seepage from TSF4 will be largely captured by the Scuddles Cone of depression
- Potential local mounding promoting flow to the north towards Cattle Creek.

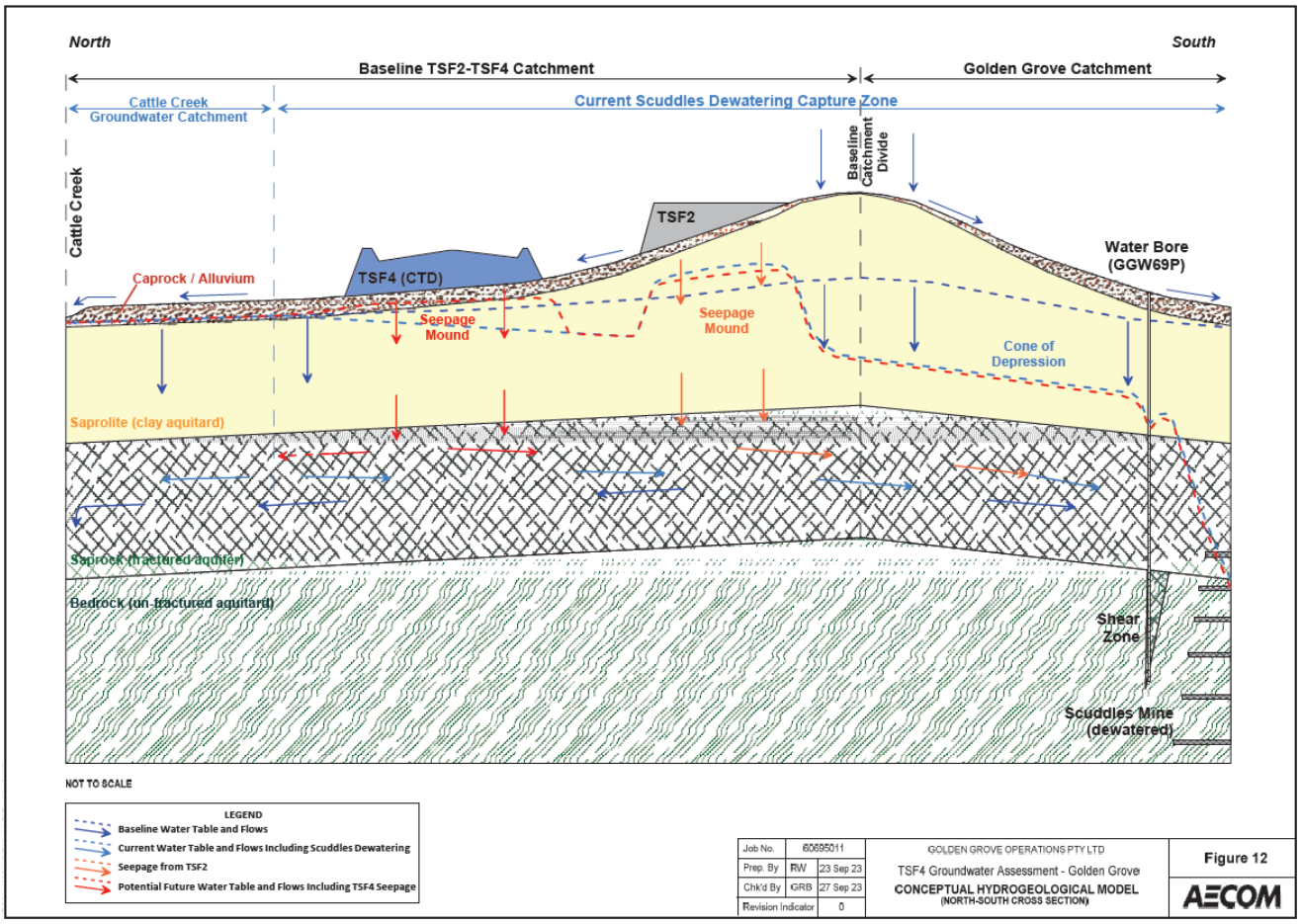

Figure 7: TSF4 conceptual hydrogeological model

AECOM 2023 concluded that:

- Water table mounding because of seepage from the decant pond is predicted to be up to 12.5 m above current levels (resulting in a water table that is within 5 m of the surface) if seepage recovery abstraction is not undertaken.
- Mounding of this magnitude presents a risk to vegetation near and down-gradient of the TSF4 decant pond where the roots extend to +/- 5 m (or deeper) below the ground surface. Deep-rooted vegetation could be exposed to saline groundwater for 5 to 10 years near the end of operations and for several years after operations cease.
- Solute transport simulations indicated:
    - Sulphate concentrations, averaged across the saprock profile, of over 3,500 mg/L near the TSF4 decant pond near the end of operations. Based on results of monitoring elsewhere at the Premises, sulphate concentrations in the order of 2,500 mg/L are associated with salinities of between 10,000 and 15,000 mg/L

TDS.

- Groundwater containing seepage will remain close to the TSF4 decant and embankment. After closure, low to very low concentrations of sulphate, cadmium and zinc are predicted to reach monitoring bores MB89 and MB90, located east and south of the TSF4 decant area.

The applicant is proposing to install two seepage collection bores (RB6 and RB7) near the perimeter of the TSF4 embankment as shown in Figure 8 (noting the locations of these two bores are indicative). The water from these bores will be directed to the Seepage Collection Pond, to be used within the process water circuit.

