27 January 2026

Mt Ida Gold Project, WA

DESIGN OF IWLTSF STAGE 6 TO STAGE 8 RAISES

Aurenne Mt Ida Pty Ltd

Job No. PER2025-0260AB | Version 1

Perth
Suite 1 | Level 3
29 Flynn Street
Wembley WA 6014
Australia

Ph: +61 8 6555 4920

www.cmwgeosciences.com

[redacted]

Review and Update History

Revision	Date	Comments
A	18 September 2025	Initial draft for internal review
A	22 September 2025	Issue for client comment
0	12 January 2026	Issue as final
1	27 January 2026	Included latest comment

CONTENTS

Appendices

Figures

Tables

1.0 EXECUTIVE SUMMARY

CMW Geosciences Pty Ltd (CMW) has prepared this report to support an application by Aurenne Mt Ida Pty Ltd (Aurenne) for regulatory approval from the Department of Local Government , Industry Regulation and Safety (LGIRS / DMPE) and the Department of Water and Environmental Regulation (DWER) for the staged raising of Integrated Waste Landform Tailings Storage Facility (IWLTSF) at the Mt Ida Gold Project (MIGP), Western Australia.

The MIGP is located approximately 100 km northwest of Menzies in the Goldfields region. IWLTSF is a single-cell, circular facility centred at MGA Zone 51 coordinates 6,772,578 mS and 252,515 mE, approximately 725 m east of the Southwark and Emu pits and 800 m north of the mill site. The facility was initially designed in 2020 and Stage 1 was constructed in 2023, with subsequent raises (Stage 2 and Stage 3) completed in 2024 and 2025. During the preparation of this design report, the construction of Stage 4 and Stage 5 was completed, the crest level of the IWLTSF is now sitting at RL 510m.

The current design proposes three additional raises comprising lifts of 3 m, 3 m, and 4 m in height to achieve a final crest level of RL520 m AHD. This will increase the maximum embankment height to approximately 32 m and provide an additional storage capacity of 3.4 Mm^3, extending the operational life of the facility. Tailings production is forecast at 2.7 Mtpa, with deposition at 60% solids and a dry density of 1.5–1.6 t/m^3.

The embankments will be constructed as zoned structures, with an upstream low-permeability compacted clayey mine waste zone and a downstream traffic-compacted mine waste zone. Slopes are 1V:2H upstream and 1V:3H downstream, with a minimum crest width of 13 m. Water will be recovered via a central decant system with a minimum recovery capacity of 4,932 m^3/day (206 tph), and returned directly to the process plant. Minimum freeboard requirements of 0.7 m, including operational, beach, and storm storage allowances.

Seepage modelling indicates low seepage rates of approximately 21 m^3/day, while stability analyses confirm adequate safety factors with FoS values above recommended thresholds for drained, undrained, and post-seismic cases. A dam break assessment indicated a worst-case release volume of approximately 5.15 Mm^3 under probable maximum precipitation conditions, with inundation risk primarily affecting the mill area south of the facility. The probability of such failure is considered very low given the provision of adequate freeboard, embankment design, and pond management requirements. In accordance with LGIRS (2013) and ANCOLD (2019), IWLTSF has been assigned a 'High, Category 1' hazard rating and a 'High C' consequence category, with a population at risk of between 10 and 100, primarily mine personnel.

The closure objectives for the IWLTSF are to leave the facility in a safe, stable, erosion resistant and non-polluting state.

- Downstream slopes of the IWLTSF perimeter embankments will be rehabilitated. The maximum slope angle will be approximately 1(V): 3(H) plus a 17 m wide intermediate bench thus an overall slope angle of 1(V): 3.6(H).
- The decant structure will be decommissioned, and the areas 'sealed'.
- The tailings top surface will be covered with a layer of non-acid forming (NAF) oxide, transition or fresh mine waste for a minimum thickness of 0.5 m (to be validated with field trials).
- Topsoil to suit local flora species will be applied as part of the cover works.

Aurenne as the operator of the IWLTSF makes the following commitments:

- The TSF will be constructed in accordance with the specifications and drawings.
- Reference to the Operations Manuals must be made for the operation, maintenance, and monitoring of the TSF. This should include the instrumentation monitoring program associated with the TSF.

- 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.
- Independent audits will be performed annually as a minimum. The material parameters adopted in the analyses should be confirmed during the life of the TSF by undertaking suitable in-situ and laboratory testing. The stability analyses are to be updated based on these future assessments. A detailed rehabilitation/decommissioning plan will be prepared prior to the decommissioning of the facility. The plan will include, where appropriate, other studies made in consultation with relevant stakeholders.

2.0 INTRODUCTION

This report provides a detailed design for the future staged raisings of Integrated Waste Landform Tailings Storage Facility (IWLTSF) at the Mt Ida Gold Project (MIGP), located approximately 100 km northwest of Menzies, Western Australia. The proposed raises include 3 m lifts for Stages 6 and 7, and a 4 m lift for Stage 8, with the final elevation reaching RL 520 m.

The MIGP is part of the 360 km² Mt Ida Project, owned and operated by Aurenne Mt Ida Pty Ltd (Aurenne). IWLTSF is situated on Exploration Lease E29/921-1, to the east of Mining Leases M29/150 and M29/151. It lies approximately 725 m east of the Southwark and Emu pits, and 800 m north of the mill site. The approximate centre of IWLTSFis located at MGA Zone 51 coordinates: 6,772,544 m South and 252,479 m East.

A layout plan showing the location of IWLTSF in relation to mine tenement boundaries and operations is provided in Figure 1.

CMW previously assisted Aurenne with the design of IWLTSF in 2020, as documented in report ref. PER2020-0443AB Rev 3 dated 13 June 2022 (CMW 2022). This included the design and construction of the starter embankment (Stage 1), as well as subsequent Stage 2 to Stage 5 embankment raises.

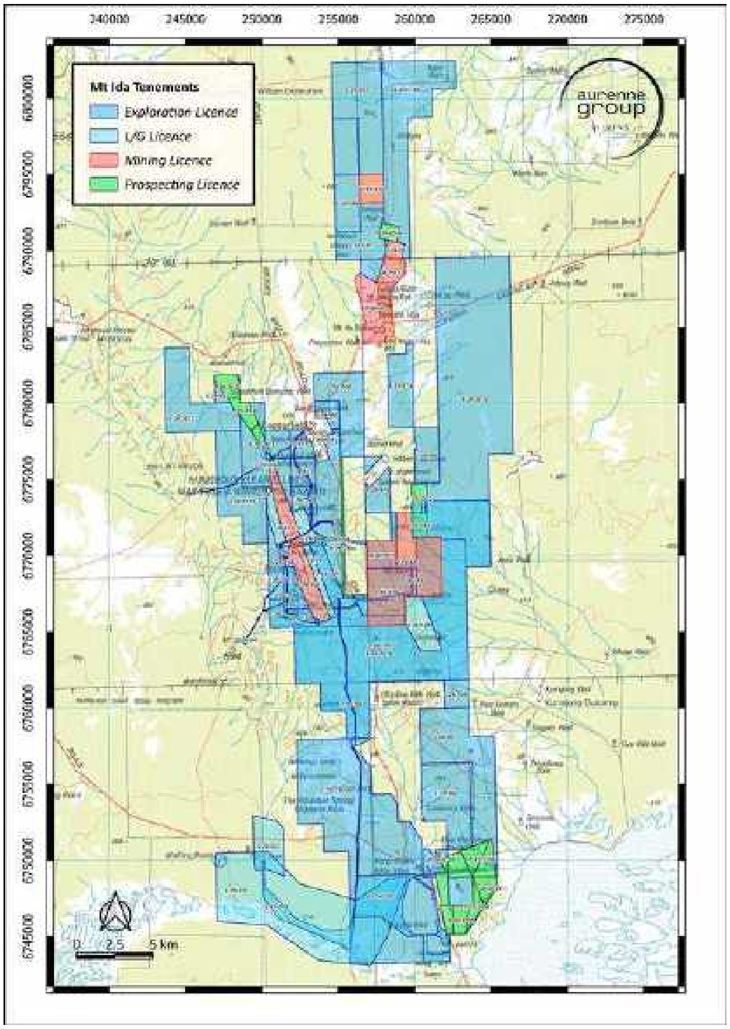


Figure 1: The extent of IWL

2.1 Design Codes/Standards/Guidelines

The design has been conducted in general accordance with the following guidelines:

- Department of Mines and Petroleum (2013), ‘Code of practice: tailings storage facilities in Western Australia’.
- Department of Mines and Petroleum (2015), ‘Guide to the preparation of a design report for tailings storage facilities (IWLs)’.

In addition to the LGIRS / DMPE documents above, the design presented in this report has been undertaken using ANCOLD Guidelines (2019) ‘Guidelines on Tailings Dams – Planning, Design, Construction, Operation and Closure’. The consequence category will determine the water management requirements (e.g., freeboard and stormwater storage capacity) and the geotechnical embankment design requirements.

3.0 BACKGROUND INFORMATION

The Mt Ida Gold Project (MIGP) is located approximately 100 km northwest of Menzies, Western Australia. It comprises ten deposits across two regions: Bottle Creek (Emu, Southwark, Cascade, VB North, VB, and Boags) and Mt Ida (Tim’s Find, Shepards Bush, Forrest Belle, and Boudie Rat).

Site infrastructure includes a gold processing plant, offices, accommodation camp, aerodrome, and the Integrated Waste Landform Tailings Storage Facility (IWLTSF).

IWLTSF was designed by CMW in 2020 (report ref. PER2020-0443AB Rev 3, dated 13 June 2022) and constructed in stages: Starter Stage 1 (Crest level at RL 498m) to Stage 5 (Crest level at RL 510m). It is a circular, single-cell IWLTSF located on Mining Lease M29/151, centred at MGA Zone 51J coordinates 6,772,578 mS and 252,515 mE. From Stage 1 to Stage 5 the facility was designed to store approximately 4 Mm^3 (6 Mt) of tailings over a six-year life, based on an ore processing rate of 1.2 Mtpa, a minimum in-situ dry density of 1.5 t/m^3, and a 1% beach slope. The tailings annual throughput is planned to increase to 2.5 Mtpa from early 2026.

IWLTSF is located approximately 725 m east of the Southwark and Emu pits, each about 750 m long. Further south, the VB and Boags pits (approximately 1,300 m and 700 m long, respectively) are separated by Bottle Creek. Tailings from current operations will be deposited in IWLTSF, with construction materials expected to be sourced from the Southwark and Emu pits.

No spillways are required during operations or closure of IWLTSF. Stormwater from major rainfall events will be temporarily stored within the basin and evaporated from the surface. A 1:100 AEP, with a 72-hour rainfall depth of 228 mm, was adopted for stormwater storage design.

IWLTSF is designed as a ‘High C’ consequence category facility in accordance with ANCOLD (2019) guidelines. Freeboard and wave run-up under 1:10 AEP winds were considered, but the 1% beach slope and perimeter deposition are expected to prevent wave action from reaching the embankments. Stormwater from major events will be temporarily stored, with a 1:100 AEP, 72-hour rainfall depth of 228 mm used in the design`.

Based on the DMP Code of Practice (2013) and ANCOLD (2019), TSF1 has a hazard rating of ‘High’, Category 1, and a damage level of ‘Medium’. With a population at risk ranging from 10 to 100, the overall consequence category remains ‘High C’.

3.1 Design and Construction Activities – History

The following section provides a chronological overview of IWLTSF's history. The information is included in each annual surveillance report for completeness and continuity purposes and remains unchanged except for the current year’s activities.

3.1.1 Design History and Reports

CMW carried out the initial geotechnical investigation for the tailings facility in December 2020 and April 2021. A geotechnical report summarising the findings was issued on 2 November 2021, following two earlier submissions of the factual report, Rev 1 on 4 May 2021 and a final version on 2 November 2021.

The original design report titled “Integrated Waste Landform Tailings Storage Facility” was completed by CMW on 13 June 2022, detailing a facility designed to store 6 Mt of tailings over six years, based on an ore processing rate of 1.2 Mtpa and a minimum in-situ dry density of 1.5 t/m³.

On the same date, CMW issued supporting documents, including:

- An Operations Manual, outlining procedures for tailings deposition, decant pump operation, and routine inspection and maintenance.
- A Scope of Works for Embankment Construction, specifying requirements to achieve the design grades shown in the construction drawings.
- Emergency action plan, defining the responsibilities and actions required to ensure an appropriate response to and management of any emergency at the project site.

Subsequent construction reporting has included:

- Stage 1 construction completion report (May 2023), reaching a crest level of RL498 m AHD.
- Earthworks Completion Report (August 2024) for the Stage 2 Raise to RL501 m AHD.
- Construction Completion Report (April 2025) for Stage 3 Raise, from RL501 m to RL504 m, completed in March 2025.
- Construction Completion Report (January 2026) for Stage 4 Raise, from RL504 m to RL507 m, completed in August 2025.
- Construction Completion Report (January 2026) for Stage 5 Raise, from RL507 m to RL510 m, practical completed in November 2025.

3.1.2 Stages 1 – 5

Table 1 Summarises staged construction information.

Table 1: Staged Construction Information

Stage	RL (m AHD)	Design report date	Start date of construction	End date of construction	Construction report
1	498	13 June 2022	Early 2023	May 2023	Integrated Waste Landform (IWL) TSF – Construction Completion Report (CMW, May 2023)
2	501	20 February 2024	Early 2024	July 2024	IWL TSF Stage 2 Raise – Construction Completion Report (CMW, August 2024)
3	504	20 February 2024 (updated 15 May 2024)	Late 2024	March 2025	IWL TSF Stage 3 Raise – Construction Completion Report (CMW, April 2025)
4	507	20 February 2024 (updated 15 May 2024)	April 2025	August 2025	IWL TSF Stage 4 Raise – Construction Completion Report (CMW, January 2026)
5	510	20 February 2024 (updated 15 May 2024)	August 2025	November 2025	IWL TSF Stage 5 Raise – Construction Completion Report (CMW, January 2026)

3.1.3 Stage 1 Starter Embankment Construction

Stage 1 construction of the starter embankment was completed to RL498 m AHD in May 2023, with a maximum embankment height of approximately 10 m and a footprint of around 105 ha. The embankment incorporates a cut-off trench excavated to refusal on Ferricrete (Wiluna Hardpan) to reduce seepage losses. An underdrainage system was installed adjacent to the upstream toe, comprising two Megaflo 300 lines with a combined capacity of 3 L/s. The embankment was constructed using zoned materials: Zone 1 (low-permeability clayey/silty mine waste) sourced from the Emu/Southwark pits, and Zone 2 (traffic-compacted mine waste) forming the bulk of the structure. Slopes are 1V:2H upstream and 1V:3H downstream, with a minimum crest width of 13 m. Construction was undertaken by APS Mining and Civil, with operator support from Aurenne. A decant tower and pump system were installed for water recovery, accessed via a causeway with 1V:1.5H slopes and a 6 m crest width.

3.1.4 2024 Activities – Stage 2 Raise Construction

Stage 2 construction commenced in early 2024 and was completed in July 2024, raising the embankment by 3 m to RL501 m AHD and expanding the footprint to approximately 108 ha. The embankment design replicated Stage 1, with zoned construction and materials sourced from the Emu/Southwark pits. A 2 m bench was incorporated on the upstream face to support perimeter tailings slurry pipeline operations. Aurenne managed construction and survey works. The works were documented in CMW's Stage 2 Raise – Construction Completion Report, dated August 2024.

3.1.5 2025 Activities – Stage 3 Raise Construction

Stage 3 construction commenced in late 2024 and reached practical completion in March 2025, raising the embankment from RL 501 m to RL 504 m AHD and increasing the footprint to approximately 111 ha. The design and construction approach mirrored Stage 2, including the upstream bench for pipeline operations.

Aurenne internally managed construction and survey works. The works were documented in CMW's Stage 3 Raise – Construction Completion Report, dated April 2025.

3.1.6 2025 Activities – Stage 4 Raise Construction

Stage 4 construction commenced in April 2025 and reached practical completion in August 2025, raising the embankment from RL 504 m to RL 507 m AHD and increasing the footprint to approximately 114 ha. The design and construction approach mirrored Stage 3, including the upstream bench for pipeline operations. Aurenne internally managed construction and survey works. The works were documented in CMW's Stage 4 Raise – Construction Completion Report, dated January 2026.

3.1.7 2025 Activities – Stage 5 Raise Construction

Stage 5 construction commenced in conjunction with Stage 4 construction and reached practical completion in November 2025, raising the embankment from RL 507 m to RL 510 m AHD and increasing the footprint to approximately 117 ha. The design and construction approach mirrored Stage 4, including the upstream bench for pipeline operations. Aurenne internally managed construction and survey works. The works were documented in CMW's Stage 5 Raise – Construction Completion Report, dated January 2026.

3.2 Tailings Production

Table 2 Summarises tailings production information since the commencement of operations in 2023.

Table 2: Tailing Production Parameters

Year	Ore Production (tonnes)	Tailings Solids to Tailings Dam (tonnes)	Cumulative Tailings Solids to TD (tonnes)	Average Slurry Density (%)	Estimated Water Tonnage (tonnes)	Estimated Slurry Weight (tonnes)
2023 – 2024	1,206,685	776,179	776,179	45	947,526	1,723,705
2024 – 2025	1,690,000	1,572,031	1,572,031	48.5	1,712,135	3,284,166
2025 – ongoing	2,146,200	1,095,591	1,095,591	43.8	1,401,553	2,497,144

A further increase to 2.5 Mtpa is planned from early to mid-next year. The installation of a tailings thickener has also been proposed, which would deliver tailings at 60% solids, compared with the current 45%. These updated throughput and solids concentration parameters have been incorporated into this design report.

4.0 TENURE AND SITE CONDITION

The IWL and associated infrastructure fit within the tenement boundaries as shown in Figure 2 below.

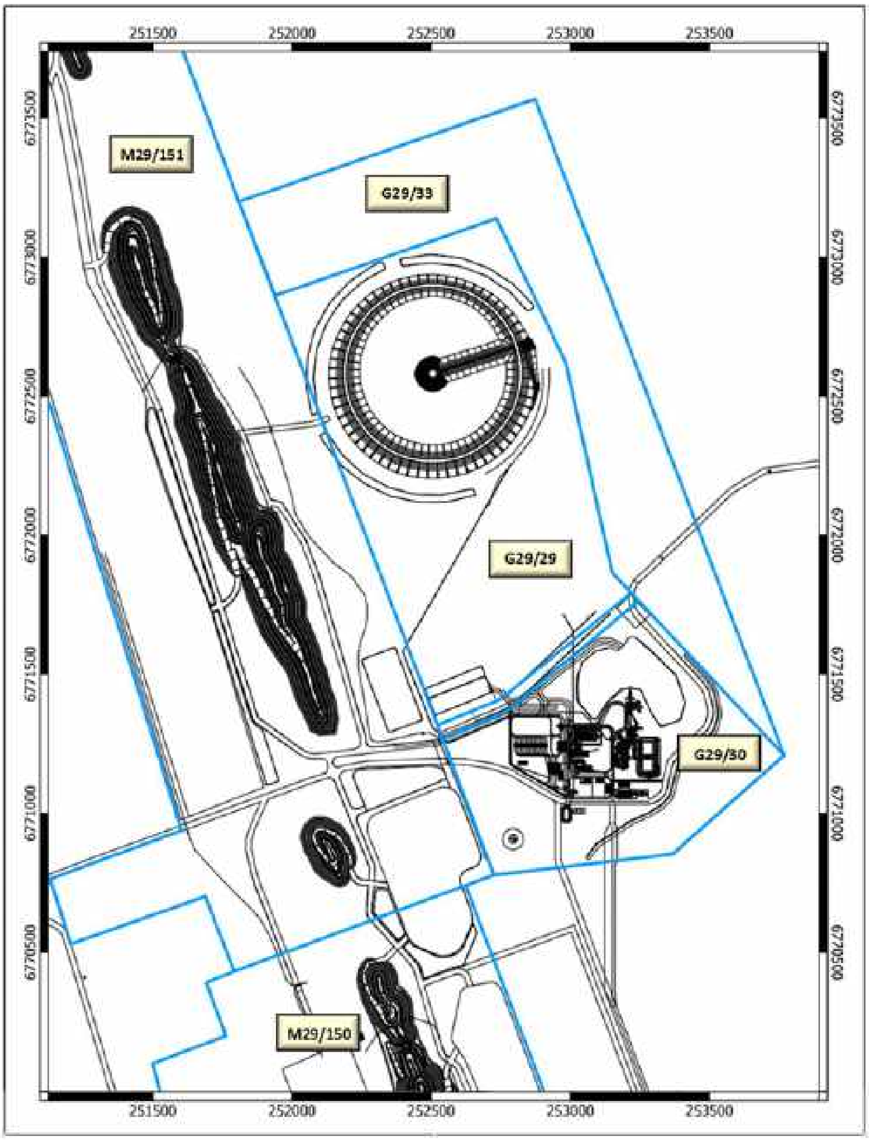


Figure 2: The Extent of IWLTSF

4.1 Climate

The project area has a semi-arid climate. The area has hot summers and mild winters. The following data has been utilised in the design.

- Mean annual rainfall of 270.5 mm (BOM data for Station 012205 (Riverina), closest to Mt Ida Gold Project).
- Mean annual evaporation of between 2,750 mm (BOM image – Average Pan Evaporation (Annual)) to 3,000 mm (BOM Technical Note 65).
- Annual evapotranspiration of 2,000 mm (BOM data for Kalgoorlie-Boulder Airport for 2020).

- 1:100 yr AEP 72-hour event, 228 mm (refer: Commonwealth of Australia Bureau of Meteorology (BOM) for Latitude 29.1625 (S) Longitude 120.4625 (E)).
- Probable Maximum Precipitation (PMP) storm event, 4.5 hrs duration of 640 mm (BOM (2002) 'The Estimation of Probable Maximum Precipitation in Australia: Generalised Short-Duration Method').

4.2 Surface Conditions

The topography of the project area is gradually sloping from approximately RL 500 m to RL 488 m AHD from the northeast to the south. Originally the site was predominantly an open woodland comprising small to medium mallee trees, scattered shrubs, and perennial grasses. To the east of the site, numerous drainage lines are meandering south.

4.3 Geology

According to the surface geology detailed on the 1:100,000 Geological Series Map of Mount Mason, the geology of the site comprises granitic plains to the west and basalts to the east separated by a narrow strip of Banded Iron Formation (BIF) beds. The Archaean granite batholith intrusion has caused the BIF to dip about 30° to the east, leaving the BIF as a dominant range of hills trending north-north-westerly. The basalts have undergone various degrees of alteration, producing mafic schists and associated greenstone mineralised zones. Ferruginous gravel and reworked duricrust, which overlays a laterite duricrust, covers an extensive area. There are scattered outcrops of various rock types, except the soft mafic schists. The project area is made up of two principal landforms. Alluvial flats along the drainage courses have generally shallow (1 m), red, earthy loams to sands over red-brown hardpan.

4.4 Hydrology

The hydrology of the Mt Ida Gold Project including the IWL area of BGCP was established by reviewing the 'Bottle Creek Surface Water Assessment' by Hydrologia (Hydrologia 2021) and the 'Groundwater Assessment' by Pendragon Environmental Solutions (PES 2021).

The studies suggested the project area locality lies in the headwaters of Mt Ida Gold Project Bottle Creek that drains to Lake Ballard, located approximately 20 km to the south east of the project area. In proximity to the project, Mt Ida Gold Project Bottle Creek drains from low hills (i.e. the catchment boundary) and has a defined drainage network; however, further downstream, east and south-east of the mine, Mt Ida Gold Project Bottle Creek and other drainage features dissipate on a broad wash plain above Lake Ballard. No major drainage diversions are required as part of IWLTSF.

4.5 Sub-surface and Foundations

CMW carried out geotechnical investigations of the proposed IWL from 15 to 16 December 2020 and from 20 to 22 April 2021. The scope of fieldwork completed was as follows:

- A walkover survey of the site to assess the general landform, site conditions and geology of the three open pits (Emu, VB & Boag);
- Nine test pits, denoted TP01 to TP13 (Note: we had originally planned to complete 13 test pits, however due to access constraints were only able to complete 9), were excavated in the footprint of the proposed IWL using a small excavator;
- Collect bulk samples from the walls of the Emu Pit which is proposed to be the source of waste for the IWL for subsequent laboratory testing;
- Four reverse circulation (RC) drilled boreholes within the proposed IWL storage to a maximum depth of 21.5 m, with in-situ falling head tests in each of the borehole.

Engineering logs and photographs of the test pits are presented in the geotechnical investigation report, included as Appendix C in this report.

The encountered sub-surface profiles across the proposed IWLTSF site can be generalised to the following subsurface sequences:

SANDY CLAY-GRAVEL (CI-CH): red-brown, medium to high plasticity; gravel lateritic, ferruginous, pale grey, fine, angular to subangular; sand fine to coarse grained, angular to subangular; moderately cemented; Colluvial.

FERRICRETE: retrieved as Sandy Clayey GRAVEL (GC); red-brown, high plasticity; gravel lateritic, ferruginous, fine, subrounded to rounded; sand fine to coarse grained, angular to subangular; generally, well cemented; Laterite.

RESIDUAL: retrieved as CLAY-SILT (CH); pale red in the upper layer, grading to white in the lower layer; metamorphosed mafic rock dominant with an intrusion of ultramafic sequence.

Based on the results of the investigations, the following was adopted in design:

- Following topsoil stripping, the basin area of the IWL decant comprising clayey sands will be compacted to a depth of 0.3 m.
- A cut-off trench, to nominally 0.5 m to 1 m below ground level (bgl) on Wiluna Hardpan has been included in the embankment design to reduce horizontal seepage losses.
- An underdrainage system has been included in the design in order to recover leachate from the tailings in the southern section of the IWLTSF.

4.6 Seismicity

The project area is located in a region of low seismic risk. An Operating Basis Earthquake (OBE) of 0.06g, derived from AS 1170.4 (2007) for a 1:475-year AEP applicable to the 'High C' consequence category, has been used in the seismic design of the embankments. The corresponding Maximum Design Earthquake (MDE), also referred to as the Safety Evaluation Earthquake (SEE), is 0.10g for a 1:2,000-year AEP, based on a probability factor (kp) of 1.7.

4.7 Hydrogeology

This hydrogeology summary is referenced from the 'Groundwater Assessment' by Pendragon Environmental Solutions (PES 2021), which have taken into consideration the preceding studies by Groundwater Development Services (GDS 2019) and Golder Associates (Golder 1988 and 1989).

The Mt Ida Project including the IWL area of BGCP lies within the Rebecca and Raeside subareas of the Goldfields which include fractured rock and paleochannel aquifers. Groundwater across the region occurs in basins of weathering and shear/fracture systems, which vary in vertical and lateral extent, and which may be compartmentalised on a regional scale where there is little if any hydraulic connection between the different compartments. Consequently, groundwater is likely to move or drain very slowly and may be considered stagnant.

Groundwater levels vary between 26 metres below ground level (mbgl) and 44 mbgl (GDS 2019). The groundwater levels varied between 30 m and 40 mbgl between 1988 and 1989 (Golder 1988 and 1989).

Groundwater qualities generally are considered poor due to low rainfall and large evaporation, and generally is non-potable and unsuitable for stock watering if untreated. Groundwater and open pit waters may be classified as saline to highly saline (i.e. close to the 35,000 mg/L threshold for brines). Groundwater has alkaline pH of between 7.6 and 8.0 with the open pits being particularly highly alkaline at a pH of around 8.2.

The groundwater generally has low dissolved metal concentrations with occasional and sporadic elevated concentrations of Arsenic particularly in the existing open pits, and elevated concentrations of Total Dissolved Solids (TDS) comprising predominantly of chloride, sodium, sulfate and potassium. The dominant sodium chloride character is indicative of a rather stagnant groundwater regime receiving little recharge from rain.

4.8 Retaining Structure Properties

The IWL embankments will be constructed out of waste sourced from mining operations. The perimeter embankment will be zoned with an upstream zone of clay mine waste materials and a downstream zone of mine waste.

The clayey mine waste material to be used in the upstream zone will predominantly be clayey gravels and clayey saprolite materials below the laterite /hardpan zones within the pit(s). Visual assessment of the pit walls indicated that these materials are resistant to erosion and are non-dispersive.

The clayey materials and mine waste were respectively classified as clayey gravel and well graded mine waste (sandy gravel with cobbles, minor fines) and are considered unlikely to liquefy from dynamic loadings or seismic activities. In order to reduce embankment permeability, the upstream zone clayey material should have a minimum fines content of 20%.

Laboratory tests to determine strength parameters inferred a dense consistency of the clay materials, and mine waste when compacted. Considering the IWL embankments construction will be controlled (e.g. using engineering supervision and QA/QC), material properties as determined in the laboratory can be replicated in the field, and hence were adopted as design properties. In addition, it is expected that as a result erosion and piping mechanisms will be limited.

Appendix D provides the technical specifications for the embankment construction materials.

5.0 BASIS FOR DESIGN

The design basis for the raising of IWLTSF is discussed with Aurenne and list as following:

- Tailings production rate of 2.5 Mtpa
- Tailings slurry density of 60% solids
- Design of staged embankment raising to RL520 m, the current approved crest level RL510 m
- Design in general accordance with ANCOLD Guidelines (2019). The consequence category will determine the water management (e.g. freeboard and stormwater storage capacity required) and geotechnical embankment design requirements.

5.1 Tailings Properties

5.1.1 Tailings Physical Properties

The engineering properties of the tailings adopted for the IWLTSF stages 6, 7 and 8 raise design are summarised in Table 3. The properties were referenced to the lab test results which in Appendix C. The ore types in the future are expected to be similar to previous testing.

Table 3: Tailings Physical Properties

Properties	Tailings	Comment
Soil Particle Density (SG)	2.7 t/m³	From CMW IWL Design Report 2022
Average Slurry Density	60 % Solids	Provided by Aurenne
Tailings Density	In-situ bulk density: 1.66 t/m³ Air-dried density: 1.36 t/m³	Latest Tailings testwork 2026
Moisture content	25%	Assume based on increase % solid of tailings slurry
Particle Size Distribution (PSD)	Tailings classified as non-plastic silt with sand with 97% fines (i.e. material passing the 75-micron sieve).	Latest Tailings testwork 2026
Cohesion	0 kPa	From CMW IWL Design Report 2022
Friction Angle	33°	From CMW IWL Design Report 2022
Hydraulic Conductivity	Tailings: 1×10^{-7} m/s.	From CMW IWL Design Report 2022

5.1.2 Geochemical Characteristics

Geochemical characterisation of the oxide-transitional tailings at Mt Ida indicated that:

- Tailings solids classify as Non-Acid Forming (NAF); having a Sulphur concentration between 0.14% and 0.24% (Chromium Reducible Sulfur, CRS, between 0.023% and 0.026%), acid neutralising capacities between 12.2 and 14.2 kgH2SO4/t and positive net acid production potential.
- Global Abundance Indices calculations suggest that the tailings is enriched by one element only i.e. Arsenic.
- Groundwater sampling events encountered elevated dissolved Arsenic (As3+ based on laboratory speciation analytical data) in water in several open pits and groundwater sources at Mt Ida.
- Laboratory leachates prepared at a pH of 7 and 9 (the current pH level at the IWLTSF) reported elevated concentrations of Aluminium, Arsenic and Copper and Arsenic respectively.

Geochemical characterisation has been undertaken for blended oxide–transitional and fresh sulphide tailings, reflecting proposed deposition for IWLTSF Stages 6 to 8 (Pendragon, 2026). Test results indicate that:

- The blended tailings solids are classified as Acid Forming (AF), with total sulphur contents between 4.6% and 9.0% and Chromium Reducible Sulfur (CRS) values between 2.3% and 4.0%. Acid neutralising capacities range from 10.9 to 11.5 kg H_2SO_4/t, resulting in strongly positive net acid production potentials of between 129 and 265 kg H_2SO_4/t.Samples generally had no excess neutralisation capacity.
- Global Abundance Indices calculations indicate enrichment of Antimony, Arsenic, Cadmium, Lead and Zinc (to a lesser extent).
- Groundwater sampling identified elevated dissolved Arsenic (predominantly As^{3+}) in several open pits and groundwater sources at Mt Ida.
- Laboratory leach testing conducted at pH 5, 7 and 9 (with pH 9 representative of current IWLTSF conditions) reported elevated concentrations of:
    - Aluminium, Arsenic, Lead, Manganese and Nickel at pH 5;
    - Aluminium and Lead at pH 7; and
    - Aluminium and Arsenic at pH 9.

At decommissioning of the IWLTSF, placement of a benign waste rock and topsoil store-and-release cover will be required to limit tailings dusting, support revegetation, and minimise water ingress into the tailings within wth IWLTSF (ie to minimise any acid generation from AF tailings).

6.0 HAZARD RATING AND DESIGN CRITERIA

6.1 Hazard Rating

Based on the DMP Code of Practice (2013), the hazard rating for the IWLTSF has been assessed as 'High' Category 1 based on the following:

- Possible loss of life, Population at Risk (PAR) of ≥10 and <100 (noting the PAR are mine personnel). The potential for tailings to flow > 725 m to the west towards Southwark Pit and Emu Pit operations, and > 800 m to the south towards the processing plant, office, workshop, and campsite operated by ARS;
- Significant impact on business;
- Adverse effects on natural environment, flora and fauna, possible;
- Mine infrastructure economic loss medium, $10M to $100M. No loss of public infrastructure expected;
- Repairs to the IWLTSF would be practicable; and
- Maximum embankment height is 38 m.

Based on the above considerations and Table 1 of ANCOLD (2019), a 'Medium' damage is assigned. It is characterised by loss of infrastructure of the order $10 M to $100 M, significant impacts to business (i.e. the mine), impact area 5 km^2 or less, impact duration less than 5 years and limited effects to native flora and fauna. The consequence category to 'Medium' damage, based on Table 2 of ANCOLD (2019) and with a population at risk (PAR) of ≥10 to <100, is 'High C'.

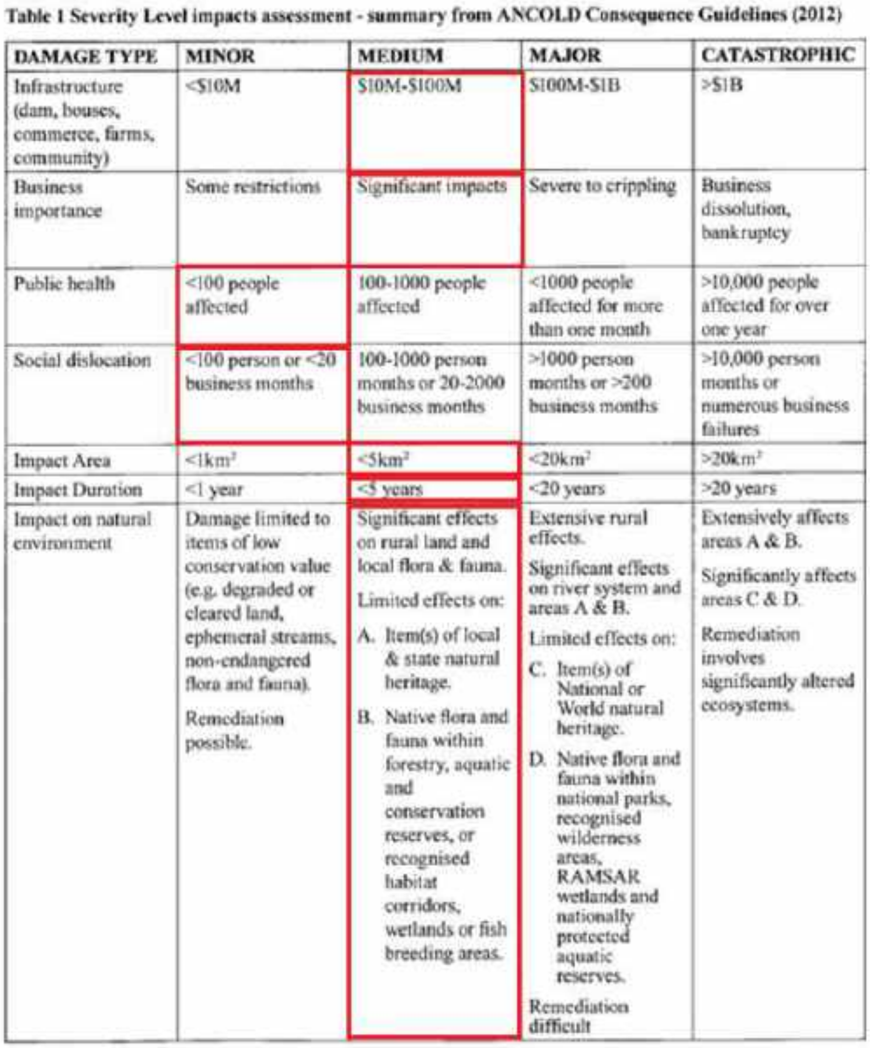
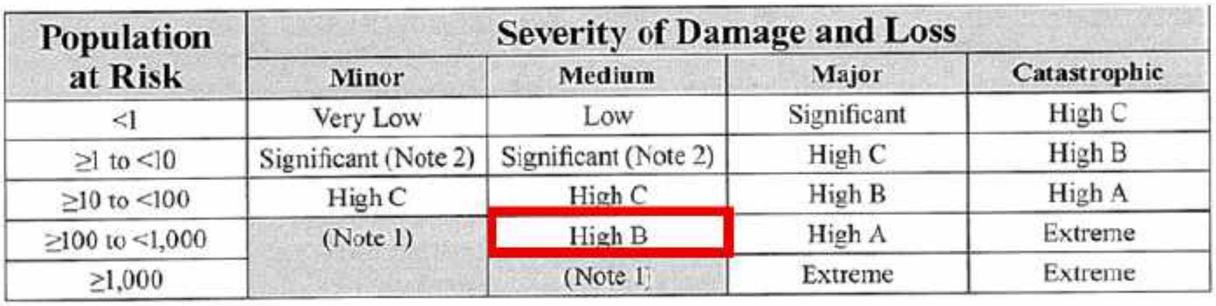


Table 1 Severity Level impacts assessment - summary from ANCOLD Consequence Guidelines (2012)

DAMAGE TYPE	MINOR	MEDIUM	MAJOR	CATASTROPHIC
Infrastructure (dam, houses, commerce, farms, community)	<$10M	$10M-$100M	$100M-$1B	>$1B
Business importance	Some restrictions	Significant impacts	Severe to crippling	Business dissolution, bankruptcy
Public health	<100 people affected	100-1000 people affected	<1000 people affected for more than one month	>10,000 people affected for over one year
Social dislocation	<100 person or <20 business months	100-1000 person months or 20-2000 business months	>1000 person months or >200 business months	>10,000 person months or numerous business failures
Impact Area	<1km²	<5km²	<20km²	>20km²
Impact Duration	<1 year	<5 years	<20 years	>20 years
Impact on natural environment	Damage limited to items of low conservation value (e.g. degraded or cleared land, ephemeral streams, non-endangered flora and fauna). Remediation possible.	Significant effects on rural land and local flora & fauna. Limited effects on: A. Item(s) of local & state natural heritage. B. Native flora and fauna within forestry, aquatic and conservation reserves, or recognised habitat corridors, wetlands or fish breeding areas.	Extensive rural effects. Significant effects on river system and areas A & B. Limited effects on: C. Item(s) of National or World natural heritage. D. Native flora and fauna within national parks, recognised wilderness areas, RAMSAR wetlands and nationally protected aquatic reserves. Remediation difficult	Extensively affects areas A & B. Significantly affects areas C & D. Remediation involves significantly altered ecosystems.

Figure 3: Severity Level impacts assessment – summary from ANCOLD Consequence Guideline (2019[2])



Population at Risk	Severity of Damage and Loss			
	Minor	Medium	Major	Catastrophic
<1	Very Low	Low	Significant	High C
≥1 to <10	Significant (Note 2)	Significant (Note 2)	High C	High B
≥10 to <100	High C	High C	High B	High A
≥100 to <1,000	(Note 1)	High B	High A	Extreme
≥1,000		(Note 1)	Extreme	Extreme

Figure 4: Recommended Consequence Category (2019[2])

6.2 Design Criteria

Based on the hazard rating/consequence category assessment and data supplied by Aurenne, the design criteria adopted in the IWLTSF stages 6, 7 and 8 are summarised in the Table 4.

Table 4: IWLTSF Stage 8 Design Criteria

General	
Production Rate	2.5 Mtpa (by Aurenne)
% Solids	Tailings slurry density of 60% solids.
Density of Tailings (design)	Dry density range: 1.66 t/m³
Average Beach Slope	beach slope of 1%
Design Flood and Freeboard (ANCOLD, 2019[2])	
Design Storm Storage Allowance (DSA)	1 in 100-year AEP, 72-hour storm event
Wave Run-up	1 in 10-year AEP wind
Freeboard	A 300 mm operational + 200 mm beach freeboard
Spillway During Operation	Spillways are not required for this IWLTSF
Spillway Post-Closure	Spillways are not required for this IWLTSF
Diversion Structures During Operation	Not required because IWL is a paddock facility and incident rainfall can be stored on the facility.
Stability (ANCOLD, 2019[2])	
Earthquake Loading	Operation: Operating Basic Earthquake (OBE), 1:475-year AEP (some damage to the dam but no loss in operational integrity) Operation and Active Care Closure: Safety Evaluation Earthquake (SEE), 1:2,000-year AEP (High C) Post-Closure - Maximum Credible Earthquake (MCE), 1:2,000-year AEP
Minimum Factor of Safety (FoS)	Short-term undrained after construction, 1.3 Long-term drained during operations, 1.5 Short-term undrained during operations, 1.5 Post-seismic, 1.0-1.2. 1.0 would be adopted for analysis with lower-bound strength parameters.
Dam Safety Inspection Levels for a TSF Classed 'Significant' (ANCOLD, 2019[2])	
Comprehensive	After the first year of operation, then 5-yearly by Dams Engineer and Specialist
Intermediate	Annual by Dams Engineer
Routine	Twice weekly to weekly by Operations Personnel / Inspector. However, routine daily inspection and appropriate remedial action are recommended.
Special	As required by Dams Engineer and Specialist including: Seepage along downstream slope; Embankment slope failure or settlement; Uncontrolled spills of tailings from IWL TSF1 footprint; and Sustained period where the pond size exceeds the operating size.

General	
Emergency	As required by Dams Engineer

7.0 TAILING DAM DESIGN

7.1 Operation and Design Considerations

The primary design objectives for the raising of IWLTSF are as follows:

- Maximise water recovery by facilitating efficient drainage and return of process water to the plant, thereby enhancing the in-situ dry density of deposited tailings.
- Optimise storage capacity through strategic tailings deposition practices (e.g. cyclic spigotting), which promote higher deposition density and reduce drying times.
- Minimise environmental impact by reducing seepage losses and maximising reuse of recovered water within the processing circuit.

The general arrangement and section details for the IWLTSF raising are shown in Drawings PER2025-0260-101 to PER2025-0260-105(refer to Appendix B). The Scope of Works and Technical Specification Document, including construction schedules and quantities, is provided in Appendix D.

7.2 Embankment Design

The existing IWLTSF is a single-cell, circular facility constructed within a waste dump and was originally developed through five (5) stages to a crest elevation of RL 510 m. A further raising design is now proposed for Stages 6 to 8, comprising three (3) additional embankment raises of approximately 3 m, 3 m, and 4 m, respectively, to achieve a final crest elevation of RL 520 m (Stage 8). The Stage 6–8 raises are designed to provide approximately 3.4 Mm^3 of additional tailings storage capacity, with the maximum embankment height increasing to approximately 32 m.

The embankment of the IWL will be a zoned embankment comprising an upstream zone of low permeability roller compacted clayey mine waste and a downstream zone of traffic compacted mine waste material. The low permeable clay materials (upstream) will be sourced from the oxide zone within the VB and Cascade Pits. Mine waste (downstream zone) will form the bulk of the embankment and will be sourced from mining operations (i.e. various stages of the VB and Cascade Pits). Figure 5 showing a typical embankment cross-section is presented below.

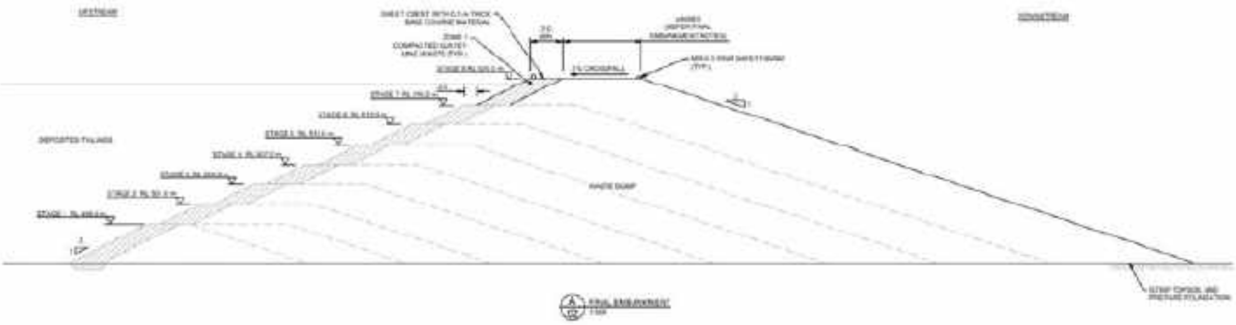


Figure 5: Typical Cross Section IWLTSF Perimeter Embankment

The IWLTSF embankment has design slopes of 1(V):2(H) upstream and 1(V):3(H) downstream, with a minimum crest width of 13 m (upstream and downstream zones). The compacted upstream zone (clay) will have a minimum width of 5 m including the crest of the embankment. Mining vehicles used to carry out construction and maintenance shall be selected to suit dimensions. The upstream embankment crest will have a 2% cross-fall towards the upstream side, 0.5 m (min.) high mine waste safety bund (windrow) at the downstream crest, and above ground tailings pipeline at the upstream crest.

The decant causeway has design slopes of 1:1.5 (V: H) and a nominal 6 m crest width. The crest of the decant causeway will have 0.5 m minimum high windrows on both sides of the accessway. Breaks in the windrow on the low side will allow surface water to run off.

The design geometry of the proposed IWLTSF Embankment construction is presented on drawings in Appendix B.

Key dimensions of IWLTSF are presented in Table 5.

Table 5: Summary of Embankment Geometry

Embankment Geometry	Dimensions
Maximum final embankment height	32
Overall upstream, slope angle	1:2 (v.:h.) plus benches
Overall downstream, slope angle	1:3 (v.:h.)
Embankment Crest Width	6m
Embankment crest level – Stage 6, 7, 8	RL513 m, RL516 m, RL520 m

7.3 Drawings

The following design drawings are presented in Appendix B.

Table 6: Drawings

Title	Drawing no.
TSF1 -Stage 6 Plan	PER2025-0260-101
TSF1 -Stage 7 Plan	PER2025-0260-102
TSF1 -Final Stage 8 Plan	PER2025-0260-103
Sections and Details	PER2025-0260-104
Pipeline & Spigot Details	PER2025-0260-105

7.4 Water Recovery System

Liberated tailings slurry water and surface water are removed from IWLTSF via a decant pump located within a decant structure comprised of slotted concrete with select rockfill surround. Return water will be pumped directly to the processing plant for reuse. Current operational controls ensure the water pond is not located near any perimeter embankment.

7.5 Storage Characteristics

The estimated tailings storage areas, volumes and storage capacity for IWLTSF are summarised in Table 7. The estimated storage characteristics of the proposed IWLTSF staged embankment raise assumptions about the tailings in-situ density of 1.6 t/m³ and average beach slope of 1%.

Table 7: Estimated Tailings Storage Areas and Storage Volumes

Stage	Crest RL (m)	Approx. Stage Volume (Mm^3)	Additional Storage Capacity (Mt)	Storage Life (years)
Stage 6	513	1.21	1.93	0.7
Stage 7	516	1.03	1.65	0.6
Stage 8	520	1.20	1.92	0.7

7.6 Erosion Control

The embankments have been designed with a downstream slope of approximately 18° or 1:3 (v:h). The downstream slopes constructed at this angle with such material should be resistant to erosion. Further assessments will be required during mining on the erodibility of the materials to be included in the outer mine waste dump and downstream batters of the IWLTSF. As part of the final rehabilitation design, a 6 m wide berm at RL 510 m is proposed on the downstream slope to break slope length, reduce runoff velocities, and mitigate erosion risk over the long term.

7.7 Tailings Discharge and Water Management

The following operational considerations have been incorporated into the design:

- Tailings in the form of slurry will be discharged sub-aerially and cyclically into IWLTSF in thin discrete layers, not exceeding 0.3 m thickness, in order to allow optimum density and strength gain by subjecting each layer to a drying cycle. Deposition will take place via multiple spigots located on the upstream perimeter embankment crest.
- The tailings have rapid settling characteristics hence some experimentation will be required on the number of spigots to be utilised during deposition. I
- Spigotting of tailings is to be carried out such that a beach is developed to force the supernatant pond to be maintained within and around the decant structure. The pond is to be maintained away from the perimeter embankments at all times.
- Water will be removed from the facility and pumped back to the processing plant via a decant structure comprised of slotted concrete well liners with select rockfill surround. The recommended decant system water recovery capacity should not be less than 4,932 m^3/day or 206 tph.
- The tailings basin will assume the form of a truncated prism with a depressed cone on the top surface. The facility will have the capacity to store a considerable volume of water during a storm event. The minimum freeboard for the TSF under normal operating conditions is 0.5 m, plus an allowance for the temporary storage of the 1:100 years or 1% average exceedance probability (AEP) storm event of 72-hour duration whilst maintaining the required total freeboard.
- On eventual decommissioning, the facility will remain as a permanent feature of the landscape and drain to an increasingly stable mass. The top surface and batters will be stabilised and rehabilitated in accordance with the Mine Development and Closure Plan (MDCP) as described in Section 14.0.

7.8 Design Floods

IWLTSF is a paddock-type facility, so water inflow into the basin is by incidental rainfall only. IWLTSF has been designed such that a 1:100 years AEP, 72-hour duration rainfall depth of 228 mm can be temporarily stored within the facility.

8.0 SEEPAGE ANALYSIS

8.1 Method of Analyses

Seepage analyses were undertaken in order to assess the potential for seepage from the IWLTSF embankment at the crest level of RL520 m. These analyses utilized the groundwater module of the GeoStudio software package, which employs 2D finite element analysis to model groundwater seepage under saturated, steady-state flow conditions. It is important to highlight that 2D modelling provides a simplified representation and does not account for 3D effects, such as seepage through geological structures like joints.

8.2 Model Assumptions

The upstream boundary condition used in the analyses was determined based on a maximum water pond level of 0.5 m below the crest level of RL520 m (Stage 8, crest). Models have been based on the worst-case operating conditions where the decant pond extends to the embankment.

The downstream boundary condition was assumed based on the groundwater located at the ground surface level at the downstream toe of the embankment.

8.3 Permeability

The material permeabilities used in the seepage analyses were based on values derived from site geotechnical investigations and materials laboratory testing supplemented with assumed textbook values, appropriate to the materials. Table 8 provides a summary of the permeability used in the analyses.

Table 8: Permeability adopted

Material Type	Permeability, K (m/s)
Deposited Tailings	1×10^{-7}
Compacted Mine Waste	1×10^{-7}
Compacted Clayey Mine Waste	1×10^{-9}
Foundation, upper	1×10^{-6}
Foundation, lower	1×10^{-7}

8.4 Results of Seepage Analyses

The results of the seepage analyses of IWLTSF at RL520 m with a decant pond extending to the embankment are summarised in Table 9.

Table 9: Results of Seepage Analyses

RL	Seepage Flow (m^3/day/m of embankment)	Approximate Embankment Length (m)	Estimated Seepage per day for Embankment Section (m^3/day)
520	1.2×10^{-2}	2,160	21

8.5 Discussion and Recommendations

Plots of the phreatic surfaces and distribution of pore pressures throughout the embankments are presented in Appendix E. The seepage from the facility is expected to be low. The seepage estimates in the analyses are conservative and largely dependent on the hydraulic head and tailings permeability. Based on the predicted seepage rate and geochemical characteristics of the tailings, the following measures are recommended:

- Install a seepage collection trench along the downstream toe of the IWLTSF to intercept and recover shallow seepage, prevent uncontrolled migration beyond the facility footprint, and allow measurement of seepage volumes and quality.
- Maintain regular water level and water quality monitoring in monitoring bores around the IWLTSF to confirm seepage containment and detect any changes in pH, salinity, sulphate, and dissolved metals (particularly arsenic).
- It is noted that the pond size also will has a great influence on the seepage outflows from the IWLTSF and the position of the phreatic surface. The supernatant pond size, when present, should be minimised as far as possible during operation of the facility, which will in turn reduce the risk of phreatic surface daylighting at the downstream face of the embankment and minimise outgoing seepage through the base of the IWLTSF and its embankments.

9.0 STABILITY ANALYSIS

9.1 Method and Objectives of Analysis

Stability analyses were undertaken in general accordance with ANCOLD (20192). The analyses were carried out using the GeoStudio 2025.1.1 Inc. computer software package 'Slope/W & Seep/W. GeoStudio is a 2D slope stability program for evaluating the safety factor of circular and non-circular failure surfaces in soil and rock slopes. GeoStudio analyses the stability of slip surfaces using vertical slice limit equilibrium methods. The Morgenstern-Price method was used in the analyses.

Stability analyses were conducted to assess the stability of the IWLTSF Southern embankments at Stage 6, 7, and 8 Raises, with crest levels of RL 513 m, RL 516 m, and RL 520 m, respectively. The heights of the southern embankment at Stage 6, 7 and 8 Raises would be approximately 3m, 3 m and 4 m, respectively. The analyses were undertaken in general accordance with ANCOLD (2019).

9.2 Model Description and Assumptions

In all modelling scenarios, a maximum tailings level of 300 mm below the embankment crest was assumed. The phreatic surface corresponding to the worst-case event (PMP / 1-in-100-year rainfall) was considered in the assessment, under which the water pond was assumed to extend to the upstream embankment.

The following cases were examined in the stability analyses:

- Case 1: Static Analysis – Downstream failure of southern embankment, at stage 8, raise crest level RL520m (32m embankment height) under drained condition based on the limit equilibrium method.
- Case 2 Static Analysis – as per Case 1 but under undrained conditions based on the limit equilibrium method.
- Case 3: Post-Seismic Analysis – as per Case 2, utilising post-seismic strength parameters. The strength parameters in general were reduced by 20% for embankment materials, and tailings are assumed to have liquefied (post-liquefaction (Su/σ_v).

9.3 Strength Parameters

The stability analyses of the embankment were extracted from the "2024 Annual Audit & Management Review" review by CMW dated July 2025 by using the effective stress condition (c, ϕ) with pore pressure derived from the seepage analyses. The effective strength parameters were assumed with a level of conservativeness based on the results of the geotechnical investigations and the subsequent laboratory test results. Table 10 provides a summary of the strength parameters used in the stability analyses.

Table 10: Strength parameters

Material Type	Bulk Density (kN/m³)	Effective Strength Parameter		Undrained Strength Parameter	Pseudo-Static Parameters	
		Cohesion c' (kPa)	Friction Angle ϕ' (degs)	Cohesion S_u (kPa)	Friction Angle ϕ' (degs)	Cohesion S_u (kPa)
Deposited Tailings	16	0	33	0.3 σ'_v, min. 50 kPa	-	0.05 σ'_v, min. 5 kPa
Compacted Mine Waste	20	0	40	-	32	1

Material Type	Bulk Density (kN/m^3)	Effective Strength Parameter		Undrained Strength Parameter	Pseudo-Static Parameters	
		Cohesion c' (kPa)	Friction Angle ϕ' (degs)	Cohesion S_u (kPa)	Friction Angle ϕ' (degs)	Cohesion S_u (kPa)
Compacted Clayey Mine Waste	18	5	35	100	28	4
Foundation, upper	20	5	35	-	-	-
Foundation, lower	20	120	40	-	-	-

9.4 Results of the Stability Analyses

The results of the stability analyses for the various cases examined are summarised in Table 11, with the computer printouts presented in Appendix E.

Table 11: Results of Stability Analyses

Cases for RL520 m	FoS	Recommended Minimum FoS*
1	2.5	1.5
2	2.5	1.5
3	2.0	1.0 – 1.2

*Note: Recommended factors of safety (FoS) in accordance with ANCOLD (2019).

The stability analyses indicate that the cases examined have adequate factors of safety (FOS) for the drained, undrained and pseudo-static conditions when compared with the recommended minimum factors of safety in ANCOLD (2019).

10.0 EARTHQUAKE-INDUCED DEFORMATION

A preliminary assessment of embankment deformation due to earthquake was estimated using the Swaisgood (2003) method. This method utilises an empirical formula based on observed crest settlement resulting from analysed 'real' earthquakes, with no liquefaction.

The permanent displacements and settlements expected for a 32 m high embankment were estimated under a Magnitude 7.5 earthquake, corresponding with a PGA loading of 0.10 g for 1: 2,000 years AEP for the SEE event. The parameters were conservatively derived based on respectively the maximum earthquake magnitude recorded in Meckering WA as gathered by the Geoscience Australia, and the intensity measure as outlined in AS 1170.4 (2007).

From the analysis, it is concluded that for the highest embankment section, the deformation due to an MDE event is likely to be in the order of 14 mm. Such deformation is insignificant when compared with the minimum required total freeboard of 700 mm.

11.0 WATER BALANCE

Water balance analysis for the proposed operation for the raising of IWLTSF operation has been undertaken using a spreadsheet to examine expected inflows and outflows.

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). Water balance calculations are included in Appendix F.

Based on the most recent surveillance review reports, the average annual water return for the IWLTSF is estimated at around 60% slurry water inflow. A water balance analysis for the IWLTSF operation has been undertaken using a mathematical simulation to examine expected inflows and outflows for the facility. Inflows included rainfall and slurry water. Outflows included evaporation, seepage losses and water retained in tailings (pore water). The analysis examined the annual/monthly rainfall and average evaporation under average climatic conditions.

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 Riverina (recording period: 1964 to 2009) of 270.5 mm/pa, and average annual evaporation is estimated at approximately 2,750 mm/year.
- Tailings area of approx. 36 ha.
- A tailings runoff coefficient of 1.0 was assumed.
- Pool area equal to approximately 9% of tailings area (radius approx. 100 m).
- Running beaches equal to approximately 21% of the tailings area.
- Evaporation pan factor of 0.75.
- Average tailings residual moisture content of 25%.
- Tailings slurry density of 60% solids.
- Tailings production rate of 2,500,000 tpa.
- Seepage from seepage analyses of approximately 21 m^3/day.

The results of the analysis indicate potential annual average water returns of approximately 55% 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 mill 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 IWLTSF. The minimum capacity of the water recovery system should be not less than 206 tph including the additional capacity to recover water from design storm events.

12.0 DAM BREAK ASSESSMENT

12.1 Credible Events That Lead to a Dam Break

The most credible events that could lead to a TSF dam break/embankment failure are:

- Uncontrolled overtopping of a perimeter embankment following an extreme rainfall event (PMP).
- Slope failure of an external embankment under static conditions.
- Foundation failure.
- Slope failure of a perimeter embankment under an extreme seismic event leading to embankment and foundation (for upstream raised embankment) liquefaction.
- Erosion of an embankment due to a pipeline breakage.
- Progressive sloughing of embankment due to seepage
- Piping erosion failure through a perimeter embankment due to seepage
- Piping erosion failure through a perimeter embankment due to seepage through the embankment

Several coinciding events would be required for a major IWLTSF dam break/embankment failure to occur. The assessment is primarily a breach resulting from overtopping (under rainy day conditions); however, it is also applicable to breaches resulting from embankment piping/slope instability (under sunny day conditions). The peak flows resulting from these secondary events are expected to be lower when compared to those associated with the overtopping event.

The probability of a major IWLTSF dam break/embankment failure due to the above credible events is assessed to be low based on:

- Embankment overtopping is unlikely due to provisions for adequate freeboard and correct operation and management.
- Tailings forming part of the foundation of the upstream raised embankment section will not be susceptible to liquefaction under Safety Evaluation Earthquake (SEE) conditions (1:2,000 AEP seismic event). A slope embankment failure/instability with the assumption of a liquefied tailings foundation is unlikely based on adequate FoS values from embankment stability analyses.
- A foundation piping failure for the IWLTSF is unlikely. It is noted that foundation preparation for the IWLTSF embankment typically involved the removal of ‘topsoil’ and near-surface loose materials under the embankment footprint areas and compaction of the stripped surface; as such, the embankments will be founded on competent ground.
- A piping failure from the embankment of the IWLTSF is also unlikely. It is noted that suitable, non-erodible clayey fill materials/clayey mine waste were used for construction. The clayey fill materials / clayey mine were compacted to 95% SMDD (min).

The analysis was performed to assess the consequences of the IWLTSF stage 8 raised embankment failure, and does not indicate the likelihood of the event. The results should not be interpreted as indicating that the proposed IWLTSF stage 8 embankment raise presents a likely risk to humans, infrastructure, or the environment.

12.2 Breach Characteristics

If IWLTSF embankment breach was to occur, tailings that flow out of containment will behave as a slurry and therefore will not be as free-flowing as water.

Under worst-case probable maximum precipitation (PMP) rainy day failure conditions:

- The storage capacity of IWLTSF is estimated at 7.4 Mm³.
- PMP storm volume is estimated at nominal 812,800 m³. This was based on a 4.5 hr probable maximum precipitation event (PMP) rainfall depth of 640 mm over the IWL catchment of 127 ha.
- The tailings failure volume likely to be released from the IWLTSF at the final height of nominally 32 m, in the event of an embankment failure under PMP rainy day conditions, would be of the order 5.15 Mm³ i.e. approximately 67% of the impounded storage capacity plus the PMP storm volume.
- Based on T MacDonald and J Langridge - Monopolis (1984), embankment breaches typically occur relatively quickly (typically 0.5 an hour to 4 hours). Based on this methodology, it is estimated that the breach will occur over approximately 4 hours.

The calculation of breach characteristics is included in Appendix G.

The Rourke and Luppnow Method (H Rourke, D Luppnow, 2015) for estimating volume released from the IWL was also utilised to assess potential stored volume release. This method is based on a relation between the potential volume released from an IWL and the size of the decant pond. The greater the ratio of the pond area to the total area, the greater the ratio of release volume to stored volume. Table 12 presents a summary of case data used in the analyses taken from Table 1 of the referenced paper.

Table 12: Summary of Case Study Data (H Rourke, D Luppnow, 2015)

Name	Impoundment Storage Volume (Mm3)	Release Volume (m3)	Ratio of Release Volume to Stored Volume (%)	Ratio of Pool Area to Total Area (%)
Merriespruit	7.0	0.6	9	14
Bafokeng	13.0	3.0	23	30
Mount Polley	50.0	24.4	49	72
Kolontar	1.2	0.7	58	88
Stava	0.3	0.2	67	100

It was noted from Rourke and Luppnow analysis of past tailings storage facility (TSF) failures, that the release volume varies between 9% and 67% of stored volume. The 67% of IWLTSF volume plus a PMP event, or approximately 5.15 Mm3 scenario represents a likely maximum release from a relatively low embankment height, IWLTSF in a semi-arid region such as the Goldfields region of WA (i.e. the water pond should not be this large as the water balance is negative and water should not accumulate on the facility).

The Rourke and Luppnow Method demonstrates that in order to mitigate the consequence of a dam-break, the pond volume and area should be minimised by the adoption of good operating practices.

12.3 Energy Methods

The sunny day case was examined by assessing a dam break using energy methods as referenced in K D Sneddon (2010) and estimate tailings run-out distance. The method presented in the paper assumes the tailings and the embankment are assumed to liquefy and move as a block downstream.

The height of the block was assumed to be 32 m and the run-out distance a function of the residual shear strength and material density. For residual shear strengths of 4 kPa and 7 kPa the run-out distances were estimated to be 1,330 m and 865 m, respectively.

Based on the analyses performed, the tailings from a sunny day dam break could potentially go to the south of the IWLTSF and inundate the mill area.

The calculations of the run-out distance for a sunny day case are presented in Appendix G.

12.4 Hydraulic Modelling

The result from breach modelling indicates that the maximum (peak) run-out flow from a ‘dam break’ under ‘worst case’ (PMP) rainy day conditions will be approximately 715 to 2,770 m^3/s. The flow will generally flow toward south of the project area. The flow is estimated to be between 90 to 220 m wide, with a flow depth of up to 3.0 m.

In a worst-case scenario, tailings and water run-out could inundate a large part of the mill area. Refer to the inundation plan in Appendix G.

The following consequences of a dam break are considered most likely:

- Loss of human life: Personnel at the mill should be able to be evacuated as any breach from the IWL will occur over time and should be discovered by IWL operations personnel. There is also a potential for loss of life of mining personnel visiting the IWL. The PAR has been conservatively estimated to be between ≥10 to <100 (noting the PAR are mine personnel).
- Economic loss due to mill shutdown and production loss, repairs of damaged sections of IWL and local access roads.
- Environmental impact: there will be potential for contamination of soils and surface water requiring environmental ‘clean-up’.

12.5 Control

The conditions for IWLTSF embankment failure to occur would be driven largely by the size and extent of the decant pond on the facility, as well as the magnitude of a trigger seismic event, embankment deformation, the grading of the tailings and the saturation of the tailings adjacent to the embankment. Effective management of the decant pond to ensure excess water is continually removed and that the location of the pond is maintained centrally on IWLTSF will minimise the risk of a perimeter embankment breach and release of saturated tailings.

IWLTSF embankment failure is not expected provided the facility is operated in accordance with the requirements set out in the IWLTSF Operations Manual. To date, the annual surveillance reviews have confirmed that a small water pond is present, and the pond is kept well away from the perimeter embankment. The pond is at least 200m from the main embankment.

In the event that the IWLTSF were in imminent danger of failure and breach, an Emergency Action Plan (EAP) would need to be enacted (also refer to Operations Manual).

13.0 OPERATIONAL ASPECTS

The existing Operating Manual and the Mine Safety Management Plan are reviewed annually as part of the surveillance review of IWLTSF. The Operation Manual has been updated and attached in Appendix H as part of the Stage 6 to Stage 8 design.

13.1 Discharge Management and Decant Control

The existing Operations Manual and Mine Safety Management Plan for the IWLTSF have include the operating procedures, inspection criteria, monitoring requirements and log sheets for the facility.

The following routine inspection and maintenance procedures are to be carried out for the various components of the system. A minimum of one inspection is to be undertaken during each shift by an operator or shift supervisor.

The inspections should cover:

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

A monthly independent inspection should also be performed by senior site management. The operation, safety and environmental aspects should be periodically reviewed during an annual audit inspection by a suitably experienced and qualified engineer.

13.2 IWLTSF Water management

13.2.1 Freeboard

IWLTSF has been designed to temporarily store the runoff from a 1:1,00-year Annual Exceedance Probability (AEP) 72-hour duration storm event on top of the facility. The design assumes that proper operational controls are followed, and that water is consistently removed from the facility, ensuring that minimum freeboard requirements are maintained.

The design provides for a minimum total freeboard of 0.7 m, which includes:

- A minimum operational freeboard of 300 mm (the vertical distance between the tailings beach and embankment crest),
- A minimum beach freeboard of 200 mm,
- An allowance for the 1:1,00-year AEP 72-hour storm event, with a depth of 228 mm.

ANCOLD guidelines (20192) also recommend an allowance for wave run-up due to a 1:10 AEP wind event for a 'High C' consequence category IWLTSF (refer to Section 3.1). However, it is expected that perimeter tailings deposition and an anticipated beach slope of 1% will provide sufficient separation distance between the perimeter embankments and the designed stormwater pond, thereby preventing wave action from reaching the embankments.

illustrates the freeboard nomenclature. Intensity-Frequency-Duration (IFD) data relevant to the site is presented in Figure 5. Based on the chart in Figure 5, a 1:100-year AEP, 72-hour rainfall depth of 228 mm was adopted for the design. This amount of rain could produce the maximum volume of water assessed at 289,560 m^3 (i.e. approx. 127 ha x 228mm), with a runoff coefficient of 1.0 over the full area of the catchment (127 ha). The 4.5 hr Probable Maximum Precipitation (PMP) indicates a rainfall of 640 mm; thus, the total 812,800 m^3 of water could be expected to accumulate from this rainfall event, assuming a runoff coefficient of 1.0.

When IWLTSF is filled to its design capacity, maintaining a freeboard of 700 mm provides an additional storage capacity of approximately 889,000 m³. This exceeds the required 812,800 m³ storage volume for the Probable Maximum Precipitation (PMP) event. Accordingly, the risk of overtopping at IWLTSF is considered low.

