



TRANSITIONAL PROGRESSIVE REHABILITATION AND CLOSURE PLAN

YANDAN GOLD PROJECT

PREPARED FOR
STRAITS GOLD PTY LTD

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Table of Abbreviations

AARC	AARC Environmental Solutions
AEP	Annual exceedance probability
AQP	Appropriately qualified person
EA	Environmental Authority
EP Act	<i>Environmental Protection Act 1994</i>
ERA	Environmentally relevant activity
FoS	Factor of safety
HLP	Heap leach pad
LOM	Life of Mine
LOD	Land outcome document
ML / MLs	Mining Lease / Mining Leases
MM	Management milestone
NUMA	Non-use management area
PMF	Probable maximum flood
PMLU	Post-mining land use
PMLUP	Post mine land use plan
PoO	Plan of Operations
PRCP	Progressive Rehabilitation and Closure Plan
PRCP Guideline	Progressive Rehabilitation and Closure Plan Guideline
RM	Rehabilitation milestone
RMP	Rehabilitation Monitoring Programs
ROM	Run-of-mine
RUSLE	Revised Universal Soil Loss Equation
SBE	See Built Earth
SEP	Stakeholder Engagement Plan
SQP	Suitably qualified person
The Project	Yandan Gold Mine
TSF	Tailings storage facility

1 Introduction

AARC Environmental Solutions Pty Ltd (AARC) has been commissioned by Straits Gold Pty Ltd (Straits Gold) to develop a Progressive Rehabilitation and Closure Plan (PRCP) for the Yandan Gold Mine (the Project) in accordance with the requirements of the *Environmental Protection Act 1994* (EP Act).

Straits Gold Pty Ltd is a wholly owned subsidiary of GBM Resources Limited (GBM), which acquired the Project site (and the Straits Gold Pty Ltd entity) in January 2021, from the previous owner, Aeris Resources Limited.

This PRCP is applicable to Mining Leases (MLs) ML 1095 and ML 1096. The current version of the Environmental Authority (EA) for the Project (EPML00771913) was issued on 20 December 2012 to Straits Gold Pty Ltd; then a wholly owned subsidiary of Aeris Resources Limited.

The Project EA authorises the environmentally relevant activity (ERA) of mining gold ore under Schedule 3 of the Environmental Protection Regulation 2019 (EP Regulations).

2 Scope and objective

The purpose of this PRCP is to describe how progressive rehabilitation will be carried out at the Project. The PRCP has been developed in accordance with the requirements of the *Progressive Rehabilitation and Closure Plan Guideline* (DES 2023) (PRCP Guideline), which states that the PRCP must include the following parts:

1) Rehabilitation planning part

The purpose of the rehabilitation planning part of the PRCP is to provide evidence and justification to support the development of the proposed PRCP schedule. This part must detail how progressive rehabilitation and closure will be carried out over the entire Project. The PRCP planning part is required to address the following:

- community consultation (refer Section 3.2);
- post-mining land use (PMLU) and/or non-use management area (NUMA) determination (refer Section 3.3 and Section 3.4);
- the rehabilitation and management methodology to be implemented (refer Section 3.5);
- an assessment of rehabilitation risk (refer Section 3.6); and
- a program for monitoring and maintenance of rehabilitation (refer Section 3.7).

2) Rehabilitation schedule part

The development and implementation of the schedule part is an essential element of a PRCP. Once approved, the schedule part becomes a legally binding and enforceable instrument with which the Project must comply. The schedule part must include:

- nomination of either a PMLU or NUMA for all land within the relevant resource tenures;
- identification of when land becomes available for rehabilitation or improvement;
- rehabilitation or management milestones to achieve the PMLU and/or NUMA outcomes;
- milestone criteria that demonstrate when each milestone has been completed;
- completion dates for each milestone to be achieved; and
- any conditions considered necessary or desirable.

The administering authority may impose a condition on a draft PRCP schedule or a PRCP schedule if it considers the condition is necessary or desirable (Section 4.2 of the Guideline). Two deemed conditions are to be included in all PRCP schedules in accordance with Section 206A of the EP Act. The first condition states that when carrying out a relevant activity under the PRCP schedule, the holder must comply with a requirement stated in the EA relevant to carrying out the activity.

The second condition states that the holder must comply with the following matters stated in the schedule:

- each rehabilitation milestone and management milestone; and
- when each rehabilitation milestone and management milestone is to be achieved.

3 Project planning part

3.1 Project planning

3.1.1 Project description

The Project is situated in the Drummond Basin, central Queensland, located approximately 50 km to the west of the township of Mount Coolon and approximately 150 km southeast of Charters Towers (Figure 1). The Project falls on the boundary of the Whitsunday Regional Council and Charters Tower Regional Council local government areas.

Yandan Gold Mine consists of two MLs, being ML 1095 and ML 1096, comprising a total area of 1,971.3 ha. Table 1 indicates the current status of the MLs. The Project MLs and tenement boundaries are shown in Figure 2.

Table 1: Yandan tenements

Permit Number	Authorised Holder	Grant	Expiry	Area (ha)	Real Property Description
ML 1095	Straits Gold Pty Ltd	27/06/1991	30/06/2036	1368.9	Lot 5060 on PH387
ML 1096	Straits Gold Pty Ltd	27/06/1991	30/06/2036	602.4	Lot 5060 on PH387

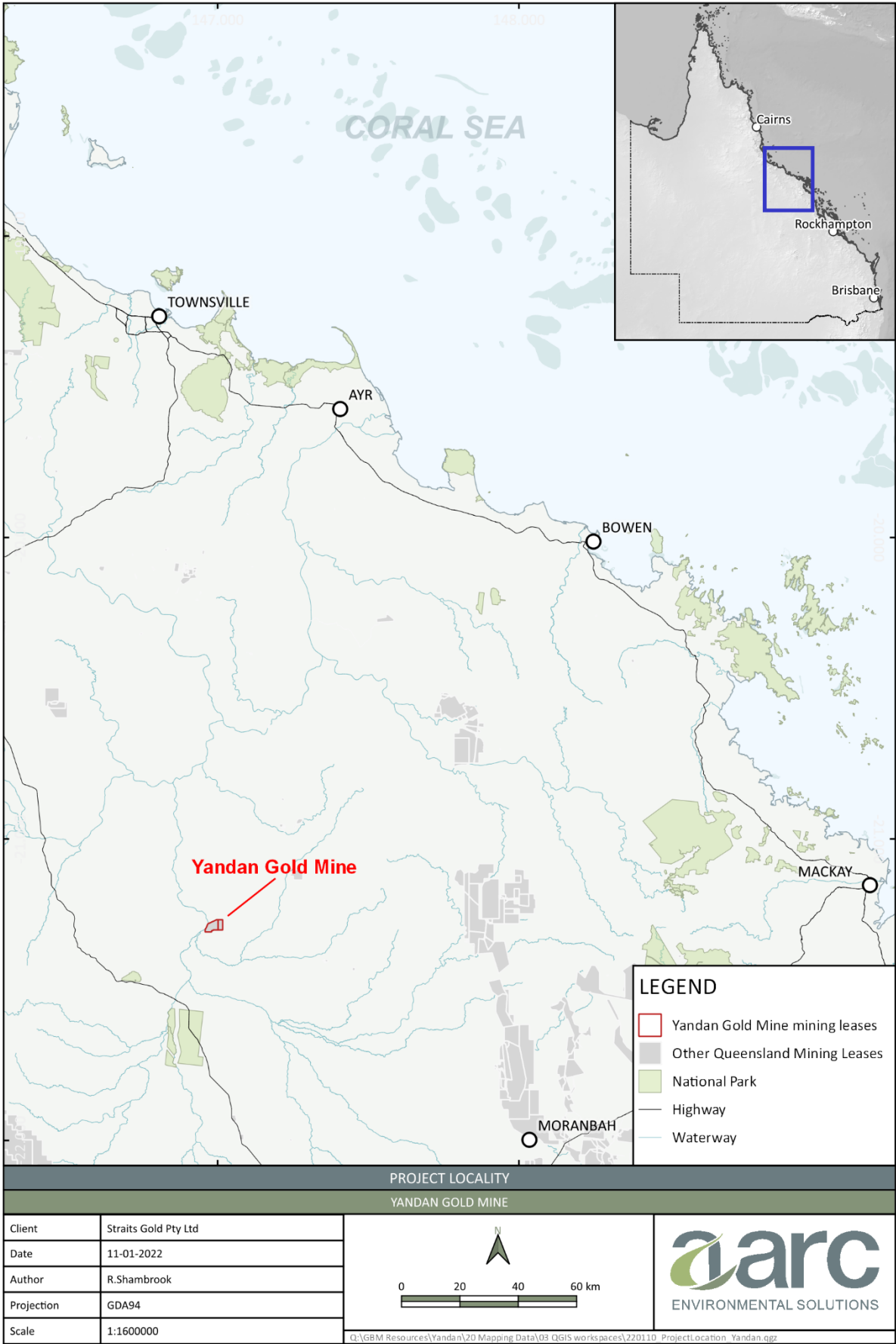


Figure 1: Project locality

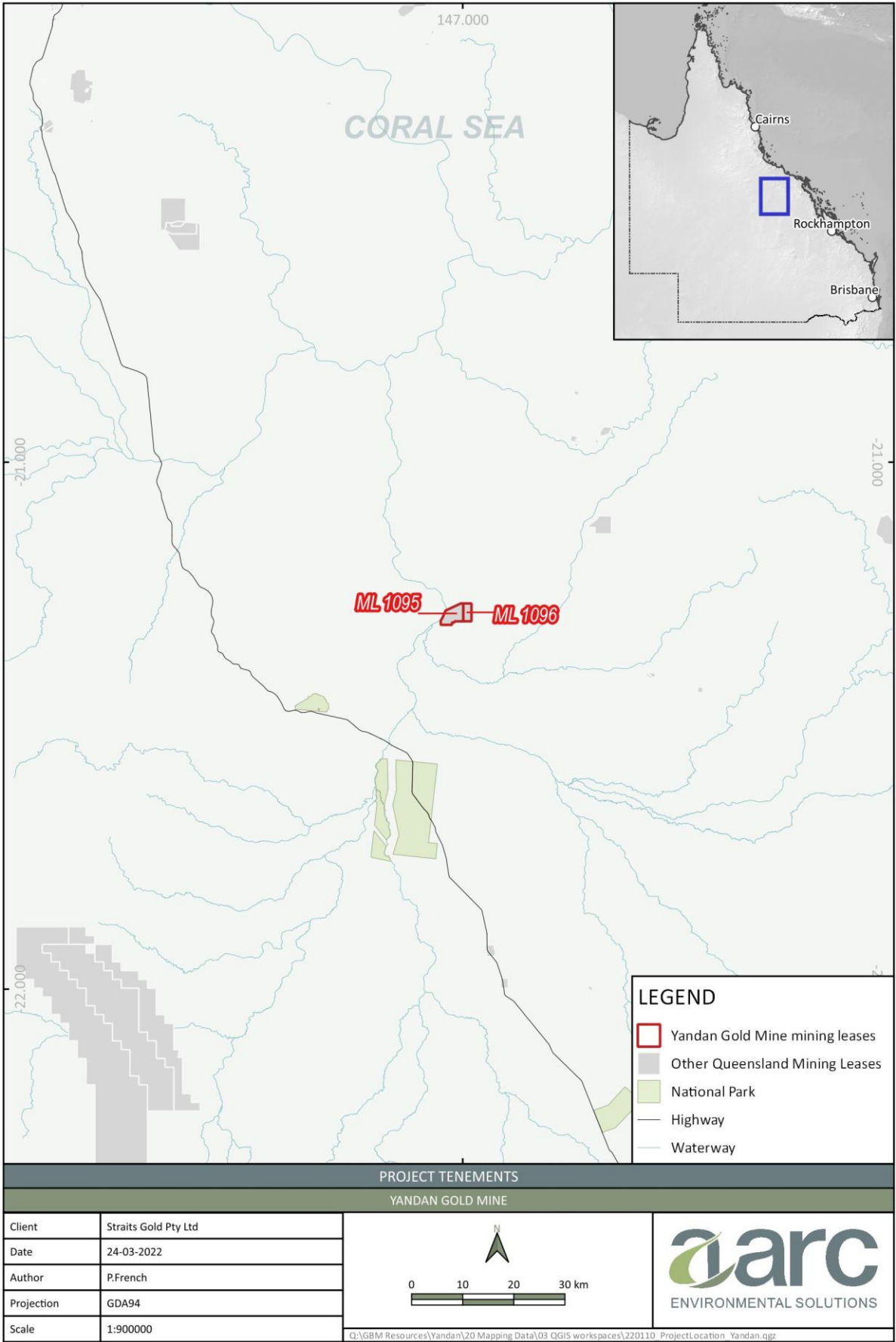


Figure 2: Project tenements

3.1.1.1 Past operations

Ross Mining N.L. operated the Project between 1993–2002, producing over 350,000 ounces of gold from heap leach operations and a Carbon in Leach (CIL) process plant. Ore was sourced from three open cut pits during operation, principally being Main Pit and South Pit, with a small pit also excavated at East Hill. During operations, low grade oxide ore (predominately clay rich) sourced from the three open cut pits was placed on a Heap Leach Pad (HLP).

Open cut mining operations ceased in 1998, with the HLP remaining operational until September 2002 (Figure 3). The site was placed into care and maintenance in April 1999, pending final closure works. The gold processing plant was later removed in 2006/2007, prior to the acquisition of the Project by Straits Gold; a wholly owned subsidiary of Aeris Resources Ltd at that time. The Project has remained in care and maintenance since cessation of operations in 1999, with some exploration activities undertaken since that time.

EP Act Schedule 3 Notifiable activities which are deemed likely to have been conducted at the Project site include:

- *Notifiable Activity 7 – Chemical storage (other than petroleum products or oil under item 29) – storing more than 10 t of chemicals (other than compressed or liquefied gases) that are dangerous goods under the dangerous goods code;*
- *Notifiable Activity 15 – Explosives production or storage— operating an explosives factory under the Explosives Act 1999;*
- *Notifiable Activity 20 - Landfill—disposing of waste (excluding inert construction and demolition waste).*
- *Notifiable Activity 24 – Mine wastes;*
 - (a) Storing hazardous mine or exploration wastes, including, for example, tailings dams, overburden or waste rock dumps containing hazardous contaminants; or*
 - (b) Exploring for, or mining or processing, minerals in a way that exposes faces, or releases groundwater, containing hazardous contaminants;*
- *Notifiable Activity 25 - Mineral processing—chemically or physically extracting or processing metalliferous ores.*
- *Notifiable Activity 29 – Petroleum product or oil storage, storing petroleum products or oil;*
 - (a) In underground tanks with more than 200 litre (L) capacity; or*
 - (b) In above ground tanks with:*
 - (i) For petroleum products or oil in class 3 in packaging groups 1 and 2 of the dangerous goods code – more than 2,500 L capacity; or*
 - (ii) For petroleum products or oil in class 3 in packaging groups 3 of the dangerous goods code – more than 5,000 L capacity; or*
 - (iii) For petroleum products that are combustible liquids in class C1 or C2 in Australian Standard (AS) 1940, 'The storage and handling of flammable and combustible liquids' published by Standards Australia – more than 25,000 L capacity.*

Rehabilitation has been approached progressively, with some domains partially rehabilitated. Rehabilitated domains include South Pit, the run-of-mine (ROM) pad, Cell A of the Tailings Storage Facility (TSF), the village infrastructure area, and the infrastructure/hardstand area.

Key existing infrastructure at Yandan includes the following (refer Figure 3):

- a Tailings Storage Facility (TSF);
- a HLP and associated treatment ponds;
- infrastructure and hardstand area;
- Main Pit;
- East Hill Pit;
- borrow pits for rehabilitation materials; and
- a number of water storage structures for the management of raw and mine affected water, including the Tailings Return Water Dam (TWRD), Water Storage Dam, Mine Water Dam, Heap Leach Pregnant and Barren Ponds, and the Heap Leach Stormwater Pond.

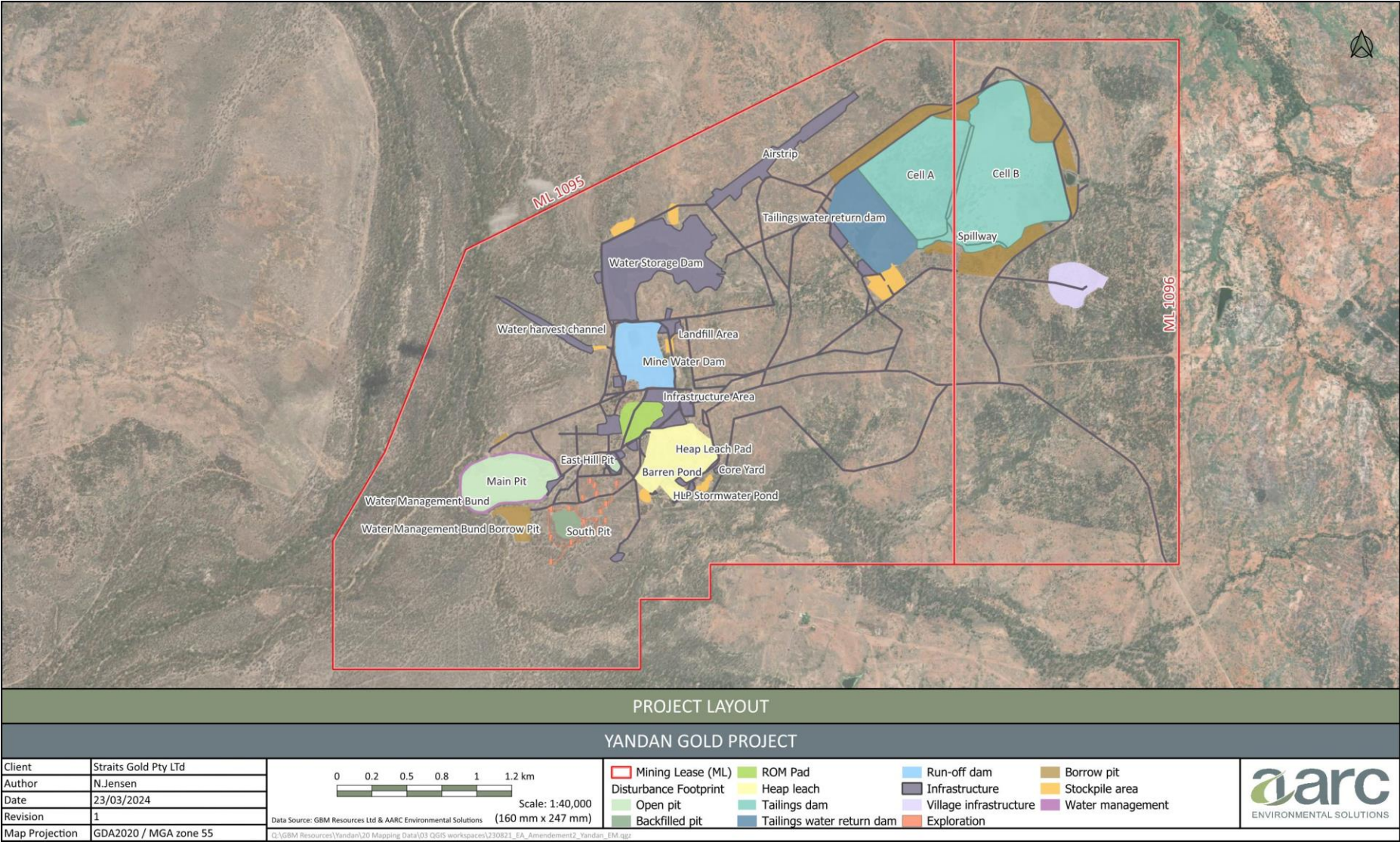


Figure 3: Project layout

3.1.1.2 Future mining activity

Exploration and resource optimisation

Since acquiring the Yandan Gold Mine in January 2021, GBM have identified opportunities to extract additional value from Yandan and consider Yandan to be under explored and prospective for further gold discoveries.

Under GBM's new ownership, exploration has re-commenced at Yandan. In April 2021, a Phase 1 diamond and reverse circulation drilling program commenced. The drilling program targeted high grade mineralisation lying east of the Main Pit for potential open cut targets, with the aim of expanding existing resources located between the Main Pit and East Hill deposits. At the completion of Phase 1 drilling in July 2021, a total of 13 holes had been drilled for a total of 5,676 m.

Results from the Phase 1 drilling program have confirmed the potential to further expand the current gold resources at East Hill. At the time of this report, existing resources for the Yandan Project total 514,500 ounces gold (JORC 2012 'indicated' and 'inferred' resource estimate) of which 47% is 'indicated' resource. The total resource for the Yandan Project includes 55,000 ounces gold from nearby Illamata resource. The current phase of active exploration and resource optimisation aims to upgrade, as well as grow, the Yandan resource estimate to support development of a life of mine (LOM) plan for the Project.

Disturbance caused by exploration activities will be progressively rehabilitated during this phase. The approved post-mining land use (PMLU) for areas disturbed by exploration activities is 'open pasture'. The rehabilitation methodology to achieve this PMLU involves:

- removal of all equipment;
- capping or permanently plugging drill holes;
- a drying out period to allow water to evaporate from the drilling mud in the sumps;
- backfilling of drill sumps to natural surface;
- scarifying disturbed areas to promote revegetation;
- seeding of disturbed areas; and
- all exploration tracks (earthen) are to be ripped, graded and re-seeded, with soil to be salvaged from track windrows.

Mine planning and development

Yandan is a key asset in GBM's 'processing halo strategy' for the Drummond Basin, joining the nearby Mount Coolon asset and the recently acquired Twin Hills asset. It is proposed that in the future the Yandan site will provide a central processing hub for ore from the three projects, with existing infrastructure at Yandan supporting and accelerating the development of a gold mining and processing operation.

Subject to the resource optimisation work being completed across the three projects and forward market trends, the Project will move into a detailed mine planning phase. This planning work will ensure the development of an efficient and sustainable mine plan, with a focus on achieving progressive rehabilitation milestones at Yandan.

It is anticipated that the duration of the resource optimisation and mine planning phases will collectively be five years (i.e. to the end of 2030), noting that at the time of submission the Project is currently within the exploration and resource optimisation phase.

Construction

Construction activities will focus on preparing the site for safe operations. These activities will include:

- acquiring a suitable workforce and contractors;
- securing accommodation;
- clearing infrastructure and laydown areas;
- installation of roads and tracks;
- construction of temporary offices and other infrastructure;
- earthworks to ensure safe operating areas;
- installation of services such as power and water transfer equipment; and
- re-activation of the existing water storage structures.

Operation

Processing and operational activities are planned to restart at Yandan, with mined ore from Yandan, Mount Coolon and Twin Hills to be processed at the Yandan site, once confirmed by project evaluation steps and approvals.

Future activities at Yandan are anticipated to include open cut mining operations. Exploration has identified that economic reserves remain within the East Hill and South Pit area, with this being the target of the current resource optimisation phase (Figure 4). New open cut mining activities are anticipated within this area.

Open cut mining is authorised under the Yandan EA. . It is anticipated that an EA amendment would be sought to authorise any new open pits and/or expand existing resource and supporting infrastructure footprints.

GBM are also currently exploring the potential for re-processing the tailings within the existing TSF footprint, and re-irrigating the HLP using a bacterial treatment method. These concepts will be considered and refined within the detailed mine planning phase.

Water supply to the Project will be provided through existing water licences that permit water harvesting from the Sutor River (valid to 2111). Management of raw and mine affected waters on the Project will be through the existing water storage network.

Project duration

Operations are expected to occur for a duration of approximately ten years. This timing is subject to mine planning and the broader development plans for GBMs assets within the Drummond Basin.

Much of the existing infrastructure at Yandan is planned to be re-commissioned for processing and operational activities, with rehabilitation to follow the operational phase of the Project. The following key considerations have been made with regards to the availability of land for rehabilitation:

- Commencement of mining—Yandan contains gold ore reserves which will be mined within five (5) years; following a sequence of:
 - resource optimisation and mine planning (1–5 years); and
 - construction activities (1–2 years).
- GBMs broader developmental plans incorporate its three Drummond Basin assets; Yandan Gold Project, Mount Coolon Gold Project, and the newly acquired Twin Hills Operation. Yandan is proposed to be a central processing hub for ore from all three assets; with ore from Yandan to be initially processed, followed by ore from Twin Hills and then Mount Coolon.
- Existing infrastructure—Yandan has existing infrastructure to accelerate the development of a gold mining operation and central processing facility for ore from its Drummond Basin assets. As such, infrastructure at Yandan will be required for processing the material from other projects following the cessation of mining activities at Yandan. Centralising processing activities at Yandan has the dual benefit

of minimising new disturbance by using existing infrastructure footprints, and maximising project efficiencies by limiting the need for new infrastructure.

- Improvement of voids—Main Pit and East Hill Pit present future open cut mining potential, and as such, are not planned to undergo any significant rehabilitation until mining has been completed.
- Rehabilitation of the HLP—GBM have identified potential for irrigating the HLP using a bacterial treatment to maximise recovery of the remaining mineral resource. Rehabilitation of the HLP will therefore be completed following re-treatment activities.
- Rehabilitation of Cell B of the TSF—GBM have identified potential for re-use of the existing facility for additional tailings storage (subject to raising the existing embankments), and/or placement of a heap leaching facility within the existing disturbance footprint. Installation of a suitable capping system would therefore occur following the completion of mining and processing or when the future storage capacity is exhausted, and/or following the decommissioning of the proposed heap leach facility.
- Rehabilitation of water storage dams and processing ponds—water storage dams and processing ponds will remain operational to support future operations, unless it is determined through the detailed mine planning phase that the facility would not be required. All remaining water storage dams and processing ponds would be decommissioned on closure (unless subject to a landholder agreement or identified as having a post mining land use of ‘water storage’).
- Rehabilitation of infrastructure / hardstand areas—infrastructure / hardstand areas will remain operational to facilitate mine operations and rehabilitation activities.

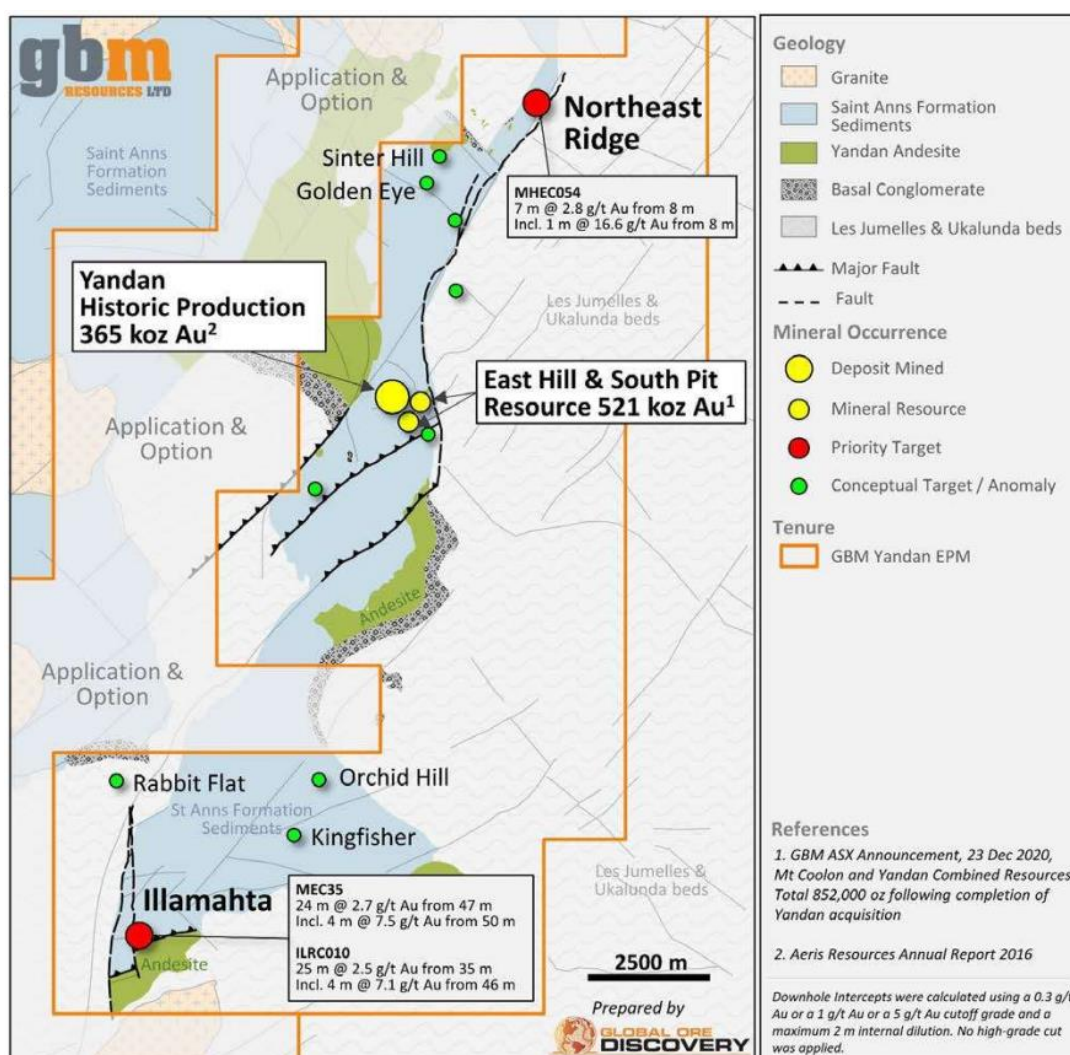


Figure 4: Yandan reserve targets

3.1.2 Existing rehabilitation

Existing rehabilitation and associated monitoring have been undertaken in accordance with the objectives Project EA conditions, where:

(F2-4) All land subject to mining activities must be rehabilitated to:

(a) a stable landform and with a self-sustaining vegetation cover and species that are similar to adjoining undisturbed areas;

(b) a safe landform, which is non-polluting, geo-chemically and geo-technically stable.

(c) ensure that all land is reinstated to the pre-disturbed land use and suitability class unless otherwise stated in Schedule F – Table 1 (Post Mine Land Description);

(d) ensure that the maintenance requirements for rehabilitated land is no greater than that required for the land prior to its disturbance by mining activities; and

(e) ensure that the water quality of any residual void or water bodies constructed by mining activities meets criteria for subsequent uses and does not have potential to cause environmental harm.

(F2-5) Maintenance of rehabilitated areas must take place to ensure and demonstrate:

(a) stability of landforms;

(b) erosion control measures remain effective;

(c) stormwater runoff and seepage from rehabilitated areas does not negatively affect the environmental values of any waters; and

(d) plants show healthy growth and recruitment is occurring.

Rehabilitation has been approached progressively at Yandan since operations ceased in 2002, with some domains partially rehabilitated. Rehabilitation has been undertaken for Cell A of the TSF, South Pit (including a complete backfill), and much of the infrastructure and mine village infrastructure areas (with the minor exception of some remaining concrete footings and hardstands); refer Figure 3. A detailed description of rehabilitations works and rehabilitation monitoring outcomes for these domains is provided below.

It is noted that knowledge of the specifics of rehabilitation activities (seeding rates, topsoiling methods etc.) undertaken prior to the ownership of Straits Gold Pty Ltd is limited. However, ongoing rehabilitation monitoring have indicated that suitable methodology has been employed with rehabilitation trending towards completion criteria.

Rehabilitation monitoring

Rehabilitation monitoring is ongoing and has been undertaken at Yandan since 2014, with reference locations established and monitored during this time. Progressive rehabilitation sites are located at the following mine domains:

- South Pit (SP1 and SP2);
- Run-of-Mine (ROM1, ROM2, and ROM3);
- Cell A (A1 and A2);
- Rehabilitated Infrastructure (RI1 and RI2); and
- Village Infrastructure (V1 and V2).

Cover trial sites on TSF Cell B provide for monitoring of each trial cover system type, including:

- Thin Cover – 300 mm topsoil placed on the tailings surface (monitoring location 'B1' and 'B2').
- Thick Cover – 450 mm topsoil placed over oxide tailings (monitoring location 'B3' and 'B4').
- Gravel Topsoil cover – 0 – 600 mm gravelly topsoil placed over sulphide tailings (monitoring location 'B5').
- Gravel Topsoil cover – 400 mm gravelly topsoil placed over sulphide tailings (monitoring location 'B6').

Three reference sites have been established outside of the Project disturbance footprint (R1, R2, and R3). Reference sites represent vegetation that is naturally established under local climate and substrate conditions to sustainably provide the target PMLU. In this case, low to very low-intensity grazing. Reference data from these sites continues to provide the benchmark for measuring rehabilitation performance of rehabilitated sites and cover trials towards the post-mine land use of low intensity grazing. Reference sites were selected based on the current land use, natural topography and vegetation type consistent with the nominated PMLU.

The 2023 monitoring locations are provided in Table 2 and Figure 5. The 2023 rehabilitation monitoring report (AARC) has been provided in Appendix G.

Table 2: Vegetation monitoring sites

Site name	Site type	Easting	Northing	Location	Rehabilitation method	Rehabilitation classification	Year established
Reference Sites							
R1	Reference	501535	7644552	South of the village infrastructure	-	Open pasture	2014
R2	Reference	500605	7644748	South of the village infrastructure	-	Open pasture	2014
R3	Reference	499022	7645610	East of rehabilitated infrastructure	-	Open pasture	2014
Cell B Sites							
B1	TSF Cell Trial: Cell B – Thin Cover	500590	7647564	Southern trial area Cell B	300 mm topsoil placed directly on the tailings surface	Thin Cover	2014
B2	TSF Cell Trial: Cell B – Thin Cover	500591	7647544	Southern trial area Cell B	300 mm of topsoil placed directly on the tailings surface	Thin Cover	2014
B3	TSF Cell Trial: Cell B – Thick Cover	500586	7647610	Northern trial area Cell B	450 mm topsoil over oxide tailings	Thick Cover	2014
B4	TSF Cell Trial: Cell B – Thick Cover	500587	7647593	Northern trial area Cell B	450 mm topsoil over oxide tailings	Thick Cover	2014
B5	TSF Cell Trial: Cell B – Gravel Topsoil	500655	7647058	South-east area Cell B	0-600 mm gravelly topsoil over sulphide tailings	Gravelly topsoil	2014
B6	TSF Cell Trial: Cell B – Gravel Topsoil	500573	7647785	Northern end of Cell B	400 mm of gravelly topsoil over sulphide tailings	Gravelly topsoil	2014
Cell A Sites							
A1	TSF Cell Trial: Cell A	499745	7646926	South-west Cell A	Revegetation of Oxide tailings (direct seeding)	Open woodland	2014
A2	TSF Cell Trial: Cell A	499647	7647367	North-west Cell A	Revegetation of Oxide tailings (direct seeding)	Open woodland	2014

Site name	Site type	Easting	Northing	Location	Rehabilitation method	Rehabilitation classification	Year established
South Pit Sites							
SP1	Progressive rehabilitation – South Pit	497367	7644773	Top of hill. North area of pit.	Back filled pit	Rehab grassland	2017
SP2	Progressive rehabilitation – South Pit	497379	7644712	Centre of south pit	Back filled pit	Rehab grassland	2017
SP3	Progressive rehabilitation – South Pit	497373	7644677	South portion of south pit	Back filled pit	Rehab grassland	2017
ROM Pad Sites							
ROM1	Progressive rehabilitation – Run-of-Mine	497938	7645565	Eastern ROM	Rehab low slope	Rehab grassland	2017
ROM2	Progressive rehabilitation – Run-of-Mine	497795	7645464	ROM central west	Rehab slope	Rehab grassland	2017
ROM3	Progressive rehabilitation – Run-of-Mine	497800	7645437	ROM Pad Central (east of Road)	Rehab flat	Rehab grassland	2018
Rehabilitated Infrastructure Sites							
RI1	Progressive rehabilitation – Rehabilitated Infrastructure	498036	7645587	RI North	Rehab flat	Rehab grassland	2017
RI2	Progressive rehabilitation – Rehabilitated Infrastructure	498141	7645484	RI South	Rehab flat	Rehab grassland	2017
Village Infrastructure Sites							
V1	Progressive rehabilitation – Village Infrastructure	500913	7646442	North-west sector of village, north of road	Rehab flat	Rehab grassland	2017
V2	Progressive rehabilitation – Village Infrastructure	500883	7646405	SW sector of village, south of road	Rehab flat	Rehab grassland	2017

Note: Substrate information presented in this table is sourced from a tailings characterisation undertaken by Aeris Resources Pty Ltd in October 2014. GPS information provided in UTM GDA94.

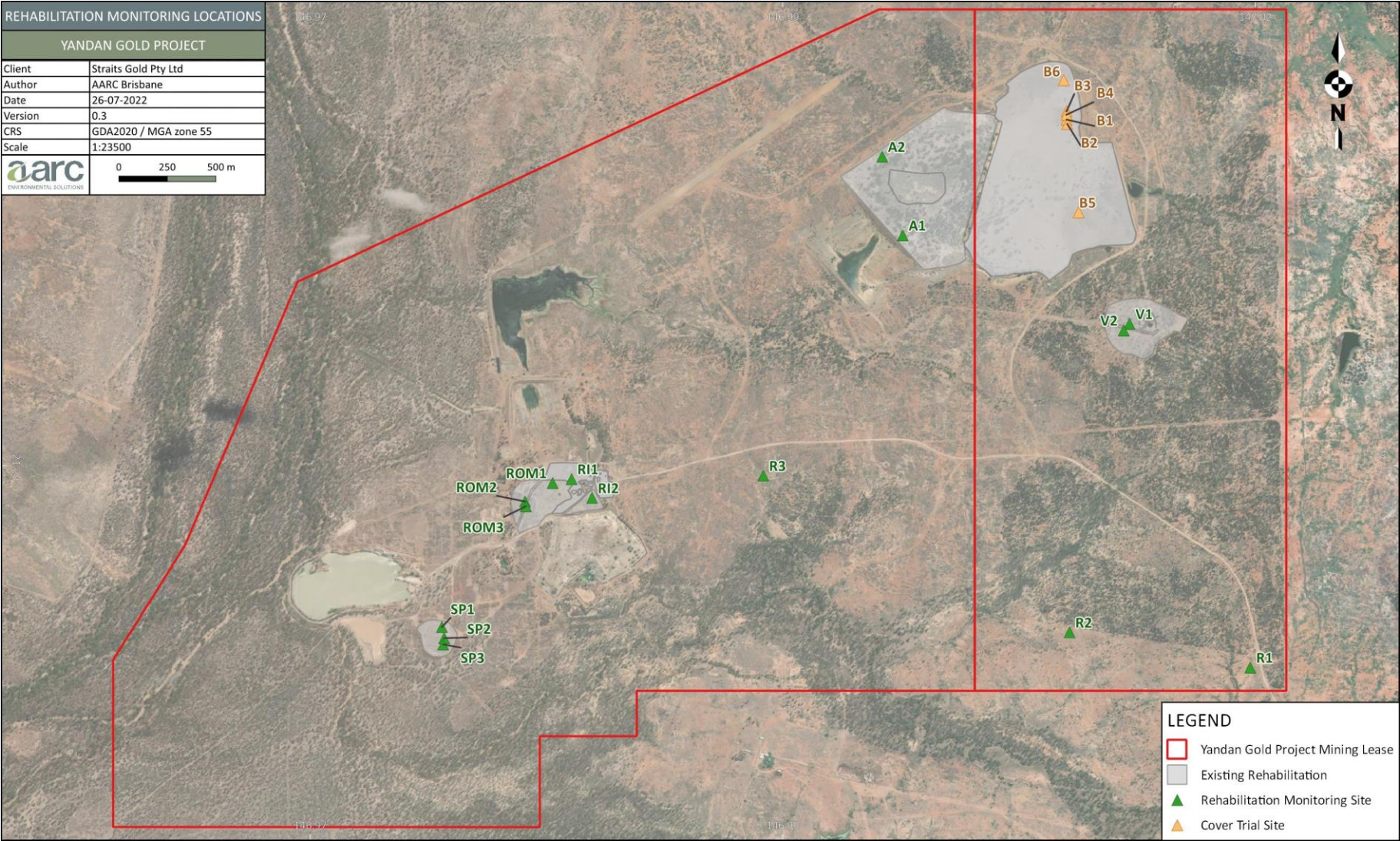


Figure 5: Rehabilitation monitoring locations

3.1.2.1 Cell A of the TSF

Rehabilitation of Cell A of the Yandan Tailings Facility was completed circa 1999–2000 (Wirralie Gold Mine 2005), informed by geochemical assessments and revegetation trials (Ross Mining N.L. 1999). During operation, Cell A was used exclusively for the deposition of oxide tailings with an estimated 2,323,035 t of oxide tailings deposited into the facility at a density of 1.1 t/m³ (Ross Mining N.L. 1992).

Two earth and rockfill embankments contain Cell A, with the Main Wall being the principal containment structure. Main Wall runs 1,400 m along the southwestern boundary of the facility, with a wall height of 15.4 m (PSM 2021a). The Northern Embankment of Cell A contains the facility on the north-eastern boundary, with a height of 2.5 m. Assessment of the embankments undertaken as part of the Regulatory Dam assessment in accordance with the Project EA found that the facility is stable, being in generally good condition with some erosion noted (PSM 2021a). A Hazard Consequence Category Assessment undertaken in July 2021 has further assessed the overall consequence category for the Yandan Tailings Dam (inclusive of Cell A and Cell B) as “low” (PSM 2021b), supporting that the facility poses a low risk to the surrounding environment.

Water management of Cell A consists of an excavated drainage line approximately 200 m long running from the northwest to the southern corner of Cell A. The drain is wide and shallow with a grade of less than 0.5:100. Water freely drains off Cell A and into the return water pond.

Geochemical assessment of the waste material has been undertaken and included sampling of the oxide tailings and composite samples of grasses found growing on the tailings surface, in addition to sampling for physical parameters and nutritional information to assist in assessing vegetation growth (Dwyer 2000). Results from this analysis found that salinity (EC) values for the oxide tailings were low, with a median value of 1,558 µS/cm (range: 201 – 16,010 µS/cm). Minor elevations of some metals were identified (antimony, arsenic and chromium) from the initial geochemical assessment however, follow-up assessments¹ have confirmed metals concentrations have decreased from the initial reported concentrations (RGS Environmental 2015). Material classification assessments have classified the oxide tailings as ‘barren’, confirming that the material is non-acid forming (NAF) and that there is no potentially acid forming (PAF) material present (RGS Environmental 2015).

Results from the geochemical assessment were used to characterise the substrate of Cell A for subsequent revegetation trials (Ross Mining N.L. 2000). Three revegetation trials (A1, A2 and pot trials) were undertaken with the objectives of determining the suitability of the tailings material as a growth medium for a number of grass and tree species and determining a suitable fertilisation rate to achieve a sustainable vegetation cover across the facility (Ross Mining N.L. 2000).

Grass and tree species that were confirmed to be suitable for growing on Cell A (as informed via the extensive field and pot trials) were directly planted into the surface of Cell A. Grass species planted included Rhodes Grass, Buffel and Couch, with Stylo (a pasture legume) also planted. Tree species River Red Gum and *Acacia salicina* (Sally Wattle) were also directly planted into Cell A.

Revegetation trials

Four sets of vegetation trials were completed over 1998 – 2000 to inform the rehabilitation methodology for Cell A; including two large plots established directly on the surface of Cell A, and two pot trials. The methodology and results for these trials are summarised below.

Trial A1

To confirm the suitability of the oxide tailings as growth media for the establishment of vegetation, a 70 m x 5 m plot was established directly on the surface of Cell A, with this plot further divided into 5 m x 5 m plots, for the application of seven treatments, with replication (refer to Figure 6). All treatments were grass seeded at a rate of 10 kg/ha and fertilised using diammonium phosphate at a rate of 200 kg/ha.

¹ RGS Environmental completed a geochemical assessment of the oxide and sulphide tailings stored in Cell B of the Yandan Tailings Dam in 2015. As the source rock for the oxide tailings in Cell A and Cell B is the same, it is anticipated that the updated geochemical assessment provides a more recent assessment on the oxide tailings geochemistry.

Treatments applied were:

- Tailings surface (Plot 1);
- 10 cm oxide waste (Plot 2);
- 10 cm oxide waste + 10 cm soil (Plot 3);
- 10 cm soil (Plot 4);
- 25 cm oxide waste + 10 cm soil (Plot 5);
- 50 cm oxide waste + 10 cm soil (Plot 6); and
- 50 cm oxide waste (Plot 7).

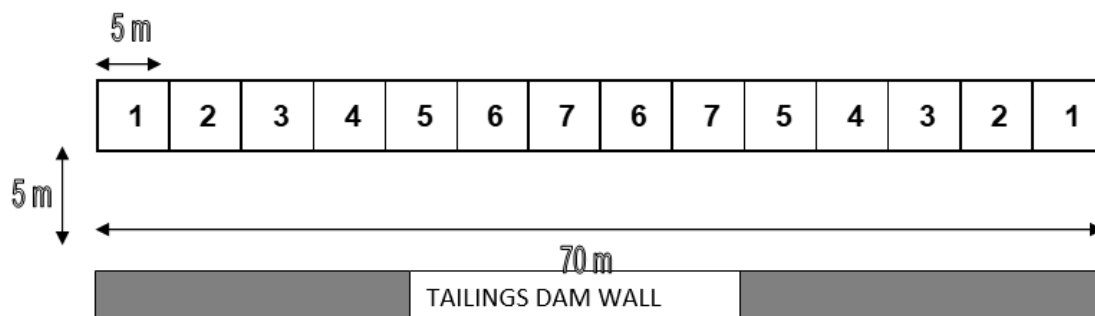


Figure 6: Trial A1 treatments plot set-up

Over an 18-month period, groundcover establishment was monitored at these trial sites. Percentage groundcover was found to increase to 100 % for the majority of treatments, including the plots established directly on the oxide tailings. Marginally lower (80 – 90 %) ground cover was recorded for other treatments, including the combined soil and oxide treatments. Ground cover on the oxide tailings treatments was comprised of Pioneer Rhodes (*Chloris gayana*) and Indian Couch (*Bothriochloa pertusa*) grasses, with Indian Couch having been originally seeded on the treatments. From the results of this trial, it was concluded that there was no quantifiable advantage in the placement of oxide waste and soil layers onto Cell A prior to revegetating (Ross Mining N.L 2000).

Trial A2

This trial was conducted to determine the fertilisation rates and species selection needed to achieve a sustainable groundcover (Ross Mining N.L 2000). The trial was completed over a 2,500 m² area, with a 10 cm topsoil layer applied over this area. Twenty-five 10 m x 10 m plots were established, each with specific treatments and three replication plots.

Treatments applied were:

- 10 kg/ha Pioneer Rhodes Mix + 100 kg/ha Diammonium Phosphate (P1);
- 10 kg/ha Pioneer Rhodes Mix + 200 kg/ha Diammonium Phosphate (P2);
- 4 kg/ha Tree Mix (*E.crebra*, *E.dichromophloia*, *E.papuana*) + 100 kg/ha Diammonium Phosphate (T1);
- 4 kg/ha Tree Mix (*E.crebra*, *E.dichromophloia*, *E.papuana*) + 200 kg/ha Diammonium Phosphate (T2);
- 4 kg/ha Katambora Rhodes + 100 kg/ha Diammonium Phosphate (K1);
- 4 kg/ha Katambora Rhodes + 200 kg/ha Diammonium Phosphate (K2);
- 4 kg/ha Saltbush (*Atriplex spp.*) + 100 kg/ha Diammonium Phosphate (S1);
- 4 kg/ha Saltbush (*Atriplex spp.*) + 200 kg/ha Diammonium Phosphate (S2);

- Control 100 kg/ha Diammonium Phosphate (C1); and
- Control 200 kg/ha Diammonium Phosphate (C2).

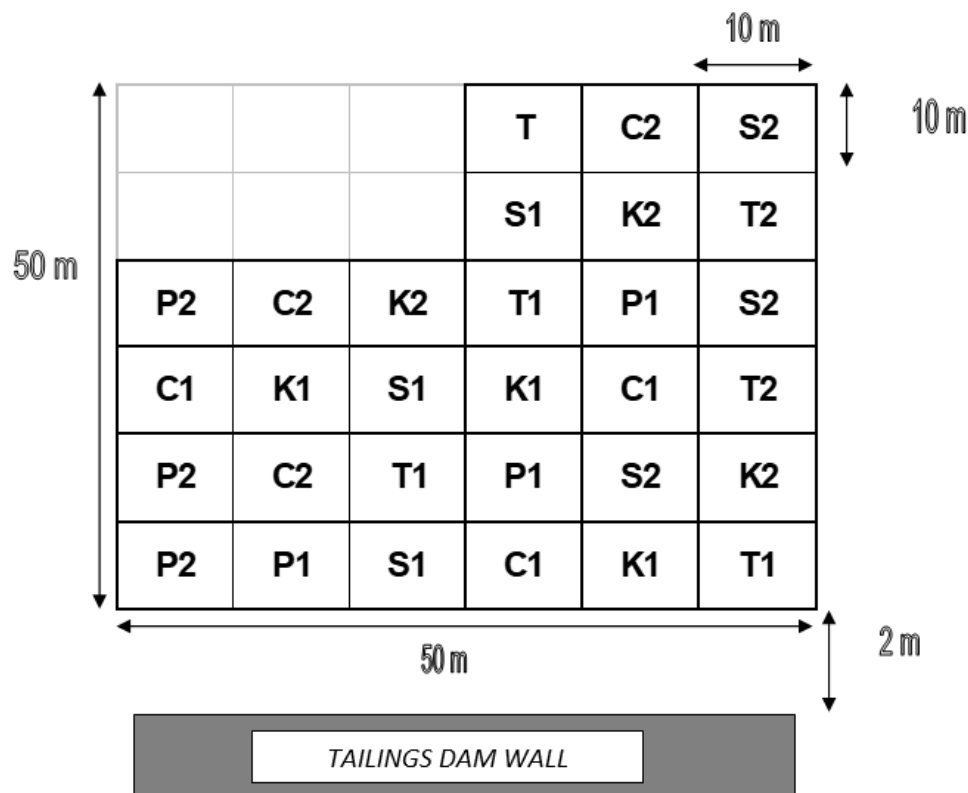


Figure 7: Trial A2 treatments – plot set-up

Ground coverage in the Trial A2 treatments was measured 1 month and 12 months after establishment. Monitoring after 12 months demonstrated that Pioneer Rhodes grass, with fertilisation rates of either 100 kg/ha or 200 kg/ha, became well established on the plots at 70% and 50%, respectively. *Katambora rhodes* grass also showed excellent establishment, with ground covers of greater than 90 % established with the 100 kg/ha fertiliser treatment. From this trial it was determined that Pioneer Rhodes and *Katambora rhodes* grass was well suited to growth in the tailings environment and were both recommended for use in rehabilitating Cell A (Ross Mining N.L 2000).

It is noted that 10 cm of topsoil was applied to the Trial A2 plot for all treatments. Results from this trial demonstrated that comparable ground cover can be established on Cell A regardless of whether seeds are directly planted into the oxide tailings (as per Trial A1) or placing a thin topsoil cover prior to re-vegetation (as per trial A2). Results from Trial A2 also support the strategy of direct seeding on Cell A as a suitable rehabilitation strategy.

Pot trials P1 and P2

Two pot trials (P1 and P2) were completed on amended oxide tailings material to confirm the suitability of the material for vegetation establishment.

The first trial (P1) assessed the establishment of various seed mixes, focusing on grasses (including native and introduced pasture species) and shrub species. Composite samples (taken from 0 – 300 mm depth) from Cell A were collected and placed into growing trays (34 cm x 15 cm), with specific treatments applied to each tray. Treatments varied in terms of species mix and whether the plot was scarified or left undisturbed. Applied treatments included:

- 1) A native grass seed mix, applied at the equivalent of 10 kg/ha. The native grass seed mix comprised *Dichanthium sericeum* (Queensland Bluegrass), *Astrebla spp.* (Mitchell grasses), *Themeda triandra* (Kangaroo Grass) and *Heteropogon contortus* (Black Speargrass).
- 2) *Petalostigma pubescens* (Quinine tree) seed applied at the equivalent of 10 kg/ha.
- 3) *Crotalaria sp.* seed applied at the equivalent of 10 kg/ha.
- 4) *Chamaecrista rotundifolia* (Wynn Cassia) seed applied at the equivalent of 10 kg/ha.
- 5) "Speedy Couch" seed applied at the equivalent of 10 kg/ha.
- 6) *Stylosanthes hamata* (Verano stylo) seed applied at the equivalent of 10 kg/ha.
- 7) *Chloris sp.* seed applied at the equivalent of 10 kg/ha.

Results from Trial P1 were assessed in terms of germination success (i.e. the number of germinated individuals) between the scarified and non-scarified treatments. Generally, germination success was higher (in some instances, double) for the scarified treatments, versus the non-scarified treatments.

Germination success was high for grass seed mixes, particularly for the Speedy Couch, Rhodes Grass and the native seed mix. Germination success declined approximately 50 – 73 % for these grasses when the growth media was not scarified, however with germination success still remaining relatively high.

Germination success was also high for *Wynn Cassia*, a legume that is sometimes used to supplement native pastures. Germination success for *Wynn Cassia* was higher in scarified treatments when compared to un-scarified treatments.

From these results, the Speedy Couch, Rhodes Grass, native grass species mixes and *Wynn Cassia* were considered to be appropriate for revegetating Cell A (Ross Mining N.L. 2000).

Table 3: Germination success for Trial P1 treatments

Species	Number of germinated individuals	
	Scarified	Not Scarified
Quinine Tree	1	4
<i>Crotalaria sp.</i>	29	40
<i>Wynn Cassia</i>	200	100
Speedy Couch	200	100
Native Grass	130	70
Verano Stylo	80	60
Rhodes Grass	150	110
Control	0	4

The second Trial (P2) focused on the assessment of the oxide tailings suitability as a growth medium for a number of tree species. Trial P2 consisted of an extensive pot trial undertaken by Ms. Thompson from the University of Queensland, with a report prepared for the study (Thompson 1999). Details of this study are summarised in the 'Rehabilitation of Yandan Tailings Facility and Return Water Dam' report

(Ross Mining N.L. 2000). Unfortunately, however, the Thompson report has since been lost from the archives. Key results are however provided in the Ross Mining report (Ross Mining N.L. 2000).

This trial was completed over a four-month period. Results from Trial P2 are summarised as follows (Thompson 1999):

- Of the tree species tested, *Eucalyptus argophloia* (Queensland White Gum), *E. camaldulensis* (River Red Gum) and *Eucalyptus ochrophloia* (Yapunya) displayed the highest tolerance to the oxide tailings material.
 - *Eucalyptus argophloia* and *E. camaldulensis* performed the best in the oxide tailings containing higher conductivity, average bulk density and low moisture content. These species also grew well in tailings of lower conductivity, higher bulk density and high moisture content sites
 - *Eucalyptus ochrophloia* showed only a moderate tolerance to conductivity.

Results from Trial P2 suggest that Queensland White Gum and River Red Gum are suitable for use as primary species for tree revegetation (Thompson 1999, Ross Mining N.L. 2000).

Revegetation trials identified that grasses, such as *Cenchrus* spp. and *Chloris* spp., were suitable for direct seeding into the tailings surface. Tree species such as *Eucalyptus argophloia* (Queensland Western White Gum) and *E. camaldulensis* (River Red Gum) were identified as primary species for tree vegetation, performing well in the tailings rooting medium trials. These species were sown directly into the tailings material and have become well established over time.

3.1.2.2 Rehabilitation monitoring

Results from the 2004-2005 monitoring event are summarised below (Wirralie Gold Mine 2005):

- Re-vegetated areas developed communities dominated by River Red Gum, interspersed with Sally Wattle. During the 2004 monitoring event, it was noted that all trees were flowering and seeding prodigiously, with evidence of recruitment for eucalypts and acacias. Tree height was approximately 15 m, with girth measurements of approximately 110 cm and a density of more than 100 trees/ha.
- Ground cover in areas dominated by trees was initially low (with areas generally having less than 30% groundcover), however higher ground cover (i.e. >50%) was recorded in areas with lower canopy cover.
- Species richness was on average 12 species, comparable to analogue sites.
- Considerable organic material (leaf litter) was recorded.
- Invertebrate activity was observed in 80% of the rehabilitated Cell A quadrats, indicating favourable habitat conditions for invertebrates and development of habitat complexity.

An annual Rehabilitation Monitoring Program (RMP) was established in 2014 for routine monitoring of various rehabilitated domains at Yandan, relevantly including Cell A of the TSF. Monitoring under this program tracks the progress of rehabilitation towards completion criteria. Rehabilitation indicators and completion criteria for the Project are set out in the Post Mine Land Use Plan (PMLUP) (AARC 2018).

The Rehabilitation Monitoring Program specifically provides for the tracking of rehabilitated sites against the following completion criteria:

- evidence in the rehabilitation report that the revegetation meets the limits set by the analogue sites; and
- certification within the rehabilitation report that key species are present, suitable diversity has been achieved and cover/density is adequate. Evidence that weed management has been successful.

Three reference sites (refer to Table 2 and Figure 5) have been established for the purpose of setting benchmarks for rehabilitated areas, with the progress of rehabilitated sites measured against these sites.

As per relevant completion criteria for vegetation, reference sites establish benchmarks for the following parameters:

- the presence of key species;
- species diversity;
- cover/density; and
- abundance of weeds.

Erosion rates at reference sites are also used to establish benchmarks for erosion rates at rehabilitated sites, which are also monitored annually as part of the Rehabilitation Monitoring Program (with comparable erosion rates between rehabilitated and reference sites also being a key rehabilitation objective).

Rehabilitation monitoring undertaken between 2014–2023 as part of the Rehabilitation Monitoring Program (RMP) has identified that vegetation on Cell A has become well established, with vegetation characteristics comparable to reference sites (AARC 2018, AARC 2019, AARC 2021, AARC 2023). Key findings include:

- ground cover (total live cover) of the Cell A monitoring sites is established and relatively stable, with mean groundcover ranging between 76.5–89% in 2023;
- species richness of the Cell A monitoring sites is comparable to reference sites, with mean species richness between 15–17 reported in 2023;
- a high proportion of woody stemmed species (shrubs and trees) were identified at Cell A monitoring sites;
- weed species groundcover is low at Cell A monitoring sites and equal to reference sites;
- consistent canopy coverage has been observed at Cell A monitoring sites throughout the monitoring period, with an overall increasing trend; and
- erosion monitoring has not recorded anything above a ‘minor’ classification for rill erosion.

With regards to the criteria for the presence of key species, rehabilitation monitoring results indicate that key species from reference sites have established at Cell A monitoring sites. Vegetation composition at reference sites is dominated by exotic pasture species, with Buffel grass being the dominant species across all reference locations. The only other species shared between reference sites was *Urochloa mosambicensis* (Sabi grass) and *Stylosanthes scabra* (Shrubby Stylo) (at ‘R2’ and ‘R3’), with other pasture species present (in significantly smaller percentages) including other exotics such as *Sporobolus actinocladus* (Katoora Grass) and *Bothriochloa pertusa* (Indian Bluegrass). Tree species were recorded infrequently within analogue sites, with observed species limited to *Acacia salicina* (Sally Wattle) and *Atalaya hemiglauca* (Whitewood). Shrubs are limited to infrequent occurrences of *Carrissa spinarum* (Currant Bush).

Vegetation composition at Cell A monitoring sites is comparable to reference location and are dominated by exotic pasture grasses, predominantly Buffel grass, with minor inclusions of *Chloris inflata* (Purpletop Chloris) and *Cynodon dactylon* (Green Couch). Tree species are also consistent with analogue sites, with Sally Wattle and Whitewood reported. Shrubs are absent from Cell A monitoring sites, noting shrubs are also infrequent at analogue sites.

Monitoring results indicate that rehabilitated Cell A sites are generally more diverse than reference sites. Over the last three years, the average species diversity at Cell A sites has been 19, versus 11 at reference sites. Rehabilitated Cell A sites therefore exceed the species diversity limit set by reference site, meeting this component of the vegetation completion criteria.

Cell A’s progress against relevant completion criteria is summarised in Table 4 and Table 5. Overall, the established vegetation cover on Cell A appears to be trending toward a grazing landscape consistent with reference sites; and with demonstrable progress towards rehabilitation. Over the seven-year duration of rehabilitation monitoring, the collated data set appears to be confirming the rehabilitation strategy as successfully trending toward a rehabilitated area that can be regarded as being safe, stable, non-polluting and generally self-sustaining. Monitoring of the receiving environment of the Yandan Tailings Dam (including Cell A) is being provided by the surface water and groundwater monitoring program as well as the Receiving

Environment Monitoring Program. This monitoring indicates that the Yandan Tailings Dam has had negligible impact on the receiving environment. Furthermore, seepage from the facility capable of causing environmental harm has not been identified. Nevertheless, following the ERC decision process in 2023 decision to rehabilitate the entire facility was made until sufficient data from the monitoring network demonstrates otherwise.

Table 4: Cell A progress against completion criteria in PMLUP

Rehabilitation Goal (PMLUP)	Rehabilitation indicator (PMLUP)	Completion Criteria (PMLUP)	Progress towards completion criteria
Safe Site	Safety assessment of final landform by an appropriately qualified person (AQP).	Evidence in rehabilitation report that ground is structurally sound and safe.	Completion criteria not yet achieved.
Non-polluting	Contaminated land assessment and site inspection.	Evidence of remediated landform in a contaminated land assessment report.	Completion criteria not yet achieved.
	Rehabilitation monitoring plan in place to monitor downstream surface, groundwater and stream sediments.	Evidence in the rehabilitation report that post-closure monitoring shows the final landform is compliant with limits in the relevant Environmental Protection Policies or other agreed limits.	Established receiving environment monitoring programs (including surface waters, groundwaters, stream sediments) has provided long-term (2011 – current) monitoring of the facility. Results generally demonstrate compliance with limits in the Yandan EA, with some localised groundwater impacts, with some minor elevated parameters within the downgradient TWRD. Collectively, results from the monitoring programs suggest any potential impacts from Cell A are contained, with no seepage from the facility capable of causing environmental harm identified.
	Technical design of barriers.	Engineer's certification of construction and maintenance to specified design performance.	Completion criteria not yet achieved.
	Geochemical characterisation to ensure rehabilitation facilitates a geochemically stable landform.	Evidence that rehabilitated landform will be geochemically stable and not result in serious environmental harm.	Geochemical characterisation has been completed for the facility (Ross Mining R.L. 2000, RGS 2015). Results indicate that the material is relatively benign (being barren, inert and having a LAFP), and stable (being unlikely to be susceptible to significant dispersion and erosion). No observed seepage of contaminants capable of causing serious environmental harm identified.
	Monitoring of surface water and groundwater.	Evidence that monitoring data meet specified criteria	Results generally demonstrate compliance with limits in the Yandan EA, with some localised groundwater impacts at

Rehabilitation Goal (PMLUP)	Rehabilitation indicator (PMLUP)	Completion Criteria (PMLUP)	Progress towards completion criteria
		relevant to potential contaminants.	monitoring bore 'TD4', and slight elevations in pH within the downgradient TWRD. Collectively, results from the monitoring programs suggest any potential impacts from Cell A are contained.
Stable Landform	Geotechnical studies of final landform.	Evidence in rehabilitation report of geotechnical studies to determine whether final landform is stable.	Geotechnical assessment and erosion stability assessment currently being completed.
	Risk assessment of final landform.	Evidence in rehabilitation report that appropriate risk assessment and control measures have been undertaken.	Completion criteria not yet achieved.
	Geotechnical, geochemical and hydrological studies of existing structures (outer batter slopes of tailings storage facilities).	Evidence in rehabilitation report that appropriate risk assessment has been undertaken and control measures are in place that will continue to meet agreed requirements.	Erosion stability assessment (including characterisation of material from outer batter slopes) is currently being completed to assess stability of Cell A embankments) and inform final slope requirements. Geotechnical assessment of the Cell A embankments is currently being undertaken by BlackRock Mining Solutions Pty Ltd. Hydrological assessment of the Yandan Tailings Dam (including Cell A) has been completed by See Built Earth (SBE 2022). The assessment identifies some remaining ponding issues on Cell A which need to be addressed through maintenance of the existing rehabilitation (rehabilitation actions have been costed in the Calculator). Flood assessment identified no risk of flooding to Cell A embankments. It is noted that groundwater monitoring bores around not representative of groundwater as they likely lay within the potentiometric surface if the tailings facility itself. As such, the groundwater monitoring network was updated in January 2024, with the first round of monitoring undertaken in February 2024.
	Engineer's assessment of design and construction of structures to control water flow.	Engineer certification in rehabilitation report that infrastructure sites (both remaining and decommissioned) have the required structures to control water flow and runoff.	Completion criteria not yet achieved.

Rehabilitation Goal (PMLUP)	Rehabilitation indicator (PMLUP)	Completion Criteria (PMLUP)	Progress towards completion criteria
	Vegetation assessment.	Evidence in the rehabilitation report that the revegetation meets the limits set by the analogue sites.	Established Rehabilitation Monitoring Program provides for monitoring progress of Cell A rehabilitation.
Sustains agreed land use	Soil testing of chemical, physical and biological properties to ensure soil is able to support PMLU before placement.	Evidence in rehabilitation report that all soil chemical, physical, and biological properties of are within acceptable limits that ensure soil is able to support PMLU.	Extensive testing of Cell A material completed prior to rehabilitation, confirming the suitability of the material as growth media.
	Vegetation assessment to determine: - presence of key species; - species type and diversity; and - abundance of weeds.	Certification within the rehabilitation report that key species are present, suitable diversity has been achieved and cover/density is adequate. Evidence that weed management has been successful	Cell A monitoring sites are achieving benchmarks for the presence of key species, diversity and weed management. Groundcover is currently slightly (approx. 10%) lower at Cell A sites over a long-term average. Appropriate costings included in Calculator for re-seeding to enhance groundcover.

Table 5: Rehabilitation objectives and completion criteria for rehabilitation sites in 2023

Objectives and completion criteria	Sites compared to reference site				
	South Pit	ROM Pad	Village Infra	Rehab. Infra	Cell A
<u>Rehabilitation objective: Adequate vegetation cover to minimise erosion</u>					
<u>Completion criteria: evidence in the rehabilitation report that the revegetation meets the limits set by the analogue sites</u>					
Ground cover	✓	✓			✓
Species richness	✓	✓		✓	✓
Restricted invasive plant species	✓		✓	✓	
Woody stem density	✓	✓	✓	✓	✓
Canopy cover	✓	✓	✓	✓	✓
Erosion	✓	✓	✓	✓	
<u>Rehabilitation objective: Self-sustaining vegetation cover and species similar to adjoining undisturbed areas.</u>					
<u>Completion criteria: (below)</u>					
Key species are present	✓	✓	✓	✓	✓
Suitable diversity has been achieved and cover/density is adequate	✓	✓		/	✓
Evidence that weed management has been successful	✓		✓		

/ - indicates completion criteria partially achieved, ✓ – indicates completion criteria has been achieved

3.1.2.3 Cell B of the TSF

The Yandan Tailings Dam is a non-operational TSF comprised of two separate cells, identified as Cell A and Cell B. The Cell B facility is physically isolated from Cell A. During operation through 1993 to 1999, the Cell B facility was used for the deposition of oxide and sulphide tailings (refer to Section 3.1). Collectively the facility had a 4,300 ML capacity.

The Yandan Tailings Dam was constructed in a valley with cross dams on clayey weathered materials with low permeability (Douglas and Partners 1988, within Ross Mining N.L. 1993). The facility is primarily contained by two walls, which are constructed with earth and rockfill embankments (AECOM 2016) and a clay core (Fraser Osborn 1997). In 1997, the perimeter walls of Cell B were raised one metre to accommodate additional tailings material from extended mine operations (Fraser Osborn 1997). The Eastern Perimeter Wall and Northern Perimeter Embankment heights are approximately 4.5 m and 1.0 m respectively, meeting the 'low' and 'very low' risk category criteria of 'embankments less than 15 m high' (Appendix A10).

Annual statutory dam inspections of Cell B are undertaken for the assessment of necessary structural, geotechnical and hydraulic performance criteria, as per the requirements of the Yandan EA. The most recent inspection (undertaken February 2023) identified that the principal containment structure for Cell B, the Eastern Perimeter Wall, was generally in good condition and required only minor earthworks to address gully erosion (PSM 2023). A Hazard Consequence Category Assessment undertaken in July 2021 has further assessed the overall consequence category for the facility as "low" (PSM 2021b), supporting that the facility poses a low risk to the surrounding environment.

The Yandan Tailings Dam was decommissioned in 1999 and has subsequently been drying for over twenty years. "Tailings management is typically easier, at least physically, in dry climates, where advantage can be taken of desiccation (that is, drying by exposure to the wind and sun) to naturally dewater, increase the density of the tailings and strengthen the tailings" (Williams 2020). This is an advantage afforded by the location of the Yandan site.

In preparation for rehabilitation works, California Bearing Ratio (CBR) testing was undertaken in 2013. Results of this testing confirmed that the tailings material is well consolidated, with CBR values generally greater than 10 (Fraser Osborn 2013), which is considered sufficient for the operation of large earth moving equipment. Geochemical testing has also confirmed that the tailings material is well consolidated and essentially impermeable (RGS 2015). This testing exceeds the 'moderate strength consolidated tailings' criteria for 'low' and 'very low' risk TSFs.

Rehabilitation trials

Development of Cell B has included placement of oxide ore as a capping material to the underlying sulphidic material (Straits Exploration 2005). Permeability and compaction testing indicate that this capping material is between 120 – 520 mm thick and is well consolidated (Straits Exploration 2005). It has long been the position that a clay low permeability cover or capillary break layer is not required to control acid mine drainage or the effects of capillary rise (Straits Exploration 2005), which has been supported by geochemical assessment (RGS 2015, 2021, 2022; Williams 2021). It is noted that the geochemical assessment undertaken by RGS concluded that it was unlikely that the tailings contained sufficient mass of soluble ions (acid, salt and metals) to significantly affect the overlying soil due to the effects of capillary rise; and therefore a capillary break is unlikely to be required (RGS 2015). As such, a 'direct soil cover' or 'store and release' cover system was proposed to be adopted.

As noted by Williams (2020), all soil covers will have some 'store and release' functionality, as such, the 2014 rehabilitation cover trials at Yandan involved the placement of topsoil and gravelly topsoil layers at varying thicknesses, directly onto the tailings surface (AARC 2021d). These trials were designed to assess performance outcomes of different material thicknesses and compositions. In 2014, four cover trials were established on the Cell B facility:

- 1) Thin cover – 300 mm topsoil placed on the tailings surface (monitoring location 'B1' and 'B2').
- 2) Thick cover – 450 mm topsoil placed over oxide tailings (monitoring location 'B3' and 'B4').

- 3) Gravel Topsoil cover – 0 – 600 mm gravelly topsoil placed over sulphide tailings (monitoring location 'B5').
- 4) Gravel Topsoil cover – 400 mm gravelly topsoil placed over sulphide tailings (monitoring location 'B6').

Annual monitoring of the cover trials has been undertaken since 2014 (refer Table 6), providing a high-value dataset for assessing the performance of the trial cover systems.

Table 6: Rehabilitation monitoring events

Monitoring event	Monitoring dates
1	8-9 October 2014
2	25-26 March 2015
3	10-11 June 2015
4	13-14 August 2015
5	17-18 May 2016
6	22 July 2017
7	28-29 May 2018
8	25-26 February 2019
9	24-26 August 2020
10	16-17 March 2021
11	31 May – 01 June 2022

Rehabilitation monitoring

Rehabilitation monitoring undertaken during 2014 – 2021 identified that the 'Gravel Topsoil cover' trials sites have established vegetation characteristics most comparable to reference sites and are meeting relevant completion criteria (refer Figure 9)(AARC 2018; AARC 2019; AARC 2021b):

- Ground cover composition and coverage of the trial sites is generally comparable to the reference sites (Figure 8);
- Species richness is well established, stable, and self-sustaining at TSF Cell B trial sites, and comparable to the reference sites.
- Canopy cover at the TSF Cell B trial sites is comparable to reference sites.
- Non-existent to minor erosion identified at trial sites, consistent with the reference sites.
- No declared/noxious weeds observed on the TSF Cell B trial sites.

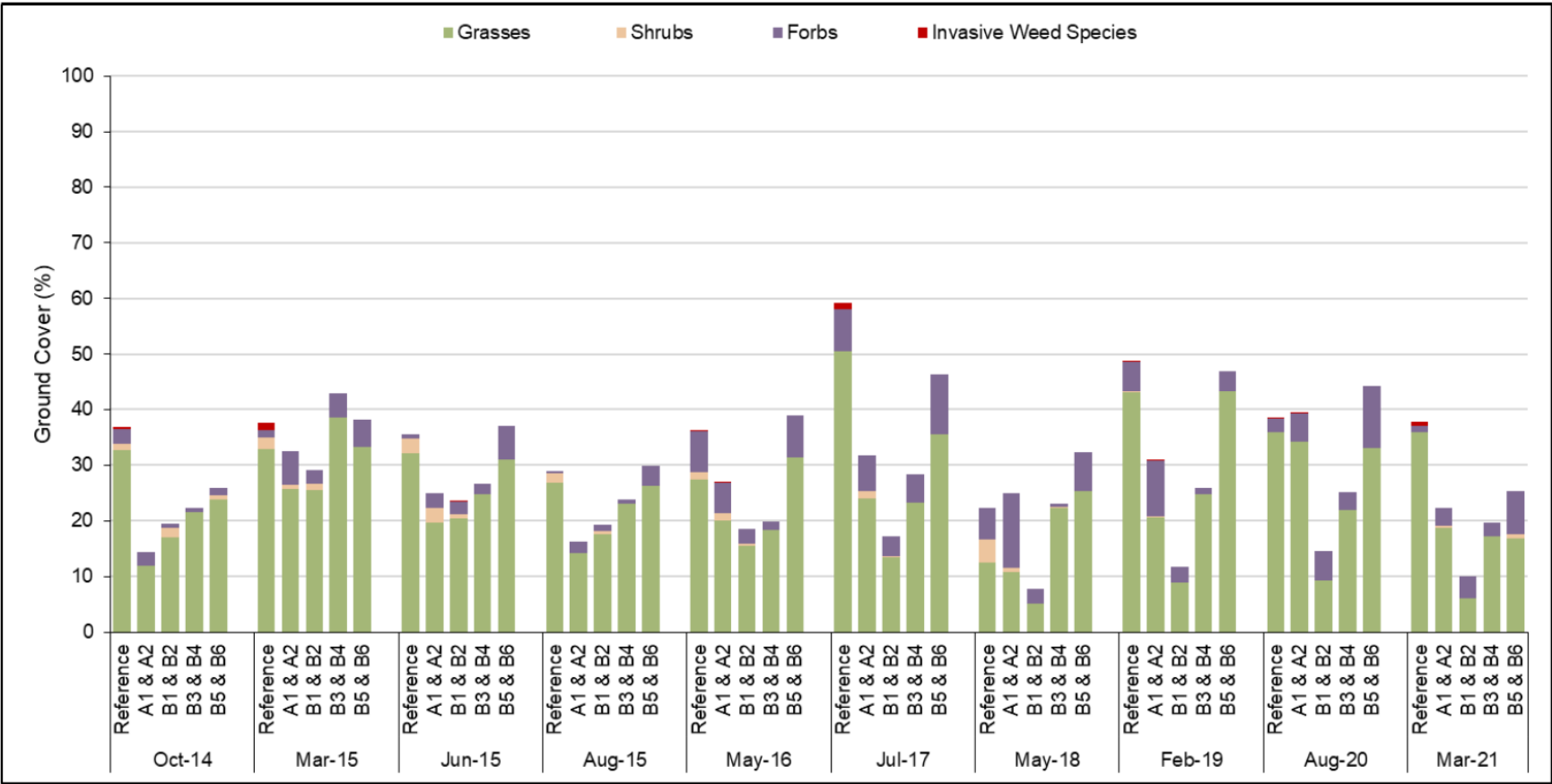


Figure 8: Ground cover at reference sites and TSF trial cover sites (Note – ‘B5’ and ‘B6’ correspond to ‘Gravel Topsoil’ trials)



Figure 9: Gravel Topsoil cover trial site (400 mm) – June 2022

Overall, the success of revegetation on the cover trial sites supports that there is no accumulation of soluble salts in the trial cover due to capillary action, which is supported by geochemical assessments. Geochemical assessment of soil and tailings material from trial sites (consisting of variable topsoil thicknesses placed directly on the TSF surface) found that “soluble and total elemental data suggest there has not been accumulation of soluble elements from the tailings into the trial soil cover through capillary action” and that it is “unlikely that the tailings contain a sufficient mass of soluble ions [...] to significantly affect the overlying soils due to the effects of capillary rise” (RGS 2015), supporting that a capillary break system is not required for the Cell B facility.

Climatic considerations

The Global Acid Rock Drainage Guide (International Network for Acid Prevention (INAP) 2011) identifies that cover systems should strongly consider the climatic conditions of the area in which they are to be located, proposing that designs should be guided by the following considerations:

- water covers are appropriate for wet climates as effective oxygen barriers;
- water-shedding soil covers are appropriate in moist climates to promote rainfall runoff and limit net percolation of rainfall; and
- store and release soil covers, which store wet season rainfall, releasing it through evapotranspiration during the dry season to sustain revegetation, are appropriate for dry or seasonally dry climates to sustain vegetation and limit net percolation of rainfall (Refer Figure 10).

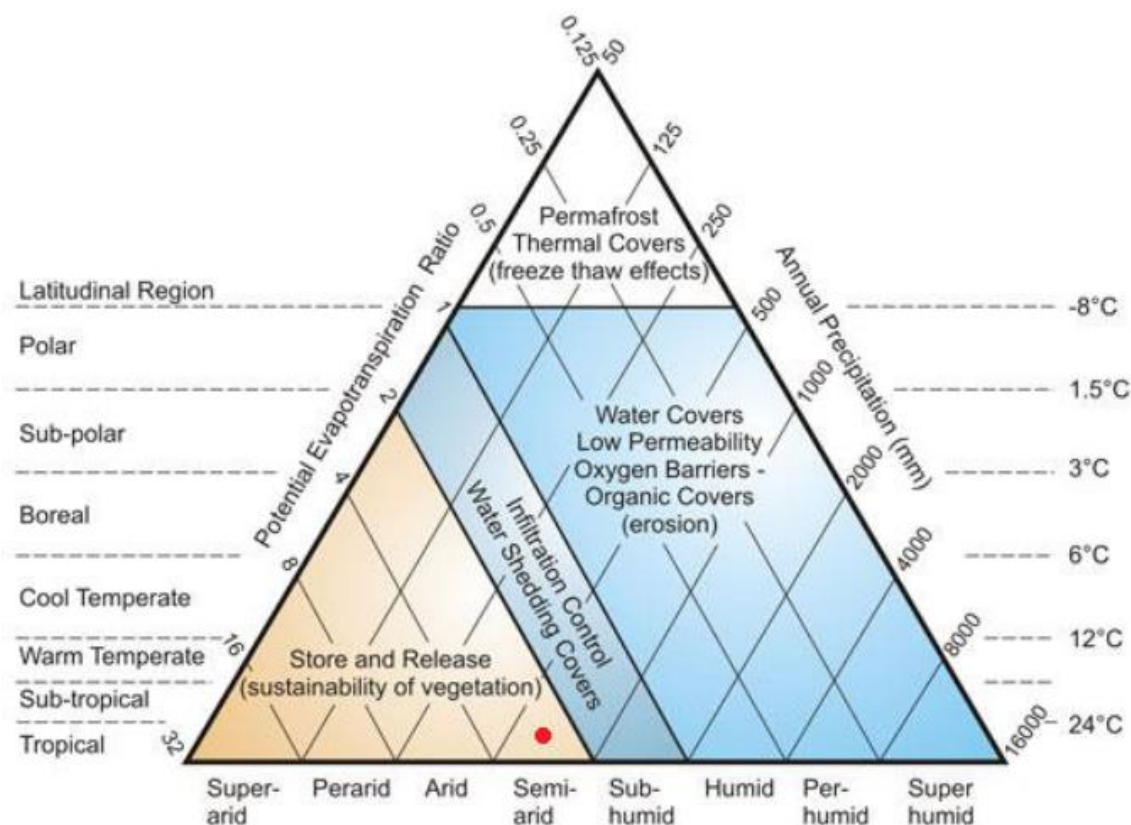


Figure 10: Cover systems and climate types (Note – Red dot indicates approximate performance for Yandan) (Source: O’Kane Consultants 2019)

With an annual rainfall of 552 mm and potential evapotranspiration of 1,749 mm, the principles outlined in GARD indicate that the Yandan climate is best suited to a ‘store and release’ cover system (INAP 2011). These principles are supported by many technical experts, as “[i]n seasonally dry climates, store and release covers are more robust than rainfall-shedding covers since they better sustain vegetation and limit erosion” (Williams 2020).

Monitoring of the Cell B cover system trials found:

- The thin topsoil cover system trials (300 mm) tend to record considerably lower live groundcover than reference sites, although meeting the benchmark established by the reference sites during the 2023 rehabilitation monitoring event. Long term monitoring indicates this cover design is unlikely to be suitable for sustaining sufficient vegetation cover.
- The thick topsoil cover system trials (450 mm) indicates that a slightly thicker cover design enhances outcomes for vegetation, with improved live groundcover on these trial plots compared to the thin topsoil cover trials. Nonetheless, live groundcover continues to be in the lower values of the reference range, with some occasional monitoring periods recording below the reference range. This cover design supports a variety of flora, although tends to record less grass species than reference sites.
- The thicker gravelly topsoil cover system trial (400 – 600 mm) has consistently demonstrated successful results for all metrics monitored.

Overall, the Cell B cover trials have achieved success in all of the completion criteria in 2023. The capping trials have resisted erosion and maintained high species richness, and indicate the cover is able to sustain vegetation cover.

Monitoring results from the Cell B cover system trials are reviewed against the relevant completion criteria in Table 7

Table 7: Objectives and completion criteria for TSF Cell B sites in 2022

Objectives and completion criteria	Sites compared to reference site			
	Cell B (Thin Cover) (B1, B2)	Cell B (Thick Cover) (B3, B4)	Cell B (Gravel 0-600mm) (B5)	Cell B (Gravel 400-600mm) (B6)
<u>Rehabilitation objective: Adequate vegetation cover to minimise erosion</u>				
<u>Completion criteria: evidence in the rehabilitation report that the revegetation meets the limits set by the analogue sites</u>				
Ground cover	✓	✓	✓	✓
Species richness	✓	✓	✓	✓
Restricted invasive plant species	✓	✓	✓	✓
Woody stem density	✓	✓	✓	✓
Canopy cover	✓	✓	✓	✓
Erosion monitoring	✓	✓	✓	✓
<u>Rehabilitation objective: Self-sustaining vegetation cover and species similar to adjoining undisturbed areas.</u>				
<u>Completion criteria: (below)</u>				
Certification within the rehabilitation report that key species are present.	✓	✓	✓	✓
Suitable diversity has been achieved and cover/density is adequate.	✓	✓	✓	✓
Evidence that weed management has been successful.	✓	✓	✓	✓

/ - indicates completion criteria partially achieved, ✓ – indicates completion criteria has been achieved.

3.1.2.4 South Pit

Rehabilitation of South Pit was completed in 1998 prior to the site entering into care and maintenance (Wirralie Gold Mine 2005). The rehabilitation methodology for South Pit involved the complete backfill of the pit, followed by profiling and the application of topsoil, seeding (mixed grasses) and topdressing with fertiliser (Straits Exploration 2005). Backfilling of the facility was achieved using sulphide-bearing waste rock from the former Waste Rock Dump, encapsulated with oxidised waste rock and clay sourced from the South Pit and flood bund (Straits Exploration 2005).

Rehabilitation monitoring sites were established on the rehabilitated South Pit in 2017, as part of the annual RMP. Results from this program have recorded total live cover on this domain exceeding reference site values (five years of data, with the exception of SP2 in 2022), with species richness also comparable to, or greater than reference sites (five years of data), and woody stem density comparable to, or greater than reference sites (five years of data, AARC 2021). Established vegetation on this domain includes a variety of native and exotic pasture grasses, and native shrubs (e.g. *Acacia holosericea*, AARC 2023a). A summary of the 2023 monitoring results are as follows:

- mean ground cover was between 64.1% and 82.5% compared to 37.5% to 95.5% at reference sites;
- mean species diversity was between 15 to 18 compared to 12 to 15 at reference sites; and
- stem density of between 0 to 840 compared to 0 at reference sites.

Overall, the rehabilitated South Pit area supports a well-established pasture community that is generally consistent with reference sites. The data demonstrates sustainable ecosystem function over at least 4 years, including periods of variable rainfall and livestock grazing pressures. Erosion monitoring indicates surface soils are stable and non-erosive. Erosion modelling for this domain also confirms that the rehabilitated South Pit area presents erosion levels that are within acceptable limits, with no evidence of ongoing active erosion recorded (AARC 2023a). As such, the South Pit is considered to be meeting revegetation rehabilitation objectives (Table 5).

3.1.2.5 ROM Pad

Interim rehabilitation of the ROM Pad was completed in 1999, with rehabilitation works including re-contouring and ripping of the surface (comprised of oxide waste), followed by seeding (with multiple re-seeding events during 2000–2002 to assist in the development of a sustainable vegetation cover). Species selection for revegetation consisted mainly of pasture grasses and *Acacia* species (Straits Exploration 2005).

Rehabilitation monitoring completed for the 2023 RMP confirms that various *Acacia* spp. Have established on the rehabilitated ROM Pad, with groundcover consisting of a variety of native and exotic pasture grasses (AARC 2023a). Vegetation is well established on the rehabilitated ROM Pad, with this site consistently recording woody stem density, species richness, total live cover and canopy cover comparable to or greater than reference sites (AARC 2023a). A summary of the 2023 monitoring results are as follows:

- mean ground cover was between 40% and 74.5% compared to 37.5% to 95.5% at reference sites;
- mean species diversity was between 17 to 30 compared to 12 to 15 at reference sites; and
- stem density of between 0 to 280 compared to 0 at reference sites.

It is considered that previous rehabilitation of the ROM Pad has provided interim rehabilitation to this domain, acknowledging that this domain may be used again in future operations, subject to outcomes from the mine planning and development phase. Should the ROM Pad be used in future operations, the rehabilitation sequence would re-commence from the first applicable rehabilitation milestone.

An assessment of rehabilitation against vegetation and erosion milestone criteria nominated in the PMLUP is presented in Table 5.

3.1.2.6 Village infrastructure

Rehabilitation of the village infrastructure area was completed in 2000, with all buildings from the village accommodation area disconnected and removed from site (Wirralie Gold Mine 2005). The footprint of the village infrastructure area was subsequently seeded, with results from the 2023 RMP indicating that a variety of native and pasture grasses have established, with some *Eucalyptus* spp. Present (AARC 2023a). Species richness at the rehabilitated village infrastructure area is reaching comparable values to reference sites, however, further time is required for total live cover and woody stem density to increase (AARC 2023a). A summary of the 2023 monitoring results are as follows:

- mean ground cover was between 21.6% and 29.2% compared to 37.5% to 95.5% at reference sites;
- mean species diversity was 9 compared to 12 to 15 at reference sites; and
- stem density of between 0 to 40 compared to 0 at reference sites.

Further rehabilitation of this area will include the removal of some remnant concrete footings. An assessment of rehabilitation against vegetation and erosion milestone criteria nominated in the PMLUP is presented in Table 5.

3.1.2.7 Hardstand/infrastructure area

Some progressive rehabilitation to the infrastructure/hardstand area was completed between 1999–2000 (Wirralie Gold Mine 2005). Completed rehabilitation has included the disconnection and removal of former buildings, with the surface ripped and seeded. This area has been monitored annually as part of the RMP since 2017. Monitoring results indicate that species richness and woody stem density at these sites is comparable to, or great than reference site values however, further time is required for total live cover to increase (AARC 2023a). A summary of the 2023 monitoring results are as follows:

- mean ground cover was between 36.3% and 51.9% compared to 37.5% to 95.5% at reference sites;
- mean species diversity was between 22 to 23 compared to 12 to 15 at reference sites; and
- stem density of between 180 to 240 compared to 0 at reference sites.

Further rehabilitation to this area will include the removal of some remaining concrete footings, hardstand and tanks. Some new portable buildings have also recently been established on-site for the exploration program and will require disconnection and removal. Following the removal of this infrastructure, land investigations will be carried out across the area, with the residual infrastructure footprint to then be ripped and seeded with pasture species.

An assessment of rehabilitation against vegetation and erosion milestone criteria nominated in the PMLUP is presented in Table 5.

3.1.3 Climate

3.1.3.1 Rainfall

The Yandan Gold Project is located in the Queensland Central Highlands, a region with a sub-tropical to semi-arid savannah climate, with hot, dry to wet summers and mild, dry winters. The Yandan area frequently experiences extended dry periods interrupted by tropical wet season rainfall, often associated with downpours or larger tropical low systems crossing the coast (SBE 2022). When rain does occur, it can be intense and highly localised, capable of depositing large depths of rain and varying significantly across the landscape (SBE 2022).

Specific rainfall data for the Yandan site area is not available, however good records are available from Bureau of Meteorology (BoM) sites' Mount Douglas (BoM station 034022) (50 km south) and St Anns Station (BoM station 34063) (10 km north).

Since 1900, rainfall has predominantly varied between 400-800 mm/year, though can range from as low as 200 mm/year to up to 1,100 mm/year when there are significant rainfall events on the east coast (e.g. cyclones and tropical lows) (Figure 11)(SBE 2022). Dry conditions prevail, with an average of 315 days without rain per year, with most of the annual rainfall received during just a few rainfall events each year. Daily and seasonal cumulative rainfall (July to June) for the past 20 years is plotted in Figure 12 (SBE 2022).

Rainfall also varies over time: a residual rainfall chart (deviation from average) in Figure 13 shows the seasonal cycle of rainfalls, with broader cycles of wetter and drier periods over the record, with clear capacity for extreme wets events and severe dry periods (SBE 2024c). The site has generally experienced dry conditions since its operation, with the exception of the wet conditions experienced in 2012, followed by ongoing drought conditions (SBE 2022).

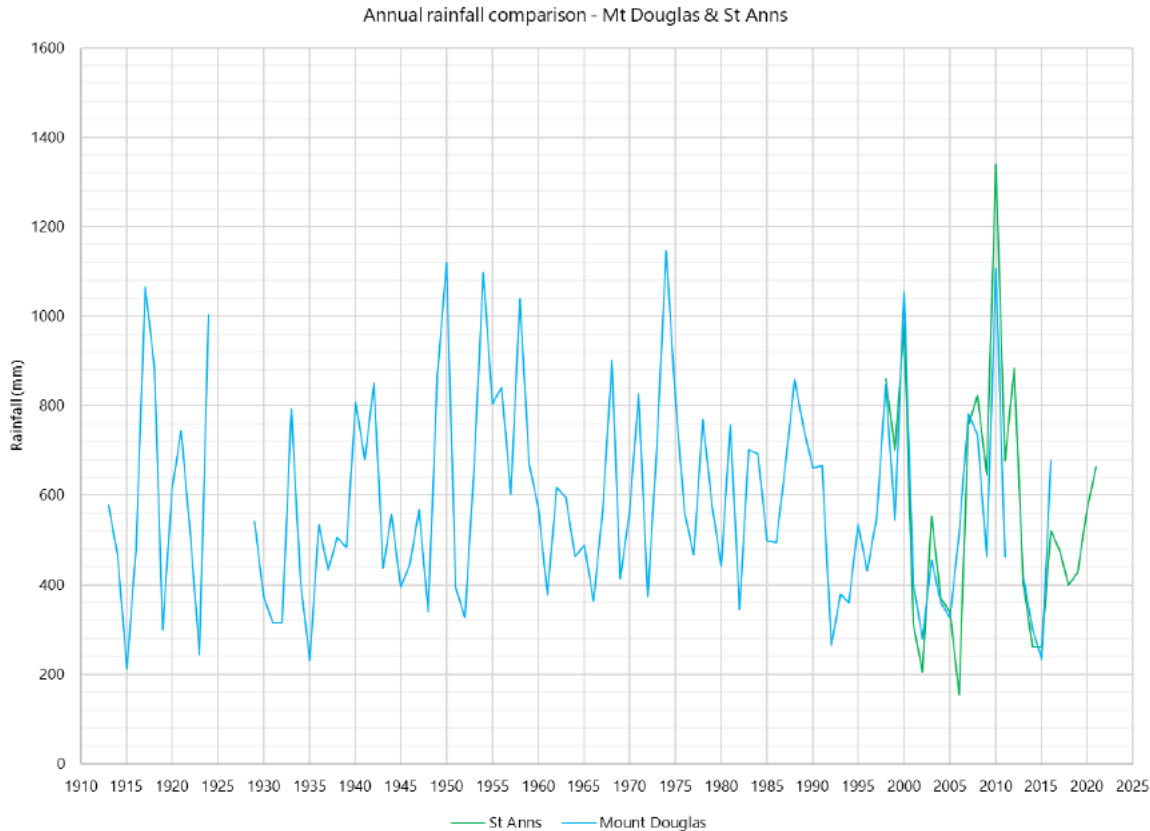


Figure 11: Annual rainfall recorded at local stations (SBE 2022)

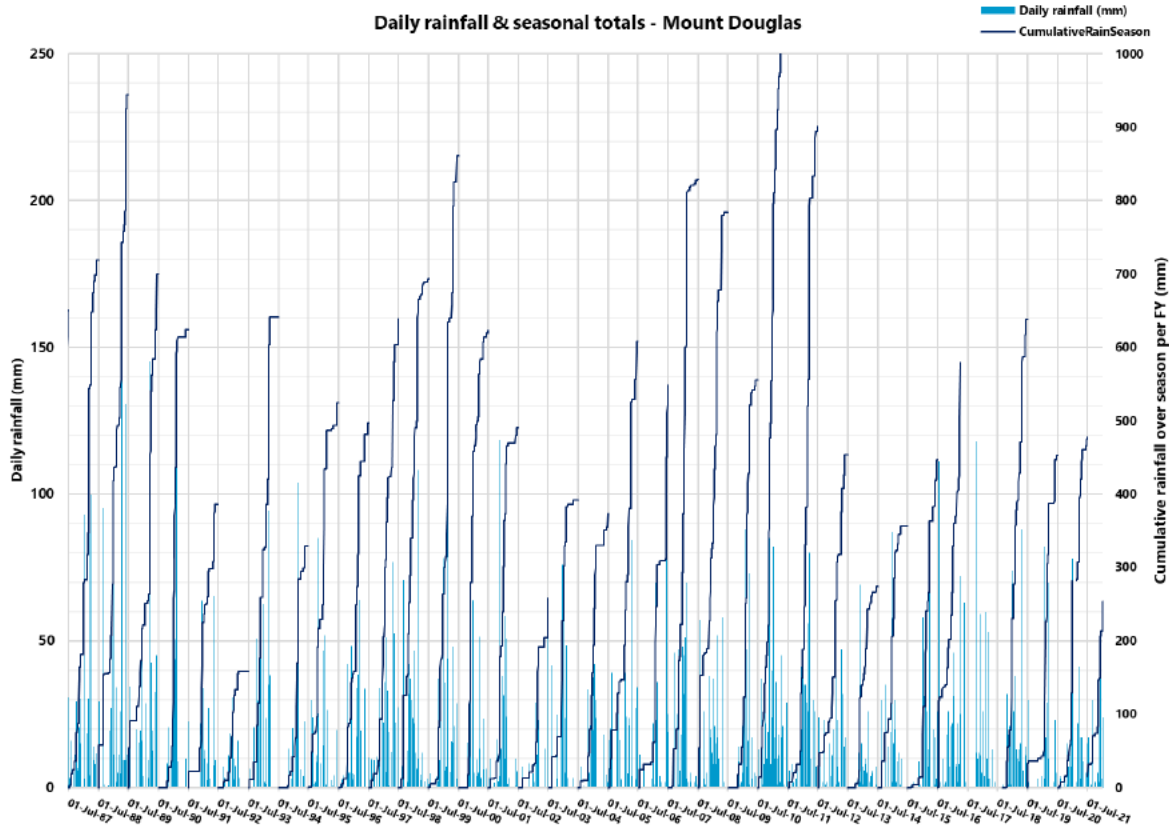


Figure 12: Seasonal annual rainfall in the Yandan region (rainfall data: 1987 – 2021) (SBE 2022)

Residual rainfall - Mount Douglas

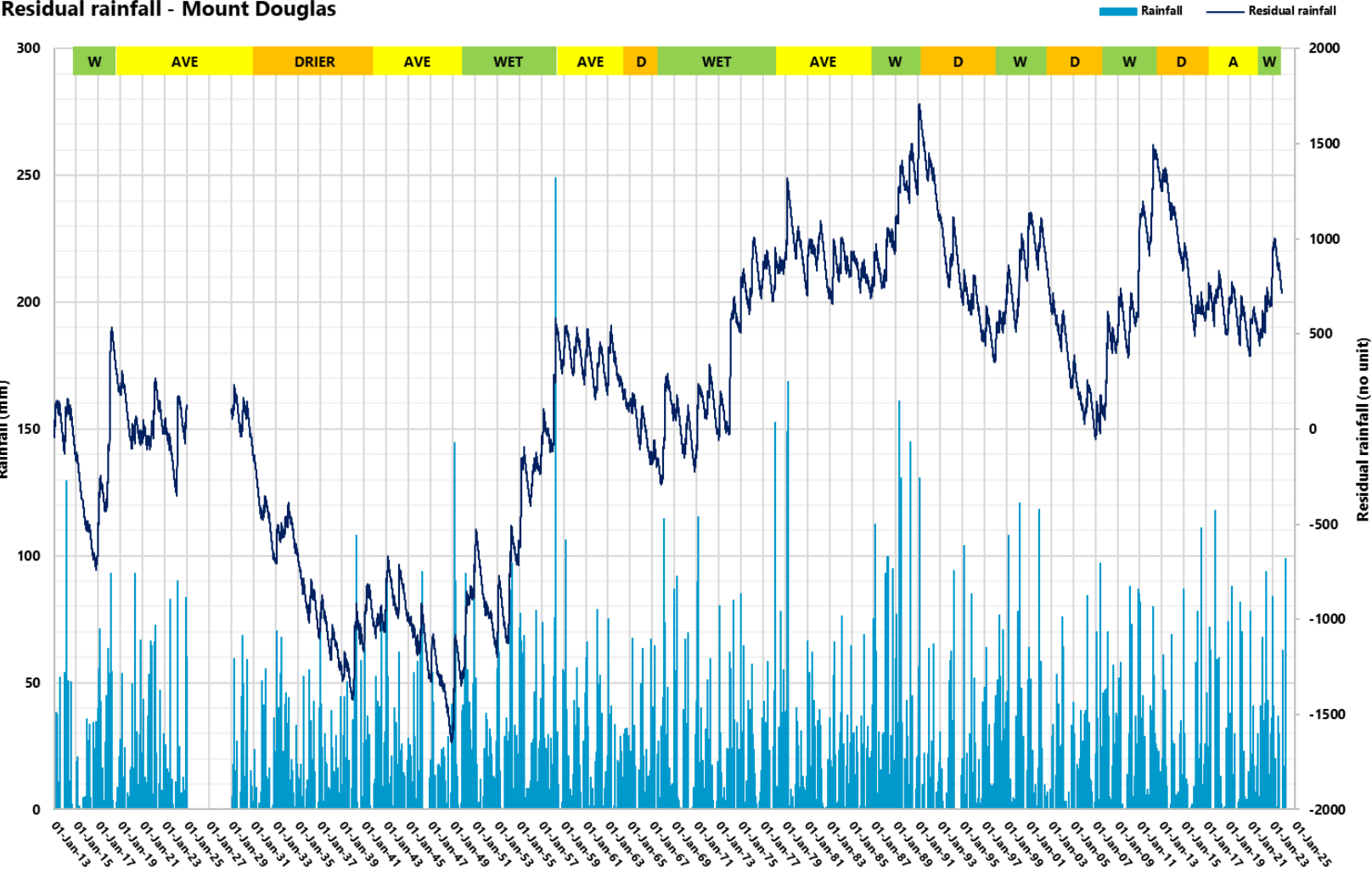


Figure 13: Residual rainfall - Mount Douglas (SBE 2024c)

3.1.3.2 Evaporation and wind

Daily rates of evaporation and average wind speeds for the Project are adapted from pan evaporation measured at the closest regional stations available, being the Moranbah Water Treatment plant, Twin Hills and the Collinsville Post office (SBE 2022). Average daily evaporation by month for each station is summarised in Table 8.

Evaporation ranges from approximately 3 mm/day over the cooler winter period, through to approximately 8.0 mm/day in November-December, in demonstration of the heat capacity in summer, particularly in the absence of seasonal rains (SBE 2022). Average annual potential evaporation equates to approximately 2,094 mm. Wind speeds range around 5 kph to 9.6 kph across a year (see Table 9).

Table 8: Evaporation rates for the Project region (SBE 2022)

Station	Dir	J	F	M	A	M	J	J	A	S	O	N	D	Average/day	Total/year
Moranbah Water Treatment	SE	8	7.4	6.8	5.7	4.3	3.5	3.7	4.9	6.6	8	8.5	8.5	6.3mm	2,306mm
Twin Hills	SW	7.5	6.5	6.1	5.2	3.6	2.9	3.1	4.2	6.1	7.9	8.6	8.7	5.9mm	2,140mm
Collinsville Post Office	NE	6.2	5.7	5.2	4.4	3.5	2.9	3.2	4.1	5.3	6.5	6.9	6.9	5.1mm	1,840mm
Average/month		7.2	6.5	6.0	5.1	3.8	3.1	3.3	4.4	6.0	7.5	8.0	8.0	5.8mm	2,094mm

Table 9: Temperature and wind speeds at Moranbah Water Treatment Plant (SBE 2022)

Station	J	F	M	A	M	J	J	A	S	O	N	D	Average annual
9am temperature (°C)	26.4	25.8	24.7	22.1	18.9	15.4	14.7	16.6	20.6	24.0	25.3	26.4	21.7
9am wind (km/h)	7.5	7.7	8.1	7.6	6.2	5.5	5.3	6.6	7.7	8.4	8.4	8.4	7.3
3pm temperature (°C)	32.7	31.9	31.2	28.6	25.8	22.9	22.9	24.6	28.3	31.4	32.2	33.0	28.8
3pm wind (km/h)	8.8	9.6	9.4	8.7	6.9	6.6	7.0	7.7	8.3	8.4	8.9	8.8	8.3

3.1.3.3 Climate change projections

The Queensland Government's Future Climate Dashboard (Queensland Government 2021) provides climate change projections at time series snapshots of 2030, 2050, 2070, 2090. This resource brings together scenarios predicted by twelve major climate models and provides a magnitude change ranked by probability (percentiles) of changes to daily precipitation and evaporation (pan) rates.

Model outcomes for the Yandan region per season and time series are shown in Figure 14 (Queensland Government 2021). Expected median rainfall suggests rates will continue, however with potential to vary much more widely over time, particularly after 2050 (SBE 2022). Evaporation rates are predicted to increase, with median rates up 1.8 mm/day in 2090 (increase of approximately 30%), but at least 0.7 mm/day and at most 3.6 mm/day.

Projected climate scenarios for the Project region in 2090 are shown in Figure 15 and Figure 16.