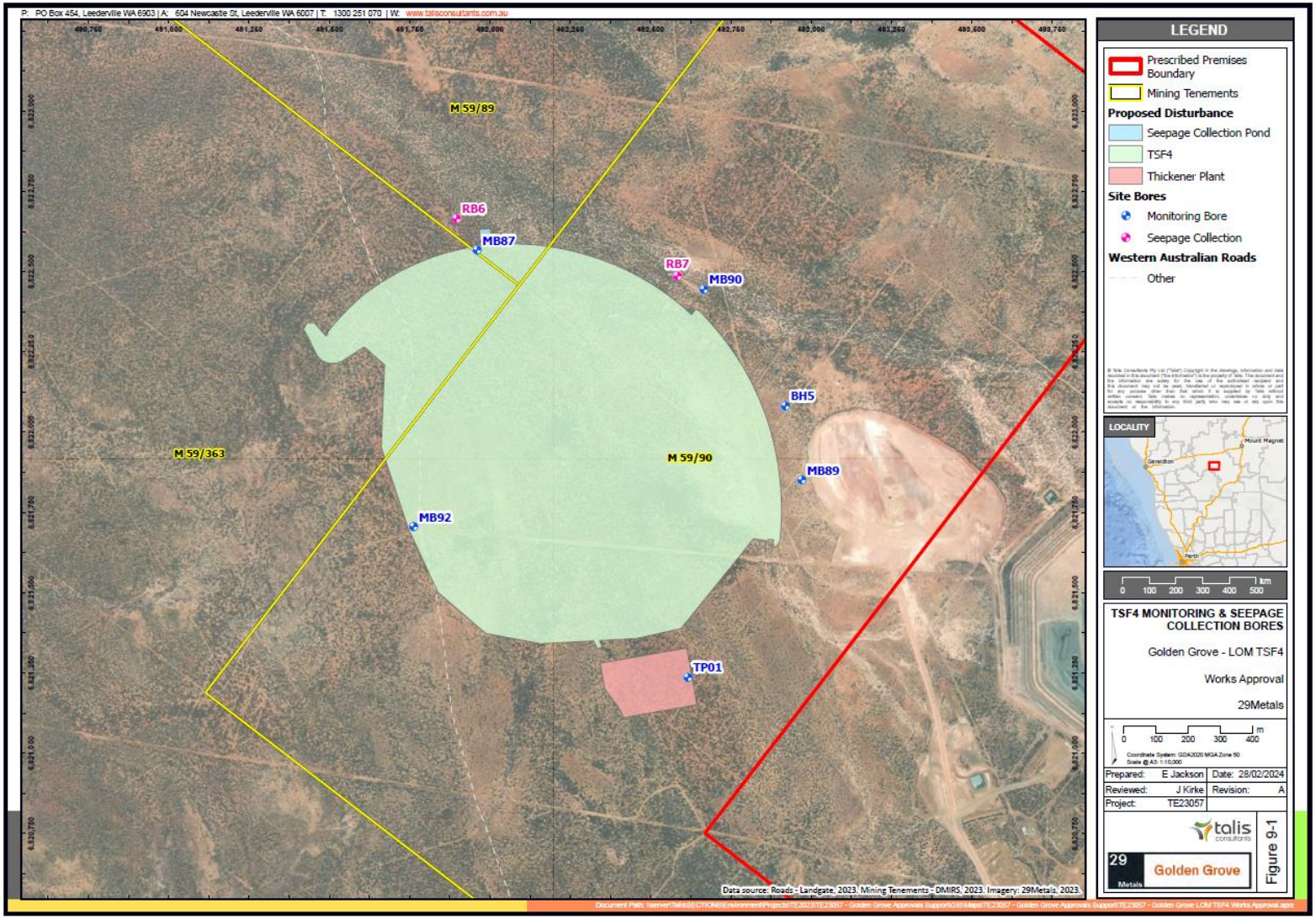

Figure 8: TSF4 monitoring and seepage collection bore locations

3. Risk assessment

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

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

3.1 Source-pathways and receptors

3.1.1 Emissions and controls

The key emissions and associated actual or likely pathway during premises construction, commissioning and operation which have been considered in this decision report are detailed in Table 7 below. Table 7 also details the control measures the applicant has proposed to assist in controlling these emissions, where necessary.

Table 7: Proposed applicant controls (Talis 2024, GGO 2024a and GGO 2024b)

Emission	Sources	Potential pathways	Proposed controls
Construction			
Dust	Construction activities associated with TSF4 infrastructure and vehicle movement	Air / windborne pathway	• Land disturbance will be kept to the minimum necessary for the development of TSF4 and associated infrastructure within the Premises. • Water cart dust suppression, with increased suppression in windy conditions will be undertaken. • Earthworks will be stopped during high winds. • Unsealed trafficable areas will be watered. • Vehicle traffic will be confined to designated roads and tracks.
Noise		Air / windborne pathway	• Machinery and equipment will be maintained in accordance with manufacturer's guidelines / recommendations. • All equipment will comply with Australian Standards for noise. • Regular inspection and maintenance will be conducted to identify and address any potential sources of excessive noise. • Compliance with the *Environmental Protection (Noise) Regulations 1997*.
Sediment laden		Overland runoff	• Surface water diversion bund constructed around the southeastern side of TSF4

Emission	Sources	Potential pathways	Proposed controls
stormwater			and around the embankment to re-direct any surface runoff from the upstream catchment to a natural drainage path downstream. • Sediment traps (silt fence) at the downstream end of the diversion bund to capture potentially sediment laden flow.
Commissioning / Time-limited operation and Operation			
Dust from TSF4 surface	Deposition of tailings into TSF4	Air / windborne pathway	• An additional dust monitoring station is to be commissioned to the west of TSF4 (SDM24) – refer to Figure 9, which will undertake monthly monitoring for total solids, cadmium, lead, zinc and copper. • Deposition plan implemented, which maintains continual flows on TSF4 surface to ensure no drying out.
Tailings supernatant containing dissolved solids, metals and metalloids		Seepage Groundwater mounding	• Clay liner under the nominal operational pond area (wet beach), compacted in two equal layers of 150 mm compacted thickness each (minimum 300 mm total thickness). • Underdrainage and seepage interception system consisting of: ○ Upstream toe drain extending the full length of the perimeter embankment. ○ Finger drains positioned at 100 m centres along the embankment alignment. ○ Downstream toe drain. ○ Interception drain that extends down to the caprock along the south-eastern embankment. ○ Cut off trench beneath the downstream toe of the embankment. • Any water or seepage water collected within the toe drains or from the seepage collection bores reports to a lined Seepage Collection Pond. • Installation of at least two seepage collection bores (RB6 and RB7) on the perimeter of the embankment. Refer to Figure 8. • On a triennial basis following initial deposition into TSF4, vegetation monitoring at areas immediately downstream of TSF4 that may be impacted through seepage from TSF4

Emission	Sources	Potential pathways	Proposed controls
			and condition analysis conducted by qualified consultants.
Tailings and contaminated water		Discharges to land	• TSF4 designed to meet the requirement for the storage of stormwater from a 1:100-year Annual Exceedance Probability (AEP), 72-hour storm event (191 mm) above the normal operating pond level. Total Freeboard (above the Storm Storage Allowance) is minimum 1,000 mm (with upstream catchment). • Decant recovery system consisting of a skid mounted pump with a floating intake installed in the decant tower (shown as the return water intake infrastructure) to minimise supernatant pond. • Supernatant water removed by pumping and returned to the Process Water Ponds 2 and 3. • Decant pond maintained to its minimum extent (nominally 500 mm in depth). • Sub-aerial deposition of tailings into TSF4. • Valved outlets operated in sequence to establish the design beach profile. • Freeboard of 300 mm maintained along the length of the causeway. • Daily inspections to ensure freeboard is maintained.
Spillage of tailings and decant return water	Leaks, pipeline ruptures or failure	Discharges to land	• Pipelines are predominately high density polyethylene (HDPE) pipe. • Localised areas are rubber lined steel pipes depending on duty. • All tailings pipes are bunded with sufficient containment in a spill event. • Flow meters installed. • Leak detection system. • Visual inspections conducted at least twice daily during facility operation.
Sediment laden stormwater	Overland runoff	Diversion of drainage line around TSF4	• A monitoring program involving surface water quality field readings and surface water sampling from three locations near TSF4 is to be implemented.
Discharge of contaminated water	Seepage Collection Pond	Discharges to land	• Bottom 2.0 m HDPE lined. • Capacity to store 1,120 m^3 of water.

