Moolart Well TSF3
Works Approval Application Supporting Document

UNCONTROLLED DOCUMENT WHEN PRINTED

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Figures

Tables

1. ATTACHMENT 1A: PROOF OF OCCUPIER STATUS

Government of **Western Australia**
Department of **Mines, Industry Regulation and Safety**

MINERAL TITLES ONLINE

MINING TENEMENT SUMMARY REPORT

MINING LEASE 38/498

Status: Live

TENEMENT SUMMARY

Area: 980.80000 HA
Death Reason :
Mark Out : 24/04/1996 15:50:00
Death Date :
Received : 01/05/1996 12:14:00
Commence : 18/04/2007
Term Granted : 21 Years

CURRENT HOLDER DETAILS

Name and Address
REGIS RESOURCES LIMITED
[redacted]
DUKETON RESOURCES PTY LTD
[redacted]

DESCRIPTION

Locality: North Duketon
Datum: Datum situated AMG 84 coordinates 434212m E 6946545m N in zone 51
Boundary: THENCE: 2450 metres bearing 360 degrees 4000 metres bearing 090 degrees 2450 metres bearing 180 degrees 4000 metres bearing 270 degrees BACK TO DATUM

Area :

Type	Dealing No	Start Date	Area
Surveyed		28/10/2007	980.80000 HA
Granted		18/04/2007	980.00000 HA
Applied For		24/04/1996	980.00000 HA

SHIRE DETAILS

Shire	Shire No	Start	End	Area
LAVERTON SHIRE	4970	24/04/1996		980.80000 HA

Government of **Western Australia**
Department of **Mines, Industry Regulation and Safety**

eMiTS MINERAL TITLES ONLINE

MINING TENEMENT SUMMARY REPORT

MINING LEASE 38/499

Status: Live

TENEMENT SUMMARY

Area: 726.95000 HA
Death Reason :
Mark Out : 24/04/1996 15:56:00
Death Date :
Received : 01/05/1996 12:14:00
Commence : 18/04/2007
Term Granted : 21 Years

CURRENT HOLDER DETAILS

Name and Address
REGIS RESOURCES LIMITED
[redacted]

DUKETON RESOURCES PTY LTD
[redacted]

DESCRIPTION

Locality: North Duketon
Datum: Datum situated AMG 84 coordinates 434222m E 6944730m N in zone 51
Boundary: THENCE: 1816 metres bearing 360 degrees 4000 metres bearing 090 degrees 1816 metres bearing 180 degrees 4000 metres bearing 270 degrees BACK TO DATUM

Area :

Type	Dealing No	Start Date	Area
Surveyed		29/10/2007	726.95000 HA
Granted		18/04/2007	726.00000 HA
Applied For		24/04/1996	726.00000 HA

SHIRE DETAILS

Shire	Shire No	Start	End	Area
LAVERTON SHIRE	4970	24/04/1996		726.95000 HA

Created 16/02/2022 15:21:16 Requested By: Reece Adam/Page 1 of 1

2. ATTACHMENT 1B: ASIC COMPANY EXTRACT

ASIC
Australian Securities & Investments Commission

Australian Company

REGIS RESOURCES LIMITED
ACN 009 174 761

Extracted from ASIC's database at AEST 18:34:40 on 16/02/2022

Company Summary	
Name:	REGIS RESOURCES LIMITED
ACN:	009 174 761
ABN:	28 009 174 761
Previous State Number:	C0816200U
Previous State of Registration:	Western Australia
Registration Date:	02/05/1986
Next Review Date:	02/05/2022
Former Name(s):	REGIS RESOURCES N.L., JOHNSON'S WELL MINING N.L.
Status:	Registered
Type:	Australian Public Company, Limited By Shares
[redacted]	
Regulator:	Australian Securities & Investments Commission

Further information relating to this organisation may be purchased from ASIC.