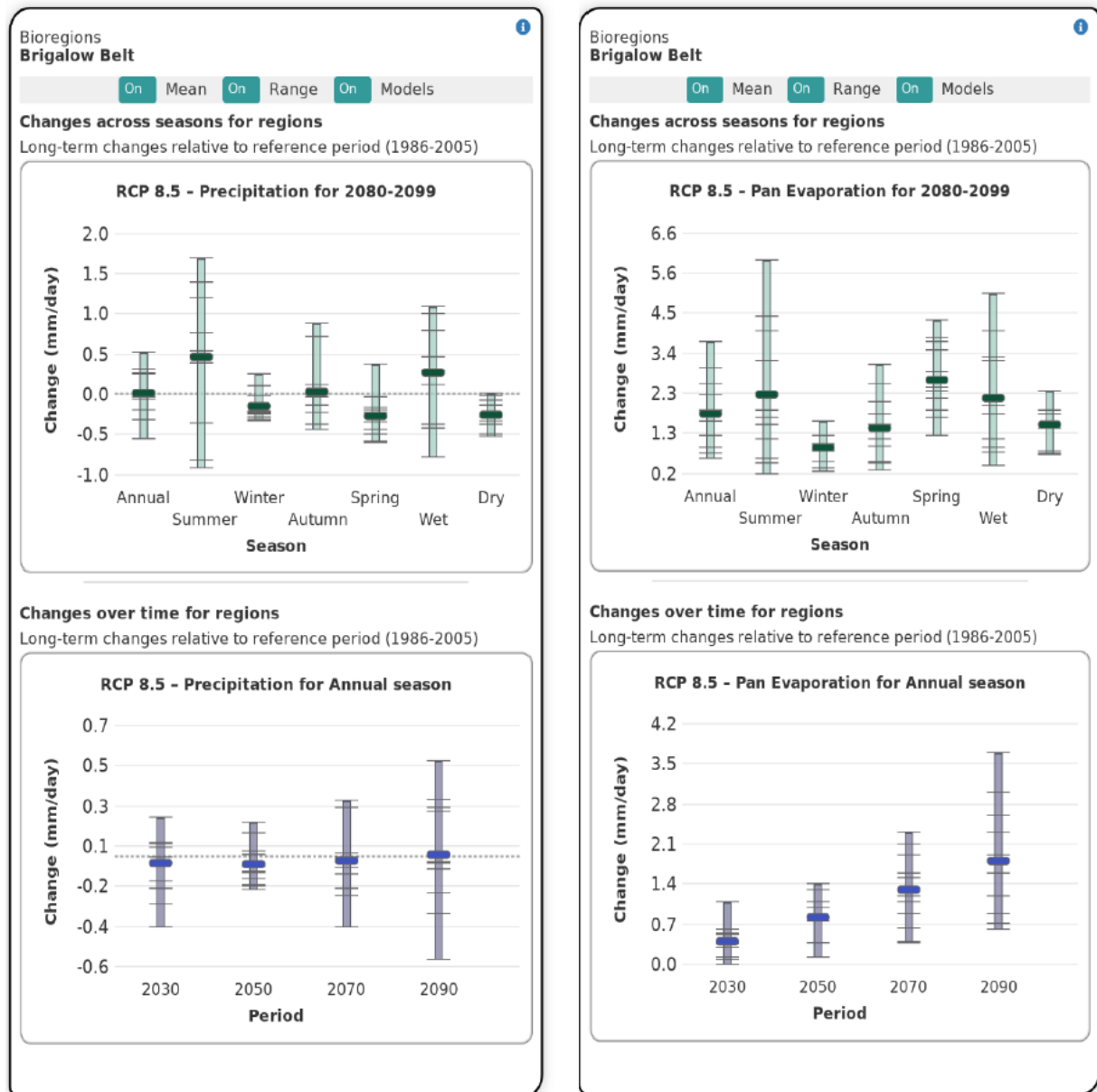


Figure 14: Climate change predictions (Queensland Government 2021 from within SBE 2022)

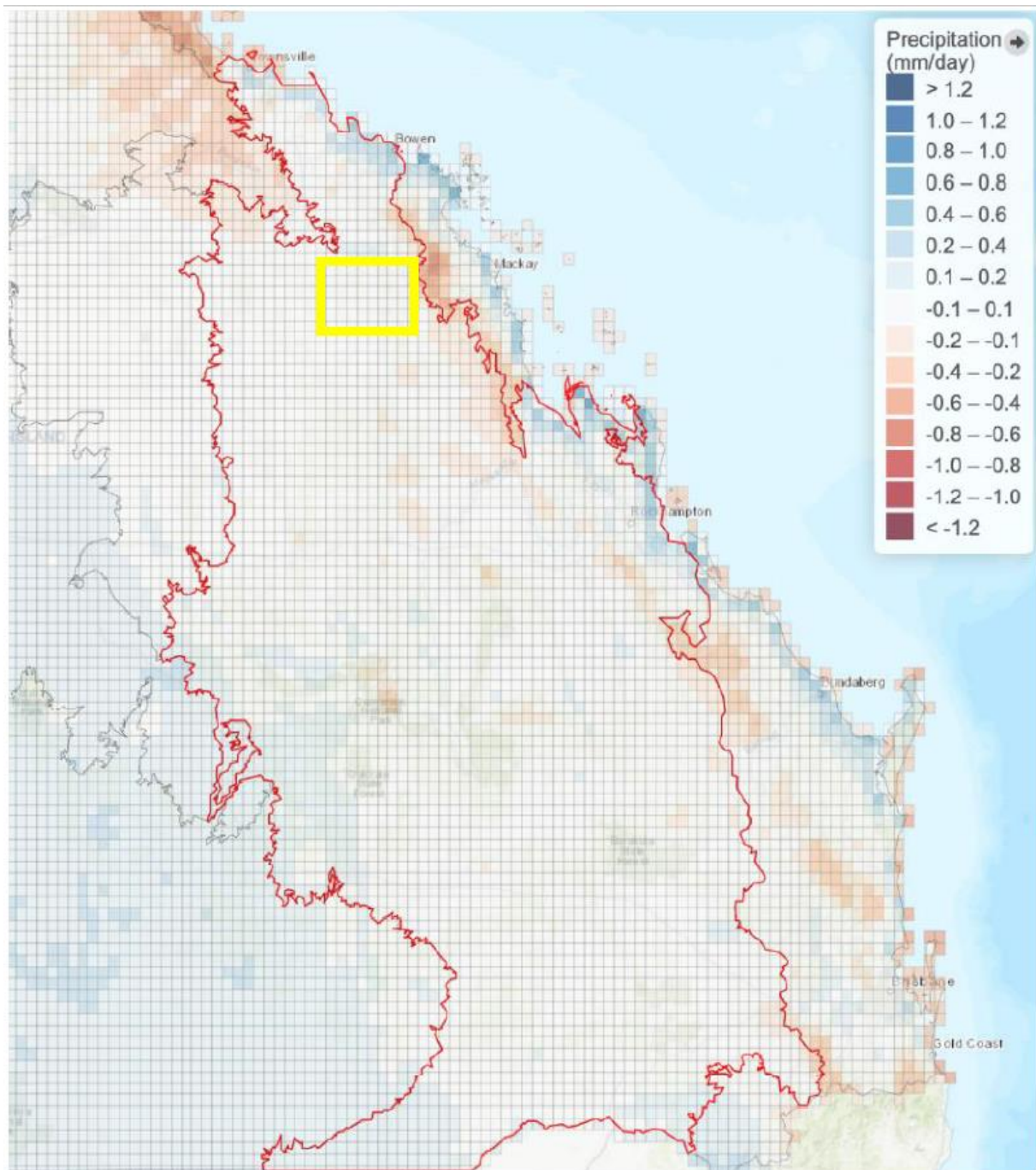


Figure 15: 2090 median precipitation changes across region (Queensland Government 2021 from within SBE 2022)
(note: Project region indicated in yellow)

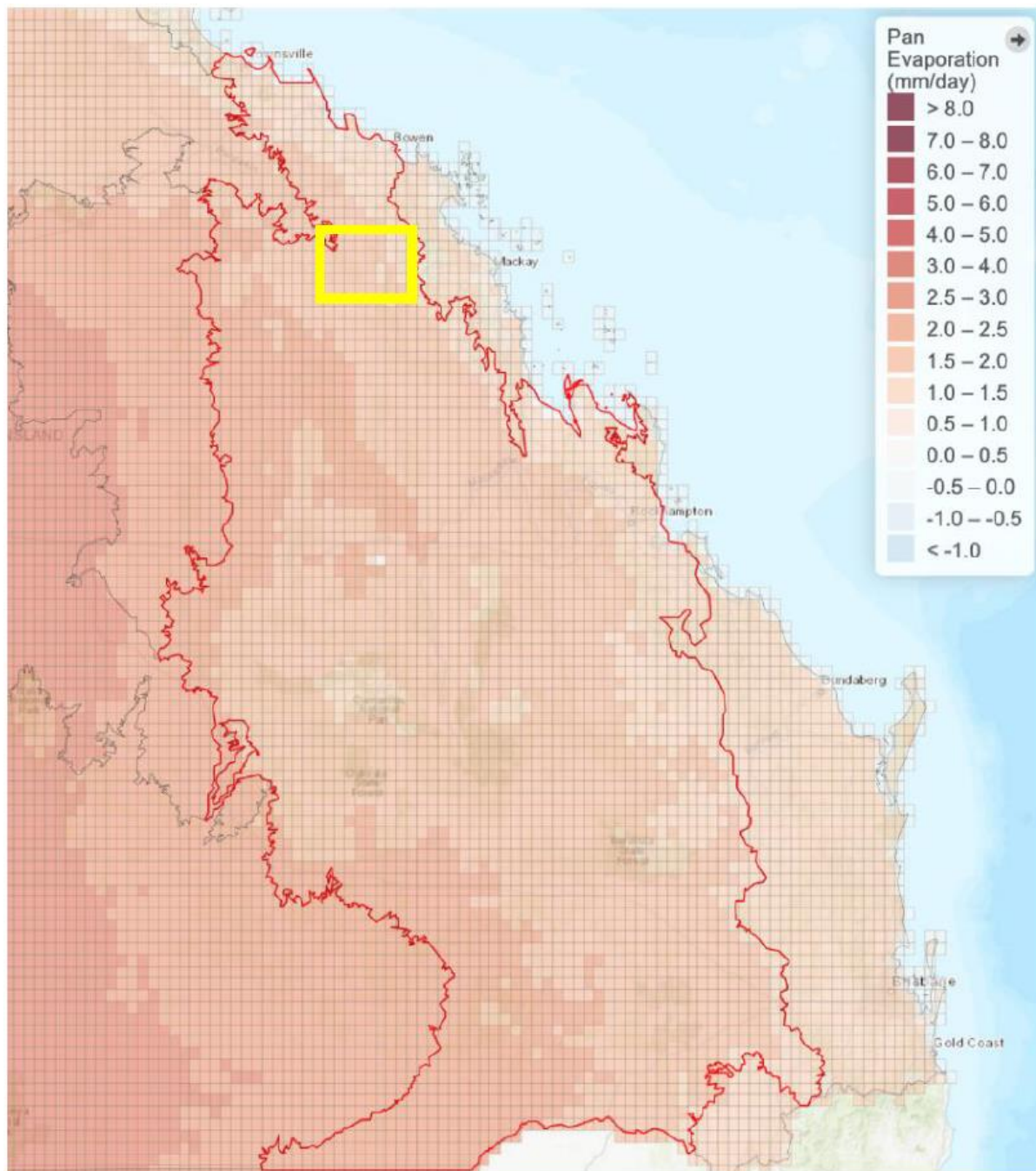


Figure 16: 2090 median evaporation changes across region (Queensland Government 2021 from within SBE 2022) (note: Project region indicated in yellow)

3.1.4 Geological setting

The Yandan Gold Project is located on the eastern margin of the western arm of the Drummond Basin, a geological basin comprised of Middle Devonian to Early Carboniferous sedimentary and volcanic rocks (Straits n.d.). The Project area can be divided into a western block of Drummond Basin units in faulted contact with an eastern basement domain, the Anakie Inlier. The Anakie Inlier is a north-south trending basement block of greenschist facies metasedimentary rocks of Neoproterozoic to mid-Ordovician age (de Caritat & Braun 1992).

Regionally the basement block has been subdivided into three main units, namely: The Anakie Metamorphic Group, Les Jumelles beds, and Ukalunda Formation. Where mapped regionally, the Les Jumelles beds are in faulted contact with the Anakie Metamorphic Group and presumed to be younger based partly on the

presence or absence of an early flat-lying foliation. In practise at a local scale, it is difficult to differentiate between the Anakie Metamorphic Group and the Les Jumelles beds due to the similarity of lithological units and discontinuous outcrop throughout the basin. The Ukalunda Formation unconformably overlies the Les Jumelles beds. The Ukalunda Formation is thought to be Lower Devonian in age and is included with the basement units as evidence exists of a considerable time gap before the Ukalunda beds and the of beginning of deposition into the Drummond Basin.

The host geology underlying the Project is comprised of basement Anakie Inlier metasediments (assumed to be Les Jumelles) metasediments, unconformably overlain by Lower to Middle Devonian Ukalunda Beds (upper basement), which in turn are unconformably overlain by the St Anne's Formation of the Middle Devonian to Early Carboniferous Drummond Basin Sequence (Straits n.d.). On the western side of the tenement, parts of the Project have been unconformably overlain by fluvial deposits of the Scartwater Formation and Mount Hall Formation (Straits n.d). The general composition of the three main geological units is summarised in the subsequent subsections.

The site is heavily faulted and structures are tight, without void development. A series of south-west to north-east and east to west faults occur to the west of the Yandan East Fault and are important in the localisation of the around mineralised zones. All known mineralisation in the project area occurs within Drummond Basin units to the west of the Yandan East Fault. Regional structural trends follow north/south and north-east/southwest orientations and are likely to present a barrier to groundwater flow (SBE 2022). Drainage lines partially follow the alignment of structural directions which may indicate the presence of subtle structures running parallel to the larger, more detectable faults.

The Yandan East Fault (also referred to as the basement contact fault and the East Hill Fault), is a steeply dipping fault that runs NNW to NNE through the Project. The Yandan East Fault marks the contact between the St Anne's Formation and the outcropping Anakie metamorphic basement. The Anakie metamorphic basement outcrops locally including at the Heap Leach Pad and adjacent to the TSF and was intersected at these locations during the 2024 groundwater bore drilling program (SBE 2024b). Geology plays a significant role in the topography, with the Anakie Inlier forming low-lying hills and the St Ann's formation forming the low-lying areas of the Project. The geology encountered at each mine landform is as follows:

- Main Pit, South Pit, East Hill Pit, exploration pad and tracks and borrow pits to the west of the Yandan East Fault - metasediments and hydrothermal mineralised areas of the St Anns Formation.
 - More specific to the Main Pit area, the geology is andesite overlain by metasediments, undifferentiated clastics, and calcareous (lime-rich and altered) fine siltstones and sandstones. Structures within the Main Pit are well developed, often with associated calcite and sulphide development.
- ROM pad and any borrow pits east of The Yandan East Fault are on Anakie Inlier (Les Jumelles beds).
- TSF, HLP, Mine Water Dam, Raw Water Dam, Tailings Water Return Dam, borrow pits, village area, landfill area, airstrip and mine infrastructure areas- metamorphic rocks (phyllites), metasediments and quartzite of the Anakie Inlier (assumed to be Les Jumelles beds).

The Yandan deposit is an adularia-sericite, low-sulphidation epithermal type with gold deposited primarily within thin quartz veins and locally as mosaic breccia fill within silicified zones. Mineralisation is structurally controlled with boiling as the depositional mechanism. Mineralisation occurs as oxide in the altered and weathered zone, or in fresh rock lenses and veins at depth as sulphides (SBE 2022). The oxide zone is typically characterised by highly weathered, clay-rich materials compared to the sulphide zone which is characterised by fresh rock and sulphide-rich veins.

Basement geology

The basement Les Jumelles metasediments are foliated metamorphosed quartz-muscovite sandstones, siltstones and mudstones (Townend 2005, within Straits n.d) and chloritic black shale. Also within the basement geology, the Ukalunda Formation sediments are various interbedded massive and bedded lithologies containing quartzose, calcareous and carbonaceous sandstones, siltstones and mudstones (Straits n.d.).

Lower St Anne's Formation

The Lower St Anne's Formation generally consists of three lithologies: andesite flows, andesite clastics and polyolithic volcanic breccia (Straits n.d.). Overlying this are primarily feldspar-lithic sandstone and siltstone (Main Pit Yandan Host), formed through weathering and erosion of the Yandan Andesite. Calcareous sandstone and Yandan Limestone are the youngest unit in the local stratigraphy, overlying parts of the Yandan Host in Main Pit (Straits n.d.).

Gold mineralisation on the Project has been substantially mined out, with the East Hill area containing the most encouraging remaining mineralisation (Straits n.d.). Three phases of gold mineralised silica have been identified within the East Hill area, including crustiform banded veining which is commonly high-grade gold mineralisation (Straits n.d.).

Surface geology

Tertiary and Quaternary sediments cover much of the Project area (Figure 18). In the south and east, the surface geology is predominantly Tertiary Suttor Formation comprised of laterised sandstone, mudstone, claystone, oil shale, diatomite and carbonaceous claystone (Hutton *et al.* 1991, within Straits n.d.). Channels incise the Suttor Formation and contain Quaternary alluvial channels that drain to flood plains (Straits n.d.). Quaternary alluvium covers much of the underlying Drummond Basin Sequence on the Project, with the depth of this stratum increasing towards major drainage lines (i.e. Suttor River, Rosetta Creek, Belyando River) (Straits n.d.).

Geological units and main structures on the Project are shown on Figure 17. A conceptual geological model of the East Hill area (the primary remaining resource deposit on the Project) is provided in Figure 19.

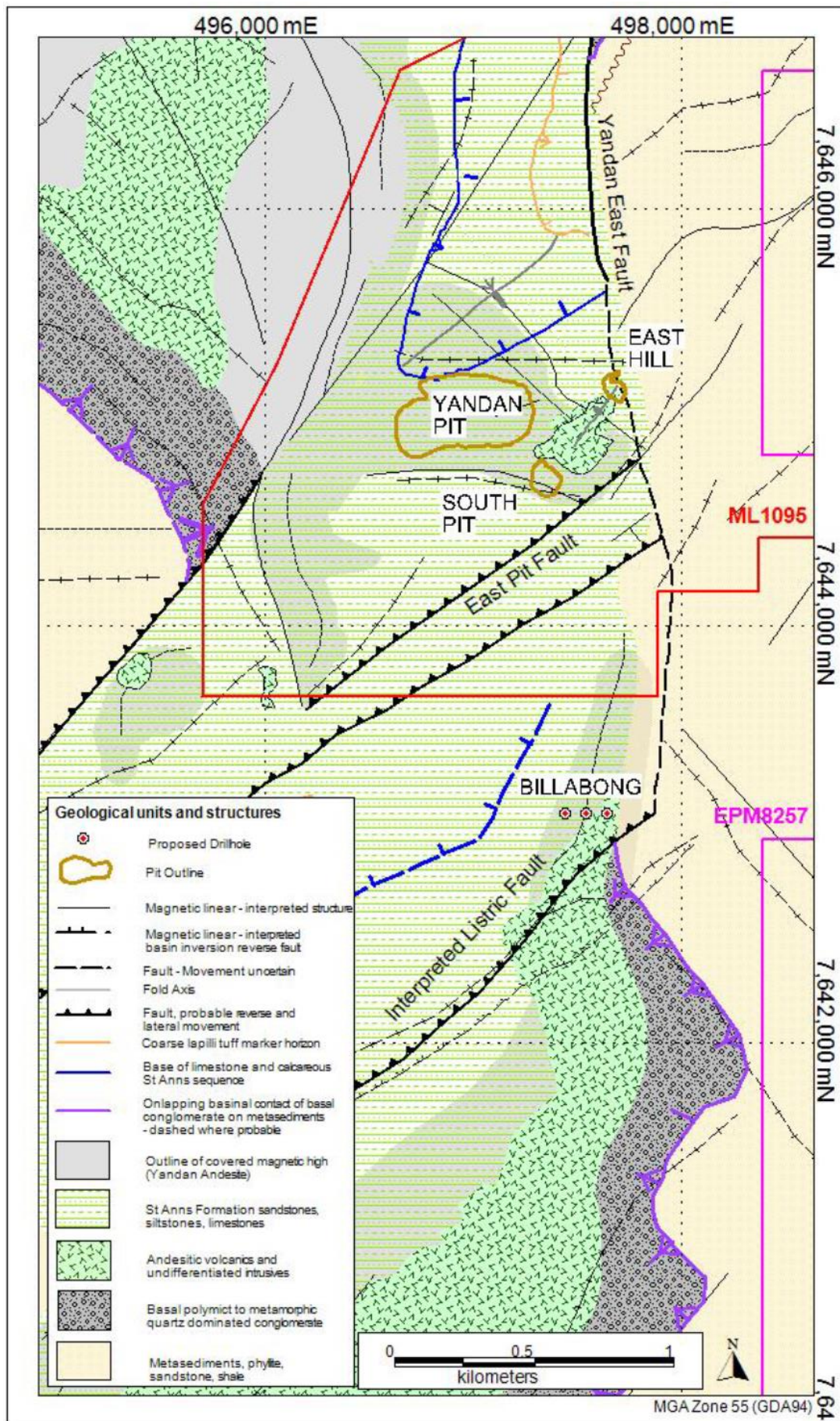


Figure 17: Geology of Yandan (Source: Straits n.d.)

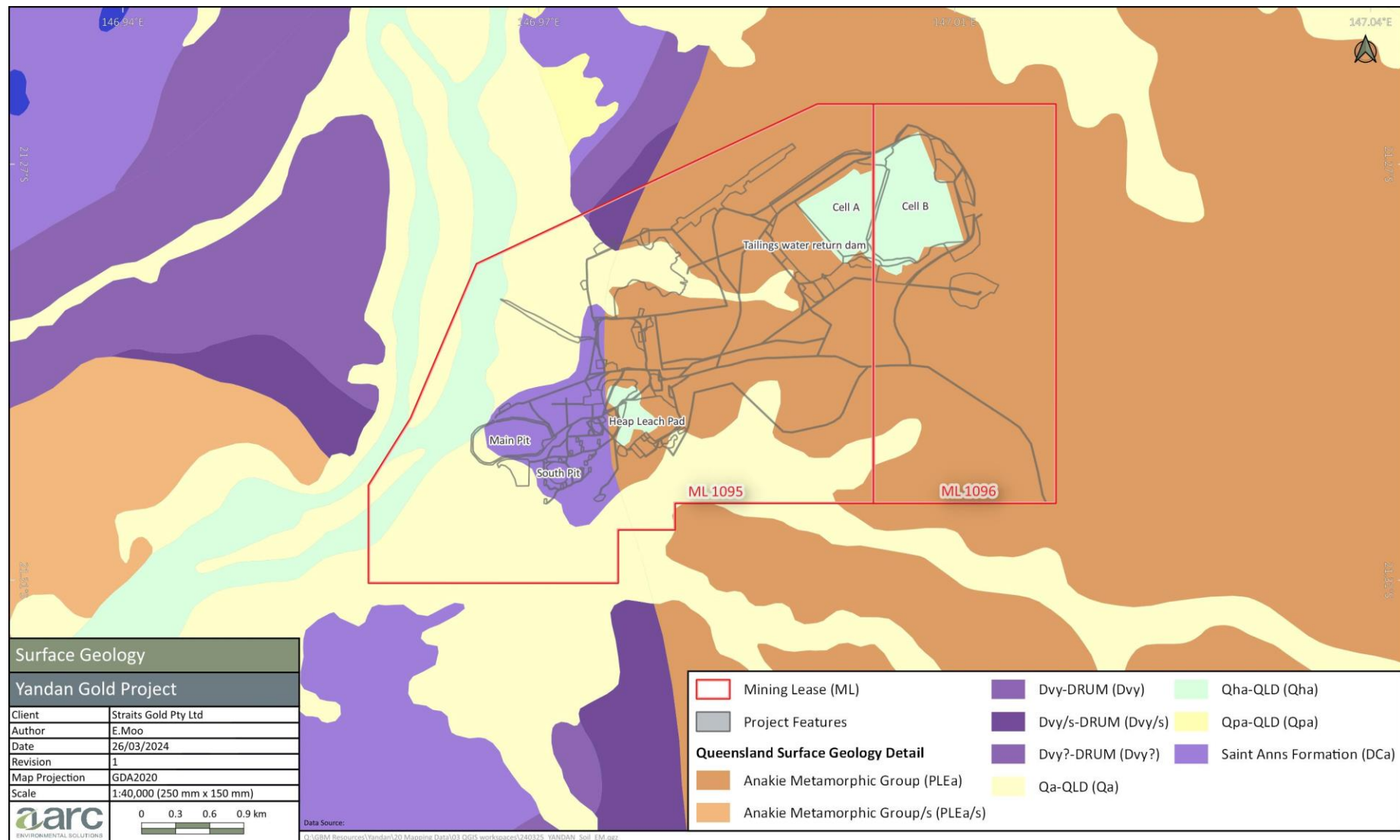


Figure 18: Regional surface geology – QLD (DoR 2023)

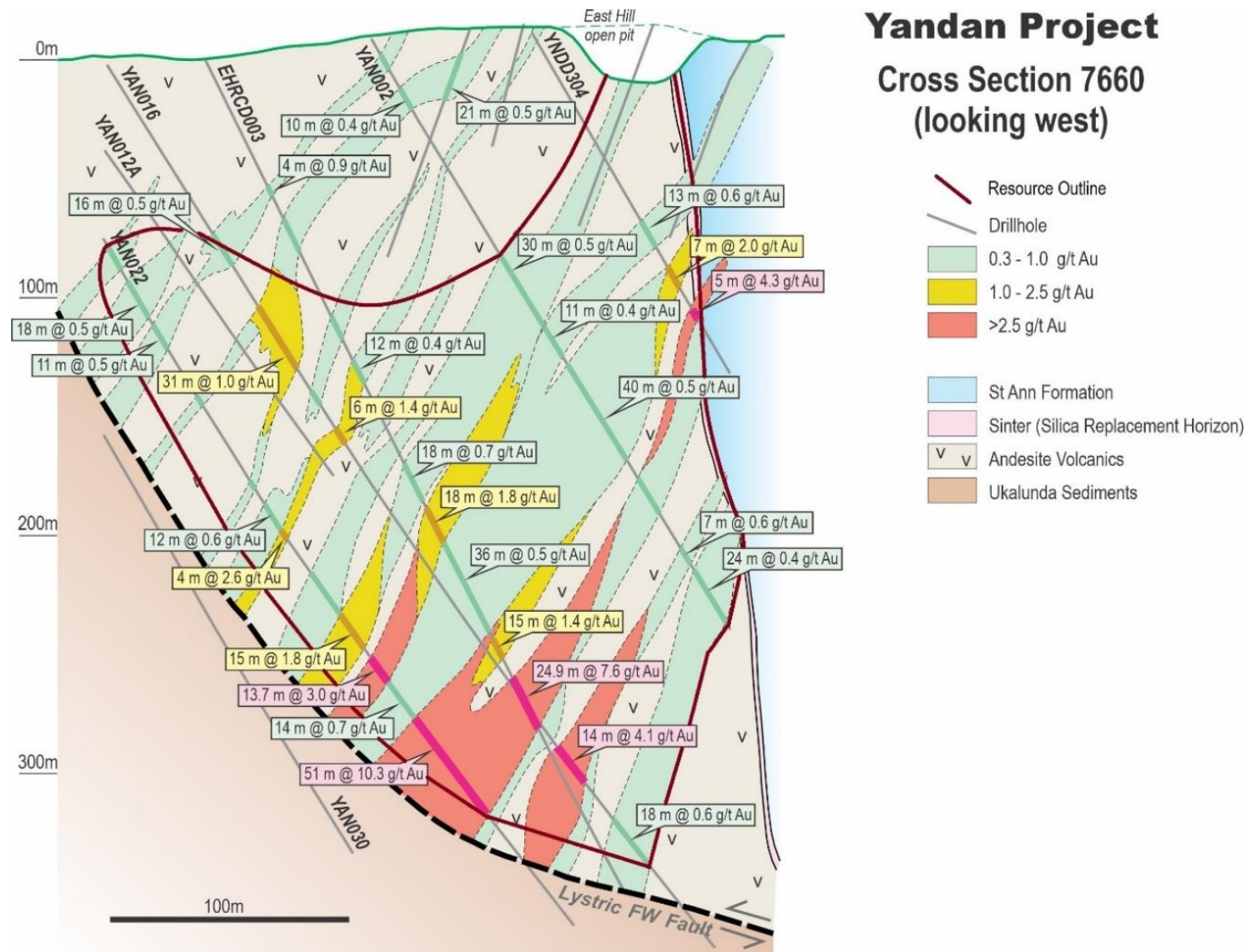


Figure 19: Conceptual geological model of the East Hill area

3.1.5 Topography and surface hydrology

3.1.5.1 Local and regional topography

The Yandan Gold Project is situated alongside the Suttor River on gently undulating plains. Elevations in the area range between 160 mAHD in the west along the Suttor River, gradually increasing to 190 mAHD in the east, with some areas reaching 200 mAHD outside of the Project disturbance footprint. Travelling through the site notable areas of elevation are associated with East Hill Pit (rising to 190 mAHD) (Figure 20).

The topography within the surrounding region is similarly level, punctuated by the occasional hill or mountain. Crossing the Suttor River and approximately 17 km to the west of the Project is the Llanarth Range. The Llanarth Range is the dominant topographical feature of the landscape, rising to approximately 280 mAHD, with the Llanarth Back Ranges further behind to the west and north, rising further to approximately 350 mAHD. Approximately 20km to the north of the Project is the Rottenstone Range, with an elevation of approximately 300 mAHD.

3.1.5.2 Waterways and drainage features

The Yandan Gold Mine is situated within the Suttor River sub-basin of the Burdekin Basin. The Suttor River drainage sub-basin spans an area of approximately 74,000 km².

The Suttor River is an 8th order stream, located on the western boundary of the Project (Figure 3). A number of 2nd, 3rd and 4th order ephemeral tributaries traverse the site and drain to the Suttor River (Figure 21). The receiving environment of the Project includes the following waterways:

- the braided channels of the Suttor River;
- Yandan Creek; and
- Sandy Creek.

Tributaries of Yandan Creek and Sandy Creek are common across the Project area, forming mainly 1st to 3rd order ephemeral streams that flow only after rainfall and act as losing streams (i.e. are not fed by groundwater) (SBE 2022). Both watercourses drain to the Suttor River to the west of the Project.

The Suttor River is a wide, ephemeral river, flowing after rainfall over wet seasons and is characterised by wide low energy flows (SBE 2022). The Suttor River flows from the south to the north, with braided channels of 7th and 8th order within the immediate receiving environment of the Project. The Suttor River ultimately drains into Lake Dalrymple, formed by the damming of the Burdekin River (HLA – Envirosciences Pty Ltd 2000). The Suttor River also flows into the wetlands associated with Lake Dalrymple and the Scartwater Aggregate, both identified as nationally important wetlands in the *Directory of Important Wetlands in Australia* (DAWE 2019).

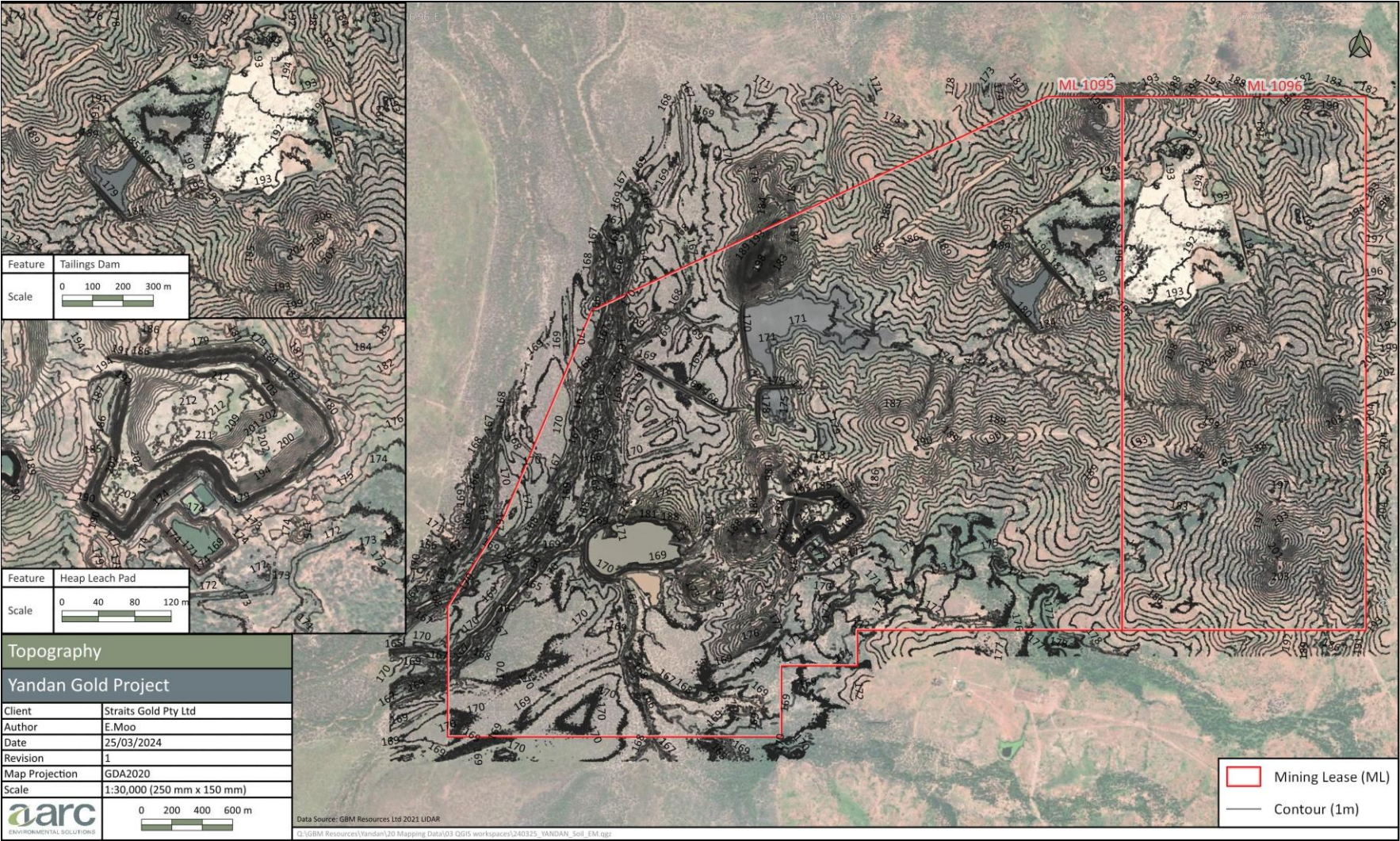


Figure 20: Yandan site elevations

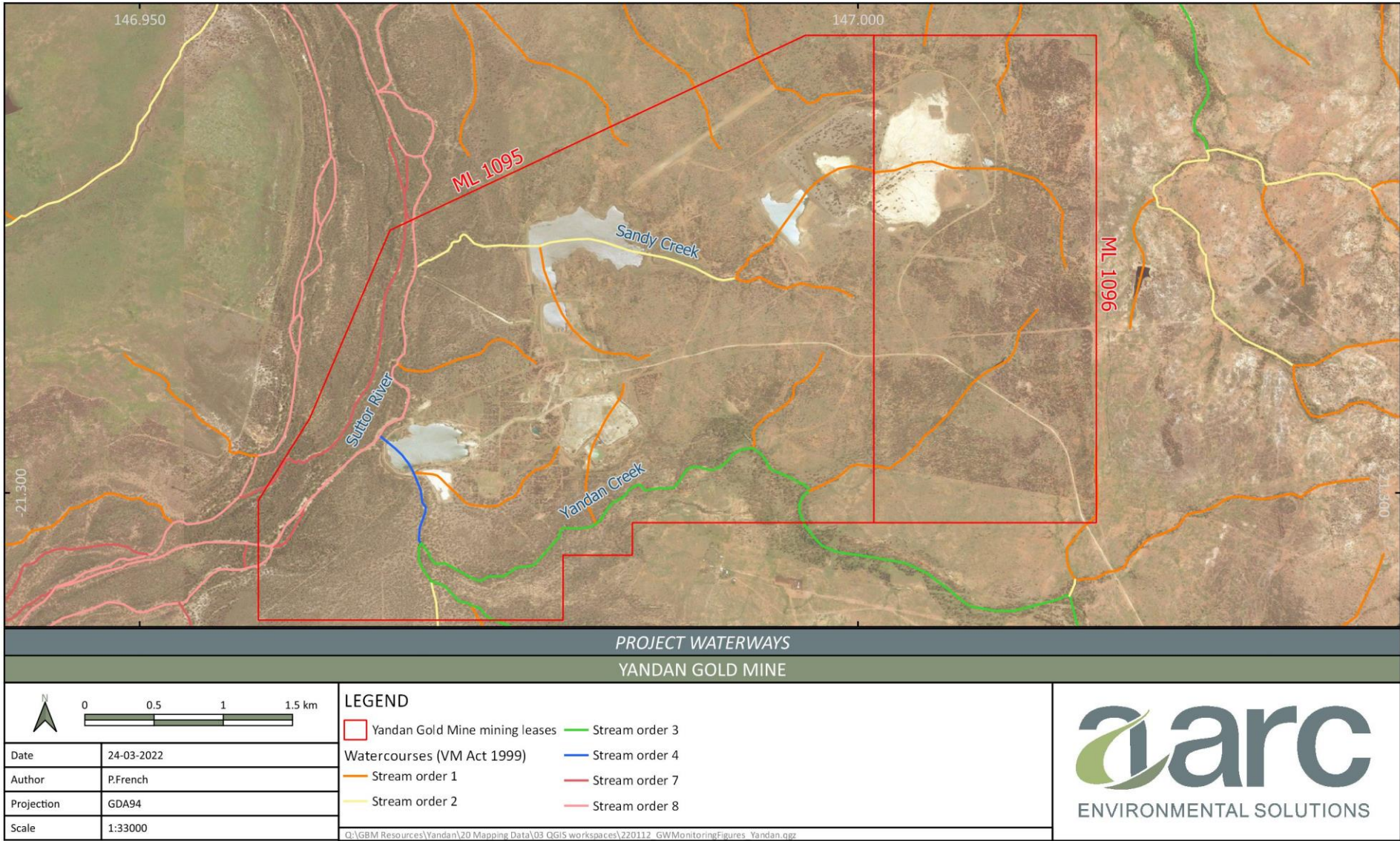


Figure 21: Waterways within the Project area



Figure 22: View of Suttor River approximately 50 km upstream of Yandan (SBE 2022)

Stream flow in the rivers and tributaries of the Suttor River sub-basin are dependent on the frequency and intensity of rainfall events within the catchment. Periods of flow are directly related to large rainfall events in the catchment; which is typical of ephemeral systems (SBE 2022; 2024c).

There are two gauging sites upstream and downstream of Yandan which record river flow, water levels and quality, with records available from the 1970's:

- Belyando near Gregory Highway (Mount Douglas) (120301A/B upstream); and
- St Anns Station (120303A downstream).

Flow records for both stations indicate the seasonal nature of flow, and capacity of the system to convey large volumes of water (Figure 23 and Figure 24). Figure 24 shows the ephemeral nature of the river with periods of pulses of flow, retreating to minimal or no river flow for long periods in between. Analysis of the peaks indicates the system conveys up to 1,000 m³/s in regular flow events and up to 18,000 m³/s in greater events (SBE 2024a). Notably flow at St Anns generally increases from flow measured at Mt Douglas given St Anns lays further down the catchment. With an interpolated base of river of 165 mAHD at the Project, the Suttor River;

- regularly rises 5-8 m in flood, at 168 - 170 mAHD (SBE 2022);
- is predicted to rise 14 m and extend approximately 6 km across the floodplain in a 1% AEP event;
- is predicted to rise 22 m and extend approximately 8 km across the floodplain in a probable maximum flood (PMF) flood event (SBE 2024c).

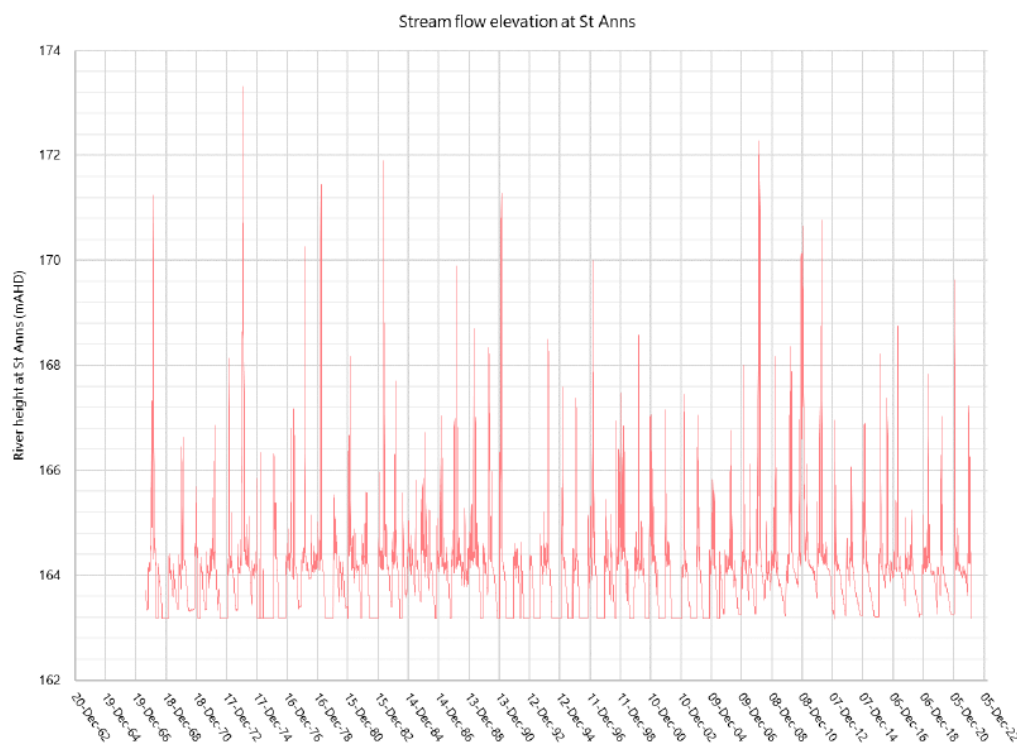


Figure 23: River heights at St Anns Station (downstream from Yandan) (SBE 2022)

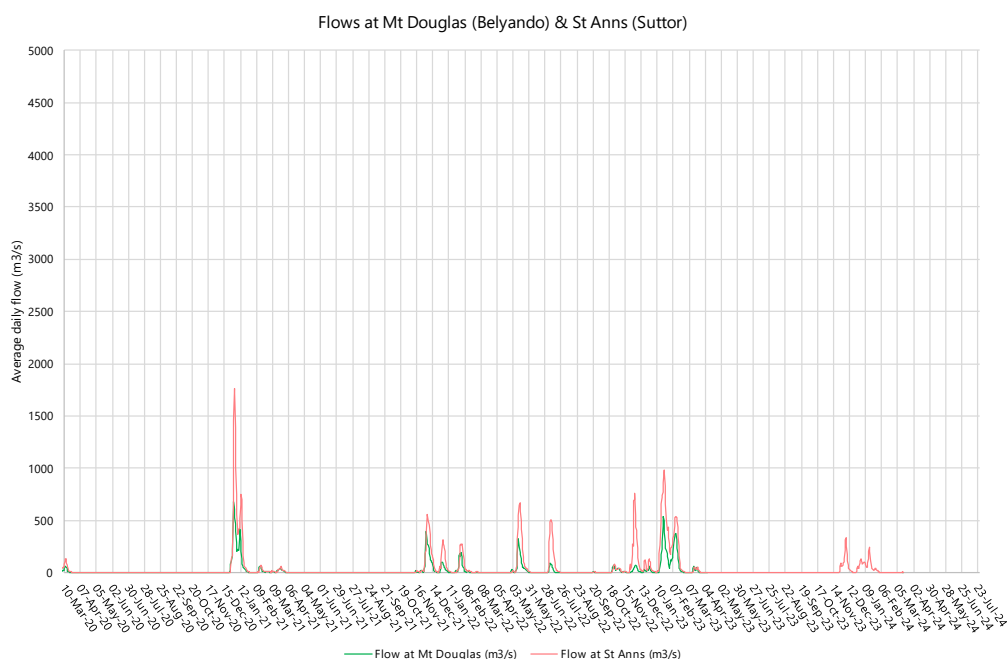


Figure 24: River flows at St Anns Station and Mt Douglas Station (SBE 2024a)

3.1.5.3 Surface water catchments

Drainage of the Yandan site is formed through a combination of natural topography and mining landforms (SBE 2022). The Project area sits close to the top of a small sub-catchment draining to the Sutor River. Generally, drainage follows east to west with topography, with some bund walls creating flow diversions or containment. Surface water catchments and drainage directions within the Project area are shown through Figure 25 and detailed in Table 10.

Table 10: Yandan surface water catchments (SBE 2022)

Code	Description	Area m2	Area ha	Status
B-01	Borrow pit catchment (Yandan Creek)	60,537,540	6,054	Undisturbed
B-WS	Borrow pit water surface	26,258	2.6	
E-01	Catchment reporting to East Pit	28,827	2.9	Mine impacted
E-Pit	East pit direct area	9,048	0.9	Mine impacted
E-WS	Water surface of East pit	1,190	0.1	
L-02	Leach pad stormwater area	53,560	5.4	Mine impacted
L-Dam	Leach pad stormwater pond	16,344	1.6	Mine impacted
L-Pad	Leach pad direct catchment	174,152	17.4	Mine impacted
L-Pond	Leach pad ponds	3,990	0.4	Mine impacted
M-01	Catchment reporting to Main Pit	112,553	11.3	Mine impacted
M-Pit	Main pit area	219,256	21.9	Mine impacted
M-WS	Main pit water surface	156,207	15.6	
S-Pit	South pit direct area (rehabilitated)	29,567	3.0	Undisturbed
T-01	Catchment reporting to tailings storage	919,825	92.0	Undisturbed
T-02	Catchment reporting to tailings storage	260,723	26.1	Undisturbed
T-03	Catchment reporting to tailings storage	282,502	28.3	Undisturbed
T-CellA	Cell A of tailings storage	426,307	42.6	Mine impacted
T-CellB	Cell A of tailings storage	726,984	72.7	Mine impacted
T-Dam	Tailings dam water catchment	36,689	3.7	Mine impacted
WS-01	Catchment reporting to water supply dam	3,257,776	325.8	Undisturbed
WS-Dam	Water supply dam surface	410,325	41.0	
MW-01	Mine water dam catchment	42,336	4.2	Undisturbed

Constructed drainage features on-site include the Suttor River / Yandan Creek Diversion Channel, and the Main Pit water management bund. Both features were constructed during mining of Main Pit, to prevent waters from flowing into the pit.

The Suttor River / Yandan Creek Diversion Channel was constructed in 1997 and is a referable structure (Water Licence 55019A). The approximate 400 m long diversion diverts waters from Yandan Creek around the perimeter of Main Pit.

Also constructed in 1997 was the Main Pit water management bund, similarly, built to protect open pit operations from floodwaters from Yandan Creek and Suttor River. The Main Pit flood bund was initially constructed to be a temporary structure to be removed on the completion of mining in Main Pit, however, this has been retained subject to demonstrating that the removal or modification of the structure would not result in an unacceptable risk of potential environmental harm.

Following the cessation of mining activities in Main Pit, it was determined that the best long-term rehabilitation option was to allow the pit to flood to form a permanent water cover over sulphidic materials in the walls and base of the pit (Ross Mining N.L 2000). This water cover was formed initially following the 1999/2000 wet season.

Connectivity with the Suttor River and Yandan Creek has continued to maintain this water cover. Two spillways have been installed on the north-west and south-east walls of the pit to enable recharge as well as discharge (Figure 26). Releases from Main Pit are limited to when flows are sufficient, where the pit water level exceeds 169 mAHD (SBE 2022). The most recent discharge event from the pit occurred in April 2023. Water quality monitoring completed during this event did not identify any contaminant issues in the receiving environment.

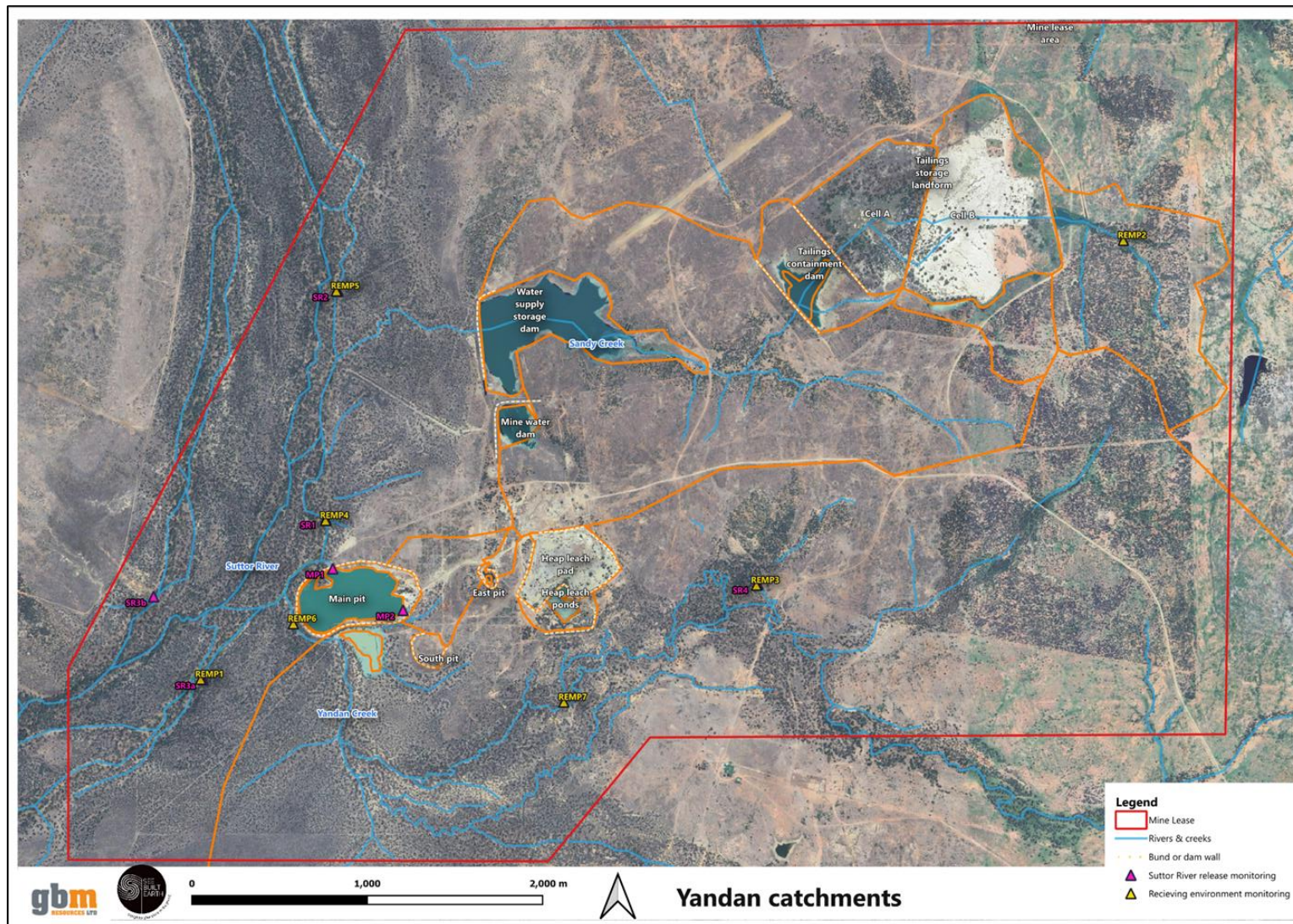


Figure 25: Yandan surface water catchments and drainage directions (SBE 2022)(Note: green – undisturbed catchment, yellow – potentially mine impacted).



Figure 26: View of Suttor River near release point of Main Pit (SBE 2022)

3.1.5.4 REMP water quality

Key results from the 2019 – 2023 receiving environment monitoring program (REMP) monitoring events are summarised as follows:

- Water quality monitoring has identified elevated levels of pH, EC, suspended solids, dissolved oxygen (DO), turbidity and ammonia at some reference (upstream) and impact (downstream) sites. No trends have been identified that would indicate higher levels at the impact sites downstream of site.
- Water quality monitoring in 2023 recorded metal concentrations within the relevant WQOs at reference and impact sites, with minor exceptions of aluminium, cobalt and copper. Aluminium tends to exceed at both reference sites and impact sites, while cobalt and copper were found to be elevated at one reference site and one impact site respectively. The elevated aluminium concentrations are considered potentially indicative of activities upstream of Yandan, with elevated selenium concentrations considered to potentially be naturally occurring within the region.
- Stream sediment sampling has recorded similar particle size distribution and metal concentrations at reference and impact sites, noting elevated nickel concentrations have been identified at a reference site upstream from site during past sampling events.
- Macroinvertebrate sampling generally indicates low taxonomic richness and SIGNAL scores at both reference and impact sites. Results indicate that Yandan is not negatively impacting the macroinvertebrate communities at downstream sites.

While the REMP was only implemented relatively recently, the annual sampling events (2019 – 2023) consistently conclude that the Project has no discernible impact on the receiving environment, with no significant trends observed between the reference (upstream) and impact (downstream) sites. Overall, results from the monitoring program suggest that the Project site has not caused any impacts to surface water values.

3.1.5.5 Suttor River water quality

Historical monitoring undertaken in 1999, shows the Suttor River water quality reports a neutral pH, with minimal sulphate and salinity (including chloride). There is a low presence of metals, including arsenic, copper, nickel and zinc. The presence of metals likely indicates an influence of elevated metals for the river as a natural condition and may result from either draining a mineralised zone upstream or some mineralised materials within alluvium deposits upstream.

Monitoring undertaken in accordance with the EA in the receiving environment and during release events at Suttor River, Yandan and Sandy Creek supports historical monitoring, where water is pH neutral, with electrical conductivity (EC) generally less than 300 uS/cm, and very low sulphate (<10 mg/L), with the presence of low levels of arsenic, copper, nickel and zinc. Selenium is present at times, although it is variable and has variable detection limits. A comparison of water quality at downstream and upstream monitoring locations indicates that inflows from Yandan do not contribute to a material change in river water quality.

Continuous monitoring at BOM sites (particularly Mt Douglas/Belyando) shows water quality patterns after rainfall. Immediately following a flow peak, salinity peaks regularly around 1,000 EC uS/cm and up to 2,000 EC uS/cm. Salinity, like flow, quickly recedes.

Table 11: Historic water quality monitoring at Suttor River (SRK, 1999b)

Table 2.5
Summary of Pre-Development Water Quality Results for the Suttor River

Location	Date (1988)	TDS (mg/L)	pH	HCO ₃ (mg/L)	SO ₄ (mg/L)	Cl (mg/L)	Ca (mg/L)	Mg (mg/L)	Na (mg/L)	K (mg/L)	Fe (mg/L)	As (mg/L)	Cu (mg/L)	Ni (mg/L)	Zn (mg/L)	Hg (mg/L)
Suttor (Down stream from minesite)	Feb. 3	91	7.4	80.8	5.9	6.4	15.2	5.2	9.6	8.3	19.1	0.003	0.015	0.018	0.05	<0.001
	Mar. 21	100	8.7	55.1	nd	10.9	9.5	4.8	16.1	5.1	12.4	0.003	0.005	0.006	0.008	<0.001
	Mar. 28	12	9.0	68.9	nd	12.2	12.6	6.3	18.4	6.3	11.9	0.003	0.007	0.007	0.009	<0.001
	Apr. 9	59	7.3	39.7	22.2	2.6	3.6	5.1	8.3	4.9	12.1	0.002	0.011	0.016	0.023	<0.001
	May 31	99	7.4	51.1	10.4	5.5	9.0	10.0	9.1	3.9						
Suttor (Up stream from minesite)	Feb. 3	91	7.5	82.1	5.0	7.6	16.2	5.5	9.5	8.1	19.1	0.004	0.015	0.018	0.05	<0.001
	Mar. 21	114	7.1	60.1	2.3	11.5	11.1	5.1	17.0	4.8	13.1	0.003	0.007	0.008	0.01	<0.001
	Mar. 28	119	8.8	67.2	7.2	11.5	12.6	6.4	18.2	6.5	13.0	0.002	0.007	0.006	0.008	<0.001
	Apr. 9															
	May 31	109	7.4	67.5	10.7	5.9	7.5	4.7	9.2	3.6						
Average		88	7.8	63.6	9.1	8.2	10.8	5.9	12.8	5.7	14.4	0.003	0.009	0.011	0.023	<0.001

3.1.5.6 Water management system

The Yandan water management system currently focuses on passive management, noting that the site is currently in an extended period of care and maintenance with limited exploration activities occurring on-site. Once operations recommence on-site, water will be required for processing activities, dust suppression, general site activities (including vehicle wash down) and amenities.

Water storages required for the operational phase of the Project will be re-activated during construction. Depending on operational requirements, this will include the Heap Leach Pregnant Pond and Barren Pond.

The water management system for the operational phase of the Project is detailed in Table 12, and shown in Figure 20.

Table 12: Water management system

Clean water	Potentially Mine affected water	Water management infrastructure
Water Storage Dam	- Yandan Tailings Dam - Tailings Water Return Dam - Heap Leach Pregnant Pond and Barren Pond - Heap Leach Stormwater Pond - Mine Water Dam - Main Pit - East Hill Pit	- The water management bund around the Heap Leach ponds (Heap Leach Stormwater Pond, Pregnant and Barren Ponds) - The water management bund around Main Pit to protect the pit from flooding. - The diversion of Yandan Creek around Main Pit.

3.1.6 Groundwater

Groundwater values within the Yandan Project area were assessed as part of the Project's feasibility studies (Forbes 1988). Groundwater occurs infrequently at the Project and is strongly controlled by geology, permeability and fault structures. The prevalence of crystalline volcanics hosting mineralised areas and compacted meta-sediments strongly restricts conductivity, connectivity and effective porosity in most areas. From available information, the conceptual hydrogeological framework across the Project area is described as (Forbes 1988):

- 1) East of the mining area and at the TSF and the HLP:
 - Meta-sediments of the Ukalunda Formation consist of low to very low permeability siltstones, sandstones and metamorphics, with limited groundwater occurrence.
- 2) Through the central area, a limited extent fracture hosted aquifer is likely associated with the Yandan Fault:
 - Faults within mining areas might host water as a highly localised system, where water storage is available in the adjacent material. Connectivity to these aquifers and the surrounding groundwater systems is limited.
 - It is unlikely that faults located within the Anakie Inlier and Drummond Basin are conductive due to the deformations and fine-grained sediments present in the materials. It is likely that faults in this location act as a hydraulic barrier to flow.
- 3) West of the Yandan Fault in the mineralised zone:
 - Volcanics, which can be classified further into oxide, the boiling zone and fresh rock.
 - Oxide materials are clay rich with very poor permeability and porosity meaning there is little movement of water throughout oxide material. This is supported by the absence of groundwater reported in this geology type.
 - The volcanics host the 'boiling zone'. A narrow zone formed through the boiling of hot fluids circulating within the epithermal system. Boiling zones may consist of voids or fractures which are more permeable, allowing the flow of groundwater at these locations. It is possible that this zone may have a role in groundwater flow around Main Pit.
 - Fresh volcanics consist of crystalline rocks, with very poor permeability and lack secondary porosity or void spaces. Groundwater is not likely to occur in this geology.
- 4) Alluvial aquifer as part of the Sutor River alluvium, reaching up to 30 m depth. However, it is noted that Project specific studies indicate no connection between the alluvial aquifers and Main Pit (Forbes 1988; SBE 2023a).

Aquifers associated with the boiling zone and Yandan Fault appear to be relatively conductive, with pre-Project dewatering studies suggesting dewatering demand rates of up to 5,000 m³/d to keep Main Pit dry, and pump test finding the fault and (what would appear to be) the boiling zone yielding draining

storativity and transmissivities of 50-1,000 m²/d (Forbes 1988, Greater Boulder Holdings Ltd 1988, within SBE 2022). It is noted that an objective of the study was to determine whether there was any potential connection to alluvial aquifers, however this was not identified at the time (Forbes 1988). Actual dewatering rates experienced during mining are not known.

Groundwater is described as flowing from east to west with topography (Forbes 1988), but with strong changes of hydraulic head changes between bores, indicating structural control and potential hydraulic separation (SBE 2022; SBE 2023b). The pressure head drops towards the west from the highest topography elevation in the east. Recent water level monitoring results from the Project's groundwater monitoring network ('RB1D', 'RB2D' and 'SH3') support a westward flow, moving from 177.7 mAHD at monitoring bore 'RB1D' in the east, to 168.4 mAHD westward, and to 162.5 mAHD at 'SH3' near Main Pit (SBE 2022). Groundwater monitoring bore networks (pre-2024) are shown through Figure 27.

At the Project groundwater is unlikely to "flow" in the traditional sense given the disconnected and low conductivity of host units (with Main Pit being the exception). The groundwater potentiometric surface more appropriately describes groundwater (SBE 2024b). The groundwater monitoring network was updated in 2024 (Figure 28) to improve groundwater understanding around key mine landforms and the potentiometric surface developed in 2022 was updated accordingly. Historical bores, such as s HL1, HL6, WSB, TD4, TD5, TD3 and TD7S/D are either not considered representative of groundwater due to location and depth, that is they are either situated too close to embankments/landforms or were known to have integrity issues and were removed from the modelling of the potentiometric surface (SBE 2024b).

The 2024 potentiometric surface is consistent with the findings of earlier work, showing a predominant gradient from east to west across the site, mimicking topography in higher-elevation areas. The gradient changes rapidly directly west of the TSF and east of the East Hill Pit into a sub-basin-style, flat gradient surface around the Water Supply Dam and Main Pit towards the Suttor River (SBE 2024b) (Figure 29). Near Main Pit, groundwater potentiometric surfaces are near pit lake water levels. From the Main Pit, the direction of the pressure head falls to the west underneath the Suttor River channel or south around the base of Yandan Creek.

Closely spaced potentiometric contours as a groundwater-surface generally signify a domain change for groundwater (SBE 2024b). At the Project, this is likely associated with the influence of both geology (changing formations between St Anns formation and Anakie Inlier) and the bounding offset of the Yandan East Fault.

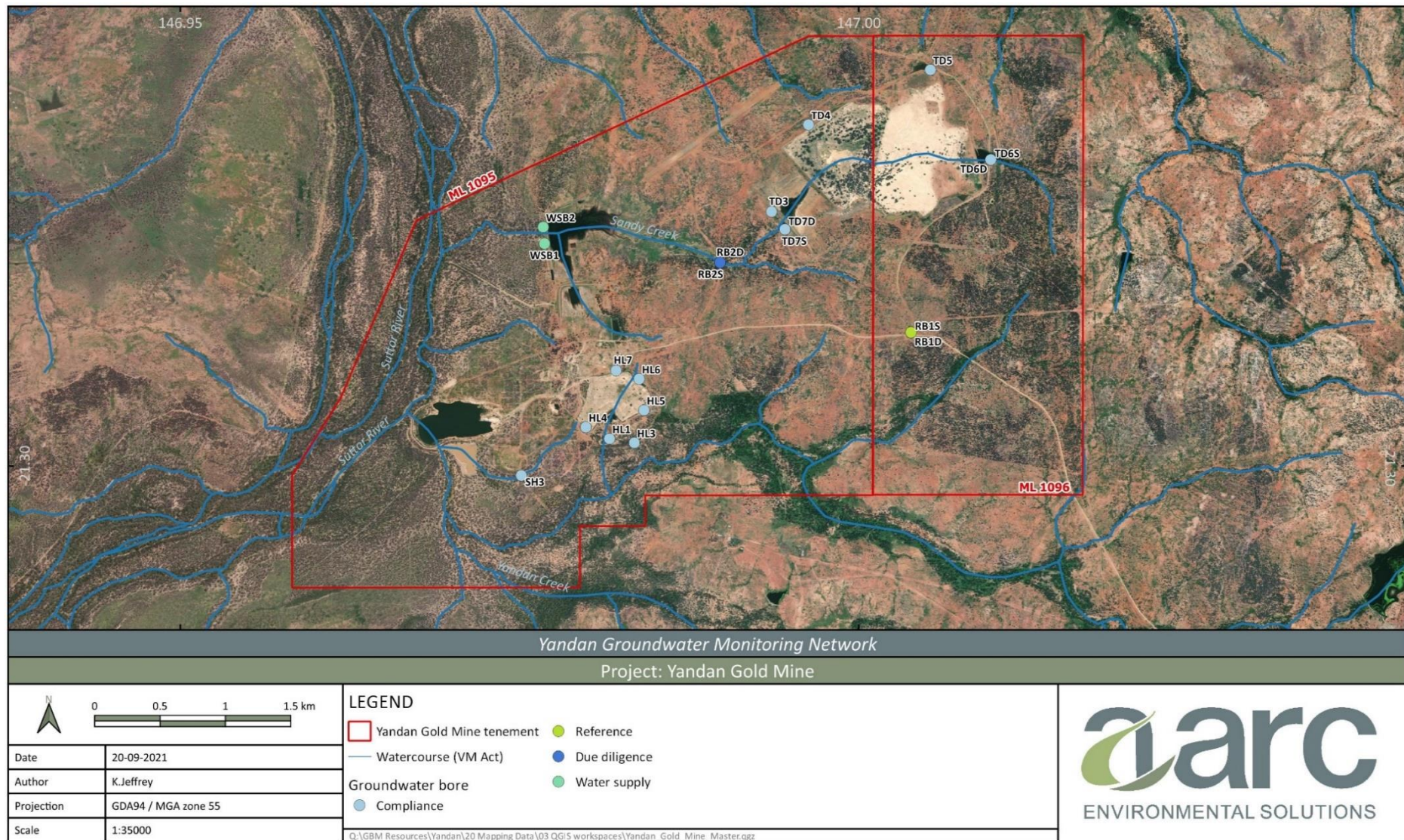


Figure 27: Yandan groundwater monitoring network (pre-2024)

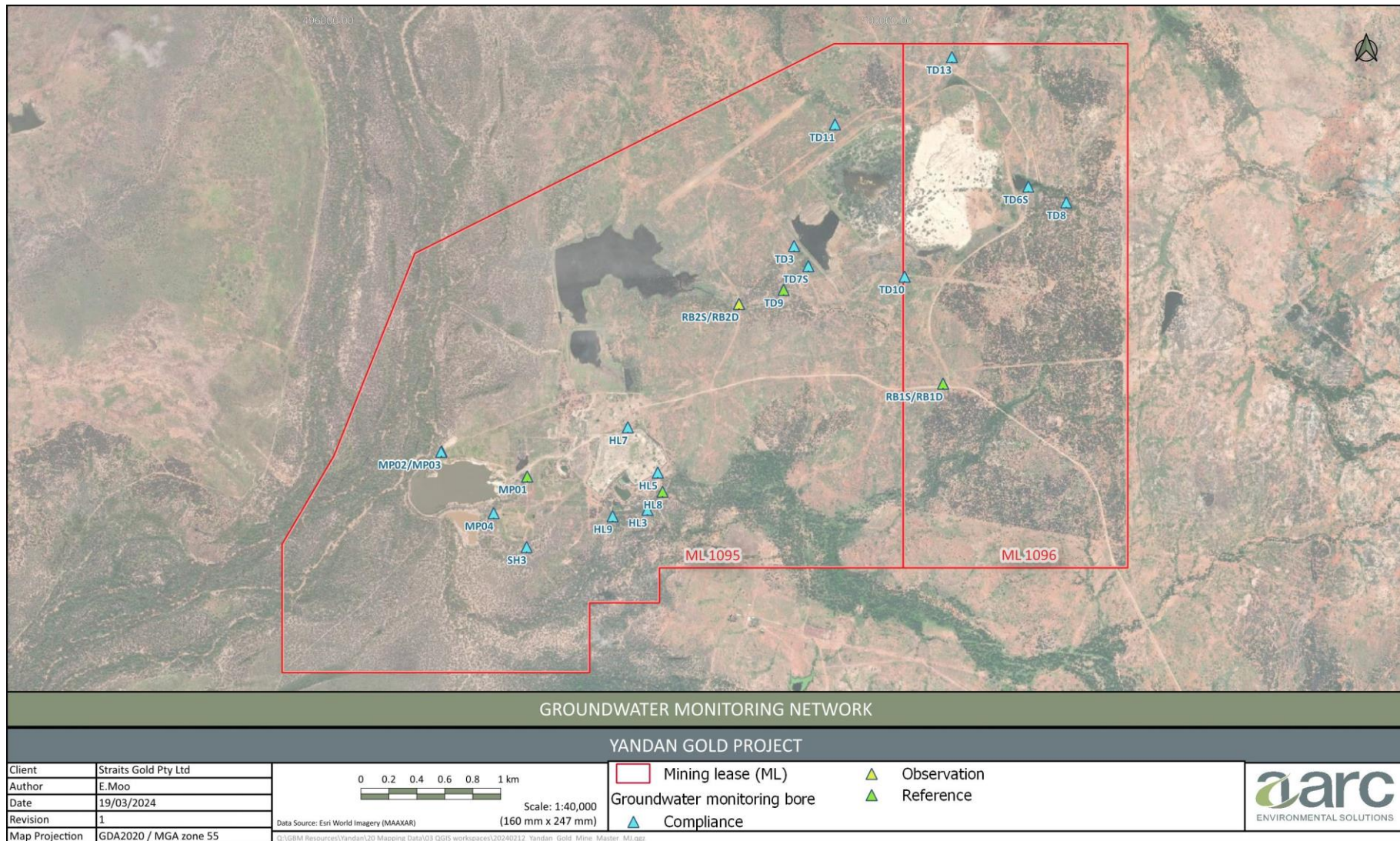


Figure 28: Yandan groundwater monitoring network (2024)

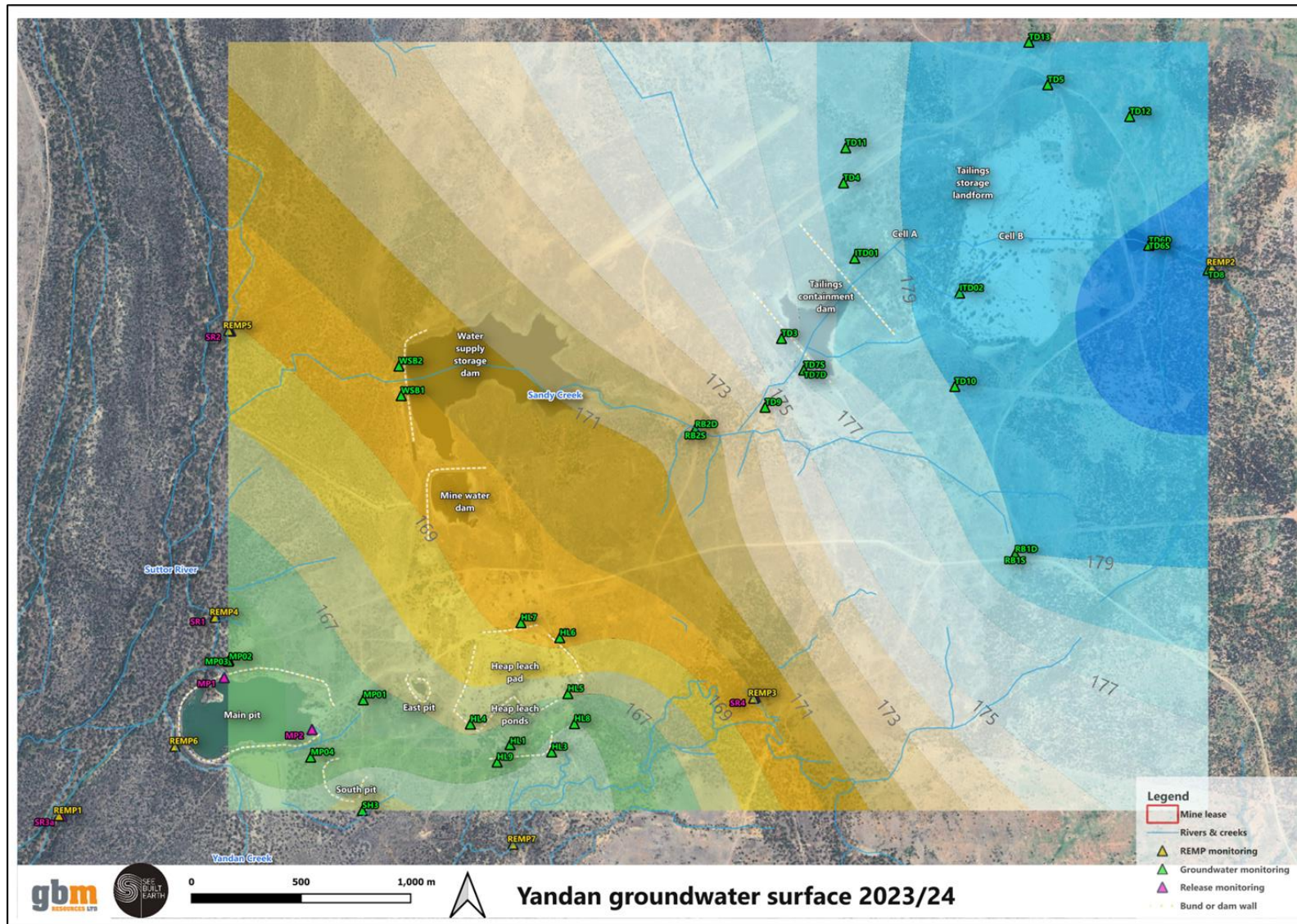


Figure 29: Yandan groundwater surface (SBE 2024a)

Groundwater levels

Groundwater level records from the Project's monitoring network indicate that groundwater levels have steadily declined since 2012 (RLA 2019) (Figure 30 and Figure 31) and have recovered in recent years. Generally, groundwater levels demonstrated a muted but delayed response to incident rainfall, indicating that the aquifers underlying the Project area of low permeability as it takes three months or more for groundwater levels to rise following peak rainfall events (RLA 2019). The exception is groundwater in the mineralised domain, with SH3 remaining relatively stable throughout. This suggests either less recharge exposure or a deeper source of groundwater that is not dependent on rainfall

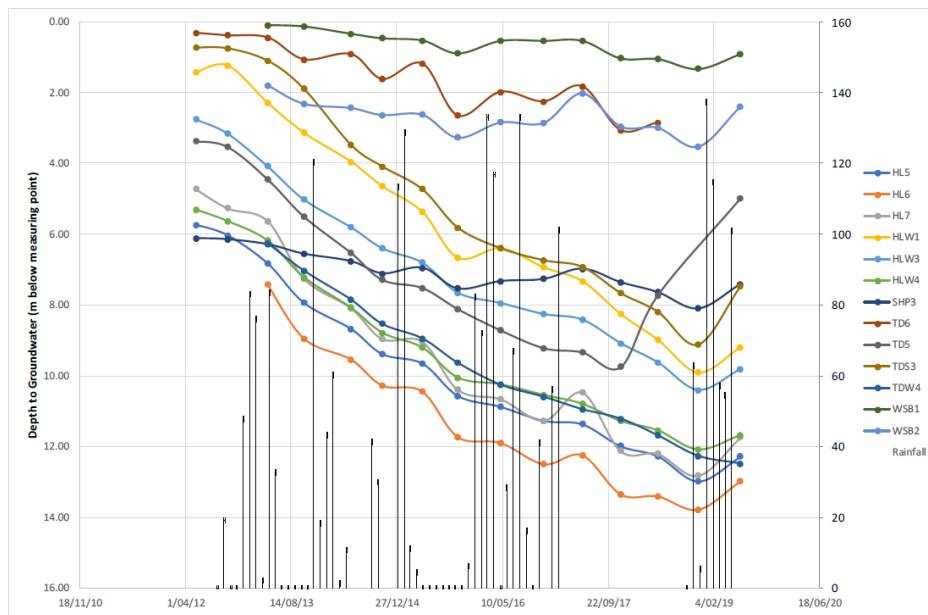


Figure 30: Groundwater level records (2012 – 2019) from the Yandan monitoring network (RLA 2019)

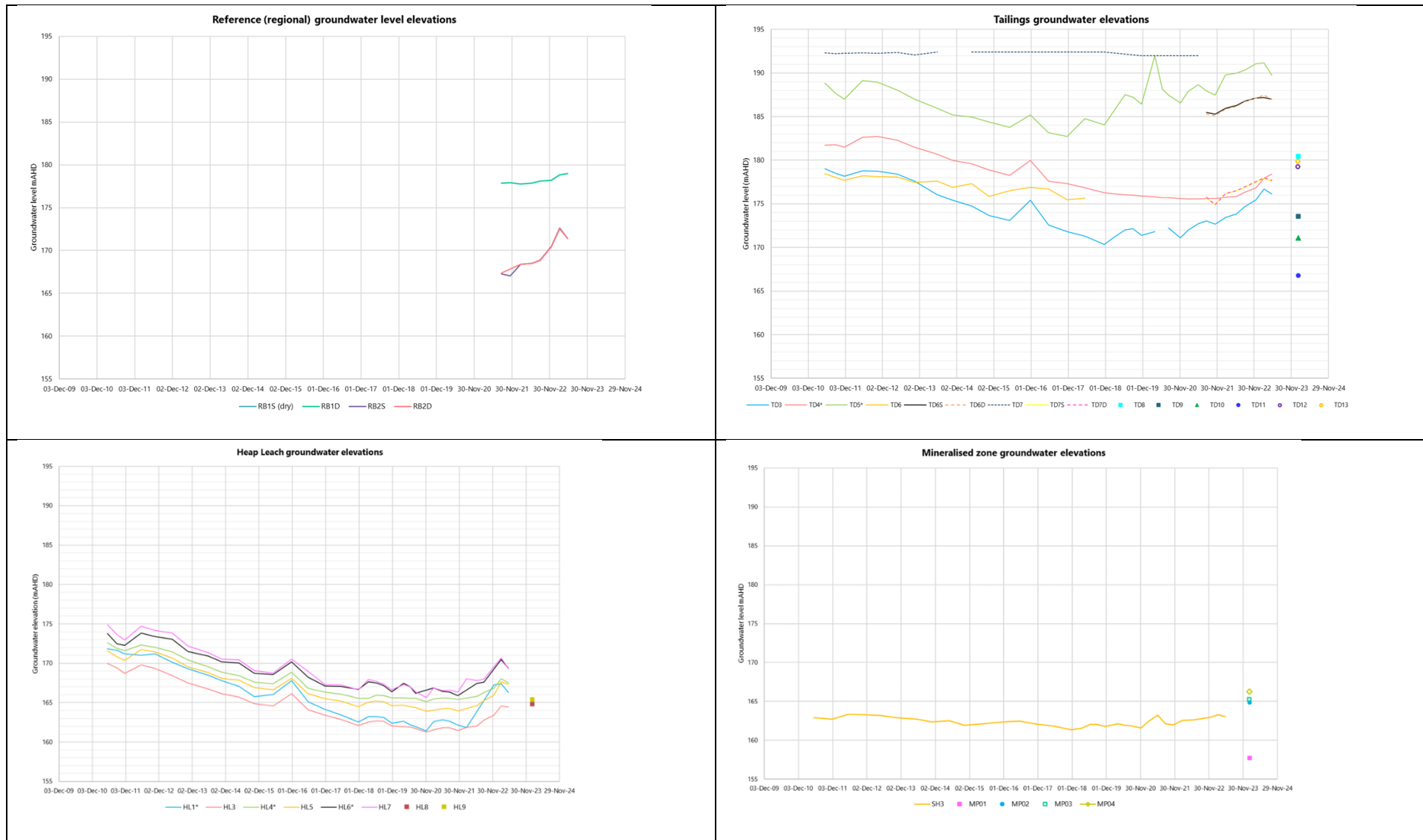


Figure 31: Groundwater level records (2011 – 2024) from the Yandan monitoring network

Drilling results from the 14 bores installed in 2024 are consistent with results to date of groundwater occurrence at the Project. Results indicate that groundwater is poorly developed, has very low conductivity and is isolated across the Project. Five bores were completely dry at the time of drilling (MP01, TD8, TD10, TD11, TD12), two of which were unable to be sampled in February 2024 due to insufficient water (TD10, TD11). The two bores constructed within the TSF (ITD01, ITD02) were damp at ground level (below the tailings) during drilling and were dry during the February 2024 monitoring event. Most of the remaining bores were reported to be 'damp at the time of drilling', which is representative of groundwater occurrence at the Project. Bore MP03 intersected the most water in February 2024 with a low yield flow from an area of associated mineralisation, likely within a localised fault at depth.

Groundwater quality

Groundwater within the region is poorly developed, generally being of low quality and availability. Baseline groundwater quality testing indicated that groundwater within the region is typically saline with total dissolved salts (TDS) ranging between 4,000 to 15,000 mg/l (Forbes 1988), therefore being considered mostly unsuitable for livestock watering, irrigation or domestic uses. Review of the registered water bores within the greater region suggests groundwater use by landholder is low, with only a few bores registered within the area (Queensland Government 2022).

A review of groundwater quality across the existing monitoring network identified a suite of bores were directly monitoring tailings water, pond water or dam water in close connection with entrained water within the facility or earthen embankment (SBE 2023). In most cases the historically elevated groundwater concentrations of salinity, EC and sulphate can be attributed to the inadequacies of the network design, such that these qualities reflect the entrained water quality rather than the receiving groundwater quality.

Following the review of the existing groundwater monitoring network (SBE 2023) and subsequent amendments to the EA, the groundwater monitoring network has been updated with the new bores (refer Figure 28). These bores were constructed in January 2024 and the first monitoring event was undertaken in February 2024. Several bores in the TSF and Heap Leach monitoring networks were removed from the compliance monitoring network by agreement with DESI.

Results from groundwater sampling (2011-2023) completed on-site are summarised as follows:

- All groundwater bores are within EA limits for pH and pH is neutral across all bores Figure 32;
- Elevated salinity values (as electrical conductivity EC) recorded within some monitoring bores in the TSF ('TD4', 'TD5', 'TD6S/D') and HLP ('HL1' and 'HL3') groundwater monitoring networks. Elevated salinity recorded within these networks is not considered to be representative of the receiving groundwater environment (SBE 2023):
 - Monitoring bores within the TSF network likely monitor water entrained within the TSF.
 - Elevated EC in the two HLP monitoring bores is considered to be related proximity to the leach ponds ('HL1').
- There is a direct correlation between chloride and salinity across all bores, when chloride increases, salinity increases. This is an indication that residence time within the bores is a key driver of high salinity observed at the Project (Figure 32).
- EC and sulphate show an ongoing declining trend at troughs and peaks (Figure 33 and Figure 34), indicating water quality is improving with time and indicating containment of the dam or cessation of drainage processes as suggested by RGS (2022).
- Elevated sulphate concentrations have been recorded within the TSF (principally 'TD6D/S') and HLP ('HL1') groundwater monitoring networks, as well as the monitoring bore downgradient from the backfilled South Hill Pit ('SH3') (Figure 34).
 - For the TSF, long-term groundwater monitoring for the network indicates sulphate concentrations have been relatively stable for some time and that the production of sulphate has now ceased or reduced (SBE 2023).

- For the HLP, long-term groundwater monitoring results demonstrate that sulphate concentrations within the monitoring network are generally < 1,000 mg/L. In the instance of 'HL1' which is immediately downgradient of the two decommissioned processing ponds, it is anticipated that leakage from these ponds is contributing to elevated sulphate levels in this bore (SBE 2022).
- For the backfilled South Hill Pit, long-term monitoring data indicates a median sulphate concentration of 2,790 mg/L in this bore, with a data range of 240 mg/L – 3,750 mg/L. Recent reporting confirms that water associated risks with this rehabilitated area are low and stable (SBE 2023).
- The water bores downgradient from the Water Storage Dam ('WSB1' and 'WSB2') were previously proposed as reference bores (RLA 2019). While long-term sulphate values at these bores (WSB1 - median: 2,500 mg/L; 'WSB2' - median: 2,310 mg/L) is elevated, it was considered that these values are indicative of regional groundwater sulphate concentrations. New bores have recently been installed for the purpose of providing reference values (RB1D/RB1S and RB2D/RB2S); data collection from these bores is ongoing.
- Metal concentration EA limits are typically met, with an isolated exception of a monitoring bore within the HLP monitoring network ('HL1'), which records elevated selenium (Figure 35 and Figure 36). This bore is considered to be an isolated and historically impacted bore.
- Regional groundwater (RB1) and Sandy Creek background (TD8) show natural enrichment across the Anakie Inlier in molybdenum, nickel, selenium and zinc before any landforms
- Groundwater within the mineralised areas is enriched in salinity, chloride, sulphate and sodium (Figure 37), consistent with characteristics of hydrothermal areas (Stumm & Morgan 2013). In comparison, groundwater within the Anakie Inlier are more enriched with carbonate and are lower in sulphate.
- Of the newly constructed bores, water quality exceedances were only noted with respect to sulphate concentrations in the four bores surrounding Main Pit (1,400 mg/L - 2,670 mg/L). These elevated sulphate concentrations are consistent with long-term monitoring trends (sulphate >1,000 mg/L) across the wider groundwater network and are associated with their proximity to the faults (and target resource) that host the mineralisation.

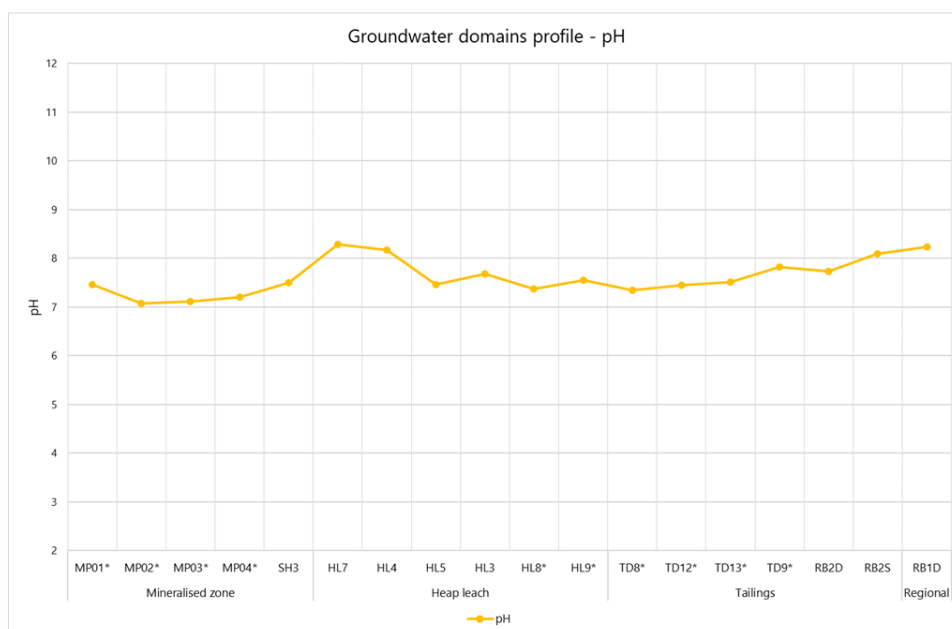


Figure 32: Groundwater quality, pH 2022-2023 (SBE 2024b)

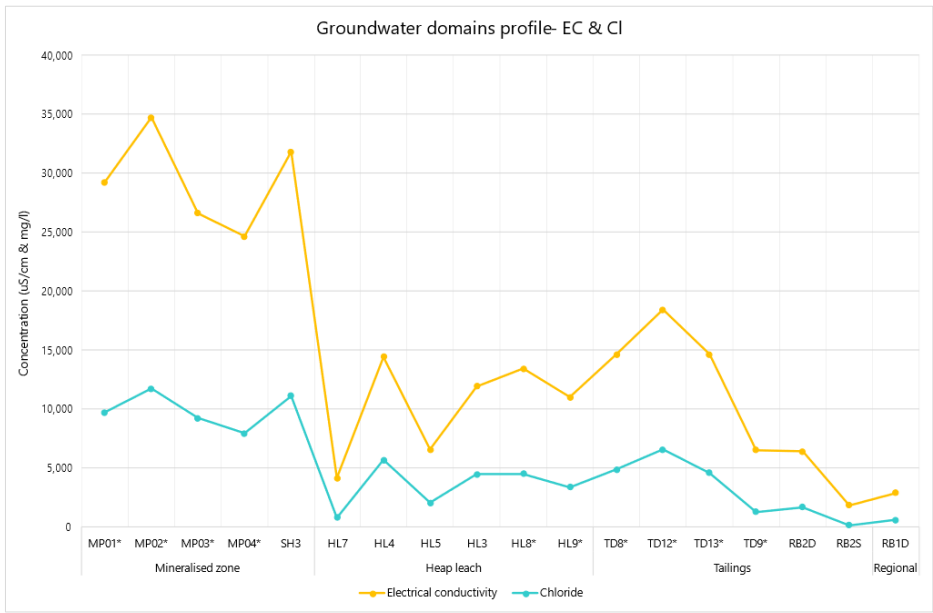


Figure 33: Groundwater quality, EC and Cl 2022-2023 (SBE 2024b)

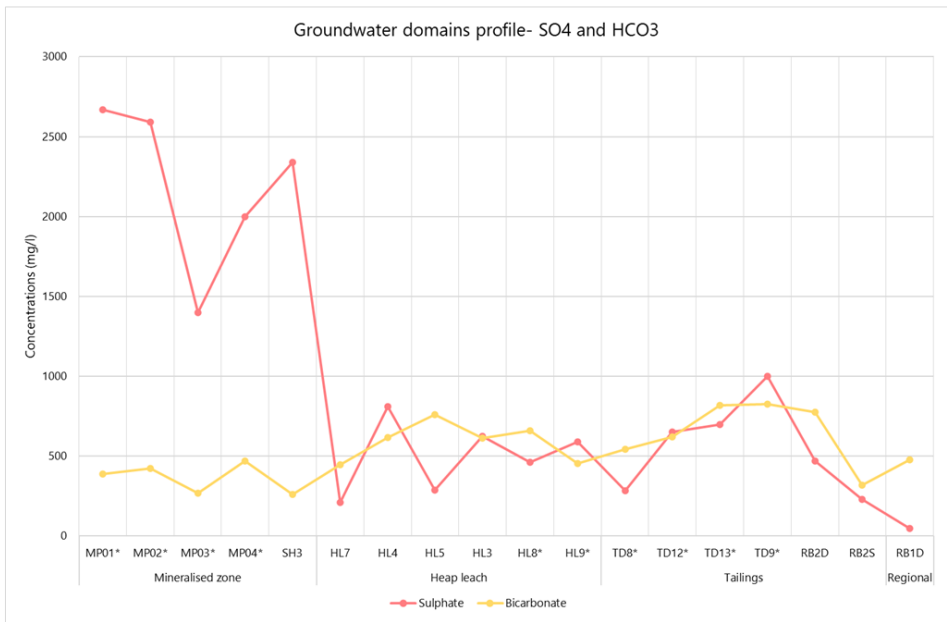


Figure 34: Groundwater quality, SO₄ and HCO₃ 2022-2023 (SBE 2024b)

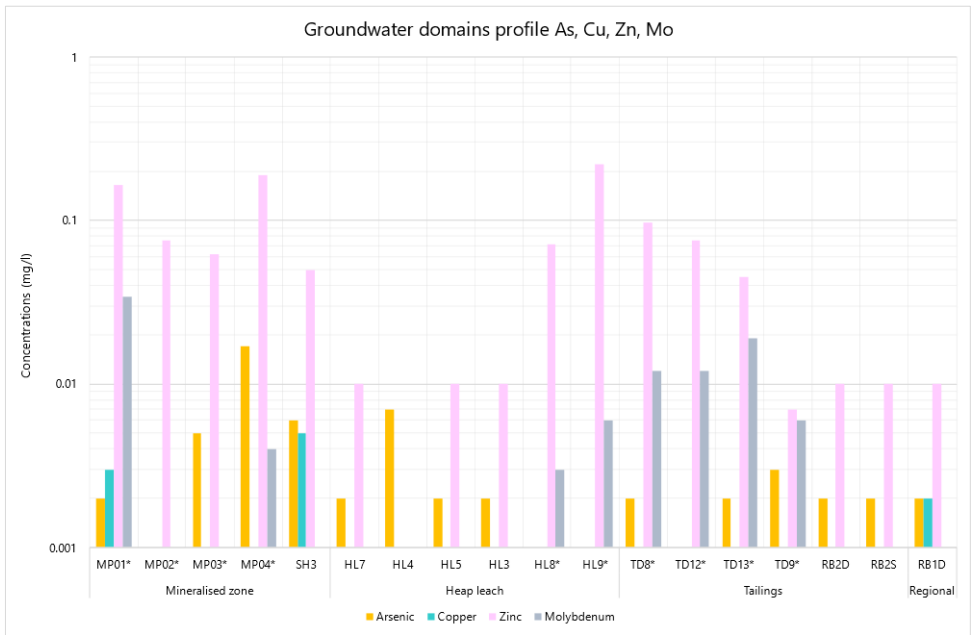


Figure 35: Groundwater quality, metals (1) 2022-2023 (SBE 2024b)

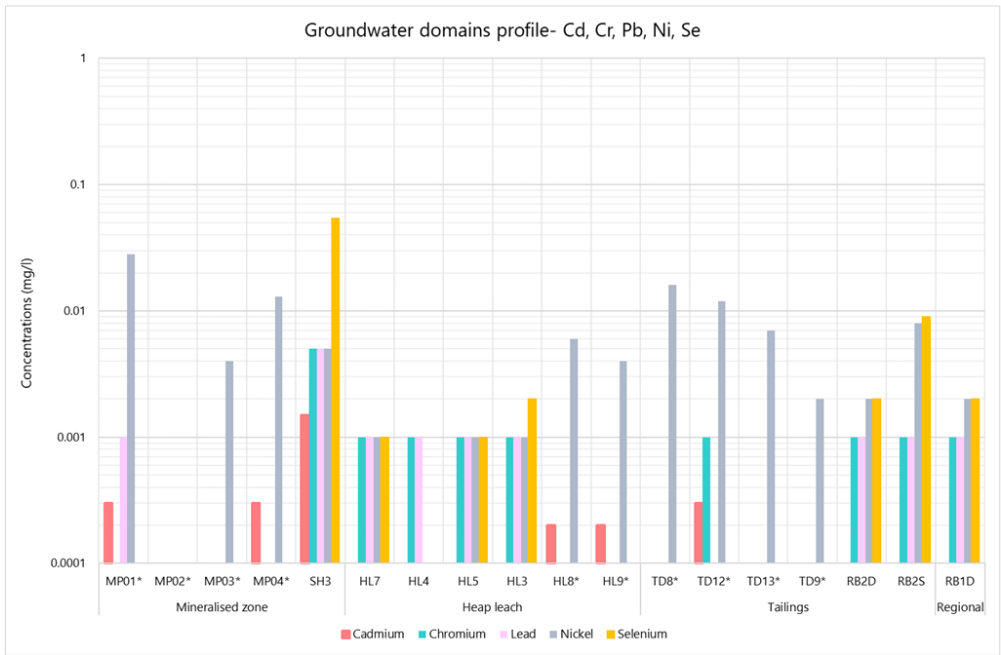


Figure 36: Groundwater quality, metals (2) 2022-2023 (SBE 2024b)

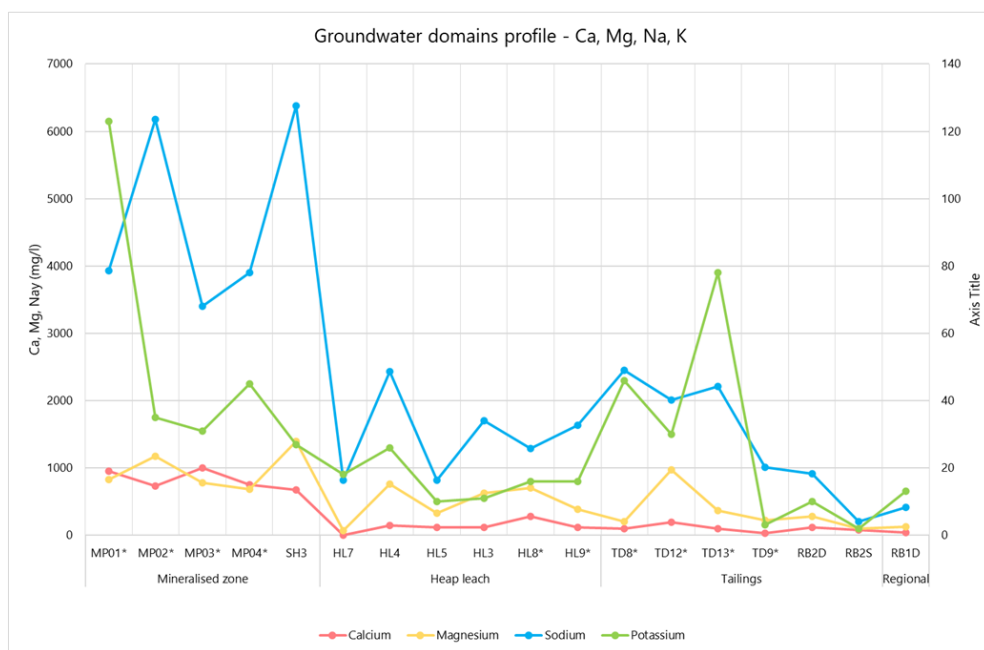


Figure 37: Groundwater quality, cations 2022-2023 (SBE 2024b)

An analysis of groundwater via piper plot was undertaken by SBE (2024b) to characterise groundwater across the Project (Figure 38). Reference locations RB1D and RB2S are separate from other groundwater populations with low chloride suggesting a localised groundwater system higher connection with rainfall compared to other bores within the monitoring network. This is supported by the topography at the bore locations, Bore RB2S is situated in the siltstones of Sandy Creek at a depth of 10 m and RB1D is situated within a small gully with elevations grading from 193 mAHD to the immediate west, to 191 mAHD at the bore location before rising to 199 mAHD to the east.

Regional groundwater (RB1) and Sandy Creek background (TD8) show natural enrichment across the Anakie Inlier in molybdenum, nickel, selenium and zinc before any landforms. There is a clear distinction between the chemistry of the St Annes Formation and the Anakie. The mineralised domain is enriched in salinity, chloride, sulphate, calcium and sodium, as often characterises hydrothermal areas (Stumm and Morgan 2013), and it reduces dramatically with transition to the Heap Leach, TSF or Regional domains

Main Pit groundwater (MP01, MP02, MP03, MP04 and SH3) can be characterised as sodium-chloride type with high chloride/elevated salinity, some sulphate and low carbonate indicative of groundwater in a hydrothermal, mineralised zone with very low movement.

The groundwater quality of TSF bores plot in three main populations (non-representative bores TD4 and TD5 have been exclude as per SBE 2022, 2023):

- Background quality bores TD8, TD6S/D are representative sodium-chloride type consistent with background water quality.
- Water quality influenced by TSF embankments due to the mixed type of groundwater recorded (TD3S, TD7S/D).
- Water quality Influenced by quartz veining and some mineralisation around the TSF as scattered groundwater population (TD9, TD12) and is heading towards calcium-chloride type groundwater.

Water quality within the HLP bores plot as similar to and between TSF populations, with results supporting the shared geology and residence time in Anakie Inlier metamorphics:

- Water quality within HL8, HL3 and HL9 plot as calcium-chloride type groundwater, similar to the water quality in TSF bore TD12 located to the east of the TSF.

- HL6, HL7, and HL1 are the exceptions due to however, they are not considered representative of groundwater due to being situated too close to embankments/landforms or were known to have integrity issues.

There are no RAMSAR wetlands or artesian groundwater within the region. The Suttor river and Yandan Creek are mapped as wetlands and potential terrestrial river groundwater dependent ecosystems (SBE 2022).

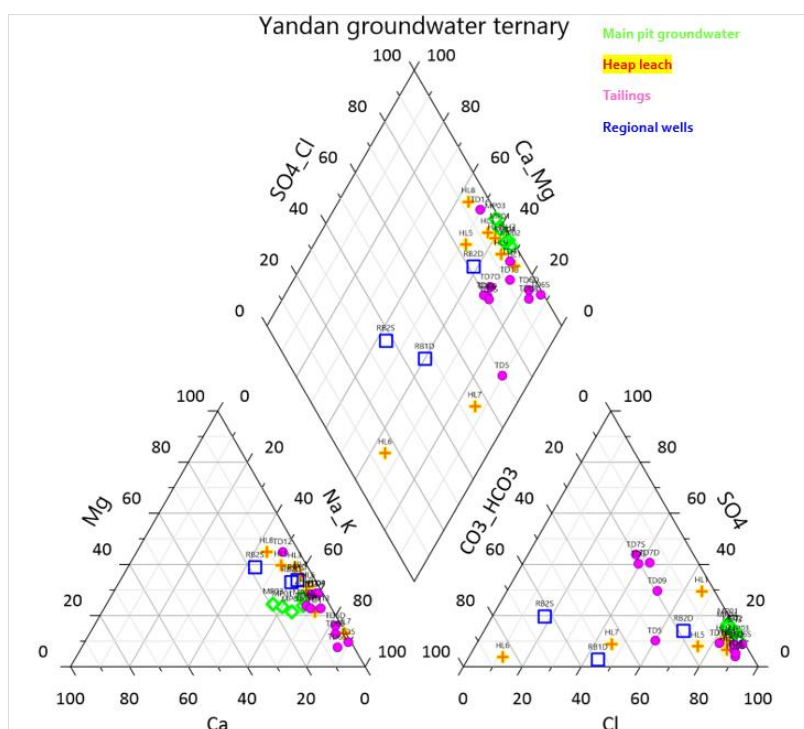


Figure 38: Piper diagram of Project groundwater (SBE 2024b)

3.1.7 Land and soil

3.1.7.1 Pre-mining land use and underlying landholders

Low intensity beef cattle grazing is the primary land use for the region, with much of the naturally occurring open forest and woodlands cleared for this purpose. Limitations of the soil, together with low rainfall and high rainfall variability render the stock carrying capacity relatively low. Information obtained from the Department of Primary Industries indicated that the carrying capacity of the land is approximately one beast per 15 ha (GHD 2008).

All rehabilitated areas of the Project are currently used by the local landholder for livestock grazing, which is consistent with the surrounding land use and the intended post mining land use for most of the Project site.

3.1.7.2 Soil types, properties and productivity

A Soil and Land Suitability Assessment (SLSA) was undertaken by AARC in 2021 (AARC 2022a). This assessment identified and characterised the soil management units (SMUs) within the MLs, evaluated management requirements, and calculated the rehabilitation material balance for the site. Standard soil survey procedures were adopted.

The SLSA identified five (5) SMUs on the Project, as summarised in Table 13 and illustrated in Figure 39. Dominant SMUs across the Project were the Clayey SMU and the Sandy SMU. Both SMUs were characterised as being non-sodic (low exchangeable sodium percentage) and non-saline.

The Clayey SMU is associated with brown chromosols on imperfectly drained soils and slowly permeable profiles. The Clayey SMU was identified with a land suitability class of 4: described as marginal land which is considered presently unsuitable for agricultural land uses due to severe limitations.

The Sandy SMU is associated with yellow arenosols, with rapidly drained soils and highly permeable profiles. The Sandy SMU was identified with a land suitability class of 5: described as unsuitable land due to extreme limitations that currently preclude its use for agricultural land uses.

It is noted that the land suitability assessment framework provides guidance in determining land suitability outcomes, however, this determination should also provide consideration to historical and existing land uses. In this instance, it is acknowledged that the pre-mining land use for the Project area was low intensity cattle grazing, as is the current use for the local area. It is therefore inferred that native pastures are adapted to the adverse soil characteristics. On this basis, it is considered that the Project area is suitable for low intensity cattle grazing, carefully managed with the implementation of appropriate management regimes to support this land use.

