BLACK CAT SYNDICATE

KAL EAST PROJECT

IMPERIAL-MAJESTIC PLANT, TAILINGS STORAGE FACILITY & DEWATERING PIPELINE

PART V WORKS APPROVAL SUPPORTING DOCUMENT (ATTACHMENT 8)

M25/350

Proponent: Black Cat (Bulong) Pty Ltd

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Environment and Stakeholder Engagement Lead

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1. GLOSSARY

Abbreviation	Definition
AEP	Annual Exceedance Probability
AHD	Australian Height Datum
ANCOLD	Australian National Committee on Large Dams
ARI	Average Recurrence Interval
BC8	Black Cat
CIP	Carbon in pulp
CKB	City of Kalgoorlie Boulder
CMP	Conservation Management Plan
DBCA	Department of Biodiversity Conservation and Attractions
DMIRS	Department of Mines, Industry Regulation and Safety
HAZOP	Hazard and operability study
HDPE	High density polyethylene
KEGP	Kalgoorlie East Gold Project
LOM	Life of Mine
MNES	Matter of National Environmental Significance
NAF	Non-acid forming
RIWI	Rights in Water and Irrigation
ROM	Run of mine
SWL	Standing water level
TDS	Total dissolved salts
TSF	Tailings Storage Facility
WRD	Waste Rock Dump

3. INTRODUCTION

3.1 Background

Black Cat Syndicate Limited ("Black Cat" or "the Company") purchased a portion of Silver Lake Resources (SLR) Mt Monger tenement package in July 2020. The purchased tenement package includes the Imperial-Majestic gold deposit. Black Cat (Bulong) Pty Ltd is a subsidiary of Black Cat Syndicate and for the purposes of this works approval application is the named applicant.

The Imperial-Majestic Project (Project) was mined by SLR from 2016-2018 with development of three open pits: Majestic, Imperial (DMIRS Reg ID 56264) and Imperial West (DMIRS Reg ID 64139). Approval for a fourth mine, named Treasure Chest was also granted (DMIRS Reg ID 64139) but it was not mined. Ore from all open pits was transported via road train for treatment at SLR's Randall's Gold Processing Facility (RGPF). Groundwater intersected during mining was transferred via a 9km dewatering pipeline to the Fingals pit located on M26/248 and M26/357 in accordance with DWER Licence L8457/2010/2 (700,000 tpa). When open pit mining at Majestic and Imperial ceased in mid-2018 dewatering to Fingals also ceased allowing the Majestic and Imperial pits to recharge with groundwater.

Black Cat now intend to recommence mining activities at the project which will comprise the development of two new underground deposits at Imperial and Majestic, along with the construction of a new Processing Plant, Tailings Storage Facility (TSF) and other miscellaneous mining facilities. To allow access to the underground workings, Black Cat proposes to discharge mine dewater stored in the Majestic pit to the adjacent Imperial pit. This water will ultimately be used as process water.

3.2 Objective

The objective of this Works Approval is to obtain approval for the Black Cat to construct a gold processing plant, TSF and dewatering pipeline under the following prescribed premises:

- Category 5 – Processing or beneficiation of metallic or non-metallic ore.
- Category 6 – Mine dewatering.

This document has been prepared to support the Works Approval application. Subject to approval, the expected commencement date is scheduled for Q4 2021.

It has been structured to include all relevant attachments and information required to support the application, in accordance with form *Application form: works approval, licence, renewal, amendment, or registration (v13, April 2020).*

3.3 Location

The Project is located approximately 640 kilometres east of Perth and 45 kilometres southeast of Kalgoorlie in Western Australia (Figure 1).

3.4 Ownership and Land Tenure

The Project is located on M25/350 which Black Cat purchased from SLR in July 2020 (Table 1, Figure 2). The current holder is the Works Approval applicant, Black Cat (Bulong) Pty Ltd. Proof of owner and ASIC company details are provided as Attachments 1A and 1B as required for this application.

The Project is located on Hampton Hill Station Pastoral Lease within the City of Kalgoorlie-Boulder.

Figure 4 shows the existing site infrastructure constructed by SLR at the Project.

Table 1: Details of Project tenure

TENEMENT	OWNER	DATE GRANTED	EXPIRY DATE	AREA (ha)
M25/350	Black Cat (Bulong) Pty Limited	24/05/2012	23/05/2033	992.4

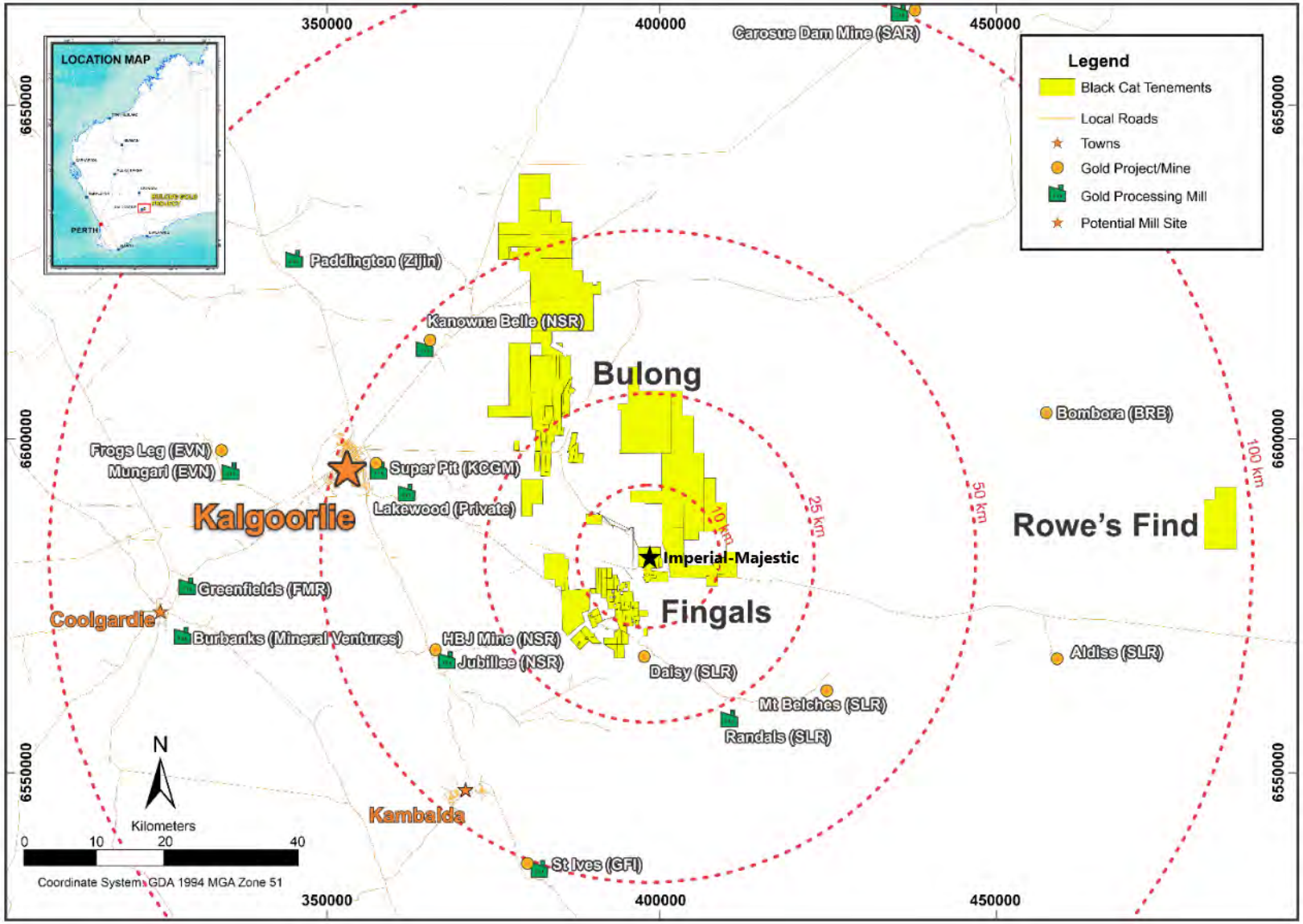


Figure 1: Imperial-Majestic Project Regional Location

Figure 2: Tenure Plan

Black Cat
Syndicate

[redacted]

6. ATTACHMENT 2 – MAP OF PRESCRIBED PREMISES

The following figures are provided in support of the Works Approval:

- Figure 3a - Prescribed Premises Map. This figure provides an aerial photograph and site plan of sufficient scale showing the proposed prescribed premises boundary. The prescribed premise boundary is aligned to the Mining Lease boundary.
- Figure 3b - Project layout. This figure illustrates the project layout with pre-existing disturbance, showing key infrastructure and buildings. Also included are the proposed key discharge and monitoring locations.
- Figure 3c – Proximity of sensitive locations. This figure illustrates the Majestic Timber Reserve as the only other land use of interest in closer vicinity to the project. This lies 1km south of the proposed plant/ore processing facility and will not be impacted by the operation. Lake Yindarlgooda is 5 km to the north.