16/02/2022 AEST 18:34:40 1

3. ATTACHMENT 2: PREMISE MAPS

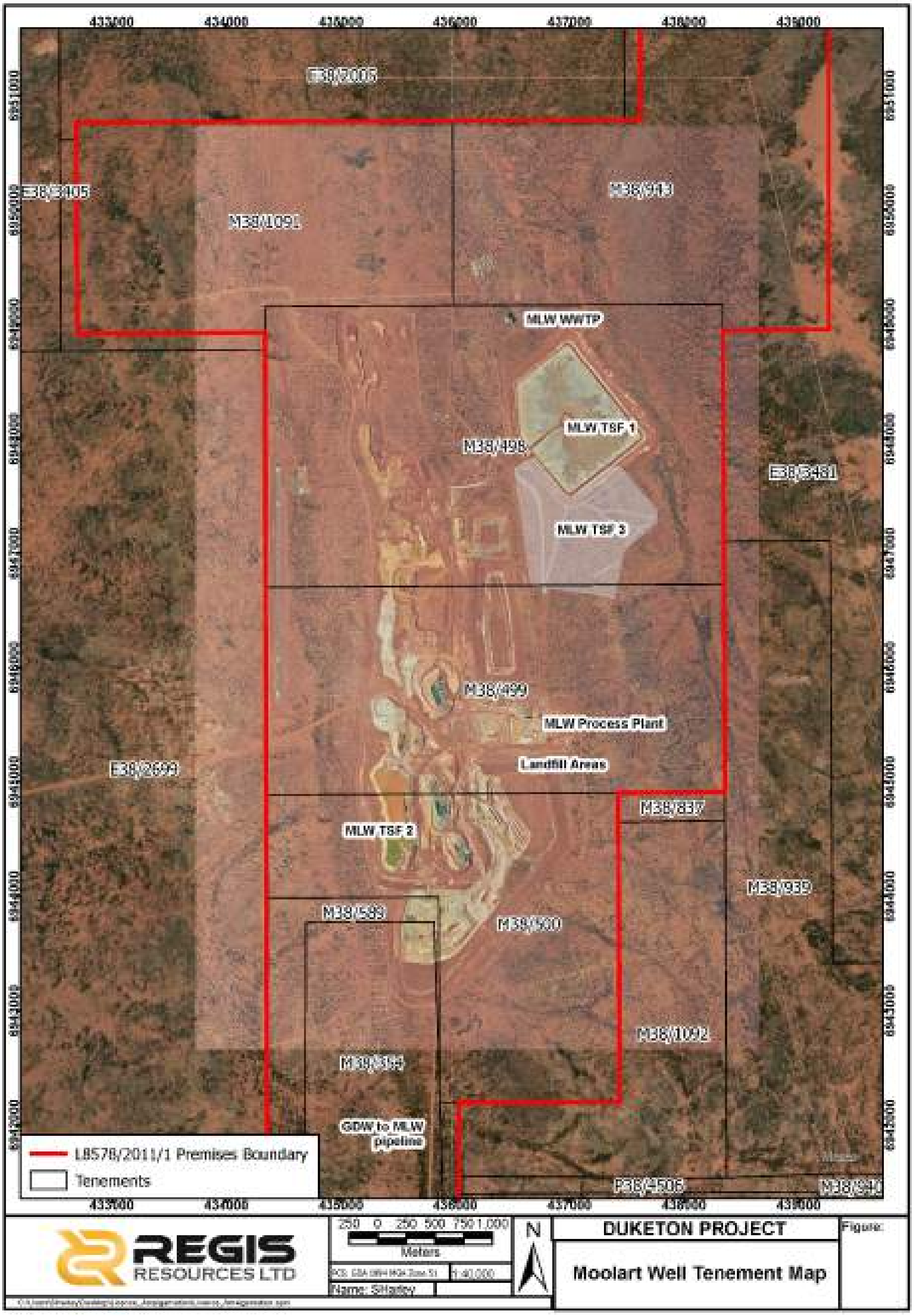

Figure 1 Tenement Layout for Moolart Well

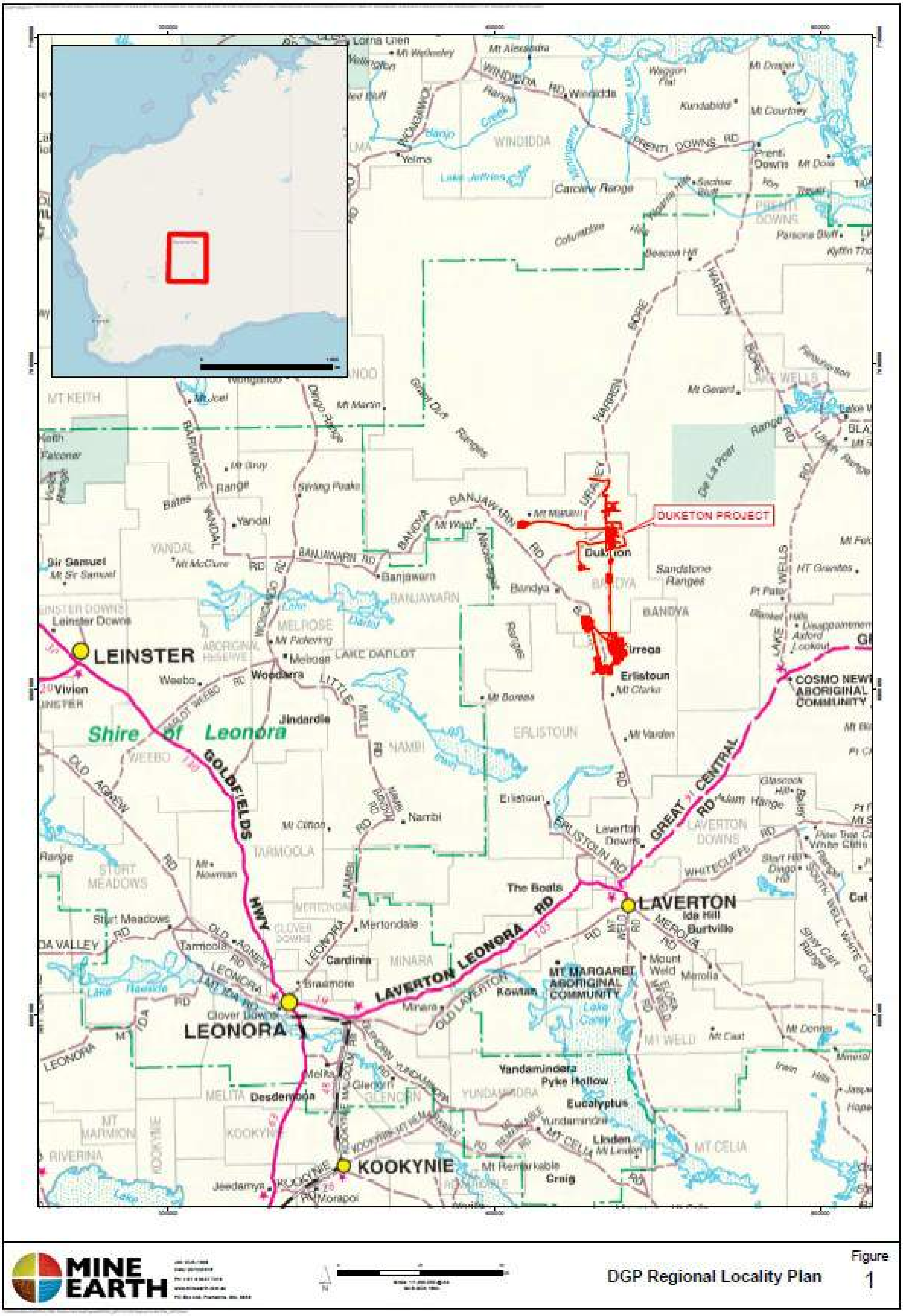

Figure 2 Site Location

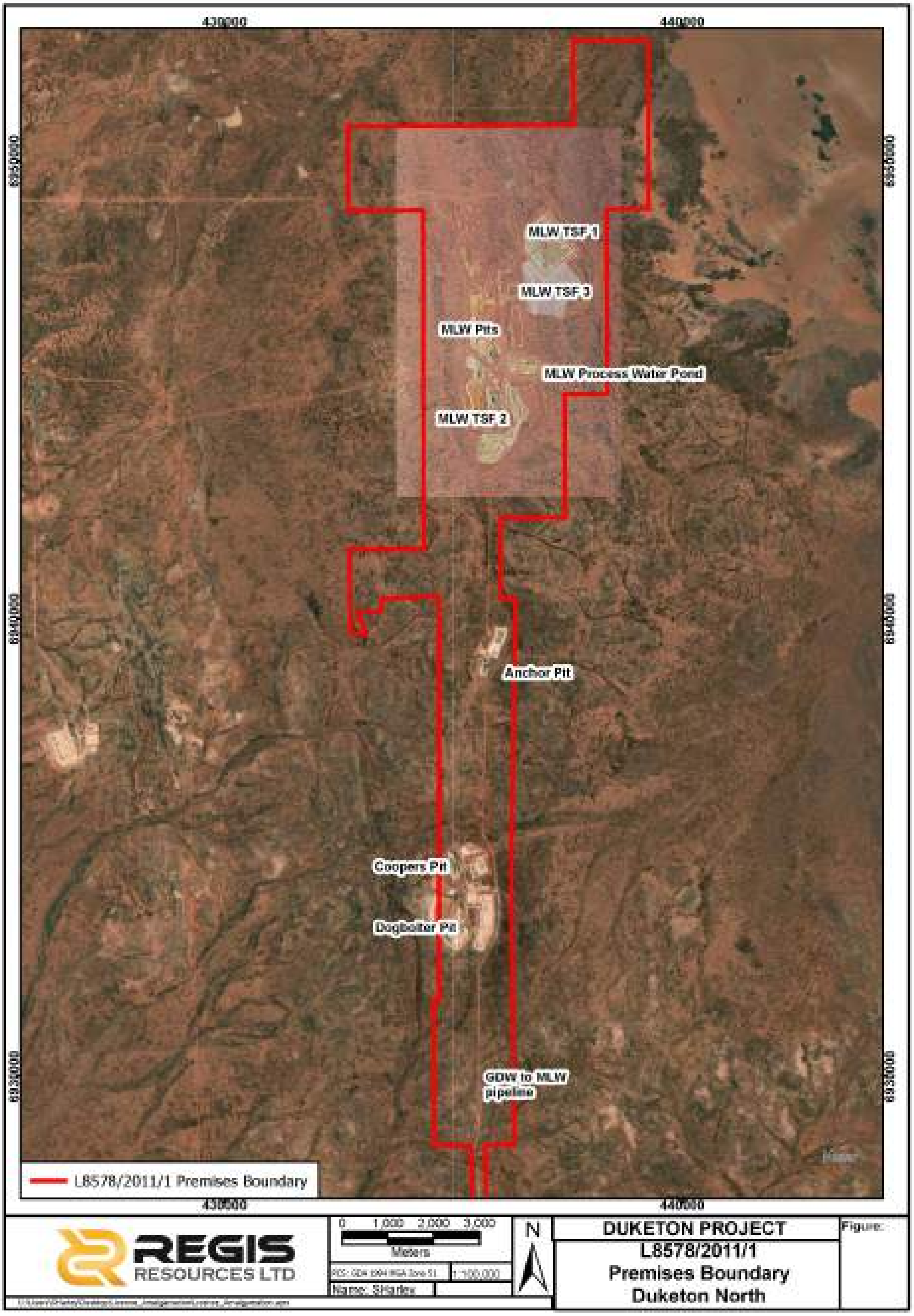

Figure 3 Premise Boundary for Duketon North

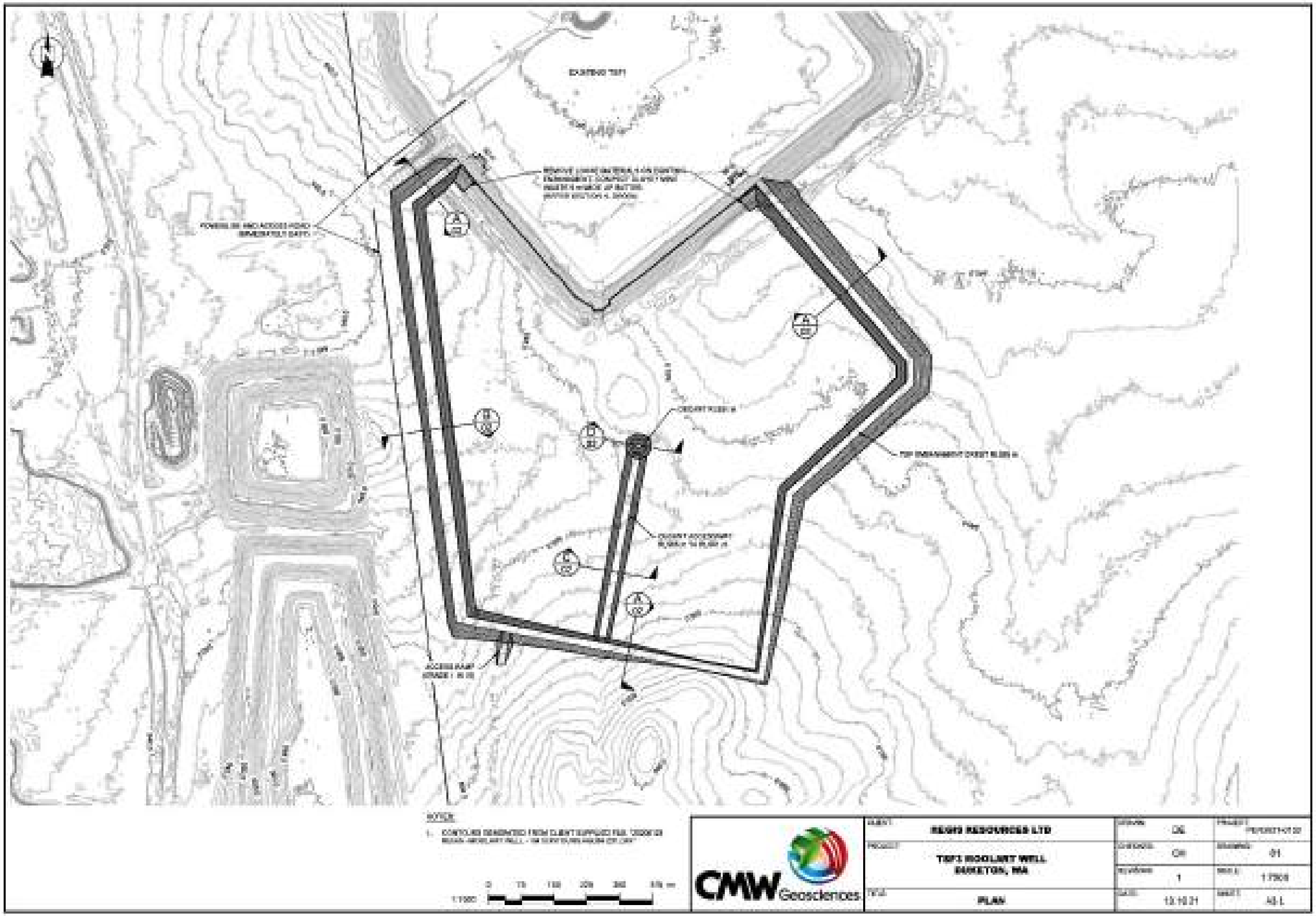

Figure 4 Site Layout for TSF3

4. ATTACHMENT 3B: PROPOSED ACTIVITIES

Sections below have used excerpts from the Regis Resources Ltd Duketon Gold Project Mining proposal (2021).

4.1. BACKGROUND

The Moolart Well (MLW) gold mine is located on Mining Leases M38/354, M38/498, M38/499, M38/500, M38/589, M38/943 and is owned and operated by Regis Resources Limited (Regis). Tailings storage at Moolart Well utilised MLW Tailings Storage Facility 1 (TSF1) until December 2019. The Stirling In-pit TSF (MLW TSF2) was commissioned in December 2019 and is currently used for tailings storage at Moolart Well. However, MLW TSF2 is insufficient to meet Regis' long terms tailings storage requirements at Moolart Well. Consequently, Regis proposes to develop MLW TSF3 which will be constructed on Mining Leases M38/498 and M38/499 as part of an integrated waste landform. The tenement plan is shown in Figure 1.

Moolart Well forms part of Duketon North Operation (DNO) approximately 130 km north of Laverton and 790 km northeast of Perth, WA (Figure 2). Regis currently operates the Moolart Well processing plant under L8578/2011/1 with an approved throughput of up to 4 Mt per annum (Figure 3).

Moolart Well is the processing hub for all sites within the operational area which includes several satellite pits. At Moolart Well, ore is mined from a variety of often overlapping and interlinking open pits generically called the Moolart Well Open Pit including Lancaster/Lancaster South, Wellington, Halifax, North, Beaufort, Blenheim, Wallace and Mitchell, plus laterite throughout the Moolart Well mining area. Infrastructure at Moolart Well consists of administration buildings, ore processing plant, MLW TSF1, MLW TSF2, accommodation village, wastewater treatment facilities, airstrip, run-of-mine pad, low grade stockpiles, water infrastructure, roads and hardstand areas (Figure 4). Waste rock from the Moolart Well open pits report to waste rock dumps and in-pit backfill. Satellite pits which provide ore to Moolart Well include Gloster, Anchor, Dogbolter, Coopers and Petra.

4.2. PRESCRIBED PREMISES CATEGORY

The prescribed premise for MLW TSF3 is Category 5 – Processing or beneficiation of metallic or non-metallic ore, as per Schedule 1 of the Environmental Protection Regulations 1987.

4.3. MLW TSF3

4.3.1. OUTLINE OF PROPOSED ACTIVITY

Regis has submitted this Works Approval to construct MLW TSF3 in order to store process tailings from the existing carbon in leach (CIL) plant located immediately south of the existing MLW TSF1. CMW Geosciences (2021) has designed the MLW TSF3 as an irregular 'octagonal' conventional single paddock (cell) facility abutting MLW TSF1 to the north. MLW TSF3 is to store approximately 8 Mt of tailings over a two year, eight month operational life assuming an ore processing rate of approximately 3 Mtpa and tailings in-situ density of 1.4 t/m^3 (dry). The TSF design report is provided as Appendix A.

MLW TSF3 will adjoin the decommissioned MLW TSF1 and has an approximate centre located at coordinates 6,947,000 m North and 437,000 m East (MGA, Zone 51). The location and layout of MLW TSF3 have been selected based on an options study which considered three sites (CMW Geosciences 2021). The preferred site was selected due to its proximity to pits for supply of construction materials, and because the site is not immediately upslope of the camp and is favourable under drainage conditions. The preferred location for MLW TSF3 has been located to avoid heritage sites and to avoid passage of an ephemeral creek to the east. A layout plan showing the location of MLW TSF3 in relation to the existing MLW TSF1 is presented as Figure 4.