Table 13: Yandan soil types, properties and productivity

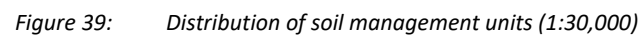
SMU	Australian Soil Classification	Description	Properties	Land Suitability Class (Grazing)
Clayey	Brown Chromosols	Greyish brown duplex soil	- weak angular block to subangular blocky structure with iron mottling observed in lower profile - slightly acidic to slightly alkaline with depth (pH 6.6–7.2) - low sodicity (ESP 1–1.9 %) - low Emerson dispersion class (2) - moderate plant available water capacity (100–125 mm) - predominantly Brigalows (<i>Acacia harpophylla</i>)	4***
Sandy	Yellow Arenosols	Reddish yellow shallow and sandy soil	- weak granular structure, with shallow profile - moderately acidic throughout solum (pH 5.6–5.8) - low sodicity (ESP 1.9–3.3 %) - low Emerson dispersion class (2) - low plant available water capacity (75–100 mm) - predominantly narrow-leaved ironbark (<i>Eucalyptus crebra</i>)	5***
Shallow*	Red Calcarosols	Reddish soil with calcium carbonate segregations	- weak granular structure with moderate subangular blocky structure between 0.2–0.3 m - field pH is slightly to moderately alkaline (pH 7–9) - Contains calcareous and ferruginous segregations - predominantly Brigalows (<i>Acacia harpophylla</i>)	-
Silty*	Brown Tenosols	Yellowish brown loamy sand soils	- weak granular structure with moderate polyhedral structure between 0.2–0.4 m - field pH is slightly acid to slightly alkaline (pH 6.5–7.5) - Contains ferruginous segregations - predominantly Gidgees (<i>Acacia cambagei</i>)	-
Alluvial**	Grey Vertosols	Grey fine cracking clays	Smooth faced peds, underlain by mottled clay	-

Note:

* SMUs were grouped without chemical and physical analysis. Assessments were conducted based on soil profile descriptions, field observations and available desktop resources.

**SMU was grouped and mapped based on the Digital Atlas of Australian Soils (Bureau of Rural Science 1991) – CC53, due to land access restrictions. Soils are located outside of the disturbance footprint and will not be used for rehabilitation.

*** Considered suitable based on current land use of low intensity grazing.



3.1.7.3 Land stability

The soils within the Project area are described to be non-sodic, due to extremely low sodium ions leading to low exchangeable sodium percentage (ESP) values. However, both SMUs present with low to deficient calcium levels, relative to magnesium, indicating a risk of dispersion. In addition, Emerson aggregate tests demonstrate slaking and some dispersion in both Clayey and Sandy SMUs (Emerson Class Number 2).

Surface erosion is noted in field observations throughout the Project area, especially within the Sandy SMU. Areas of surface erosion are associated with soil properties, slopes, and low intensity grazing; predisposing the Project to ongoing land stability issues. Management methods for mitigating land stability issues on the Project include erosion and sediment control methods, and include the following:

- good topsoil management practices;
- the addition of fertilisers and soil ameliorants;
- grading and shaping;
- timely seeding with suitable species; and
- post-establishment management of rehabilitated areas.

Further details on soil management on the Project are provided in the SLSA.

3.1.8 Flora and fauna

3.1.8.1 Flora

The Project area lies at the northern end of the Brigalow Belt, an area of open forests and woodlands dominated by *Acacia harpophylla* (Brigalow). Since European settlement, the Brigalow Belt has undergone extensive clearing, particularly with the aid of machinery, mainly for the establishment of improved pastures with intermittent cropping where the soil type and slope is viable.

Prior to the commencement of mining, much of the original open forest and woodland communities had been cleared from site for agricultural purposes (Greater Boulder Holdings Ltd 1988). A long history of agricultural use was considered to have resulted in the degradation of the remaining vegetation (Greater Boulder Holdings Ltd 1988).

Remaining vegetation on the Project occurs predominantly in the west and east of the mining lease and generally in association with drainage lines. Queensland Government Vegetation Management remnant regional ecosystem (RE) mapping (DES 2022) identifies eight REs on the Project site, including six composite REs, as listed in Table 14 and illustrated in Figure 40.

Queensland Government mapping identifies remnant REs on the Project that are listed as 'of concern' and 'endangered' under the Queensland *Vegetation Management Act 1999* (VM Act). The distribution of endangered composite REs is restricted to drainage lines associated with the Suttor River and Yandan Creek, with these areas being retained throughout the period of mining. Remnant vegetation containing of concern REs occurs mainly in the south-west and north-west of the site.

Table 14: Queensland Government mapped remnant REs within the Project (DES 2024)

Regional Ecosystem (composition %)	Short description	Vegetation Management Act Class
11.11.13/11.11.15/11.3.10 (60/30/10)	<i>Acacia harpophylla</i> or <i>A. argyrodendron</i> low open forest with a secondary tree layer of <i>Terminalia oblongata</i> on deformed and metamorphosed sediments and interbedded volcanics / <i>Eucalyptus crebra</i> woodland to open woodland on deformed and metamorphosed sediments and interbedded volcanics / <i>Eucalyptus brownii</i> woodland on alluvial plains	Of concern / Least Concern / Least Concern
11.11.9/11.11.16 (80/20)	<i>Eucalyptus populnea</i> or <i>E. brownii</i> woodland on deformed and metamorphosed sediments and interbedded volcanics / <i>Eucalyptus cambageana</i> , <i>Acacia harpophylla</i> open forest to woodland on old sedimentary rocks with varying degrees of metamorphism and folding. Lowlands	Least Concern / Of Concern
11.3.10/11.3.25/11.3.3 (70/20/10)	<i>Eucalyptus brownii</i> woodland on alluvial plains / <i>Eucalyptus tereticornis</i> or <i>E. camaldulensis</i> woodland fringing drainage lines / <i>Eucalyptus coolabah</i> woodland on alluvial plains	Least Concern / Least Concern / Of Concern
11.3.25 (100)	<i>Eucalyptus tereticornis</i> or <i>E. camaldulensis</i> woodland fringing drainage lines	Least Concern
11.3.25/11.3.37/11.3.1 (80/10/10)	<i>Eucalyptus tereticornis</i> or <i>E. camaldulensis</i> woodland fringing drainage lines / <i>Eucalyptus coolabah</i> fringing woodland on alluvial plains / <i>Acacia harpophylla</i> and/or <i>Casuarina cristata</i> open forest on alluvial plains	Least Concern / Least Concern / Endangered
11.3.3 (100)	<i>Eucalyptus coolabah</i> woodland on alluvial plains	Of Concern
11.3.3/11.3.8 (60/40)	<i>Eucalyptus coolabah</i> woodland on alluvial plains / <i>Acacia argyrodendron</i> woodland on alluvial plains	Of Concern /Least Concern
11.5.3/11.7.3 (80/20)	<i>Eucalyptus populnea</i> +/- <i>E. melanophloia</i> +/- <i>Corymbia clarksoniana</i> woodland on Cainozoic sand plains and/or remnant surfaces / <i>Eucalyptus persistens</i> , <i>Triodia mitchellii</i> open woodland on stripped margins of Cainozoic lateritic duricrust	Least Concern / Least Concern

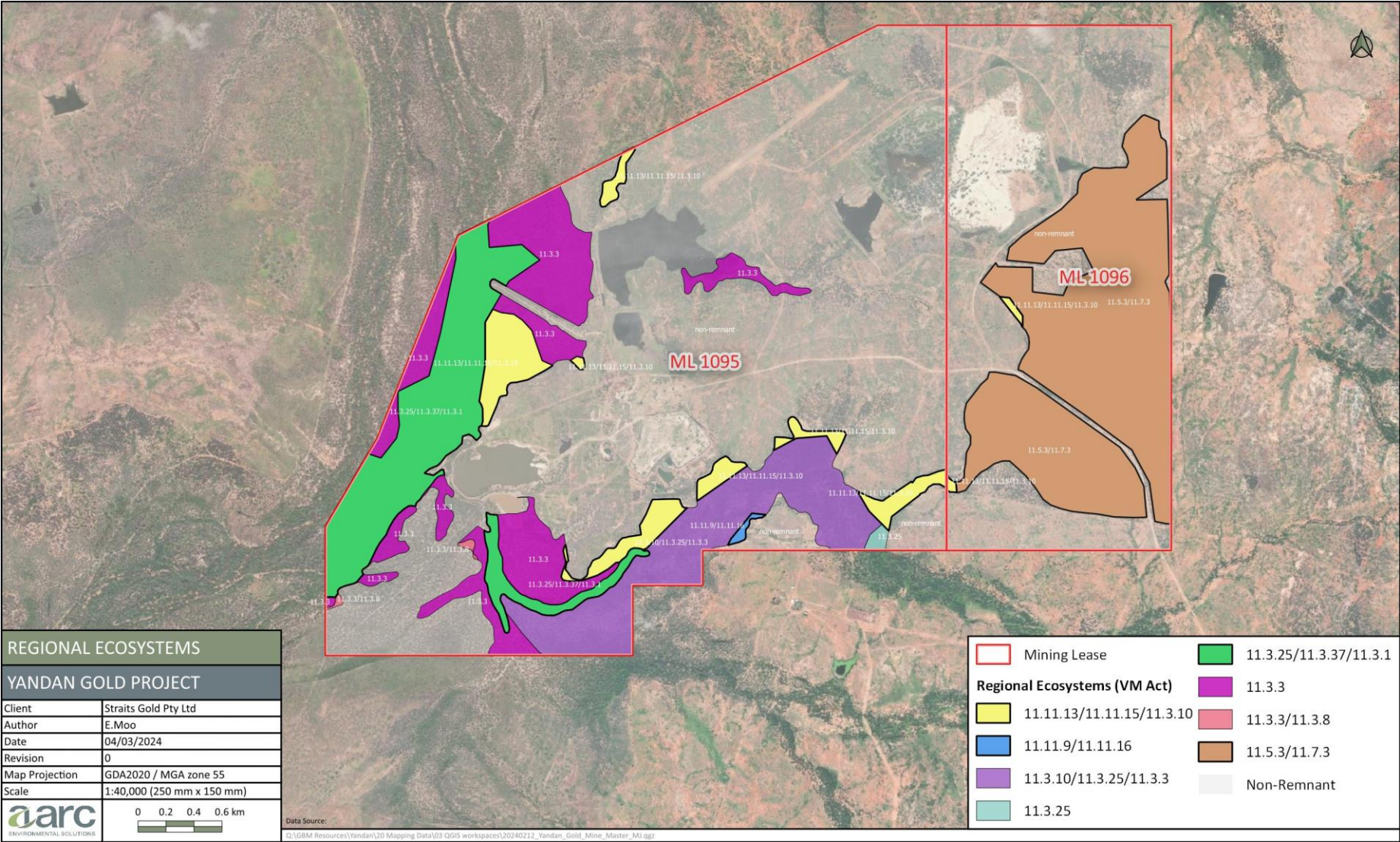


Figure 40: Queensland Government mapped remnant REs on the Project (Source: DES 2023b)

3.1.8.2 Flora

Database searches using the Federal DCCEEW's Protected Matters Search Tool (PMST) and the Queensland Government's WildNet database (undertaken in December 2023) identified 86 native flora species that may occur within the Project MLs and surrounding area.

Of those species identified in the database searches, a total of six species are of conservation significance, being listed under the Queensland *Nature Conservation Act 1992* (NC Act) and/or EPBC Act, as listed below in Table 15. All species of conservation significance have potential to occur within the Project region, however, no sightings are recorded on the WildNet database.

No Protected Plants Flora Survey Trigger Areas were identified within the Yandan MLs or the surrounding region.

Table 15: Conservation significant flora species identified or with the potential to occur

Class	Family	Scientific Name	Common Name	NC Act Status	EPBC Act Listing Status
Equisetopsida	Poaceae	<i>Dichanthium queenslandicum</i>	King Bluegrass	V	E
Equisetopsida	Poaceae	<i>Dichanthium setosum</i>	Bluegrass	LC	V
Equisetopsida	Myrtaceae	<i>Eucalyptus raveretiana</i>	Black Ironbox	LC	V
Equisetopsida	Arecaceae	<i>Livistona lanuginosa</i>	Waxy Cabbage Palm	V	V
Equisetopsida	Simaroubaceae	<i>Samadera bidwillii</i>	Quassia	V	V
Equisetopsida	Solanaceae	<i>Solanum graniticum</i>	Granite nightshade	E	E

3.1.8.3 Fauna

A terrestrial fauna assessment was completed as part of the Impact Assessment Study for the Project (Greater Builder Holdings Ltd 1988). The assessment indicated low species diversity of vertebrate fauna and low population densities compared with the surrounding area, considered to be the result of the condition of the remaining vegetation on-site (Greater Builder Holdings Ltd 1988).

Fauna species observed on the site included amphibians, reptiles, birds, and mammals, as detailed in Table 16.

Conservation significant fauna

Conservation significant fauna observed at Yandan during the baseline terrestrial assessment included *Phascolarctos cinereus* (Koala) and *Tachyglossus aculeatus* (Short-beaked Echidna). The Koala is listed as vulnerable under the Queensland *Nature Conservation Act 1992* (NC Act) and endangered under the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act). The Short-beaked Echidna is listed as special least concern under the NC Act.

Past mine activity is not anticipated to have significantly impacted these species due to the significant amount of clearing and vegetation degradation that had occurred pre-mining (see Section 3.1.8.1). No new vegetation disturbance is considered in this PRCP.

Table 16: Fauna species found on the Project site

Family	Scientific Name	Common Name	NC Act Status	EPBC Status
Amphibians				
Hylidae	<i>Litoria rubella</i>	Desert Tree Frog	LC	Not listed
Reptiles				
Gekkonidae	<i>Gehyra australis</i>	Northern Dtella	LC	Not listed
Scincidae	<i>Carlia pectoralis</i>	Open-litter Rainbow-skink	LC	Not listed
Scincidae	<i>Cryptoblepharus plagiocephalus</i>	Arboreal Snake-eyed Skink	LC	Not listed
Boidae	<i>Morelia spilota</i>	Carpet Python	LC	Not listed
Elapidae	<i>Hoplocephalus bitorquatus</i>	Pale-headed Snake	LC	Not listed
Elapidae	<i>Pseudonaja textilis</i>	Eastern Brown Snake	LC	Not listed
Elapidae	<i>Simonselaps australis</i>	Coral Snake	LC	Not listed
Birds				
Anhingidae	<i>Anhinga novaehollandiae</i>	Australasian Darter	LC	Not listed
Ardeidae	<i>Ardea pacifica</i>	White-necked Heron	LC	Not listed
Accipitridae	<i>Milvus migrans</i>	Black Kite	LC	Not listed
Accipitridae	<i>Haliastur spenurus</i>	Whistling Kite	LC	Not listed
Accipitridae	<i>Aquila audax</i>	Wedge-tailed Eagle	LC	Not listed
Falconidae	<i>Falco longipennis</i>	Australian Hobby	LC	Not listed
Falconidae	<i>Falco berigora</i>	Brown Falcon	LC	Not listed
Falconidae	<i>Falco cenchroides</i>	Nankeen Kestrel	LC	Not listed
Columbidae	<i>Geopelia placida</i>	Peaceful Dove	LC	Not listed
Columbidae	<i>Ocyphaps lophotes</i>	Crested Pigeon	LC	Not listed
Columbidae	<i>Geophaps scripta</i>	Squatter Pigeon	LC	Not listed
Cacatuidae	<i>Calyptorhynchus banksii</i>	Red-tailed Black Cockatoo	LC	Not listed
Cacatuidae	<i>Eolophus roseicapilla</i>	Galah	LC	Not listed
Cacatuidae	<i>Cacatua galerita</i>	Sulphur-crested Cockatoo	LC	Not listed
Psittacidae	<i>Trichoglossus haematodus</i>	Rainbow Lorikeet	LC	Not listed
Psittacidae	<i>Aprosmictus erythropterus</i>	Red-winged Parrot	LC	Not listed
Psittacidae	<i>Platycercus adscitus</i>	Pale-headed Rosella	LC	Not listed

Family	Scientific Name	Common Name	NC Act Status	EPBC Status
Cuculidae	<i>Chrysococcyx basalis</i>	Horsefield's Bronze Cuckoo	LC	Not listed
Cuculidae	<i>Eudynamys scolopacea</i>	Common Koel	LC	Not listed
Cuculidae	<i>Scythrops novaehollandiae</i>	Channel-billed Cuckoo	LC	Not listed
Cuculidae	<i>Centropus phasianinus</i>	Pheasant Coucal	LC	Not listed
Podargidae	<i>Podargus strigoides</i>	Tawny Frogmouth	LC	Not listed
Halcyonidae	<i>Dacelo novaeguineae</i>	Laughing Kookaburra	LC	Not listed
Halcyonidae	<i>Dacelo leachii</i>	Blue-winged Kookaburra	LC	Not listed
Meropidae	<i>Merops ornatus</i>	Rainbow Bee-eater	LC	Not listed
Campephagidae	<i>Coracina novaehollandiae</i>	Black-faced Cuckoo-shrike	LC	Not listed
Pachycephalidae	<i>Pachycephala rufiventris</i>	Rufous Whistler	LC	Not listed
Pachycephalidae	<i>Colluricincla harmonica</i>	Grey-shrike Thrush	LC	Not listed
Rhipiduridae	<i>Rhipidura leucophrys</i>	Willie Wagtail	LC	Not listed
Pomatostomus	<i>Pomatostomus temporalis</i>	Grey-crowned Babbler	LC	Not listed
Maluridae	<i>Malurus lamberti</i>	Variegated Fairy-wren	LC	Not listed
Maluridae	<i>Malurus melanocephalus</i>	Red-backed Fairy-wren	LC	Not listed
Acanthizidae	<i>Smicrornis brevirostris</i>	Weebill	LC	Not listed
Acanthizidae	<i>Acanthiza chrysorrhoa</i>	Yellow-rumped Thornbill	LC	Not listed
Meliphagidae	<i>Philemon corniculatus</i>	Noisy Friar-bird	LC	Not listed
Meliphagidae	<i>Philemon citreogularis</i>	Little Friar-bird	LC	Not listed
Meliphagidae	<i>Manorina flavigula</i>	Yellow-throated Miner	LC	Not listed
Meliphagidae	<i>Meliphaga virescens</i>	Singing Honeyeater	LC	Not listed
Nectariniidae	<i>Dicaeum hirundinaceum</i>	Mistletoe-bird	LC	Not listed
Pardalotidae	<i>Pardalotus striatus</i>	Striated Pardalote	LC	Not listed
Corcoracidae	<i>Struthidea cinerea</i>	Apostle-bird	LC	Not listed
Monarchidae	<i>Grallina cyanoleuca</i>	Magpie-lark	LC	Not listed
Artamidae	<i>Artamus minor</i>	Little Woodswallow	LC	Not listed
Artamidae	<i>Cracticus torquatus</i>	Grey Butcherbird	LC	Not listed
Artamidae	<i>Cracticus nigrogularis</i>	Pied Butcherbird	LC	Not listed
Corvidae	<i>Corvus coronoides</i>	Australian Raven	LC	Not listed
Corvidae	<i>Corvus orru</i>	Torresian Crow	LC	Not listed

Family	Scientific Name	Common Name	NC Act Status	EPBC Status
Mammals				
Tachyglossidae	<i>Tachyglossus aculeatus</i>	Short-beaked Echidna	SL	Not listed
Dasyuridae	<i>Sminthopsis crassicaudata</i>	Fat-tailed Dunnart	LC	Not listed
Potoroidae	<i>Aepyprmnus rufescens</i>	Rufous Bettong	LC	Not listed
Macropodidae	<i>Macropus giganteus</i>	Eastern Grey Kangaroo	LC	Not listed
Pteropodidae	<i>Pteropus scapulatus</i>	Little Red Flying-fox	LC	Not listed
Vespertilionidae	<i>Nyctophilus bifax</i>	North Queensland Long-eared Bat	LC	Not listed
Leporidae	<i>Orytolagus cuniculus</i> *	European Rabbit	Not listed	Not listed

Note: * Indicates an introduced species

Database searches on WildNet (Queensland Government 2022) and the Federal Department of Climate Change, Energy, the Environment and Water's (DCCEEW) PMST were also completed (in December 2023) to compile an updated list of conservation significant species. These database searches identified that the *Denisonia maculata* (Ornamental Snake) has the potential to occur within the Project region, however, noting that this species was not identified in the terrestrial fauna assessment (Greater Builder Holdings Ltd 1988).

Table 17: Fauna of conservation significance with the potential to occur within the Project region (WildNet and PMST database record)

Class	Family	Scientific Name	Common Name	NC Act Status	EPBC Status
Aves	Columbidae	<i>Geophaps scripta scripta</i>	Squatter Pigeon	V	V
Mammalia	Tachyglossid	<i>Tachyglossus aculeatus</i>	Short-beaked Echidna	SL	Not listed
Mammalia	Phascolarctidae	<i>Phascolarctos cinereus</i>	Koala	E	E
Reptilia	Elapidae	<i>Denisonia maculata</i>	Ornamental Snake	V	V

3.1.8.4 Wetlands

The Queensland wetland mapping WetlandMaps identifies wetlands within the Yandan MLs and surrounding region. Wetlands associated with riverine regional ecosystems are mapped along the Suttor River (e.g. RE 11.3.25). Lacustrine waterbodies and associated REs are mapped in occurrence with water storage dams and pits on the Project. Wetland areas associated with REs are mapped to the west of the Project MLs, alongside the Suttor River.

The EPP (Water and Wetland Biodiversity) Map of Queensland Wetland EVs identifies wetlands of general ecological significance on the Yandan MLs in association with local waterways, principally the Suttor River. The nearest mapped wetlands of high ecological significance are located approximately 10 km to the east of the Project MLs.

3.2 Community consultation

Throughout the life of the Yandan Gold Project the respective owners have maintained communications with the local community, with consultation ongoing as part of approval processes and through operational periods, as well as throughout the current care and maintenance period.

3.2.1 Project and ownership history

Ownership of the Yandan Gold Project has been transferred multiple times since development of the Project in the early 1990s. To provide context to community consultation efforts over this time, the following provides an overview of the Project's ownership against the key milestones in the life of the Project.

Applications for the Project MLs (now ML1095 and ML1096) were lodged in August 1988 by Great Boulder Holdings Limited, a member of the Western Mining Corporations Limited Group of Companies. Mining operations commenced under Western Mining Corporations Limited as manager for Great Boulder Holdings Limited.

The Impact Assessment Study for the Project approval was submitted in December 1988, with the Project MLs granted in June 1991.

In July 1992, Ross Mining N.L. acquired the Project, as well as the Wirralie Gold Mine, a controlling interest in the Mount Coolon joint venture, and exploration tenements associated with the three assets.

Ross Mining N.L. operated the Project between 1993–2000, producing over 350,000 ounces of gold from heap leach operations and a CIL process plant. Mining operations ceased in 1998, with the HLP remaining operational until September 2002. The site was placed into care and maintenance in April 1999, pending final closure works. The gold processing plant was later removed in 2006/2007, prior to the acquisition of the Project by Straits Gold, a wholly owned subsidiary of Aeris Resources Ltd at the time. The Project has remained in care and maintenance since closure in 1999.

GBM Resources acquired the Project and the Straits Gold entity on 13 January 2021.

Table 18: History of mining lease holders of Yandan Gold Project

Permit	Permit holder	Share (%)	Held from	Held to
ML 1095	Straits Gold Pty Ltd (as subsidiary of GBM Resources Ltd)	100	13 January 2021	Present
	Straits Gold Pty Ltd (as subsidiary of Aeris Resources Ltd)	100	02 August 2006	13 January 2021
	Drummond Gold Limited Farm in Agreement & Joint Venture with Straits Exploration (Australia) Pty Ltd	Unknown	May 2009	27 July 2011
	Straits Exploration (Australia) Pty Ltd (as subsidiary of Aeris Resources Ltd)	Unknown	03 May 2006	02 August 2006
	Straits Exploration (Australia) Pty Ltd Joint Venture with Wirralie Mines Pty Ltd (as subsidiary of Ashburton Minerals Ltd)	Unknown	26 February 2004	03 May 2006
	Ashburton Minerals Ltd	Unknown	2003	2004
	Delta Gold Ltd	Unknown	2000	2003
	Ross Mining N.L.	Unknown	July 1992	2000

Permit	Permit holder	Share (%)	Held from	Held to
	Greater Boulder Holdings Limited	Unknown	27 June 1991	July 1992
ML 1096	Straits Gold Pty Ltd (as subsidiary of GBM Resources Ltd)	100	13 January 2021	Present
	Straits Gold Pty Ltd (as subsidiary of Aeris Resources Ltd)	100	02 August 2006	13 January 2021
	Drummond Gold Limited Farm in Agreement & Joint Venture with Straits Resource	Unknown	May 2009	27 July 2011
	Straits Exploration (Australia) Pty Ltd (as subsidiary of Aeris Resources Ltd)	Unknown	03 May 2006	02 August 2006
	Ashburton Minerals Ltd	Unknown	2003	03 May 2006
	Delta Gold Ltd	Unknown	2000	2003
	Ross Mining N.L	Unknown	July 1992	2000
	Greater Boulder Holdings Limited	Unknown	27 June 1991	July 1992

3.2.2 Previous stakeholder and community engagement activities

Over the life of the Yandan Gold Project and prior to the implementation of the PRCP legislation in 2019, GBM and the previous mine owners have actively engaged with the community. The PMLU and NUMAs nominated for the Project have remained largely unchanged throughout the mine life.

Existing community management practices include regular consultation with affected stakeholders, particularly the sole underlying landholder. This is generally undertaken on an as needs basis. Recent community engagement has been relatively limited due the ongoing care and maintenance status of the Project. Generally, the broader community is consulted in advance of exploration or care and maintenance works being carried out on the site. During these periods, GBM utilises existing services within the town where practical (e.g., the Mount Coolon Hotel). Past engagement with the owners of Lot 5060 of Plan PH387 (the underlying landholder) has included exploration and environmental monitoring activities, and rehabilitation and closure. Planning for closure was only discussed at a high level, as future mining activity was always planned for the Project. The landholder has provided written agreement for the retention of the Water Storage Dam, all tracks/roads, and the airstrip.

Since ownership of the Project by GBM Resources, consultation activities have involved direct engagement with the landholder regarding project activities, site visits and monitoring and maintenance activities as well as consultation with DES regarding rehabilitation strategies and outcomes. Given the Project is currently in closure and maintenance with limited exploration activities, the current, ongoing and direct dialogue with the landholder is considered appropriated at this time. Engagement with the landholder has indicated the preference for a grazing PMLU (including associated infrastructure).

Table 19: Summary of rehabilitation related consultation undertaken for the Project

Consultation date(s)	Community members	Consultation type	Event	Information supplied	Issues raised, discussed and outcomes
2 November 1988	Rosetta Pastoral Company	Notice	Impact assessment study	Impact assessment study	Objection notice by the Rosetta Pastoral Company with regards to concerns for water quality, location to homestead, road quality and water rights.
22 November 1988	Hanging Rock Pastoral Company	Notice	Impact assessment study	Impact assessment study	Objection notice raised with regards to public notice, incompatibility with grazing land use, stock response to mining activities, water supply and dust.
15 October 2005	Landowner of Lot 5060 of PH387	Meeting	Introduction to SRL group	-	Advise as to the new holders of the ML1095 and ML1096. Discussed the renewal of ML and any existing land compensation agreements. Notice of intention for exploration. The landholder expressed that they would want to immediately graze their cattle across the ML once mining operations were completed.
4 November 2005	Landowner of Lot 5060 of PH387	Notice	Cattle on ML	-	Notice to landowners of change of ownership to Straits Exploration Pty Ltd. Cattle identified on TSF and Heap Leach facilities. Cattle removed from areas to allow rehabilitation progress. Landowner requested control of regrowth of undisturbed areas on the ML.
20 January 2006	Landowner of Lot 5060 of PH387	Notice	Grazing agreements	-	Discussion on grazing agreements with previous ML holder. Referral regrowth concern to appropriate authorities.
27 June 2017 – 12 October 2018	DES	Meeting	Financial Assurance (FA)	Project Background, FA history project history, FA challenges and future plans.	Existing DES notice proposing to increase Yandan FA, concerns about increasing the FA particularly the existing design for the Cell B TSF Cover System.
June 2020	Landowner of Lot 5060 of PH387	Meeting	Site Visit	-	Consultation regarding proposed Project activities.

Consultation date(s)	Community members	Consultation type	Event	Information supplied	Issues raised, discussed and outcomes
27 July 2020	DES	Meeting	Estimated Rehabilitation Cost notice	Project Background, project history, ERC challenges and future plans.	ERC decision notice.
13 – 15 September 2020	Landowner of Lot 5060 of PH387	Meeting	Advise of a site visit	-	Consultation regarding proposed Project activities.
22 September 2020	DES	Meeting	Pre-lodgement of PRCP	Land Outcome Document, project background, project layout	Land out outcome document discussed. Discussion of pits as NUMAs.
1 October 2020	Landowner of Lot 5060 of PH387	Phone call	Arranged introduction to GBM	-	-
3 October 2020	Landowner of Lot 5060 of PH387	Meeting	Introduction to GBM	Plans to start exploration	Landowner expressed concern with East Hill Pit and if rehabilitation activities would be undertaken. GBM discussed the plans for future exploration activities.
3 November 2020	Landowner of Lot 5060 of PH387	Phone call	Permission for site visit	Plans to start clearing some areas	Permission to visit areas on site.
6 November 2020	Manager at Rosetta Station	Face to face	Introduction to GBM	Plan to do exploration work in the area	Awareness of work being done in the area
16 March 2021	DES	Meeting	Design concept discussion	Past use/current condition of TSF, results of annual dam inspection, rehabilitation of HLP build (potential benefits), approval pathway	Ponding issues on upstream face of the TSF, discussion on seepage risk at various landforms, calculations from 2019 O’Kane work indicate available growth medium and topsoil on site.
6 May 2021	DES	Meeting	ERC Pre-lodgement	GBM corporate overview, Yandan Gold Mine background, activities occurring/planned on site, summary of previous ERC discussions, Cell B cover system design, third party quotes, works completed and planned for 2020-2021	Progress presentation discussing the ERC and proposed Cell B cover system.

Consultation date(s)	Community members	Consultation type	Event	Information supplied	Issues raised, discussed and outcomes
14 March 2024	DESI	Meeting	PRCP RFI Pre-lodgement	Presentation on the updates undertaken following the issue of the RFI.	Results of geotechnical and erosion stability analysis, improvements to the groundwater monitoring network, rehabilitation materials required for the Project, flood and water model updates. Issues raised included long-term stability of the Main Pit flood bund and nominated PMLU. Tolerable erosion rates. Function of the Main Pit system and water quality values. Grazing PMLU on elevated landform slopes. PRCP planning part updated to improve erosion outcomes. PMLU's revised and further justification provided.

3.2.3 Stakeholder engagement plan

Yandan Gold Project operates under a Stakeholder Engagement Plan (SEP) (Appendix E), prepared in accordance with the requirements set out in section 126C(1)(c)(iv) and (iv) of the EP Act and the PRCP Guideline.

The SEP was developed to be a practical tool for effective stakeholder engagement, to ensure stakeholders are provided the opportunity to engage on various aspects of the Project, including rehabilitation and closure matters relating to the Project. The SEP provides details on the stakeholder engagement process, engagement objectives, and how stakeholder feedback is managed. Stakeholder engagement objectives established in the SEP are described in Table 20.

Table 20: Stakeholder engagement plan objectives

SEP objective	Description
Strengthen corporate social responsibility and maintain ongoing community relationships and trust.	Stakeholder interests and concerns will continue to be incorporated into rehabilitation planning/management and where available, communicated to the relevant stakeholder upon completion.
Ensure transparent, open and informative stakeholder communication.	Information disclosed to stakeholders will be undertaken in an appropriate format to ensure a common understanding of any potential concerns or issues. Where appropriate, this information will be made available without hesitation and promptly.
Inform and liaise with key stakeholders to ensure rehabilitation activities are undertaken to achieve the agreed PMLU.	Engagement methods and frequencies will ensure ongoing updates on the status of rehabilitation as a progression towards the agreed PMLU using a wide range of engagement materials and tools, such as fact sheets and online materials.
Enhance and outline key avenues that stakeholders can utilise to provide feedback on Project rehabilitation activities.	Existing communication channels available to the general public/and or key stakeholders will continue to be made available such as primary engagement methods (face-to-face meetings and webpage) and additional methods, if needed (i.e., community advisory groups, public displays and information sessions).
Identify processes for GBM to respond to community concerns and appropriately manage stakeholder expectations	Feedback protocols will be adopted as part of a comprehensive response process to ensure community concerns (received in all formats - email, phone call, text or meeting) are responded to promptly and with the correct information. All forms of feedback will be categorised and recorded within a register to identify any stakeholder engagement trends which can be appropriately responded to, managed and addressed.

The SEP, including the corresponding list of identified stakeholders, will be reviewed periodically following any Project changes or updates. Further details of community consultation are provided in the SEP which is attached as Appendix E.

3.3 Post-mining land use

This section of the PRCP describes and discusses the PMLUs prescribed and proposed for the Project post-closure. The PMLUs for the Project were developed primarily in consideration of:

- the pre-mining land use of low intensity cattle grazing with intensive management;
- stakeholder consultation during the approvals process;
- planning considerations, as defined in the relevant Council Planning Schemes;
- environmental considerations, specifically the need to prevent release of contaminants to the receiving surface waters or groundwater;
- environmental values and physical considerations as they relate to the safe and stable nature of the final landform and the development of self-sustaining ecosystems required for successful rehabilitation; and
- economic considerations relating to the cost of recreating the final land uses and the likelihood of achieving rehabilitation success.

3.3.1 Land outcome document

The Project EA authorising mining activities at Yandan was issued on 20 January 2012. Schedule F of the EA relates to land and rehabilitation requirements, with Condition F2-1 and Schedule F – Table 1 identifying post mine land uses for the Project (refer Table 21). In accordance with Condition F3-1 of the Project EA, a Post Mine Land Use Plan (PMLUP) has been developed to assist achievement of the nominated post mine land uses. It is considered that the EA and the PMLUP meet the requirements of land outcome documents (LODs) as defined by section 750 of the EP Act. The PMLUP provides some additional understanding of the intent for PMLUs and NUMAs for the Project.

By virtue of the existence of a LOD, and in accordance with section 213 of the Environmental Protection Regulation 2019, Schedule 8A, part 3, Table 1 *Final site design assessment* and Table 2 *Post-mining land use assessment – rehabilitation milestones*, do not apply to the objective assessment to be undertaken for this PRCP.

In relation to the *progressive rehabilitation* component of Table 2, this PRCP will:

- describe how rehabilitation areas are planned in a way that achieves progressive rehabilitation;
- illustrate how progressive rehabilitation has already commenced at the Project site;
- identify risks and discuss their incorporation within, and their impact on, the milestone schedule; and
- describe community consultation approaches appropriate for the Project.

3.3.2 Pre-mining and existing land uses

Prior to the development of the mine, land underlying the Project area was used for low intensity beef cattle grazing. At the time of the commencement of mining at Yandan in 1993, much of the naturally occurring open forest and woodlands had been cleared for this purpose, with remnant stands of native vegetation remaining alongside the Suttor River.

Soil limitations of the region, together with low rainfall and high rainfall variability, have limited the stock carrying capacity of the region, limiting the land use of the area to low intensity cattle grazing only.

Review of Queensland Government land use mapping (DES 2023a) indicates that lands within the surrounding region consist predominantly of grazing lands on relatively natural environments. These lands are typically comprised of native vegetation, with limited or no deliberate attempt at pasture modification (ABARE 2016). It is noted however, that land clearing within the surrounding region has been relatively significant, with remnant vegetation generally limited to drainage lines.

Lands underlying the Project area are classified as rehabilitation with pockets of mining (DES 2020). The PMLU of open pasture grazing for the majority of the Project is therefore consistent with this broader land use. It is noted that the PMLU for the ROM Pad and HLP is listed as 'low hill'.

The Project area falls predominantly within the Whitsunday Regional Council local government area, acknowledging a small proportion of the area on the western side of the Suttor River (outside of the Project footprint) lies within the Charters Towers Regional Council local government area. The majority of land underlying the Project is therefore subject to the *Whitsunday Regional Council Planning Scheme 2017* (Whitsunday Regional Council 2017).

Lands underlying the Project are zoned as 'Rural', defined as providing primarily for a range of rural uses, including cropping, intensive horticulture, intensive animal industries, animal husbandry, animal keeping and primary production activities.

The PMLUs prescribed by the Project EA are considered to be generally compatible with the *Whitsunday Regional Council Planning Scheme 2017*.

3.3.3 Prescribed post-mining land uses

In accordance with Condition F2-1 of the Project EA:

Land disturbed by mining activities must be rehabilitated in accordance with Schedule F - Table 1 (Post Mine Land Description) and the objectives of the Post Mine Land Use Plan required under condition (F3-1).

Schedule F – Table 1 of the Project EA has been reproduced here as Table 21 below, providing 'post mine land descriptions' for various disturbance types. Descriptions of the post mine land classifications detailed in Table 21 for the Project are provided in Table 22. Prescribed post mine land descriptions include 'open pasture', 'water storage', and 'low hill' (Table 21). The post mine land classification of VII is appropriately aligned with both the pre-existing land use and the SLSA suitability classification of 4/5 (AARC 2022a). The PMLUP (AARC 2018) redefines the post mine land descriptions as PMLUs.

Table 21: Post mining land use areas (after Schedule F-Table 1, Project EA)

Tenure ID	Disturbance type	Associated infrastructure ¹	Maximum surface area (ha)	Post-mine land description	Post mine land classification
ML1095	Backfilled pit	South Pit	3.2	Open pasture	VII
	Tailings dam	Cell A Cell B TWRD Spillway	112	Open pasture	VII
	Stockpile area	Topsoil Stockpile	8.3	Open pasture	VII
	Runoff dam	Mine Water Dam	15.3	Water storage	VII
	ROM pad	ROM Pad	5.8	Low hill	VII
	Processing Plant	Hardstand Area	1.8	Open pasture	VII
	Open pit	Main Pit East Hill Pit	21	Lake	Void
	Infrastructure	Tailings Water Return Dam Water Storage Dam ²	116.5	Open pasture	VII

Tenure ID	Disturbance type	Associated infrastructure ¹	Maximum surface area (ha)	Post-mine land description	Post mine land classification
		Water Harvest Trench Infrastructure Area (including processing plant) Laydown Landfill Area Roads and tracks ¹ Airstrip Core Yard Miscellaneous footprint (cleared areas)			
	Heap Leach	Heap Leach Pad (HLP) HLP Stormwater Pond Pregnant Pond Barren Pond	20.3	Low hill	VII
	Borrow pit	Borrow pit	4.7	Open pasture	VII
	Exploration	Exploration areas	4.5	Open pasture	VII
ML 1096	Village infrastructure	Village infrastructure	9.1	Open pasture	VII
	Infrastructure	Refer to Roads and Tracks			
	Tailings Dam	Refer to Tailings Dam			

¹ Associated infrastructure column added for clarity.

² Approved for retention in the final landform subject to landholder agreement

Table 22: Description of post mine land classifications

Class	Description
Class I	Land suitable for all agricultural and pastoral uses
Class II	Land suitable for all agricultural uses with slight restrictions to cropping
Class III	Land suitable for all agricultural uses with moderate restrictions to cropping
Class IV	Land primarily used for pastoral uses but can be carefully cropped occasionally
Class V	Land primarily used for pastoral uses but can be carefully cropped if limitations were removed
Class VI	Land not suited to cultivation but well suited to pasture improvement
Class VII	Land not suitable for cultivation and only careful pastoral use possible

Class	Description
Class VIII	Land not suitable for agricultural or grazing purposes

The PMLU's as nominated in the LOD, nominates the land outcomes in Table 23.

Table 23: Description of post mine land use as per the LOD (Table 1 PMLUP)

Tenure ID	Disturbance type	Associated infrastructure ¹	Maximum surface area (ha)	Post-mine land description	Post mine land classification
ML1095	Backfilled pit	South Pit	4	Open pasture	VII
	Tailings dam	Cell A Cell B TWRD Spillway	39	Open pasture	VII
	Stockpile area	Topsoil Stockpile	8.3	Open pasture	VII
	Runoff dam	Mine Water Dam	16.6	Water storage	VII
	ROM pad	ROM Pad	3.8	Low hill	VII
	Processing Plant	Hardstand Area	1.8	Open pasture	VII
	Open pit	Main Pit East Hill Pit	18.8	Lake	Void
	Infrastructure	Tailings Water Return Dam Water Storage Dam ² Water Harvest Trench Roads ¹ Airstrip	79.8	Open pasture	VII
	Heap Leach	Heap Leach Pad (HLP) HLP Stormwater Pond Pregnant Pond Barren Pond	21	Low hill	VII
	Borrow pit	Borrow pit	8	Open pasture	VII
ML 1096	Village infrastructure	Village infrastructure	15	Open pasture	VII
	Tailings Dam	Cell A Cell B	75	Open pasture	VII

¹ Associated infrastructure column added for clarity.

² Approved for retention in the final landform subject to landholder agreement

3.3.4 Infrastructure subject to landholder agreement

A landholder agreement between Straits Gold and the registered owner of Lot 5060 PH387, the Scott Family (landholder), was signed in 2019 (provided in Appendix H). This agreement declared Straits Gold will not, upon closure of the Project and surrender of the MLs, remove the following infrastructure to be retained for use by the landholder:

- all tracks/roads;
- the airstrip; and
- the Water Storage Dam.

3.3.5 Local planning instruments

The Project is wholly located within the Whitsunday Regional Council local government area and is subject to the 'Whitsunday Regional Planning Scheme 2017' (Whitsunday Regional Council 2023). The planning scheme identifies the Project area as being zoned as rural land use which has a purpose to:

(a) provide for a wide range of rural uses, including cropping, intensive horticulture, intensive animal industries, animal husbandry, animal keeping and other primary production activities;

(b) provide opportunities for non-rural uses that are compatible with agriculture, the environment and the landscape character of the rural area, where they do not compromise the long-term use of the land for rural purposes; and

(c) protect and manage significant natural features, resources, and processes, including the capacity for primary production.

(2) The purpose of the Rural zone code in the local government area is to provide for a wide range of Rural activities and a limited range of non-rural activities, which complement or provide a service to rural areas. Activities in rural areas are sustainably managed to protect, maintain and enhance the productivity, character, visual amenity and ecological sustainability of the area.

The Project is also located within the area covered by the Mackay, Isaac and Whitsundays Regional Plan (DLGP 2012), which sets out the vision, values and strategic outcomes for the region. The Regional vision as defined in the plan is as follows:

The Mackay, Isaac and Whitsunday region (the region) is a vibrant, progressive region where the values of the community and industry are respected and in balance with the natural environment. The region's natural assets and abundant resources will be responsibly managed for the benefit of residents, visitors and future generations. It achieves its potential with a range of industries, employment and learning opportunities for everyone. The region has a resilient and inclusive community that respects and offers diversity and choice, and where residents and visitors enjoy a healthy, active and safe lifestyle.

Agricultural activities including cattle grazing are identified as a key contributing factor in ensuring a strong economy for the region with sugar production and livestock grazing contributing to 9.5% of Queensland's agricultural production (DLGP 2012). In addition, it is recognised in the Regional Plan that grazing landscape contributes to the character of the region.

3.3.6 Proposed post-mining land use

Small improvements are proposed to the PMLUs nominated in Table 21 and Table 23 to ensure the final landforms are stable and consistent with its pre-mining use, however, it is noted the overall outcome of the nominated PMLU remains consistent with the identified LOD. This is particularly so for the 'low hill' PMLU, which more describes the intended resulting landform topography rather than the actual land use to be achieved.

In an effort to improve rehabilitation outcomes for the Project, the LOD PMLUs have been reviewed and better defined, where appropriate, to provide greater clarity of the PMLU intent for the Project; including the landform and vegetation type to be achieved. It should be noted that, in accordance with PRCP Guideline requirements, and in describing PMLUs, significant focus has been placed on the current land use of the area.

Proposed PMLUs are detailed in Table 24 below, with changes indicated in blue text. It should be noted that no changes to disturbance type footprints are proposed, however post mine land classifications have been translated to the more current land use suitability classification system based on the SLSA (AARC 2022a), consistent with the EA and LOD.

Disturbance areas will be predominately returned to a grazing land use, with water storages retained for the function of stock watering, retained infrastructure for agricultural use, flood protection bund and two residual voids (Figure 41).

Table 24: Proposed post-mining land uses

Tenure ID	Disturbance type	Associated infrastructure	Maximum surface area (ha)	Post-mine land description	Post mine land classification
ML1095	Backfilled pit	South Pit	3.2	Open pasture – low intensity grazing	VII
	Tailings dam	- Cell A - Cell B - TSF Spillway - TSF Embankment	113	Open pasture – low intensity grazing	VII
	Stockpile area	Topsoil Stockpile	8.3	Open pasture – low intensity grazing	VII
	Runoff dam	Mine Water Dam	15.3	Retained water storage	VII
	ROM pad	ROM Pad	5.8	Low hill – low intensity pasture grazing	VII
	Open pit	- Main Pit - East Hill Pit	21	Void (None Use Management Area)	Void (Non-Use Management Area)
	Infrastructure	- Tailings Water Return Dam - Water Harvest Trench - Infrastructure Area (including processing plant) - Laydown - Landfill Area - Core Yard - Miscellaneous footprint (cleared areas)	45.4	Open pasture – low intensity grazing ²	VII
		Water Storage Dam²	37.5	Retained water storage	N/A

Tenure ID	Disturbance type	Associated infrastructure	Maximum surface area (ha)	Post-mine land description	Post mine land classification
		- Roads and tracks¹ - Airstrip	33.7	Retained infrastructure	N/A
	Water management	Main Pit water management bund	2.7	Flood protection landform	N/A
	Heap Leach	- HLP - HLP Stormwater Pond - Pregnant Pond - Barren Pond	20.3	Low hill – low intensity grazing	VII
	Borrow pit	Borrow pit	36.5	Open pasture – low intensity grazing	VII
	Exploration	Exploration areas	3.5	Open pasture – low intensity grazing	VII
		Tracks²	1.0	Retained infrastructure	N/A
ML 1096	Village infrastructure	Village infrastructure	9.1	Open pasture – low intensity grazing	VII
	Infrastructure	Refer roads and tracks			
	Tailings Dam	Refer to Tailings Dam			

Note: proposed changes to the LOD PMLUs are shown in blue

² Approved for retention in the final landform subject to landholder agreement

Proposed changes to the PMLUs are to clarify the following:

- 1) the target vegetation type of 'grazing' for the LOD PMLUs of 'open pasture' and 'low hill';
- 2) the existing Water Storage Dam is to be retained in the final landform as water storage for stock watering;
- 3) Main Pit flood bund to the PMLU of flood protection landform, which was previously grouped as 'infrastructure' to be rehabilitated to grazing pasture; and

Pasture grazing has been proposed as the target vegetation type for the 'open pasture' and 'low hill' PMLUs, on the basis of the pre-mining land use and the land use of the surrounding area. As summarised in Sections 3.3.2, pasture grazing was the pre-mining land use of the Project area and remains the principal land use within the surrounding region. Grazing and the retention of supporting infrastructure has been identified as the preferred PMLU by the landholder, with grazing activities currently being undertaken by the landholder outside of mine disturbance areas.

A grazing PMLU provides:

- economic value to the landholder as well as to the Whitsunday Regional Council;
- environmental benefits to the surrounding landscape providing for food source (seasonal flowers and seeds) and habitat for native fauna;

- social benefit of cohesion with the surrounding landscape; and
- social benefit of supporting the landholders wants and needs for a grazing landscape.

Dominant soil types within the Project area predominantly support pasture grasses. While limitations for these soil types have been identified (Section 3.1.7), it is inferred that local pastures are adapted to these soil characteristics on the basis of the pre-mining land use and local land use. Therefore, it is considered that the Project area is suitable for low intensity cattle grazing, carefully managed with the implementation of intensive management regimes to support this land use.

Alternative PMLUs were considered for sloped landforms, such as the TSF and HLP such as open woodland or grassland. However, while these PMLUs would provide an environmental benefit these PMLUs are not consistent with the pre-mining land-use, landholders preference or any economic benefit.

An assessment of further reshaping of the slopes at the HLP and TSF was undertaken to investigate opportunities to further reduce the final slopes. However, this is not considered a viable option due to the increase in disturbance of up to 10 ha, required to achieve a 5% reduction in slope angle at the HLP. Given the height of the TSF, the increase in disturbance to achieve a 5% reduction of slope is much less, however, a reshaping of 5% could impact on the integrity of the walls of the structure integral in containing tailings. Further, the slopes of the HLP and TSF were designed as a final landform over 20 years ago, with the placement of material during operations designed for achievement of the final landform at the time. Retrofitting modern-day standards to historical areas of completed landforms raises concerns on retrospectivity. The cost burden of doing this would also be significant, particularly for a site that has been in care and maintenance for such an extended period. As such, the focus for on these areas of historical rehabilitation continuing to demonstrate that they are safe, stable, non polluting and sustainable for the proposed PMLU. Nominated rehabilitation milestones and completion criteria developed for the Project are therefore designed to support this approach for the existing slopes. It has been anecdotally observed that cattle in the region are capable of traversing similar slopes.

The water storage for stock watering PMLU for the Mine Water Dam is considered consistent with an agricultural landscape and the landholders preference for infrastructure to support a grazing land-use. A water storage for stock watering PMLU provides:

- economic value to the landholder as well as to the Whitsunday Regional Council supporting agricultural production;
- environmental benefits to the surrounding landscape providing for food and water source and habitat for native fauna;
- social benefit of cohesion with the surrounding landscape; and
- social benefit of supporting the landholders wants and needs for a grazing landscape.

The PMLU nominated for the water management bund around Main Pit is 'Flood protection landform' with the bund required to manage flows in and out of Main Pit, as well as water quality. The surface of the flood protection landform will be managed with groundcover including seeding with pasture species nominated for the grazing PMLU, providing additional seedbank resources and connectivity values for ground-dwelling fauna. As such, the flood protection landform will resemble a landform in nature. In addition a flood protection landform PMLU will support the objectives of safe, stable and sustainable.

In summary, proposed PMLUs for the Project are consistent with the LOD PMLUs, with the following consideration given to the proposed target vegetation of 'grazing', flood protection landform and retained infrastructure:

- is generally considered viable, having regard to the use of land in the surrounding region;
- is consistent with how the land was used before the mining activity was carried out on the land;
- is consistent with the land zoning code in the *Whitsunday Regional Council Planning Scheme 2017*; and
- will deliver, or aim to deliver, a beneficial environmental outcome that is acceptable to the local community.

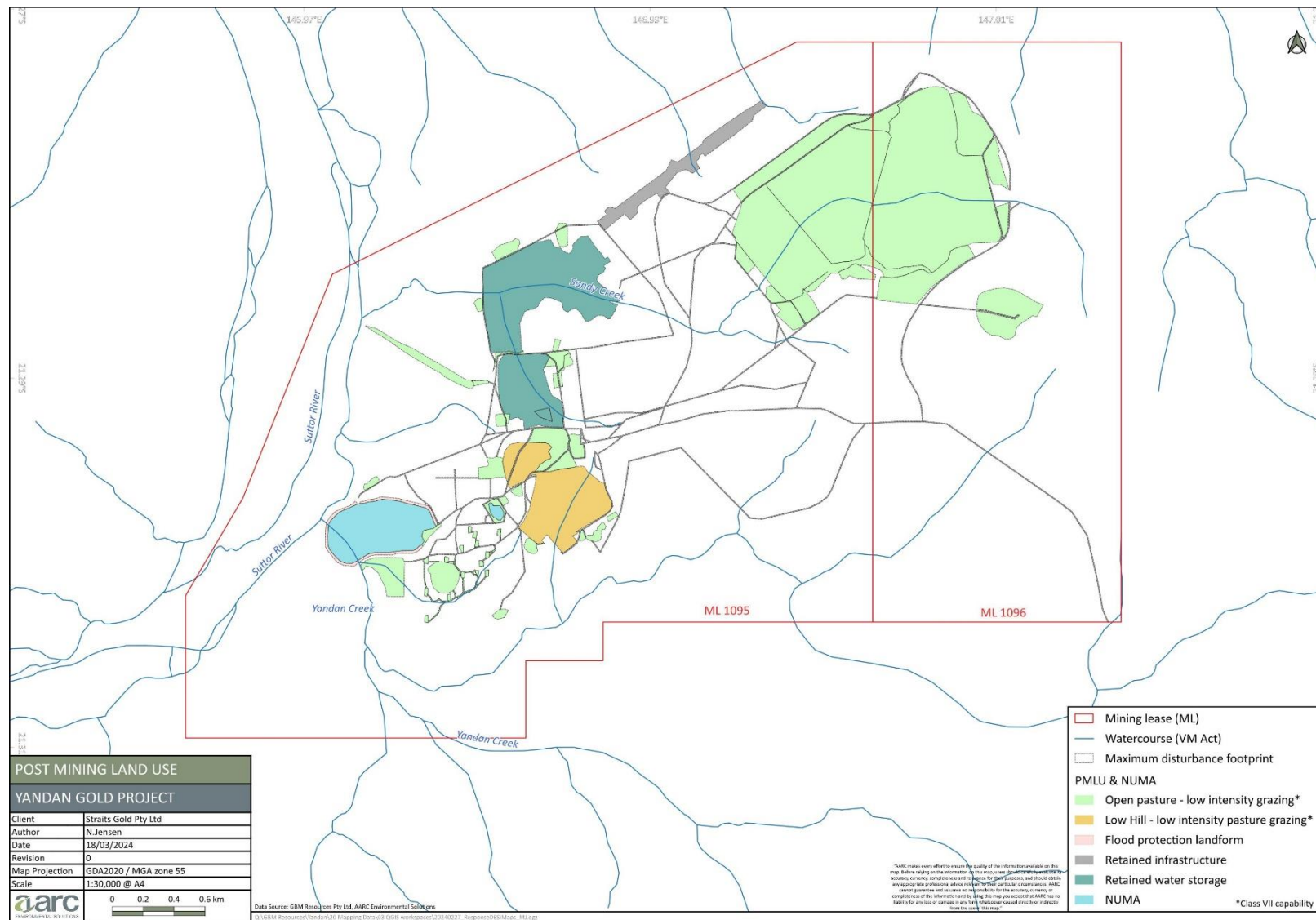


Figure 41: Nominated PMLU and NUMA areas for the Project

3.4 Non-use management areas

This section of the PRCP describes the disturbance types that will remain as NUMAs post closure.

3.4.1 Legislative requirements

In accordance with sections 126C(1)(d), (g) and (h) of the EP Act, for each proposed NUMA, the rehabilitation planning part of the PRCP must:

- state the reasons the applicant considers the area cannot be rehabilitated to a stable condition;
- include copies of reports or other evidence relied on by the applicant for each proposed NUMA;
- state the extent to which the proposed NUMA is consistent with the outcome of consultation with the community in developing the plan; and
- state the extent to which the NUMA is consistent with any strategies or plans for the land of a local government, the State or the Commonwealth.

Pursuant to section 754(3) of the EP Act and Section 6.3.2 of the PRCP guideline, a NUMA will be taken to be pre-approved if a land outcome, the same or substantially similar to a NUMA, is contained in a LOD. LODs are defined in section 750 of the EP Act. Where a NUMA has been pre-approved and is being translated into the PRCP, the EA holder is not required to:

- justify the proposed NUMA;
- give evidence to support the justification of the NUMA;
- go through the Public Interest Evaluation process; or
- comply with the prohibition of voids located within a flood plain having to be rehabilitated to a stable condition.

3.4.2 Land outcome documents

NUMAs relevant to the Project are referred to in the LODs, being the Project EA and PMLUP.

Condition F2-1 and Schedule F – Table 1 of the Project EA identifies the post-mine land description for the ‘Open pit’, comprising Main Pit and East Hill Pit, as being a ‘lake’, with a post mine land classification of ‘void’ (refer Table 21).

The PMLUP (AARC 2018) provides some additional understanding of the intent for the two open pits associated with the Project; variously referring to these as ‘lakes’, ‘residual voids’ and ‘pits’. Section 6.1.2 of the PMLUP notes the requirement for Main Pit to retain a minimum water level for the purpose of providing a cover for any potentially acid producing rock material exposed in the pit highwalls. Section 6.1.2 goes on to describe the other remaining pit, East Hill Pit, as having a fence and bund constructed, with decommissioning involving the maintenance of these safety measures to prevent livestock and human access. No specific, further PMLU is ascribed to this feature.

Given this NUMA classification for the open pits, these disturbance areas have been included within this PRCP as improvement areas that are to be subject to various management milestones.

Furthermore, with the existence of a LOD establishing the NUMAs at the Project, section 213 of the EP Regulation and Schedule 8A, part 3, Table 1 *Final site design assessment* and Table 3 – *Non-use management area assessment – management milestones* do not apply to the objective assessment to be undertaken for the PRCP. In relation to the *Progressive Improvement* component of Table 3, this PRCP will:

- describe how non-use areas will undergo improvement to a safe and stable condition post-closure;
- illustrate how improvement will commence at the Project;

- identify risks and discuss their incorporation within the improvement schedule; and
- detail the timeframe for improvement areas to progress through management milestones.

In summary, NUMAs on the Project are associated with the Main Pit and East Hill Pit voids. The open cut pit NUMAs are prescribed by the existing LODs; the details of which are established in Schedule F – Table 1 from the Project EA and Table 1 in the PMLUP, summarised here in Table 25 and shown on Figure 41.

Table 25: Non-use management areas (after Schedule F-Table 1, Project EA and Table 1, PMLUP)

Tenure ID	Disturbance type	Associated infrastructure	Maximum surface area (ha)	Post-mine land description	Post mine land classification
ML1095	Open pit	• Main Pit • East Hill Pit	18.8	Lake	Void

Under the Project EA (EPML00771913) at the time of development of this PRCP, rehabilitation requirements for residual voids on the Project relevantly include:

Condition F7-1: Residual voids must not cause any serious environmental harm to land, surface waters or any recognised groundwater aquifer, other than the environmental harm constituted by the existence of the residual void itself, and subject to any other condition within this environmental authority.

Condition F7-2: Mining voids must be managed during the operation and decommissioning phases to maximise the potential post mine beneficial uses, by consideration of the following:

- a) Limiting sulphide exposures in void walls; and*
- b) Capping of sulphide exposures in void base; and*
- c) Limiting period of exposure of sulphides in void walls and base to oxidising conditions; and*
- d) Managing catchment into the void; and*
- e) Geotechnical stability of final void.*

Rehabilitation requirements specific to the water management bund around Main Pit are also established in the Project EA, being:

Condition G6-1: The integrity of the bund wall for the Main Pit must be maintained until its removal or modification is authorised by the administering authority. This authorisation will be on the basis that the authority holder can demonstrate that the removal or modification of the bund would not result in an unacceptable risk of potential environmental harm.

Condition G6-2: Prior to removing or modifying the Main Pit bund wall, the holder of the environmental authority must submit to the administering authority for acceptance of a design plan that has been certified by a suitably qualified and experienced person, as compliant in all respects with this environmental authority, and in accordance with accepted engineering standards.

Condition G6-3: Removal or modification of the Main Pit bund wall shall be done only in accordance with an accepted design plan.

Condition G6-4: When removal or modification of the Main Pit bund wall is complete, the holder of this environmental authority must submit to the administering authority a set of 'as constructed' drawings, and a certification by a suitably qualified and experienced person that either:

- *The construction is substantially as per the accepted design plan, or*
- *The suitably qualified and experienced person certifies that the as constructed plan is compliant in all respects with this environmental authority, and in accordance with accepted engineering standards.*

The above rehabilitation requirements are addressed within Section 3.5. All NUMAs will be left in a safe and stable condition with slopes achieving a suitable FoS to achieve geotechnical stable slopes. Construction of a safety bund integrated into the final landform or installation of fencing will occur around each void to limit human and livestock / animal access. It is noted that safety infrastructure is currently in place around the NUMAs to prevent livestock access. This is consistent with the completion criteria nominated in the LOD.

With respect to the requirements of Section 126C(d) of the EP Act, Section 3.2 describes the previous and proposed engagement activities relevant to the Project. Given the remoteness of the Project location and the legacy of mining associated with the area, past approval processes and compensation discussions will have been the primary vehicles for consultation associated with the current land use expectations for the Project. The current, contemporary rehabilitation and closure planning for this site will make no changes to the size and location of the approved NUMAs defined in the EA.

The Project area is located within the Rural Zone of the Whitsunday Regional Council Planning Scheme. While the NUMAs will not specifically contribute to the objectives of the Rural Zone, their small size and nature are such that they are considered not to detrimentally impact the objectives of the Planning Scheme. NUMA areas have further been minimised with the complete backfilling of South Pit. It should be noted that the Whitsunday Regional Council Planning Scheme is acknowledged as integrating all State government planning policy interests and provisions.

The NUMAs in this PRCP are consistent with the prescribed NUMAs for the Project as identified in the LOD. As such, it can be inferred that the NUMAs are entirely consistent with the outcomes of past consultation processes (undertaken as part of the EA and ML approvals).

Under Section 754 of the EP Act, with the existence of an approved LOD that defines the NUMAs at the Project, this transitional PRCP is not required to comply with section 126C(1)(g) or (h), or section 126D(2) or (3). As such, no further justification of NUMAs is provided.

3.4.3 Safe and non-polluting

Pit lakes continue to be common in the development of closure outcomes for mining pit voids across Australia and the world (Kumar et al 2013). However, the challenge in delivery of a sustainable, stable and water-values supportive pit lake PMLU versus NUMA is unique to each void and setting, and factors may not combine to support a stable and non-polluting pit lake as a legacy landform. While, many pits host poor water quality, though there are also several highly successful pit lakes such as Lone Pine in Western Australia, or Lake Kepwari in the Collie Region, or the lignite mining areas of Germany (Lund and Blanchette 2023, Johnson and Wright 2003, McCullough et al. 2012, McCullough and Lund 2010).

A component of the Project NUMA improvement strategy is through the use of a water cover system. Being under water, the low dissolved oxygen content of water constrains access to oxygen and oxidation and limits leaching capacity, effectively controlling potential for acid or metalliferous drainage potential. The main goal for any reactive waste or materials management on a site for closure is to limit exposure to air and water percolation, and water cover achieves both (DSIP & DFAT 2016).

In areas of negative water-balances such as Yandan, access to additional inflow from fresher water sources to maintain pit water levels above cover heights, or to freshen water quality is critical (DSIP & DFAT 2016). Lake Kepwari, a coal mine pit void in the Collie region in WA demonstrates the effectiveness river flow through can have to improving water quality, where this pit has been successfully rehabilitated to a recreational lake with a permanent connection to the river system (McCullough et al. 2012). A QMRC commissioners paper (Clay et al 2022) also highlights Lake Kepwari PMLU outcomes *“Lake Kepwari, a Western Australian recreational lake in an old coal mine void, has combated water quality issues through a different approach: riverine flow through. The inputs from the local river system have been recorded to improve water quality in the lake by “adding carbon matter, improving acidity and reducing soluble metal concentrations”, at a “low risk to the downstream environment” (Premier Coal, no date).*

3.5 Rehabilitation management methodology

3.5.1 Rehabilitation objectives

In Queensland, mine rehabilitation is required under the EP Act. Amendments to the EP Act in late 2018 implemented key elements of the State Government's Mined Land Rehabilitation Policy (Queensland Government 2018) which intends to ensure that, for land disturbed by mining activities:

- the land is safe and structurally stable;
- there is no environmental harm being caused by anything on or in the land; and
- the land can sustain a PMLU (section 111A of the EP Act).

These three objectives are the general rehabilitation goals for all areas disturbed by mining in Queensland.

The proposed PMLUs for the Project are open pasture – grazing, low hill – pasture grazing, retained water storage and retained infrastructure; the authorised NUMAs for the open pits are referred to as voids in the LOD. Rehabilitation activities have been, and will continue to be, conducted towards these outcomes.

As discussed in Section 3.1.2, rehabilitation has previously been completed for a number of domains. Remaining rehabilitation activities are principally associated with:

- Cell B of the TSF – installation of an appropriate cover system design, surface preparation and revegetation activities.
- HLP and associated treatment ponds – landform development and installation of an appropriate cover system design, surface preparation and revegetation activities.
- Water storage structures – decommissioning of water storage structures not required for PMLU, landform development, surface preparation and revegetation activities.
- Infrastructure areas – remediation of infrastructure areas, landform development, surface preparation and revegetation activities.
- Maintenance of existing rehabilitation areas:
 - Cell A – re-development of water shedding landform profile (limited to small central zone only), continued progress towards rehabilitation completion criteria;
 - Village Infrastructure area – removal of some remaining concrete footings, continued progress towards rehabilitation completion criteria;
 - South Pit - continued progress towards rehabilitation completion criteria, certification of rehabilitation; and
 - ROM Pad - continued progress towards rehabilitation completion criteria (subject to outcomes of the detailed mine planning phase), certification of rehabilitation.
- Isolated areas of surface disturbance – landform development, surface preparation, revegetation.
- Infrastructure to be retained (water storages and infrastructure) – infrastructure cleaned and made safe as required.

Infrastructure components (refer Section 3.3.6) have been nominated for retention to support the open pasture - grazing PMLU and will be transferred to the landholder upon surrender. As required to support the open pasture – grazing PMLU, rehabilitation works will be completed. For example, water storage structures to be retained by the landholder will be cleaned and made safe prior to surrender.

3.5.2 Rehabilitation areas and improvement areas

To allow the development of a PRCP schedule that satisfies the requirements of the PRCP Guideline, discrete rehabilitation areas (RAs) and improvement areas (IAs) have been defined for the Project. RAs or IAs have been nominated for all areas of disturbance at Yandan, summarised as follows and detailed in Table 28 and presented in Figure 42.

RAs 1 to 4 and IAs 1 and 2 are based off the major infrastructure areas identified in the Project EA and the sequence of rehabilitation activities deemed appropriate for each RA or IA.

RAs 5 and 6 include maintenance areas of existing rehabilitation as outlined in Section 3.1.2 of this document and includes the South Pit, ROM Pad, village infrastructure and TSF Cell A.

RA7 represents the extent of authorised disturbance demarcated by the EA and includes other intermittent surface disturbance types associated with mining operations, such as minor laydown areas, exploration, borrow pits, or residual topsoil stockpile areas that will not be retained by the landholder.

RA8 includes water storages that will be cleaned and retained; being the Mine Water Dam and the Water Storage Dam.

RA9 includes infrastructure that is subject to a landholder agreement and is to be retained post-closure.

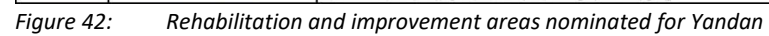
RA10 includes new disturbance proposed at the Project for rehabilitation materials.

It is important to note that the remaining surface area within the MLs will remain undisturbed for the duration of this PRCP. As such, no RA is defined for this area and the existing land use (Rural Zone as per the Whitsunday Regional Council Planning Scheme) will be retained post-closure.

Table 26: Nominated rehabilitation and improvement areas

Rehabilitation Area (RA) / Improvement Area (IA)	Description	Associated approved PMLU / NUMA	Land capability classification
Rehabilitation Areas			
RA1	TSF Cell B	Open pasture - low intensity grazing	Class VII
RA2	HLP and associated ponds	Low Hill – low intensity pasture grazing	Class VII
RA3a	Rehabilitated water management structures	Open pasture - low intensity grazing	Class VII
RA3b	Rehabilitated water management structures – Main Pit flood bund	Flood protection landform	N/A
RA4	Infrastructure areas	Open pasture - low intensity grazing	Class VII
RA5a	Maintenance of existing rehabilitation (South Pit and village infrastructure)	Open pasture - low intensity grazing	Class VII
RA5b	Maintenance of existing rehabilitation (TSF Cell A)	Open pasture – low intensity grazing	Class VII
RA6	ROM Pad	Low Hill – low intensity grazing	Class VII

RA7	Other isolated areas of surface disturbance within approved disturbance extent	Open pasture – low intensity grazing	Class VII
RA8	Retained water storages	Retained water storage	N/A
RA9	Retained infrastructure	Retained infrastructure	N/A
RA10	Borrow pits	Open pasture – low intensity grazing	Class VII
Improvement Areas			
IA1	Main Pit Final Void	Lake (None Use Management Area)	N/A
IA2	East Hill Pit Final Void	Void (None Use Management Area)	N/A



3.5.3 Rehabilitation milestones

The nominated rehabilitation milestones considered relevant to the Project are outlined in Table 29. Not all rehabilitation milestones are applicable to all RAs. The applicability of rehabilitation milestones to the various RAs is also shown in Table 29.

Table 27: Milestones and their applicability to rehabilitation areas

Milestone	Description	Applicability											
		RA1	RA2	RA3a	RA3b	RA4	RA5a	RA5b	RA6	RA7	RA8	RA9	RA10
RM1	Infrastructure decommissioning and removal	√	√	√		√	√	√	√	√	√	√	√
RM2	Remediation of contaminated land (where required)	√	√		√	√							
RM3	Landform development of infrastructure areas					√	√	√		√			√
RM4	Landform development of rehabilitated water management structures			√	√								
RM5	Landform development of TSF Cell B	√											
RM6	Landform reparation activities for Cell A							√					

Milestone	Description	Applicability											
		RA1	RA2	RA3a	RA3b	RA4	RA5a	RA5b	RA6	RA7	RA8	RA9	RA10
RM7	Landform development of HLP		√						√				
RM8	Surface preparation	√	√	√	√	√	√	√	√	√			√
RM9	Revegetation	√	√	√	√	√	√	√	√	√			√
RM10	Achievement of revegetation requirements (open pasture – grazing and low hill – pasture grazing)	√	√	√		√	√	√	√	√			√
RM11	Achievement of PMLU to stable condition (open pasture – grazing and Low hill – pasture grazing)	√	√	√		√	√	√	√	√			√
RM12	Achievement of PMLU to stable condition (retained water storages)										√		

Milestone	Description	Applicability											
		RA1	RA2	RA3a	RA3b	RA4	RA5a	RA5b	RA6	RA7	RA8	RA9	RA10
RM13	Achievement of PMLU to stable condition (retained infrastructure)											√	
RM14	Achievement of revegetation requirements PMLU (Flood protection landform)				√								
RM15	Achievement PMLU to stable condition (Flood protection landform)				√								

3.5.4 Management milestones

The nominated management milestones for NUMAs in the final landform are outlined in Table 26. All the management milestones are applicable to both IAs.

Table 28: Milestones and their applicability to improvement areas

Milestone reference	Description	Applicability	
		IA1	IA1
MM1	Achievement of final landform design	✓	✓
MM2	Achievement of surface and safety requirements	✓	✓
MM3	Achievement of sufficient improvement	✓	✓

3.5.5 Milestone criteria and completion criteria

Key to assessing the success of rehabilitation and improvement is the definition of milestone criteria. Milestone criteria are preferably specific, measurable, achievable, realistic and timely. They should:

- be outcome-based (linked to the end land use);
- be flexible to adapt to changing circumstances;
- be able to evolve as the mine life progresses;
- include metrics suitable to demonstrate that rehabilitation is trending positively; and
- undergo periodic review.

A set of milestone criteria has been identified for the Project to provide a clear definition of milestone completion and successful rehabilitation for each RA or sufficient improvement of each IA. The milestone criteria demonstrate the completion of progressive rehabilitation or improvement steps and events. The completion criteria for each PMLU will be used as the milestone criteria for the final milestone in the proposed schedule, which shows achievement of a stable condition for the PMLU at surrender. The completion criteria for the NUMA will be used as criteria for the final milestone in the proposed schedule, which shows achievement of sufficient improvement.

The rehabilitation milestones (RMs) and management milestones (MMs) nominated for the RAs and IAs of the Project are provided below in Table 29 and Table 30.

Table 29: Rehabilitation Milestone criteria

Rehabilitation milestone	Applicable rehabilitation areas	Milestone criteria	Justification for milestone criteria
RM1 -Infrastructure decommissioning and removal	All (excluding RA3b)	- With the exception of any infrastructure to remain as part of the PMLU (PMLU) or where infrastructure is agreed to be retained by the landholder as evidenced by a signed landholder agreement, the following are complete: - All non-required services disconnected and removed. - All non-required concrete and gravel removed. - All non-required operational pipelines drained and removed. - All fencing that is not part of PMLU requirements removed. - All buildings and footings demolished and/or removed off-site. - All machinery and equipment removed. - All non-retained surface water drainage infrastructure removed. - All rubbish removed.	Demonstrate that no infrastructure remains in the final landform.
RM2 - Remediation of contaminated land (where required)	RA1, RA2, RA3b, RA4	- Preliminary site investigation completed by a suitably qualified person (SQP)⁷. - Contaminated and hazardous material either remediated in-situ or removed/transported to an approved landfill for disposal and waste tracking information recorded and submitted. - Validation testing confirms that contaminated soils have been removed or remediated. - Contaminated land assessment undertaken by SQP⁷ indicates that no contamination unsuitable for the post mining land use is occurring. If required, a site investigation report including a site suitability statement prepared and submitted in accordance with the provisions of Chapter 7, Part 8 of the EP Act.	- A contaminated land investigation completed by an SQP⁷ is necessary to ensure that risks to human health and the environment have been appropriately managed. - As required, it will be necessary to remove / remediated and dispose of contaminated materials to ensure a safe and non--polluting site. - Once any contaminated soils have been removed and/or remediated validation testing will ensure a safe, non-polluting PMLU remains.
RM3 - Landform development of infrastructure areas	RA4, RA5a, RA5b, RA7	- All bulk earthworks completed. - Geotechnical assessment by an AQP¹ confirming that long-term geotechnical stability has been achieved for each relevant landform.	- To establish a stable condition for land, the final site design specifications must be met to demonstrate final landform stability - Certification must be provided by a geotechnical engineer that the final landform is geotechnically stable post reshaping / re-profiling the landform, meaning that there is low risk of mass failure.
RM4 - Landform development of rehabilitated water management structures	RA3a, RA3b	General: - All earthworks completed. - Water drainage lines reinstated and stabilised to allow natural flow. Dams: - Sediment dams cleaned (desilted). - Where landform incorporates slopes > 9.7° (17%) , geotechnical assessment by an AQP¹ confirming that long-term geotechnical stability has been achieved. Main Pit flood protection bund: - Reparation of existing erosion undertaken through either surface repair and/or the application of a gypsum/lime. - Assessment by an AQP to confirm the post-closure regulated status of the water management bunding structure. - Assessment by an AQP¹ confirming that long-term geotechnical stability has been achieved.	- To establish a stable condition for land, the final site design specifications must be met to demonstrate final landform stability - Certification must be provided by a geotechnical engineer that the final landform is geotechnically stable post reshaping / re-profiling the landform, meaning that there is low risk of mass failure.
RM5 - Landform development of TSF Cell B	RA1	- All bulk earthworks completed. - Cover system is installed with the appropriate QA/QC measures to: - Compact tailings surface to form a low permeability layer; and - Cover tailings with 400 mm – 600 mm of gravelly topsoil material. - Assessment by an AQP¹ confirming that long-term geotechnical stability (FoS≥1.5) has been achieved. - An assessment by an AQP¹ of groundwater monitoring data (collected in accordance with monitoring and maintenance program), confirms cover system is functioning as designed and risk of environmental harm is mitigated.	- To establish a stable condition for land, the final site design specifications must be met to demonstrate final landform stability - Certification must be provided by a geotechnical engineer that the final landform is geotechnically stable post reshaping / re-profiling the landform, meaning that there is low risk of mass failure. - Cover system to be installed following assessment as per recommendations in Section 3.5.13.1. - Monitoring of the surrounding groundwater setting will provide evidence that the landform is non-polluting. Achievement of the final milestone for some areas will occur during operations. There is a high likelihood that receiving water / groundwater objectives will be breached at one or more locations due to factors unrelated to areas of completed rehabilitation. Such factors may include contaminant sources from surrounding agricultural areas, release of mine affected water from

Rehabilitation milestone	Applicable rehabilitation areas	Milestone criteria	Justification for milestone criteria
			upstream mines, drawdown of or seepage to groundwater aquifers from neighbouring mines, natural variability in groundwater and receiving water environments and unrelated contaminant release from isolated incidents at the Project. Under any of these scenarios, the original conditions mean that all areas of completed rehabilitation (that have achieved milestone RM11) would become non-compliant with the PRCP schedule, despite the exceedance being unrelated to the areas of completed rehabilitation • The EA requires this monitoring be undertaken through the life-of-mine which includes the period of rehabilitation establishment and is required to continue up to the point of surrender of the EA. • EA conditions that relate to groundwater are required to be addressed holistically for a site at surrender. Also, for the purposes of progressive certification sufficient evidence must be provided in order to demonstrate compliance with the EA, regardless of if a PRCP applies, where the proposed certification area includes any groundwater interactions with surface features of the area. • It is considered that the confirmation and certification by an AQP that no potential for impacts to values exists is an appropriate metric of success, as the certification is underpinned by the life-of-mine monitoring through the period of rehabilitation assessment. This approach requires that potential impacts are assessed in consideration of: - o specific site-based factors; - o actual monitoring data from the life-of mine, including from applicable upstream and downstream locations from the rehabilitated landforms and site operations; - o long-term monitoring trend analysis; and - o a broad-catchment overview with high local resolution.
RM6 - Landform reparation activities for Cell A	RA5b	1. All bulk earthworks completed. 2. Geotechnical assessment by an AQP¹ confirming that long-term geotechnical stability (FoS$\geq$1.5) has been achieved. 3. Final landform slopes meet design specifications, TSF Cell A embankments achieves a maximum slope of 16.7° (30%) subject to geotechnical and erosional stable conditions.	• To establish a stable condition for land, the final site design specifications must be met to demonstrate final landform stability • Certification must be provided by a geotechnical engineer that the final landform is geotechnically stable post reshaping / re-profiling the landform, meaning that there is low risk of mass failure. • Erosional and geotechnical analysis indicates that a slope of 16.7° (30%) will achieve acceptable erosion rates and long-term FoS $\geq$1.5.
RM7 – Landform development of HLP	RA2	1. All bulk earthworks completed. 2. Mitigation measures for reducing flood velocities installed to landform, as required. 3. Cover system is installed with the appropriate QA/QC measures to: comprise at least 0.5 m of top rock, followed by 0.15 m of growth media. 4. Final slopes meet design specifications: maximum slope of 25% subject to geotechnical and erosional stable conditions. 5. Assessment by an AQP¹ confirming that long-term geotechnical stability (FoS$\geq$1.5) has been achieved. 6. An assessment by an AQP of groundwater monitoring data (collected in accordance with monitoring and maintenance program), confirms cover system is functioning as designed and risk of environmental harm is mitigated.	• To establish a stable condition for land, the final site design specifications must be met to demonstrate final landform stability. • Certification must be provided by a geotechnical engineer that the final landform is geotechnically stable post reshaping / re-profiling the landform, meaning that there is low risk of mass failure. • Erosional and geotechnical analysis indicates that a slope of 14.04° (25%) will achieve acceptable erosion rates and long-term FoS $\geq$1.5. • Monitoring of the surrounding environment will provide evidence that the landform is non-polluting. There is a likelihood that receiving water / groundwater objectives will be breached at one or more locations due to factors unrelated to areas of completed rehabilitation. Such factors may include contaminant sources from surrounding and upstream land uses, natural variability in groundwater and receiving water environments and unrelated contaminant release from isolated incidents at the Project. Under any of these scenarios, the original conditions mean that all areas of completed rehabilitation (that have achieved milestone RM7) would become non-compliant with the PRCP schedule, despite the exceedance being unrelated to the areas of completed rehabilitation • EA conditions that relate to groundwater are required to be addressed holistically for a site at surrender. Also, for the purposes of progressive certification sufficient evidence must be provided in order to demonstrate compliance with the EA, regardless of if a PRCP applies, where the proposed certification area includes any groundwater interactions with surface features of the area. • It is considered that the confirmation and certification by an AQP that no potential for impacts to values exists is an appropriate metric of success, as the certification is underpinned by the life-of-mine monitoring through the period of rehabilitation assessment. This approach requires that potential impacts are assessed in consideration of: - o specific site-based factors; - o actual monitoring data from the life-of mine, including from applicable upstream and downstream locations from the rehabilitated landforms and site operations; - o long-term monitoring trend analysis; and - o a broad-catchment overview with high local resolution.

Rehabilitation milestone	Applicable rehabilitation areas	Milestone criteria	Justification for milestone criteria					
RM8 – Surface preparation	RA1, RA2, RA3a, RA3b, RA4, RA5a, RA5b, RA6, RA7	1. Ripping of soil profile /subsoil profile along the contour of any slope to a depth of at least 200 mm. 2. Topsoiling at a minimum depth of 0.15 m (excluding RA3b & RA1). 3. Prior to seeding, assessment of soil health and suitability for target vegetation establishment undertaken by an AQP¹ and a recommendation made for ameliorants suitable to achieve the PMLU revegetation program. 4. Ameliorants applied and incorporated into subsoil and/or topsoil if required, as per recommendations of the soil health and suitability assessment. 5. Gypsum or organic matter applied on slopes greater than 9.7° (17%) at RA1, RA2, RA3b and RA5b. 6. Aglime applied to the surface of RA1 at a rate of 1.8t/m³, where required • Soil testing should be completed by a suitably qualified person to ensure soil is suitable for target vegetation establishment and specify any requirements for potential amelioration prior to seeding. • Ameliorants may be required to improve cohesion with the subsoil / topsoil and given local variability in soil quality it is considered appropriate for recommendations to be made following testing of the material to be used in rehabilitation prior to use. • Ripping to encourage water infiltration and grass root development to a depth that is sufficient for adequately stabilising surface soils. It is not intended to specify a ripping depth in the milestone criteria to allow the adoption of best practice rehabilitation methods over time. • Topsoil will be placed with a minimum thickness to provide sufficient depth for vegetation growth. The nominated topsoil depth has been successfully utilised on site as demonstrated by the rehabilitation trials and ongoing rehabilitation monitoring of historical sites (pre-GBM Resources ownership). • The use of gypsum was recommended for use on slopes to improve soil stability (SLSA 2024a).						
RM9 - Revegetation	RA1, RA2, RA3a, RA3b, RA4, RA5a, RA5b, RA6, RA7, RA10	1. Cover crops applied at rate of 30 kg/ha on slopes greater than 9.7° (17%) at RA1, RA2 and RA5b. 2. Seeding of target key species completed at a sowing rate of 6 kg/ha drawn from the table below. <table><tr><th>Vegetation type</th><th>Target Species</th></tr><tr><td>Groundcover</td><td><i>Aristida latifolia</i> (Feathertop wiregrass) (Native) <i>Chloris truncata</i> (Windmill grass) (Native) <i>Dactylon radulans</i> (Button Grass) (Native) <i>Cynodon dactylon</i> (Green Couch) (Native) <i>Panicum effusum</i> (Native Millet) (Native) <i>Urochloa mosambicensis</i> (Sabi Grass) (Exotic) <i>Cenchrus ciliaris</i> (Buffel Grass) (Exotic) <i>Bothriochloa pertusa</i> (Indian Bluegrass) (Exotic)</td></tr><tr><td>Shrub</td><td><i>Carrissa spinarum</i> (Currant Bush) <i>Capparis lasiantha</i> (Nipan) <i>Stylosanthes scabra</i> (Shrubby stylo) <i>Acacia salicina</i> (Sally wattle)</td></tr></table> • Records to demonstrate that seeding has been undertaken in accordance with the rehabilitation objectives set out in the PRCP. • Monitoring to demonstrate that seeds demonstrate successful germination. • The use of cover crops was recommended for use on slopes to improve soil stability.	Vegetation type	Target Species	Groundcover	<i>Aristida latifolia</i> (Feathertop wiregrass) (Native) <i>Chloris truncata</i> (Windmill grass) (Native) <i>Dactylon radulans</i> (Button Grass) (Native) <i>Cynodon dactylon</i> (Green Couch) (Native) <i>Panicum effusum</i> (Native Millet) (Native) <i>Urochloa mosambicensis</i> (Sabi Grass) (Exotic) <i>Cenchrus ciliaris</i> (Buffel Grass) (Exotic) <i>Bothriochloa pertusa</i> (Indian Bluegrass) (Exotic)	Shrub	<i>Carrissa spinarum</i> (Currant Bush) <i>Capparis lasiantha</i> (Nipan) <i>Stylosanthes scabra</i> (Shrubby stylo) <i>Acacia salicina</i> (Sally wattle)
Vegetation type	Target Species							
Groundcover	<i>Aristida latifolia</i> (Feathertop wiregrass) (Native) <i>Chloris truncata</i> (Windmill grass) (Native) <i>Dactylon radulans</i> (Button Grass) (Native) <i>Cynodon dactylon</i> (Green Couch) (Native) <i>Panicum effusum</i> (Native Millet) (Native) <i>Urochloa mosambicensis</i> (Sabi Grass) (Exotic) <i>Cenchrus ciliaris</i> (Buffel Grass) (Exotic) <i>Bothriochloa pertusa</i> (Indian Bluegrass) (Exotic)							
Shrub	<i>Carrissa spinarum</i> (Currant Bush) <i>Capparis lasiantha</i> (Nipan) <i>Stylosanthes scabra</i> (Shrubby stylo) <i>Acacia salicina</i> (Sally wattle)							
RM10 - Achievement of revegetation criteria (open pasture – grazing and low hill – pasture grazing)	RA1, RA2, RA3a, RA4, RA5a, RA5b, RA6, RA7, RA10	1. Total percentage of vegetation groundcover²: a. is not significantly lower (P<0.05) than that recorded at reference sites⁴ or b. For slopes >9.7° (17%) at RA1, RA2 and RA5b is 70%. 2. Species diversity is not significantly lower (P<0.05) than that recorded at reference sites⁴. 3. Species composition not significantly different (P<0.05) to reference sites⁴. 4. Weed⁸ presence is a maximum of 10% of total vegetative groundcover confirmed by an AQP¹ in annual monitoring. Weed management recommendations to be provided in annual reports 5. No evidence of erosion classified as ‘moderate’ or ‘severe’³. • The purpose of this milestone is to demonstrate that the RA is trending towards the final milestone, allowing for early intervention with reparation activities as required. Monitoring against the criteria nominated for this milestone is consistent with monitoring undertaken as part of the Project’s annual rehabilitation monitoring, with datasets already collected to be used for tracking progress against milestone criteria. • Within any landscape, there is natural variation over time due to variability in climatic conditions and point in time throughout the year. Comparison of factors such as species diversity, species composition and total weed cover against reference site provides a comparison of grazing characteristics in the surrounding landscape, accounting for natural variability. Using a parameter such as • Erosion monitoring to be utilised to further demonstrate stability of the landform. • Excessive weed cover has the potential to outcompete grass cover. Demonstrating that weed cover is similar to reference locations or below 15% live cover will demonstrate rehabilitation areas are trending towards the natural landscape. • The nominated criteria are considered to meet the SMART principles. Using criteria RM101a) "For slopes <9.7° (17%) is not significantly lower (P<0.05) than that recorded at reference sites⁴" as an example, this criterion is:						

Rehabilitation milestone	Applicable rehabilitation areas	Milestone criteria	Justification for milestone criteria
			- o Specific –vegetation cover at rehabilitation areas is compared to reference location and statistical analysis using p-values indicate that it is not less than p<0.05. - o Measurable – vegetation cover is to be measured at reference sites and rehabilitation sites. - o Achievable – comparison against reference locations provides for local variability that naturally occurs over time due to changes in climatic conditions. - o Reasonable / relevant – groundcover provides for a measure of landform stability comparable to the adjacent landscape and with regards to grazing suitability for grazing comparable to the adjacent landscape. - o Time specific – the milestone must be achieved within a period of 10 years.
RM11 - Achievement of PMLU to stable condition (open pasture – grazing and Low hill – pasture grazing)	RA1, RA2, RA3a, RA4, RA5a, RA5b, RA6, RA7, RA10	1. Land suitability assessment by an AQP¹ confirming land has achieved a post-mine land suitability⁵ of a. 4 for low intensity grazing for Clayey soils, or b. 5 for low intensity grazing for Sandy soils, supported by an appropriate management regime. 2. Demonstration within the final rehabilitation report that vegetation groundcover², species diversity and species composition in rehabilitation areas is not significantly lower (P<0.05) than reference sites for a minimum of three consecutive years. 3. Demonstration within the final rehabilitation report that total percentage of weed groundcover in rehabilitation areas is not significantly higher (P<0.05) than reference sites for a minimum of three consecutive years. 4. No evidence of erosion classified as ‘moderate’ or ‘severe’³ for three consecutive years. 5. Hazard and Safety Assessment completed by an AQP¹ demonstrates that hazards in rehabilitation areas are of a similar type and not significantly different to hazards in reference sites. As defined in AS/NZS ISO 31000:2018 Risk Management. 6. Surface water quality monitoring undertaken through the life of the mine (as required by the EA), has indicated no potential impacts to any surface water values including aquatic ecology, resulting from the rehabilitated landforms. 7. Groundwater quality monitoring undertaken through the life of the mine and through the period of rehabilitation establishment (as required by the EA), has indicated no potential impacts to any groundwater values resulting from the rehabilitated landforms.	• Land suitability assessment to demonstrate that land suitability is similar to the pre-mining landscape. • Monitoring of the surrounding environment will provide evidence that the landform is non-polluting. Achievement of the final milestone for some areas will occur during operations. There is a high likelihood that receiving water / groundwater objectives will be breached at one or more locations due to factors unrelated to areas of completed rehabilitation. Such factors may include contaminant sources from surrounding agricultural areas, natural variability in groundwater and receiving water environments and unrelated contaminant release from isolated incidents at the Project. Under any of these scenarios, the original conditions mean that all areas of completed rehabilitation (that have achieved milestone RM11) would become non-compliant with the PRCP schedule, despite the exceedance being unrelated to the areas of completed rehabilitation • The EA requires this monitoring be undertaken through the life-of-mine which includes the period of rehabilitation establishment and is required to continue up to the point of surrender of the EA. With specific regard to surface water and aquatic ecology, the REMP monitoring currently required by the EA is undertaken to determine potential impacts to the receiving environment and its values from site activities, by AQPs. • EA conditions that relate to groundwater are required to be addressed holistically for a site at surrender. Also, for the purposes of progressive certification sufficient evidence must be provided in order to demonstrate compliance with the EA, regardless of if a PRCP applies, where the proposed certification area includes any groundwater interactions with surface features of the area. • It is considered that the confirmation and certification by an AQP that no potential for impacts to values exists is an appropriate metric of success, as the certification is underpinned by the life-of-mine monitoring through the period of rehabilitation assessment. This approach requires that potential impacts are assessed in consideration of: a. specific site-based factors; b. actual monitoring data from the life-of mine, including from applicable upstream and downstream locations from the rehabilitated landforms; c. long-term monitoring trend analysis; and d. a broad-catchment overview with high local resolution. e. Monitoring of stream sediment parameters is to be undertaken in accordance with the requirements of the Project Receiving Environment Monitoring Program.
RM12 - Achievement of PMLU to stable condition (retained water storages)	RA8	1. Assessment by an AQP¹ confirms the structure is not regulated. 2. Mine Water Dam de-silted and sediment removed to an average depth of 0.25 m. 3. All retained water storages to be assessed and approved as safe and stable⁶ by an appropriately¹ qualified person: where, a. no ‘moderate’ or ‘Severe’ erosion⁴ and drainage follows appropriate paths; b. for slopes of banks and spillways >9.7° (17%) , geotechnical assessment confirms slopes achieve a FoS of >1.5. 4. Hazard and Safety Assessment completed by an AQP¹ demonstrates that hazards in retained water storages are of a similar type and not significantly different to hazards in neighbouring unmined water storages subject to similar use. As defined in AS/NZS ISO 31000:2018 Risk Management.	• Monitoring records to demonstrate water contained within retained water storages is suitable for stock use on consecutive monitoring occasions. • Assessment of retained infrastructure by an AQP¹ to demonstrate that the PMLU is safe, stable, sustainable and non-polluting. For dams to be erosionally stable, visual inspections indicate that there is no risk of weathering from natural processes to the extent that causes instability from moderate or severe erosion.

Rehabilitation milestone	Applicable rehabilitation areas	Milestone criteria	Justification for milestone criteria
		5. Retained storage water quality parameters to be below the trigger values for livestock drinking water defined in Environmental Protection (Water and Wetland Biodiversity) Policy 2019 Suttor River Sub-basin Environmental Values and Water Quality Objectives (EPPD & DES 2022). 6. Transfer of ownership agreements in place for all infrastructure to be retained.	
RM13 - Achievement of PMLU to stable condition (retained infrastructure)	RA9	7. Transfer of ownership agreements in place for all infrastructure to be retained. 8. Final landform survey confirms no built structures remain other than those that form part of a landholder agreement. 9. All retained structures and landforms assessed and approved as safe and stable ⁶ by an AQP ¹ . As defined in AS/NZS ISO 31000:2018 Risk Management.	Assessment of retained infrastructure by an AQP¹ to demonstrate that the PMLU is safe, stable, sustainable and non-polluting.
RM14 – Achievement of target revegetation criteria (Flood management landform)	RA3b	1. Total groundcover (vegetation, rock, erosion matting etc) ≥70%. 2. No “moderate: or “severe” erosion as per the Erosion classification ³ . 3. Exclusion of Stock – Standard barbed wire fencing, with four barbed wire stands and the use of strainers as required have been erected around the perimeter of the East Hill Pit void to prevent access by humans and fauna.	- Total groundcover required has been informed by the RUSLE analysis undertaken for the landform. - Stock should be excluded from the landform to avoid disturbance to the surface. Surface cover is required to ensure stability through wetting and drying cycles due to flood inundation.
RM15 - Achievement of PMLU to stable condition (Flood management landform)	RA3b	1. Total groundcover (vegetation, rock, erosion matting etc) ≥70% on three consecutive monitoring occasions. 2. No evidence of erosion classified as ‘moderate’ or ‘severe’ ³ on three consecutive occasions. 3. Certification from AQP ¹ that the area has achieved stable condition, which includes: a. flood management bund achieves a FoS ≥1.5. b. Hazard and safety assessment completed in accordance with AS/NZS ISO 31000:2018 Risk Management.	Assessment of retained infrastructure by an AQP¹ to demonstrate that the PMLU is safe, stable, sustainable and non-polluting. For dams to be erosionally stable, visual inspections indicate that there is no risk of weathering from natural processes to the extent that causes instability from moderate or severe erosion.

1. *Appropriately qualified person* means a person who has professional qualifications, training, skills or experience relevant to the nominated subject matter and can give authoritative assessment, advice and analysis on performance relating to the subject matter using the relevant protocols, standards, methods, or literature.

2. *Vegetation groundcover* incorporates native pasture grass species, exotic pasture grass species, non-pasture grass species, shrubs (woody plant multi-stemmed at base or, if single stemmed, <2 m tall), forbs and other non-grass species.

3. Erosion classification framework:

Erosion classification	Minor	Moderate	Severe
Sheet erosion	Shallow soil deposits downslope	Partial exposure of roots; moderate soil deposits downslope, etc	Loss of surface horizon; root exposure, etc
Rill/gully erosion	<15 rills and <0.3m deep	15-30 rills and <0.3m deep	>30 rills and/or any >0.3m deep.
Tunnel erosion	Absent	Absent	Present
Mass movement	Absent	Absent	Present

**Gully: highly visible form of soil erosion, with steep-sided, incised drainage lines greater than 30 cm deep.*

4. Vegetation reference monitoring locations:

Site name	Easting	Northing	Location	Year established
R1	501535	7644552	South of the village infrastructure	2014
R2	500605	7644748	South of the village infrastructure	2014
R3	499022	7645610	East of rehabilitated infrastructure	2014

5. Department of Science, Information Technology and Innovation and Department of Natural Resources and Mines (2015) *Guidelines for Agricultural Land Evaluation in Queensland* (Second Edition), State of Queensland or later version. (<https://www.publications.qld.gov.au/dataset/qld-agricultural-land-evaluation-guidelines/resource/d6591386-08e2-453f-a6fa-dff2a756215f>).

6. Stable as defined in section 111A of the Environmental Protection Act 1994: 111A Meaning of stable condition Land is in a stable condition if— (a) the land is safe and structurally stable; and (b) there is no environmental harm being caused by anything on or in the land; and (c) the land can sustain a PMLU.

7. A suitably qualified person must have qualifications and experience relevant to the work being undertaken and must be a current member of a professional organisation prescribed under Schedule 14 of the Environmental Protection Regulation 2008.
8. Weeds are defined by the Biosecurity Act 2014.

Table 30: Management milestone criteria

Management milestone	Applicable improvement areas	Milestone criteria	Justification for milestone criteria
MM1 - Achievement of final landform design	IA1, IA2	1. Final void high walls comply with maximum safe and stable slope angles as nominated in geotechnical stability assessment, where: a. slopes achieve a FoS ≥ 1.5. b. Pit high walls achieve a slope $\leq 70^\circ$ in competent rock and $\leq 50^\circ$ in the weathered horizon.	• Assessments by AQP¹ will demonstrate that land is safe, stable and non-polluting. • Achievement of FoS>1.5 in accordance with best practice for safety and stability of pit walls.
MM2 - Achievement of surface requirements	IA1, IA2	1. Safety bunding constructed around perimeter of the East Hill Pit, with a minimum height of 2 m and constructed of non-dispersive material, or by placing hard barriers, or standard barbed wire fencing, with four barbed wire stands and the use of strainers as required have been erected around the perimeter of the East Hill Pit void to prevent access by humans and livestock. 2. Standard barbed wire fencing, with four barbed wire stands and the use of strainers as required have been erected around the perimeter of the flood protection landform to prevent access to main pit by humans and livestock. 3. Warning signage posted every 100 m around the perimeter of the residual void.	• Nominated fencing is consistent with the surrounding landscape. • Fence damage from floodwaters is usually caused by the build-up of flood debris against the fence which provides a wide surface area for the flowing water to push against, increasing forces against the fence (after DELWP 2015). Therefore, minimising the number of wires and increasing the spacing between them (while still function for exclusion purposes) helps to limit the load a fence carries during a flood, by reducing the ability of the fence to catch debris (DELWP 2015). Fencing around the pits will consist of steel posts with four strings of barbed wire fencing spaced to minimise the potential of debris transported during floods to damage fencing. • Fences can also be strengthened through the use of strainer assemblies (DELWP 2015). The use of strainer assemblies is consistent with the surrounding landscape and have been utilised where required along the currently installed fencing. <u>Fencing used on site (East Hill Pit)</u>  <u>Fencing in the surrounding landscape</u> 
MM3 – Achievement of sufficient improvement	IA1, IA2	1. Assessment by an AQP that the water quality and/or level in the void will not cause environmental harm to the surrounding environment: a. Main Pit – water balance modelling confirms that long-term pit water depth will remain greater than 160 m AHD for the maintenance of a permanent water cover over sulphide material in the pit walls and floor. b. Main Pit – water quality monitoring downstream of the void:	• Assessments by AQP¹ will demonstrate that land is safe, stable and non-polluting. • It is considered that the confirmation and certification by an AQP that no potential for impacts to values exists is an appropriate metric of success, as the certification is underpinned by the life-of-mine monitoring through the period of rehabilitation assessment and best practices at that point in time. This approach requires that potential impacts are assessed in consideration of: a. specific site-based factors;

Management milestone	Applicable improvement areas	Milestone criteria	Justification for milestone criteria
		i. meets the aquatic ecosystem water quality objectives for the Suttor River Sub-basin on three consecutive monitoring occasions; or ii. where monitoring parameters have exceeded the aquatic ecosystem water quality objectives for the Suttor River Sub-basin, a comparison with water quality at upstream monitoring locations demonstrate that exceedances are not a result of the void water. c. Main Pit – Groundwater quality monitoring undertaken through the period of rehabilitation establishment (as required by the EA), has indicated no potential impacts to any groundwater values resulting from the void. d. East Hill Pit – review of the groundwater surface, evaporation rates and groundwater quality monitoring data indicate that there is low risk of environmental harm to groundwater quality values of the Project 2. Hazard and Safety Assessment completed by an AQP¹ demonstrates that hazards relating to fencing are of a similar type and not significantly different to hazards in reference sites. As defined in AS/NZS ISO 31000:2018 Risk Management. 3. Assessment by a geotechnical professional concludes that NUMAs are geotechnically stable.	b. actual monitoring data from the life-of mine, including from applicable upstream and downstream locations from the rehabilitated landforms; c. long-term monitoring trend analysis; and d. a broad-catchment overview with high local resolution. • The inspection and reparation of fencing following a significant flood event is considered typical land management practice in any landscape, especially for cattle grazing in a flood plain. MM3.2 has been added to assess the risk of fencing in the landscape. Initial review of the groundwater surface, evaporation rates and groundwater quality monitoring data indicate that there is low risk of environmental harm to groundwater quality values of the Project given the constrained nature of groundwater and being situated in the mineralised domain upgradient of MP01 and Main Pit. • Monitoring of water quality within East Hill Pit since 2014 indicates that water quality in East Hill Pit is relatively stable, with worse-case scenario modelling of water quality undertaken. Monitoring of water quality within East Hill Pit since 2021 shows improvements with water quality follow rainfall input. The additional pit water volume has improved water quality with: o pH rising from a relatively constant and acidic 4 to a pH of 7-8 (Figure 96). o Salinity declines from 20,000 to 5,000 EC uS/cm and sulphate reduces to between 4,500 to 1,000 mg/L (Figure 97). o Strong reductions in concentration for arsenic, copper, nickel and zinc (Figure 98 and Figure 99). • The results of opportunistic geological and geotechnical mapping of East Hill Pit will be used to inform the final closure report

1. *Appropriately qualified person* means a person who has professional qualifications, training, skills or experience relevant to the nominated subject matter and can give authoritative assessment, advice and analysis on performance relating to the subject matter using the relevant protocols, standards, methods, or literature.

3.5.6 Rehabilitation timeframes

Rehabilitation milestones must be achieved as soon as practicable after land becomes available for rehabilitation. Land is considered to become available for rehabilitation at the completion of mining, except where land is being used for operating infrastructure, placement of topsoil stockpiles, use for borrowed pits, is required for rehabilitation activities or is identified as being retained infrastructure post-closure.

Rehabilitation milestone timeframes have been developed with consideration for the size of the rehabilitation area, the applicable milestone activities and interim rehabilitation activities that are scheduled to occur or anticipated to be required before the area becomes available for rehabilitation. Milestones that involve revegetation activities, including monitoring of revegetation, make provision for unfavourable growing seasons and unforeseen extreme events such as droughts or storms that could negatively impact vegetation establishment. As a result, milestone timeframes are extended to ensure achievement.

A risk assessment for rehabilitation activities was undertaken for the Project and the risks identified have informed the timeframe assigned to each milestone. The Project risk assessment is detailed further in Section 3.6 and has been provided in full in Appendix G.

The nominated rehabilitation timeframes considered for scheduling the rehabilitation and management milestones are shown in Table 31 and Table 32.

Table 31: Rehabilitation milestones timeframe

Milestone Timeframe	Summary rehabilitation methodology	Associated risks	Risk level assigned	Typical time frame (years)	Justification for assigned timeframe
Available for rehab → Landform Development (RM1, RM2, RM3, RM4, RM5, RM6, RM7)	- Infrastructure decommissioning and removal (RM1). - Remediation of contaminated land, as required (RM2). - Bulk earthworks reshaping. - Water drainage lines reinstated and stabilised to allow natural flow (RM4). - Sediment removal from dams (RM4). - Development of design plan for Main Pit water management bund (RM4). - Installation of cover system designs for the TSF Cell B (RM5), TSF Cell A (RM6) and the HLP (RM7). - Geotechnical assessment confirming long-term geotechnical stability. - Hydrogeological assessment, as required.	- No risks were associated with infrastructure decommissioning. - Hydrocarbon or heavy metal contamination from buildings/workshop and laydown areas. - Surface roughness (rockiness, depressions) in excess of that expected for the PMLU - Significant slope failure. - Initial/ongoing gully, pipe and/or sheet erosion of rehabilitated areas. - Identification and management of contaminated land.	Moderate	2 – 8	Some mine infrastructure (e.g. haul road) will be required to facilitate rehabilitation activities and will therefore not become available for rehabilitation for several years post-closure. Decommissioning activities are considered low risk; therefore decommissioning is expected to take less than 1 years. A preliminary site investigation will be undertaken by an SQP to identify potential areas of contamination. A detailed site investigation report will be completed by an SQP. If contaminated land is identified, contaminated materials will be removed and appropriately disposed or remediation. Following this, validation testing will be undertaken to confirm mitigation activities have been adequate. A site suitability statement from a SQP confirms the uses or activities for which the land is suitable, align to the approved PMLUs for the site. Given the risk classification associated with this activity and the activities required to achieve the milestone criteria the timeframe assigned is 1 year. Bulk earthworks and installation of drainage features are to be completed according to rehabilitation design specifications, including assessment as geotechnically stable by a suitably qualified person. Given the relatively large scale of RA1, RA2 and RA5b, the timeframe assigned to these RAs is 6 years, respectively. For smaller RAs, a timeframe of 1 years has been proposed.