Emission	Sources	Potential pathways	Proposed controls
Accidental loss of contaminated water due to liner failure		Seepage	• Maintain 1.0 m freeboard. • Self-priming pump with a dedicated HDPE pipe to transfer water back to the Process Water Ponds 2 and 3.

Discharge of contaminated water	Process Water Ponds 2 and 3	Discharges to land	• HDPE lined.
			• Pond volumes:
			  ○ Pond 2 – 7,968 m^3
			  ○ Pond 3 – 7,632 m^3
			• Ponds are hydraulically balanced and have a total 100% volume level (RL 361.35) storage capacity of 15,600 m^3 (inclusive of dead volume below pump suction level).
			• Freeboard of 400 mm maintained.

Accidental loss of contaminated water due to liner failure		Seepage	

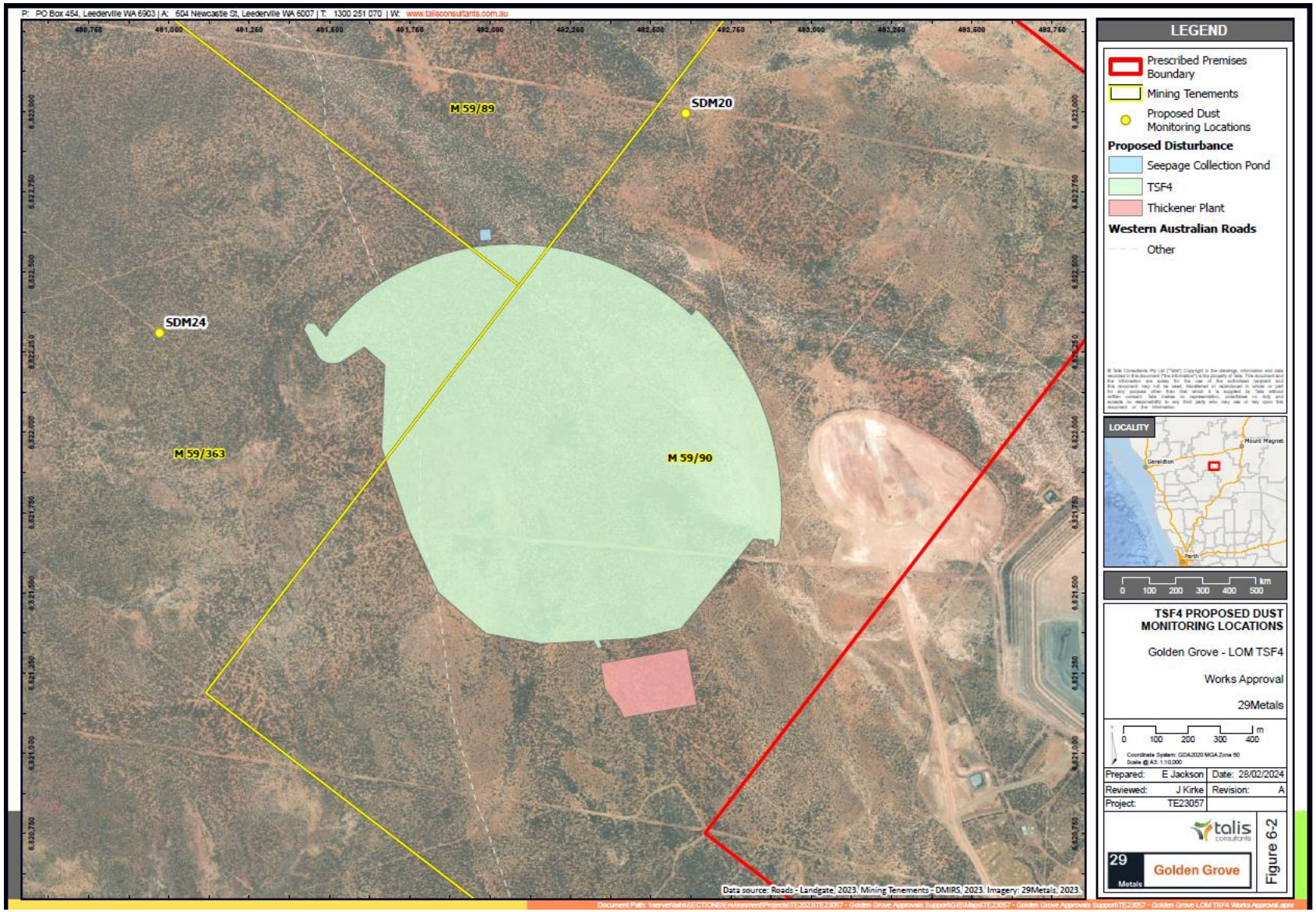

Figure 9: Proposed and existing dust monitoring locations near TSF4

3.1.2 Receptors

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

Table 8 and Figures 10 and 11 below provides a summary of potential environmental receptors that may be impacted as a result of activities upon or emission and discharges from the prescribed premises *(Guideline: Environmental Siting* (DWER 2020)).

Table 8: Environmental receptors and distance from prescribed activity

Environmental receptors	Distance from prescribed activity
Priority Ecological Community (PEC) buffer	Priority 1 - Minjar and Chulaar Hills vegetation complexes (banded ironstone formation) within the proposed premises boundary.
Conservation significant flora	*Talis 2024* states two priority flora species were recorded in the survey area - *Petrophile vana* (Priority 1) and *Acacia speckii* (Priority 4). *Petrophile vana* found in and around the proposed TSF4 location. They also lie within a buffer of the Priority 1 PEC. *Talis 2024* states the design and placement of TSF4 effectively avoids the species.
Conservation significant fauna	*Leipoa ocellata* Malleefowl (Vulnerable). *Talis 2024* states there are Malleefowl mounds in the Premises area that are managed in accordance with a Malleefowl Management Plan, but no active mounds are close to the proposed TSF4 area.
Aboriginal Sites and Heritage Places	Within the proposed premises boundary - Place_ID 34478 (lodged), Artefacts / Scatter (MMGAS12-02) approximately 400 m from the proposed TSF4 area. Place_ID 26426 (lodged), Artefacts / Scatter, Water Source (OZ Minerals Gnamma Hole) approximately 300 m from the proposed TSF4 area.
Rights in Water and Irrigation Act 1914 Proclaimed Groundwater Area	The proposed premises boundary is located within the Gascoyne Groundwater Area.
Groundwater Refer also to section 2.2.4	Groundwater occurs within the weathered bedrock in the project area. The aquifer associated with base of the weathered zone is regionally extensive but varies considerably in depth, thickness, and hydraulic properties. Baseline groundwater levels at TSF4 ranged from about 325 m Australian Height Datum (AHD) to 337.5 m AHD. Groundwater in the project area is fresh