The overall footprint of MLW TSF3 will be 96.8 ha with a storage footprint area of approximately 92.3 ha. The embankment height will average 10 m, with a maximum height of 15 m and the final crest at RL 555 m AHD (Figure 4). CMW Geosciences (2021) has performed embankment stability, embankment deformation, seepage, dam break and water balance analyses to support the design for a maximum crest embankment height of 15.0 m above the natural ground levels.

MLW TSF3 will be constructed partially within a Waste Rock Landform (WRL) and will include a cut-off trench nominally 0.6 m deep to reduce seepage losses CMW Geosciences (2021). Designs for MLW TSF3 are included within the design report within Appendix A.

The facility is classified, in accordance with Tables 1 and 2 of the DMP (2013) code, as hazard rating 'Category 2 – Medium'. The Australian National Committee on Large Dams consequence rating is 'High C' (ANCOLD, 2019). A dam break assessment has been performed and the hazard rating is based on this assessment.

4.3.2. CONSTRUCTION

MLW TSF3 will be constructed in one stage and then commissioned. As part of preparation works, the footprint of the facility will be cleared of vegetation and the insitu colluvial clayey silty sand subgrade material at the embankment foundation will be compacted. Topsoil from the footprint will be stripped to a nominal depth of 0.1 m and stockpiled for use in rehabilitation. The subgrade material at the embankment foundation will be compacted to achieve a minimum of 95% dry density ratio in accordance with AS1289.5.1.1.

No liners are proposed for MLW TSF3 basin. The reduction in permeability achieved through compaction of the sandy surface soils within the basin floor is marginal and therefore not justified from seepage modelling.

Embankments of MLW TSF3 will be zoned, comprising an upstream zone of low permeability roller compacted clayey mine waste (Zone A) and a structural waste dump downstream (Zone B). The decant accessway will be constructed using traffic compacted mine waste (Zone C) and selected filter rock (Zone D). Slopes of 1(V):2(H) upstream and 1(V):3(H) downstream, have been incorporated into the design with a minimum crest width of 18 m. Along the western corridor where an existing powerline and access road are located, the MLW TSF3 embankment will have design slopes of 1(V):2(H) upstream and 1(V):1.5(H) downstream, with a minimum crest width of 29 m, during its operational life. The downstream slope will be battered back to 1(V):3(H) at closure.

The designs by CMW Geosciences (2021) have adopted required setbacks from existing infrastructure during the life of MLW TSF3 to allow for rehabilitation and closure.

The embankment crest will have a 2% cross-fall towards the upstream side, 0.5 m (min.) high rock/mine waste windrow at the downstream crest, and above ground tailings pipeline at the upstream crest.

The perimeter embankment will incorporate a cut-off trench 0.6 m (nominal) deep founded on a cemented ferricrete layer in order to reduce seepage losses. An underdrainage system comprising perforated pipe underdrainage lines in seepage intersection trenches grading to collection manholes via seepage collection trenches will be constructed along the northwest, west and northeast embankment alignments where the topographical lowest levels occur (CMW Geosciences 2021). The collection manholes will comprise a tower constructed using concrete well liners with a minimum depth of approximately 1.35 m below the levels of collection seepage trenches, including slab base. The seepage intersection trenches will extend approximately 1.04 km underneath the northwest and west embankments, and approximately 0.59 km underneath the east and northeast alignments.