Milestone Timeframe	Summary rehabilitation methodology	Associated risks	Risk level assigned	Typical time frame (years)	Justification for assigned timeframe
Landform development (RM3, RM4, RM5, RM6, RM7) → Surface preparation (RM8)	- Ripping of soil profile/subsoil - Soil health and suitability assessment - As required, application of ameliorants to subsoil and topsoil.	- Erodible topsoils and subsoils not able to be rectified with amelioration. - Initial/ongoing gully, pipe and/or sheet erosion of rehabilitated areas - Insufficient quality of topsoil resources onsite available to undertake rehabilitation activities.	Moderate	1	Soil health and suitability assessment, amelioration and prompt vegetation establishment are key processes to minimise the identified risks. Given the moderate scale of the RAs and the low risk associated with the activity itself, the timeframe assigned is 1 year.
Surface preparation (RM8) → Revegetation (RM9)	Seeding of target key species completed at specified sowing rates (refer Section 3.5.5)	- Failure to meet seeding rate of key target species. - Natural hazards (fire, drought, heavy rainfall) following planting resulting in poor seed establishment and loss of topsoil.	Low	2	The seeding and / or planting of suitable target species is classified as low risk, however, there is an inherent risk associated with the impact of natural weather events. The assigned timeframe of 2 year allows time for vegetation establishment and planting to consider climatic conditions to optimise planting success.
Revegetation (RM9) → Achievement of revegetation criteria (RM10)	Revegetated areas to be assessed against ground cover and stability related completion criteria (refer Section 3.5.5).	- Initial/ongoing gully, pipe and/or sheet erosion of rehabilitated areas (Moderate to Significant) - Erodible topsoils and subsoil; - Insufficient vegetative cover required to achieve landform stability. - Excessive rainfall, droughts or fire events that may directly affect groundcover establishment; and - pests and weeds.	Moderate	10	Achievement of target revegetation criteria is dependent on good climatic conditions soil preparation. The timeframe assigned considers the time necessary for establishment of mature, self-sustaining vegetation (i.e., multiple seasons of successful recruitment) and the various risks identified. Allowance is made for poor growing seasons and extreme events such as droughts or storms that will negatively impact vegetation establishment, and consequent maintenance actions that may be required. Given these factors and the moderate risk classification, the timeframe assigned is 10 years.

Milestone Timeframe	Summary rehabilitation methodology	Associated risks	Risk level assigned	Typical time frame (years)	Justification for assigned timeframe
Achievement of revegetation requirements (RM10) → Achievement of stable PMLU (RM11)	Revegetated areas to be assessed against all completion criteria developed with reference to analogue sites of similar characteristics and land use (refer Figure 5 and Section 3.5.5).	- Ongoing gully, pipe and/or sheet erosion of rehabilitated areas - Water quality in retained storages not meeting PMLU water quality requirements (Low) - Insufficient pasture productivity or density - Pests and weeds	Moderate	10	Achievement of a sustainable and non-polluting target PMLU is dependent on establishment of mature, self-sustaining vegetation demonstrated through multiple seasons. As the target PMLU has not yet been achieved, allowance is provided for uncertainty associated with any required maintenance activities, the likelihood of natural hazard events such as fires or severe storms, and challenges associated with pest/weed control. Given these factors and the moderate risk classification, the timeframe assigned is 10 years.
Land available (RA8) → Achievement of retained water storage (RM12)	Water quality monitoring of retained water storages indicates that water is suitable for stock. Hazard and safety assessment undertaken for areas of retained infrastructure and landholder agreement in place.	- Poor water quality in retained water storage. - Hazards in excess of those expected for the PMLU.	Moderate	8	Allowance is made for uncertainty associated with maintenance activities, the likelihood of natural hazard events, consecutive water quality monitoring events and challenges associated with pest/weed control. The timeframe assigned is 8 years.
Land available (LA) → Achievement of retained infrastructure (RM13)	Hazard and safety assessment undertaken for areas of retained infrastructure and landholder agreement in place.	Hazards in excess of those expected for the PMLU.	Low	2	Given the minimal active rehabilitation work required to achieve a stable condition for retained infrastructure, the timeframe assigned is 2 years to allow sufficient time for any reparation activities required following a hazard and safety assessment.
Revegetation (RM9) → Achievement of revegetation requirements (RM14)	Areas to be assessed against all completion criteria	- Initial/ongoing gully, pipe and/or sheet erosion of rehabilitated areas (Moderate to Significant) - Insufficient ground cover required to achieve landform stability. - Excessive rainfall, droughts or fire events that may directly	Moderate	5	A timeframe of 5 years has been assigned due to the moderate risk and nature of milestone requirements. Allowance is made for uncertainty associated with maintenance activities, the likelihood of natural hazard events, and challenges associated with pest/weed control.

Milestone Timeframe	Summary rehabilitation methodology	Associated risks	Risk level assigned	Typical time frame (years)	Justification for assigned timeframe
		affect groundcover establishment; and pests and weeds.			
Achievement of revegetation requirements (RM14) → Achievement of stable PMLU (RM15)	Hazard and safety assessment and geotechnical assessment undertaken. Achievement of groundcover requirements over consecutive years.	- Hazards in excess of those expected for the PMLU. - Insufficient ground cover required to achieve landform stability. - Initial/ongoing gully, pipe and/or sheet erosion of rehabilitated areas (Moderate to Significant)	Moderate	5	A timeframe of 5 years has been assigned due to the moderate risk and nature of milestone requirements. Allowance is made for uncertainty associated with maintenance activities, the likelihood of natural hazard events, and challenges associated with pest/weed control.

Table 32: Management milestones timeframe

Milestone Timeframe	Summary of completion criteria	Associated risks	Risk level assigned	Typical time frame (years)	Justification for assigned timeframe
Available for rehab → Achievement of final landform design (MM1) and achievement of surface and safety requirements (MM2)	MM1 - Final void high walls comply with maximum safe and stable slope angles as nominated in geotechnical stability assessment. MM2 - Safety infrastructure established around the void, including the following: - Adequate bunding in place; and - Perimeter fencing and signage erected to prevent access to fauna and humans.	- Slope failure; and - Inundation by floodwaters, rising pit water levels.	Moderate	6	For both residual voids, the process for creating the stable final void landform will require alignment with nominated geotechnical specifications regarding safe highwall design other mitigation strategies such as the establishment of catch benches and buttressing, as to be identified by a geotechnical assessment. Safety infrastructure will be installed around both residual voids. It is estimated it will require a timeframe of 5 years post-mining before a safe and final landform surface design is achieved.
Achievement of final landform design (MM1) and achievement of surface and safety requirements (MM2) → Achievement of sufficient improvement (MM3)	- Assessment to confirm the residual void will not cause environmental harm outside of the relevant tenure boundary. - Hydrogeological assessment to confirm that pit water quality and/or level will not cause environmental harm to surrounding environment.	- Significant slope failure; - Insufficient water level and poor water quality in Main Pit; - Potential groundwater quality impacts; - Localised land impact and downstream water quality impacts; - Potential erosion of residual void walls and spillways.	Moderate	10	Ten years has been assigned to provide sufficient time to monitor water quality, water level and slope stability to comply with final landform design. Furthermore, it allows for extreme rainfall events that may affect groundwater flow to the pits and potentially impact the groundwater quality.

3.5.7 General rehabilitation practice

The rehabilitation practices used at any mining site inevitably evolve as a result of increasing knowledge gained from experience in the following areas:

- early rehabilitation successes and failures;
- weather, subsoils, soils, local flora and fauna and revegetation species; and
- site preparation, seeding practices, the maintenance and repair of previously rehabilitated areas and/or local agricultural practices.

For this reason, the rehabilitation practices outlined in the following subsections should not be interpreted as the precise method that will be used from this point on, but rather as a record of the current rehabilitation knowledge and intent at the time of writing; and with the expectation that rehabilitation practices will further evolve and develop from this point on. A record of the existing rehabilitation efforts at site is provided at Section 3.1.2.

While rehabilitation objectives, performance indicators and completion criteria for the Project are detailed at Sections 3.5.1 and 3.5.2, from the perspective of operational rehabilitation planning and practice, the following overarching principles are considered key:

- Ensuring that reshaped areas proposed for rehabilitation meet the required landform design principles, that prepared areas meet the rehabilitation design specification for the area, and that local site drainage has been considered and surrounding areas graded to mitigate any rainfall runoff from adjacent areas to run-on to prepared RAs.
- Topdressing materials, final surface preparation methods and soil amelioration activities have the objective of supporting vegetative growth.
- Revegetation species selection, seeding and/or planting methods, and fertiliser applications target rapid vegetative ground cover effective at mitigating soil erosion, during the period of initial revegetation when areas are most at risk.
- Ongoing monitoring and maintenance are used both to assess rehabilitated area performance against completion criteria as well as to feedback to, and update rehabilitation practices; and to identify maintenance or modification requirements such that RAs are proceeding along a trajectory towards the designated PMLU.

There will be circumstances when rehabilitation practices outside of those discussed within this PRCP are utilised. For example, discrete areas of steeper slopes, rehabilitation failures or other scenarios that may necessitate more intensive rehabilitation practices. These circumstances will be identified, assessed and rehabilitation activities planned for as required.

3.5.8 Final landform design

Final landform design planning has been informed by a combination of monitoring data (including environmental monitoring and material characterisation) and various assessments to predict the long-term stability of final landforms. The following sub-sections summarises the assessments completed to inform this design, and the methodology to be used to construct safe and structurally stable final landforms.

3.5.8.1 Heap Leach Pad

The HLP will be rehabilitated to a PMLU of low hill – low intensity pasture grazing. Slopes will be regraded to an angle of $\leq 14.04^\circ$ (25%) with a maximum slope length of 30 m. Benches of 5 m, will be utilised reduce overall slope lengths. The final landform design is shown on Figure 43. The surface of the landform will then be prepared and revegetated according to methods described in Section 3.5.17.

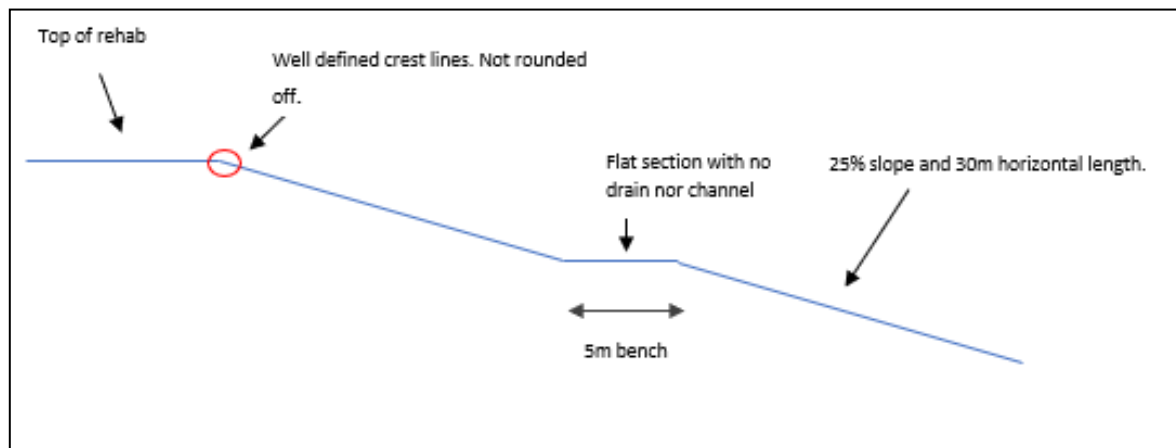


Figure 43: Final landform design of HLP

3.5.8.2 Yandan Tailings Dam

The TSF will be rehabilitated to a PMLU of low intensity grazing. The existing landform of the Yandan Tailings Dam is one of low relief, with 1-3 m embankments in the top of the catchment to a 12 m earthen embankment downstream, over a broad 113 ha landform (SBE 2022). The landform sits above the modelled flood extents (Section 3.5.11).

It is understood that the embankment of the TSF was constructed with a central clay core, with this material borrowed from around the perimeter of the TSF (Greater Boulder Holdings Ltd 1988). Clay cores are effective in restricting seepage from reporting to the receiving environment, and in this instance, it is also understood to have the dual purpose of preventing upstream waters from infiltrating the facility and wetting the tailings. Given the TSF was constructed across a minor drainage channel, some ponding occurs against the upstream wall which is located within the top of the catchment. The inclusion of a clay core in the embankment walls was therefore an important consideration for the long-term stability and function of the facility.

To minimise the potential of surface / soil erosion as a consequence of steep slopes, backfilling on the downstream face of the wall is proposed to achieve 16.7° (30%) grade slopes with a 20 m horizontal length, and a single, intermediate flat bench of 5 m (Figure 44).

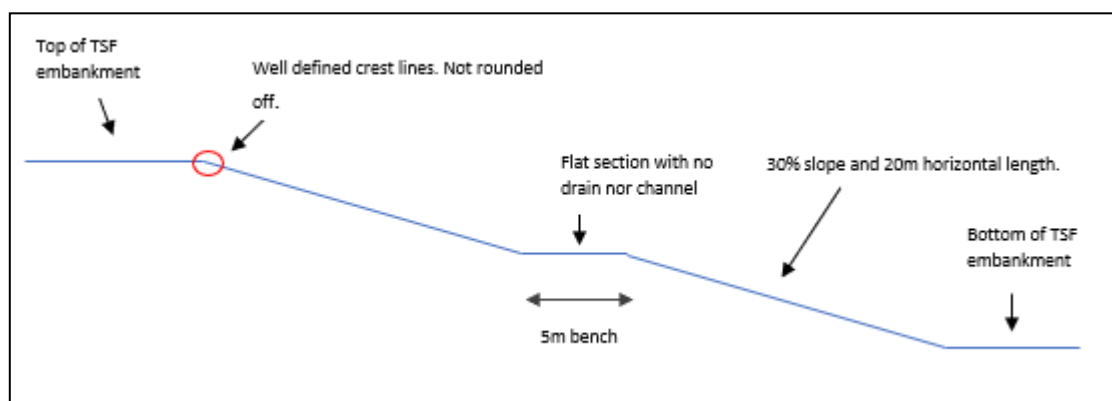


Figure 44: Final landform design of Main Wall

3.5.8.3 Residual voids

Residual voids are areas of the post mining landform that are below the natural ground level and will not be rehabilitated to achieve a PMLU (i.e. are NUMAs). Approved residual voids at Yandan are associated with Main Pit and East Hill Pit, having a combined surface area of approximately 21 ha (Figure 3).

Main Pit

Most rehabilitation works for Main Pit were completed following the decommissioning of the pit in 1999. Prior to flooding the pit, sulphidic material in the pit was dozed flat, treated with at a rate of 1 kg/m² and capped with compacted oxide material (Ross Mining N.L. 2000). At a minimum depth of 0.3 m SRK Consulting 1999). A water layer was established during the 1999/2000 wet season (Ross Mining N.L. 2000).

Pit slopes have been designed to achieve $\leq 70^\circ$ in competent rock and $\leq 50^\circ$ in the weathered horizon.

Main Pit is to remain as a residual void post-closure with a permanent water cover to limit the ingress of oxygen into reactive material. (refer Section 3.5.12). The rate of oxygen diffusion through water is 10,000 times slower than air, effectively reducing the rate of sulphide oxidation (DFAT 2016). The management of acid rock drainage with the use of a water cover system is considered suitable when water cover can be maintained either through climatic conditions or where water can be harvested topographically (DFAT 2016) similar to what is in place at the Project.

Two spillways were installed on the north-west and south-east walls of the pit to enable connectivity with the Suttor River. These spillways have been lowered to ensure frequent inflows from the Suttor River. At the present spillway level (3.8 m), pit inflows have an annual occurrence probability of approximately 68% (Fletcher 2012).

Releases from the pit will occur at times where flooding flow from the Suttor River and Yandan Creek allowing for sufficient mixing at rates in excess of 500 m³/s. Monitoring of the receiving environment over the past 20 years has shown that during releases water quality objectives are achieved. Water quality within the pit has remained stable over time and at depth with no observable signs of acid rock drainage, however, elevated levels of arsenic and low rates of dissolved oxygen have been reported. Dissolved oxygen is improved periodically at times of inflow from Suttor River. The water profile within the pit demonstrates sufficient water mixing throughout the water column with no thermocline or zoning, with water quality reporting consistent at depth and with distance from the spillways (SBE 2022; SBE 2024a).

Further rehabilitation planned for Main Pit includes a geotechnical assessment of the existing void batter angles, to determine residual void angle requirements.

Stock fencing and safety signage will be installed around the perimeter of the pit on closure for the protection of livestock and people.

Additionally, further works to the existing bund around Main Pit may be required. As discussed in Section 3.5.12, additional monitoring data (to provide at least 3–5 years data) is required to improve site water balance modelling for Main Pit to enable a final position on the long-term use of the bund (SBE 2022). For the purposes of PRCP planning, it is presently assumed that the bund will be retained within the final landform, subject to appropriate assessments (as described in the PRCP Schedule, see Section 3.5.5).

East Hill Pit

East Hill Pit is to remain as a small residual void post-closure. To reduce exposure of reactive materials within the pit (see Section 3.5.12), a partial backfill of the pit will be undertaken. Pit slopes have been designed to achieve $\leq 70^\circ$ in competent rock and $\leq 50^\circ$ in the weathered horizon.

An existing safety bund and stock fence are in place for the protection of livestock. Safety signage will be installed around the perimeter of the pit on closure, noting however the remoteness of the site.

3.5.8.4 Main Pit bund

A flood protection bund (3 – 4 m high) surrounds the southern and western portions of the Main Pit, originally constructed as a temporary measure for protection during mining, was relied upon to slow the release of contaminated floodwater to the Suttor River after flooding. The bunds were constructed as earth fill embankments, utilising clay material sourced on-site from a nearby borrow pit, with a clay core and rock facing on the embankment face (AECOM 2015).

The bund that runs along the northern catchment of the pit (a relatively clean catchment) diverts flow around Main Pit to the Suttor River, without interaction with pit waters. This bund therefore ensures pit water levels do not increase dramatically due to inflows from the localised pit catchment. Diverted waters also work to provide increased flow to the Suttor River, to support the mixing potential as pit outflows occur.

The second portion of the bund, that runs along the western extent (between the pit and the Suttor River) is designed to hold a short head of water within the pit and manage pit outflows through the constructed spillways.

The Main Pit flood bund is to be rehabilitated to the PMLU of 'flood protection bund', to be retained at the current geotechnical design; slopes of $\leq 25^\circ$, maximum slope length of 10 m and height of 3-4 m. Trees and shrubs should be retained around the base of the landform to assist in reducing flood velocities acting against the final landform during significant flood events. Rehabilitation will require achievement of sufficient groundcover on the landform for erosional stability.

3.5.8.5 Borrow pits

Rehabilitation of the proposed topsoil and growth medium borrow pits will occur at closure, following the excavation of the required material for use in rehabilitation activities around the site. Given that the borrow pits are required as a source of rehabilitation materials, rehabilitation of the borrow pits will be one of the final rehabilitation activities on-site.

Rehabilitation of the borrow pit will involve a dozer push to the sides to lessen the slope, grading and reprofiling of the residual footprint to create a free draining landform, to be followed by topsoil application to a target depth of 0.15 m and seeding with pasture species.

3.5.8.6 Built Infrastructure

The rehabilitation strategy for the built infrastructure areas is summarised below:

- tracks and roads – the established roads and tracks will remain post-closure as part of the agreement with the landowner;
- airstrip – the existing airstrip will also remain post-closure as part of the agreement with the landowner;
- portable buildings – any portable buildings that exist on-site upon completion of mining operations and rehabilitation activities will be removed, including any mechanical and electrical connections, and transported off-site; and
- concrete pads - concrete pads will be removed and disposed of on-site in the approved landfill facility.

The exposed areas remaining after infrastructure removal will undergo a Phase 1 contaminated land assessment to ensure contaminants, if any, are identified and removed. The area will then be graded and seeded using pasture species, with fertiliser applied as required.

3.5.8.7 Water storage structures

Water storages to be retained in the final landform are the Water Storage Dam and Mine Water Dam. Following closure, both facilities are to be cleaned (desilted) and made safe for use by the landholder, as per the existing landholder agreement. Rehabilitation activities will be completed during the dry season as far as practicable. It is noted that the site water balance is in a net-deficit water balance position (Straits Gold 2008), as such it is likely that dewatering requirements will be minimal.

The Mine Water Dam is an earth fill and rockfill embankment. Following cessation of mining activities, the Mine Water Dam is collecting run-off from the immediate adjacent area. The Mine Water Dam has been constructed to the following design:

- maximum embankment height of 8.7 m;

- crest length of approximately 550 m;
- crest width of 4 m;
- base width of approximately 48 m; and
- slope on the outer embankment of $\leq 19^\circ$.

The Raw Water Dam is an earth fill embankment incorporating a clay core. The Raw Water Dam has been constructed to the following design:

- maximum embankment height of 7.5 m;
- crest length of approximately 560 m;
- crest width of 4 m;
- base width of approximately 42 m; and
- slope on the outer embankment of $\leq 19^\circ$.

Prior to transfer to the landholder, the following rehabilitation activities will be completed for the dams:

- As required, water will be transferred on-site to other available water storage structures;
- Spoil will be removed from the drained dam footprint;
- As required, minor earthworks to make the dam structurally safe and stable; and
- Additionally, a small section of the dam wall of the Water Storage Dam will be directly seeded.

3.5.8.8 Erosion stability assessment

An Erosion Stability Assessment was completed to inform final landform planning and predict the long-term stability of key final landform features at Yandan (AARC 2024b).

Erosion modelling for this assessment used the Revised Universal Soil Loss Equation (RUSLE) approach to predict long-term stability outcomes for the final landform of the HLP. The RUSLE analysis predicts long-term average annual soil loss values based on factors such as rainfall erosivity, slope steepness and length, soil properties, groundcover, and land management factors. Site specific soils data and vegetation data was also incorporated into the RUSLE analysis.

The RUSLE calculation for mean annual soil loss (t/ha/yr) as used for the Project is a product of five variables:

$$A = R \times K \times L \times S \times C \times P$$

Where:

A = Average annual soil loss (t/ha/yr)

R = Rainfall erosivity factor - measure of the ability of rainfall to cause erosion

K = Soil erodibility factor - measure of the susceptibility of the soil to erosion

LS = Slope Length/gradient factor – the combined effect of slope length and slope gradient on soil loss

C = ground cover and management factor – ratio of soil loss from land under specific cover conditions to the corresponding loss from bare soil

P = Supporting practice factor - ratio of soil loss with a specific supporting practice as compared to soil loss in regular conditions.

Results from this assessment have provided general landform design guidance for the final landform of the HLP (and also the TSF embankments, see below), having evaluated the erosional stability of the conceptual final landform.

Heap Leach Pad

From the erosion assessment a final landform design for the HLP was proposed, with this involving grading of the existing landform to a slope grade of 14.04° (25%) , with 5 m benches every 30 m (Figure 46). Benches have been proposed to break an otherwise continuous slope. It is noted that special care would be taken when constructing benches, to ensure these do not concentrate water and potentially cause erosion. The top of the facility would be graded from centre to edge to achieve a water shedding design. A desktop assessment of a further reshape of the HLP to slopes of 20% was undertaken and indicated that a further disturbance of 9.1 ha is required at the base of the HLP. A trade-off between additional disturbance and slope angle is required. Given the proposed PMLU land capability class and the ability to achieve suitable geotechnical and erosional stability at a 14.04° (25%) slope, it is considered no further slope reshape is required. Further, it is noted through anecdotal observations in the area that cattle are able to access grazing pasture on slopes of this grade.

Following re-shaping works, the facility is to be capped using a minimum of 0.5 m of top rock and a minimum of 0.15 m of topsoil, with the final landform to be seeded with pasture species. The erosional stability of the HLP has been assessed considering the proposed design.

It is anticipated that relatively high ground coverage will be required to achieve surface erosion stability of the rehabilitated HLP (AARC 2024b). A rock mulch groundcover (cross-rippled with topsoil) may be applied on the embankment to provide additional cover and stability while reducing surface water runoff and potential erosion. This is consistent with RUSLE literature (Rosewell 1993, Lu *et al.* 2001) where it is stipulated that rock cover should be used in combination with vegetation cover to estimate the total groundcover for the cover and management factor (C-factor) of the RUSLE equation. Total groundcover (rock and/or vegetation) proposed for the final landform is 70% (i.e. a C-factor value of 0.02908) (AARC 2024b).

Overall, RUSLE values for the proposed final landform design of the HLP are within acceptable limits (i.e. being <10t/ha/year) (Table 33). Surface erosion of this structure is predicted to be manageable under these conditions (AARC 2024b).

Table 33: RUSLE values for the HLP

Location	Cross Section	R-factor	K-factor	LS-factor	C-factor	P-factor	RUSLE value t/ha/year
HLP	-	2197.17	0.028	4.43	0.035	1.00	9.60
					0.02908		6.67

Tailings Storage Facility

A slope analysis was conducted over the current (unrehabilitated) embankment of the TSF, principally on the Main Wall (downstream face of the TSF) (AARC 2024). Several cross sections were analysed on the Main Wall showing a slope length of 35 meters and a slope gradient of 18.3° (33%) (Figure 45). A desktop assessment of a further reshape of the HLP to slopes of 14.04° (25%) was undertaken and indicated that a further disturbance of 1.5 ha is required at the base of the TSF. A trade-off between additional disturbance and slope angle is required. It is not recommended to reshape the TSF walls as this may cause structural issues. Given the proposed PMLU land capability class and the ability to achieve suitable geotechnical and erosional stability at a 16.7° (30%) slope it is considered no further slope reshape is required. Further, it is noted through anecdotal observations in the area that cattle are able to access grazing pasture on slopes of this grade.

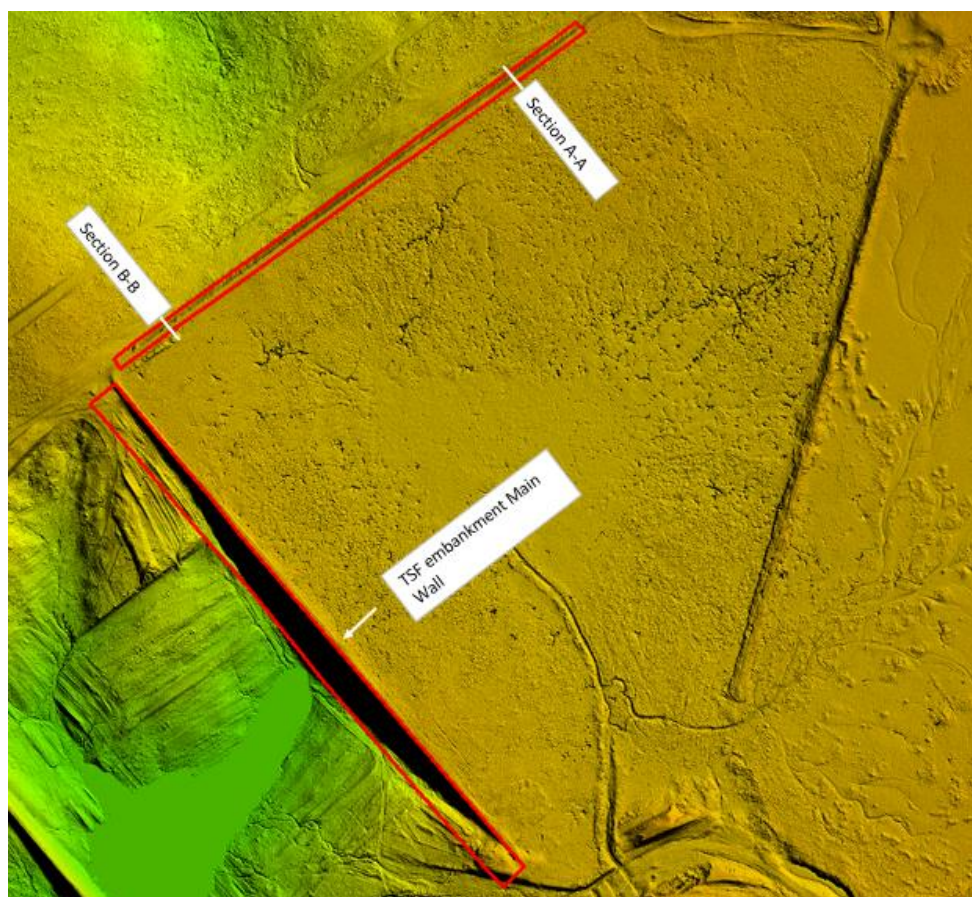


Figure 45: Erosion stability assessment area: TSF embankment (AARC 2024)

As per the rehabilitation approach for the HLP, it is anticipated that relatively high ground coverage will be required to achieve surface erosion stability of the rehabilitated TSF embankments (AARC 2024b). Similarly, a rock mulch groundcover (cross-rippled with topsoil) may be applied on the TSF embankment to provide additional cover and stability while reducing surface water runoff and potential erosion. Total groundcover (rock and/or vegetation) proposed for the final landform is 65% (i.e. a C-factor value of 0.035) (AARC 2024b).

Overall, RUSLE values for the proposed final landform design, at 70% groundcover cover of the TSF embankments are within acceptable limits (i.e. being <10t/ha/year) (Table 34). Surface erosion of this structure is predicted to be manageable under these conditions (AARC 2024b).

Table 34: RUSLE results for the TSF embankment

Location	Cross Section	R-factor	K-factor	LS-factor	C-factor	P-factor	RUSLE value t/ha/year
TSF embankment	A-A	2197.17	0.028	1.09	0.035	1.00	2.36
					0.02908		1.64
	B-B	2197.17	0.028	0.8	0.035	1.00	1.73
					0.02908		1.20
	Main Wall	2197.17	0.028	3.86	0.035	1.00	8.37

Location	Cross Section	R-factor	K-factor	LS-factor	C-factor	P-factor	RUSLE value t/ha/year
					0.02908		5.81

The cover system design for Cell B of the Yandan Tailings Dam is discussed in Section 3.5.13.1

Main Pit flood bund

A slope analysis was conducted over the current (unrehabilitated) embankment of the Main Pit flood bund (AARC 2024b). The characteristics of the cross-section included a bund height of 3.5 m, maximum slope length of 10 m and angle of 25°. Overall, RUSLE values for the proposed final landform design, with 70% cover of the TSF embankments are within acceptable limits (i.e. being <10t/ha/year) (Table 35). Surface erosion of this structure is predicted to be manageable under these conditions (AARC 2024b).

Table 35: RUSLE values for the Main Pit flood bund

Location	Cross Section	R-factor	K-factor	LS-factor	C-factor	P-factor	RUSLE value t/ha/year
Main Pit flood bund	1	2197.17	0.04854	4.43	0.03534	1.00	8.36
					0.02908		6.88

3.5.8.9 Geotechnical stability assessment

Heap Leach Pad

Geotechnical analysis of representative sections of the HLP (Figure 46 - Figure 50) was undertaken by Blackrock (2024) of both the current landform and following regrading of slopes to 14.04° (25%) using the industry standard 2D Limit Equilibrium methods in Slide2 (V9.023). Modelling was undertaken using static conditions and tested using circular and non-circular failure methods. The following assumptions were incorporated into the model:

- Landform was constructed on altered clay oxide material with St Ann Formation underlying the bedrock;
- Non-circular failure surface incorporated into the model
- Stacked material assumed to be originally granular with moderate clay alteration;
- Estimated mohr coulomb strength values were estimated based on experience with similar materials.

The assessment indicated that following reshaping to 14.04° (25%) a FoS >1.5 can be achieved. The results from the analysis are provided in Table 36.

Table 36: FoS for HLP slopes

Section	Scenario	Failure surface	FoS
Angle of repose			
Section 1	North slope	Circular - AutoRef	1.26
	South slope	Circular - AutoRef	1.14
		Non-circular - Block	1.28
Section 2	North-east slope	Circular - AutoRef	1.40
		Non-circular - Block	2.49
Regrade to 14.04° (25%)			
Section 1	North slope	Circular - AutoRef	2.27
	South slope	Circular - AutoRef	2.11
		Non-circular - Block	2.13
Section 2	North-east slope	Circular - AutoRef	2.09
		Non-circular - Block	2.18

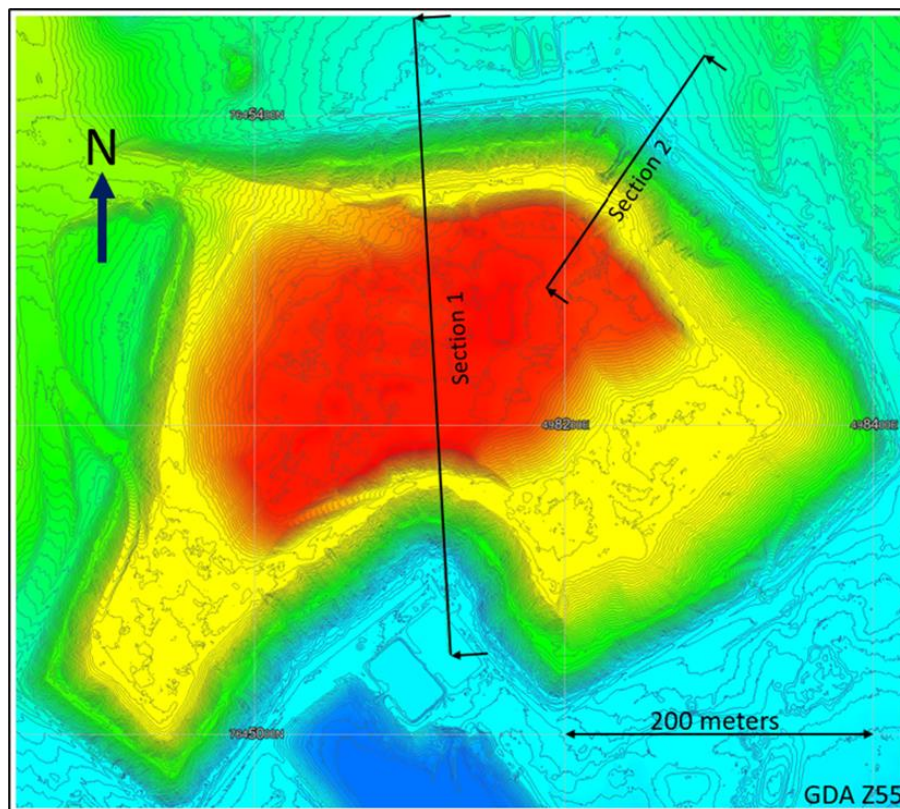


Figure 46: HLP cross section layout (Blackrock Mining Solutions 2024)

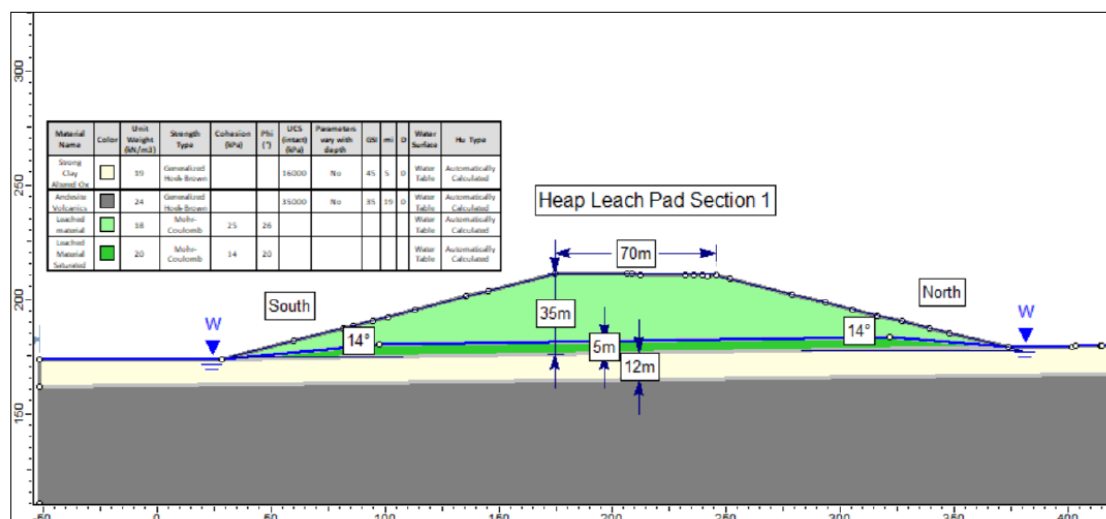


Figure 47: HLP reprofiled (Blackrock Mining Solutions 2024)

Tailings Storage Facility

Geotechnical analysis of representative sections of the TSF (Figure 48 to Figure 50) was undertaken by Blackrock (2024) using the industry standard 2D Limit Equilibrium methods in Slide2 (V9.023). Modelling was undertaken using static conditions and tested using circular and non-circular failure methods. Embankment slope stability analysis was carried out for global slope failure (crest to toe) and groundwater raised near the surface scenarios. The following assumptions were incorporated into the model:

- for dams and embankments 3 m or higher, cross-sectional profiles were assumed to include a clay core;
- embankments below 3 m were compacted homogeneous engineered fill;
- all embankments were assumed keyed into the quaternary cover;
- material contained within the tailing's facility was assumed to be fine grained sandy silt with (cat 1 spoil mass strength parameters); and
- estimated mohr coulomb strength values were estimated based on experience with similar materials.

The assessment indicated that following reshaping to 16.7° (30%) a FoS >1.5 can be achieved. The results from the analysis are provided in Table 36.

Table 37: FoS for slopes at the TSF

Section	Scenario	Failure surface	FoS
Section 1	Downstream face – Cell A	Circular - AutoRef	4.48
		Non-circular - Block	3.25
Section 2	Downstream face – Cell A	Circular - AutoRef	4.15
		Non-circular - Block	3.14
Section 3	Downstream face – Cell B	Circular - AutoRef	4.00
		Non-circular - Block	2.04

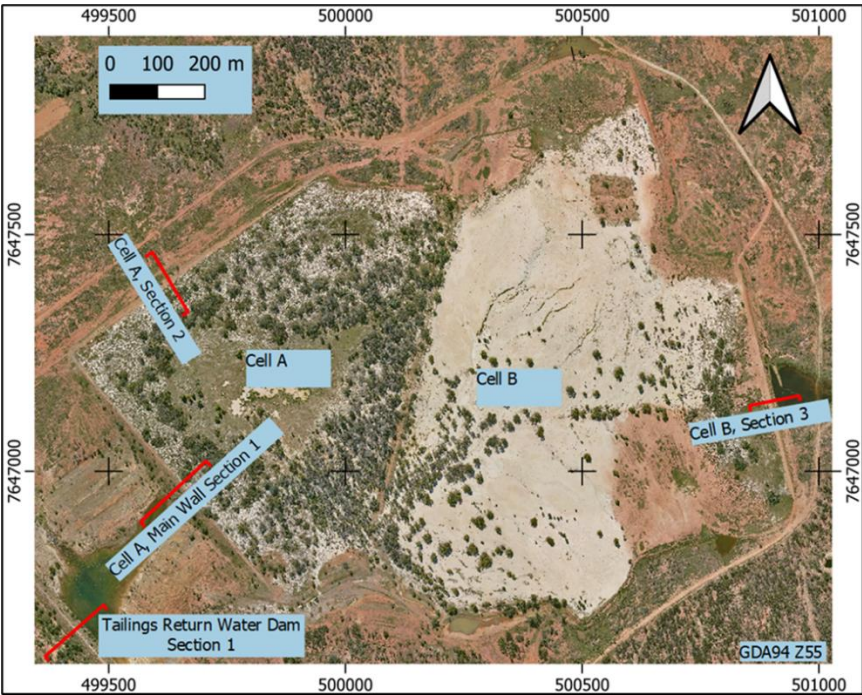


Figure 48: Tailings Storage Facility cross section layout (Blackrock Mining Solutions 2024)

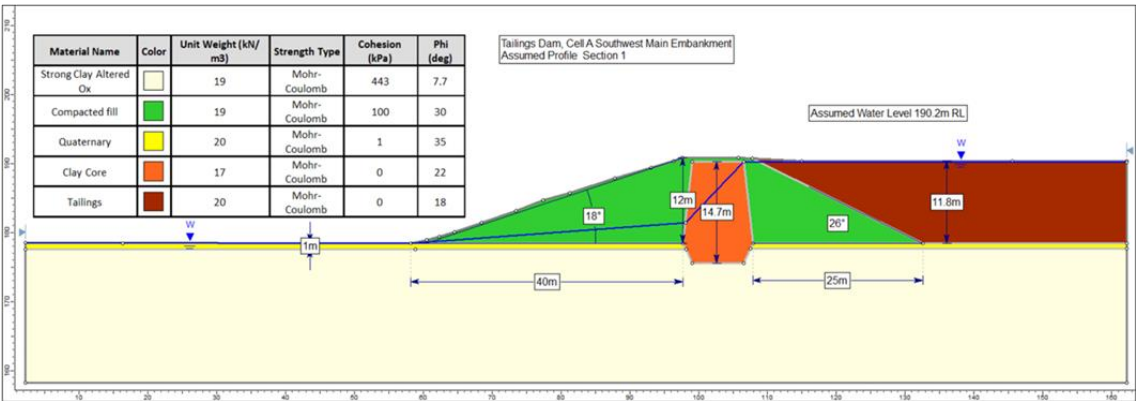


Figure 49: Tailings Storage Facility cross section 1 (Blackrock Mining Solutions 2024)

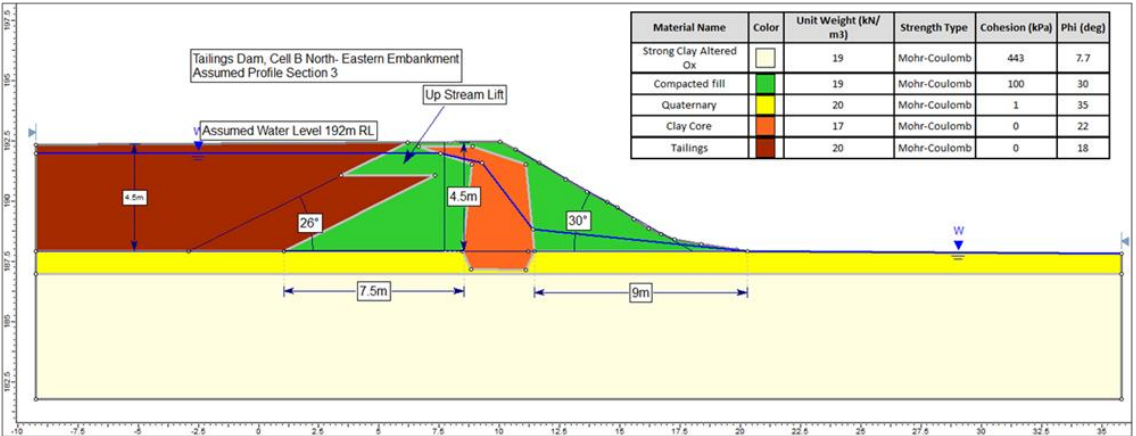


Figure 50: Tailings Storage Facility cross section 2 (Blackrock Mining Solutions 2024)

Main Pit and spillways

Geotechnical stability in rock slopes is generally controlled by geological structure, as rock material is generally too strong to permit shear failure. Permit shear failure is considered unlikely for the current Project design for the following reasons:

- Given the thin covering of Quaternary and potential friability of the weathered material across the site, which can extend up to approximately 30 m (combined thickness), these units are unlikely to cause geotechnical instability over the long-term; and
- Rock mass strength failures are unlikely to occur at slope heights below 300 m under normal conditions (Simmons 1995). Given maximum slope heights are typically > 60 m for both pits, the residual void slopes are likely to be inherently stable from mass failures in the absence of adverse geological structures (i.e., faults or shears) that could interact with the pit slopes.

However, rock mass strength is typically scale-dependent, and if the block size produced by the discontinuities is small enough compared to the slope height, steep slip pathways could be generated in the batter faces through the intersection of fractures or discontinuities in the rock mass – referred to as kinematic availability.

Geotechnical analysis of representative sections of the Main Pit and Main Pit Spillway (Figure 51 to Figure 57) was undertaken by Blackrock (2024) using the industry standard 2D Limit Equilibrium methods in Slide2 (V9.023). Modelling was undertaken using static conditions and tested using circular and non-circular failure methods. Pit slope stability analysis was carried out for complete pit inundations, circular failure in the weathered horizon and global slope failure (crest to toe) using non-circular methods. The following assumptions were incorporated into the model:

- assumptions on structural orientation of alteration halos and mineral zones using site data and a constructed generalised layout map;
- pit void shape was interpreted to presumably follow encountered geological and geotechnical constraints observed in the regional scale mapping;
- for pit void geological lithotypes, material properties were estimated using two methods:
 - assigning typical values for similar geological structures from other projects such as weak planes (faults and shears); and
 - using photographs of documented lithotypes provided in historical reports to estimate the Geological Strength Index and subsequent Generalised Hoek Brown parameters. This included estimating:
 - unconfined compressive strength of intact rock based on provided lithological description;
 - Geological Strength Index from photographs included in the historical reports;
 - Intact rock material constant ‘mi’ based on known material types; and
 - Blast disturbance factor for the rock mass on the slope faces.
- estimated mohr coulomb strength values for weathered horizons were estimated based on experience with similar materials.

The assessment indicated that pit slopes in competent rock <70° and <50° in the weathered horizon can achieve a FoS >1.5. With the exception of failure of the in-pit sulphide backfilled (Figure 56, which does not form part of the pit shell, would report to the void and does not report any significant long-term stability risk. The results from the analysis are provided in Table 36. Table 38.

Safety bunding or fencing should be located at an appropriate distance from the pit crest to avoid damage from erosion or time dependent degradation. Safety bunding should be a minimum of 2 m high and constructed from non-dispersive material or alternatively be constructed with hard barriers ensuring run-off is not constricted.

Table 38: Fos for Main Pit slopes and Main Pit Spillway

Section	Scenario	Failure surface	FoS
Main Pit			
Section 1	North slope	Non-circular - Autoref	2.64
	South slope	Non-circular - Autoref	2.86
Section 2	North slope	Non-circular - Autoref	3.34
		Non-circular - Cuckoo	3.35
	South slope	Non-circular - Autoref	1.26
		Non-circular - Cuckoo	1.26
Section 3	West	Non-circular - Autoref	2.32
		Non-circular - Cuckoo	2.34
Main Pit Spillway			
Section 1	North slope	Non-circular - Autoref	8.01
	South slope	Non-circular - Autoref	9.23

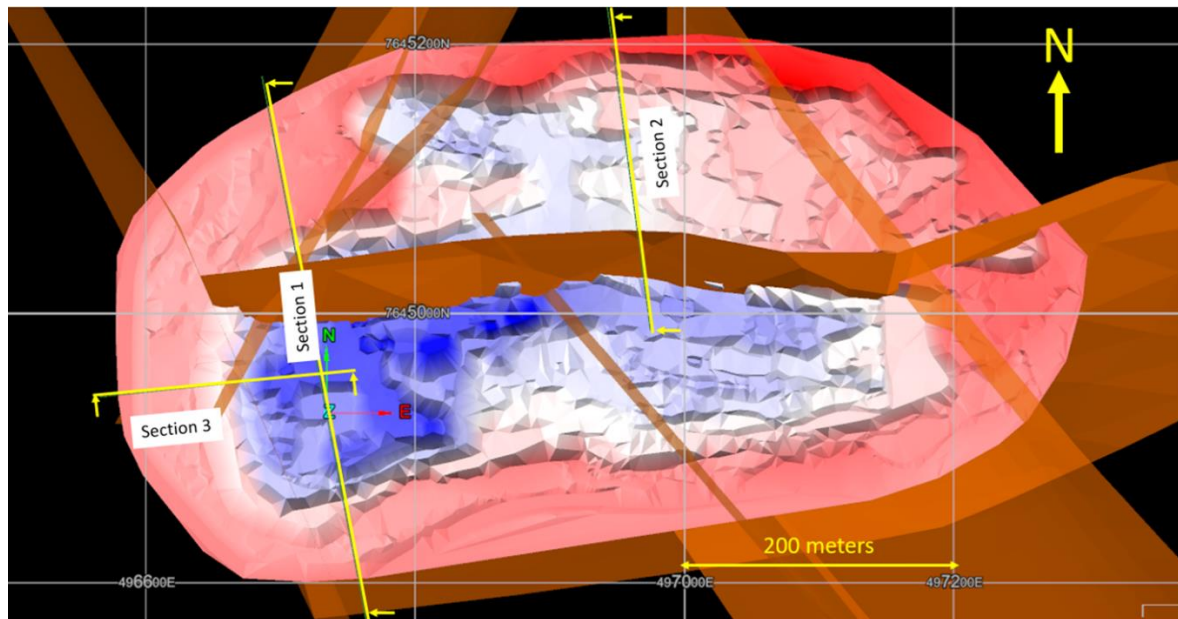


Figure 51: Main Pit cross section (Blackrock Mining Solutions 2024)

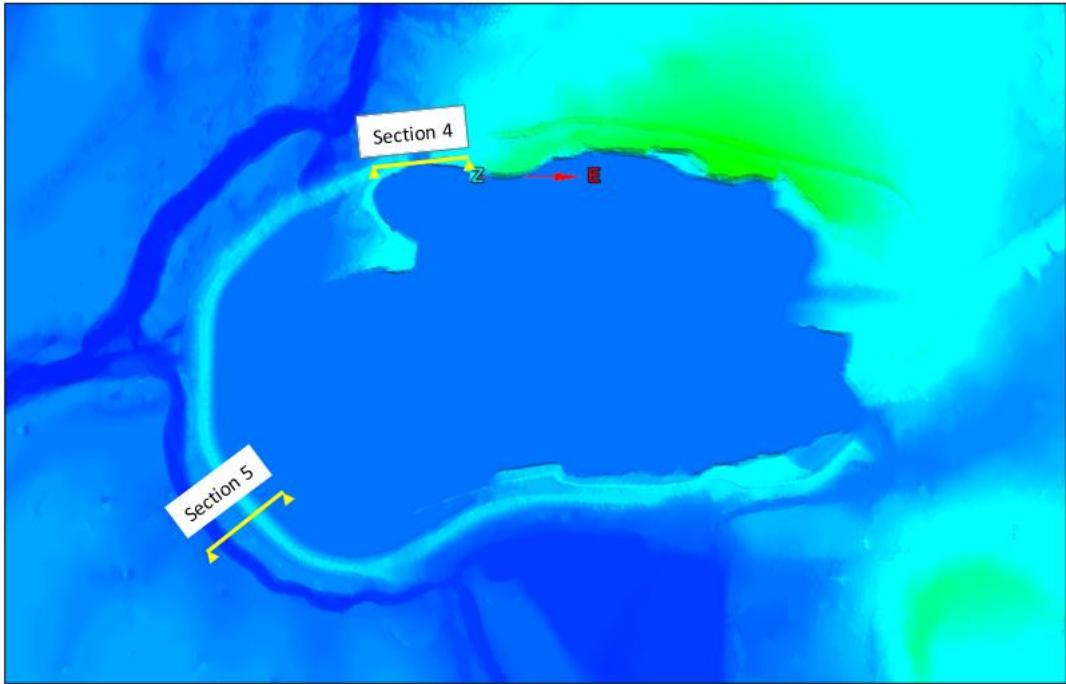


Figure 52: Main Pit cross section bund and spillway (Blackrock Mining Solutions 2024)

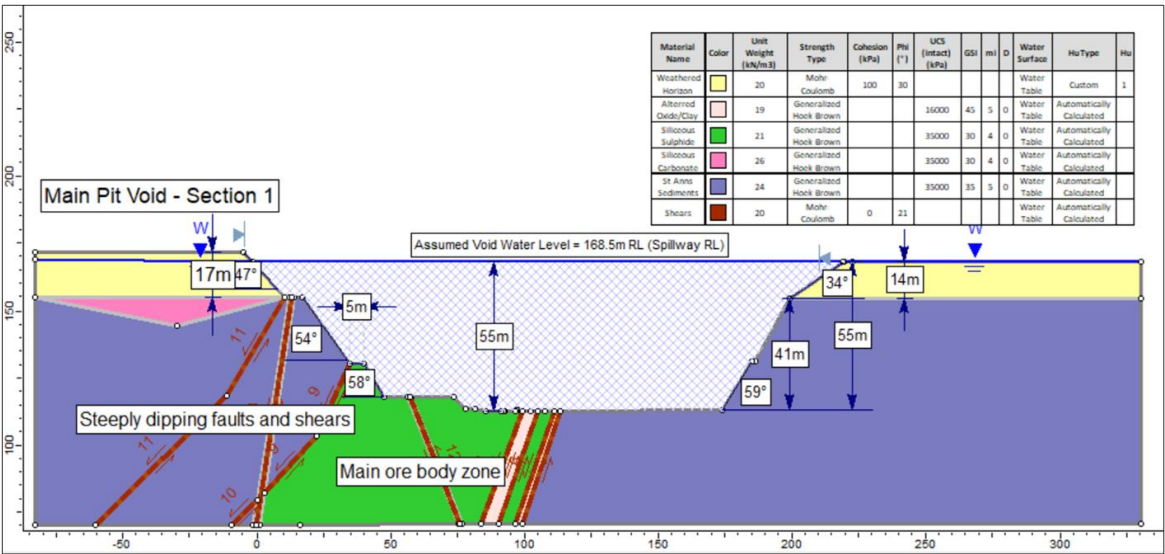


Figure 53: Main Pit cross section 1 (Blackrock Mining Solutions 2024)

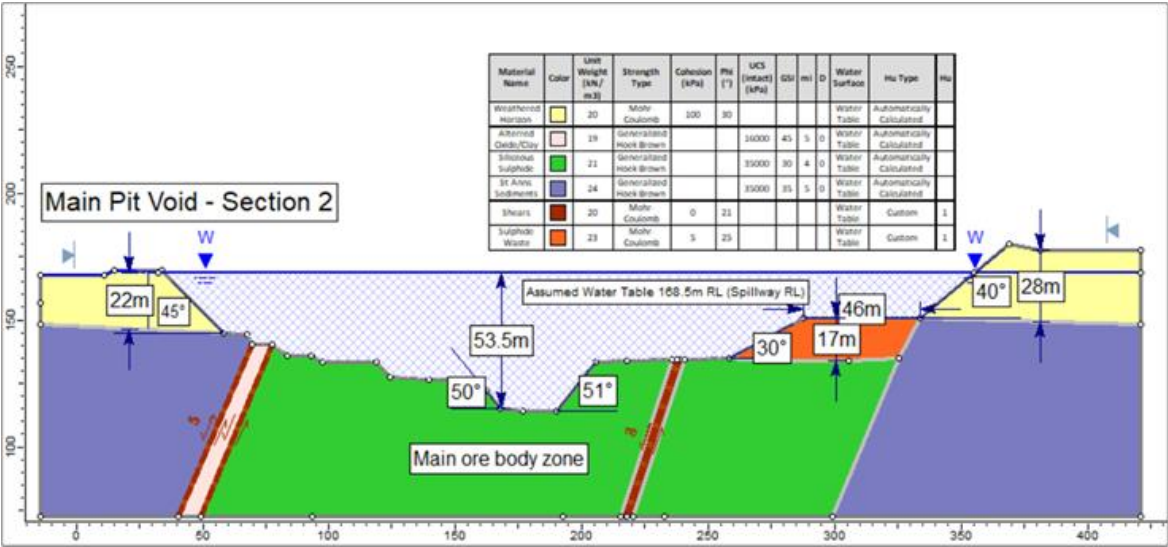


Figure 54: Main Pit cross section 2 (Blackrock Mining Solutions 2024)

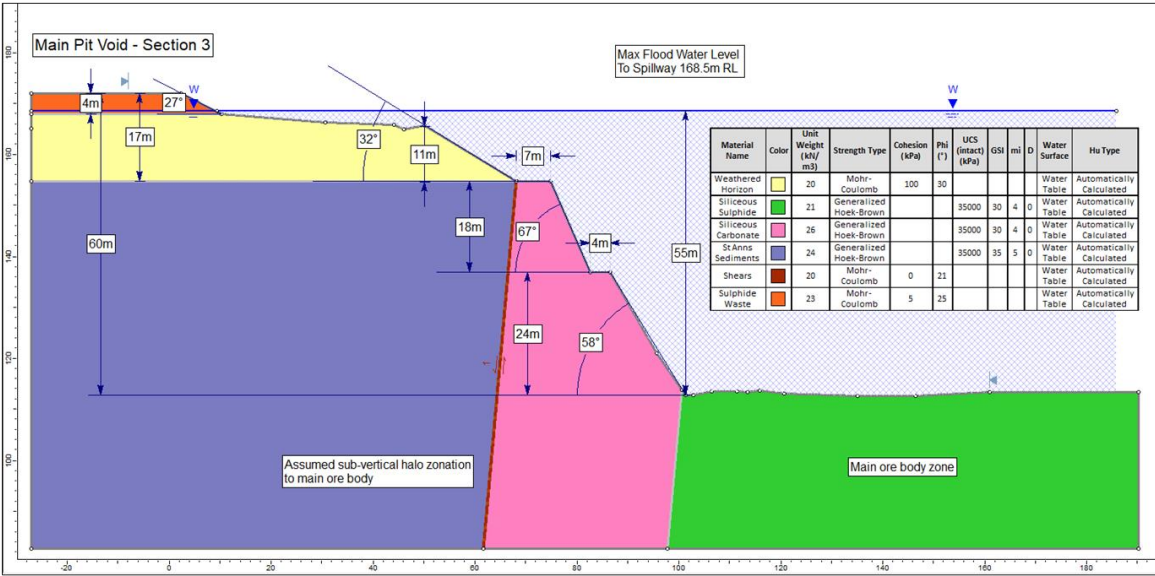


Figure 55: Main Pit cross section 3 (Blackrock Mining Solutions 2024)

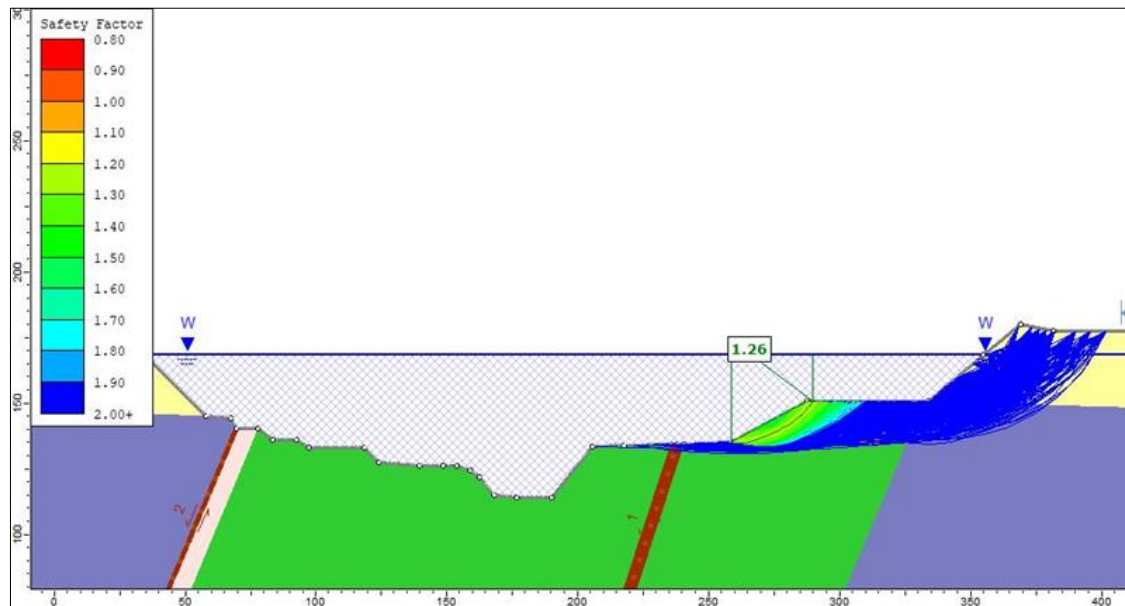


Figure 56: Main Pit cross section (Blackrock Mining Solutions 2024)

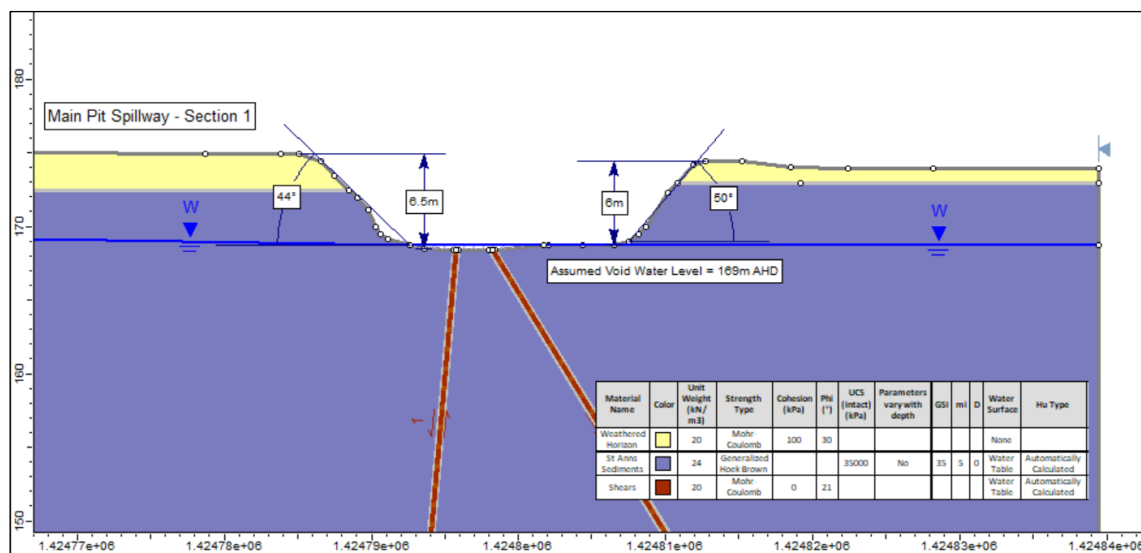


Figure 57: Main Pit spillway cross section 4 (Blackrock Mining Solutions 2024)

East Hill Pit

Geotechnical stability in rock slopes is generally controlled by geological structure, as rock material is generally too strong to permit shear failure. Permit shear failure is considered unlikely for the current Project design for the following reasons:

- Given the thin covering of Quaternary and potential friability of the weathered material across the site, which can extend up to approximately 30 m (combined thickness), these units are unlikely to cause geotechnical instability over the long-term; and
- Rock mass strength failures are unlikely to occur at slope heights below 300 m under normal conditions (Simmons 1995). Given maximum slope heights are typically > 60 m for both pits, the residual void slopes are likely to be inherently stable from mass failures in the absence of adverse geological structures (i.e., faults or shears) that could interact with the pit slopes.

However, rock mass strength is typically scale-dependent, and if the block size produced by the discontinuities is small enough compared to the slope height, steep slip pathways could be generated in the batter faces through the intersection of fractures or discontinuities in the rock mass – referred to as kinematic availability.

Geotechnical analysis of representative sections of the Main Pit and Main Pit Spillway (Figure 58 to Figure 60) was undertaken by Blackrock (2024) using the industry standard 2D Limit Equilibrium methods in Slide2 (V9.023). Modelling was undertaken using static conditions and tested using circular and non-circular failure methods. Pit slope stability analysis was carried out circular failure in the weathered horizon and global slope failure (crest to toe). The following assumptions were incorporated into the model:

- lithologies were estimated from a large scale cross-section showing generalised East Hill Pit geology;
- in-situ intact rock strength parameters were estimated using Generalised Hoek Brown parameters estimated from review of historic wall rock photographs; in conjunction with lithological description;
- In-pit water level of 169 m AHD was assumed providing approximately 1 m of floor cover that appeared consistent with historic photographs, pit void shape was interpreted to presumably follow encountered geological and geotechnical constraints observed in the regional scale mapping;
- for pit void geological lithotypes, material properties were estimated using two methods:
 - assigning typical values for similar geological structures from other projects such as weak planes (faults and shears); and
 - using photographs of documented lithotypes provided in historical reports to estimate the Geological Strength Index and subsequent Generalised Hoek Brown parameters. This included estimating:
 - unconfined compressive strength of intact rock based on provided lithological description;
 - Geological Strength Index from photographs included in the historical reports;
 - Intact rock material constant ‘mi’ based on known material types; and
 - Blast disturbance factor for the rock mass on the slope faces.
- estimated mohr coulomb strength values for weathered horizons were estimated based on experience with similar materials.

The assessment indicated that pit slopes in competent rock $<70^\circ$ and $<50^\circ$ in the weathered horizon can achieve a FoS >1.5 . The results from the analysis are provided in Table 39Table 36..

Safety bunding should be located at an appropriate distance from the pit crest to avoid damage from erosion or time dependent degradation. Safety bunding should be a minimum of 2 m high and constructed from non-dispersive material or alternatively be constructed with hard barriers ensuring run-off is not constricted.

Table 39: Fos for East Hill Pit slopes

Section	Scenario	Failure surface	FoS
Section 2	Northeast slope	Non-circular - Autoref	3.35
		Non-circular - Cuckoo	3.49
	Southwest slope	Non-circular - Autoref	11.43
		Non-circular - Cuckoo	11.86
Section 2	Northeast slope	Non-circular - Autoref	2.80
		Non-circular - Cuckoo	3.05

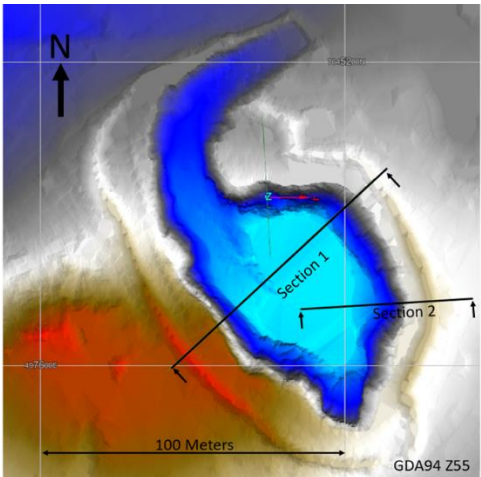


Figure 58: East Hill Pit cross section layout (Blackrock Mining Solutions 2024)

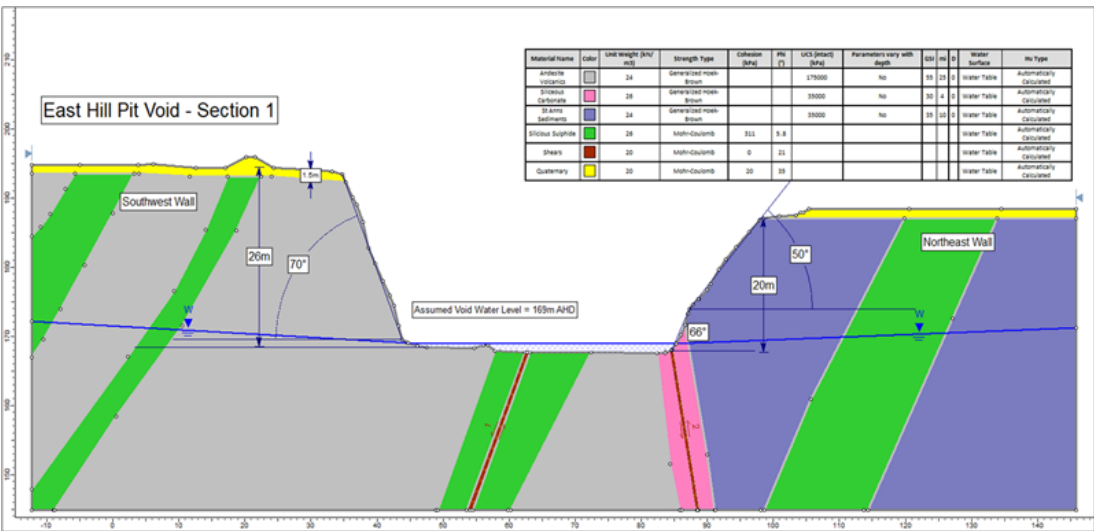


Figure 59: East Hill Pit cross section 1 (Blackrock Mining Solutions 2024)

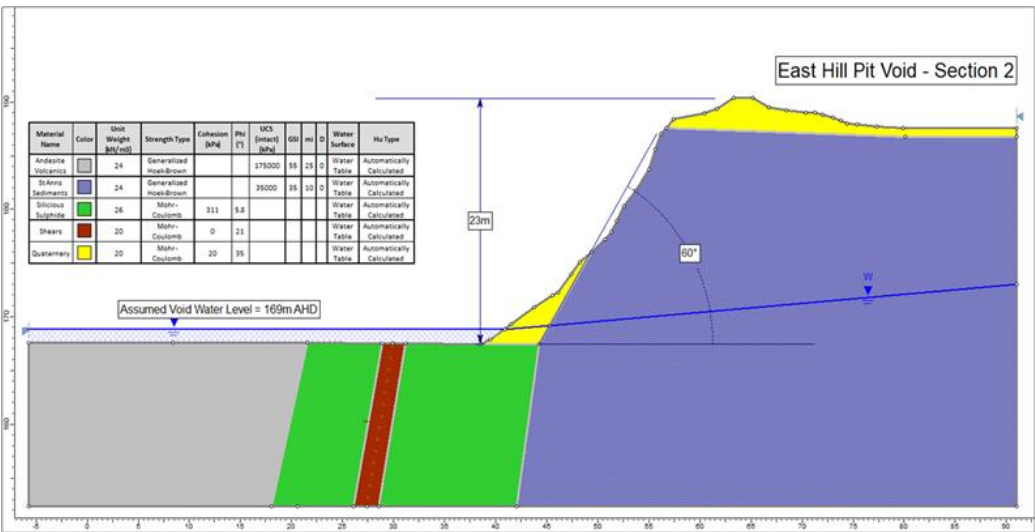


Figure 60: East Hill Pit cross section 2 (Blackrock Mining Solutions 2024)

Main Pit flood bund

Geotechnical analysis of a representative section of the Main Pit flood bund (refer section 5 on Figure 52 and Figure 61) was undertaken by Blackrock (2024) using the industry standard 2D Limit Equilibrium methods in Slide2 (V9.023). Modelling was undertaken using static conditions and tested using non-circular failure methods.

The assessment indicated that at the current angle of repose at a maximum 25° a FoS >1.5 can be achieved. The results from the analysis are provided in Table 40.

Table 40: Fos for Main Pit flood bund

Section	Scenario	Failure surface	FoS
Section 1	East slope	Non-Circular - AutoRef	13.72
	West slope	Non-Circular - AutoRef	10.26

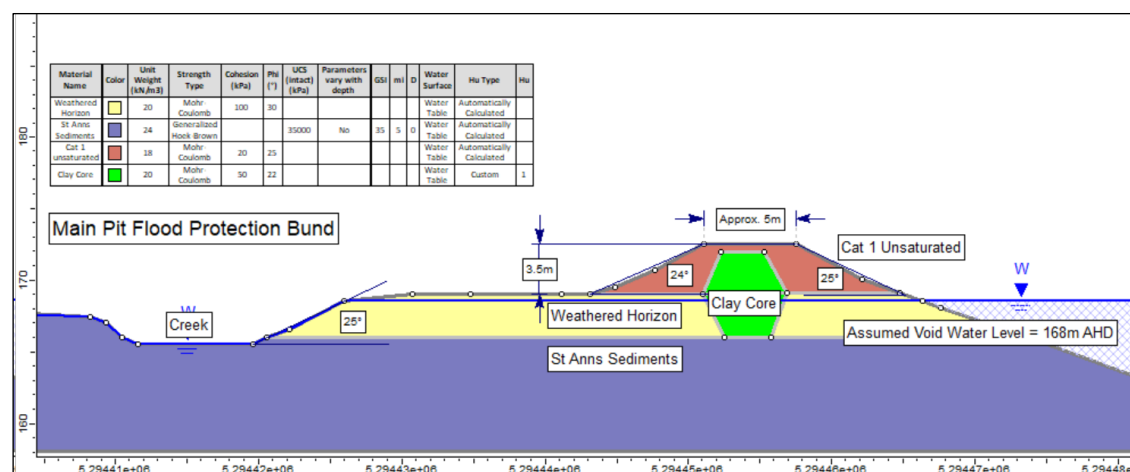


Figure 61: Main Pit flood bund cross section (Blackrock Mining Solutions 2024)

Water storage structures

Geotechnical analysis of representative sections of the water storages (Figure 62 to Figure 65) was undertaken by Blackrock (2024) using the industry standard 2D Limit Equilibrium methods in Slide2 (V9.023). Modelling was undertaken using static conditions and tested using circular and non-circular failure methods. Embankment slope stability analysis was carried out for the representative worse-case scenarios, which includes:

- structure filled to capacity (spillway height);
- structure partially filled with sediment where apparent in the DEM; and
- global slope failure (crest to toe) using circular and non-circular methods.

The following assumptions were incorporated into the model:

- for dams and embankments 3 m or higher, cross-sectional profiles were assumed to include a clay core;
- embankments below 3 m were compacted homogeneous engineered fill;
- all embankments were assumed keyed into the quaternary cover;

- material contained within the tailing's facility was assumed to be fine grained sandy silt with (cat 1 spoil mass strength parameters); and
- estimated mohr coulomb strength values were estimated based on experience with similar materials.

The assessment indicated that a FoS >1.5 can be achieved on slopes greater than 9.7° (17%) for retained water infrastructure. The results from the analysis are provided in Table 41.

Table 41: FoS for slopes of representative water management structures

Section	Scenario	Failure surface	FoS
Section 2	Northeast slope	Non-circular - Autoref	3.35
		Non-circular - Cuckoo	3.49
	Southwest slope	Non-circular - Autoref	11.43
		Non-circular - Cuckoo	11.86
Section 2	Northeast slope	Non-circular - Autoref	2.80
		Non-circular - Cuckoo	3.05

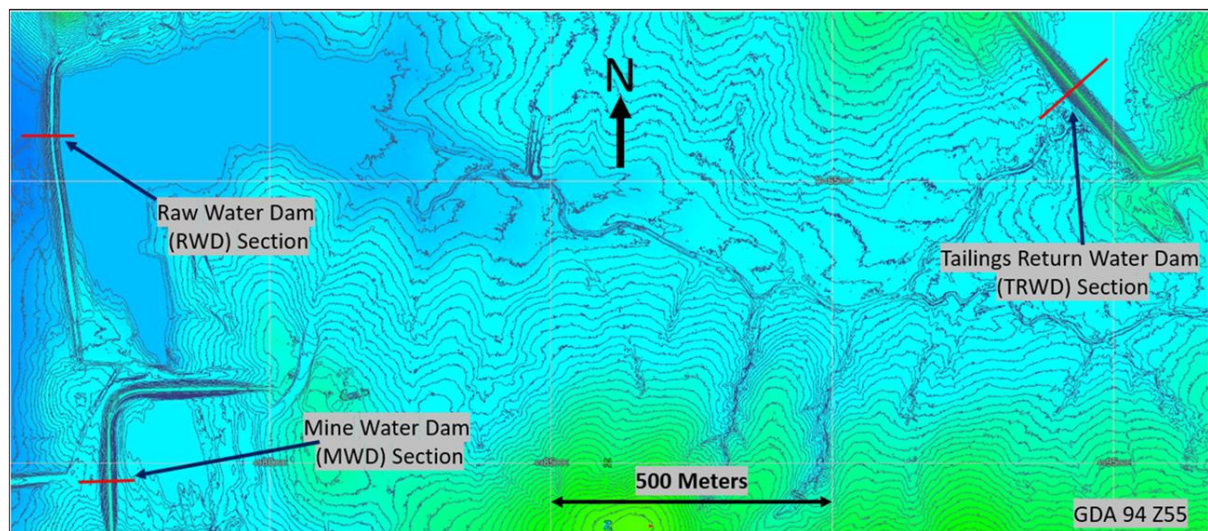


Figure 62: Water storage facility cross section layout (Blackrock Mining Solutions 2024)

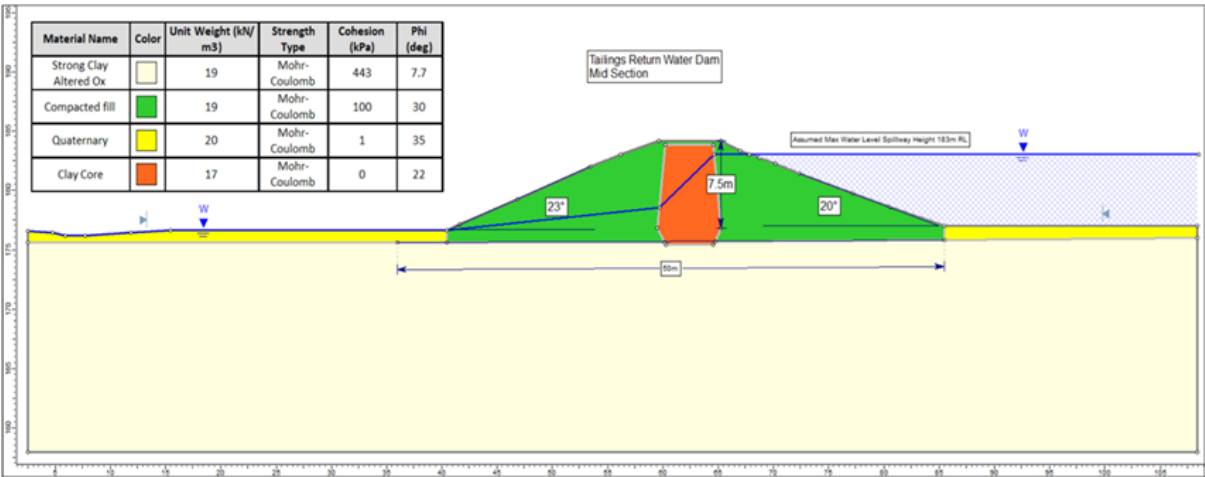


Figure 63: Tailings Water Return Dam cross section 1 (Blackrock Mining Solutions 2024)

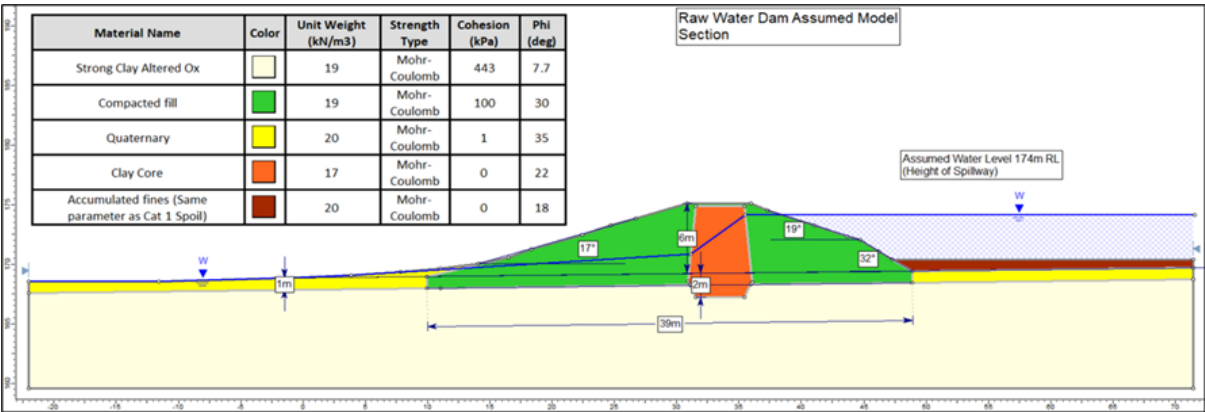


Figure 64: Raw Water Dam cross section 1 (Blackrock Mining Solutions 2024)

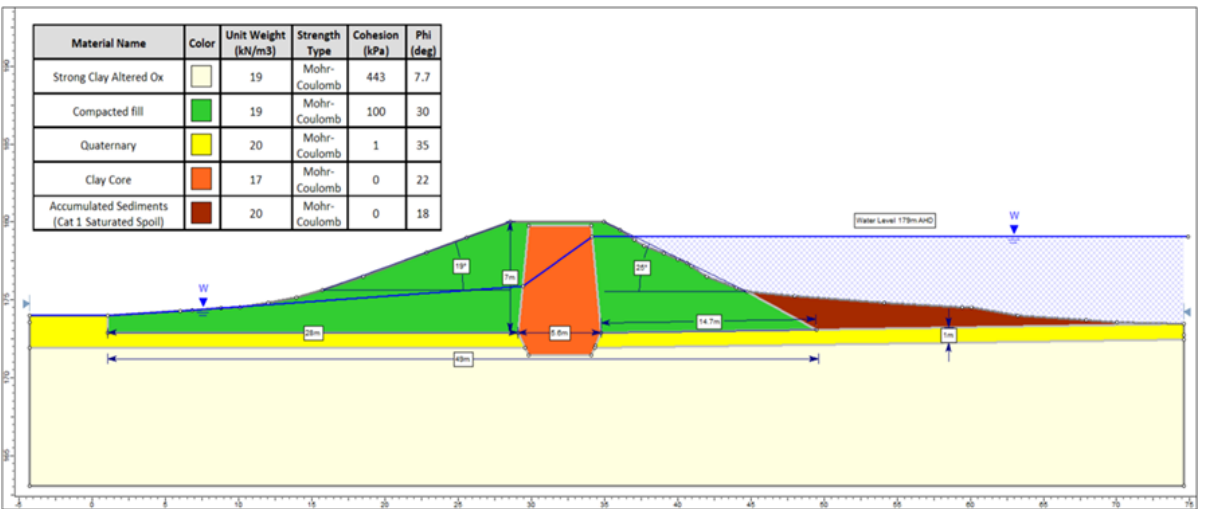


Figure 65: Mine Water Dam cross section 1 (Blackrock Mining Solutions 2024)

3.5.8.10 Quality assurance / quality control

Rehabilitation activities will be carried out in accordance with the applicable methods described in this document and records will be maintained to demonstrate achievement of rehabilitation milestones. The

monitoring and maintenance program (Section 3.7) has been developed to ensure that rehabilitation progresses towards achievement of milestone criteria and ultimately relinquishment. Rehabilitation monitoring will allow for timely identification of the need for corrective action or maintenance work, and changes to the rehabilitation strategy based on past rehabilitation successes and failures; and as new information becomes available.

The site has been subject to various assessments with a view to increasing knowledge of the site to inform the final landform design and rehabilitation activities.

3.5.8.11 Methodology to verify predicted success of the final landform

The rehabilitation methodologies described in this PRCP are currently employed at the Project, demonstrating the effectiveness of the methodology and landform design. Regardless, rehabilitation strategies will be continually refined as the outcomes of earlier rehabilitation events are monitored and evaluated.

Erosion modelling, geotechnical analysis and hydrological assessments indicate that the proposed landform design will achieve long term stability (technical studies are provided in Appendix G).

3.5.9 Hydrology

The TSF is situated to the north-east of the ML, at elevations of approximately 190-194 mAHD in the hills as a shallow, blanket-type landform across the hills just inside the head of the Sandy Creek tributary. The Tailings Water Return Dam is situated adjacent the TSF, downgradient. The Raw Water Dam is located further downgradient of the TSF at elevations of approximately 174 – 169 mAHD. The catchment of the TSF is the landform itself.

To the south of the ML is the Heap Leach Pad situated at elevations at the surface of approximately 174 – 195 mAHD. The Heap Leach Pad is the highest elevation landform of the site (and natural topography), with maximum elevations of approximately 212 mAHD, noting this is at the angle of repose. The HLP was constructed on a natural low-lying hill, and directly west is the East Hill Pit. East Hill Pit is located east of the HLP, on the eastern side of an adjoining low-lying hill at surface elevations of approximately 180 – 194 mAHD. The East Hill Pit has a small catchment to the north and a direct footprint.

Main Pit and Main Pit bund are situated adjacent to the Suttor River and downstream of Yandan Creek at elevations of 169 mAHD. Main Pit has a limited catchment, with direct rainfall on the Pit constituted the catchment. In non-flood conditions, Yandan Creek deviates around the west of the Main Pit via a levee bank. In flooding conditions, Yandan Creek flows into the eastern spillway and out to the Suttor via the western spillway or, at times, becomes part of a connected system.

The backfilled South Pit is located south of Main Pit at elevations at the surface of approximately 173 – 180 mAHD. South Pit reports to Yandan Creek during rainfall and flood events.

3.5.10 Hydrogeology

Hydrogeological units within the Project area are described in Section 3.1.6. Four water bearing formations are considered to be aquifers, namely:

- 1) east of the mining area – low to very low permeability siltstones, sandstones and metamorphics, with limited groundwater occurrence;
- 2) through the central mining area, a limited extent fracture hosted aquifer associated with the Yandan Fault;
- 3) west of the Yandan Fault in the mineralised zone; a porous unit associated with mineralisation and is likely the boiling zone of the epithermal system; and
- 4) an alluvial aquifer as part of the Suttor River alluvium; reaching up to 30m depth.

Pumping tests as part of impact studies for the Project around Main Pit encountered groundwater flow boundaries and identified two possible groundwater sources: either the Yandan Fault, or a porous 'boiling zone' alteration horizon formed as part of hydrothermal activity (Forbes 1988, SBE 2022).

Hydraulic assessments suggest groundwater transmissivities in the order of 60–200 m²/day, with no connectivity identified between these groundwaters and the alluvial aquifers associated with the Suttor River (SBE 2022). Like many ephemeral drainage systems, the Suttor River is likely to be a losing river system, where water recharges into alluvial aquifers rather than being permanently groundwater fed (SBE 2022).

Inside the fault boundaries the lithologies of Main Pit and East Hill Pit are comprised of altered andesite and sinter, with shears and silicified veining hosting the mineralisation (SBE 2022). Oxidised zones in the geology will likely be more porous/conductive than fresh, crystalline rock, and there is likely a change in hydraulic conductivity between the types of materials that is expected to be depth and fault dependent (SBE 2022). The conductivity of crystalline rock is low given the lack of porosity, which suggests much of the transmissivity observed in early pumping tests is primarily through the boiling zone unit, or alternatively, that the fault can potentially deliver reasonable groundwater flow volumes (SBE 2022).

It is considered unlikely that groundwater flow within the Project is via other pathways, given the low conductivity of crystalline rocks (SBE 2022). Guidance published on the typical conductivity of crystalline rock units indicates very low hydraulic conductivity, as per Figure 66 below. As such, it is considered that groundwater flow within the Project is mainly via faults and the boiling zone unit (SBE 2022), with groundwater flow generally described as flowing from east to west with topography (Forbes 1988) (Figure 29).

Crystalline Rocks	
Material	Hydraulic Conductivity (m/sec)
Permeable basalt	4×10^{-7} to 2×10^{-2}
Fractured igneous and metamorphic rock	8×10^{-9} to 3×10^{-4}
Weathered granite	3.3×10^{-6} to 5.2×10^{-5}
Weathered gabbro	5.5×10^{-7} to 3.8×10^{-6}
Basalt	2×10^{-11} to 4.2×10^{-7}
Unfractured igneous and metamorphic rock	3×10^{-14} to 2×10^{-10}

Figure 66: Typical conductivity values of crystalline rocks (Domenico & Schwartz 1990)

The Ukalunda Formation or metasediment of the Anakie Inlier underlays the HLP and the Tailings Storage Facilities. The geology under the HLP is metamorphic mid-greenschist facies, phyllite and sandstones which have a hydraulic conductivity of approximately 1.4×10^{-8} to 1×10^{-11} . However, the upper limit is considered more likely due to the metamorphosed rock in this location and the structure of the formation (faults, folds) reducing conductivity. As such, water that percolates through the HLP or TSF to the underlying groundwater is constrained.

Site observations of groundwater occurrence and characteristics support the hydrogeological model, where:

- during drilling and mine operations groundwater is highly localised with low conductivity and is infrequently occurring;
- during the construction of groundwater bores, the bores are often dry or 'damp'; and
- water levels within groundwater bores slowly recover following purging during groundwater monitoring, with monitoring procedures requiring two days of recharge before sampling.

Results from characterisation of groundwater monitoring undertaken to date demonstrates a stable system with no detectable occurrence of acid mine drainage.

Groundwater recharge and discharge

Due to low groundwater transmissivity within the Project area, recharge to the groundwater system is limited, accounting for the poor quality of the groundwater (Forbes 1988).

It is considered that Main Pit is likely connected with groundwater, with groundwater inflows to the pit rather than outflows (SBE 2022) which is supported by site observations of water levels and dewatering that was required during mining. It is likely that groundwater connectivity occurs at about current pit water levels, supporting the apparent consistency in pit water level (SBE 2022).

Groundwater and pit water level data for East Hill Pit is acknowledged to be limited for the determination of groundwater interactions with this system (SBE 2022). Observations are that pit water levels are consistently low, with water quality data indicating deteriorating water quality in the pit over time in response to a combination of exposed sulphides, limited inflows and evaporation effects (SBE 2022).

Preliminary reviews of the East Hill Pit system suggest a potential hydraulic link between Main Pit and East Hill Pit, acknowledging however that present data to support this is very limited (SBE 2022). It is considered that any potential hydraulic connectivity between the two pits would be via a bounding fault connection, noting that there would be limited impacts outside of any potential structural link given the low conductivity of the crystalline rock units (SBE 2022). As such, there is potential for groundwater leakage from East Hill Pit via this fracture line, but groundwater flow would be limited and likely towards Main Pit (SBE 2022).

The risk of groundwater discharge out of the voids is considered low as a result of the following (SBE 2022):

- Main Pit is likely a gaining pit with the lowest groundwater level in the landscape. The presence of groundwater inflows has been determined from historical studies determining no connection with the and therefore will act as a groundwater sink, with groundwater flow into the void.
- East Hill Pit is either hydraulically separate or with limited connectivity to Main Pit. If hydraulic connection is present, groundwater will only flow towards Main Pit when the hydraulic gradient allows this (i.e. East Hill Pit water level would need to have greater elevation than Main Pit). In this scenario, groundwater contributions from East Hill Pit would be relatively small, with significant dilution achieved in the much larger volume of Main Pit (noting this is an order of magnitude greater even at full supply level).
- No known connection with alluvial aquifers is present

The Main Pit conceptual model has also been developed with consideration to:

- Water cover to 160 mAHD to provide an oxygen deficient environment, further reducing the risk of oxidation of rock.
- Hydraulic separation from the Suttor River with the Main Pit western bund wall.
- The interaction of the Suttor River and Yandan Creek at flood heights of 169 mAHD (5-25 % AEP event).

Conceptual models for Main Pit and East Hill Pit groundwater interactions are provided within Figure 67 and Figure 68.

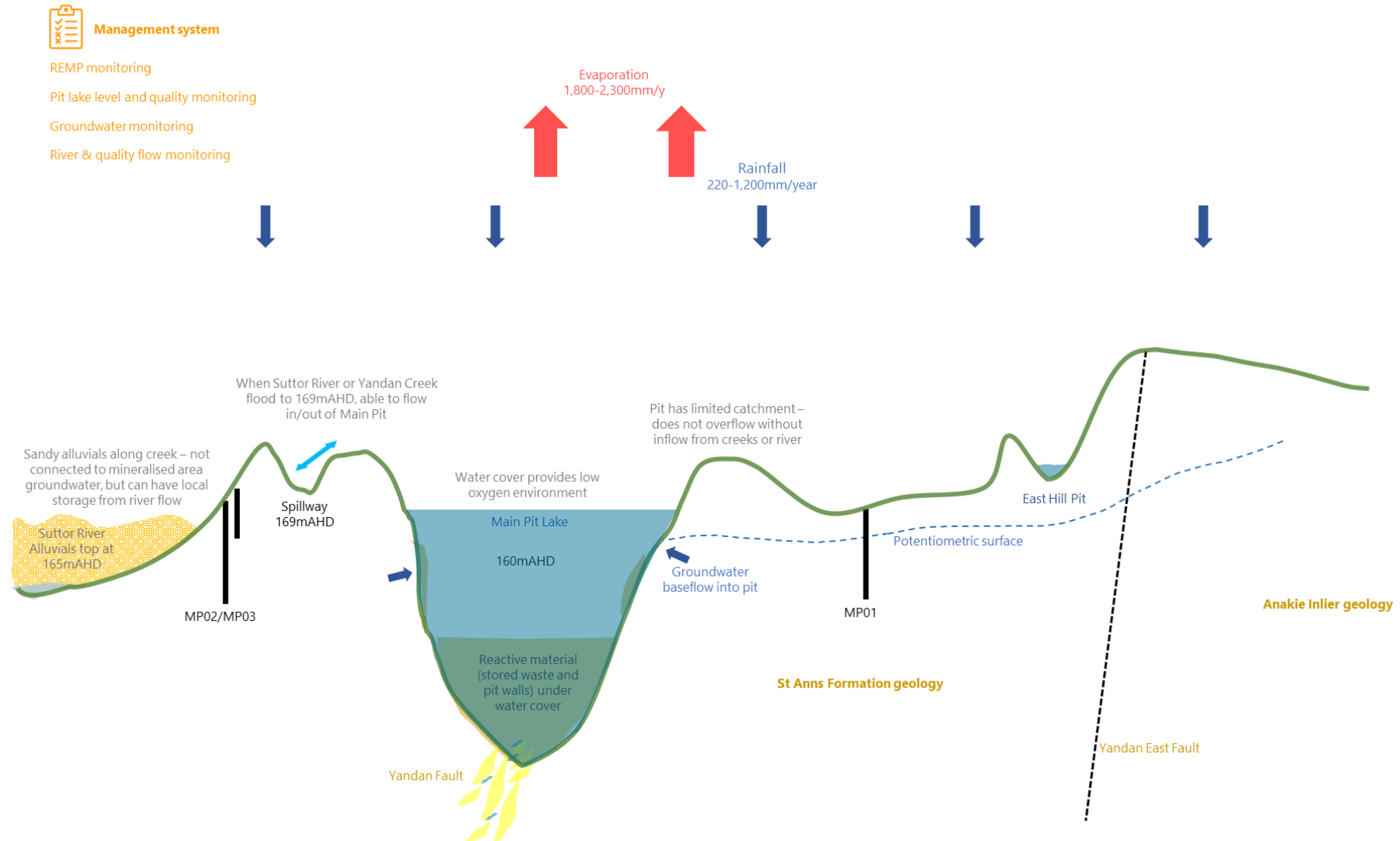


Figure 67: Conceptual model for Main Pit

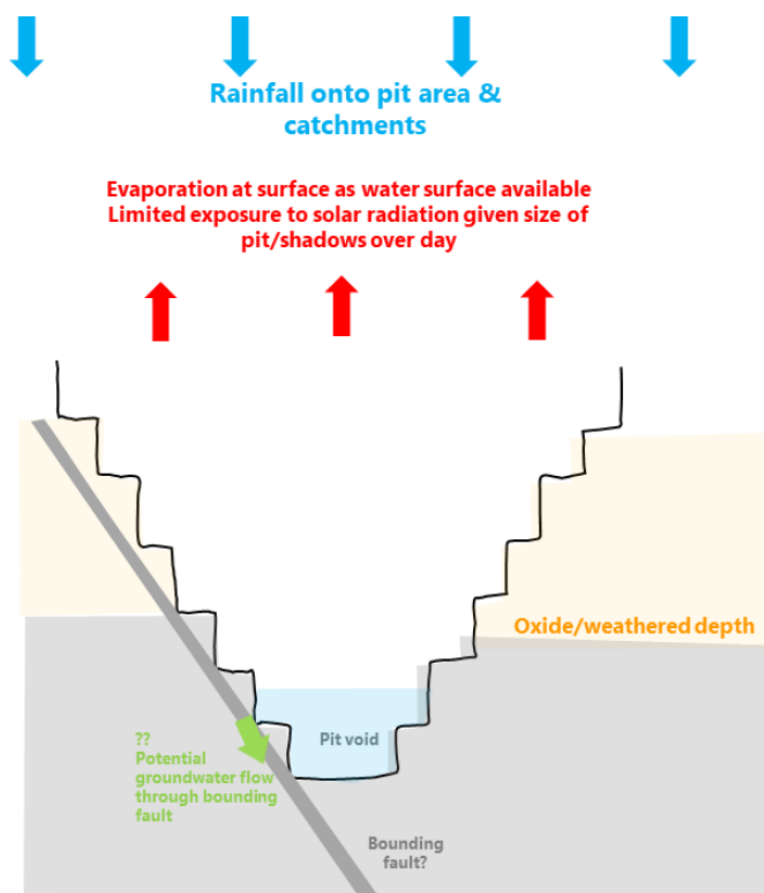


Figure 68: East Hill Pit conceptual model (SBE 2022)

3.5.10.1 Domain conceptual models

A domain assessment using cross-sections through key landform catchments, geology, groundwater-surface, groundwater quality populations and likely residence time at the Project was undertaken by SBE (2024b). Four key domains were identified and are summarised with relevant monitoring bores in Table 42.

Table 42: Groundwater domains and relevant groundwater monitoring locations

	Domain				
	Yandan Creek and Suttor River	HLP and Yandan Creek	TSF and Sandy Creek	Regional	Monitoring purpose
Geology	Mineralised zone – St Anns Formation	Anakie Inlier	Anakie Inlier	Anakie Inlier	-
Groundwater residence time	Extended residence time in system			Local/short-term residence time in system	
Landform	East Hill Pit	HLP	TSF	-	
	Main Pit				

	South Pit				
Monitoring location	MP01	HL7	TD8	RB1D	Background
	MP02/03, MP04, SH3	HL4, HL5, HL3, HL8, HL9	TD12, TD13, TD9, RB2D, RB2S	-	Downgradient

Regional domain

The regional domain cross-section bisects the southern portion of the MLs from West to east, starting at the Suttor River and moving west through Main Pit, East Hill Pit, Main Pit and extends to the east outside mine disturbance (Figure 69). The profile developed through the Regional domain shows that the groundwater potentiometric surface is situated below the HLP and East Hill Pit (Figure 70). Groundwater follows a subdued version of the topography and appears to flatten again on the western side of the Yandan East Fault.

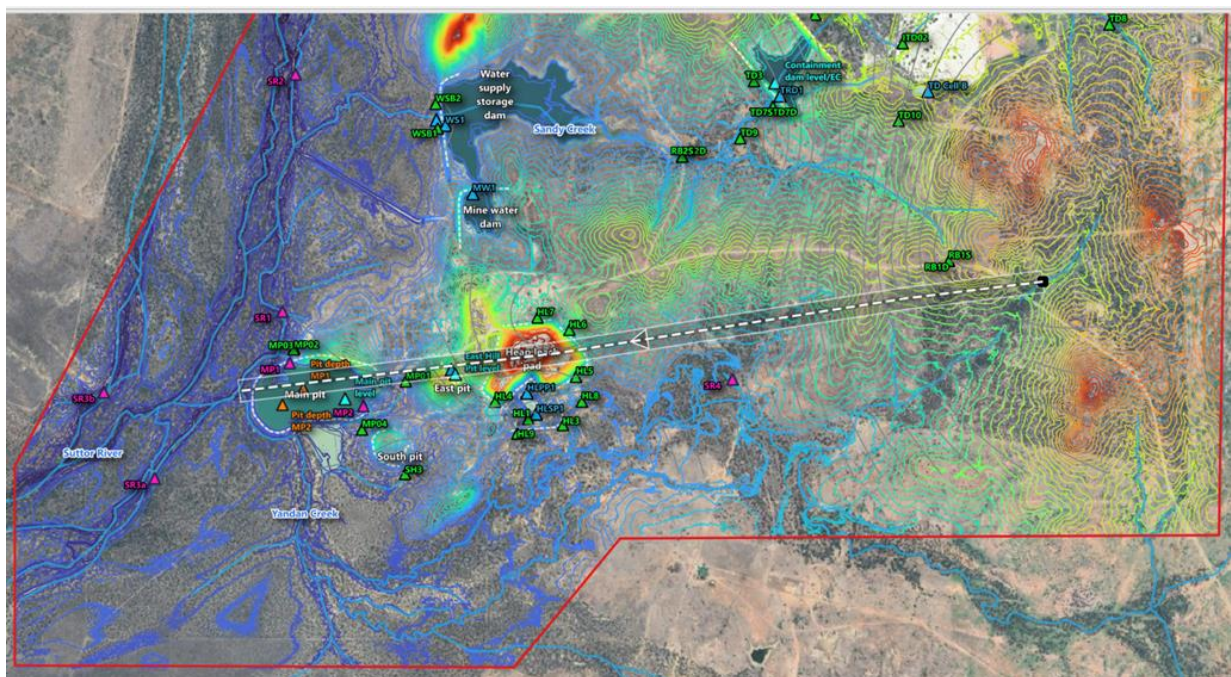


Figure 69: Cross-section through the Regional domain (SBE 2024b)

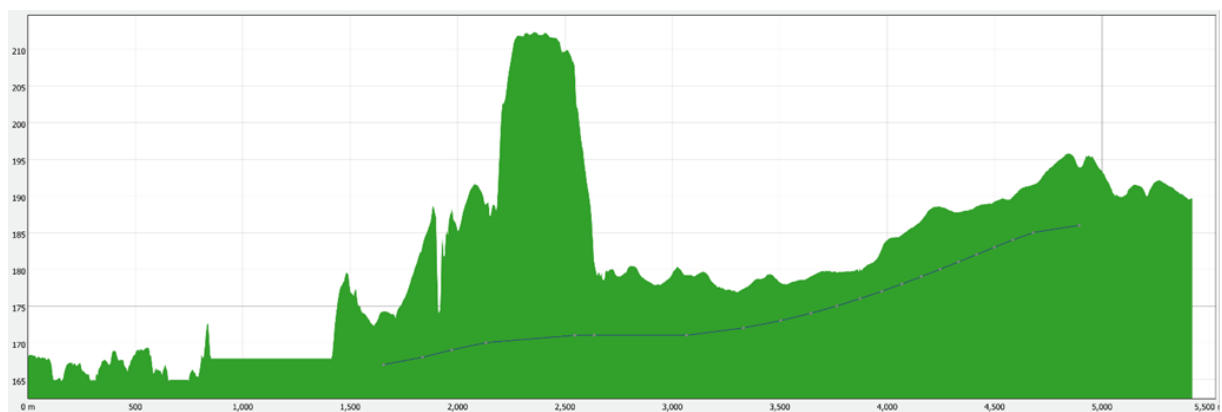


Figure 70: Groundwater profile through the Regional domain (SBE 2024b)

Sandy Creek and TSF domain

The Sandy Creek and TSF domain cross-section bisects the north of the MLs from east to west starting at the Suttor River in the West, then moving through the Raw Water Dam, Tailings Water Return Dam, the TSF and out to the east outside mine disturbance near the naturally elevated landform (Figure 71). The groundwater gradient in this location is steeply dipping and as such, the Sandy Creek and TSF conceptual model shows groundwater at a depth above the base of the TSF and passing below to an inferred fault located near the embankment of the Tailings Water Return Dam (Figure 72). The groundwater gradient then flattens from TD9 down to the Raw Water Dam. Groundwater is near the surface at the Raw Water Dam, suggesting it is likely the dam is partially groundwater-fed.