Environmental receptors	Distance from prescribed activity
	(approximately 440 mg/L TDS), but can also be brackish in low-lying areas. Due to elevated sulphate concentrations, the current day salinities are close to that of TSF2. Recent groundwater salinities have ranged from 2,000 – 8,000 mg/L TDS. Naturally high levels of cadmium, chromium, copper and zinc occur at the site.
Surface water bodies	There are no permanent surface water bodies within the proposed premises boundary. Drainage at the premises is dominated by sheet flow, which concentrates into several unnamed ephemeral watercourses scattered throughout the landscape. These watercourses are dry throughout the year and only flow following intense rainfall events. TSF4 is located within the catchment that drains to the northwest where it joins Cattle Creek. The nearest creekline to TSF4 is approximately 1.5 km away in a north-east direction.

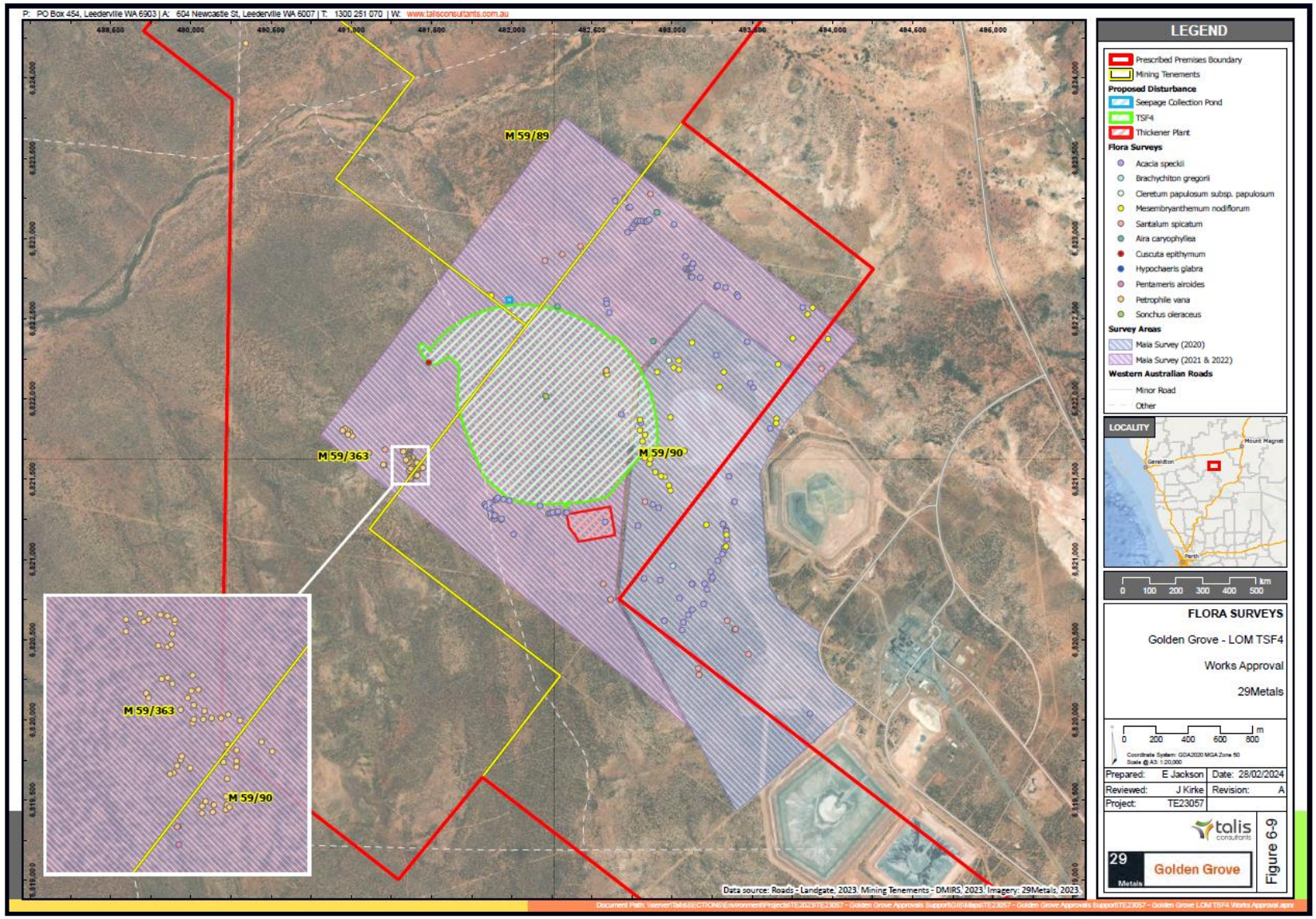

Figure 10: Distance to sensitive receptors

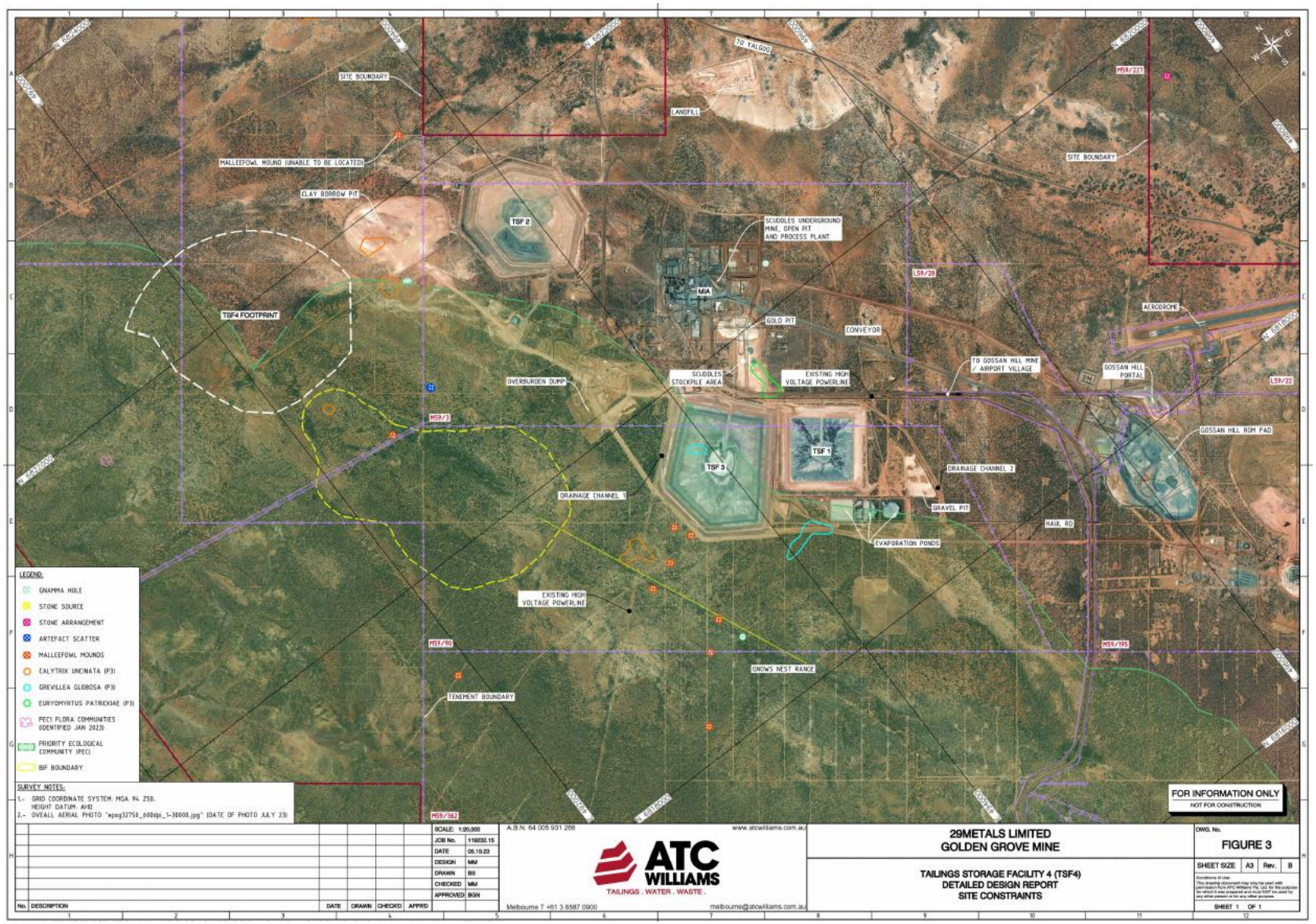

Figure 11: Distance to sensitive receptors

Works approval: W6934/2024/1

3.2 Risk ratings

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

Where the applicant has proposed mitigation measures / controls (as detailed in Section 3.1), these have been considered when determining the final risk rating. Where the delegated officer considers the applicant's proposed controls to be critical to maintaining an acceptable level of risk, these will be incorporated into the works approval 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 9.

Works approval W6934/2024/1 that accompanies this decision report authorises construction, commissioning and time-limited operations. The conditions in the issued works approval, as outlined in Table 9 have been determined in accordance with *Guidance Statement: Setting Conditions* (DER 2015).

An amendment to existing Licence L9423/2024/1 is required following the time-limited operational phase authorised under the works approval to authorise emissions associated with the ongoing operation of TSF4 and associated infrastructure at the Premises. A risk assessment for the operational phase has been included in this decision report, however licence conditions will not be finalised until the department assesses the licence amendment application.

Table 9: Risk assessment of potential emissions and discharges from the Premises during construction, commissioning and operation

Risk events					Risk rating [1] C = consequence L = likelihood	Applicant controls sufficient?	Conditions [2] of works approval	Justification for additional regulatory controls / DWER comments
Sources / activities	**Potential emission**	**Potential pathways and impact**	**Receptors**	**Applicant controls**				
Construction								
Construction activities associated with TSF4 infrastructure and vehicle movement	Dust	Air / windborne pathway causing impacts to vegetation health due to dust deposition leading to reduced ability for photosynthesis and smothering	Surrounding vegetation Priority flora PEC	Refer to Section 3.1	C = Minor L = Possible **Medium Risk**	Y	No conditions imposed The general provisions of the EP Act apply	N/A
	Noise	Windborne noise / vibrations which may disrupt foraging behaviour	Fauna	Refer to Section 3.1	C = Slight L = Unlikely **Low Risk**	Y	No conditions imposed *Environmental Protection (Noise) Regulations 1997* applies	N/A
	Sediment laden stormwater	Overland runoff impacting surrounding vegetation and resulting in sedimentation of surface water drainage	Surrounding vegetation Drainage lines	Refer to Section 3.1	C = Minor L = Unlikely **Medium Risk**	Y	Condition 1 – Applicant control conditioned for the stormwater diversion bund around TSF4 The *Environmental Protection (Unauthorised Discharges) Regulations 2004* also applies	N/A