The decant accessway has design slopes of 1:1.5 (V: H), 18 m crest width, and a transversal slope of 10 degrees from the embankment down to the rock-ring decant. The crest of the decant causeway will have minimum 0.5 m high rock/mine windrows on both sides, with breaks in the windrows on the low side to allow surface water to run off. The rock-ring decant will be 30 m in diameter and has design slopes of 1:1 (V: H) and a crest width of 4 m.

4.3.3. OPERATION

Surface water will be removed from the rock ring central decant using a pontoon-mounted decant pump. Return water will be pumped directly to the process plant for reuse. The efficacy of the water return system is the key to achieving a high in-situ dry density within the tailings stack. The minimum capacity of the water recovery system should be not less than 420 tph including the additional capacity needed to recover water from design storm events.

Deposition of tailings will be in the form of a slurry, no more than 0.3 m in thickness sub aerially and cyclically. Multiple spigots along the upstream perimeter embankment crest will be where the slurry will come from to allow optimum density and strength gain by each layer (CMW Geosciences 2021).

Inspections will be carried out during each shift by an operator or shift supervisor, which will include inspecting the following:

- The pipelines (tailings delivery line and water return lines) to and from TSF3.
- Leak detection.
- Pumps.
- Valves.
- Discharge locations.
- Location and size of the decant pond.
- Decant and return water pumps.
- Seepage collection pipe flow and pumps.
- The general integrity of the embankment i.e. any new cracking (daily).
- Seepage downstream of TSF3.
- Any changes to existing cracking or seepage.

A 0.7 m freeboard has been incorporated into the design that also comprises a minimum operating freeboard of 0.3 m and will allow a 1:100 year annual exceedance probability (AEP) 72-hour event of 0.2m. With a perimeter tailings deposition setup, along with an expected beach slope of 1.0%, it is expected that wave action will be prevented or severely mitigated.

4.3.4. COMMITMENTS

Regis, as operator, makes the following commitments in accordance with recommendations made by CMW Geosciences (2021):

- MWL TSF3 will be constructed, commissioned, operated, maintained, rehabilitated, monitored and closed in accordance with the specifications and drawings, including where appropriate other studies made in consultation with relevant stakeholders.
- Construction will be supervised and monitored by personnel with experience in this type of construction. Details of construction will be provided in a construction report.
- Investigation and exploration drill holes within the TSF footprint are planned to be sealed prior to construction.
- MWL TSF3 will be managed and operated in general accordance with the Regis Operations Manual. Independent audits will be performed annually.

5. ATTACHMENT 5: OTHER APPROVALS AND CONSULTATION DOCUMENTATION

5.1. DEPARTMENT OF MINES, INDUSTRY, REGULATION AND SAFETY

Resources Safety Division

The design of the TSF was developed by CMW Geosciences (2021; Appendix A) in accordance with the following guidelines:

- Australian National Committee on Large Dams (ANCOLD) (2019), 'Guidelines on Tailings Dam Planning, Design, Construction, Operation and Closure'.
- Department of Mines, Industry Regulation and Safety (DMIRS, 2013), 'Code of Practice: Tailings Storage Facilities in Western Australia'; and
- DMIRS (2015), 'Guide to the preparation of a design report for Tailings Storage Facilities (TSFs)'.

Environment Division

An updated Mining Proposal, Version 7.1 has been submitted for the addition of MLW TSF3. Regis is seeking parallel processing of this works approval with the Mining Proposal.

Native vegetation Branch

An updated clearing permit application has been submitted for the Duketon Gold project (DGP) to DMIRS. This permit covers approximately 5 ha of MLW TSF3 which falls outside of the approved CPS 6657/10 for the DGP. The updated application also includes disturbance activities for other projects across the DGP.

Dangerous Goods

There will not be any dangerous goods or hazardous substances beyond of what is already generated by this project and already licenced at Moolart Well.

5.2. DEPARTMENT OF WATER AND ENVIRONMENTAL REGULATION

Department of Water

Regis currently has four licences to take water in accordance with section 5C of the *Rights in Water and Irrigation Act 1914* that are currently active for the DGP. GWL169314(3) is directly used within the Moolart Well area.

Department of Environmental Regulation

L8578/2011/1 applies to the DGP and includes the following prescribed premises categories relevant to Moolart Well:

- 5 - Processing or beneficiation of metallic or non-metallic ore
- 6 - Mine dewatering
- 73 - Bulk storage of chemicals
- 85 - Sewage facility
- 64 - Putrescible landfill

6. ATTACHMENT 6A: EMISSIONS AND DISCHARGES

6.1. TAILINGS PROPERTIES

Tailings Testwork

Tailings testwork was performed on a sample of mill tailings by a NATA registered laboratory in early 2019 (CMW Geosciences, 2021). The tailings sample was a non-plastic SANDY SILT (ML) with 73% fines (% passing 75 µm).

The settling test results indicated moderate settling rates with the maximum dry density in the settling tests achieved in five to seven days. The moderate rate of settling is due to the relatively high fines content of the tailings. It was noted that future tailings are expected to be coarser and hence settling should be more rapid and settled densities higher. The consolidation test indicated that consolidation will be relatively rapid.

The results of the tailings testwork are summarised below:

- Particle Size Distribution (PSD), 73% passing 75 micron, approximately 12% passing three micron.
- Undrained settled density, 0.92 t/m3 (dry), with maximum density achieved in five days.
- Drained settled density, 1.10 t/m3 (dry), with maximum density achieved in five days.
- Air drying test, final density 1.49 t/m3 (dry) after 16 days.
- Consolidation test, final density 1.57 t/m3 (dry) at 600 kPa.

Geotechnical Characteristics

The engineering properties of the tailings are based on information provided by Regis in 2019. These are summarised below:

- Slurry density ex-plant approximately 45% solids.
- Initial and final tailings density 1.0 t/m³ (dry) and 1.4 t /m³ (dry), respectively.
- Specific gravity of approximately 2.7.
- Effective angle of internal friction, φ of 32º (assumed based on PSD testing).
- PSD of 55% to 60% passing the 75 µm, and 85% to 90% passing the 300 µm.
- Tailings beach slope of 1%.
- Permeability, k of 10^{-7} to 10^{-8} m/s.
- Coefficient of Consolidation, Cv of 200 m^2/year to 1,000 m^2/year.

Based on the above parameters and traditional consolidation theory, a 15 m depth of tailings would likely consolidate over one to two years, assuming one-way drainage.

Geochemistry and Mineralogy Characteristics

Geochemical characterisation has been undertaken of tailings samples at Moolart Well and other satellite ores processed at Moolart Well including Gloster, Dogbolter-Coopers and Petra (CMW Geosciences 2021). A summary of tailings classifications and observations from TSF1 and TSF2 Licence monitoring bores reported in the most recent Annual Environmental Report are presented below:

- The vast majority of tailings samples analysed across Moolart Well, Gloster, Dogbolter-Coopers and Petra have been classified as Non-Acid Forming (NAF).

- The only Potentially Acid Forming (PAF) tailings samples from composite testwork at Moolart Well includes one sample from Mitchell pit, which is the smallest active pit at Moolart Well, and one (out of five) samples analysed from Petra pit (a site located 20 km southwest of MLW), which has reached its life of mine.
- Licence monitoring bores are very low in WAD CN concentrations (less than 0.1 mg/L).
- With the exception of one outlier, salinities of Licence monitoring bores are generally brackish ranging from 1,300 mg/L to 5,100 mg/L.
- The pH of Licence monitoring bores has remained circum-neutral ranging between 6.84 and 7.87.

Further testwork recently conducted for expansion of the Wallace pit was conducted on ten composites samples based on material types (as a proxy for tailings). The ten composites comprised five fresh rock composites, four saprock composites and one saprolite (oxide) composite. From these, two of the five fresh rock composites were found to be PAF, whilst three fresh rock composites, and all saprock and oxide composites were NAF.

Operational tailings will comprise a mixture of fresh rock oxide and saprock (as to operate purely with fresh rock tailings requires a reduction in processing rate). Tailings are also a mixture of ore sources from the various Moolart Well pits as well Gloster, Anchor, Dogbolter, Coopers and Petra.

MLW TSF3 is therefore expected to comprise primarily NAF tailings (CMW Geosciences, 2021).

6.2. WATER BALANCE

A water balance analysis for the proposed MLW TSF3 operation has been undertaken using a spreadsheet to examine expected MLW TSF3 inflows and outflows (CMW Geosciences, 2021).

Inflows and outflows for the facility were estimated on a monthly basis. Inflows include rainfall and slurry water. Outflows include evaporation, seepage losses and water retained in tailings (pore water).