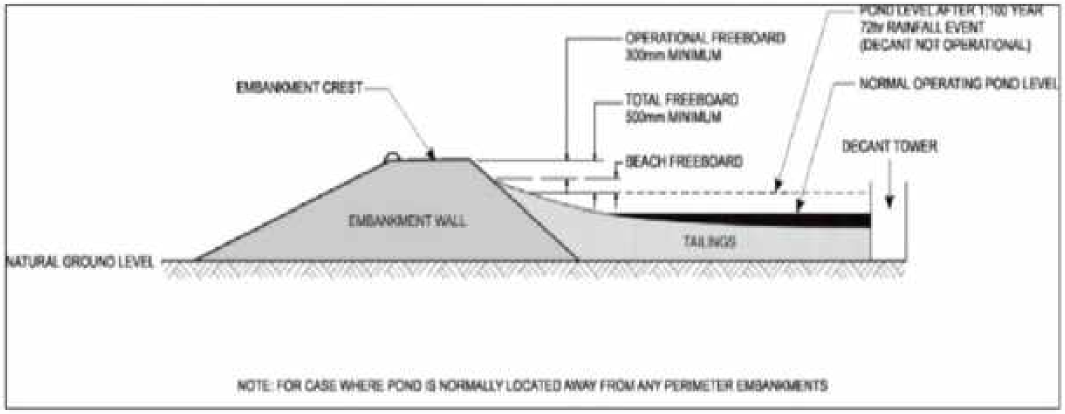


Figure 6: Freeboard Nomenclature

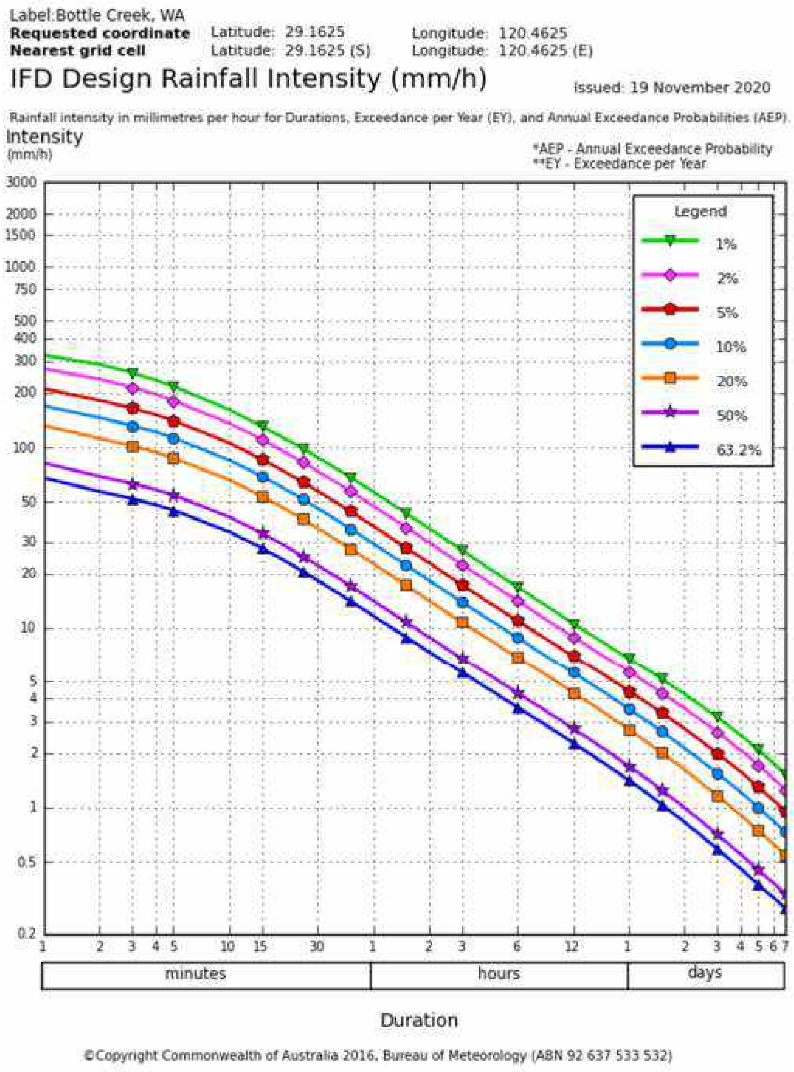


Figure 7: Intensity-Frequency-Duration (IFD) Data

13.2.2 Surface Water Diversion

The IWL has been located such that no major diversion is required, based on a hydrology study. The IWLTSF is located to the northwest of a creek line that flows from the north/northeast, bypassing the IWLTSF to the west of the plant site.

A small catchment extends to the northeast of the IWLTSF, and most flow from the catchment is concentrated in a flow path that passes to the south of the IWLTSF. Reference to Hydrologia report (Hydrologia 2021) indicates that for a 1% AEP event, the maximum flow depth will be 0.35 m with a velocity of 0.75 m/s. There should be no requirement for erosion protection at the toe of the IWL during operations, as the flow path is outside of the IWLTSF footprint.

13.3 Dust Control

The IWLTSF construction works will include a water cart on location to provide dust suppression as required. This control measure will prevent dust from becoming airborne and subsequently being mobilised into the surrounding environment, from becoming a visibility issue, or from becoming a respiratory hazard for construction personnel.

Dust generation from the tailings beaches is not expected as the tailings are saline and a crust is likely to form on the beaches, binding the tailings surface and reducing the potential for dusting. If dust generation becomes an issue (i.e. in periods the IWLTSF may be inactive), the tailings beaches could be irrigated (i.e. with sprinklers or similar) or tailings deposition managed such that beach areas do not dry back to such an extent that dust generation occurs.

14.0 CLOSURE CONSIDERATIONS

14.1 Overview

The closure objectives for the IWLTSF are to leave the facility in a safe, stable, erosion resistant and non-polluting state.

The downstream tailings slopes of the IWLTSF perimeter embankments will be rehabilitated as part of the waste dump rehabilitation works. The final rehabilitation slopes will have a maximum inclination of 18°, with a 6 m wide bench constructed at RL 510 m to reduce slope length and improve long-term stability and erosion control.

Once tailings deposition has been completed within the IWLTSF and the top surface of the tailings has gained adequate bearing capacity, it will be capped with a layer of mine waste (0.5 m –1 m nominal thickness) to act as a store and release cover, minimise dust generation from dried tailings and provide support for topsoil/growth medium for re-vegetation.

The IWLTSF concept requires the integration of the planning, construction, and closure of the IWLTSF with waste dump construction. The IWLTSF concept provides an optimum solution to the rehabilitation of an IWLTSF by encompassing the IWLTSF within a waste dump. Mine waste for rehabilitation of the top surface will be sourced from nearby waste dumps.

14.2 Rehabilitation

Upon completion of tailings placement within the facility, the surface will undergo a rehabilitation program. The rehabilitation program will include the identification of appropriate capping material and local flora species to revegetate the surface of the facility.

At final closure, the decant structure will be decommissioned and the decant area 'sealed'. This will involve:

- Removing excess filter rock in the decant structure to the surrounding tailings level;
- Covering the rock layer surrounding the decant structure with geofabric to prevent movement of fine material through rock voids;
- Backfilling the annulus of the rock ring with tailings to the adjacent tailings level; and
- Capping the IWL decant areas with nominal 0.5 m thick clayey mine waste (to be validated with field trials or otherwise).

Upon decommissioning of the facility, the rehabilitated surface will follow the grade of the finished tailings surface and therefore have the capacity to store a considerable volume of stormwater. Internal bunding may be constructed to distribute stored rainfall and maximise at-source infiltration.

14.3 Performance Monitoring against Closure Criteria

Rehabilitation closure criteria for the IWLTSF including observations specific to the tailings and consolidation will be developed and progressed as part of a Mine Development and Closure Plan.

15.0 REFERENCES

1. New South Wales Dams Safety Committee (DSC), June 2012, DSC3F Guide, 'Tailings Dams'
2. ANCOLD (2019), 'Guidelines on Tailings Dams: Planning, Design, Construction, Operation and Closure'.
3. Australian Government Bureau of Meteorology website: www.bom.gov.au.
4. Geoscience Australia Earthquakes at GA website: www.earthquakes.ga.gov.au.
5. AS 1170.4-2007, 'Australian Standard Structural Design Actions Part 4: Earthquake Actions in Australia'.
6. Pendragon Environmental Solutions, (2026), 'Mt Ida Gold Project Aurenne Mining Sulphide Tailings characterisation', date 27 January 2026. Ref: PES21005.
7. Jefferies, M.G. and Been, K. (2016), 'Soil Liquefaction – A Critical State Approach'. 2nd ed. Taylor and Francis. ISBN 978-1-4822-1368-3. 676p.
8. Fell, R., MacGregor, P., Stapledon, D. & Bell, G. (2005), 'Geotechnical Engineering of Dams', A.A. Balkema Publisher.
9. ANCOLD (2019), 'Guidelines for Design of Dams and Appurtenant Structures for Earthquake'.
10. Robertson, P.K. and Wride, C.E. (1998), 'Evaluating Cyclic Liquefaction Potential Using Cone Penetration Test', Canadian Geotechnical Journal, 35(3): 442-459.
11. Youd, T.L. et al. (2001), 'Liquefaction Resistance of Soils: Summary Report from the 1996 NCEER and 1998 NCEER/NSF Workshop on Evaluation of Liquefaction Resistance Soils', ASCE Journal of Geotechnical & Geoenvironmental Engineering, Vol. 127, October.
12. Robertson, P.K. (2009), 'Interpretation of Cone Penetration Tests – a Unified Approach', Canadian Geotechnical Journal, 46: 1337-1355.
13. Moss, R.E.S., Seed, R.B., Kayen, R.E., Stewart, J.P., DerKiureghian, A. and Cetin, K.O. (2006), 'CPT-Based Probabilistic and Deterministic Assessment of In-Situ Seismic Soil Liquefaction Potential', ASCE Journal of Geotechnical and Geoenvironmental Engineering, Vol. 132, Issue 8, 2006.
14. Idriss, I.M. and Boulanger, R.W. (2008), 'Liquefaction-Induced Ground Deformations Evaluation Based on Cone Penetration Tests (CPT)', EERI Publication, Monograph MNO-12, Earthquake Engineering Research Institute, Oakland.
15. Boulanger, R.W. and Idriss, I.M. (2014), 'CPT and SPT Based Liquefaction Triggering Procedures', University of California Report No. UCD/CGM-14/01 dated April 2014.
16. Iwasaki, T. (1986), 'Soil Liquefaction Studies in Japan: state-of-the-art, Soil Dynamics and Earthquake Engineering', Vol. 5, No. 1, 2-70.
17. Been, K. and Jefferies, M.G. (1985), 'A State parameter for Sands', Géotechnique 35, No. 2, 99-112.
18. Jefferies, M.G. and Been, K. (2006), 'Soil Liquefaction – A Critical State Approach', 1st ed. Taylor and Francis, ISBN 0-419-16170-8. 478p.
19. Robertson, P.K. (2010), 'Evaluation of Flow Liquefaction and Liquefied Strength Using the Cone Penetration test', ASCE, Journal of Geotechnical and Geoenvironmental Engineering, 136 (6): 842-853.
20. Swaisgood (2003), 'Embankment Dam Deformations caused by Earthquakes'.
21. T MacDonald and J Langridge - Monopolis (1984), 'Breaching Characteristics of Dam Failures', Journal of Hydraulic Engineering, May 1984.
22. A Dalpatram (2011), 'Estimation of Tailings Dam Break Discharges', presentation at USSD workshop on Dam Break Analysis Applied to Tailings Dams.
23. ANCOLD (2012), 'Guidelines on the Consequence Category for Dam'.

USING YOUR CMW GEOTECHNICAL REPORT

Geotechnical reporting relies on interpretation of facts and collected information using experience, professional judgement, and opinion. As such it generally has a level of uncertainty attached to it, which is often far less exact than other engineering design disciplines. The notes below provide general advice on what can be reasonably expected from your report and the inherent limitations of a geotechnical report.

Preparation of your report

Your geotechnical report has been written for your use on your project. The contents of your report may not meet the needs of others who may have different objectives or requirements. The report has been prepared using generally accepted Geotechnical Engineering and Engineering Geology practices and procedures. The opinions and conclusions reached in your report are made in accordance with these accepted principles. Specific items of geotechnical or geological importance are highlighted in the report.

In producing your report, we have relied on the information which is referenced or summarised in the report. If further information becomes available or the nature of your project changes, then the findings in this report may no longer be appropriate. In such cases the report must be reviewed, and any necessary changes must be made by us.

Your geotechnical report is based on your project’s requirements

Your geotechnical report has been developed based on your specific project requirements and only applies to the site in this report. Project requirements could include the type of works being undertaken; project locality, size and configuration; the location of any structures on or around the site; the presence of underground utilities; proposed design methodology; the duration or design life of the works; and construction method and/or sequencing.

The information or advice in your geotechnical report should not be applied to any other project given the intrinsic differences between different projects and site locations. Similarly geotechnical information, data and conclusions from other sites and projects may not be relevant or appropriate for your project.

Interpretation of geotechnical data

Site investigations identify subsurface conditions at discrete locations. Additional geotechnical information (e.g. literature and external data source review, laboratory testing etc) are interpreted by Geologists or Engineers to provide an opinion about a site specific ground models, their likely impact on the proposed development and recommended actions. Actual conditions may differ from those inferred to exist due to the variability of geological environments. The actual interface between materials may be far more gradual or abrupt than assumed based on the facts obtained. Nothing can be done to change the actual site conditions which exist, but steps can be taken to reduce the impact of unexpected conditions. Interpretation of factual data can be influenced by design and/or construction methods. Where these methods change review of the interpretation in the report may be required.

Subsurface conditions can change

Subsurface conditions are created by natural processes and then can be altered anthropically or over time. For example, groundwater levels can vary with time or activities adjacent to your site, fill may be placed on a site, or the consistency of near surface conditions might be susceptible to seasonal changes. The report is based on conditions which existed at the time of investigation. It is important to confirm whether conditions may have changed, particularly when large periods of time have elapsed since the investigations were performed.

Interpretation and use by other design professionals

Costly problems can occur when other design professionals develop their plans based on misinterpretations of a geotechnical report. To help avoid misinterpretations, it is important to retain the assistance of CMW to work with other project design professionals who are affected by the contents of your report. CMW staff can explain the report implications to design professionals and then review design plans and specifications to see that they have correctly incorporated the findings of this report.

Your report's recommendations require confirmation during construction

Your report is based on site conditions as revealed through selective point sampling. Engineering judgement is then applied to assess how indicative of actual conditions throughout an area the point sampling might be. Any assumptions made cannot be substantiated until construction is complete. For this reason, you should retain geotechnical services throughout the construction stage, to identify variances from previous assumption, conduct additional tests if required and recommend solutions to problems encountered on site.

A Geotechnical Engineer, who is fully familiar with the site and the background information, can assess whether the report's recommendations remain valid and whether changes should be considered as the project develops. An unfamiliar party using this report increases the risk that the report will be misinterpreted.

Environmental matters are not covered

Unless specifically discussed in your report environmental matters are not covered by a CMW Geotechnical Report. Environmental matters might include the level of contaminants present of the site covered by this report, potential uses or treatment of contaminated materials or the disposal of contaminated materials. These matters can be complex and are often governed by specific legislation.

The personnel, equipment, and techniques used to perform an environmental study can differ significantly from those used in this report. For that reason, our report does not provide environmental recommendations. Unanticipated subsurface environmental problems can have large consequences for your site. If you have not obtained your own environmental information about the project site, ask your CMW contact about how to find environmental risk-management guidance.

CMW Geosciences
Great People | Practical Solutions

CERTIFICATION OF COMPLIANCE

Tailings Storage Facility Design Report

For and on behalf of CMW Geosciences Pty Ltd (CMW) I, [redacted] being a duly authorised officer of the above company and a qualified professional engineer and a member of Engineers Australia, IEAUST, do hereby certify and confirm that the Raising Tailings Storage Facility No. 1 (TSF1) to RL520 m at the Mt. Ida Gold Project (MIGP), located approximately 100 km northwest of Menzies, Western Australia, has been designed in accordance with the current edition of the *Tailings Storage Facilities in Western Australia – Code of Practice* issued by the Department of Local Government, Industry Regulation and Safety (LGIRS), Western Australia, and the design is referenced PER2025-0260AB Rev 1 dated 27 January 2026.

[redacted]

[redacted]

CMW Geosciences
Great People | Practical Solutions

APPENDIX A

Tailings Storage Data Sheet (TSDS) and Explanatory Notes

TAILINGS STORAGE DATA SHEET

Project operator: Aurenne Group	
Project name: Integrated Waste Landform (IWL)	Date: January 2026
TSF name: IWLTSF1	Commodity: Gold
Name of data provider: CMW / Aurenne Group	[redacted]
TSF centre co-ordinates: 6,772,544 m North and 252,479 m East on Zone 51 of the MGA geodetic datum	
Mining Tenement and Holder(s) details: Exploration Lease E29/921-1	
TSF Data	
TSF status: Existing	
Type of TSF: [1] Paddock	Number of cells: [2] 1
Hazard rating: [3] High	TSF category: [4] 1
Catchment area: [5] 36 ha	Nearest watercourse: Lake Ballard (~20 km south east)
Date deposition started (mm/yy): May 2023	Date deposition completed (mm/yy): -
Tailings discharge method: [6] Multi-point spigot	Water recovery method: [7] pumped central decant
Bottom of facility sealed or lined? [✓ Y] / N	Type of seal or liner: [8] Compacted low permeable materials
Depth to original groundwater level m below GL: ≥26	Original groundwater TDS mg/L: 35,000
Ore process: [9] CIL/CIP	Tailings Deposition rate Mtpa: [10] 2.5
Impoundment volume (present) Mm^3: 2.2	Expected maximum m^3: 4.0 x 10^6
Mass of solids stored (present): Mt: 3.3	Expected maximum tonnes: 6.0 x 10^6
Above ground facilities	
Foundation soils: Compacted Sandy Clay-Gravel	Foundation rocks: Residual and Weathered Granite
Starter bund construction materials: [11] Clay borrow and mine waste	Wall lifting by: Mechanical
Wall construction method/materials: Downstream method	Wall lifting material: [12] Clay borrow and mine waste
Maximum wall height (present) m above GL: [13] 0	Expected maximum m: 32
Crest length (present) m: 3,454	Expected maximum m: 3,700
Impoundment area (present) ha: 117	Expected maximum ha: 126
Below ground (in-pit) facilities NA	
Initial pit depth (maximum) m: -	Area of pit base ha: -
Thickness of tailings (present) m: -	Expected maximum m: -
Current surface area of tailings ha: -	Final surface area of tailings ha:

Properties of tailings and return water			
TDS mg/l: 85 – 86 mg/L	pH: 8.4 - 9.4	Solids content %: 60	Deposited density t/m^3: 1.5 dry
Potentially hazardous substances: [14] Cyanide		WAD CN mg/l: 21 – 106	Total CN mg/l: 144 – 247
Any other NPI listed substances in the TSF? [15] [✓ Y] / N (Copper)			

Explanatory notes for completing tailings storage data sheet

The following notes are provided to assist the proponent to complete the tailings storage data sheet.

1. Paddock (ring-dyke), cross-valley, side-hill, in-pit, depression, waste fill, central thickened discharge, stacked tailings
2. Number of cells operated using the same decant arrangement
3. See Table 1 – Hazard rating system in the Code of practice
4. See Table 2 – Matrix of hazard ratings in the Code of practice
5. Internal for paddock (ring-dyke) type, internal plus external catchment for other facilities
6. End of pipe, (fixed), end of pipe (movable), single spigot, multi-spigots, cyclone, central thickened discharge (CTD)
7. Gravity feed decant, pumped central decant, floating pump, wall/side mounted pump
8. Clay, synthetic
9. See list below for ore process method
10. Tonnes of solids per year
11. Record only the main material(s) used for construction, e.g. clay, sand, silt, gravel, laterite, fresh rock, weathered rock, tailings, clayey sand, clayey gravel, sandy clay, silty clay, gravelly clay or any combination of these materials
12. Any one or combination of the materials listed under item 11 above
13. Maximum wall height above the ground level (not AHD or RL)
14. Arsenic, Asbestos, Caustic soda, Copper sulphide, Cyanide, Iron sulphide, Lead, Mercury, Nickel sulphide, Sulphuric acid, Xanthates, radioactive elements
15. NPI – National pollution inventory (contact Department of Environmental Protection for information on NPI listed substances)

Ore process methods

The ore process methods may be recorded as follows:

Acid leaching (Atmospheric)

Acid leaching (Pressure)

Alkali leaching (Atmospheric)

Alkali leaching (Pressure)

Bayer process

Becher process

BIOX

Crushing and screening

CIL/CIP

Flotation

Gravity separation

Heap leaching

Magnetic separation

Ore sorters

Pyromet

SX/EW (Solvent extraction/Electro wining)

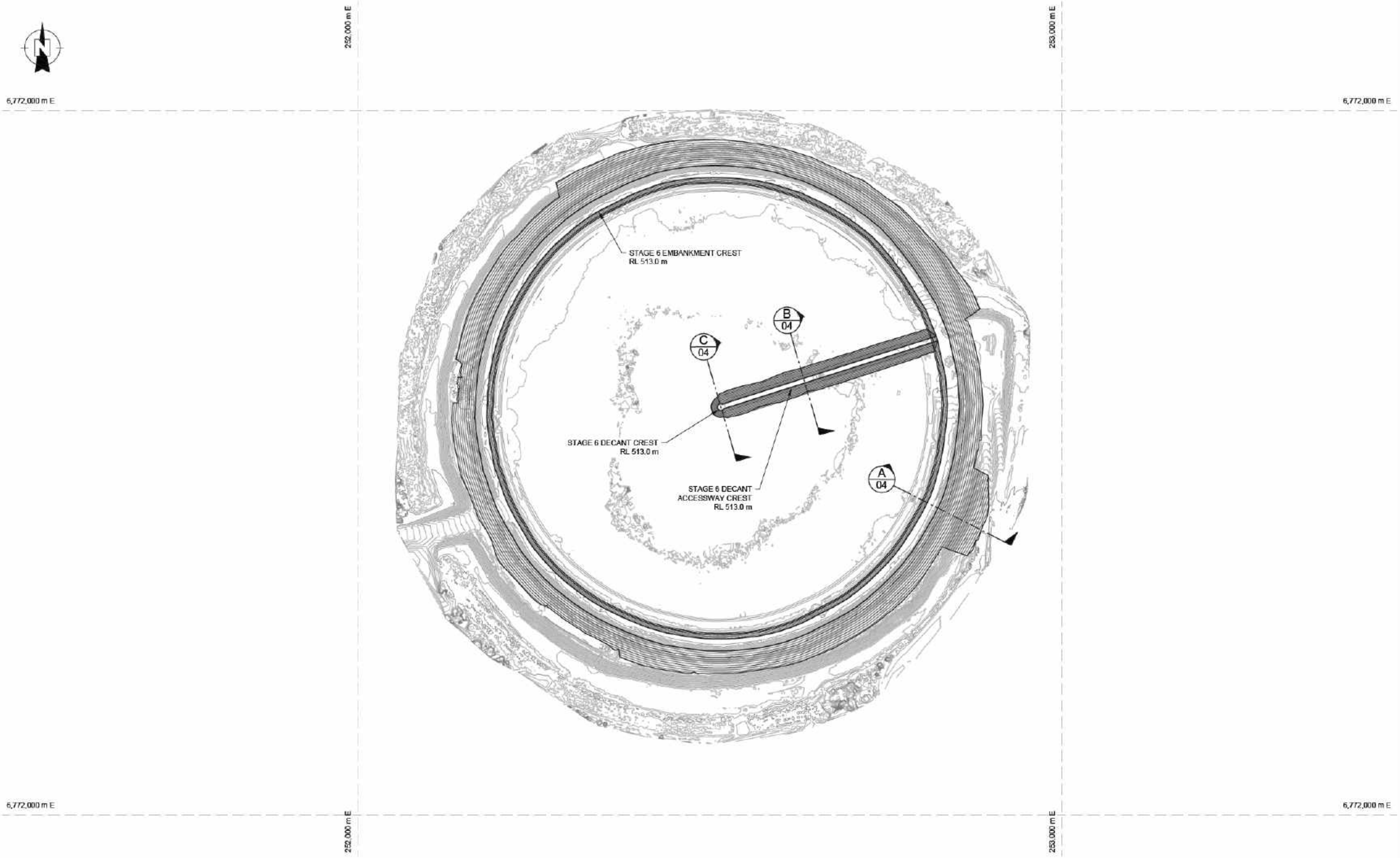
Vat leaching

Washing and screening

CMW Geosciences
Great People | Practical Solutions

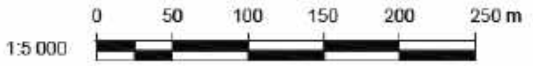
APPENDIX B

Drawings



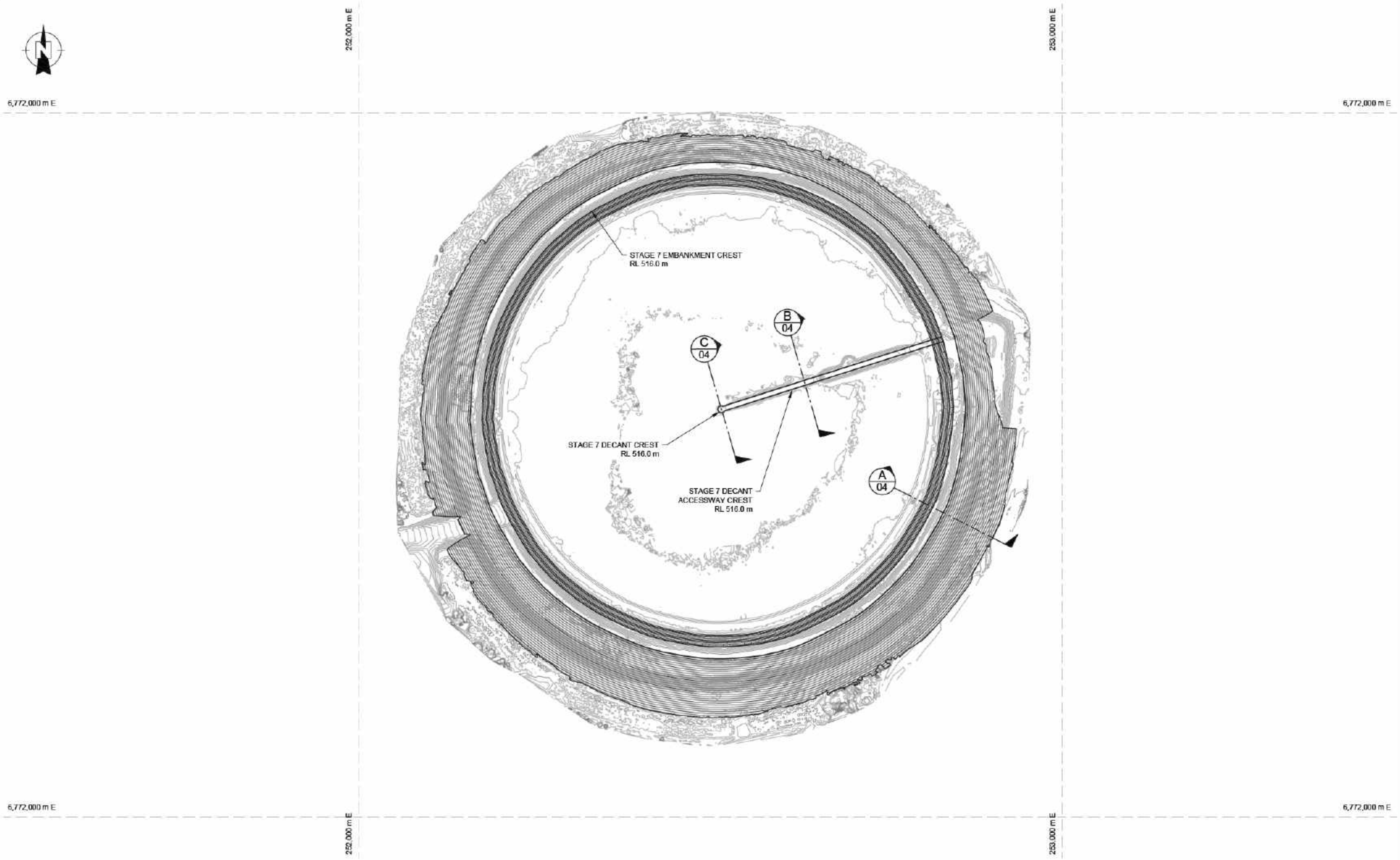
NOTES:

1. SURVEY CONTOURS GENERATED FROM CLIENT SUPPLIED FILE: "250629_TSF_EOM_Surf".
2. COORDINATE SYSTEM: MGA51, GDA94



CMW Geosciences
Great People | Practical Solutions

CLIENT: **AURENNE GROUP HOLDINGS PTY LTD**		DRAWN: DE	PROJECT: PER2025-0260
PROJECT: **MT IDA** **TSF1 RAISING**		CHECKED: HZ	DRAWING: 01
		REVISION: A	SCALE: 1:5000
TITLE: **STAGE 6 PLAN**		DATE: 22/09/2025	SHEET: A4 L



NOTES:

1. SURVEY CONTOURS GENERATED FROM CLIENT SUPPLIED FILE: "250629_TSF_EOM_Surf".
2. COORDINATE SYSTEM: MGA51, GDA94

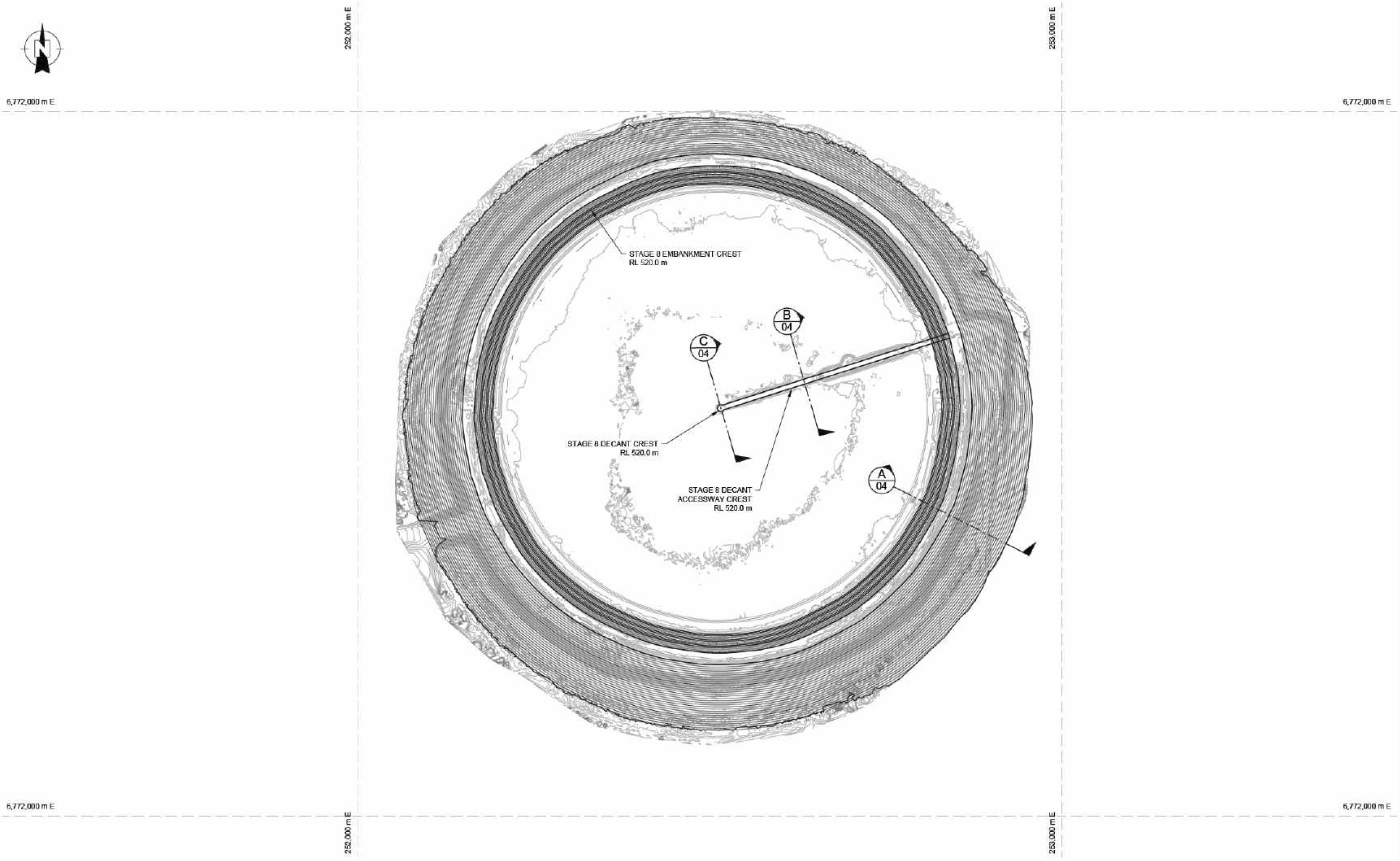
0 50 100 150 200 250 m

1:5 000

CMW Geosciences
Great People | Practical Solutions

CLIENT: **AURENNE GROUP HOLDINGS PTY LTD**		DRAWN: DE	PROJECT: PER2025-0260
PROJECT: **MT IDA** **TSF1 RAISING**		CHECKED: HZ	DRAWING: 02
		REVISION: A	SCALE: 1:5000
TITLE: **STAGE 7 PLAN**		DATE: 22/09/2025	SHEET: A4 L

C:\Users\DarrenE\CMW Geosciences Pty Ltd\Perth office - PER2025-0260 Mt Ida TSF1 Raise to RL520m Design\Drawings\PER2025-0260-02 TSF1 PLAN_STAGE7 220925.dwg 23/09/2025 1:39:23 PM



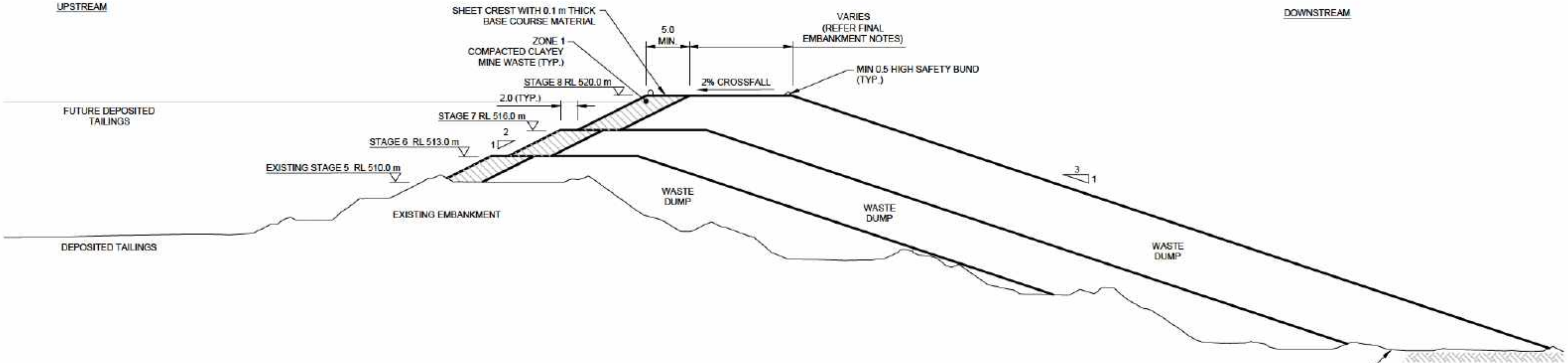
NOTES:

1. SURVEY CONTOURS GENERATED FROM CLIENT SUPPLIED FILE: "250629_TSF_EOM_Surf".
2. COORDINATE SYSTEM: MGA51, GDA94

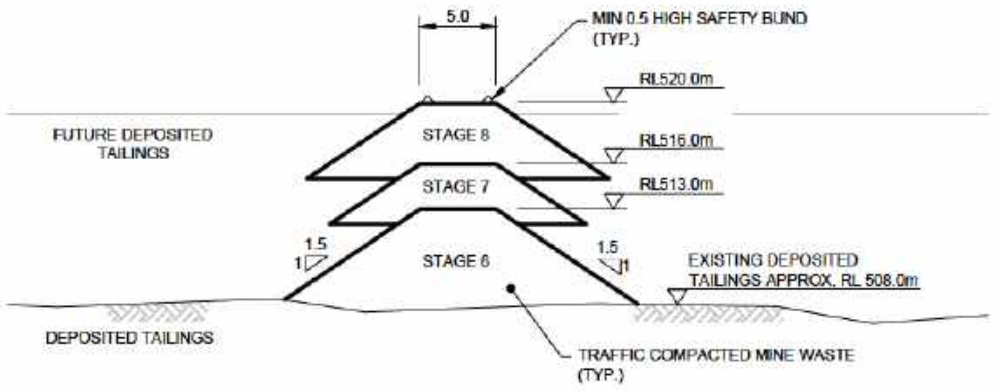
1:5 000 0 50 100 150 200 250 m

CMW Geosciences Great People | Practical Solutions	CLIENT: **AURENNE GROUP HOLDINGS PTY LTD**	DRAWN: DE	PROJECT: PER2025-0260
	PROJECT: **MT IDA** **TSF1 RAISING**	CHECKED: HZ	DRAWING: 03
		REVISION: A	SCALE: 1:5000
	TITLE: **STAGE 8 PLAN**	DATE: 22/09/2025	SHEET: A4 L

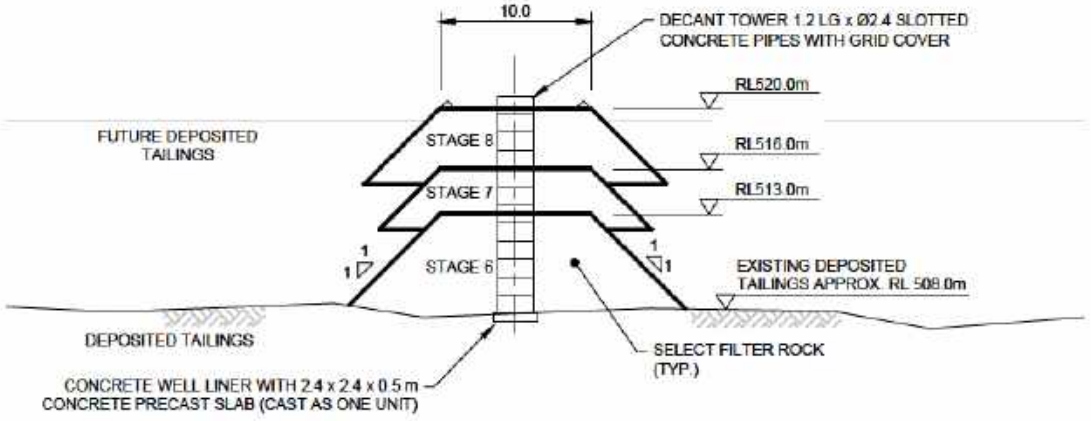
C:\Users\DarrenE\CMW Geosciences Pty Ltd\Perth office - PER2025-0260 Mt Ida TSF1 Raise to RL520m Design\Drawings\PER2025-0260-03 TSF1 PLAN_STAGE8 220925.dwg 23/09/2025 2:00:09 PM



A TSF1 EMBANKMENT (STAGES 6 TO 8)
01/02/03 1:500



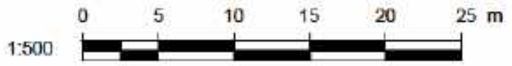
B DECANT ACCESSWAY
01/02/03 1:500



C DECANT
01/02/03 1:500

NOTES:

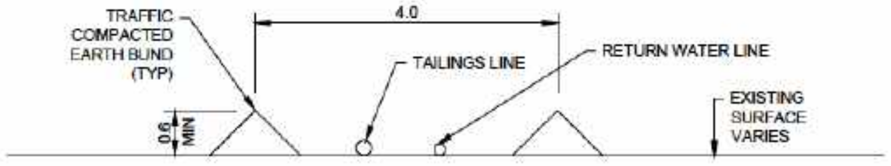
1. SURFACE PROFILE GENERATED FROM CLIENT SUPPLIED FILE: "250629_TSF_EOM_Surf".
2. ALL DIMENSIONS IN METRES UNLESS NOTED OTHERWISE.



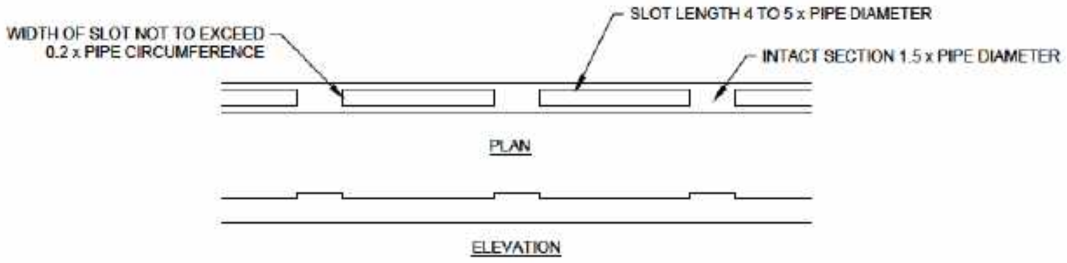
CMW Geosciences
Great People | Practical Solutions

CLIENT: **AURENNE GROUP HOLDINGS PTY LTD**
PROJECT: **MT IDA**
TSF1 RAISING
TITLE: **SECTIONS AND DETAILS**
DRAWN: DE
CHECKED: HZ
REVISION: A
DATE: 22.09.2025
PROJECT: PER2025-0260
DRAWING: 04
SCALE: 1:500
SHEET: A4 L

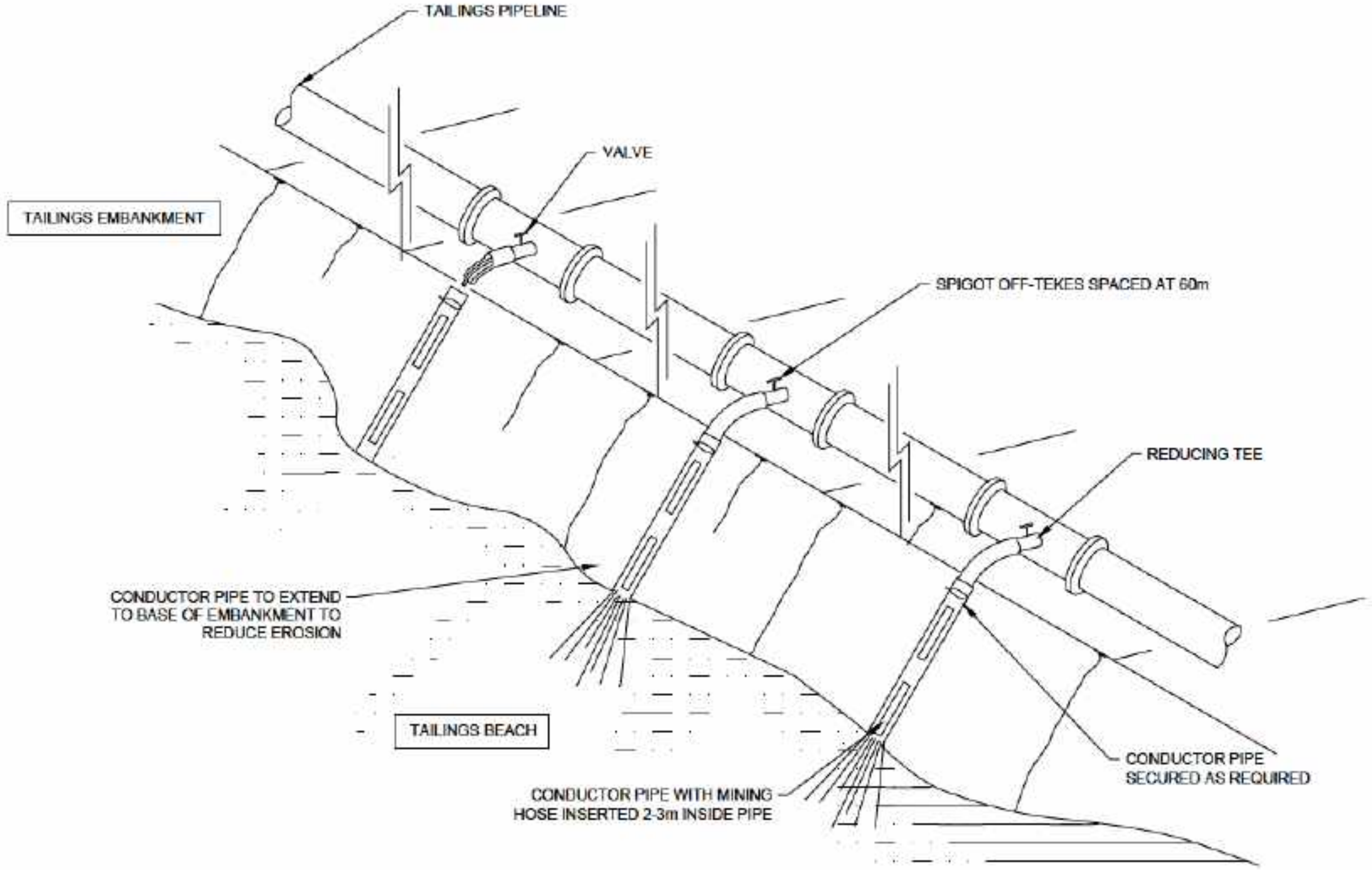
C:\Users\DarrenE\CMW Geosciences Pty Ltd\Perth office - PER2025-0260 Mt Ida TSF1 Raise to RL520m Design\Drawings\PER2025-0260-04 TSF1 SECTIONS & DETAILS 220925.dwg 22/09/2025 4:14:51 PM



PIPELINE BUNDING - TYPICAL SECTION
1:100



CONDUCTER PIPE (SLOTTED PVC) - TYPICAL DETAIL
1:50



PROPOSED SPIGOT ARRANGEMENT
ISOMETRIC VIEW (NTS)

NOTES:

1. ALL DIMENSIONS IN METRES UNLESS SPECIFIED

1:100 0 1 2 3 4 5 m

CMW Geosciences
Great People | Practical Solutions

CLIENT: **AURENNE GROUP HOLDINGS PTY LTD**	DRAWN: DE	PROJECT: PER2025-0260
PROJECT: **MT IDA** **TSF1 RAISING**	CHECKED: HZ	DRAWING: 05
	REVISION: A	SCALE: AS SHOWN
TITLE: **PIPELINE AND SPIGOT DETAILS**	DATE: 22.09.2025	SHEET: A3 L

CMW Geosciences
Great People | Practical Solutions

APPENDIX C
Tailings Testwork and Geotechnical Investigation Report

C-1 Tailings lab test results

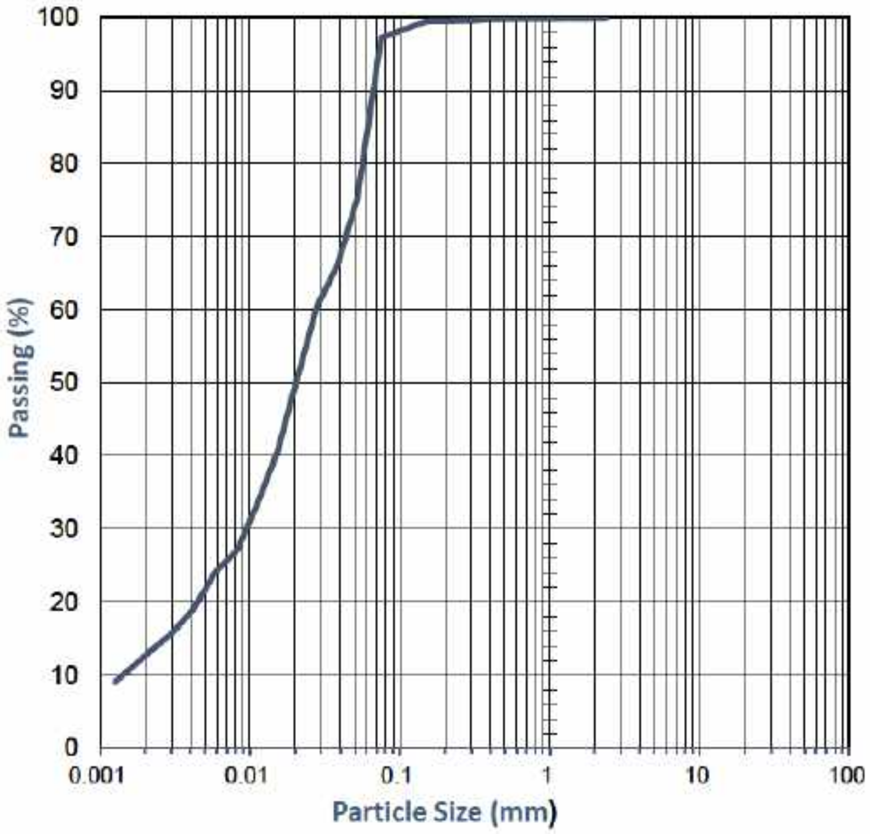
TEST REPORT - AS 1289.3.6.1, 3.6.3, 3.5.1

Client:	Aurenne Mining	*Ticket No.*	S19887
Client Address:	Level 2, 3 Ord Street West Perth WA 6005	*Report No.*	WG25.22218_1_PSDHY
Project:	Mt Ida	*Sample No.*	WG25.22218
Location:	Ularring, Menzies, WA	*Date Sampled:*	15/12/2025
Sample Identification:	Tails Sample 60% Solids	*Date Tested:*	23/12 - 30/12/2025

TEST RESULTS - Particle Size Distribution of Soil & Hydrometer Analysis

Sampling method:	**Sampled by Client, Tested as Received**
Sample description:	**Tailings**
Sample preparation:	**Oven Dried <50°C**
Loss in pre-treatment (%):	**N/A**
Type of hydrometer:	**g/L**
Method of dispersion:	**Mechanical Device**

Sieve Size (mm)	Passing (%)
75	
37.5	
19	
9.5	
4.75	
2.36	100
1.18	100
0.6	100
0.425	100
0.3	100
0.15	100
0.075	97
0.052	75
0.038	66
0.028	60
0.021	50
0.015	40
0.011	34
0.008	27
0.006	24
0.004	19
0.003	16
0.002	13
0.001	9



AS 1289.3.5.1 -2.36mm Particle Density (g/cm^3)
3.20

Comments:

[redacted]

NATA Accreditation No. 20599
Accredited for compliance
with ISO/IEC 17025 - Testing
This document shall not be reproduced except in full

WESTERN
GEOTECHNICAL
& Laboratory Services

SOIL | AGGREGATE | CONCRETE | CRUSHING

TEST REPORT - AS 1289.3.1.1, 3.2.1, 3.3.1 & 3.4.1

Client:	Aurenne Mining	*Ticket No.*	S19887
Client Address:	Level 2, 3 Ord Street West Perth WA 6005	*Report No.*	WG25.22218_1_PI
Project:	Mt Ida	*Sample No.*	WG25.22218
Location:	Ularring, Menzies, WA	*Date Sampled:*	15/12/2025
Sample Identification:	Tails Sample 60% Solids	*Date Tested:*	30/12/2025

TEST RESULTS - Consistency Limits (Casagrande)

Sampling Method:	**Sampled by Client, Tested as Received**
History of Sample:	**Oven Dried <50°C**
Method of Preparation:	**Dry Sieved**

AS 1289.3.1.1	**Liquid Limit (%)**	**23**
AS 1289.3.2.1	**Plastic Limit (%)**	**18**
AS 1289.3.3.1	**Plasticity Index (%)**	**5**
AS 1289.3.4.1	**Linear Shrinkage (%)**	**2.5**
AS 1289.3.4.1	**Length of Mould (mm)**	**125**
AS 1289.3.4.1	**Condition of Dry Specimen:**	**-**

Comments:

[redacted]

NATA
Accreditation No. 20599
Accredited for compliance
with ISO/IEC 17025 - Testing

This document shall not be reproduced except in full

Perth
16 Gympie Way, Willetton
WA 6155
Ph: (08) 9418 8742

[redacted]

E-PRECISION LABORATORY

AIR DRYING SETTLING TEST

METHOD: Supplied by Client SRC-WF-100 / SRC-RF-100

Client:	Western Geotechnical Lab Services	Date Tested:	04/01/2026
Project:	Material Assessment	EP Lab Job Number:	WGEO
Sample No:	Tails Sample 60% Solids		
Lab ID:	WG25_19987_AIR_DRY	Room Temperature at Test:	19°

Tested by: [redacted]

Type of Test: Air Dry Testing

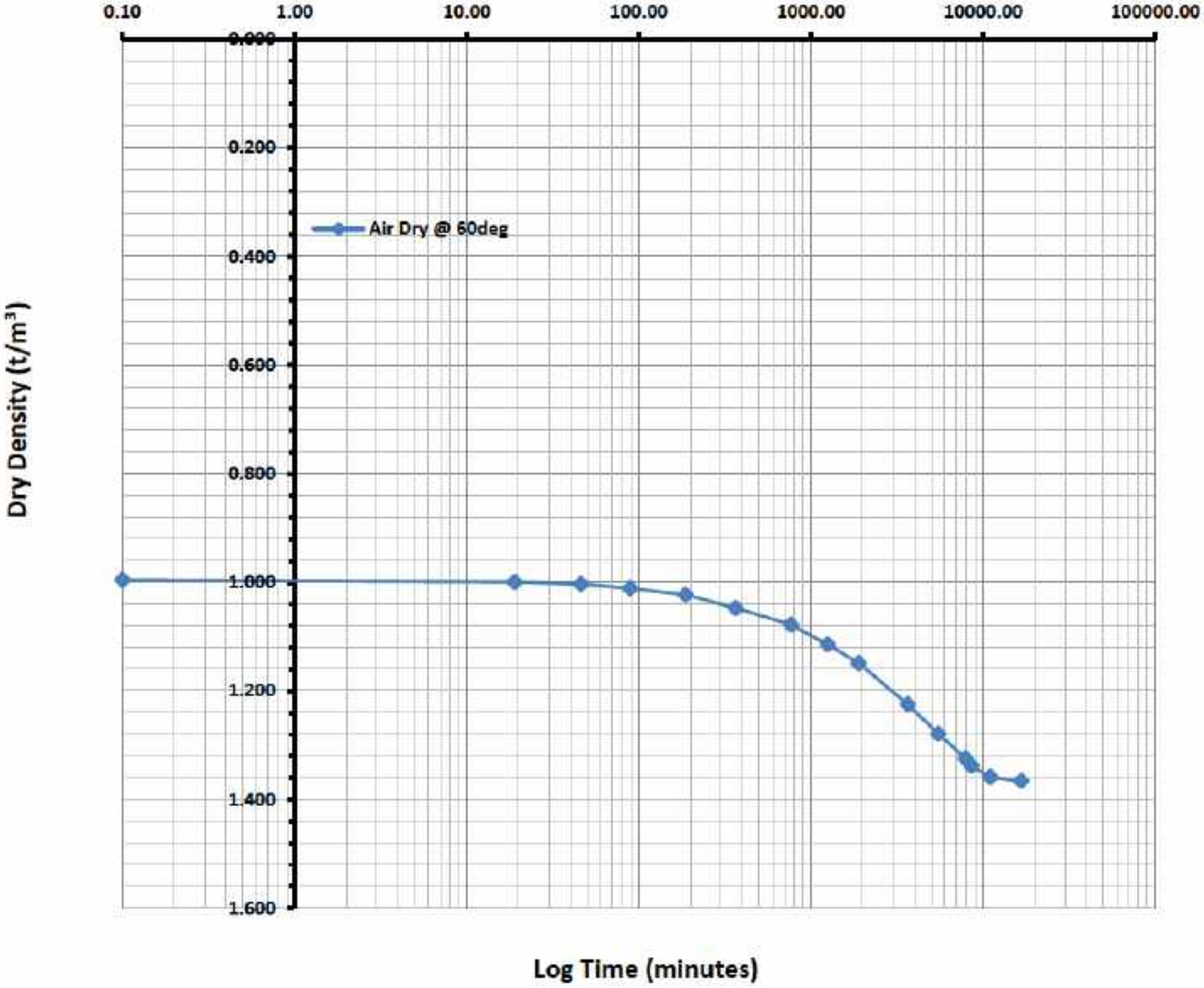
Sample Preparation: 60% Solids

Initial Bulk Density (t/m³): 1.662

Particle Density (t/m³): 2.987

Moisture Content Initial (%): 66.889

Dry Density (t/m³) Vs Time (minutes)



Comments:

Authorised Signature (Geotechnical Engineer): [redacted]

The results of tests performed apply only to the specific sample at time of test unless otherwise clearly stated. Reference should be made to E-Precision Laboratory's "Standard Terms and Conditions" E-Precision Laboratory ABN 431 559 578 87

Integrity Precision Innovation

[redacted]

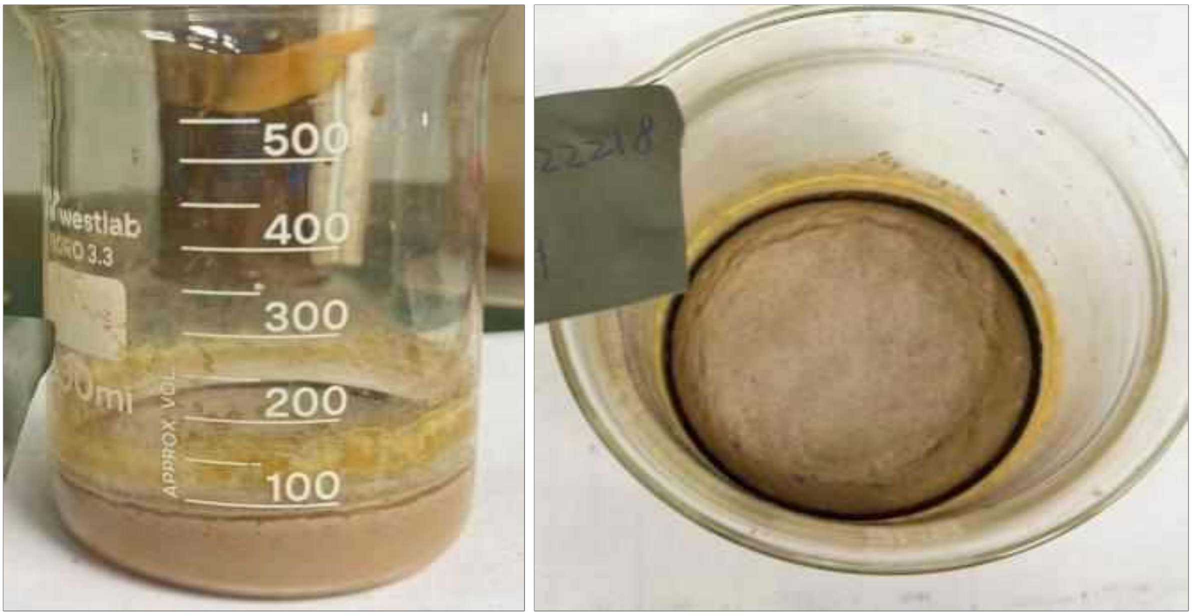
E-PRECISION LABORATORY

AIR DRYING SETTLING TEST

METHOD: Supplied by Client SRC-WF-100 / SRC-RF-100

Client:	Western Geotechnical Lab Services	Date Tested:	04/01/2026
Project:	Material Assessment	EP Lab Job Number:	WGEO
Sample No:	Tails Sample 60% Solids		
Lab ID:	WG25_19987_AIR_DRY	Room Temperature at Test:	19°

Photo of Samples after Testing



Oven dried @ 60deg

Comments:

Authorised Signature (Geotechnical Engineer) [redacted]

[redacted]

E-PRECISION LABORATORY

SETTLEMENT TESTING TAILINGS

METHOD: IN-HOUSE METHOD

Client:	Western Geotechnical Lab Services	Date Tested:	04/01/2026
Project:	Material Assessment	EP Lab Job Number:	WGEO
Sample No:	Tails Sample 60% Solids		
Lab ID:	WG25_19987_SETTLEMENT	Room Temperature at Test:	19°

Tested by: [redacted]

Type of Test: Settlement Testing

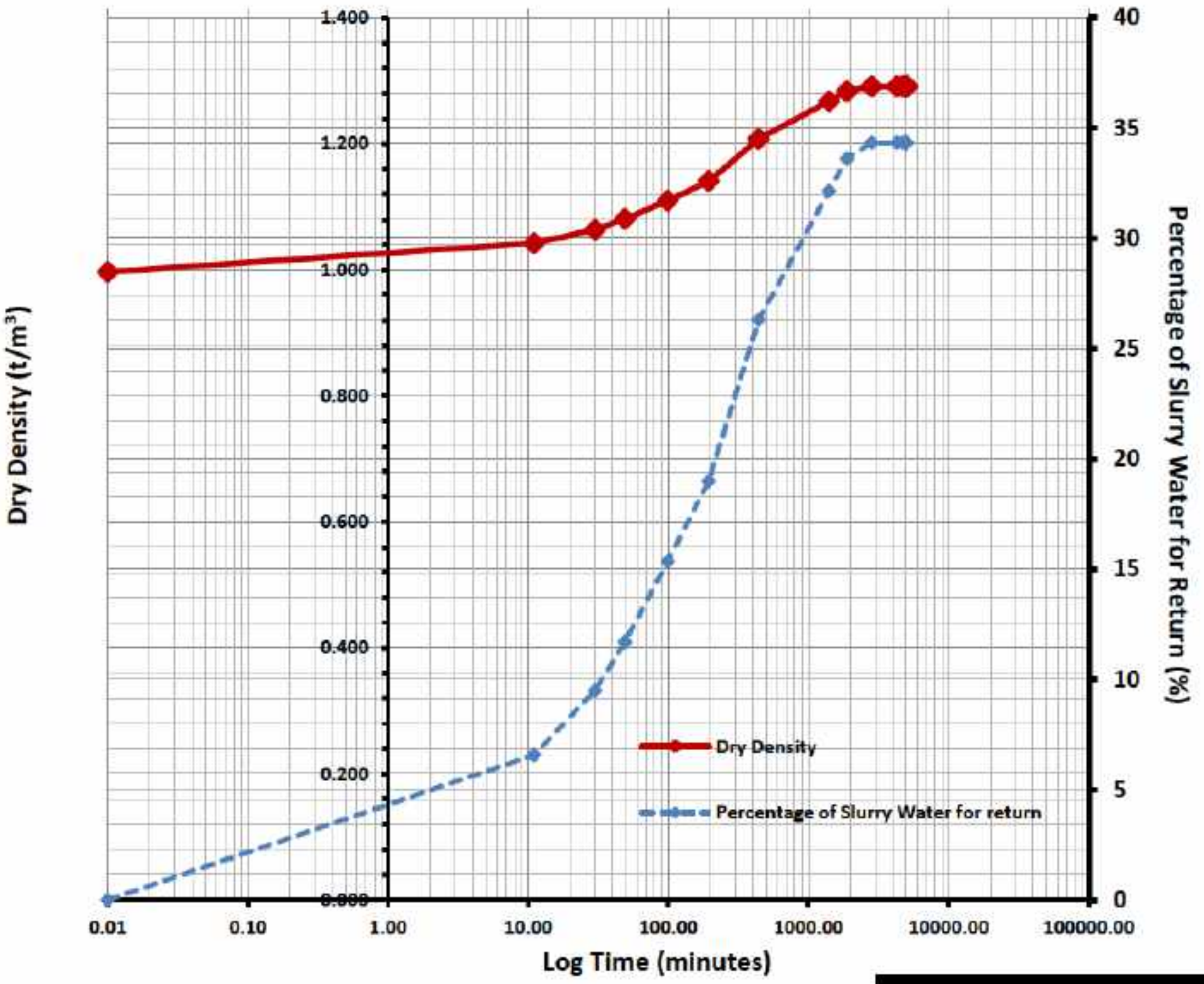
Sample Preparation: 60% Solids

Initial Dry Density (t/m³): 0.997

Particle Density (t/m³): 2.987

Initial Bulk Density (t/m³): 1.661

Undrained Dry Density (t/m³) Vs Log Time (minutes)



Comments:

Authorised Signature (Geotechnical Engineer): [redacted]

[redacted]

E-Precision Laboratory

SETTLEMENT TESTING TAILINGS

METHOD: IN-HOUSE METHOD

Client:	Western Geotechnical Lab Services	Date Tested:	04/01/2026
Project:	Material Assessment	EP Lab Job Number:	WGEO
Sample No:	Tails Sample 60% Solids		
Lab ID:	WG25_19987_SETTLEMENT	Room Temperature at Test:	19°

Tested by: [redacted]

Type of Test: Settlement Testing

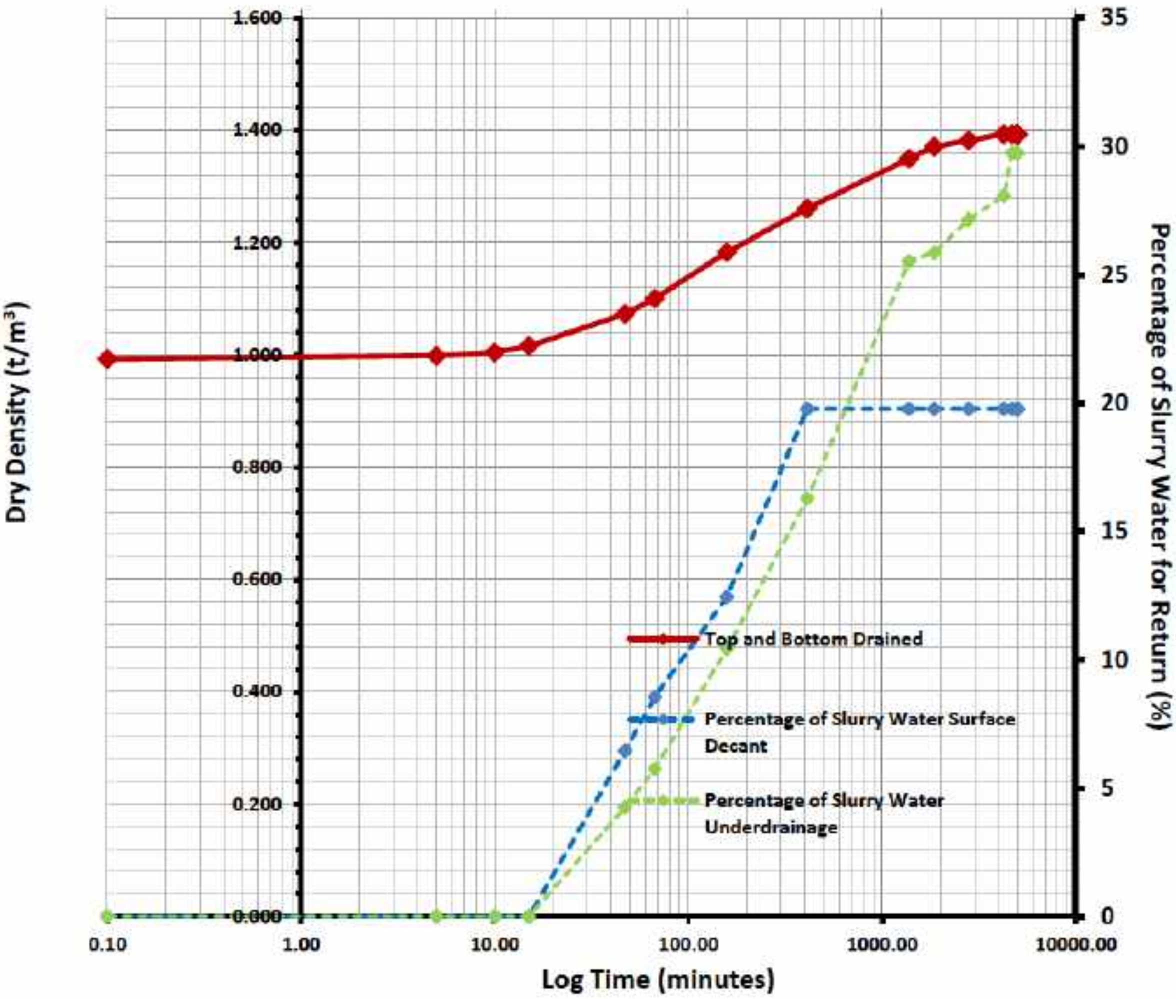
Sample Preparation: 60% Solids

Initial Dry Density (t/m^3): 0.993

Particle Density (t/m^3): 2.987

Initial Bulk Density (t/m^3): 1.655

Top and Bottom Drained Dry Density (t/m^3) Vs Log Time (minutes)



Comments:

Authorised Signature (Geotechnical Engineer): [redacted]

The results of tests performed apply only to the specific sample at time of test unless otherwise clearly stated. Reference should be made to E-Precision Laboratory's "Standard Terms and Conditions" E-Precision Laboratory ABN 431 559 578 87

Perth
16 Gympie Way, Willetton
WA 6155
Ph: (08) 9418 8742
[redacted]

E-Precision Laboratory

SETTLEMENT TESTING TAILINGS

METHOD: IN-HOUSE METHOD

Client:	Western Geotechnical Lab Services	Date Tested:	04/01/2026
Project:	Material Assessment	EP Lab Job Number:	WGEO
Sample No:	Tails Sample 60% Solids		
Lab ID:	WG25_19987_SETTLEMENT	Room Temperature at Test:	19°

Tested by:	[redacted]	**Initial Dry Density (t/m³):**	-
Type of Test:	Settlement Testing	**Particle Density (t/m³):**	-
Sample Preparation:	60% Solids	**Initial Bulk Density (t/m3):**	-

Photo of Test Setup

Undrained

Drained

Comments:

Authorised Signature (Geotechnical Engineer): [redacted]

Perth
16 Gympie Way, Willetton
WA 6155
Ph: (08) 9418 8742
[redacted]