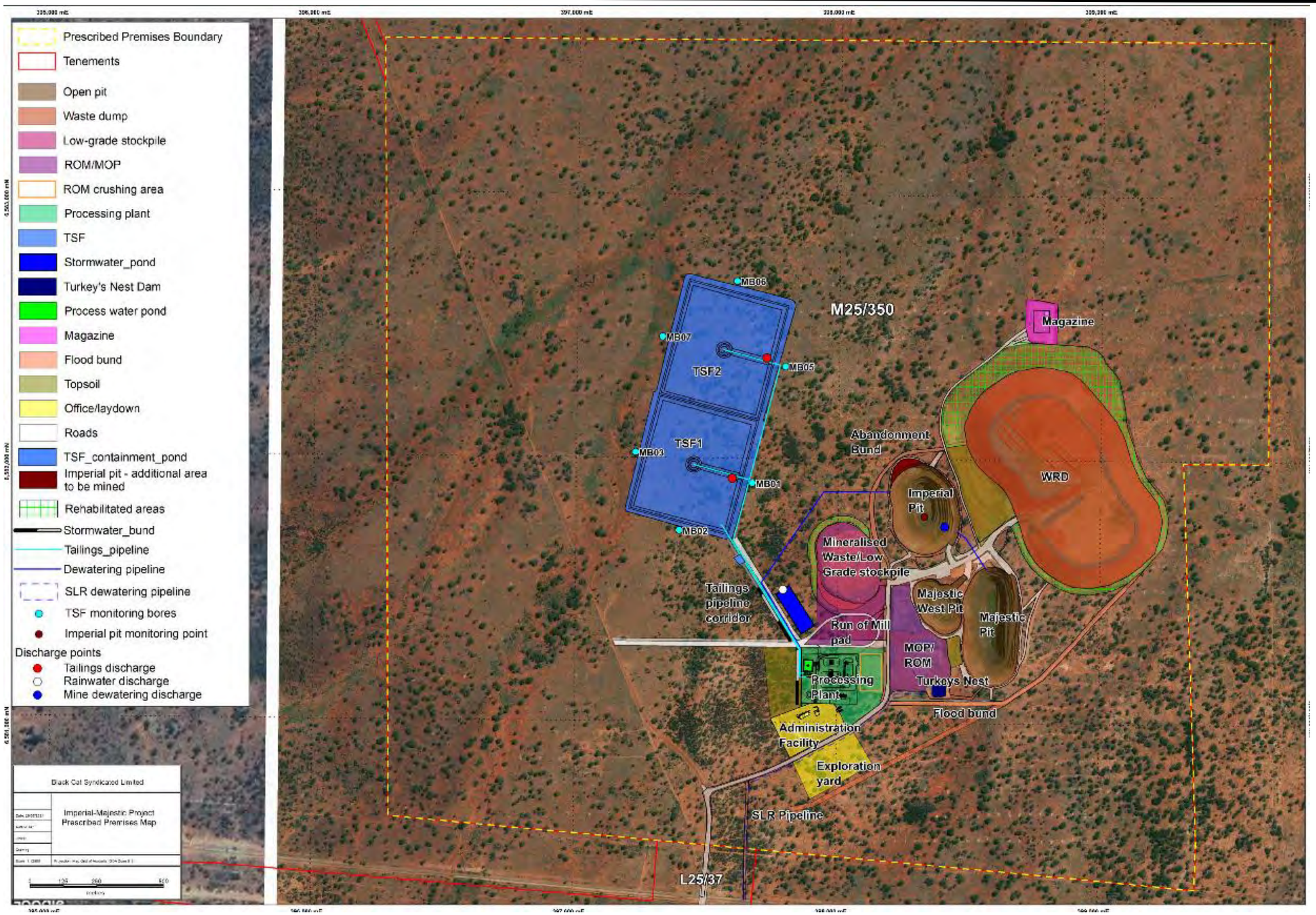


Figure 3a: Prescribed Premises Map

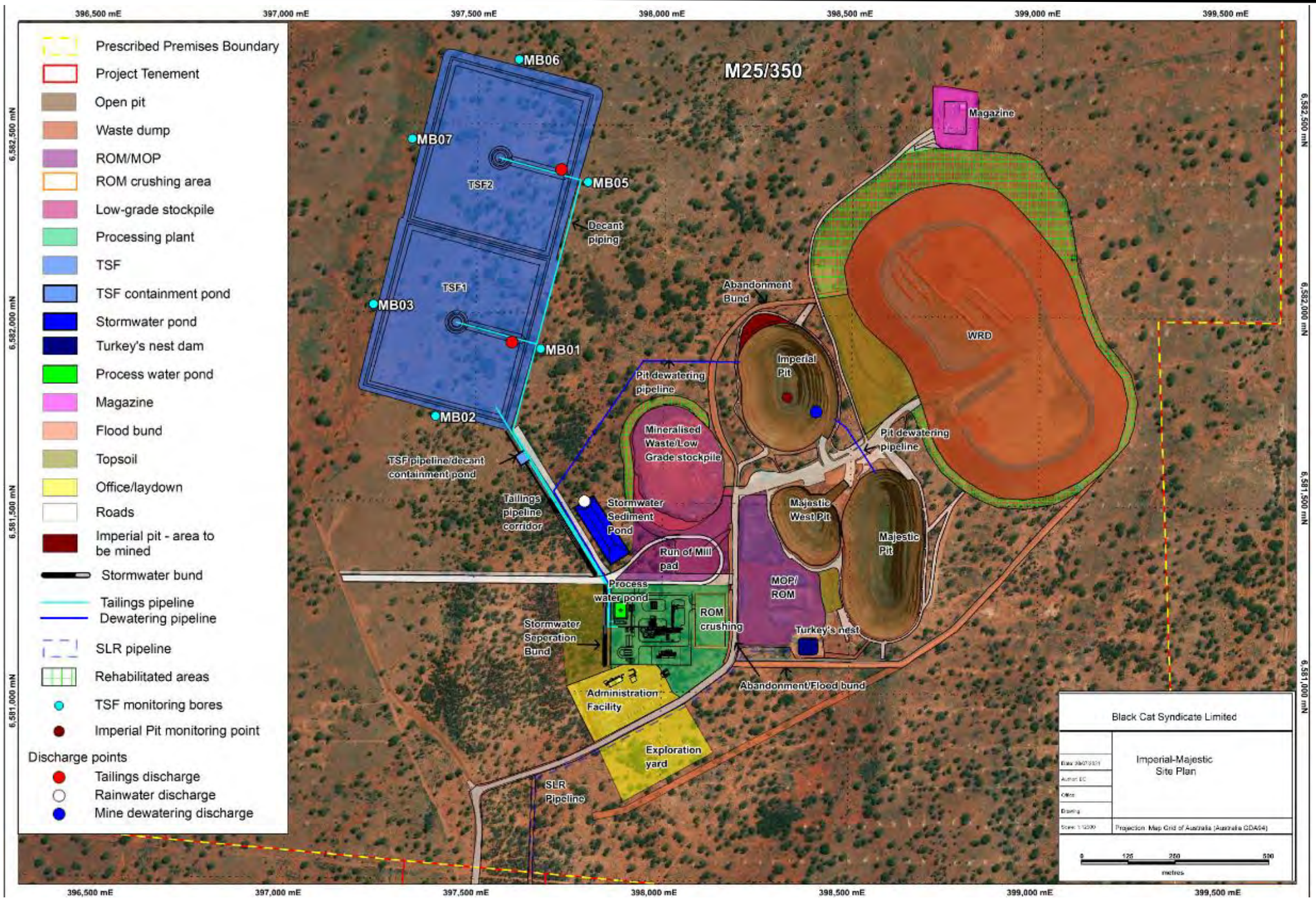


Figure 3b: Project layout

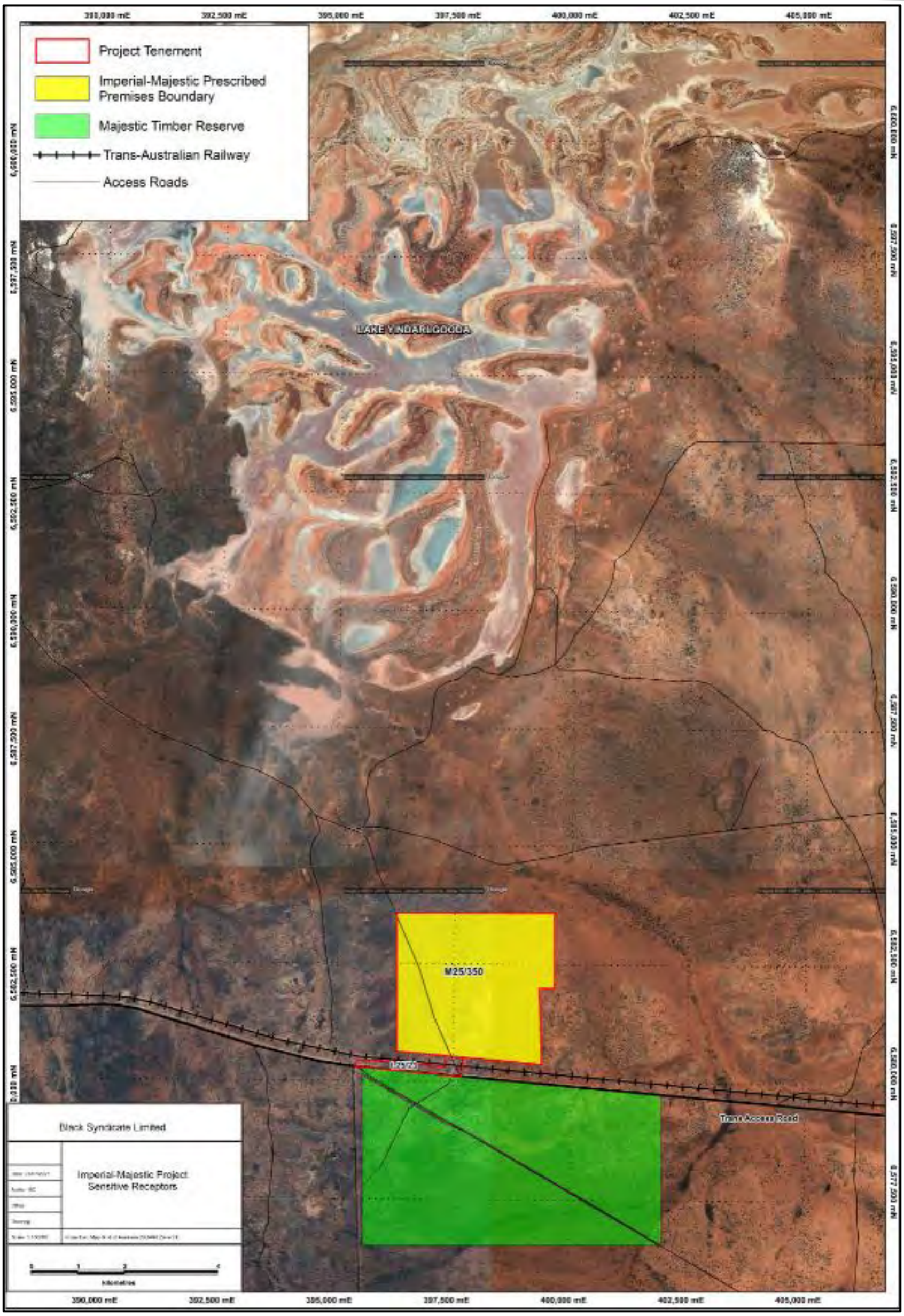


Figure 3c: Proximity of sensitive locations

7. ATTACHMENT 3B – PROPOSED ACTIVITIES

7.1 Existing infrastructure

As outlined in Section 1.1, previous mining operations occurred at the Project by SLR from 2016-2018. Existing infrastructure (Figure 4) at Imperial-Majestic mine includes:

- Majestic open pit.
- Majestic West open pit.
- Imperial open pit.
- Majestic-Imperial combined WRD (rehabilitated).
- Topsoil stockpiles.
- Low grade/mineralised waste stockpile.
- ROM pad.
- Admin/laydown/workshop/fuel storage (surface infrastructure removed).
- Turkeys nest.
- Dewatering pipeline – Black Cat do not intend to utilise the dewatering pipeline from the turkey's nest to Fingals.
- Diversion bund (which will also act as an abandonment bund).
- Magazine
- Groundwater extraction and monitoring bores.
- Roads.