Assumptions and other data adopted for the water balance are listed below:

- Climate data were obtained from the BOM website. Average monthly rainfall figures for Laverton, WA (recording period: 1899 to 2021) with an annual average of 235.7 mm/year, and average annual evaporation and evapotranspiration at approximately 3,746 mm/year and 1,350 mm/year, respectively.
- Tailings area of approx. 92.3 ha.
- A tailings runoff coefficient of 0.4 was assumed.
- Pool area equal to approximately 2% of tailings area (radius approx. 150 m).
- Running beaches equal to approximately 5% of the tailings area.
- Evaporation pan factor of 0.7.
- Average tailings residual moisture content of 35%.
- Tailings slurry density of 45% solids.
- Tailings production rate of 3 Mtpa.
- Seepage rate from seepage analyses of approximately 16 m^3/day.

The results of the analysis indicate potential annual average water returns of 68% of the tailings slurry water deposited into the facility can be expected under average climatic conditions.

The results also indicate that water recovery will vary according to the management of the facility, specifically the size of the pond and running beaches. The actual quantity of water available for return to the plant may vary from the figures presented based on the following factors:

- Variations in slurry density.
- Continuity of tailings discharge.
- Distance between the discharge point and decant pond.
- Size of the decant pond and running beaches from where evaporation is greatest.
- Climatic conditions at the time of operation.
- The efficiency of the decant system during operation.

The efficacy of the water return system is the key to achieving a higher in-situ tailings dry density within the TSF. The minimum capacity of the water recovery system should be not less than 420 tph including the additional capacity needed to recover water from design storm events.

6.3. SENSITIVE RECEPTORS

Key elements of the receiving environment (or receptors) are described below.

Location and Other Users

Moolart Well is a remote isolated mine site located on a Pastoral Station. The nearest town is Laverton, approximately 110 km south of the mine, whilst the nearest settlement is Mulga Queen, located 29 km west of Moolart Well. With no external dwellings within 29 km of Moolart Well, there are no direct human receptors.

Whilst there is a co-existing pastoral land use, for practical and safety purposes, Moolart Well is fenced from the remainder of the Pastoral Station, limiting interaction between the two.

Groundwater

Groundwater quality around Moolart Well is typically brackish between 1,000 and 5,000 mg/L, but within the tolerance of livestock. The closest Pastoral Station bore is 2.3 km from MLW TSF3, west of the Moolart Well pits. The bore is not susceptible to changes in quality from MLW TSF3 as there is a cone of depression of the pits between MLW TSF3 and the Pastoral Station bore.

Vegetation

Moolart Well is dominated by Mulga tall sparse shrubland as is typical of the East Murchison IBRA subregion, dominated by Mulga woodlands often rich in ephemerals, hummock grasslands saltbush shrublands and *Tecticornia* shrublands. There are no Threatened Ecological Communities in the East Murchison subregion. Likewise, Moolart Well resides in the Austin Botanical District which is the largest of the Eremaean regions and is predominantly Mulga low woodlands on red loams and siliceous hardpans on the plains, reducing to scrub on rises and hills.

Mulga vegetation is present on the eastern and southern sides of MLW TSF3, whereas the northern end of MLW TSF3 directly abuts MLW TSF1 and the Central Waste Rock Dump occurs to the west. Thus vegetation exposure is limited to two sides of the MLW TSF3. No Threatened flora have been recorded at Moolart Well, whilst the Priority 3 taxa *Calytrix praecipua* and *Phyllanthus baeckiodies* and the Priority 4 taxon *Eremophila pungens* have been recorded at or near Moolart Well in past surveys.

The closest nature reserve (De La Poer Nature Reserve; R41831) is ~20 km northeast of Moolart Well, too far to be impacted by MLW TSF3 (or Moolart Well).

6.4. ASSESSMENT OF ENVIRONMENTAL RISKS FROM EMISSIONS

6.4.1. RISK IDENTIFICATION

Potential emissions from the proposed MLW TSF3 include:

- Dust;
- Hydrocarbons;
- Process Chemicals; and
- Tailings.

6.4.2. RISK ASSESSMENT

The risk assessment process that was adopted aligns with the Australian and New Zealand Risk Management Standard (AS/NZ 31000:2009). The risk matrices used to undertake the assessment were sourced from the Guidelines for Mining Proposals in Western Australia (Table 1 to Table 3 DMIRS, 2020).

During the risk assessment the cause and impact of each of the identified risk events were first detailed. The consequence and likelihood of risk events occurring without any control options was then assessed to determine the inherent risk. Professional judgement and experience were used to define control options in the form of standard mine practice, Regis policy and procedures (through application of the Environmental Management System [EMS]), commitments from previous Mining Proposals, relevant regulations, guidelines and standards, and existing permits and licences. Controls were then applied to each risk event. Using the DMIRS likelihood and consequence descriptors (Table 4 and Table 5) the consequence and likelihood of each risk event occurring with the control options in place was then assessed to determine the corresponding risk rating (Table 6).

The risks and controls associated with TSF3 are listed within Table 4.

Table 1: DMIRS Likelihood Descriptors

Likelihood Descriptors

Descriptor	Frequency	Probability
Almost Certain	Twice or more per year	Event will occur during the Project / period under review.
		High number of known incidents.
Likely	Once per year	Event likely to occur during the Project / period under review.
		Regular incidents known.
Possible	Once in 5 years	Event may occur in some instances during the Project / period under review.
		Occasional incidents known.
Unlikely	Once in 10 years	Event is not likely to occur during the Project / period under review.
		Some occurrences known.
Rare	Once in 20 years	Event will occur in exceptional circumstances during the Project / period under review.
		Very few or no known occurrences.

Source: DMIRS (2020)

Table 2: DMIRS Consequence Descriptors

Consequence Descriptors

Factor	Insignificant	Minor	Moderate	Major	Severe
Biodiversity	Alteration or disturbance to an isolated area with no effect on habitat or ecosystem. Loss of an individual plant / animal of conservation significance.	Alteration or disturbance to <10% of a habitat or ecosystem resulting in a recoverable impact within 2 years. Loss of multiple plants / animals of conservation significance.	Alteration or disturbance to 10-40% of a habitat or ecosystem resulting in a recoverable impact within 2-5 years. Loss of <50% known local population of plant / animal of conservation significance.	Alteration or disturbance to 40-70% of a habitat or ecosystem resulting in a recoverable impact within 5-15 years. Loss of >50% known local population of plant / animal species with possible loss of entire local population.	Alteration or disturbance to >70% of a habitat or ecosystem resulting in a recoverable impact >15 years. Local loss of conservation significant or listed species. Extinction of a species.
Water Resources	Negligible change to hydrological processes, water availability or water quality.	Short-term modification of hydrological processes, water availability and quality within project tenure, but no change in beneficial use.	Medium-term modification of hydrological processes, water availability and water quality within project tenure, but no change in beneficial use. Short-term modification of hydrological processes, water availability and water quality outside project tenure, but no change in beneficial use.	Long-term modification of hydrological processes, water availability and water quality within project tenure, but no change in beneficial use. Medium-term modification of hydrological processes, water availability and water quality outside project tenure, with change in beneficial use.	Long-term or permanent modification of hydrological processes, water availability or water quality outside project tenure, with impacts to a water-dependent environmental value and/or change in beneficial use.
Land and Soils	Clean-up by site personnel, rectified immediately. Confined to immediate area around source.	Clean-up by site personnel, remediation within 1 year. Confined to operational area.	Clean-up by site personnel, remediation within 1-3 years. Minor impact outside disturbance envelope or minor impact to soil stockpiles.	Clean-up requiring external specialist, remediation within 3-10 years. Impact has migrated outside the disturbance envelope or contamination of soil stockpiles.	Clean-up requiring external specialist. Remediation >10 years, or permanent residual impact. Impact outside the tenement boundary.
Rehabilitation and Mine Closure	Site is safe, stable a non-polluting. Post mining land use is not adversely affected.	Site is safe, all major landforms are stable, and any stability or pollution issues are contained and require no residual management. Post mining land use is not adversely affected.	Site is safe, and any stability or pollution issues require minor, ongoing maintenance by end land-user. Post mining land use cannot proceed without some management.	Site cannot be considered safe, stable or non-polluting without long-term management or intervention. Post mining land use cannot proceed without ongoing management.	Site is unsafe, unstable and/or causing pollution or contamination that will cause an ongoing residual affect. Post mining land use cannot be achieved.