Commissioning and Operation (including time-limited operations)								
Deposition of tailings into TSF4	Dust from TSF4 surface	Air / windborne, then deposition Dust deposition on surrounding vegetation impacting vegetation health	Surrounding vegetation PEC Priority flora	Refer to Section 3.1	C = Minor L = Rare **Low Risk**	Y	Condition 20 – Operational requirements for TSF4	The applicant conducts dust monitoring at 12 locations at the mine site. This monitoring is not currently imposed as a regulatory control through this works approval or Licence L9423/2024/1 (refer to Table 7 and Figure 9 for details of the proposed new monitoring location near TSF4).
	Tailings supernatant	Seepage from the TSF potentially	Soil and vegetation in	Refer to	C = Moderate	N	Conditions 1 and 2 – Design and	**Refer to section 3.3**

Risk events					Risk rating [1] C = consequence L = likelihood	Applicant controls sufficient?	Conditions [2] of works approval	Justification for additional regulatory controls / DWER comments
Sources / activities	**Potential emission**	**Potential pathways and impact**	**Receptors**	**Applicant controls**				
	containing dissolved solids, metals and metalloids	contaminating and waterlogging the soil impacting on vegetation health and groundwater quality	vicinity of TSF4 Groundwater	Section 3.1	L = Possible **Medium Risk**		construction requirements **Condition 3** – Construction of groundwater monitoring bores Condition 4 – Construction of seepage collection bores Condition 14 –Commissioning requirements Condition 20 – Operational requirements **Condition 21** – Groundwater monitoring Condition 23 – Water balance **Conditions 27 and 28** – Trigger exceedance and management actions for sulphate **Condition 29** – Notification of limit breaches	As part of transitioning infrastructure, equipment and operational requirements onto the licence (subsequent licence amendment process), the following conditions of existing Licence L9423/2024/1 will be amended: • Condition 11 – Containment infrastructure • Condition 14 – Inspection of infrastructure • Condition 19 – Water balance • Condition 30 – Monitoring of ambient groundwater quality • Condition 31 - Management actions required for SWL exceedances
		Groundwater mounding resulting in seepage expression on surface, impacting vegetation and reducing surface water quality	Vegetation downstream of the TSF embankment where the roots are about 5 m (or deeper) below the ground surface	Refer to Section 3.1	C = Moderate L = Possible **Medium Risk**	N		
	Tailings and contaminated water	Overtopping resulting in direct discharges to land causing contamination of surrounding soils and impacting vegetation health	Soil and vegetation in vicinity of TSF4 PEC Priority flora	Refer to Section 3.1	C = Moderate L = Rare **Medium Risk**	Y	Conditions 1 and 2 – Design and construction requirements Condition 14 –Commissioning requirements Condition 15 – Authorised discharge point Condition 20 – Operational requirements Condition 23 – Water balance Condition 24 – Inspection of infrastructure	As part of a subsequent licence amendment process, the following conditions of existing Licence L9423/2024/1 will be amended to include the operation of TSF4 and its associated infrastructure: • Condition 11 – Containment infrastructure including freeboards • Condition 14 – Inspection of infrastructure • Condition 19 – Water balance
Tailings delivery and return water pipelines	Spillage of tailings and	Direct discharges to land and infiltration to	Soil and vegetation	Refer to Section 3.1	C = Minor	Y	Conditions 1 – Design and construction requirements	Licence L9423/2024/1 has existing conditions in relation