Groundwater inflows encountered during mining were stored in the fenced, HDPE lined turkeys nest. This water was used to for surface dust suppression and as an intermediary stage in pumping the pit lake water to the Fingals pit.

Details of the existing infrastructure is outlined in Table 2. This infrastructure remains the property of Silver Lake.

Table 2: Existing containment infrastructure

Premises	As-constructed design
Turkeys nest	65m x 55m single cell 2m high (4.0m deep) Fenced, fauna egress matting in corners HDPE poly liner
Dewatering pipeline	Located in bunded trench.

7.2 Proposed infrastructure

The recommencement of mining activities at the Project by Black Cat will involve the following:

- Commence underground mining activities below the existing Majestic open pit once dewatering is complete. The Imperial underground will commence once the pit water is depleted through mineral processing (dewatering of Imperial through operating the processing plant is anticipated to take nine months);
- Dewater the Majestic pit lake by pumping water to the Imperial pit. Water from Imperial will then be used for mineral processing and dust suppression;
- Deposit waste in the Majestic West open pit with material generated from the underground mines;
- Construct a Run-of-Mill pad immediately north of the plant;

- Construct a conventional crush – grind – gravity/CIP recovery processing plant which will target a nominal operational throughput of 800,000 tpa;
- Construct and operate a 2 – cell TSF designed to store 2Mt of tailings;
- Increase the size of the area for the workshop/office/fuel storage and laydown/hardstand south of the existing approved area for the exploration yard;
- Utilise the as-constructed turkeys nest;
- Extend the length of the diversion bund to the southwest to divert water flow east of the additional workshop etc area;
- Reuse most of the existing clearing and infrastructure for its original purpose (magazine, roads, ROM pad, low-grade stockpile, saline water dam, office area, workshop area, laydown, haul road).
- The proposed project layout is provided in Attachment 2 and again in Figure 5 below.

7.3 Prescribed Premises

As part of the mining recommencement at the Majestic and nearby gold deposits, Black Cat intends to construct the prescribed premises:

- Category 5 – Processing or beneficiation of metallic or non-metallic ore:
    - Processing Plant;
    - TSF (2 – cell).
- Category 6 – Mine dewatering:
    - Dewatering pipeline from Majestic to Imperial pit.

The key infrastructure and equipment is summarised in Table 3 with further detail specific to the provided in the subsequent sections.

The prescribed premises boundary, proposed site layout and discharge points are shown in Attachment 2 (Figure 3a – 3c)

The prescribed premise boundary has been defined as the tenement boundary for M25/350.

Table 3: Key Equipment and Infrastructure to be installed

Category	Equipment and Infrastructure to be installed
5	Plant – 2-stage crushing circuit with conventional CIP circuit Crushing circuit – Primary Jaw crusher and Secondary cone crusher Screening Milling (Bal mill) and gravity separation Cyclone classification Leaching and adsorption Elution circuit and carbon regeneration Raw water tank Process water pond Power station (diesel)
5	TSF Facility Decant return tower Tailings and decant return pipelines TSF monitoring bores
6	Dewatering pipeline Pipelines Pump, pontoon

7.4 Project timing and phases

A summary of the Project timing is provided in Table 4.

Table 4: Timing for prescribed premises

Premises	Construction	Commissioning	Operations
Plant	Sep 2021 – July 2022	Aug – Oct 2022	Nov 2022
TSF	Dec 2021 – Feb 2022	Aug – Oct 2022	Nov 2022
Dewatering pipeline	Dec 2021	Dec 2021	Jan 2021