Source: DMIRS (2020)

Table 3: DMIRS Risk Assessment Matrix

Risk Matrix		Most Credible Consequence Level				
		Insignificant	Minor	Moderate	Major	Severe
Likelihood	Almost Certain	M	H	H	E	E
	Likely	M	M	H	H	E
	Possible	L	M	M	H	H
	Unlikely	L	L	M	M	H
	Rare	L	L	L	M	M

Extreme
High
Medium
Low

Source: DMIRS (2020)

Table 4 Risk Assessment for MLW TSF3

Activity/Change	Potential Emissions	Potential Receptors	Potential Pathway	Potential Adverse Impacts	Consequence Rating	Likelihood Rating	Risk	Controls/Comment
Construction of a new TSF (MLW TSF3) to store ~8 Mt of tailings	Increase in seepage from the TSF	Native vegetation occurs adjacent to the eastern and southern embankments of MLW TSF3	Seepage through the floor of the TSF, resulting in a rise in groundwater level, affecting vegetation	Vegetation stress and/or death	Moderate	Unlikely	Medium	*Note: Licence condition 3.4.1 requires standing water levels at monitoring bores to be greater than 4 m below ground level (mbgl).* • Supernatant recovery system to maximise decant (supernatant) recycling and minimise size of the decant pond. • Installation of new monitoring bores to be added to the groundwater monitoring programme (under Licence condition 3.4.1). • Installation of cut off trench under embankments nominally 0.6 m deep founded in a cemented ferricrete layer. • Installation of seepage interception trenches parallel to the crest of the embankment flowing into seepage collection manholes for recovery (Licence condition 1.2.9).

Activity/Change	Potential Emissions	Potential Receptors	Potential Pathway	Potential Adverse Impacts	Consequence Rating	Likelihood Rating	Risk	Controls/Comment
								• Modelling indicates seepage will be 6.1 x 10^{-3} m^3/day/m of embankment. Total seepage is expected to be 16 m^3/day during operations and up to 20 m^3/day from the TSF during closure.
		Livestock bores	Seepage through the floor of the TSF into groundwater	Beneficial use of bores for livestock impacted	N/A	N/A	N/A	• Closest pastoral bore is 2.3 km from MLW TSF3, west of the Moolart Well pits. • Seepage therefore cannot impact the bore as the Moolart Well pits lie between MLW TSF3 and the pastoral bore.

Activity/Change	Potential Emissions	Potential Receptors	Potential Pathway	Potential Adverse Impacts	Consequence Rating	Likelihood Rating	Risk	Controls/Comment
	Overtopping the TSF	Native vegetation occurs adjacent to the eastern and southern embankments of MLW TSF3	Stormwater accumulating in the TSF exceeds freeboard resulting in overtopping the embankment onto vegetated areas	Diluted supernatant water entering vegetation at a time when the surrounding natural environment is also saturated (i.e. >1% AEP 72-hour storm). Actual water quality overtopping is expected to have no adverse chemical concentrations as a result of dilution.	Minor	Rare	Low	• MLW TSF3 has been designed to have a minimum of 0.7 m freeboard, comprising, an operational freeboard of 0.3 m, beach freeboard of 0.2 m and allowance for a 1% AEP 72-hour event of 0.2 m. • Such an event would yield approximately 170,800m3 (92.3 ha x 185 mm). This volume would occupy approximately 10% of the TSF basin. The TSF also has sufficient capacity to contain the probably maximum flood of 692,300 m3 (92.3 ha x 750 mm). Complies with Licence condition 1.2.8 • TSF inspections include freeboard (Licence condition 1.2.10) • Supernatant constantly removed from the TSF through supernatant pumps for recycling in the process plant. Pumps over-sized to allow pumping of up to 420 t/h to accommodate water removal from storm events.

Activity/Change	Potential Emissions	Potential Receptors	Potential Pathway	Potential Adverse Impacts	Consequence Rating	Likelihood Rating	Risk	Controls/Comment
								• Whilst not a control, MLW TSF3 embankment will be built as a single embankment, eliminating the need to construct raises, meaning freeboard will only come close to the design freeboard at the end of mine life. Prior to then the embankment will have metres of freeboard.
	Pipeline Leaks / Rupture	Vegetation and soil adjacent to tailings pipeline alignment	Leak or rupture releasing tailings to land	Impacts to vegetation condition or death from tailings or return water inundation	Minor	Rare	Low	• Tailings and return water pipelines to be located in bunds or trenches as secondary containment during operation (Licence condition 1.2.11). • Pipelines to have leak detection (Licence condition 1.2.11). • Pipeline inspections to detect spills below sensitivity of leak detection (Licence condition 1.2.10).

Activity/Change	Potential Emissions	Potential Receptors	Potential Pathway	Potential Adverse Impacts	Consequence Rating	Likelihood Rating	Risk	Controls/Comment
	Dust	No residential premises within 29 km of MLW TSF3	Emission to air	Health and amenity impacts	NA	NA	NA	• Distance to receptors is too great to have an impact
		Native vegetation occurs adjacent to eastern and southern embankments of MLW TSF3	Emission to air	Decline in vegetation health due to incremental increase in dust interfering with photosynthesis and respiration.	Moderate	Unlikely	Medium	• Whilst undisturbed vegetation is adjacent to the TSF on two sides, dust emissions from TSF construction are minimal. • Water carts used during embankment works • Zone A "clay" material has a higher potential for generating dust compared to Zone B (mine waste), but Zone A may require water addition to be within 2% of the optimum moisture content for construction), limiting dust generation. • As Zone B is effectively run of mine waste its placement is managed with water carts as per mining operations on other waste rock dumps.

Activity/Change	Potential Emissions	Potential Receptors	Potential Pathway	Potential Adverse Impacts	Consequence Rating	Likelihood Rating	Risk	Controls/Comment
	Acid generation	Native vegetation occurs adjacent to the eastern and southern embankments of MLW TSF3	Oxidation of Potentially Acid Forming (PAF) tailings reporting to seepage	Vegetation stress and/or death caused by acid in seepage interacting with roots if groundwater levels rise within 4 m of ground level	Moderate	Rare	Low	• Past testing work has identified tailings at Moolart Well and its satellite pits have been Non-Acid Forming (NAF). • The only PAF tailings which have been identified are: – Petra 1 of 5 samples (transitional tailings sample) – mining has been completed at Petra. – Mitchell 1 of 2 samples (Transitional Chert/Sediment/Dolerite composite sample). Mining is yet to commence at Mitchell but is the smallest pit at Moolart Well. – Wallace expansion (2 out 10 samples of which 2 out of 5 were fresh rock). Wallace expansion is yet to be mined but will be the deepest pit at Moolart Well.

Activity/Change	Potential Emissions	Potential Receptors	Potential Pathway	Potential Adverse Impacts	Consequence Rating	Likelihood Rating	Risk	Controls/Comment
								• In contrast, Lancaster, Blenheim, Wellington, Gloster, Anchor, Dogbolter and Coopers pits are all NAF tailings. Overall tailings will be NAF. • Tailings are deposited in a saturated state and stored at matric potential, limiting oxygen ingress. • Tailings deposition is cycled in layers up to 0.3 m providing fresh cover over tailings limiting oxygen ingress.

7. ATTACHMENT 7: SITING AND LOCATION

The section below on site and location details comprise excerpts from the Regis Resources Ltd Duketon Gold Project Mining Proposal (2021).

7.1. REGIONAL SETTING

The DGP is situated within the East Murchison subregion of the Murchison bioregion according to the Interim Biogeographic Regionalisation for Australia (IBRA) (Environment Australia, 2012). This region is characterised by its internal drainage and areas of elevated red desert sandplains with minimal dune development. Salt lake systems are common and associated with the paleodrainage system. The subregion is dominated by plains of red-brown soils, along with breakaway complexes and red sandplains. Vegetation consists of Mulga Woodlands, hummock grasslands and salt bush shrublands (Cowan, 2001).

The dominant land uses in the region include pastoral and mining activities. A number of unallocated crown land and Crown reserves account for approximately 11% of the subregion (Cowan, 2001).

7.2. GEOLOGY

Regionally, Moolart Well is located in the Duketon Greenstone Belt in the north-eastern sector of the Eastern Goldfields Super-terrane of the Yilgarn Craton. The Duketon Greenstone Belt is characterised by a metamorphosed succession of Archaean mafic, ultramafic, and felsic volcanic rocks with associated volcanogenic sedimentary rocks and thin units of banded chert and banded iron formation. Late-stage sills and dykes and associated small plutons intrude the sequence. These associations have been deformed into both N-S and NE-SW trending tight folds and strike slip thrust belts under mainly E-W stress. Subsequently, the sequence has been extensively sheared and elongated along the strike. Deep weathering occurs across the region.

Within the Moolart Well project area, the near-surface regolith overlying the deeply weathered Archaean geology comprises relatively recent alluvium and colluvium deposits that have been reworked and cemented through the Tertiary and Quaternary Periods. A thin surface layer, typically less than 0.5 m thick, of red-brown silty sand soil overlies a cemented hardpan rock layer between 0.5 m to 3.0 m thick. The hardpan is fairly ubiquitous across the landscape and comprises a silcrete cemented layer developed within the Quaternary colluvium and alluvium deposits along drainage channels and/or within residual, extremely weathered bedrock material around the slightly elevated outcrop areas.