E-Precision Laboratory

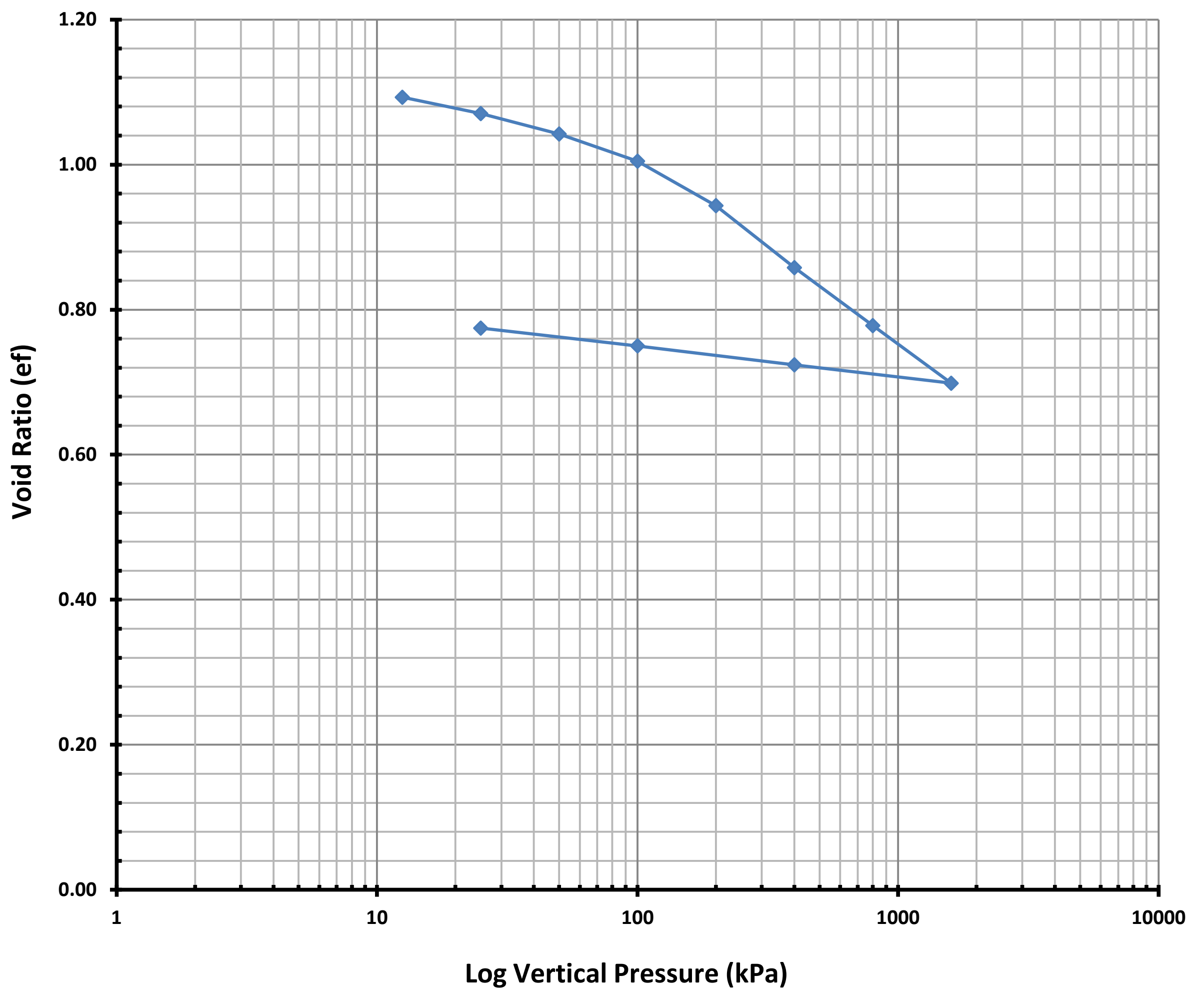
CONSOLIDATION - ONE DIMENSION

Method: AS1289 6.6.1 / Inhouse Method

Client:	Western Geotechnical Lab Services	Date Tested:	08/01/2026
Project:	Material Assessment	EP Lab Job Number:	WGEO
Sample ID:	Tails Sample 60% Solids		
Lab ID:	WG25_19987_OED	Lab:	EPLab
Depth (m):	-	Room Temperature at Test:	~ 19°C

Tested by:	[redacted]	Initial Moisture (%):	33.15	Test Condition:	Undrained
Height (mm):	37.92	Final Moisture Content (%):	27.50	Sample Condition:	Saturated
Diameter (mm):	61.80	Bulk Density (t/m³):	1.86	Particle Density (t/m³):	2.987
Direction:	Vertical	Dry Density (t/m³):	1.39	Initial Void Ratio (e_i):	1.144

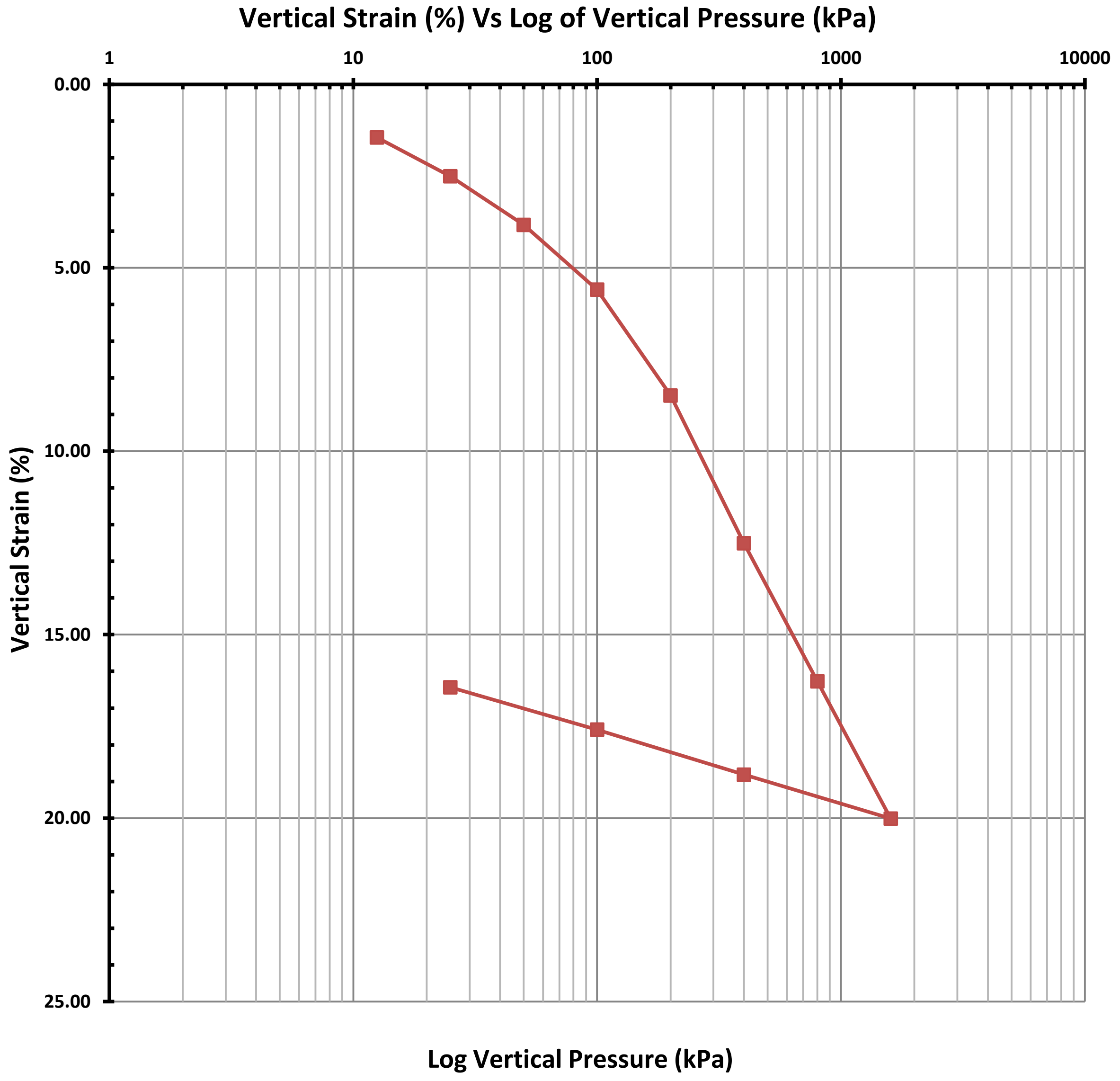
Void Ratio (e_f) Vs Log of Vertical Pressure (kPa)



CONSOLIDATION - ONE DIMENSION

Method: AS1289 6.6.1 / Inhouse Method

Client:	Western Geotechnical Lab Services	Date Tested:	08/01/2026
Project:	Material Assessment	EP Lab Job Number:	WGEO
Sample ID:	Tails Sample 60% Solids		
Lab ID:	WG25_19987_OED	Lab:	EPLab
Depth (m):	-	Room Temperature at Test:	~ 19°C



Integrity Precision Innovation

[redacted]

CONSOLIDATION - ONE DIMENSION

Method: AS1289 6.6.1 / Inhouse Method

Client:	Western Geotechnical Lab Services	Date Tested:	08/01/2026
Project:	Material Assessment	EP Lab Job Number:	WGEO
Sample ID:	Tails Sample 60% Solids		
Lab ID:	WG25_19987_OED	Lab:	EPLab
Depth (m):	-	Room Temperature at Test:	~ 19°C

Test Results

*

Stages	Vert Disp (mm)	Cv (m^2/yr)		Compressibility Mv (m^2/kN)	K (m/s)		Void Ratio (e_f)	Vertical Strain (%)
		*t_{50}	t_{90}					
Stage 1 @ 12.5kPa	0.548	3.671	-	1.16E-03	1.3E-09		1.093	1.45
Stage 2 @ 25kPa	0.949	3.577	-	8.58E-04	9.6E-10		1.070	2.50
Stage 3 @ 50kPa	1.452	3.472	-	5.44E-04	5.9E-10		1.042	3.83
Stage 4 @ 100kPa	2.121	3.355	-	3.67E-04	3.8E-10		1.005	5.59
Stage 5 @ 200kPa	3.216	2.143	-	3.06E-04	2.0E-10		0.943	8.48
Stage 6 @ 400kPa	4.743	1.456	-	2.20E-04	1.0E-10		0.858	12.51
Stage 7 @ 800kPa	6.170	0.888	-	1.08E-04	3.0E-11		0.778	16.27
Stage 8 @ 1600kPa	7.589	0.694	-	5.59E-05	1.2E-11		0.699	20.01

Unload @ 400kPa	7.135
Unload @ 100kPa	6.669
Unload @ 25kPa	6.232

** Values interpreted via lab only*

Comments: **Samples collected from Drained Settlement Testing**
Cv values to be interpreted via Engineer

Samples supplied by the Client

Authorised Signatory (Geotechnical Engineer): [redacted]

Perth
16 Gympie Way, Willetton
WA 6155
Ph: (08) 9418 8742
[redacted]

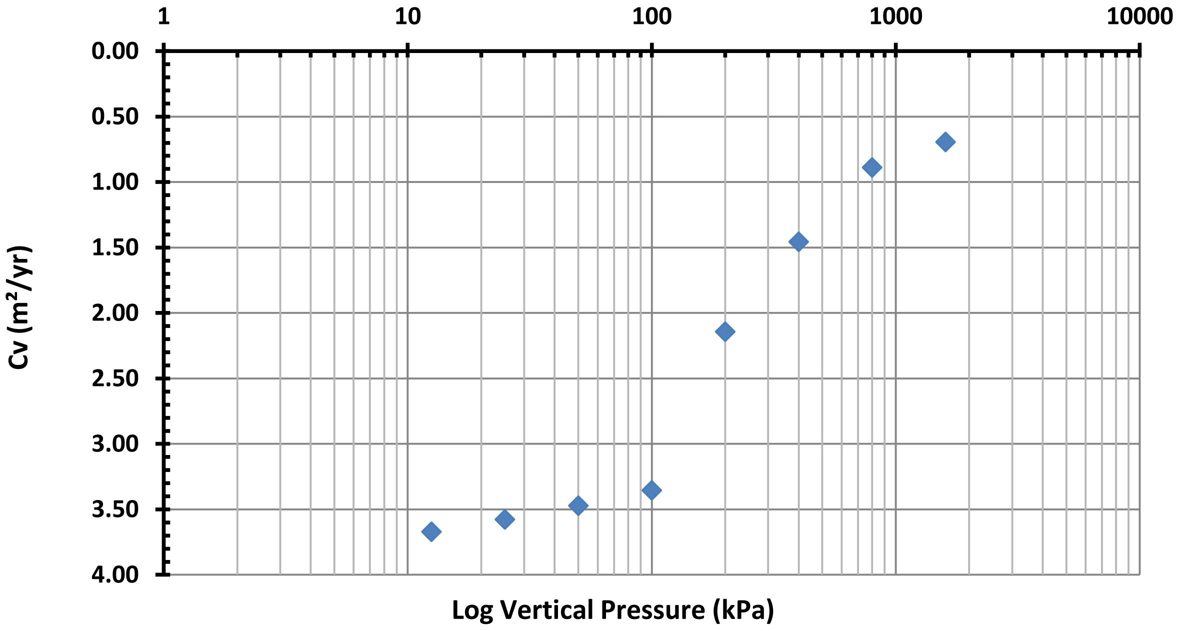
E-PRECISION LABORATORY

CONSOLIDATION - ONE DIMENSION

Method: AS1289 6.6.1 / Inhouse Method

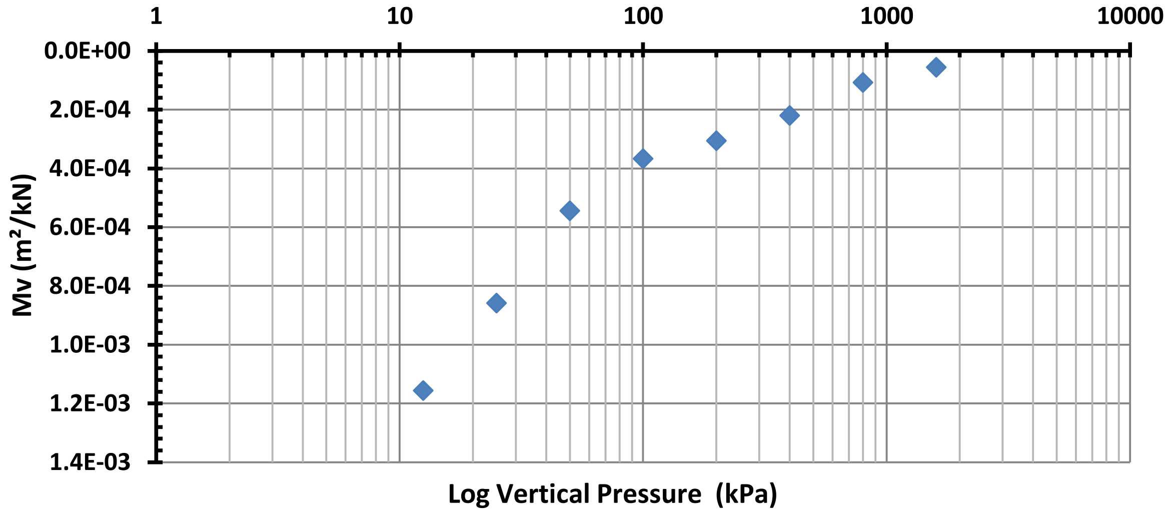
Client:	Western Geotechnical Lab Services	Date Tested:	08/01/2026
Project:	Material Assessment	EP Lab Job Number:	WGEO
Sample ID:	Tails Sample 60% Solids		
Lab ID:	WG25_19987_OED	Lab:	EPLab
Depth (m):	-	Room Temperature at Test:	~ 19°C

Cv (m²/yr) Vs Log of Vertical Pressure (kPa)



* Plot based on Log (time) data

Mv (m²/kN) Vs Log of Vertical Pressure (kPa)



CONSOLIDATION - ONE DIMENSION

Method: AS1289 6.6.1 / Inhouse Method

Client:	Western Geotechnical Lab Services	Date Tested:	08/01/2026
Project:	Material Assessment	EP Lab Job Number:	WGEO
Sample ID:	Tails Sample 60% Solids		
Lab ID:	WG25_19987_OED	Lab:	EPLab
Depth (m):	-	Room Temperature at Test:	~ 19°C

TEST RESULTS PLEASE SEE PAGES BELOW

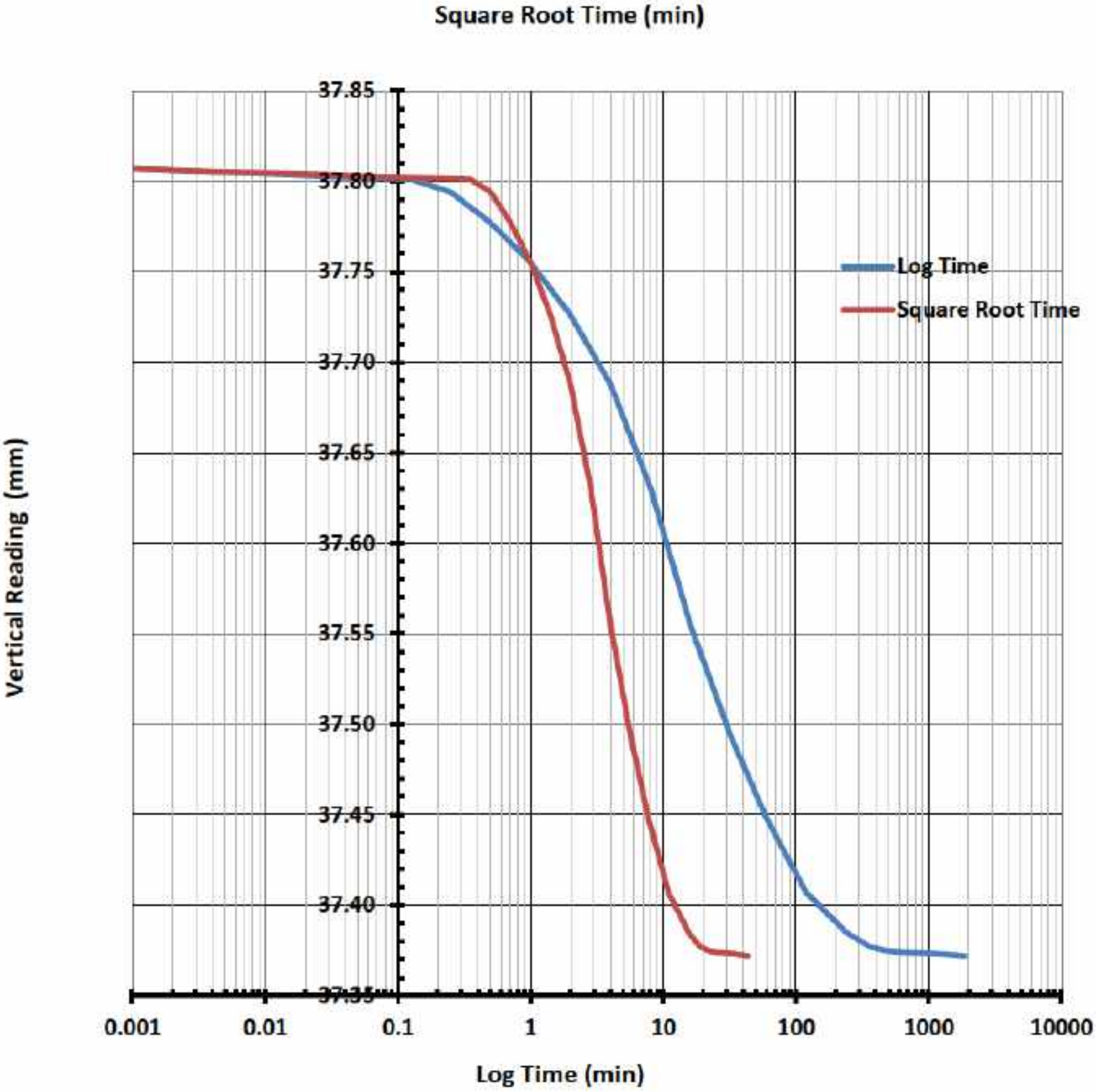
[redacted]

CONSOLIDATION - ONE DIMENSION

Method: AS1289 6.6.1 / Inhouse Method

Client:	Western Geotechnical Lab Services	Date Tested:	08/01/2026
Project:	Material Assessment	EP Lab Job Number:	WGEO
Sample ID:	Tails Sample 60% Solids		
Lab ID:	WG25_19987_OED	Lab:	EPLab
Depth (m):	-	Room Temperature at Test:	~ 19°C

Stage 1 @ 12.5kPa

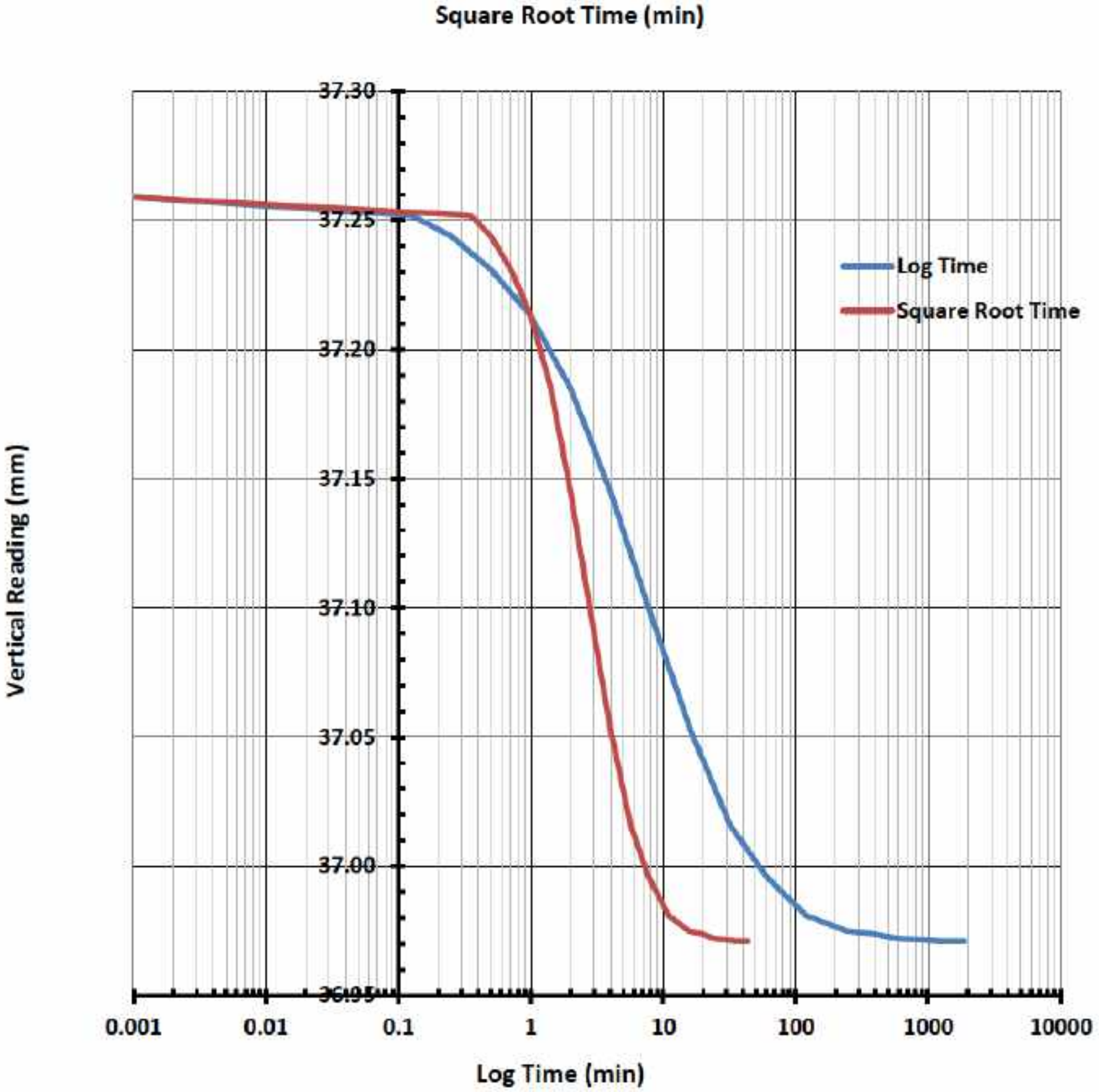


CONSOLIDATION - ONE DIMENSION

Method: AS1289 6.6.1 / Inhouse Method

Client:	Western Geotechnical Lab Services	Date Tested:	08/01/2026
Project:	Material Assessment	EP Lab Job Number:	WGEO
Sample ID:	Tails Sample 60% Solids		
Lab ID:	WG25_19987_OED	Lab:	EPLab
Depth (m):	-	Room Temperature at Test:	~ 19°C

Stage 2 @ 25kPa

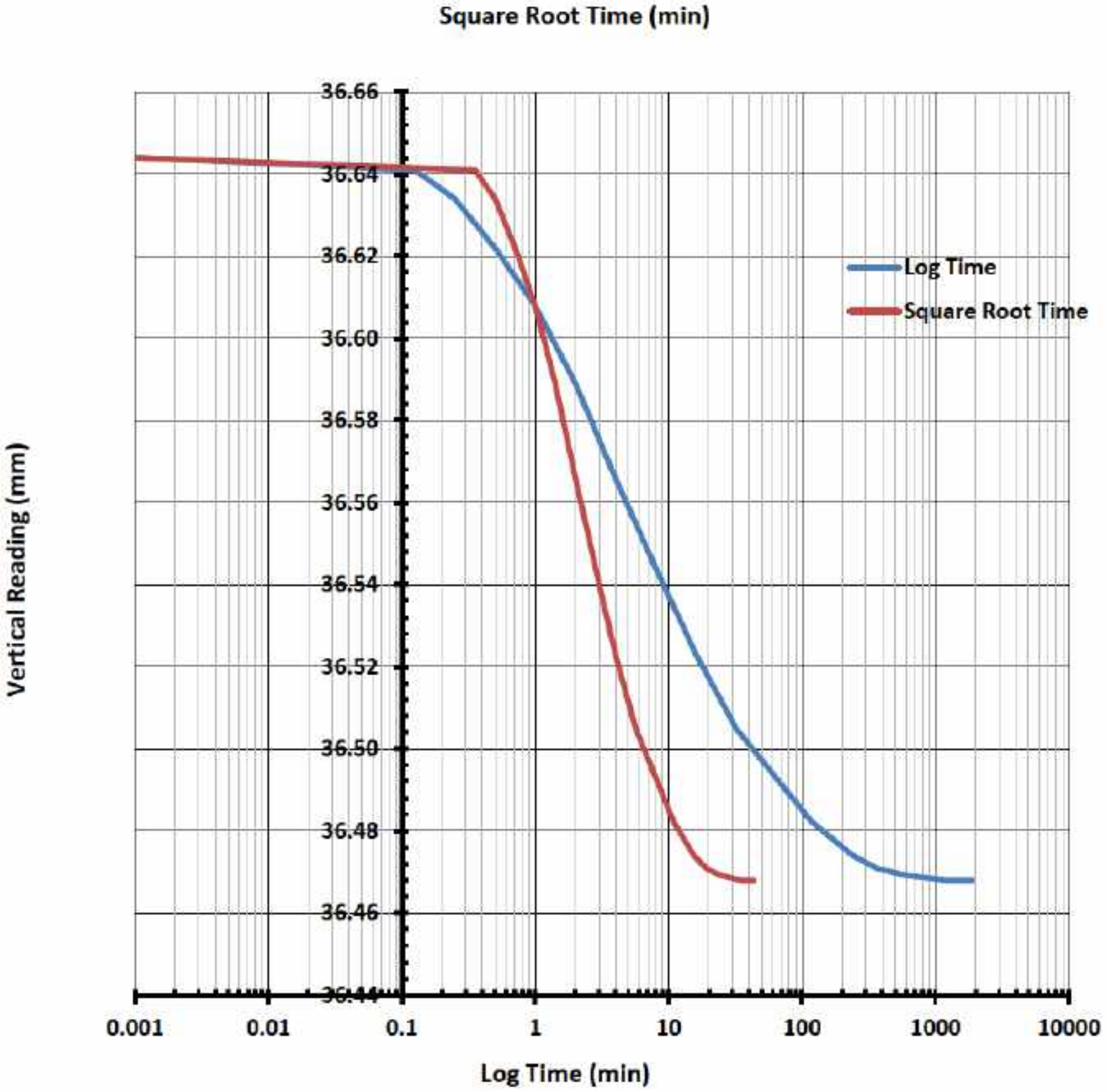


CONSOLIDATION - ONE DIMENSION

Method: AS1289 6.6.1 / Inhouse Method

Client:	Western Geotechnical Lab Services	Date Tested:	08/01/2026
	Material Assessment	EP Lab Job Number:	WGEO
Sample ID:	Tails Sample 60% Solids		
Lab ID:	WG25_19987_OED	Lab:	EPLab
Depth (m):	-	Room Temperature at Test:	~ 19°C

Stage 3 @ 50kPa

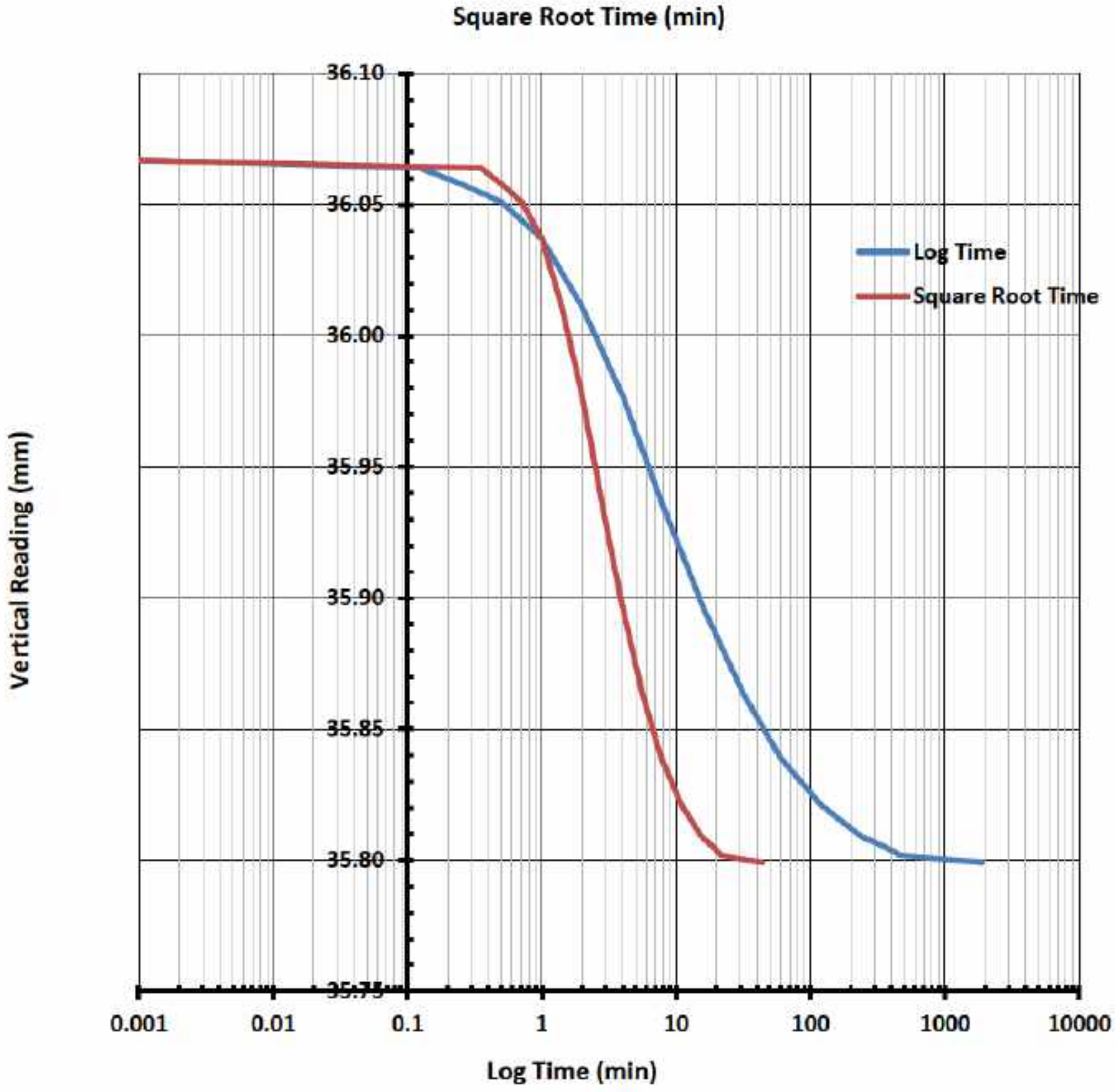


CONSOLIDATION - ONE DIMENSION

Method: AS1289 6.6.1 / Inhouse Method

Client:	Western Geotechnical Lab Services	Date Tested:	08/01/2026
Project:	Material Assessment	EP Lab Job Number:	WGEO
Sample ID:	Tails Sample 60% Solids		
Lab ID:	WG25_19987_OED	Lab:	EPLab
Depth (m):	-	Room Temperature at Test:	~ 19°C

Stage 4 @ 100kPa



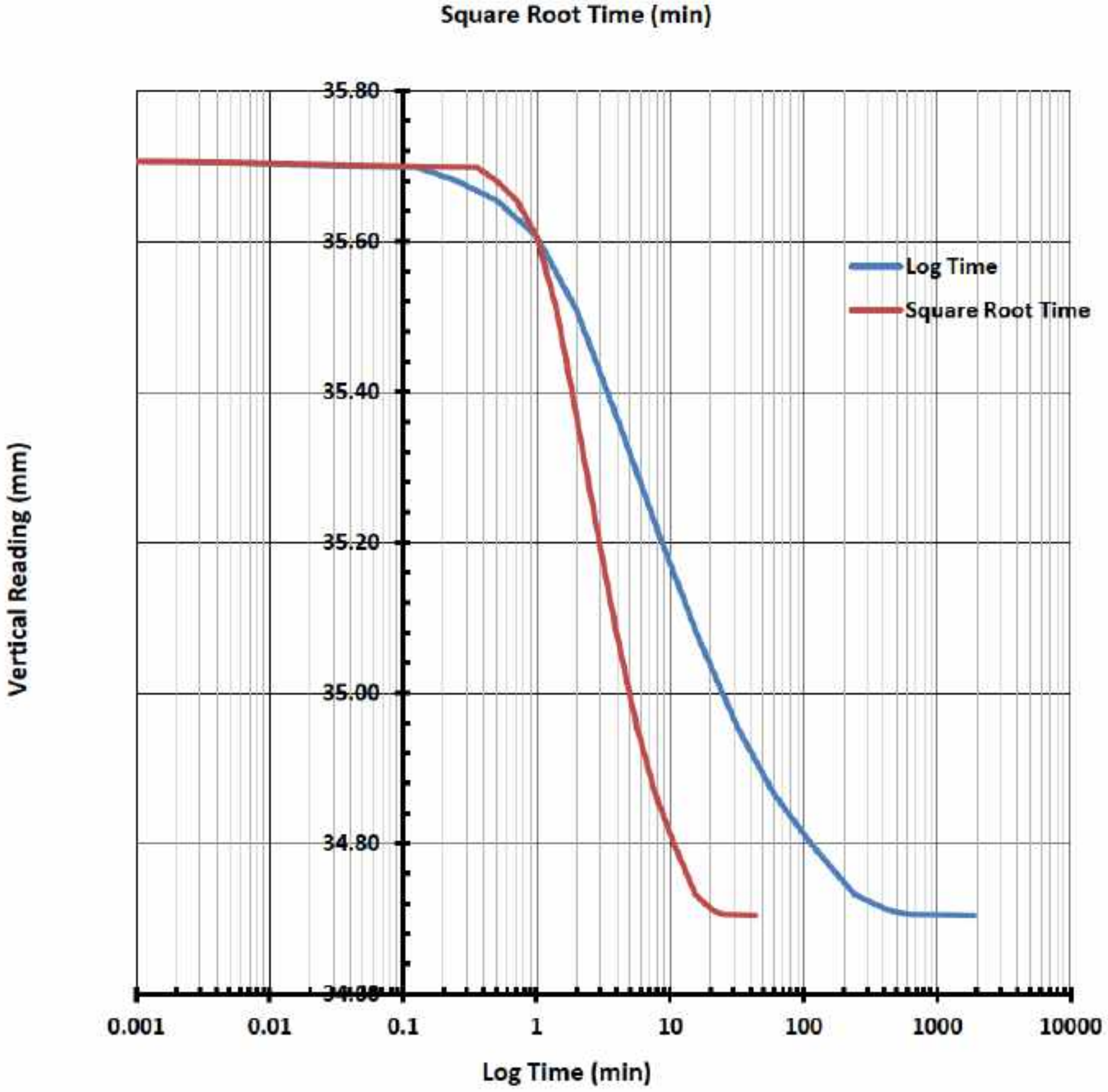
[redacted]

CONSOLIDATION - ONE DIMENSION

Method: AS1289 6.6.1 / Inhouse Method

Client:	Western Geotechnical Lab Services	Date Tested:	08/01/2026
Project:	Material Assessment	EP Lab Job Number:	WGEO
Sample ID:	Tails Sample 60% Solids		
Lab ID:	WG25_19987_OED	Lab:	EPLab
Depth (m):	-	Room Temperature at Test:	~ 19°C

Stage 5 @ 200kPa

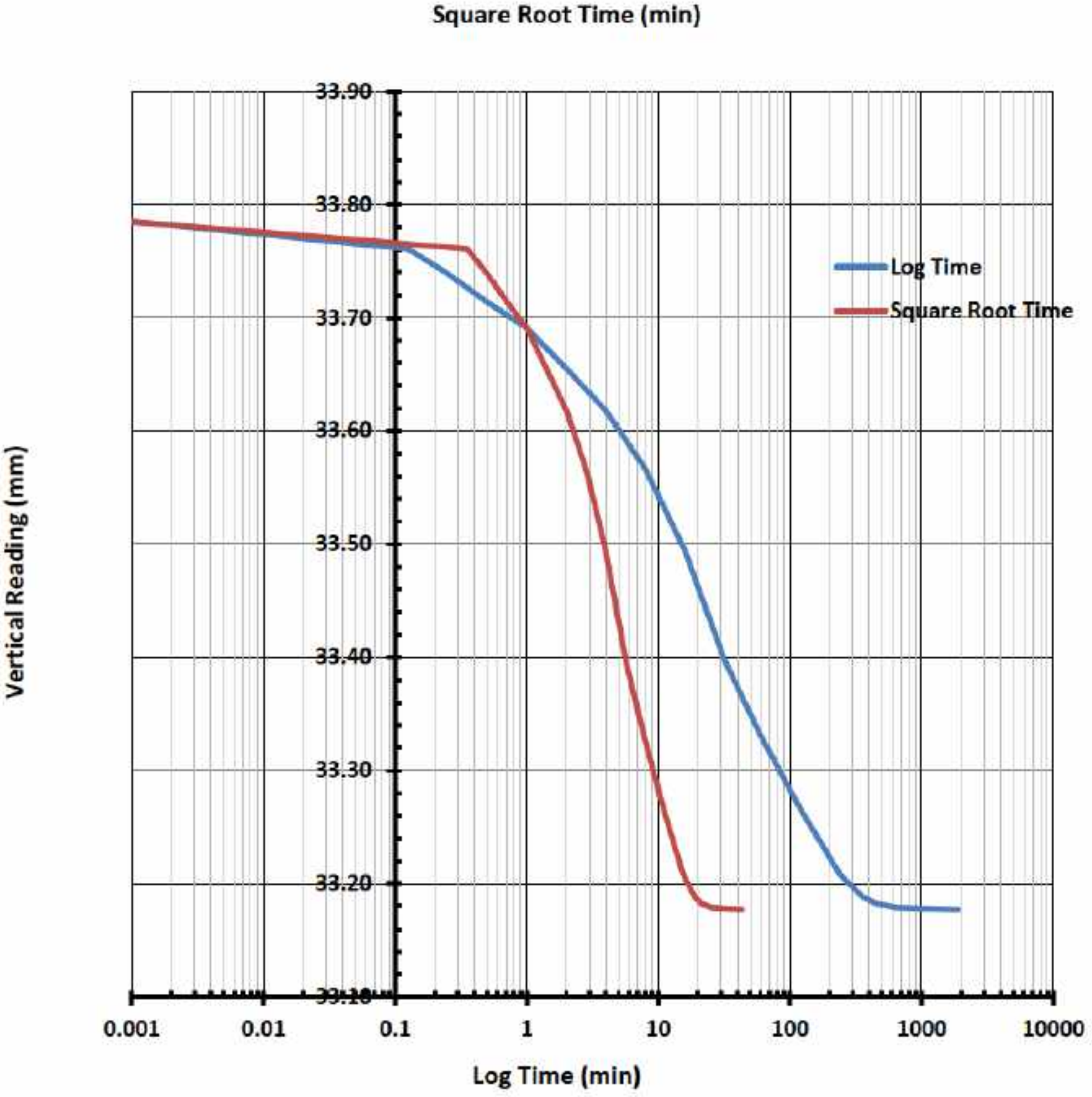


CONSOLIDATION - ONE DIMENSION

Method: AS1289 6.6.1 / Inhouse Method

Client:	Western Geotechnical Lab Services	Date Tested:	08/01/2026
Project:	Material Assessment	EP Lab Job Number:	WGEO
Sample ID:	Tails Sample 60% Solids		
Lab ID:	WG25_19987_OED	Lab:	EPLab
Depth (m):	-	Room Temperature at Test:	~ 19°C

Stage 6 @ 400kPa

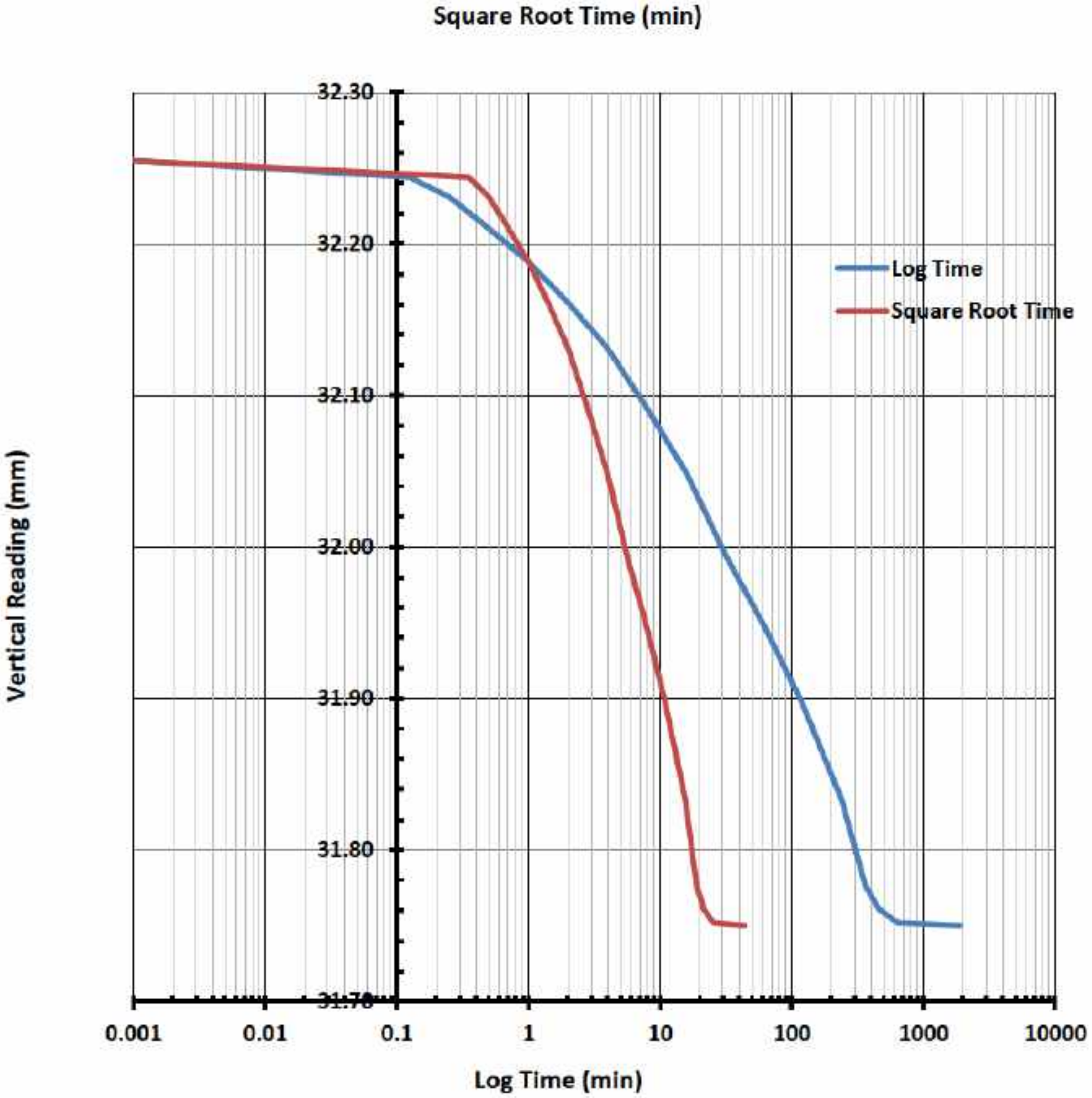


CONSOLIDATION - ONE DIMENSION

Method: AS1289 6.6.1 / Inhouse Method

Client:	Western Geotechnical Lab Services	Date Tested:	08/01/2026
Project:	Material Assessment	EP Lab Job Number:	WGEO
Sample ID:	Tails Sample 60% Solids		
Lab ID:	WG25_19987_OED	Lab:	EPLab
Depth (m):	-	Room Temperature at Test:	~ 19°C

Stage 7 @ 800kPa



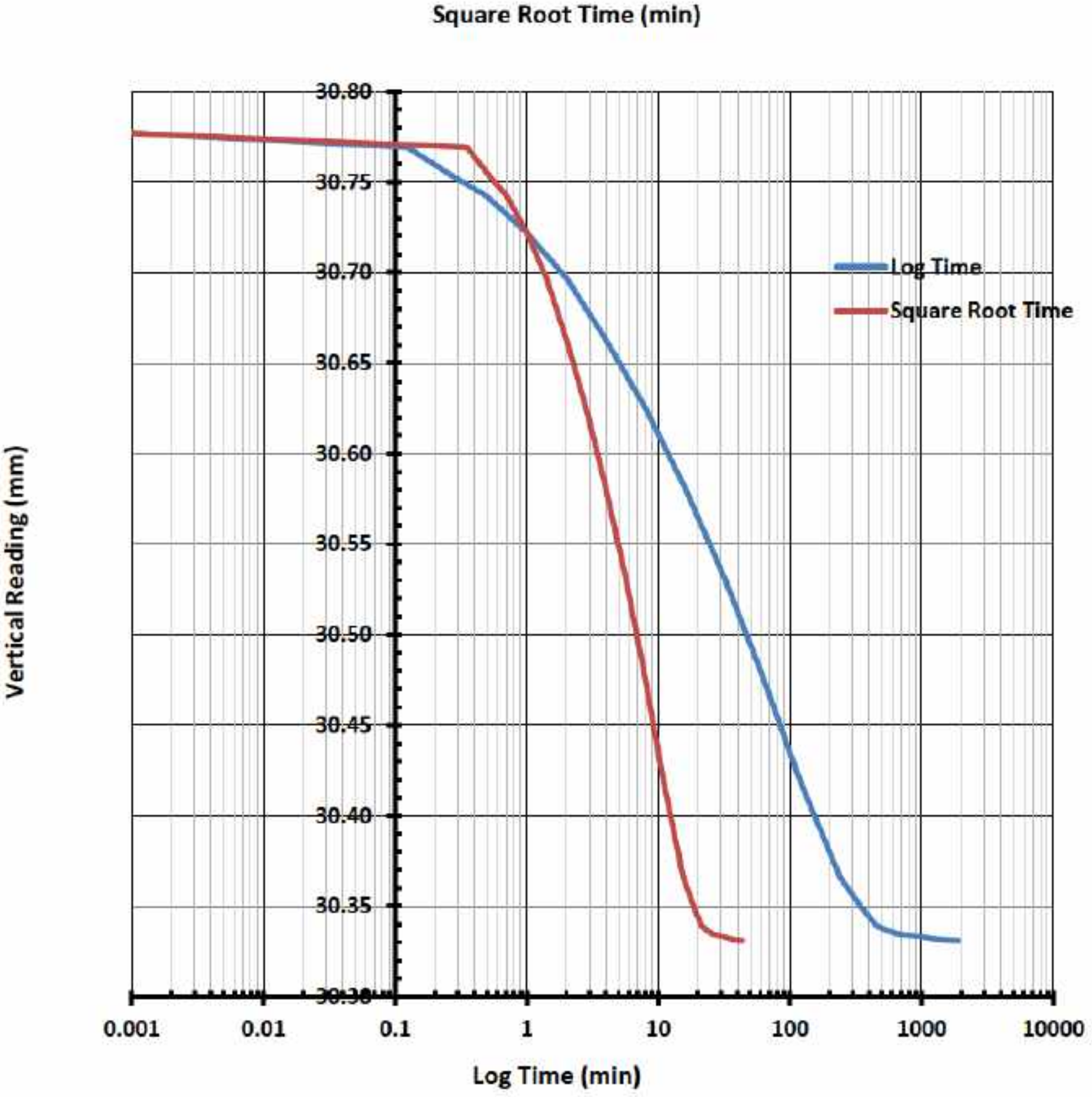
[redacted]

CONSOLIDATION - ONE DIMENSION

Method: AS1289 6.6.1 / Inhouse Method

Client:	Western Geotechnical Lab Services	Date Tested:	08/01/2026
Project:	Material Assessment	EP Lab Job Number:	WGEO
Sample ID:	Tails Sample 60% Solids		
Lab ID:	WG25_19987_OED	Lab:	EPLab
Depth (m):	-	Room Temperature at Test:	~ 19°C

Stage 8 @ 1600kPa



Mt Ida Gold Project
Bottle Creek Mining and Processing
Aurenne Mining

Sulphide Tailings Characterisation

Revision No 1
January 2026

pendragon environmental solutions
ABN: 92 147 485 416

Leaders in Environmental Practice

Pendragon Environmental Solutions

ABN: 92 147 485 416

info@pendragonenvironmental.com

www.pendragonenvironmental.com

Limitations, Uses and Reliance

This document, once read in its entirety, may be relied upon for the purposes stated within the limits of:

Environmental investigations and assessments are undertaken in accordance with an agreed term of reference and timeframe and may involve intrusive investigations of subsurface conditions, generally at a few selected locations. Although due care, skill and professional judgement are applied in the interpretation and extrapolation of environmental conditions and factors to elsewhere, the potential for variances cannot be discounted. Therefore, the results, analyses and interpretations presented herein cannot be considered absolute or conclusive. Pendragon Environmental Solutions does not accept any responsibility for variances between the interpreted and extrapolated and those that are revealed by any means. Specific warning is given that many factors, natural or artificial, may render conditions different from those that prevailed at the time of investigation, and should they be revealed at any time subsequently, they should be brought to our attention so that their significance may be assessed, and appropriate advice may be offered. Users are also cautioned that fundamental assumptions made in this document may change with time and it is the responsibility of any user to ensure that assumptions made, remain valid.

The comments, findings, conclusions and recommendations contained in this document represent professional estimates and opinions and are not to be read as facts unless expressly stated to the contrary. In general, statements of fact are confined to statements as to what was done and/or what was observed; others have been based on professional judgement. The conclusions are based upon information and data, visual observations and the results of field and laboratory investigations and are therefore merely indicative of the environmental conditions at the time, including the presence or otherwise of contaminants or emissions. In addition, presentations in this document are based upon the extent of the terms of reference and/or on information supplied by the client, agents and third parties outside our control. To the extent that the statements, opinions, facts, conclusions and/or recommendations in this document are based in whole or part on this information, those are contingent upon the accuracy and completeness of the information which has not been verified unless stated otherwise. Pendragon Environmental Solutions does not accept responsibility for omissions and errors due to incorrect information or information not available at the time of preparation of this document and will not be liable in relation to incorrect conclusions should any information be incorrect or have been concealed, withheld, misrepresented or otherwise not fully disclosed. Neither will we be liable to update or revise the document to consider any events, emergent circumstances or facts occurring or becoming apparent after the date of this document.

Within the limitations imposed by the terms of reference, the assessment of the study area and preparation of this document have been undertaken and performed in a professional manner, by suitably qualified and experienced personnel, in accordance with generally accepted practices and using a degree of skill and care ordinarily exercised by environmental consultants under similar circumstances. No other warranty, expressed or implied, is made.

This document has been prepared for the purposes stated herein. Every care was taken in the interpretation of environmental conditions and the nature and extent of impacts, presentation of findings and recommendations which are provided in good faith in the general belief that none of these are misleading. No responsibility or liability for the consequences of use and/or inference by others is accepted.

Intellectual and copyright in the information, data and representations such as drawings, figures, tabulations and text, included in this document remain the property of Pendragon Environmental Solutions. This document is for the exclusive use of the authorised recipient(s) and may not be used, copied or re-produced in whole, or in part, for any purpose(s) other than that for which it was prepared for. No responsibility or liability to any other party is accepted for any consequences and/or damages arising out of the use of this document without express and written consent.

The above conditions must be read as part of the document and must be reproduced where permitted. Acceptance of this document indicates acceptance of these terms and conditions.

Report

Title:	Mt Ida Gold Project Aurenne Mining Sulphide Tailings Characterisation
File:	PES21005
Author(s):	[redacted]
Client:	Aurenne Mining
Contact:	[redacted]
Synopsis:	This document: ▪ Details the characterisation of sulphide tailings from the Mt Ida Bottle Creek deposits and which are to be deposited in the existing Integrated Waste Landform (IWL) at the Mt Ida Gold Project. ▪ Takes due cognisance of the Western Australian Department of Mines and Petroleum (DMP), now the Department of Mines, Energy and Industry Regulation (DEMIRS) Draft Guidance *Materials Characterisation Baseline Data Requirements for Mining Proposals*, March 2016.

Document Control

Revision No	Date	Author(s)	[redacted]
1	27 January 2026	Carel van der Westhuizen and Edgardo Alarcôn Léon	[redacted]

Distribution

Revision No	Date	Approved	Recipient(s)	[redacted]
1	27 January 2026	Ryan Lawrence	Aurenne Mining	[redacted]

Revision

Revision No	Date	Description	[redacted]
1	27 January 2026	Issued for inclusion in Mining Proposal and Mine Closure Plan.	[redacted]

Recipients are responsible for eliminating all superseded documents in their possess [redacted]

Table of Contents

Figures

Tables

Appendices

Executive Summary

Aurenne Mining is disposing of tailings from processing oxide ores from the Mt Ida Bottle Creek deposits in an Integrated Waste Landform (IWL) at the Mt Ida Gold Project. Aurenne Mining intends to mine and process sulphide ores blended with oxide and transitional ores and dispose of the tailings in the existing IWL on top of the oxide ores disposed thus far.

Scope of Works

To undertake characterisation of the mixed oxide-transitional-sulphide tailings, the following sampling regime was implemented:

- Obtain representative samples of raw water (water from open pits and production bores) and process water (thickener overflow, TSF decant return water and raw water).
- Obtain 2 composite samples: one a mixture of 20% sulphide and an 80% blend of oxide and transitional ore and the other a mixture of 40% sulphide and a 60% blend of oxide and transitional ore.
- Analyse each sample for:
  - Acid Base Accounting characteristics including pH (1:5), Electrical Conductivity (1:5), Total Sulfur, Total Oxidised Sulfur as Sulfate, Chromium Reducible Sulphur, field (pH_f), oxidised (pH_{fox}) and Net Acid Generation (NAG) pH (pH_{ox} or NAG pH), NAG at pH 4.5 and 7.0, Acid Neutralising Capacity (ANC), Net Acid Production Potential (NAPP) and Acid Buffering Characteristic Curve (ABCC).
  - Analyse each sample total metals and metalloids: antimony (Sb), arsenic (As), aluminium (Al), barium (Ba), cadmium (Cd), chromium (Cr), cobalt (Co), copper (Cu), iron (Fe), manganese (Mn), mercury (Hg), molybdenum (Mo), lead (Pb), nickel (Ni), selenium (Se), uranium (U), vanadium (V) and zinc (Zn) as well as leachable metals and metalloids, using the Australian Standard Leaching Procedure (ASLP), at a pH of 5 (acidic environment), pH 7 (neutral environment) and pH 9 (alkaline environment).

Summary and Conclusions of Salient Findings

Geochemical characterisation of the oxide-transitional tailings at Mt Ida indicated that:

- Tailings solids classify as Non-Acid Forming (NAF); having a Sulphur concentration between 0.14% and 0.24% (Chromium Reducible Sulfur, CRS, between 0.023% and 0.026%), acid neutralising capacities between 12.2 and 14.2 kgH_2SO_4/t and positive net acid production potential.
- Global Abundance Indices calculations suggest that the tailings is enriched by one element only i.e. Arsenic.
- Groundwater sampling events encountered elevated dissolved Arsenic (As^{3+} based on laboratory speciation analytical data) in water in several open pits and groundwater sources at Mt Ida.
- Laboratory leachates prepared at a pH of 7 and 9 (the current pH level at the IWLTSF) reported elevated concentrations of Aluminium, Arsenic and Copper and Arsenic respectively.

Current investigations and assessments of blended oxide-transitional and fresh sulphide tailings composites, proposed to be deposited in the IWLTSF (Stage 6 to 8) on top of the existing oxide-transitional tailings, indicated that:

- The blended tailings solids classify as Acid Forming (AF), having a Sulfur concentration between 4.6% and 9.0% (Chromium Reducible Sulfur, CRS, between 2.3% and 4.0%), acid neutralising capacities between 10.9 and 11.5 kgH_2SO_4/t and positive net acid production potential between 129 and 265 kgH_2SO_4/t.
- Mineralogical assessments indicated that the primary components of the blended ore samples are quartz,

iron, sulphur and aluminium oxide with pyrite the dominant sulphur form hence the potential for acid formation is considered long term.

- Global Abundance Indices calculations indicate that the blended tailings are enriched by Antimony, Arsenic, Cadmium, Lead and Zinc, to a lesser extent.
- Laboratory leachates prepared at pH's of 5, 7 and 9 (the current pH level at the IWLTSF) reported elevated concentrations of:
    - pH 5: aluminium, arsenic, lead, manganese and nickel.
    - pH 7: aluminium and lead.
    - pH 9: aluminium and arsenic.
- Groundwater associated with the ore body contains elevated concentrations of major ions and heavy metals and metalloids particularly Arsenic and Boron. Arsenic, Boron and Cadmium exceed their Groundwater Investigation Levels.

  Groundwater (raw water from bores and open pits), tailings return water (including tailings pore waters) and process water at Mt Ida are circumneutral to alkaline and of a Sodium-Chloride type.

  Groundwater underlying the IWL-TSF and Processing Plant contain markedly less concentrations of major ions and metals and metalloids, particularly arsenic, than the groundwater associated with the ore body and process water, tailings return water and tailings pore waters. Cognisance must be taken that these bores were drilled to first water strike and hence may not intersect the main aquifer. Boron, Nickel and Zinc concentrations exceed their Groundwater Investigation Levels.

  Process water, tailings return water and tailings pore water contain markedly elevated concentrations of major ions and metals and metalloids well above the concentrations in the underlying groundwater regime and/or groundwater associated with the ore body. Several metals and metalloids including Aluminium, Arsenic, Boron, Cadmium, Copper, Lead, Mercury, Nickel, Selenium, Silver and Zinc exceed their Groundwater Investigation Levels.

  The characteristics of the existing groundwater regime preclude all potential beneficial uses without further treatment to confirm their suitability for a particular or intended use.
- Groundwater levels at the IWL-TSF, currently well below the trigger level, seem to respond to rainfall-infiltration; however, the monitoring record is too short to make any definitive observations pertaining to groundwater level trends.
- The current (31 December 2025) volume of oxide tailings in the IWL is 3.145 million m^3 at a height between 505mRL and 506mRL (the IWL is on a sloping floor between 488mRL in the south and 500mRL in the north).

  The volume of blended sulphide tailings that the IWL can accept is estimated at 3.193 million m^3 to a level between 510mRL and 519.5mRL.

  The existing IWL will not be raised any further and investigations into a valley-fill TSF to the immediate north-east of the IWL is ongoing.
- Hydrated Lime (92% to 97% $Ca(OH)_2$ at a pH of 12) is currently added to the oxide ore feed into the CIL, typically at between 3.0kg/tonne and 4.3kg/tonne. Testing on the blended sulphide ore indicated that on average 6.3kg/tonne will be required to raise the pH of the ore from 3.9 to 10.2 which approximates the calculated requirement based on the balance obtained from acid base accounting.

Taking due cognisance of the current assessment, consideration should be given to the following:

- Continue investigations and assessments pertaining to the characterisation of sulphide tailings (in accordance with the protocol agreed to by DWER) to provide more certainty with regard to the metalliferous character of these materials once production of tailings from these ores commences at the Mt Ida plant.

- Providing an oxide/store and release cover when the IWL is decommissioned.
- The design and operation of the current IWLTSF and proposed new valley-fill TSF.

1. Introduction

1.1 Background

Aurenne Mining is currently disposing of tailings from processing oxide ores from the Mt Ida Bottle Creek deposits in an Integrated Waste Landform (IWL) at the Mt Ida Gold Project (Figures 1.1 and 1.2).

Aurenne Mining now intends to mine and process sulphide ores blended with oxide and transitional ores and dispose of the tailings in the existing IWL on top of the oxide ores disposed of thus far.

1.2 Scope of Works

To undertake characterisation of the mixed oxide-transitional-sulphide tailings, the following sampling regime was implemented:

- Obtain representative samples of raw water (water from open pits and production bores) and process water (thickener overflow, TSF decant return water and raw water).
- Obtain two composite samples: one a mixture of 20% sulphide and an 80% blend of oxide and transitional ore and the other a mixture of 40% sulphide and a 60% blend of oxide and transitional ore.
- Analyse each sample for:
    - Acid Base Accounting characteristics including pH (1:5), Electrical Conductivity (1:5), Total Sulfur, Total Oxidised Sulfur as Sulfate, Chromium Reducible Sulphur, field (pH_f), oxidised (pH_{fox}) and Net Acid Generation (NAG) pH (pH_{ox} or NAG pH), NAG at pH 4.5 and 7.0, Acid Neutralising Capacity (ANC), Net Acid Production Potential (NAPP) and Acid Buffering Characteristic Curve (ABCC).
    - Analyse each sample total metals and metalloids: antimony (Sb), arsenic (As), aluminium (Al), barium (Ba), cadmium (Cd), chromium (Cr), cobalt (Co), copper (Cu), iron (Fe), manganese (Mn), mercury (Hg), molybdenum (Mo), lead (Pb), nickel (Ni), selenium (Se), uranium (U), vanadium (V) and zinc (Zn) as well as leachable metals and metalloids, using the Australian Standard Leaching Procedure (ASLP), at a pH of 5 (acidic environment), pH 7 (neutral environment) and pH 9 (alkaline environment).
- Undertake mineralogical testing on the two composite samples.

This document details the characterisation of blended sulphide tailings from the Mt Ida Bottle Creek ore deposits taking due cognisance of the Western Australian Department of Mines and Petroleum (DMP), now the Department of Mines, Energy and Industry Regulation (DEMIRS) Draft Guidance Materials Characterisation Baseline Data Requirements for Mining Proposals, March 2016.

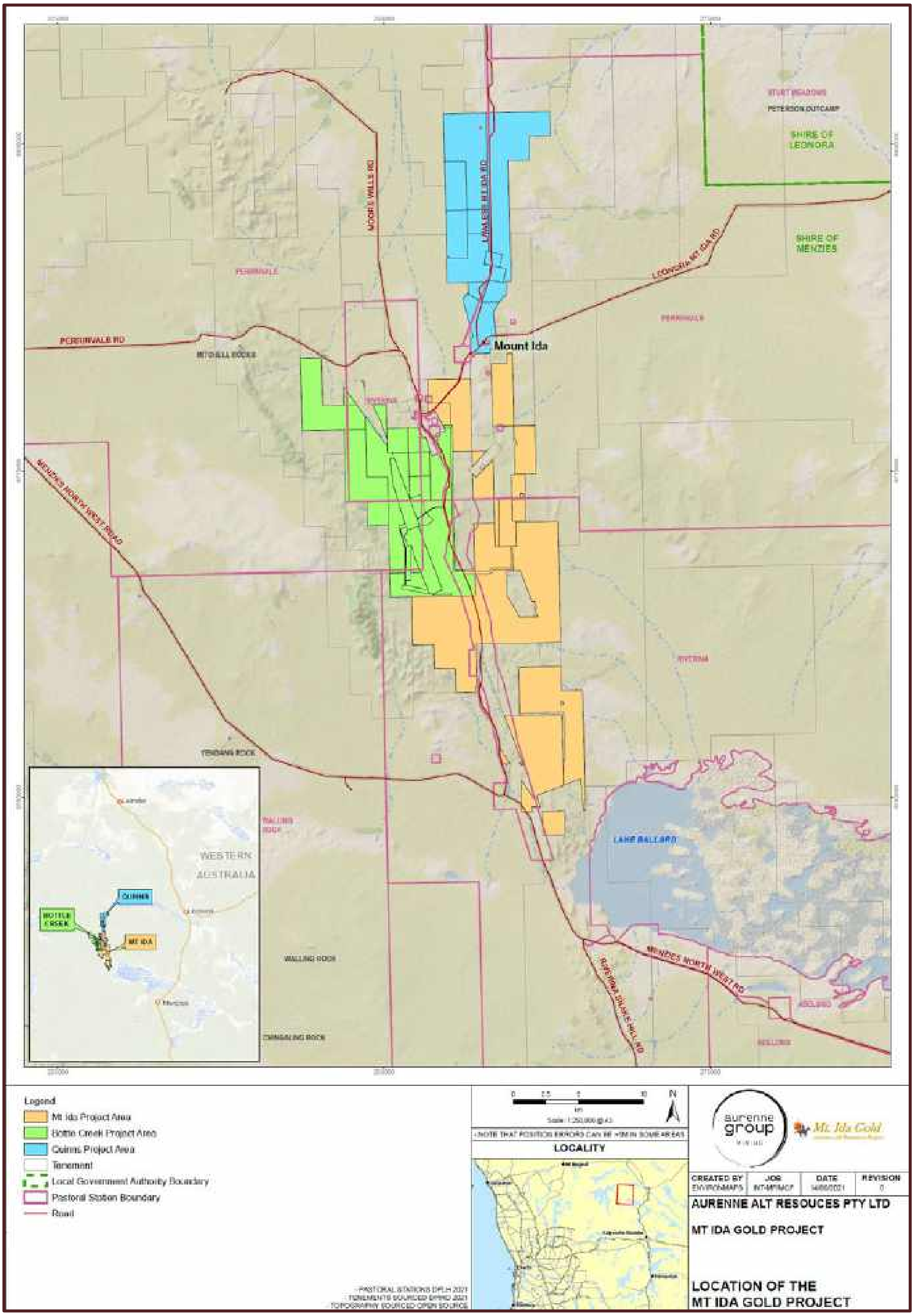


Figure 1.1 Project Location and Tenure.

Figure 1.2 Mt Ida Gold Project Layout.

2. Tailings Materials Characterisation

2.1 Characterisation of Tailings

2.1.1 Key Lithologies at Bottle Creek

The simplicity and homogeneity of the Bottle Creek Mt Ida Shear deposits are demonstrated by the same lithology along the 6km strike of the orebody with mafic volcanics on the west and felsic volcanics to the east, subsequently intruded by dolerite quartz porphyry and anorthosite (Pendragon Environmental Solutions, 2025a).

Earlier waste characterisations demonstrated that the oxide materials across the ore body (between surface and as deep as 80m below surface) are non-acid forming (NAF). The underlying transitional materials below vary between NAF (upper zone) and potentially acid forming (PAF) in the lower domains transgressing into hard, unweathered fresh bedrock which is most likely PAF.

Whilst the Processing Plant at Mt Ida, a standard hybrid carbon in leach (CIL) circuit, was not designed to process elevated sulfur content ore in the deeper (below 80m depth) transitional and fresh potentially acid forming materials, recent investigations indicated that 80% recoveries can be achieved using the same CN extraction methods. To assist recovery, Aurenne is currently installing:

- An additional tank and larger CN storage and distribution system.

  The additional CIL tank will be used as a pre-conditioning tank to manage the addition levels of CN to the leach. Current dosing is at about 0.6kg/tonne milled which will increase to 3kg/tonne for the 40:60 oxide:sulphide blend.
- Installing two additional thickeners (this is not related to treating sulphide ore). One is a larger pre-leach thickener to assist stabilizing throughput at the higher level we are running at and the second is a tails thickener, designed to retain more water, and therefore CN, in the process plant and reduced disposal to the IWL. This is the subject of a Works Approval currently with DWER.

2.1.2 Sampling of Sulphide Tailings

The primary samples were obtained from reverse circulation drill cuttings across one-metre intervals. A series of sixteen bottle roll tests were performed on oxide, transitional and sulphide samples at standardized conditions of 1000 ppm cyanide, 45 mm grind size, and pH 9.5 over a 24-hour leach period. Upon completion, the residual tailings solids from all sixteen tests were composited in the Aurenne laboratory to provide representative blends of oxide, transitional and sulphide for subsequent tailings characterisation.

2.1.3 Sample Analysis

The samples were submitted to ALS Environmental Laboratories, a National Association of Testing Authorities (NATA) accredited laboratory, in Wangara Perth and analysed for the parameters listed in Table 2.1.

Table 2.1: Laboratory Test Program.