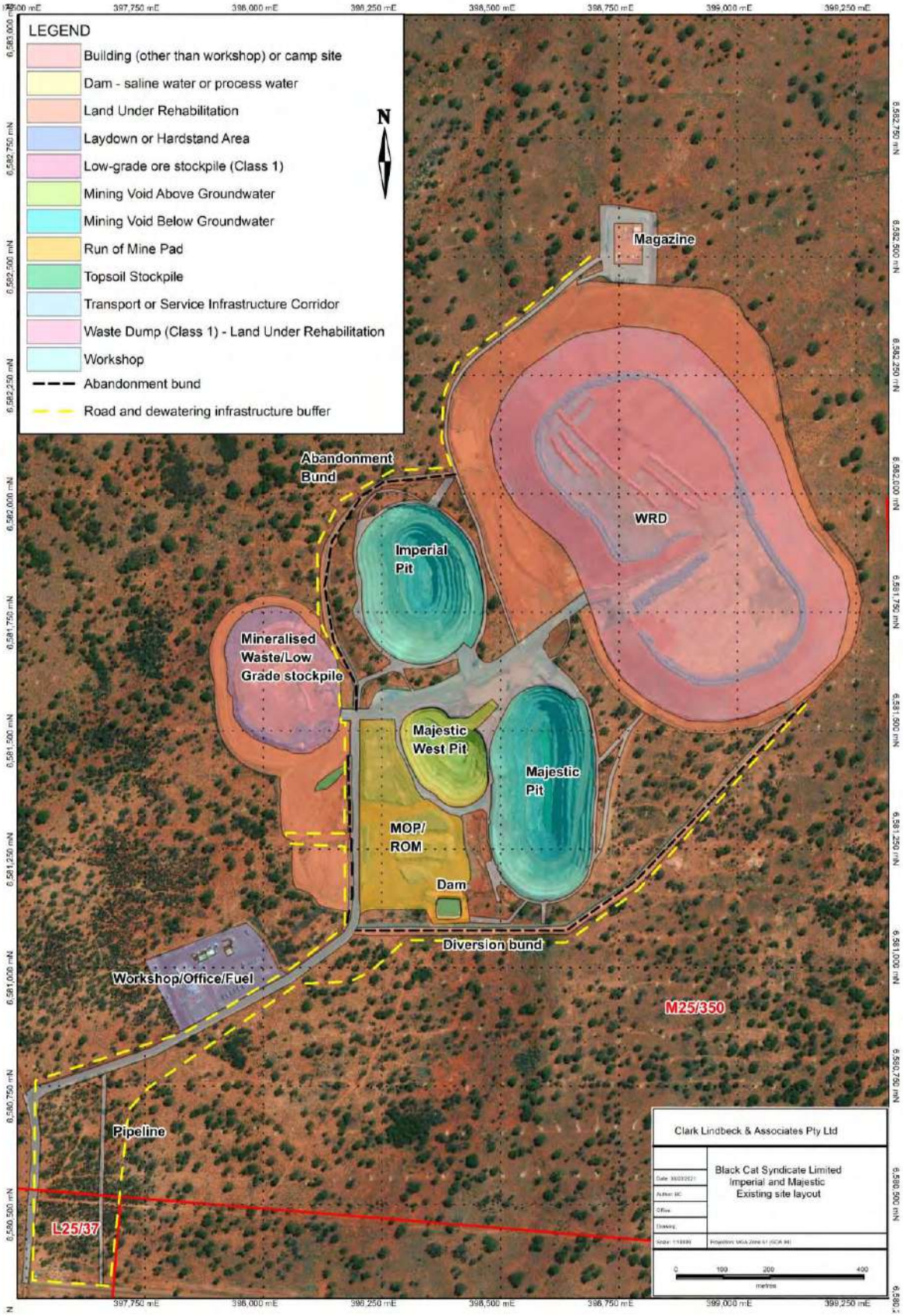


Figure 4: Existing site infrastructure areas constructed by SLR

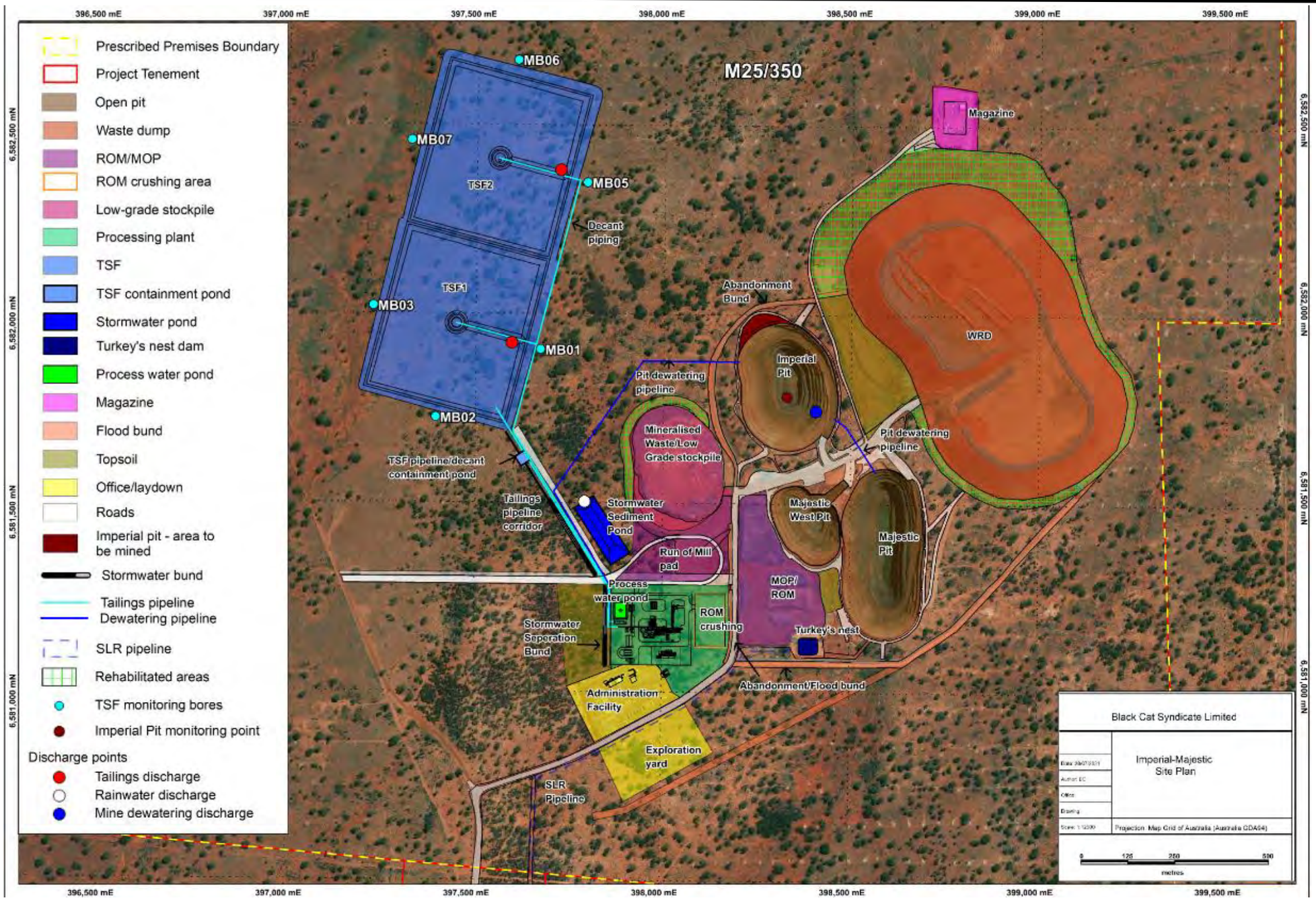


Figure 5: Final site layout

7.5 Dewatering pipeline

7.5.1 Overview

Black Cat intends to construct a dewatering pipeline to discharge mine dewater from the Majestic pit to the Imperial pit to allow mining of the underground deposit.

The Majestic pit currently has 600,000 kL of water stored in the pit. GRM (2018) identified groundwater inflows to the pit lake at this time as 1,043 kL/day. Groundwater inflows to Imperial are far lower than Majestic at 140 kL/day.

The initial phase of dewatering will involve dewatering of the Majestic pit from the current water level (280 mRL) to below the future portal (235mRL) at a rate of approximately 90 L/second. Once the water reaches the 235 mRL, dewatering will occur at 25 L/second to maintain the water level between 234 mRL-235 mRL while mining occurs over a 3.5 year operational period.

The Imperial pit was mined to 220m RL and the current pit water level is at 260 mRL (i.e. ~68 m below pit crest). It is estimated Imperial pit has a minimum water storage capacity of 1.87M kL (total pit capacity 2.8 Mm3).

It is anticipated mine dewater will be discharged from Majestic to Imperial at a rate of up to 400 kL/yr until completion of mining of the Majestic underground deposit which is estimated to take 3.5 years.

Mine water stored in the Imperial pit will be used for dust suppression during construction and mining operations, as well as process water for the operation of the 800,000 tpa processing plant (Section 6.6).

7.5.2 Design

The proposed dewatering pipeline corridor to be constructed between the Majestic pit and Imperial pit will comprise:

- 3 x 200m DN225 PN16 HDPE pipe up the high wall of the Majestic pit;
- 3 x 178m DN160 PN6.3 HDPE pipes will then run across the surface to the Imperial pit;
- 3 x 100m DN160 PN10 HDPE pipe will then run over the high wall of the Imperial pit to direct water just below the level where the existing pit ramp meets the current water level.

The pipelines between the pits will be laid within a v-drain that will be 1,000 mm wide and 500 mm deep. Any loss of containment will flow back into the pits from the v-drain.

The 3 x DN160 PN6.3 HDPE pipes will run alongside an existing track which will be upgraded as part of the construction works. The upgraded road will allow access between the two pits and to allow monitoring of the pipeline.

The dewatering pipeline corridor will be located on already disturbed areas of which no additional clearing of native vegetation is required.

The pipelines will be buried at road crossings to a depth of 450 mm and will have an average cover that includes mounding of approximately 500 – 600 mm. An indicative section showing the design of the pipeline at road crossings is provided in Figure 6.

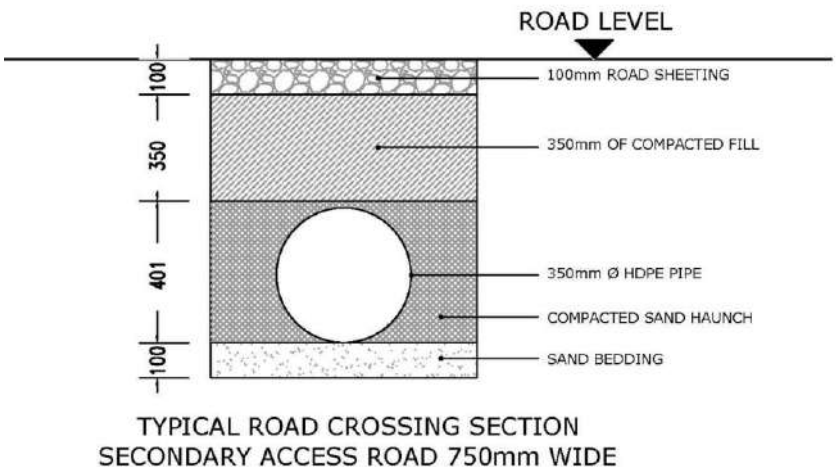


Figure 6: Pipeline construction at road crossing

7.5.3 Construction

Construction of the pipeline corridor will commence when approval is received and will take approximately one week to be completed. Construction works will be undertaken during daylight hours only.

Construction of the pipeline corridor will involve establishment of a 10 m wide corridor (no clearing is required). This will allow sufficient area for the installation of the pipeline, machinery and stockpiles of surface soils that will be pushed in at closure.

The pipelines will be laid within a v-drain that will be constructed with an excavator and the pipeline then laid progressively to a maximum depth of 800 mm.

The v-drain will have ramped edges to allow fauna egress.

7.5.4 Pipeline Testing

The pipeline will be hydrotested prior to commencement of dewatering activities to ensure the pipelines integrity.

7.5.5 Process water supply infrastructure

Pipelines will be installed to pump water from the Imperial Pit to the process pond water.

The proposed dewatering pipeline corridor to be constructed between Imperial pit and the process plant will comprise a line made from DN160 PN6.3 HDPE pipes. The pipes will run alongside existing infrastructure within the disturbance footprint of the mine infrastructure already on site. The pipelines will be laid within a v-drain that will be constructed with an excavator and the pipeline then laid progressively to a maximum depth of 800 mm. As with the mine dewatering lines, any loss of containment will flow back into the pits from the v-drain.

These pipelines will also be buried at road crossings to a depth of 450 mm and will have an average cover that includes mounding of approximately 500 – 600 mm.

7.5.6 Pipeline Inspections

Dayshift and night shift inspections of all saline water pipelines during operations will be undertaken (so twice daily inspections in any given 24-hour period).

7.6 Plant

7.6.1 Overview

Black Cat intend to construct and operate a CIP Gold Plant at the Imperial Majestic Gold Deposit. The processing plant has been designed based on processing 800,000tpa of gold ore. The design crusher

throughput rate is 210tph based equating to 75% availability (dayshift operation only). Design milling rate is 100tph based on availability of 91.3% to process 0.8Mt per annum.

The processing circuit includes the following major equipment areas:

- Primary Jaw crusher;
- Secondary cone crusher;
- Screening;
- Milling and gravity separation;
- Cyclone classification;
- Leaching and adsorption;
- Elution circuit and carbon regeneration;
- Tailings;
- Services and reagents.

Plant layouts are provided in Figure 7 - Figure 9 below. A summary of the construction and operational parameters and plant design criteria is provided in Table 5 and Table 6.

Table 5: Plant construction and operational requirements summary

Infrastructure	Design and construction requirement/installation requirement
Processing Plant	Two-stage crushing circuit with conventional CIP circuit. 800,000 tpa production capacity. Plant area will be constructed upon a compacted pad +300mm above natural surface. Reagents, dangerous goods and diesel stored in concrete bunded areas in accordance with AS AS1940 and AS1692. Facilities will be licenced (where required) in accordance with the Dangerous Goods Safety Act 2004.
Process water pond	34m x 45m dimensions, 2.5m depth. HDPE lined and fenced. Freeboard markers installed.
Infrastructure	**Operational requirements**
Processing Plant	Daily inspections and record of the following: Dust generation at crusher and transfer points. Records of any excessive dust generation observed. Integrity of bunds in chemical and reagent storage areas. Integrity of all reagent and process water lines and location within bunding. Any leaks or spills outside of containment areas. Process water pond freeboard maintained. Daily records of: • Ore processed • Product produced • Metred water use • Reagent use • Tailings volumes discharged to TSF • Tailings density.
Process water pond	Maintain a minimum freeboard of 300mm. Daily inspections to ensure minimum freeboard maintained.