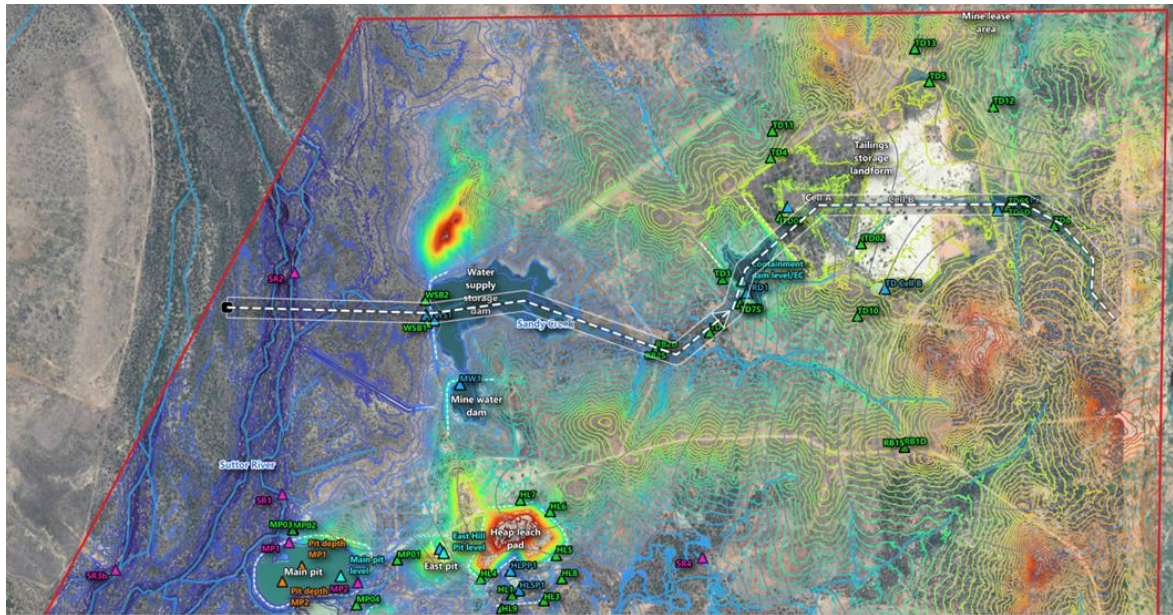


Figure 71: Cross-section through the Sandy Creek and TSF domain (SBE 2024b)

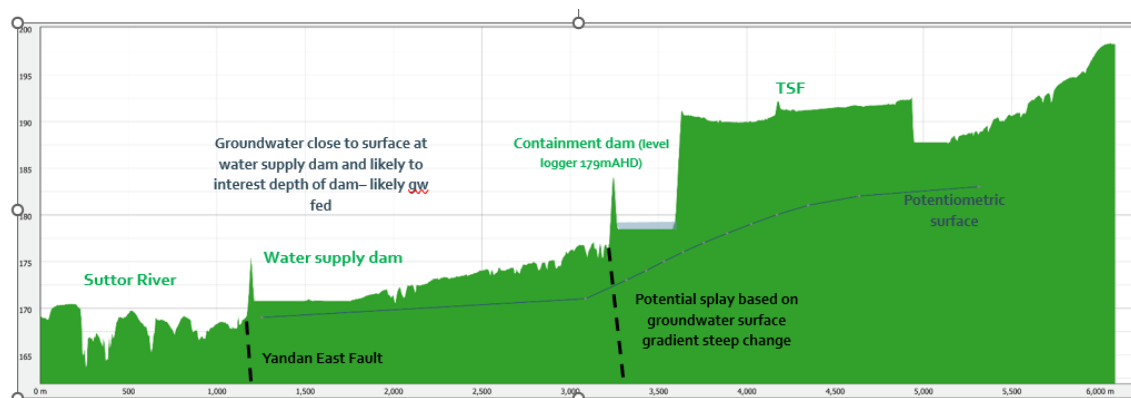


Figure 72: Groundwater profile through the Sandy Creek and TSF domain (SBE 2024b)

Heap Leach Pad to Yandan Creek domain

The HLP to Yandan Creek domain cross-section runs in a west to north direction beginning south of Yandan Creek and moves north through the Heap Leach ponds, HLP and infrastructure area (Figure 73). The groundwater surface moves downgradient from the infrastructure area to Yandan Creek, following the natural topography (Figure 74). The groundwater potentiometric surface is modelled at a depth well below the HLP. The potentiometric surface suggests that groundwater intersects the base of the Heap Leach ponds,

however, it is noted that these ponds are fully lined and will be decommissioned and reprofiled to natural/above natural topography post-closure.

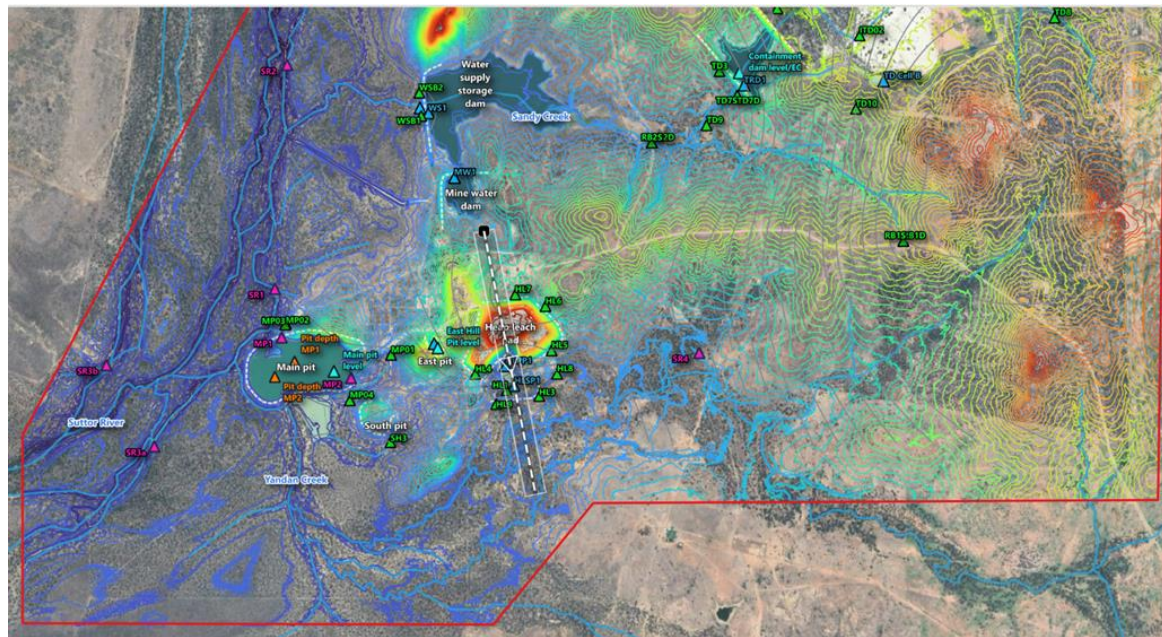


Figure 73: Cross-section through the HLP and Yandan Creek (SBE 2024b)

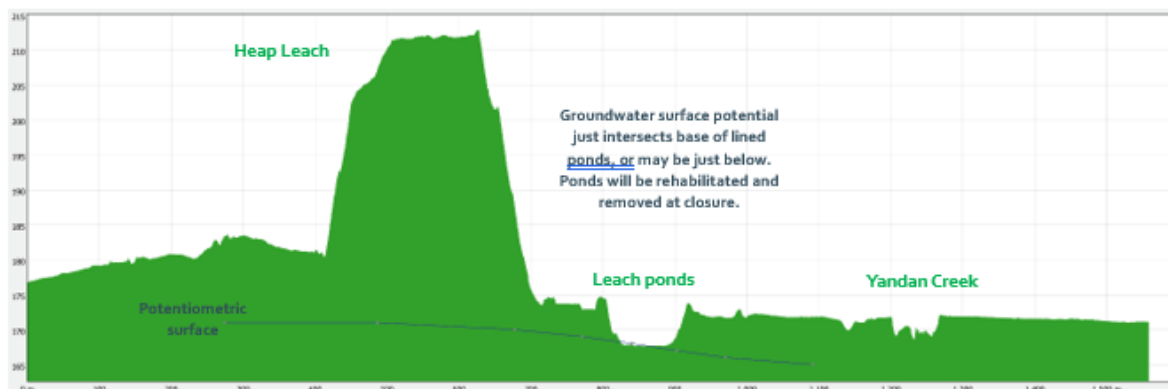


Figure 74: Groundwater profile through the HLP and Yandan Creek (SBE 2024b)

Heap Leach Pad and mineralised area domain

The HLP and mineralised domain begins to the south at South Hill Pit moving north-west through Main Pit, before moving east through East Hill Pit and HLP (Figure 75). The groundwater head at the HLP grades east to the mineralised zone, west of the Yandan East Fault, likely intercepting Main Pit (Figure 76). The base of Main Pit lake depth extends 40-60 m from below the elevation of the lake surface and underneath the potentiometric surface. Groundwater is likely to flow into Main Pit where, saline groundwater will move into the freshwater in Main Pit.

At East Hill Pit, pit lake water levels are currently higher than during the 2021 LiDAR survey (shown by the green elevation), and the groundwater surface is shown as intersecting through the pit. The initial groundwater surface is shown as intersecting through the East Hill Pit at the deepest point. The nature of the potential connection is still being defined, as there are multiple factors to consider:

- There is no evidence of leakage from East Hill Pit (and associated acidic quality) in downgradient MP01.

- Pumping from the Heap Leach ponds to East Hill Pit was undertaken during the 2022/2023 wet season to manage design storage allowance at these facilities.
- The declining rate of water levels suggest levels are reducing at rates expected for evaporation and that there is no detectable groundwater inflow or outflow.
- The presence of the Yandan East Fault might easily offset the groundwater pressure head to below the East Pit Fault.
- At stable levels of 166 mAHD, the East Hill Pit may be a groundwater sink but has minimal inflow.

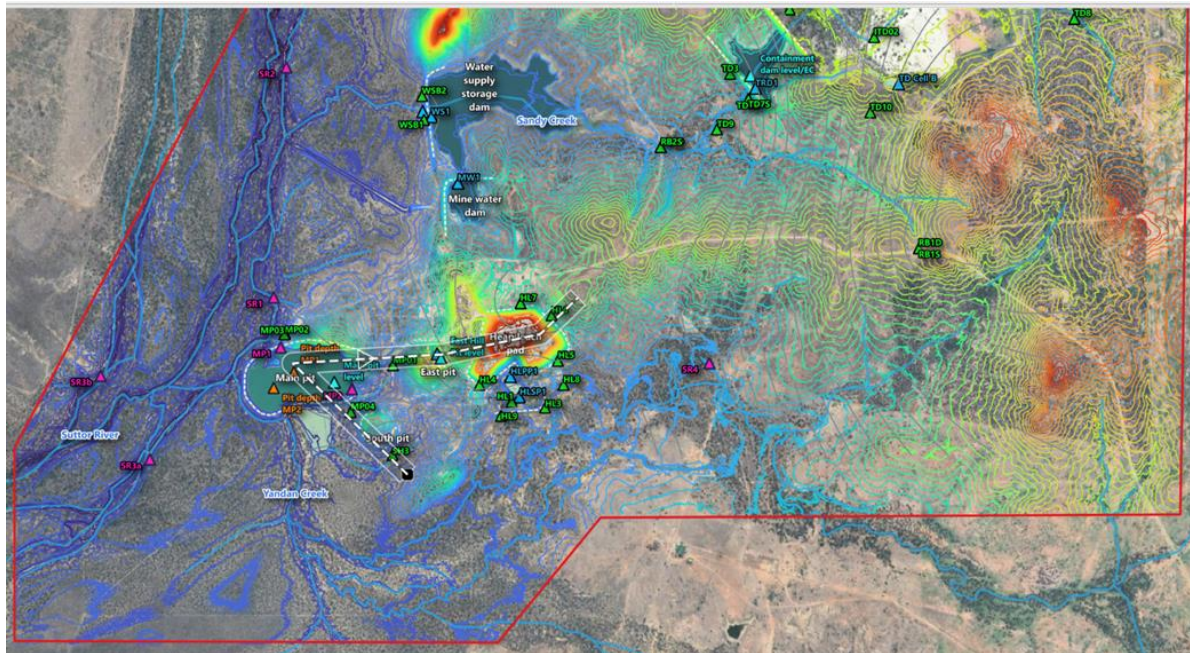


Figure 75: Cross-section through the Sandy Creek and TSF domain (SBE 2024b)

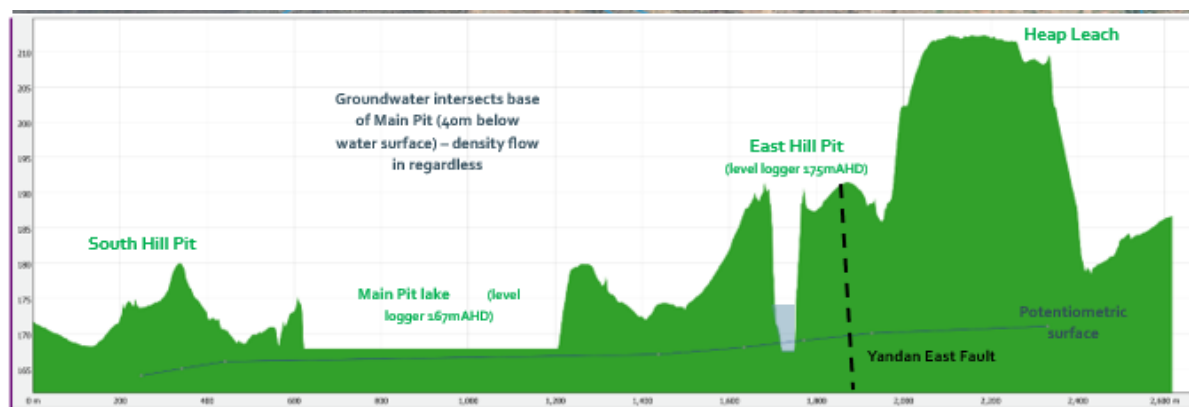


Figure 76: Groundwater profile through the Sandy Creek and TSF domain (SBE 2024b)

3.5.11 Flooding

The Sutor River flows within the western boundary of the Yandan MLs, with this joined by the minor tributaries of Sandy Creek and Yandan Creek which traverse the Project area. A flood assessment was completed by See Built Earth (SBE) in 2022 to assess the Project's susceptibility and influence to flooding and a supplementary update undertaken in 2024 (SBE 2024c).

Flood extents for the Project were assessed based on a regional assessment of a 1% annual exceedance probability (AEP) event and a probable maximum flood (PMF) event (SBE 2022; SBE 2024c). Flood contours

for a 1% AEP event and PMF event have been calculated at 179 mAHD and 187 mAHD, respectively (DoR 2021). Flood extent modelling is provided in Figure 77.

On the basis of a 1% AEP flood event, the western part of the Project area is susceptible to flooding, including Main Pit and the water storage dams (Water Storage Dam and Mine Water Dam). The Yandan Tailings Dam, and East Hill Pit are situated above the 1% AEP event (SBE 2022).

A PMF event was calculated using the Generalised Short Duration Method (SBE 2022). The PMF event represents an extreme rainfall event equivalent to 1,233 mm in six hours. In the instance of a PMF event, the flood extent within the tenements moves further to the east. The Yandan Tailings Dam would remain above the PMF flood extent.

There is potential for partial flooding through the base of the HLP during a PMF event. On the basis of available flood modelling data, it is expected that the level of inundation for the HLP during a PMF event would be between 0–2 m (SBE 2022; SBE 2024c). Similarly, there is potential for floodwaters to egress East Hill Pit from the north during a PMF event, where the lowest point in the landform lies. It is noted that floodwaters during a PMF event are not expected to flow into the pit from other directions (i.e., floodwaters would not rise sufficiently up gradient to flow into East Hill Pit).

A graphic of flood levels in relation to landforms of the Project is shown on Figure 78 and Figure 79. Consideration to final landform designs to mitigate flooding risk is provided below.

An assessment of potential flood velocities against the final landform using relevant publicly available data was undertaken to inform the flood risk profile for the Project (SBE 2024a). One flood impact assessment used in determining the flood risk at the Project was undertaken at a node upstream of the Project (Engeny 2011). The assessment by Engeny (2011) was considered appropriate for comparison as it was undertaken in a setting with similar topography, roughness and river characteristics to the mid-Suttor River as it passes the Project. Flood velocities of 1.2–1.8 m/s in central areas and river channels were identified at this node, slowing with distance and shallower flow to <0.4 m/s on the edges of the flood extents (SBE 2024a). At Yandan landforms, the gradients are flatter and landforms located towards the flood extents (with the exception of Main Pit bund), presenting a lower risk to flooding at Yandan velocities, with the slowest water and lowest time of exposure to floodwaters scheduled on the flooding extents.

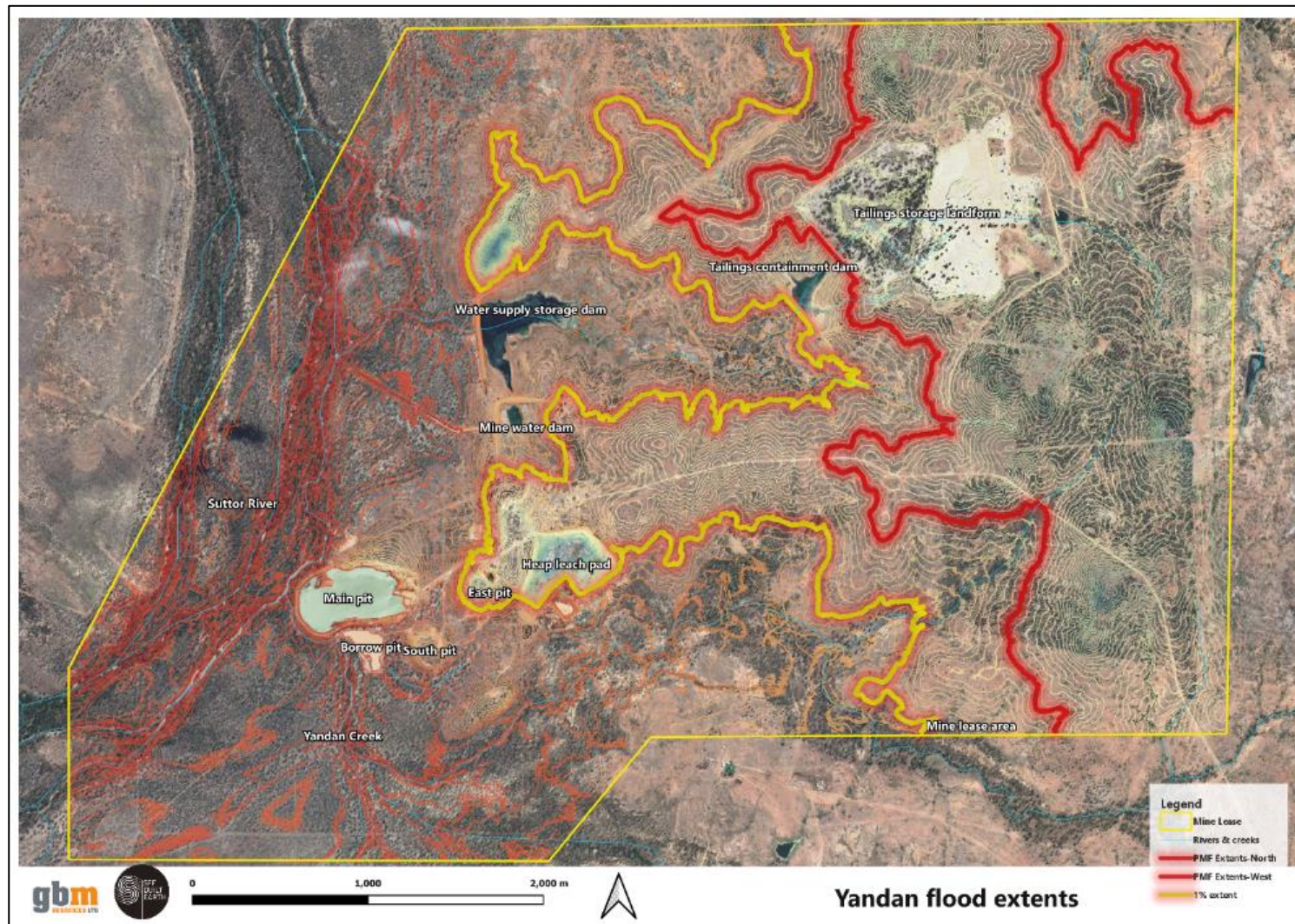


Figure 77: Yandan flood extent – 1% AEP and PMF events (SBE 2022)

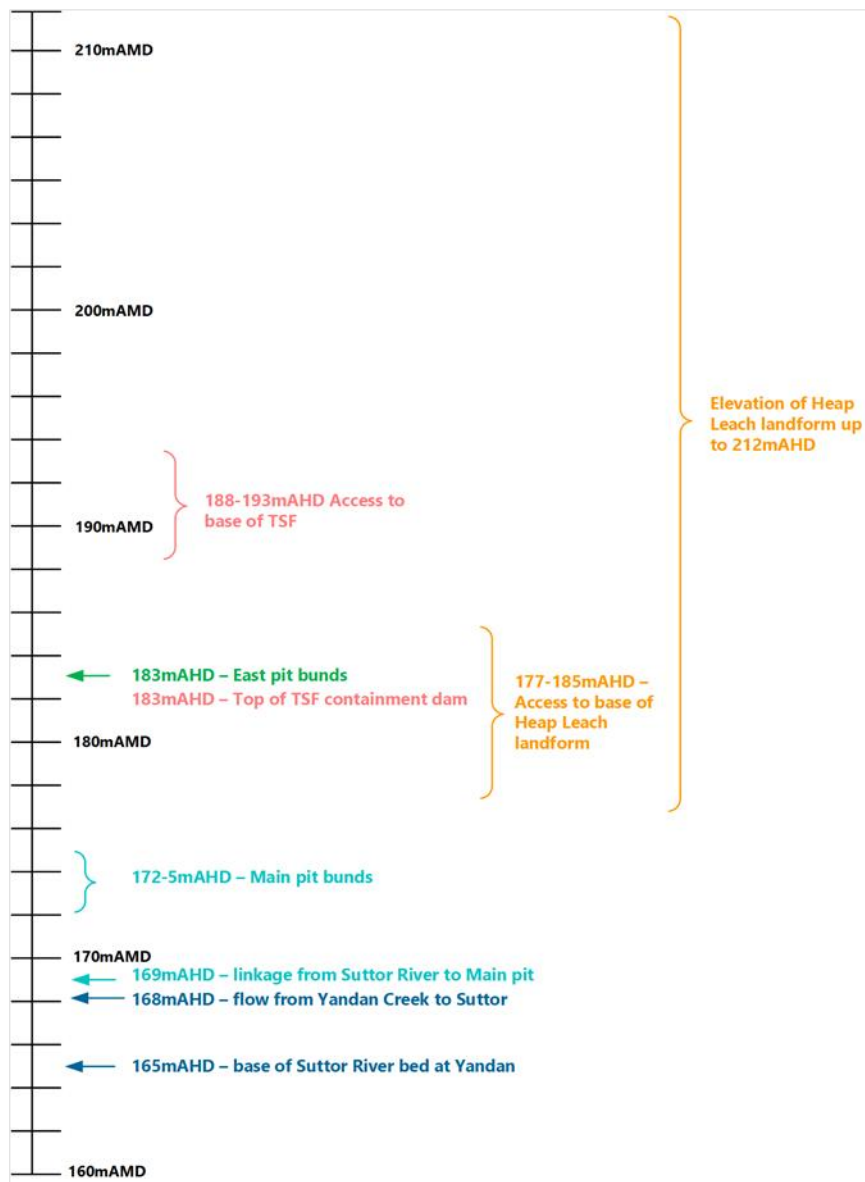


Figure 78: Flood heights at Suttor River and Yandan Creek compared to final landforms (SBE 2024a)

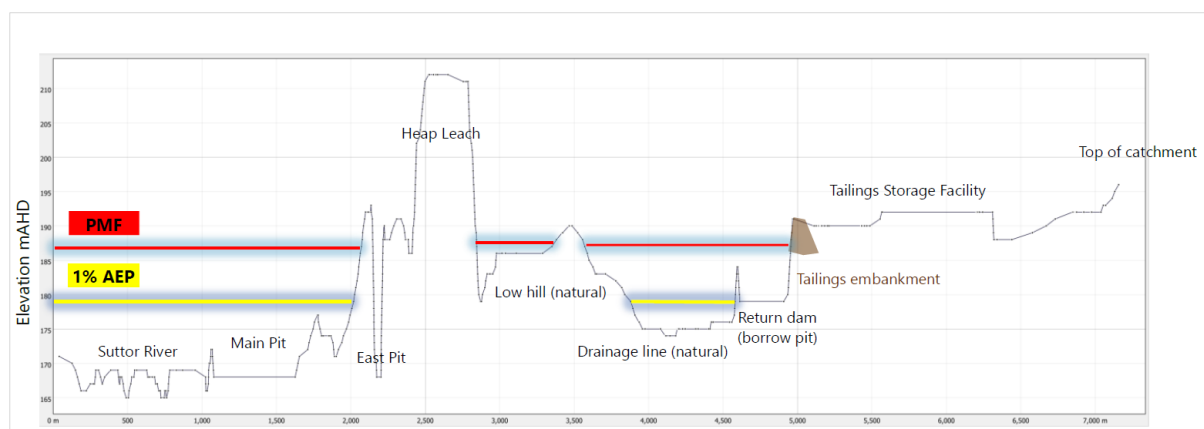


Figure 79: Flood heights and final landforms (SBE 2024a)

3.5.11.1 Heap Leach Pad

At the time of construction, it was considered best practice for all major infrastructure to be constructed above a 1% AEP flood event. During a 1% AEP flood event, the base of the HLP at the southern face is predicted to be subject to flooding, compared to a PMF flood event where the entire base of the HLP is predicted to be subject to flooding up to 2 m (SBE 2024c). Predicted flood velocities during a PMF flood event are predicted to be less than 1.5 m/s. Rock rip rap, vegetation buffering, or slight landform reshaping (e.g. buttressing) should be undertaken at the base of the HLP at pinch points, to reduce flood velocity against the landform. The HLP should be inspected following flood events to ensure the integrity of the design.

3.5.11.2 Tailings Storage Facility

There is no risk to Cell A or Cell B of the TSF as they remain above flood elevations up to and including a PMF flood event, with only minor flooding predicted on the downstream side of the embankment in a PMF event.

3.5.11.3 Residual voids

Flooding was considered from project design with WMC (1998), which recommended all major infrastructure be constructed above the 1% AEP flood levels, as was considered best practice at the time of construction. As a result, all landforms except the Main Pit (given that it lies in the Suttor River flood plain) are built above the 1% AEP event elevation.

Full saturation of Main Pit, with water levels above both constructed bunds and natural barrier are predicted in both a 1% AEP and PMF flood events (SBE 2024a). The current natural outcrop is expected to remain viable. Water in the pit will freshen as flood levels rise from Suttor and Yandan Creek, mixing fresh water with pit water to protect environmental values against potential marginal quality concerns.

During a 1% AEP, Suttor River flows of 8 ML/s are predicted, against a total pit capacity of 6800 ML at full supply level, requiring 10-15 minutes of flow to replace pit volume. During a PMF flood event, Suttor River flows are expected to be 18 ML/s, against a total pit capacity of 6800 ML, requiring 5-6 minutes to replace pit volume completely.

Flood velocities at Main Pit are expected to be less than 2 m/s. Rock rip/rap, vegetation, or other stabilising measures should be installed at the base of the bund, facing the Suttor River to improve the stability of the bund against flood velocities. At current, it is noted that rock rip rap is placed at various locations along the bund. Tree/shrubs currently located at the base of the bund will also assist in reducing flood velocities against the landform.

East Hill Pit sits outside the 1% AEP flood event. During a PMF flood event, East Hill Pit will fill to the excavated volume mixing water from the base of the pit with flood waters and then form part of the flooded landscape, remaining after the flooding event (SBE 2024a). Flood levels will likely flow into the East Hill Pit via the access road (from the north). The volume of pit water is unlikely to be material for quality concerns given the volume of impacted stored water, pit volume and magnitude of flows (for volumes and storage curves, refer to SBE 2022). Given the available storage volume, significant dilution would occur improving water quality.

Flood velocities of up to 1.5 m/s may be experienced at the East Hill Pit safety bund, as such mitigation measures such as rock rip rap or vegetation buffering to reduce velocities should be utilised at pinch points in at the base of the bund.

The connectivity conceptual model during flood events for Main Pit and the Suttor River is discussed in Section 3.5.12.6.

3.5.12 Residual void hydrology and hydrogeology

3.5.12.1 Catchment

East Hill Pit is a small open cut pit with a limited footprint of only 0.9 ha, with pit walls reaching approximately 20 m above a small pit lake (Figure 81). The surface catchment reporting to East Hill Pit is 2.9 ha (refer to Section 3.1.5).

Main Pit is located in close proximity to the Suttor River and within its floodplain. When the Suttor River reaches a height of 169 mAHD, connectivity between the Suttor River and the pit waters is established, allowing inflows and outflows via the excavated spillways (SBE 2022). There are two ways for water to enter the pit: from the Suttor River when at level >169 mAHD, or from Yandan Creek (to the south) where the borrow pit constructed to the south fills and water flows to the pit (Figure 80)(SBE 2022). To manage water levels within the pit and limit interactions with the Suttor River to appropriate river flows, there are two primary bunds with the following functions (SBE 2022):

- Along the northern catchment of the pit (a relatively clean catchment): to divert river flow around the pit to the Suttor River without interaction with pit waters. This bund is required to ensure pit water levels do not increase dramatically due to flow from the catchment without ensuring appropriate flow in the Suttor River. This enables mixing of river water with pit water to increase the dilution of pit release waters and protect the receiving environment water quality.
- Along the western extent (between the pit and the Suttor River): to hold a short head of water within the pit and manage flow by the constructed spillways.

The catchment area draining to each residual void is shown on Figure 80 and Figure 81.

3.5.12.2 Groundwater inflows

Water levels in Main Pit are supported by groundwater inflows. Historical mining (Forbes 1988) records indicate that Main Pit required dewatering during operations and a lack of connection to Suttor River alluvial. Records of pump tests or dewatering demand have since been lost. According to current estimates and pit water elevations, there is a minimal flow (14 L/s) over the entire pit, and it is considered sourced from the Yandan Fault across the pit and crosscuts. (SBE 2024b) Further work and investigation are required to further define groundwater inflow with ongoing monitoring of levels and groundwater responses at the 2024 updated groundwater monitoring network.

Review of the potentiometric surface through East Hill Pit undertaken in 2024 (SBE 2024b) suggests a potential connection with groundwater inflows to the Pit. However, countering monitoring data evidence suggests that this is not the case, particularly since MP01 does not show similar quality to the pit. The hydrogeology at East Hill Pit is discussed further in Section 3.5.10.1.

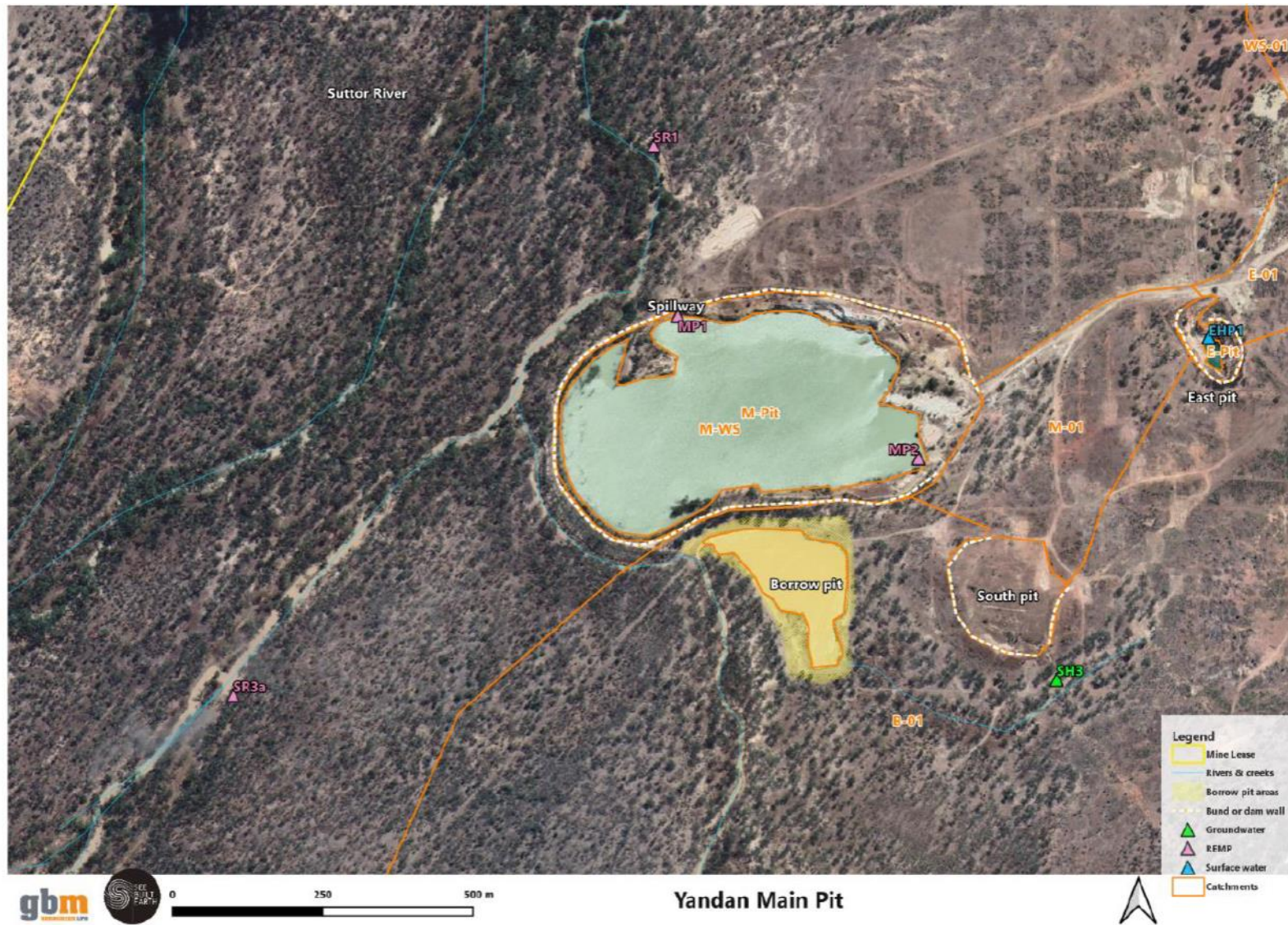


Figure 80: Main Pit domain (SBE 2022)



Figure 81: East Hill Pit domain (SBE 2022)

3.5.12.3 Void water balance

Long term (present–2090) water simulations were completed for the residual voids to determine the water balance of these voids post-closure (SBE 2022). A void mass balance method was selected, with modelling accounting for rainfall, evaporation, pit lake levels, groundwater, and river inflows and outflows to the system. Long term rainfall records (1913–2021) were used as inputs to the model, while also accounting for various climate change scenarios (3.1.3.3), thus informing on projected future conditions also. Detailed methodology on this modelling (including calibration and parameters) is provided in *Water performance of Yandan Mine landscape at closure* (SBE 2022).

Existing void geometries of Main Pit and East Hill Pit used in the water balance modelling are summarised in Table 43.

Table 43: Key void geometry parameters

Parameter	Base (mAHD)	Spill level (mAHD)	Capacity (ML)
Main Pit	110	169	6,800
East Hill Pit	166	184	45

The water storage curve for each void based on void geometries is presented in Figure 82 and Figure 83.

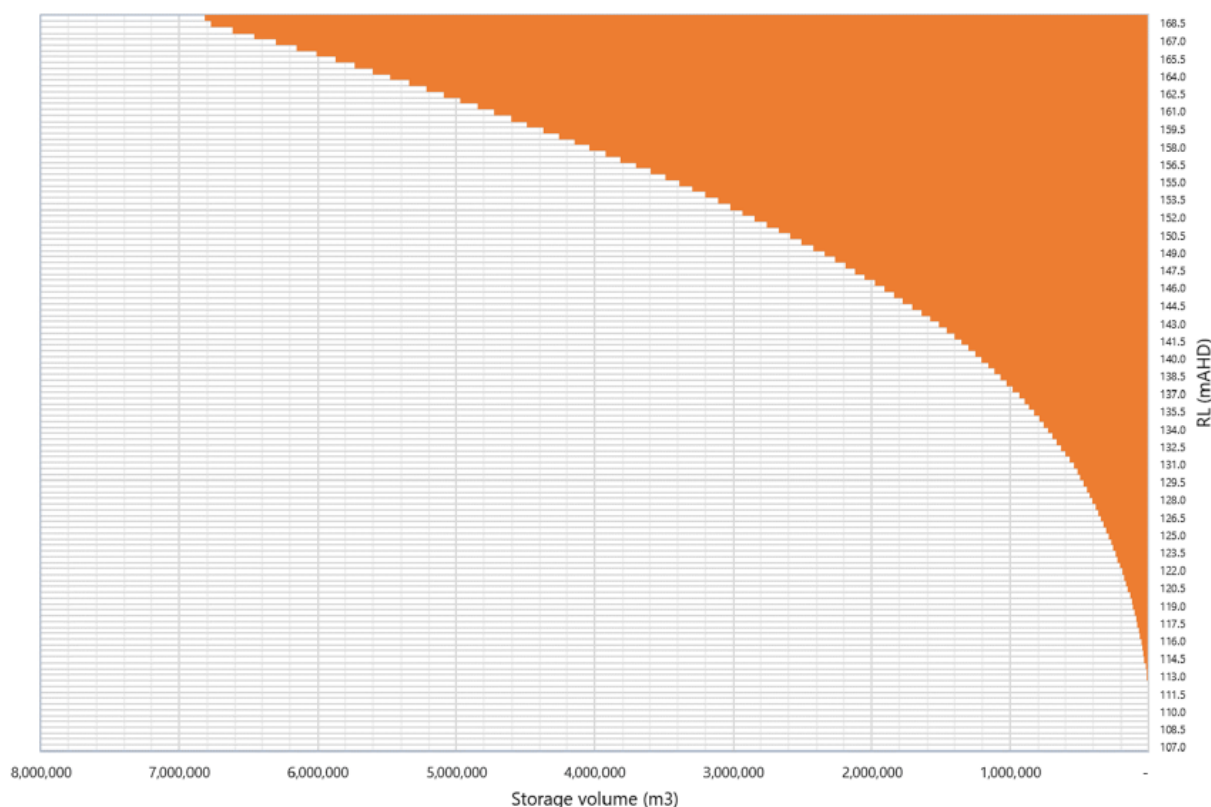


Figure 82: Main Pit storage curve (SBE 2022)

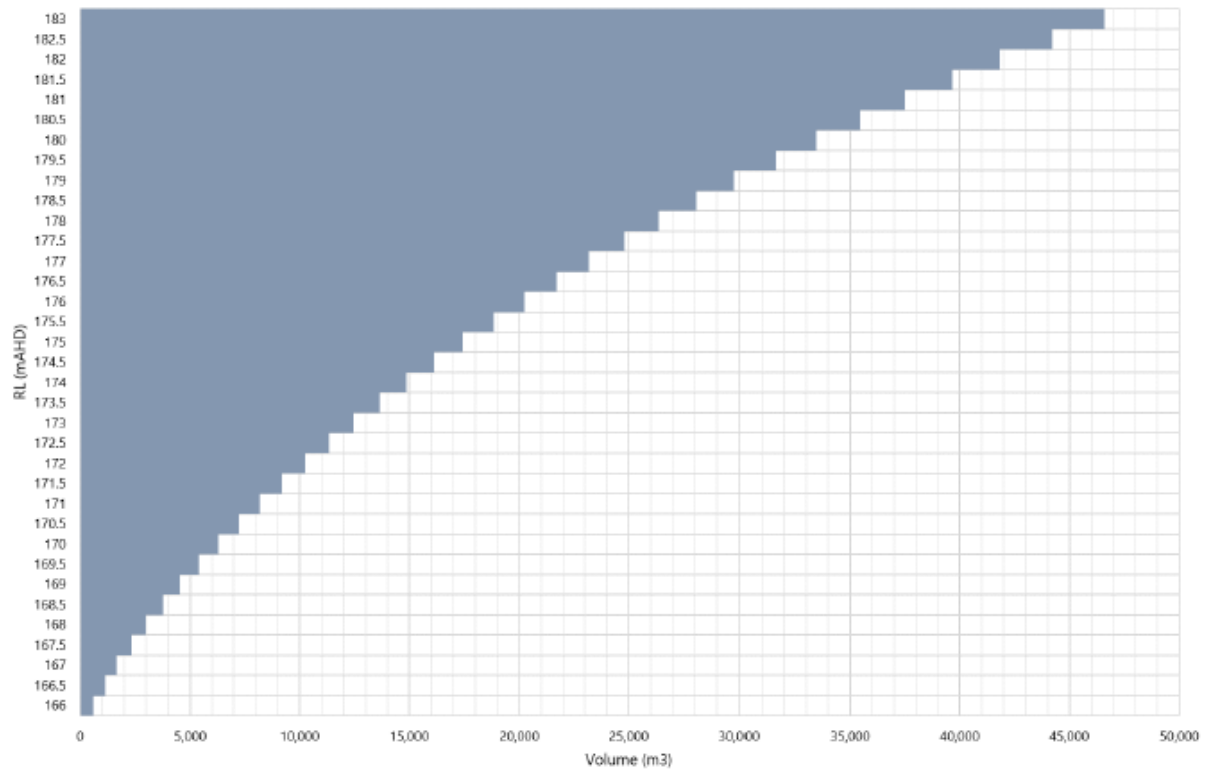


Figure 83: East Hill Pit storage curve (SBE 2022)

Model outcomes for the 'base case' (i.e. based on observations over the past 20 years) are shown in Figure 84.

Under base case conditions, water volumes within Main Pit indicate relative stability. For Main Pit, the model demonstrates that minimum pit water levels remain above 160 mAHD (as required by the Project EA), even when the model omits river inflows (SBE 2022). Generally, modelling suggests that inflows from the Suttor River will occur simultaneously with pit release events, thus ensuring adequate mixing of floodwaters with pit waters on release (SBE 2022).

For East Hill Pit, the model predicts that water levels will vary more widely within the pit, though overall remaining low (SBE 2022). The risk of overtopping from East Hill Pit is considered to be very low to almost negligible, with only the extremely rare scenario of a PMF flood event providing any level of potential risk (refer Section 3.5.11). In this scenario, it is possible for floodwaters to egress the pit from the north where the access road to the pit is located (SBE 2022). In the exceptional event of a PMF flood, there would be regional flooding that would facilitate significant dilution of any potential contaminants in the pit water (SBE 2022).

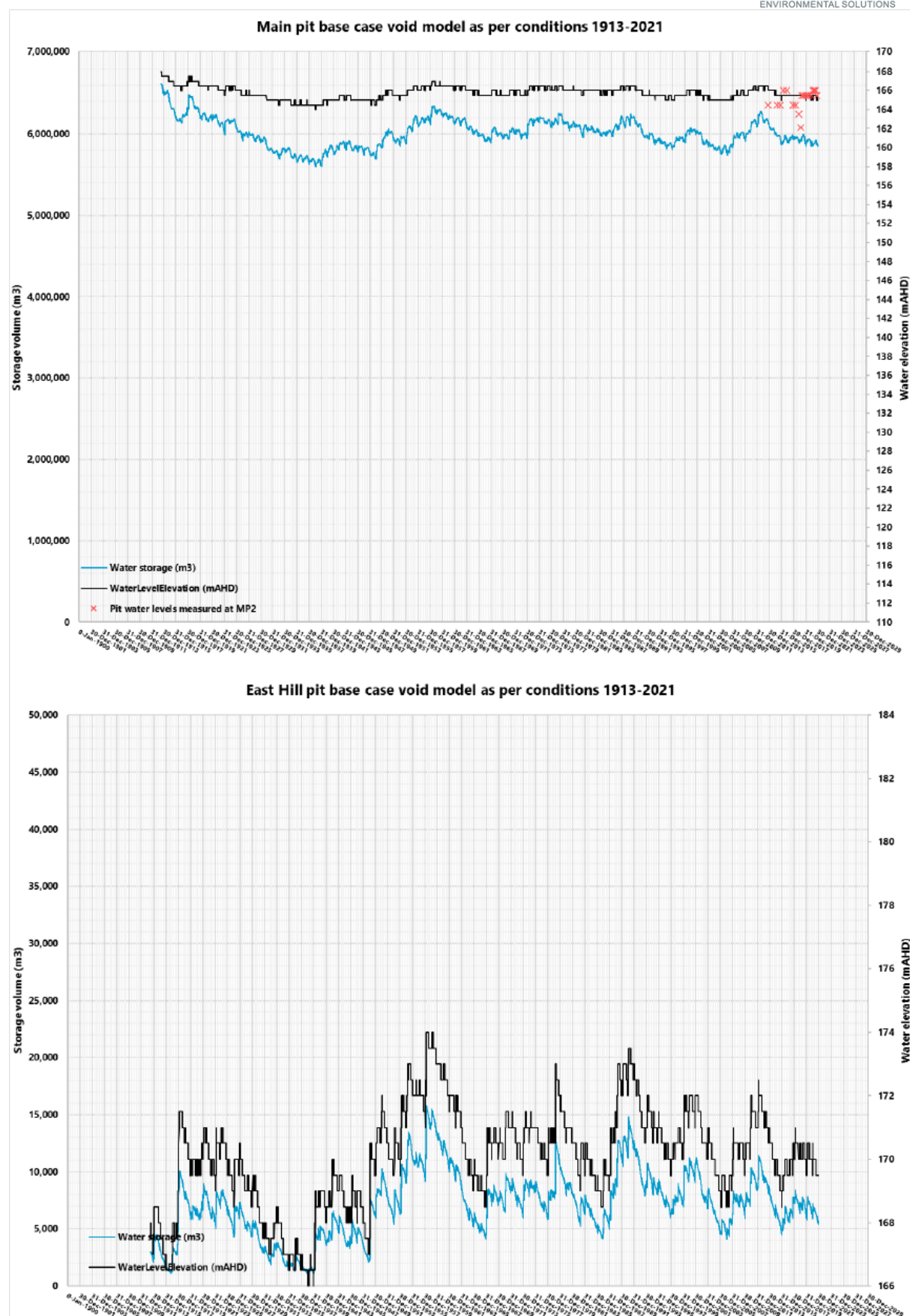


Figure 84: Base case void model outcomes for Main Pit (top) and East Hill Pit (bottom) (SBE 2022)

Responses to climate change have also been modelled for the residual pits. This assessment has considered potential impacts and implications of changing rainfall and evaporation to Main Pit and East Hill Pit (SBE 2022).

The Queensland Government Future Climate predictions for the region were used to assess impacts to void mass balance under changing climate. The following model scenarios were chosen:

- the 50th percentile for changes in rain and evaporation rates for 2030, 2050, 2070, and 2090; and
- to capture the potential for extreme bounds, the 10th and 90th percentiles for 2090 were adopted to simulate extremely wet, low evaporation scenarios and extremely dry, high evaporation scenarios.

A summary of the expected changes to the climate component of the void water model is provided in Table 44.

Table 44: Summary of climate change values

Year	Probability profile	Rainfall (mm/y)	Evaporation (mm/d)
2030	50 th percentile (mean)	18.2	0.36
2050	50 th percentile (mean)	-29.2	0.8
2070	50 th percentile (mean)	-21.9	1.2
2090	50 th percentile (mean)	-10.96	1.6
2090 wet	90 th /10 th percentile (upper bound)	116.9	0.7
2090 dry	90 th /10 th percentile (upper bound)	-113.2	3.0

For Main Pit, under the climate change scenarios '2050' and '2090 wet', pit water levels are predicted to be maintained above 160 mAHD. Under scenarios '2070', '2090' and '2090 dry' however, it is predicted that the pit water level falls below 160 mAHD without additional river inflow. However, with application of an average flow event every 10 years pit water levels are maintained in all scenarios except for the dryer/higher evaporation 2090 climate scenarios where water levels drop to approximately 155 mAHD for a short period of time. However, the risk of water quality impacts is considered low due to the application of lime to waste rock and clay cover prior to filling with water. Model predictions for Main Pit are shown in Figure 85. However, it is expected that as water levels in the void decline, groundwater inflows are likely to increase as elevation head decline with the pit, until equilibrium is achieved. Modelling of climate change scenarios should be undertaken once sufficient water level and groundwater data is obtained (approximately 2 years).

In East Hill pit, climate scenarios of '2070', '2090' and '2090 dry' result in a relatively dry pit which supports containment. Scenarios '2030', '2050' and '2090 wet' maintain contained water levels within the pit, although '2050' may have periods of dry and wet for pit storage. Model predictions for East Hill Pit are shown in Figure 86.

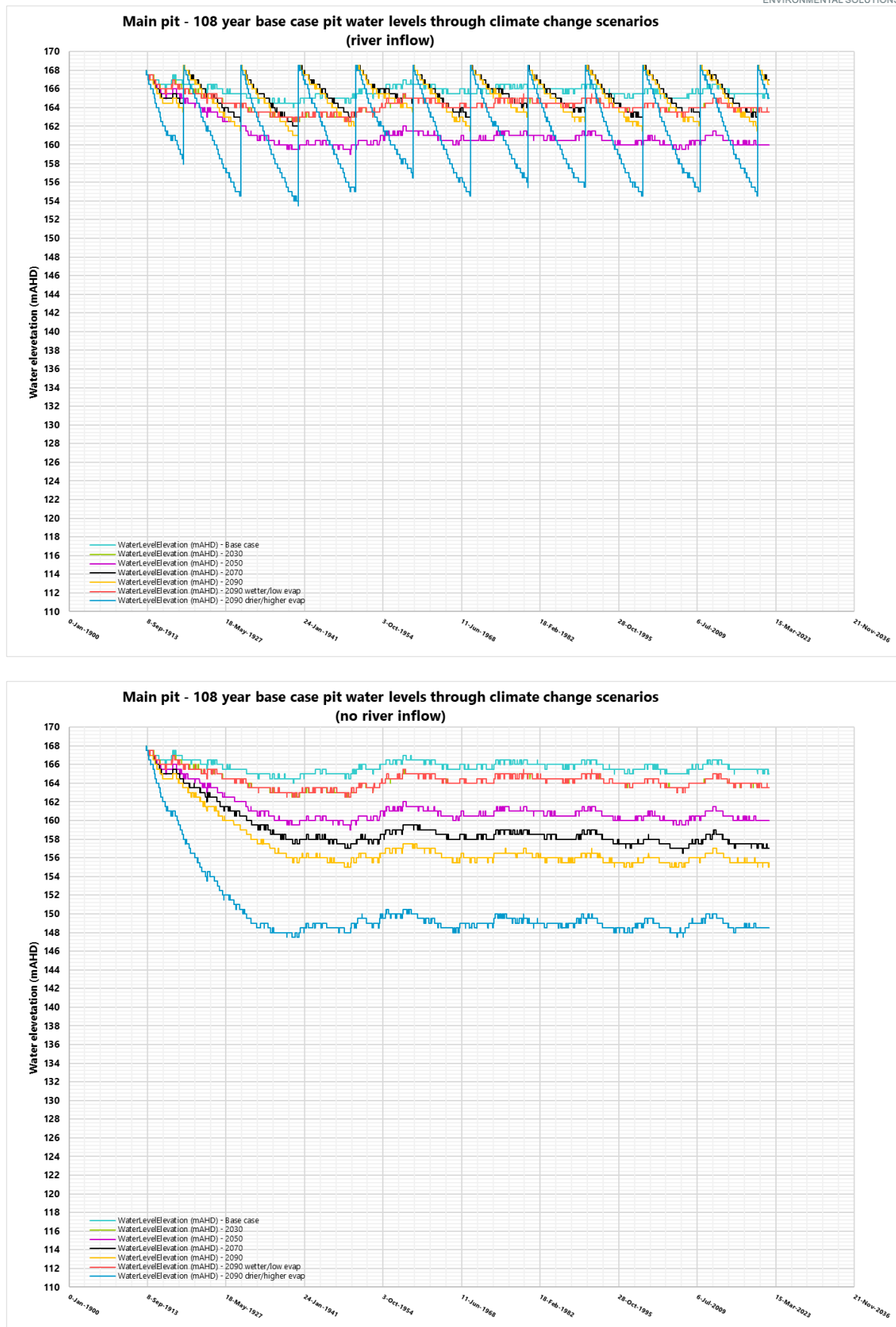


Figure 85: Main Pit void model under climate change scenarios – without and with river inflow (SBE 2024c)

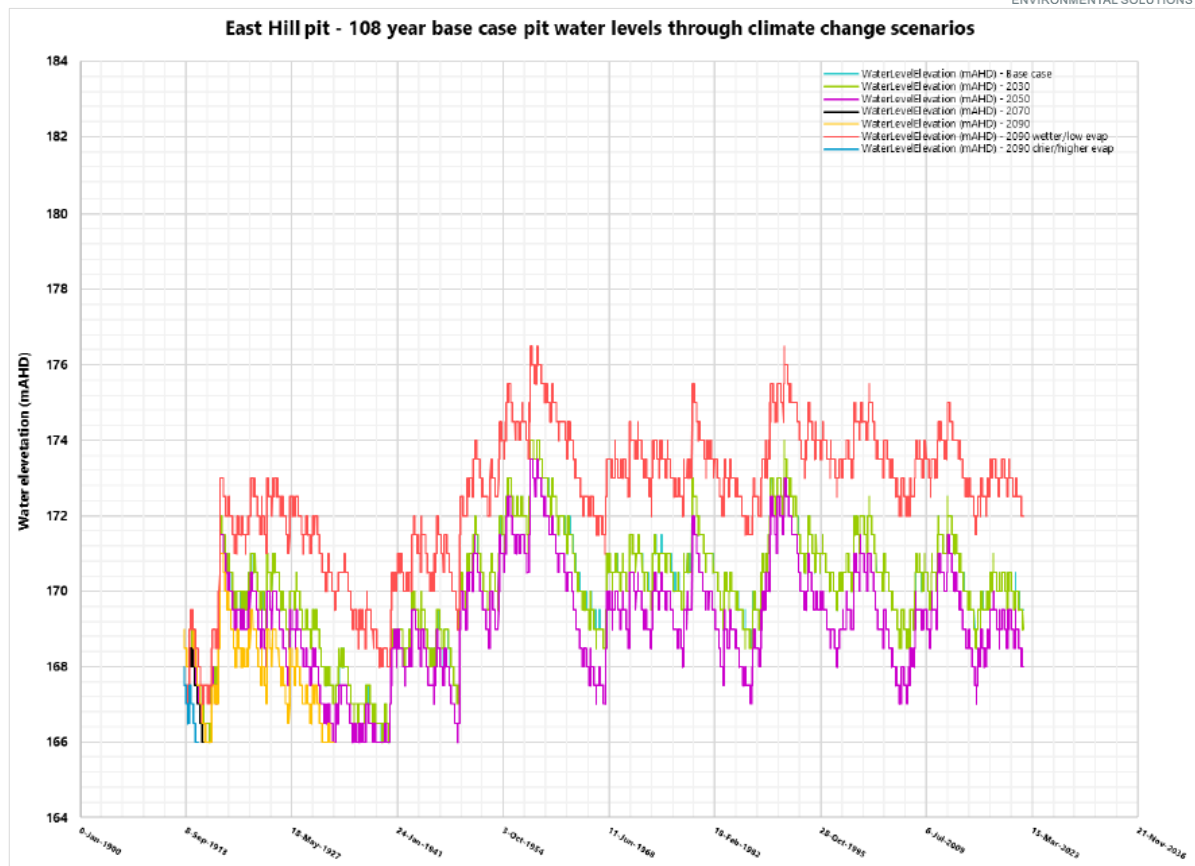


Figure 86: East Hill Pit void model outcomes under climate change scenarios (SBE 2022)

3.5.12.4 Void water quality and potential for stratification

East Hill Pit

A small volume of poor-quality water has accumulated in the base of East Hill Pit. Materials characterisation assessments have identified that arsenic, copper (Figure 87), nickel and zinc exist as potentially mobile metals. No mercury has been detected (SBE 2022).

Water monitoring results indicate this water has stabilised around pH 4 since 2011. Results from 2022 indicated that over time, electrical conductivity and sulphate concentrations have increased and were approximately 20,000 $\mu\text{S}/\text{cm}$ and 5,000 mg/L, respectively (SBE 2022). Pumping of water from HL ponds in recent years to East Hill Pit, along with large rainfall events has lifted water levels 175.3 mAHD (13/02/2024). The additional pit water volume has improved water quality with:

- pH rising from a relatively constant and acidic 4 to a pH of 7-8 (Figure 87).
- A salinity decline from 20,000 to 5,000 EC $\mu\text{S}/\text{cm}$ and sulphate reduction of 4,500 to 1,000 mg/L (Figure 88).
- Strong reductions in concentration for arsenic, copper, nickel and zinc (Figure 89 and Figure 90).

As identified through water quality monitoring, East Hill Pit has developed a small reactive, acid pit lake with indications of increasing salts and metal loads (SBE 2022)

As noted in Section 3.5.11, there is potential for floodwaters to enter East Hill Pit during an extremely rare flood event (i.e. a PMF event). The lowest point of East Hill Pit is 183 m AHD, presenting some opportunity for floodwaters to flow around the pit and enter from the north during a PMF event (SBE 2022). However, the introduction of water into East Hill pit over recent years indicates that in a PMF event, should

floodwaters enter the pit water would be rapidly mixed and not present any additional harm if overflow were to occur (SBE 2024b).

Given the minimal water storage of East Hill Pit (being only a few metres), the pit water is not conducive to the development of thermoclines or the development of density gradients (SBE 2022).

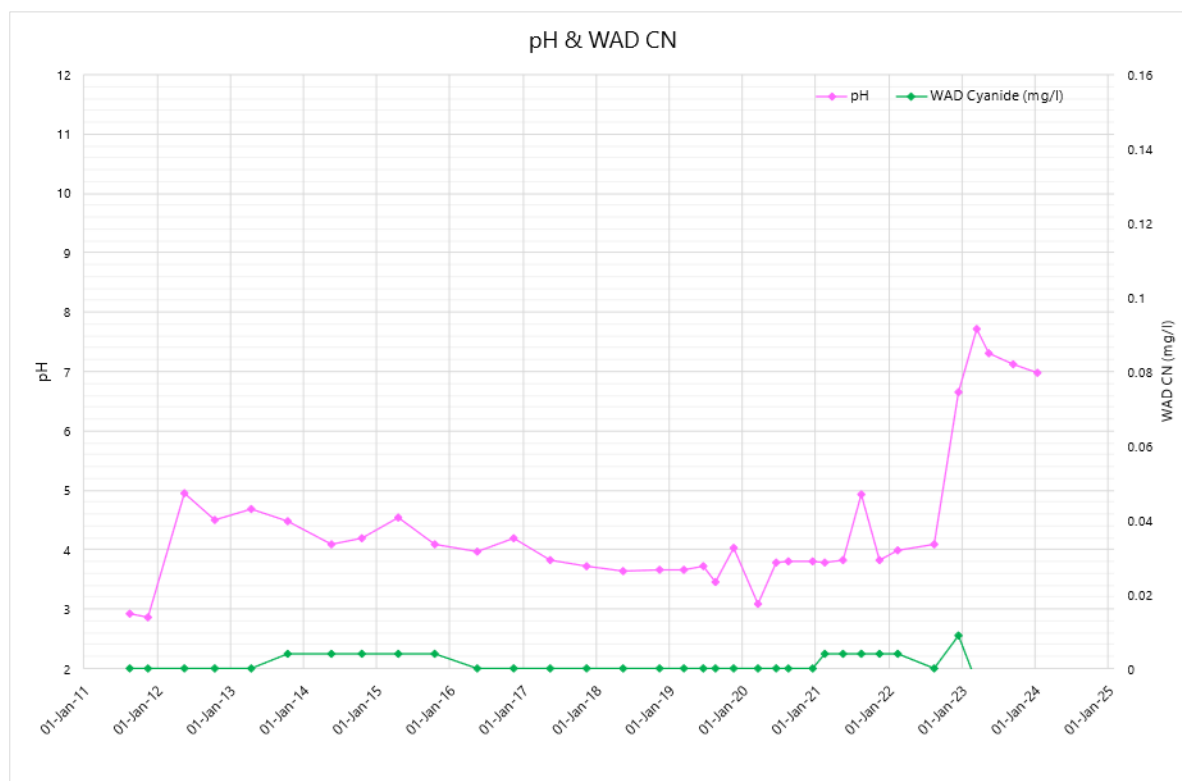


Figure 87: pH and WAD CN concentrations in East Hill Pit water (SBE 2024b)

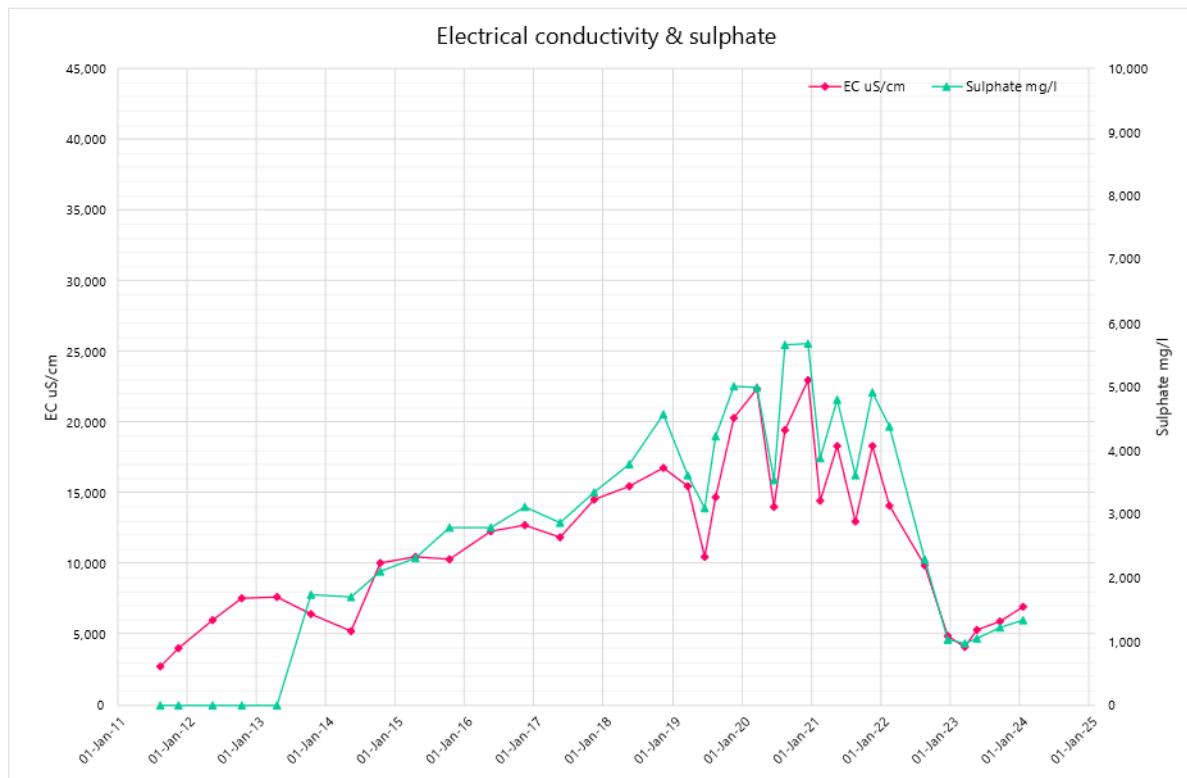


Figure 88: EC and sulphate concentrations in East Hill Pit water (SBE 2024b)

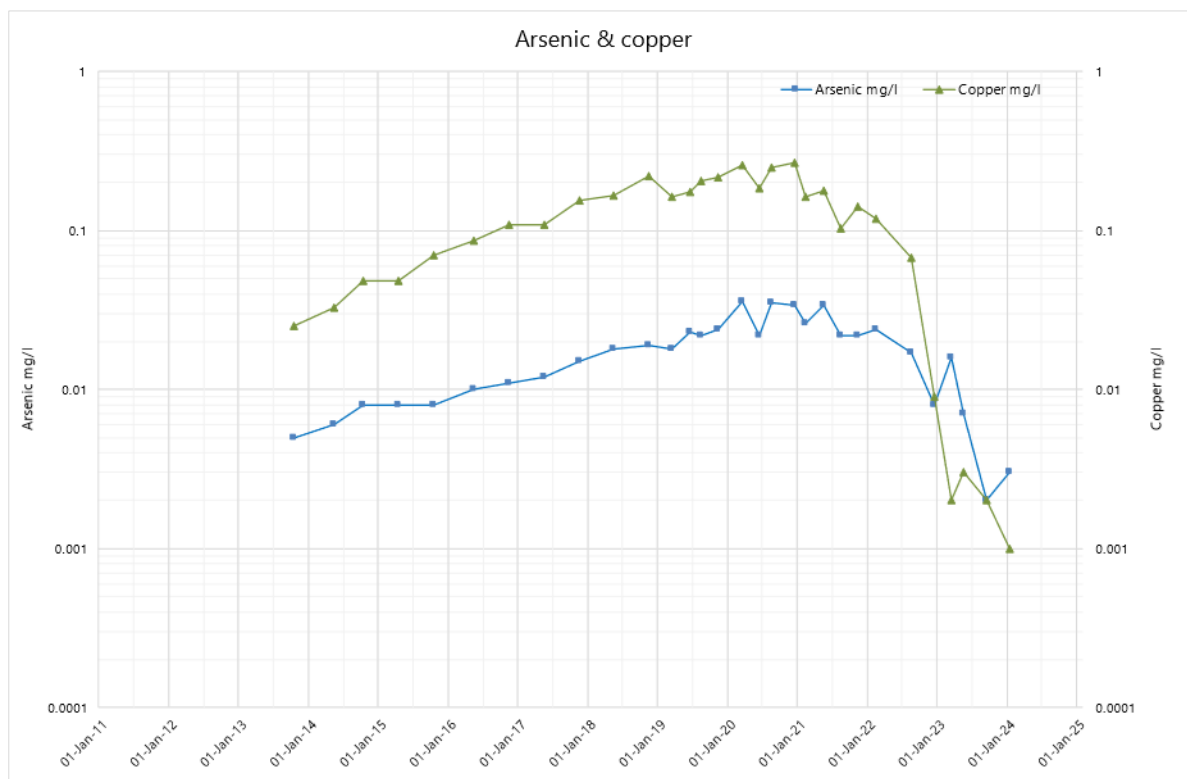


Figure 89: Arsenic and copper concentrations in East Hill Pit water (SBE 2024b)

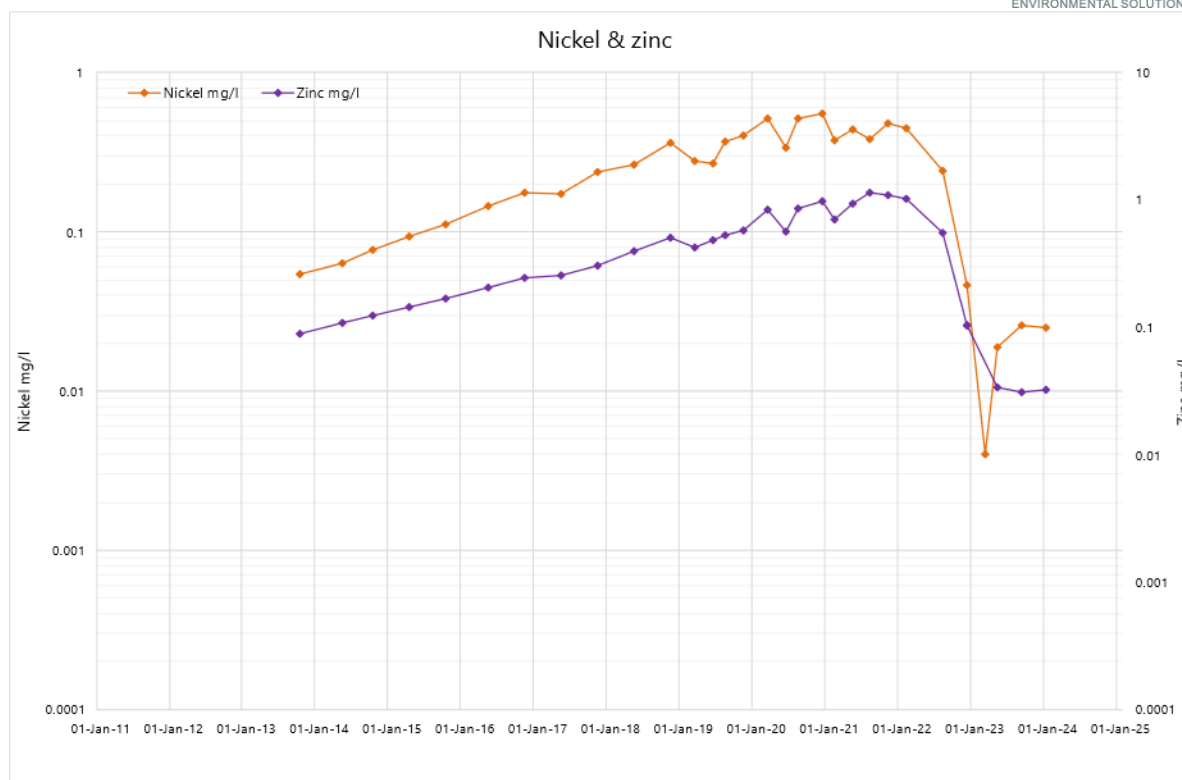


Figure 90: Nickel and zinc concentrations in East Hill Pit water (SBE 2024b)

Main Pit

Water quality in Main Pit is demonstrated as stable and has required no intervention over the 25 years since establishment, with self-sustaining water levels with flood water flow through to/from Suttor River, conditions of discharge and mixing meet background and water quality objectives to protect water values, and the water cover design effectively encapsulates reactive materials to protect water quality.

Pit lake stratification occurs where vertical layering of the water column develops, based on physical or chemical factors, such as temperature or salinity (SBE 2022). Stratification can influence the state of safety and health of the pit lake, for example, in oxygenation of water, or if gases are produced.

As part of the established water monitoring program at Yandan, water samples are collected from two locations within Main Pit using a Van Dorn water sampler, with samples collected at 5 m depth intervals. This monitoring has collected stratigraphic water quality data since 2011.

Review of Main Pit water quality monitoring (including stratification sampling) indicates that pit waters are of neutral pH (Figure 91 and Figure 92), consistent temperature, low salinity (350 $\mu\text{S}/\text{cm}$) (Figure 93 and Figure 94), and with low sulphate levels (<100 mg/L) (Figure 95 and Figure 96) (SBE 2024c). An assessment of water quality against the WQO's for aquatic ecosystems and stock watering for the Suttor River Sub-basin is summarised in Table 45. As a water body, Main Pit it is lower in dissolved oxygen than for a healthy lake environment, and similar to other parts of the site, elevated arsenic occurs (Figure 97 and Figure 98), with trace copper and zinc (though at trace levels) (SBE 2022).

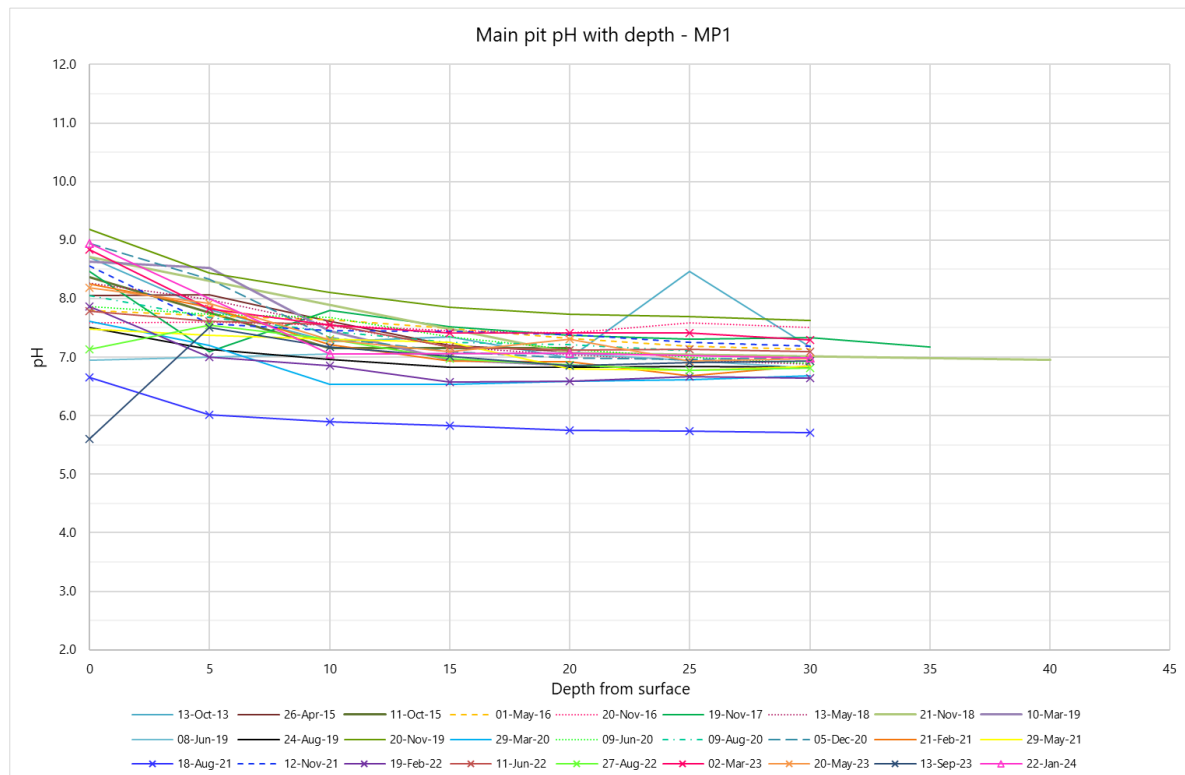


Figure 91: Main Pit pH concentrations with depth at 'MP1' (SBE 2024c)

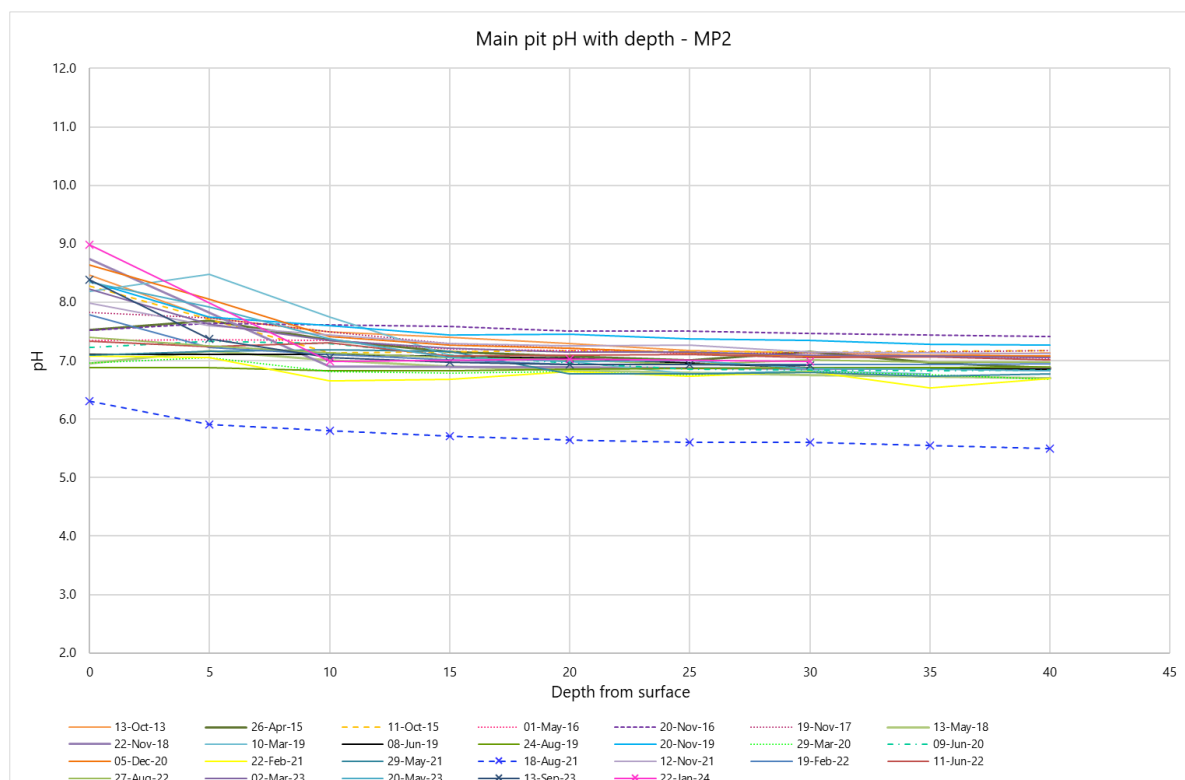


Figure 92: Main Pit pH concentrations with depth at 'MP2' (SBE 2024c)

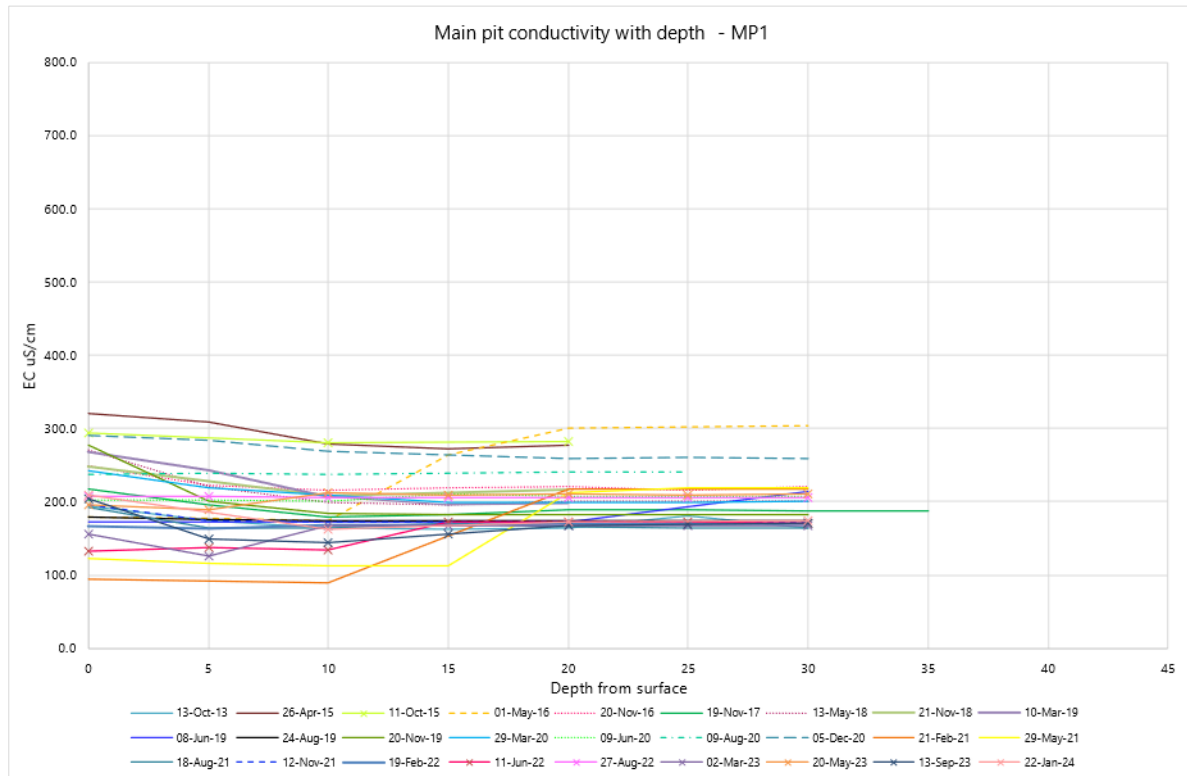


Figure 93: Main Pit EC concentrations with depth at 'MP1' (SBE 2024c)

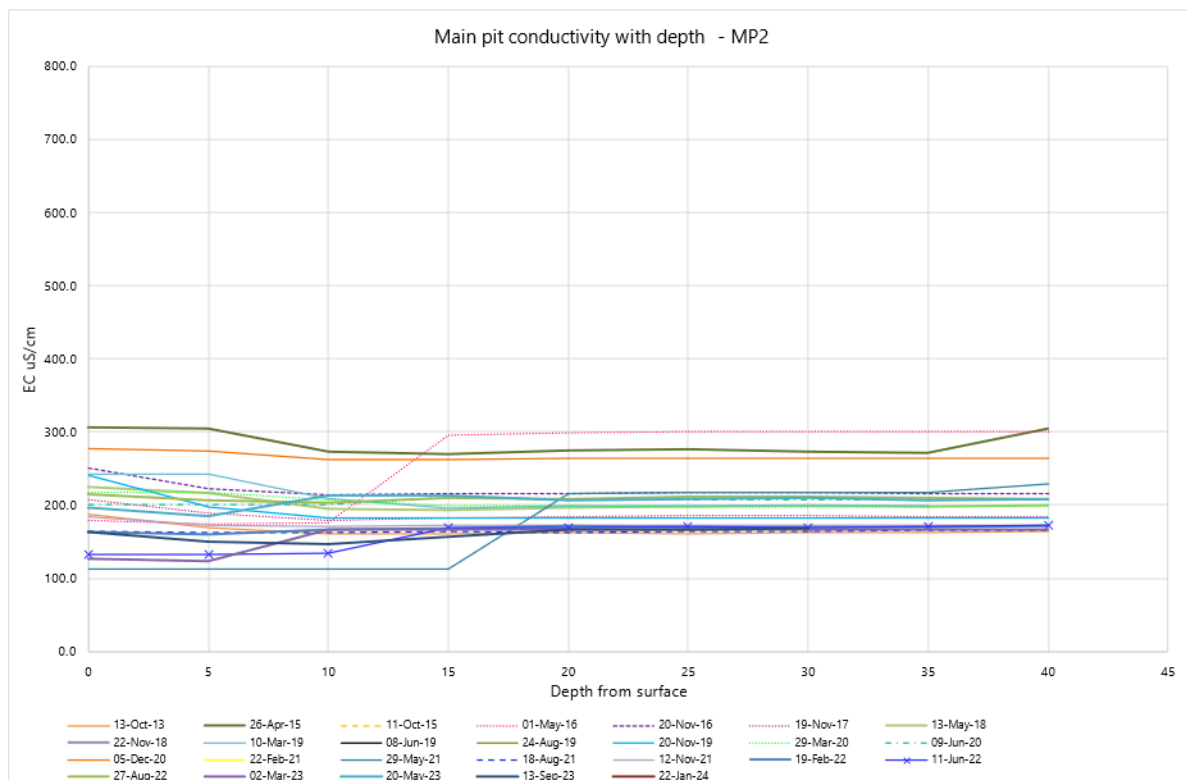


Figure 94: Main Pit EC concentrations with depth at 'MP2' (SBE 2024c)

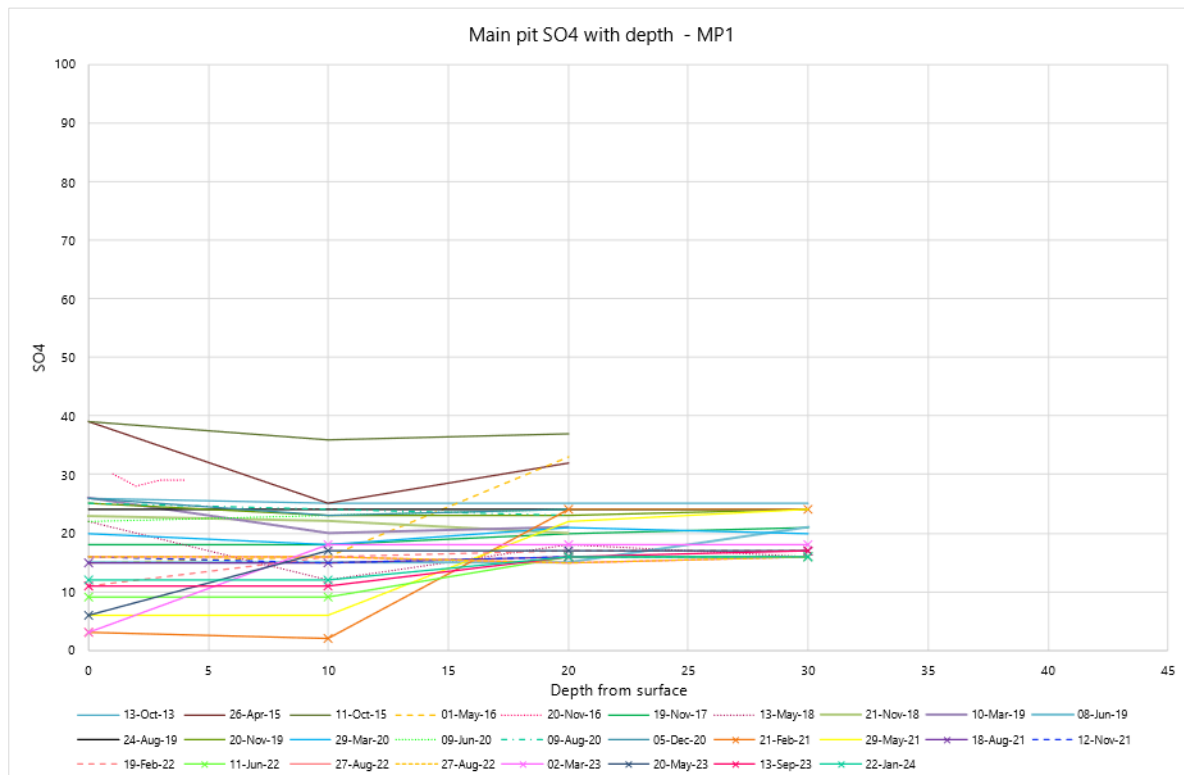


Figure 95: Main Pit sulphate concentrations with depth at 'MP1' (SBE 2024c)

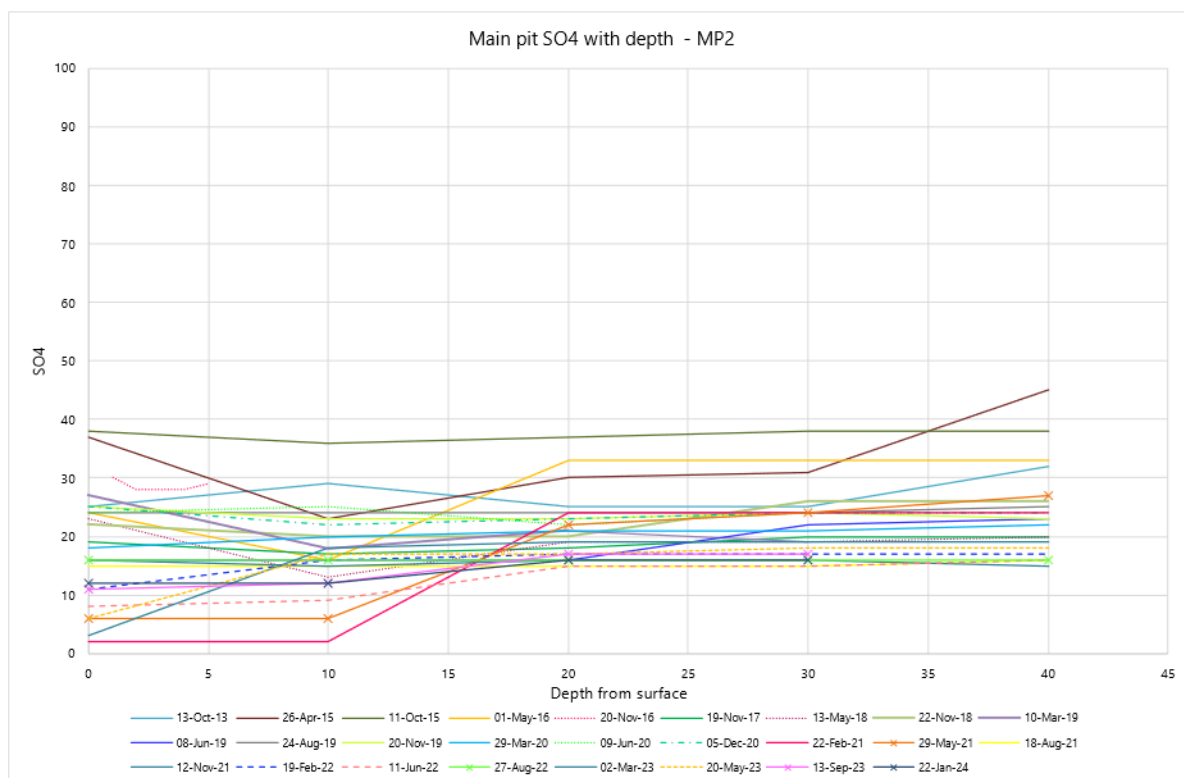


Figure 96: Main Pit sulphate concentrations with depth at 'MP2' (SBE 2024c)

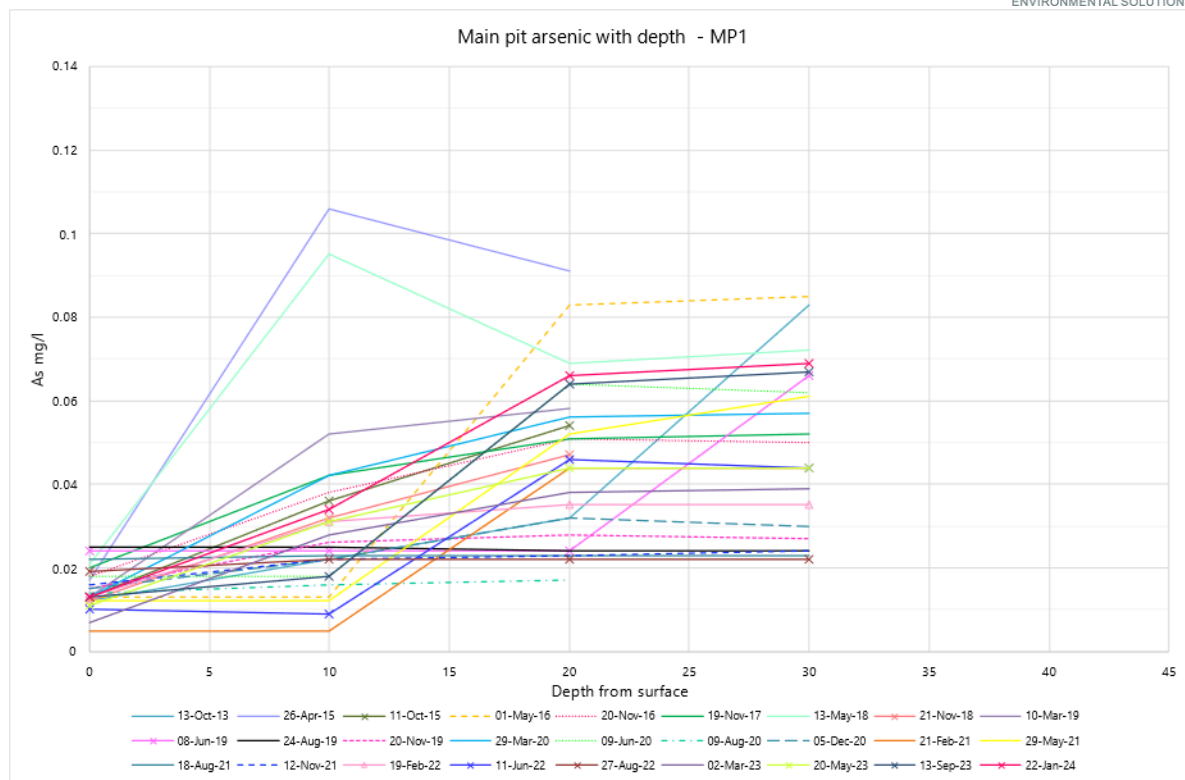


Figure 97: Main Pit arsenic concentrations with depth at 'MP1' (SBE 2024c)

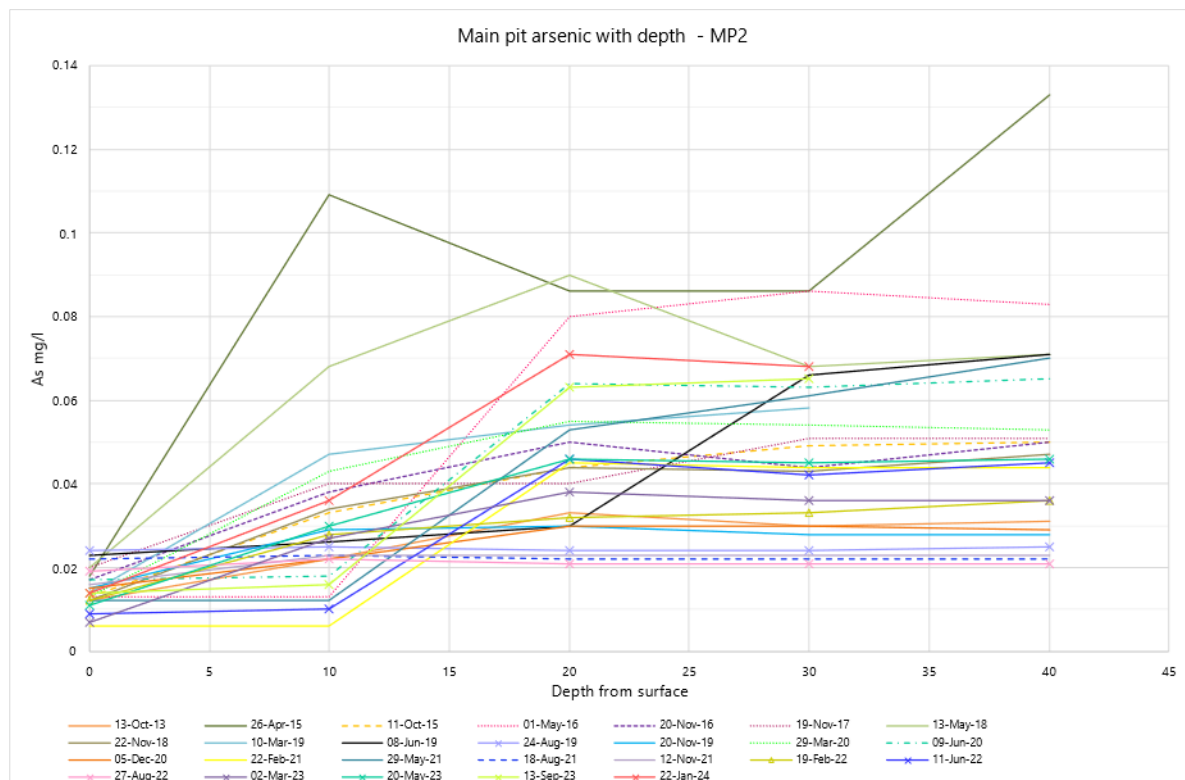


Figure 98: Main Pit arsenic concentrations with depth at 'MP2' (SBE 2024c)

Main Pit water quality data indicates complete mixing of the water column across all parameters, with river and groundwater inflows resulting in increased oxygenation and mixing of waters (SBE 2022). Wind is present throughout the year across the pit lake surface, and there are strong temperature differentials throughout the year, creating conditions conducive to mixing and oxygenation of the water column (SBE 2022). Any future potential of stratification of Main Pit waters is considered unlikely (SBE 2022).

Table 45: Summary of water quality trends for Main Pit water and receiving environment (SBE 2022;SBE 2024a) ¹

Parameter	Pit water	Receiving environment
pH	Stable and average Slightly alkaline at the surface. Single event in 2021 with pH of 6, but not repeated in any subsequent events and may be an error or an anomaly. Ph at the surface is typically within the range for protection of aquatic ecosystem values in low flow and high flow events and with depth for stock watering (WQ1204).	Stable and predominately within normal ranges.
Temperature	Stable and average	-
Sulphate	<30-40 mg/L. Sulphate is meets the WQOs for both aquatic ecosystems and stock watering (WQ1204).	<50mg/L.
Electrical conductivity	<350 μ S/cm. EC meets the WQOs for both aquatic ecosystems and stock watering (WQ1204).	1300 and <200 μ S/cm.
Dissolved oxygen	10 mg/L	N/A
Arsenic	Elevated <0.07 mg/L at depth of over 20 m. At the surface is stable and typically within the range for protection of aquatic ecosystem values in low flow and high flow events and with depth for stock watering (WQ1204).	Not detected to detection limit. Meets the WQOs for aquatic ecosystems (WQ1204).
Cadmium	Not detected to detection limit	Not detected to detection limit. Meets the WQOs for both ecosystems (WQ1204).
Copper	Elevated to trace levels. At the surface is typically within the range for protection of aquatic ecosystem values in low flow and high flow events and with depth for stock watering (WQ1204).	Not detected to detection limit. Meets the WQOs for aquatic ecosystems (WQ1204).
Lead	Not detected to detection limit. Meets the WQOs for both aquatic ecosystems and stock watering (WQ1204).	Not detected. Meets the WQOs for aquatic ecosystems (WQ1204).
Mercury	Not detected. Meets the WQOs for both aquatic ecosystems and stock watering (WQ1204).	Not detected. Meets the WQOs for aquatic ecosystems (WQ1204).

Parameter	Pit water	Receiving environment
Molybdenum	Not detected to detection limit. Meets the WQOs for both aquatic ecosystems and stock watering (WQ1204).	Not detected. Meets the WQOs for aquatic ecosystems (WQ1204).
Selenium	Not detected to detection limit. Meets the WQOs for both aquatic ecosystems and stock watering (WQ1204).	Not detected. Meets the WQOs aquatic ecosystems (WQ1204).
Zinc	Elevated to trace levels. At the surface is typically within the range for protection of aquatic ecosystem values in low flow and high flow events and with depth for stock watering (WQ1204).	Not detected to detection limit. Meets the WQOs aquatic ecosystems (WQ1204).

1. Environmental Protection (Water and Wetland Biodiversity) Policy 2019 Suttor River Sub-basin Environmental Values and Water Quality Objectives (EPPD & DES 2022).

3.5.12.5 Void water levels

East Hill Pit

A continuous water level logger was installed into East Hill Pit in November 2023 to monitor responses to rainfall and evaporation within the pit (SBE 2024b). Monitoring indicates a weak response to rainfall with water levels showing a decline consistent with evaporation rates (Figure 99).

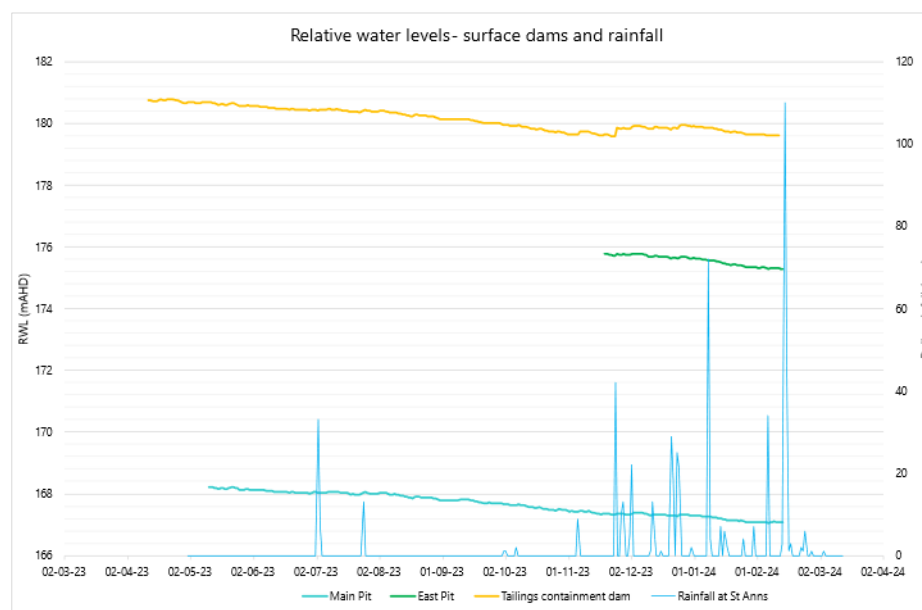


Figure 99: Water level logger monitoring data and rainfall events (SBE 2024b)

Main Pit

A continuous water level logger was installed into Main Pit in May 2023 to monitor responses to rainfall and evaporation within the pit. There have not been any occurrences of connection with the Suttor River since installation. Main Pit levels show limited response to rain recorded at St Ann's (Figure 99), which is as expected given the limited catchment and containment of water in Main Pit in non-flood conditions.

Since May 2023, Main Pit water levels have declined from 168.2 mAHD to 167.1 mAHD. The rate of water level decline in Main Pit is slower when compared to what is reported at East Hill Pit and in the TSF (SBE 2024c). This suggests and supports the predictive modelling that groundwater inflows are sustaining water levels, buffering water level decline resulting from evaporation. Comparative rates of decline are shown in Figure 100 across all records available, noting TSF shows strong response to rainfall).

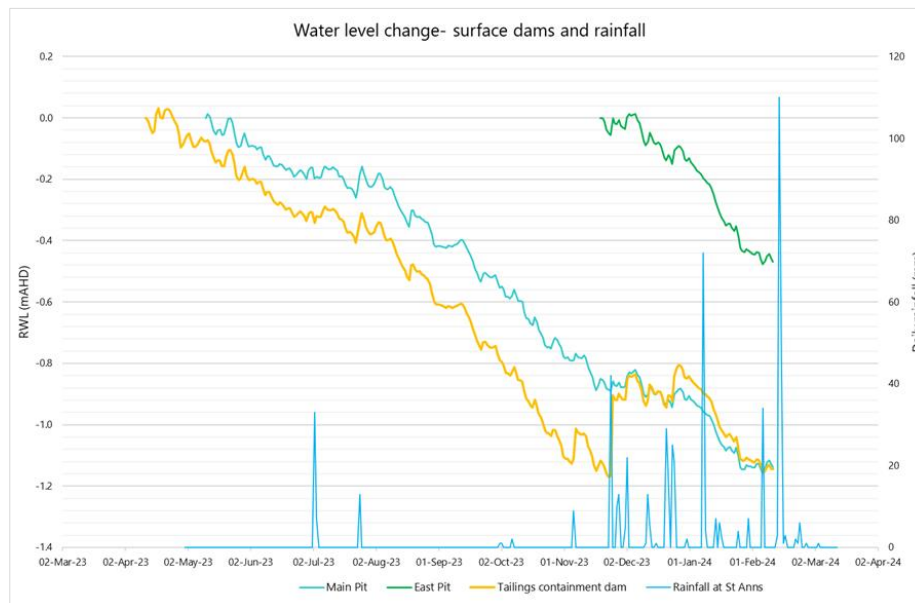


Figure 100: Change in water level at Main Pit, East Hill Pit and TSF (SBE 2024b)

3.5.12.6 Main Pit and Suttor River conceptual model

The conceptual model is shown on Figure 67. The Main Pit is located within 80 m to the East of the Suttor River, adjacent to a braid of a Suttor River channel. Direct connectivity between Main Pit waters and the Suttor River is established if the Suttor River reaches a sufficient height (SBE 2022; SBE 2024c), with two spillways permitting inflows and outflows with the Suttor River as part of the 'flushing pit' design. There is no groundwater connection between Main Pit and the Suttor River alluvials. River inflows to Main Pit are established when the height of the Suttor River reaches 3.8 m, or when flow elevation is established at 169 mAHD at Yandan (SBE 2022; SBE 2024a). This is equivalent to a 5-25% AEP flood event. Main Pit does not overflow outside of these events, due to the limited catchment. Pit water undergoes mixing before any water leaves the site.

River height records for the Project are inferred from the St Ann's gauging station, located downstream from the Project on the Suttor River. Based on a river height records, connectivity between Main Pit and the Suttor River has occurred eight times since the establishment of the flushing pit design (i.e. in 2001, 2003, 2004, 2007, 2011, 2023 and 2023) (SBE 2024c).

Water quality monitoring of pit water and the receiving environment demonstrate the success of the flushing pit rehabilitation approach applied to Main Pit. It is considered that the water cover has successfully managed the risk of materials exposure in the pit, while being relatively self-sustaining and suitable as a long-term strategy (SBE 2022). Given the success of this rehabilitation approach, the water cover is proposed to be maintained post-closure.



Figure 101: Main Pit inflows during flooding of the Suttor River in February 2020

Model validation

The conceptual flood model, including interactions between Main Pit and Suttor River and Yandan Creek have been validated against observations during flood events. In early 2023, the Project experienced a flood event, where the Suttor River began rising on the 14th of January, peaked on the 21/22nd January, and quickly receded back within a week. St Anns gauge on the Suttor River recorded a peak flow rate of 1,000 m³/s (or 1 ML/s). Remote imagery using a normalised difference water index was acquired on 19th January 2023 which shows connection between Main Pit and the Suttor River and Yandan Creek, indicating the system is performing as designed. This flood event was consistent with a 2.5-5% AEP flood event. The observed elevation, water flow volume, and AEP align with modelled predictions and provides validation of the system model.