Risk events					Risk rating [1] C = consequence L = likelihood	Applicant controls sufficient?	Conditions [2] of works approval	Justification for additional regulatory controls / DWER comments
Sources / activities	**Potential emission**	**Potential pathways and impact**	**Receptors**	**Applicant controls**				
	return water through leaks, pipeline ruptures or failure	soil resulting in contamination	along pipeline route		L = Unlikely **Medium Risk**		Condition 14 –Commissioning requirements Condition 15 – Authorised discharge point Condition 20 – Operational requirements Condition 24 – Inspection of infrastructure	to pipelines including: • Condition 14 – Inspection of infrastructure • Condition 15
TSF4	Sediment laden stormwater	Overland runoff impacting surrounding vegetation and resulting in sedimentation of surface water drainage	Surrounding vegetation Drainage lines	Refer to Section 3.1	C = Minor L = Unlikely **Medium Risk**	Y	No conditions imposed *Environmental Protection (Unauthorised Discharges) Regulations 2004* apply	N/A
Seepage Collection Pond	Discharge of contaminated water	Direct discharge from overtopping causing contamination of the surrounding soil and impacting vegetation health	Soil and vegetation in vicinity of pond	Refer to Section 3.1	C = Moderate L = Rare **Medium Risk**	Y	Condition 1 - Design and construction requirements Condition 4 - Construction of seepage collection bores Condition 14 –Commissioning requirements Condition 20 – Operational requirements **Condition 21** – Groundwater monitoring Condition 24 – Inspection of infrastructure	**Refer to section 3.3** As part of a subsequent licence amendment process, the following conditions of existing Licence L9423/2024/1 will be amended to include the Seepage Collection Pond: • Condition 11 – Containment infrastructure including freeboards • Condition 14 – Inspection of infrastructure • Condition 30 – Monitoring of ambient groundwater quality
	Accidental loss of contaminated water due to liner failure	Seepage of contaminated water through liner damage resulting in contamination of the surrounding soil and impacting vegetation health and groundwater quality	Soil and vegetation in vicinity of pond Groundwater quality	Refer to Section 3.1	C = Moderate L = Unlikely **Medium Risk**	N		
Process Water Ponds 2 and 3	Discharge of contaminated water	Direct discharge from overtopping causing contamination of the surrounding soil and impacting vegetation health	Soil and vegetation in vicinity of pond	Refer to Section 3.1	C = Moderate L = Rare **Medium Risk**	Y	Condition 1 - Design and construction requirements **Condition 3** – Construction of groundwater monitoring bores Condition 14 –Commissioning	**Refer to section 3.3** As part of a subsequent licence amendment process, the following conditions of existing Licence L9423/2024/1 will be amended to include the

Risk events					Risk rating [1] C = consequence L = likelihood	Applicant controls sufficient?	Conditions [2] of works approval	Justification for additional regulatory controls / DWER comments
Sources / activities	**Potential emission**	**Potential pathways and impact**	**Receptors**	**Applicant controls**				
	Accidental loss of contaminated water due to liner failure	Seepage of contaminated water through liner damage resulting in contamination of the surrounding soil and impacting vegetation health and groundwater quality	Soil and vegetation in vicinity of pond Groundwater quality	Refer to Section 3.1	C = Moderate L = Unlikely **Medium Risk**	N	requirements Condition 20 – Operational requirements **Condition 21** – Groundwater monitoring Condition 24 – Inspection of infrastructure	Process Water Ponds: • Condition 11 – Containment infrastructure including freeboards • Condition 14 – Inspection of infrastructure • Condition 30 – Monitoring of ambient groundwater quality

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

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

3.3 Additional regulatory controls imposed

Condition 3:

The applicant has proposed groundwater monitoring bores as shown in Figure 8.

MB87, MB89, MB90, MB92 and BH5 have already been constructed. TP01 is yet to be constructed so installation requirements have been imposed through condition 3.

The application (Talis 2024) was referred internally. A department hydrogeologist has made the following recommendation:

- *The position of a groundwater divide north of the proposed TSF4 is uncertain and could be backed up further with an additional monitoring bore. The additional bore could be placed to the southwest of MB88 to ensure the local flow direction during mining operations is not flowing toward Cattle Creek and that there is in fact a divide. For example, in the image below, placement in this general area should suffice.*