Table 6: Plant Process Design Criteria

Description	Units	Value at 800ktpa
Operating Schedule		
Annual Throughput	tpa	800,000
Plant Capacity	tphr	100.0
Design Gold Recovery	%	94
Design CIP Recovery	%	90.4
Design Gravity Recovery	%	35
Nominal gold recovery	oz pa	60,000
Physical Ore Characteristics		
Ore Source		Multiple Pits/Underground
Bond Ball Mill Work Index	kWh/t	14.5
Crushing and Milling Circuit		
Crushing Circuit Type		Contract 2 stage Crushing
Crusher Feed Size		R.O.M.
Mill Feed Size F80	mm	16
Gravity Circuit		
Circuit type		Knelson/Gekko ILR
CIP Circuit		
Leach Tanks	No	2
Leach Tanks (Total live capacity)	m3	2090
Adsorption Tanks	No	6
Adsorption Tanks (Total live capacity)	m3	2550
Carbon Elution/Electrowinning and Regeneration		On Site Gekko/Cadia Facility
Elution type		Acid Wash/Pressure Zadra
Elution Capacity	t/d	2
Carbon Regeneration Kiln type		Gas fired rotary kiln

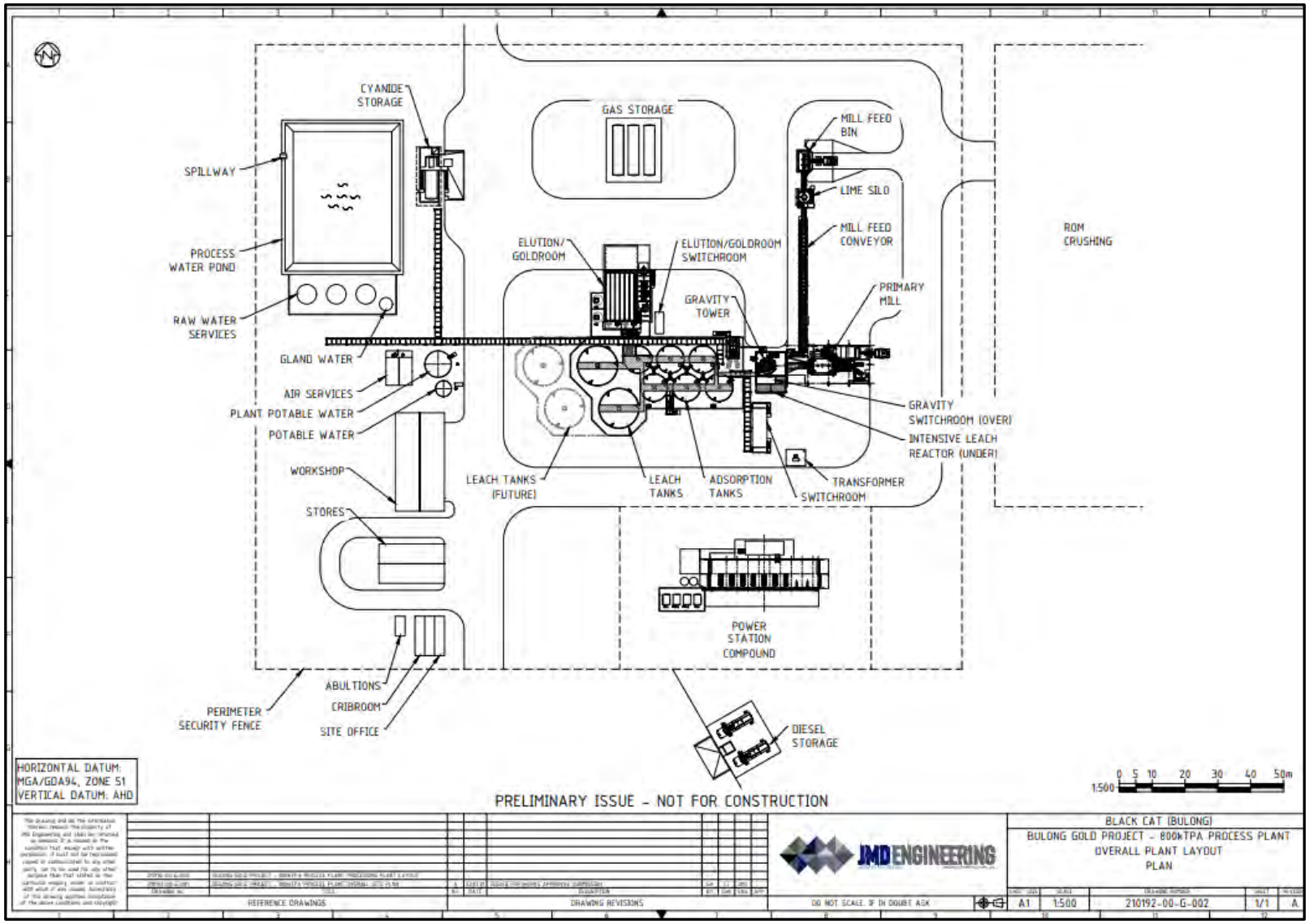


Figure 7: KEGP layout – General Arrangement (from JMD Engineering 2021)