Analyte	Unit	Limit of Reporting/Detection (LoR)
$pH_{(1:5)}$, pH_f, pH_{fox} and NAG-pH (or pH_{ox})	pH Unit	0.1
Electrical Conductivity, $EC_{(1:5)}$ @ 25°C (1:5)	µS/cm	1
Total Sulfur (S) and Chromium Reducible Sulphur (S_{cr}) Sulfate-Sulfur (S-SO4) and Total Oxidised Sulfur as SO4 2-	% mg/kg	0.01 and 0.005 100 and 20
Net Acid Generation (NAG at pH4.5 and 7.0)	kg H_2SO_4/t	0.1
Net Acid Producing Potential (NAPP)	kgH_2So_4/t	0.5
Acid Neutralising Capacity (ANC)	kgH_2So_4/t	0.5
Acid Buffering Characterisation Curve (ABCC)	-	-
Total metals and metalloids: aluminium (Al), antimony (Sb), arsenic (As), beryllium (Be), boron (b), cadmium (Cd), chromium (trivalent Cr^{3+} and hexavalent CR^{6+}), cobalt (Co), copper (Cu), iron (Fe), lead (Pb), manganese (Mn), mercury (Hg), molybdenum (Mo), nickel (Ni), selenium (Se), silver (Ag), strontium (Sr), thallium (Tl), vanadium (V) and zinc (Zn).	mg/kg	1 to 50
X-ray fluorescence (XRF) and Quantitative X-ray diffraction (XRD)	% and wt%	<0.01 and <0.5
Leachates (acetic acid at pH 5), de-ionised water at pH 7 and reagent water at pH 9.0): Leachable metals and metalloids: aluminium (Al), antimony (Sb), arsenic (As), beryllium (Be), boron (b), cadmium (Cd), chromium (trivalent Cr^{3+} and hexavalent Cr^{6+}), cobalt (Co), copper (Cu), iron (Fe), lead (Pb), manganese (Mn), mercury (Hg), molybdenum (Mo), nickel (Ni), selenium (Se), silver (Ag), strontium (Sr), thallium (Tl), vanadium (V) and zinc (Zn).	mg/L	0.0001 to 0.05
Raw and process water:		
pH Value	pH unit	0.01
Electrical Conductivity, EC @ 25°C	µS/cm	1
Total Dissolved Solids, TDS @180°C	mg/L	10
Alkalinity and Acidity (as $CaCO_3$)	mg/L	1
Major cations and anions: calcium (Ca), magnesium (Mg), sodium (Na), potassium (K), chloride (Cl), sulfate (SO_4), nitrite (as N) and nitrate (as N)	mg/L	1 and 0.1
Total metals and metalloids: aluminium (Al), antimony (Sb), arsenic (As), beryllium (Be), boron (b), cadmium (Cd), chromium (trivalent Cr^{3+} and hexavalent Cr^{6+}), cobalt (Co), copper (Cu), iron (Fe), lead (Pb), manganese (Mn), mercury (Hg), molybdenum (Mo), nickel (Ni), selenium (Se), silver (Ag), strontium (Sr), thallium (Tl), vanadium (V) and zinc (Zn).	mg/L	0.0001 to 0.05

2.1.4 Analytical Assessment

This section details the analytical assessment (Appendix A) of the Mt Ida Gold Project suplhide tailings which are to be deposited in a purpose built IWL in the context of their potential for acid and metalliferous (neutral and saline) drainage and their total and leachable metal and metalloid concentrations in different pH regimes i.e. acidic (pH ≈ 5), neutral (pH ≈7) or alkaline (pH ≈9).

Mineralogical Assessment

Two methods were employed:

- XRF technology, or X-ray fluorescence, is a non-destructive analytical technique used to determine the elemental composition of materials, by measuring the fluorescent X-rays emitted from a sample when it is excited by a primary X-ray source.
- Quantitative X-ray diffraction (QXRD) is an analytical technique used to determine the composition and phase distribution of materials and involves measuring the intensities of diffraction peaks in X-ray diffraction patterns to determine the relative proportions of different phases in a sample.

Table 2.2: Mineralogical Assessment.

Method	Composite Samples 3 and 4
XRF	**Primary components:** (% in Composites 3 and 4): **SiO_2** (66.6 and 77.0), **Fe** (11.8 and 8.3), **S** (8.5 and 4.3), **Al_2O_3** (4.5 and 3.3) **Minor components:** K_2O (1.1 and 0.8), MgO (0.9 and 0.6), TiO_2 (0.5 and 0.3), CaO (0.4 and 0.6), As (0.32 and 0.25), Pb (0.24 and 0.21), Mn (0.20 and 0.23) and Zn (0.12 and 0.07). **Trace components (<0.05%):** P_2O_5, BaO, Sb, Mo, Cr, Sr, V, Zr and Cu. **Below LOR (<0.01%):** Bi, Co, Ni and Sn.
QXRD	**Quartz (SiO_2):** 62wt% and 74wt%. Amorphous (non-crystalline): 12wt% and 10wt% **Pyrite (FeS_2):** 13wt% and 6wt%. Mica group minerals $(K,Ca,Na,Li)(Al,Mg,Fe)_2(Si,Al)_4C_{10}(OH)_2)$: 7wt% and 5wt%. Goethite (FeO(OH)): 4wt% and 5wt%. Chlorite group minerals $(Fe,Al,Mg,Li,Ni)_6(Si,Al)_4O_{10}(OH)_8)$: 1wt% and <0.5wt%. Rutile (TiO_2), Calcite ($CaCO_3$) and Bassanite ($CaSO_4O5H_2O$): <0.5wt.

The mineralogical assessment indicated that:

- The primary components include quartz, iron, sulphur and aluminium oxide.
- The dominant sulphur form is pyrite hence potential generation of acidity is expected to be long term.

Acid Mine Drainage (AMD)

pH characterises the chemical environment and is a measure of acidity:

- pH$_{(1:5)}$ and field pH$_f$ vary between 9.4 and 8.4.
- pH$_{fox}$ and pH$_{ox}$ (or NAG pH) vary between 1.4 and 2.3 (well below 4.5), with very little difference between the samples, indicating that the samples are PAF.

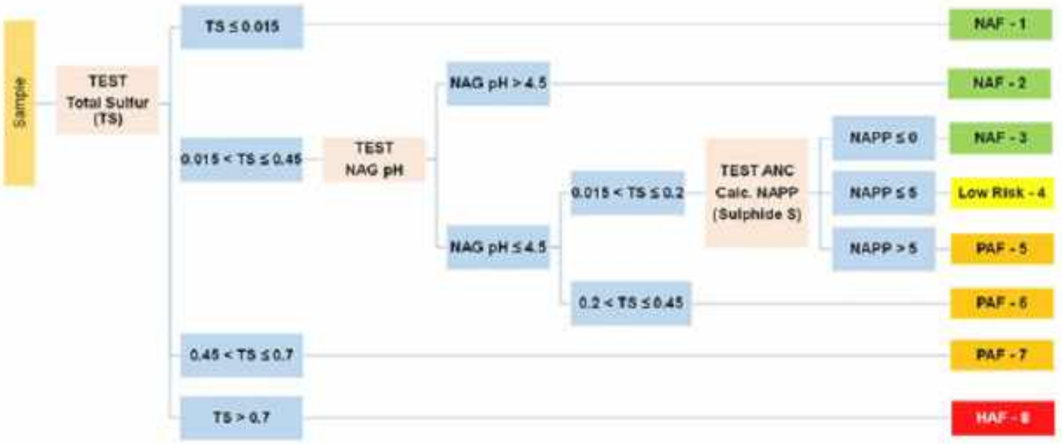
The sulphide tailings are non-saline with electrical conductivities (EC) between 0.293dS/m and 0.965dS/m (well less than the 2dS/m assessment level).

The classification of the analytical acid base accounting data employs primarily three methods, each refining the last:

- A worst-case Total Sulfur based Maximum Potential Acidity (MPA = 30.6 x %S) method.
- An Acid Potential Ratio (APR) which is calculated by dividing the Acid Neutralising Capacity (ANC) of the sample by the Total Sulfur-derived MPA (excluding a reduction for sulfate-sulfur).
- A Net Acid Production Potential (NAPP) value, calculated by subtracting ANC from MPA (excluding a reduction for sulfate-sulfur).

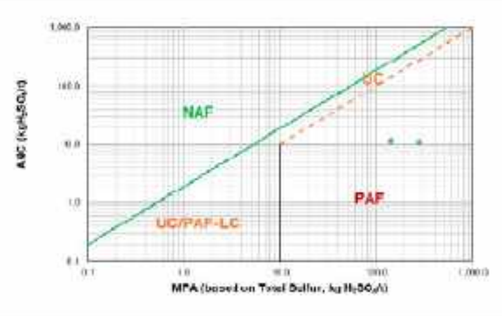
Based on this approach, the tailings were classified as follows:

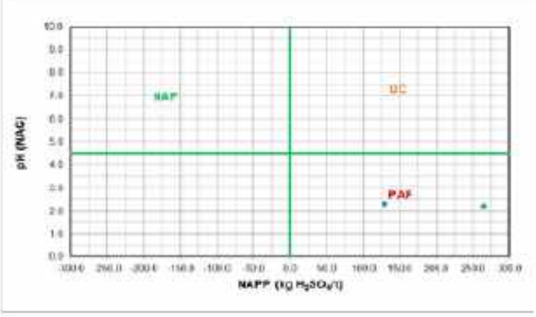
Table 2.3: AMD Classification of Tailings.

Analyte	Minimum	Maximum	Average	Observation
 **Acid and Metalliferous Drainage Decision Nodes and AMD Classification (adapted from AMIRA, 2002)**				
Total Sulfur, S%	4.59	9.02	-	Total Sulfur includes sulfide minerals (such as pyrite, pyrrhotite and arsenopyrite with a potential to generate acidity), sulfate minerals (such as alunite with a reduced potential to generate acidity, if any), and elemental sulfur (with a potential to generate acidity). The Total Sulfur distribution provides an initial, conservative indication of the potential acid generation capacity of a sample/material. The assessment assumes that all sulfur is present as reactive pyrite; it is therefore an inherently conservative assessment as it discounts non-acid forming sulfur species or any inherent neutralising capacity; nevertheless, Total Sulfur is well above the accepted threshold of 0.45%S and increases with the amount of sulphide ore in the sample.
Chromium Reducible Sulfur, S_{CR}%	2.26	4.07	-	S_{CR} is indicative of the reduced inorganic reactive sulphide-sulfur which includes forms such as iron sulfide (pyrite, etc.) and elemental sulfur, that can oxidize to produce sulfuric acid and contribute to acid mine drainage. S_{CR}<Total S suggests that Total S includes sulfate-sulfur.
Sulfate-Sulfur, Sulfate-S as a %	3.2	12.7	-	Sulfate-S concentrations are elevated exceeding Total Sulfur indicative of little if any reactive sulfide forms.
Tota Oxidisable Sulfur, TOS as a %	-3.68	1.39	-	Negative TOS values in waste characterization, while unusual, may indicate that the waste contains a higher proportion of sulfate-S (sulfate sulfur) than sulfide-S (sulfide sulfur) hence the tailings may possess little if any potential acidity.

Analyte	Minimum	Maximum	Average	Observation
NAG pH, pH units	2.3	2.2	-	NAG pH<4.5 indicative of an acidic environment.
Maximum Potential Acidity, MPA (or Acid Production Potential, AP) as kgH_2SO_4/t	140.5	276.0	-	MPA calculated using Total Sulfur: the average MPA demonstrates that the tailings have a consistently high sulfur content well below the typically accepted *low capacity potentially acid forming material* (DITR, 2007) value of 10kgH_2SO_4/t.
	-112.6	42.5	-	MPA calculated using TOS: A negative MPA value, due to large non-reactive sulfate-sulfur concentrations, indicates that the waste material has a higher buffering capacity (alkalinity) than its acid-generating potential, meaning it is more likely to neutralize any acidity rather than generate it.
	69.2	124.5	-	MPA calculated using S_{CR}: values (indicative of the reactive sulfur forms) are markedly lower than the values calculated using Total Sulfur; however, the sulphide tailings remain potentially acid forming.
Acid Forming Potential Ratio (APR)	0.08	0.04	-	This ratio is an alternative way of reporting laboratory data to ascertain initial AMD risk and provides an indication of the relative margin of safety (or factor of safety) with respect to the potential for net acid generation (INAP, 2009). The ratio of neutralising potential (ANC) to acid production potential (AP) is <1 indicating the tailings is acid-generating.
Acid Neutralising Capacity (ANC) in kgH_2SO_4/t	11.5	10.9	-	ANC is markedly less exceeds MAP indicating there is insufficient buffer capacity to neutralise any potential acidity.
Net Acid Production Potential (NAPP) as kgH_2SO_4/t.	129.0	265.0	-	A positive NAPP value indicates that the sulphide tailings possess insufficient inherent buffering capacity (acid neutralizing capacity or ANC) to prevent acid generation.
Tailings samples assessed during this investigation classify as Potentially-Acid Forming (PAF)				

Graphical illustrations confirm that the tailings classify as PAF.

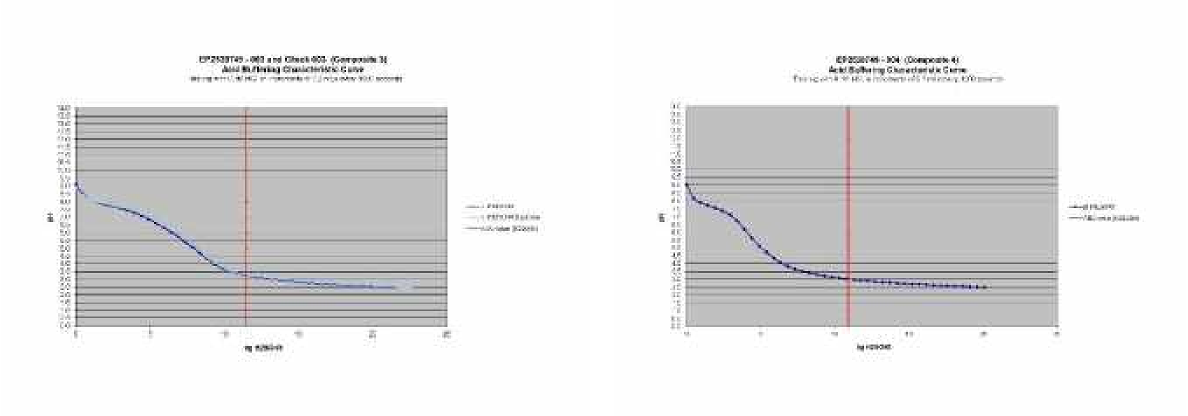




Acid Buffering Characteristic Curves (ABCC)

The acid neutralisation properties of the tailings were assessed by analysing their Acid Buffering Characteristic Curves (ABCC). These quasi-kinetic geochemical tests involve incremental addition of acid to a test material to decrease the pH to 2.5.

Sulphide Tailings Samples



The acid buffering characteristic curves display buffering up to the equivalent of about 10kgH_2SO_4/t and demonstrates that there is insufficient effective reactive carbonate ANC capacity in the tailings to prevent potential for acidic leachates by oxidation of sulphides. The value of the Effective ANC's, calculated as the amount of kgH_2SO_4/t required to reduce the pH below 4.5, is less than the amount of acid that may result from the oxidation of all available Sulfur. When the pH falls below 4.5 (potentially due to ferrous iron and arsenic ions causing oxidation of sulphide minerals), the rate and amount of acid produced stabilises and continue steadily.

Total Metals and Metalloids

The most dominant metals and metalloids are Aluminium, Arsenic, Iron, Lead, Manganese and Zinc (Appendix A). Regarding potential contamination from the tailings once deposited in the IWL-TSF, the following are relevant:

- Mercury, Molybdenum and Selenium are below their limits of reporting.
- Antimony, Arsenic, Cadmium, Lead and Zinc occur in elevated concentrations.

A geochemical abundance index (GAI, Förstner *et. al*., 1993) was calculated to assess enrichment of the tailings by metals/metalloids:

$$GAI = \log[(C_n/(1.5*Bn)),2]$$

where C_n is the measured content of the nth element in the sample and Bn is the average crustal abundance of the element. The Average Crustal Abundance values were sourced from the GARD Guide, Chapter 5 (INAP, 2009) and where no value was available for a particular element, values were obtained from *Environmental Chemistry of the Elements* (Bowen, 1979).

The GAI is expressed in integer increments from 0 to 6, where a value of 0 indicates that the element is present at a concentration less than, or similar to, the average crustal abundance; and a GAI value of 6 indicates a 96-fold enrichment above the median crustal abundance. Generally, a GAI of 3 or greater signifies enrichment that may warrant further examination; this is particularly the case with some environmentally important *trace* elements, such as arsenic, chromium, cadmium, copper, lead, selenium and zinc, more so than with major rock-forming elements, such as aluminium, calcium, iron, manganese and sodium.

Elements identified as enriched may not necessarily be a concern for revegetation, drainage water quality or public health, but their significance should still be evaluated. Cognizance should be taken of:

- Whilst some element concentrations can be elevated relative to the median crustal abundance, the nature of an ore deposit implies that background levels are generally expected to be elevated.
- If a sample is enriched relative to the average crustal abundance, there is no direct correlation that that sample will also leach metals/metalloids at elevated concentrations. The mobility, bioavailability and toxicity of metals/metalloids are dependent on many factors including mineralogy, adsorption/desorption and the environment in which it occurs.
- Because an element is not enriched does not mean it will never be a concern, because under some conditions (e.g. low pH) the solubilities of common environmentally important elements such as aluminium, copper, cadmium, iron and zinc increase significantly.

The GAI calculations (Appendix A) for tailings materials indicate that only Antimony, Arsenic, Cadmium, Lead and Zinc are *enriched* at a GAI value greater than 6 except for Zinc at a value of 3 i.e. it seems these metals and metalloids are enriched 96-fold above the median crustal abundance.

Arsenic speciation (Pendragon Environmental Solutions, 2025b) identifies and quantifies the different forms (species) of arsenic, including inorganic (Arsenite [As^{3+}], the trivalent form and Arsenate [As^{5+}] the pentavalent form of arsenic with the order of toxicity: $As^{3+} > As^{5+}$) and organic (low toxicity) forms (such as Monomethylarsonate [MMA] and Dimethylarsinate [DMA], the methylated forms of arsenic and Arsenobetaine [ASB, a non-toxic organic form of arsenic found in seafood, and Arsenosugars). Under moderately reducing conditions, As^{3+} is the predominant species; in oxygenated water, As^{5+} is the predominant species.

ASB, DMA and MMA are absent in groundwaters at the IWL-TSF and processing plant. As^{3+} and As^{5+} are present in concentrations between <0.0005mg/L and 0.0053mg/L and between <0.0005mg/L and 0.0045mg/L with an outlier at 0.0365mg/L. Only the 0.0365mg/L As^{5+} concentration in IWL-2 (24 April 2023) exceeded the threshold for Groundwater Investigation Levels (ASC NEPM: Fresh Water, typical slightly-moderately disturbed systems); a subsequent sampling event (29 January 2025) did not detect As^{5+} in the same monitoring bore. Concentrations of As^{3+} (the dominant and more soluble and reactive form of As in groundwater at Mt Ida) and As^{5+} (which is less reactive but still soluble) in groundwater underlying the IWL-TSF and processing plant, excluding the one cited, did not exceed the thresholds for Groundwater Investigation Levels (ASC NEPM).

Earlier sampling events (2019 and 2021) encountered dissolved As^{3+} in water in several open pits and groundwater sources at Mt Ida between 0.001mg/L and 0.252mg/L exceeding the relevant thresholds for Groundwater Investigation Levels (ASC NEPM). Taking due cognisance of materials characterisations to date (Pendragon Environmental Solutions, 2025a), these elevated concentrations are attributed to the alkaline nature of groundwater in proximity to the orebodies containing arsenopyrite. However, due to the highly saline character of groundwater there is no attributable beneficial use of groundwater at Mt Ida. Cognisance must also be taken of the Western Australian Department of Health policy that *untreated groundwater can only be used if it is tested and confirmed to be suitable for the proposed use*.

Metalliferous Drainage (Leachable Metals and Metalloids)

The sulphide tailings samples were subjected to laboratory leachate testing (Appendix A) at a pH of 5 (indicative of an acidic environment, 7 (replicating a neutral environment) and a pH of 9 (replicating an alkaline environment):

Table 2.4: Leachable Metals and Metalloids.

pH	**Leachable Metals and Metalloids in Sulphide Tailings**
5	Aluminium (0.40), Antimony (0.1), Arsenic (0.6), Barium (0.3), Iron (1.1), Lead (2.2), Manganese (7.4), Nickel (0.1), Uranium (0.001) and Zinc (0.6)
Metals/Metalloids exceeding an Assessment Level	ASC NEPM GIL: **Aluminium, Manganese and Nickel** ANZG (Livestock): **Arsenic and Lead**
7	Aluminium (0.74), Antimony (0.1), Arsenic (0.21), Iron (4.23), Lead (0.18), Manganese (0.06) and Zinc (0.02)
Metals/Metalloids exceeding an Assessment Level	ASC NEPM GIL: **Aluminium** ANZG (Livestock): **Lead**
9 (the most likely scenario during deposition of tailings in the IWL-TSF)	Aluminium (0.2), Arsenic (0.7) and Iron
Metals/Metalloids exceeding an Assessment Level	ASC NEPM GIL: **Aluminium** ANZG (Livestock): **Arsenic**

Notes:

Maximum concentrations in mg/L are indicated in brackets.

Metals and metalloids absent in all leaches: Cadmium, Chromium, Cobalt, Copper, Mercury, Molybdenum, Selenium and Vanadium.

In addition:

Metals and metalloids absent in acidic leaches: none.

Metals and metalloids absent in neutral leaches: Barium, Nickel and Uranium.

Metals and metalloids absent in alkaline leaches: Antimony, Barium, Lead, Manganese, Nickel, Uranium and Zinc.

Metal and Metalloid concentrations were assessed against:

1. NEPM ASC Table 1C Groundwater Investigation Levels (GILs).
2. ANZG, 2023: Draft Livestock Drinking Water Guidelines (Cattle).

The dominant land use across the area, other than gold mining and prospecting, is pastoral mainly cattle grazing.

From the above assessment it is evident that Arsenic and Lead occur in elevated concentrations in tailings leachates and to a lesser extent Aluminium, Antimony, Iron, Manganese and Zinc. This in essence confirm the observations pertaining to metal enrichment in association with the ore body.

Cognisance must be taken when interpreting leachate analytical data:

- That the laboratory methods for leachates involves leaching a finely ground sample with a 1:20 solid:liquid extraction after tumbling end over end for more than 24 hours at various pH levels; conditions which are seldom met and/or replicated in the environment hence much lower concentrations can be expected during actual operations.
- The potential for increased concentration by recycling of process water and evaporation at the IWL-TSF.

Groundwater Levels

Groundwater levels are currently deeper than 35m below the trigger level, coupled with a dominant horizontal trend, suggesting that groundwater levels are not impacted by seepage from the IWL-TSF, the monitoring record is too short to make any definitive observations pertaining to groundwater level trends (Pendragon Environmental Solutions, 2025b).

Groundwater Quality

Historic and recent groundwater monitoring data and the analytical data obtained during this investigation, were assessed to ascertain the hydrogeochemical characteristics of the IWL-TSF and surrounding groundwater regime (Pendragon Environmental Solutions, 2025b).

The salient geochemical characteristics of water at Mt Ida are summarised below (Appendix A).

Table 2.5: Geochemical Characteristics of Water.

Water Type	Primary Geochemical Characteristics
Groundwater and Open Pit Water in proximity to the IWL-TSF – Raw Water	pH: circumneutral to slightly alkaline (7.9). TDS: saline (22,933) including elevated concentrations of Chloride (10,606), Sodium (5,354), Sulphate (3,144), Magnesium (1,133), Calcium (756), Potassium (213) and Nitrate (6.6). Dominant metals and metalloids include Arsenic (0.106) and Boron (8.9).
In excess of Assessment Level	ASC NEPM: Arsenic, Boron and Cadmium. ANZG: Total Dissolved Solids, Calcium, Magnesium, Sulfate and Arsenic.
Groundwater Monitoring Bores at the IWL-TSF and Processing Plant	pH: circumneutral to slightly alkaline (8.4). TDS: saline (8,377) including elevated concentrations of Chloride (3,485), Sodium (2,178), Sulphate (1,277), Magnesium (355), Calcium (276), Potassium (96) and Nitrate (6.9). Dominant metals and metalloids include Arsenic (0.006), Boron (4.2), Manganese (0.5), Nickel (0.007) and Zinc (0.06). **Groundwater underlying the IWL-TSF and Processing Plant contain markedly less concentrations of major ions and metals and metalloids and particularly Arsenic.**
In excess of Assessment Level	ASC NEPM: Boron, Nickel and Zinc. ANZG: Total Dissolved Solids, Magnesium and Sulphate.
Process Water, Tailings Decant Water, Tailings Pore Water and make-up Raw Water	pH: circumneutral to slightly alkaline (9.4); alkalinity (174) exceeds acidity (<1). TDS: saline (37,803) including elevated concentrations of Chloride (15,588), Sodium (9,255), Sulphate (2,544), Calcium (2,454), Potassium (467), Magnesium (113) and Nitrate (25). Dominant metals and metalloids include Aluminium (5.4), Arsenic (0.868), Boron (1.2), Cadmium (0.022), Chromium (0.061), Copper (1.229), Lead (0.077), Manganese (0.151) Mercury (0.0008), Molybdenum (0.025), Nickel (0.072), Selenium (0.095), Silver (0.346) and Zinc (0.803). Cognisance must be taken that these waters are recycled and subject to concentration by evaporation. **Process water, tailings decant water and tailings pore water contain markedly elevated concentrations of major ions and metals and metalloids well above the concentrations in the underlying groundwater regime.**
In excess of Assessment Level	ASC NEPM: Aluminium, Arsenic, Boron, Cadmium, Copper, Lead, Mercury, Nickel, Selenium, Silver and Zinc. ANZG: Total Dissolved Solids, Calcium, Sulphate, Aluminium, Arsenic, Cadmium, Copper, Manganese, Molybdenum and Selenium.
Notes: **Average concentrations in mg/L are indicated in brackets where relevant.** **Assessment/Investigation Level:** **1. NEPM ASC Table 1C Groundwater Investigation Levels (GILs).** **2. ANZG, 2023: Draft Livestock Drinking Water Guidelines (Cattle).**	

Pertinent salient findings include (Pendragon Environmental Solutions:

- All waters at Mt Ida are circumneutral to slightly alkaline and of a Sodium-Chloride type.

- Groundwater associated with the ore body contains elevated concentrations of major ions and heavy metals and metalloids particularly Arsenic and Boron.
- Groundwater underlying the IWL-TSF and Processing Plant contain markedly less concentrations of major ions and metals and metalloids, particularly arsenic, than the groundwater associated with the ore body and process water, tailings return water and tailings pore waters. Cognisance must be taken that these bores were drilled to first water strike and hence may not intersect the main aquifer.
- Process water, tailings return water and tailings pore water contain markedly elevated concentrations for major ions and metals and metalloids well above the concentrations in the underlying groundwater regime and/or groundwater associated with the ore body.
- Arsenic, Boron and Cadmium in groundwater associated with the orebody exceeds the Groundwater Investigation Levels (ASC NEPM and ANZG).

  Groundwater underlying the IWL-TSF and Processing Plant contains Boron, Nickel and Zinc in excess of the Groundwater Investigation Levels (ASC NEPM).

  Several metals and metalloids including Aluminium, Arsenic, Boron, Cadmium, Copper, Lead, Mercury, Nickel, Selenium, Silver and Zinc in process and tailings waters exceed the Groundwater Investigation Levels (ASC NEPM and ANZG).
- The characteristics of the existing groundwater regime preclude all potential beneficial uses without further treatment for a particular use.

Geochemical Diagrams

Piper diagrams, also known as Piper plots or trilinear diagrams, are graphical representations of the chemical composition of water samples. The primary purpose of Piper diagrams is to:

- Visualize and compare the chemical composition of multiple water samples by plotting the concentrations of major ions (such as calcium, magnesium, sodium, potassium, chloride, sulfate, and bicarbonate) on a single diagram, similarities and differences between samples can be identified quickly.
- Identify hydrogeochemical processes and trends such as ion exchange, mineral dissolution, and mixing of different water sources, which may provide valuable insights into the hydrogeochemical evolution of the water samples.

Information that can be obtained from the interpretation of Piper diagrams includes:

- Water type classification into different types, such as calcium-bicarbonate, sodium-chloride, or mixed types.
- Hydrogeochemical facies which are regions with distinct chemical characteristics.
- Ion exchange and mineral dissolution reactions by examining the relationships between different ions.
- Mixing of different water sources such as surface water and groundwater.

The samples all plot in close proximation on the right-hand side indicative of a dominant sodium-chloride (Na-Cl; saline) type water often associated with specific hydrogeochemical processes or geological influences, such as interaction with saline or brackish water sources and dissolution of sodium-rich minerals.

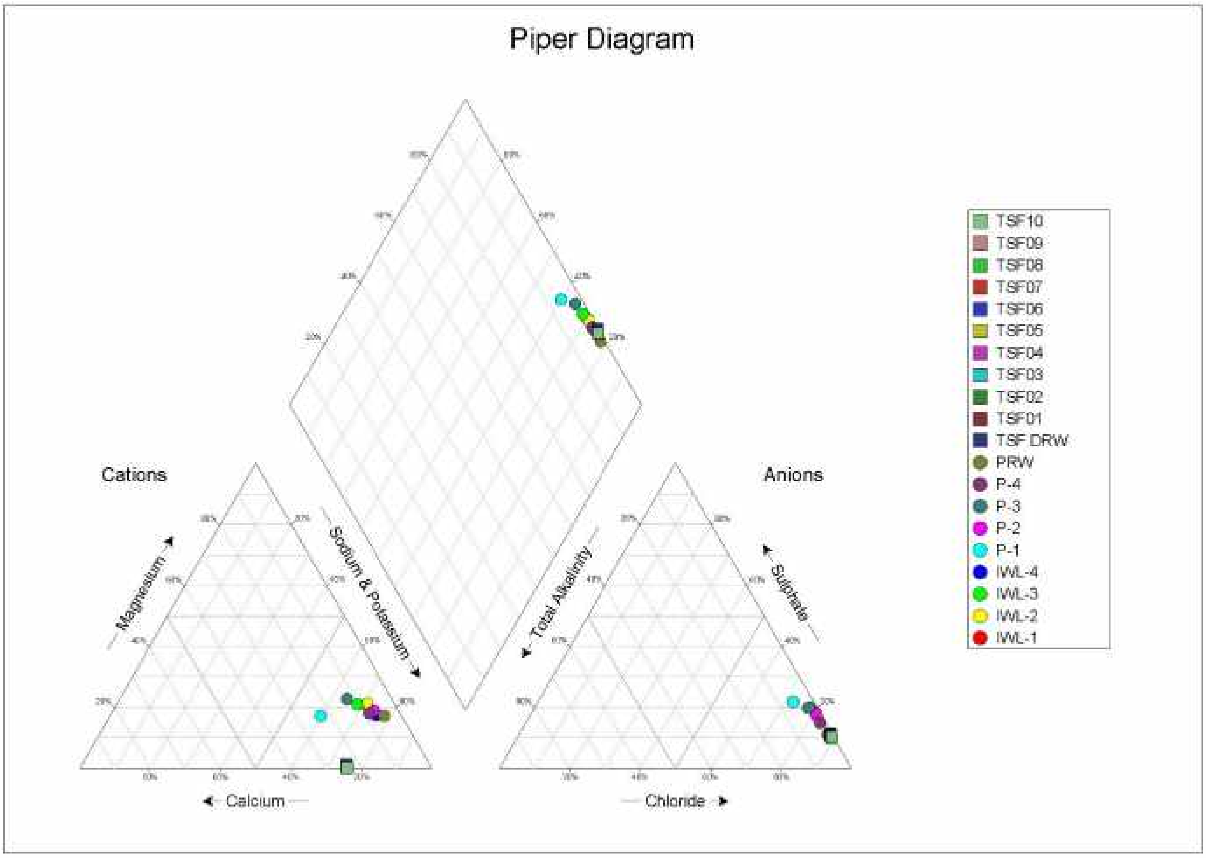


Figure 2.1 Piper Diagram.

Piper and Durov diagrams are both graphical representations used in hydrogeochemistry to display the chemical composition of water samples. While they share similarities in their purpose and application, there are distinct differences between the two diagrams. Both diagrams can be used to classify water samples into different types, identify hydrogeochemical facies, and infer ion exchange and mineral dissolution reactions. However, Piper diagrams are typically trilinear plots that display the relative concentrations of major cations and anions, whereas Durov diagrams are square or rectangular plots that show the absolute concentrations of these ions. This difference in representation can make Piper diagrams more suitable for visualizing the relative proportions of ions, while Durov diagrams can provide a more detailed view of the absolute concentrations. Ultimately, both diagrams are useful tools in hydrogeochemical analysis, and the choice between them depends on the specific goals and requirements of the study.

The Durov diagram reveals that most samples plot on the bottom right of the rectangle, indicating a dominant sodium-chloride (Na-Cl; saline) type water in an alkaline pH environment. The samples from the plant bores exhibit a slightly distinct hydrogeochemical signature, plotting slightly above the samples from the IWL-TSF bores. This classification is consistent with the Piper diagram. The characteristic signature observed in the Durov diagram is attributed to similar hydrogeochemical processes or geological controls as those inferred from the Piper diagram.

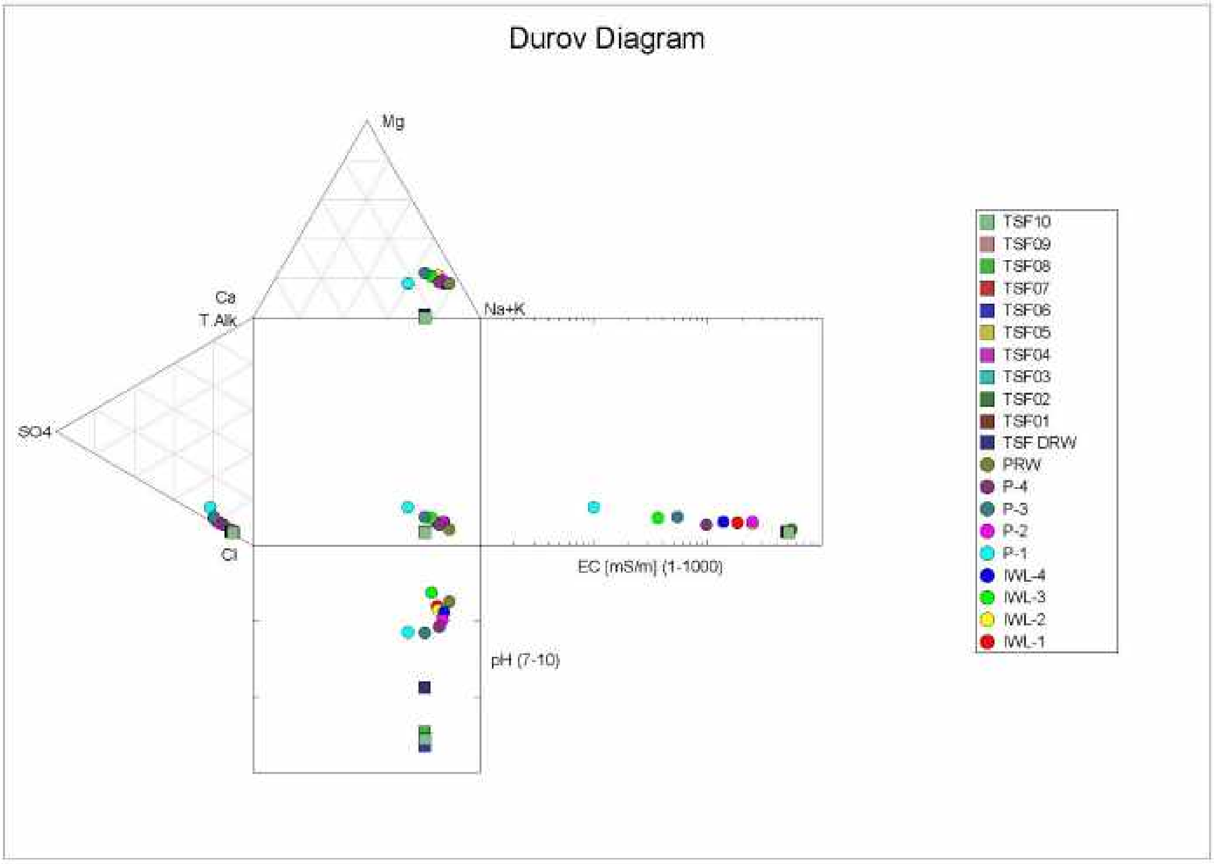


Figure 2.2 Durov Diagram.

Stiff diagrams are a type of graphical representation used in hydrogeochemistry to display the chemical composition of water samples. The primary purpose of Stiff diagrams is to provide a unique visual representation of the relative concentrations of major ions in water samples, allowing quick identification of patterns and trends in the data.

Stiff diagrams differ from Piper and Durov diagrams in their approach to visualizing hydrogeochemical data:

- Shape and Structure: Stiff diagrams are typically represented as a polygon or shape, with each axis representing a different ion or parameter.
- Relative Concentrations: Stiff diagrams display the relative concentrations of major ions, rather than absolute concentrations.
- Visual Representation: The shape and size of the polygon or shape provide a visual representation of the water sample's chemical composition.

The samples from the IWL groundwater monitoring bores can be broadly categorized into two groups: IWL-1, IWL-2, and IWL-4, which display similar shapes, and IWL-3, which deviates from this pattern. The underlying cause for this discrepancy at IWL-3 is unclear and warrants further investigation to determine the factors contributing to this anomaly.

The TSF tailings characterisation samples exhibit a notable consistency in the distribution of various chemical parameters, suggesting a degree of homogeneity in their hydrochemical signature.

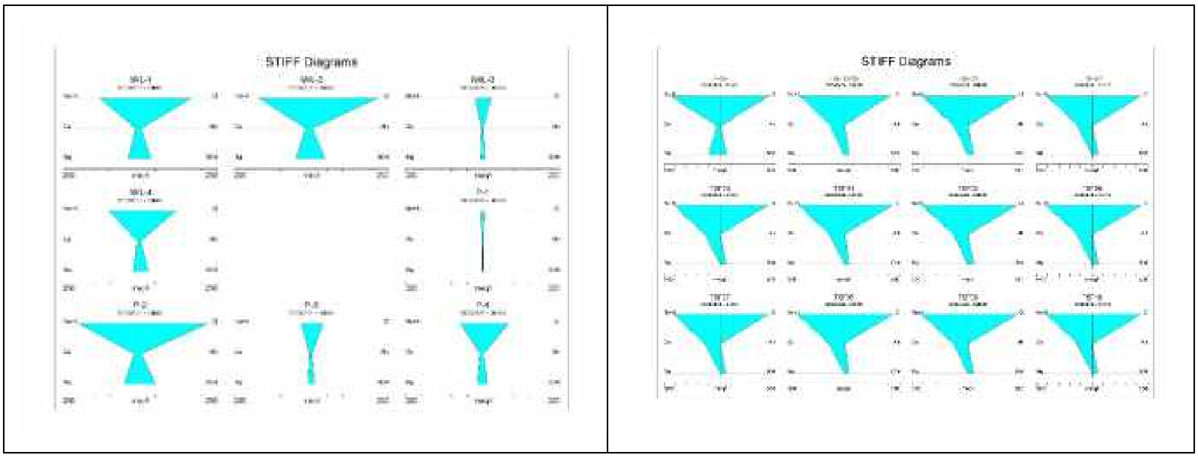


Figure 2.3 Stiff Diagrams.

3. Conclusions and Recommendations

3.1 Conclusions

The following salient findings are relevant:

- Two individual representative samples of tailings from blended oxide-transitional-sulphide ores were obtained and subjected to a detailed analytical program to determine the likely behaviour of elements in acidic, circumneutral and alkaline environments.
- The blended tailings are acid forming containing large concentrations of sulfur compounds with little acid neutralising capacities, well below their maximum potential acidities.
- Total metals and metalloids and subsequent geochemical assessments indicate that the blended ores are enriched with regard to only Antimony, Arsenic, Cadmium, Lead and Zinc.
- Laboratory leachates at pH's of 5, 7 and 9 contain Arsenic and Lead in elevated concentrations and to a lesser extent Aluminium, Antimony, Iron, Manganese and Zinc. This in essence confirm the observations pertaining to metal enrichment in association with the ore body.
- The potential for and concentrations of leachates must take cognisance of the quality of process water sourced from groundwater including the additional of lime during processing and the impacts of recycling and evaporation.
- Groundwater levels at the IWL-TSF, currently well below the trigger level, seem to respond to rainfall-infiltration; however, the monitoring record is too short to make any definitive observations pertaining to groundwater level trends.
- Groundwater (raw water from bores and open pits), tailings return water (including tailings pore waters) and process water at Mt Ida are circumneutral to alkaline and of a Sodium-Chloride type.

  Groundwater associated with the ore body contains elevated concentrations of major ions and heavy metals and metalloids particularly Arsenic and Boron. Arsenic, Boron and Cadmium exceeds their Groundwater Investigation Levels.

  Groundwater underlying the IWL-TSF and Processing Plant contain markedly less concentrations of major ions and metals and metalloids, particularly arsenic, than the groundwater associated with the ore body and process water, tailings return water and tailings pore waters. Cognisance must be taken that these bores were drilled to first water strike and hence may not intersect the main aquifer. Boron, Nickel and Zinc concentrations are in excess of their Groundwater Investigation Levels.

  Process water, tailings return water and tailings pore water contain markedly elevated concentrations of major ions and metals and metalloids well above the concentrations in the underlying groundwater regime and/or groundwater associated with the ore body. Several metals and metalloids including Aluminium, Arsenic, Boron, Cadmium, Copper, Lead, Mercury, Nickel, Selenium, Silver and Zinc exceed their Groundwater Investigation Levels.

  The characteristics of the existing groundwater regime preclude all potential beneficial uses without further treatment to confirm their suitability for a particular or intended use.
- The current (31 December 2025) volume of oxide tailings in the IWL is 3.145 million m^3 at a height between 505mRL and 506mRL (the IWL is on a sloping floor between 488mRL in the south and 500mRL in the north).

  The volume of blended sulphide tailings that the IWL can accept is estimated at 3.193 million m^3 to a level between 510mRL and 519.5mRL.

The existing IWL will not be raised any further and Aurenne is considering a valley-fill TSF to the immediate north-east of the IWL.

- Hydrated Lime (92% to 97% $Ca(OH)_2$ at a pH of 12) is currently added to the oxide ore feed into the CIL, typically at between 3.0kg/tonne and 4.3kg/tonne. Testing on the blended sulphide ore indicated that on average 6.3kg/tonne will be required to raise the pH of the ore from 3.9 to 10.2 which approximates the calculated requirement based on the balance obtained from acid base accounting:

Tailings	Volume (tonne)	MPA (kgH_2SO_4)	ANC (kgH_2SO_4)	Surplus/Deficit
Oxide	4.7 million	28.3 million	62.7 million	34.4 million
Sulphide	4.8 million	997.2 million	53.6 million	-943.6 million
			Total Deficit	**909.2 million**

Using lime, at an effective neutralisation of 90%, to achieve a pH where the heavy metals can no longer dissolve i.e. to neutralise the deficit caused by using sulphide ore, will require at least 5.3kg/tonne of ore.

3.2 Recommendations

Continue investigations and assessments pertaining to the characterisation of sulphide tailings (in accordance with the protocol detailed in Pendragon Environmental Solutions, 2025b, and agreed to by DWER) to provide more certainty with regard to the metalliferous character of these materials once production of tailings from these ores commences at the Mt Ida plant.

Consider the findings of this assessment in:

- Providing an oxide/store and release cover when the IWL is decommissioned.
- The design and operation of the current IWLTSF and proposed new valley-fill TSF.

References

AMIRA, 2002: Project P387A Prediction & Kinetic Control of Acid Mine Drainage - ARD Test Handbook. AMIRA International Limited, Melbourne.

ANZECC & ARMCANZ (2000): Australian and New Zealand Guidelines for Fresh and Marine Water Quality. Australian and New Zealand Environment and Conservation Council (ANZECC) and Agriculture and Resource Management Council of Australia and New Zealand (ARMCANZ).

Australian Government, Department of Industry Tourism and Resources, 2006: Mine Closure and Completion. Leading Practice Sustainable Development Program for the Mining Industry.

Bowen HJM, 1979: Environmental Chemistry of the Elements, Academic Press, New York.

Department of Industry, Tourism and Resources (DITR, 2016): Preventing Acid and Metalliferous Drainage.
Hazelton P, Murphy B (2007). Interpreting Soil Test Results. NSW Government Department of Natural Resources.

Department of Industry, Tourism and Resources (DITR, 2007): Managing Acid and Metalliferous Drainage. Manual in the Leading Practice Sustainable Development Program for the Mining Industry series. Department of Industry, Tourism and Resources, (DITR) Canberra. February 2007.

Department of Mines and Petroleum, 2016: Draft Guidance Materials Characterisation Baseline Data Requirements for Mining Proposals.

Förstner U., Ahlf W. and Calmano W., 1993: Sediment Quality Objectives and Criteria Development in Germany. Water Science and Technology. V 28:307-316.

Graeme Campbell and Associates, 2021: Mt Ida Project: Geochemical Assessment of Tailings-Slurry Samples Derived from the Emu, Southwark, Tims Find and Boags Deposits, Implications for Tailings Management.

INAP, 2009: Global Acid Rock Drainage Guide (GARD Guide) http://www.inap.com.au/GARDGuide.htm The International Network for Acid Prevention.

National Environment Protection (Assessment of Site Contamination, ASC NEPM) Measure 1999 (revised in 2013).

Pendragon Environmental Solutions, 2025a: Mt Ida Gold Project, Bottle Creek Mining and Processing, Aurenne Mining, Materials Characterisation, Revision No 7.

Pendragon Environmental Solutions, 2025b: Mt Ida Gold Project, Bottle Creek Mining and Processing, Aurenne Mining, Tailings Characterisation, Revision No 1, April 2025.

Rengasamy P, Churchman GJ (1999). Cation Exchange Capacity, Exchangeable Cations and Sodicity. Soil Analysis an Interpretation Manual. CSIRO: Melbourne.

Abbreviations

Abbreviations	
ADWG	Australian Drinking Water Guideline
AHD	Australian Height Datum
AMIRA	Australian Mineral Industries Research Association
ANZECC	Australian and New Zealand Environment and Conservation Council
ARMCANZ	Agriculture and Resource Management Council of Australia and New Zealand
ASLP	Australian Standard Leaching Protocol
CSM	Conceptual Site Model
DEMIRS	Western Australian Department of Energy, Mines and Industry Regulation and Safety
DO	Dissolved Oxygen
DWER	Western Australian Department of Water and Environmental Regulation
EC	Electrical Conductivity
EIA	Environmental Impact Assessment
EIS	Environmental Impact Statement
EMP	Environmental Management Plan
EMS	Environmental Management System
EPA	Western Australian Environmental Protection Authority
IWL	Integrated Waste Landform
LoM	Life of Mine
GDE	Groundwater Dependent Ecosystem
MCP	Mine Closure Plan
MP	Mining Proposal
NEPM	National Environment Protection (Assessment of Site Contamination) Measure 1999 (updated 2013), abbreviate to: ASC NEPM.
ORP	Oxidation Reduction Potential
TDS	Total Dissolved Solids
TSF	Tailings Storage Facility
TSS	Total Suspended Solids
WRL	Waste Rock Dump
Units	
cm	centimetre
d	day
ha	hectare
hr	hour

Abbreviations	
kg	kilogram
km	kilometre
m	metre
mm	millimetre
mg/L	milligram per litre
µg/L	micro-gram per litre
min	minute
yr	year
s	second
t	tonnes
µS/cm	micro-Siemens per centimetre

Discipline

Acronym	Parameter Definition/(Determination)	Unit
ABA	The Acid Base Accounting test was developed in 1974 to evaluate coal mine waste and was modified by Sobek *et al.* in 1978. Acid-Base Accounting is a test to assess the potential of a material to produce both acid and neutralisation potential.	
ABCC	Acid Buffering Characteristics Curves	
AC	Acid Consuming, materials with a capacity to neutralise acid.	kgH_2SO_4/ton
AFP	Acid Formation Potential is the potential for a material to produce acid.	kgH_2SO_4/ton
AMD	Acid Metalliferous/Mine Drainage – originates when sulfide material is exposed to the atmosphere. This causes the formation of sulfuric acid and the potential outflow of acidic and usually highly metal-rich water into the environment. Potential sulfide-bearing material includes waste rock from overburden, interburden, and processed ore (tailings).	
AMDMP	Acid Mine Drainage Management Plan	
ANC	Acid Neutralising Capacity (Laboratory Analysis) - is the measure of acid neutralising capacity, usually expressed by carbonates (e.g. calcite and dolomite) and silicates.	kgH_2SO_4/ton
APR	Acid Potential Ratio (Calculation) – is the ratio of ANC/MPA and is used to classify material as either NAF or PAF (see definitions below).	
APP	Acid producing potential; also referred to acid generating potential (AGP).	kgH_2SO_4/ton
ARD	Acid Rock Drainage – the use of this term indicate natural weathering and oxidation unmined outcrops of sulfide bearing materials.	
CaO	Calcium Oxide.	%
CEC	Cation Exchange Capacity	
EDS	Energy Dispersive Spectroscopy (EDS) Analyses	
Fe	Iron	
GAI	Geochemical Abundance Index.	

Acronym	Parameter Definition/(Determination)	Unit
ICPMS	Inductively Coupled Plasma Mass Spectrometry	
INAP	International Network for Acid Prevention	
KNAG	Kinetic Net Acid Generation	
Kinetic Testing	Tests results provide information on the rate of sulphide reaction over time, time periods for reaction, and control techniques which can optimise treatment and control to address the specific severity and duration of reaction.	
LC	Low Capacity.	
LoR	Limit of Reporting or Detection Limit	
MgO	Magnesium Oxide.	%
MPA	Maximum Potential Acidity or APP (Acid Production Potential) (Calculation) - It is determined by multiplying the Sulfide-S values (in %) by 30.6, which accounts for the reaction stoichiometry for the complete oxidation of pyrrotite and pyrite by O_2 to $Fe(OH)_3$ and H_2SO_4. MPA does not take into account the effect of any acid consuming materials in the rock material.	kgH_2SO_4/ton
NAF	Non-Acid Forming (Calculation). Materials are classified as NAF if either: - Sulfide-S < 0.3%, or - Sulfide-S ≥ 0.3% and NAPP is negative with ANC/MPA ≥ 2.0 (see also PAF definition below)	
NAG	Net Acid Generation or NAP (Net Acid Production) (Laboratory Analysis) –hydrogen peroxide is used to accelerate the oxidation of sulphides present in the material. The acid produced may be partially or totally consumed by acid neutralising components in the material. The pH of the solution is determined and then titrated to pH 7. This gives a value for the Net acid or neutralizing potential of the sample.	kgH_2SO_4/ton
NAPP	Net Acid Producing Potential (Calculation) - NAPP = MPA - ANC. Conceptually, a negative NAPP indicates all acid produced is neutralised and a positive NAPP indicates the material is net acid producing.	kgH_2SO_4/ton
NNP	Net Neutralising Potential (Calculation) - NNP = ANC - MPA. Conceptually, a positive NNP indicates all acid produced is neutralised and a negative NAPP indicates the material is net acid producing. NNP is a conservative measure as it tends to overestimate the acid producing potential because it does not differentiate between acid producing and non-acid producing forms of sulfur.	kgH_2SO_4/ton
NPR	Net Potential Ratio	
PAF	Potential Acid Forming (Calculation). Materials are classified as PAF if either: - Sulfide-S ≥ 0.3% and NAPP is positive, or - Sulfide-S ≥ 0.3% and NAPP is negative, but ANC/MPA < 2.0 (see also NAF definition above).	
PAFLC	Potentially Acid Forming – Low Capacity	
ROM	Run of Mine	
SEM	Scanning Electron Microscopy (SEM) Analyses	
SOR	Sulfide Oxidation Rate - Sulfide reaction over period of time.	$mgSO_4/kg/$ week
Static Testing	A static test determines both the total acid generating and total acid neutralizing potential of a sample.	
Sulfide-S	Sulfide Sulfur (Calculation) – is the sulfur in the material present as sulphide. Sulfide Sulfur = Total-S - Sulfate-S	%(w/w)
Total-S	Total Sulfur (Laboratory Analysis) – is the total sulfur in a material in all its forms.	%(w/w)
UC	Uncertain Waste Rock Classification	
WAD CN	Weak Acid Dissociable Cyanide	

Acronym	Parameter Definition/(Determination)	Unit
XRF	X-Ray Fluorescence	

Appendices

Appendix A: Sulphide Tailings Characterisation.

Appendix A: Sulphide Tailings Characterisation.

								Field Screen			Net Acid Generation									
Sample ID	Laboratory Certificate	Total S (Leco)	S_{CR}	Total Oxidised Sulfur as SO_4^{2-}	TOS	$EC_{(1\ 5)}$	$pH_{(1\ 5)}$	pH_f	pH_{fox}	Field Screen Reaction Rate	NAG pH or pH_{ox}	$NAG_{pH\ 4.5}$	$NAG_{pH\ 7.0}$	Maximum Potential Acidity MPA (or Acid Production Potential, AP)	Acid Forming Potential Ratio (APR)	ANC Fizz Rating 1 - slight	Acid Neutralising Capacity (ANC)	Net Acid Production Potential (NAPP)		Waste Material Classification
					TOS=S-S-SO_4													Laboratory	NAPP=AFP-ANC	
		%	%	mg/kg	%	µS/cm	pH units				pH unit	kgH_2SO_4/t		MPA=Total Sulfur*30.6 (kgH_2SO_4/t)	APR=ANC/MPA		kgH_2SO_4/t			
Composite 3: 20% sulphide, 80% oxide and transitional blend	EP2520749	4.59	2.260	32,000	1.39	293	9.4	8.8	1.7	Extreme	2.3	86.8	92.7	140.5	0.08	1	11.5	129.0	129.0	S>0.3%, NAG pH<4.5; NAPP positive; APR<1: Acid Forming (PAF)
Composite 4: 40% sulphide, 60% oxide and transitional blend	EP2520749	9.02	4.070	127,000	-3.68	965	9.1	8.4	1.4	Extreme	2.2	153.0	164.0	276.0	0.04	1	10.9	265.0	265.1	
	Minimum	**4.59**	**2.260**	**32,000**	**-3.68**	**293**	**9.1**	**8.4**	**1.4**	**-**	**2.2**	**<0.1**	**<0.1**	**140.5**	**0.0**	**-**	**10.9**	**129**	**129.0**	**-**
	Maximum	**9.02**	**4.070**	**127,000**	**1.39**	**965**	**9.4**	**8.8**	**1.7**	**-**	**2.3**	**<0.1**	**<0.1**	**276.0**	**0.1**	**-**	**11.5**	**265**	**265.1**	**-**
	Average	**6.81**	**3.165**	**79,500**	**-1.15**	**629**	**9.25**	**8.6**	**1.55**	**-**	**2.3**	**<0.1**	**<0.1**	**208.2**	**0.1**	**-**	**11.2**	**197.0**	**197.0**	**-**
	St.Dev	**3.13**	**1.280**	**67,175**	**3.59**	**475.1758**	**0.212132**	**0.282843**	**0.212132**	**-**	**0.1**	**<0.1**	**<0.1**	**95.9**	**0.0**	**-**	**0.4**	**96.2**	**96.3**	**-**

Sample ID	Laboratory Certificate	Heavy Metals and Metalloids																	
		Aluminium (Al)	Antimony (Sb)	Arsenic (As)	Barium (Ba)	Cadmium (Cd)	Chromium (Cr)	Cobalt (Co)	Copper (Cu)	Iron (Fe)	Lead (Pb)	Manganese (Mn)	Mercury (Hg)	Molybdenum (Mo)	Nickel (Ni)	Selenium (Se)	Uranium (U)	Vanadium (V)	Zinc (Zn)
		mg/kg																	
Composite 3	EP2520749	2,090	47	1,380	70	5	55	11	46	51,800	1,320	912	<0.1	<2	20	<5	0.2	9	532
Composite 4	EP2520749	3,740	39	2,160	40	9	41	23	34	72,900	1,450	1,090	<0.1	<2	35	<5	0.1	16	1,080
Average Crustal Abundance GARDGuide		**82,000**	**0.2**	**1.5**	**500**	**0.1**	**100**	**20**	**50**	**41,000**	**14**	**950**	**0.05**	**4**	**80**	**0.05**	**2**	**160**	**75**
Global Abundance Index GAI = log2 [C / (1.5*S)]																			
Composite 3	EP2520749	-6	7	9	-3	5	-1	-1	-1	0	6	-1	-	-	-3	-	-4	-5	2
Composite 4	EP2520749	-5	7	10	-4	6	-2	0	-1	0	6	0	-	-	-2	-	-5	-4	3
GAI Assessment (a GAI of 3 or above is considered significant and such an enrichment may warrant further examination)																			
Composite 3	EP2520749	0	7	9	0	5	0	0	0	0	6	0	-	-	0	-	0	0	2
Composite 4	EP2520749	0	7	10	0	6	0	0	0	0	6	0	-	-	0	-	0	0	3

Sample ID (EP2520749; 10 December 2025) - Sulphidic Tailings	Leachable Metals																	
	Aluminium (Al)	Antimony (Sb)	Arsenic (As)	Barium (Ba)	Cadmium (Cd)	Chromium (Cr)	Cobalt (Co)	Copper (Cu)	Iron (Fe)	Lead (Pb)	Manganese (Mn)	Mercury (Hg)	Molybdenum (Mo)	Nickel (Ni)	Selenium (Se)	Uranium (U)	Vanadium (V)	Zinc (Zn)
	mg/L																	
Acetic Acid Leachate (pH~5.2-5.3)																		
Composite 3	0.10	<0.1	0.20	0.30	<0.05	<0.1	<0.1	<0.1	0.70	0.300	7.4	<0.001	<0.1	<0.1	<0.05	<0.001	<0.1	0.300
Composite 4	0.40	0.1	0.60	0.30	<0.05	<0.1	<0.1	<0.1	1.10	2.200	2.0	<0.001	<0.1	0.10	<0.05	0.001	<0.1	0.600
De-ionised Water (DI) ASLP Leach; pH 8.9 to 8.4																		
Composite 3	0.74	0.1	0.21	<0.1	<0.005	<0.01	<0.01	<0.01	4.23	0.180	0.06	<0.001	<0.01	<0.01	<0.01	----	<0.01	0.020
Composite 4	0.47	0.1	0.14	<0.1	<0.005	<0.01	<0.01	<0.01	2.81	0.140	0.04	<0.001	<0.01	<0.01	<0.01	----	<0.01	0.020
TSLP Leachate (pH=9.3)																		
Composite 3	0.10	<0.1	0.40	<0.1	<0.05	<0.1	<0.1	<0.1	1.30	<0.1	<0.1	<0.001	<0.1	<0.1	<0.05	<0.001	<0.1	<0.1
Composite 4	0.20	<0.1	0.70	<0.1	<0.05	<0.1	<0.1	<0.1	1.00	<0.1	<0.1	<0.001	<0.1	<0.1	<0.05	<0.001	<0.1	<0.1
ASC NEPM Table 1C Groundwater Investigation Levels (GILs) Drinking Water	**0.055**	**ns**	**0.024**	**ns**	**0.0002**	**ns**	**ns**	**0.0014**	**ns**	**0.0034**	**1.9**	**0.00006**	**ns**	**0.01**	**0.005**	**ns**	**ns**	**0.008**
ANZG, 2023: Draft Livestock Drinking Water Guidelines (Cattle)	**5**	**ns**	**0.025**	**ns**	**0.01**	**0.050**	**1**	**1**	**ns**	**0.1**	**10**	**0.002**	**0.01**	**1**	**0.02**	**0.2**	**0.1**	**20**

Notes:

ns denotes not specified.

The limits of reporting for several metals and metalloids were raised due to large Total Dissolved Solids content and sample matrix interferences.

ASC NEPM investigation levels apply to typical slightly-moderately disturbed systems at a 95% species protection level.

Arsenic: 24 as As(III) 13 as As(V).

0.3	**Concentration exceeds Limit of Reporting (LoR or Detection Limit). LoRs have been raised for some samples due to matrix interferences.**
0.052	**Concentration exceeds lowest assessment level (colour coded).**

Sample ID	Physicochemical Properties																Dissolved Metals and MetalloidsMetals																								
	pH	Electrical Conductivity (EC) @ 25°C	Total Dissolved Solids TDS) @ 180°C	Hydroxide Alkalinity as CaCO3	Carbonate Alkalinity as $CaCO_3$	Bicarbonate Alkalinity as $CaCO_3$	Total Alkalinity as $CaCO_3$	Acidity as $CaCO_3$	Calcium (Ca)	Magnesium (Mg)	Sodium (Na)	Potassium (K)	Chloride (Cl)	Sulfate (SO_4)	Nitrite (as N)	Nitrate (as N)	Aluminium (Al)	Antimony (Sb)	Arsenic (As)	Barium (Ba)	Beryllium (Be)	Boron (B)	Cadmium (Cd)	Chromium (Cr)	Chrmium (Cr^{3+})	Chromium (Cr^{6+})	Cobalt (Co)	Copper (Cu)	ron (Fe)	Lead (Pb)	Manganese (Mn)	Mercury (Hg)	Molybdenum (Mo)	Nickel (Ni)	Selenium (Se)	Silver (Ag)	Strontium (Sr)	Thallium (Tl)	Uranium (U)	Vanadium (V)	Zinc (Zn)
	pH units	µS/cm	mg/L														mg/L																								
Limit of Reporting	0 01	1	10	1	1	1	1	1	1	1	1	1	1	1	0.01	0.01	0 01	0.001	0.001		0 001	0.05	0.0001	0 001	0.01	0.01	0.001	0.001	0.05	0.001	0.001	0.0001	0.001	0.001	0 01	0 001	0.001	0.001		0.01	0 005
Historic Groundwater Data 2019, EP1913167																																									
Emu Bore	7 62	22,200	16,600	<1	<1	162	162	-	543	703	3,430	174	7,330	2,200	<0 01	11 8	<0 05	-	0.107	-	-	7 0	0.0005	0 023	-	-	<0.005	<0.005	<0.005	<0.005	0.014	<0.0001	<0.005	0.014	-	-	-	-	-	-	<0.025
Boags Bore	7 83	12,200	8,000	<1	<1	122	122	-	266	369	1,970	86	3,550	1,030	0.40	4.3	<0 01	-	0.047	-	-	4.7	0.0002	0 003	-	-	<0.001	0.002	<0.001	<0.001	0.025	<0.0001	<0.001	0.001	-	-	-	-	-	-	0 016
Boags Pit	8 29	37,800	29,700	<1	<1	134	134	-	686	1,320	6,800	241	12,900	4,460	0 04	1.1	<0 05	-	0.089	-	-	11.9	<0.0005	<0.005	-	-	<0.005	<0.005	<0.005	<0.005	0.025	<0.0001	<0.005	<0.005	-	-	-	-	-	-	<0.025
VB Pit	8.18	40,300	33,900	<1	<1	106	106	-	1,140	1,520	6,970	246	14,300	4,000	<0 01	0.2	<0 05	-	0 24	-	-	9.4	0.0017	<0.005	-	-	<0.005	<0.005	<0.005	<0.005	0.087	<0.0001	<0.005	<0.005	-	-	-	-	-	-	<0.025
Historic Groundwater Data 2021, EP2110749																																									
Emu Bore	7 51	22,900	16,600	<1	<1	255	255	-	605	773	3,680	184	7,530	2,120	<0 01	9.8	<0 02	-	0.079	-	<0 002	7.4	0.0003	0 017	-	-	<0.002	<0.002	-	<0.002	0.021	<0.0001	<0.002	0.013	-	-	-	-	-	-	<0.010
Boags Bore	7 63	24,200	17,400	<1	<1	352	352	-	578	931	4,130	210	7,740	2,290	<0 01	23 6	<0 02	-	0.036	-	<0 002	6 5	0.0007	0 010	-	-	<0.002	<0.002	-	<0.002	0.005	<0.0001	<0.002	0.004	-	-	-	-	-	-	0 045
Boags Pit	8 00	42,400	32,600	<1	<1	193	193	-	806	1,540	7,510	269	14,300	4,190	<0 01	2.0	<0 05	-	0.063	-	<0 005	13.6	<0.0005	<0.005	-	-	<0.005	<0.005	-	<0.005	0.019	<0.0001	<0.005	<0.005	-	-	-	-	-	-	<0.025
VB Pit	7 98	48,200	39,100	<1	<1	150	150	-	1,420	1,910	8,340	290	17,200	4,860	<0 01	0.4	<0 05	-	0.252	-	<0 005	11.2	0.0023	<0.005	-	-	<0.005	<0.005	-	<0.005	0.088	<0.0001	<0.005	<0.005	-	-	-	-	-	-	<0.025
Groundwater Data April 2023, EP230537																																									
IWL-1	7 80	18,200	11,400	-	-	-	-	-	307	473	2,960	96	5,930	1,670	1.18	0.14	<0 01	0.003	<0.001	-	<0 001	5 6	0.0003	0 018	<0 01	0.02	0.005	0.002	<0.05	<0.001	0.263	<0.0001	0.002	0.017	<0 01	<0 001	2.04	-	-	-	0.174
IWL-2	7 85	24,500	15,100	-	-	-	-	-	373	621	3,840	149	7,670	2,100	0.05	43.40	<0 02	<0.002	0.032	-	<0 002	8.1	0.0004	0 009	<0 01	0.02	<0.002	<0.002	<0.05	<0.002	0.030	<0.0001	0.003	0.009	0 02	<0 002	3.31	-	-	-	0 024
IWL-3	7 62	3,650	2,060	-	-	-	-	-	76	90	532	39	957	331	1.92	3.63	<0 01	0.002	0.004	-	<0 001	1.1	<0.0001	<0 001	<0 01	<0.01	<0.001	<0.001	<0.05	<0.001	0.089	<0.0001	<0.001	0.004	<0 01	<0 001	0.688	-	-	-	0 064
IWL-4	7 88	13,700	8,130	-	-	-	-	-	191	282	2,270	81	4,120	1,250	<0 01	<0.01	<0 01	0.003	0.006	-	<0 001	4 9	<0.0001	<0.001	<0 01	<0.01	0.006	<0.001	<0.05	<0.001	0.435	<0.0001	0.015	0.013	<0 01	<0 001	1.79	-	-	-	<0.005
IWL-5	12.10	4,120	1,430	-	-	-	-	-	373	<1	208	82	283	187	2.32	4.88	0 24	<0.001	<0.001	-	<0 001	0 2	<0.0001	0 075	0.02	0.06	<0.001	0.005	<0.05	<0.001	<0.001	<0.0001	0.037	<0.001	<0 01	<0 001	1.06	-	-	-	<0.005
P-1	8.14	988	551	-	-	-	-	-	44	20	123	14	182	74	0.50	6.16	0 01	0.004	<0.001	-	<0 001	0.4	<0.0001	<0 001	<0 01	<0.01	<0.001	<0.001	<0.05	<0.001	0.036	<0.0001	0.016	0.002	<0 01	<0 001	0 246	-	-	-	0 008
P-2	7 98	24,600	15,800	-	-	-	-	-	378	629	4,560	139	7,860	2,380	0.04	38.40	<0 02	0.004	<0.002	-	<0 002	10.2	0.0005	0 002	<0 01	0.02	0.003	<0.002	<0.05	<0.002	0.185	<0.0001	0.006	0.014	0 02	<0 002	3.64	-	-	-	0.136
P-3	8.15	5,390	3,060	-	-	-	-	-	133	143	748	34	1,360	470	0.31	0.07	<0 01	0.005	0.003	-	<0 001	1 6	<0.0001	0 006	<0 01	<0.01	0.002	0.002	<0.05	<0.001	0.086	<0.0001	0.004	0.011	<0 01	<0 001	1.01	-	-	-	0 038
P-4	8 07	9,690	5,900	-	-	-	-	-	177	219	1,650	55	3,000	724	<0 01	0.01	<0 01	0.006	<0.001	-	<0 001	3 5	<0.0001	<0 001	<0 01	<0.01	0.004	<0.001	<0.05	<0.001	0.516	<0.0001	0.007	0.006	<0 01	<0 001	1.49	-	-	-	0 024
Groundwater Data January 2025, EP2501285																																									
IWL-1	-	14,300	8,780	-	-	-	-	-	218	304	2,390	89	-	1,300	0 07	0.15	<0 01	0.001	0.003	-	<0 001	4 2	<0.0001	0 002	<0 01	<0.01	<0.001	<0.001	<0.05	<0.001	0.529	<0.0001	<0.001	0.002	<0 01	<0 001	1.87	-	-	-	<0.005
IWL-2	-	14,000	8,490	-	-	-	-	-	215	311	2,420	90	-	1,260	<0 01	0.09	<0 01	0.002	0.001	-	<0 001	4 3	<0.0001	0 001	<0 01	<0.01	<0.001	<0.001	<0.05	<0.001	0.521	<0.0001	<0.001	0.001	<0 01	<0 001	1.90	-	-	-	<0.005
IWL-3	-	13,600	8,260	-	-	-	-	-	209	296	2,320	86	-	1,210	<0 01	0.03	<0 01	0.001	<0.0005	-	<0 001	4 3	<0.0001	0 002	<0 01	<0.01	<0.001	<0.001	<0.05	<0.001	0.485	<0.0001	0.001	0.005	<0 01	<0 001	1.85	-	-	-	<0.005
IWL-4	-	14,000	8,480	-	-	-	-	-	212	307	2,380	89	-	1,190	<0 01	0.03	<0 01	0.002	0.001	-	<0 001	4.4	<0.0001	0 001	<0 01	<0.01	<0.001	<0.001	<0.05	<0.001	0.497	<0.0001	0.002	0.004	<0 01	<0 001	1.91	-	-	-	<0.005
IWL-5	-	9,490	2,470	-	-	-	-	-	721	<1	308	125	-	11	1 96	5.12	0.15	<0.001	<0.0005	-	<0 001	0.1	<0.0001	0 055	0.06	<0.01	0.002	0.007	<0.05	0.004	<0.001	<0.0001	0.032	0.001	<0 01	<0 001	4.86	-	-	-	<0.005
P-1	-	25,300	17,000	-	-	-	-	-	394	688	4,650	155	-	3,040	0 56	9.44	<0 02	<0.002	<0.0005	-	<0 002	10.5	<0.0002	<0.002	<0 01	<0.01	<0.002	<0.002	<0.10	<0.002	0.136	<0.0001	0.002	0.012	<0 02	<0 002	3.92	-	-	-	0 010
P-2	-	23,400	15,600	-	-	-	-	-	571	805	4,240	184	-	2,670	0.17	0.71	<0 02	<0.002	<0.0005	-	<0 002	6 9	<0.0002	<0.002	<0 01	<0.01	0.003	<0.002	<0.10	<0.002	1.510	<0.0001	0.004	0.019	<0 02	<0 002	5.52	-	-	-	<0.010
P-3	-	14,300	8,520	-	-	-	-	-	184	234	1,720	60	-	1,450	0.15	2.07	<0 01	0.001	0.003	-	<0 001	2 9	<0.0001	<0.001	<0 01	<0.01	0.002	0.001	<0.05	<0.001	1.750	<0.0001	0.002	0.003	<0 01	<0 001	1.48	-	-	-	0 022
P-4	-	16,000	9,760	-	-	-	-	-	193	264	1,880	65	-	1,660	0 20	2.57	<0 01	<0.001	0.001	-	<0 001	3.1	<0.0001	<0.001	<0 01	<0.01	0.002	<0.001	<0.05	<0.001	1.600	<0.0001	0.002	0.003	<0 01	<0 001	1.59	-	-	-	<0.005
Process, Decant and Tailings Pore Water (EP250129 29 January 2025)																																									
Process Raw Water	7.74	53,900	37,100	<1	<1	352	352	61	553	1,200	10,000	417	15,900	2,730	0 02	16.7	<0 05	0.017	0.026	-	<0 005	6.52	0.0017	<0.005	<0 01	<0.01	0.006	0.018	<0.3	<0.005	0.243	<0.0001	0.026	0.01	<0 05	<0 005	8.3	<0.005	-	<0.05	<0.026
TSF Decant Return Water	8 88	48,800	35,400	<1	25	19	45	<1	2,480	84	8,740	463	14,700	2,560	0 60	26.4	5.76	0.035	0.595	-	<0 005	1.19	0.0271	0 050	0.050	<0.05	0.106	1.890	32.4	0.061	0.221	0.0005	0.025	0.10	0 05	0 273	10.1	<0.005	-	<0.05	0.722
TSF Sample 1 - Decant Water	9 52	50,700	37,000	45	122	<1	167	<1	2,660	9	9,270	455	15,600	2,560	0 59	25.4	6 66	0.027	1.160	-	<0 005	0.77	0.0219	0 077	0.080	<0.01	0.094	1.300	29 8	0.072	0.158	0.0007	0.027	0.08	0.14	0.492	8.7	<0.005	-	0.07	0 904
TSF Sample 2 - Decant Water	9 59	51,000	37,200	50	121	<1	171	<1	2,610	8	9,110	446	15,500	2,620	0 59	24.7	3 86	0.021	0.877	-	<0 005	0.71	0.0188	0 051	0.050	<0.01	0.092	1.280	16 6	0.039	0.090	0.0009	0.030	0.09	0.18	0 610	8.6	<0.005	-	<0.05	0.636
TSF Sample 3 - Decant Water	9 60	50,500	36,600	54	122	<1	176	<1	2,600	7	9,180	449	15,500	2,590	0 60	25.1	7 00	0.024	1.060	-	<0 005	0.66	0.0262	0 076	0.080	<0.01	0.096	1.300	27 2	0.064	0.171	0.0007	0.025	0.07	0 06	0 228	8.9	<0.005	-	0.07	0 955
TSF Sample 4 - Decant Water	9 58	50,600	36,800	55	123	<1	178	<1	2,590	7	9,050	442	15,500	2,530	0 59	24 9	5 22	0.024	0.972	-	<0 005	0.65	0.0268	0 058	0.060	<0.05	0.096	1.290	21.1	0.322	0.118	0.0008	0.026	0.07	0 06	0 244	8.9	<0.005	-	0.05	0 918
TSF Sample 5 - Decant Water	9 56	50,900	37,300	49	122	<1	171	<1	2,670	8	9,270	455	15,600	2,570	0 58	24 9	6.78	0.022	1.070	-	<0 005	0.68	0.0201	0 075	0.080	<0.05	0.096	1.130	25 2	0.064	0.216	0.0009	0.022	0.09	0.15	0.519	8.7	<0.005	-	0.06	0.767
TSF Sample 6 - Decant Water	9 64	50,800	36,700	56	127	<1	182	<1	2,670	8	9,350	458	15,700	2,610	0 60	25 0	6 23	0.020	1.050	-	<0 005	0.66	0.0272	0 068	0.070	<0.05	0.097	1.310	22 3	0.053	0.186	0.0008	0.019	0.07	<0 05	0 245	9.1	<0.005	-	0.06	0 932
TSF Sample 7 - Decant Water	9 56	50,900	36,800	50	121	<1	171	<1	2,650	7	9,200	448	15,700	2,420	0 59	24 6	3 59	0.020	0.826	-	<0 005	0.62	0.0250	0 052	0.050	<0.05	0.093	1.340	14 8	0.034	0.084	0.0009	0.024	0.07	0 06	0 228	8.8	<0.005	-	<0.05	0.671
TSF Sample 8 - Decant Water	9.46	50,800	37,200	34	119	<1	154	<1	2,670	8	9,270	458	15,700	2,400	0 59	25.1	6 53	0.023	1.130	-	<0 005	0.67	0.0211	0 077	0.080	<0.02	0.095	1.310	28.1	0.068	0.164	0.0007	0.026	0.08	0.13	0.495	8.8	<0.005	-	0.06	0 896
TSF Sample 9 - Decant Water	9 55	51,000	37,400	45	118	<1	163	<1	2,660	7	9,380	462	15,700	2,500	0 60	25 0	2 27	0.019	0.696	-	<0 005	0.62	0.0261	0 037	<0 05	<0.05	0.093	1.280	9.9	0.020	0.046	0.0008	0.028	0.06	0 06	0 235	9.0	<0.005	-	<0.05	0.714
TSF Sample 10 - Decant Water	9 56	51,000	39,500	41	122	<1	163	<1	2,640	7	9,240	451	15,600	2,440	0 60	25 2	4 90	0.021	0.954	-	<0 005	0.60	0.0256	0 058	0.060	<0.05	0.097	1.300	21.4	0.052	0.116	0.0009	0.027	0.07	0 06	0 233	9.0	<0.005	-	0.05	0.714
Raw Process and process Water (EP2520749 10 December 2025)																																									
Raw Water (Open Pits and Bores)	8.15	62,300	48,900	<1	<1	480	480	14	708	1,660	14,800	323	23,000	2,940	0 23	16.1	<0.10	<0.010	0.010	0.035	-	-	0.0015	<0.010	-	-	<0.010	<0.010	<0.50	<0.010	0.217	<0.0001	0.023	0.01	<0.040	-	-	-	0.044	<0.10	<0.050
Process Water (thickener overflow, TSF decant return water, pit water and bore water)	8.11	71,500	58,400	<1	<1	220	220	11	2,880	370	16,500	451	26,700	3,260	0 82	31 0	<0.10	0.038	0.098	0.164	-	-	0.1050	<0.010	-	-	0.053	2.340	<0.50	<0.010	0.036	0.0002	0.022	0.05	<0.040	-	-	-	<0.010	<0.10	0 327
ASC NEPM Table 1C Groundwater Investigation Levels (GILs) Drinking Water	**ns**	**ns**	**ns**	**ns**	**ns**	**ns**	**ns**	**ns**	**ns**	**ns**	**ns**	**ns**	**ns**	**ns**	**ns**	**ns**	**0.055**	**ns**	**0.024**	**ns**	**ns**	**0.37**	**0.0002**	**ns**	**ns**	**0.001**	**ns**	**0.0014**	**ns**	**0.0034**	**1.9**	**0.00006**	**ns**	**0.01**	**0.005**	**0.00005**	**ns**	**ns**	**ns**	**ns**	**0.008**
ANZG, 2023 Draft Livestock Drinking Water Guidelines (Cattle)	**ns**	**ns**	**4,000**	**ns**	**ns**	**ns**	**ns**	**ns**	**1,000**	**250**	**ns**	**ns**	**ns**	**500**	**33**	**443**	**5**	**ns**	**0.025**	**ns**	**0.06**	**5**	**0.01**	**0.050**	**0.050**	**0.050**	**1**	**1**	**ns**	**0.1**	**10**	**0.002**	**0.01**	**1**	**0.02**	**ns**	**ns**	**ns**	**0.2**	**0.1**	**20**

Notes

ns denotes not specified.