3.5.12.7 Main Pit release

Mixing model

Given the existing pit water quality, minimal mixing is required with site or river water to meet receiving environment requirements (SBE 2022). Further due to landform design, water releases will only occur during high flow events (in excess of 500 m³/s) when flood waters from the Suttor River and Yandan Creek reach a height of 169 mAHD.

A mixing model for connection events has been developed by SBE (2024a) to predict the water quality at 500 m³/s. The mixing model presents the 'worse case' scenario with the period of greatest concentration model. The mixing model confirms even conservative (or worst-case scenario of known concentrations) mixing meets toxicant and water health guidelines for a slight to moderate environment, and generally either meets or is lower than measured as ambient conditions and background.

Table 46: Project mixing model outcomes

Flow in Suttor River at 169.05mAH	500	m3/s								
Flow over spillway from pit to Suttor	2.7	m3/s								
Total flow downstream of Main Pit	502.7	m3/s								
Parameter	Historical background	Gauge background	99th % in event background river quality	1st % in event background river quality	Selected background value for mixing	99th % in pit lake (all depths)	1st % in pit lake (all depths)	Basic mixing model outcome (for MP/Suttor)	Toxicant limits (95% slightly disturbed) or ADWG* for freshwater uS/cm mg/l	Fit to background water quality
pH	7.1-8.8		8.0	7.3	7.6	8.9	5.6	7.6	6.5-8.5*	Aligns to background and ADWQ
Electrical conductivity (EC)	Not detected	<1,000	617	153	10	304	106	11.6	420*	Aligns to background and ADWQ
Sulphate	<11		5.8	ND	8	39	2	8.2	250*	Aligns to background and ADWQ
Arsenic	0.002-0.004		0.003	ND	0.003	0.103	0.006	0.004	0.024	Aligns to background and underneath FW toxicant limit
Cadmium	Not detected		0.0002	ND		ND	ND		0.0002	Not detected in pit, below background. River background similar to FW toxicant limit
Copper	0.007-0.015		0.004	ND	0.004	0.008	ND	0.004	0.0014	Above FW toxicant limit, however within historical and river background
Lead	Not detected		0.003	ND	0.003	0.004	ND	0.003	0.0034	Aligns to background and below FW toxicant limit
Mercury	Not detected		0.0005	ND		ND	ND		0.00006	Not detected in pit, below background. River background similar to FW toxicant limit
Molybdenum	Not detected		0.009	ND		ND	ND		0.034	Not detected in pit, below background. River background well below to FW toxicant limit
Selenium	Not detected		0.004	ND	0.004	0.01	ND	0.004	0.005	Aligns to background and below FW toxicant limit
Zinc	0.008-0.05		0.055	ND	0.008	0.053	ND	0.008	0.008	Below background and aligns to FW toxicant limit

Release events

The mixing model developed for Main Pit releases is supported by monitoring records from actual connection events. Connection between the Suttor River and the Suttor River has occurred on eight occasions over the past 25 years. Metal concentrations, pH and EC recorded during three connection events have been compared to the water quality of upstream and downstream locations (Table 47, Figure 102 and Figure 103)

Key observations from the reconciliation include:

- Arsenic is generally present in background, and quality downstream is either matched or slightly less after mixing.
- Cadmium, mercury and selenium are generally not present.
- Copper, and zinc are variably present (as we see in pit lake quality) – but when detected can be in background/upstream flow and downgradient flow at similar levels.
- Lead is generally not detected (generally not detected in pit water), but when present is recorded in background and downstream waters.
- Nickel may or may not be present in upstream/background waters but is generally not detected downstream.

Review of results demonstrates there is no detectable change or impact to water quality for the Suttor River through mixing of Main Pit lake water during periods of connection.

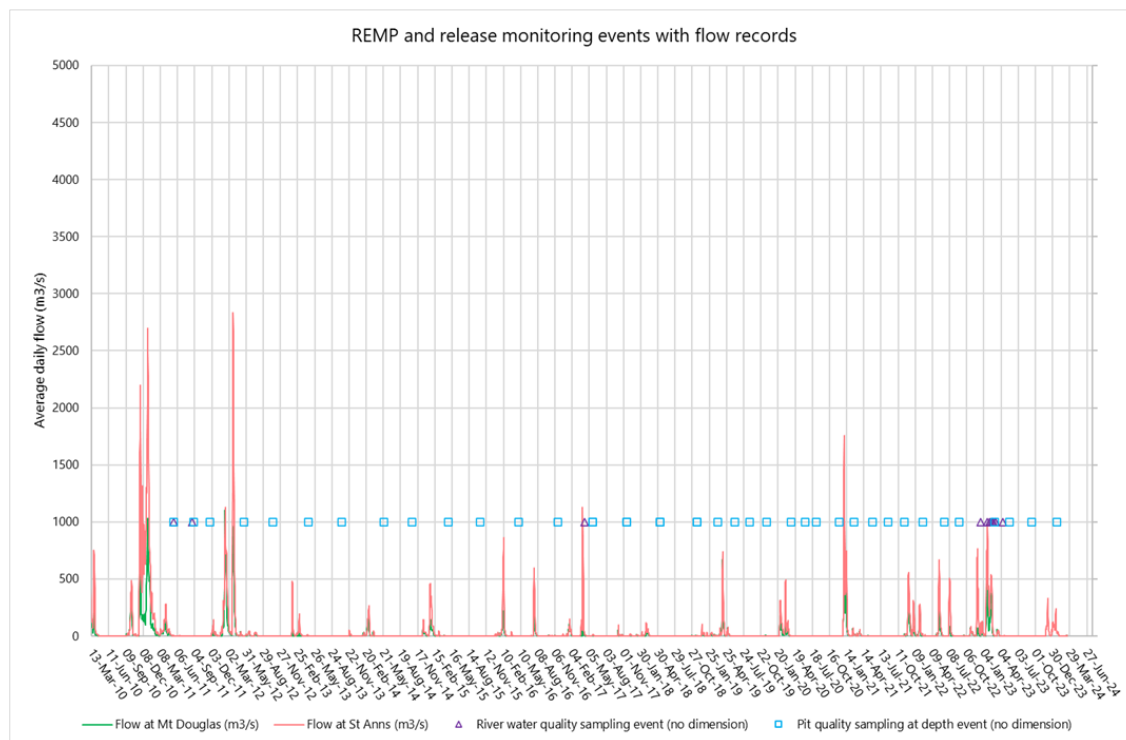


Figure 102: Release monitoring events and timing of monitoring (SBE 2024a)

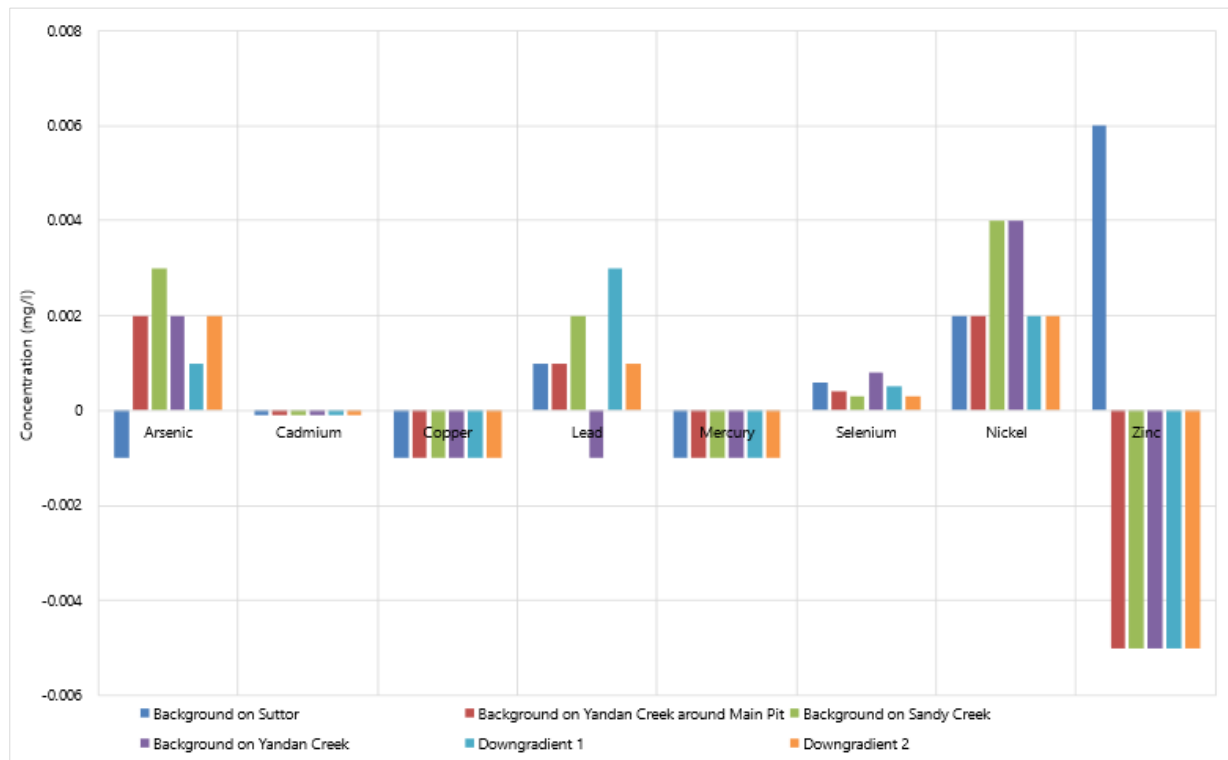


Figure 103: Reconciliation of 3 connection events - Metals (SBE 2024a)

Table 47: Water quality from Main Pit – Suttor River connection events (SBE 2024a)

Event Count	Date	Site	Site location	pH	EC	SO4	Aluminium	Arsenic	Cadmium	Copper	Lead	Mercury	Selenium	Nickel	Zinc
Event 1	18-May-11	REMP4-SR1	Downgradient 1	8.32	1330	22									
	23-Aug-11	REMP4-SR1	Downgradient 1	8.05	1620	5									
Event 2	10-Apr-17	REMP1-SR3a	Background on Suttor	7.36	152	2	0.95			0.004					0.055
	16-Apr-17	REMP4-SR1	Downgradient 1	7.37	152	4	0.98	0.002		0.004	-0.001			0.003	0.038
Event 3	19-Dec-22	REMP2	Background on Sandy Creek			1	0.218	-0.001	-0.0001	-0.001	-0.002	-0.001	-0.0002	0.003	0.006
	19-Dec-22	REMP3-SR4	Background on Yandan Creek			1	-0.005	0.003	-0.0001	-0.001	-0.001	-0.001	-0.0002	0.004	-0.005
	23-Jan-23	REMP4-SR1	Downgradient 1	7	128	-1		0.001		0.004				-0.002	
	01-Feb-23	REMP4-SR1	Downgradient 1	7.28	177	-1	0.12	0.002	-0.0001	0.001	-0.001	-0.0001	-0.0001	-0.002	-0.005
	10-Feb-23	REMP4-SR1	Downgradient 1	7.13	144	-1	0.11	0.002	-0.0001	0.001	-0.001	-0.0001	-0.0001	-0.002	-0.005
Event 4	16-Feb-23	REMP3-SR4	Background on Yandan Creek	7.42	567	3	0.02	0.001	0.0002	0.002	-0.001	-0.0001	-0.01	-0.002	-0.005
	16-Feb-23	REMP4-SR1	Downgradient 1	7.47	148.4	4	0.04	0.002	-0.0001	0.003	-0.001	-0.0001	-0.01	-0.002	-0.005
Event 5	22-Feb-23	REMP1-SR3a	Background on Suttor	7.66	181.8	-1	0.1	0.003	-0.0001	0.004	0.003	-0.0001	-0.01	-0.002	0.008
	22-Feb-23	REMP3-SR4	Background on Yandan Creek	8.02	620	-1	0.02	0.001	-0.0001	0.001	-0.001	-0.0001	-0.01	0.003	-0.005
	22-Feb-23	REMP4-SR1	Downgradient 1	7.42	185.5	-1									
	22-Feb-23	REMP4-SR1	Downgradient 1	7.42	208.1	2	0.01	0.002	-0.0001	0.001	-0.001	-0.0001	-0.01	-0.002	-0.005
Event 6	05-Mar-23	REMP1-SR3a	Background on Suttor	7.31	220.7	2	0.02	0.002	-0.0001	0.002	-0.001	-0.0001	-0.01	-0.002	0.006
	05-Mar-23	REMP4-SR1	Downgradient 1	7.41	228.4	-1	0.02	0.002	-0.0001	0.001	-0.001	-0.0001	-0.01	-0.002	-0.005
	05-Mar-23	REMP4-SR1	Downgradient 1	7.38	215.5	2	0.02	0.002	-0.0001	0.001	-0.001	-0.0001	-0.01	-0.002	-0.005
	05-Mar-23	REMP5-SR2	Downgradient 2	7.42	230.8	2	0.02	0.002	-0.0001	0.002	-0.001	-0.0001	-0.01	-0.002	-0.005
Event 7	13-Apr-23	REMP1-SR3a	Background on Suttor	7.5	186.2		0.24	0.001	-0.0001	0.002	-0.001	-0.0001	-0.01	-0.002	-0.005
	13-Apr-23	REMP4-SR1	Downgradient 1	7.3	187.4	7	0.01	0.001	-0.0001	0.001	-0.001	-0.0001	-0.01	-0.002	0.007
	13-Apr-23	REMP4-SR1	Downgradient 1	7.45	255.7	3	0.01	0.002	-0.0001	0.002	-0.001	-0.0001	-0.01	-0.002	0.008
	13-Apr-23	REMP5-SR2	Downgradient 2	7.45	238.2	3	0.19	0.002	-0.0001	0.002	-0.001	-0.0001	-0.01	-0.002	0.024
Event 8	15-Apr-23	REMP1-SR3a	Background on Suttor			4	0.379	-0.001	-0.0001	-0.001	0.001	-0.001	0.0006	0.002	0.006
	15-Apr-23	REMP6	Background on Yandan Creek around Main Pit			3	0.007	0.002	-0.0001	-0.001	0.001	-0.001	0.0004	0.002	-0.005
	16-Apr-23	REMP2	Background on Sandy Creek			1	0.024	0.003	-0.0001	-0.001	0.002	-0.001	0.0003	0.004	-0.005
	16-Apr-23	REMP3-SR4	Background on Yandan Creek			6	0.058	0.002	-0.0001	-0.001	-0.001	-0.001	0.0008	0.004	-0.005
	16-Apr-23	REMP4-SR1	Downgradient 1			3	0.264	0.001	-0.0001	-0.001	0.003	-0.001	0.0005	0.002	-0.005
	16-Apr-23	REMP5-SR2	Downgradient 2			3	0.204	0.002	-0.0001	-0.001	0.001	-0.001	0.0003	0.002	-0.005

3.5.13 Tailings and processing facilities

Mining waste materials on the Project comprise the tailings stored in the Yandan Tailings Dam (comprising Cell A and Cell B) and low-grade ore within the HLP. Both waste containment structures were operated during the 1990s and are currently non-operational. HLP

Geochemical characteristics of the tailings material within TSF Cell A, Cell B and the low-grade ore within the HLP are described below.

3.5.13.1 Tailings management facilities

The Yandan Tailings Dam (comprising Cell A and Cell B) was operated between 1993 – 1998, with an estimated 7,500,000 tonnes (t) of tailings pumped into the facility during this time (HLA-Environmental 2000). It is estimated that 2,900,000 t and 4,600,000 t of tailings are stored within Cell A and Cell B, respectively (RGS 2021).

Tailings deposition into Cell A was exclusively from the processing of oxidised ore, with no known tailings from sulphide ore deposited into this facility (HLA-Environmental 2000). Therefore, there is no potential for acid producing tailings from Cell A.

Cell B of the tailings dam is predominantly an oxide tailings dam, containing also a small proportion of sulphide tailings. The original Environmental Management Overview Strategy estimated that sulphide ore was likely to represent less than 15 % of the total mined ore on-site (Ross Mining N.L 1992). Over the operational life of Cell B, a sequence of oxide then sulphide and then oxide tailings were deposited (Scott 2000). As such deposition of sulphide ore is limited to the upper portion of TSF Cell B, with this underlain and overlain in most areas by oxide tailings. Material characterisation

Cell B

Geochemical assessments of Cell B tailings material have been undertaken on multiple occasions since the TSF's decommissioning. Recent assessments have been completed by RGS Environmental Pty Ltd (RGS) (2015) and O'Kane Consultants Pty Ltd (O'Kane Consultants) (2019), with a subsequent review of results from the 2015 assessment also completed by RGS in 2021 (RGS 2021). Since the initial submission of the transitional PRCP in 2022, a further geochemical assessment has been undertaken by RGS (2022) and the results are discussed in this section further below.

Recent assessments have included:

- RGS Environmental Pty Ltd (RGS) 2015 Report:
 - 85 tailings and soil samples from TSF Cell B (Figure 104). Soil sampling included samples taken from the cover trial sites. Analysis included static geochemical and physical analysis, kinetic geochemical analysis.
- O'Kane Consultants Pty Ltd (O'Kane Consultants) (2019):
 - 2 test pits excavated on the field trial area on the northern area of TSF Cell B and the TSF Cell B surface. Analysis included stratigraphy, in-situ chemical analysis, physical analysis. Further test pitting to confirm the suitability of rehabilitation materials.
- RGS 2022 Report (RGS 2022)
 - 9 tailings samples from across TSF Cell B (Figure 105). Additional analysis for field permeability measurements, static geochemical analysis, physical analysis, and kinetic geochemical analysis.

RGS completed a comprehensive geochemical assessment of Cell B in late 2014, collecting 85 tailings (oxide and sulphide) and soil samples (RGS 2015) (refer to Figure 104). Soil sampling included samples taken from the cover trial sites monitored as part of the Rehabilitation Monitoring Program.

Material characterisation (using static) methods involved the following (RGS 2015):

- pH (1:5 w:v);
- Electrical Conductivity (EC) (1:5 w:v);
- Total sulphur [LECO Australia Pty Ltd (LECO) high temperature method];
- Acid Neutralising Capacity (AMIRA 2000);
- Net Acid Producing Potential (NAPP);
- Chromium reducible sulphur testing (Scr) [AS 4969.7-2008 method] (n=43);
- Net acid generating (NAG) analysis (n=26);
- Total metals (aluminium (Al), arsenic (As), cadmium (Cd), chromium (Cr), cobalt (Co), copper (Cu), iron (Fe), mercury (Hg), lead (Pb), manganese (Mn), molybdenum (Mo), nitrogen (N), nickel (Ni), antimony (Sb), selenium (Se), vanadium (V), zinc (Zn)) in solids [hydrochloric acid (HCl) and nitric acid (HNO₃) acid digest followed by ICP-AES and selected ICP-MS] (n=13);
- Total mercury [Flow Injection Mercury System method] (n=13);
- Total cations (calcium (Ca), magnesium (Mg), sodium (Na), potassium (K)) and Exchangeable cations (Ca, Mg, Na, K) (n=13);
- 1:5 (solid to water) water soluble metals (Al, As, Cd, Cr, Co, Cu, Fe, Hg, Pb, Mn, Mo, N, Ni, Sb, Se, V, Zn) by ICP-AES or ICP-MS (n=13);
- 1:5 (solid to water) water soluble metals (Ca²⁺, Mg²⁺, K⁺, Na⁺, Cl⁻, SO₄²⁻, pH, EC, alkalinity and acidity) (n=13);
- Cation Exchange Capacity (eCEC) (n=7);
- Exchangeable Sodium Percentage (ESP) (n=7).

Kinetic leach column (KLC) test methods were undertaken to verify the results of the static testing (as above), quantify the rate of sulphide oxidation and acid consumption, and for the prediction of potential mine drainage quality (RGS 2015).

Kinetic test methodology broadly involved (RGS 2015):

- Sample classification, in terms of -
 - Total Sulphur (TS) > 0.3 %;
 - NAPP >10 kg H₂SO₄/tonne;
 - Acid Neutralising Capacity (ANC) / Maximum Potential Acidity (MPA) ratio <1;
- Standard KLC Test Cells (using 2 kg sample); and
- Large KLC Test Cells (using 20 kg sample).

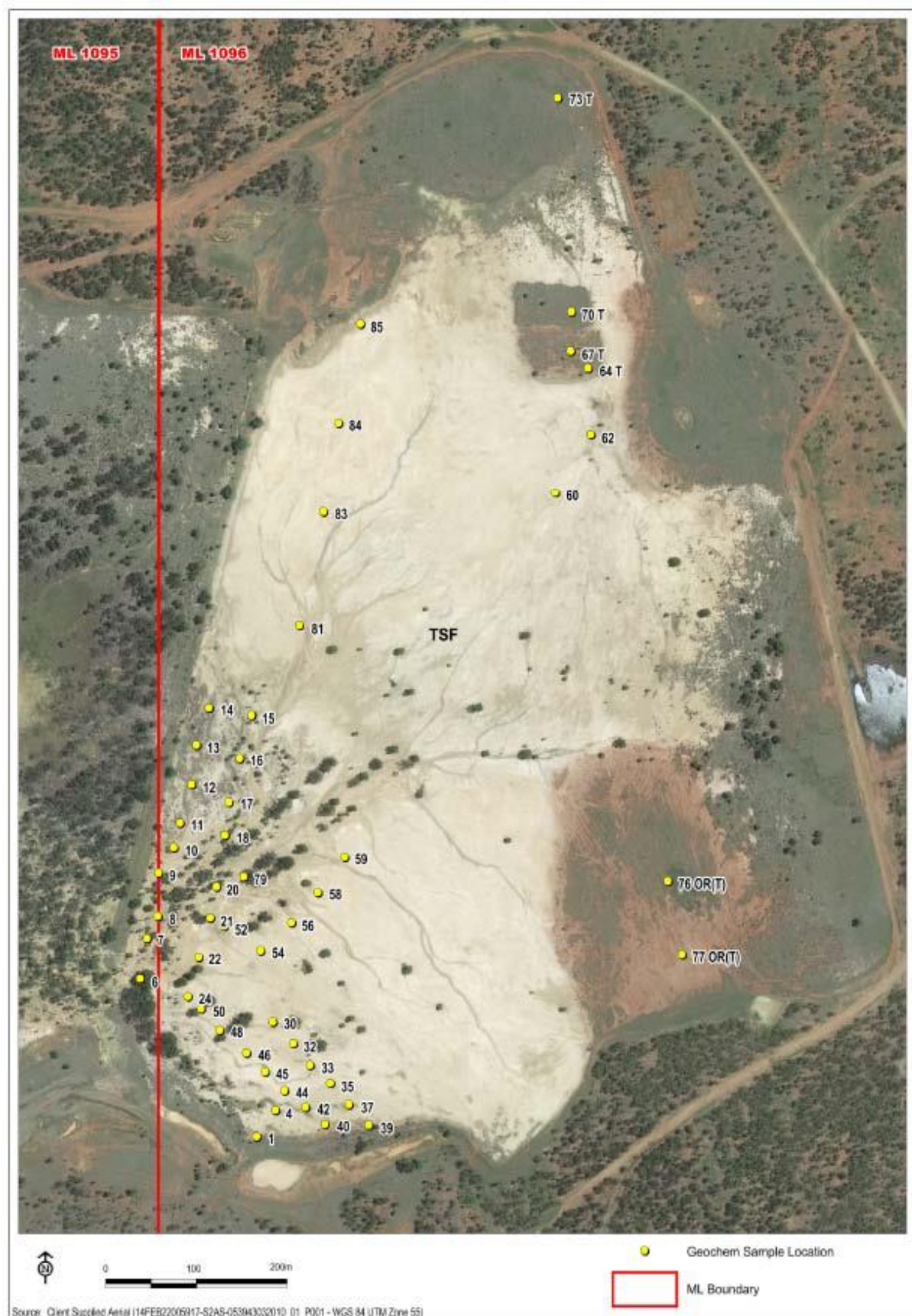
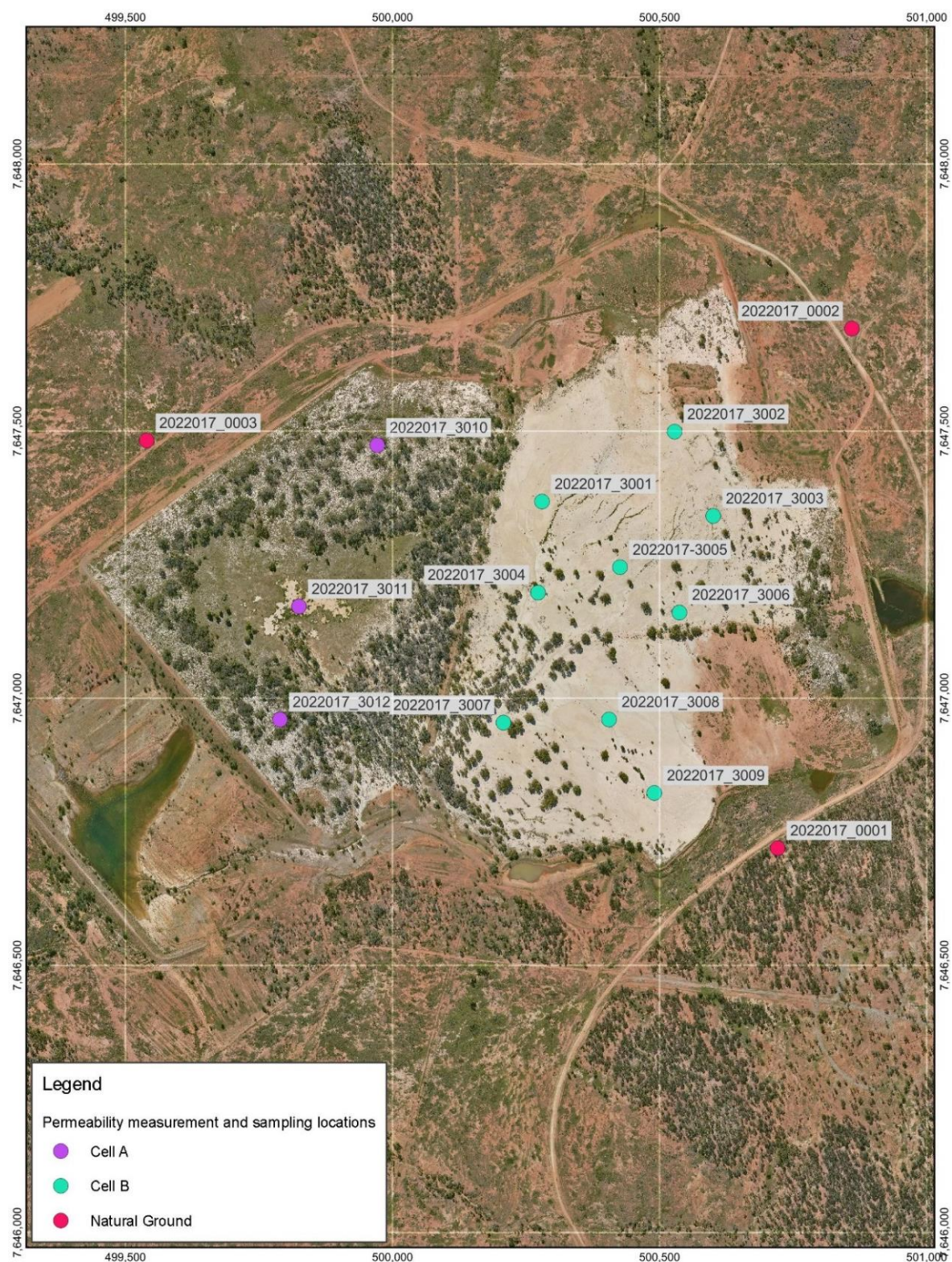


Figure 104: Sample points from the geochemical assessment (RGS 2015)



Source: GBM Resources Ltd

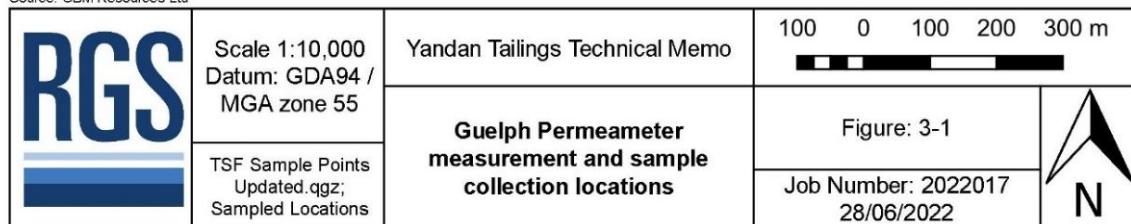


Figure 105: RGS 2022 sampling locations

Static test results

Salinity (EC) values for the 85 samples collected from Cell B varied from 159 – 2,950 $\mu\text{S}/\text{cm}$, with the oxide tailings paste EC ranging from 600 – 2,950 $\mu\text{S}/\text{cm}$, and the sulphidic tailings paste EC ranging from 600 – 2,400 $\mu\text{S}/\text{cm}$ (RGS 2015). The average salinity for tailings and soil samples was 1,498 $\mu\text{S}/\text{cm}$ and 1,017 $\mu\text{S}/\text{cm}$, respectively (RGS 2015). A small minority of samples (10 of 85) had low to moderate salinity, exceeding 3,000 $\mu\text{S}/\text{cm}$. It is noted that water extracts with an EC of < 2,000 $\mu\text{S}/\text{cm}$ are considered suitable for irrigation, and that the majority (75 of 85) samples fell within this category (RGS 2015). It is noted that this is also below the known threshold at which soil salinity may impact agronomic plants (Hazelton & Murphy 2007), and well within the threshold at which salinity may affect beef cattle (ANZECC & ARCENZ 2000). These results support that the tailings material is of low to moderate salinity.

Most trace metals/metalloids were low compared with average crustal abundance, being below the Laboratory Limit of Reporting value and the livestock drinking water guideline (ANZECC & ARCENZ 2000). A limited number of samples provided minor exceptions, with some exceedances of Al, Cd, Fe, and Mn identified (RGS 2015). It is considered unlikely that dissolved metal/metalloid concentrations from the soil and tailings material would impact surface and groundwater resources (RGS 2015). These results support that the tailings material is of low reactivity.

Material Classification Methods

All tailings have been classified as NAF. The material classification methods are set out below.

Total sulphur (TS) testing supports that the sulphide minerals have undergone significant or complete oxidation, resulting in essentially no residual sulphide minerals present within the top 600 mm of tailings (RGS 2015). TS measurements for all sulphur species (e.g. organic S, sulphide S, sulphate minerals) indicated a TS range of 0.02 – 0.53%, with the majority of samples having a TS < 0.4 %. Sulphide sulphur (SS) testing was conducted to verify the proportion of SS present in the TS mass; as TS can overestimate the MPA of a sample (RGI 2015). SS testing verified that the concentration of SS in the material is effectively zero, with a chromium reducible sulphur (CRS) % < 0.005%.

Material classification methods typically use the Acid Base Account (ABA) scheme to classify whether mine waste samples are potentially acid forming (PAF) (Table 48). This standard scheme is used to determine whether material has the potential to produce acidity from sulphide oxidation at some point in the future. Under this classification scheme, all 85 samples were classified as 'barren', indicating that the tailings material is NAF. Any future very low acid forming potential would come from the pore water or secondary minerals, such as Jarosite (Williams 2021). Again, this supports that the material is of low reactivity, and confirms that there is no PAF material present.

Table 48: Standard ABA Classification Criteria typically used for material classification

Geochemical Classification	Sulfide Sulfur ¹ (%)	NAPP (kg H ₂ SO ₄ /t)	ANC:MPA Ratio
Barren ²	≤ 0.1	-	-
Acid Consuming	> 0.1	> -50	≥ 2
Non-Acid Forming	> 0.1	≤ 0 and -50	≥ 2
Potentially Acid Forming - Low Capacity	> 0.1	> 0 and ≤ +10	< 2
Potentially Acid Forming-Moderate Capacity	> 0.1	> +10 and ≤ +50	< 1
Potentially Acid Forming – High Capacity	> 0.1	> +50	< 1

Notes:

1. If total sulfur or sulfide sulfur is less than or equal to 0.1 %, the NAPP and ANC: MPA ratio is not required for material classification as the sample is essentially barren of oxidisable sulfur.
2. A sample classified as NAF can be further described as 'barren' if the total sulfur and/or sulfide sulfur content is less than or equal to 0.1 per cent, as the sample essentially has negligible acid generating capacity from future sulfide oxidation.

Given the tailings material has already weathered/oxidised *in situ*, pH criteria have been used to describe the samples in terms of their Acid Forming Potential (AFP), as per Table 49. Under the existing APF classification

method, soil and tailings samples from Cell B are classified as having a low acid forming potential (LAPF). The measured acidity of the samples was considered quite low, with an average measured acidity of 19 mg/L.

Table 49: pH Classification Criteria – Existing Acid Forming Samples

Existing Acid Forming Potential (AFP) (Sulfide minerals have oxidised and acid neutralising capacity is consumed)		AFP Criteria
No Acid Forming Potential	Inert	pH 6 to 7
Low Acid Forming Potential	LAFP	pH 4 to 6
Mild Acid Forming Potential	MAFP	pH 3 to 4

Based on the above classification methods, all tailings materials were classified as NAF (with no potential to produce acid through sulphide oxidation) and being inert and having a LAFP (i.e. dominated by pH values of 4 - 6) (RGS 2015). Other methods have further determined that the salinity values of the material are low (meeting relevant guideline values). Dissolved metal/metalloid concentrations of the tailings material are also low and are considered unlikely to impact upon surface water and groundwater quality (RGS 2015).

Kinetic test results

KLC tests were conducted to provide information on the reaction kinetics of the tailings material and investigate metal release and the quality of any potential seepage from the Cell B facility. This analysis was completed in 2015 and again in 2022 (RGS).

The results from the KLC tests were used to predict the ongoing geochemical characteristics and likely quality of pore water in the TSF surface materials if these are disturbed and to assess the effectiveness of the addition of crushed limestone ('Aglime') to neutralise any existing acidity.

The KLC leach test results were considered alongside Australian water quality guideline values for livestock drinking water quality. These guidelines are provided for context only and are not intended to be interpreted as "maximum permissible levels" for site water storage or discharge. The ratio of sample to water in the KLC tests is currently approximately 3:1 for the tailing samples (i.e., concentrated), whereas the ratio of sample to water generally used in tests where results can (arbitrarily) be compared against guideline concentrations to provide relevant context is typically more than an order of magnitude more dilute at 1:5 (w/v). Whilst arbitrary comparisons against guideline concentrations can be helpful in some situations to provide relevant context, such comparisons cannot be directly extrapolated to the field situation at the Project and numerical modelling with a wider range of material balance, water balance and water quality inputs would also typically be required.

Results from the KLC tests are summarised below (RGS 2015)

Under extreme conditions isolated to laboratory testing, it was possible to produce mild acidic drainage of around pH 4 – 5 from the tailings material (RGS 2015). It is acknowledged however, that these results assume 100 % permeability and significant physical re-disturbance of the tailings, characteristics that were intentionally created for the purposes of the test and which are not present *in situ* (RGS 2015). RGS considered that the leachate sampling "has probably resulted in tailings/water interaction in the laboratory that will not occur in the field, even if the tailings mass remained uncovered" (RGS 2015). *In situ* however, the tailings material is well consolidated and essentially impermeable, and therefore it is likely that runoff is significantly greater than infiltration (RGS 2015).

RGS considered it unlikely that soluble concentrations of major ions and trace elements in the Cell B tailings material are causing chronic or acute eco-toxic impacts, noting that healthy vegetation has established in the drainage channels of the Cell B facility (RGS 2015) (Figure 106). RGS considered that the revegetation of the Cell B tailings, apart from along drainage lines (as per Figure 106 below) is likely limited by the availability of water (2015). Geochemical assessment indicates that the tailings material is of low permeability, limiting deep drainage (RGS 2015). Monitoring of the receiving environment also supports that there has been no observed contaminated seepage capable of causing environmental harm.



Figure 106: Established vegetation in the drainage channels of Cell B

Cell A

A series of geochemical test work has been undertaken on waste materials prior to rehabilitation activities at TSF Cell A. Initial geochemical testing was undertaken by Stuart and Miller Associates (1988) prior to the commencement of mining activities. It was concluded here that oxide material was likely to be non-acid forming and would not require any special disposal methods (Stuart and Miller Associates 1988). In 2000 a geochemical analysis was undertaken by Dwyer on the materials stored in Cell A and on vegetation that had naturally regenerated. Geochemical laboratory tests were conducted by Australian Laboratory Services (Brisbane). The nineteen representative waste material samples were analysed for:

- Sulphur content (total);
- pH;
- Electrical Conductivity (EC);
- Metals – copper, lead, zinc, silver, arsenic, bismuth, cadmium, cobalt, manganese, molybdenum, nickel, antimony and chromium.

Total sulphur was chosen as a conservative indicator of the acid producing potential of the tailings material. Total sulphur analysis was undertaken according to the high temperature Leco furnace method. pH and EC were calculated using a 1:5 mix of tailings to distilled water. The metals selected for analysis were chosen on the basis of element concentrations common to the Yandan deposit. Metal analysis of the tailings was undertaken by ICP optical emission spectrometry on a mixed acid digest (total extraction).

Thirteen selected samples (A5-A6, A8, A10-A19) were tested for:-

- Maximum Potential Acidity (MPA) (ALS EA-009);
- Acid Neutralising Capacity (ANC) (ALS EA-009);
- Net Acid Producing Potential (NAPP) (ALS EA-009); and
- Net Acid Generation (NAG) (ALS EA-0011);

Five samples (A15-A19) were tested (ALS EK-028A) for Weak Acid Dissociable (WAD) cyanide.

Twenty-five sites were tested, 1:5 tailings to distilled water, by the onsite laboratory for conductivity (mS), salinity (ppm) and pH at depths of 0 cm, 30 cm, 60 cm, and 90 cm.

Overall, geochemical results identify the oxide tailings as very low risk; being barren (i.e. NAF), inert, having no potential to produce acidity, and containing zero reactive material (Stuart Miller & Associates 1988; Dwyer 2000).

Given the benign nature of the material, rehabilitation options explored included direct planting into the TSF surface. To determine the suitability of the material in terms of nutritional properties for vegetation, samples were analysed for the following parameters:

- Acidity;
- Major Elements (N, P, K);
- Secondary Elements (S, Ca, Mg);
- Trace Elements (Cu, Zn, Mn, Fe, B);
- Organic Matter;
- Salinity (as EC, Na, Chloride (Cl));
- Cation Exchange;
- Exchangeable Na, K, C and Mg; and
- Ca/Mg Ratio.

Overall, the oxide tailings were found to be suitable as a growth medium. Nutritional results for the material are summarised below (Dwyer 2000):

- Nitrogen (nitrate) concentrations were found to be relatively high (157 mg/kg) at the time of sampling, compared with an optimal range of 10 – 50 mg/kg. The high concentration of nitrogen was considered to be due to the breakdown of sodium cyanide in the tailings stream. Whilst elevated, reporting indicates that elevated nitrate concentrations in livestock feed are unlikely to be detrimental to adapted animals, with feeds containing > 2,100 mg/kg fed without harm to cattle, with feeds as high as > 9,300 mg/kg of nitrate being potentially toxic to unadapted animals, but not necessarily adapted animals (Drewnoski et al 2019). It is considered that the nitrate concentrations within the tailings are unlikely to accumulate at intolerable levels for livestock.
- At the time of sampling, exchangeable sodium was on average 9.18 meq/100g, above the ideal range of <0.7meq/100g (DEECA 2023) for plant growth. More comprehensive and subsequent sampling indicates however that ESP results are on average 4.9% (RGS 2015). The oxide tailings are considered to have relatively low sodicity values and are unlikely to be susceptible to significant dispersion and erosion (RGS 2015).
- Zinc concentrations were on average 13.2 mg/kg, within typical background concentrations of 10 – 100 mg/kg and meeting general soil fertility requirements (Mertens & Smolders 2012).
- The Ca/Mg ratio of the tailings material was on average 16.21. The exchangeable Ca:Mg ratio is a key parameter of good (fertile and structurally stable) soils. If the exchangeable Ca:Mg ratio in mine waste materials is less than 4, then amelioration may be required before the materials can be used as part of a revegetation growth layer (Hazleton and Murphy 2010). As such, amelioration of the oxide tailings is for Ca/Mg is not required.
- Exchangeable potassium, calcium and magnesium all within limits of plant tolerance.

Existing grasses (comprising *Cenchrus ciliaris* (Buffel) and *Chloris spp.* (Rhodes)) growing on the surface of Cell A were also sampled and analysed for potential metal enrichment (including Cu, Pb, Ag, As, Bi, Cd, Co, Mn, Mo, Ni, Sb, Cr). Representative grass samples from surrounding areas were also analysed for comparison.

Generally, metal concentrations were comparable between grasses growing directly on the tailings, and grasses from the surrounding area. Manganese was a minor exception, with manganese concentrations found to be higher in grasses growing on the tailings (Buffel: 200 mg/kg, Rhodes: 940 mg/kg) compared to local grasses (Buffel: 46 mg/kg, Rhodes: 94 mg/kg). Recent geochemical assessments have also noted that

manganese is also elevated in water extracts (RGS 2015). Manganese concentrations in cropping plants has been found to vary significantly, being approximately 120 – 200 mg/kg for most pasture plants (Hosking *et al.* 1986). Manganese toxicity for cattle is understood to occur in diets containing > 1000 mg/kg (Jenkins & Kramer 1991) and > 2,000 mg/kg (McDowell 1992), meanwhile sheep are known to be unaffected up to 2,500 mg/kg (Paynter 1982). Impacts from elevated manganese concentrations are therefore considered to be unlikely.

Table 50: Nutrient properties of Yandan tailings (from Ross Mining N.L 2000)

Analysis	Unit	101	103	105	107	109	111	113	115	117	119	Average	Standard Deviation
pH	mg/kg	8.8	8.9	8.3	9	8.8	8.8	8.3	8.5	8.4	8.9	8.67	0.27
Nitrogen (nitrate)	mg/kg	240	2	180	250	190	90	220	110	65	230	157.70	85.40
Phosphorus	mg/kg	10	9	9	5	12	12	12	15	7	8	9.90	2.92
Potassium	mg/kg	400	130	420	400	470	210	420	380	220	520	357.00	126.23
Sulphur	mg/kg	600	57	1300	320	340	220	1000	600	510	500	544.70	368.60
Calcium	mg/kg	730	1400	2090	440	530	710	1700	1200	640	620	1006.00	562.06
Magnesium	mg/kg	45	100	40	20	20	50	85	50	20	15	44.50	28.81
Copper	mg/kg	0.5	0.4	1.9	0.3	1.1	0.6	1.2	1.6	2.2	3.4	1.32	0.98
Zinc	mg/kg	0.2	0.1	0.2	0.1	0.3	0.2	0.5	0.5	0.2	0.2	0.25	0.14
Manganese	mg/kg	2	0.6	1.2	1	0.5	1.2	1.4	8.1	2.4	0.6	1.90	2.26
Iron	mg/kg	11	4.8	15	5.9	14	8.5	16	44	17	10	14.62	11.13
Boron	mg/kg	0.2	0.2	0.4	0.1	0.3	0.2	0.5	0.3	0.2	0.2	0.26	0.12
Organic matter	%	1.2	1.2	1.2	0.9	0.5	0.4	0.5	0.9	0.8	1.2	0.88	0.32
Conductivity	dS/m	3.08	0.24	3.54	2.47	3.08	1.37	3.61	2.32	1.56	3.74	2.50	1.15
Sodium	mg/kg	2900	190	2500	2300	2800	1200	2800	2100	1100	3200	2109.00	971.10
Chloride	mg/kg	3100	120	3000	2500	4100	1300	3500	2400	1200	4700	2592.00	1403.56

Analysis	Unit	101	103	105	107	109	111	113	115	117	119	Average	Standard Deviation
Cation Exchange	meq/100 g	17.7	9	22.3	13.4	16.2	9.7	22.5	16.5	9.7	18.5	15.55	4.99
Exchange sodium	meq/100 g	12.6 (71.4%)	0.8 (9.2%)	10.9 (48.8%)	10 (74.7%)	12.2 (75.2%)	5.2 (53.7%)	12.2 (54.2%)	9.1 (53.3%)	4.8 (49.2%)	13.9 (75.3%)	9.17	-
Exchange potassium	meq/100 g	1.0 (5.8%)	0.3 (3.7%)	1.1 (4.8%)	1.0 (7.7%)	1.2 (7.4%)	0.5 (5.5%)	1.1 (4.8%)	1.0 (5.9%)	0.6 (5.8%)	1.3 (7.2%)	0.91	-
Exchange calcium	meq/100 g	3.7 (20.7%)	7.0 (77.8%)	10.0 (44.9%)	2.2 (16.4%)	2.7 (16.4%)	3.6 (36.5%)	8.5 (37.8%)	6.0 (36.3%)	4.2 (43.2%)	3.1 (16.8%)	5.1	-
Exchange magnesium	meq/100 g	0.4 (2.1%)	0.8 (9.3%)	0.3 (1.5%)	0.2 (1.2%)	0.2 (1.0%)	0.4 (4.3%)	0.7 (3.2%)	0.4 (2.5%)	0.2 (1.7%)	0.1 (0.7%)	0.37	-
Ca/Mg ratio		9.7	8.4	30	13.2	15.9	8.5	12	14.4	25.2	24.8	16.21	7.73

Table 51: Metal concentrations in grasses growing on Cell A (after Ross Mining N.L 2000)

Element	Copper	Lead	Zinc	Silver	Arsenic	Cadmium	Cobalt	Manganese	Molybdenum	Nickel	Antimony	Chromium
Unit	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg
Sample No.												
Cell A												
Buffel Grass	5	<1.0	82	<0.5	<1.0	<1.0	<1.0	200	1	3	2	6
Rhodes Grass	9	<1.0	51	<0.5	<1.0	<1.0	1	940	2	1	1	6
Control												
Buffel Grass	2.5	3.5	19.5	<0.5	<0.5	<0.5	<0.5	46	<0.5	1	<0.5	4.5
Rhodes Grass	3.5	<0.5	48.5	<0.5	<0.5	<0.5	<0.5	94	<0.5	1	<0.5	3.5

Cell A & Cell B RGS 2022 study

Additional geochemical test work was undertaken in 2022 (RGS) in line with the recommendations provided in the RGS 2015 geochemical report, with field work undertaken between 20th to 31st March 2022. The RGS 2015 Report made recommendations to complete the following:

- Field permeability measurements at Cell B and Cell A sites, in addition to surrounding soil reference sites. This recommendation related to the assumption that the permeability of tailings in the field was likely to have a significant effect on the proportion of rainfall that reports as surface runoff versus infiltration.
- Event based water monitoring to understand the quality of surface water runoff from the tailings leach during a storm event and understand whether this water could be discharged directly to the environment. This recommendation was related to the assumption that 1:5 water extracts from the tailings may be used to infer water quality on the tailings beach during a rainfall event.
- Addition of fine agricultural limestone ('Aglime') (CaCO₃) to the tailings samples to ascertain whether the addition of an alkaline material changed the rate that metals were released from the tailings samples. This recommendation was related to the assumption that secondary sulfide minerals (e.g. jarosite) may be controlling solute chemistry.

To verify these assumptions, RGS completed the following geochemical assessments:

- Field permeability measurements for Cell B (9 samples), Cell A (3 samples), with comparisons also to surrounding reference sites (3 samples) (sample locations are provided through Figure 105).
- Static geochemical analysis –completed on the 15 surface samples (as per the locations shown through Figure 105) for a range of parameters, including Acid Base Accounting, total major cations, metals/metalloids (solids and soluble), titratable alkalinity and acidity, soluble major ions, exchangeable cations, soil nutrients.
- Physical analysis – including in-situ bulk density, dried bulk density and soil particle density for all samples.
- Kinetic geochemical analysis – kinetic leach column (KLC) tests were completed for the tailings samples, with a single composite sample for the Cell B samples (including 9 samples), and a second composite sample for the Cell A samples (three samples).
- The results of this sampling, as relevant to the recommendations made in the 2015 RGS Report are summarised below. Refer to the 2022 RGS Report (Appendix G) for the complete report.

Field permeability measurements:

- In-situ saturated hydraulic conductivity (permeability) measurements were recorded at 15 locations on and around the Yandan Tailings Dam. The measurements were taken using a Guelph Permeameter at nine locations in TSF Cell B, three locations in TSF Cell A, and three locations outside the Yandan Tailings Dam (as per Figure 105).
- In-situ saturated hydraulic conductivity measurements confirmed that the tailings in Cell A and Cell B indeed have a lower hydraulic conductivity than surrounding soil sites. These findings support the RGS 2015 Report finding that the Cell B tailings are low permeability; supporting the recommendation of additional tailings compaction to provide a low permeability layer in the cover design recommended for Cell B (Williams 2021, RGS 2022).
- Long-term water quality results at the downgradient surface water monitoring site (discussed below) also tend to confirm limited infiltration of rainfall/surface runoff into tailings materials and that this material is naturally fine grained and well-compacted.
- The results from the 2022 RGS Report have verified the assumptions of the 2015 RGS Report, noting no further recommendations have been made in the 2022 RGS Report regarding this matter.

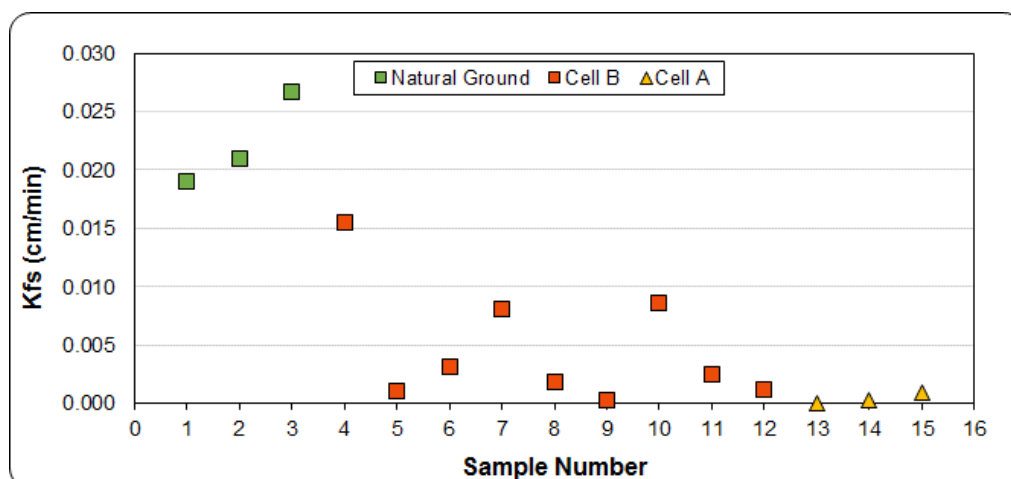


Figure 107: In situ saturated hydraulic conductivity results for soil and tailings (RGS 2022)

Kinetic geochemical analysis

A KLC test program was completed on two composite tailing samples (TSF Cell A and TSF Cell B composites). A total of six KLC tests were established (Table 52) and were initially leached on a weekly basis for four weeks. KLC test results for collected leachate were found to be relatively similar for the TSF cell composites with 4 g/kg CaCO₃ and 2 g/kg CaCO₃ 'Aglime' mixed, such that leaching was discontinued on the KLCs with 4 g/kg CaCO₃ (KLC 1 and KLC 4) after Week 4. The remaining KLC tests (KLC 2, KLC 3, KLC 5 and KLC 6) continued for a further two weeks.

The results from the KLC tests were used to predict the ongoing geochemical characteristics and likely quality of pore water in the TSF surface materials if these are disturbed and to assess the effectiveness of the addition of crushed limestone ('Aglime') to neutralise any existing acidity

The KLC leach test results were considered alongside Australian water quality guideline values for livestock drinking water quality. These guidelines are provided for context only and are not intended to be interpreted as "maximum permissible levels" for site water storage or discharge. The ratio of sample to water in the KLC tests is currently approximately 3:1 for the tailing samples (i.e., concentrated), whereas the ratio of sample to water generally used in tests where results can (arbitrarily) be compared against guideline concentrations to provide relevant context is typically more than an order of magnitude more dilute at 1:5 (w/v). Whilst arbitrary comparisons against guideline concentrations can be helpful in some situations to provide relevant context, such comparisons cannot be directly extrapolated to the field situation at the Project and numerical modelling with a wider range of material balance, water balance and water quality inputs would also typically be required.

Table 52: KLC compositions (RGS 2022)

Column	Tailings Composite	Crushed Limestone Added
KLC 1	TSF Cell B	4 g limestone/kg of sample
KLC 2	TSF Cell B	2 g limestone/kg of sample
KLC 3	TSF Cell B	No limestone added
KLC 4	TSF Cell A	4 g limestone/kg of sample
KLC 5	TSF Cell A	2 g limestone/kg of sample
KLC 6	TSF Cell A	No limestone added

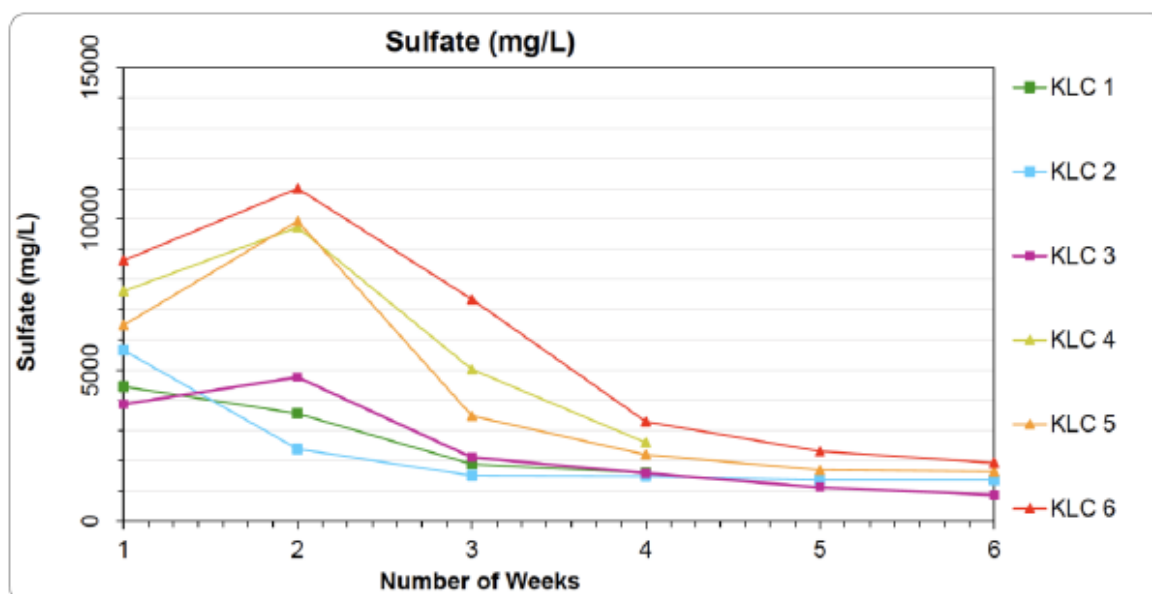


Figure 108: Sulphate production through rapid kinetic testing (RGS 2022)

Results from the KLC tests are summarised below (RGS 2022):

- Leachate from the TSF Cell B composite tailing sample control test (i.e., that does not contain 'Aglime' (KLC 3)) has an acidic pH value ranging from 3.67 to 4.28. Leachate from the same TSF Cell B composite tailing sample with "Aglime" added/mixed has a neutral pH value in the range 6.87 to 7.76. Leachate from TSF Cell B composite tailing sample control test (KLC3) has an elevated acidity value that ranges from 657 to 101 mg/L (as CaCO₃ equivalent), negligible alkalinity, a negative net alkalinity, and shows a decreasing acidity trend over time. The acidity of the same TSF Cell B sample with "Aglime" added/mixed has a lower acidity value (8 to 43 mg/L (as CaCO₃ equivalent), a higher alkalinity value (73 to 224 mg/L (as CaCO₃) and a positive net alkalinity value.
- Leachate from the TSF Cell B composite tailing sample control test (KLC 3) has elevated dissolved concentrations of aluminium, arsenic, cadmium, cobalt, chromium, copper, manganese, nickel, selenium and zinc compared to the applied freshwater aquatic ecosystem (95 % species protection¹) values. Some of these metals/metalloids have dissolved concentrations in leachate (aluminium, arsenic, cadmium, cobalt, nickel and selenium) greater than the applied livestock drinking water criteria. In contrast, leachate from the same TSF Cell B composite tailing sample with 'Aglime' added/mixed has lower concentrations of these dissolved metals/metalloids whereby only cadmium, cobalt, nickel are greater than livestock drinking water guideline values in initial leachates and show a decreasing trend over time.
- Leachate from the TSF Cell A composite tailing sample control test (i.e., that does not contain 'Aglime' (KLC 6)) initially has a neutral pH value (7.02) that tends to decrease over time (4.88). Leachate from the same TSF Cell A composite tailing sample with 'Aglime' added/mixed also has an initial neutral pH value that tends to decrease over time (5.82).
- Leachate from the TSF Cell A composite tailing sample control test (KLC 6) has elevated dissolved concentrations of arsenic, cadmium, cobalt, chromium, copper, lead, manganese, nickel, and zinc compared to the applied freshwater aquatic ecosystem (95% species protection) values. Some of these metals/metalloids have dissolved concentrations in leachate (arsenic, cadmium, cobalt, nickel and selenium) greater than the applied livestock drinking water criteria. Leachate from the same TSF Cell A composite tailing sample with 'Aglime' added/mixed generally has lower concentrations of these dissolved metals/metalloids although cobalt remains greater than livestock drinking water guideline value in one of the initial leachates but shows a decreasing trend over time.
- It is acknowledged that most metals/metalloids are not enriched in tailings materials compared to un-mineralised soils (RGS 2022). Arsenic and antimony can be slightly enriched in some tailings samples compared to un-mineralised soil samples collected in the surrounding area. The physical disturbance of

tailings materials under laboratory conditions is considered to have resulted in the increased solubility of metals. Surface water results (discussed below) confirm low mobility of potential solutes from the tailings under field conditions. On the basis of these results, RGS recommend that physical disturbance to the tailings is avoided during rehabilitation activities. RGS further advise:

“Indeed additional compaction of surface tailings prior to placement of a soil cover system (as previously advocated by RGS2 and Williams6) would appear to be warranted to minimise water infiltration and to form a low permeability layer to enhance the “store and release” function of a revegetated gravelly topsoil layer on TSF Cell B.”

Results from the KLC test work support the application of ‘Aglime’ for TSF Cell B final rehabilitation activities, to mitigate the presence of secondary minerals such as jarosite and/or alunite. RGS recommend the addition of ‘Aglime’ to surface materials in TSF Cell B to increase the pH and alkalinity and reduce the acidity and concentrations of some metals/metalloids that could potentially be present in tailings pore water and periodically report as seepage to the TWRD. It is considered that the addition of ‘Aglime’ may be beneficial as part of final rehabilitation activities for Cell B and has accordingly been costed into the proposed Calculator. In regard to Cell A, RGS considered that the benefits of adding ‘Aglime’ were less pronounced, and as such the addition of ‘Aglime’ to Cell A was not warranted.

Rehabilitation strategies (including maintenance of the existing rehabilitation at Cell A) for the TSF cells aim to create final landforms that are water shedding, to further minimise water infiltration through the tailings and therefore potential interactions with tailings.

Event based water monitoring

The 2015 RGS Report suggested that 1:5 water extracts from the tailings may be used to infer water quality on the tailings beach during a rainfall event. The report recommended event-based water monitoring to understand the quality of surface water runoff from the tailings beach during a storm event and understand whether this water could be discharged directly to the environment. It is acknowledged that opportunities for event-based monitoring have been limited, given that personnel are not permanently established on-site.

Extensive water quality data from the receiving environment are however available, relevantly including the Tailings Water Return Dam (TWRD). The TWRD is located directly downgradient from the TSF and collects runoff from the facility. A recent review of water quality data associated with rainfall interaction with the tailings, as monitored at the TWRD, from 2011 – 2022 has recently been completed (SBE 2022). This report and the extensive water quality dataset were made available to RGS, with RGS completing their own review of these findings from a geochemical perspective on the tailings material.

RGS found that the water quality results at the TWRD were in direct contrast to the 1:5 water extract results from the tailings (RGS 2022), contrasting to the assumptions made in the 2015 RGS Report. RGS noted the following water quality results:

- the pH of water at the TWRD has typically been in the pH neutral range (6 to 9) with occasional pH values between pH 5.5 and 6.0. The salinity is dominated by sulfate however sulfate concentrations in groundwater are stable and can increase in the TWRD following rainfall.
- Dissolved metal/metalloid concentrations measured at the TWRD are typically low and well below relevant contaminant limits set out in the EA. While some low and infrequent peaks in the concentration of dissolved metals (cadmium, copper, nickel and zinc) at the TWRD are apparent in the available dataset, these also appear to be associated with limited infiltration with surface tailings or loss of dilution over the dry season. The relatively low concentrations of metals/metalloids in the TWRD confirms the limited infiltration of rainfall/surface runoff into tailing materials at the TSF as these materials are naturally fine grained and well compacted and therefore low mobility of potential solutes from tailing materials under field conditions.

On review of these water quality results, RGS consider that the disturbance of the tailing materials through sampling and physical agitation during laboratory preparation has increased the solubility of metals, for example, and therefore physical disturbance of surface tailings in the field should be avoided. RGS further

suggest that additional compaction of the Cell B surface tailings prior to placement of a soil cover system may assist to further minimise water infiltration by forming a low permeability layer to enhance the “store and release” function of a revegetated gravelly topsoil layer on TSF Cell B (as previously suggested by Williams 2021 and RGS 2015, RGS 2021).

Cover design and rehabilitation

Cell A

Rehabilitation of Cell A was initially completed circa 1999 - 2000 (Wirralie Gold Mine 2005). Grass and tree species that were confirmed to be suitable for growing on Cell A (as informed via the extensive field and pot trials described in Section 3.1.2) were selected for use, with these species directly planted into the surface of Cell A. Grass species selected for revegetation included Rhodes Grass, Buffel and Couch, with Stylo (a pasture legume) also planted. Tree species directly planted into Cell A included River Red Gum and Acacia salicina (Sally Wattle)).

Rehabilitation monitoring has shown that an area of approximately 4.5 ha of Cell A is poorly drained, with vegetation growth across this area reduced when compared to the remainder of Cell A. Buffel and large trees have established around the perimeter of the cell, grading to salt tolerant, green couch in around the central area. Cattle grazing was introduced to Cell A for a period between 2013-2014 with cattle grazing across the entire cell, where green couch provided a protective mat across the surface (Fletcher 2014). It was noted that trees encouraged cattle camping, increasing surface disturbance. Further, groundwater monitoring pre-2025 would suggest minor seepage from the TSF: it is important to note however, that this is not considered to be representative of groundwater seepage due to the location of the bores in the TSF and not the receiving environment (SBE 2023). As such, rehabilitation maintenance is planned to be undertaken across the entire surface of Cell A at this time, unless further groundwater monitoring can provide sufficient evidence that there is low risk of seepage from the TSF. Reparation activities are planned to include the removal of current vegetation, placement of fill (growth medium as needed, followed by 0.15 m topsoil) to form a water shedding surface and reseeded of the surface. Existing shallow drainage channels in the surface of Cell A are to be filled with coarse rock gravel to facilitate adequate function.

Cell B

Rehabilitation of the Yandan Tailings Dam has been approached progressively, with Cell A of the facility rehabilitated. Cell B of the TSF has remained unrehabilitated pending further operation and is therefore the focus of this section.

The Yandan Tailings Dam was constructed in a valley with cross dams on clayey weathered materials of low permeability, estimated at 10^{-9} m/s (Douglas and Partners 1988, within Greater Boulder Holdings Ltd 1988). Cell B of the facility has a surface footprint of approximately 70 ha, with a capacity of 4,700 ML. As the facility is not a regulated structure, no hydraulic performance requirements apply (PSM 2021b).

The facility is primarily contained by two embankments, with the eastern perimeter wall being the principal containment structure. The eastern perimeter wall was constructed with a central clay core (Fraser Osborn 1997), with earth and rockfill embankments (PSM 2021a) (Figure 109). The eastern perimeter wall is approximately 530 m in length, with a maximum wall height of 5 m (PSM 2021a). The spillway for the facility is located to the south-west, spilling to the TWRD (Figure 109). No contaminated seepage capable of causing environmental harm from the facility has been identified through the regular dam inspections.

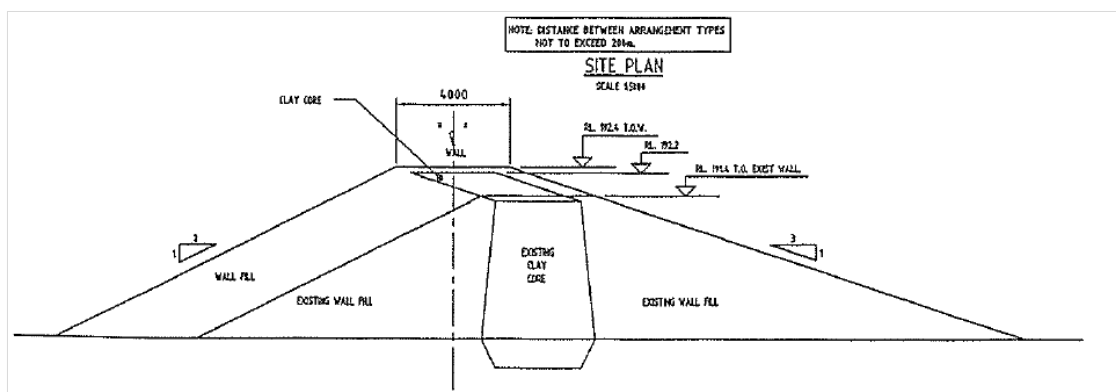


Figure 109: TSF Cell B - Eastern perimeter wall construction (Fraser Osborne 1997)

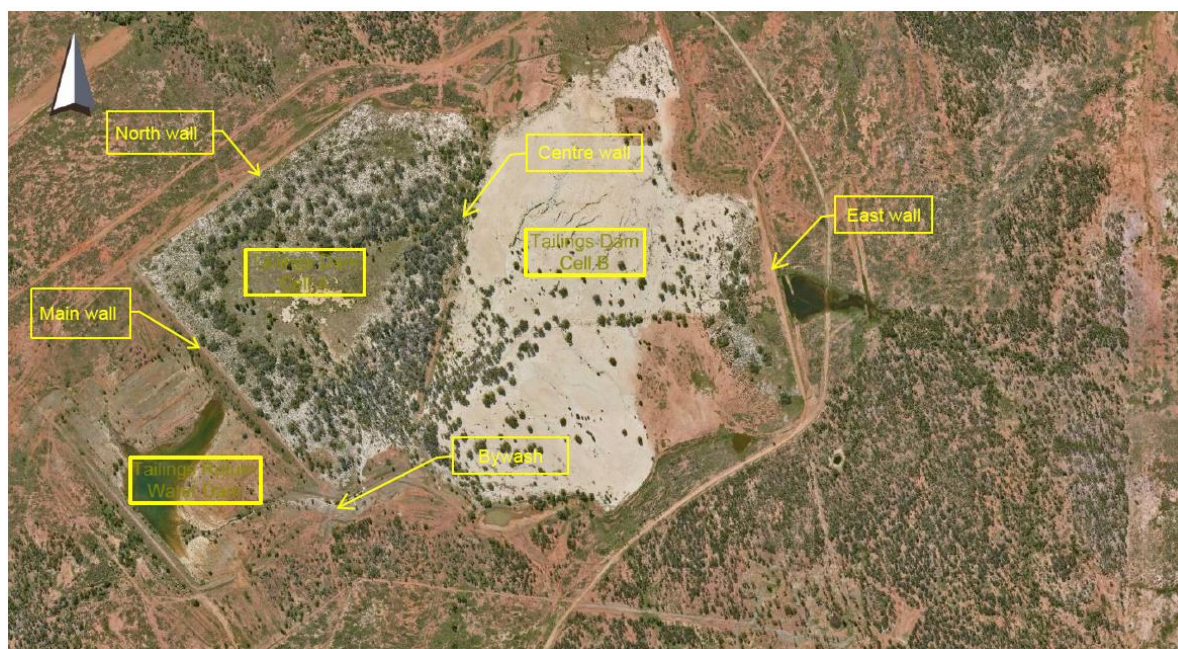


Figure 110: Containment structures for Cell A and Cell B (PSM 2021b)

Geochemical assessment of the Cell B tailings material indicates that the stored material poses a low geochemical risk. The tailings material is classified as NAF, is considered unlikely to generate acidic drainage, and there are no saline issues apparent (RGS 2015).

The rehabilitation objective for the facility is to restore a post mining land use of open pasture grazing. To achieve this a store-and-release cover system is proposed.

A store-and-release cover system has been recommended as the 'best fit' cover system for the Cell B facility, as determined by an independent expert (Williams 2021). This review confirmed that Cell B satisfies the ERC 'low' risk category for TSFs, fulfilling all relevant risk category characteristics established in the *User Guide for Estimated Rehabilitation Cost Calculator for Mining* (DES 2020), being (Williams 2021):

- Sulfide minerals in the tailings are completely oxidised to a depth of at least 600 mm.
- Metals, such as aluminium, iron and manganese, are low compared with average crustal abundance, and other metals, such as arsenic and mercury, are sparingly soluble; hence salinity is low.

- *The tailings support traffic.*
- *The TSF embankments are <15 m high.*
- *The compacted tailings are of low permeability; that is, suitable as a low permeability layer to hold-up rainfall infiltration, limit net percolation into the underlying tailings and hence limit seepage to the environment, and limit potential uptake of salts into the cover.*
- *Revegetation of 400 to 600 mm of gravelly topsoil placed on the Cell B tailings achieved similar success to reference sites, with similar minor erosion, over a 7-year period.*

On this basis of geochemical analysis and outcomes of field trials a 400 – 600 mm gravelly topsoil is proposed to be used as the cover system.

Whilst not completed for the field trials, compaction of the Cell B surface has been recommended to form a low permeability layer to the proposed cover system (RGS 2015, RGS 2021, RGS 2022, Williams 2021). Geochemical analysis has demonstrated that the tailings in TSF Cell B are low permeability (RGS 2022), and that the permeability of the tailings could be further reduced with additional compaction (RGS 2015, RGS 2022). This is supported by the finding that compacted tailings with a bulk density of 1.8 t/m³ are essentially impermeable to water infiltration (RGS 2015).

Williams (2021) and RGS (2021, 2022) have both recommended compaction to the TSF Cell B surface prior to the placement of the proposed cover system. Williams considered that the compaction would enhance the store and release function of a gravelly topsoil cover on the facility (2021). With the low permeability layer improving the hold-up of moisture available to support revegetation, and limiting net percolation and seepage, as well as limiting potential salt uptake into the cover (Williams 2021).

Based on the expert recommendations from Williams and RGS, it is proposed that preparation for full-scale construction of the proposed cover system includes compaction of the TSF Cell B surface tailings. Compaction is proposed to involve use of a smooth drum roller to form a low permeability layer.

Water quality observations 2012-2024

Material characterisation assessments have identified that potential water quality threats associated with the tailings material relate to salinity, sulphate, mercury, arsenic, copper, zinc, manganese, chromium, antimony and cobalt (SBE 2022). Monitoring records for surface waters and groundwater associated with the Yandan Tailings Dam are available from 2012–2024, with key findings summarised in Table 53.

A review of water quality data identified the following (SBE 2022; SBE 2024b):

- Tailings impacts are characterised by low-risk saline drainage and not acid rock processes (either pH or sulphate). Sulphate may be elevated; however, levels have been stable for some time which indicates that the production of sulphate has reduced (Figure 111).
- The primary mobile metals of interest are arsenic, cadmium, copper, nickel, zinc (mobile at neutral to alkaline pH). Most metals were not detected, with the minor exception of arsenic values at monitoring bore 'TD4'. It is considered likely that this bore is monitoring water in direct contact with tailings, noting this bore is positioned close to a ponding area of Cell A and directly adjacent to the facility.
- Downgradient monitoring bores demonstrate containment of potential impacts is effective: in surface water, the TWRD is capturing surface water runoff. Whilst there may be some quality concerns for perimeter monitoring bores, these impacts are likely to be limited by topography and geology.
- The current landform of the TSF captures and stores water on the facility, which maximises infiltration and percolation of water through stored tailings: the final landform design should seek to avoid this.
- Groundwater bores on the perimeter of the TSF are generally located in borrow pits and in close proximity to the facility and are therefore likely to be directly monitoring tailings water (Figure 112)). Likewise, monitoring bore 'TD6S/D' as an upgradient bore is further away, but at a much lower relative level and therefore will be in a direct area of the potentiometric surface.

- Background quality bores TD8, TD6S/D are representative sodium-chloride type consistent with background water quality.
- Water quality Influenced by quartz veining and some mineralisation around the TSF as scattered groundwater population (TD9, TD12) and is heading towards calcium-chloride type groundwater.

Table 53: Summary of surface water and groundwater quality trends, Yandan Tailings Facility

Parameter	Groundwater	Surface storage
pH	Stable and within normal ranges	Varies with rainfall for both TRD1/3 (dam downgradient) and TDP (dam upgradient), approaching pH 10
Salinity (EC)	Elevated in TD4 to 25,000 $\mu\text{S}/\text{cm}$ (north Cell A), TDS (prior to breakdown) at 15,000 $\mu\text{S}/\text{cm}$ (north Cell B), TD6S/D (upstream) at 35,000 $\mu\text{S}/\text{cm}$, and stable downgradient at 1,000 $\mu\text{S}/\text{cm}$ at TD3 and TD7 D/S well within background	<5,000 $\mu\text{S}/\text{cm}$ for all sites, TRD1 varies with rainfall, likely TDS through dilution with freshwater
Sulphate	All relatively stable at 1,000 mg/L or less, except for TD6S/D (upgradient) at 1,400 mg/L	Peaks at TRD1 after rainfall, <5,000 mg/L. Either dilution or pulse driven through rainfall (not tested at TDP)
Arsenic	All stable to not detected except for TD4, which is on an increasing trend	Peaks at low levels associated with rainfall or lack of rainfall
Antimony	Not currently monitored	Not tested.
Cadmium	Not detected to detection limit	Peaks associated with rainfall above compliance
Chromium	Not detected to detection limit	Single sampling event (not detected)
Cobalt	Not currently monitored	Not currently monitored
Copper	Not detected to detection limit	Peaks at low levels associated with rainfall
Cyanide	Not detected	Not detected
Lead	Not detected to detection limit	Not detected to detection limit
Manganese	Single sampling event	Single sampling event
Mercury	Not detected	Not detected
Molybdenum	Not detected to detection limit	Not currently monitored
Nickel	Single sampling event	Peaks at low levels associated with rainfall
Selenium	Not detected to detection limit	Not currently monitored
Zinc	Not detected to detection limit	Peaks at low levels associated with rainfall

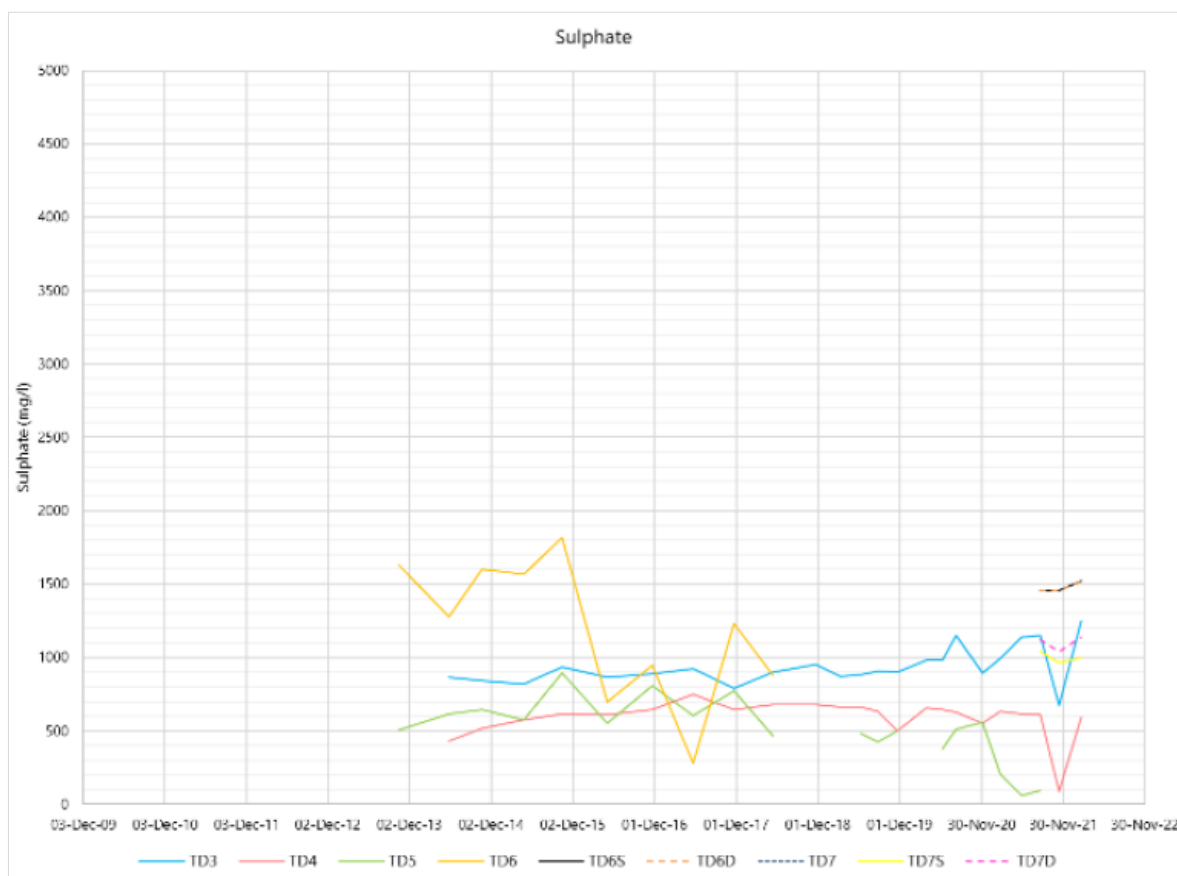


Figure 111: Groundwater sulphate concentrations (2013–2021) (SBE 2022)

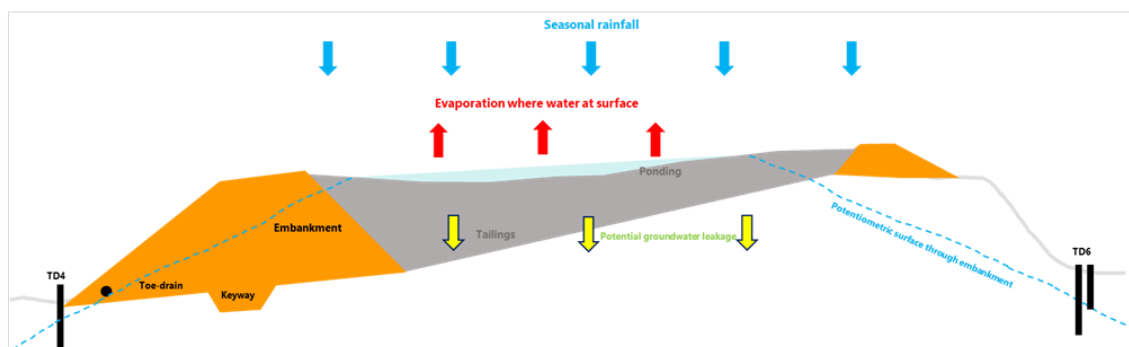


Figure 112: Conceptual model of Yandan Tailings Dam (SBE 2022)

Response to rainfall

A water level and salinity logger was installed into the tailing containment dam in April 2023 to monitor TSF responses to rainfall and evaporation (SBE 2024b). Monitoring indicates a strong response to rainfall with water levels showing a decline consistent with evaporation rates (Figure 99). Monitoring over the April 2023 – February period shows that salinity levels slowly increase as water levels decline (SBE 2024b). Salinity concentrations initially peak with initial run-off, declining rapidly following this ‘first-flush’ (Figure 113). It is noted that this applies to the current landform, prior to rehabilitation and provides a baseline for tracking against rehabilitation progress.

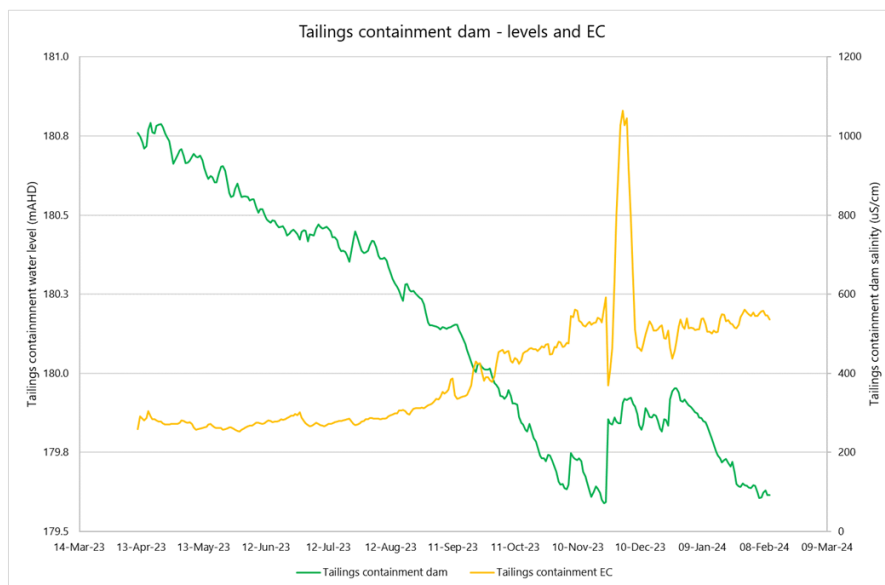


Figure 113: Salinity and water levels in the Tailings Water Return Dam (SBE 2022)

3.5.13.2 Processing facilities

The HLP is approximately 550 m (L) x 450 m (W) x 26 m(H), covering an area of approximately 16.9 ha. The coarse rock material has been end-dumped and dozed in two ten metre lifts, and one six metre lift, at or below the natural angle of repose. As such, the existing structure is inherently stable. Evidencing this is vegetation coverage that has established over the benches.

The facility is lined with high density polyethylene (HDPE) that extends over the bund walls to the two processing ponds. Low grade oxide ore (predominately clay rich) sourced from the three open cut pits (Main Pit, South Pit and East Hill Pit) was placed on the HLP during the Project's operation (1994 – 1998) (EGI 2002). An estimated 3,200,000m³ (or an estimated 2,880,000 t) of ore is contained within the facility, which covers an area of 16.9 ha. Gold and silver were extracted from the facility utilising conventional cyanide leach processes up until September 2002.

Material characterisation

Environmental Geochemistry International Pty Ltd (EGI) completed a geochemical assessment of the HLP material in 2002 (EGI 2002). With further sampling also completed by RGS in 2013 (RGS 2013).

Sampling during the 2002 assessment included twenty samples from a depth interval of 300 – 500 mm, with a further 20 samples collected from a depth interval of 5 – 10 m. Samples were assessed by a comprehensive analytical program, which included the following tests (EGI 2002):

- pH and EC determinations;
- Total S assay;
- ANC determinations;
- Multi-element scans on solids;
- NAG testing;
- Multi-element scans on water extracts and EDTA extracts; and
- Leach column tests and elemental analysis of leachates.

The results of the geochemical assessment are summarised in the below subsections.

Acid forming potential

Acid-base analyses and NAG test results were used to classify the AFP of the heap leach material. Acid-base analyses estimate the balance between the potential for material to generate acid and to neutralise acid; and provide the net acid producing potential (NAPP) value and the ANC/MPA ratio. NAG testing is further used to confirm geochemical classification for the estimation of acid and metalliferous drainage (AMD) potential.

Sulphur concentrations of the material were low, ranging from 0.02 – 0.42 %S, with a mean value of 0.15 %S (EGI 2002). The ANC of the samples was low to moderate, ranging from 5 – 89 kg H₂SO₄/t, with a mean value of 31 kg H₂SO₄/t (EGI 2002). It is noted that this excluded three samples with values exceeding 100 kg H₂SO₄/t that had been collected from areas of the pad that had been treated with lime. The relationship between ANC and sulphide content for the samples is shown in the acid-base account plot (refer Figure 114).

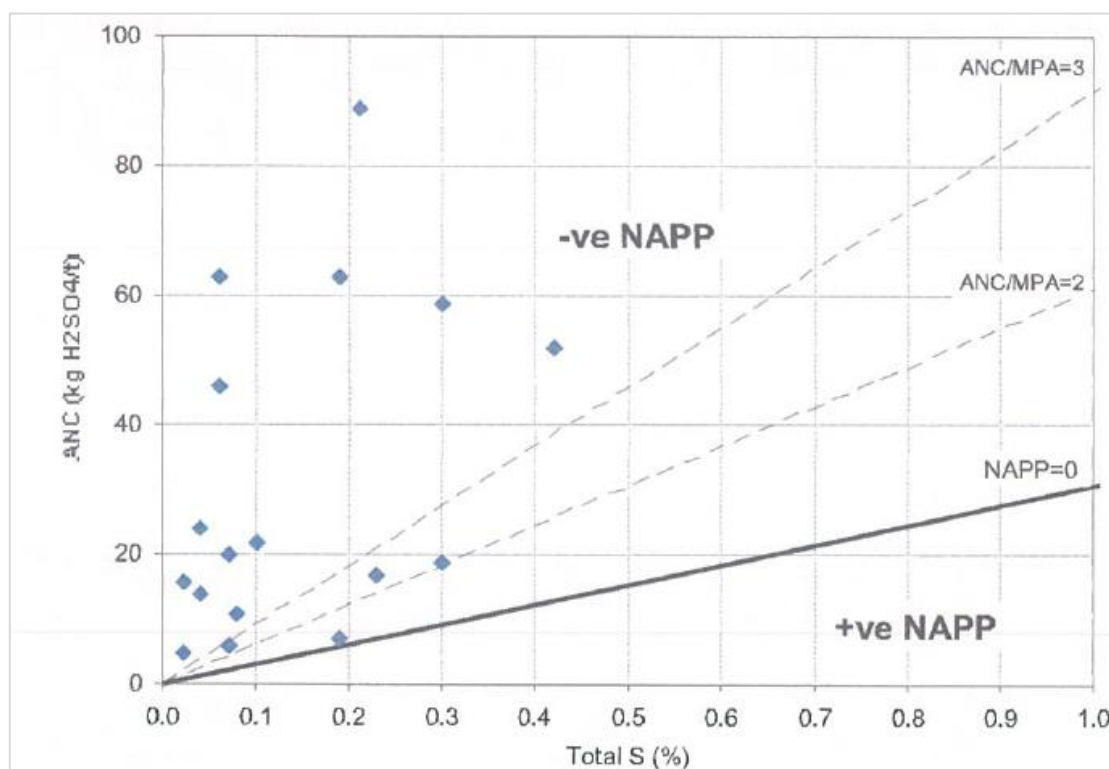


Figure 114: Acid-base account plot for HLP samples (Source: EGI 2002)

The acid-base account plot demonstrates the distribution of samples between the higher risk (NAPP positive) and lower risk (NAPP negative) domains (Australian Government 2016). Samples that fall in the lower risk domain have a reduced potential of generating a net acidic pH and are therefore unlikely to generate AMD. Results from the geochemical assessment confirm that the HLP material is NAPP negative and the material has an excess capacity to neutralise acid (EGI 2002). The ANC/MPA ratio for the samples was generally greater than 3, noting that values greater than 2 are generally considered to indicate a high probability that the material will remain near-neutral in pH and is unlikely to generate acidic drainage (Australian Government 2016).

Samples with ANC/MPA ratio values of 3 or less were selected for NAG testing to further confirm their geochemical classification. Testing confirmed that all samples had NAG pH values greater than 4.5 (NAG pH 6.8 – 7.9), confirming that these samples are NAF. It is noted that subsequent sampling has continued to indicate that the material is NAF and slightly alkaline (range 8.1 – 10, n = 6) (RGS 2013).

In summary, the AFP analyses confirmed that the HLP material is NAF (EGI 2002, RGS 2013) and of low reactivity.

Salinity

At the time of the assessment, salinity (EC) values for the HLP material ranged from 232 – 2730 $\mu\text{S}/\text{cm}$ (EGI 2002). Approximately 50% of samples were considered ‘non saline’ and ‘slightly saline’, with 30% of samples falling within the ‘highly saline’ range ($>1500 \mu\text{S}/\text{cm}$). It is noted that this sampling was undertaken in 2002, following the decommissioning of the facility in September 2002. At the time of the assessment, EGI considered it likely that the HLP would generate highly saline runoff and seepage for a short period after decommissioning, however, that this would rapidly stabilise post-closure, following flushing of the facility (EGI 2002) (refer Figure 115). Indeed, a subsequent geochemical assessment in 2013 found that water extract from the heap leach materials had a relatively low EC/salinity value of 551 $\mu\text{S}/\text{cm}$, with heap leach material also being of low salinity (median: 201 $\mu\text{S}/\text{cm}$, range: 131 – 440 $\mu\text{S}/\text{cm}$) (RGS 2013).

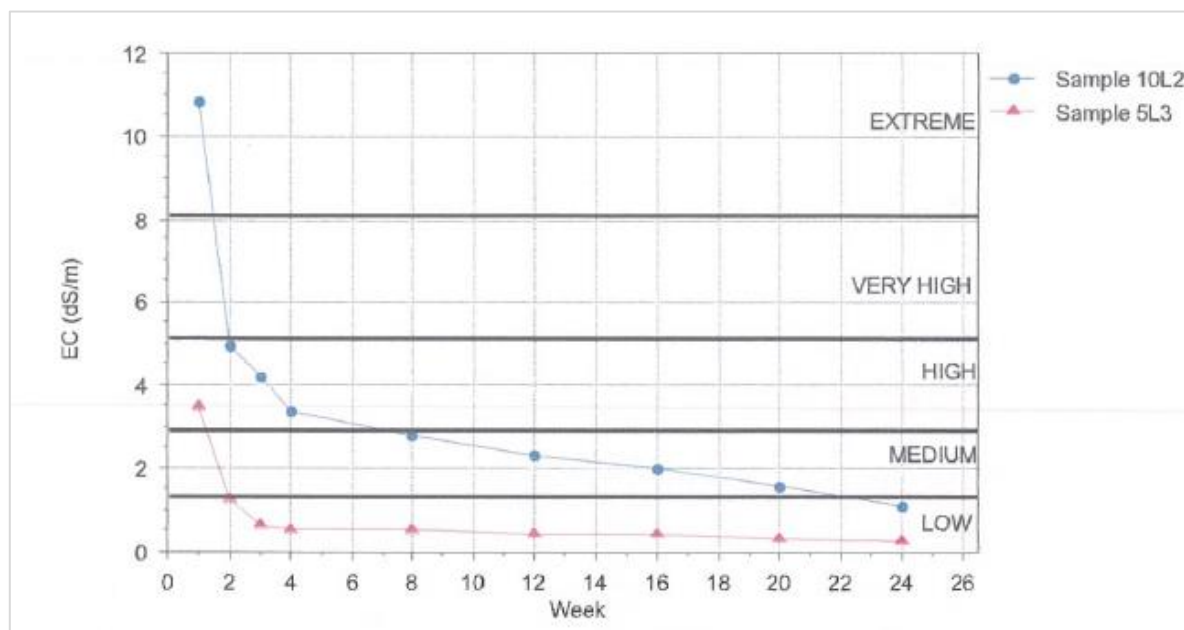


Figure 115: Line plot of column leachates EC. Irrigation water salinity ratings are also shown (ANZECC 2000) (Source: after ‘Figure 4’, EGI 2002)

Element composition and solubility

At the time of the assessment, multi-element scans found the following metals were enriched in the majority of samples: As, Hg, Sb and Se (EGI 2002). A minor number of samples were significantly enriched in silver (Ag) and Pb (EGI 2002). Some metals were found to be slightly soluble under test conditions (being As, Co, Cu, Sb and Se); Ag and Hg were not soluble in any samples (EGI 2002). During decommissioning and as the material reverts to more neutral conditions it is possible that the solubility of some of these elements may increase (EGI 2002). Initial flushing of the facility was anticipated to result in some leaching of Co, Mo and Se; however, this was anticipated to reduce after a relatively short period to low levels, being below the ANZECC (2000) irrigation water criteria (EGI 2002). Longer-term releases of arsenic were noted as a potential concern post closure (EGI 2002).

Review of total metal concentrations in 2013 confirmed that values were unlikely to present a significant risk to the environment or rehabilitation (RGS 2013). Arsenic concentrations (67 mg/kg) were noted to be significantly less than the health-based investigation level (HIL (E)) (200 mg/kg) established for parks and recreational open spaces (RGS 2013). RGS considered that the applicability of the HIL (E) guideline value was appropriate given the final land use of low intensity grazing (RGS 2013). It is also noted that monitoring of the receiving environment has not detected contaminated seepage capable of causing environmental harm.

Overall, the results from these investigations have identified that the heap leach material is of low reactivity, being NAF, and is not expected to produce saline drainage. EGI considered that reprofiling and a “relatively simple soil cover” would therefore be appropriate for the rehabilitation of the HLP (2002). This rehabilitation

methodology remains valid today, further supported by the extended duration (19 years) that the facility has had to stabilise.

Cover design and rehabilitation

The rehabilitation objective for the facility is to achieve a post mining land use of pasture grazing on a low hill landform. To achieve this a simple store-and-release cover system is proposed.

Assessment of the HLP's characteristics against the Department's ERC User Guideline confirms that the facility meets the ERC 'low' risk category for HLPs, on the basis that:

- the material is NAF;
- the material is of low reactivity;
- the material is of low salinity;
- some seepage issues have been identified, however, there is no indication that contaminants are reaching, or would be expected to reach, the receiving environment and cause environmental harm; and
- the facility will not impact on the proposed end land use.

On this basis, the planned cover system for the HLP is to be the 'low risk' cover system design described in the Departments' *'User Guide for Estimated Rehabilitation Cost Calculator for Mining'* (ESR/2019/4626) (DES 2020) (ERC User Guideline), with this comprising a 0.5 m top rock layer and 0.15 m of growth media.

It is noted that the heap leach material is not considered to present risks to the environment with respect to total metal concentrations in solids and is considered to pose negligible risk of impact on the quality of surface waters and groundwaters (RGS 2013). Therefore, it is considered that a low permeability system is not required for the facility.

Construction of the final landform will involve reshaping activities, involving relatively high productivity down slope pushing using a dozer to reduce the slope gradient to improve the stability of the final landform. The leachate treatment ponds adjacent to the facility will also be integrated under the final landform. Following reshaping, a 0.5 m top rock layer will be established, followed by the application of 0.15 m of topsoil.

The heap leach material has been confirmed to be texturally suitable for use as coarse rock in rehabilitation works (O'Kane Consulting 2019). As such, the existing in situ material would be used to comprise the required 0.5 m top rock layer, with QA/QC testing to confirm the textural suitability of this material over the landform, in addition to further assessments of its geochemical suitability (Section 3.5.12). Topsoil sources for the cover system would be sourced from the topsoil stockpiles located at the toe of the facility, to the south-west and south-east (refer Section 3.5.12)

Water quality observations

Materials characterisation identified the heap leach material as non-acid forming, with some potential for saline runoff, as well as the potential to increase calcium, sulphate, chloride and sodium runoff given the extent of lime addition through the heap leach. Metals of interest include arsenic, mercury, antimony, silver, lead and selenium (SBE 2022).

Monitoring records for surface waters and groundwater associated with the HLP are available from 2011; the key findings are (SBE 2022; SBE 2023):

- Potential impacts are characterised by low-risk saline drainage, not acid rock processes (either pH or sulphate). Sulphate may be elevated; however, levels are stable and likely indicate that the rate of sulphate production has reduced.
- The landform has been actively draining since operations ceased (approximately 20 years ago), groundwater is likely to continue to improve in quality over time. The current form of the heap leach actively sheds water effectively, though some sedimentation of the perimeter drains may not keep all surface runoff water within the heap leach catchment during periods of heavy rainfall.

- The primary mobile metals of interest are arsenic, and potentially copper and zinc. Mobility in arsenic is localised to monitoring bore 'HL6' on the northeastern extent, and is demonstrating a decreasing trend.
- Downgradient monitoring bore 'HL3' shows elevated salinity but limited impacts from other contaminants and is potentially useful as an indicator of overall risk and impact.
- Leakage from the leach ponds is likely contributing to elevated conductivity and sulphate in the groundwater of monitoring bore 'HL1', with quality likely reflecting remnant quality from within and around the ponds.

The rehabilitation approach for the HLP includes landform development (principally focusing on slope reduction and stabilisation) and installation of a store-and-release cover system. In regard to water management considerations, the leach ponds will be fully rehabilitated and integrated into the final landform. Groundwater monitoring for closure is described in Section 3.7.1.6.

As identified through the flood assessment (Section 3.5.11) in the extremely rare scenario of a PMF event there is potential for 0–2 m of floodwaters through part of the HLP domain. Given the relatively low flood levels predicted in this scenario, it is anticipated that flood water velocities may exceed erosive thresholds at pinch points and landform and mitigation measures reducing the velocities in these areas may be implemented.



Figure 116: View of HLP (SBE 2022)

Table 54: Summary of water quality trends for HLP surface water and groundwater (SBE 2022)

Parameter	Groundwater	Surface storage
pH	Stable and within normal ranges	Stable and within normal ranges
Salinity (EC)	HL1 and HL3 at 15,000 $\mu\text{S}/\text{cm}$	Typically approximately 20,000 $\mu\text{S}/\text{cm}$
Sulphate	HL1 approximately 2,500 mg/L, others <1,000 mg/L	Typically around 5,000 mg/L
Arsenic	Stable except for HL6	Leach ponds elevated
Aluminium	Not detected to detection limit	Not detected to detection limit
Cadmium	Not detected to detection limit	Single sampling event
Chromium	Single sampling event	Not currently monitored
Cobalt	Not currently monitored	Not currently monitored
Copper	Not detected to detection limit	Not detected to detection limit
Cyanide	Not detected	Not detected
Lead	Not detected to detection limit	Not detected to detection limit
Manganese	Single sampling event	Single sampling event
Mercury	Not detected	Not detected
Molybdenum	Not detected to detection limit	Single sampling event
Nickel	Single sampling event	Not detected to detection limit
Selenium	Not detected to detection limit	Not currently monitored
Zinc	Not detected to detection limit	Not detected to detection limit

3.5.14 Soil and capping material assessment

3.5.14.1 Available rehabilitation materials

Estimates of available rehabilitation materials (including topsoil, growth medium and clay) are available from material volume assessments completed as part of the 2022 SLSA soil survey (AARC 2022a), and as part of the material characterisation work completed by O’Kane Consultants (2019) for the Cell B cover system design assessment. Estimated volumes of rehabilitation materials are detailed in Table 55, with locations shown in Figure 117. Soils to be used in rehabilitation activities are predominately sourced from the Sandy SMU.

The Project requires an estimated 319,369 m³ of topsoil resources and an estimated 851,790 m³ of growth medium (coarse rock materials) to complete rehabilitation. The Project material balance indicates that there are sufficient resources available, with an estimated 469,560 m³ of topsoil resources available; and an estimated 3,542,352 m³ of growth medium resources available.

Table 55: Estimated rehabilitation materials available and required

Material type	Source	SMU	Estimated maximum volume (m ³) of material available	Rehabilitation purpose	Estimated volume of material (m ³) required for rehabilitation
Clay	HL Pond Embankment (clay core) ¹	Clayey	2,430	If required	NA
	Upstream of MWD (clay borrow)	Clayey	8,000		
	Upstream of Water Storage Dam (clay borrow)	Clayey	380,000		
Topsoil	Topsoil (borrows north and south of the TWRD)	Sandy	80,000	Cell B	80,000
	HLP topsoil stockpile #1	Sandy	22,000	HLP	27,345
	HLP topsoil stockpile #2	Sandy	9,400		
	Floodplain Borrow Pit	Sandy	11,150	Cell A	40,564
	North WSD topsoil stockpile	Sandy	12,000		
	TWRD topsoil stockpile	Sandy	17,800		
	MWD topsoil stockpile		1,550		
	WSD topsoil stockpile	Sandy	19,700		
	WHC topsoil stockpile	Sandy	2,000		
	Borrow pits ³	Sandy/Shallow	65,043	Borrow pit	65,0543
	Gravelly topsoil (around the TSF and TWRD)	Sandy/Shallow	60,000	Cell B	19,726
				Laydown yards	8,021
				TSF spillway	4,117
				Main Pit water management bund borrow pit	6,450
				Cell A	21,686
Growth medium (including coarse rock)	Gravel / coarse rock (around the TSF and TWRD)	Sandy/Shallow	510,000	Cell B	510,000
	Coarse rock from HLP ²	Mixed	3,032,352	HLP	91,150

Material type	Source	SMU	Estimated maximum volume (m ³) of material available	Rehabilitation purpose	Estimated volume of material (m ³) required for rehabilitation
				Cell B	154,840
				Heap leach ponds (backfill)	78,200
				TSF Cell B embankment (rock armour)	17,600
Dam embankment material (combined)	Mine Water Dam embankment	Clayey	83,200	Not proposed for use in rehabilitation	
	Water Storage Dam embankment	Sandy	28,200		
	Water Harvest Trench embankments	Clayey	58,500	Backfill of water harvest channel	17,000
	Tailings Water Return Dam embankment	Sandy	104,500	Backfill of tailings water return dam	103,500
	HL Pond Embankment ¹	Sandy	1,800	Partial backfill of Heap Leach Stormwater Pond	1,800
	TSF Spillway	Sandy	4,117	Backfill of TSF spillway	4,117
	Total		4,495,612	Total	1,832,542

¹ HL Pond Embankment was constructed using two materials which has been taken into account for the volume calculation. The HL Pond embankment consists of a 3 m width and 3 m high clay core (for the entire length of the embankment) in addition to being capped with dam embankment material (combined).

² Physical properties of the HLP material indicate the material is suitable for use as coarse rock capillary break layers. Prior to any potential use, a QC/QA and testing program would need to be developed to confirm use of the material. Additional material from the HLP may be suitable for rehabilitation purposes, if required.

³ Stripped topsoils from borrow pit construction to be replaced.