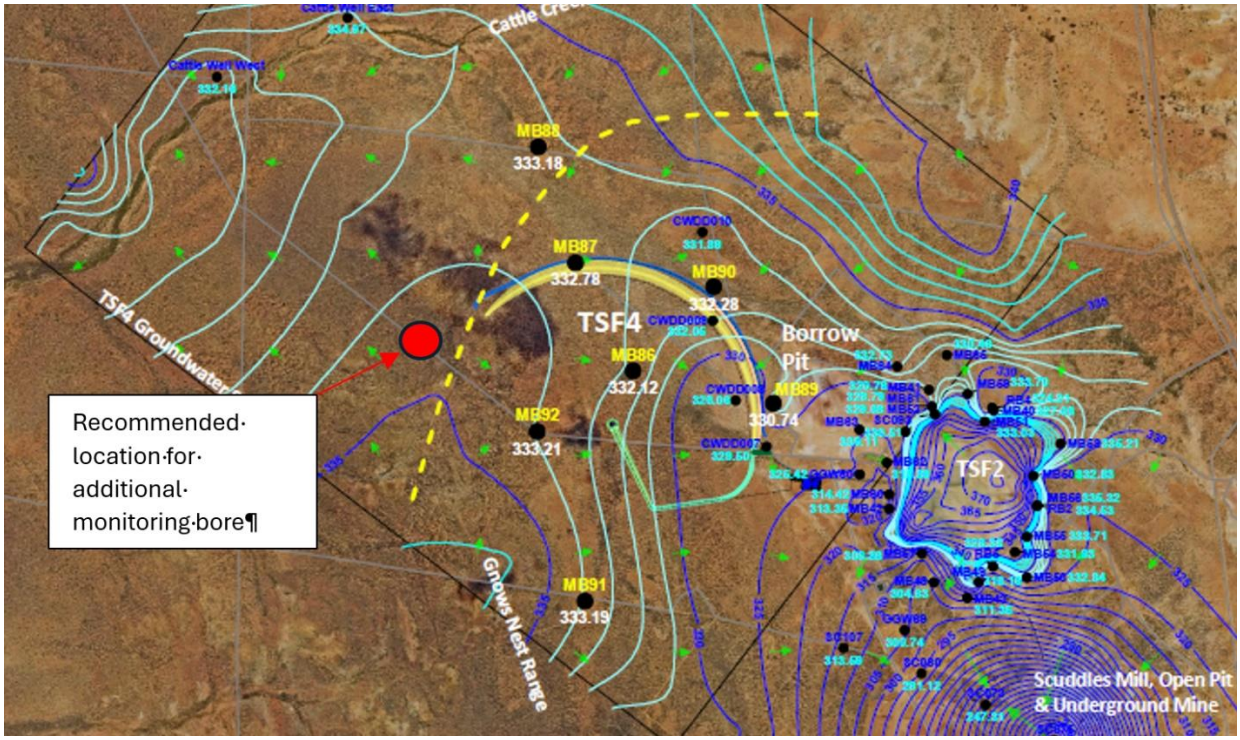

Figure 12: Recommended location for an additional groundwater monitoring bore

Based on the above, the requirement to install a new bore south-west of MB88 in the vicinity of the red dot shown in Figure 12 has also been imposed through condition 3.

Additional comments / recommendations made in relation to *AECOM 2023* were:

- *The modelling outputs and cross section included in the report does not seem to indicate a divide in this location. It would be good if the model outputs of the water levels showed the entire model domain with the groundwater divide.*
- *It is recommended that the model backup the conceptualisation of the groundwater divide north of the TSF4 as the Cattle Creek line is the main receptor in the model domain, and this should be communicated in the output figures in the report.*

Condition 21:

Table 10 shows the parameters and trigger levels proposed by the applicant for ambient groundwater monitoring at TSF4.

Table 10: Proposed monitoring bore trigger levels

Groundwater Reference Point	Parameter	Trigger Level
MB87 MB89 MB90 MB92 TP01 BH5	Arsenic	0.5 mg/L
	Cadmium	0.01mg/L
	Chromium	1.0 mg/L
	Copper	0.4 mg/L
	Lead	0.1 mg/L
	Mercury	-
	Total Nitrogen	-
	Nitrate	-
	pH	≥6.0 ≤ 9.0
	Selenium	0.02 mg/L
	Standing water level	5 mbgl
	Sulphate	1000 mg/L
	Total dissolved solids	5000 mg/L
	Total acidity (CaCO3)	40 mg/L
	Zinc	20 mg/L

The department notes that the proposed parameters are those that are already monitored at other emissions points on Licence L9423/2024/1 and the proposed trigger levels seem to be associated with the *ANZECC & ARMCANZ 2000 – Livestock drinking water guidelines* (with the exception of copper). It should be noted that Licence L9423/2024/1 sets the proposed trigger levels as limits.

Notwithstanding the above, section 2.2.3 identifies the tailings characteristics for the copper and zinc tails and outlines that the tails may be enriched or contain elevated concentrations of certain parameters.

For those enriched and / or elevated parameters listed in section 2.2.3 (and not listed in Table 10 above), the department has added these parameters (aluminium, antimony, beryllium, bismuth, cobalt, iron, manganese, molybdenum, nickel, silver, thallium and uranium) to the ambient groundwater monitoring requirements through condition 21.

Where there is an associated *ANZECC & ARMCANZ 2000 – Livestock drinking water guidelines* value for any of these parameters they have been included in condition 21 as limits. For example: aluminium of 5.0 mg/L; cobalt of 1.0 mg/L; mercury of 0.02 mg/L; molybdenum of 0.15 mg/L; nickel of 1.0 mg/L; and uranium of 0.2 mg/L.

The department's hydrogeologist advised that *the quarterly chemistry sampling should be in line with the major chemistry analysis in the DWER 'operational policy no. 5.12 – Hydrogeological reporting associated with a groundwater well licence'. This should also include sampling for metals and major/minor ions.*

Based on the above and Appendix C4 of the *Operational policy no. 5.12 – Hydrogeological*

reporting associated with a groundwater well licence (DWER 2009) the following parameters have been included to the ambient groundwater monitoring requirements of condition 21: electrical conductivity; bicarbonate; total hardness; total alkalinity; calcium (including limit of 1,000 mg/L); magnesium (including limit of <600 mg/L); sodium; potassium; ammonia; phosphate; carbonate; chloride; nitrate (including limit of 400 mg/L); nitrite (including limit of 30 mg/L); silica; and total phosphorus.

Noting the limits applied are in line with the *ANZECC & ARMCANZ 2000 – Livestock drinking water guidelines.*

The parameters and limits applied through condition 21 can be re-evaluated for inclusion on Licence L9423/2024/1 when the amendment application to include TSF4 to the Licence is made.

Conditions 27 and 28:

The department's hydrogeologist recommended that the sulphate trigger level also be reduced to 500 mg/L which in the event of Acid Mine Drainage (AMD) waters, will control all the other trigger levels.

The department has retained the sulphate limit of 1,000 mg/L in condition 21, but has included conditions 27 and 28 which require management actions to be undertake if the sulphate trigger value of 500 mg/L is exceeded at any of the TSF4 groundwater monitoring bores.

The sulphate value of 500 mg/L is above the ambient background levels (refer to section 2.2.4, Table 6) and should be sufficient to detect (in the unlikely event) AMD contamination downstream.

Condition 29:

Condition 29 has been included requiring the applicant to notify the department within 7 days of becoming aware of a breach of a limit specified within the works approval.

4. Consultation

Table 11 provides a summary of the consultation undertaken by the department.

Table 11: Consultation

Consultation method	Comments received	Department response
Application advertised on the department's website on 03 June 2024	No comments received.	N/A.
Local Government Authority (Shire of Yalgoo) advised of proposal on 28 May 2024	No comments received.	N/A.
Department of Energy, Mines, Industry Regulation and Safety (DEMIRS) advised of proposal 28 May 2024	DEMIRS replied on 12 June 2024 stating the following: • Golden Grove's Mining Proposal (Reg ID 121513) for the LoM TSF4 was approved on 24 May 2024. • "*An assessment by DEMIRS' geotechnical engineers was undertaken as part of this approval. There were* ***no concerns***	Noted.