ASC NEPM investigation levels apply to typical slightly-moderately disturbed systems i.e. 95% species protection level.

Arsenic 24 as As(III) 13 as As(V).

0.3	**Concentration exceeds Limit of Reporting (LoR or Detection Limit). LoRs have been raised for some samples due to matrix interferences.**
0.052	**Concentration exceeds lowest assessment level (colour coded)**

Ground and pit waters have Dissolved Oxygen concentrations between 6.3mg/L and 10.3mg/L (2021).

Groundwater levels vary between 39.2m and 43.3m below surface (2021).

C-2 Geotechnical Investigation Report

2 November 2021

INTEGRATED WASTE LANDFORM

MT IDA GOLD PROJECT, WA

GEOTECHNICAL INVESTIGATION FACTUAL REPORT

Aurenne Mt Ida Pty Ltd

PER2020-0443AE Rev 2

PER2020-0443AE		
Date	Revision	Comments
15 January 2021	Rev A	Internal review
20 January 2021	Rev B	Issued for external review
18 February 2021	Rev 0	Issued for client's review
4 May 2021	Rev 1	Issued for submission
2 November 2021	Rev 2	2nd issue for submission

Table of Contents

Figure

Appendices

1 INTRODUCTION

CMW Geosciences Pty Ltd (CMW) was authorised by James Anderson of Aurenne Alt Resources Ltd, now Aurenne Mt Ida Pty Ltd (ASX: ARS) to carry out a geotechnical investigation as part of the design and regulatory approvals of an Integrated Waste Landform (IWL) at the Bottle Creek Gold Project, now Mt Ida Gold Project. An IWL is essentially a tailings storage facility surrounded by a waste dump. The site is located approximately 100 km northwest of Menzies, Western Australia. The scope of work and associated terms and conditions of our engagement were detailed in our services proposal referenced PER2020-0433AA Rev 0 dated 21 October 2020.

The purpose of this factual report is to describe the ground conditions encountered during geotechnical site investigations completed by CMW on 15 to 16 December 2020 and on 20 to 22 April 2021, and to provide a geotechnical assessment of the materials proposed for the construction of the Integrated Waste Landform.

2 SITE DESCRIPTION AND PROPOSED DEVELOPMENT

The IWL is located on Mining Lease M29/151 with an approximate centroid point of 6772543 m North and 252482 m East on Zone 51 of the MGA geodetic datum.

The centroid point of the IWL is situated approximately 725 m east of the unfinished Southwark and Emu pits, the northern open pits at Mt Ida Gold Project which is approximately 750 m long. Mt Ida Gold Project comprises two other open pits located further south, VB which is approximately 1300 m long and Boags which is approximately 700 m long. The VB and Boags pits are separated by Bottle Creek. Tailings from the new Mt Ida Gold Project operations will be stored in the proposed IWL facility. The Southwark and Emu pits will also likely be the source of materials during the construction of the IWL.

The subject site and its immediate surroundings are described as being gradually sloping from approximately RL 506 m AHD in the north-eastern corner to RL 494 m AHD along the southern boundary. The site is predominantly an open woodland comprising small to medium mallee trees, scattered shrubs, and perennial grasses. To the east-southeast of the subject site, numerous drainage lines are meandering south.

The site is considered undisturbed apart from disturbance due to minor access tracks.

3 FIELD INVESTIGATION

The CMW field investigations were carried out from 15 to 16 December 2020 and from 20 to 22 April 2021. All fieldwork was carried out under the direction of personnel from CMW Geosciences Pty Ltd in general accordance with AS1726 (2017), Geotechnical Site Investigations.

The scope of fieldwork completed on 15 to 16 December 2020 was as follows:

- A walkover survey of the site to assess the general landform, site conditions and geology of the three open pits (Emu, VB & Boags);
- Nine test pits, denoted TP01 to TP13 (Note: we had originally planned to complete 13 test pits, however, due to access constraints were only able to complete 9), were excavated in the footprint of the proposed IWL to depths of up to 0.8 m using a Hitachi 5 tonne excavator fitted with a 300 mm wide-toothed bucket to investigate the underlying soil conditions and facilitate sampling for laboratory testing. Engineering logs of the test pits and photographs are presented in Appendix A; and
- Collect bulk samples from the walls of the Emu Pit which is proposed to be the source of waste for the IWL for subsequent laboratory testing. Access into the Emu Pit was available from the

south of the pit. Samples were taken from the upper 2 m overburden horizon of the accessible walls in the Emu Pit and denoted Emu Pit Wall 1 (west) and Emu Pit Wall 2 (East). Photos in Appendix C show views of the existing pits.

The scope of fieldwork completed on 20 to 22 April 2021 was as follows:

- Four reverse circulation (RC) drilled boreholes within the proposed IWL storage to a maximum depth of 21.5 m, with in-situ falling head tests in each of the borehole.

The approximate locations of the respective investigation sites referred to above are shown in the attached Figure 1 – Site Investigation Plan. Test locations were selected by CMW and generally positioned in the footprint of the proposed IWL where access allowed. Test locations were measured using a hand-held GPS to an accuracy of ±5 m. Elevations were inferred from Google Earth to an accuracy of up to 10 m.

4 LABORATORY TESTING

A suite of soil laboratory testing was carried out as part of CMW's geotechnical investigation on representative samples generally in accordance with the requirements of the latest edition of AS1289, Methods of Testing Soils for Engineering Purposes (where applicable).

The in-situ samples were taken from the excavation spoils of the test pits and the accessible walls of the Emu Pit (i.e. lateritic zone under the hardpan, refer to photo in Appendix C).

All testings were commissioned by CMW and carried out by or under the direction of Western Geotechnical & Laboratory Services, a NATA registered testing authority.

Triaxial tests were carried by E-Precision Laboratory, also a NATA registered testing authority.

The extent of testing carried out to provide the geotechnical parameters required for this study are presented in Table 1 and testing certificates are presented in Appendix B.

Table 1: Laboratory Test Schedule Summary

Type of Test	Test Method	Quantity
Particle Size Distribution	AS 1289.3.6.1	6
Atterberg Limits	AS 1289.3.1.1, 3.2.1, 3.3.1	3
Falling Head Permeability	AS 1289.6.7.2	1
Constant Head Permeability	AS 1289.6.7.1	1
Single Stage Unconsolidated Undrained (UU) Triaxial Test	AS 1289.6.4.2	3
Standard Compaction	AS 1289.5.1.1	3

5 GROUND MODEL

5.1 Geology

The published geological map (*1:1,000,000 Kalgoorlie Geological Survey of Western Australia*) describes the site as being overlain by colluvium and/or residual deposits, sheetwash, talus, scree, boulder, gravel, sand and may include minor alluvial or sandplain deposits, local calcrete and reworked laterite.

5.2 Subsurface Conditions

The ground conditions encountered and inferred from the investigation of the IWL site were considered to be generally consistent with the published geology for the area and can be generalised and split according to the following subsurface sequences:

SANDY CLAY-GRAVEL (CI-CH)	red-brown, medium to high plasticity; gravel lateritic, ferruginous, pale grey, fine, angular to subangular; sand fine to coarse grained, angular to subangular; moderately cemented; Colluvial.
Overlying	
FERRICRETE	retrieved as Sandy Clayey GRAVEL (GC); red-brown, high plasticity; gravel lateritic, ferruginous, fine, subrounded to rounded; sand fine to coarse grained, angular to subangular; generally well cemented; Laterite.
Overlying	
RESIDUAL	retrieved as CLAY-SILT (CH); pale red in the upper layer, grading to white in the lower layer; metamorphosed mafic rock dominant with an intrusion of ultramafic sequence.

The distribution of these units is presented in Table 2.

Table 2: Summary of Encountered Soil Stratigraphy

Description	Depth to base of layer (mbgl)		
	Minimum	Maximum	Average
SANDY CLAY-GRAVEL (CI-CH)*	1.0	3.0	1.5
SANDY CLAYEY GRAVEL (GC, FERRICRETE)	3.0	11.0	6.1
CLAY-SILT (CH, RESIDUAL)	> 20.0	-	-

Note:

* Encountered below the Ferricrete layer at 3-11 m mbgl in BH03.

5.3 Groundwater

Groundwater was not encountered within any of the test pits during our investigation. Groundwater was observed from the surface to be pooled at the base of the VB and Boags open pits at a depth of approximately 30 m below ground level.

5.4 In-situ Permeability

The four in-situ permeability tests undertaken in the four RC drilled boreholes. Water levels over time were measured using a groundwater dipmeter. The testing was carried out over 2 days.

Water was added to the boreholes, which in three of the holes had stabilised within a PVC sleeve. The water level drop in each borehole was recorded over time.

A minimum of 3 sets of measurements was made in each borehole including one that was allowed to 'soak' overnight, and with an exception for the latter, each set of measurements comprised a minimum of ten readings. The results were then processed using the Hvorslev method to estimate the soil permeabilities.

The measured in-situ soil permeabilities in BH01 to BH04 were 1.19 x 10^{-7} (1.02 x 10^{-2}), 2.71 x 10^{-7} (2.34 x 10^{-2}), 9.16 x 10^{-8} (7.91 x 10^{-3}), 6.88 x 10^{-8} (5.95 x 10^{-3}), m/s (m/day), respectively.

Results of the in-situ permeability tests are presented in Appendix D. Discussion of the testing is provided in Section 7.

6 LABORATORY TEST RESULTS

6.1 Soil Classification and Permeability Results

Two laboratory permeability tests were undertaken on materials excavated from the proposed footprint of the IWL in TP06 and TP09 using constant head permeability and falling head permeability test methods, respectively. The samples were remoulded to 95% of the standard maximum dry density (SMDD) before being tested for permeability.

The constant head permeability method was employed on the sample taken from TP06 due to the test running too quickly for the falling head test method which was likely the result of the material at this location containing less fines.

The soil coefficient of permeability of the near-surface soils for TP06 was recorded to be 8.9 x 10^{-5} m/s (7.66 m/day) while the soil coefficient of permeability of the near-surface soils for TP09 was recorded to be 4.2 x 10^{-6} m/s (0.36 m/day). The test results reflect the amount of fines (8 % to 12 %) and the degree of compaction of the samples.

Results of the soil classification and permeability laboratory tests provided in Appendix B are summarised in Table 3 below. Discussion of the testing is provided in Section 7.

Table 3: Summary of Soil Classification and Permeability Test Results

Location & Coordinates	Depth (mbgl)	Particle Size Distribution				Atterberg Limits				Standard Compaction		FH Perm	CH Perm
		Cobble (%)	Gravel (%)	Sand (%)	Fines (%)	LL (%)	PL (%)	PI (%)	LS (%)	OMC (%)	SMDD (t/m^3)	K_{20} (m/s)	K_{20} (m/s)
Test Pit TP03 252455 m E 6772175 m N	0.4 – 0.6	0	46	39	15	-	-	-	-	-	-	-	-
Test Pit TP06 252654 m E 6772880 m N	0.5 - 0.6	0	59	33	8	-	-	-	-	8.5	2.35	-	8.9 x 10^{-5}
Test Pit TP09 252320 m E 6772477 m N	0.5 – 0.7	0	52	36	12	NO	NP	NP	1.0	6.5	2.39	4.2 x 10^{-6}	-
Test Pit TP10 252403 m E 6772733 m N	0.4 – 0.5	2	49	37	12	-	-	-	-	-	-	-	-
Test Pit TP13 252368 m E 6772303 m N	0.5 – 0.6	0	42	43	15	NO	NP	NP	1.0	-	-	-	-
Emu Pit Wall 1 251674 m E 6772221 m N	-	0	44	40	16	-	-	-	-	15.0	1.74	-	-
Emu Pit Wall 2 251702 m E 6772279 m N	-	-	-	-	-	36	24	12	3.5	-	-	-	-

Note: Gravel, sand and fines percentages are by weight, LL = Liquid Limit, PL = Plasticity Limit, PI = Plasticity Index, LS = Linear Shrinkage, NO = Not Obtainable, NP = Non-Plastic, MC = Natural Moisture Content, OMC = Optimum Moisture Content, SMDD = Standard Maximum Dry Density, FH = Falling Head, CH = Constant Head, K_{20} = Coefficient of Permeability.

6.2 Triaxial Results

Results from the unconsolidated undrained (UU) triaxial tests provided in Appendix B are summarised in Table 4 below. Discussion of the testing is provided in Section 7.

Table 4: Summary of UU Triaxial Test Results

Location	Shear Stage	Confining Pressure (kPa)	U'_0 (kPa)	U'_f (kPa)	Principal Effective Stresses (kPa)			$\sigma'_1 - \sigma'_3$ (kPa)	Strain (%)
					σ'_1	σ'_3	σ'_1 / σ'_3		
Emu Pit Wall 1 251674 m E 6772221 m N	1	100	58	69	217	31	7.0	186	1.27
Emu Pit Wall 1 251674 m E 6772221 m N	1	200	150	173	430	27	15.94	403	3.11
Emu Pit Wall 1 1251674 m E 6772221 m N	1	400	308	321	669	79	8.47	590	3.04

Note: U'_0 = Initial Pore Pressure, U'_f = Final Pore Pressure, σ'_1 = Effective Vertical Stress, σ'_3 = Effective Confining Stress.

7 GEOTECHNICAL MATERIALS ASSESSMENT

7.1 IWL Footprint Material

The in-situ materials recovered from the test pits are proposed to be used as the foundation in the construction of the IWL. The results from the laboratory testing indicated the materials were generally consistent across much of the site with the overburden material described as sandy Clay-Gravel in overall. The majority of it would be described as Clayey Sandy Gravel in accordance with AS1726 (2017). Slight variations occurred in test pit TP06 which recorded lower quantities of fines while TP01 had a surface Clayey Gravelly Sand layer overlying Clayey Sandy Gravel.

From the 5 particle size distribution tests that were undertaken the constituents of each test pit were relatively constant. The fines content ranged from 8 % (TP06) to 15 % (TP03, TP13), while the sands content ranged from 33 % (TP06) to 43 % (TP13), followed by the gravel content which ranged from 42 % (TP13) to 59 % (TP06). The fines were recorded as not obtainable for a liquid limit and non-plastic for plasticity limit and plasticity index values. The materials did, however, record a linear shrinkage value of 1.0 % resulting in an expected low shrink-swell potential.

The standard compaction tests carried out on the in-situ materials showed optimum moisture contents to range from 6.5 to 8.5 % with standard maximum dry densities ranging from 2.35 to 2.39 t/m^3.

In order to reduce the permeability of the foundation of the TSF/IWL, it is proposed to compact the foundation layer of the IWL/TSF basin to a minimum of 95 % of SMDD. A cut-off trench backfilled with compacted clayey material will also be installed under the IWL embankment.

7.2 Emu Pit Material

Mine waste material from the Emu Pit (Pictured in Appendix C) is proposed to be used for the construction of the IWL. The material sampled for laboratory testing was similar to the material recovered in the proposed footprint for the IWL and is classified as a clayey sandy GRAVEL (Appendix C, Picture 2, but had a greater fines content). It is important to note that the waste dump samples collected for laboratory testing were attained from the walls of the pit with volumes of larger particles (cobbles, boulders) being omitted. The presence of cobble and boulder was observed within the walls.

It is proposed that the underlying saprolite (residual) layer (Appendix C, Picture 3, and Picture 4) will be used in the construction of the IWL embankments as this is expected to have a greater fines content than the overlying laterite zones. This saprolite (residual) layer was observed in boreholes BH01 to BH04 as primarily pale red metamorphosed mafic rock dominant retrieved as high plasticity Clay-Silt, and in the VB open pit walls as a competent grey and pale-yellow chemically weathered rock.

Laboratory results of the Emu Pit material indicated the clay content of the material in the Emu Pit to be medium plasticity recording a liquid limit of 36 %, plastic limit of 24 % and plasticity index of 12 %. The materials are expected to have a low shrink-swell potential result from a linear shrinkage value of 3.5 %. The standard maximum dry density was measured as 1.74 t/m^3 at an optimum moisture content of 15.0 %.

Unconsolidated undrained (UU) triaxial tests revealed strength parameters were inconclusive as the sample failed through bulging resulting in a non-representative response of the material. Assessment of the three UU triaxial tests indicated, conservative effective strength parameters with the cohesion of 5 kPa and angle of internal friction (ϕ) of 35 ^{o}.

8 CLOSURE

The findings contained within this report are the result of limited discrete investigations conducted in accordance with normal practices and standards. To the best of our knowledge, they represent a reasonable interpretation of the general condition of the site. Under no circumstances, can it be considered that these findings represent the actual state of the ground conditions away from our investigation locations.

If the ground conditions encountered during construction are significantly different from those described in this report and on which the conclusions and recommendations were based, then we must be notified immediately.

This report has been prepared for use by ARS in relation to the construction of an IWL at the Mt Ida Gold Project in accordance with generally accepted consulting practice. No other warranty, expressed or implied, is made as to the professional advice included in this report. Use of this report by parties other than ARS and their respective consultants and contractors is at their risk as it may not contain sufficient information for any other purposes.

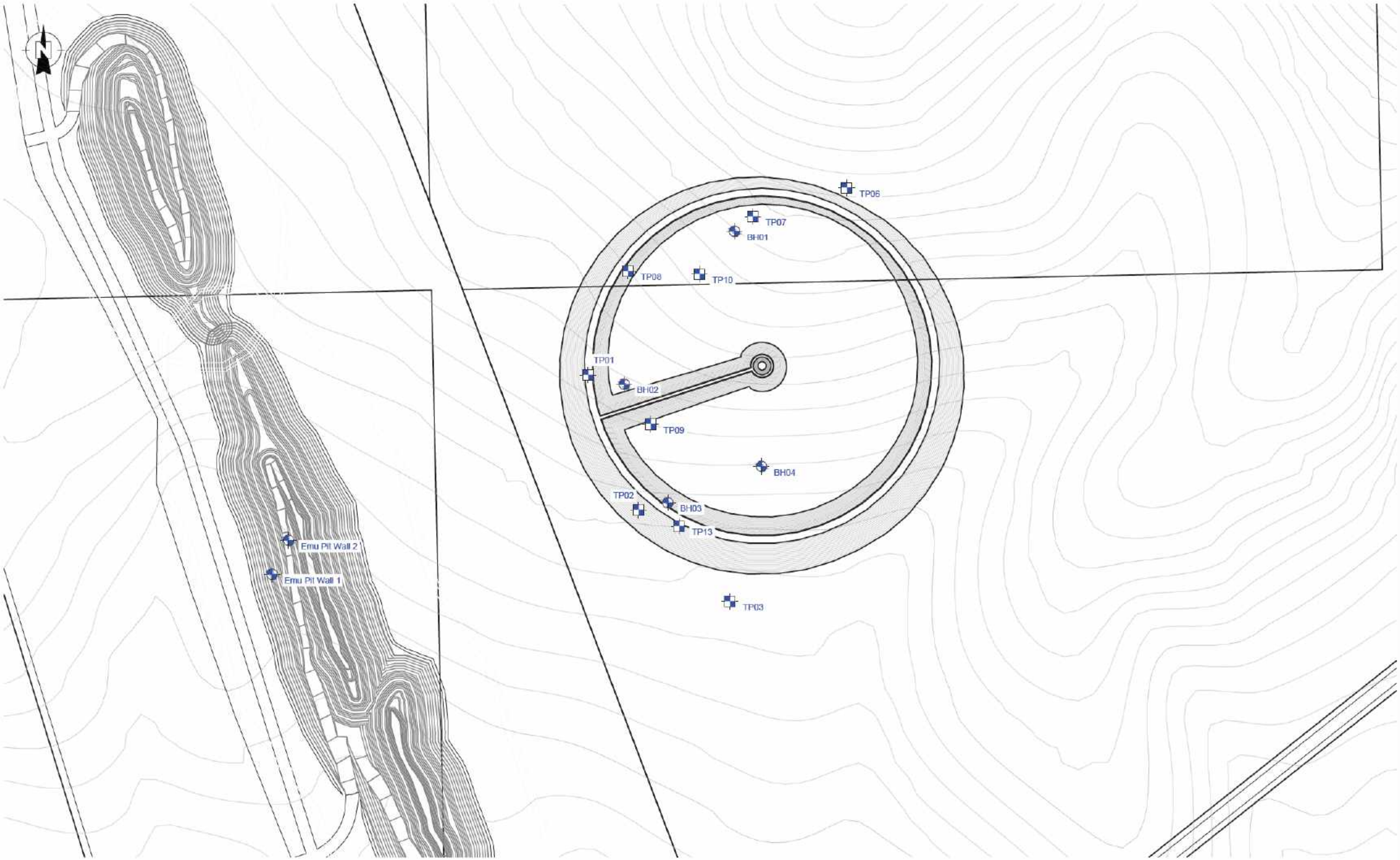
[redacted]

Distribution:	1 copy to ARS (electronic)
	Original held by CMW Geosciences Pty Ltd

9 REFERENCES

- AS 1289, *Methods of testing soils for engineering purposes,* Standards Australia, Sydney.
- AS 1726, *Geotechnical Site Investigations,* Standards Australia, Sydney, 2017.
- Hvorslev, M.J., 1951, ‘Time Lag and Soil Permeability in Ground-Water Observations’, Bulletin No. 36, Waterways Experiment, Station Corps of Engineers, U.S. Army, Vicksburg, Mississippi, pp. 1-50.
- *Kalgoorlie, Sheet SH 51*, Geological Survey of Western Australia, 1:1 000 000 Geological Series, First Edition, 1976

Figure



LEGEND:

BH01	BOREHOLE LOCATION
TP01	TEST PIT LOCATION

0 60 120 180 240 300 m

1:6000

CMW Geosciences

CLIENT: AURENNE MT IDA PTY LTD	DRAWN: DE	PROJECT: PER2020-0443
PROJECT: MT IDA GOLD PROJECT INTEGRATED WASTE LANDFORM	CHECKED: PA	DRAWING: SK01
	REVISION: C	SCALE: 1:6000
TITLE: SITE INVESTIGATION PLAN	DATE: 02.11.21	SHEET: A3 L

Appendix A

CMW Explanatory Notes, Test Pit Logs + Photographs, Borehole Logs

Explanatory Notes – Soil Description

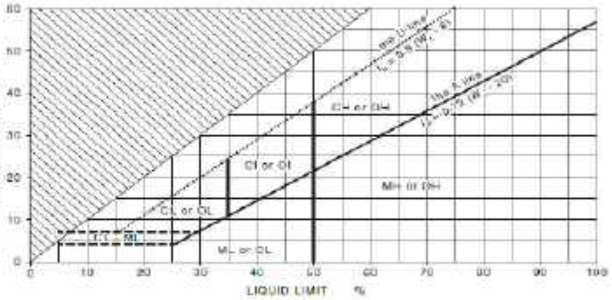
CMW Geosciences

▨	**GRAVEL**	▨	**Gravelly SAND**	▨	**Sandy CLAY**	▨	**FILL**
▨	**SILTY GRAVEL**	▨	**SILTY SAND**	▨	**SILT**	▨	**TOPSOIL**
▨	**CLAYEY GRAVEL**	▨	**CLAYEY SAND**	▨	**Gravelly SILT**	▨	**COBBLES & BOULDERS**
▨	**Sandy GRAVEL**	▨	**CLAY**	▨	**Sandy SILT**	▨	**CONCRETE**
▨	**SAND**	▨	**Gravelly CLAY**	▨	**PEAT**	☐	**NO CORE**

GP	Poorly Graded Gravel	ML	Low Plasticity Silt
GW	Well Graded Gravel	MH	High Plasticity Silt
GM	Silty Gravel	CL	Low Plasticity Clay
GC	Clayey Gravel	CI	Medium Plasticity Clay
SP	Poorly Graded Sand	CH	High Plasticity Clay
SW	Well Graded Sand	OL	Organic Soils (LP)
SM	Silty Sand	OH	Organic Soils (HP)
SC	Clayey Sand	PT	Peat
	Fill		Cobbles & Boulders

Soil colours based on BGS internal report IR/05/123 "A Revised scheme for coding unlithified deposits", 2005.

WATER	
▼ Groundwater (Strike)	▽ Groundwater (rise)



CLASSIFICATION AND INFERRED STRATIGRAPHY

Particle Size		
Major Division	Sub Division	Particle Size
Boulders		> 200 mm
Cobbles		63 to 200 mm
Gravel	Coarse	19 to 63 mm
	Medium	6.7 to 19 mm
	Fine	2.36 to 6.7 mm
Sand	Coarse	0.6 to 2.36 mm
	Medium	0.21 to 0.6 mm
	Fine	0.075 to 0.21 mm
Silt		0.002 to 0.075 mm
Clay		< 0.002 mm

SECONDARY/MINOR COMPONENTS	
TERMS FOR SANDS/GRAVELS (Less than 35% Particles < 0.075mm)	**TERMS FOR CLAYS/SILTS** (More than 35% Particles < 0.075mm)
trace... sand/gravel = <15% clay/silt = <5%	**trace...** sand/gravel = <15%
with... sand/gravel = >15%, <30% clay/silt = >5%, <12%	**with...** sand/gravel = >15%, <30%
Sandy... / Gravelly... >30% **Clayey... / Silty ... >12%**	**Sandy... / Gravelly... >30%**

MOISTURE CONDITION (Cohesionless Soils)

Symbol	Term	Description
D	**Dry**	Looks and feels dry. Cohesionless and free-running.
M	**Moist**	No free water on remoulding. Soil feels cool, darkened in colour. Soil tends to cohere.
W	**Wet**	Free water on remoulding. Soil feels cool, darkened in colour. Soil tends to cohere.

MOISTURE CONDITION (Cohesive Soils)

Symbol	Term	Description
<PL	**Dry**	Looks and feels dry. Hard and friable or powdery, well dry of the plastic limit
=PL	**Moist**	Soil feels cool, darkened in colour. Soil can be moulded. Near plastic limit.
>PL	**Wet**	Soils feels cool, darkened in colour. Usually weakened and free water forms when remoulding. Wet of plastic limit.

DENSITY (Cohesionless Soils)

Sym.	Term	Density Index (%)	SPT 'N'
VL	Very Loose	Less than 15	0 to 4
L	Loose	15 to 35	4 to 10
MD	Medium Dense	35 to 65	10 to 30
D	Dense	65 to 85	30 to 50
VD	Very Dense	Above 85	Above 50

STIFFNESS (Cohesive Soils)

Sym.	Term	Undrained Shear Strength
VS	Very Soft	0 to 12 kPa
S	Soft	12 to 25 kPa
F	Firm	25 to 50 kPa
St	Stiff	50 to 100 kPa
VSt	Very Stiff	100 to 200 kPa

SAMPLING AND LABORATORY / INSITU TESTING RESULTS

B	Bulk Disturbed Sample	**U**	Undisturbed Push-in Sample	**CBR**	California Bearing Ratio
BLK	Block Sample	**W**	Water Sample	**UCS**	Unconfined Compressive Strength
C	Core Sample	**LL**	Liquid Limit	**PLI**	Point Load Index
ES	Environmental Soil Sample	**PI**	Plasticity Index	**N**	SPT-N Value
P	Piston Sample	**LS**	Linear Shrinkage		

DRILLING/EXCAVATION METHOD

AC	Air Core	**HA**	Hand Auger	**RC**	Rotary Cored
ADH	Hollow Auger Drilling	**HQ**	Rotary Core 63.5mm	**RO**	Rotary Open Hole
AD/V	Auger with V-Bit	**HQ3**	Rotary Core 61.1mm	**SPT**	Standard Penetration Test
AD/T	Auger with TC-Bit	**PQ3**	Rotary Drill 83mm	**TP**	Test Pit
DPP	Direct Push Probe	**PT**	Push Tube	**W**	Wash Bore

Explanatory Notes – Rock Description

▤	**MUDSTONE**	▦	**LIMESTONE**	⚬	**CONGLOMERATE**	◊	**GYPSUM**
⨯	**SILTSTONE**	▦	**CHALK**	+	**IGNEOUS**	▤	**SHALE**
⁚	**SANDSTONE**	△	**BRECCIA**	∿	**METAMORPHIC**	■	**PYROCLASTIC**

ROCK MATERIAL STRENGTH

Symbol	Term	Uniaxial Compressive Strength - UCS (MPa)	Point Load Index - $I_{s(50)}$ (MPa) - GUIDE ONLY	Field Guide
EL	Extremely Low	Less than 0.6	Less than 0.03	Easily remoulded by hand to a material with soil properties (logged as soil).
VL	Very Low	0.6 to 2	0.03 to 0.1	Material crumbles under firm blows with sharp end of pick; can be peeled with knife; too hard to cut a triaxial sample by hand. Pieces up to 3 cm thick can be broken by finger pressure.
L	Low	2 to 6	0.1 to 0.3	Easily scored with a knife; indentations 1 mm to 3 mm show in the specimen with firm blows of the pick point; has dull sound under hammer. A piece of core 150 mm long 50 mm diameter may be broken by hand. Sharp edges of core may be friable and break during handling.
M	Medium	6 to 20	0.3 to 1	Readily scored with a knife; a piece of core 150 mm long by 50 mm diameter can be broken by hand with difficulty.
H	High	20 to 60	1 to 3	A piece of core 150 mm long by 50 mm diameter cannot be broken by hand but can be broken by a pick with a single firm blow; rock rings under hammer.
VH	Very High	60 to 200	3 to 10	Hand specimen breaks with pick after more than one blow; rock rings under hammer.
EH	Extremely High	More than 200	More than 10	Specimen requires many blows with geological pick to break through intact material; rock rings under hammer.

WEATHERING CLASSIFICATION

Symbol	Term	Definition
RS	Residual Soil	Material is weathered to such an extent that it has soil properties. Mass structure and material texture and fabric of original rock are no longer visible, but the soil has not been significantly transported.
XW	Extremely weathered rock	Material is weathered to such an extent that it has soil properties. Mass structure and material texture and fabric of original rock are still visible.
HW (or DW)	Highly Weathered	Rock strength usually changed by weathering. The rock may be highly discoloured. Porosity may be increased by leaching, or may be decreased due to deposition of weathering
MW (or DW)	Moderately Weathered	The whole of the rock material is discoloured, usually by iron staining or bleaching to the extent that the colour of the original rock is not recognizable, but shows little or no change of strength from fresh rock.
SW	Slightly weathered rock	Rock is partially discoloured with staining or bleaching along joints but shows little or no change of strength from fresh rock.
FR	Fresh rock	Rock shows no sign of decomposition or staining.

CEMENTATION CLASSIFICATION

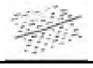
Symbol	Term	Definition
Uc	Uncemented	Clean grains, exhibiting soil properties.
VWc	Very weakly cemented	Marginal soil-rock strengths, collapsing feel under light finger pressure, cement seen on some washed grains.
Wc	Weakly Cemented	Collapsing feel under light soil pressure, breaks down to individual grains or with some grains cemented together, cement seen on many washed grains.
MWk	Moderately Weakly Cemented	Cement on nearly all grains, breaks down to lumps and some individual grains under finger pressure, can crush to individual grains under knife blade.
Mo	Moderately Cemented	Cement on most grains; can break fragments off by hand and crush to small lumps under knife blade.
We	Well Cemented	Practically all grains cemented together, cannot break fragments off by hand, dull sound under hammer.
VWe	Very Well Cemented	Most Primary Pores filled with cement, requires firm blow with hammer to break off fragments, rings when struck.

ROCK CORE RECOVERY

Symbol	Term	Definition
TCR	Total Core Recovery (%)	The ratio of total length of core recovered to length of core run drilled, expressed as a percentage.
SCR	Solid Core Recovery (%)	The ratio of the total length of solid cylindrical pieces of core recovered to length of core run drilled, expressed as a percentage.
RQD	Rock Quality Designation (%)	The ratio of the total length of solid cylindrical pieces of core over 100mm in length recovered to length of core run drilled, expressed as a percentage.

Explanatory Notes – Defect Description

Defect Type

ABBREVIATION	TERM	DEFINITION	DIAGRAM
PT	**Parting**	A surface or crack across which the soil has little or no tensile strength. Parallel or sub parallel to layering (eg bedding). May be open or closed.	
JT	**Joint**	A surface or crack across which the soil has little or no tensile strength but which is not parallel or sub parallel to layering. May be open or closed.	
SS	**Sheared Surface**	A near planar, curved or undulating surface which is usually smooth, polished or slickensided and which shows evidence of shear displacement.	
SZ	**Sheared Zone**	Zone of rock material with roughly parallel near planar, curved or undulating boundaries cut by closely spaced joints, sheared surfaces or other defects. Some of the defects are usually curved and intersect to divide the mass into lenticular or wedge-shaped blocks.	
CS	**Crushed Zone / Seam**	Seam of soil material with roughly parallel almost planar boundaries, composed of disoriented, usually angular fragments of the host rock material which may be more weathered than the host rock. The seam has soil properties.	
SM	**Seam**	Seam of soil material usually with distinct roughly parallel boundaries formed by the migration of soil into an open cavity or joint, infilled seams less than 1 mm thick may be described as a veneer or coating on a joint surface.	

Surface Roughness

ABBREVIATION	TERM	Description
VR	**Very Rough**	Many large irregularities generally > 1 mm
RO	**Rough**	Many small irregularities generally > 1 mm
SM	**Smooth**	Few or no surface irregularities
PO	**Polished**	Shiny smooth surface
Sl	**Slickensided/Striated**	Grooved/striated surface, usually polished

Orientation

ABBREVIATION	TERM
SH	**Sub Vertical**
SV	**Sub Horizontal**
10°	**Angle from horizontal**

Surface Shape

ABBREVIATION	TERM	Description
PL	**Planar**	Does not vary in orientation
CU	**Curved**	gradual change in orientation
UN	**Undulating**	wavy surface
ST	**Stepped**	one or more well defined steps
IR	**Irregular**	many sharp changes in orientation

Aperture

ABBREVIATION	TERM
DIS	**Discontinuous**
CL	**Closed**
5mm	**Measured width between joint surfaces**

Coatings

ABBREVIATION	TERM	Description
CN	**Clean**	No visible coating
SN	**Stained**	No coating but surface discoloured
VN	**Veneer**	visible coating too thin to measure
CT	**Coating**	visible coating up to 1mm thick
IF	**Infilled**	Over 1mm thick of soil present

Block Shape

Term	Description
Blocky	Roughly equidimensional blocks.
Tabular	thickness of blocks much less than length or width.
Columnar	lengths much greater than other dimensions
Irregular	Irregular discontinuities without arrangement into distinct sets,

TEST PIT LOG - TP01

Client: ALT Resources Ltd
Project: Bottle Creek IWL TSF
Location: Menzies, WA
Project: PER2020-0443
Date: 15/12/2020

1:15

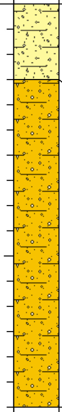
Sheet 1 of 1

Logged by: MO
Checked by:CH

Position: E.252213m N.6772561m
Elevation: 499 m

Plant: Hitachi 5 tonne excavator
Contractor: ALT Resources

Dimensions : 0.40m x 3.00m

Groundwater	Samples & Insitu Tests		RL (m)	Depth (m)	Graphic Log	Material Description Soil Type, Plasticity or Particle Characteristics, Colour, Secondary and Minor Components	Moisture Condition	Consistency/ Relative Density	Structure & other observations
	Depth	Type & Results							
			498.8			SC: CLAYEY GRAVELLY SAND: fine to medium grained, subangular to subrounded; clay, non plastic; gravel, medium to coarse grained, subangular to subrounded; red brown, trace roots and rootlets; trace branches; gravel is lateritic . (Colluvial).			
			498.2			GC: CLAYEY SANDY GRAVEL: fine to coarse grained, subangular to subrounded; clay, non plastic; sand, fine to medium grained, subangular to subrounded; red brown, trace roots and rootlets; trace branches; gravel is lateritic , with calcium carbonate cementation. (Colluvial).	D		
						Test pit terminated at 0.80 m			
				1					
				2					

Termination Reason: Equipment refusal
Remarks: Backfilled

This report must be read in conjunction with accompanying notes and abbreviations.

TEST PIT LOG - TP02

Client: ALT Resources Ltd
Project: Bottle Creek IWL TSF
Location: Menzies, WA
Project: PER2020-0443
Date: 15/12/2020

1:15

Sheet 1 of 1

Logged by: MO	Position: E.252299m N.6772331m	Plant: Hitachi 5 tonne excavator	
Checked by:CH	Elevation: 496 m	Contractor: ALT Resources	Dimensions : 0.40m x 3.00m

Groundwater	Samples & Insitu Tests		RL (m)	Depth (m)	Graphic Log	Material Description Soil Type, Plasticity or Particle Characteristics, Colour, Secondary and Minor Components	Moisture Condition	Consistency/ Relative Density	Structure & other observations
	Depth	Type & Results							
					▨	GC: CLAYEY SANDY GRAVEL: fine to coarse grained, subangular to subrounded; clay, non plastic; sand, fine to medium grained, subangular to subrounded; red brown, trace roots and rootlets; trace branches; gravel is lateritic . (Colluvial).	D		
			495.4			Test pit terminated at 0.60 m			
				1					
				2					

Termination Reason: Equipment refusal

Remarks: Backfilled

This report must be read in conjunction with accompanying notes and abbreviations.

TEST PIT LOG - TP03

Client: ALT Resources Ltd
Project: Bottle Creek IWL TSF
Location: Menzies, WA
Project: PER2020-0443
Date: 15/12/2020

1:15

Sheet 1 of 1

Logged by: MO	Position: E.252455m N.6772175m	Plant: Hitachi 5 tonne excavator	
Checked by:CH	Elevation: 494 m	Contractor: ALT Resources	Dimensions : 0.40m x 3.00m

Groundwater	Samples & Insitu Tests		RL (m)	Depth (m)	Graphic Log	Material Description Soil Type, Plasticity or Particle Characteristics, Colour, Secondary and Minor Components	Moisture Condition	Consistency/ Relative Density	Structure & other observations
	Depth	Type & Results							
	0.4 - 0.6	BLK			▨	GC: CLAYEY SANDY GRAVEL: fine to coarse grained, subangular to subrounded; clay, non plastic; sand, fine to medium grained, subangular to subrounded; red brown, trace roots and rootlets; trace branches; gravel is lateritic . (Colluvial).	D		
			493.4			Test pit terminated at 0.60 m			
				1					
				2					

Termination Reason: Equipment refusal

Remarks: Backfilled

This report must be read in conjunction with accompanying notes and abbreviations.

TEST PIT LOG - TP06

Client: ALT Resources Ltd
Project: Bottle Creek IWL TSF
Location: Menzies, WA
Project: PER2020-0443
Date: 15/12/2020

1:15

Sheet 1 of 2

Logged by: MO
Checked by:CH

Position: E.252654m N.6772880m
Elevation: 506 m

Plant: Hitachi 5 tonne excavator
Contractor: ALT Resources

Dimensions : 0.40m x 3.00m

Groundwater	Samples & Insitu Tests		RL (m)	Depth (m)	Graphic Log	Material Description Soil Type, Plasticity or Particle Characteristics, Colour, Secondary and Minor Components	Moisture Condition	Consistency/ Relative Density	Structure & other observations
	Depth	Type & Results							
	0.5 - 0.8	BLK			▨	GC: SANDY GRAVEL: fine to coarse grained, subangular to subrounded; sand, fine to medium grained, subangular to subrounded; red brown; with clay, non plastic; trace roots and rootlets; gravel is lateritic . (Colluvial). *... from 0.45m to 0.80m, with iron and calcium carbonate cementation*	D		
			505.2			Test pit terminated at 0.80 m			
				1					
				2					

Termination Reason: Equipment refusal
Remarks: Backfilled



This report must be read in conjunction with accompanying notes and abbreviations.

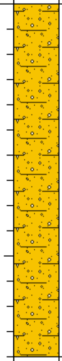
TEST PIT LOG - TP07

Client: ALT Resources Ltd
Project: Bottle Creek IWL TSF
Location: Menzies, WA
Project: PER2020-0443
Date: 15/12/2020

1:15

Sheet 1 of 2

Logged by: MO	Position: E.252494m N.6772831m	Plant: Hitachi 5 tonne excavator	
Checked by:CH	Elevation: 505 m	Contractor: ALT Resources	Dimensions : 0.40m x 3.00m

Groundwater	Samples & Insitu Tests		RL (m)	Depth (m)	Graphic Log	Material Description Soil Type, Plasticity or Particle Characteristics, Colour, Secondary and Minor Components	Moisture Condition	Consistency/ Relative Density	Structure & other observations
	Depth	Type & Results							
						GC: CLAYEY SANDY GRAVEL: fine to coarse grained, subangular to subrounded; clay, non plastic; sand, fine to medium grained, subangular to subrounded; red brown, trace roots and rootlets; colluvial; gravel is lateritic; trace cobble and boulder sized weakly cemented laterite; with calcium carbonate and iron cementation. (Colluvial).	D		
						... from 0.45m to 0.70m, with iron and calcium carbonate cementation			
			504.3			Test pit terminated at 0.70 m			
				1					
				2					

Termination Reason: Equipment refusal
Remarks: Backfilled

TEST PIT LOG - TP08

Client: ALT Resources Ltd
Project: Bottle Creek IWL TSF
Location: Menzies, WA
Project: PER2020-0443
Date: 15/12/2020

1:15

Sheet 1 of 1

Logged by: MO	Position: E.252281m N.6772738m	Plant: Hitachi 5 tonne excavator	
Checked by:CH	Elevation: 501 m	Contractor: ALT Resources	Dimensions : 0.40m x 3.00m

Groundwater	Samples & Insitu Tests		RL (m)	Depth (m)	Graphic Log	Material Description Soil Type, Plasticity or Particle Characteristics, Colour, Secondary and Minor Components	Moisture Condition	Consistency/ Relative Density	Structure & other observations
	Depth	Type & Results							
						GC: CLAYEY SANDY GRAVEL: fine to coarse grained, subangular to subrounded; clay, non plastic; sand, fine to medium grained, subangular to subrounded; red brown, trace roots and rootlets; trace branches; gravel is lateritic . (Colluvial).	D		
			500.2			Test pit terminated at 0.80 m			
				1					
				2					

Termination Reason: Equipment refusal

Remarks: Backfilled

This report must be read in conjunction with accompanying notes and abbreviations.

TEST PIT LOG - TP09

Client: ALT Resources Ltd
Project: Bottle Creek IWL TSF
Location: Menzies, WA
Project: PER2020-0443
Date: 15/12/2020

1:15

Sheet 1 of 1

Logged by: MO
Checked by:CH

Position: E.252320m N.6772477m
Elevation: 498 m

Plant: Hitachi 5 tonne excavator
Contractor: ALT Resources

Dimensions : 0.40m x 3.00m

Groundwater	Samples & Insitu Tests		RL (m)	Depth (m)	Graphic Log	Material Description Soil Type, Plasticity or Particle Characteristics, Colour, Secondary and Minor Components	Moisture Condition	Consistency/ Relative Density	Structure & other observations
	Depth	Type & Results							
	0.5 - 0.7	BLK	497.3			GC: CLAYEY SANDY GRAVEL: fine to coarse grained, subangular to subrounded; clay, non plastic; sand, fine to medium grained, subangular to subrounded; red brown, trace roots and rootlets; trace branches; gravel is lateritic . (Colluvial).	D		
				1 2		Test pit terminated at 0.70 m			

Termination Reason: Target depth reached

Remarks: Backfilled

This report must be read in conjunction with accompanying notes and abbreviations.

TEST PIT LOG - TP10

Client: ALT Resources Ltd
Project: Bottle Creek IWL TSF
Location: Menzies, WA
Project: PER2020-0443
Date: 15/12/2020

1:15

Sheet 1 of 1

Logged by: MO	Position: E.252403m N.6772733m	Plant: Hitachi 5 tonne excavator	
Checked by:CH	Elevation: 502 m	Contractor: ALT Resources	Dimensions : 0.40m x 3.00m

Groundwater	Samples & Insitu Tests		RL (m)	Depth (m)	Graphic Log	Material Description Soil Type, Plasticity or Particle Characteristics, Colour, Secondary and Minor Components	Moisture Condition	Consistency/ Relative Density	Structure & other observations
	Depth	Type & Results							
	0.4 - 0.5	BLK				GC: CLAYEY SANDY GRAVEL: fine to coarse grained, subangular to subrounded; clay, non plastic; sand, fine to medium grained, subangular to subrounded; red brown, trace roots and rootlets; gravel is lateritic . (Colluvial). *... from 0.45m to 0.50m, with iron and calcium carbonate cementation*	D		
			501.5			Test pit terminated at 0.50 m			
				1					
				2					

Termination Reason: Equipment refusal

Remarks: Backfilled

This report must be read in conjunction with accompanying notes and abbreviations.

TEST PIT LOG - TP13

Client: ALT Resources Ltd
Project: Bottle Creek IWL TSF
Location: Menzies, WA
Project: PER2020-0443
Date: 15/12/2020

1:15

Sheet 1 of 1

Logged by: MO
Checked by:CH

Position: E.252368m N.6772303m
Elevation: 495 m

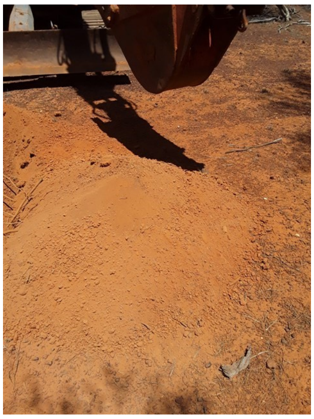
Plant: Hitachi 5 tonne excavator
Contractor: ALT Resources

Dimensions : 0.40m x 3.00m

Groundwater	Samples & Insitu Tests		RL (m)	Depth (m)	Graphic Log	Material Description Soil Type, Plasticity or Particle Characteristics, Colour, Secondary and Minor Components	Moisture Condition	Consistency/ Relative Density	Structure & other observations
	Depth	Type & Results							
	0.5 - 0.6	BLK				GC: CLAYEY SANDY GRAVEL: fine to coarse grained, subangular to subrounded; clay, non plastic; sand, fine to medium grained, subangular to subrounded; red brown, trace roots and rootlets; trace branches; gravel is lateritic . (Colluvial).	D		
			494.4			Test pit terminated at 0.65 m			
				1					
				2					

Termination Reason: Equipment refusal

Remarks: Backfilled



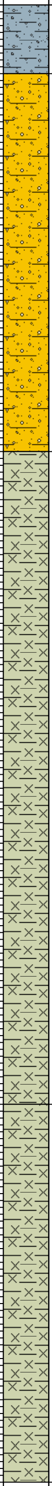
This report must be read in conjunction with accompanying notes and abbreviations.

BOREHOLE LOG - BH01

Client: ALT Resources Ltd
Project: Bottle Creek IWL TSF
Location: Menzies, WA
Project ID: PER2020-0443
Date: 21/04/2021

1:110
Sheet 1 of 1

Logged by: PA
Checked by: CH
Position: E.252463m N.6772806m
Elevation: 504 m (MGA Zone 51 J)
Hole Diameter: 132mm
Angle from horizontal: 90°
Plant used: Rig 16 BSD
Contractor: Blue Spec Drilling

Samples & Insitu Tests		RL (m)	Depth (m)	Graphic Log	Material Description Soil Type, Plasticity or Particle Characteristics, Colour, Secondary and Minor Components	Moisture Condition	Consistency/ Relative Density	Structure & other observations
Depth	Type & Results							
					CI: SANDY CLAY-GRAVEL: red-brown, medium plasticity; gravel lateritic, ferruginous, pale grey-pale red, fine, angular to subangular; sand fine to coarse grained, angular to subangular; weakly cemented; Colluvial (Colluvium)		VSt	0.00-0.67m: Collapsed to ~150-500 mm dia. 0.00-21.50m: 50 mm Slotted PVC
		503.0	1 2 3 4 5 6		GC: SANDY CLAYEY GRAVEL: red-brown, high plasticity; gravel lateritic, ferruginous, pale grey, fine, subangular to subrounded; sand fine to coarse grained, angular to subangular; well cemented; Ferricrete (Laterite)			
		497.5	7 8 9 10		CH: CLAY-SILT: pale red; metamorphosed mafic rock dominant; Residual (upper) (Unit 4)			
			11 12 13 14		*... from 11.00m to 13.00m, pale brown-pale red*	<PL	H	
			15		*... from 15.00m to 16.00m, becoming Gravelly, red; gravel fine, subangular to subrounded*			
		488.0	16 17		CH: CLAY-SILT: white; metamorphosed mafic rock dominant; Residual (lower) (Unit 4)			
			18 19 20 21		*... from 18.00m to 20.00m, pale brown-mottled pale grey; trace fine subrounded gravel; well cemented at parts*			
		482.5	22		Borehole terminated at 21.50 m			

DCP/PSP Equipment Ref.:
In Situ Vane Equipment Ref.:
Pocket Penetrometer Equipment Ref.:

Termination Reason: Target Depth

Remarks: Support units include ST03 BSD, AUX02 BSD and AllQuip Water Tank

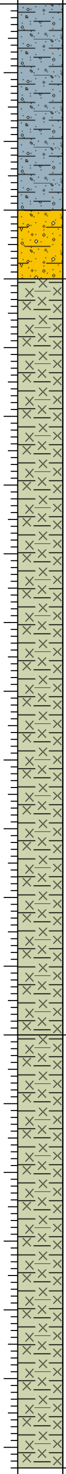
This report must be read in conjunction with accompanying notes and abbreviations.

BOREHOLE LOG - BH02

Client: ALT Resources Ltd
Project: Bottle Creek IWL TSF
Location: Menzies, WA
Project ID: PER2020-0443
Date: 21/04/2021

1:110 Sheet 1 of 1

Logged by: PA	Position: E.252275m N.6772545m	Hole Diameter: 132mm	Plant used: Rig 16 BSD
Checked by: CH	Elevation: 499 m (MGA Zone 51 J)	Angle from horizontal: 90°	Contractor: Blue Spec Drilling

Samples & Insitu Tests		RL (m)	Depth (m)	Graphic Log	Material Description Soil Type, Plasticity or Particle Characteristics, Colour, Secondary and Minor Components	Moisture Condition	Consistency/ Relative Density	Structure & other observations
Depth	Type & Results							
					CH: SANDY CLAY-GRAVEL: red-brown, medium to high plasticity; gravel lateritic, ferruginous, pale grey, fine, angular to subangular; sand fine to coarse grained, angular to subangular; moderately cemented; Colluvial (Colluvium)	<PL	Vst to H	0.00-0.40m: Collapsed to ~150 mm dia. 0.00-21.30m: 50 mm Slotted PVC
		496.0	3		GC: SANDY CLAYEY GRAVEL: red-brown, high plasticity; gravel lateritic, ferruginous, fine, subrounded to rounded; sand fine to coarse grained, angular to subangular; well cemented; Ferricrete (Laterite)		H	
		495.0	4		CH: CLAY-SILT: pale red; metamorphosed mafic rock dominant; Residual (upper) (Unit 4)			
			7		*... from 7.00m to 9.00m, red*			
			9		*... from 9.00m to 10.00m, pale red*			
			10		*... from 10.00m to 12.00m, pale brown-pale red*			
			12		*... from 12.00m to 13.50m, becoming Gravelly, red; gravel fine, subangular to subrounded*			
					... from 13.50m to 15.00m, pale brown; with red-brown, fine, subangular to subrounded gravel; amorphous			
		484.0	15		CH: CLAY-SILT: white; metamorphosed ultramafic rock dominant; Residual (lower) (Unit 4)			
					... from 16.50m to 19.00m, pale brown-mottled pale grey; trace fine subrounded to rounded gravel; well cemented at parts			
19.0-20.0	BH02_19.0-20.0 m D		19		*... from 19.00m to 20.00m, pale grey; trace pale brown, fine, subangular to subrounded gravel*			
		477.7			Borehole terminated at 21.30 m			

DCP/PSP Equipment Ref.:
In Situ Vane Equipment Ref.:
Pocket Penetrometer Equipment Ref.:

Termination Reason: Target Depth

Remarks: Support units include ST03 BSD, AUX02 BSD and AllQuip Water Tank

This report must be read in conjunction with accompanying notes and abbreviations.

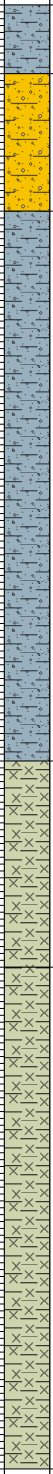
BOREHOLE LOG - BH03

Client: ALT Resources Ltd
Project: Bottle Creek IWL TSF
Location: Menzies, WA
Project ID: PER2020-0443
Date: 20/04/2021

CMW Geosciences

1:110 Sheet 1 of 1

Logged by: PA
Checked by: CH
Position: E.252349m N.6772343m
Elevation: 496 m (MGA Zone 51 J)
Hole Diameter: 132mm
Angle from horizontal: 90°
Plant used: Rig 16 BSD
Contractor: Blue Spec Drilling



Samples & Insitu Tests		RL (m)	Depth (m)	Graphic Log	Material Description Soil Type, Plasticity or Particle Characteristics, Colour, Secondary and Minor Components	Moisture Condition	Consistency/ Relative Density	Structure & other observations
Depth	Type & Results							
0.0-3.0	BH03_0-3.0m D				CH: SANDY CLAY-GRAVEL: red-brown, medium to high plasticity; gravel lateritic, ferruginous, pale grey, fine, angular to subangular; sand fine to coarse grained, angular to subangular; moderately cemented; Colluvial (Colluvium)		Vst to H	0.00-3.00m: 150 mm Plain PVC
		495.0	1		GC: SANDY CLAYEY GRAVEL: red-brown, high plasticity; gravel lateritic, ferruginous, fine, subrounded to rounded; sand fine to coarse grained, angular to subangular; well cemented; Ferricrete (Laterite)			
			2				H	
		493.0	3		CH: SANDY CLAY-GRAVEL: red-brown, medium to high plasticity; gravel lateritic, ferruginous, pale grey, fine, angular to subangular; sand fine to coarse grained, angular to subangular; moderately cemented; Colluvial (Colluvium) *... from 4.00m to 11.00m, red*			
			4					
			5					
6.0-9.0	BH03_6.0-9.0m D		6					
			7				Vst to H	
			8					
			9					
			10			<PL		
11.0-14.0	BH03_11.0-14.0 m D	485.0	11		CH: CLAY-SILT: pale red; metamorphosed mafic rock dominant; Residual (upper) (Unit 4)			
			12					
			13		*... from 13.00m to 14.00m, pale brown-pale red*			
		482.0	14		CH: CLAY-SILT: white; metamorphosed mafic rock dominant; Residual (lower) (Unit 4)			
			15					
16.0-19.0	BH03_16.0-19.0 m D		16				H	
			17					
			18					
19.0-20.0	BH03_19.0-20.0 m D		19		*... from 19.00m to 20.00m, pale grey-pale red; trace fine subrounded to rounded Gravel; cemented at parts*			
			20					
			21					
		474.7			Borehole terminated at 21.30 m			
			22					

DCP/PSP Equipment Ref.: In Situ Vane Equipment Ref.: Pocket Penetrometer Equipment Ref.:

Termination Reason: Target Depth

Remarks: Support units include ST03 BSD, AUX02 BSD and AllQuip Water Tank

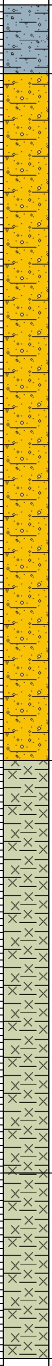
This report must be read in conjunction with accompanying notes and abbreviations.

BOREHOLE LOG - BH04

Client: ALT Resources Ltd
Project: Bottle Creek IWL TSF
Location: Menzies, WA
Project ID: PER2020-0443
Date: 21/04/2021

1:110 Sheet 1 of 1

Logged by: PA	Position: E.252509m N.6772405m	Hole Diameter: 132mm	Plant used: Rig 16 BSD
Checked by: CH	Elevation: 498 m (MGA Zone 51 J)	Angle from horizontal: 90°	Contractor: Blue Spec Drilling



Samples & Insitu Tests		RL (m)	Depth (m)	Graphic Log	Material Description Soil Type, Plasticity or Particle Characteristics, Colour, Secondary and Minor Components	Moisture Condition	Consistency/ Relative Density	Structure & other observations
Depth	Type & Results							
					CI: SANDY CLAY-GRAVEL: red-brown, medium plasticity; gravel lateritic, ferruginous, pale red-pale brown, fine, angular to subangular; sand fine to coarse grained, angular to subangular; weakly cemented; Colluvial (Colluvium)	<PL	VSt	0.00-1.15m: Collapsed to ~150 mm dia. 0.00-19.70m: 50 mm Slotted PVC
		497.0	1		GC: SANDY CLAYEY GRAVEL: red-brown, medium to high plasticity; gravel lateritic, ferruginous, fine, subangular to subrounded; sand fine to coarse grained, angular to subangular; moderately cemented; Ferricrete (Laterite)		H	
		487.0	11		CH: CLAY-SILT: pale red; metamorphosed mafic rock dominant; Residual (upper) (Unit 4) *... from 12.00m to 13.00m, becoming Gravelly, pale brown-pale red; gravel fine, subangular to subrounded; with fine to coarse, subangular sand* *... from 13.00m to 14.00m, with gravel* *... from 16.00m to 17.00m, pale red*			
		481.0	17		CH: CLAY-SILT: white; metamorphosed mafic rock dominant; Residual (lower) (Unit 4) *... from 18.00m to 20.00m, pale grey; trace pale brown, fine, subangular to subrounded gravel*			
		478.3			Borehole terminated at 19.70 m			

Depth (m) scale: 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20, 21, 22

DCP/PSP Equipment Ref.:	In Situ Vane Equipment Ref.:	Pocket Penetrometer Equipment Ref.:

Termination Reason: Target Depth

Remarks: Support units include ST03 BSD, AUX02 BSD and AllQuip Water Tank

This report must be read in conjunction with accompanying notes and abbreviations.