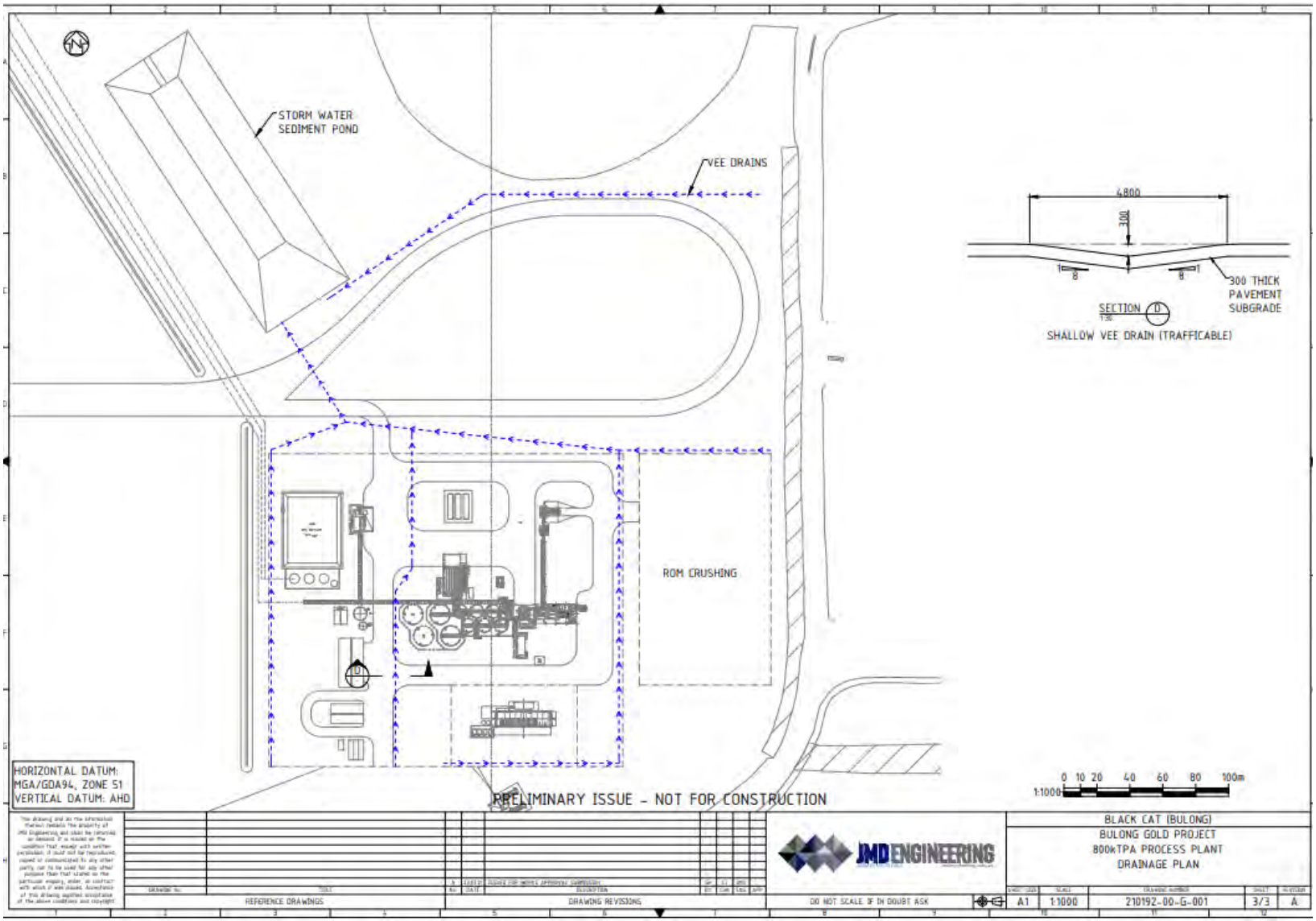


Figure 8: KEGP – Process plant site pad drainage plan

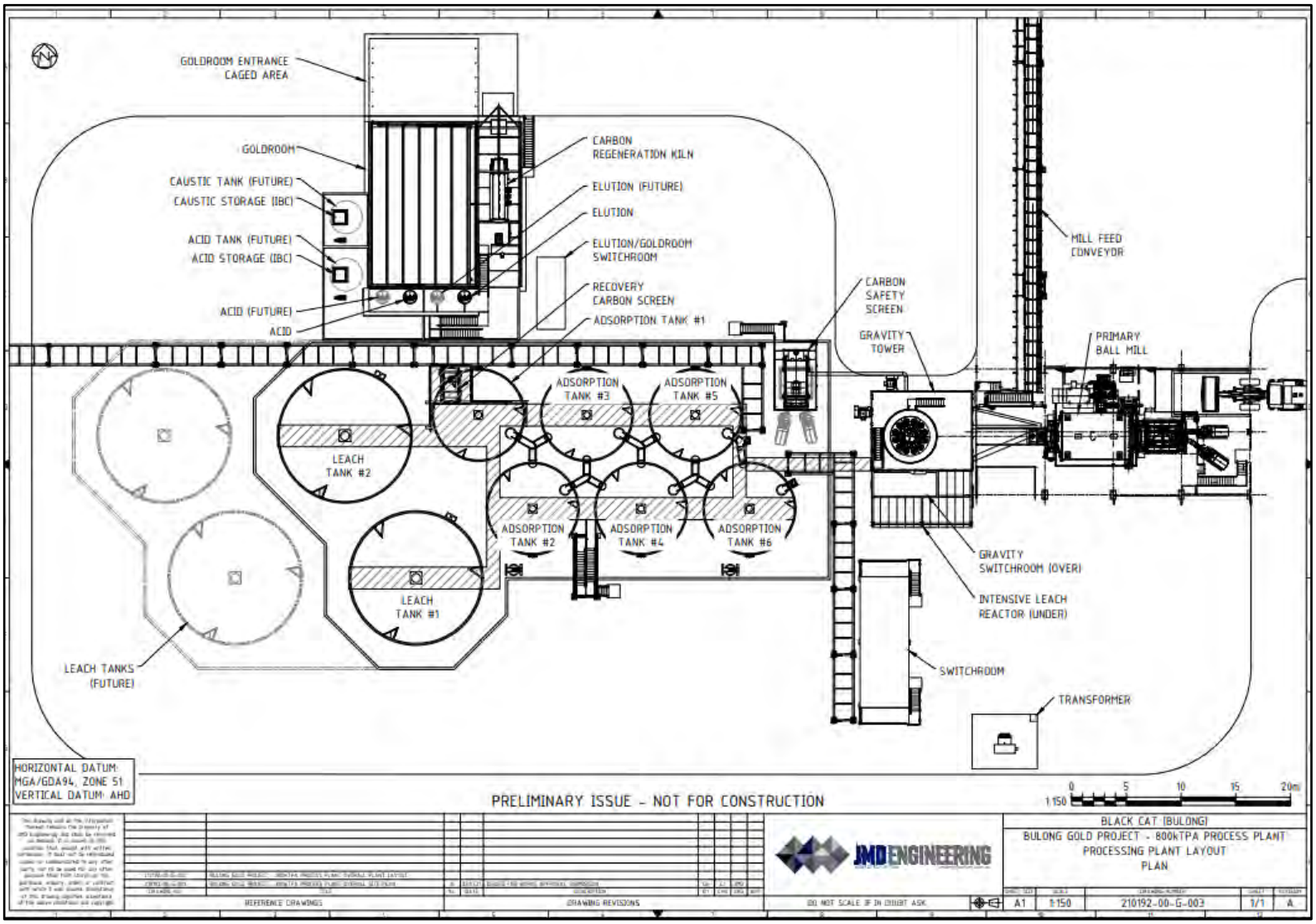


Figure 9: KEGP – detail of processing circuit

7.6.2 Process Description

The process description is summarised in the following sections with process flow sheets included as Figure 10.

7.6.2.1 Crushing

The KEG Project will use a two stage crushing to produce a nominal 16mm feed for the milling circuit. The crushing circuit is expected to be a mobile contract facility.

The nominal crushing design rate is 210tph at 75% crusher dayshift only runtime. It should be noted this is the basis of design and that the facility will operate 24/7 at lower throughput rates.

Crushed orewill be transported to a crushed ore stockpile by a fixed stacking conveyor. The crushed ore stockpile will be kept full by operating the crushing circuit at a rate exceeding the milling capacity. This allows for crusher maintenance shutdowns when required, without interruption of milling operations.

All conveyors in the crushing circuit are fixed speed and will be equipped with:

- Belt scrapers;
- Belt ploughs;
- Belt underspeed detection;
- Belt drift detection;
- Local emergency stop button;
- Local isolation, and
- Conveyor pull wires.

Walkway access will be provided on one side of the conveyor to the head pulleys on the secondary crusher feed conveyor. The fixed product stackers without walkways and will require an EWP for maintenance access.

All conveyor transfer chutes will be fitted with blocked chute detectors which are interlocked to stop the respective conveyor drive if a chute has a high level.

Primary Crushing

Ore will be fed by front-end loader to a ROM bin which will be fitted with parallel grizzly scalping bars at 600mm spacing to prevent oversize entering the ROM bin. The width of the ROM bin will be sized to allow a front loader with a bucket width of 3.0m to dump directly to the bin.

The ROM bin will be equipped with dump /no dump lights to regulate feeding ore to the bin.

Ore will be withdrawn from the ROM bin at a controlled rate by a variable speed vibrating feeder, feeding the primary crusher and controlled from the crusher control room.

The primary crusher will be a jaw crusher.

Ore passing through the jaw crusher falls onto the heavy-duty Primary Crusher Discharge Conveyor. This conveyor also receives crushed product from the secondary crusher and is fitted with an overhead magnet to remove tramp metal. The Primary Crusher Discharge Conveyor discharges to the Screen Feed Conveyor.

From the primary crusher, crushed ore feeds onto a double deck vibrating screen which sizes the crushed ore into mill feed and secondary crusher feed. The transfer chute onto the screen is designed to ensure even distribution of material across the screen.

The screen undersize (nominally -16mm crushed product) is conveyed to the Fine Ore Stockpile.

Secondary Crushing

Oversize from the product screen will fed to the secondary crusher surge bin. The conveyor will be fitted with a self-cleaning magnet to remove tramp metal that could damage the crusher. A metal detector will be fitted after the magnet to detect any tramp metal that will missed by the magnet.

The secondary crusher surge bin will be fitted with a level element transmitter. Ore will be withdrawn from the crusher feed bin by a vibrating feeder fitted with a variable speed drive (VSD) to allow the feed rate to the crusher to be controlled.

The crusher feed rate can be automatically controlled by the level indicator installed above the crusher feed bowl.

The secondary crusher has adjustable closed side setting, which can be changed using the vendor supplied hydraulic adjustment pack.

7.6.2.2 Fine Ore Feed Bin

The Fine Ore Feed Bin will be fed by a FEL from the Fine Ore Stockpile.

Crushed ore will be withdrawn from the Fine Ore Feed Bin using a belt feeder with variable speed drive. The speed of the belt feeder will be controlled by a process loop to the weightometer located on the Ball Mill Feed Conveyor. The mill feed rate will be automatically controlled to the selected mill feed rate.

The crushed ore will be transferred from the Fine Ore Belt Feeder to the Ball Mill Feed Conveyor. The mill feed conveyor will be fitted with a walkway to one side and a dual idler weightometer linked to the Fine Ore Belt Feeder VSD to control the mill feed rate.

A lime silo and feeder will be located above the mill feed conveyor. Bulk lime will be delivered to site and pneumatically transferred to the lime silo. The lime will be fed by a variable speed screw feeder onto the mill feed conveyor at a rate controlled by a pH loop in the first leach tank.

7.6.2.3 Milling and Classification

The milling circuit will comprise a single stage 1800kW ball mill, fitted with rubber liners, discharge trommel and operating in closed circuit with cyclone classification. The mill discharge density will be controlled by water addition to the mill feed chute, regulated using a flowmeter and flow control valve. The mill discharge slurry flows through the trommel screen into the mill discharge hopper fitted with a level indicator. The slurry level in the mill discharge hopper will be maintained constant by a level control loop to the VSD on the Cyclone Feed Pump motor.

The mill discharge slurry is pumped to a cluster of cyclones for classification to oversize (product which is at the targeted size for the leach circuit) and coarse undersize. Operation of the cyclones will be monitored by a slurry flowmeter and pressure transmitter. The cyclone feed density will be regulated by water addition to the mill discharge hopper using a flowmeter and flow control valve.

The cyclone underflow (coarse fraction) will flow to a Gravity Feed Splitter Box and will then gravitate back to the ball mill via a pipe and boiler box arrangement.

7.6.2.4 Gravity Circuit

A fraction of the cyclone underflow slurry will be diverted from a splitter box to the horizontal vibrating Gravity Concentrator Feed Screen. Oversize from the screen (nominally +2mm) will be directed to the mill feed chute. Undersize from the Gravity Concentrator Feed screen (nominally -2mm) flows into a batch centrifugal concentrator.

The concentrator maintains a fluidized bed using raw water added at a constant flow rate which will be controlled by a flowmeter and flow control valve. The concentrator and feed screen can be bypassed if required for maintenance or operational purposes.

The gravity concentrator will be operated semi-continuously by a local PLC. Concentrate from the batch centrifugal concentrator will be periodically will be charged to a secure hopper feeding the gravity leach unit located in the secure compound below the Gravity Concentrator Feed Screen.

Tailings from the gravity concentrator and the gravity screen oversize will be discharged into the mill feed chute.

The milling and gravity treatment (ILR) area will each be equipped with a manually operated sump pump.

7.6.2.5 Leaching and Adsorption

The cyclone overflow will gravitate to a horizontal trash screen, which has a 0.8mm aperture polyurethane deck. The oversize trash will fall into the Tails Pump Hopper and is pumped with the CIP Tailings directly to the TSF.

Trash screen undersize will flow into the leach tank.

The leach circuit will comprise 2 x 1045m3 (live volume) leach tanks, followed by 6 x 425m3 (live volume) adsorption tanks. A pH probe will be installed in the first leach tank to control the lime addition rate to the milling circuit.

Cyanide will be added to the leach tanks at a set rate controlled using a flowmeter and flow control valve.

Air will be added to the leach tank sparges at a rate manually controlled using a flow control valve and monitored using a flowmeter. The air addition rate is adjusted to target the required dissolved oxygen levels as measured by the dissolved oxygen probe installed in the first leach tank.

Barren eluate from the elution circuit will be returned to the first leach tank in a controlled manner.

Carbon will be added to the adsorption tanks to collect the gold from solution and is pumped counter current to the direction of slurry flow using airlift pumps. Carbon concentration in the adsorption tanks will typically be 15-20g/L. The granular activated carbon adsorbs the dissolved gold from solution as it travels counter current to the slurry flow. Carbon is retained within each tank by mechanically agitated cylindrical wedge wire inter-tank screens as the slurry flows through the screens and overflow launders.

Barren carbon is added to the last adsorption tank and is successively moved up the tank train using air lifts, as the carbon loads with gold.

The loaded carbon is recovered from the first adsorption tank by an air lift to the horizontal vibrating Loaded Carbon Screen, where it is washed by sprays and then flows to the acid wash circuit.