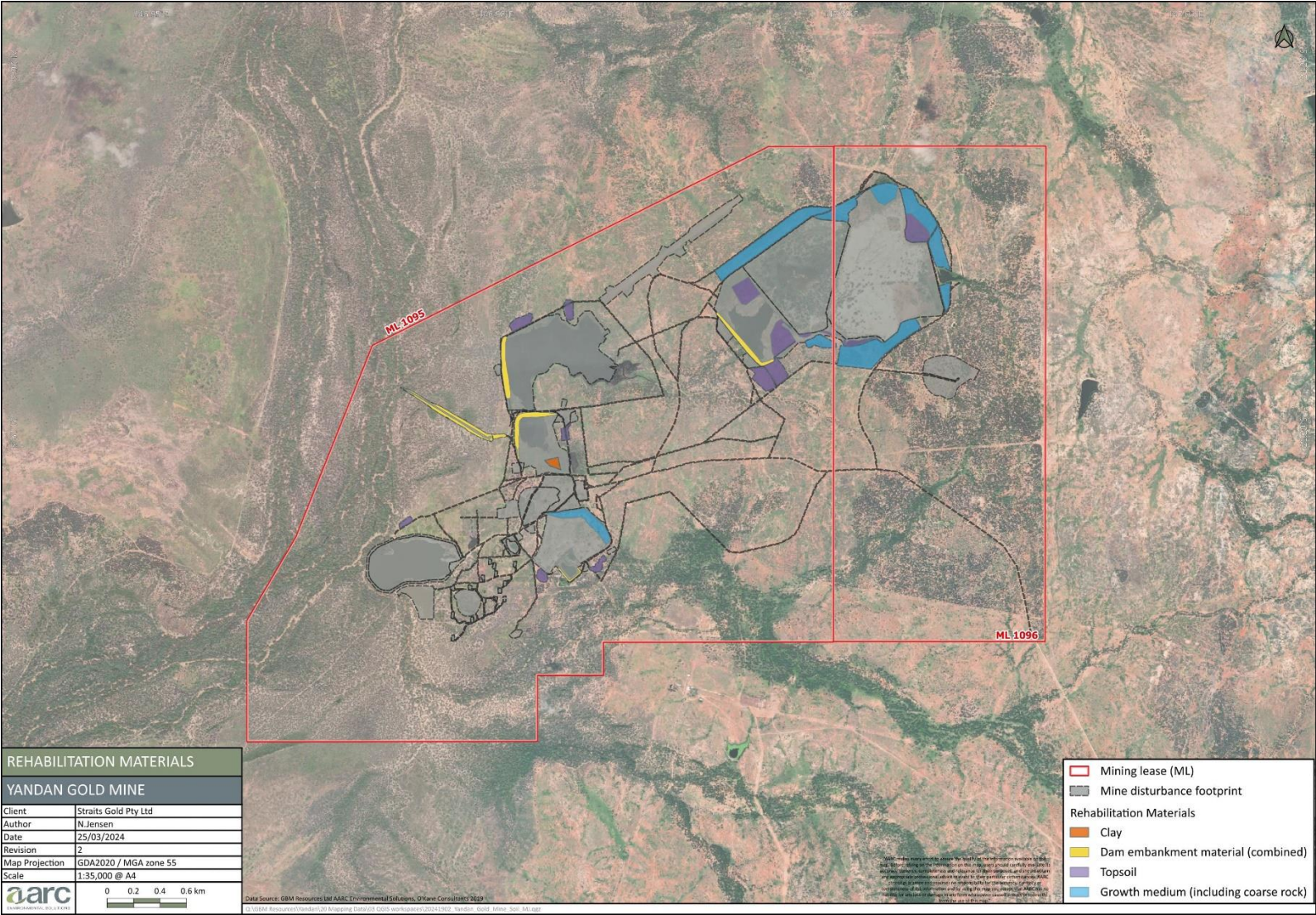


Figure 117: Available rehabilitation material on the Project

3.5.14.2 Quality of rehabilitation materials

Capping material

Chemical and physical properties of the cover materials used in the field trial have been assessed by two geochemical programs since installation of the cover in 2002. RGS completed geochemical testing of the cover in 2015 (RGS 2015), with O’Kane Consultants also completing a test pit excavation into an area of the field trial in 2019.

Chemical properties of topsoils used in the field trial (refer Section 3.1.2.3):

- pH range 4.8 – 6.2, with all samples pH 5.2 or greater, except 74T (part of the B6 field trial transect). RGS note that samples with a pH less than 5 are considered to be acidic, and that 50% of agricultural soils have a $\text{pH} \leq 5.5$ (Caritat et al 2011), within RGS 2015.
- EC range of 225 – 2,000 $\mu\text{S}/\text{cm}$, with a median of 1,017 $\mu\text{S}/\text{cm}$. RGS noted that soils with an EC of $< 2,000 \mu\text{S}/\text{cm}$ have negligible effects on agronomic plants (Hazelton and Murphy 2007, within RGS 2015). Williams also considered that any surface salinity in the cover materials is most likely related to evaporative concentration in ponded surface water rather than to uptake from the tailings (Williams 2021).
- Trace metals/metalloids in the 76 OR sample indicate concentrations meet ANZECC & ARMCANZ 2000 Livestock Drinking Water guidelines, with the minor exception of manganese.
- All soil samples have a geochemical classification of ‘barren’ and inert (having a pH 6 – 7) or with a low acid forming potential (LAFP) (pH 4 – 6).

Elemental assays for field trial topsoil sample indicates (RGS 2015):

- Minor elements fall well below National Environmental Protection Council (NEPC) Health-based Investigation Levels (HIL(C)) for soils in public open spaces.
- Geochemical Abundance Index (GAI) values indicate no enrichment of elemental concentrations.

Physical properties of the cover trial materials indicate (O’Kane Consultants 2019):

- Soil particle density of 2.67 t/m^3 .
- Particle sizing identifies material as containing approximately 24% gravel (2 - 80 mm), indicating low erosion potential.
- Emerson class 4, indicating low dispersion potential.

The suitability of other rehabilitation materials (growth media, clay, coarse rock) is also summarised as follows: (O’Kane Consulting 2019):

- Clay sources: materials from the embankment of the Heap Leach Pond embankment core, upstream of Mine Water Dam and upstream of the Water Storage Dam were found to have good consistency for constructing a barrier layer.
- Growth medium sources: the particle size of material located immediately north of Cell A confirms the suitability of this material as growth medium. Other suitable material adjacent to the TSF has been identified with positive permeability and fertility characteristics. One potential growth medium source displayed slight dispersive characteristics, however, given that growth medium will be located under a topsoil layer this property is not considered a concern.
- Coarse rock sources: material from the HLP and adjacent to Cell B found to be coarse, well-graded material suitable for use as a capillary break layer. Initial geochemical assessments of the heap leach rock material have indicated this material is geochemically benign and likely suitable for rehabilitation use (RGS 2013). RGS considered that this type of rock material should not present any significant risk to the environment with respect to total metal concentrations in solids and poses negligible risk of potential impact on the quality of surface and groundwater (2013). In addition, it is considered that the heap leach rock is unlikely to have structural stability problems related to potential dispersion and erosion (RGS 2013). Prior to any

potential use, further QC/QA assessments and a testing program would be developed to further assess the use of the material.

Topsoil

Assessments of material suitability have been completed to determine topsoil fertility and the physical characteristics of other rehabilitation materials such as growth media and coarse rock (AARC 2022a, O’Kane Consultants 2019).

Plant growth and establishment may be significantly inhibited by unfavourable soil conditions. Parameters important for soil fertility include pH, electrical conductivity (i.e. salinity), nitrogen, phosphorus, potassium and sulphur. Assessing the suitability of materials to be used for rehabilitation is therefore an important step towards ensuring the establishment of vegetation and ultimately achieving successful rehabilitation.

The suitability of soil sources on the Project for rehabilitation is summarised as follows:

- Topsoil sources adjacent to HLP (AARC 2022a): soil analysis results show topsoil sources have suitable pH for plant growth, are non-saline and non-sodic. Soil fertility is considered adequate with high levels of plant available nitrogen (nitrate) and adequate levels of potassium and sulphur. The topsoil resource may benefit from phosphorus addition to improve soil fertility before application.
- Main Pit water management bund (AARC 2022a): soil resources were measured with low pH values, presenting the risk of aluminium toxicity to plant growth. Lime addition would benefit to raise pH into plant growth suitable range. EC and ESP values were low, indicating non-saline and non-sodic soils. Soil potassium and sulphur levels are considered adequate. Soil phosphorus concentrations are relatively high, with potential to cause toxic conditions to plant growth. However, nitrate levels are extremely low therefore requiring fertiliser addition to improve soil fertility before application.
- Various topsoil sources, including borrow pits on TWRD (O’Kane Consulting 2019): soil fertility testing confirmed acceptable fertility characteristics and grading of soils on-site. Some topsoil sources exhibited dispersive qualities and limited water holding capacities. However, it is considered that these materials may still be suitable for use as topsoil.

Results from the material suitability assessment indicate that materials are generally suitable for use in rehabilitation activities and are able to support vegetation. Topsoil resources have generally proven to be fertile, with indications of erosion potential from some sources. Amelioration could therefore benefit some material sources to improve rehabilitation outcomes, with amelioration methods to be considered including fertiliser, lime and gypsum applications (AARC 2022a). The application of these ameliorants is discussed further within the SLSA (AARC 2022a). Prior to use in rehabilitation, the suitability of materials and the requirement for any amelioration would be confirmed.

Topsoil sources on the Project have been confirmed to be fertile and generally well suited for vegetation growth and establishment. On the basis of the SLSA, it is anticipated that rehabilitated landforms will be able to support a PMLU of open pasture – grazing.

3.5.14.3 Topsoil stripping

Generally, soil fertility decreases with depth in response to the variation within a number of factors including soil texture, pH, organic matter content etc. Chemical and physical analysis of the SMUs identified in the study area indicates usable soil resources are mainly confined to the surface horizons, which contain seedstock, micro-organisms and nutrients necessary for plant growth.

Where practicable, stripping should be timed to avoid periods of excessive rain or prolonged dry periods. Topsoil should be directly placed in prepared rehabilitation areas and used immediately rather than stockpiled for later use. Where topsoils have been identified as requiring amelioration and where practicable, the areas where they have been re-spread and/or the stockpiles where they have been stored should be delineated and recorded to ensure the appropriate treatment subsequently occurs.

Clayey soil management unit (stripping depth 0.1 m)

The Clayey SMU contains low CEC, contributing to limited capacity to retain nutrients on pedal surfaces throughout the profile. Although the solum does not indicate sodicity concerns, it presents dispersive characteristics. However, moderate organic matter content in the top 10 cm of the profile may provide additional stability to the surface horizon along with further nutrients upon decomposition.

A stripping depth of 0.1 m is recommended for the Clayey SMU. The application of this topsoil resource for rehabilitation purposes would benefit from further amelioration to improve productivity of cattle grazing as a PMLU.

Sandy soil management unit (stripping depth 0.1 m)

The top 0.1 m of the Sandy SMU is suitable for most rehabilitation uses, as it contains most nutrients, seedstock and organic matter. The nutrient composition and distribution of this SMU is generally low and unfavourable, therefore would benefit from additional fertiliser application.

The topsoil of this SMU is predominantly composed of sand (48%) and should not be placed on slopes exceeding 3% without consideration of appropriate measures to manage stability. Organic matter content is low, contributing to poor structural stability of topsoil. The profile is non-sodic, however, presents dispersive characteristics and is susceptible to erosive conditions. Amelioration is recommended to improve structural stability of topsoil through the addition of organic matter and/or gypsum.

3.5.14.4 Topsoil handling stockpiling and handling

Where stockpiling of topsoil is required, the following recommendations for soil management will reduce the risk of soil degradation and improve the chances of rehabilitation success:

- Stockpiles should generally be less than 2 m high and be constructed and positioned in a manner that encourages water drainage and discourages erosion; and with appropriate erosion and sediment controls in place.
- If there is a risk of a grass cover not establishing voluntarily, stockpiles will need to be ripped and seeded with a quick establishment pasture. Topsoil should ideally be stockpiled for the minimum time. Studies in the Hunter Valley have shown that most deterioration occurs within the first year (Keipert et al. 2005).
- Stockpiles should be monitored for erosion and weeds and control measures implemented as appropriate.
- Where soil has been stockpiled for extended periods, soil testing is recommended before use for rehabilitation purposes. If required, fertilisers and soil ameliorants should be applied

Topsoil will predominately be sourced from the Sandy SMU, which is characterised as having low organic matter content and relatively high sand content, therefore at a greater risk of erosion-induced movement. For this SMU, establishing a sufficient vegetative cover to mitigate erosion risk is important, particularly as rehabilitated slopes increase. To create a favourable environment for vegetation growth, topsoil from the Sandy SMU will require application of one or more of the amelioration measures. Rehabilitation materials should be tested prior to use in rehabilitation and ameliorations applied as per recommendations by an AQP.

Topsoil is to be placed at a minimum thickness of 0.15 m to create a growth medium of sufficient depth to hold water and support revegetation. For all rehabilitated areas, deep ripping to a depth of 90 cm of the landform after topsoil placement should be undertaken to key the topsoil and subsoil layers together, and to improve seed germination conditions.

3.5.14.5 Topsoil amelioration

Some recommendations for likely amelioration of soils is provided below, however, these are a guide only and amelioration should be advised by testing of material prior to use in rehabilitation.

Organic matter application

The addition of organic matter improves soil structure by creating a binding effect. Humus molecules bind soil particles into aggregates which are more resistant to physical breakdown. The humus molecules increase soil moisture retention, minimise erosion, and provide an important source of nitrogen, phosphorus and sulphur. Where possible, topsoil should be stripped with its existing ground cover vegetation and, if subject to stockpiling, relocated with its cover crop vegetation.

Depending on availability, additional organic matter (such as mulches, manures, or compost), could be incorporated into the topsoil. Organic materials incorporated into the topsoil will increase organic carbon levels, providing more exchange sites for necessary cations, increase water holding capacity, and ensure less organic matter is oxidised into carbon dioxide and nitrous oxide or reduced into methane (Smith et al. 2018). Application rates will vary depending on mulch type.

Fertiliser application

The low concentration and imbalanced distribution of nutrients in soils can be ameliorated through fertiliser application. It is noted that some ameliorants (such as ammonium-based fertilisers) can contribute to an acidifying effect, hence, care must be taken when selecting fertiliser types to be applied on acidic soils. The Sandy SMU is moderately acidic (pH of 5.6), requiring lime (calcium carbonate) application to neutralise the acidifying effects of certain fertilisers upon application.

Urea (47% N) is widely applied as it is the most economical nitrogen fertiliser. This fertiliser must be applied in combination with lime as it contributes to acidifying effects. A rate of 150 kg/ha of urea is recommended for soils in low rainfall areas where soil nitrate content is below 3 mg/kg. For best results, nitrogen fertiliser should be incorporated into the ground, either through rainfall soon after broadcasting on the surface or by burying into the soil.

The suggested rate of calcium carbonate is approximately 1 t/ha of lime. It is expected that 1 t/ha of lime (incorporated in the top 10 cm of soil) can increase the pH of sandy soils by 0.57 units (Department of Primary Industries n.d.). A follow up pH test is necessary to evaluate the need for additional lime applications. Lime should be applied initially in small doses, gradually increasing application rates as necessary.

Alternatively, calcium nitrate-based fertilisers such as calcium ammonium nitrate (15 to 27% N) may be selected for their near neutral effect on soil pH, providing both nitrogen and calcium cations. An application rate of 25–50 kg N/ha should be sufficient for successful vegetation establishment (CRDC 2020). Sulphate of potash (41% K) may be applied in conjunction with calcium ammonium nitrate to increase potassium and sulphate levels in soils. The fertiliser is drilled with seeds before spreading onto the soil surface (unlike other potassium fertilisers such as muriate of potash which can have negative effects on seed germination). Typical application rates of potassium for pastures in light soils are 20 kg K/ha (Department of Primary Industries n.d.).

The natural Australian landscape is low in available phosphorus, causing native species to be adapted to low soil phosphorus concentrations. Phosphorus application rates should be considered carefully. Application rates of 10–20 kg P/ha have been suggested for grazing pastures (Victoria Government 2013) and mine restoration (Daws et al. 2013). Single superphosphate (8.8% P) may be applied, which satisfies the phosphorus requirements as well as supplying sulphate. It should be noted that this fertiliser should not be blended with urea.

Upon application of soil ameliorants, it is important to incorporate fertilisers into the soil, preferably to a depth of approximately 0.3 m (using a scarifier or ripper tynes). This is to prevent loss of nutrients through wind erosion (blown away) or water erosion (carried/washed away by rainfall). Following vegetation establishment (6 to 12 months after sowing), it is recommended to analyse the chemical and physical properties of topsoil to determine the requirement for any further ameliorants.

Natural methods of increasing soil nitrogen levels may be applied through the incorporation of native leguminous forbs such as *Rhynchosia minima* (Rhynchosia) and *Glycine tabacina* (Variable Glycine) to the seed mix. The legume species are capable of fixing nitrogen, as well as establishing a natural nitrogen cycle within the topsoil resulting in long-term improvements in soil fertility and self-sustaining vegetation.

Gypsum application

Structural stability issues may be enhanced through addition of gypsum (calcium sulphate), allowing clay particles to form stable aggregates. Soil aeration and water infiltration rates should be improved, minimising runoff and formation of rill erosion. The recommended gypsum application rate (based on the light textured soils of the Sandy SMU) is 2.5–5 t/ha of fine grade gypsum to be broadcasted every few years, assuming water application rate of up to 10 mm/h (equivalent to moderately intense rain) (Abbott and McKenzie 1996).

Cover crops

Topsoil loss to erosive processes may be minimised through the establishment of ground cover vegetation. A fast-establishing sterile annual cover crop is recommended to be included in the seed mix. This approach will also suppress weeds and assist in reviving biological processes in the soil, creating a favourable micro-environment for the germination and emergence of the native seeds. Considering the sandy nature of the Sandy SMU topsoil resource, it is recommended that a cover crop is sown at a high seed density, of approximately 30 kg/ha. This should provide a rapid ground cover and assist in achieving soil stabilisation. *Echinochloa esculenta* (Japanese Millet) could be used for summer applications and *Lolium sp.* (Rye Grass) for winter applications. In the transition between cold and warm seasons, a combination of both species should be used.

Hydromulching

The use of hydro mulching as an alternative to direct seeding is a further option that can be considered in zones at higher risk of erosion. Hydro mulch consists of a semi-liquid water-based mixture composed of seed, water, mulch and other components (such as fertiliser, coir and tackifiers) which can be added depending on the amelioration requirements. The seed mix is included in the hydro mulch slurry, which is sprayed onto the revegetation site as a thin layer (approximately 10 mm) to the soil surface, usually at a rate of approximately 50 m³/ha for topsoil applications. The aim of using hydro mulch is to cover and protect the soil, together with providing a suitable germination environment for seeds. The use of hydro mulch can be effective at controlling erosion and stabilising the soil, by providing an erosion resistant layer for the period of time it takes for vegetation to become established.

3.5.15 Water management

3.5.15.1 Operational water management

Ongoing water management at Yandan is undertaken as per the Water Management Plan (WMP) (AARC 2023). The Yandan water management system focuses on passive management, noting that the site is currently in an extended period of care and maintenance. Active water management is required only occasionally, with many of the water storages being seasonally dry as a result of the site's net-deficit water balance (Straits Gold 2008).

GBM Resources have actively maintained the water storage network with the objective of reactivating these facilities as needed to support site activities. As such, no rehabilitation of water structures has occurred with this planned for closure. The voids associated with Main Pit and East Hill Pit are to remain as NUMAs in the final landform (Section 3.4).

The current water management system involves a network of containment dams for the capture and management of mine affected water on-site, with mainly passive mechanisms (e.g. spillways) facilitating any potential release to other water storages within the site water management system. The water management system provides for the transfer of water between water storages to maximise available storage capacity where it is needed. Water inventories within the water management system are generally low, minimising the potential for releases from site.

Details of the water management network are provided in Table 56.

Table 56: Yandan water storage structures

Water storage	Volume (ML)	Description	Regulated structure?	Retained post-closure
Yandan Tailings Dam	9,000	Tailings Storage Facility (comprises Cell A and Cell B)	No	No
Tailings Water Return Dam	381	Catches runoff from the Yandan Tailings Dam	Yes – ‘low’ rating for both ‘failure to contain – overtopping’ and ‘dam break’ failure modes (PSM 2021b)	No
Mine Water Dam	370	Process water storage	Yes – ‘low’ rating for both ‘failure to contain – overtopping’ and ‘dam break’ failure modes (PSM 2021b)	Yes
East Hill Pit	50	Open cut mining void	Yes – ‘low’ rating for ‘failure to contain – overtopping’; ‘dam break’ failure mode not applicable	Yes
Heap Leach Stormwater Pond	55	Receives discharge from the Pregnant Pond and Barren Pond	Yes – ‘low’ rating for both ‘failure to contain – overtopping’ and ‘dam break’ failure modes (PSM 2021b)	No
Water Storage Dam	1,371	Raw water storage	No	Yes
Main Pit	2,800	Open cut mining void	No	Yes
Pregnant Pond and Barren Pond	5.5	During operation were used to treat leachate from the HLP	No	No
Water Harvest Trench / Channel	17	Channels any discharge received from the Mine Water Dam during significant rainfall events towards to the Suttor River. Also used for harvesting water from the Suttor River	No	No

3.5.15.2 Closure water management

As part of site closure planning, SBE completed a technical evaluation of water performance to identify potential risks to rehabilitation outcomes and to inform rehabilitation processes (SBE 2022; SBE 2024a; SBE 2024b). Important water management considerations for site closure relate to the Yandan Tailings Dam, HLP and the residual voids (Main Pit and East Hill Pit).

Observations and recommendations made from this assessment are summarised below are presented in detail Sections 3.5.10, 3.5.11, 3.5.12 and 3.5.13.

Main Pit

As introduced in Section 3.5.11, the rehabilitation strategy for the Main Pit residual void has been to establish a permanent water cover over sulphide materials in the pit walls and floor, based on the principle of a ‘flushing pit’ design. For this rehabilitation outcome to be successful, the water cover is required to be maintained above 160 mAHD. The permanent water cover was initially established during the 1999/2000 wet season and has been maintained since.

For final closure, the existing permanent water cover and flushing pit design will be maintained using the flood protection landform. Additional monitoring infrastructure (monitoring bores around the Main Pit and a pit water level gauge) were installed in 2023-2024 to obtain groundwater information and assist water balance modelling. A review of the groundwater model is recommended following collection of at least two years of monitoring data (SBE 2024c).

Main Pit design and modelling is described further in Section 3.5.12.

East Hill Pit

East Hill Pit design and modelling is described further in Section 3.5.12.

TSF

Important water management considerations for the rehabilitation of the Yandan Tailings Dam relate to installation of a water-shedding cover design and enhanced groundwater monitoring (SBE 2022; SBE 2023).

As discussed in Section Tailings management facilities, installation of an enhanced store-and-release cover design is proposed for Cell B of the Yandan Tailings Dam, with the enhanced component of this system associated with a low permeability layer to limit net percolation into the tailings (Williams 2021). As identified above, the current landform is incidentally capturing water on the facility and thus promoting water infiltration to the tailings. To reduce water interaction with the tailings, the installed cover system will be designed to be water-shedding; so that water flow is managed across the surface of the facility (SBE 2022). To further prevent interaction of water with tailings, borrow pits on the perimeter of the facility will be regraded to prevent water ponding against the TSF embankments.

TSF design is described further in Section 3.5.13.

HLP

The HLP drains from north to south with a perimeter capture drain directing flows towards a remnant leach collection pond area and stormwater capture dam (SBE 2022; SBE 2023). A bund wall lays further to the south of the stormwater capture dam (i.e. the Heap Leach Stormwater Pond) as a secondary precaution for any overland flow. Groundwater monitoring has historically been provided by shallow monitoring bores around the perimeter of the facility. The proposed closure monitoring network is described in Section 3.1.7.6.

HLP design is described further in Section 3.5.13.

Retained water storage dams

The Water Storage Dam and the Mine Water Dam are to be retained in the final landform to support the open pasture – grazing PMLU. Prior to landholder use, these dams will be cleaned (silt removed) and minor earthworks completed to make the dams structurally safe and stable. If required, the water would be treated to ensure this meets relevant stock watering guidelines. Follow-up testing will be undertaken for a period to ensure the continued suitability of the water for livestock.

Water quality will be monitored against the trigger values for livestock drinking water defined in Australian and New Zealand Guidelines for Fresh and Marine Water Quality (ANZECC & ARMCANZ 2000) and/or Environmental Protection (Water and Wetland Biodiversity) Policy 2019 Suttor River Sub-basin Environmental Values and Water Quality Objectives (EPPD & DES 2022). Recent water quality data is for retained water storages provided in Table 57 and pH and EC shown on Figure 118, Figure 119, Figure 120 and Figure 121. An assessment against the stock watering guidelines for the Suttor River Sub-Basin (EPP & DES 2022) indicates that water storages demonstrate the capability of achievement of the nominated PMLU. It is noted, however, the likely water quality will be improved as land is rehabilitated.

Table 57: Water quality for retained water storages 2021 - 2023

	Parameter				Total Metals							
		pH	EC	SO ₄	Aluminium	Arsenic	Cadmium	Copper	Lead	Nickel	Zinc	WAD Cyanide
	Unit	pH Units	µs/cm	mg/L	mg/L	mg/L	mg/L	mg/L	(mg/L)	mg/L	mg/L	mg/L
	Stock watering water quality objectives ¹	6 to 9	3200*	100	5	0.5	0.01	1	0.1	1	20	
Sample Date	Monitoring Point											
21/02/2021	Mine Water Dam (MW1)	9.76	2030	272	<0.01	0.005	<0.0001	0.002	0.001	<0.001	<0.005	<0.004
21/02/2021	Water Storage Dam (WS1)	9.43	581	49	0.07	0.003	<0.0001	0.001	0.002	0.001	<0.005	<0.004
29/05/2021	Mine Water Dam (MW1)	7.88	3017	403	0.06	0.004	<0.0001	0.002	<0.001	0.001	<0.005	<0.004
29/05/2021	Water Storage Dam (WS1)	10.46	722	32	0.03	0.004	<0.0001	<0.001	<0.001	<0.001	<0.005	<0.004
18/08/2021	Mine Water Dam (MW1)	8.25	3800	472	0.17	0.003	<0.0001	0.003	<0.001	0.002	<0.005	<0.004
18/08/2021	Water Storage Dam (WS1)	8.99	850	28	0.04	0.003	<0.0001	<0.001	<0.001	0.001	<0.005	<0.004
14/11/2021	Mine Water Dam (MW1)	7.34	5659	827	0.2	0.005	<0.0001	0.003	<0.001	0.003	<0.005	<0.004
14/11/2021	Water Storage Dam (WS1)	9.76	1570	32	0.09	0.009	<0.0001	<0.001	<0.001	0.002	<0.005	<0.004

	Parameter				Total Metals							
		pH	EC	SO ₄	Aluminium	Arsenic	Cadmium	Copper	Lead	Nickel	Zinc	WAD Cyanide
	Unit	pH Units	µs/cm	mg/L	mg/L	mg/L	mg/L	mg/L	(mg/L)	mg/L	mg/L	mg/L
	Stock watering water quality objectives ¹	6 to 9	3200*	100	5	0.5	0.01	1	0.1	1	20	
21/02/2022	Mine Water Dam (MW1)	8.69	2620	282	0.14	0.006	<0.0001	0.002	<0.001	0.002	<0.005	<0.004
21/02/2022	Water Storage Dam (WS1)	8.99	896	16	0.05	0.006	<0.0001	<0.001	<0.001	0.002	<0.005	<0.004
11/06/2022	Mine Water Dam (MW1)	8.25	2534	207	0.03	0.003	<0.0001	0.002	<0.001	0.002	<0.005	<0.004
11/06/2022	Water Storage Dam (WS1)	9	863	23	0.06	0.002	<0.0001	<0.001	0.003	0.001	<0.005	<0.004
27/08/2022	Mine Water Dam (MW1)	9.49	2625	204	0.01	0.002	<0.0001	0.002	<0.001	0.001	<0.005	<0.004
27/08/2022	Water Storage Dam (WS1)	9.83	1037	26	0.03	0.002	<0.0001	<0.001	<0.001	<0.001	<0.005	<0.004
17/12/2022	Mine Water Dam (MW1)	7.76	1615	102	0.02	0.007	<0.0001	<0.001	<0.001	<0.001	<0.005	<0.004
17/12/2022	Water Storage Dam (WS1)	7.63	531	5	0.14	0.003	<0.0001	<0.001	<0.001	<0.001	<0.005	<0.004
1/02/2023	Water Storage Dam (WS1)	7.88	486	4	0.25	0.003	<0.0001	<0.001	<0.001	<0.001	<0.005	Not reported

	Parameter				Total Metals							
		pH	EC	SO ₄	Aluminium	Arsenic	Cadmium	Copper	Lead	Nickel	Zinc	WAD Cyanide
	Unit	pH Units	µs/cm	mg/L	mg/L	mg/L	mg/L	mg/L	(mg/L)	mg/L	mg/L	mg/L
	Stock watering water quality objectives ¹	6 to 9	3200*	100	5	0.5	0.01	1	0.1	1	20	
1/02/2023	Water Storage Dam (WS1)	7.91	620	1	Not reported	Not reported	Not reported	Not reported	Not reported	Not reported	Not reported	Not reported
10/02/2023	Water Storage Dam (WS1)	7.73	487	4	0.14	0.002	<0.0001	<0.001	<0.001	<0.001	<0.005	Not reported
22/02/2023	Water Storage Dam (WS1)	8.25	658	3	Not reported	0.003	<0.0001	<0.001	<0.001	Not reported	<0.005	Not reported
4/03/2023	Mine Water Dam (MW1)	8.09	1705	80	0.05	0.007	<0.0001	0.001	<0.001	0.001	<0.005	<0.004
4/03/2023	Water Storage Dam (WS1)	9.38	7.03	5	0.08	0.003	<0.0001	<0.001	<0.001	<0.001	<0.005	<0.004
5/03/2023	Water Storage Dam (WS1)	8.32	666	3	0.13	0.003	<0.0001	<0.001	<0.001	<0.001	<0.005	Not reported
13/04/2023	Water Storage Dam (WS1)	9	7.59	5	0.03	0.004	<0.0001	<0.001	<0.001	<0.001	<0.005	Not reported
22/05/2023	Mine Water Dam (MW1)	8.95	2232	92	0.15	0.004	<0.0001	0.002	<0.001	0.002	<0.005	<0.004
22/05/2023	Water Storage Dam (WS1)	8.52	793	10	0.05	0.002	<0.0001	<0.001	<0.001	0.001	<0.005	<0.004

	Parameter				Total Metals							
		pH	EC	SO ₄	Aluminium	Arsenic	Cadmium	Copper	Lead	Nickel	Zinc	WAD Cyanide
	Unit	pH Units	µs/cm	mg/L	mg/L	mg/L	mg/L	mg/L	(mg/L)	mg/L	mg/L	mg/L
	Stock watering water quality objectives ¹	6 to 9	3200*	100	5	0.5	0.01	1	0.1	1	20	
30/09/2023	Mine Water Dam (MW1)	9.46	2865	129	0.02	0.005	<0.0001	<0.001	<0.001	0.001	<0.005	<0.004
30/09/2023	Water Storage Dam (WS1)	9.33	596	10	0.03	0.003	<0.0001	<0.001	0.002	<0.001	<0.005	<0.004

1. Environmental Protection (Water and Wetland Biodiversity) Policy 2019 Suttor River Sub-basin Environmental Values and Water Quality Objectives (EPPD & DES 2022).

2. Red shaded cells highlight exceedance of nominate WQO's.

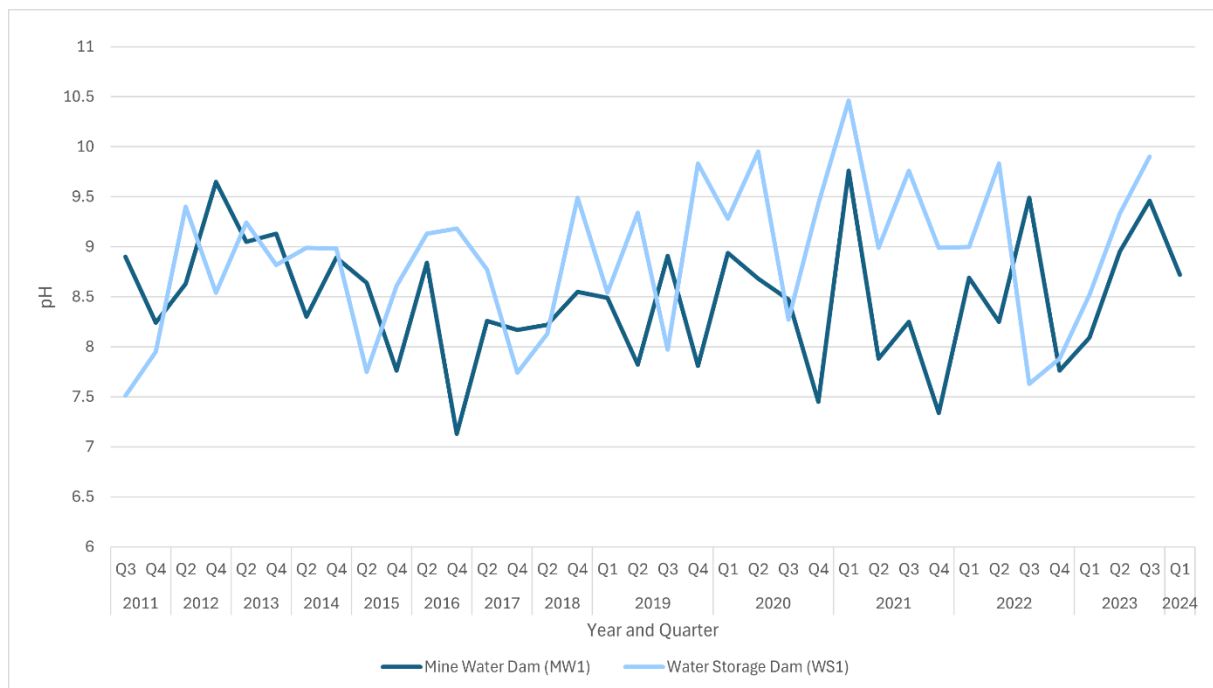


Figure 118: pH of retained water storages

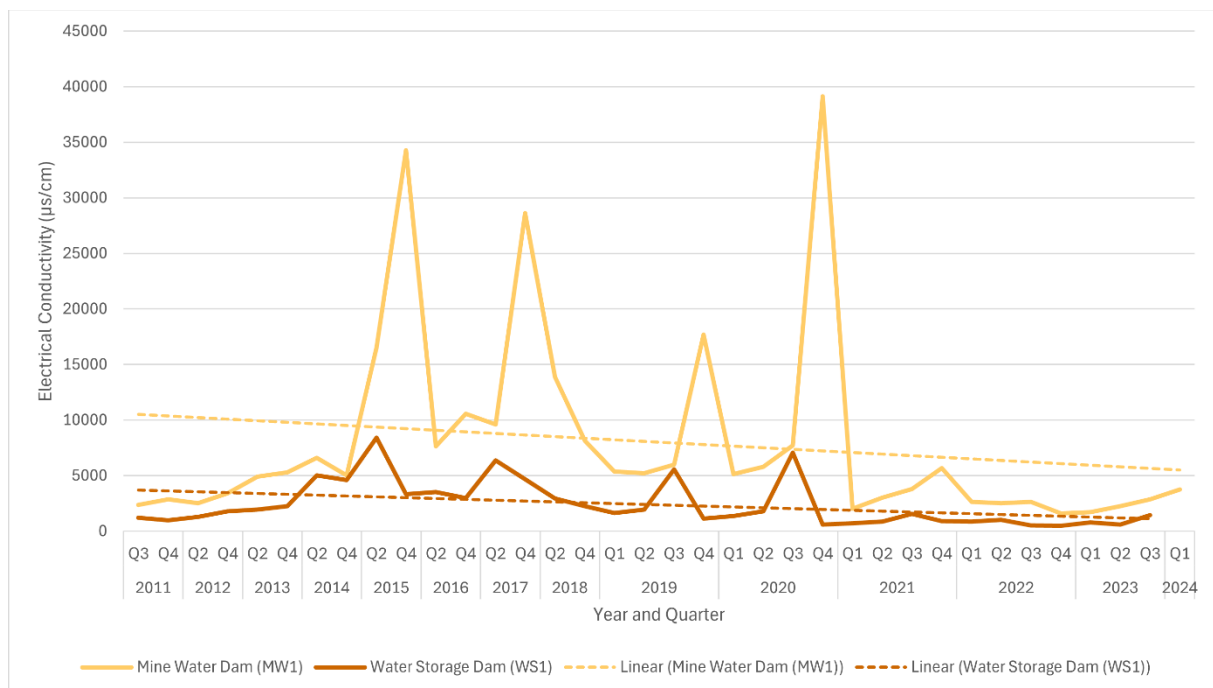


Figure 119: EC of retained water storages

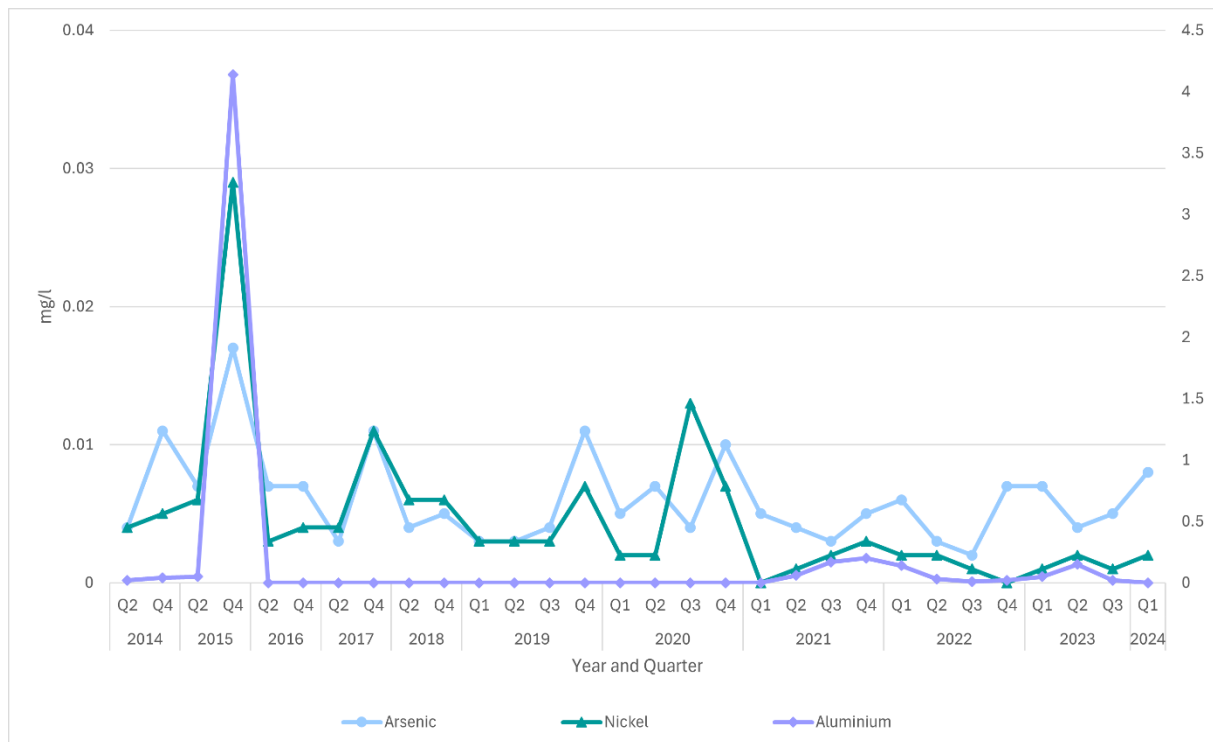


Figure 120: Total metals arsenic, nickel, aluminium in the Mine Water Dam

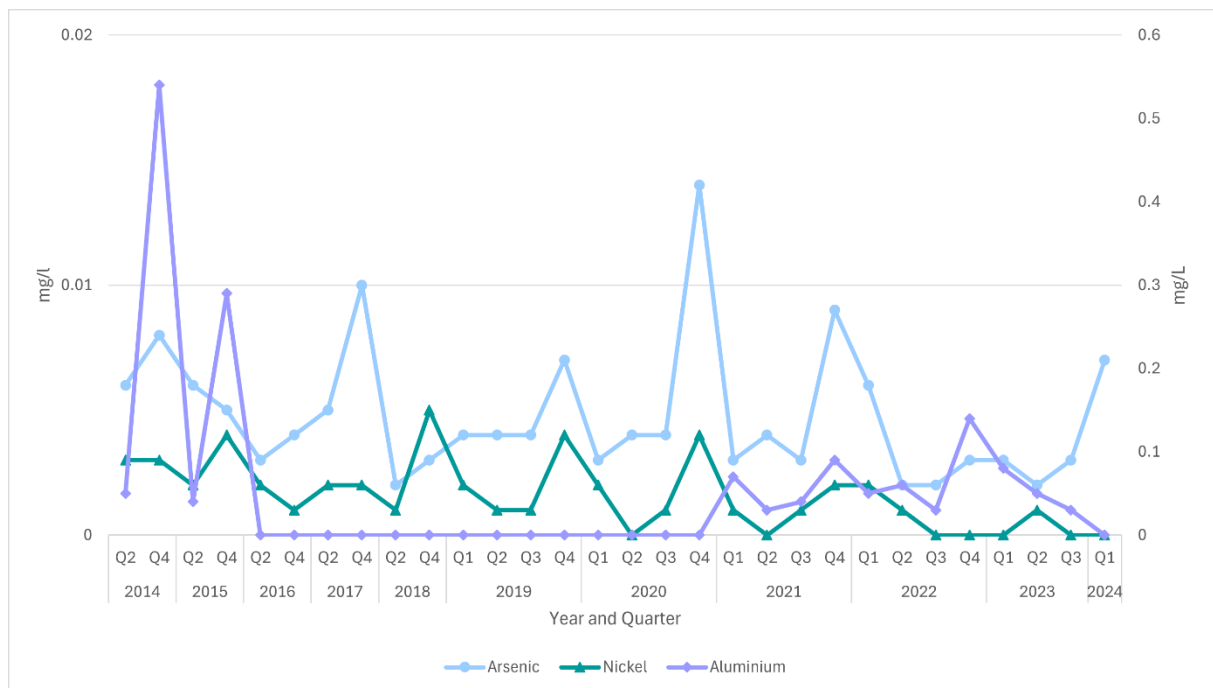


Figure 121: Total metals arsenic, nickel, aluminium in Raw Water Dam

3.5.16 Landform preparation

The final landform will be reshaped and profiled according to the final landform design and specifications outlined in Section 3.5.8.

3.5.17 Revegetation

Revegetation of the Project site aims to restore the land to pasture grazing, being the target vegetation type for the 'open pasture' and 'low hill' PMLUs. Revegetated areas will be developed to form vegetation cover and species that are comparable to the surrounding area, with no greater management input than for surrounding areas of the same use of low intensity cattle grazing. The methodology to achieve the target vegetation for the PMLUs is described in the below section.

3.5.17.1 Flora species selection

Flora species to be used in revegetating the Project include a mix of native and introduced pasture species to achieve the target final land use of low intensity cattle grazing. Flora species to be used for revegetation have been proposed on the basis of baseline ecological assessments and the long-term monitoring results from the RMP, which provides for monitoring of undisturbed areas of the lease. Recommended flora species are listed in Table 58.

It is noted that this list is provisional and is subject to change based on suitability and availability and as new information becomes available from rehabilitation monitoring and research.

Table 58: Recommended species for revegetation

Vegetation type	Target Species
Groundcover	<i>Aristida latifolia</i> (Feathertop wiregrass) (Native) <i>Chloris truncata</i> (Windmill grass) (Native) <i>Dactylon radulans</i> (Button Grass) (Native) <i>Cynodon dactylon</i> (Green Couch) (Native) <i>Panicum effusum</i> (Native Millet) (Native) <i>Urochloa mosambicensis</i> (Sabi Grass) (Exotic) <i>Cenchrus ciliaris</i> (Buffel Grass) (Exotic) <i>Bothriochloa pertusa</i> (Indian Bluegrass) (Exotic)
Shrub	<i>Carrissa spinarum</i> (Currant Bush) <i>Capparis lasiantha</i> (Nipan) <i>Stylosanthes scabra</i> (Shrubby stylo) <i>Acacia salicina</i> (Sally wattle)
Trees	-

Although ongoing rehabilitation monitoring indicates *Cenchrus ciliaris* (Buffel grass) is the most dominant species at reference sites, this species has not been included in the recommended species list. If not suitably managed, Buffel grass can develop into a thick monoculture, thereby constraining the establishment of other species. Furthermore, it is expected that Buffel grass will naturally repopulate areas from existing seedbanks or future seed dispersal. For this reason, it is recommended that other species are used to encourage greater species diversity.

For large areas that require revegetation, particularly on sloped landforms, a fast-establishing sterile annual cover crop will be included in the seed mix. This cover crop will help rapidly establish ground cover and minimise topsoil loss. This approach will help suppress weed colonisation and aid the re-establishment of integral biological and nutrient cycling that naturally occur in soil, creating a favourable micro-environment for the germination and emergence of the native seeds. This should also provide a rapid ground cover and assist in

achieving soil stabilisation. *Echinochloa esculenta* (Japanese Millet) is intended to be used for summer applications and *Lolium* sp. (Rye Grass) for winter applications. In the transition between seasons, a combination of both species will be used.

3.5.17.2 Method for surface preparation and seeding

Following final landform development, the surface of rehabilitated areas will be prepared for revegetation. This process will involve ripping of the soil surface and subsoil profile to create a rough surface for water retention. Soil health assessments will be completed prior to revegetation to determine requirements for fertiliser or other soil ameliorants.

For project efficiencies, surface preparation and seeding process will occur simultaneously. A dozer will be used to rip the surface, with an air seeder attachment to broadcast the seed mix and fertiliser at the same time. Seed mix will be applied at a rate of 6 kg/ha, with fertiliser applied at 150 kg/ha.

As far as practicable, revegetation will occur during the spring months (September, October and November), and prior to the onset of the wet season.

3.6 Risk assessment

3.6.1 Risk assessment requirements

Section 126C(1)(f) of the EP Act requires the PRCP to identify the risks, for each PMLU, of a stable condition not being achieved and how the applicant intends to manage or minimise the risk.

A risk assessment has been carried out in accordance with the following standards:

- AS/NZS ISO 31000:2018 Risk management - Guidelines; and
- HB203:2012 Managing environment-related risk.

3.6.2 Risk assessment process

Any risk assessment needs to be undertaken with consideration of the scope, context and criteria relevant to the assessment. For this risk assessment, the following scope and purpose was discussed and agreed to:

- identify the risks of a stable condition for land not being achieved for the agreed PMLUs nominated;
- identify the risks of sufficient improvement not being achieved for the agreed NUMAs nominated; and
- identify the approach to be taken by the Project to manage and minimise the risks identified.

For this risk assessment, risk scenarios (or 'threats') were identified and considered for each RA and NUMA associated with the Project. The causes attributable to each risk scenario were documented as well as the potential impacts. Existing controls were noted, defined as those reasonably expected to be in place for a Project of this nature and having appropriate and contemporary management systems. Each risk scenario was then assessed with respect to health, safety, the environment and compliance against the risk assessment schema outlined in Section 3.6.3.

3.6.3 Risk assessment schema

Risks specific to the rehabilitation of the Yandan Gold Project were classified using the risk classification schema which is described below. The risk assessment schema used is comparable to those used widely within the mining industry and comprises the following components:

- a control effectiveness ranking (Table 59) used for assessing the operational controls expected to be in place for a project of this type;
- a likelihood classification descriptors table (Table 60); and
- a consequence classification descriptors table (Table 61) intended to guide a consistent assessment of consequence.

Following a consensus determination of likelihood and consequence, the risk level was determined using the matrix shown in Table 62. For any risks classified as 'significant' or above, mitigation and management measures were identified and documented.

Table 59: Control effectiveness ranking

Control Rank	Description	Guidance
C1	Substantially effective/adequate design	Controls considered adequate and operating effectively on almost all occasions
C2	Mostly effective/adequate design	Controls considered adequate and operating effectively on most occasions
C3	Inadequate design/partially effective	Controls are considered inadequately designed or are only operating to partial effectiveness on most occasions
C4	No controls/ineffective	There are no controls designed or the existing controls are operating ineffectively on all occasions

Table 60: Likelihood of exposure to the hazard

	Likelihood				
	Rare	Unlikely	Possible	Likely	Almost certain
Frequency interval (multiple events)	<1/100 years	1/10 – 1/100 years	1/year – 1/10 years	2/year – 1/year	>2/year
Probability (single events)	<0.1%	0.1% – 1%	1% – 10%	10% – 25%	>25%

Table 61: Consequence classification descriptors

Category	Consequence Scale				
	Very low	Low	Moderate	High	Very high
Safety	Low level short term subjective inconvenience or symptoms. First aid treatment.	Reversible injuries requiring treatment but does not lead to restricted duties. Medical treatment.	Reversible injury or moderate irreversible damage or impairment to one or more persons. Lost time injury.	Single fatality and/or severe irreversible damage or severe impairment to one or more persons.	Multiple fatalities or permanent damage to multiple people.
On-site environmental	Near-source confined and promptly reversible impact (typically a shift).	Near-source confined and short-term reversible impact (typically a week).	Near-source confined and medium-term recovery impact (typically a month).	Impact that is unconfined and requiring long-term recovery, leaving residual damage (typically years).	Impact that is widespread unconfined and requiring long-term recovery, leaving major residual damage (typically years).

Off-site environmental	Not applicable.	Near-source confined and promptly reversible impact (typically a shift).	Near-source confined and short-term reversible impact (typically a week).	Near-source confined and medium-term recovery impact (typically a month).	Impact that is unconfined and requiring long-term recovery, leaving residual damage typically years).
Compliance	Non-conformance with internal requirement with very low potential for impact. Non-compliance with community commitment goes unnoticed by external party/parties, requiring minimal effort to correct.	Non-compliance with external or internal requirement with low potential for impact. Formal censure. Non-compliance with community commitment, requiring limited effort to correct.	Non-compliance with internal or external requirement with moderate impact. Moderate penalties for breach of legislation, contract, permit or licence. Non-compliance with community commitment reported formally, with significant effort to correct.	Breach of licence(s), legislation, regulation-high potential for prosecution. Contract breach-significant penalty. Systemic internal standards breach-high impact. Community commitment breach-high potential business impact-significant effort to fix.	Suspended or severely reduced operations imposed by regulators. Breach of community commitment results in direct loss of established consents with widespread secondary effects.

Table 62: Risk level classification matrix

Likelihood	Consequence				
	Very low	Low	Moderate	High	Very High
Almost certain	Class II	Class III	Class IV	Class IV	Class IV
Likely	Class II	Class III	Class III	Class IV	Class IV
Possible	Class I	Class II	Class III	Class IV	Class IV
Unlikely	Class I	Class I	Class II	Class III	Class III
Rare	Class I	Class I	Class II	Class III	Class III

3.6.4 Risk assessment outcomes and management

Detailed risk assessment outcomes are provided in Appendix F. For this Project, a total of 100 individual risk assessment scenarios were identified resulting in no risk scenarios classified as 'Class IV', 14 risk scenarios were

classified as 'Class III', 67 classified as 'Class II', and the remainder (19) classified as 'Class I'. A summary of the risk outcomes is shown in Table 63.

Table 63: Risk assessment outcomes by risk category

Risk category	Risk level				
	Class I	Class II	Class III	Class IV	Total
HLP	3	5	3	0	11
Tailings Storage Facility (Cell A)	1	6	2	0	9
Tailings Storage Facility (Cell B)	4	8	0	0	12
Retained infrastructure	1	2	0	0	3
Retained water storages	1	4	0	0	5
Built infrastructure areas	2	6	0	0	8
Rehabilitated water management structures	1	5	0	0	6
ROM pad	2	7	1	0	9
Main Pit flood bund	1	7	3	0	11
South pit (backfilled)	1	8	0	0	9
Final voids (NUMAs)	2	9	0	2	13
Natural hazards	0	4	0	0	4
Total	15	57	10	0	82

The risk scenarios classified as 'Class III' were associated with the risk of erosion on rehabilitated landforms with steeper slopes or the inherent risk of failure to infrastructure surrounding the NUMAs despite the use of best-practice. Management measures identified as appropriate for lowering this risk include:

- landform design to moderate slopes;
- good topsoil management practices;
- adequate and effective soil amelioration;
- surface grading and shaping;
- the application of rock mulch;
- prompt revegetation; and
- revegetation monitoring and maintenance as required.

3.7 Monitoring and maintenance

For the purposes of developing the PRCP Schedule, twelve rehabilitation milestones (RM) and three management (MM) milestones have been proposed as being applicable for the Project. The PRCP Guideline (DES 2023) requires consideration of measures to be undertaken to demonstrate that milestones and milestone criteria have been achieved.

With respect to determining the achievement of rehabilitation and management milestones, completion criteria and corresponding indicators have been developed for each RM and MM (Section 3.5.5). Assessment of rehabilitation and improvement areas against completion criteria will be incorporated into the Projects' ongoing environmental management. Assessment of rehabilitation areas against the completion criteria that pertain to vegetation and achievement of post mining land uses will be undertaken as part of the annual Rehabilitation Monitoring Program that exists for the Project.

Table 64 and Table 65 provides a summary of the measures to be undertaken with respect to determining the achievement of each rehabilitation milestone and management milestone, respectively. Determination of the boundary of an area reaching a given milestone at a given point in time, will be done with standard survey techniques, including land-based survey and airborne survey at an appropriate frequency – nominally annually – to achieve satisfactory geolocation of areas.

Table 64: Rehabilitation milestones - management and monitoring measures

Rehabilitation milestone	Description / criteria	Proposed management/ monitoring measure(s)
RM1: Infrastructure decommissioning and removal	Applicable to all RAs. Applicable to all infrastructure identified to be decommissioned/ disposed of. Considered to be met when the area can be transitioned to RM2, RM3, RM4, RM9, RM11 or RM12, where applicable.	Infrastructure decommissioned/ disposed at closure will be subject to strict environment and safety planning requirements including completion inspections.
RM2: Remediation of contaminated land (where required)	Applicable to RA1, RA2 and RA4. This milestone is applicable to any areas where notifiable activities have been carried out and involves as a minimum the completion of a phase 1 contaminated land investigation undertaken by an AQP. Where required, remediation activities will be undertaken and recorded, and notifications completed.	A completed phase 1 contaminated land investigation report, as well as any consequent reports where required.
RM3: Landform development of infrastructure areas	Applicable to RA4, RA5, RA7, RA10. Considered to be met when all bulk earthworks are completed, and former infrastructure area is assessed as geotechnically stable by a suitably qualified person. Areas can transition to RM8 where applicable.	Regular meetings (at least six monthly) will be held between the mining contractor and the GBM mining and environment team to track the progress of areas subject to this activity within the Schedule. Survey of completed areas.
RM4: Landform development of rehabilitated	Applicable to RA3a and RA3b.	Regular meetings (at least six monthly) will be held between the mining contractor and the GBM mining and environment team to track the

Rehabilitation milestone	Description / criteria	Proposed management/ monitoring measure(s)
water management structures	Includes bulk earthworks and water drainage lines reinstated. For dams, considered to be met when dams are cleaned and assessed as geotechnically stable by an AQP. For Main Pit flood bund, considered to be met when assessed as not being a regulated structure; certified design plan for the bund is developed and approved by the administering authority; all subsequent earthworks are completed as per the approved design plan, as required; and assessed as geotechnically stable by an AQP. Area can transition to RM8 when applicable.	progress of areas subject to this activity within the Schedule. Survey of completed areas.
RM5: Landform development of TSF Cell B	Applicable to RA1. Considered to be met when all bulk earthworks completed and cover system is installed; area is assessed as geotechnically stable by an AQP; and assessment by an AQP confirms cover system is functioning as designed and there is no migration of contaminants. Area can transition to RM8 when applicable.	Land based survey techniques will be implemented to confirm that specified design for RA1 has been met. Additionally, visual inspection determines if any future maintenance/repair action is required.
RM6: Landform development of TSF Cell A	Applicable to RA5b. Considered to be met when all bulk earthworks completed and cover system is installed; area is assessed as geotechnically stable by an AQP; and assessment by an AQP confirms cover system is functioning as designed and there is no migration of contaminants. Area can transition to RM8 when applicable	Land based survey techniques will be implemented to confirm that specified design for RA1 has been met. Additionally, visual inspection determines if any future maintenance/repair action is required.
RM7: Landform development of HLP	Applicable to RA2. Considered to be met when all bulk earthworks completed and cover system is installed; area is assessed as geotechnically stable by an AQP; and assessment by an AQP confirms cover system is functioning as designed and there is no migration of contaminants. Area can transition to RM8 when applicable.	Land based survey techniques will be implemented to confirm that specified design for RA2 has been met. Additionally, visual inspection determines if any future maintenance/repair action is required.
RM8: Surface preparation	Applicable to RA1, RA2, RA3a, RA3b, RA4, RA5a, RA5b RA7, RA10. Includes final profiling and application of topsoil or alternative topdressing materials as required; soil health assessment for determination of ameliorant requirements;	Regular meetings (at least six monthly) will be held including the mining contractor and the GBM mining and environment teams to track the progress of areas subject to this activity within the mine plan. Survey of completed areas.

Rehabilitation milestone	Description / criteria	Proposed management/ monitoring measure(s)
	application of final surface amelioration and/or preparation activities. Areas can transition to RM8 when applicable.	
RM9: Revegetation	Applicable to RA1, RA2, RA3a, RA3b, RA4, RA5a, RA5b RA7, RA10. Revegetation of prepared areas (RM7) as outlined in Section 3.5.16. Areas can transition to RM10 when applicable.	Regular meetings (at an appropriate frequency) will be held including the mining contractor and the GBM mining and environment teams to plan revegetation activities with consideration of the areas available for revegetation and weather conditions. Survey of completed areas, and record of revegetation method retained.
RM10: Achievement of revegetation requirements (open pasture – grazing and low hill – pasture grazing)	Applicable to RA1, RA2, RA3a, RA4, RA5, RA6, RA7, RA10 Revegetated areas to be assessed against ground cover and stability related completion criteria (refer Section 3.5.5). Areas can transition to RM11 when applicable.	Regular meetings (at an appropriate frequency) will be held to track progress towards the achievement of surface requirements. Ongoing rehabilitation activities to manage and achieve successful revegetation will include, as required: • repair of erosion prone areas; • application of hay mulching (or similar technique) to control erosion at the early stages of seeding (window of erosional risk); • weed management and control; and • re-seeding and/or additional planting when required. Erosion monitoring to identify and control severe or extreme rill and gully erosion as defined in Section 3.5.5. Field survey monitoring will be supplemented with remote sensing to improve data analysis and provide a more accurate measures to determine if rehabilitation objectives are being met.
RM11: Achievement of PMLU to stable condition (open pasture – grazing and Low hill – pasture grazing)	Applicable to RA1, RA2, RA3a, RA4, RA5, RA6, RA7, RA10. Revegetated areas to be assessed against all completion criteria developed with reference to analogue sites of similar characteristics and land use (refer Figure 5 and Section 3.5.5). Considered to be met when land is able to be transitioned to progressive certification.	Field surveys, drone and satellite data analysis as part of the annual rehabilitation monitoring. The following assessments will be undertaken to demonstrate that the land has achieved RM10: • closure post-mining soil and land suitability assessments; • vegetation, erosion and weed assessments to be provided in a final rehabilitation report; and • hazards, safety and stability assessment completed; •
RM12: Achievement of PMLU to stable condition	Applicable to RA8. Considered to be met when the area is rehabilitated to be safe, stable and non-	A hazards, safety and stability assessment is to be done for all retained water structures. Retained storage water quality is to achieve ANZECC guidelines for water quality objectives for livestock drinking water.

Rehabilitation milestone	Description / criteria	Proposed management/ monitoring measure(s)
(retained water storages)	polluting as per the completion criteria in Section 3.5.5.	
RM13: Achievement of PMLU to stable condition (retained infrastructure)	Applicable to RA9. Considered to be met when the area is rehabilitated to be safe, stable and non-polluting as per the completion criteria in Section 3.5.5.	A hazards, safety and stability assessment is to be done undertaken all retained infrastructure.
RM14: Achievement of revegetation requirements (Flood protection bund)	Applicable to RA3b. Revegetated/other ground cover material areas to be assessed against ground cover and stability related completion criteria. Areas can transition to RM15 when applicable.	Regular meetings (at an appropriate frequency) will be held to track progress towards the achievement of surface requirements. Ongoing rehabilitation activities to manage and achieve successful revegetation will include, as required: • repair of erosion prone areas; • application of hay mulching (or similar technique) to control erosion at the early stages of seeding (window of erosional risk); • weed management and control; and • re-seeding and/or additional planting when required. Erosion monitoring to identify and control severe or extreme rill and gully erosion as defined in Section 3.5.5. Field survey monitoring will be supplemented with remote sensing to improve data analysis and provide a more accurate measures to determine if rehabilitation objectives are being met.
RM15: Achievement of PMLU to stable condition (Flood protection bund)	Applicable to RA3b. Considered to be met when the area is rehabilitated to be safe, stable and non-polluting as per the completion criteria in Section 3.5.5.	Field surveys, drone and satellite data analysis as part of the annual rehabilitation monitoring. The following assessments will be undertaken to demonstrate that the land has achieved RM10: • vegetation, erosion and weed assessments to be provided in a final rehabilitation report; and • hazards, safety and stability assessment completed;

Table 65: Management milestones - management and monitoring measures

Management milestone	Description / criteria	Proposed management/ monitoring measure(s)
MM1: Achievement of final landform design	Improvement areas to be assessed against the landform design completion criteria developed for voids in Section 3.5.5. Considered to be met when void batter slopes are within the nominated target slope range and confirmation that voids act as groundwater sinks.	Regular meetings (at least six monthly) will be held between the mining contractor and the GBM mining and environment team to track the progress of areas subject to this activity within the schedule. Land based survey techniques will be implemented to confirm that specified batter and graded slopes have met design specifications Geotechnical modelling and hydrogeological survey of completed areas by suitably qualified persons.
MM2: Achievement of surface requirements	Bunding and safety warning signage erected around perimeter of each void. Considered to be met when voids are inaccessible.	Regular meetings (at least six monthly) will be held between the mining contractor and the GBM mining and environment team to track the progress of areas subject to this activity within the schedule. Visual inspection and land based survey around perimeter of all voids.
MM3: Achievement of sufficient improvement	Improvement areas to be assessed against the landform design completion criteria developed for voids. Considered to be met when improvement areas can be transitioned to progressive certification.	Survey of completed areas. Geotechnical modelling and hydrogeological survey of completed areas by suitably qualified persons.

3.7.1 Monitoring methodology

3.7.1.1 Terrestrial monitoring locations

Rehabilitation progress of the various rehabilitated domains and cover trial sites is monitored at established monitoring sites, as shown in Figure 5 and as detailed in Table 2.

Progressive rehabilitation sites are located at the following domains:

- South Pit (SP1 and SP2);
- Run-of-Mine (ROM1, ROM2, and ROM3);
- Cell A (A1 and A2);
- Rehabilitated Infrastructure (RI1 and RI2); and
- Village Infrastructure (V1 and V2).

Cover trial sites on TSF Cell B provide for monitoring of each trial cover system type, including:

- Thin Cover – 300 mm topsoil placed on the tailings surface (monitoring location 'B1' and 'B2').
- Thick Cover – 450 mm topsoil placed over oxide tailings (monitoring location 'B3' and 'B4').

- Gravel Topsoil cover – 0 – 600 mm gravelly topsoil placed over sulphide tailings (monitoring location 'B5').
- Gravel Topsoil cover – 400 mm gravelly topsoil placed over sulphide tailings (monitoring location 'B6').

Three established reference sites are located outside of the Project disturbance footprint (R1, R2, and R3). Reference data from these sites provides the benchmark for measuring the rehabilitation performance of rehabilitated sites and cover trials towards the post-mine land use of 'open pasture'.

3.7.1.2 Vegetation monitoring

This method involves the collection of quantitative data on ground cover, species richness, and tree and shrub density within each plot at monitoring sites. Each monitoring site has a central 50 m long transect and observations/ measurements are taken 5 m on either side of the transect, thereby representing a plot size of 50 m x 10 m. A plastic post has been installed at each end of the transect to ensure the exact location of the permanent transect can be identified.

To measure species richness, all vascular plants occurring within 5 m of either side of the 50 m transect are recorded. Any species unable to be identified are collected for later identification. Percentage ground cover for each species is recorded within ten 1 m x 1 m quadrats placed every 5 m along the 50 m transect. In each quadrat, the percentage cover of rock, bare ground, organic litter, and each plant species present is recorded. Species are classified into one of the following five groups for reporting purposes:

- native pasture species;
- exotic pasture species;
- shrubs;
- forbs; and,
- noxious weeds.

This methodology is used to record species richness and percentage live and dead groundcover to assess against the success criteria.

The above methodology has been adapted based on information contained within *The BioCondition Assessment Framework* (Eyre et al. 2015), the *Vegetation Assessment Guide* (DoE 2013), and *Methodology for Survey and Mapping of Regional Ecosystems and Vegetation Communities in Queensland* (Neldner et al. 2019).

Groundcover

This method involved the collecting quantitative data on average ground cover (%), where the percentage of all types of ground cover within ten 1 m x 1 m quadrats was determined. The quadrat was placed every 5 m on alternating sides along the 50 m transect, commencing at 0 m on the left and the final quadrat at 45 m (refer to Figure 122). In each quadrat the percentage cover of rock, bare ground, organic litter, and each plant species present, was recorded. Live plant species were classified into one of the following six groups for reporting purposes:

- native pasture grass species (grass species that are palatable to stock);
- exotic pasture grass species (grass species that are palatable to stock);
- non-pasture grass species (grass species that are not palatable to stock);
- shrubs (woody plant multi-stemmed at the base or, if single-stemmed, less than 2 m tall);
- forbs and other non-grass species (sedges, vines, and non-declared weeds); and,
- restricted invasive plants as listed in the Queensland *Biosecurity Act 2014*.

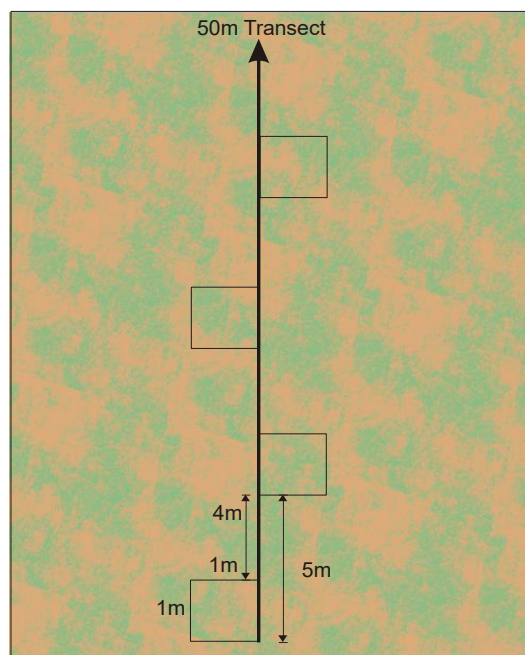


Figure 122: Ground cover percentage sampling

Species richness

Species richness was assessed using the method outlined in Eyre *et al.* (2017) where all vascular plants that occurred within a 10 m x 50 m Site area were recorded. The surveyor walked along each side of the 50 m transect centreline and recorded all trees, shrubs, forbs/other species and grasses occurring within 5 m of either side of the centreline.

Species that could not be identified within the field were collected for later identification or sent to the Queensland Herbarium for identification.

Species richness includes all species present in a monitoring Site. As shown with fractional ground cover, the time of year and seasonal rainfall impact the field observable number of species within a monitoring Site. Perennial plant species such as grasses may be identified at any time of the year depending on grazing or fire while forbs and annuals may only be visible following rain or at specific times of the year. Progress of rehabilitation is therefore assessed by functional group, compared to the mean species richness of the reference site. Species richness is presented as a proportion of reference site to indicate performance against rehabilitation targets. Values equal or greater than one represents rehabilitation with a greater species richness than the reference site average.

Woody stem density

Woody stem density was calculated using a methodology adapted from Eyre *et al.* (2017). All woody stems for each tree and shrub species were counted within the 10 m by 50 m site area (i.e. 5 m on both sides of each 50 m transect). From this data, both total woody stem density, as well as the density of each individual tree or shrub species, was calculated.

The density of species and growth forms on the monitoring sites is calculated using the following equation:

$$\text{Density per hectare (ha)} = \text{Number of stems recorded within the transect} \times 20$$

Canopy cover

Tree canopy cover can be used to characterise stand productivity and the distribution and abundance of above-ground plant biomass (Eyre *et al.* 2017). Percentage canopy cover of the living, native tree layer can be

estimated along a 50 m transect, using the line intercept method (Greig-Smith *et al.* 1964). For this attribute, the vertical projection of tree canopy cover of the species making up the tree canopy cover was assessed. The vertical projection of the tree canopy over the 50 m transect was recorded as illustrated in Figure 123:

Guide to monitoring canopy cover

(after Eyre *et al.* 2017). The total length of the projected canopy of the tree canopy is divided by the total length of the transect to estimate the percentage canopy cover on the site.

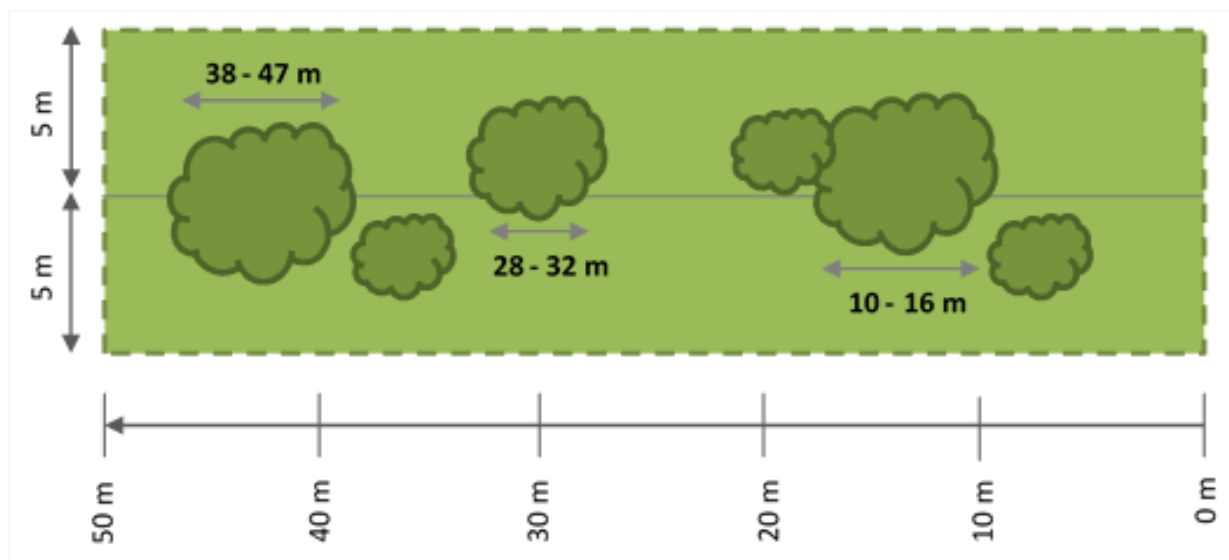


Figure 123: Guide to monitoring canopy cover (after Eyre *et al.* 2017)

Photographic monitoring

Photographic monitoring provides a visual record of the vegetation, ground cover, erosion and general appearance of each reference and rehabilitation site, allowing these sites to be compared over time.

A digital camera was used to take the photos so that a permanent record can be maintained on file for each site (Eyre *et al.* 2017). The process of collecting the monitoring photos is:

- The person taking the photograph stands at the star picket that marks the beginning of the 50 m transect at each of the sites.
- The camera is then aimed directly towards the end of the 50 m transect and a single photograph is taken. The photo is taken directly above the star picket at chest height (approximately 110 cm above the ground).
- The photographer then stands at the star picket at the opposite end of the 50 m transect.
- The camera is aimed directly towards the start of the 50 m transect and a single photograph is taken. The photo is taken directly above the star picket at chest height (approximately 110 cm above the ground).
- The digital photographs are uploaded and stored for future reference.

3.7.1.3 Erosion monitoring

Erosion at survey sites is monitored through visual assessment over time. Assessment is undertaken by traversing the 50 m transects and recording the number and average depth of any erosion features, rill lines or gullies. It should be noted that the placement of permanent transects may not be representative of the level of erosion across the entire rehabilitated landform. To compensate for this, general observations undertaken during the survey are also utilised in assessing rehabilitation performance.

Table 33 outlines how erosion observed on site is classified. The overall classification of the erosion on each transect is determined by the highest classification attributed to either the number of rills/gullies or the

average depth. For example, a transect may present only one or two rills but if these are recorded as being 25 cm deep, the transect will be classified as presenting a Moderate erosion classification.

Some erosion is expected in the first years due to topsoil ripping, an absence of vegetation and the frequency and severity of storm events. Therefore, erosion stability will be assessed from year four following seeding/planting. Monitoring will commence in the first year and the first three years will represent landform establishment.

The following information is recorded at each site:

- GPS reading of location;
- general description of type of erosion (gully [>30 cm], rill line [<30 cm]) and possible causes;
- depth of erosion;
- width of erosion;
- length of erosion;
- where eroded material is being deposited; and
- whether the erosion line is stabilised by vegetation.

Table 66: Erosion classification

Erosion classification	Minor	Moderate	Severe
Sheet erosion	Shallow soil deposits downslope	Partial exposure of roots; moderate soil deposits downslope, etc	Loss of surface horizon; root exposure, etc
Rill/gully erosion	<15 rills and <0.3 m deep	$15-30$ rills and <0.3 m deep	>30 rills and/or any >0.3 m deep.
Tunnel erosion	Absent	Absent	Present
Mass movement	Absent	Absent	Present

3.7.1.4 Fauna observations

Opportunistic observations of any fauna species or indicators of fauna presence (e.g., scats, tracks or other signs of fauna activity) within or in the vicinity of the rehabilitation areas will be noted as part of rehabilitation monitoring.

3.7.1.5 Surface water quality

Surface water quality monitoring will be undertaken as part of the current Yandan Gold Project Receiving Environment Monitoring Program (REMP) (AARC 2023). Samples will be collected from each of the surface water monitoring sites listed in Table 67 and shown on Figure 124, where surface water is present in accordance with the methodology specified in the Department of Environment and Science (DES) *Monitoring and Sampling Manual: Environmental Protection (Water) Policy 2009* (DES 2018).

REMP monitoring sites have been positioned with consideration of surface water drainage patterns and potential contaminant sources associated with key site infrastructure, with three reference sites selected for each waterway relevant to the Project. Monitoring will be undertaken at two types of representative sites:

- Reference sites – Located upstream of the Project site and outside the immediate zone of influence from the discharge points, although they may be affected by other activities upstream of the Project; and

- Receiving sites – Located downstream of the Project site and within the potential zone of influence as outlined in the EA.

Surface water sampling should occur during flow events, where possible. Field readings of pH, Dissolved Oxygen, Turbidity, Electrical Conductivity (EC) and Temperature are to be recorded. In-situ measurements shall be collected using a multi-parameter water quality meter that is laboratory calibrated to the manufacturers' specifications.

Grab samples will be collected at a depth of 10 to 20 cm where sufficient water is available. Two water samples, one total (unfiltered) and one dissolved (field filtered) will be collected at each site. Water quality samples will be analysed under laboratory testing conditions for the parameters listed below:

- pH;
- EC;
- suspended solids;
- turbidity;
- sulphate; and
- sodium.

Samples will be collected in suitable sample collection bottles provided by the laboratory with preservative added when appropriate. All water samples should be kept on ice or refrigerated during storage and transport to a National Association of Testing Authorities (NATA) accredited laboratory for analysis.

The results of the analysis will be compared to the EPP (Water) WQO for the protection of aquatic ecosystems for the Lower Suttor River sub-catchment waters (WQ1204). Where monitoring parameters have exceeded the aquatic ecosystem water quality objectives for the Lower Suttor River sub-catchment waters (WQ1204), a comparison with water quality of upstream monitoring locations demonstrate that exceedances are not a result of mine disturbance, that is water quality in downstream monitoring locations are statistically equivalent ($p < 0.05$) to reference sites (upstream monitoring locations).

Table 67: REMP monitoring locations

Site Code	Receiving Waters Location Description	Purpose	Easting (GDA 94)	Northing (GDA 94)
Upstream reference site				
REMP1	Located upstream of the Project site on the Suttor River	Reference site on Suttor River, upstream of Project and Main Pit release point 'MP1'	496050	7644545
REMP2	Located upstream of the Yandan Tailings Dam, along Sandy Creek	Reference site on Sandy Creek, upstream of Yandan Tailings Dam and various other infrastructure and any surface runoff from site	501308	7647055
REMP3	Located upstream along an unnamed watercourse that drains to Yandan Creek	Reference site for Yandan Creek, upstream of the HLP and Main Pit release point 'MP2'	499214	7645089
Downstream receiving site				
REMP4	Located downstream of Main Pit release points on the Suttor River	Receiving site downstream the HLP, Main Pit release points 'MP1' and 'MP2' on Suttor River	496754	7645359
REMP5	Located on the north-western boundary of the Project on the Suttor River, downstream of release points (MP1 and MP2) and other drainage lines from site	Receiving site downstream from all Project infrastructure on the Suttor River.	496825	7646696
REMP6	Located on the diverted section of Yandan Creek adjacent to Main Pit and downstream of release point 'MP2'	Receiving site downstream from Main Pit release point 'MP2' and the HLP	496577	7644839
REMP7	Located on an unnamed watercourse that drains to Yandan Creek, downstream of the HLP	Monitoring for potential contaminants from the HLP.	498107	7644410

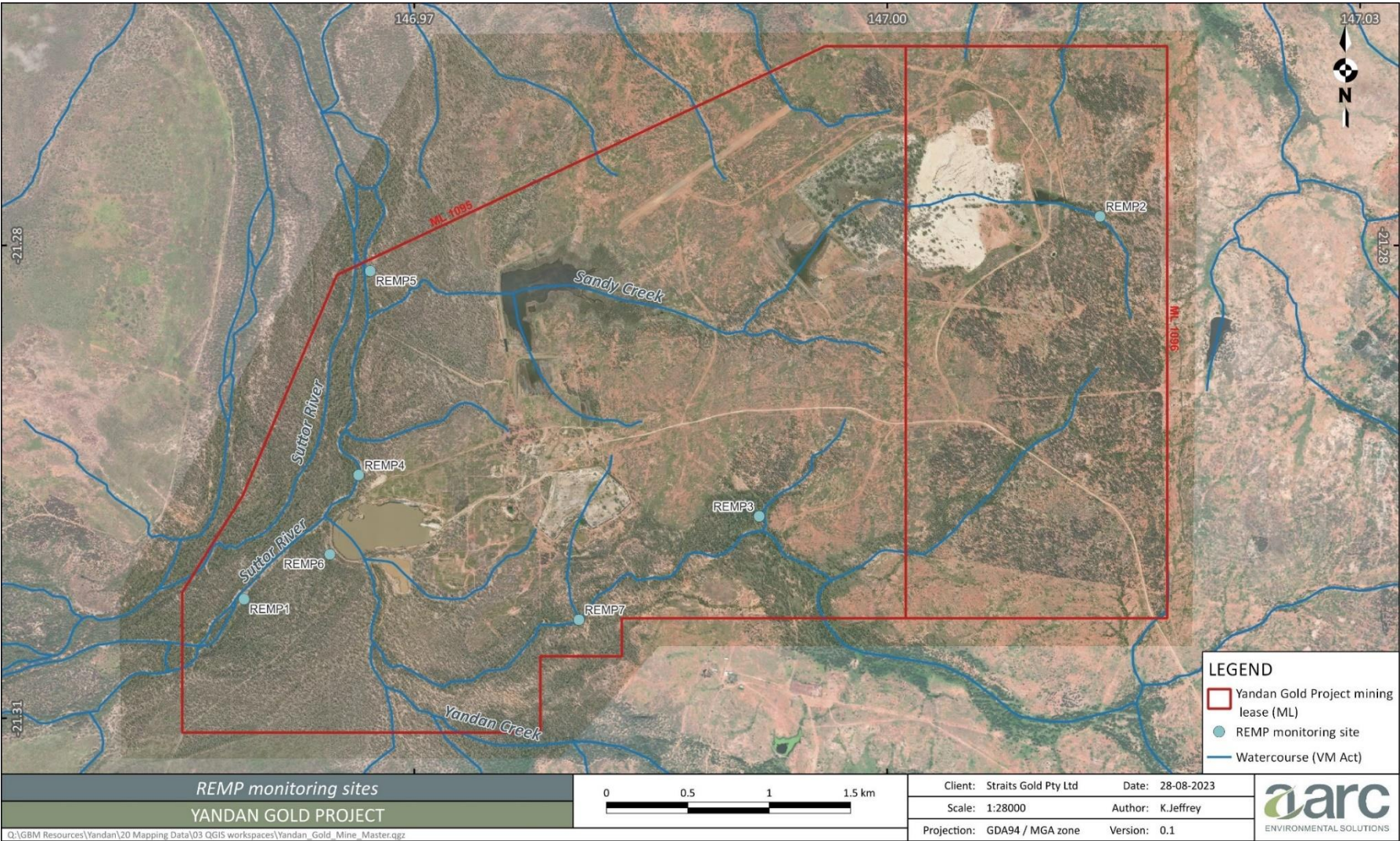


Figure 124: REMP monitoring locations

3.7.1.6 Groundwater

Groundwater monitoring is currently undertaken across the Project site at the locations specified in Table 68 and shown through Figure 27. In 2022 a review of the groundwater monitoring network for monitoring of closure criteria was undertaken by SBE. In January 2024 new bores were installed following recommendations from the review (SBE 2022). A summary of the bores installed in 2024 and monitoring purpose is provided as follows:

- Main Pit monitoring to determine groundwater response to faults and confirm that Main Pit is not causing harm to the surrounding groundwater environment.
 - MP01 – constructed to a depth of 25 m in the crystalline fault zone to determine the connection between East and Main pits as well as water quality.
 - MP02 – is nested within MP03, constructed to a depth of 11 m in the alluvial zone north-west of Main Pit where water may occur to monitor the alluvial aquifer.
 - MP03 – is nested with site MP02, constructed to a depth of 41 m in the crystalline fault zone and potential water bearing zone north-west of Main Pit, to monitor faults and fresh rock.
 - MP04 – constructed to a depth of 14 m in the crystalline fault zone and potential water bearing zone south-east of Main Pit, to monitor the north-west to south-east fault between Main Pit and South Pit.
- Monitoring of HLP to confirm that there is no seepage from the HLP to the groundwater system.
 - HL8 – constructed to a depth of 20 m in the moisture bearing zone, located to the south-east and downgradient of the HLP.
 - HL9 – constructed to a depth of 20 m in the moisture bearing zone, located to the south-west and downgradient of the HLP.
- Monitoring of the TSF to confirm that there is no seepage from either Cell A or Cell B of the TSF to the groundwater system.
 - TD8 – constructed to a depth of 20 m, in the moisture bearing zone upgradient to the east of Cell B and outside of the influence of the tailings facility. This bore will be used for background reference.
 - TD9 – constructed to a depth of 13 m, in the moisture bearing zone downgradient to the south-west of the Tailings Water Return Dam and outside of the influence of the tailings facility.
 - TD10 – constructed to a depth of 20 m, in the moisture bearing zone downgradient to the south of Cell B and outside of the influence of the tailings facility.
 - TD11 – constructed to a depth of 20 m, in the moisture bearing zone downgradient to the north-west of Cell A and outside of the influence of the tailings facility.
 - TD12 – constructed to a depth of 20 m, in the moisture bearing zone downgradient to the north-east of Cell B and outside of the influence of the tailings facility.
 - TD13 – constructed to a depth of 20 m, in the moisture bearing zone downgradient to the north of Cell B and outside of the influence of the tailings facility.
- Monitoring within the tailings facility for interpretation purposes.
 - ITD01 – constructed in the natural surface of Cell A at a depth of 10.5 m, where ponding has been observed to monitor infiltration rates and water level response within the tailings Cell A.
 - ITD02 – constructed in the natural surface of Cell B at a depth of 7 m, near a drainage line to monitor infiltration rates and water level response within the tailings Cell B.

Additional historic bores will continue to be monitored and are outlined in Table 68 and spatially shown on Figure 27. Reference monitoring locations have been located upgradient and outside the influence of final landforms.

Groundwater monitoring will be undertaken for water quality parameters and assessed against the default guideline values from ANZECC 2000 for aquatic ecosystems. Where monitoring parameters have exceeded the default guideline values, a comparison with water quality of reference monitoring locations demonstrate that exceedances are not a result of mine disturbance, that is water quality in the receiving environment are statistically equivalent ($p < 0.05$) to reference sites (reference monitoring locations).

Table 68: Groundwater monitoring bore locations

Groundwater bore	Easting (MGA94)	Northing (MGA94)	Monitoring purpose
HL3	498284	7644837	HLP – Perimeter of HLP
HL5	498358	7645103	HLP – Perimeter of HLP
HL7	498144	7645427	HLP – Perimeter of HLP
HL9	498036	7644792	HLP – Receiving environment
TD8	501281	7647037	TSF - Background
TD10	500125	7646506	TSF – Receiving environment
TD11	499627	7647595	TSF – Receiving environment
TD12	500923	7647738	TSF – Receiving environment
TD13	500463	7648077	TSF – Receiving environment
SH3	497420	7644570	TSF – Receiving environment
MP02	496812	7645256	Main Pit – Siltstone aquifer
MP03	496809	7645252	Main Pit – Siltstone aquifer
MP04	497185	7644814	Main Pit/South Pit – Fault between pits
HL8	498393	7644967	Reference - metasediment
TD9	499259	7646411	Reference - metasediment
MP01	497425	7645076	Reference – Mineralised zone Main Pit/East Hill Pit – Fault between pits
RB1D	500400	7645740	Reference - Metasediment

3.7.1.7 Water storage monitoring

Given the intended use of retained dams as grazing infrastructure, water storages to be retained by landholder agreement will be monitored against the ANZECC & ARMCANZ (2000) stock water quality guidelines for:

- pH (pH unit);
- EC ($\mu\text{S}/\text{cm}$);
- Sulphate (mg/L);
- Aluminium (mg/L);

- Arsenic (mg/L);
- Cadmium (mg/L);
- Copper (mg/L);
- Lead (mg/L);
- Nickel (mg/L); and
- Zinc (mg/L)

WAD Cyanide (mg/L) will be monitored against the guideline value nominated in the 'International Cyanide Management Code For the Manufacture, Transport, and Use of Cyanide In the Production of Gold'.

3.7.1.8 Main Pit water cover

Monitoring of the permanent water cover for depth and water quality will assist in demonstrating the achievement of milestone criteria. The Project EA requires a permanent water cover to be maintained in Main Pit. Main Pit water cover monitoring is currently undertaken quarterly, with water samples collected from two locations within the Main Pit (accessed *via* boat) using a Van Dorn water sampler. Samples are collected at 5 m depth intervals.

Table 69: Main Pit water quality parameters (Source: Table 7 from Project EA)

Parameter	Units	Depth intervals (m)
pH		5 and 10
Temperature	°C	5 and 10
Electrical Conductivity	µS/cm	5 and 10
Salinity	Ppm	5 and 10
Dissolved Oxygen	DO	5 and 10
Oxidation Reduction Potential	mV/Eh	5 and 10
Total Dissolved Solids	mg/L	10
Sulfate	mg/L	10
Arsenic	mg/L	10
Cadmium	mg/L	10
Copper	mg/L	10
Lead	mg/L	10
Mercury	mg/L	10
Molybdenum	mg/L	10
Selenium	mg/L	10
Zinc	mg/L	10

3.7.1.9 Release monitoring

The release of waters from Main Pit at the northwest and southwest spillways will be monitored for water quality at the locations specified in Table 70 until relinquishment of NUMAs. The results of the analysis will be compared to the EPP (Water) WQO for the protection of aquatic ecosystems for the Lower Suttor River sub-catchment waters (WQ1204). Where monitoring parameters have exceeded the aquatic ecosystem water quality objectives for the Lower Suttor River sub-catchment waters (WQ1204), a comparison with water quality of upstream monitoring locations demonstrate that exceedances are not a result of mine disturbance, that is water quality in downstream monitoring locations are statistically equivalent ($p < 0.05$) to reference sites (upstream monitoring locations). Monitoring results will be used to demonstrate that during connection to the Suttor River from Main Pit, impacts to water quality values are not likely.

Table 70: Release monitoring points

Monitoring Point	Easting GDA94	Northing GDA94	Description of Monitoring Point
Receiving environment			
SR1	496750	7645460	Monitoring point in the Suttor River causeway approximately 150 meters downstream of the MP1 contaminant release point.
SR2	496820	7646759	Monitoring point in the Suttor River approximately 1.7 kilometres downstream of MP1 contaminant release point.
Reference Points			
SR3a	496050	7644545	Monitoring point in Suttor River upstream of the main pit on the western side.
SR3b	495734	7645032	Monitoring point in the Suttor River upstream of the main pit on the western side. (Alternative monitoring point to SR3a to be used when access to SR3A is restricted due to flood waters).
SR4	498842	7645095	Monitoring point upstream of the main pit in Yandan Creek branch on the eastern side of the Suttor River.

3.7.2 Maintenance

Rehabilitation indicators and visual observations will be used to identify any aspects of the rehabilitated area that are of concern or suggest rehabilitated land is not on a trajectory of meeting the required completion criteria. These may include:

- evidence of active erosion,
- inadequate vegetation cover or growth,
- invasive weed or pest species,
- soil dispersion/instability, and

- soil infertility.

Following the annual monitoring process, areas of rehabilitation will be assessed for maintenance. An annual visual inspection of all unrelinquished areas will be undertaken to provide an overview of the status of the rehabilitation and identify any noticeable issues such as erosion or inadequate vegetation cover or growth. This information, along with monitoring results, will be used to inform the maintenance schedule.

Maintenance may include repairing areas of excessive soil erosion or undertaking supplementary plantings or seeding to increase floristic diversity and cover to assist in achieving completion criteria.

If issues re-occur an investigation will be carried out to determine the reason and inform appropriate remediation actions. Modification of rehabilitation methods and specifications may be required, and the Plan will be updated accordingly.

3.7.2.1 Pit wall monitoring

Opportunistic geological/geotechnical mapping East Pit walls to inform final closure report.

4 References

AARC Environmental Solutions Pty Ltd (AARC) 2018, *Yandan Gold Mine post mine land use plan*, unpublished report prepared for Aeris Resources Limited, AARC Environmental Solutions Pty Ltd, Brisbane Queensland.

AARC Environmental Solutions Pty Ltd (AARC) 2019, *Yandan Gold Mine rehabilitation monitoring report*, unpublished report prepared for Aeris Resources Limited, AARC Environmental Solutions Pty Ltd, Brisbane Queensland.

AARC Environmental Solutions Pty Ltd (AARC) 2021a, *Yandan Gold Mine Water Management Plan*. Version 1.1, unpublished report prepared for Aeris Resources Limited, AARC Environmental Solutions Pty Ltd, Brisbane Queensland.

AARC Environmental Solutions Pty Ltd (AARC) 2021b, *Yandan Gold Project – Rehabilitation Monitoring Report*. AARC, Brisbane.

AARC Environmental Solutions Pty Ltd (AARC) 2023a, *Yandan Gold Mine rehabilitation monitoring report*, unpublished report prepared for Strait's Gold Pty Limited, AARC Environmental Solutions Pty Ltd, Brisbane Queensland.

AARC Environmental Solutions Pty Ltd (AARC) 2023b, *Yandan Gold Project receiving environment monitoring program*, unpublished report prepared for Strait's Gold Pty Limited, AARC Environmental Solutions Pty Ltd, Brisbane Queensland.

AARC Environmental Solutions Pty Ltd (AARC) 2024a, *Yandan Gold Project, erosion stability assessment*, version 2.0, unpublished report prepared for Strait's Gold Pty Limited, AARC Environmental Solutions Pty Ltd, Brisbane Queensland.

AARC Environmental Solutions Pty Ltd (AARC) 2024b, *Yandan Gold Project, soils and land suitability assessment*, V2.0, unpublished report prepared for Strait's Gold Pty Limited, AARC Environmental Solutions Pty Ltd, Brisbane Queensland.

ABARE 2016, *The Australian land use and management classification, Version 8*, Australian Bureau of Agricultural and Resource Economics and Sciences, Canberra.

Abbott, TS & McKenzie, DC, 1996, *Improving soil structure with gypsum and lime*, Agfact AC 10, second edition, NSW Agriculture.

AECOM Australia Pty Ltd (AECOM) 2016, *Yandan Gold Mine, 2016 annual statutory dam inspections*, prepared for Straits Gold Pty Ltd., Job No.: 60278331 dated 6 July 2016.

AMIRA 2002, *ARD Test Handbook: Project 387A prediction and kinetic control of acid mine drainage*, Australian Minerals Industry Research Association, Ian Wark Research Institute and Environmental Geochemistry International Pty Ltd, May 2002.

ANZG 2018, *Australian and New Zealand Guidelines for Fresh and Marine Water Quality*, Australian and New Zealand Governments and Australian state and territory governments, Canberra, ACT, Australia <<https://www.waterquality.gov.au/>>.

Australian and New Zealand Environment and Conservation Council (ANZECC) & Agriculture and Resource Management Council of Australia and New Zealand (ARMCANZ) 2000, *Australian and New Zealand Guidelines for fresh and marine water quality volume 1, the guidelines*, ANZECC and ARMCANZ.

ANZMEC/MCA 2000, *Strategic framework for mine closure*, Australian and New Zealand Minerals and Energy Council and Minerals Council of Australia, National Library of Australian Catalogue Data.

Blackrock Mining Solutions (Blackrock) 2024, *Yandan Gold Project, Progressive rehabilitation and closure planning (PRCP) geotechnical assessment report*, Blackrock, Brisbane.

Bureau of Meteorology (BoM) 2021, *Rose of Wind direction versus Wind speed in km/h (01 Jan 1957 to 10 Aug 2021): Collinsville Post Office*, Bureau of Meteorology (BoM), Commonwealth of Australia.

Commonwealth of Australia (CoA) 2016, *Leading Practice Sustainable Development Program for the Mining Industry* 2022, <<http://www.qld.gov.au/environment/land/vegetation/mapping/qlump/>>.

CRDC 2020, *Best Management Practices for Nitrogen (N) Fertilizer Use on Dairy Pastures - More Profit from Nitrogen Program*, viewed 5th February 2022 <<https://www.crdc.com.au/more-profit-nitrogen>>.

Clay, M, Dunlop, J, & Gagen, E 2022, *Review of open-cut coal mine void rehabilitation planning practices in Queensland*, Student project report. Brisbane: Office of the Queensland Mine Rehabilitation Commissioner, Queensland Government.

Daws, MI, Standish, J, Koch, JM and Morald, TK 2013, 'Nitrogen and phosphorus fertilizer regime affect jarrah forest restoration after bauxite mining in Western Australia', *Applied Vegetation Science*, 16 (4): 610 – 618.

DAWE 2019, *Directory of Important Wetlands*, Retrieved from: <http://www.environment.gov.au/cgi-bin/wetlands/search.pl?smode=DOIW>.

de Caritat, P & Braun, J 1992, 'Cyclic development of sedimentary basins at convergent plate margins: 1. Structural and tectono-thermal evolution of some Gondwana basins of eastern Australia', *Journal of Geodynamics*, 16: 241–282.

Department of Energy, Environment and Climate Action (DEECA) 2024, *Understanding soil test for pastures*, webpage, viewed 19th March 2024, <<https://agriculture.vic.gov.au/farm-management/soil/understanding-soil-tests-for-pastures#:~:text=Ideally%20exchangeable%20sodium%20should%20be%20%3C0.7%20meq%2F100g%20and,lose%20structural%20integrity%2C%20compact%20and%20form%20surface%20crusts>>.

Department of Environment, Land, Water and Planning (DELWP) 2015, *Guidelines for riparian fencing in flood-prone areas*, The State of Victoria Department of Environment, Land, Water & Planning.

Department of Environmental Policy and Planning Division, Department of Environment and Science 2022, *Environmental Protection (Water and Wetland Biodiversity) Policy 2019 Suttor River Sub-basin Environmental Values and Water Quality Objectives*, DES, State of Queensland, Brisbane.

Department of Environment and Science (DES) 2022, *Vegetation management regional ecosystem map version 10.0*, viewed 17 March 2022: <<http://qldspatial.information.qld.gov.au/catalogue/>>.

Department of Environment and Science (DES) 2023a, *Land Use Mapping – 1999-2017 – Queensland*, DES, State of Queensland, Department of Environment and Science (DES) 2023a, *Land Use Mapping – 1999-2017 – Queensland*, DES, State of Queensland.

Department of Environment and Science (DES) 2023b, *Biodiversity status of 2021 remnant regional ecosystems - Queensland*, DES, State of Queensland.

Department of Environment and Science (DES) 2023c, *Guideline-Progressive rehabilitation and closure plans (PRC Plans)*, ESRI/2019/4964, version 3.00, effective 04 April 2023, DES, Queensland Government, Brisbane.

Department of Industry, Sciences and Resources (DISR) & Department of Foreign Affairs and Trade (DFAT), *Preventing acid and metalliferous drainage, leading practice sustainable development program for the mining industry*, Department of Industry, Science and Resources, Commonwealth of Australia.

Department of Local Government and Planning (DLGP) 2012, *Mackay, Isaac and Whitsunday Regional Plan*, prepared by the Honourable Paul Lucas, Attorney-General, Minister for Local Government and Special Minister of State in accordance with the *Sustainable Planning Act 2009*, section 27 and 58, State of Queensland.

Department of Primary Industries Victoria (n.d.), *Fertilizing pastures*, viewed 5th February 2022, <http://www.ccmaknowledgebase.vic.gov.au/shkb/brown_book/documents/15_Sulphur/Greener_pastures_Chapter5.pdf>.

Department of Science, Information Technology and Innovation and Department of Natural Resources and Mines 2015, *Guidelines for agricultural land evaluation in Queensland* (Second Edition), State of Queensland).

Department of Resources (DoR) 2021, Queensland spatial catalogue, viewed 16 March 2022:

<https://qldspatial.information.qld.gov.au/catalogue/custom/index.page>.

ERC User Guide 2022, *User guide for estimated rehabilitation cost calculator for mining* (ESR/2019/4626), Version 3.00, State of Queensland.

Engeny Water Management (Engeny) 2011, *Waratah Coal: Heavy haul rail corridor flood study*, M1799_01 1 February 2011, viewed 1 February 2024, <developed for Waratah Coal, <[https://eisdocs.dsdiqld.gov.au/Galilee%20Coal%20Project%20\(Northern%20Export%20Facility\)%20\(aka%20China%20First\)/EIS/EIS%2022%20Sep%202011/Vol%205%20-%20Appendices/16-rail-flood-modeling.pdf](https://eisdocs.dsdiqld.gov.au/Galilee%20Coal%20Project%20(Northern%20Export%20Facility)%20(aka%20China%20First)/EIS/EIS%2022%20Sep%202011/Vol%205%20-%20Appendices/16-rail-flood-modeling.pdf)>

Environmental Geochemistry International Pty Ltd (EGI) 2002, *Environmental geochemical assessment of the Yandan heap leach dump*, EGI, Balmain.

Eyre, TJ., Kelly AL & Neldner VJ 2017, *Method for the establishment and survey of reference sites for BioCondition*, version 3. Queensland Herbarium, Department of Science, Information Technology and Innovation, Brisbane.

Fletcher, G 2015, *Yandan Tailings Storage Facility: Justification of rehabilitation cover specifications*, prepared for Yandan Gold Project, unpublished report, LRS Environmental.

Fraser Osborn 1997, *Tailings Dam compartment 'B' raising of perimeter walls*, Fraser Osborn (Qld) Pty Ltd (Fraser Osborn), Townsville.

Fraser Osborn 2013, *Yandan rehabilitation works, tailings storage facility – capping works site plan*, Fraser Osborn (Qld) Pty Ltd (Fraser Osborn), Townsville.

GHD Group Pty Ltd (GHD) 2008, *Report for Yandan Gold Mine - mine closure plan*, August 2008. GHD, Brisbane.

Greater Boulder Holdings Ltd 1988, *Yandan Gold Project – impact assessment study*, December 1988, prepared by Kinhill Engineers Pty Ltd.

Hazelton, PA & Murphy, BW (eds) 2007, *Interpreting soil test results: What do all the numbers mean?* [2nd edn.] CSIRO Publishing, Collingwood, Victoria.

Hazelton, P & Murphy, B 2016, *Interpreting soil test results – What do all the Numbers Mean?* Third Edition, CSIRO Publishing, Melbourne.

HLA-Envirosciences 2000, *Preliminary mine reclamation and closure plan*, prepared for Ross Mining N.L., HLA-Envirosciences.

Hosking, WJ, Caple, IW, Halpin, CG, Brown, AJ, Paynter, DI, Conley, DN, & North-Coombes, PL 1986, *Trace elements for pasture and animals in Victoria*, Victorian Government Printing Office: Melbourne.

International Network for Acid Prevention (INAP) 2011, *Global Acid Rock Drainage Guide*, Property of the INAP, www.gardguide.com, September 2011.

Jenkins, KJ & Kramer 1991, 'Effect of excess dietary manganese on lipid composition of calf blood plasma, heart, and liver', *Journal of Dairy Science*, Nov;74(11):3944-8.

Keipert, NL 2005, *Effect of different stockpiling procedures in open cut coal mine rehabilitation in the Hunter Valley*, NSW, Australia, PhD thesis, University of New England.

Kumar, RN, McCullough, CD & Lund, MA 2013, 'Pit lakes in Australia', in Geller, W, Schultze, M, Kleinmann, RLP & Wolkersdorfer, C (eds), *Acidic pit lakes: legacies of surface mining on coal and metal ores* (pp. 342–361), Springer.

Lu, H, Gallant, J, Prosser, I.P., Moran, C, & Priestley, G, 2001, *Prediction of sheet and rill erosion over the Australian continent, incorporating monthly soil loss distribution*, technical report 13/01, CSIRO Land and Water, Canberra, Australia.

Lund MA & Blanchette ML 2023, 'Closing pit lakes as aquatic ecosystems: Risk, reality, and future uses', *Wiley Interdisciplinary Reviews: Water*, 10(4) 1648.

McCullough, C & Lund, M 2010, *Mine voids management strategy (IV): conceptual models of Collie Basin pit lakes*. Perth, Department of Water (Western Australia), Western Australia:

McDowell, LR 1992, *Minerals in animal and human nutrition*, Academic Press Inc. Harcourt Brace Jovanovich Publishers, San Diego, CA.

Mertens, J & Smolders, S, 'Co-tolerance to zinc and copper of the soil nitrifying community and its relationship with the community structure', *Soil Biology and Biochemistry*.

Neldner, V, Wilson, B, Dilleward, H, Ryan, T, Butler, D, McDonald, W, Addicot, E & Appelman, C, 2020. *Methodology for surveying and mapping regional ecosystems and vegetation communities in Queensland*. Version 5.1. Brisbane: Department of Environment and Science (DES).

PSM Consult Pty Limited (PSM) 2021a, *2021 Annual statutory dam inspection*, 25 February 2021, PSM, Brisbane.

PSM Consult Pty Limited (PSM) 2021b, *Yandan Gold Mine – hazard consequence category assessment*, 27 September 2021, Revision 2. PSM, Brisbane.

PSM Consult Pty Limited (PSM) 2023, *2023 Annual statutory dam inspection*, 11 January 2024, PSM, Brisbane.

Queensland Government 2018, *Mined Land Rehabilitation Policy*, Department of Environment and Heritage Protection, Department of Natural Resources and Mines Queensland Treasury.

Queensland Government 2021, *The Long Paddock: Queensland Future Climate Dashboard*, viewed 22 March 2022, < <https://www.longpaddock.qld.gov.au/qld-future-climate/dashboard/>>.

Queensland Government 2022, *Queensland Globe: Registered water bores (DRDMW and private)*, viewed 22 March 2022, < <https://www.longpaddock.qld.gov.au/qld-future-climate/dashboard/>>.

RGS Environmental Pty Ltd (RGS) 2013 *Geochemical assessment of TSF Cell B cover materials, tailings and heap leach rocks at Yandan Gold Mine*, RGS, Brisbane.

RGS Environmental Pty Ltd (RGS) 2015, *Yandan oxide and sulfide tailings assessment*, RGS, Brisbane.

RGS Environmental Pty Ltd (RGS) 2021, *Yandan Tailings Storage Facility: Technical memorandum*, RGS, Brisbane.

RGS Environmental Pty Ltd (RGS) 2022, *Yandan Tailings Storage Facility: Technical Memorandum*, RGS, Brisbane.

Rob Lait & Associates Pty Ltd (RLA) 2019, *Groundwater data review – Yandan Project*, RLA, Innisfail, Queensland.

Rosewell, CJ 1993, 'SOILOSS – A program to assist in the selection of management practices to reduce erosion', *Technical Handbook No. 11*, Soil Conservation Service of NSW, Sydney.

Ross Mining N.L. (Ross Mining) 1993, *Plan of Operations - Yandan Gold Project*, Ross Mining N.L, Brisbane.

Ross Mining N.L 2000, *Rehabilitation of Yandan Tailings Facility and return water dam Waterworks Licences G-55021 and G-55022*, prepared by Ross Mining N.L.

Ross Mining N.L 2000, *Amendment to Plan of Operations to allow flushing of Yandan Pit* Prepared by Ross Mining N.L..