Appendix B
Laboratory Test Reports

Perth
Unit 3, 34 Sphinx Way
Bibra Lake
WA 6163
Ph: (08) 9418 8742
[redacted]

E-PRECISION LABORATORY

SINGLE-STAGE UNCONSOLIDATED UNDRAINED TRIAXIAL TEST

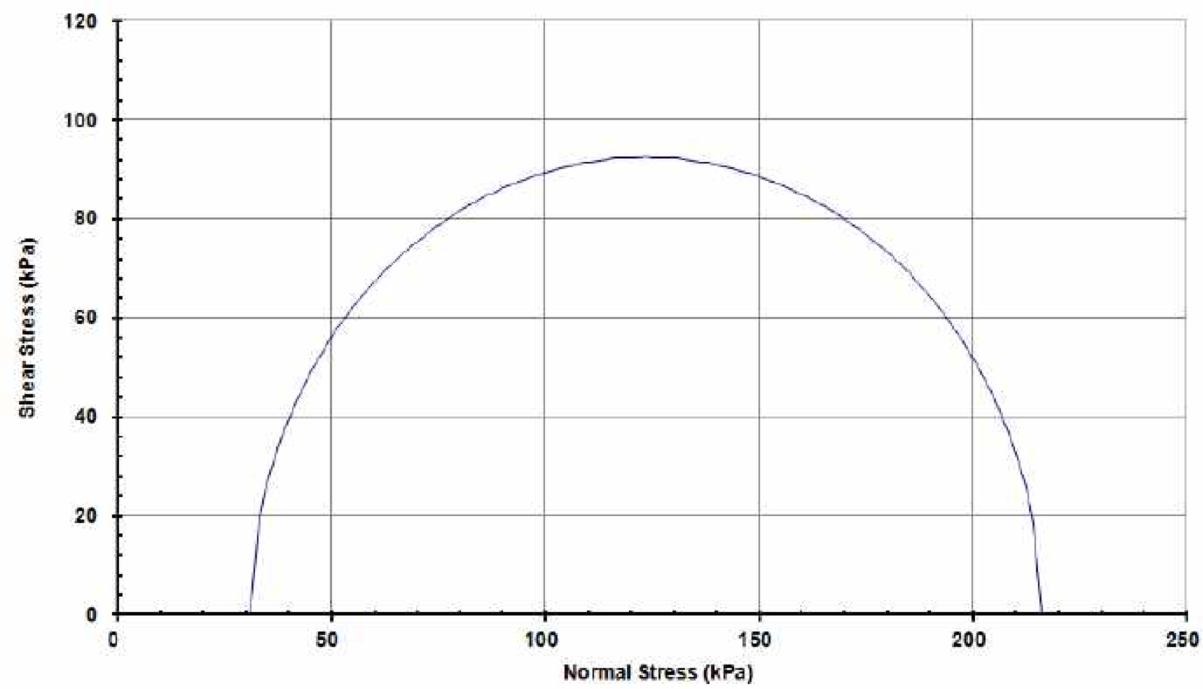
Method: ASTM D2850 / Inhouse Method

Client:	Western Geotechnical Lab Services	Date Tested:	26/12/2020
Project:	Bottle Creek 2020 Testing	EP Lab Job Number:	BV
Sample No:	Emu Pit Wall 1	Lab:	EPLAB
Sample ID:	W20_11968_A_UU		
Depth (m):	-	Room Temperature at Test:	~ 18°C

Tested by:	[redacted]	Initial Moisture (%):	14.68	Strain Rate (mm/min):	0.05
Height (mm):	125.45	Final Moisture (%):	14.65	Skempton's (B):	-
Diameter (mm):	61.80	Bulk Density (t/m³):	1.89	Geology:	-
L/D Ratio:	2.03	Dry Density (t/m³):	1.65		

Failure Criteria used: Peak Deviator Stress

Mohr Circle Diagram (Effective Stress)



Interpretation from Mohr Circle:	Stage 1 & 2	Stage 1 & 3	Stage 2 & 3
Cohesion C' (kPa):	-	-	-
Angle of Shear Resistance Φ' (Degrees) :	-	-	-

Perth
Unit 3, 34 Sphinx Way
Bibra Lake
WA 6163
Ph: (08) 9418 8742

[redacted]

E-PRECISION LABORATORY

SINGLE-STAGE UNCONSOLIDATED UNDRAINED TRIAXIAL TEST

Method: ASTM D2850 / Inhouse Method

Client:	Western Geotechnical Lab Services	Date Tested:	26/12/2020
Project:	Bottle Creek 2020 Testing	EP Lab Job Number:	BV
Sample No:	Emu Pit Wall 1	Lab:	EPLAB
Sample ID:	W20_11968_A_UU		
Depth (m):	-	Room Temperature at Test:	~ 18°C

Photo After Test

Sample ID:	Emu Pit Wall 1	**Depth (m):**	-
Lab ID:	W20_11968_A_UU	**Date Tested:**	26/12/2020

Failure Mode: Bulging Failure

Notes: **Sample remolded to 95% SMDD as requested**

Stored and Tested the Sample as received

Samples supplied by the Client

Authorised Signatory (Geotechnical Engineer): [redacted]

Perth
Unit 3, 34 Sphinx Way
Bibra Lake
WA 6163
Ph: (08) 9418 8742
[redacted]

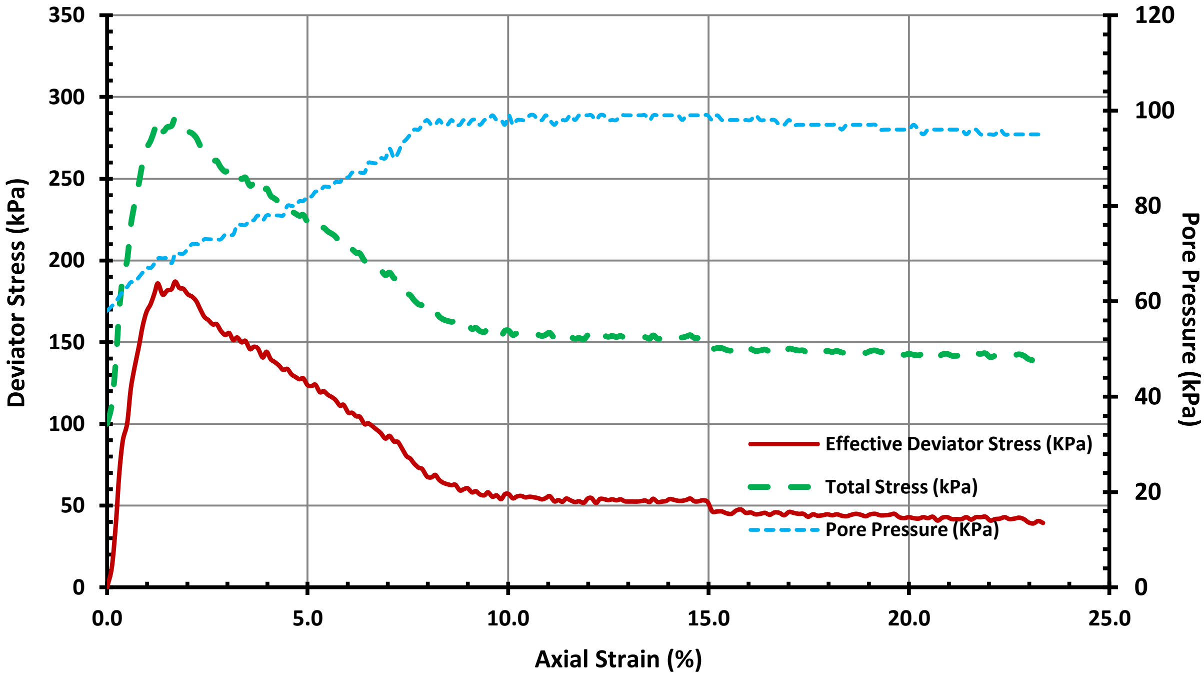
E-PRECISION LABORATORY

SINGLE-STAGE UNCONSOLIDATED UNDRAINED TRIAXIAL TEST

Method: ASTM D2850 / Inhouse Method

Client:	Western Geotechnical Lab Services	Date Tested:	26/12/2020
Project:	Bottle Creek 2020 Testing	EP Lab Job Number:	BV
Sample No:	Emu Pit Wall 1	Lab:	EPLab
Sample ID:	W20_11968_A_UU		
Depth (m):	-	Room Temperature at Test:	~ 18°C

Deviator Stress Vs Strain Diagram



SHEAR STAGE DATA AND STRESS MEASUREMENTS (kPa)

Shear Stage	Confining Pressure	U'0	U'f	Principal Effective Stresses			σ'1 - σ'3	Strain (%)
				σ'1	σ'3	σ'1 / σ'3		
1	100	58	69	217	31	7.00	186	1.27

Perth
Unit 3, 34 Sphinx Way
Bibra Lake
WA 6163
Ph: (08) 9418 8742

[redacted]

E-PRECISION LABORATORY

SINGLE-STAGE UNCONSOLIDATED UNDRAINED TRIAXIAL TEST

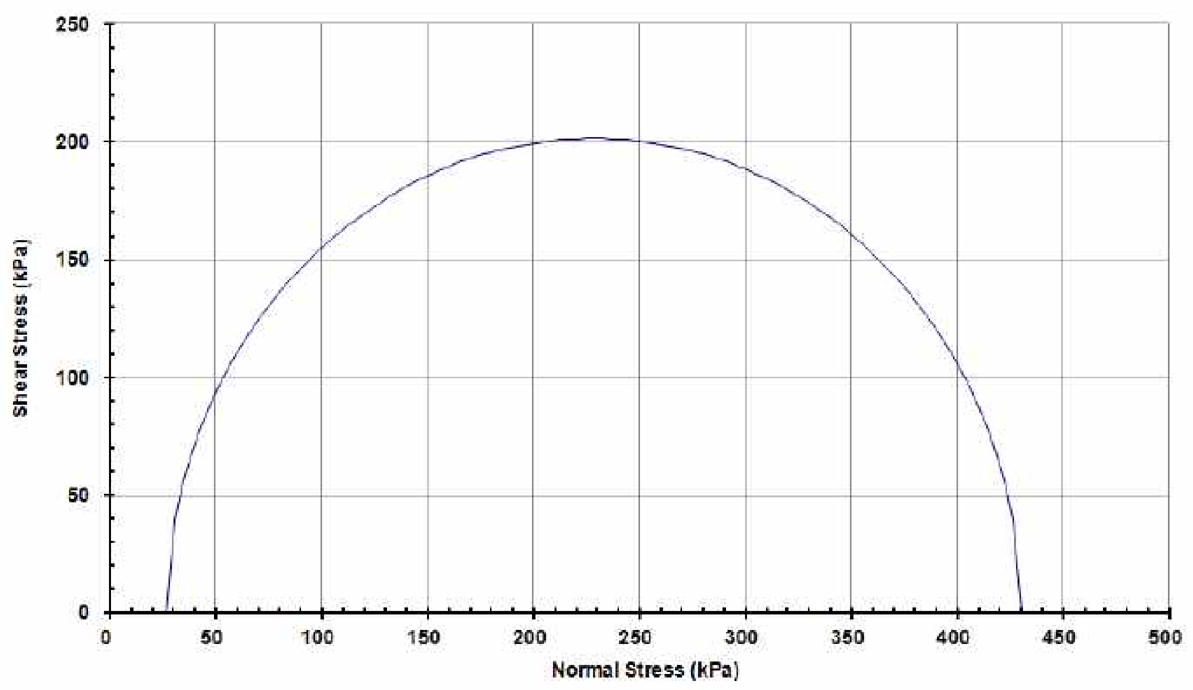
Method: ASTM D2850 / Inhouse Method

Client:	Western Geotechnical Lab Services	Date Tested:	26/12/2020
Project:	Bottle Creek 2020 Testing	EP Lab Job Number:	BV
Sample No:	Emu Pit Wall 1	Lab:	EPLAB
Sample ID:	W20_11968_B_UU		
Depth (m):	-	Room Temperature at Test:	~ 18°C

Tested by:	[redacted]	Initial Moisture (%):	14.86	Strain Rate (mm/min):	0.05
Height (mm):	125.54	Final Moisture (%):	14.82	Skempton's (B):	-
Diameter (mm):	61.80	Bulk Density (t/m³):	1.89	Geology:	-
L/D Ratio:	2.03	Dry Density (t/m³):	1.64		

Failure Criteria used: Peak Deviator Stress

Mohr Circle Diagram (Effective Stress)



Interpretation from Mohr Circle:	Stage 1 & 2	Stage 1 & 3	Stage 2 & 3
Cohesion C' (kPa):	-	-	-
Angle of Shear Resistance Φ' (Degrees) :	-	-	-

Perth
Unit 3, 34 Sphinx Way
Bibra Lake
WA 6163
Ph: (08) 9418 8742
[redacted]

E-PRECISION LABORATORY

SINGLE-STAGE UNCONSOLIDATED UNDRAINED TRIAXIAL TEST

Method: ASTM D2850 / Inhouse Method

Client:	Western Geotechnical Lab Services	Date Tested:	26/12/2020
Project:	Bottle Creek 2020 Testing	EP Lab Job Number:	BV
Sample No:	Emu Pit Wall 1	Lab:	EPLAB
Sample ID:	W20_11968_B_UU		
Depth (m):	-	Room Temperature at Test:	~ 18°C

Photo After Test

Sample ID:	Emu Pit Wall 1	**Depth (m):**	-
Lab ID:	W20_11968_B_UU	**Date Tested:**	26/12/2020

Failure Mode: Bulging Failure

Notes: **Sample remolded to 95% SMDD as requested**

Stored and Tested the Sample as received

Samples supplied by the Client

Authorised Signatory (Geotechnical Engineer): [redacted]

Perth
Unit 3, 34 Sphinx Way
Bibra Lake
WA 6163
Ph: (08) 9418 8742
[redacted]

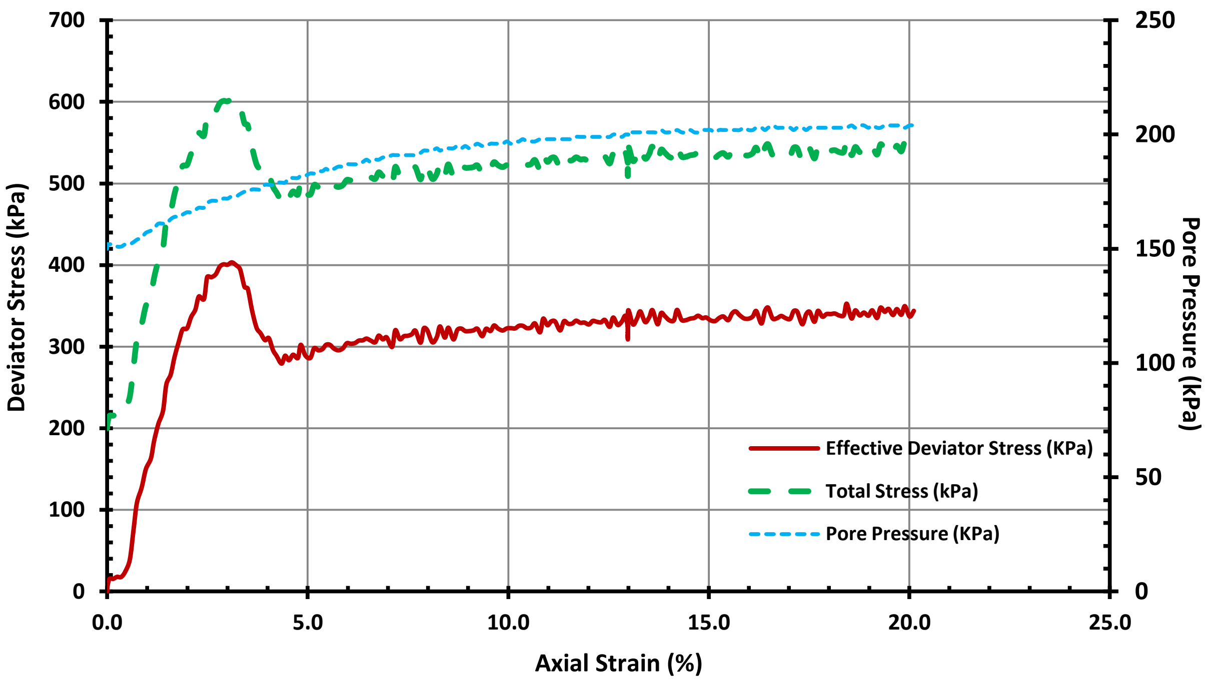
E-PRECISION LABORATORY

SINGLE-STAGE UNCONSOLIDATED UNDRAINED TRIAXIAL TEST

Method: ASTM D2850 / Inhouse Method

Client:	Western Geotechnical Lab Services	Date Tested:	26/12/2020
Project:	Bottle Creek 2020 Testing	EP Lab Job Number:	BV
Sample No:	Emu Pit Wall 1	Lab:	EPLab
Sample ID:	W20_11968_B_UU		
Depth (m):	-	Room Temperature at Test:	~ 18°C

Deviator Stress Vs Strain Diagram



SHEAR STAGE DATA AND STRESS MEASUREMENTS (kPa)

Shear Stage	Confining Pressure	U'_0	U'_f	Principal Effective Stresses			$\sigma'_1 - \sigma'_3$	Strain (%)
				σ'_1	σ'_3	σ'_1 / σ'_3		
1	200	150	173	430	27	15.94	403	3.11

[redacted]

E-PRECISION LABORATORY

SINGLE-STAGE UNCONSOLIDATED UNDRAINED TRIAXIAL TEST

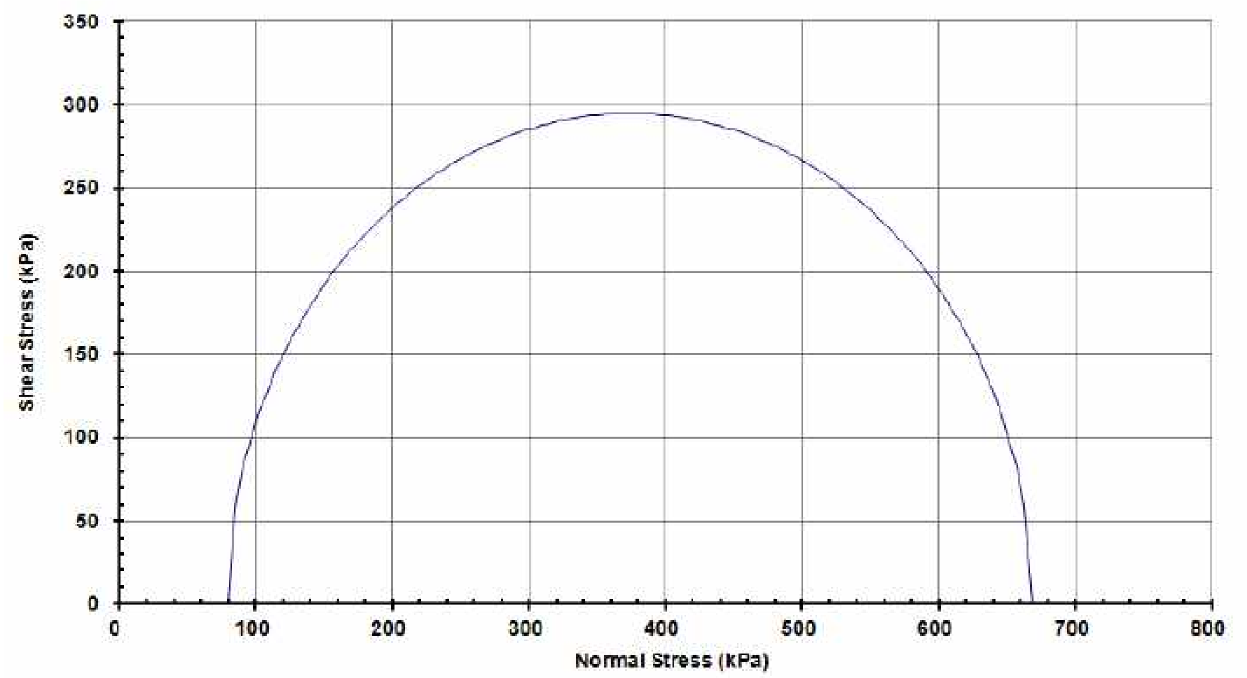
Method: ASTM D2850 / Inhouse Method

Client:	Western Geotechnical Lab Services	Date Tested:	26/12/2020
Project:	Bottle Creek 2020 Testing	EP Lab Job Number:	BV
Sample No:	Emu Pit Wall 1	Lab:	EPLAB
Sample ID:	W20_11968_C_UU		
Depth (m):	-	Room Temperature at Test:	~ 18°C

Tested by:	[redacted]	Initial Moisture (%):	15.49	Strain Rate (mm/min):	0.05
Height (mm):	124.84	Final Moisture (%):	15.45	Skempton's (B):	-
Diameter (mm):	61.80	Bulk Density (t/m³):	1.90	Geology:	-
L/D Ratio:	2.02	Dry Density (t/m³):	1.64		

Failure Criteria used: Peak Deviator Stress

Mohr Circle Diagram (Effective Stress)



Interpretation from Mohr Circle:	**Stage 1 & 2**	**Stage 1 & 3**	**Stage 2 & 3**
Cohesion C' (kPa):	-	-	-
Angle of Shear Resistance Φ' (Degrees) :	-	-	-

Perth
Unit 3, 34 Sphinx Way
Bibra Lake
WA 6163
Ph: (08) 9418 8742

[redacted]

E-PRECISION LABORATORY

SINGLE-STAGE UNCONSOLIDATED UNDRAINED TRIAXIAL TEST

Method: ASTM D2850 / Inhouse Method

Client:	Western Geotechnical Lab Services	Date Tested:	26/12/2020
Project:	Bottle Creek 2020 Testing	EP Lab Job Number:	BV
Sample No:	Emu Pit Wall 1	Lab:	EPLAB
Sample ID:	W20_11968_C_UU		
Depth (m):	-	Room Temperature at Test:	~ 18°C

Photo After Test

Sample ID:	Emu Pit Wall 1	**Depth (m):**	-
Lab ID:	W20_11968_C_UU	**Date Tested:**	26/12/2020

Failure Mode: Bulging Failure

Notes: **Sample remolded to 95% SMDD as requested**

Stored and Tested the Sample as received

Samples supplied by the Client

Authorised Signatory (Geotechnical Engineer): [redacted]

Perth
Unit 3, 34 Sphinx Way
Bibra Lake
WA 6163
[redacted]

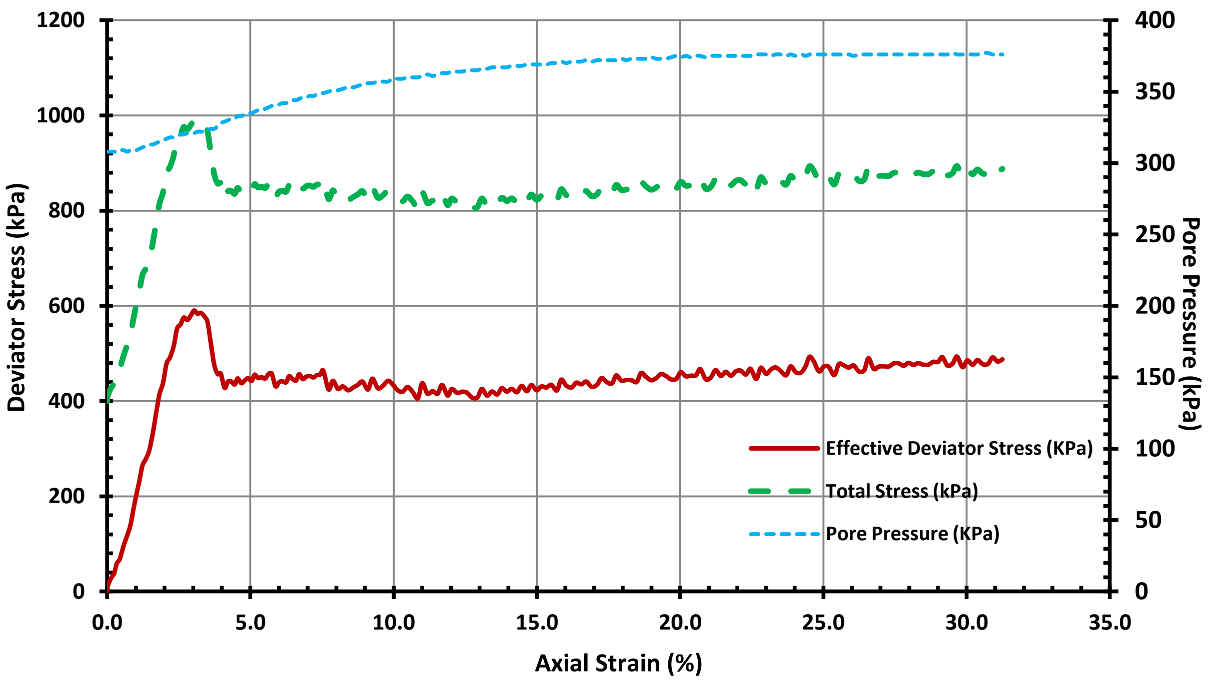
E-Precision Laboratory

SINGLE-STAGE UNCONSOLIDATED UNDRAINED TRIAXIAL TEST

Method: ASTM D2850 / Inhouse Method

Client:	Western Geotechnical Lab Services	Date Tested:	26/12/2020
Project:	Bottle Creek 2020 Testing	EP Lab Job Number:	BV
Sample No:	Emu Pit Wall 1	Lab:	EPLab
Sample ID:	W20_11968_C_UU		
Depth (m):	-	Room Temperature at Test:	~ 18°C

Deviator Stress Vs Strain Diagram



SHEAR STAGE DATA AND STRESS MEASUREMENTS (kPa)

Shear Stage	Confining Pressure	U'_0	U'_f	Principal Effective Stresses			$\sigma'_1 - \sigma'_3$	Strain (%)
				σ'_1	σ'_3	σ'_1 / σ'_3		
1	400	308	321	669	79	8.47	590	3.04

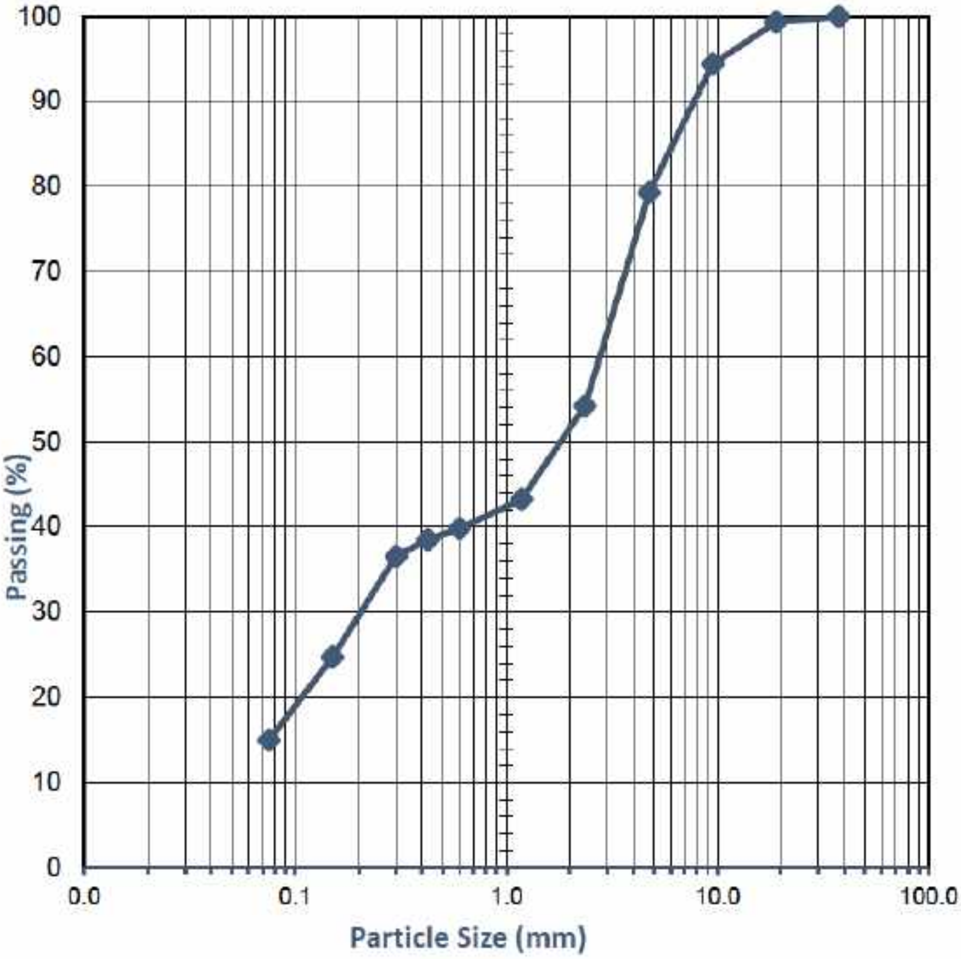
TEST REPORT - AS 1289.3.6.1

Client:	CMW Geosciences	*Ticket No.*	S2257
Client Address:	Suite 1, Level 3/29 Flynn Street, Wembley WA	*Report No.*	WG20/11963_1_PSD
Project:	Bottle Creek Project	*Sample No.*	WG20/11963
Location:	Kalgoorlie	*Date Sampled:*	Not Specified
Sample Identification:	TP03 0.4-0.6m	*Date Tested:*	30/12/2020

TEST RESULTS - Particle Size Distribution of Soil

Sampling Method: **Sampled by Client, Tested as Received**

Sieve Size (mm)	Percent Passing Sieve (%)
150.0	
100.0	
75.0	
37.5	100
19.0	99
9.5	94
4.75	79
2.36	54
1.18	43
0.600	40
0.425	39
0.300	37
0.150	25
0.075	15



Comments:

[redacted]

NATA
Accreditation No. 20599
Accredited for compliance
with ISO/IEC 17025 - Testing
WORLD RECOGNISED ACCREDITATION

This document shall not be reproduced except in full

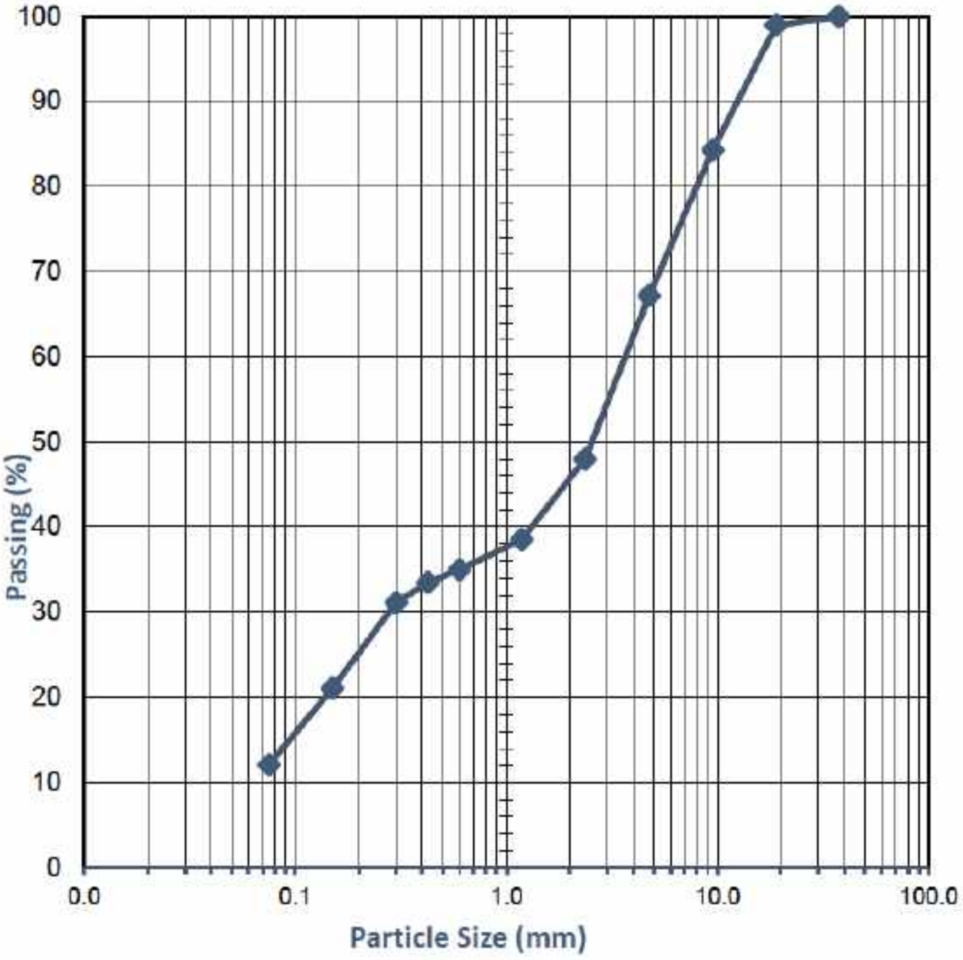
TEST REPORT - AS 1289.3.6.1

Client:	CMW Geosciences	*Ticket No.*	S2257
Client Address:	Suite 1, Level 3/29 Flynn Street, Wembley WA	*Report No.*	WG20/11964_1_PSD
Project:	Bottle Creek Project	*Sample No.*	WG20/11964
Location:	Kalgoorlie	*Date Sampled:*	Not Specified
Sample Identification:	TP09 0.5-0.7m	*Date Tested:*	30/12/2020

TEST RESULTS - Particle Size Distribution of Soil

Sampling Method: **Sampled by Client, Tested as Received**

Sieve Size (mm)	Percent Passing Sieve (%)
150.0	
100.0	
75.0	
37.5	100
19.0	99
9.5	84
4.75	67
2.36	48
1.18	39
0.600	35
0.425	33
0.300	31
0.150	21
0.075	12



Comments:

[redacted]

NATA
Accreditation No. 20599
Accredited for compliance
with ISO/IEC 17025 - Testing

This document shall not be reproduced except in full

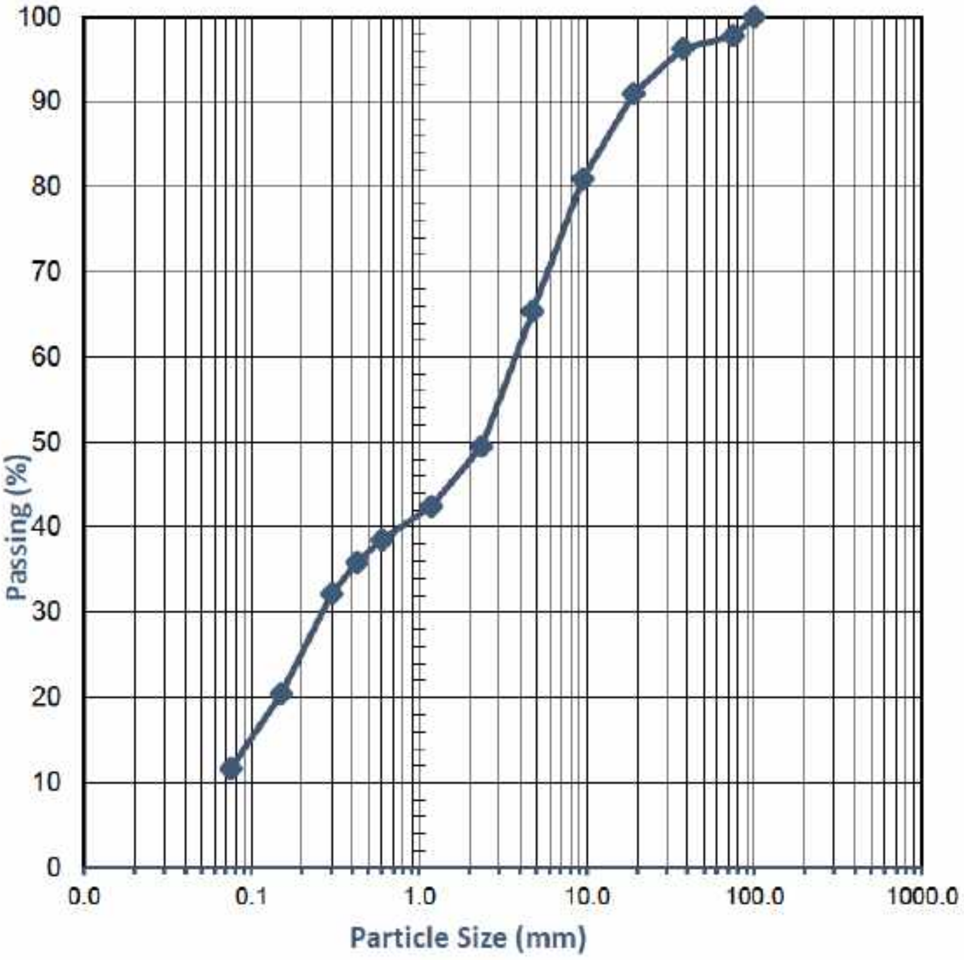
TEST REPORT - AS 1289.3.6.1

Client:	CMW Geosciences	*Ticket No.*	S2257
Client Address:	Suite 1, Level 3/29 Flynn Street, Wembley WA	*Report No.*	WG20/11965_1_PSD
Project:	Bottle Creek Project	*Sample No.*	WG20/11965
Location:	Kalgoorlie	*Date Sampled:*	Not Specified
Sample Identification:	TP10 0.4-0.5m	*Date Tested:*	30/12/2020

TEST RESULTS - Particle Size Distribution of Soil

Sampling Method: **Sampled by Client, Tested as Received**

Sieve Size (mm)	Percent Passing Sieve (%)
150.0	
100.0	100
75.0	98
37.5	96
19.0	91
9.5	81
4.75	65
2.36	49
1.18	42
0.600	39
0.425	36
0.300	32
0.150	20
0.075	12



Comments:

[redacted]

NATA
Accreditation No. 20599
Accredited for compliance
with ISO/IEC 17025 - Testing

This document shall not be reproduced except in full

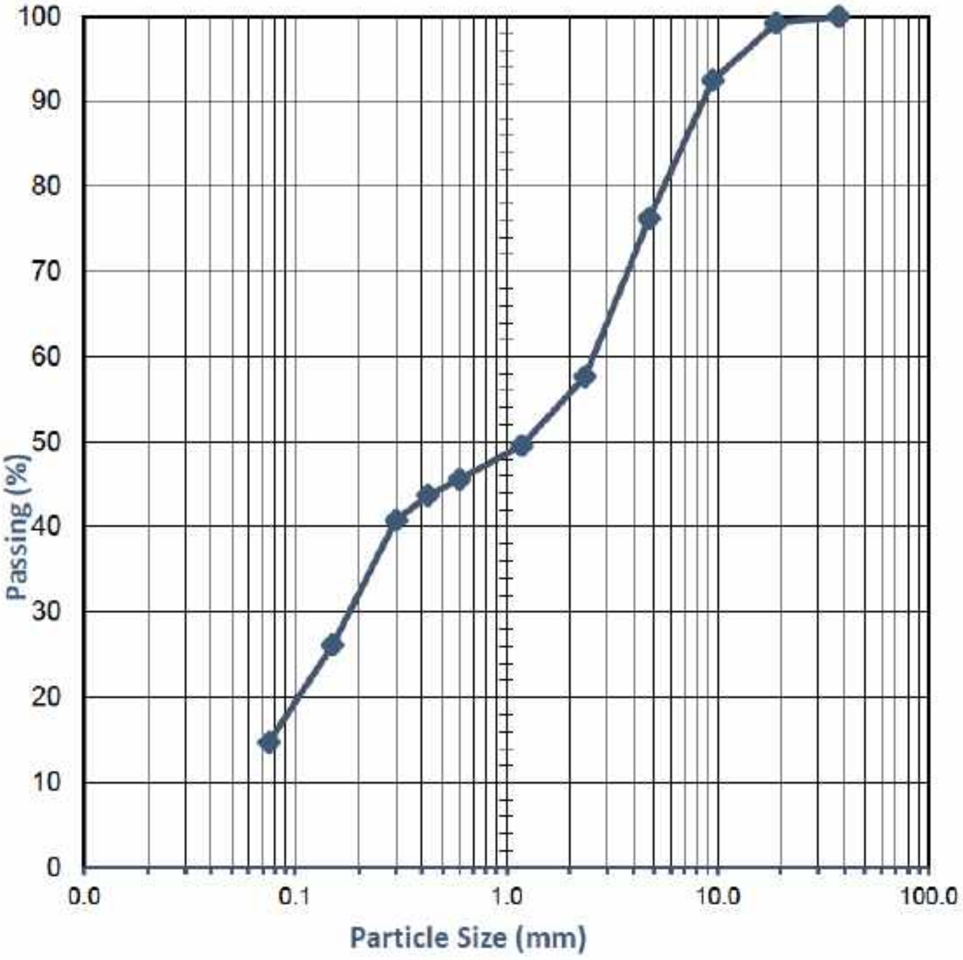
TEST REPORT - AS 1289.3.6.1

Client:	CMW Geosciences	*Ticket No.*	S2257
Client Address:	Suite 1, Level 3/29 Flynn Street, Wembley WA	*Report No.*	WG20/11966_1_PSD
Project:	Bottle Creek Project	*Sample No.*	WG20/11966
Location:	Kalgoorlie	*Date Sampled:*	Not Specified
Sample Identification:	TP13 0.5-0.6m	*Date Tested:*	30/12/2020

TEST RESULTS - Particle Size Distribution of Soil

Sampling Method: **Sampled by Client, Tested as Received**

Sieve Size (mm)	Percent Passing Sieve (%)
150.0	
100.0	
75.0	
37.5	100
19.0	99
9.5	92
4.75	76
2.36	58
1.18	50
0.600	46
0.425	44
0.300	41
0.150	26
0.075	15



Comments:

[redacted]

Accreditation No. 20599
Accredited for compliance
with ISO/IEC 17025 - Testing

This document shall not be reproduced except in full

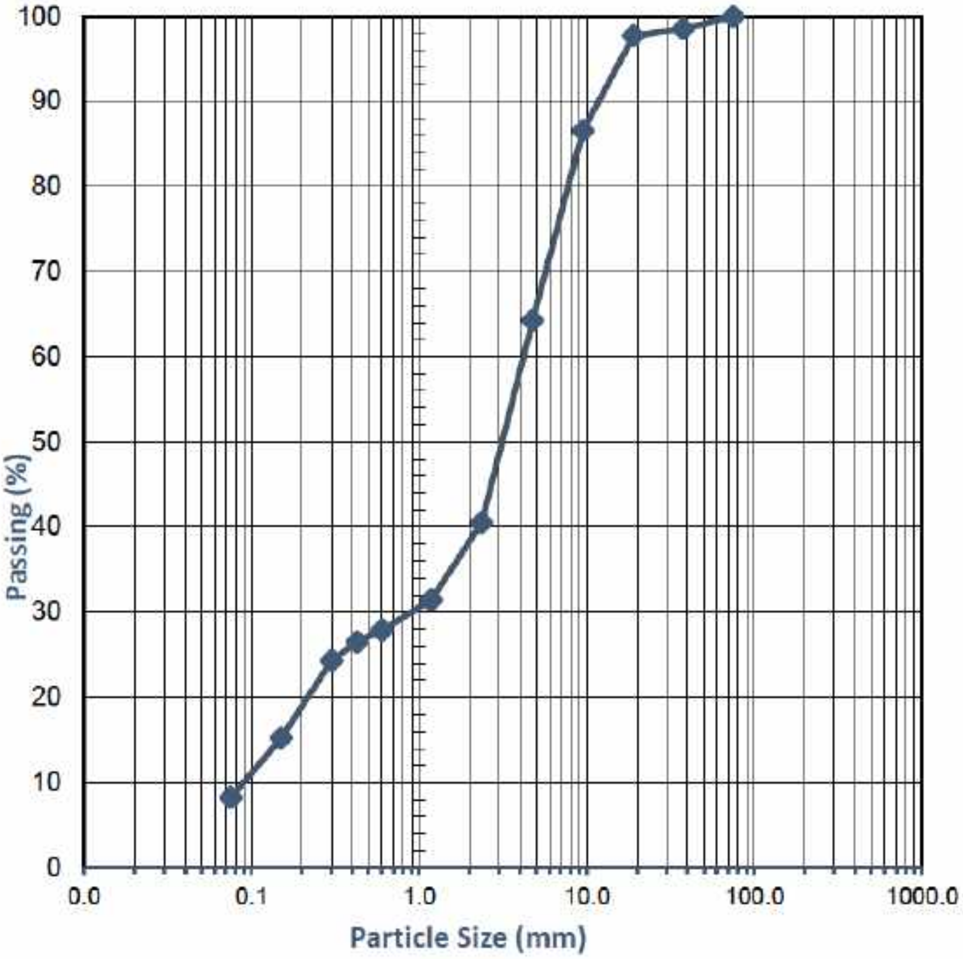
TEST REPORT - AS 1289.3.6.1

Client:	CMW Geosciences	*Ticket No.*	S2257
Client Address:	Suite 1, Level 3/29 Flynn Street, Wembley WA	*Report No.*	WG20/11967_1_PSD
Project:	Bottle Creek Project	*Sample No.*	WG20/11967
Location:	Kalgoorlie	*Date Sampled:*	Not Specified
Sample Identification:	TP06 0.5m	*Date Tested:*	30/12/2020

TEST RESULTS - Particle Size Distribution of Soil

Sampling Method: **Sampled by Client, Tested as Received**

Sieve Size (mm)	Percent Passing Sieve (%)
150.0	
100.0	
75.0	100
37.5	99
19.0	98
9.5	87
4.75	64
2.36	41
1.18	31
0.600	28
0.425	26
0.300	24
0.150	15
0.075	8



Comments:

[redacted]

Accreditation No. 20599
Accredited for compliance
with ISO/IEC 17025 - Testing

This document shall not be reproduced except in full

WESTERN GEOTECHNICAL
& Laboratory Services

SOIL | AGGREGATE | CONCRETE | CRUSHING

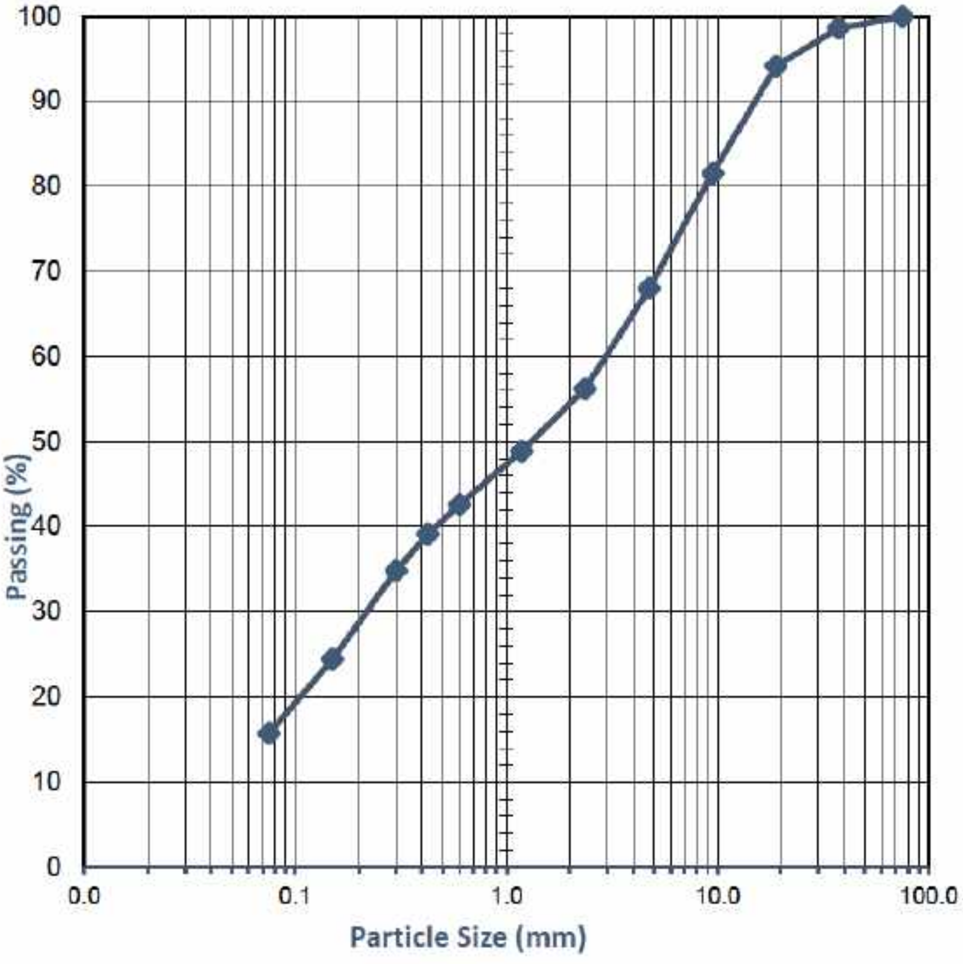
TEST REPORT - AS 1289.3.6.1

Client:	**CMW Geosciences**	*Ticket No.*	**S2257**
Client Address:	**Suite 1, Level 3/29 Flynn Street, Wembley WA**	*Report No.*	**WG20/11968_1_PSD**
Project:	**Bottle Creek Project**	*Sample No.*	**WG20/11968**
Location:	**Kalgoorlie**	*Date Sampled:*	**Not Specified**
Sample Identification:	**Emu Pit Wall 1**	*Date Tested:*	**30/12/2020**

TEST RESULTS - Particle Size Distribution of Soil

Sampling Method: **Sampled by Client, Tested as Received**

Sieve Size (mm)	Percent Passing Sieve (%)
150.0	
100.0	
75.0	**100**
37.5	**99**
19.0	**94**
9.5	**82**
4.75	**68**
2.36	**56**
1.18	**49**
0.600	**43**
0.425	**39**
0.300	**35**
0.150	**24**
0.075	**16**



Comments:

[redacted]

NATA
Accreditation No. 20599
Accredited for compliance
with ISO/IEC 17025 - Testing
This document shall not be reproduced except in full

TEST REPORT - AS 1289.3.1.1, 3.2.1, 3.3.1 & 3.4.1

Client:	CMW Geosciences	*Ticket No.*	S2257
Client Address:	Suite 1, Level 3/29 Flynn Street, Wembley WA	*Report No.*	WG20/11969_1_PI
Project:	Bottle Creek Project	*Sample No.*	WG20/11969
Location:	Kalgoorlie	*Date Sampled:*	Not Specified
Sample Identification:	Emu Pit Wall 2	*Date Tested:*	1/01/2021

TEST RESULTS - Consistency Limits (Casagrande)

Sampling Method:	**Sampled by Client, Tested as Received**
History of Sample:	**Oven Dried <50°C**
Method of Preparation:	**Dry Sieved**

AS 1289.3.1.1	**Liquid Limit (%)**	**36**
AS 1289.3.2.1	**Plastic Limit (%)**	**24**
AS 1289.3.3.1	**Plasticity Index (%)**	**12**
AS 1289.3.4.1	**Linear Shrinkage (%)**	**3.5**

AS 1289.3.4.1	**Length of Mould (mm)**	**250**
AS 1289.3.4.1	**Condition of Dry Specimen:**	**Cracked**

Comments:

[redacted]

NATA
Accreditation No. 20599
Accredited for compliance
with ISO/IEC 17025 - Testing

This document shall not be reproduced except in full

TEST REPORT - AS 1289.3.1.1, 3.2.1, 3.3.1 & 3.4.1

Client:	CMW Geosciences	*Ticket No.*	S2257
Client Address:	Suite 1, Level 3/29 Flynn Street, Wembley WA	*Report No.*	WG20/11964_1_PI
Project:	Bottle Creek Project	*Sample No.*	WG20/11964
Location:	Kalgoorlie	*Date Sampled:*	Not Specified
Sample Identification:	TP09 0.5-0.7m	*Date Tested:*	1/01/2021

TEST RESULTS - Consistency Limits (Casagrande)

Sampling Method:	**Sampled by Client, Tested as Received**
History of Sample:	**Oven Dried <50°C**
Method of Preparation:	**Dry Sieved**

AS 1289.3.1.1	**Liquid Limit (%)**	**Not Obtainable**
AS 1289.3.2.1	**Plastic Limit (%)**	**Non-Plastic**
AS 1289.3.3.1	**Plasticity Index (%)**	**Non-Plastic**
AS 1289.3.4.1	**Linear Shrinkage (%)**	**1.0**
AS 1289.3.4.1	**Length of Mould (mm)**	**250**
AS 1289.3.4.1	**Condition of Dry Specimen:**	**-**

Comments:

[redacted]

NATA Accreditation No. 20599
Accredited for compliance with ISO/IEC 17025 - Testing

This document shall not be reproduced except in full

TEST REPORT - AS 1289.3.1.1, 3.2.1, 3.3.1 & 3.4.1

Client:	CMW Geosciences	*Ticket No.*	S2257
Client Address:	Suite 1, Level 3/29 Flynn Street, Wembley WA	*Report No.*	WG20/11966_1_PI
Project:	Bottle Creek Project	*Sample No.*	WG20/11966
Location:	Kalgoorlie	*Date Sampled:*	Not Specified
Sample Identification:	TP13 0.5-0.6m	*Date Tested:*	1/01/2020

TEST RESULTS - Consistency Limits (Casagrande)

Sampling Method:	**Sampled by Client, Tested as Received**
History of Sample:	**Oven Dried <50°C**
Method of Preparation:	**Dry Sieved**

AS 1289.3.1.1	**Liquid Limit (%)**	**Not Obtainable**
AS 1289.3.2.1	**Plastic Limit (%)**	**Non-Plastic**
AS 1289.3.3.1	**Plasticity Index (%)**	**Non-Plastic**
AS 1289.3.4.1	**Linear Shrinkage (%)**	**1.0**
AS 1289.3.4.1	**Length of Mould (mm)**	**250**
AS 1289.3.4.1	**Condition of Dry Specimen:**	**-**

Comments:

[redacted]

NATA WORLD RECOGNISED ACCREDITATION

Accreditation No. 20599

Accredited for compliance with ISO/IEC 17025 - Testing

This document shall not be reproduced except in full

WESTERN
GEOTECHNICAL
& Laboratory Services

SOIL | AGGREGATE | CONCRETE

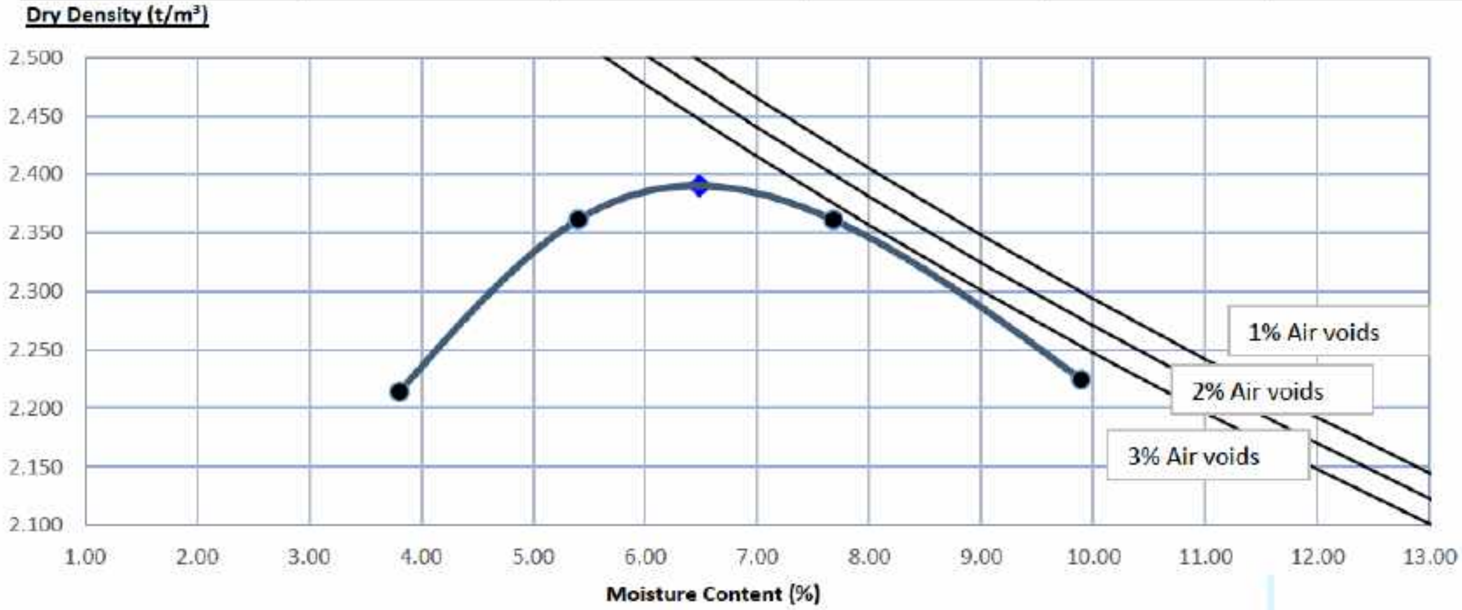
TEST REPORT - AS 1289.5.1.1

Client:	CMW Geosciences	*Ticket No.*	S2257
Client Address:	Suite 1, Level 3/29 Flynn Street, Wembley WA	*Report No.*	WG20/11964_1_SMDD
Project:	Bottle Creek Project	*Sample No.*	WG20/11964
Location:	Kalgoorlie	*Date Sampled:*	Not Specified
Sample Identification:	TP09 0.5-0.7m	*Date Tested:*	22/12/2020

TEST RESULTS - Standard Maximum Dry Density

Sampling Method:		**Sampled by Client, Tested as Received**	
Sample Curing Time:		**2 Hours**	
Method used to Determine Liquid Limit:		**Visual / Tactile Assessment by Competent Technician**	
Material + 19.0mm (%):	**0**	**Material + 37.5mm (%)**	**-**

Moisture Content (%)	**3.8**	**5.4**	**7.7**	**9.9**	
Dry Density (t/m^3)	**2.214**	**2.361**	**2.361**	**2.225**	



Standard Maximum Dry Density (t/m^3) **2.39**

Optimum Moisture Content (%) **6.5**

Comments: *The above air void lines are derived from a calculated apparent particle density of 3.015 t/m^3*

[redacted]

NATA **Accreditation No. 20599**
Accredited for compliance
with ISO/IEC 17025 - Testing

This document shall not be reproduced except in full

TEST REPORT - AS 1289.5.1.1

Client:	CMW Geosciences	*Ticket No.*	S2257
Client Address:	Suite 1, Level 3/29 Flynn Street, Wembley WA	*Report No.*	WG20/11967_1_SMDD
Project:	Bottle Creek Project	*Sample No.*	WG20/11967
Location:	Kalgoorlie	*Date Sampled:*	Not Specified
Sample Identification:	TP06 0.5m	*Date Tested:*	22/12/2020

TEST RESULTS - Standard Maximum Dry Density

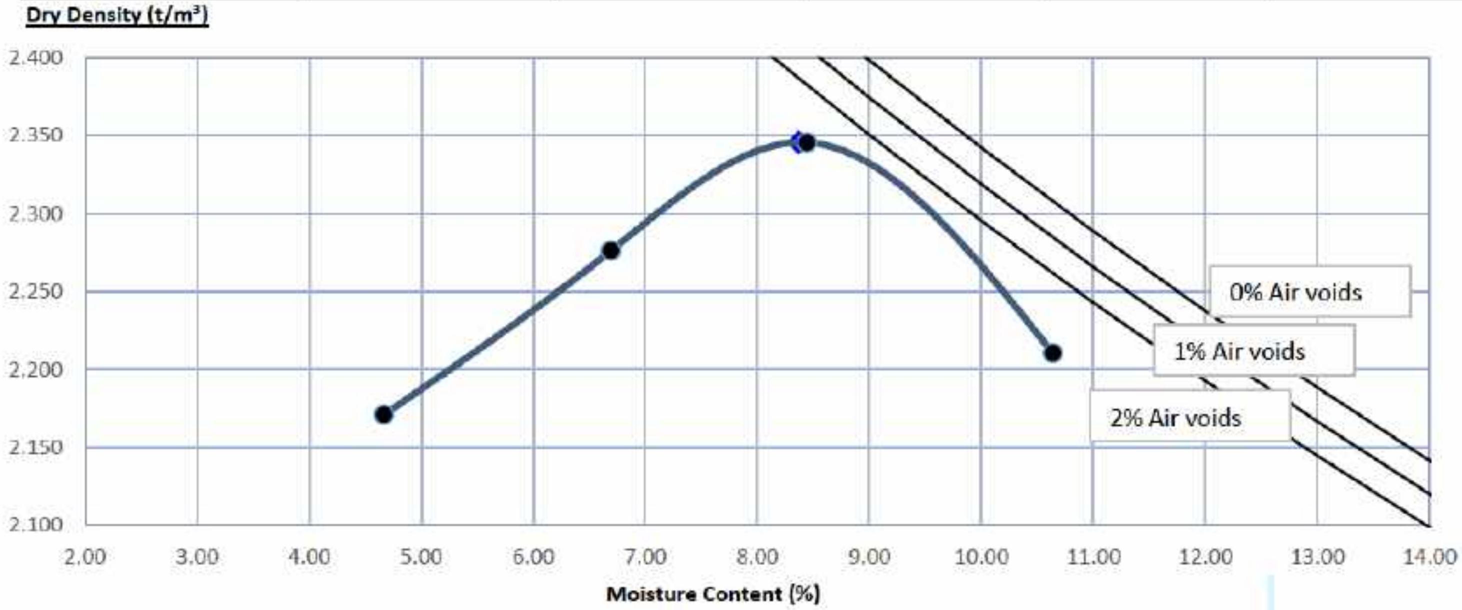
Sampling Method: **Sampled by Client, Tested as Received**

Sample Curing Time: **2 Hours**

Method used to Determine Liquid Limit: **Visual / Tactile Assessment by Competent Technician**

Material + 19.0mm (%): **1** **Material + 37.5mm (%)** **-**

Moisture Content (%)	**4.7**	**6.7**	**8.4**	**10.6**	
Dry Density (t/m³)	**2.171**	**2.276**	**2.345**	**2.210**	



Standard Maximum Dry Density (t/m^3) **2.35**

Optimum Moisture Content (%) **8.5**

Comments: *The above air void lines are derived from a calculated apparent particle density of 3.058 t/m³*

[redacted]

NATA **Accreditation No. 20599**
Accredited for compliance
with ISO/IEC 17025 - Testing

This document shall not be reproduced except in full

TEST REPORT - AS 1289.5.1.1

Client:	CMW Geosciences	*Ticket No.*	S2257
Client Address:	Suite 1, Level 3/29 Flynn Street, Wembley WA	*Report No.*	WG20/11968_1_SMDD
Project:	Bottle Creek Project	*Sample No.*	WG20/11968
Location:	Kalgoorlie	*Date Sampled:*	Not Specified
Sample Identification:	Emu Pit Wall 1	*Date Tested:*	22/12/2020

TEST RESULTS - Standard Maximum Dry Density

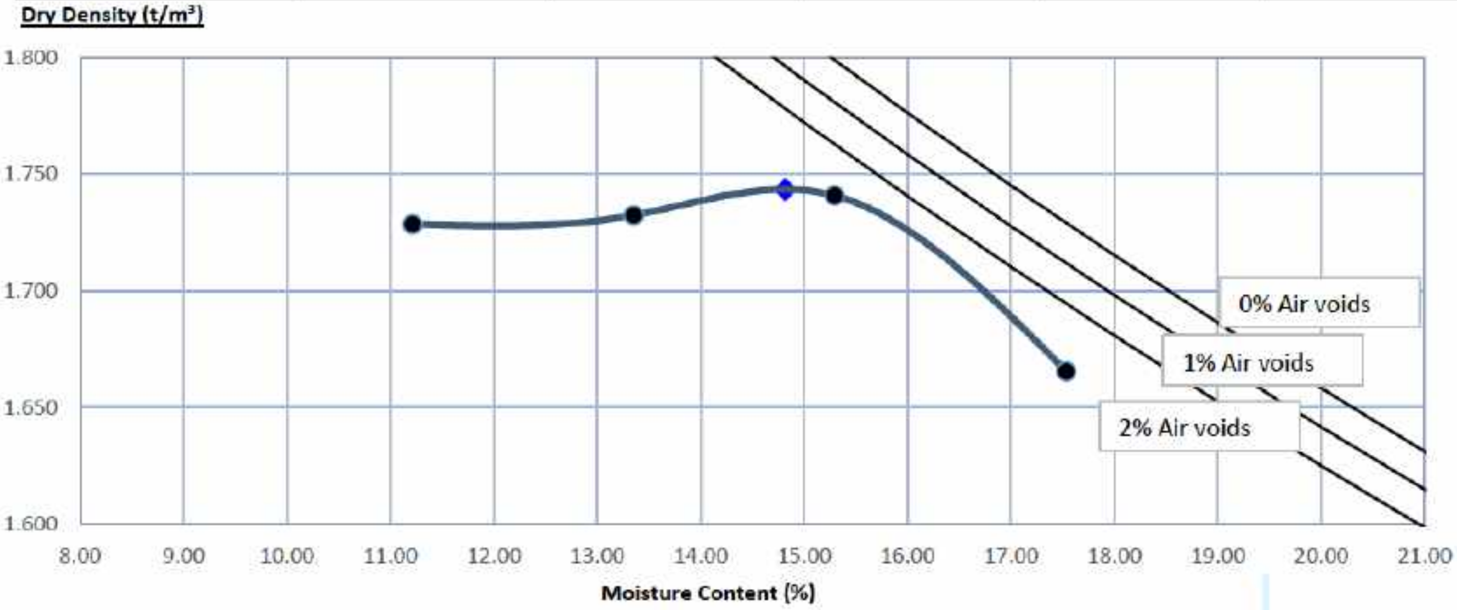
Sampling Method: **Sampled by Client, Tested as Received**

Sample Curing Time: **2 Hours**

Method used to Determine Liquid Limit: **Visual / Tactile Assessment by Competent Technician**

Material + 19.0mm (%): **6** **Material + 37.5mm (%)** **-**

Moisture Content (%)	**11.2**	**13.4**	**15.3**	**17.5**	
Dry Density (t/m³)	**1.729**	**1.732**	**1.741**	**1.666**	



Standard Maximum Dry Density (t/m³) **1.74**

Optimum Moisture Content (%) **15.0**

Comments: *The above air void lines are derived from a calculated apparent particle density of 2.481 t/m³*

[redacted]

NATA Accreditation No. 20599
Accredited for compliance
with ISO/IEC 17025 - Testing

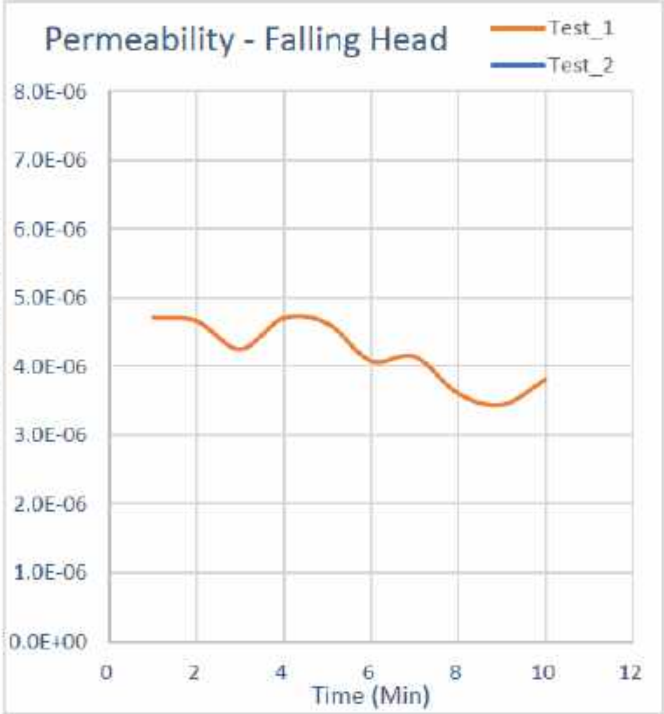
This document shall not be reproduced except in full

TEST REPORT AS 1289.6.7.2

Client:	CMW Geosciences	*Ticket No.*	S2257
Client Address:	Suite 1, Level 3/29 Flynn Street, Wembley WA	*Report No.*	WG20/11964_1_FHPERM
Project:	Bottle Creek Project	*Sample No.*	WG20/11964
Location:	Kalgoorlie	*Date Sampled:*	Not Specified
Sample Identification	TP09 0.5-0.7m	*Date Tested:*	23/12/20 - 4/1/21

TEST RESULTS - FALLING HEAD PERMEABILITY

Sampling Method: Sampled by Client, Tested as Received



Compaction Details	
Compaction Method	AS1289.5.1.1
Hammer Type	Standard
% Retained of 19.0mm	0
Maximum Dry Density (t/m^3)	2.39
Optiumum Moisture (%)	6.5
Target Dry Density Ratio	95
Target Moisture Ratio	100

Specimen Conditions at Compaction	
Laboratory Density Ratio (%)	95.2
Laboratory Moisture Ratio (%)	95.6
Surchare (kPa)	3

Coefficient of Permeability K_{20} (m/s) 4.20E-06

Comments:

[redacted]

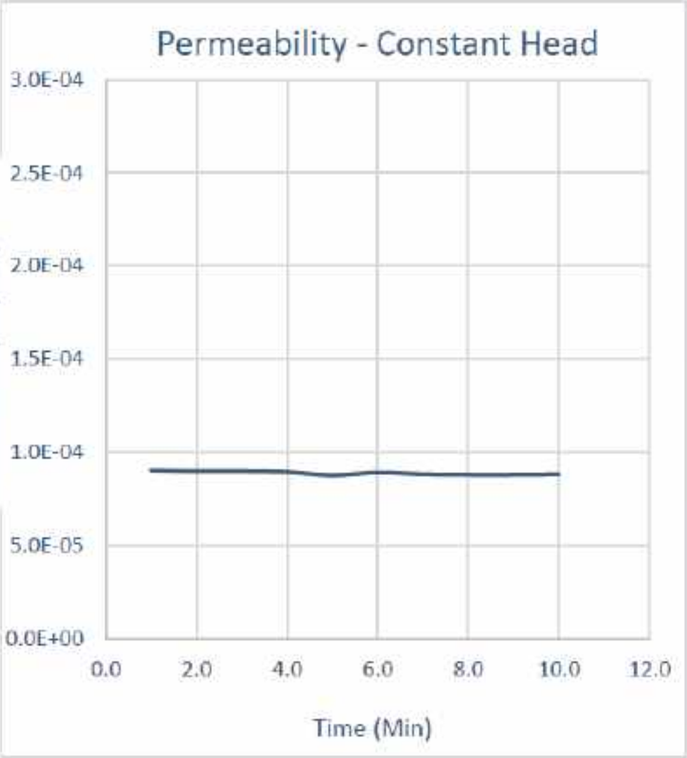
Accreditation No. 20599
Accredited for compliance
with ISO/IEC 17025 - Testing
This document shall not be reproduced except in full

TEST REPORT - AS 1289.6.7.1

Client:	CMW Geosciences	*Ticket No.*	S2257
Client Address:	Suite 1, Level 3/29 Flynn Street, Wembley WA	*Report No.*	WG20/11967_1_CHPERM
Project:	Bottle Creek Project	*Sample No.*	WG20/11967
Location:	Kalgoorlie	*Date Sampled:*	Not Specified
Sample Identification:	TP06 0.5m	*Date Tested:*	23/12/2020 - 4/1/2021

TEST RESULTS - CONSTANT HEAD PERMEABILITY

Sampling Method: Sampled by Client, Tested as Received



Compaction Details	
Compaction Method	AS 1289.5.1.1
Hammer Type	Standard
% Retained on 19.0mm	1.3
Maximum Dry Density (t/m3)	2.345
Optimum Moisture (%)	8.4
Target Dry Density Ratio	95
Target Moisture Ratio	100

Specimen Conditions at Compaction	
Laboratory Density Ratio (%)	95.2
Laboratory Moisture Ratio (%)	98.5
Surcharge (kPa)	3.0
Hydraulic Gradient (mm)	0.7

Coefficient of Permeability K_{20} (m/s): 8.86E-05

Comments:

[redacted]

NATA
Accreditation No. 20599
Accredited for compliance with ISO/IEC 17025 - Testing

This document shall not be reproduced except in full

Appendix C
Geological Photographs

Emu Pit

Clayey Sandy
Gravel from
Emu Pit walls


Colluvium and
Lateritic Layer


Cap Rock Layer
Saprolite Layer

Appendix D
Permeability Test Results

CMW Geosciences

CLIENT:	**ALT Resources**
PROJECT:	**Bottle Creek IWL Bottle Creek, Ularring WA**
TITLE:	**Falling Head Permeability Test**