The tailings slurry flow from the last adsorption tank will gravitate to a linear vibrating Carbon Safety Screen. This screen will collect carbon if there is a leaking intertank screen. The undersize from the carbon safety screen will flow to the Tailings Pump Hopper. Allowance has been included to feed the carbon safety screen from either adsorption tank number 5 or 6, for periods when one tank is offline.

The leach and adsorption area will be equipped with a manually operated sump pump.

7.6.2.6 Elution and Goldroom

The elution circuit is a 2-tonne Pressure Zadra on-site Gekko/Cadia Facility. The carbon elution facility has been sized to accommodate future expansion. The circuit includes separate acid and elution columns, electrowinning circuit, thermal heater and a carbon regeneration kiln. The elution process will be automated by a PLC system.

Slurry with loaded carbon from Adsorption Tank number 1 is transferred to the loaded carbon screen by an air lift.

The loaded carbon screen recovers and washes the loaded carbon, while the underflow gravitates back to Adsorption Tank number 1.

The loaded cathodes from the electrowinning cells are periodically removed and the gold sludge is washed from the stainless-steel mesh using a high-pressure washer. The sludge is pumped to the gold sludge filter press, from where the sludge cake will be recovered and dried in the drying oven. The drying oven is positioned beneath an extraction hood which vents external to the goldroom.

Dried sludge from the electrowinning cells is mixed with fluxes and smelted in the baring furnace as described below.

7.6.2.7 Gold Room

Gold from the centrifugal concentrator gravitates into the intensive leach reactor. The intensive leach reactor dissolves gold recovered in the gravity concentrate by using a high concentration cyanide solution with added Leachaid. After leaching the gold, solids are allowed to settle and the clarified solution is then transferred to a loaded solution tank for recovery by electrowinning. Gold is recovered as sludge from the electrowinning cathodes and after drying can be smelted separately for reconciliation.

The loaded cathodes from the electrowinning cells will be periodically removed and gold sludge washed from the stainless-steel mesh using a high-pressure washer. The sludge is pumped to the gold sludge filter press, from where the sludge cake will be recovered and dried in the drying oven. The drying oven is positioned beneath an extraction hood which vents external to the goldroom.

After drying, the gold sludge will be mixed with fluxes and smelted in the gas fired tilting Barring Furnace at ~1100°C. The Barring Furnace is positioned beneath an extraction hood which vents external to the goldroom. Once the contents of the barring furnace are fully molten, it will have separated into two phases: reduced metal and slag. The molten contents will then be poured into moulds, the heavier metal remaining in the base of these moulds and the slag flowing over the top.

7.6.3 Reagents and Dangerous Goods

Table 7 provides a summary of key reagents and dangerous goods that will be brought to site. A process plant HAZOP has been completed.

7.6.3.1 Hydrated lime

Hydrated lime will be delivered to site in bulk and transferred to the Lime Silo, located over the mill feed conveyor. Lime is dosed from the Lime Silo by the Lime Silo Rotary valve into the Lime Silo Discharge Screw Feeder and drops onto the mill feed conveyor. The lime feed rate is controlled via a variable speed drive in a control loop to the leach tank required pH.

7.6.3.2 Cyanide

Liquid cyanide will be delivered by road train and transferred in a fully bunded holding tank fitted with a level indicator. Cyanide solution is pumped to the leach circuit using a variable speed dosing pump. The variable speed dosing pump is interlocked to a level switch in the tank to prevent the pump running dry. The cyanide area is equipped with a manually operated area sump pump.

7.6.3.3 Gas

Gas for the elution circuit (LPG), carbon regeneration and barring furnace will be delivered by road train and stored in three 7,500 m3 supplier owned storage bullets.

7.6.3.4 Elution reagents

Sodium hydroxide and hydrochloric acid will be delivered in 1000L IBC for use in the elution circuit and acid wash circuit respectively.

Antiscalent will be delivered in 1000L IBC for use in the elution circuit.

Flux reagents for gold smelting will be delivered in powder form in 25kg bags, including silica sand, sodium nitrate, soda ash and borax.

Leachaid will be delivered in 20kg buckets for use in the intensive leach reactor.

All hydrocarbon and chemical storages will be designed and constructed in accordance with Australian Standards AS1940 and AS1692. Facilities will be licenced (where required) in accordance with the Dangerous Goods Safety Act 2004.

The reagent areas will have a sump pump installed, maintained, and operated to remove any collected material (including rainwater). The area will be routinely inspected to confirm the bunding integrity and containment volume is not compromised.

Table 7: Reagents used in processing

Reagent	Storage	Containment/pollution control
Hydrate Lime	Lime Silo – 80t capacity	Silo will have a dust collector.
Cyanide	Double Skinned TVE supplied 110 t tank/bund facility	Tank will be located within a concrete bunded area in accordance with the Dangerous Goods Act and AS1940 and AS1692. Equipped with a manually operated area sump pump.
Sodium Hydroxide	1,000 L IBC	Located within a concrete bunded area in accordance with the Dangerous Goods Act and AS1940 and AS1692.
Hydrochloric Acid	1,000 L IBC	Tank will be located within a concrete bunded area in accordance with the Dangerous Goods Act and AS1940 and AS1692.
Antiscalant	1,000 L IBC	Tank will be located within a concrete bunded area in accordance with the Dangerous Goods Act and AS1940 and AS1692.
Leach Aid	20 kg Buckets	Located within a concrete bunded area and separated from other reagents as required.
Activated Carbon	500 kg Bags	Located in a storage shed.
Flux Reagents	25 kg Bags	Located within a concrete bunded area and separated from other regents as required.
Gas	Three 7,500 L gas bullets	
Diesel	2 x 110 kL self-bunded tanks	

7.6.4 Process Water Supply

Process water will be sourced from:

- Imperial and Majestic open pits;
- TSF return water;
- Recycled water from the thickeners;
- Bore field located north of the Project as per GWLs listed below.

Black Cat has a 5C licence GWL 176418(4) granted by DWER to abstract 700,000 kL per annum groundwater from M25/350 for dewatering for mining purposes and use in dust suppression.

There is an estimated 600,000 kL of water in the Majestic and Imperial pits and this, with ongoing inflows will provide water for processing in the initial phases.

The DWER 5C licence GWL 181140(5) includes approval to take water from L25/53 being a bore field location to the north-west of the majestic mining centre. This will supplement water requirements as required.

7.6.5 Process Water Pond

A HDPE lined process water pond will be constructed to the northwest of the plant and have dimensions of approximately 34 m X 45 m (with a depth of up to 4m).

Water from the TSF decant return will be returned to the pond and used for processing.

7.6.6 Stormwater

Surface runoff (incidental rainfall) from the process plant will be collected and directed to a stormwater dam which has been designed and located to contain surface runoff from the process plant and ROM pad (refer to Figure 8), noting that all reagent areas in the process plant will be bunded in accordance with Australian Standards AS1940 and AS1692.

The stormwater pond has been designed to account for a 1% (1 in 100 year event) AEP 72 hour event from the design catchment.

Water captured in this pond will be removed using one of the following options;

- Water will be reused in the process by directing to the raw water tank or process water pond;
- Discharged to the dewatering location in the Imperial pit;
- Clean water/rainwater will be discharged to the environment via an engineered spillway and directed through to an existing natural drainage line.

7.6.7 Associated infrastructure

Other associated infrastructure to support the processing plant includes:

- Diesel-fired power station;
- Laboratory;
- Site workshop, stores, emergency response facility, Administration, Crib Room, Training Room;
- Mill control room and switch room;
- Internal access roads.