Consultation method	Comments received	Department response
	***regarding the stability of the landform**. All other concerns were adequately addressed to DEMIRS' satisfaction prior to approval*."	
Bundi Yamatji Aboriginal Corporation RNTBC advised of proposal on 28 May 2024	Yamatji Southern Regional Corporation (YSRC) as representatives for the Yamatji Nation Indigenous Land Use Agreement responded on 18 June 2024. YSRC made three recommendations to the applicant regarding the ground-breaking disturbance works, specifically relating to: 1. 2x (Widi) Yamatji Heritage Monitors being engaged; 2. Development of an engagement plan and a Cultural Heritage Management Plan; and 3. Adoption of a site Discovery Procedure.	The recommendations made by YSRC are outside the remit of Part V, Division 3 of the EP Act regulation of emissions and discharges from prescribed premises. Notwithstanding this, on 10 July 2024, the department sent the recommendations made by YSRC to the applicant. The department also requested a status (timeframe) update on the development of the Cultural Heritage Management Plan. The applicant responded on 11 July 2024 and this response was provided to YSRC on 17 July 2024. No further action will be taken by the department.
Applicant was provided with draft documents on 08 August 2024	On 02 September 2024, the applicant provided responses to the department's request for further information within the draft package. Refer to Appendix 1 for the applicant's comments on the draft package.	Documents updated accordingly to incorporate the applicant's responses. Refer to Appendix 1.

5. Conclusion

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

References

1. AECOM 2023, *TFS4 Project Groundwater Assessment Golden Grove Mine*, prepared for Golden Grove Operations Pty Ltd by AECOM, 19 October 2023 (DWER reference A2270387).
2. Australian and New Zealand Environment and Conservation Council (ANZECC) & Agriculture and Resource Management Council of Australian and New Zealand (ARMCANZ) 2000 – Livestock drinking water guidelines, *Australian and New Zealand guidelines for fresh and marine water quality – Volume 3* available at ANZECC & ARMCANZ (2000) guidelines (waterquality.gov.au).
3. Department of Environment Regulation (DER) 2015, *Guidance Statement: Setting Conditions*, Perth, Western Australia.
4. Department of Water and Environmental Regulation (DWER) 2020, *Guideline: Environmental Siting*, Perth, Western Australia.
5. DWER 2020, *Guideline: Risk Assessments*, Perth, Western Australia.
6. DWER 2009, *Operational policy no. 5.12 – Hydrogeological reporting associated with a groundwater well licence,* Perth, Western Australia.
7. Golden Grove Operations Pty Ltd (GGO) 2024a, *RE: Application for a Works Approval under the Environmental Protection Act 1986 – Request for Further Information*, dated 20 May 2024 (DWER reference A2280386).
8. GGO 2024b, *RE: Application for a Works Approval under the Environmental Protection Act 1986 – Draft Instrument and Decision Report*, dated 30 August 2024 (DWER reference DWERDT1001731).
9. Licence L9423/2024/1 available at Licences and works approvals search - Department of Water and Environmental Regulation (der.wa.gov.au).
10. Talis Consultants Pty Ltd (Talis) 2024, *Works Approval Supporting Documentation, Works Approval – TSF4* (Project Number: TE23057), prepared for 29 Metals, 4 April 2024 (DWER reference A2270387).

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

Condition	Summary of applicant's comment (GGO 2024b)	Department's response
1, Table 1 for the Tailings Distribution System	The applicant has stated that instead of the deposition tank a ring main system is to be implemented (Appendix III), which is also shown in Schedule 1, Figure 5 of the draft works approval. The applicant has determined that risks associated with this variation are negligible and provides improved performance of tailings deposition.	The department has updated the documents to specify ring main system rather than deposition tank.
2, Table 2 for TSF4 perimeter embankment	The applicant has stated that the length of the embankment should be 1585 m as per figure 119232.15-006 (Appendix XV). The maximum embankment height should be 8.0 m as per figure 119232.15-007 (Appendix X).	The department has made the requested change.
20, Table 7 for TSF4 for operational requirement – *Maximum throughput of 800,000 tonnes per annual period (i.e. tailings discharge into TSF4).*	The applicant has stated "*TSF4 has been designed as central thickened discharge (CTD) scheme with tailings thickened to relatively high solid concentration. TSF4 can certainly accommodate tailings production of significantly greater than 800,000 tpa. Unlike conventional TSFs (e.g. TSF1 to TSF3), the production rate or the overall rate of rise for the tailings deposit has no influence over the safety or performance of the TSF. Also tailings are discharged via a distribution system (i.e. splitting the flow), that results in increasing the tailings beach surface area and accelerating the tailings desaturation process within the TSF*."	The department has retained this requirement. This is the assessed design capacity for Category 5 as shown on the front page of the works approval. It is also the production or design capacity that the applicant applied for Category 5 (section 2, Table 2-1 of *Talis 2024*).
20, Table 7 for TSF4 for operational requirement – *Supernatant pond maintained to its minimum extent (nominally 500 mm in*	The applicant has stated that "*During normal operating conditions, the supernatant pond will be maintained to its minimum extent, with a nominal depth of around 500mm (minimum that can be achieved by a floating pontoon). With the CTD operation, limited supernatant pond is expected to form due to the limited release of tailings interstitial water (i.e. high*	The department has updated this requirement to – *Supernatant pond maintained to its minimum extent.*

Condition	Summary of applicant's comment (GGO 2024b)	Department's response
depth).	*solids concentration). However, with precipitation and surface runoff particularly after larger storm events, the size of the decant pond may inevitably increase and is expected to exceed the normal operational depth which is considered acceptable. This only represents a transient stage which will reduce to the normal operating condition with further pumping and return of water to the mill over time. The design of TSF4 allows for sufficient storm storage below the spillway invert level.*"	
20, Table 7 for TSF4 for operational requirement – *Maintain a minimum separation distance of 150 m from the supernatant pond and the embankment wall.*	The applicant has stated "*The design of the TSF4 follows a down-valley discharge arrangement, and hence the supernatant pond will naturally form against the perimeter embankment along the natural drainage gradient. The tailings thickened in paste thickeners will have a relatively high solids concentration and therefore the tailings bleed will be limited with a small pond expected to form near the perimeter embankment. The perimeter embankment has been designed with an upstream low permeability clayey zone, a base clay liner, and an upstream toe drain. Hence the operational supernatant pond can be safely stored against the perimeter embankment*."	The department has removed this requirement.