DESIGNER:	PA
CHECKED:	CH
BH NO.:	BH01
DATE:	20-22 April 2021
PROJECT:	PER2020-0443

Specifications - Open-Ended Tube

Length L_1 of Tests 1, 2, 3:		
21.5 m	Diameter:	132 mm
21.5 m	Non-Perm L	0 m
21.5 m	Above Gnd	0 m

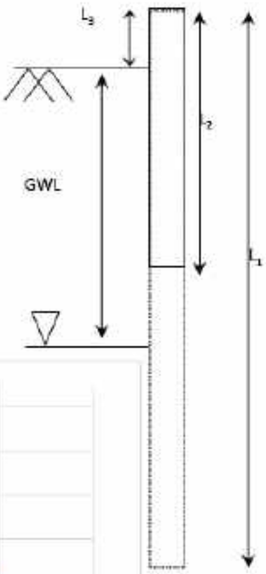
Ground Conditions

GWL: 30 m BGL (Blank - Bottom of hole)

Permeability Anisotropy

m: 1 $m = \sqrt{k_h/_{k_v}}$

Bottom of Test Hole: 21.50 m BGL

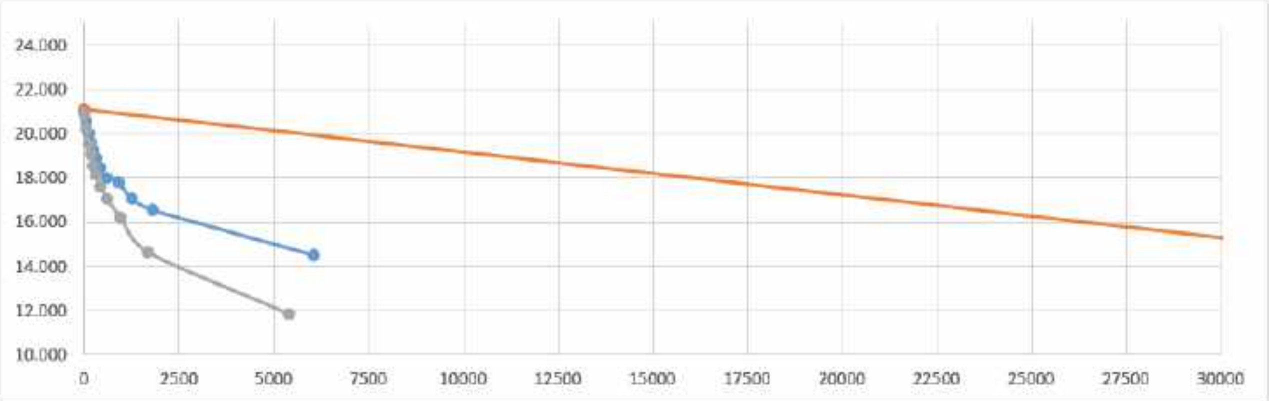


Hydraulic Conductivity (k)

Hvorslev: Hvorslev (1951) *Time Lag and Soil Permeability in Ground-Water Observations* , Fig 18, p49

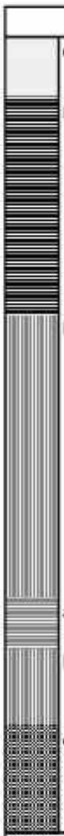
$$k = \frac{d^2 \ln\left(\frac{mL}{d} + \sqrt{\left(\frac{mL}{d}\right)^2 + 1}\right)}{8L(t_2 - t_1)} \ln\frac{H_1}{H_2} =$$

1.19E-07 ms^{-1} = 1.02E-02 m/day



Data	Time	Tape Avg	Head	Perm. Length	Hvorslev 'k'	Average 'k'
Test No.	(s)	(m)	(m)	(m)	Case G (ms^{-1})	ms^{-1}
Test 1	0	0.400	21.100			1.40E-07
	60	0.950	20.550	20.825	2.65E-07	
	120	1.500	20.000	20.275	2.78E-07	
	180	1.900	19.600	19.800	2.11E-07	
	240	2.250	19.250	19.425	1.91E-07	
	300	2.600	18.900	19.075	1.98E-07	
	420	3.050	18.450	18.675	1.32E-07	
	600	3.500	18.000	18.225	9.21E-08	
	900	3.700	17.800	17.900	2.54E-08	
	1260	4.450	17.050	17.425	8.33E-08	
	1800	4.950	16.550	16.800	3.96E-08	
	6060	7.000	14.500	15.525	2.38E-08	
Test 2	0.00	0.400	21.100			1.00E-08
	57900.00	11.600	9.900	15.500	1.00E-08	
Test 3	0.00	0.600	20.900			2.05E-07
	60.00	1.300	20.200	20.550	3.45E-07	
	120.00	1.950	19.550	19.875	3.41E-07	
	180.00	2.450	19.050	19.300	2.77E-07	
	240.00	2.950	18.550	18.800	2.90E-07	
	300.00	3.350	18.150	18.350	2.43E-07	
	420.00	3.900	17.600	17.875	1.75E-07	
	600.00	4.450	17.050	17.325	1.24E-07	
	960.00	5.300	16.200	16.625	1.03E-07	
	1680.00	6.850	14.650	15.425	1.08E-07	
	5400.00	9.650	11.850	13.250	4.97E-08	

STRATIGRAPHIC LOG



COLLUVIAL, retrieved as sandy GRAVEL-CLAY

FERRICRETE, retrieved as sandy clayey GRAVEL

RESIDUAL (upper), retrieved as CLAY-SILT

amorphous, trace gravel

RESIDUAL (lower), retrieved as CLAY-SILT

cemented at parts, trace gravel

EOH @ 21.5m

CMW Geosciences	CLIENT: **ALT Resources**	DESIGNER: PA
	PROJECT: **Bottle Creek IWL** **Bottle Creek, Ularring WA**	CHECKED: CH
		BH NO.: BH02
	TITLE: **Falling Head Permeability Test**	DATE: 20-22 April 2021
		PROJECT: PER2020-0443

Specifications - Open-Ended Tube

Length L_1 of Tests 1, 2, 3, 4:		
21.3 m	Diameter:	132 mm
21.3 m	Non-Perm L	0 m
21.3 m	Above Gnd	0 m
21.3 m		

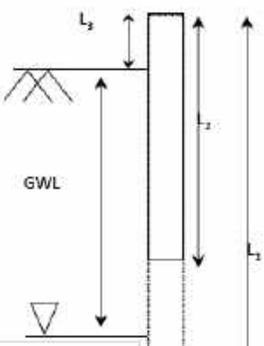
Ground Conditions

GWL: 30 m BGL (Blank = Bottom of hole)

Permeability Anisotropy

m: 1 $m = \sqrt{k_h/k_v}$

Bottom of Test Hole: 21.30 m BGL

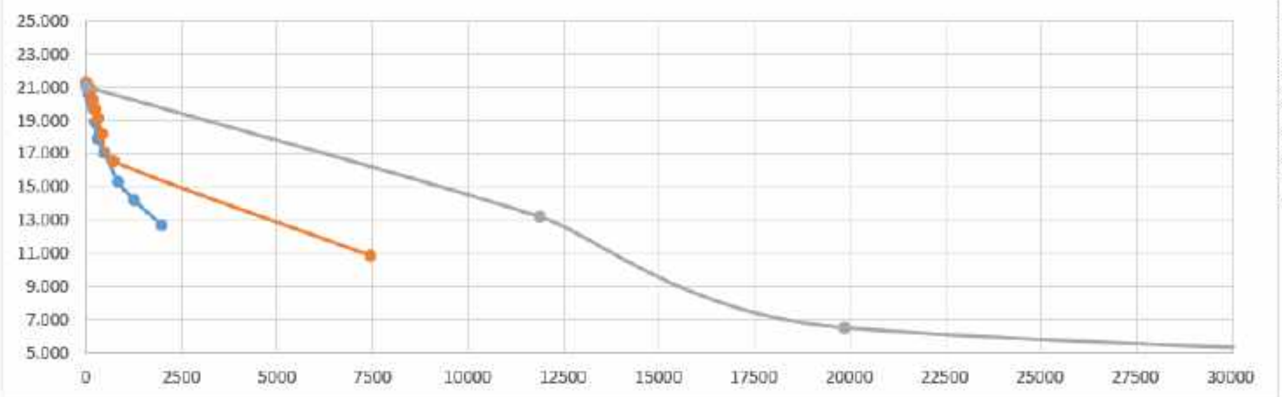


Hydraulic Conductivity (k)

Hvorslev: Hvorslev (1951) *Time Lag and Soil Permeability in Ground-Water Observations*, Fig 18, p49

$$k = \frac{d^2 \ln\left(\frac{mL}{d} + \sqrt{\left(\frac{mL}{d}\right)^2 + 1}\right)}{8L(t_2 - t_1)} \ln\frac{H_1}{H_2} =$$

2.71E-07 ms^{-1} = 2.34E-02 m/day



Data	Time	Tape Avg	Head	Perm. Length	Hvorslev 'k'	Average 'k'
Test No.	(s)	(m)	(m)	(m)	Case G (ms^{-1})	ms^{-1}
Test 1	0	0.000	21.300			2.81E-07
	60	0.650	20.650	20.975	3.09E-07	
	120	1.150	20.150	20.400	2.50E-07	
	180	1.550	19.750	19.950	2.08E-07	
	240	2.400	18.900	19.325	4.69E-07	
	300	3.400	17.900	18.400	6.04E-07	
	480	4.250	17.050	17.475	1.88E-07	
	840	6.000	15.300	16.175	2.23E-07	
	1260	7.100	14.200	14.750	1.42E-07	
	1980	8.600	12.700	13.450	1.34E-07	
Test 2	0.00	0.000	21.300			2.06E-07
	60.00	0.250	21.050	21.175	1.17E-07	
	120.00	0.450	20.850	20.950	9.53E-08	
	180.00	1.050	20.250	20.550	2.96E-07	
	240.00	1.600	19.700	19.975	2.86E-07	
	300.00	2.150	19.150	19.425	3.01E-07	
	420.00	3.100	18.200	18.675	2.79E-07	
	720.00	4.750	16.550	17.375	2.21E-07	
	7440.00	10.450	10.850	13.700	5.33E-08	
Test 3	0.00	0.250	21.050			5.28E-08
	11880.00	8.100	13.200	17.125	2.78E-08	
	19860.00	14.800	6.500	9.850	9.83E-08	
	69360.00	18.400	2.900	4.700	3.22E-08	
Test 4	0	2.1	19.2			5.45E-07
	60	4.3	17	18.1	1.37E-06	
	120	4.9	16.4	16.7	4.32E-07	
	180	5.7	15.6	16	6.23E-07	
	240	6.3	15	15.3	5.07E-07	
	300	6.7	14.6	14.8	3.59E-07	
	480	8.3	13	13.8	5.44E-07	
	720	10.5	10.8	11.9	7.34E-07	
	1200	11.5	9.8	10.3	2.16E-07	
	1860	14.3	7	8.4	6.41E-07	
	3180	16.15	5.15	6.075	3.77E-07	
	9120	18.25	3.05	4.1	1.93E-07	

STRATIGRAPHIC LOG

COLLUVIAL, retrieved as sandy GRAVEL-CLAY

FERRICRETE, retrieved as sandy clayey GRAVEL

RESIDUAL (upper), retrieved as CLAY-SILT

amorphous, trace gravel

RESIDUAL (lower), retrieved as CLAY-SILT

cemented at parts, trace gravel

EOH @ 21.3m

CMW Geosciences	CLIENT:	**ALT Resources**	DESIGNER: PA
	PROJECT:	**Bottle Creek IWL Bottle Creek, Ularring WA**	CHECKED: CH
			BH NO.: BH03
	TITLE:	**Falling Head Permeability Test**	DATE: 20-22 April 2021
			PROJECT: PER2020-0443

Specifications - Open-Ended Tube

Length L_1 of Tests 1, 2, 3:		
21.3 m	Diameter:	132 mm
21.3 m	Non-Perm L	3 m
21.3 m	Above Gnd	0 m

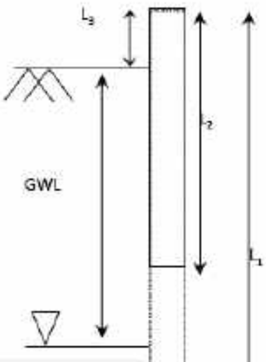
Ground Conditions

GWL: 30 m BGL (Blank = Bottom of hole)

Permeability Anisotropy

m: 1 $m = \sqrt{k_h/_{k_v}}$

Bottom of Test Hole: 21.30 m BGL

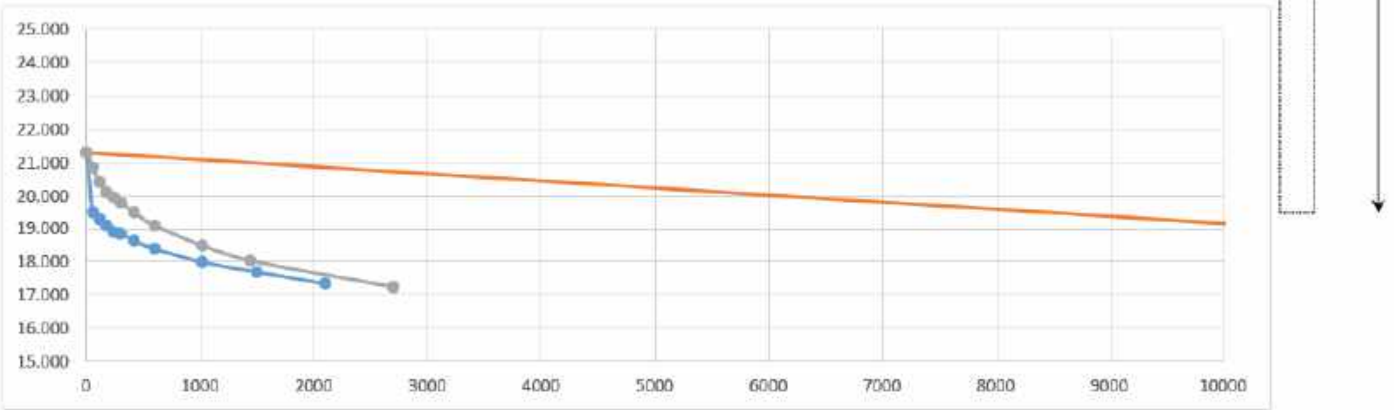


Hydraulic Conductivity (k)

Hvorslev: Hvorslev (1951) *Time Lag and Soil Permeability in Ground-Water Observations*, Fig 18, p49

$$k = \frac{d^2 \ln\left(\frac{mL}{d} + \sqrt{\left(\frac{mL}{d}\right)^2 + 1}\right)}{8L(t_2 - t_1)} \ln\frac{H_1}{H_2} =$$

9.16E-08 ms^{-1} = 7.91E-03 m/day



Data	Time	Tape Avg	Head	Perm. Length	Hvorslev 'k'	Average 'k'
Test No.	(s)	(m)	(m)	(m)	Case G (ms^{-1})	ms^{-1}
Test 1	0	0.000	21.300			1.56E-07
	60	1.800	19.500	18.300	9.85E-07	
	120	2.000	19.300	18.300	1.15E-07	
	180	2.200	19.100	18.300	1.16E-07	
	240	2.400	18.900	18.300	1.17E-07	
	300	2.450	18.850	18.300	2.96E-08	
	420	2.650	18.650	18.300	5.95E-08	
	600	2.900	18.400	18.300	5.02E-08	
	1020	3.300	18.000	18.200	3.52E-08	
	1500	3.600	17.700	17.850	2.39E-08	
	2100	3.950	17.350	17.525	2.31E-08	
Test 2	0.00	0.000	21.300			9.97E-09
	46800.00	10.000	11.300	16.300	9.97E-09	
Test 3	0.00	0.000	21.300			1.09E-07
	60.00	0.450	20.850	18.300	2.38E-07	
	120.00	0.900	20.400	18.300	2.43E-07	
	180.00	1.200	20.100	18.300	1.65E-07	
	240.00	1.350	19.950	18.300	8.36E-08	
	300.00	1.500	19.800	18.300	8.42E-08	
	420.00	1.800	19.500	18.300	8.52E-08	
	600.00	2.200	19.100	18.300	7.71E-08	
	1020.00	2.800	18.500	18.300	5.09E-08	
	1440.00	3.250	18.050	18.275	3.93E-08	
	2700.00	4.050	17.250	17.650	2.48E-08	

STRATIGRAPHIC LOG

COLLUVIAL, retrieved as sandy GRAVEL-CLAY

FERRICRETE, retrieved as sandy clayey GRAVEL

COLLUVIAL, retrieved as sandy GRAVEL-CLAY

RESIDUAL (upper), retrieved as CLAY-SILT

RESIDUAL (lower), retrieved as CLAY-SILT

cemented at parts, trace gravel

EOH @ 21.3m

CMW Geosciences	CLIENT: ALT Resources	DESIGNER: PA
	PROJECT: Bottle Creek IWL Bottle Creek, Ularring WA	CHECKED: CH
		BH NO.: BH04
	TITLE: Falling Head Permeability Test	DATE: 20-22 April 2021
		PROJECT: PER2020-0443

Specifications - Open-Ended Tube		
Length L_1 of Tests 1, 2, 3:		
19.7 m	Diameter:	132 mm
19.7 m	Non-Perm L	0 m
19.7 m	Above Gnd	0 m

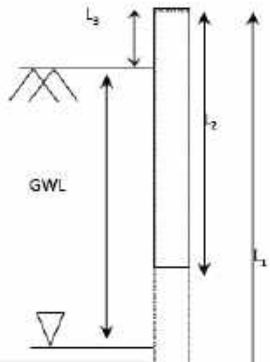
Ground Conditions

GWL: 30 m BGL (Blank = Bottom of hole)

Permeability Anisotropy

m: 1 $m = \sqrt{k_h/k_v}$

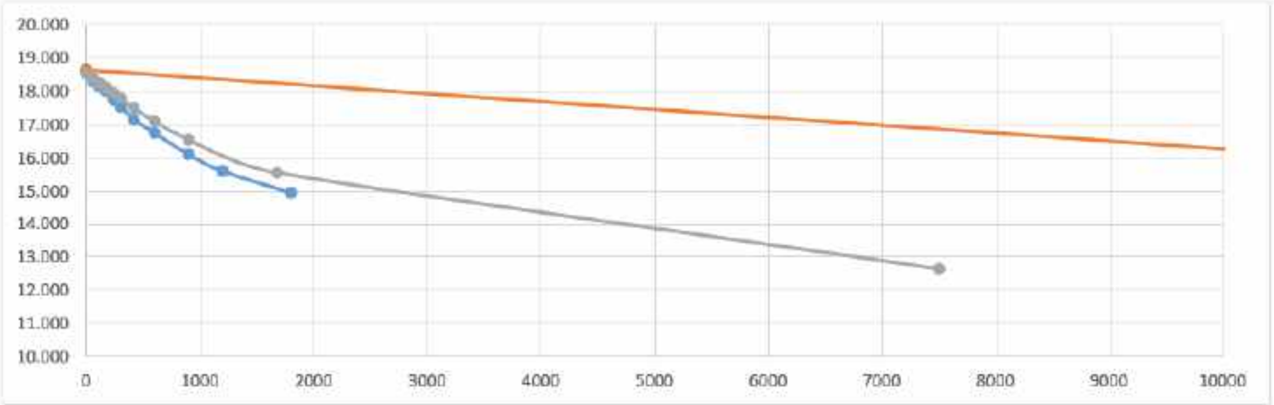
Bottom of Test Hole: 19.70 m BGL



Hydraulic Conductivity (k)

Hvorslev: Hvorslev (1951) *Time Lag and Soil Permeability in Ground-Water Observations*, Fig 18, p49

$$k = \frac{d^2 \ln\left(\frac{mL}{d} + \sqrt{\left(\frac{mL}{d}\right)^2 + 1}\right)}{8L(t_2 - t_1)} \ln\frac{H_1}{H_2} = \quad 6.88\text{E-}08 \text{ ms}^{-1} \quad = \quad 5.95\text{E-}03 \text{ m/day}$$



Data **Test No.**	Time (s)	Tape Avg (m)	Head (m)	Perm. Length (m)	Hvorslev 'k' Case G (ms^{-1})	Average 'k' ms^{-1}
Test 1	0	1.050	18.650			1.06E-07
	60	1.400	18.300	18.475	2.10E-07	
	120	1.550	18.150	18.225	9.21E-08	
	180	1.700	18.000	18.075	9.35E-08	
	240	1.950	17.750	17.875	1.59E-07	
	300	2.150	17.550	17.650	1.30E-07	
	420	2.550	17.150	17.350	1.34E-07	
	600	2.950	16.750	16.950	9.35E-08	
	900	3.600	16.100	16.425	9.65E-08	
	1200	4.100	15.600	15.850	7.92E-08	
	1800	4.750	14.950	15.275	5.51E-08	
	2700	5.100	14.600	14.775	2.10E-08	
Test 2	0.00	1.050	18.650			1.88E-08
	51000.00	13.200	6.500	12.575	1.88E-08	
Test 3	0.00	1.150	18.550			8.18E-08
	60.00	1.300	18.400	18.475	8.99E-08	
	120.00	1.450	18.250	18.325	9.12E-08	
	180.00	1.600	18.100	18.175	9.26E-08	
	240.00	1.750	17.950	18.025	9.40E-08	
	300.00	1.900	17.800	17.875	9.55E-08	
	420.00	2.200	17.500	17.650	9.77E-08	
	600.00	2.600	17.100	17.300	9.01E-08	
	900.00	3.150	16.550	16.825	7.82E-08	
	1680.00	4.150	15.550	16.050	5.96E-08	
	7500.00	7.050	12.650	14.100	2.94E-08	

STRATIGRAPHIC LOG

COLLUVIAL, retrieved as sandy GRAVEL-CLAY

FERRICRETE, retrieved as sandy clayey GRAVEL

RESIDUAL (upper), retrieved as CLAY-SILT

RESIDUAL (lower), retrieved as CLAY-SILT

cemented at parts, trace gravel

EOH @ 19.7m

APPENDIX D

Scope of Work

17 December 2025

INTEGRATED WASTE LANDFORM TAILINGS STORAGE FACILITY (IWL TSF) STAGE 2 RAISE

MT IDA GOLD PROJECT

WA

CONSTRUCTION SPECIFICATION, SCOPE OF WORKS & TECHNICAL SPECIFICATION

Aurenne Group Pty Ltd

PER2025-0260AC Rev0

TABLE OF CONTENTS

APPENDIX

TABLES

TERMINOLOGY AND ABBREVIATIONS

The following terminology and abbreviations are defined as stated, unless otherwise indicated:

AS	Australian Standard
ASTM	American Society for Testing and Materials
Aurenne	Aurenne Mt Ida Pty Ltd
Contractor	Appropriate individual, partnership, company or corporation contractually obligated to perform the work prescribed in this document and becomes contractually obligated to the Owner/Principal
Design Drawings	Detailed Design Drawings issued by the Owner/Principal to the Contractor
DMIRS	Department of Mines, Industry, Regulation and Safety
DMIRSWA	Department of Mines, Industry, Regulation and Safety Western Australia
DWER	Department of Water and Environmental Regulation
Engineer	The Engineer (or designated Representative) appointed by the Owner/Principal who is responsible for evaluating the suitability of the materials involved in the work and for verifying the compliance of the work to the requirements of this SoW
Independent Testing and Inspection Firm	The company, partnership, or corporation retained to perform the inspections and tests, required to determine and verify compliance of the work with the requirements of this SoW
IWL	Integrated Waste Landform
MIGP	Mt Ida Gold Project
NAF	Non-acid Forming
NATA	National Association of Testing Authorities
OMC	Optimum Moisture Content at which the SMDD is achieved
Owner/Principal	Aurenne
Project Superintendent	The designated Representative of the Owner/Principal appointed by the Owner/Principal who is responsible for the work on the project
QA/QC	Quality Assurance and Quality Control
RL	Reduced Level
SMDD	Standard Maximum Dry Density as per AS 1289.5.1.1 (2017) for testing of a representative material sample of that to be compacted in the field
SoW	Construction Specification, Scope of Work and Technical Specification Document
t/m^3	Tonnes per cubic metre
TSF	Tailings Storage Facility
USCS	Unified Soil Classification System
Work / Works	The activities specified within this document as the responsibility for the Contractor

1 INTRODUCTION

This SoW prescribes the requirements for the embankment construction works to achieve the site finished grades indicated on the Design Drawings for IWL TSF Stage 6 to Stage 8 construction at Mt Ida Gold Project (MIGP) in Western Australia (WA).

The works mainly involve bulk earthworks to raise the engineered containment perimeter embankment, decant accessway and structure for the IWL. All details presented herein are to be read in conjunction with the Design Drawings presented in the CMW design report referenced PER2025-0260AB RevA dated 19 September 2025 and its subsequent iteration.

The SoW shall comprise the provision of all materials, construction plant, equipment, labour, supervision, tools, services, warehousing if required, testing equipment, and each and every item of expense necessary for the construction, acceptance testing and preparing of "as-built" drawings and documents for work shown in the drawings, materials schedules and specifications forming part of the construction of IWL Stage 6 to 8 .

Also prescribed are the requirements for clearing and grubbing, the removal, replacement, and disposal of unsuitable materials, the disposal of surplus materials and the furnishing, placement and compaction of embankment fill material.

All works must be constructed complete and operational except as specifically excluded and must include all necessary auxiliary works, accessories and the incorporation of all miscellaneous material, minor parts and other such items, whether or not the items are specified, where it is clearly the intent of the design that they should be supplied or where they are obviously required and necessary to complete and commission the work.

The milling and processing teams should fully cooperate with each other and at all times coordinate activities to ensure IWL Stage 6 to 8 are constructed in accordance with the intent of the design in a timely manner and is ready to accept the tailings. The protection of all active and non-active pipework and instrumentation which is in place is paramount. The Mine Superintendent must be immediately notified of any damage to pipework or instrumentation no matter how minor.

The Contractor must liaise with the milling team, other contractors and the Owner/Principal to agree on a sequence for the works. The Contractor and other contractors must endeavour to complete the embankment in the sequence agreed. The Contractor must coordinate work prescribed by this document with other related works to be performed, such as relocation of tailings pipework.

1.1 Design Drawings

This SoW must be read in conjunction with the latest revisions of the following Design Drawings:

Title	Project and Drawing Number
Stage 6 Plan	PER2025-0260-101
Stage 7 Plan	PER2025-0260-102
Stage 8 Plan	PER2025-0260-103
Sections & Details	PER2025-0260-104

1.2 Applicable Codes / Standards

The works must be carried out to comply with the latest revision of the Design Drawings, Codes and Standards specified or to the appropriate Australian Standards or to other recognised International Standards approved by the Owner/Principal or the Engineer where there is no comparable Australian Standard.

The applicable Australian Standards for earthworks are as follows:

- AS 1289 - Methods of testing soils for engineering purposes;
- AS 1726 - Geotechnical site investigations; and
- AS 3798 - Guidelines on earthworks for commercial and residential developments.

Before making any change in any work under the Contract to comply with any revisions to the relevant codes and standards, the Contractor shall give to the Owner/Principal written notice specifying the reason therefore and requesting his direction thereon. The Owner/Principal shall decide whether a change is necessary and issue an order accordingly under the provisions of the General Conditions of Contract.

1.3 Safety

The Contractor must:

- Carry out the works in a safe manner and comply with all of Owner/Principal's procedures and guidelines.
- Conform to all relevant Acts or Statutes of Parliament, Regulations, By-Laws or Orders relating to the safety of persons and property on or about the site.

1.4 Submittals

All submittals must be delivered to the Owner/Principal. The following information must be submitted by the Contractor one month prior to the start of the work:

- A description of construction procedures/sequences together with;
- Proposed methods and construction details for any excavation where groundwater is expected to be encountered, to ensure that all excavations are kept dry during construction. Discharge/disposal of the dewatering system effluent must be coordinated with the temporary installations for stormwater management and dust control.

The following information must be submitted at the completion of the work:

- All field and laboratory test results and comments, which must be compiled in date order, for permanent project records.

1.5 Site Location

MIGP is located approximately 100 km northwest of Menzies, Western Australia. The IWLTSF1 has an approximate centre located at (MGA, Zone 51J) coordinates 6,772,578 mS and 252,515 mE. The IWLTSF1 is located approximately 0.7 km east of Southwark and Emu pits, and 0.8 km north of the mill.

1.6 Design Summary

The raise design includes three additional raises comprising lifts of Stage 6 (3 m), Stage 7 (3 m), and Stage 8 (4 m) to achieve a final crest level of RL520 m AHD. This will increase the maximum embankment height to approximately 32 m and provide an additional storage capacity of 3.4 Mm^3, extending the operational life of the facility. Tailings production is forecast at 2.7 Mtpa, with deposition at 60% solids and a dry density of 1.5–1.6 t/m^3.

The embankments will be constructed as zoned structures, with an upstream low-permeability compacted clayey mine waste zone and a downstream traffic-compacted mine waste zone. Slopes are 1V:2H upstream and 1V:3H downstream, with a minimum crest width of 13 m.

Stage 6 to 8 construction of the IWLTSF1 would comprise establishment works followed by foundation preparation, borrowing of the clayey and gravelly mine waste from the open pit cutbacks, and placement of the mine waste to build the perimeter embankment. Construction will also include raising the decant accessway and structure. Ancillary works will include the reconfiguration of the entry ramp into the IWLTSF1, to suit the Stage 6 to 8 construction.

1.7 Site Inspection

Before starting work, the Contractor must thoroughly examine the site to ascertain conditions under which the work must be performed and the nature of the materials to be used in the construction. The Contractor must obtain all necessary site-specific permits prior to commencing work on site.

2 DESCRIPTION OF WORKS - SPECIFIC

The SoW includes, but is not necessarily limited to the following:

2.1 General

The work shall include:

- Attend a Site Induction of approximately five (5) hours duration before the commencement of works if they have not already attended one in the last six (6) months.
- Carry out all works indicated or implied in the Design Drawings or in the SoW.
- Supply all labour, plant and materials (except those indicated as being supplied by the Owner/Principal) necessary for the completion of the works.
- Maintain all works as required by the Contract documents and for the period stated therein.

All construction shall be to the minimum lines and grades shown on the Drawings or as required by the Owner/Principal's Representative as work progresses.

During the progress of the works, the Owner/Principal's Representative may find it necessary to revise the lines, levels and grades of any part of the works because of the conditions revealed by the works.

2.2 Survey

The Contractor must:

- Perform all ground surveys using conventional and agreed surveying techniques.
- Survey and setting out the works based on the datum points provided.
- Be responsible for the protection of all permanent and temporary beacons/benchmarks.
- Be wholly responsible for the setting out of his works in accordance with the terms of the SoW. Although the Owner/Principal's Representative will cause such setting out to be checked from time to time, such checking will not relieve the Contractor of full responsibility for the accuracy of such setting out.
- Carry out surveys prior to the commencement of the item of work and at the completion of the item of work.
- Carry out a post-construction survey by a licensed surveyor of the works to verify that the works were constructed within the specified tolerances and submit to the Owner/Principal's Representative.
- Submit his survey data and calculations to the Owner/Principal's Representative.

- Ensure initial and/or final surveys are undertaken and approved by the Owner's Representative prior to the removal or placement of any material, especially where such action will destroy or cover the surface just surveyed. All survey checks or quantity measurements must be supplied to the Owner/Principal's Representative and suitable time must be given to the Owner/Principal's Representative to allow such calculations to be checked and approved prior to the works being covered or removed.

The Owner/Principal's Representative may undertake their own survey of any item, either in conjunction with the Contractor or separately.

The Contractor and Owner/Principal's Representative must agree on the results of measurement surveys that are carried out prior to any works being covered up or within seven (7) days of a survey being undertaken. Should an agreement not be reached, the difference must be documented such that the matter can be later decided without disruption to the construction programme.

2.3 Construction Tolerances

The embankment shall be constructed to the lines, grades, dimensions and details shown on the Design Drawings.

The embankment foundation footprint shall be surveyed following stripping, prior to the placement of any fill materials. Finished work shall comply with the tolerances set out in Table 1.

The maximum permissible horizontal deviation from the finished lines or zone boundaries shall be −0 m to +0.5 m. Vertical deviation shall be −0 m to +0.2 m, provided no abrupt changes in slope or level are present on any finished surface. Payment shall, however, be to the design lines, minimum requirements, excluding tolerances.

TABLE 1: CONSTRUCTION TOLERANCES

Construction Item	Tolerance Item		Tolerance [1]
Perimeter Embankment	Crest Level		+200 mm, -0 mm
	Crest Width		+500 mm, -0 mm
	Slopes [2]	Upstream	+ or -10% of specified
		Downstream	+ or -2% of specified
Decant Accessway	Crest Level		+200 mm, -0 mm
	Crest Width		+500 mm, -0 mm
	Side Slopes [2]		+ or -5% of specified

Notes:

1. These shall mean that if a dimension is checked at a particular location, the work is acceptable provided that the dimension departs from that shown on the Drawings by no more than the amount shown above. They shall not be read to imply any basis for payment other than the design dimensions or levels are shown on the Design Drawings, upon which all quantities for payment purposes shall be calculated. The average dimension shall be not less than that shown on the Design Drawings.
2. Tolerances on slopes assume that slopes are specified in the format 1 vertical: X horizontal. The tolerance shall apply to X.

Measurement for payment of all embankment fill materials shall be made for the compacted material, measured in place and only to the lines and grades required (excluding tolerances), measured in either metres (m), square metres (m^2) or cubic metres (m^3) as defined in the Schedule of Quantities. Measurement for payment shall be undertaken to AS1181 (1982). The Owner/Principal may inspect or check any setting out or measurements at any time and the Contractor shall allow for delays while any works are checked.

At the completion of the works, the Contractor shall provide detailed as-built details including hardcopy plan layout and survey information in electronic format as well as a concise summary of item volumes.

3 MATERIALS

3.1 General

Satisfactory materials must be free from large lumps or clods, refuse or other material that might prevent proper compaction. All materials must be approved for use by the Engineer prior to placement.

The material zones, as indicated on the Design Drawings, are as follows:

- Zone 1, Clayey Mine Waste – this material must be used to construct the upstream (inner) zone of the IWL Stage 2 perimeter embankment.
- Zone 2, Mine Waste – this material shall be used to construct the bulk section or downstream (outer) zone of the IWL perimeter embankment and the decant accessway.
- Zone 3, Select Filter Rock – this material shall be placed around the decant tower.
- Zone 4, Wearing (Base) Course – this material forms the upper 100 mm of the perimeter embankment and decant accessway.

3.2 Zone 1 – Clayey Mine Waste

Zone 1 – Clayey Mine Waste for the IWL perimeter embankment must be sourced from the designated pit areas near the IWL and must meet the requirements listed in Table 2.

TABLE 2: PROPERTIES OF ZONE 1 – CLAYEY MINE WASTE

Item	Test Method	Requirement
Soil Classification (USCS)	AS 1726	GC / CL / CI / CH
Particle Size Distribution	AS 1289	100% passing 150 mm, 95% passing 50 mm, ≥20% passing 0.075 mm
Plasticity Index	AS 1289	<30%
Liquid Limit	AS 1289	<60%

Testing frequencies as per Section 7.5.

3.3 Zone 2 – Mine Waste

Zone 2 – Mine Waste will be sourced from pits and facilities operated by Aurenne. The properties of Mine Waste at the interface with Zone 1 – Clayey Mine Waste should meet the following conditions in Table 3.

TABLE 3: PROPERTIES OF ZONE 2 – MINE WASTE

Item	Test Method	Requirement
Soil Classification (USCS)	AS 1726	GM / GC
Particle Size Distribution	AS 1289	100% passing 300 mm, <20% passing 0.075 mm, well graded

No testing is required for Zone 2 – Mine waste as this material is to be traffic compacted during placement.

3.4 Zone 3 – Select Filter Rock

Zone 3 – Select Filter Rock will be sourced from designated borrow areas in MIGP, subject to the conditions listed in Table 4.

TABLE 4: PROPERTIES OF ZONE 3 – SELECT FILTER ROCK

Item	Test Method	Requirement
Soil Classification (USCS)	AS 1726	GW including Cobbles with a trace of Boulders.
Particle Size Distribution	AS 1289	100% passing 300 mm, <15% passing 50 mm, <3% passing 0.075 mm, hard durable competent rock with a particle density greater than 2.5 t/m³ and geochemically inert.

No testing is required for Zone 3 – Select Filter Rock as this material is to be placed by excavator and tamped with its bucket.

3.5 Zone 4 – Wearing (Base) Course

Zone 4 – Wearing Course must be well graded gravel and meet the requirements listed in Table 5.

TABLE 5: PROPERTIES OF ZONE 4 – WEARING (BASE) COURSE

Item	Test Method	Requirement
Soil Classification (USCS)	AS 1726	GW / GP / GM / GC
Particle Size Distribution	AS 1289	100% passing 37.5 mm, ≥60% retained on 4.75 mm, >4% to <20% fines (0.075 mm), low plasticity or non-plastic

No testing is required for Zone 4 – Wearing Course.

3.6 Unsuitable Materials

Materials that do not meet the requirements listed in Table 2 to Table 5, and soil having insufficient strength or stability to carry the loads that will be superimposed on the completed embankment or decant without excessive settlement or loss of stability, must not be used in the constructed works. Materials containing vegetable matter, muck refuse, large rocks, debris, or other materials that could cause the embankment not to compact, and organic soils with USCS of Pt, OH, or OL, are considered to be unsuitable material and shall be removed from the site.

4 EXECUTION OF THE WORK

This SoW must include, but is not necessarily limited to the following:

4.1 Site Preparation

4.1.1 Construction Layout

The earthworks must be set out in accordance with the Design Drawings. The Contractor must examine the site and verify all existing levels and survey control points and the set-out points shown on the Design Drawings, before commencing the earthworks. The Contractor must be responsible for checking and agreeing with the correctness of all values of monuments, datum or benchmarks, prior to the commencement of work. The

Engineer may find it necessary to revise the lines, levels and grades of any part of the works during progress, because of conditions revealed during construction.

The Contractor must confirm that there are no existing services in the area. If any services are noted, the Contractor must bring them to the notice of the Owner/Principal.

4.1.2 Clearing and Establishment Works

The Contractor shall, as appropriate:

- Agree on routes of all haul roads with the Owner/Principal's Representative;
- As required repair and maintain and do all things needed to maintain reliable and safe haul roads linking the nominated borrow areas to the works area and other haul roads necessary for the works and which are approved by the Principal's Representative;
- Agree with the Owner/Principal on the preferred alignment of the access roads to the IWL site. Where directed, salvage any material considered suitable for rehabilitation purposes (such as topsoil and vegetation);
- Keep roads sprayed and wetted to mitigate the generation of airborne dust during road construction and usage;
- Prepare a quality assurance and quality control program to cover all aspects of work included within this document for the approval of the Owner/Principal's Representative; and
- Provide all things necessary to implement the approved quality control and quality assurance program.

4.2 Foundation Preparation

The Contractor shall, as appropriate:

- Inspect the existing embankment crest to determine the extent of the requirements for preparatory works;
- As required, remove any gravel wearing course materials from the existing crests (perimeter embankment and decant accessway) and stockpile for re-use if practical, otherwise doze (remove) to waste following approval from the Owner/Principal's Representative. No material shall be disposed of onto the tailings beach that is within the intended embankment footprint area. Material can be placed outside the footprint of the Stage 2 construction;
- Survey and clearly peg the embankment footprint area;
- Tyne, moisture condition and proof roll (min. 4 passes of a 12 tonnes roller) any areas of loose material on the prepared and surveyed surface of the embankment footprint areas identified by the Owner/Principal's Representative;
- Leave all areas to receive fill in a clean and suitable condition to allow an uninterrupted placement of fill;
- Do not place any fill until the prepared surface has been inspected and approved by the Owner/Principal's Representative (especially prior to the placement of the first layer);
- On the prepared embankment crest, scarify the surface of areas on which fill is to be placed to a depth of no less than 150 mm, water as required (to within -2% / +2% of OMC) and then compact to no less than 95% of the SMDD; and
- Allow for keeping water from excavations by pumping, dewatering, or other suitable means, and appropriately dispose of it clear of the works.

4.3 Earthworks

4.3.1 General

The Contractor shall:

- Ensure suitable embankment material is well mixed to ensure uniform distribution of fines;
- Ensure that all materials shall be stockpiled, transported and placed in such a manner as to minimise segregation;
- Allow for keeping water from the works during construction by shaping finished surfaces with a fall to the centre of the storage;
- Allow for maintaining the borrow areas free of large accumulations of water;
- Maintain access roads, haul roads and/or ramps, as appropriate, to the designated borrow to enable the fill materials to be recovered and hauled to the work area. The Contractor shall submit details of any proposed infrastructure or upgrade to the Owner/Principal's Representative prior to the commencement of construction. It is envisaged that existing infrastructure can be utilised; and
- Carry out testing to comply with the Specification and QA/QC procedures.

4.3.2 Perimeter Embankment – Zone 1

The Contractor shall meet the requirements listed below:

- Construct Zone 1 (upstream) of IWLTSF1 Stage 6 to 8 perimeter embankment using clayey mine waste obtained from nominated sources. The embankment material shall comply with Section 3 of this SoW, and be free of unsuitable materials.
- Adjust the moisture content of the upstream materials to within the range of -2% / +2% of OMC as determined from laboratory test AS1289.5.1.1. The borrow materials shall be cured to ensure the moisture is thoroughly mixed and evenly spread through all materials proposed for embankment construction.
- Only materials approved by the Owner/Principal's Representative should be utilised in construction
- Place the Zone 1 clayey mine waste material within the perimeter embankment in homogeneous horizontal layers not exceeding 300 mm compacted lift thickness;
- Placement should be continuous. If a break in fill placement allows the exposed surface to dry, the surface shall be lightly tyned, moisture conditioned and compacted prior to fill placement recommencing;
- Compact each layer to achieve a density ratio greater than 98% of SMDD. Allow a minimum of 6 passes of the padfoot roller (CAT 825 or equivalent) for compaction. The actual number of passes of the roller to achieve a density greater than 98% SMDD shall be determined on site using roller trials;
- Ensure that placed material which fails to meet the minimum test requirements of compaction or moisture content is reworked (moisture content adjusted and/or reworked) to meet the specified requirements. The Contractor shall maintain an up-to-date Compaction Record Log in accordance with a spreadsheet example to be provided by the Owner/Principal;
- Where a compacted layer fails to meet the requirements of this document, placement of the next layer of filling will not be approved. It will remain the responsibility of the Contractor to demonstrate management of the compaction process. Failed layers which have fill placed upon them shall be exposed by clearing the unauthorised fill and treated until moisture content and compaction targets are demonstrated to have been achieved.

4.3.3 Perimeter Embankment – Zone 2

- Mechanically place mine waste to construct the downstream of the perimeter embankment. At the interface with Zone 1, the material shall comply with Section 3 of this SoW and be free of voided rock, oversize materials (boulders etc) and unsuitable materials.
- The mine waste should be placed in layers no greater than 0.5 m thick and traffic compacted by construction equipment across the full width of the layer. Allow a minimum of 4 passes of loaded dump trucks (CAT 777 or equivalent) for traffic compaction.

4.3.4 Perimeter Embankment – Completion

In addition to Sections 4.3.2 and 4.3.3, the Contractor must also comply with the following requirements:

- Form windrows of adequate height on both crest edges as the works proceed to comply with mill safety and operational guidelines, typically ≥500 mm in heights or 1/2 wheel height of the largest vehicle likely to traffic across the embankment crest (whichever is greatest). The windrows shall be raised as the works proceed. Loose edge materials shall be removed as the works proceed;
- Shape the crests of the completed perimeter embankment to the upstream (inside) of the storage, with a cross fall of at least 2%;
- A windrow of ≥500 mm height or 1/2 the wheel height of the largest vehicle shall be left on the outside (as a minimum) of the crest of the perimeter embankment as well as both sides of the decant accessway. The windrows shall have gaps left at 30 m centres to facilitate water runoff flow to prevent ponding on the crests; and
- Sheet the embankment crests with a minimum thickness of 100 mm of gravel wearing course material. The material shall be sourced from a location nominated (pit areas/waste dump area) by the Owner/Principal's Representative and from reclaimed gravel wearing course materials if deemed suitable for reuse.

4.3.5 Decant Accessway and Structure

The Contractor shall meet the requirements listed here:

- As required grade or upgrade any existing roads or ramps associated with IWLTSF1;
- Form the decant accessway using Zone 2 mine waste as outlined in Section 3 of this SoW. The Zone 2 mine waste should be placed in layers no greater than 0.5 m thick and traffic compacted by construction equipment across the full width of the layer. Edge windrows are required on either side of the accessway with frequent gaps for water shedding;
- Supply and install slotted pre-cast concrete well liners of nominal 2.4 m diameter (internal) and 1.2 m length to form the decant towers;
- Carefully place evenly graded Zone 3 select filter rock, as outlined in Section 3 of this SoW, around the decant tower. All rock shall be carefully placed to minimise segregation. The contractor is to ensure the concrete pipes are not dislodged or damaged during placement of rock. Any damaged pipes or electric cables shall be reported to the Owner/Principal and repaired and replaced by the Contractor at their cost.

4.3.6 Surface and Drainage

The Contractor must conduct fill operations in such a manner and sequence that proper drainage is maintained at all times in and around the work area. Promptly remove surface waters that become impounded. Remove and replace with satisfactory fill materials, or stabilise (by drying or approved mechanical or chemical amendment methods) materials that become loosened due to exposure to the elements.

4.3.7 Maintenance

The Contractor must maintain the final surfaces in a well-drained, dewatered and sufficiently moist condition to prevent shrinkage cracking and minimise dusting. The compacted surface must be smooth and generally free from roller marks, ruts, holes, depressions or protrusions.

4.4 Completion

The Contractor shall meet the requirements listed here:

- Clean up all rubbish, remove all plant and supply materials, trim all banks neatly, spread all excavated material not specified to be removed from the site and leave the site in a clean and tidy condition;
- Batter down the sides of the borrow pits, as appropriate, for stability on completion of the work. Materials not considered suitable for use in the works shall be stockpiled as directed by the Owner/Principal; and
- Provide as-built drawings and quantities to the Owner/Principal within two weeks of the completion of the earthworks in hard copy and electronically (3D AutoCAD DXF).

4.5 Construction Sequence

The Contractor shall liaise with the Owner/Principal to agree a sequence for the works. The Contractor shall endeavour to complete the works in the sequence agreed.

The Contractor shall cooperate with and provide full opportunity to the Owner/Principal's Representative to monitor regularly the progress of the Works of the Contractor and their subcontractors to the extent necessary to confirm satisfactory progress relative to the Construction Program.

All pertinent information to enable the Owner/Principal's Representative to determine the adequacy of advance planning for material procurement, machine and manpower resources to meet the Construction Program shall be made freely available to the Owner/Principal's Representative.

These requirements shall be incorporated in orders placed with Subcontractors.

5 EXCLUSIONS

The following works will be performed by others:

- Removal of pipework, electrical services and other infrastructure as deemed necessary by the Owner/Principal;
- At the completion of the construction of the embankment, the Owner/Principal will install the tailings distribution pipework (pipes, spigots, droppers, etc.) on the embankment crest;
- Supply and placement of pumps for return water networks; and
- Placement of all associated electrical equipment at the decant structure.

The Contractor shall:

- Fully cooperate with the pipe handling and operating crew and shall work in with their activities at all times; and
- Avoid damaging the tailings distribution pipework and any electrical installations which is either operational or has been removed from the crest of the storage by the Owner/Principal. Any pipework or electrical equipment damaged by the Contractor through carelessness shall be replaced at no additional cost to the Owner/Principal.

6 OWNER/PRINCIPAL SUPPLIED ITEMS

Any services or materials not specifically identified as being provided by the Owner/Principal shall be provided by the Contractor.

6.1 Survey

The Owner/Principal will provide coordinates and levels of survey marks within the vicinity of the storage. The Contractor shall set out all lines and levels using the survey marks provided.

6.2 Materials

The Owner/Principal will supply the following from designated sources:

- Borrow materials for construction (the Contractor will allow for winning, loading, hauling and placement of fill);
- Wearing course material for sheeting of crests;
- Clean rock for use as decant select filter rock, noting crushing and screening may be required subject to sources available at the time of construction;
- Slotted concrete pipes and spacers for use in decant structure raising; and
- Fuel (free issue via Contractor's service truck), noting adequate records of vehicle consumption will be required for reporting purposes.

Water will be made available to the Contractor at no charge. Supply will be from a standpipe/pond nominated by the Owner/Principal. Access to the water source will not be exclusive to the Contractor. The Contractor shall determine the type and suitability of the water supplies for use in this Contract, noting site water is saline and cannot be fresh. The Contractor shall make their own arrangements for loading and hauling.

The Contractor shall advise the expected daily and total water requirements to allow the Owner/Principal to plan water consumption requirements and advise the Contractor accordingly.

It is to be noted that water supplies are sometimes limited, and the Owner/Principal may, from time to time, direct the Contractor to use alternative sources.

During construction, the existing mine infrastructure will be used (haul roads, washdown bay, refuelling facilities, standpipe/pond, and hydrocarbon management).

The Owner/Principal will supply accommodation and messing for the Contractor.

7 TESTING AND INSPECTION

7.1 Testing Firm/Facilities

An Independent Testing and Inspection Firm will be retained by the Owner/Principal to perform field and laboratory testing and soil evaluations for control of construction activities and/or to verify compliance of the work with the requirements of this SoW. The performance or lack of performance of Quality Control tests and inspections must not be construed as granting relief from the requirements of this SoW or the other contract documents.

The Independent Testing and Inspection Firm must meet the technical criteria of NATA for agencies involved in soil and rock inspection and testing.

Any work failing to meet the criteria of the SoW must be rectified at the Contractor's expense.

7.2 Finishing Tolerances

Refer to Table 1 in Section 2.3.

7.3 Material Suitability

Prior to the placement of clayey mine waste materials, field and laboratory testing must be performed by the Independent Testing and Inspection Firm to assess the suitability of the materials for construction. Materials must meet the requirements outlined in Section 3 of this document.

The Contractor must make provision for physical testing of the mine waste materials upon selection of their sources by the Owner/Principal. Test results must be made available to the Engineer for further comment.

Compaction criteria for the IWL Stage 2 construction must be established by performing compaction testing on representative samples in accordance with AS 1289.1.1 as appropriate to the materials.

7.4 Compaction Testing

Field density testing must be performed by the Independent Testing and Inspection Firm on the compacted embankment material to ensure the compaction criteria meets the requirements of this document. The preferred field density testing method is the Nuclear Density test method in accordance with AS 1289.5.8.1. The calibration curves must be checked and adjusted using either the sand cone method as described in AS 1289.5.3.1, or by an approved method by the Engineer.

The calibration checks of both the density and moisture of each gauge must be made at the beginning of the project, on each different type of material encountered, and at intervals as directed by the Engineer. The number of tests must be increased if visual inspection indicates non-uniform moisture content or variable compaction effort considered inadequate to achieve the specified dry density.

The Contractor must provide the survey data for the locations and RLs of the test sites.

7.5 Testing Program

The testing must follow the requirements of Table 6 as a minimum.

TABLE 6: QUALITY CONTROL TESTS

Property	Test Method	Minimum Testing Frequency
Particle Size Distribution (PSD)	AS 1289.3.6.1	1 per 5,000 m^3
Atterberg Limits incl. USCS classification	AS 1289.3.1.1, 3.2.1, 3.3.1 and 3.4.1	1 per 5,000 m^3
Field Dry Density	AS 1289.5.8.1	1 per layer per 500 m^3 or 2,500 m^2
Density Moisture Relation (Standard Compaction)	AS 1289.5.3.1	1 per 3 Field Dry Densities (min.)

Each test location shall be identified by the Contractor or the Owner/Principal. The test location and result will be deemed to be representative of the section or volume of work being tested.

The Contractor shall, at their own expense, rework or replace materials which do not meet the moisture content requirements.

7.6 Additional Inspection

The Contractor must perform a random survey of the top surface of every layer to monitor fill progress.

8 PERMITS, LICENCES AND APPROVAL

Further to the General Conditions of Contract, the Owner/Principal will obtain all government approvals relevant to the works. All other necessary permits, licenses and approvals shall be obtained by the Contractor.

9 SHIPMENT (GENERAL)

The Contractor shall be responsible for transporting plant and equipment to the site and shall maintain full responsibility for loading, unloading, handling, site storage and insurance of the plant and equipment during transportation and while on the worksite.

Notice of dispatch shall be sent by the Contractor to the Owner/Principal at the time of dispatch of all consignments of the plant. Such notice shall contain the method and date of dispatch and date of arrival on site.

10 DATA REQUIREMENTS

The Contractor shall supply to the Owner/Principal as-built drawings within 14 days of the issue of a Certificate of Practical Completion, in addition to the data requirements detailed elsewhere in this Scope of Work as part of the Work. The Contractor shall show the reference contract number and identifying item numbers, if applicable, on all data submitted.

The Contractor shall supply to the Owner/Principal within 14 days of the completion of testing a copy (digital and hard) of laboratory test certificates and a summary of all test results in a spreadsheet. The Contractor shall show the reference contract number and identifying item numbers, if applicable, on all data submitted.

11 CONSTRUCTION PROGRAM

The Contractor shall provide a construction program and indicate the following milestone dates:

- Contract award;
- Notice to proceed with the fieldwork;
- Owner/Principal completion date; and
- Final completion date.

12 SCHEDULE OF QUANTITIES

A preliminary Schedule of Quantities (Appendix A) has been provided to allow material requirements to be gauged for the IWLTSF Stage 6 to 8 construction. The Schedule of Quantities has not been calculated by a quantity surveyor and is provided for convenience only. The Contractor shall be responsible for independently determining quantities for the purpose of bidding the works.

Appendix A:
Schedule of Quantities

PROJECT: MT IDA IWLTSF1 RAISING
CLIENT: Aurenne Group Holdings Pty Ltd
LOCATION: Mt Ida , WA
SUBJECT: TSF1 Stage 6

Project No: *per2025-0260*
Date: *23.09.2025*
Rev: *A*
Page: *1*

Item No	Description	Unit	Quantity	Rate ($AUD)	Total ($AUD)
1	***Preliminaries***				
1.01	Including all preliminaries, insurances, mobilisation to/from site, etc.	Sum	1	-	
	ITEM 1.0 SITE ESTABLISHMENT TOTAL				
2	***Earthworks***				
2.01	Clearing of vegetation from TSF footprint area (to 10 m downstream toe of perimeter embankment)	m^2	32,000	-	
2.02	Strip and stockpile topsoil from TSF footprint area, nominally 0.1 m depth to 10 m past downstream toe of the perimeter embankment, as appropriate	m^3		-	
2.03	Foundation preparation for perimeter embankment	m^2	35,000	-	
2.04	Borrow, moisture condition, transport, place and compact clayey oxide fill to upstream section of perimeter embankment (to be sourced from mine waste)	m^3	31,050	-	
2.05	Transport, place and compact waste fill to downstream section of perimeter embankment	m^3		-	
2.06	Borrow, moisture condition, transport, place and traffic compact road access to decant pump	m^3	55,100	-	
2.06	Borrow, transport, place clean rock to the decant rock ring filter	m^3	3,300	-	
	ITEM 2.0 EARTHWORKS TOTAL				
3	***Ancillary Items***				
3.01	Surveying during construction	Item	1	-	
3.02	Earthworks Compliance Testing	Item	1	-	
	ITEM 3.0 ANCILLARY WORKS TOTAL				$ -
				SUBTOTAL	
			CONTINGENCY:	10%	
				TOTAL	

Note: Quantities are raw values taken from the 3D model. No allowance has been included for bulk factor, wastage.

PROJECT: MT IDA IWLTSF1 RAISING
CLIENT: Aurenne Group Holdings Pty Ltd
LOCATION: Mt Ida , WA
SUBJECT: TSF1 Stage 7

Project No: *per2025-0260*
Date: *23.09.2025*
Rev: *A*
Page: *2*

Item No	Description	Unit	Quantity	Rate ($AUD)	Total ($AUD)
1	***Preliminaries***				
1.01	Including all preliminaries, insurances, mobilisation to/from site, etc.	Sum	1	-	included in mining
	ITEM 1.0 SITE ESTABLISHMENT TOTAL				**$ -**
2	***Earthworks***				
2.01	Clearing of vegetation from TSF footprint area (to 10 m downstream toe of perimeter embankment)	m^2	34,000	-	
2.02	Strip and stockpile topsoil from TSF footprint area, nominally 0.1 m depth to 10 m past downstream toe of the perimeter embankment, as appropriate	m^3	6,500	-	
2.03	Foundation preparation for perimeter embankment	m^2	35,000	-	
2.04	Borrow, moisture condition, transport, place and compact clayey oxide fill to upstream section of perimeter embankment (to be sourced from mine waste)	m^3	31,800	-	
2.05	Transport, place and compact waste fill to downstream section of perimeter embankment	m^3		-	
2.06	Borrow, moisture condition, transport, place and traffic compact road access to decant pump	m^3	12,225	-	
2.06	Borrow, transport, place clean rock to the decant rock ring filter	m^3	1,400	-	
	ITEM 2.0 EARTHWORKS TOTAL				**$ -**
3	***Ancillary Items***				
3.01	Surveying during construction	Item	1	-	
3.02	Earthworks Compliance Testing	Item	1	-	
					$ -
	ITEM 3.0 ANCILLARY WORKS TOTAL				**$ -**
				SUBTOTAL	
			CONTINGENCY:	**10%**	
				TOTAL	

Note: Quantities are raw values taken from the 3D model. No allowance has been included for bulk factor, wastage.

PROJECT: MT IDA IWLTSF1 RAISING
CLIENT: Aurenne Group Holdings Pty Ltd
LOCATION: Mt Ida , WA
SUBJECT: TSF1 Stage 8

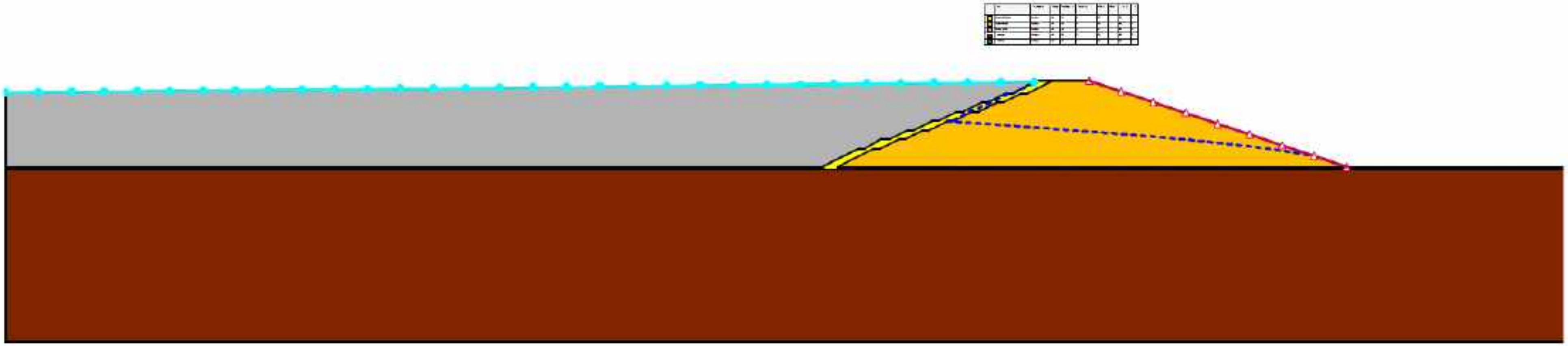
Project No: *per2025-0260*
Date: *23.09.2025*
Rev: *A*
Page: *3*

Item No	Description	Unit	Quantity	Rate ($AUD)	Total ($AUD)
1	***Preliminaries***				
1.01	Including all preliminaries, insurances, mobilisation to/from site, etc.	Sum	1	-	included in mining
	ITEM 1.0 SITE ESTABLISHMENT TOTAL				**$ -**
2	***Earthworks***				
2.01	Clearing of vegetation from TSF footprint area (to 10 m downstream toe of perimeter embankment)	m^2	36,000	-	
2.02	Strip and stockpile topsoil from TSF footprint area, nominally 0.1 m depth to 10 m past downstream toe of the perimeter embankment, as appropriate	m^3	7,000	-	
2.03	Foundation preparation for perimeter embankment	m^2	45,000	-	
2.04	Borrow, moisture condition, transport, place and compact clayey oxide fill to upstream section of perimeter embankment (to be sourced from mine waste)	m^3	43,660	-	
2.05	Transport, place and compact waste fill to downstream section of perimeter embankment	m^3		-	
2.06	Borrow, moisture condition, transport, place and traffic compact road access to decant pump	m^3	18,816	-	
2.06	Borrow, transport, place clean rock to the decant rock ring filter	m^3	2,000	-	
	ITEM 2.0 EARTHWORKS TOTAL				**$ -**
3	***Ancillary Items***				
3.01	Surveying during construction	Item	1	-	
3.02	Earthworks Compliance Testing	Item	1	-	
					$ -
	ITEM 3.0 ANCILLARY WORKS TOTAL				**$ -**
				SUBTOTAL	
			CONTINGENCY:	10%	
				TOTAL	

Note: Quantities are raw values taken from the 3D model. No allowance has been included for bulk factor, wastage.

APPENDIX E

Seepage and Stability Analyses

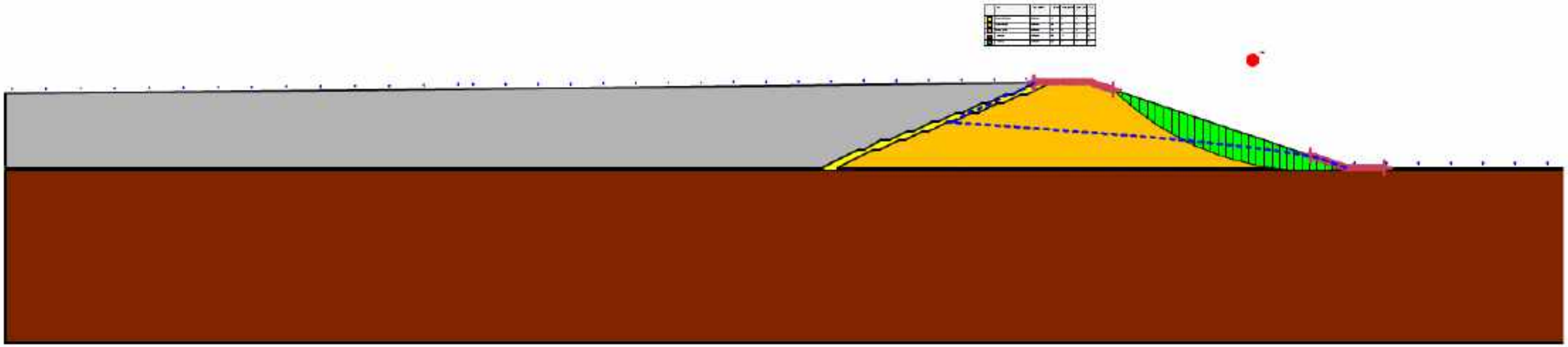


Name: Steady-State Seepage

Date: 18/09/2025

Scale: 1:2,000

[redacted]

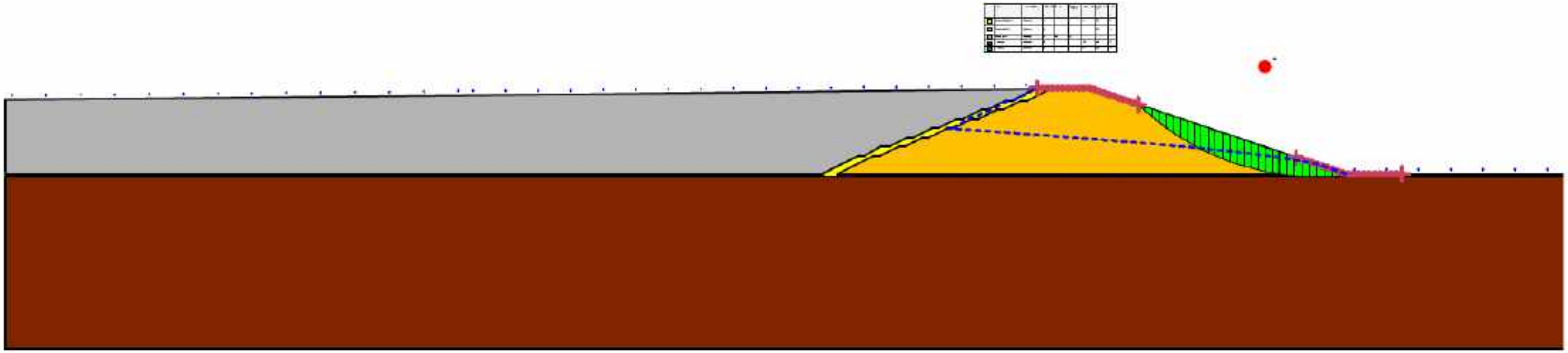


Name: Slope Stability DR

Date: 18/09/2025

Scale: 1:2,000

[redacted]

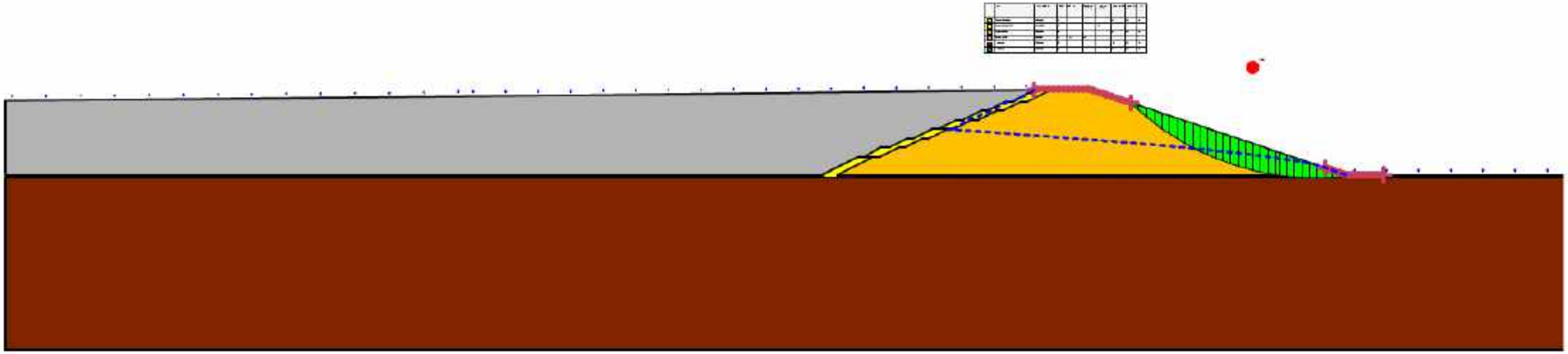


Name: Slope Stability PS

Date: 18/09/2025

Scale: 1:2,000

[redacted]



Name: Slope Stability UD

Date: 18/09/2025

Scale: 1:2,000

[redacted]

CMW Geosciences
Great People | Practical Solutions

APPENDIX F
Water Balance

PROJECT : Mt Ida Gold Project

CLIENT : Aurenne

LOCATION : Mt Ida, WA

Date	27-Jan-26
Job No	PER2025-0260
File	PER2025-0260
Subject	Water Balance
Revision	0

SUBJECT : WATER BALANCE TOTAL TAILINGS STREAM CALENDAR YEAR - FINAL STAGE

		Month	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	TOTAL
INFLOWS		Days per month	31	28.25	31	30	31	30	31	31	30	31	30	31	
RAINFALL															
Rainfall (mm)			28	29	23	27	26	35	24	22	15	13	17	16	271
Average Daily Rainfall (mm)			0.89	1.01	0.75	0.90	0.85	1.15	0.77	0.70	0.49	0.42	0.56	0.53	
Tailings Dam Storage Area (m2)			360,000	360,000	360,000	360,000	360,000	360,000	360,000	360,000	360,000	360,000	360,000	360,000	
Runoff Coefficient Tailings			1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	
Catchment Area above Storage (m2)			0	0	0	0	0	0	0	0	0	0	0	0	
Runoff Coefficient Catchment			0.60	0.60	0.60	0.60	0.60	0.60	0.60	0.60	0.60	0.60	0.60	0.60	
Pool Area (m2)			70,686	70,686	70,686	70,686	70,686	70,686	70,686	70,686	70,686	70,686	70,686	70,686	
Running Beaches (m2)			99,400	99,400	99,400	99,400	99,400	99,400	99,400	99,400	99,400	99,400	99,400	99,400	
Rainfall Inflow Total Volume (m3/day)			320.5	364.5	271.7	322.8	304.3	414.0	278.7	252.0	175.2	152.1	200.4	189.3	
SLURRY WATER															
Tonnes per year	2,500,000														
Total tonnes per month			208,333	208,333	208,333	208,333	208,333	208,333	208,333	208,333	208,333	208,333	208,333	208,333	2,500,000
% Solids =	60		60	60	60	60	60	60	60	60	60	60	60	60	
Tailings Output Solids (tpd)			6,720.4	7,374.6	6,720.4	6,944.4	6,720.4	6,944.4	6,720.4	6,720.4	6,944.4	6,720.4	6,944.4	6,720.4	
Volume of Water (m3/day)			4,480.3	4,916.4	4,480.3	4,629.6	4,480.3	4,629.6	4,480.3	4,480.3	4,629.6	4,480.3	4,629.6	4,480.3	1,666,667
OTHER WATER INFLOWS															
Pit Dewatering (m3/day)			0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
Other			0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
Other Water Inflow Total (m3/day)			0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
TOTAL INFLOW (m3/day)			**4,801**	**5,281**	**4,752**	**4,952**	**4,785**	**5,044**	**4,759**	**4,732**	**4,805**	**4,632**	**4,830**	**4,670**	
TOTAL INFLOW (m3/month)			**148,825**	**149,185**	**147,313**	**148,573**	**148,321**	**151,309**	**147,529**	**146,701**	**144,145**	**143,605**	**144,901**	**144,757**	**1,765,163**
OUTFLOW-LOSSES FROM TAILINGS DAM			**JAN**	**FEB**	**MAR**	**APR**	**MAY**	**JUN**	**JUL**	**AUG**	**SEP**	**OCT**	**NOV**	**DEC**	**TOTAL**
EVAPORATION (from pond and beaches)															
Evaporation Rate (mm)			415	321	292	193	128	85	92	124	174	257	300	369	**2,750**
Pan Factor			0.66	0.66	0.66	0.66	0.66	0.66	0.66	0.66	0.66	0.66	0.66	0.66	
Monthly Dam Evaporation Rate (mm)			274.1	211.8	193.0	127.7	84.7	56.3	60.5	81.7	115.0	169.4	197.8	243.2	
Average Daily Evaporation Rate (mm)			8.84	7.50	6.23	4.26	2.73	1.88	1.95	2.63	3.83	5.46	6.59	7.85	
Pool Area & Running Beaches (m2)			170,086	170,086	170,086	170,086	170,086	170,086	170,086	170,086	170,086	170,086	170,086	170,086	
Daily Evaporation Loss/Outflow (m3/day)			1,503.7	1,274.9	1,058.9	723.7	464.7	319.0	331.9	448.1	651.7	929.4	1,121.6	1,334.4	
EVAPO-TRANSPIRATION (from drying tailings)															
Evaporation Rate (mm)			272	216	175	139	84	69	80	101	147	210	233	273	**2,000**
Evapo-transpiration Rate (Pan/3)			90.6	72.1	58.4	46.4	27.9	22.8	26.6	33.8	49.0	70.0	77.7	91.0	
Average Daily Evapo-transpiration Rate (mm)			2.92	2.55	1.88	1.55	0.90	0.76	0.86	1.09	1.63	2.26	2.59	2.94	
Area Transpiring (m2)			149,100.0	149,100.0	149,100.0	149,100.0	149,100.0	149,100.0	149,100.0	149,100.0	149,100.0	149,100.0	149,100.0	149,100.0	
Daily transpiration Loss (m3/day)			435.8	380.5	281.0	230.6	134.2	113.5	127.9	162.4	243.7	336.7	386.3	437.7	
SEEPAGE															
Downstream Embankment (m3/day)			0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
Upstream Embankment (m3/day)			0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
Seepage Rate m/sec	1.26E-08														
Dam Floor (m3/day).			21.0	21.0	21.0	21.0	21.0	21.0	21.0	21.0	21.0	21.0	21.0	21.0	
Total Seepage Outflow (m3/day)			21.0	21.0	21.0	21.0	21.0	21.0	21.0	21.0	21.0	21.0	21.0	21.0	
RETENTION															
Tailings Output (tpd)			6,720.4	7,374.6	6,720.4	6,944.4	6,720.4	6,944.4	6,720.4	6,720.4	6,944.4	6,720.4	6,944.4	6,720.4	
Calculated Ave. Insitu Dry Density (t/m^3) and MC	1.6	25.0%													
Volume Retained in Tailings (m3/day)			1,680.1	1,843.7	1,680.1	1,736.1	1,680.1	1,736.1	1,680.1	1,680.1	1,736.1	1,680.1	1,736.1	1,680.1	
TOTAL OUTFLOW-LOSSES FROM TAILINGS DAM			**3,640.6**	**3,520.1**	**3,041.0**	**2,711.5**	**2,300.0**	**2,189.6**	**2,161.0**	**2,311.6**	**2,652.5**	**2,967.2**	**3,265.1**	**3,473.2**	
BALANCE INFLOW-OUTFLOW/LOSSES (m3/day)			1,160.2	1,760.8	1,711.0	2,241.0	2,484.5	2,854.0	2,598.0	2,420.7	2,152.3	1,665.2	1,565.0	1,196.4	
BALANCE INFLOW-OUTFLOW/LOSSES (m3/month)			35,967.5	49,742.5	53,040.4	67,229.0	77,020.4	85,621.2	80,538.3	75,040.2	64,569.3	51,621.0	46,948.6	37,087.9	
RETURN WATER TO THE PLANT (if available)															
Total Water Return per month (balance of inflow -outflow for planning)			35,967.5	49,742.5	53,040.4	67,229.0	77,020.4	85,621.2	80,538.3	75,040.2	64,569.3	51,621.0	46,948.6	37,087.9	
Volume of Water (m3/day),estimated at			1,160.2	1,760.8	1,711.0	2,241.0	2,484.5	2,854.0	2,598.0	2,420.7	2,152.3	1,665.2	1,565.0	1,196.4	
Average water return			26%	36%	38%	48%	55%	62%	58%	54%	46%	37%	34%	27%	**43%**

	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	
Summary of Water Balance													
Water shortfall (make up water) or excess of requirements (m3/day)	**-3,320**	**-3,156**	**-2,769**	**-2,389**	**-1,996**	**-1,776**	**-1,882**	**-2,060**	**-2,477**	**-2,815**	**-3,065**	**-3,284**	
Total water in excess of requirements (m3/month)	**-102,921**	**-89,146**	**-85,848**	**-71,660**	**-61,868**	**-53,268**	**-58,351**	**-63,849**	**-74,320**	**-87,268**	**-91,940**	**-101,801**	-942,240
Total water in excess of requirements (m3/year) =	**-942,240**												

CMW Geosciences
Great People | Practical Solutions

APPENDIX G
Dam Break Analyses

CMW Geosciences
Chapman Morton Woodward

PROJECT : **Mt Ida Gold Project**
CLIENT : **Aurenne Group**
LOCATION : **Mt Ida WA**
SUBJECT : **Dam Break Study, Worse Case**
Scenario: **TSF Worst Case (PMP Rainy Day Failure Conditions)**

Date	19-Sep-25
Job No	PER2025-0260
Rev	0

BREACH CHARACTERISTICS	**Using Empirical Method**		**MacDonald and Langridge - Monopolis (1984)**
Input Parameters	**Value**	**Unit**	**Comments**
New Embankment Crest Level	520.0	mRL	From design
Approx. ROM Pad level	488.0	mRL	From design
Maximum Embankment Height (on South-Western Side)	**32.0**	m	From design
Approximate Emb Length corresponding to Highest Section	550	m	assumed
Embankment Crest Width	13.0	m	From design
Upstream Embankment Slope	2.0	H to 1V	From design
Downstream Embankment Slope	3.0	H to 1V	From design
Embankment Cross Section Area	2,976.0	m^2	Embankment cross section area at highest section
Total Tailings Tonnes stored in TSF	10.28	Mt	Estimated total storage capacity
Dry Density	1.40	t/m^3	From design
Bulk Density	1.75	t/m^3	From laboratory test works 2019
Tailings Volume stored in TSF (V_T)	7,342,857	m^3	Estimated total tailings volume
PMP Storm Volume over TSF Catchment	**230,400**	m^3	*Rainy Day Failure Scenario - PMP storm event adopted 4.5 hrs 640 mm - Area - 350,000 m2 (35 ha)*
Total Released Tailings Volume from the TSF (V_F)	**5,150,100**	m^3	Allowed for released tailings ~ 67% of storage volume
	4,211	acre-feet	Converted from m^3 to acre-feet (1 acre-feet = 1233 m3)

Note: For conservative assessment, it was assumed that embankment breaches will be occurred through the whole embankment height. Tailings released from the embankment breaches were assumed to be liquefied.