Geology in the pit areas comprises a laterite horizon overlying mafics, diorite and dolerite. Based on site observations, the geology is deeply weathered to at least 60 m. Based on tactile assessments, it is likely there will be ample clayey mine waste for use in integrated waste landform type construction.

7.3. LAND SYSTEMS AND SOILS

Land systems as mapped by the Department of Primary Industries and Regional Development (former Department of Agriculture) (Pringle et al., 1994) that occur in the area are described in Table 5 and shown in Figure 5.

Mapping of soils and landscapes has been undertaken by Department of Primary Industries and Regional Development in "Soil-landscapes of Western Australia's Rangelands and Arid Interior" (Tille, 2006). The DGP falls within the Murchison province of this categorisation This mapping is at a broader scale than the land system mapping and includes two soil-landscape units over the entire DGP. Given that the land system mapping is more detailed, the soil-landscape units mapping does not provide any additional information useful for describing the DGP and therefore it is not included here.

Table 5 Land Systems of the TSF3 region

Land System	System Code	Description
Ararak	279Ar	Broad plains with mantles of ironstone gravel supporting mulga shrublands with wanderries grass
Bevon	279Bv	Irregular low ironstone hills with stony lower slopes supporting mulga shrublands
Violet	279Vi	Undulating stony and gravelly plains and low rises supporting mulga shrublands

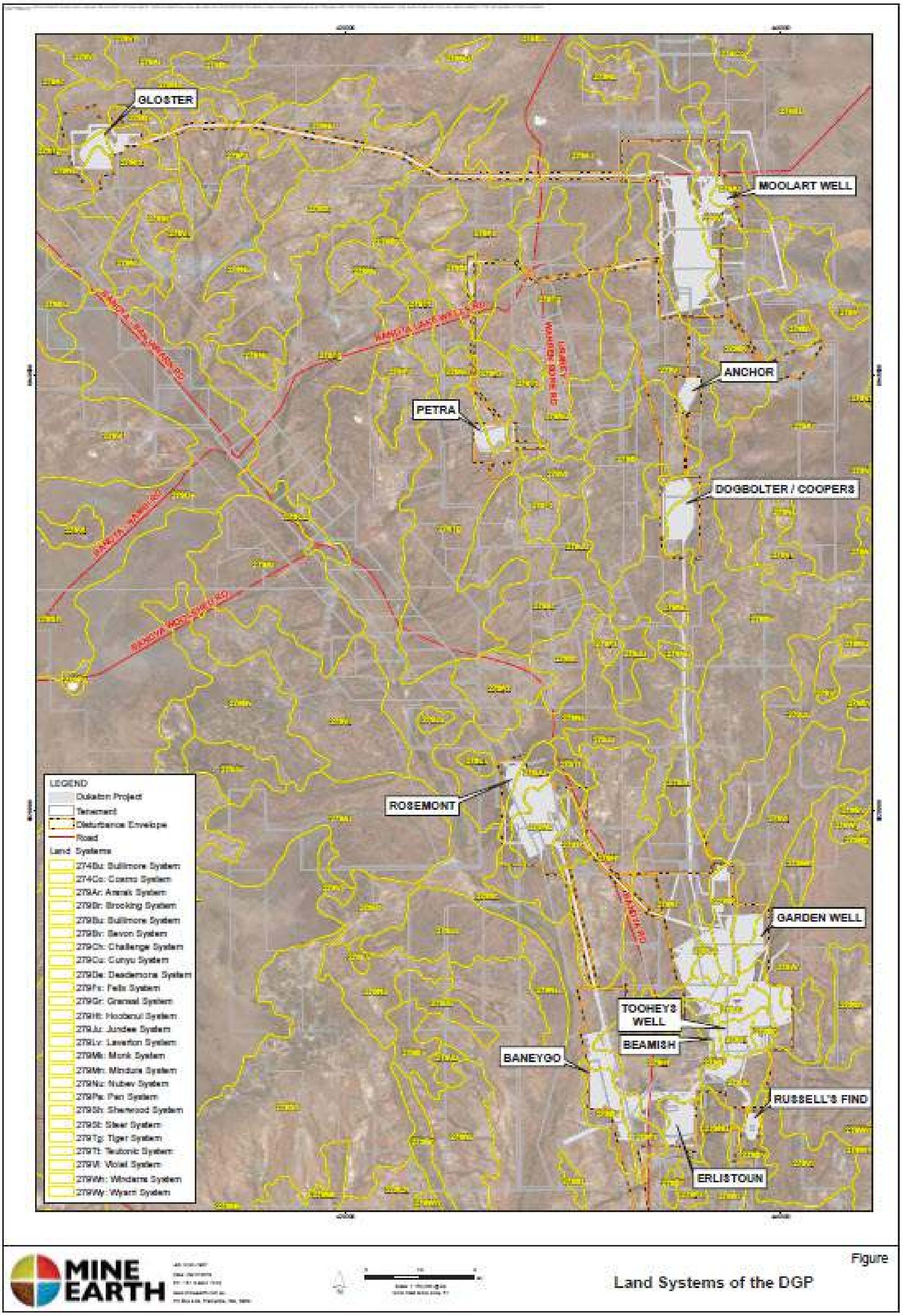

Figure 5 Land Systems of the DGP

7.4. FLORA AND FAUNA

7.4.1. FLORA

The De La Poer Range Nature Reserve is located approximately 20 km north-east of Moolart Well. The nature reserve is vested to the Conservation Commission of WA for the purposes of conservation of flora and fauna. There are no other registered conservation areas within 50 km of the DGP.

A level 2 flora and vegetation assessment was conducted for the Moolart Well and Dogbolter operations by OES (2007). A total of 26 vegetation associations were identified across the Moolart Well and Dogbolter operations areas. These vegetation types were considered relatively widespread across the north-eastern Goldfields region and the majority are present within the conservation reserves of the Goldfields and Murchison. Two Priority 3 species (*Phyllanthus baeckeoides* and *Calytrix praecipua*) and one Priority 4 species (*Eremophila pungens*) were identified in the Moolart Well and Dogbolter operations areas. *Eremophila pungens* (an estimated 922 plants) was located within the proposed disturbance areas. The local population of this species was estimated to be in the thousands. An additional 12 plants of *Calytrix praecipua* were located within the Dogbolter operations disturbance areas. A second population of 20 plants was located outside of the proposed disturbance areas. OES (2007) noted that mulga species present at the operations were particularly susceptible to changes in surface hydrology which may require management.

A supplementary flora and vegetation survey was conducted in 2021 along the eastern edge of the Moolart Well operational area to accommodate potential MLW TSF3 options along the eastern boundary of the operational area (Mattiske Consulting Pty Ltd 2021). The survey recorded 56 flora species from 24 genera dominated by *Acacia* and *Eremophila* species. The Priority 4 taxon *Eremophila pungens* was recorded in three locations. No introduced flora species were recorded in the survey area.

Seven vegetation communities were mapped in the survey area, with the dominant community being Ash11 (*Acacia aneura* /*Acacia ayersiana* tall sparse shrubland over *Triodia scariosa* grassland which occurred on clay soil flats) which occupied 44.1% of the survey area. The vegetation communities present are consistent with pre-European vegetation associations and are similar to those mapped previously at Moolart Well and adjacent surveys. The survey concluded “there do not appear to be any floristic or vegetative concerns within the survey area to inhibit the progress of mining operations. It is however recommended that operations avoid areas containing *Eremophila pungens*, where possible, to minimise impacts to the species” (Mattiske Consulting Pty Ltd 2021).

7.4.2. FAUNA

A level 2 fauna assessment for the Moolart Well and Dogbolter operations was completed in 2008 (Coffey Environments, 2008). Three major fauna habitats were identified at the operations; mulga woodland on a sandy-clay substrate, mulga woodland on a sandy-clay substrate, spinifex with an over-storey of shrubs and small trees on a sandy substrate, and spinifex with an over-storey of eucalyptus. From a fauna perspective, areas vegetated with spinifex were described as having very good or excellent condition, whereas much of the Mulga woodland was degraded by cattle. All vertebrate fauna species recorded in the Moolart Well area were wide-ranging and have been recorded in various other surveys in the bioregion. There was a relatively high abundance of reptiles in habitat vegetated with spinifex however the number of mammals trapped was low. Coffey Environments (2008) determined that the impact of the clearing will be localised when placed in a regional context and that on a regional scale the proposed disturbance is unlikely to result in a significant loss of fauna and fauna habitat.