Rosser, J, Swartz, GL, Dawson, NM & Briggs, HS 1974, *A Land Capability Classification for agricultural purposes*, Division of Land Utilisation Technical Bulletin No. 14, Queensland Department of Primary Industries.

See Built Earth (SBE) 2022a, *Water Performance of Yandan Mine landscape at closure*, March 2022, SBE, Brisbane.

See Built Earth (SBE) 2022b, *Summary tailings heap leach landforms risk review for cover design*, March 2022, SBE, Brisbane.

See Built Earth (SBE) 2023, *PRCP & ERC water performance of TSF & heap leach landforms*, March 2022, SBE, Brisbane.

See Built Earth (SBE) 2024a, *Main Pit and Suttor River characterisation*, March 2024, SBE, Brisbane.

See Built Earth (SBE) 2024b, *Yandan groundwater and conceptual model characterisation*, March 2024, SBE, Brisbane.

See Built Earth (SBE) 2024c, *Flooding profile characterisation for closure*, March 2024, SBE, Brisbane.

Smith, KA, Ball, T, Conen, F, Dobbie, KE, Massheder, A & Rey A 2018, 'Exchange of greenhouse gases between soil and atmosphere: interactions of soil physical factors and biological processes', *European Journal of Soil Science*, 69(1), 10 – 20.

SRK Consulting 1999, *Yandan Pit reflooding waste rock backfill cover placement specification*, prepared for Ross Mining N.L., SRK Consulting.

State of Queensland (DES) 1999, *Land use mapping – 1999 to Current – Queensland*, viewed 21 February 2022, < <https://qldspatial.information.qld.gov.au/catalogue/custom/detail.page?fid=%7B273F1E50-DD95-4772-BD6C-5C1963CAA594%7D>>.

State of Queensland (DES) 2020, *Land use mapping – 1999 to Current – Queensland*, viewed 21 February.

Straits Exploration (Australia) Pty Ltd, 2005, *Plan of Operations*, Yandan Gold Mine: 1 November 2005 to 1 November 2006.

Straits Gold Pty Ltd (Straits Gold) 2008, *Plan of Operations - Yandan Gold Mine*, 10 September 2008 to 9 September 2013. Straits Gold Pty Ltd, Perth.

Stuart and Miller Associates Pty Ltd (Stuart and Miller Associates) 1988, *Geochemistry of waste rock, ore and tailings and implications for waste management*, prepared for Kinhill Engineers Pty Ltd.

Stumm W & Morgan JJ 2013, *Aquatic Chemistry: Chemical Equilibria and Rates in Natural Waters*, 3rd Edition, Wiley.

Western Mining Corporation (WMC) 1998, *Great Boulder Holdings Limited Yandan Gold Project: Impact assessment study*, self-published.

Whitsunday Regional Council 2023, *Whitsunday Regional Council Planning Scheme 2017*, version 4.7 Whitsunday Regional Council.

Williams, D 2020, The role of technology and innovation in improving tailings management, *Towards Zero Harm – a Compendium of Papers Prepared for the Global Tailings Review*. 4: 64 – 83.

Williams, D 2021, *Independent desktop review of risk level and appropriate capping strategy for TSF Cell B at Yandan Gold Mine*, report prepared for Straits Gold Pty Ltd.

Wirralie Gold Mine 2005, *2004 Environmental Monitoring Report – Wirralie Gold Mine: Yandan Mt Coolon Glen Eva*.

Appendix A. PRCP Schedule

Rehabilitation area					RA1					
Relevant activities					TSF Cell B					
Total rehabilitation area size (ha)					68.3					
Commencement of first milestone: RM1					1/06/2026					
PMLU					Open pasture - low intensity grazing					
Date area is available	10/12/25									
Cumulative area available (ha)	68.3									
Milestone completed by	10/12/30	10/12/35	10/12/40	10/12/46	10/12/56	10/12/55	10/12/60			
Milestone Reference	Cumulative area achieved (ha)									
RM1	68.3									
RM2	68.3									
RM5		68.3								
RM8		68.3								
RM9			68.3	68.3						
RM10				68.3						
RM11					68.3					

Rehabilitation area		RA2								
Relevant activities		Heap Leach Pad and associated ponds								
Total rehabilitation area size (ha)		20.8								
Commencement of first milestone: RM1		1/06/2036								
PMLU		Low hill - low intensity pasture grazing								
Date area is available	10/12/35									
Cumulative area available (ha)	20.8									
Milestone completed by	10/12/40	10/12/45	10/12/50	10/12/56						
Milestone Reference	Cumulative area achieved (ha)									
RM1	20.8									
RM2	20.8									
RM7		20.8								
RM8		20.8								
RM9			20.8							
RM10				20.8						
RM11				20.8						

Rehabilitation area		RA3a								
Relevant activities		Rehabilitated water management structures								
Total rehabilitation area size (ha)		32.5								
Commencement of first milestone: RM1		1/06/2037								
PMLU		Open pasture - low intensity grazing								
Date area is available	10/12/36									
Cumulative area available (ha)	32.5									
Milestone completed by	10/12/41	10/12/46	10/12/56	10/12/66						
Milestone Reference	Cumulative area achieved (ha)									
RM1	32.5									
RM4	32.5									
RM8	32.5									
RM9		32.5								
RM10			32.5							
RM11				32.5						

Rehabilitation area		RA3b								
Relevant activities		Rehabilitated water management structures - Main Pit flood bund								
Total rehabilitation area size (ha)		2.7								
Commencement of first milestone: RM2		1/06/2026								
PMLU		Flood protection landform								
Date area is available	10/12/25									
Cumulative area available (ha)	2.7									
Milestone completed by	10/12/30	10/12/35	10/12/56	10/12/66						
Milestone Reference	Cumulative area achieved (ha)									
RM2	2.7									
RM3	2.7									
RM8	2.7									
RM9	2.7									
RM14		2.7								
RM15										

Rehabilitation area		RA4								
Relevant activities		Infrastructure areas								
Total rehabilitation area size (ha)		5.9								
Commencement of first milestone: RM1		1/06/2037								
PMLU		Open pasture - low intensity grazing								
Date area is available	10/12/36									
Cumulative area available (ha)	5.9									
Milestone completed by	10/12/41	10/12/46	10/12/52	10/12/62						
Milestone Reference	Cumulative area achieved (ha)									
RM1	5.9									
RM2	5.9									
RM3	5.9									
RM8	5.9									
RM9		5.9								
RM10			5.9							
RM11				5.9						

Rehabilitation area		RA5a								
Relevant activities		Maintenance of existing rehabilitation (South Pit, Village infrastructure)								
Total rehabilitation area size (ha)		12.3								
Commencement of first milestone: RM1		Prior to 2025								
PMLU		Open pasture - low intensity grazing								
Date area is available	Prior to 2025									
Cumulative area available (ha)	12.3									
Milestone completed by	10/12/30	10/12/40								
Milestone Reference	Cumulative area achieved (ha)									
RM1	12.3									
RM3	12.3									
RM8	12.3									
RM9	12.3									
RM10	12.3									
RM11		12.3								

Rehabilitation area		RA5b								
Relevant activities		Maintenance of existing rehabilitation (TSF Cell A)								
Total rehabilitation area size (ha)		41.6								
Commencement of first milestone: RM1		1/06/2026								
PMLU		Open pasture - low intensity grazing								
Date area is available	10/12/25									
Cumulative area available (ha)	41.6									
Milestone completed by	10/12/30	10/12/35	10/12/40	10/12/46	10/12/56					
Milestone Reference	Cumulative area achieved (ha)									
RM1	41.6									
RM2	41.6									
RM6		41.6								
RM8		41.6								
RM9			41.6							
RM10				41.6						
RM11					41.6					

Rehabilitation area		RA6								
Relevant activities		ROM Pad								
Total rehabilitation area size (ha)		5.8								
Commencement of first milestone: RM1		Prior to 2025								
PMLU		Low hill - low intensity pasture grazing								
Date area is available	Prior 2025									
Cumulative area available (ha)										
Milestone completed by	10/12/34	10/12/44								
Milestone Reference	Cumulative area achieved (ha)									
RM1	5.8									
RM3	5.8									
RM8	5.8									
RM9	5.8									
RM10	5.8									
RM11		5.8								

Rehabilitation area				RA7						
Relevant activities				Other isolated areas of surface disturbance within approved disturbance extent						
Total rehabilitation area size (ha)				19.9						
Commencement of first milestone: RM1				Prior 2025						
PMLU				Open pasture - low intensity grazing						
Date area is available	Prior to 2025		10/12/35							
Cumulative area available (ha)	1.4		19.9							
Milestone completed by	10/12/2030	10/12/35	10/12/40	10/12/45	10/12/51	10/12/2061				
Milestone Reference	Cumulative area achieved (ha)									
RM1	1.4		19.9							
RM3	1.4		19.9							
RM8	1.4		19.9							
RM9	1.4		19.9							
RM10		1.4	1.4	19.9	19.9					
RM11				1.4	1.4	19.9				

Rehabilitation area		RA8								
Relevant activities		Retained water storages								
Total rehabilitation area size (ha)		52.8								
Commencement of first milestone: RM1		1/06/2047								
PMLU		Retained water storage								
Date area is available	10/12/46									
Cumulative area available (ha)	52.8									
Milestone completed by	10/12/47	10/12/56								
Milestone Reference	Cumulative area achieved (ha)									
RM1	52.8									
RM12		52.8								

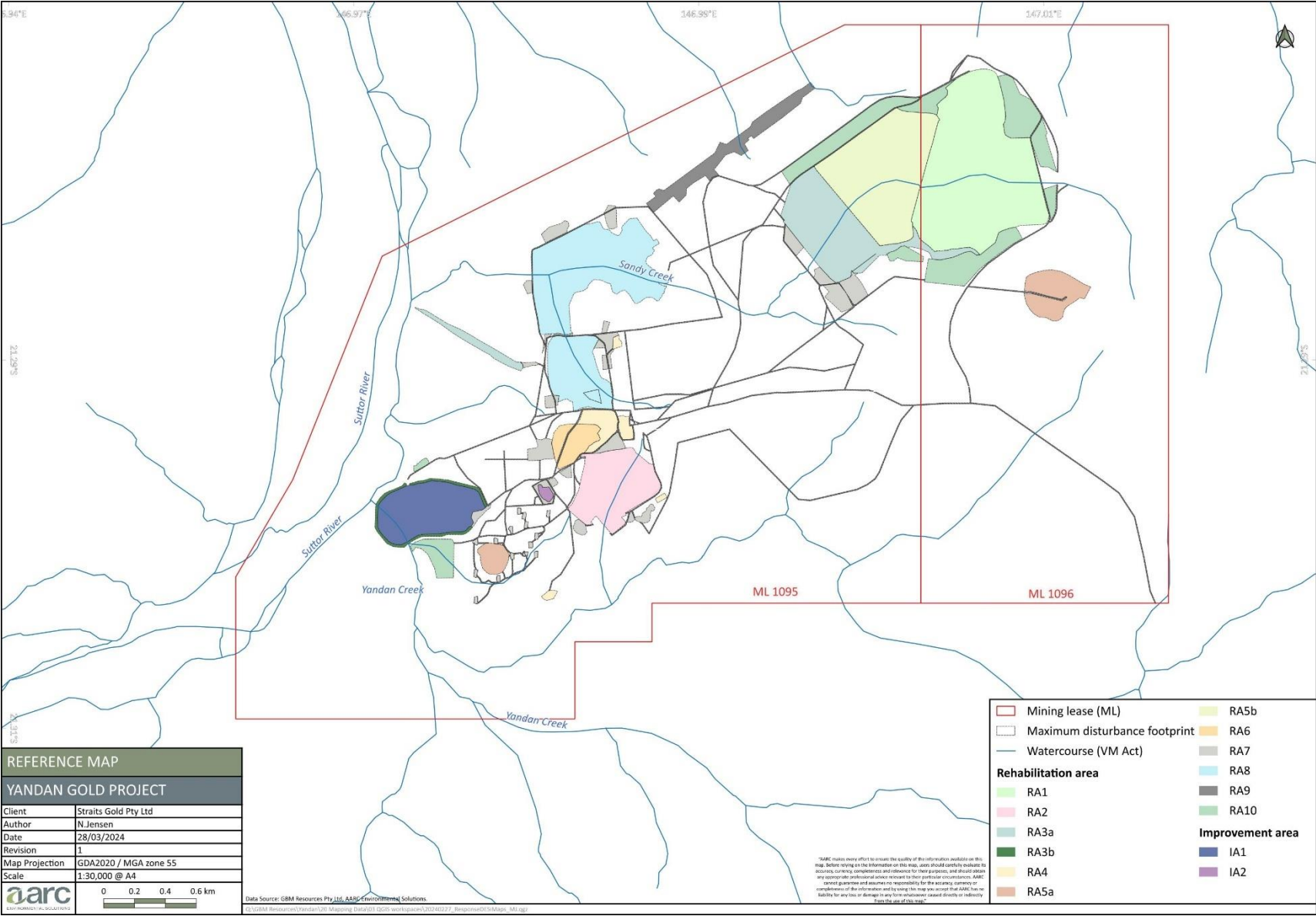
Rehabilitation area			RA9							
Relevant activities			Retained infrastructure							
Total rehabilitation area size (ha)			34.7							
Commencement of first milestone: RM1			1/06/2047							
PMLU			Retained infrastructure							
Date area is available	20/12/46	10/12/66								
Cumulative area available (ha)	0.98	34.7								
Milestone completed by	10/12/48	10/12/68								
Milestone Reference	Cumulative area achieved (ha)									
RM1	0.98	34.7								
RM13	0.98									

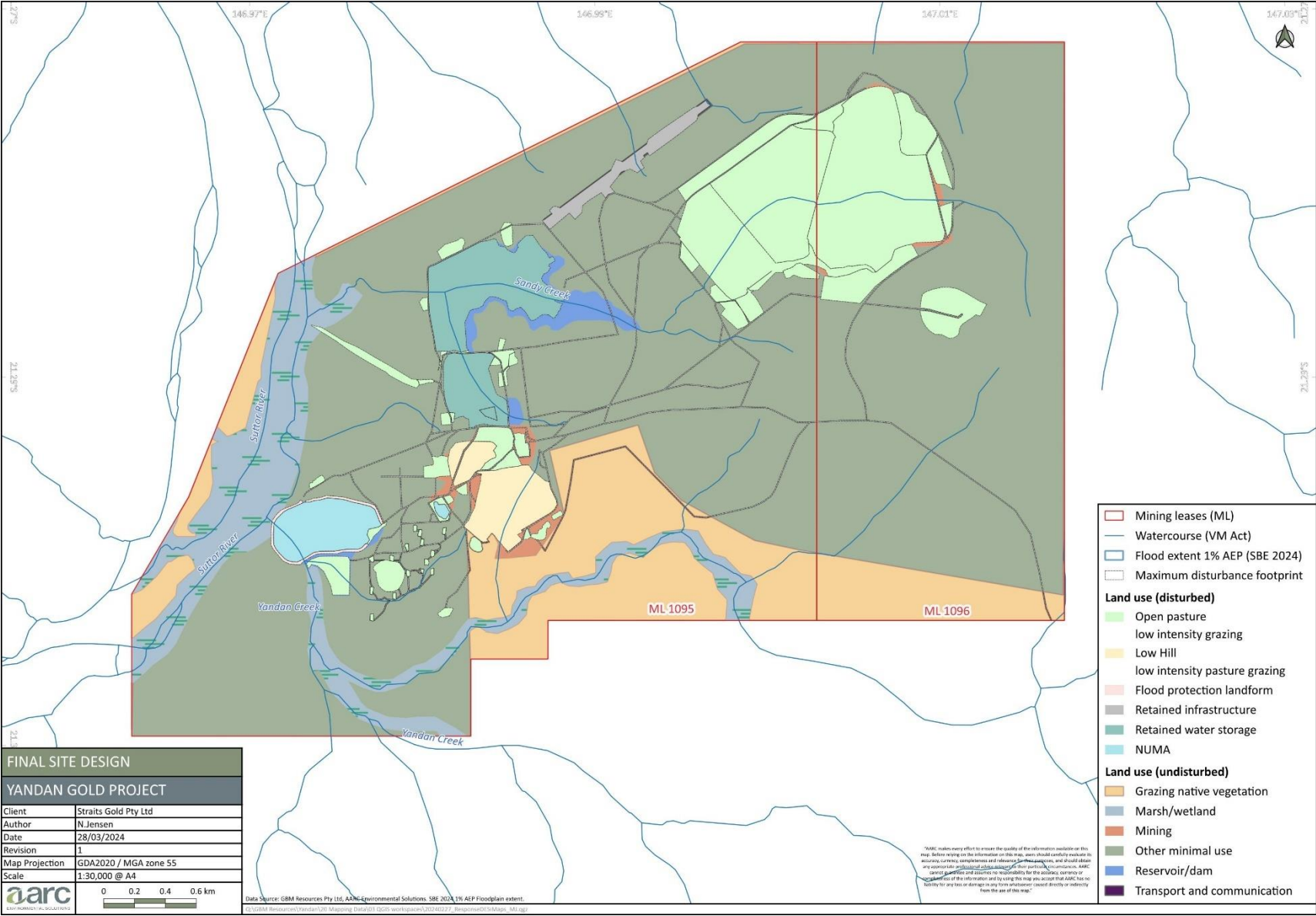
Rehabilitation area		RA10								
Relevant activities		Borrow pits								
Total rehabilitation area size (ha)		36.6								
Commencement of first milestone: RM1		1/06/2034								
PMLU		Open pasture - low intensity grazing								
Date area is available	10/12/33									
Cumulative area available (ha)	36.6									
Milestone completed by	10/12/38	10/12/43	10/12/48	10/12/58						
Milestone Reference	Cumulative area achieved (ha)									
RM1	36.6									
RM3	36.6									
RM8	36.6									
RM9		36.6								
RM10			36.6							
RM11				36.6						

Improvement area				IA1						
Relevant activities				Main Pit Final Void						
Total size (ha)				20.3						
Commencement of first milestone: MM1				1/06/2026						
NUMA				Pit lake						
Date area is available	10/12/25									
Cumulative area available (ha)	20.3									
Milestone completed by	10/12/30	10/12/31	10/12/40							
Milestone Reference	Cumulative area achieved (ha)									
MM1	20.3									
MM2		20.3								
MM3			20.3							

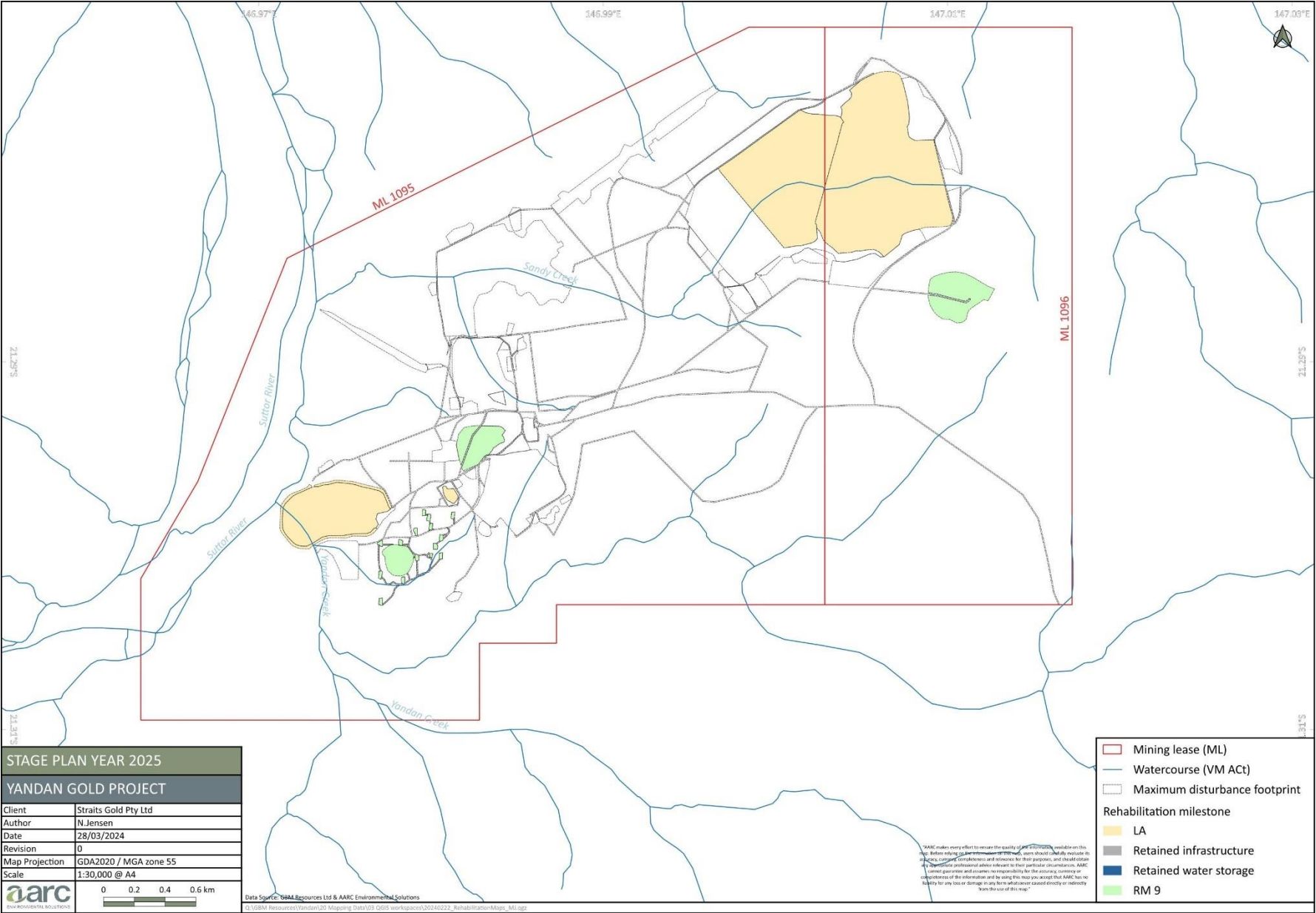
Improvement area				IA2						
Relevant activities				East Hill Pit Final Void						
Total size (ha)				0.7						
Commencement of first milestone: MM1				1/06/2026						
NUMA				Void						
Date area is available	10/12/25									
Cumulative area available (ha)	0.7									
Milestone completed by	10/12/30	10/12/31	10/12/41							
Milestone Reference	Cumulative area achieved (ha)									
MM1	0.7									
MM2		0.7								
MM3			0.7							

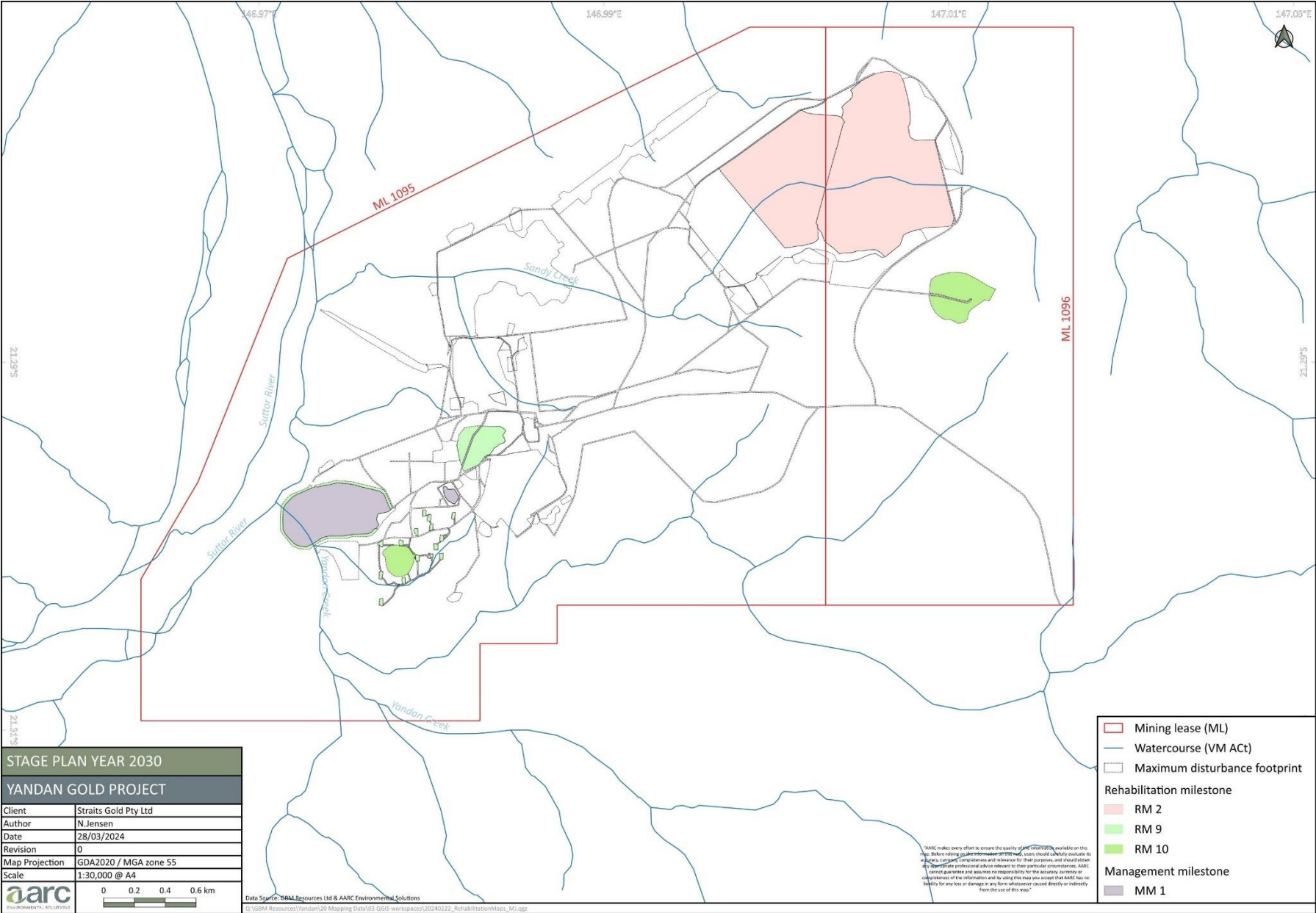
Appendix B. PRCP Reference Map and Final Site Design

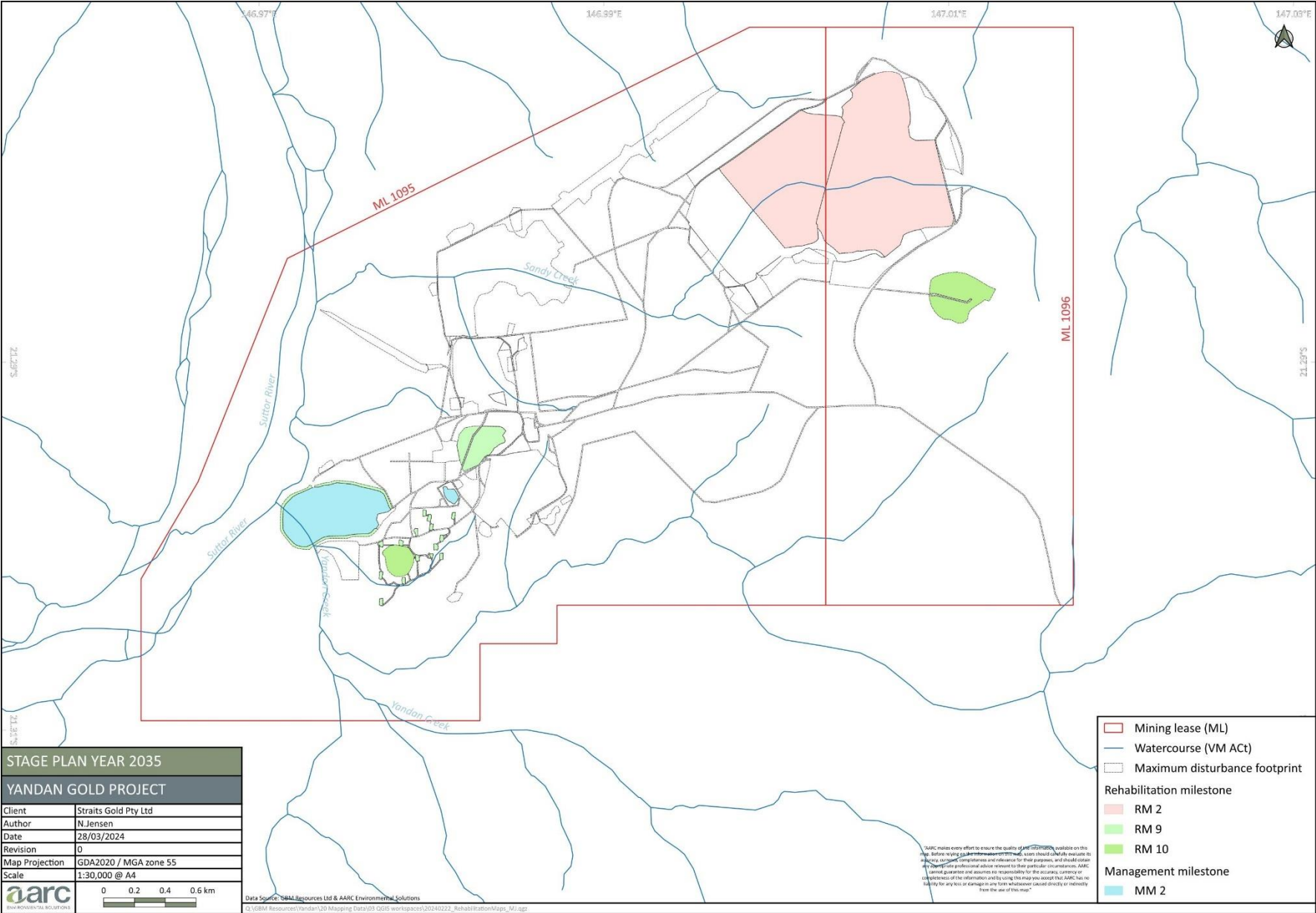


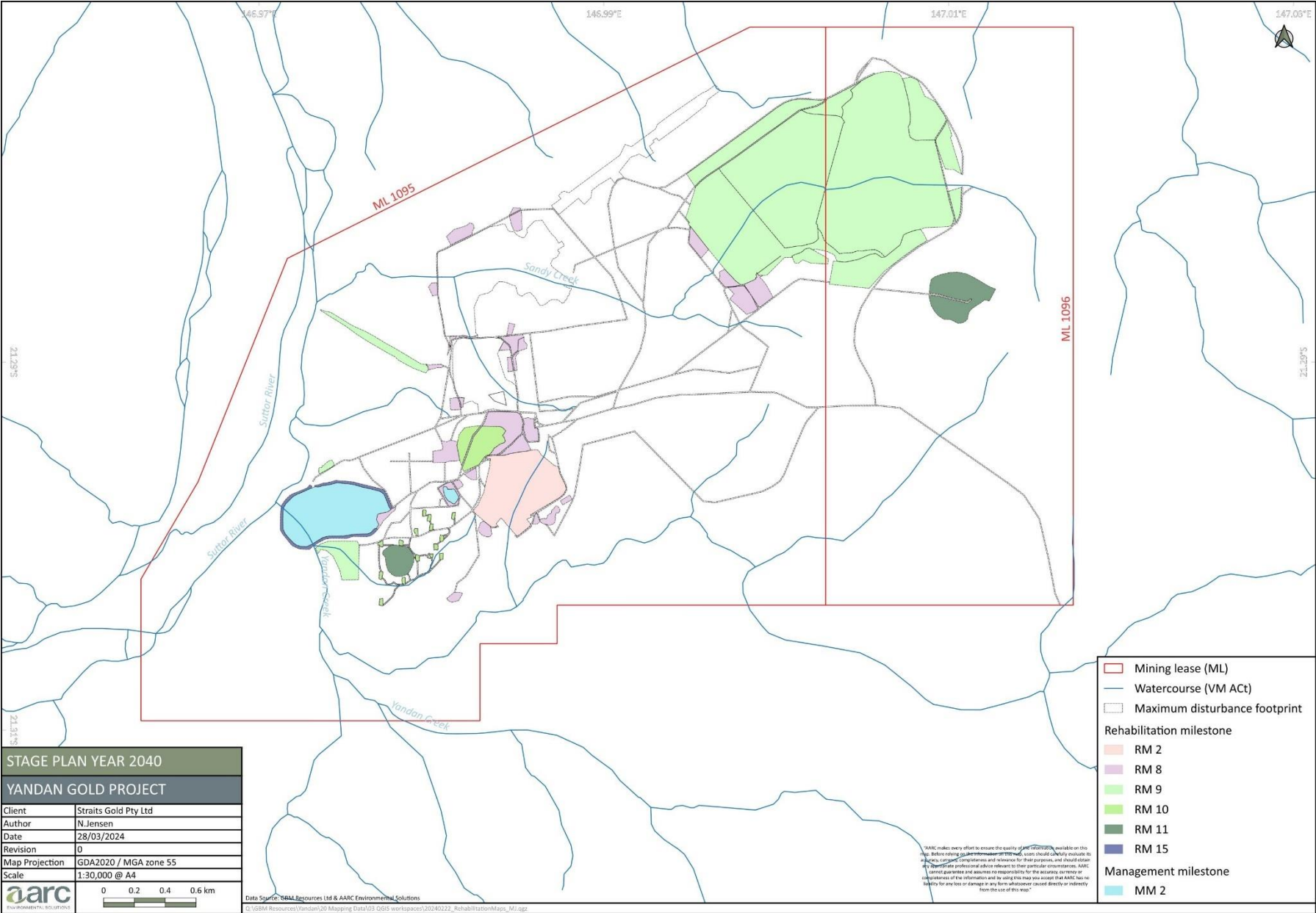


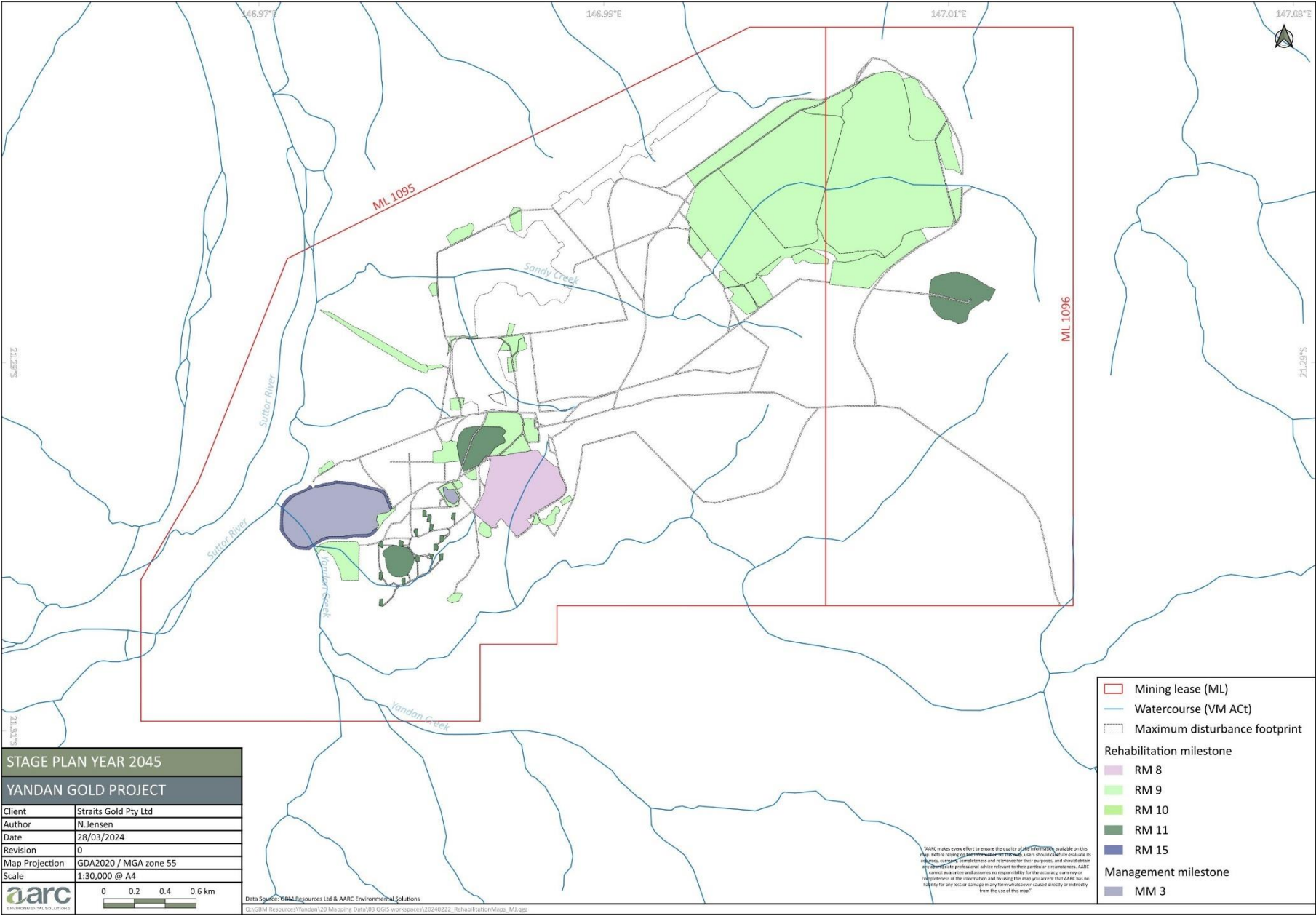
Appendix C. Schedule stage plans

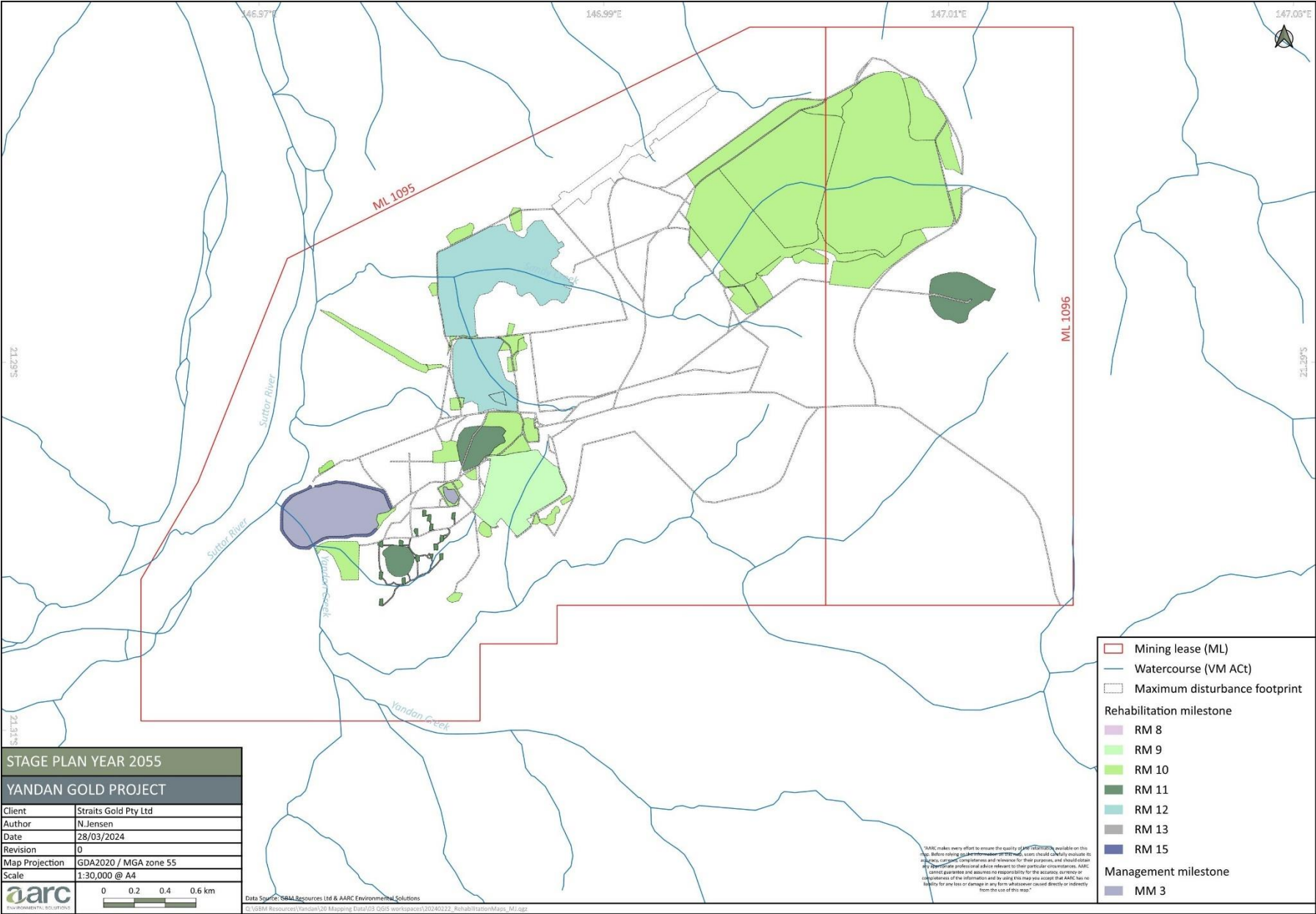


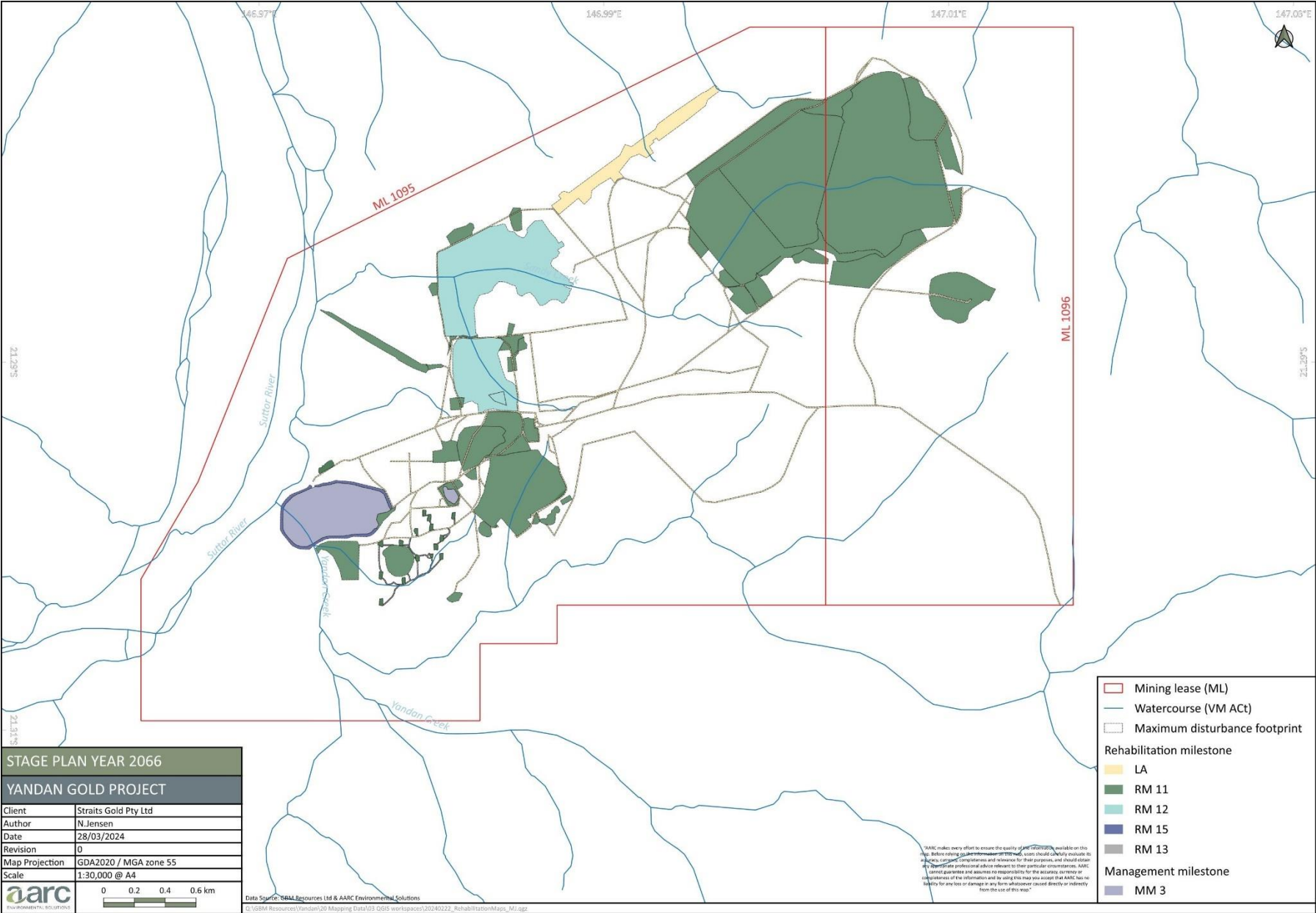












Appendix D. Spatial information

Spatial information prepared in accordance with the guideline '*Spatial Information Submission*' (DES 2024) to accompany this PRCP has been submitted electronically to the administering authority.

Appendix E. Stakeholder Engagement Plan



YANDAN GOLD PROJECT STAKEHOLDER ENGAGEMENT PLAN

PREPARED FOR
STRAITS GOLD PTY LTD

MARCH 2024

Document Control

Project Name:	Yandan Gold Project
Report Title:	Stakeholder Engagement Plan
Client:	Straits Gold Pty Ltd
Project Manager:	Rod Hailstone

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1 Introduction

The Yandan Gold Project (the Project) is located in the Drummond Basin in Central Queensland, approximately 50 kilometres (km) to the west of the Mount Coolon township and approximately 150 km southeast of Charters Towers (Figure 1). GBM Resources Limited (GBM) acquired the Project and the Straits Gold Pty Ltd (Straits Gold) identity in January 2021.

This Stakeholder Engagement Plan (SEP) has been prepared to provide a summary of the consultation provided on the Project and detail ongoing community consultation in relation to the rehabilitation planned to be carried out under the Project's Progressive Rehabilitation and Closure Plan (PRCP) for the Project.

1.1 Purpose

The purpose of this SEP is to comply with the requirements set out in section 126C(1)(c)(iv) and (iv) of the *Environmental Protection Act 1994* (EP Act), being the inclusion of the following in the proposed PRCP:

- details of the consultation undertaken by the applicant in developing the proposed PRC plan, and
- details of how the applicant will undertake ongoing consultation in relation to the rehabilitation to be carried out under the plan.

1.2 Project description

The Impact Assessment Study for the Project approval was submitted in December 1988, with the Project mining leases (ML) (ML1095 and ML1096) granted in June 1991. In July 1992, Ross Mining N.L. acquired the Project; in addition to the Wirralie Gold Mine, a controlling interest in the Mount Coolon joint venture, and exploration tenements associated with the three assets.

Ross Mining N.L. operated the Project between 1993 - 2002, producing over 350,000 ounces (oz) of gold from heap leach operations and a Carbon in Leach (CIL) process plant. Mining operations ceased in 1998, with the Heap Leach Pad remaining operational until September 2002. The site was placed into care and maintenance in April 1999, pending final closure works. The gold processing plant was later removed in 2006/2007, prior to the acquisition of the Project by Straits Gold, which was a wholly owned subsidiary of Aeris Resources Ltd at the time. The Project has remained in care and maintenance since closure in 1999.

GBM acquired the Project and the Straits Gold entity on 13 January 2021, and have since taken significant steps towards restoring operations. This has included re-commencing exploration at Yandan, most recently including the 2021 drilling program which focused on the identification of potential open pits targets in the area between Main Pit and East Hill deposits.

Yandan is a key asset in GBM's 'processing halo strategy' for the Drummond Basin, joining the nearby Mount Coolon asset and the recently acquired Twin Hills asset. It is proposed that Yandan will provide a central processing hub for material from the three projects, with existing infrastructure at Yandan supporting and accelerating the development of a gold mining and processing operation.

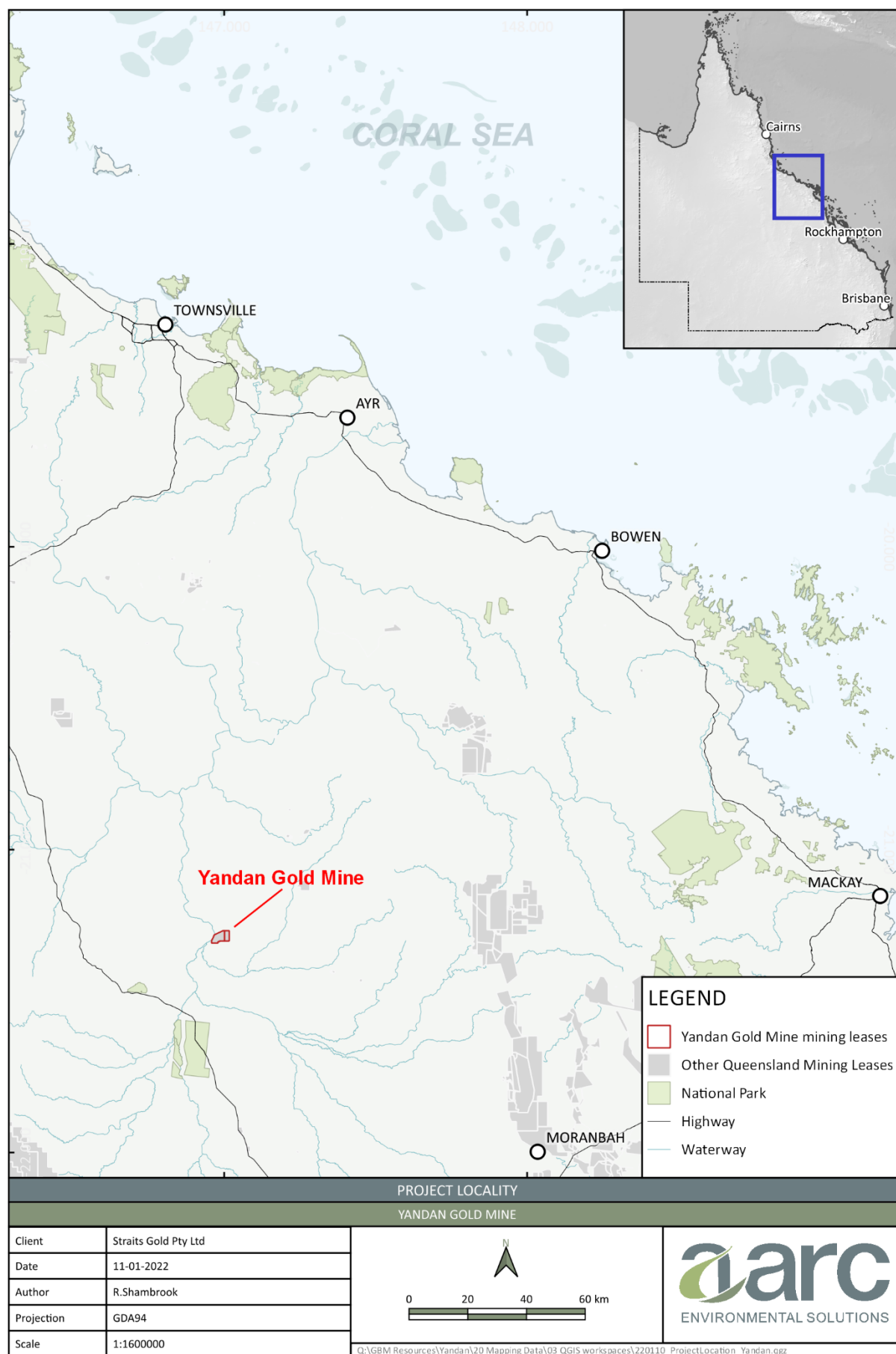


Figure 1: Project locality

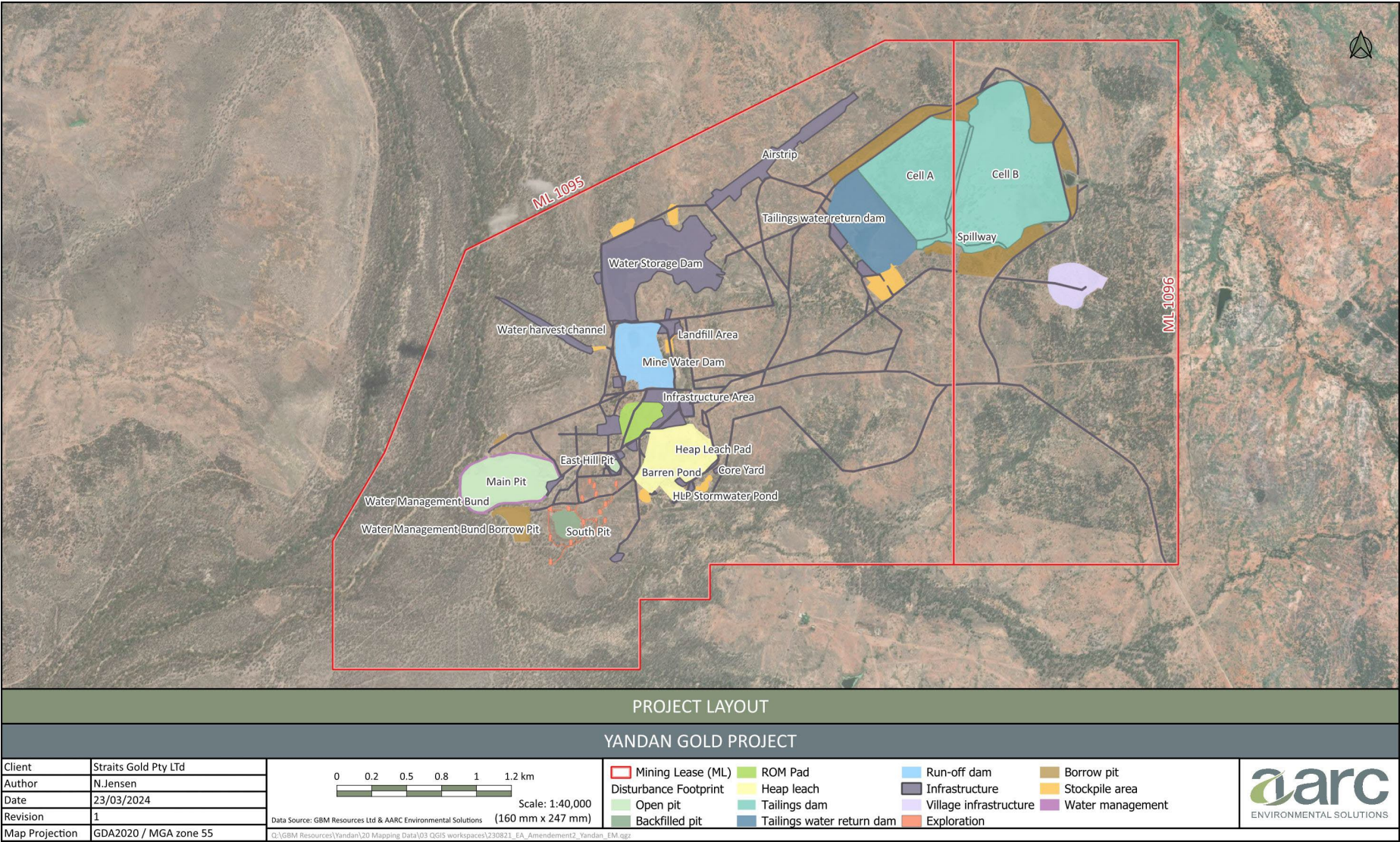


Figure 2: Project layout

2 Communication Engagement Approach

2.1 Key objectives

The objectives of the SEP are to achieve the following:

- strengthen the company's corporate social responsibility and effectively maintain an on-going community relationship and trust;
- define opportunities to provide transparent, open and informative information to key stakeholders and increase awareness on progressive rehabilitation activities and schedules;
- inform and liaise with key stakeholders to ensure rehabilitation activities outlined in the PRCP are undertaken to achieve the historically agreed post-mining land use (PMLU) or non-use management area (NUMA);
- enhance and outline key avenues that stakeholders can utilise to provide feedback on Project rehabilitation activities; and
- identify measures for GBM to respond to community concerns and appropriately manage stakeholder expectations.

2.2 Responsibilities

The responsibility to facilitate and uphold the SEP objectives are distributed to the following roles:

- GBM Directors -
 - ultimate responsibility for environmental and social governance falls to the GBM executive team; and
 - final approval of all company policy;
- Site Manager -
 - manage the overall direction of the Project;
 - responds to media enquiries;
 - manage direct, formal notification of intentions and actions relating to the Project;
 - interacts with community and engages on issues/concerns at all levels;
- Environment and Community Support officer -
 - development of the SEP with GBM;
 - technical support in regulatory and community engagement, led by GBM;
 - technical support for GBM media releases and responses; and
 - technical input for development of Project materials (fact sheets, posters, newsletters, etc).

3 Stakeholders Mapping

3.1 Affected and interested stakeholder groups

Yandan Gold Mine is located approximately 35 km north-west of the small township of Mount Coolon, which has an approximate population of 64 people (ABS 2016). Mount Coolon is located at the intersection of the Bowen Development Road and Sutton Development Road. The town is primarily in an agricultural and rural setting, with mining activities in the surrounding region. Nearby mining activities include the Mount Coolon Gold Mine and the Twin Hills Operation, also owned by GBM Resources.

The identification of all relevant stakeholders, such as interested and affected peoples, groups and statutory bodies, is important to ensure that consultation on the Project's planned rehabilitation activities is provided to relevant parties.

Interested and affected stakeholders to the Project have been identified in Table 1 below. Due to the isolated nature of the Project region, the small population size in the surrounding region, and the current care and maintenance status of the Project, there are currently only a small number of key stakeholders.

Table 1: *Affected and interested stakeholders*

Stakeholder Classification	Stakeholder	Status
Affected	Scott Family	Landholder on Lot 5060 of PH387
	Jangga People Traditional Owners	Native Title Determination over Project area QCD2012/009
	Neighbouring and downstream landholders	Landholders of properties directly downstream (e.g. Lot 22 on SP218335, Lot 1 on SM47)
	Whitsunday Regional Council Andrew Willcox (Mayor)	Local Government
	Charters Towers Regional Council ¹ Frank Beveridge (Mayor)	Local Government
	Department of Environment and Science	State Government
	Department of Transport and Main Roads	State Government
	Department of Resources	State Government
	Department of Regional Development, Manufacturing and Water	State Government
	Mount Coolon Community	Township
	Mount Coolon Hotel	Local Business
Interested	Collinsville Hospital	Nearby Medical Facility
	Mount Coolon Rural Fire Brigade	Fire Service

¹ Majority of the Project falls under the Whitsunday Regional local government area (LGA), with a small area of the mining lease falling under the Charters Tower Regional LGA.

4 Stakeholder Engagement Methods and Frequency

4.1 Principle engagement methods

4.1.1 Face-to-face meetings or phone calls

Additional face-to-face meetings or phone calls will be a principal engagement method during both the operational and rehabilitation phases. These meetings will occur on a complaint basis and offer stakeholders the opportunity to discuss in-person any concerns or issues relating to rehabilitation in accordance with the PRCP.

Consultation will be undertaken on an as required basis, such as when a change in activities or circumstances on the ground occurs that may have an impact on stakeholders.

The purpose of face-to-face meetings is to:

- continue the on-going point of contact for stakeholders of the Project;
- provide current information and updates on the Project and proposed rehabilitation activities;
- allow opportunity for stakeholders to initiate enquiries relating to the Project; and
- operate as a feedback function to allow the collation and reporting of community concerns in relation to the Project.

4.1.2 Project webpage

A 'Yandan Gold Project' specific webpage already exists and is a resource for disseminating current information relating to the on-going Project status. The Project-specific webpage can be found at:

<https://www.gbmr.com.au/projects/yandan-gold-project/>

Announcements relevant to the Project and GBM's other projects are also regularly released:

<https://www.gbmr.com.au/asx-announcements/>

The above webpages are updated regularly with the following information:

- references to the approvals regulatory body (Department of Environment and Science (DES));
- historic mining activities;
- future exploration intentions and mineral resource estimates;
- technical report findings;
- company policies; and
- any other public documents relevant to Project such as newsletters and fact sheets that may be published as part of consultation activities.

A contact form linked to the existing reception@gbmex.com.au feedback email address is available on the above webpages and guarantees a response within 72 hours. A contact number (with contact times) and mailing address are also listed to provide stakeholders with three communication avenues to voice any concerns or queries.

GBM will update the relevant websites regularly as part of this SEP to ensure content is current and representative of the Project's operations.

4.2 Additional engagement options

4.2.1 Public displays and community information sessions

Where available, community events provide GBM the opportunity to disseminate information and receive feedback from a broad community cross-section. These events allow the two-way flow of information between the community and GBM personnel.

For such events, stalls and or poster displays are options to provide access to information including the fact sheets already developed, as well as additional contextual information relevant to mining and the local area, as well as providing information promoting contact and Project feedback.

Due to the remote location of the Project and its surrounding small population, community social events are limited. However, current information on local community events can be found at:

<https://www.whitsundayrc.qld.gov.au/community-and-environment/our-community/events?yearMonthStart=01-2022>

Where suitable opportunities exist, GBM will consider a company presence at any upcoming events as an additional avenue of stakeholder engagement.

5 Stakeholder Engagement Tools and Materials

5.1 Contact telephone and email

The company contact phone number and email address are the two primary stakeholder engagement tools to facilitate open, honest and timely communication streams.

Phone number: +61 493 239 674

Email: reception@gbmex.com.au

The general phone contact number is available for assistance by an office manager on weekdays, Monday to Friday between 9.00am - 5.00pm. Out-of-hours phone traffic will be responded to as soon as possible the following weekday. It is proposed that the office manager who fields these calls will be advised to forward messages to the designated GBM team responder for action and recording. The email address is available at any time for stakeholders to send any queries or concerns, with these directed to the designated team responder.

5.2 Fact sheets and newsletters

Fact sheets may be developed to support engagement with the immediate and broader community. Factsheets are likely to include the most updated and relevant Project information, particularly relating to exploration and rehabilitation, and be distributed to stakeholders via stakeholder meetings. Factsheets can also be used at any community events that might be attended by GBM for the Project. It is anticipated that factsheets will cover the following topics:

- general Project updates;
- Project maps and diagrams;
- information on the status of the Project rehabilitation studies;
- information on planned consultation activities; and
- progressive rehabilitation success and scheduled timelines.

Newsletters tend to be Project-specific and of a more regular nature, also typically more suited for a broader community audience. Due to the current status of the Project (being in care and maintenance), it is not proposed to publish regular newsletters until notable activities are scheduled. All fact sheets and newsletters will also be made available online and accessible through the existing webpage.

5.3 Community consultation register

In accordance with section 126C(1)(c)(iii) of the EP Act and as required by DES' *'Progressive rehabilitation and closure plans (PRC plans) Guideline'* (ESR/2019/4964) (PRCP Guideline), GBM have developed a community consultation register as part of the approval requirements for the PRCP.

GBM have actively engaged with the community prior to the implementation of the PRCP Guideline, and concerns raised by stakeholders have been integrated into rehabilitation planning. Following the approval of the PRCP, the register will continue to be used to document each individual stakeholder consultation event (including all meetings, presentations, feedback, phone calls and written submissions). The register will enable record keeping that details consultation dates, engaged community member(s), communication type, information provided, key issues raised, response actions and/or outcomes and any GBM commitments made.

This will provide an efficient mechanism to track, respond, and report, on any feedback received. It will also provide a mechanism to measure stakeholder perception and collate public consultation and response records.

The community consultation register template is provided below in Table 2.

Table 2: Community consultation register template

Date	Community Members	Consultation Type	Information Supplied	Issues Raised Discussed	Straits Gold Response and Outcome

6 Feedback protocols

Routine protocols will be implemented to facilitate a transparent and timely feedback process and respond to all existing communications received from the general public, and or other key stakeholders. The process has been designed in accordance with the company's approach to establishing and maintaining a constructive relationship with all key stakeholders. GBM are committed to integrity in the reporting of stakeholder engagement and to demonstrate accountability during the consultation process.

The feedback protocol to ensure a timely response to stakeholders and achieve feedback handling efficiency is outlined below (Figure 3).

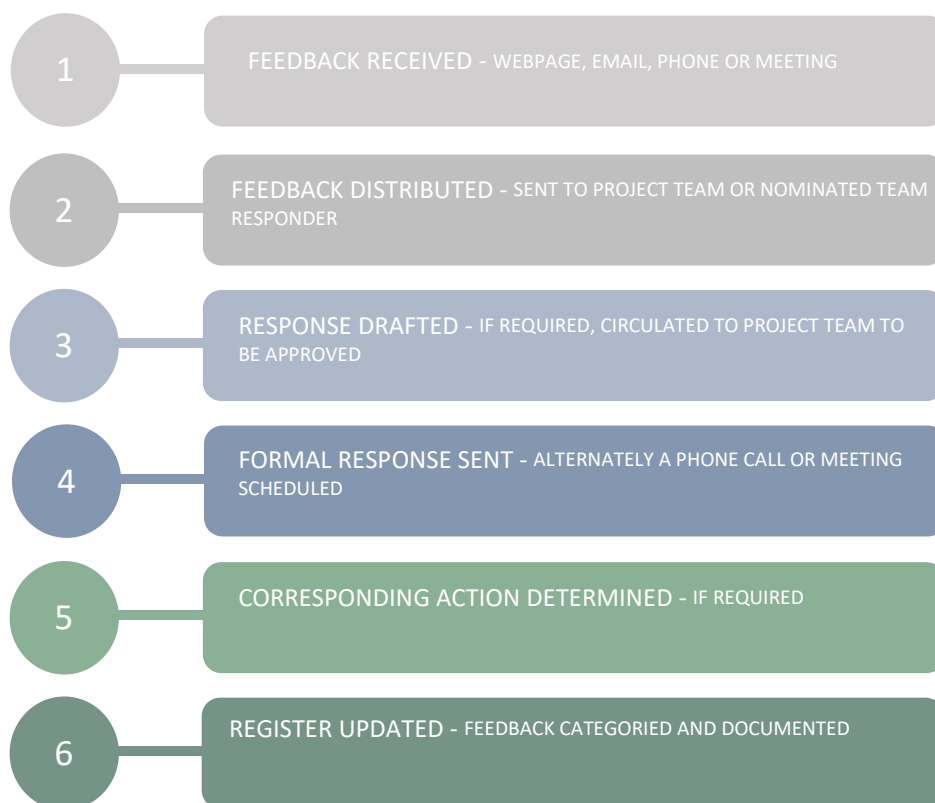


Figure 3: Feedback protocol

7 References

Australian Bureau of Statistics (ABS) 2016, *Mount Coolon 2016 Census Quick Status*, Available from: https://quickstats.censusdata.abs.gov.au/census_services/getproduct/census/2016/quickstat/SSC31967?opendocument Accessed 2 March 2021

Appendix F. Rehabilitation Risk Assessment

Risk Type (T=Threat)	Ref.	Category	Subcategory	Item	Risk Description				Control Effectiveness	Risk Evaluation				Risk Rating							Count				Risk Management Class	Manageability	Risk Management Planning		
					Threat Title	Causes (Triggers / Indicators)	Impacts (Consequences)	Existing Controls		Likelihood - Frequency	Likelihood - Probability	Health	Safety	On-site Environment	Off-site Environment	Health	Safety	On-site Environment	Off-site Environment	Community Trust	Compliance	Stakeholders	Count				Risk Management Approach		
																							IV	III				II	I
T	A				Evaluated 59 of 75 risks Remaining) (16																								
T	A	01			Heap leach pad Safe																								
T	A	01	01		Surface roughness (rockiness, depressions) in excess of that expected for the PMLU	Erosion gullies etc due to challenging subsoils/ topsoils, inadequate surface preparation, localised settlement	Safety hazard for personnel, stock and wildlife	Surface preparation measures (initial), monitoring and maintenance controls	C2	P			M				III						0	1	0	0	III		Rehabilitation area monitoring and assessment, undertake repairs and maintenance as required
T	A	01	02		Slope steepness in excess of that expected for the PMLU	Inappropriate landform design	Safety hazard for personnel, stock and wildlife, increased erosion against final landform	Landform design appropriate to PMLU, slope controls embedded in design	C1		U		M				II						0	0	1	0	II		Rehabilitation area monitoring and assessment, undertake repairs and maintenance promptly as required. Visual assessment of the landform following significant flood events.
T	A	02			Stable - geotechnical risk																								
T	A	02	01		Significant slope failure	Excessive slope steepness, physical material properties, poor drainage, adverse rainfall event	Localised land impacts and downstream water quality impacts	Slope moderation (coarse rock material end-dumped at or below the natural angle of repose), geotechnical assessment required for completion criteria	C1		U		M				II						0	0	1	0	II		Rehabilitation area monitoring and assessment, undertake repairs and maintenance promptly as required
T	A	02	02		Significant slope failure	Inundation by floodwaters	Localised land impacts and downstream water quality impacts	Maximum PMF flood depth est. < 2 m, low flood water velocities only at HLP. Mitigation measures such as rock armouring or landform reshaping will be undertaken in areas subject to PMF flooding.	C2		R		M				II						0	0	1	0	II		Rehabilitation area monitoring and assessment, undertake repairs and maintenance promptly as required. Visual inspection following flood events.
T	A	03			Stable - erosional risk																								
T	A	03	01		Initial/ongoing gully, pipe and/or sheet erosion of rehabilitated areas	Erodible topsoils, adverse weather events	Localised land impacts and downstream water quality impacts	Good topsoil management practices; adequate/effective soil amelioration, grading and shaping, rock mulch, prompt revegetation establishment, revegetation monitoring and management as required	C2	P			M				III						0	1	0	0	III		Rehabilitation area monitoring and assessment, undertake repairs and maintenance promptly as required
T	A	03	02		Initial/ongoing gully, pipe and/or sheet erosion of rehabilitated areas (medium-long term risk)	Rehabilitation failure/ revegetation disease, climatic events (drought)	Localised land impacts and downstream water quality impacts	Landform design moderating slope, adequate/effective soil amelioration, prompt revegetation establishment, revegetation monitoring and management as required	C2	P			M				III						0	1	0	0	III		Rehabilitation area monitoring and assessment, undertake repairs and maintenance promptly as required
T	A	03	03		Initial/ongoing gully, pipe and/or sheet erosion of rehabilitated areas	Adverse climatic events and/or climatic sequences beyond design capacity	Localised land impacts and downstream water quality impacts	Rehabilitation of slope, sedimentation controls, revegetation, monitoring and maintenance	C2	U			M				II						0	0	1	0	II		Rehabilitated areas will be visually assessed after the first year to identify any areas of low germination, and soil sampling undertaken to identify a likely cause. Ameliorative action will then be undertaken to improve the substrate if required and the area reseeded. Trends in monitoring data will be assessed to identify whether interim and final targets are likely to be met, and contingency actions undertaken if required.
T	A	04			Non-polluting - geochemical risk																								
T	A	04	01		Acid and saline drainage generation	Adverse material geochemistry	Revegetation performance impacts, downstream receiving environment water quality	Confirmed NAF and low salinity material. Regular water quality monitoring and assessment.	C2		U		L				I						0	0	0	1	I		Rehabilitation area monitoring and assessment. Trends in monitoring data will be assessed to identify whether interim and final targets are likely to be met, and contingency actions undertaken if required.
T	A	04	02		Impacts to groundwater and surface water	Adverse material geochemistry, seepage from the Heap Leach Pad	Groundwater and surface water impacts	Confirmed NAF and low salinity material. Construction on a HDPE liner. Rinsing to remove residual cyanide solution. Confirmed low risk with respect to total metal concentrations. Material under the base of the facility are the Anakie formation, metamorphosed rocks to mid-greenschist facies here and contain phyllite along with fine-grained sandstone, with low conductivity, severely constricting any groundwater flow. Monitoring of groundwater and surface water of the receiving environment. Regular water quality monitoring and assessment.	C2		U		L				I						0	0	0	1	I		Rehabilitation area monitoring and assessment. Trends in monitoring data will be assessed to identify whether interim and final targets are likely to be met, and contingency actions undertaken if required.
T	A	05			Non-polluting - other environmental harm																								
T	A	05	01		Not applicable																		0	0	0	0			

PRCP Risk Assessment
AARC Environmental Solutions Pty Ltd

Commercial-in-Confidence

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Risk Type (T=Threat)	Ref.	Category	Subcategory	Item	Risk Description				Control Effectiveness	Risk Evaluation				Risk Rating						Count				Risk Management Class	Manageability	Risk Management Planning			
					Threat Title	Causes (Triggers / Indicators)	Impacts (Consequences)	Existing Controls		Likelihood - Frequency	Likelihood - Probability	Health Safety	On-site Environment	Off-site Environment	Health Safety	On-site Environment	Off-site Environment	Community Trust	Compliance	Stakeholders						Risk Management Class	Manageability	Risk Management Approach	
																					IV	III	II						I
T	B	06		01	Sustainable - PMLU																								
T	B	06	01	01	Weeds	Weeds could invade via wind, vehicle or footwear during vegetation development. Unsterilised equipment / vehicle, and insufficient weed monitoring	Inhibit the establishment of desirable species and preventing achievement of revegetation targets	Regular weed monitoring program to allow early detection and treatment of new weed infestations.	C2	P				L				II						0	0	1	0	II	Rehabilitation area monitoring and assessment, undertake repairs and maintenance as required. Rehabilitation reference sites for grazing pasture PMLU established in unmined pastures areas within the lease. Vegetation composition and weed presence including in milestone criteria.
T	B	06	02	02	Low pasture productivity	Insufficient vegetation development, pasture species become shaded out, intruding livestock & other fauna, insufficient monitoring	Insufficient pasture density and species richness to meet completion criteria, increased risk of erosion	Seed mixes based on native and introduced pasture species, suitable fertilisation rates based on vegetation trials, supplementary sowing and fertilising in bare patches, monitoring of weeds, pests or diseases and early detection of failure undertaken as part of the monitoring and maintenance of rehabilitated areas	C2	U				L				I						0	0	0	1	I	Rehabilitated areas will be visually assessed after the first year to identify any areas of low germination, and soil sampling undertaken to identify a likely cause. Ameliorative action will then be undertaken to improve the substrate if required and the area reseeded. Trends in monitoring data will be assessed to identify whether interim and final targets are likely to be met, and contingency actions undertaken if required. Rehabilitation reference sites for grazing pasture PMLU established in unmined pastures areas within the lease. Vegetation composition and weed presence including in milestone criteria.
T	B				Tailings storage facility (Cell B)																								
T	B	01		01	Safe																								
T	B	01	01	01	Surface roughness (rockiness, depressions) in excess of that expected for the PMLU	Challenging subsoils/ topsoils, inadequate surface preparation, localised settlement, erosion gullies	Safety hazard for personnel, stock and wildlife	Minimal batters present, surface preparation measures (initial), monitoring and maintenance controls	C2	U			M					II						0	0	1	0	II	Rehabilitation area monitoring and assessment, undertake repairs and maintenance as required
T	B	02			Stable - geotechnical risk																								
T	B	02	01	01	Significant slope failure	Excessive slope steepness, physical material properties, poor drainage, adverse rainfall event	Localised land impacts and downstream water quality impacts	Minimal batters present, slope moderation, max. slopes subject to engineered design, geotechnical assessment required for completion criteria	C1		R			L				I						0	0	0	1	I	Landform development and final landform slopes are consistent with the quality of the soils and the nominated PMLU. Landform development criteria and water management measures provided in milestones.
T	B	03			Stable - erosional risk																								
T	B	03	01	01	Initial/ongoing gully, pipe and/or sheet erosion of rehabilitated areas	Erodible topsoils, adverse weather events	Localised land impacts and downstream water quality impacts	Good topsoil management practices; adequate/effective soil amelioration, grading and shaping, prompt revegetation establishment, revegetation monitoring and management as required	C2	U				M				II						0	0	1	0	II	Landform development and final landform slopes are consistent with the quality of the soils and the nominated PMLU. Landform development criteria and water management measures provided in milestones.
T	B	03	02	02	Initial/ongoing gully, pipe and/or sheet erosion of rehabilitated areas (medium-long term risk)	Rehabilitation failure/ revegetation disease, climatic events (drought)	Localised land impacts and downstream water quality impacts	Landform design moderating slope, adequate/effective soil amelioration, prompt revegetation establishment, revegetation monitoring and management as required	C2	U				M				II						0	0	1	0	II	Rehabilitation area monitoring and assessment, undertake repairs and maintenance as required
T	B	03	03	03	Initial/ongoing gully, pipe and/or sheet erosion of rehabilitated areas	Adverse climatic events and/or climatic sequences beyond design capacity	Localised land impacts and downstream water quality impacts	Rehabilitation of slope, sedimentation controls, revegetation, monitoring and maintenance. Geotechnical assessment of landform.	C2	R				M				II						0	0	1	0	II	Implementation of engineering controls as per recommendations of bi-annual inspection by a RPEQ.
T	B	04			Non-polluting - geochemical risk																								
T	B	04	01	01	Contaminants from tailings material impacting receiving environment	Adverse tailings geochemistry	Revegetation performance impacts, downstream receiving environment water quality	Confirmation that oxidation of sulphides has occurred with likely conversion to jarosite within the landform, as all tailings materials now classified as non-acid forming (NAF). Low porosity of materials within the tailings facility below that of natural soils, inhibiting infiltration & percolation. Low sulphate responses in water within tailings samples & kinetic leaching results with a maximum of 2,000mg/l potential. Key base materials enrichment metals of aluminium, arsenic, cadmium, chromium, copper, manganese, nickel & zinc, but which have limited mobility. Use of oxide rock from heap leach pad as capping material lowers geochemical risk. Regular monitoring of surface water and groundwater.	C2	U				M				II						0	0	1	0	II	Ongoing internal environmental audit of ground water quality.
T	B	04	02	02	Contaminants from tailings material impacting receiving environment	Seepage through the base of the facility	Downstream receiving environment water quality	Material under the base of the facility are the Anakie formation, metamorphosed rocks to mid-greenschist facies here and contain phyllite along with fine-grained sandstone, with low conductivity, severely constricting any groundwater flow. Monitoring of groundwater and surface water of the receiving environment. Material confirmed as NAF with no PAF material present.	C1		R			M				II						0	0	1	0	II	Rehabilitation area monitoring and assessment. Trends in monitoring data will be assessed to identify whether interim and final targets are likely to be met, and contingency actions undertaken if required.
T	B	04	03	03	Insufficient capping cover	Cell B not sufficiently covered with vegetation cover and other capping material (inert capillary break layer and topsoil)	Oxidation of reduced sulphides and release of acid drainage and soluble metals; airborne particulate matter, noncompliance	Extensive rehabilitation trials, geochemical characterisation and third-party review has been undertaken to inform cover design. Cover thickness (capillary break layer and topsoil) have been included as milestone criteria. Revegetation, monitoring, inspections, surface water monitoring and reparation activities undertaken as required.	C2	U				M	L			II	I		I			0	0	1	2	II	Rehabilitation area monitoring and assessment, undertake repairs and maintenance as required
T	B	05			Non-polluting - other environmental harm																								
T	B	05	01	01	Not applicable																			0	0	0	0		

Risk Type (T=Threat)	Ref.	Risk Description				Control Effectiveness	Risk Evaluation				Risk Rating								Count				Risk Management Class	Manageability	Risk Management Planning					
		Category	Subcategory	Item	Threat Title		Causes (Triggers / Indicators)	Impacts (Consequences)	Existing Controls	Likelihood - Frequency	Likelihood - Probability	Health	Safety	On-site Environment	Off-site Environment	Health	Safety	On-site Environment	Off-site Environment	Community Trust	Compliance	Stakeholders			IV	III	II	I		
T	B	06	01	Weeds	Weeds could invade via wind, vehicle or footwear during vegetation development. Unsterilised equipment / vehicle, and insufficient weed monitoring	Inhibit the establishment of desirable species and preventing achievement of revegetation targets	Regular weed monitoring program to allow early detection and treatment of new weed infestations.	C2	P				L				II						0	0	1	0	II		Rehabilitation area monitoring and assessment, undertake repairs and maintenance as required. Rehabilitation reference sites for grazing pasture PMLU established in unmined pastures areas within the lease. Vegetation composition and weed presence including in milestone criteria.	
T	B	06	02	Low pasture productivity	Insufficient vegetation development, pasture species become shaded out, intruding livestock & other fauna, insufficient monitoring	Insufficient pasture density and species richness to meet completion criteria, increased risk of erosion	Seed mixes based on native and introduced pasture species, suitable fertilisation rates based on vegetation trials, supplementary sowing and fertilising in bare patches, monitoring of weeds, pests or diseases and early detection of failure undertaken as part of the monitoring and maintenance of rehabilitated areas	C2	U				L				I						0	0	0	1	I		Rehabilitated areas will be visually assessed after the first year to identify any areas of low germination, and soil sampling undertaken to identify a likely cause. Ameliorative action will then be undertaken to improve the substrate if required and the area reseeded. Trends in monitoring data will be assessed to identify whether interim and final targets are likely to be met, and contingency actions undertaken if required. Rehabilitation reference sites for grazing pasture PMLU established in unmined pastures areas within the lease. Vegetation composition and weed presence including in milestone criteria.	
T	C			Retained infrastructure																										
T	C	01		Safe																										
T	C	01	01	Not applicable																				0	0	0	0			
T	C	02		Stable - geotechnical risk																										
T	C	02	01	Not applicable																				0	0	0	0			
T	C	03		Stable - erosional risk																										
T	C	03	01	Initial/ongoing gully, pipe and/or sheet erosion of rehabilitated areas	Erodible topsoils, adverse weather events	Localised land impacts and downstream water quality impacts	Grading and shaping, monitoring and management as required	C2	U				M				II							0	0	1	0	II		Rehabilitation area monitoring and assessment, undertake repairs and maintenance as required
T	C	03	02	Initial/ongoing gully, pipe and/or sheet erosion of rehabilitated areas	Adverse climatic events and/or climatic sequences beyond design capacity	Localised land impacts and downstream water quality impacts	Sedimentation controls, monitoring and maintenance	C2	U				M				II							0	0	1	0	II		Rehabilitation area monitoring and assessment, undertake repairs and maintenance as required
T	C	04		Non-polluting - geochemical risk																										
T	C	04	01	Not applicable																				0	0	0	0			
T	C	05		Non-polluting - other environmental harm																										
T	C	05	01	Not applicable																				0	0	0	0			
T	C	06		Sustainable - PMLU																										
T	C	06	01	Not consistent with surrounding land use	Not consistent with post-mining land use	Not consistent with post-mining land use	Obtain landowner agreement for retained infrastructure at relinquishment. Assessment by an appropriately qualified person that use is consistent with surrounding land use	C1	R											I				0	0	0	1	I		None applicable.
T	D			Retained water storages																										
T	D	01		Safe																										
T	D	01	01	Dam overtopping	Extreme rainfall events beyond the hydrological model predicted, insufficient monitoring of water level, wall failure/dam break	Failure to achieve targets of rehabilitation completion criteria, local land and downstream receiving environment water quality and dependent ecosystem impacts	Regulated structures have 'low' rating for 'failure to contain - overtopping' and 'dam break' failure models. Landholder agreement to address any residual regulated structure liability. Geotechnical assessment required for completion criteria applicable to all retained water structures.	C2	U				M				II							0	0	1	0	II		Undertake reparation activities as per recommendations by the RPEQ following geotechnical assessment.
T	D	02		Stable - geotechnical risk																										
T	D	02	01	Wall failure/dam break (see dam overtopping risk)					C1	U			M				II							0	0	1	0	II		
T	D	03		Stable - erosional risk																										
T	D	03	01	Initial/ongoing gully, pipe and/or sheet erosion of rehabilitated areas	Erodible topsoils, adverse weather events	Increased risk of not achieving designated PMLU	Good topsoil management practices; adequate/effective soil amelioration, grading and shaping of dam banks, prompt revegetation establishment of dam banks, revegetation monitoring and management as required	C2	U				M				II							0	0	1	0	II		Rehabilitation area monitoring and assessment, undertake repairs and maintenance promptly as required
T	D	04		Non-polluting - geochemical risk																										
T	D	04	01	Water quality in retained storages not meeting PMLU water quality objectives	Adverse physio-chemical characteristics from materials in catchment or Landform not constructed to design	Livestock health	Landform constructed to design, regular water quality monitoring and assessment	C2	P		L						II							0	0	1	0	II		Review of monitoring data to determine mitigation activities as required.
T	D	05		Non-polluting - other environmental harm																										
T	D	05	01	Not applicable																				0	0	0	0			

Risk Type (T=Threat) Category Subcategory Item	Ref.	Risk Description				Risk Evaluation				Risk Rating				Count				Risk Management Class		Risk Management Planning																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																			
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Risk Type (T=Threat)	Ref.	Category	Subcategory	Item	Risk Description				Control Effectiveness	Risk Evaluation				Risk Rating						Count				Risk Management Class	Manageability	Risk Management Planning				
					Threat Title	Causes (Triggers / Indicators)	Impacts (Consequences)	Existing Controls		Likelihood - Frequency	Likelihood - Probability	Health	Safety	On-site Environment	Off-site Environment	Health	Safety	On-site Environment	Off-site Environment	Community Trust	Compliance	Stakeholders	IV			III	II	I		
																													Evaluated 59 of 75 risks Remaining)	
T	F	01	01		Surface roughness (rockiness, depressions) in excess of that expected for the PMLU	Erosion gullies etc due to challenging subsoils/ topsoils, inadequate surface preparation, localised settlement	Safety hazard for personnel, stock and wildlife	Surface preparation measures (initial), monitoring and maintenance controls	C2	P				M				III					0	1	0	0	III		Risk Management Approach	Rehabilitation area monitoring and assessment, undertake repairs and maintenance as required.
T	F	01	02		Failure of fence	Flood events, human intervention	Safety hazard for personnel, stock and wildlife	Fencing to be similar to what is used in the current grazing landscape. Fencing to be inspected following flood events and reparation undertaken accordingly. Signage every 100 m along fencing.	C2	P			M	M				III	III				0	2	0	0	III			
T	F	02			Stable - geotechnical risk																									
T	F	02	01		Structural failure during flood event	Bunding constructed not in accordance with design plan	Localised land impacts and downstream water quality impacts	Construction to follow design requirements. Geotechnical assessment required for completion criteria. Geotechnical assessment undertaken as part of PRCP process indicates current design has a long-term FoS in excess of 1.5.	C1		U			M	M				II	II			0	0	2	0	II			Visual inspection following flood events where structure is affected by flooding. Review of final landform design as required.
T	F	03			Stable - erosional risk																									
T	F	03	01		Erosion of Main Pit flood protection landform	Floodwater erosive velocities against the landform, insufficient groundcover	Localised land impacts	Adequate/suitable groundcover, prompt revegetation establishment, revegetation monitoring and management as required	C2	U				M					II				0	0	1	0	II			Rehabilitation area monitoring and assessment, undertake repairs and maintenance promptly as required
T	F	03	02		Initial/ongoing gully, pipe and/or sheet erosion of rehabilitated areas (medium-long term risk)	Rehabilitation failure/ revegetation disease, climatic events (drought)	Localised land impacts and downstream water quality impacts	Landform design moderating slope, adequate/effective soil amelioration, prompt revegetation establishment, revegetation monitoring and management as required.	C2	P				M				III				0	1	0	0	III			Rehabilitation area monitoring and assessment, undertake repairs and maintenance as required.	
T	F	03	03		Initial/ongoing gully, pipe and/or sheet erosion of rehabilitated areas	Adverse climatic events and/or climatic sequences beyond design capacity	Localised land impacts and downstream water quality impacts	Rehabilitation of slope, sedimentation controls, revegetation, monitoring and maintenance. Geotechnical assessment of landform.	C2	U				M					II				0	0	1	0	II			Rehabilitation area monitoring and assessment, undertake repairs and maintenance as required.
T	F	04			Non-polluting - geochemical risk																									
T	F	04	01		Not applicable																	0	0	0	0					
T	F	05			Non-polluting - other environmental harm																									
T	F	05	01		Not applicable																	0	0	0	0					
T	F	06			Sustainable - PMLU																									
T	F	06	01		Weeds	Weeds could invade via wind, vehicle or footwear during vegetation development. Unsterilised equipment / vehicle, and insufficient weed monitoring	Inhibit the establishment of desirable species and preventing achievement of revegetation targets	Regular weed monitoring program to allow early detection and treatment of new weed infestations.	C2	P				L					II				0	0	1	0	II			Rehabilitation area monitoring and assessment, undertake repairs and maintenance as required. Rehabilitation reference sites for grazing pasture PMLU established in unmined pastures areas within the lease. Vegetation composition and weed presence including in milestone criteria.
T	F	06	02		Low pasture productivity	Insufficient vegetation development, pasture species become shaded out, intruding livestock & other fauna, insufficient monitoring	Insufficient pasture density and species richness to meet completion criteria, increased risk of erosion	Seed mixes based on native and introduced pasture species, soil health assessment and fertiliser / ameliorants application prior to revegetation, supplementary sowing and fertilising in bare patches, monitoring of weeds, pests or diseases and early detection of failure undertaken as part of the monitoring and maintenance of rehabilitated areas	C2	U				L				I	I			0	0	0	1	I			Rehabilitated areas will be visually assessed after the first year to identify any areas of low germination, and soil sampling undertaken to identify a likely cause. Ameliorative action will then be undertaken to improve the substrate if required and the area reseeded. Trends in monitoring data will be assessed to identify whether interim and final targets are likely to be met, and contingency actions undertaken if required. Rehabilitation reference sites for grazing pasture PMLU established in unmined pastures areas within the lease. Vegetation composition and weed presence including in milestone criteria.	
T	F	01			South pit (backfilled)																									
T	F	01	01		Safe																									
T	F	01	01		Surface roughness (rockiness, depressions) in excess of that expected for the PMLU	Erosion gullies etc due to challenging subsoils/ topsoils, inadequate surface preparation, localised settlement	Safety hazard for personnel, stock and wildlife	Low slopes, surface preparation measures (initial), monitoring and maintenance controls	C2	U				M					II				0	0	1	0	II			Rehabilitation area monitoring and assessment, undertake repairs and maintenance as required.
T	F	02			Stable - geotechnical risk																									
T	F	02	01		Significant slope failure	Excessive slope steepness, physical material properties, poor drainage, adverse rainfall event	Localised land impacts and downstream water quality impacts	Slope moderation, max. slopes subject to design, geotechnical assessment required for completion criteria	C1		U			M					II				0	0	1	0	II			
T	F	03			Stable - erosional risk																									
T	F	03	01		Initial/ongoing gully, pipe and/or sheet erosion of rehabilitated areas	Erodible topsoils, adverse weather events	Localised land impacts and downstream water quality impacts	Good topsoil management practices; adequate/effective soil amelioration, grading and shaping, prompt revegetation establishment, revegetation monitoring and management as required	C2	U				M					II				0	0	1	0	II			Rehabilitation area monitoring and assessment, undertake repairs and maintenance as required.
T	F	03	02		Initial/ongoing gully, pipe and/or sheet erosion of rehabilitated areas (medium-long term risk)	Rehabilitation failure/ revegetation disease, climatic events (drought)	Localised land impacts and downstream water quality impacts	Landform design moderating slope, adequate/effective soil amelioration, prompt revegetation establishment, revegetation monitoring and management as required	C2	U				M					II				0	0	1	0	II			Rehabilitation area monitoring and assessment, undertake repairs and maintenance as required.
T	F	03	03		Initial/ongoing gully, pipe and/or sheet erosion of rehabilitated areas	Adverse climatic events and/or climatic sequences beyond design capacity	Localised land impacts and downstream water quality impacts	Rehabilitation of slope, sedimentation controls, revegetation, monitoring and maintenance	C2	U				M					II				0	0	1	0	II			Rehabilitation area monitoring and assessment, undertake repairs and maintenance as required.

Risk Type (T=Threat) Category Subcategory Item	Ref.	Risk Description																Count		Risk Management Planning								
		Evaluated 59 of 75 risks (16 Remaining)																										
		Threat Title		Causes (Triggers / Indicators)		Impacts (Consequences)		Existing Controls		Control Effectiveness	Risk Evaluation		Risk Rating				Risk Management Class	Manageability	Risk Management Approach									
T	F	04	Non-polluting - geochemical risk																IV	III	II	I	Risk Management Class	Manageability	Risk Management Approach			
T	F	04	01	Acid drainage generation	Adverse material geochemistry	Revegetation performance impacts, downstream receiving environment water quality	Oxidised waste rock and clay capping material lowers geochemical risk. Oxide waste material confirmed NAF	C2	U					M			II					0	0	1	0	II		Review of monitoring data to determine mitigation activities as required.
T	F	04	02	Impacts to groundwater values	Adverse material geochemistry and presence of exposure pathways	Unfavourable groundwater quality	Modelling indicates that limited exposure pathways exist. The Suttor River is a perched system, some 8 metres above groundwater. The groundwater levels recorded for the South Hill bores are approximately 10 m below riverbed level. Pre-mine groundwater assessments suggested no hydraulic connection between the clay and silt alluvium of the Suttor and fractured rock aquifers, such as those that may be open to the South Hill pit. Capping of sulphide-bearing waste; establishment of a vegetative cover on final land surface; monitoring of groundwater bores and revegetation. Groundwater monitoring bore network to monitor any potential impacts to groundwater from South Pit.	C2	R					M			II					0	0	1	0	II		Review of monitoring data to determine mitigation activities as required.
T	F	05	Non-polluting - other environmental harm																									
T	F	05	01	Not applicable																		0	0	0	0			
T	F	06	Sustainable - PMLU																									
T	F	06	01	Weeds	Weeds could invade via wind, vehicle or footwear during vegetation development. Unsterilised equipment / vehicle, and insufficient weed monitoring	Inhibit the establishment of desirable species and preventing achievement of revegetation targets	Regular weed monitoring program to allow early detection and treatment of new weed infestations, development of a site specific weed management plan.	C2	P					L			II					0	0	1	0	II		Rehabilitation area monitoring and assessment, undertake repairs and maintenance as required. Rehabilitation reference sites for grazing pasture PMLU established in unmined pastures areas within the lease. Vegetation composition and weed presence including in milestone criteria.
T	F	06	02	Low pasture productivity	Insufficient vegetation development, pasture species become shaded out, intruding livestock & other fauna, insufficient monitoring	Insufficient pasture density and species richness to meet completion criteria, increased risk of erosion	Seed mixes based on native and introduced pasture species, soil health assessment and fertiliser / ameliorants application prior to revegetation, supplementary sowing and fertilising in bare patches, monitoring of weeds, pests or diseases and early detection of failure undertaken as part of the monitoring and maintenance of rehabilitated areas	C2	U					L			I					0	0	0	1	I		Rehabilitated areas will be visually assessed after the first year to identify any areas of low germination, and soil sampling undertaken to identify a likely cause. Ameliorative action will then be undertaken to improve the substrate if required and the area reseeded. Trends in monitoring data will be assessed to identify whether interim and final targets are likely to be met, and contingency actions undertaken if required. Rehabilitation reference sites for grazing pasture PMLU established in unmined pastures areas within the lease. Vegetation composition and weed presence including in milestone criteria.
T	F	01	Final void(s) - NUMAs Safe																									
T	F	01	01	Void areas are accessible by public and/or fauna	Insufficient warnings, barriers preventing access to hazardous areas (highwalls, pit lake)	Falls, slips, trips impacting humans, livestock, fauna	Signage, physical barriers, slope moderation included in monitoring and maintenance procedures for Improvement Areas, remoteness of site and landowner controls.	C2	U					M			II					0	0	1	0	II		
T	F	01	02	Void overtopping	Extreme rainfall events beyond design capacity, insufficient water level monitoring	Increased hazard to humans and animals	Void water level monitoring, hydrological modelling, constructed to design criteria.	C2		R				L			I					0	0	0	1	I		
T	F	01	03	Failure of fence	Inadequate fencing and signage, flooding	Potential health impacts to stock, loss of life due to falls	Fencing and/or bunding installed around the perimeter of the pit. Fencing to be similar to what is used in the current grazing landscape.	C2		R	H	H				III	III					0	2	0	0	III		Stabilize landform, exclude stock, fencing to be inspected following flood events. Review of fencing type to be undertaken should fencing not perform consistent with the surrounding landscape.
T	F	02	Stable - geotechnical risk																									
T	F	02	01	Significant slope failure	Excessive slopes, not constructed to design, adverse rainfall event, inadequate drainage controls	Localised land impacts	Voids to follow design requirements for maximum slope.	C2		U				M			II					0	0	1	0	II		Ongoing, opportunistic visual inspection of the void walls. Landform development criteria provided in milestones as informed by geotechnical assessment.

Risk Type (T=Threat) Category Subcategory Item	Ref.	Risk Description				Control Effectiveness	Risk Evaluation			Risk Rating					Count				Risk Management Class	Manageability	Risk Management Planning							
		Evaluated 59 of 75 risks Remaining) (16					Likelihood - Frequency	Likelihood - Probability	Health Safety	On-site Environment	Off-site Environment	Health Safety	On-site Environment	Off-site Environment	Community Trust	Compliance	Stakeholders					Risk Management Class	Manageability	Risk Management Planning				
		Threat Title	Causes (Triggers / Indicators)	Impacts (Consequences)	Existing Controls													IV			III				II	I		
T	F	03	Non-polluting - geochemical risk																							Risk Management Approach		
T	F	03	01	Poor pit lake water quality (applicable to Main pit)	Exposure of sulphidic materials to air (oxidising conditions) resulting in accumulation of soluble salts and acidity	Worsening void water quality and potential for negative impacts to groundwater and Suttor River / Yandan Creek	Capping of sulphide material and design of final landform maintains permanent water cover of sulphidic materials in walls and base of pit, including spillways between the pit lake and Suttor River and Yandan Creek.	C2	U				M	M			II	II				0	0	2	0	II		Ongoing, opportunistic visual inspection of the void walls. Water management measures provided in milestones. Review of water management measures to be undertaken with recommendations for mitigation measures as required (e.g. should milestones not be achieved).
T	F	03	02	Insufficient water cover in Main pit	Exposure of sulphidic materials to air (oxidising conditions) resulting in accumulation of soluble salts and acidity	Worsening void water quality within Main pit	Surface-water/groundwater scenario modelling indicates that sufficient water cover will be achieved in all climate scenarios with the exception of the extremely dry 2090 scenario where water cover drops slightly below 160 mAHD for a short period of time before recovering above 160 mAHD. The connection to the pit void and subsequent release of void water to the Suttor River and Yandan Creek has been designed to only occur in flood events of approximately 5-25% AEP. In such events, rainfall and water inflows to the void allows for sufficient mixing of void water to protect aquatic ecosystem values. Further prior to filling water, a non-reactive material and lime cover were placed over the floor of the pit. Ongoing monitoring of pit water and of the downstream environment to ensure landform is performing as designed.	C2		R			VL	L			I	I				0	0	0	2	I		Ongoing monitoring of pit water quality and of the receiving environment during release events. Review of water management measures to be undertaken with recommendations for mitigation measures as required (e.g. should milestones not be achieved).
T	F	05	Achievement of sufficient improvement																									
T	F	05	01	Sufficient improvement not achieved due to excessive slopes, not constructed to design, adverse rainfall event	Excessive slopes, not constructed to design, adverse rainfall event	Localised land impacts	Voids to follow design requirements for maximum slope, geotechnical assessment required for completion criteria.	C2		U			M				II					0	0	1	0	II		
T	F	05	02	Sufficient improvement not achieved due to poor water quality (applicable to Main pit)	Exposure of sulphidic materials to air (oxidising conditions) resulting in accumulation of soluble salts and acidity	Localised land impacts and downstream water quality impacts	Assessment by an appropriately qualified person that the water level and quality meet design requirements.	C2		U			M	M			II	II				0	0	2	0	II		
T	F	05	03	Groundwater contamination (applicable to East Hill pit)	rising water level accessing the siltstone unit	Groundwater quality impacts	Water balance model, catchment area controls, assessment by an appropriately qualified person that the water level meet design requirements.	C2		U			M				II					0	0	1	0	II		
T	F	05	04	Inundation by flood waters (applicable to East Hill pit)	Inundation by floodwaters resulting in water level rising above known unit of siltstone	Groundwater quality impacts	Maximum PMF flood depth est. < 1 m, minor permanent bunding constructed around the north of the pit.	C1		R			M				II					0	0	1	0	II		
T	F	Natural Hazards																										
T	F	1	01	Heavy rainfall or Droughts after initial planting	Natural event	Poor seed establishment, erosion of rehabilitated areas, loss of topsoil and surface water contamination through flooding	Weather monitoring prior to seeding. Monitoring for early detection of poor seed germination. Extreme droughts may require extra seeding and supplementary irrigation as required.	C2		U			M				II					0	0	1	0	II		Annual monitoring will track progress and trigger maintenance as required.
T	F	1	02	Fires	Natural event	Loss of planted stock. Increased erosion and soil loss due to decreased groundcover	Immediate action through re-seeding and hay mulching to minimize soil loss and erosion.	C2		U			M				II					0	0	1	0	II		Annual monitoring will track progress and trigger maintenance as required.
T	F	2	03	Flooding	Natural event. The site is in a floodplain and a flooding assessment indicates that some areas of the final landform are subject to 1% AEP and PMF flooding.	Flooding threatens landform stability.	Flood risk assessment has been undertaken to examine the susceptibility of the site to flooding. Modelling to understand the depth and velocity of PMF flooding events. Modelling indicates that the site (Main Pit, East Pit and Heap Leach Pad) are subject to low flood velocities.	C2		U			M	M			II	II				0	0	1	0	II		Visual inspections after significant flooding events to validate predictions that the landforms are safe and stable under such conditions. If landform integrity is found to be compromised during a flood event, repair works will be undertaken and the need to adopt additional controls such as rock armouring or landform reshaping will be evaluated.
				Extreme weather events	Extreme weather events (general) and climate-change.	Weather events prevent the undertaking of rehabilitation activities.	Weather monitoring prior to the planning of rehabilitation activities. The potential for the influence of climatic activities on the has been considered in the proposed timing for achievement of each milestone.	C2		U			L	M			I	II				0	0	1	0	II		Annual monitoring will track progress and trigger maintenance as required. PRCP schedule amendment if required.

Appendix G. Provided technical studies

- AARC 2018, Post Mine Land Use Plan
- AARC 2023, Yandan Gold Mine 2023 Rehabilitation Monitoring Report
- AARC 2024a, Erosion Stability Assessment
- AARC 2024b, Soil and Land Suitability Assessment
- Blackrock Mining Solutions 2024, Yandan Gold Project Geotechnical Assessment
- Chapman & Dwyer 1999, Water quality prediction for the flooding of the open pit
- EGI 2002, Environmental Geochemical Assessment of the Yandan Heap Leach Dump
- Forbes 1988, YGP groundwater dewatering study
- HLA-Envirosciences 2000, Mine reclamation and closure plan
- HLA-Envirosciences 2001, Yandan pit water study
- O’Kane Consultants 2019, Yandan Gold Mine - TSF Cell B Conceptual Cover System Design Update
- RD Environmental 1999, Introduction of Yandan pit water into the Suttor River system
- RGS 2013, Geochemical Assessment of TSF Cell B cover materials, tailings and heap leach rocks at Yandan Gold Mine
- RGS 2015, Yandan Oxide and Sulfide Tailings Assessment
- RGS 2021, Yandan Tailings Storage Facility: Technical Memorandum
- RGS 2022, Yandan Tailings technical memorandum
- Ross Mining N.L. 1999, Yandan Gold Project Environmental Management Overview System
- Ross Mining N.L. 200, Amendment to Plan of Operations to allow flushing of Yandan pit
- SBE 2022a, Water Performance of Yandan Mine landscape at closure
- SBE 2022b, Summary tailings & heap leach landforms risk review for cover design
- SBE 2023, PRCP & ERC Water performance of TSF & heap leach landforms
- SBE 2024a, Main pit and Suttor River water system characterisation (this report).
- SBE 2024,b Yandan groundwater and conceptual model characterisation.
- SBE 2024c, Yandan site flooding profile characterisation
- SRK Consulting 1999, Pit reflooding and waste rock backfill
- SRK Consulting 1999, Pit water quality prediction
- Williams 2021, Independent desktop review of risk level and appropriate capping strategy for TSF Cell B at Yandan Gold Mine