Output Parameters - Breach Characteristics	**Value**	**Unit**	**Comments**		
Breach Shape - Trapezoidal Side Slopes	**2**	**V to 1H**	Adopted approximate trapezoidal breach shape (T MacDonald and J Langridge - Monopolis, 1984)		
Breach Height (H_b)	**32.0**	m	Adopted the bottom of the breach is at the base of the embankment		
	104.9	feet	Converted from meter to feet		
Breach Formation Factor (V_F x H_b)	**164,803,200**	m^3 x m	Used this figure to predict the volume of embankment material removed during a breach		
	4.4E+05	acre-ft x ft	Converted from m^3 x m to acre-feet x feet		
Embankment Volume Eroded during Breach (V_M)	5.9E+04	yrd^3	Embankment volume removed during a breach (determined from **Figure 1**, T MacDonald and J Langridge - Monopolis, 1984)		
	45,370	m^3	Converted from cubic yard to cubic meter (1 cubic yard = 0.765 cubic meter)		
Average Breach Width (W_{ave})	**15**	m	Calculated based on the removed embankment volume during a breach and embankment geometry		
Base Breach Width (W_b)	**-1**	m	Calculated based on the removed embankment volume during a breach and embankment geometry		
Top Breach Width (W_t)	**31**	m	Calculated based on the removed embankment volume during a breach and embankment geometry		
Breach Shape Area (A_F)	**488**	m^2	Breach shape area at highest embankment section		
Equivalent Released Tailings Volume behind Breach Area	**292,574**	m^3	Used this figure to estimate the equivalent tailings failed length behind breach area		
Equivalent Tailings Failed Length behind Breach Area (x_o)	**600**	m	Calculated based on the released tailings volume (behind breach area) and breach shape		
Adopted Breach Development Time (t_f)	**4.00**	hour	Determined from **Figure 2**, T MacDonald and J Langridge - Monopolis, 1984)	4.4 check	
Released Tailings Run-out Flow (Q_F) - average flow	**358**	m^3/s	Calculated based on released tailings volume and breach development time		
Peak Tailings Run-out Flow (Q_p)	**715**	m^3/s	Assuming a triangular hydrograph		
Peak Tailings Run-out Flow (Q_P)	**2,773**	m^3/s	Based on Rico M, Beniti G, Diez-Herrero G 2008	Run-out distance (Dmax)	47 km

CMW Geosciences Pty Ltd
Chapman Morten Woodward

PROJECT **: Mt Ida Gold Project**
CLIENT **: Aurenne Group**
LOCATION **: Mt Ida WA**
SUBJECT **: DAM BREAK STUDY, SUNNY DAY**
Scenario: **TSF Sunny Day Conditions**

Date	19-Sep-25
Job No	PER2025-0260
Rev	0

BREACH CHARACTERISTICS	**Using Empirical Method**		**MacDonald and Langridge - Monopolis (1984)**
Input Parameters	**Value**	**Unit**	**Comments**
New Embankment Crest Level	520.0	mRL	From design
Approx. ROM Pad level	488.0	mRL	From design
Maximum Embankment Height (on South-Western Side)	**32.0**	m	From design
Approximate Emb Length corresponding to Highest Section	550	m	assumed
Embankment Crest Width	13.0	m	From design
Upstream Embankment Slope	2.0	H to 1V	From design
Downstream Embankment Slope	3.0	H to 1V	From design
Embankment Cross Section Area	2,976.0	m^2	Embankment cross section area at highest section
Total Tailings Tonnes stored in TSF	10.28	Mt	Estimated total storage capacity
Dry Density	1.40	t/m^3	From design
Bulk Density	1.75	t/m^3	From design
Tailings Volume stored in TSF (V_T)	7,342,857	m^3	Estimated total tailings volume
PMP Storm Volume over TSF Catchment	**0**	m^3	*Rainy Day Failure Scenario - PMP storm event adopted 4.5 hrs 640 mm - Area - 350,000 m2 (35 ha)*
Total Released Tailings Volume from the TSF (V_F)	**2,423,100**	m^3	Allowed for released tailings ~ 33% of storage volume
	1,981	acre-feet	Converted from m^3 to acre-feet (1 acre-feet = 1233 m3)

Note: For conservative assessment, it was assumed that embankment breaches will be occurred through the whole embankment height. Tailings released from the embankment breaches were assumed to be liquefied.

Output Parameters - Breach Characteristics	**Value**	**Unit**	**Comments**
Breach Shape - Trapezoidal Side Slopes	**2**	**V to 1H**	Adopted approximate trapezoidal breach shape (T MacDonald and J Langridge - Monopolis, 1984)
Breach Height (H_b)	**32.0**	m	Adopted the bottom of the breach is at the base of the embankment
	104.9	feet	Converted from meter to feet
Breach Formation Factor (V_F x H_b)	77,539,200	m^3 x m	Used this figure to predict the volume of embankment material removed during a breach
	2.1E+05	acre-ft x ft	Converted from m^3 x m to acre-feet x feet
Embankment Volume Eroded during Breach (V_M)	3.2E+04	yrd^3	Embankment volume removed during a breach (determined from **Figure 1**, T MacDonald and J Langridge - Monopolis, 1984)
	24,797	m^3	Converted from cubic yard to cubic meter (1 cubic yard = 0.765 cubic meter)
Average Breach Width (W_{ave})	**8**	m	Calculated based on the removed embankment volume during a breach and embankment geometry
Base Breach Width (W_b)	**-8**	m	Calculated based on the removed embankment volume during a breach and embankment geometry
Top Breach Width (W_t)	**24**	m	Calculated based on the removed embankment volume during a breach and embankment geometry
Breach Shape Area (A_F)	**267**	m^2	Breach shape area at highest embankment section
Equivalent Released Tailings Volume behind Breach Area	**107,200**	m^3	Used this figure to estimate the equivalent tailings failed length behind breach area
Equivalent Tailings Failed Length behind Breach Area (x_o)	**400**	m	Calculated based on the released tailings volume (behind breach area) and breach shape
Adopted Breach Development Time (t_f)	**2.00**	hour	Determined from **Figure 2**, T MacDonald and J Langridge - Monopolis, 1984) 3.4 check
Released Tailings Run-out Flow (Q_F) - average flow	**337**	m^3/s	Calculated based on released tailings volume and breach development time
Peak Tailings Run-out Flow (Q_p)	**673**	m^3/s	Assuming a triangular hydrograph
Peak Tailings Run-out Flow (Q_P)	**2,021**	m^3/s	Based on Rico M, Beniti G, Diez-Herrero G 2008 Run-out distance (Dmax) 28 km

CLIENT:	Aurenne Group	ESIGNER:	PA
ROJECT:	IWL	HECKED	CH
		EVISION:	0
TITLE:	PRELIMINARY DAM BREAK ASSESSMENT-SUNNY DAY CASE	ATE:	19/09/2025
		ROJECT	PER2025-0260

Step 1: Estimate runout volume following a dam overtopping, embankment stability or piping failure.

Total volume of tailings and water in the facility at the time of failure, V_T (m^3):	7,342,857	
Volume of tailings and water released at failure, V_F (m^3):	2,949,818	Eq. 7 Rico et. Al. 2007

$$V_F = 0.354 \times V_T^{1.008}$$

Assumptions:

The formula represents the maximum tailings volume that can be released in the most extreme situation in which pond volume was empouted following the dam break.

The failure mechanism is from the base of the facility to the highest embankment level at RL1491m.

Step 2: Estimate preflow horizontal distance of failure volume.

Embankment height, h_0 (m):	32	
Embankment Length 1	200	
Estimated pre-flow horizontal distance, x_0 embankment 1(m):	400	Seddon K. D. 2010

Assumptions:

Failure occurs along full length of embankment. Failure at aech embankment is assessed.
Eneregy based linear method as per Seddon K.d> 2010
Zero grade.

$$H_o x_o = h\, x_f$$

$$\therefore h = (x_o / x_f) H_o$$

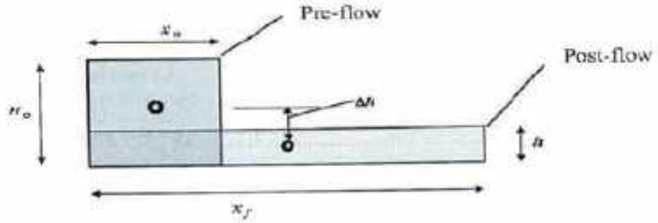


Figure 2 Simplified flow slide geometry

Step 3: Estimate runout distance following a dam overtopping, embankment stability or piping failure.

Bulk unit weight (kN/m^3):	18	
Undrained shear strength (kPa):	4	
Estimated post-flow horizontal distance of failure volume, x_f embankment 1 (m):	1730	Eqn. 6 Seddon K.D. 2010

$$x_f^2 + x_o x_f - 2\gamma x_o H_o^2 / s_u = 0$$

Runout distance, R_0 embankment 1 (m):	1330	Eqn. 7 Seddon K.D. 2010

$$Ro = x_f - x_o$$

CMW Geosciences Pty Ltd Chapman Morton Woodward	CLIENT: Aurenne Group	DESIGNER:	PA
	PROJECT: IWL	CHECKED:	CH
		REVISION:	0
	TITLE: PRELIMINARY DAM BREAK ASSESSMENT-SUNNY DAY CASE	DATE:	19/09/2025
		PROJECT:	PER2025-0260

Step 1: Estimate runout volume following a dam overtopping, embankment stability or piping failure.

Total volume of tailings and water in the facility at the time of failure, V_T (m^3):	7,342,857	
Volume of tailings and water released at failure, V_F (m^3):	2,949,818	Eq. 7 Rico et. Al. 2007

$$V_F = 0.354 \times V_T^{1.008}$$

Assumptions:

The formula represents the maximum tailings volume that can be released in the most extreme situation in which pond volume was empouted following the dam break.

The failure mechanism is from the base of the facility to the highest embankment level at RL1491m.

Step 2: Estimate preflow horizontal distance of failure volume.

Embankment height, h_0 (m):	32	
Embankment Length 1	200	
Estimated pre-flow horizontal distance, x_0 embankment 1(m):	400	Seddon K. D. 2010

Assumptions:

Failure occurs along full length of embankment. Failure at aech embankment is assessed.
Eneregy based linear method as per Seddon K.d> 2010
Zero grade.

$$H_o x_o = h x_f$$

$$\therefore h = (x_o / x_f) H_o$$

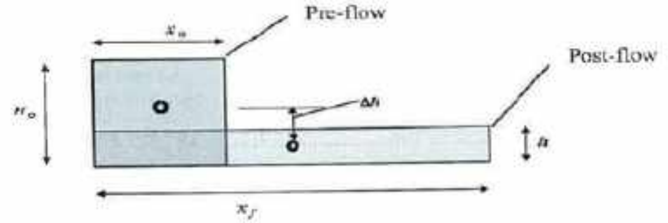


Figure 2 Simplified flow slide geometry

Step 3: Estimate runout distance following a dam overtopping, embankment stability or piping failure.

Bulk unit weight (kN/m^3):	18	
Undrained shear strength (kPa):	7	
Estimated post-flow horizontal distance of failure volume, x_f embankment 1 (m):	1265	Eqn. 6 Seddon K.D. 2010

$$x_f^2 + x_o x_f - 2\gamma x_o H_o^2 / s_u = 0$$

Runout distance, R_0 embankment 1 (m):	865	Eqn. 7 Seddon K.D. 2010

$$Ro = x_f - x_o$$

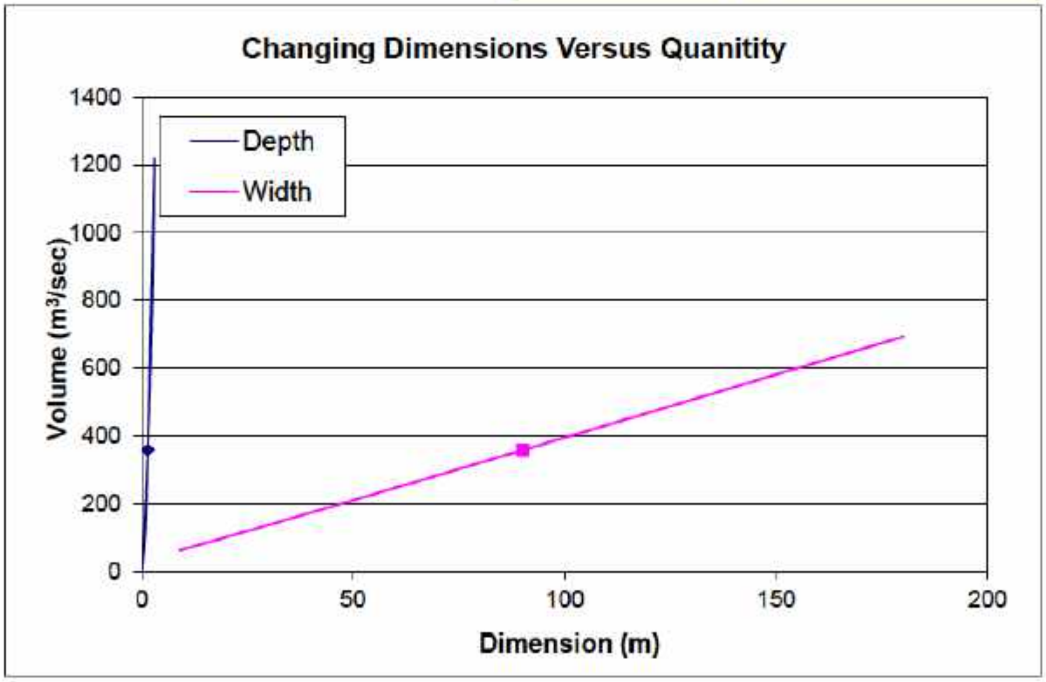
Project: Mt Ida Gold Project
Client: Aurenne Group
Location WA
Job No.: PER2025-0260
Dam Break

Input Data

Channel Width (w) =	90 m
Flow Depth (d) =	1.5 m
Side Slope (C) =	10 : 1
Channel Slope (s) =	0.0091
Manning No. =	0.05

Output

Area (A) =	157.50 m
Perimeter =	120.15 m
Effective Radius (R) =	1.31 m
Quantity (Q) =	359.09 m^3/s
Depth (d) =	1.50 m
Velocity (v) =	2.28 m



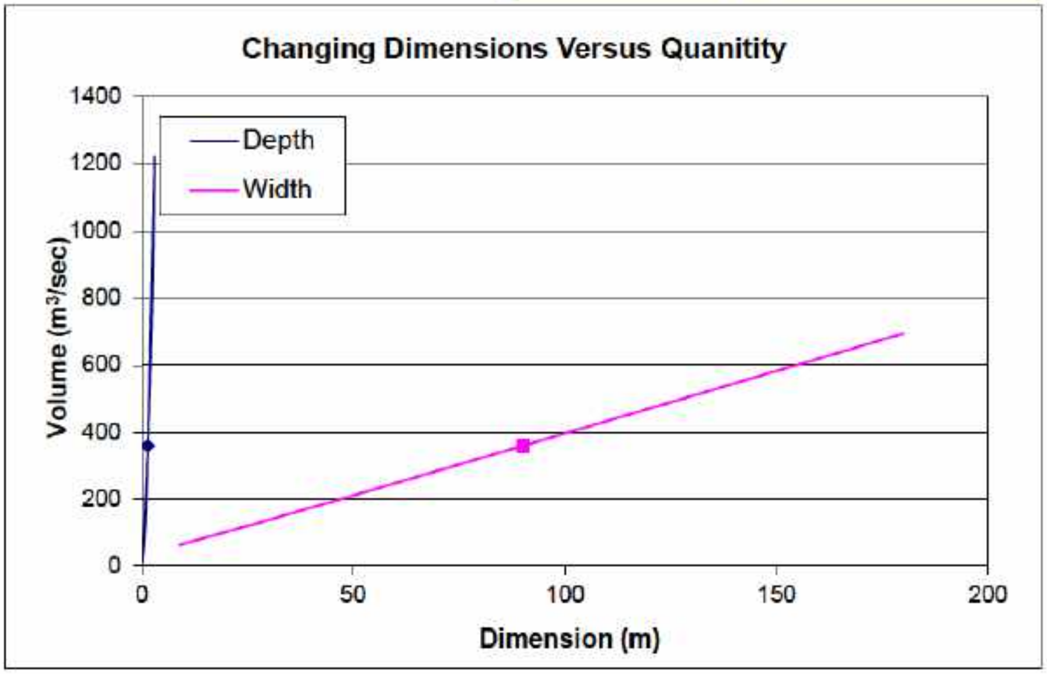
Project: Mt Ida Gold Project
Client: Aurenne Group
Location WA
Job No.: PER2025-0260
Dam Break

Input Data

Channel Width (w) =	220 m
Flow Depth (d) =	3 m
Side Slope (C) =	10 : 1
Channel Slope (s) =	0.0091
Manning No. =	0.05

Output

Area (A) =	750.00 m
Perimeter =	280.30 m
Effective Radius (R) =	2.68 m
Quantity (Q) =	2738.45 m^3/s
Depth (d) =	3.00 m
Velocity (v) =	3.65 m



CMW Geosciences Pty Ltd
Chapman Morton Woodward

CLIENT:	Aurenne Group	DESIGNER:	PA
PROJECT:	IWL	CHECKED:	CH
		REVISION:	0
TITLE:	PRELIMINARY DAM BREAK ASSESSMENT-INUNDATION MAP	DATE:	19/09/2025
		PROJECT:	PER2025-0260

CMW Geosciences
Great People | Practical Solutions

APPENDIX H

Operation Manual

13 June 2022

INTEGRATED WASTE LANDFORM TAILINGS STORAGE FACILITY

MT IDA GOLD PROJECT, WA

OPERATIONS MANUAL

Aurenne Mt Ida Pty Ltd

PER2020-0443AD Rev 3

Table of Contents

Figures

Appendices

1 INTRODUCTION

This manual is intended to be used by process plant staff who undertake daily inspections of the Integrated Waste Landform/Tailings Storage Facility (IWL/TSF) tailings storage at the Mt Ida Gold Project. The purpose of this manual and the attached proformas is to allow both shift and daily inspection records to be taken and recorded and, if required, reported to senior staff. The provisions of the Operating Manual must be strictly adhered to by the owner and the storage must be operated strictly in accordance with its provisions. CMW Geosciences Pty Ltd (CMW), the designers shall not be liable in any respect whatsoever for any damage to or failure in the operations of the tailings storages resulting from failure of the Owner, its servants or agents to comply with the provisions of this Operating Manual.

This document sets out details of the components of the storage facility which are influenced by the general day to day activities. Each of these components forms part of the overall operation of the storage facility and attention must be paid to each component to ensure the storage facility is operated to achieve the design objectives.

The components which are influenced by the general day to day activities include:

- Tailings deposition
- Decant pump operation
- Routine inspections and maintenance

1.1 Scope of the Operations Manual

The OM ‘this document’ details the requirements for plant management and operators who have the responsibility for ensuring that:

- The containment embankment for the IWL/TSF has been constructed to achieve the design objectives relevant to the operation of the facility.
- The tailings storage facility and all associated infrastructure is operated, maintained and monitored to achieve the design objectives.
- The facility is operated in accordance with the parameters that have been provided by the client for use in the design of the tailings storage facility. Where changes in the parameters are proposed, the process plant management must advise the designers in order that the impact of the changes can be fully assessed.
- Additional storage requirements are planned, designed, budgeted for and constructed well in advance of the expected availability of the additional capacity.
- The annual engineering audit is completed.

1.2 Roles and Responsibilities

The individual responsibilities for the IWL/TSF for this project are detailed in Table 1.

Table 1 – Individual Responsibilities

Staff Designation	Operation	Maintenance	Surveillance & Reporting	Emergency Response	Reports to
Resident Manager (RM)	√	√	√	√	Board / Company Directors
Process Plant Metallurgist (PPM)	√	√	√	√	General Manager (GM)
Process Plant Supervisor (PPS) and Process Plant Operators (PPO)	√		√	√	PPM
Maintenance Supervisor (MS) electrical, instrumentation, pumping and piping		√		√	PPM
Mining Foreman (MF) mining activities and other earthworks				√	GM
Environmental Consultant (EC)			√		GM / PPM
Emergency Response Team (ERT)				√	GM
Design Consultant (DC)			√		GM / PPM

1.3 Training and Competency

The Process Plant Metallurgist (PPM) has the responsibility for ensuring that the training and competency of all the personnel relevant to the day to day operation of the IWL/TSF is completed.

The PPM will also ensure the various departments (Process Plant, Maintenance, Mining and Environmental) are each aware of their respective duties and roles and shall confirm that the training and competency of the relevant personnel within these departments has been completed.

The PPM also has the responsibility to ensure the training and competency of contractors is completed prior to work being undertaken on the IWL/TSF or the associated infrastructure.

All personnel involved with the IWL/TSF must be aware of visual indicators (leaking pipes, high solution levels, cracking, etc.) of the performance of the IWL/TSF.

1.4 Document Control

The PPM or his appointed designate has the responsibility for all document control for the IWL/TSF including the Operating Manuals. The essential documents for the IWL/TSF comprise the following:

- Design documents, including drawings.
- Operating Manual, including the associated records.
- Managing Change Documents.

1.5 Managing Change Documents

1.5.1 Modifications to Design and/or Operation

No changes shall be made to the design or operation of the IWL/TSF without the written approval of the PPM, the GM and IWL/TSF designers where the proposed change to the IWL/TSF materially affects the design or the operation of the facility.

Where design standards change, the designers should contact the PPM and the General Manager and advise of the changes required to bring either the design or operation of the facilities into line with current standards.

All approved changes to the design and/or operation of the IWL/TSF, no matter how minor, must be thoroughly documented and recorded in the master document control sheet for the IWL/TSF.

The procedures for making changes to the design and operation of the IWL/TSF comprise:

- Submission of a written Request for Change to the PPM. The Request for Change Submission must outline the proposed change, the reason for the change, the expected impact (if any) of the change and the expected benefit (if any) of the change.
- Determination by the PPM if the proposed change has any impact, either positive or negative, and determine the value of the benefits of the proposed change.
- If the proposed change has no material effect on the design and/or operation of the IWL/TSF, the Request for Change Submission can be implemented and the relevant design and operational documents updated as required and the change noted in the master document.
- If the proposed change materially affects the design and/or operation of the IWL/TSF, the Request for Change Submission will be forwarded to the GM and DC with the comments of the PPM, for action as appropriate.
- Where the Request for Change Submission affects the design of the IWL/TSF, the DC will review the submission and make the necessary changes ensuring that any impacts not envisaged by the

PPM are noted on the submission. The revised documents and the submission will be returned to the PPM. The revised documents will be appended to the OM document and the amendments noted on the document control sheet.

- Where the Request for Change Submission affects the operation of the IWL/TSF, the DC will review the submission and note the changes ensuring that any impacts not envisaged by the PPM are noted on the submission. The revised documents and the submission will be returned to the PPM. The revised documents will be appended to the OM document and the amendments noted on the document control sheet.
- Where the Request for Change Submission affects the operation of the IWL/TSF, the training and competency procedures will be reviewed to assess whether changes need to be made. Where changes are required, the relevant documents will be amended and the amendments noted on the document control sheets.

1.5.2 Regulatory Changes

Changes in the regulatory requirements will be passed to the PPM to be assessed, processed and documented using the same procedures as outlined in Section 1.5.1 above.

1.5.3 Ownership and Designation Changes

Changes in the ownership or changes to the organisational structure or designation hierarchy (Table 1) will be passed to the PPM, processed and documented using the same procedures as outlined in Section 1.5.1 above.

2 DESIGN CONCEPT

Details of the design are presented in the CMW (2021) report, '*Integrated Waste Landform Tailings Storage Facility, Mt Ida Gold Project, WA, Design Report*'. The IWL/TSF has been designed to store approx. 6 Mt of tailings over a 6-year life.

Based on the DMP Code of Practice (2013), the hazard rating for the IWL/TSF has been assessed as 'High', Category 1. The ANCOLD (2012) consequence rating is 'High C'.

The IWL/TSF will be a single cell paddock style facility, constructed in five stages as part of the mining operations with the IWL/TSF being located partially within the waste dump.

Following topsoil stripping, the IWL/TSF basin subgrade comprising clays will be moisture conditioned and compacted to produce a low permeability liner at the base of the IWL/TSF to reduce seepage.

The embankment of the IWL/TSF will be a zoned embankment comprising an upstream zone of low permeability roller-compacted clayey mine waste and a downstream zone of traffic compacted mine waste material. It has design slopes of 1(V):2(H) upstream and 1(V):3(H) downstream, with a minimum crest width of 13 m (upstream and downstream zones). The compacted upstream zone will have a minimum width of 5 m including the crest of the embankment.

The embankment incorporates a cut-off trench founded on Ferricrete (Wiluna Hardpan) a nominal depth 0.5m to 1.0 m below ground level in order to reduce seepage losses.

Surface water will be removed from IWL by a pontoon mounted decant pump located within a rock-ring type central decant structure. Return water will be pumped directly to the process plant for reuse. An underdrainage system will collected leachate. The recovered leachate will be pumped from an underdrainage sump via an inclined bore, with recovered water discharged onto the tailings beach.

3 SUMMARY OF OPERATIONAL PROCEDURES

3.1 General

The operational design of the facilities is aimed at:

- Provide LOM tailings storage.
- Provide optimum removal of water from the facility and return to the plant for re-use in processing (i.e. an existing water treatment facility).
- Optimise tailings storage capacity by maximising tailings density (i.e. undertaking cyclic tailings deposition between groups of spigots).
- Reduce environmental impact (i.e. due to seepage).

The following operational considerations have been incorporated into the design:

- Tailings in the form of slurry will be discharged sub-aerially and cyclically into the facility in thin discrete layers, not exceeding 300 mm thickness, in order to allow optimum density and strength gain by subjecting each layer to a drying cycle. The deposition will take place via multiple spigots from around the facility. Tailings deposition will be from the perimeter of the storage.
- Spigotting of tailings is to be carried out such that the supernatant pond is maintained within and around the rock-ring decant. The pond is to be maintained away from the perimeter embankments at all times.
- Water will be removed from the facility and pumped back to the process plant via a decant pump located in a centrally located rock-ring type decant structure.
- The tailings storage area will assume the form of a truncated prism with a depressed cone on the top surface. The facility will have the capacity to store a considerable volume of water during a storm event. The minimum operational freeboard for the IWL/TSF under normal operating conditions is 0.3 m, plus an allowance for the temporary storage of the 1% average exceedance probability (AEP) (previously the 1 in 100-year average recurrence interval (ARI)) 72-hour storm event whilst maintaining required total freeboard (refer Figure 2).
- Frequent inspections should be made of the tailings line, water return line, discharge points, underdrainage system, water recovery system and the position of the supernatant pond in relation to the water recovery system.
- Only by regular inspection and appropriate remedial action can the performance of the water return system be optimised and operational problems be avoided.
- The operation, safety and environmental aspects should be periodically reviewed during an audit by a suitably experienced and qualified engineer. This audit should be done at least every year.
- On eventual decommissioning, the facility will remain as a permanent feature of the landscape and drain to an increasingly stable mass. The top surface and batters will be stabilised and rehabilitated as detailed in the design report.

4 COMPONENTS OF TAILINGS STORAGE

4.1 Deposition of Tailings

The method of deposition of tailings into the storage is one of the major controlling factors in achieving:

- Higher in-situ densities in the tailings storage.
- Higher water returns.
- Maintaining embankment stability.

In order to understand the tailings deposition requirements, detailed knowledge of the components of the tailings system is required. These components include:

- Tailings Pipe-work.
- Tailings deposition process.
- Ring Main Flushing.

4.1.1 Tailings Pipe-work

Tailings are transported from the process plant to the IWL/TSF via an HDPE pipeline. At the IWL/TSF, the pipeline will split into two distribution lines to distribute the tailings around the active storage. One line distributes tailings to the western section and one to the eastern section.

The tailings distribution lines comprise welded HDPE pipe. The distribution lines have spigot offtakes are located at nominally 40 m intervals on the embankment. The pipework is located adjacent to the upstream crest of the embankment and perimeter access road.

4.1.2 Deposition Process

Tailings should be deposited over the exposed beaches, at a low velocity from several spigot discharge points. The deposition should occur for a period of around two days from each group of spigots. Each spigot comprises a mining hose fitted with a valve/scissor clamp to control flow through the spigot (or similar). Tailings should not be discharged so as to erode the perimeter containment embankments. During deposition, conductor pipes (slotted) should be utilised to ensure the tailings are deposited at the toe of the embankment. Drawing PER2020-0443-05 shows typical spigot details.

4.1.3 Main Flushing

At the completion of the sequential deposition on each distribution main and following the change over to the alternative distribution main, the inoperative tailings line should be flushed with water (tails return water) until it is clean. The flushing operation will be supervised by the Shift Foreman.

4.2 Return Water Operation

Surface water will be removed from IWL/TSF by a decant pump located within a rock-ring type central decant structure. Return water will be pumped back to the process plant for reuse.

The location of the decant water pond will be controlled by the tailings discharge sequence employed. The process of tailings deposition is aimed at ensuring that the pond is positioned around the decant facilities and that the pond is maintained in that position. The pond is positioned by altering the location of deposition point around the perimeter of the storage, as appropriate.

The pond around the decant should be maintained at the smallest practical operational size to maximise water return to the plant to enable most of the free water to be recovered through the decant for recycling to the process plant. The capacity of the return water system should be 185 t/hr.

The size of the pond will be largely governed by the efficiency of the decant system in removing water from the tailings storage. Other controlling factors will be:

- Evaporation from the surface of the pond;
- Variations to the input of tailings water (percentage solids);

- Rainfall events;
- Difference in permeability between the tailings and the underlying rock units; and
- The ratio of horizontal to vertical permeability of the tailings.

4.2.1 Start-up

At start-up (Stage 1), decant water recovery will be via a temporary pump in the lower levels of the storage. Rock fingers/temporary accessways could be provided to allow access to the pump and ensure water can be recovered at the earliest opportunity.

5 ROUTINE INSPECTIONS AND MAINTENANCE

The following routine inspection and maintenance procedures are to be carried out for the various components of the system. Reporting sheets (Proformas) are attached covering the following inspections:

• Monthly Inspection Log	PF1
• Daily Inspection Log	PF2
• Personnel Contact Details	PF3
• Staff Confirmation Log	PF4
• Assembly Points	To be supplied by ARL

Routine inspections, as detailed below, are to be undertaken by an operator or shift supervisor, each shift on a daily basis. The date and time of each inspection are to be entered onto the inspection log and is to be signed by the person allocated to undertake the inspection on that shift to ensure the requirements have been undertaken. Suggested proformas are attached to this operations manual.

The Shift Inspection Log Sheet is to be filled out on each shift, daily. Copies of inspection logs should be retained on-site.

The inspections should cover:

- The pipelines (tailings delivery line and water return lines) to and from the IWL/TSF.
- Leak detection.
- Pumps.
- Valves.
- Spigotting and deposition.
- Location and size of the decant pond.
- Decant, underdrainage and return water pumps operational.
- Seepage from the embankment toe.
- The general integrity of the embankments i.e. any new cracking or new seepage (daily).
- Any changes to existing cracking or seepage.

5.1 Monthly Inspections

Monthly inspections of the IWL/TSF should be carried out by process plant management, refer to PF1 in order to provide management oversight of the facility.

These inspections should assess the items listed in the proforma and note any changes which have occurred since the previous inspection.

5.2 Annual Engineer's Inspection

An audit by a qualified geotechnical engineer with experience in the design, operation and auditing of tailings storages should be carried out at least once every year.

5.3 Special Inspections

Inspections of the IWL/TSF should be performed after significant rainfall events. Special attention should be given to erosion of embankments, and remedial works should be initiated as required.

Inspections of the IWL/TSF embankment should be performed after an earthquake event (i.e. an M=5 event or above on the Modified Mercalli Scale). Special attention should be given to cracking on crests and evidence of embankment movement (i.e. slumping). If cracking or slumping is evident, the party responsible for surveillance and safety reporting (i.e. CMW or independent 3rd Party) should be consulted before initiating remedial works.

5.4 Inspections

5.4.1 Tailings Lines

The tailings line is to be inspected a least once per shift. The date and time of each inspection are to be entered onto the inspection log.

All tailings lines will be bunded. The HDPE tailings lines are sensitive to temperature, and the expansion and contraction of this line can cause leaks, and in extreme situations, failure of the pipeline. Any leaks or failures of the tailings pipeline should be immediately reported to the following personnel or project equivalents and an incident report completed.

- Shift Foreman; or
- Mill Superintendent (Processing Manager).

5.4.2 Return Water System

The position and size of the pond in relation to the rock-ring / decant pump should be inspected at the same time as the tailings lines are inspected. Any abnormalities (i.e. lack of freeboard, pumps not operable) should be reported immediately to the following personnel or project equivalents:

- Shift Foreman; or
- Mill Superintendent (Processing Manager).

The return water lines to the plant from the IWL/TSF should also be inspected at the same time as the tailings line. All return water lines will be bunded. Any leaks or failure of the water pipeline should be immediately reported to the following personnel or project equivalents:

- Shift Foreman; or
- Mill Superintendent (Processing Manager).

5.5 Embankments

Part of the general activities of the Shift Foreman, when visiting the storage facilities, shall be to inspect the embankments, including berms and batter slopes. The inspection shall note any cracking or new features, such as seepage, embankment erosion or scour (caused by tailings deposition or rainfall runoff) or any other obvious changes or problems.

6 MONITORING REQUIREMENTS

The following section details the monitoring requirements to ensure the IWL/TSF is performing in accordance with the design parameters and the details presented in the detailed design report.

Monitoring results (e.g. water quality and water level) should be recorded on spreadsheets and plotted and graphed as soon as possible. The information should be reviewed after being entered and graphed to allow any changes to be identified and acted upon.

The plotting of recorded information allows trends to be determined. Where newly recorded information deviates (generally significantly) from a previously established trend the reading should be checked, the general area should be inspected and the information reported to plant management for consideration and action.

Copies of the current leased licence conditions (DWER) relevant to the tailings storage should be attached to this document to allow for easy reference. Each time the licence is renewed or updated all conditions should be checked for any changes, with appropriate confirmation they have been read and records have been updated and will be acted upon as considered appropriate.

6.1 Process Plant

In addition to the daily visual inspections of the water pond, spigots, water return pumps, tailings and return water pipelines the following information should be recorded at a minimum on a monthly basis:

- Ore treatment, measured in dry tonnes.
- Tailings slurry density, measured in percentage solids or slurry water volume.
- Water return from all sources from the IWL/TSF to the process plant, measured in cubic metres or tonnes.

This information will be utilised to estimate a water balance as part of the annual review of the IWL/TSF.

6.2 Embankment Monitoring

The requirement for additional instrumentation (i.e. monitoring bores, piezometers) associated with the IWL should be reviewed as part of the yearly audit.

6.3 Environmental Monitoring

6.3.1 Climatic Data

If climatic information is collected on-site or at a nearby BOM station, the following climatic data is to be collected daily or at the end of each month:

- Rainfall for the month.
- Evaporation for the month (if recorded on site or a nearby BOM station).

This information can be utilised in order to assist with determining a water balance for the annual review of the IWL/TSF.

6.3.2 Water Quality

Water quality monitoring (sampling and testing) is required from the following areas or sources:

- Monitoring bores located in and around the IWL/TSF.
- Seepage and any surface water located either downstream or upstream of the IWL/TSF.
- Slurry water discharged into the storage, water stored on the storage and water returned to the plant.

The frequency of the water quality monitoring is usually determined by the regulatory authorities with the details of the water quality requirements stipulated either on a licence or other approval documents issued by the regulatory authorities.

6.3.3 Storage Monitoring

Detailed mudline and water pond level surveys are to be carried out at least on an annual basis. This will enable the storage volume that has been used to be reconciled with the tailings tonnage deposited into the storage to establish an in-situ density of the tailings from comparison with the design in-situ density.

If any embankment construction is undertaken, as-built survey plans should be updated.

7 EMERGENCY ACTION PLAN

The Emergency Response Plan for the Mt Ida Gold Project (including the plant) should be based on the results of the dam break analyses presented in the design report. The plan should be reviewed and updated as a minimum on a yearly basis.

The plan should include:

- Management responsibilities and emergency coordination.
- Muster points.
- Seeking specialist geotechnical advice.
- Emergency Plan Triggers, namely:
  - Freeboard less than design values.
  - Significant embankment distress.
  - Imminent overtopping.
  - Damage following an earthquake or extreme rainfall event.

The emergency response should be managed by the Processing Manager. When the triggers above have been exceeded, personnel should be directed to the muster area, upslope of the IWL/TSF area (i.e. at the access road to the northeast of mill/administration site or similar location), as appropriate. The designers should also be advised as required when geotechnical advice is required.

To enable the emergency action plan to be implemented and to allow a safe and timely response to be instigated, the attached documents (Personnel Contact Details, Assembly Points and Staff Confirmation Log) outline current information pertaining to assembly points and contact names. The sheets shall be reviewed at least six monthly or updated as required when new staff become responsible for activities in and around the facilities.

Contractors shall also be made familiar with the location of the assembly point and be made aware of their reporting responsibilities and to whom they shall report to.

The attached sheets should provide a list of relevant contact details of staff associated with the tailings storage, senior site responsible staff, safety officers and emergency services.

8 INCIDENT REPORTING

The undertaking of regular inspections and monitoring is aimed at identifying any problems prior to them causing a major impact on the operation or integrity of the structure. The inspections may result in the identification of an event that may require reporting to senior staff and in some cases to relevant government departments, i.e. new seepage as indicated by monitoring bores.

Typical reporting events include:

- Any fauna death on or near the IWL/TSF (not road kill).
- Any uncontrolled release of tailings slurry or return water and the cause (pipe break, overtopping, pump malfunction, automatic switch malfunction, operator error, etc.).
- Impact from seepage (vegetation distress, soil contamination, water quality changes).
- Defects to the tailings storage facility covering such things as the pit walls and return water system (i.e. pertaining to safety issues).
- Changes in water quality that exceed prescribed conditions of licence criteria.
- Increases in production tonnages.

It is recommended that prior to submitting an incident report to DWER or DMIRS that an assessment be undertaken to confirm the nature, type and impact of the incident by either senior site staff or an independent organisation. If an incident requires reporting to the DWER or DMIRS, as a minimum, an incident report form should be used as well as any other reporting requirements (refer to licences).

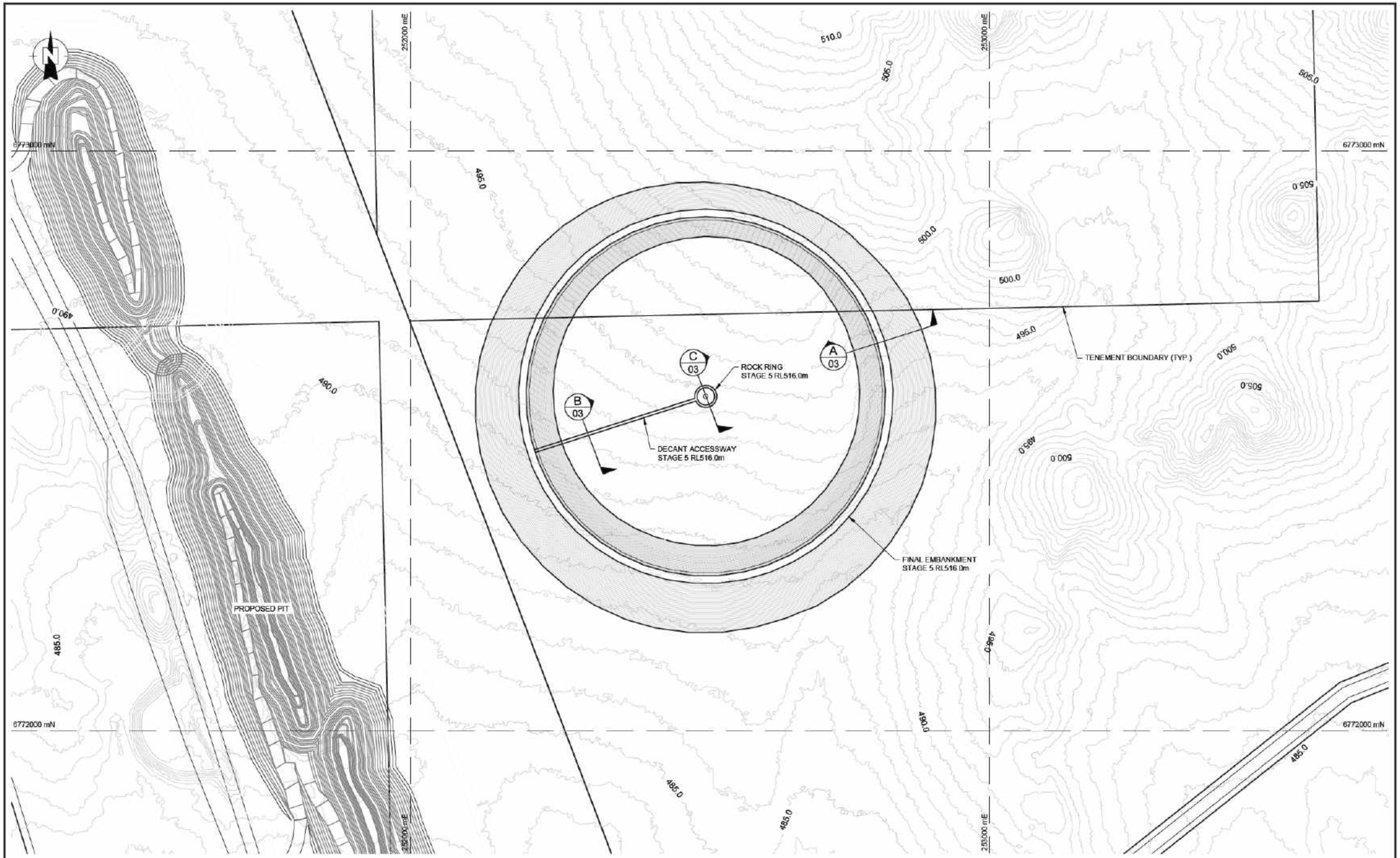
9 REHABILITATION WORKS

Refer to the detailed design report for details of closure works associated with the IWL/TSF. Progressive rehabilitation works cannot be performed for the IWL/TSF during operations until the final waste dump has been constructed.

10 CLOSURE

This Operations Manual is to be read in conjunction with the Design Report. This Operating Manual contains copies of proforma log sheets and lists of information to be inspected and recorded on a daily, monthly or yearly basis.

Figures



NOTES:

1. CONTOURS BASED ON "Leonora_Cartographic_Contours_20cm.DXF"

0 60 120 180 240 300 m

1:6000

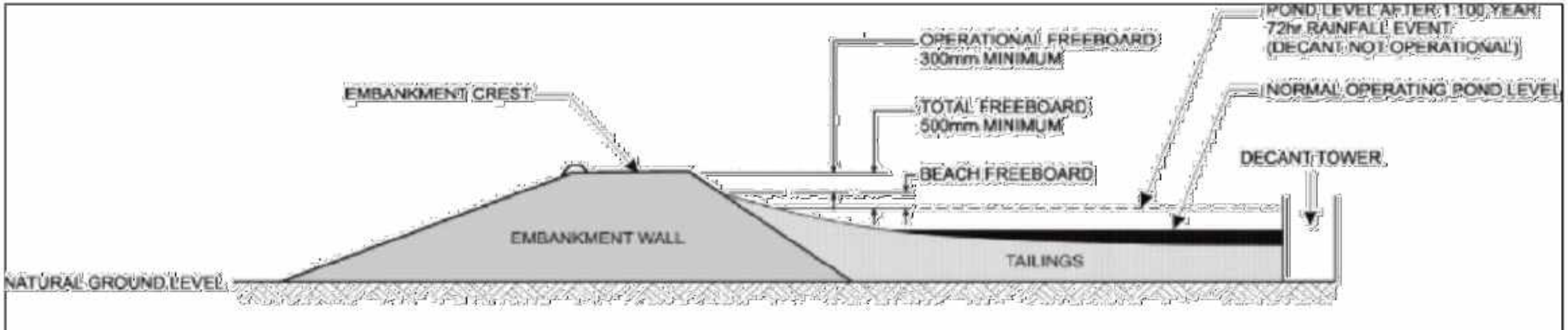
CMW Geosciences

CLIENT: **AURENNE MT IDA PTY LTD**

PROJECT: **MT IDA GOLD PROJECT**
INTEGRATED WASTE LANDFORM

TITLE: **GENERAL ARRANGEMENT - FINAL STAGE**

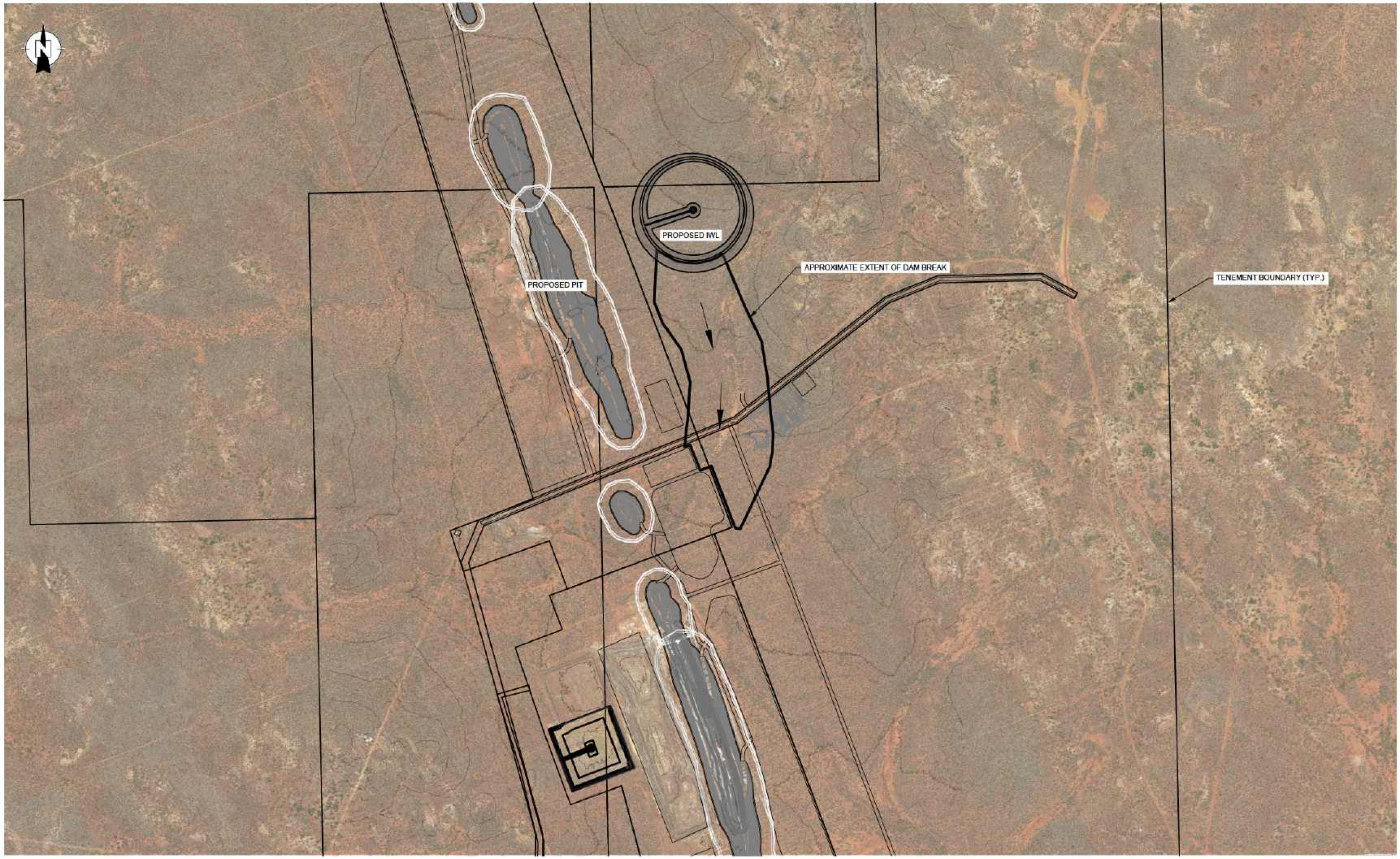
DRAWN:	DE	PROJECT:	PER2020-0443
CHECKED:	CH	DRAWING:	02
REVISION:	B	SCALE:	1:6000
DATE:	02.11.21	SHEET:	A3 L



NOTE: FOR CASE WHERE POND IS NORMALLY LOCATED AWAY FROM ANY PERIMETER EMBANKMENTS.

CMW Geosciences

CLIENT:	**AURENNE MT IDA PTY LTD**	DRAWN:	DE	PROJECT:	PER2020-0443
PROJECT:	**MT IDA GOLD PROJECT INTEGRATED WASTE LANDFORM**	CHECKED:	CH	FIGURE:	02
		REVISION:	A	SCALE:	NTS
TITLE:	**FREEBOARD NOMENCLATURE**	DATE:	08.02.21	SHEET:	A4 L



NOTES:

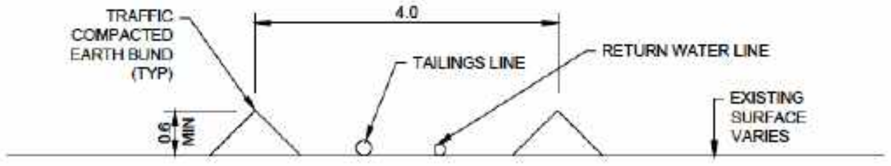
1. CONTOURS BASED ON "Leonora_Cartographic_Contours_20cm.DXF"
2. AERIAL IMAGE FROM BING MAPS

0 200 400 600 800 1000 m

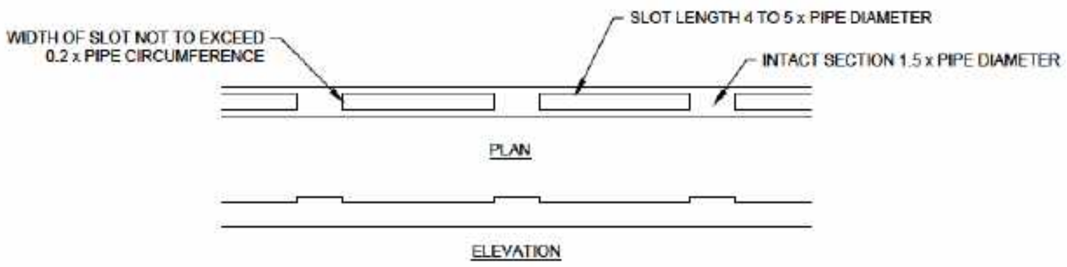
1:20 000

CMW Geosciences

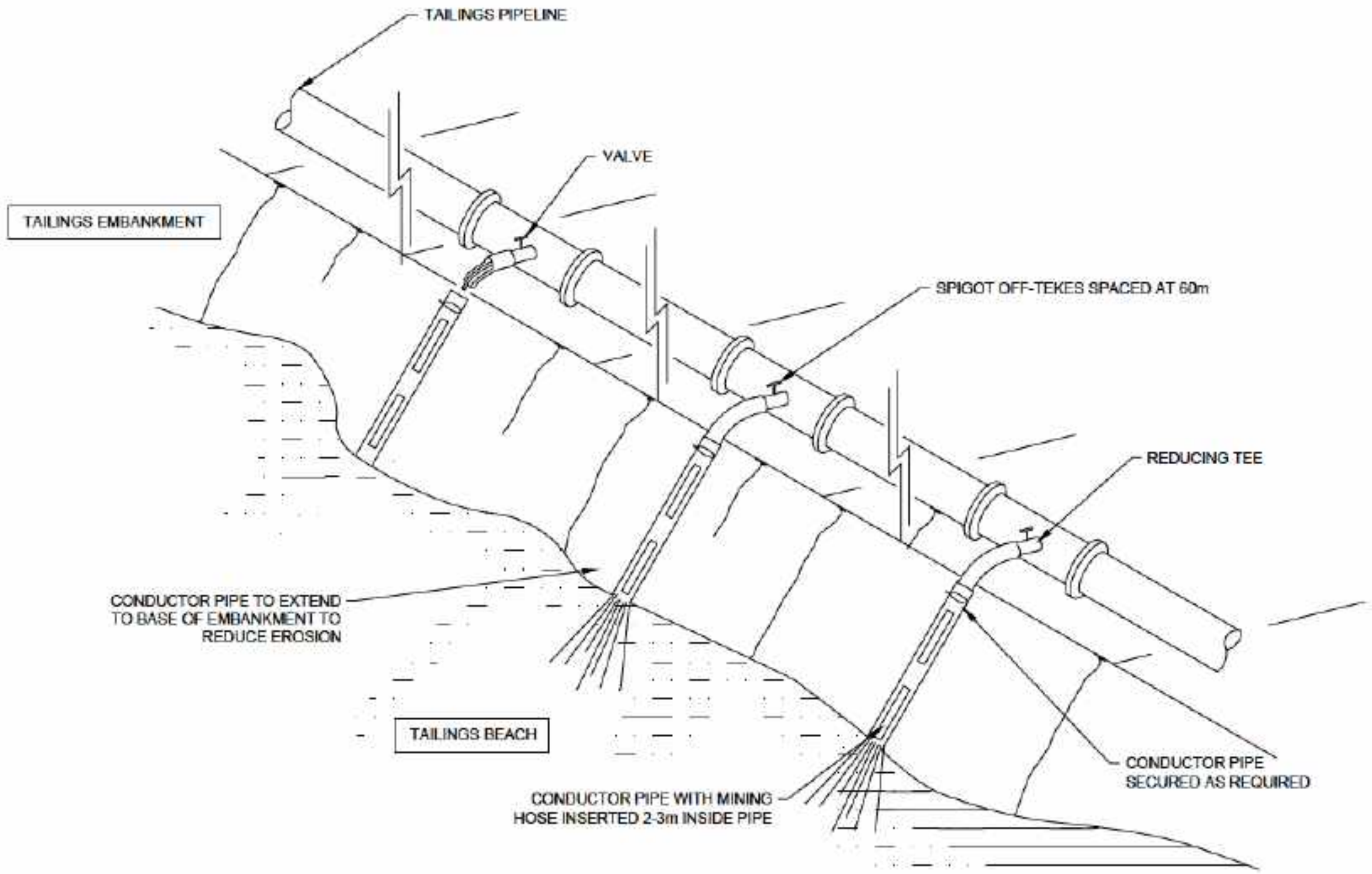
CLIENT: **AURENNE MT IDA PTY LTD**	DRAWN: DE	PROJECT: PER2020-0443
PROJECT: **MT IDA GOLD PROJECT INTEGRATED WASTE LANDFORM**	CHECKED: CH	DRAWING: 04
	REVISION: B	SCALE: 1:20000
TITLE: **INUNDATION PLAN**	DATE: 02.11.21	SHEET: A3 L



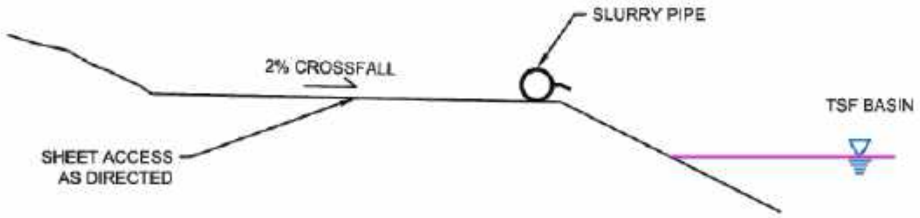
PIPELINE BUNDING - TYPICAL SECTION
1:100



CONDUCTER PIPE (SLOTTED PVC) - TYPICAL DETAIL
1:50



PROPOSED SPIGOT ARRANGEMENT
ISOMETRIC VIEW (NTS)



PIPE BENCH
SECTION VIEW (NTS)

NOTES:

1. ALL DIMENSIONS IN METRES UNLESS SPECIFIED

1:100 0 1 2 3 4 5 m

CMW Geosciences

CLIENT: **AURENNE MT IDA PTY LTD**	DRAWN: DE	PROJECT: PER2020-0443
PROJECT: **MT IDA GOLD PROJECT INTEGRATED WASTE LANDFORM**	CHECKED: CH	DRAWING: 05
	REVISION: A	SCALE: AS SHOWN
TITLE: **PIPELINE AND SPIGOT DETAILS**	DATE: 08.02.21	SHEET: A3 L

Appendix A

Proformas

PROJECT : **INTEGRATED WASTE LANDFORM / TAILINGS STORAGE FACILITY (IWL/TSF)**

CLIENT : **AURENNE MT IDA PTY LTD**

LOCATION : **MT IDA GOLD PROJECT, WA**

SUBJECT : **MONTHLY INSPECTION LOG AND MONITORING SHEETS - PROCESS PLANT MANAGEMENT**

Date	13-Jun-22
Job No	PER2020-0443
File	PER2020-0443AD
Subject	Inspections
Revision	3

PF1 sheet 1 of 1

Date:
Shift Supervisor:

Time:
Inspection by:
Employee Number:

Shift Number:
Verified by:

Item	**Description of Inspection Activity**	**Comments**	**Remedial Works**	
			Start	**Finish**
1.0	**Embankments**			
	Is cracking, slumping or other distress present around the embankment crests and benches? If yes, is it new cracking or existing cracking? Has existing increased in extent?			
	Is the freeboard above the designated level? (Based on DMIRS criteria that is 0.3m, operation freeboard (at embankment))			
	Is staining or discolouration present on any of the downstream batter slopes of the embankments?			
	Is water ponding at the downstream toe of any of the embankments?			
	Is there evidence of seepage or seepage water flow from the downstream toe of any of the embankments? If yes, is it new or or existing seepage? Has existing increased in extent?			
2.0	**Tailings Deposition**			
	Is the distribution of the tailings on the beaches as required by the operations manual?			
3.0	**Decant System**			
	Is the supernatant water positioned around the decant facility?			
	Is the supernatant surface (within the storage) as planned, or is there excess water on the storage?			
	Can the decant system handle storm runoff in addition to the reclaim water efficiently?			
	Is the underdrainage system operating? Discharge of water onto beach (how many L/s)			
4.0	**Process Plant Information**			
	Ore processed for the month (tonnes)			
	Average tailings slurry density, measured in percentage solids			
	Water return from the tailings storage to the process plant (in tonnes and m3)			
	Compare the water return to the target of 60% of slurry water inflow (on an average annual basis). Any comments? Corrections required to operations?			
5.0	**Monitoring**			
	Have the water levels in the vibrating wire piezometers been downloaded from the data loggers and data assessed?			
	Have the water levels in the monitoring bore been measured and data entered to the appropriate sheet?			
	Has the water quality data from the monitoring bores been checked and data entered into the appropriate spreadsheet?			
7.0	**Climatic Data**			
	Has the site rainfall been recorded entered daily into spreadsheet? monthly total?			
8.0	**Other Aspects**			
	Comments			

PROJECT	**: IWL/TSF**	Date	13-Jun-22
		Job No	PER2020-0443
CLIENT	**: AURENNE MT IDA PTY LTD**	File	PER2020-0443AD
		Subject	**Inspections**
LOCATION	**: MT IDA GOLD PROJECT, WA**	Revision	3
SUBJECT	**: DAILY INSPECTION LOG SHEET**	**PF2**	sheet 1 of 1

Date: **Shift Supervisor:**	**Time:** **Inspection by:** **Employee Number:**	**Shift Number:** **Verified by:**

Item	Criteria	Operating/Defective YES/NO		Comments
		N/S	**D/S**	
Roadways	Condition	■	Y/N	
Downstream areas	Any seepage/wet areas	■	Y/N	
	Any spillages	■	Y/N	
Pipelines	Leaks?	Y/N	Y/N	
Underdrainage	Pumps operating	Y/N	Y/N	
Decant	Pumps operating	Y/N	Y/N	
	Discharge water clarity	Y/N	Y/N	
Tailings discharge	Location, no. of spigots?	Y/N	Y/N	
Freeboard	Pond position	■	Y/N	
	Depth (estimate)	■	Y/N	
	Operational freeboard (at wall >0.3m) (Estimate)	■	Y/N	
Embankments	Any distress? Any cracking?	■	Y/N	
Fauna	Any deaths	■	Y/N	
Flora	Any new distress	■	Y/N	
Monitoring	Damage to instruments	■	Y/N	

NOTES :

Please provide any comments or notes relating to the tailings storage facility
N/S, D/S - Night Shift, Day Shift

PROJECT	**: IWL/TSF**	Date	13-Jun-22
		Job No	PER2020-0443
CLIENT	**: AURENNE MT IDA PTY LTD**	File	PER2020-0443AD
		Subject	Contact Details
LOCATION	**: MT IDA GOLD PROJECT, WA**	Revision	3
SUBJECT	**: PERSONNEL CONTACT DETAILS**	**PF3**	sheet 1 of 1

Name	Company	Responsibility	Contact Details
		General Manager (GM)	
		Resident Manager (RM)	
		Process Plant Metallurgist (PPM)	
		Process Plant Supervisor (PPS) and Process Plant Operators (PPO)	
		Maintenance Supervisor (MS)	
		electrical, instrumentation, pumping and piping	
		Mining Foreman (MF)	
		mining activities and other earthworks	
		Environmental Consultant (EC)	
		Emergency Response Team (ERT)	
		Design Consultant (DC)	

Last updated :

ref : **PER2020-0443AD**

PROJECT	: IWL/TSF	Date	13-Jun-22
		Job No	PER2020-0443
CLIENT	: AURENNE MT IDA PTY LTD	File	PER2020-0443AD
		Subject	Confirmation Log
LOCATION	: MT IDA GOLD PROJECT, WA	Revision	3
SUBJECT	: STAFF CONFIRMATION LOG SHEET	PF4	sheet 1 of 1

As part of the requirements for the safe operation of the Integrated Waste Landform / Tailings Storage Facility (IWL/TSF), all personnel involved with the daily or regular operation and inspection of the IWL/TSF as well as those who are responsible for the TSF, are required to sign this form as confirmation that you have attended and understood all safety and induction procedures. In particular that you are familiar with the prepared operations manual that has been prepared to in accordance with DMIRS guidelines.

NAME :

SIGNATURE :

DATE :

CMW Geosciences
Great People | Practical Solutions

Perth

Suite 1 | Level 3
29 Flynn Street
Wembley WA 6014
Australia

[redacted]

www.cmwgeosciences.com