During the assessment, Coffey Environments (2008) recorded the former Vulnerable now Priority 4 taxon Mulgara (*Dasycercus cristicauda*).

Although not recorded within the surveys, Coffey Environments (2008) assessed that the Migratory species Oriental Plover (*Charandrius veredus*) and Fork-tailed Swift (*Apus pacificus*) along with the Other Specially protected Peregrine Falcon (*Falco peregrinus*) may infrequently be present in the general area.

Coffey Environments (2008) believed that the disturbance associated with the Moolart Well and Dogbolter operations were unlikely to impact upon the birds as they will readily move to adjacent areas if they are disturbed and that there is sufficient suitable habitat in the adjacent areas. One Mulgara was caught at the site and an active Mulgara burrow was located in the proposed borefield area.

7.4.3. SUBTERRANEAN FAUNA

A subterranean fauna survey was undertaken at the Moolart Well site (Bennelongia, 2007). The survey aimed to assess the impact upon subterranean fauna from the development of Moolart Well and from abstraction for the associated water requirements. The primary potential impact to subterranean fauna was considered to be via water abstraction for the processing plant; with some potential impact associated with open pit development. A total of 25 stygofauna taxa were collected; of these four species were found only in impacted bores within the water supply calcrete (three undescribed harpacticoid copepods and one syncarid *Bathynella* sp. B1). No species was restricted to the pit shell. Bennelongia (2007) determined that the conservation status of the three copepod species was unclear but unlikely to be restricted to one calcrete unit. Little information was available as to the distribution of this family primarily due to taxonomic work being deferred pending an overall revision of the family. No troglofauna were located within the bores in the mine pit area at Moolart Well. Bennelongia (2007) concluded that the Moolart Well operation posed little risk to subterranean fauna communities.

7.5. HYDROLOGY

7.5.1. SURFACE WATER

Drainage in the area of the Moolart Well project area grades to the north and a salt lake system several kilometres to the north of the Moolart Well camp. There are three catchments in the MLW TSF3 site area, with an eastern catchment that drains from a ridgeline near the plant and flows to the east of the existing MLWTSF1, a central catchment that drains north from near the plant to the west of existing MLW TSF1, and west of the camp. A surface water study was prepared by Carrick Consulting (WA) Pty Ltd (2021) for design MLW TSF3. The eastern ephemeral drainage was of particular focus for selection of options for MLW TSF3 (Figure 6). The final footprint for MLW TSF3 straddles and almost entirely occupies two minor internal catchment areas which both drain away from MLW TSF3 (northwest catchment area 0.22 km^2 and southwest catchment area 0.78 km^2). The main catchment in the area originates to the south of the pit area and is diverted to the west around the pit area and runs immediately to the east of the airport runway.

7.5.2. GROUNDWATER

Two investigation bores constructed within the MLW TSF1 area were measured prior to MLW TSF1 development (ATC 2017). The stratigraphy in the investigation bores comprised surface soil at 1-5 m, Ferricrete at 1-5 m and weathered basement at 5-20+ m. Groundwater was inferred at depths of approximately 18 m to 20 m, hosted within fractured basement sequences.

The estimated permeability values of the encountered stratigraphy in TSF1 were $1x10^{-7}$ m/s (surface soil), $1x10^{-7}$ m/s (Ferricrete) and $9x10^{-7}$ m/s (weathered basement). Further drilling and permeability testing as part of the recent investigations for MLW TSF3 indicated typical permeability values between 10^{-6} to 10^{-7} m/s for depths to 15 m below ground level.

Groundwater salinity is generally 1,000 mg/L to 2,200 mg/L and was considered potable to brackish. In some instances groundwater can reach 5,000 mg/L. Groundwater movement would typically be sympathetic with topography, flowing towards Lake Wells/Lake Carnegie.

7.6. CLIMATE

The project area has a semi-arid climate with hot summers and mild to cool winters (Cowan 2001). The closet BoM station is at Laverton (No. 012045) and has recorded a mean annual rainfall of 235.2 mm (BOM 2022). The evaporation rate for the area exceeds the annual rainfall by a factor of 15 at 3,746 mm (Luke et al., 1987). BOM 2016 data indicates that a 1:100 year annual exceedance probability (AEP) event of 72 hours would be 185 mm.

A Probable Maximum Precipitation (PMP) storm event of three hours would be 750 mm (BOM 2003). The 100 and 1,000 year average recurrence interval (ARI) rainfall events are presented in Table 6. ARI rainfall events were determined using the BOM's (2017) 2016 Intensity-Frequency-Duration tool.

Table 6 100 and 1,000 year ARI rainfall events

Duration	100-year ARI	1000-year ARI
24 hours	**140 mm**	**217 mm**
72 hours	**185 mm**	**305 mm**

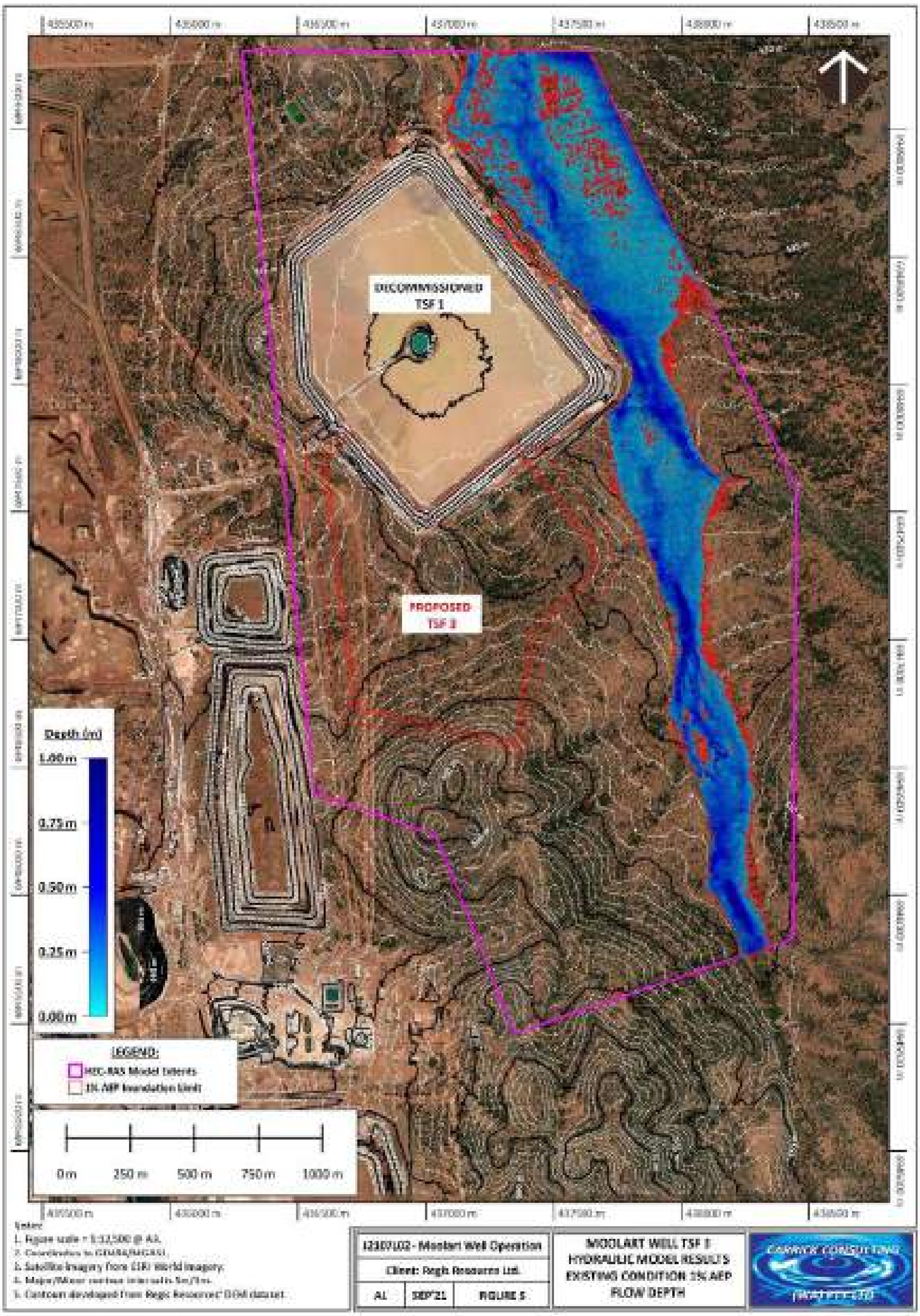

Figure 6 1% AEP Flood Modelling for MLW TSF3

[redacted]

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10. APPENDICES

10.1. MLW TSF3 DESIGN REPORT – CMW GEOSCIENCES 2021

10.2. MLW TSF3 DESIGN FIGURES