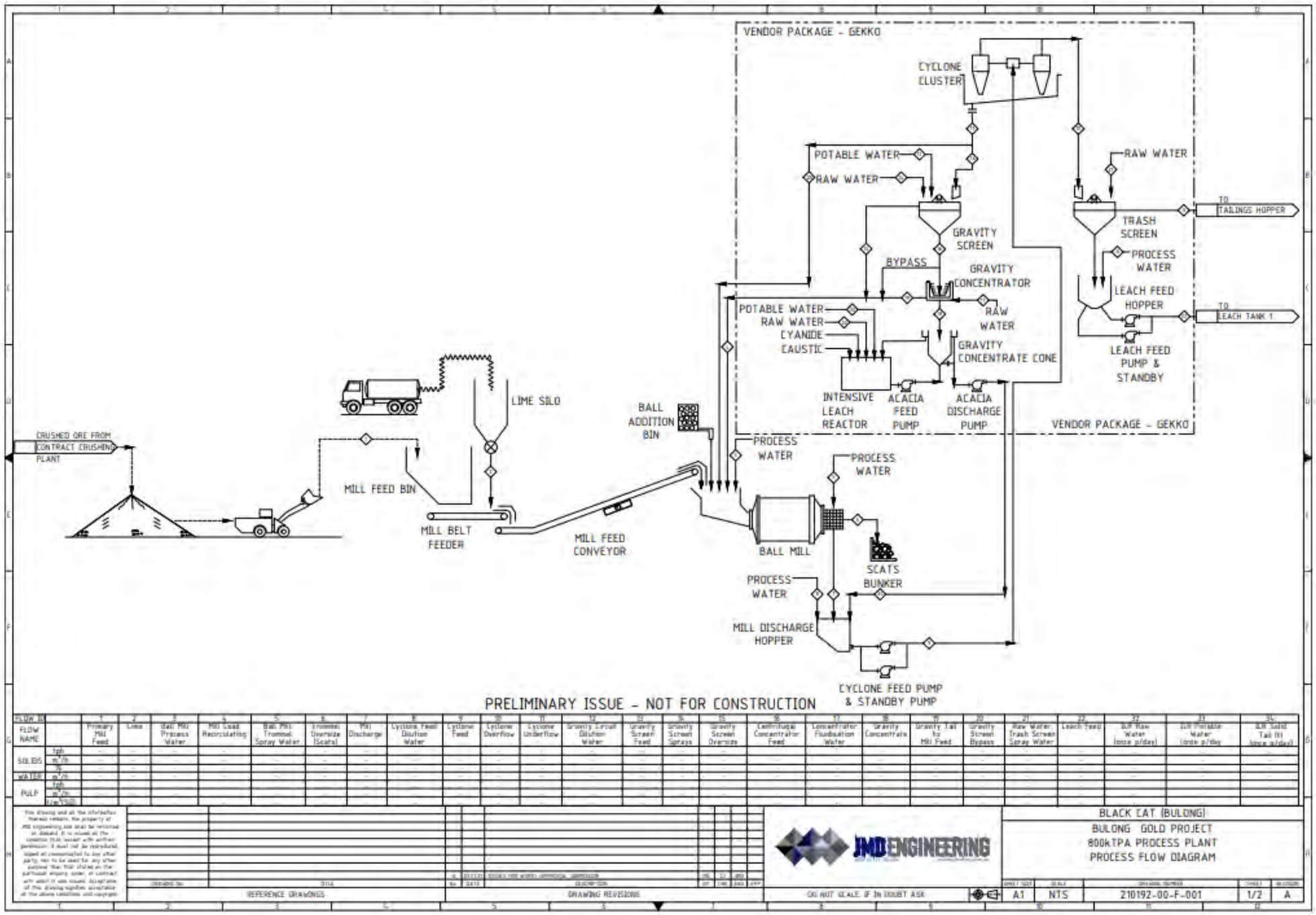


Figure 10: Process Flow sheet 1 - Crushing and Milling Circuit

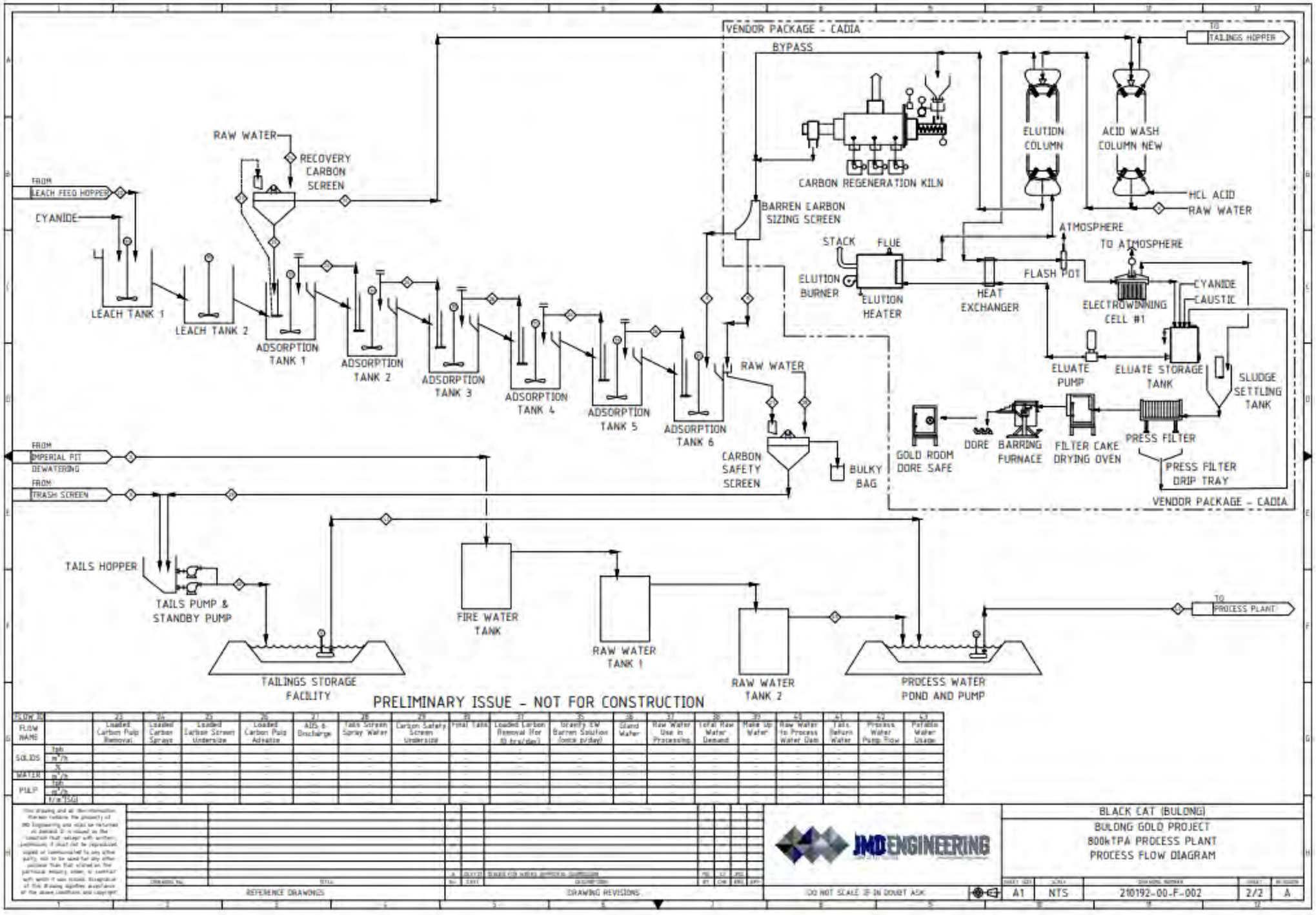


Figure 11: Process Flow sheet 2 - Leaching Process

7.7 TSF

7.7.1 Design description

The proposed TSF will comprise two paddock (cell) style, rectangular facilities, constructed in a single stage and is subject to a Mining Proposal application in parallel with this Works Approval application. Each cell has been designed to store approximately 1 Mt of tailings over 3.5-years (Figure 12). As the plant has a LOM of four years (minimum), expansion of the TSF will be the subject of a future DWER submission.

The proposed TSFs are located approximately 550 m northwest of the plant site (refer to Figure 5). The TSF design report has been prepared by CMW Geosciences (2021) and is attached as Appendix A. The following section contains information sourced from CMW (2021).

The design has been peer reviewed by Land and Marine Geological Services Pty Ltd. A copy of this report is provided in Appendix H, along with the certification of compliance (Appendix I)

A TSF construction and operational requirements summary is provided Table 8.

The TSFs have a combined external footprint of approximately 42 ha. The maximum embankment height of TSF1 and TSF2 is 9 m at final crest levels of RL 348.5 m AHD and RL 345.5 m respectively and a maximum storage depth of 11 m which includes approximately 2 m deep excavations for borrowing of in-situ clay materials.

The TSFs embankments will be zoned embankments comprising an upstream zone of low permeability roller compacted clay borrow materials and a downstream zone of traffic compacted clayey gravel mine waste. It has design slopes of 1(V):2(H) upstream and 1(V):3(H) downstream, with a minimum crest width of 6 m. The dividing embankment between TSF1 and TSF2 will have design slopes of 1(V):2(H) both sides. The embankment crest will have a 2 % cross-fall towards any upstream side, 0.5 m (min.) high rock/mine waste windrow at the downstream crest, and above ground tailings pipeline at the upstream crest.

The embankment incorporates a cut-off trench founded within the surficial clay, a minimum of 1 m below ground level in order to reduce horizontal seepage losses. The cut-off trench has also been designed as part of the dividing embankment wall between TSF1 and TSF2. Plan and section views are provided in Figure 14.

The TSF construction materials and outline of the placement of material for each zone during construction are detailed in Appendix A of the TSF Design Report (Appendix A), Section 4.4.6 and Section 4.5 respectively).

Based on the current TSF1 and TSF2 designs, the total volume of clay and mine waste required is 243,000 m3 and 197,000 m3, respectively.

Earthworks will comprise an upstream (or inner) clay zone and a downstream (or outer) mine waste zone embankment construction plus a dividing wall built of clayey materials. Borrow for clayey materials will be carried out from within the TSFs storage areas.

CMW (2021) has estimated that up to 94,000 m3 and 79,000 m3 (total 173,000 m3) of clay materials can be won from the borrows in TSF1 and TSF2, respectively, which will have minimum offsets of 20 m from the upstream toe of the perimeter embankments and dividing wall. Approximately 197,000 m3 of construction material will be supplemented by mine waste from the northern section of the Imperial Pit that is located approximately 600 m from the centre of the TSFs.

Tailings discharge to the TSF has been designed to:

- Tailings in the form of slurry will be transferred from the plant to the TSF using a nominally 6” diameter pipework. The ring main will be flanged and split at points around the TSF to enable a moving multi-point discharge (refer to the drawings for a schematic detail). The embankments should be protected from erosion by using used conveyor mats or geotextile with rock (or similar).
- Tailings slurry will be discharged sub-aerially and cyclically into the facility in thin discrete layers, not exceeding 300 mm thickness, in order to allow optimum density and strength gain by subjecting each layer to a drying cycle. The deposition will take place via spigots located on the upstream perimeter embankment crest.

Spigotting will be performed from all sides of each TSF cell.

Water will be removed from each cell of the facility and pumped back to the process plant via a 'turret' pump decant system within a central rock-ring decant within each TSF cell. The pump will be encased in a floating 'turret' intake system, requiring a minimal draft, thus allowing it to operate with a small volume of water on the TSF. Water will be pumped from the decant system and transferred back to the plant using a nominally 6" diameter pipework.

Return water will be recovered from the TSF decant using a Decant Return Pump to the runoff sump and will then be pumped to the plant for reuse. The water recovery system will have a capacity of ≥90 tph including the additional capacity to recover water from design storm events.

The minimum freeboard for the TSF under normal operating conditions is 0.7 m, which includes an allowance for the temporary storage of the 1 in 100 years or 1 % average exceedance probability (AEP) storm event of 72-hour duration whilst maintaining the required total freeboard.

Monitoring bores surrounding TSF1 will be used to monitor groundwater during operations (Figure 14). One of the four existing monitoring bores, located to the north of TSF will be decommissioned and 'sealed' prior to the construction of TSF2. Three additional monitoring bores will be installed around TSF2 prior to commissioning for the longer term monitoring program required under the operating licence.

A minimum of six vibrating wire piezometers (VWP) will be installed in the TSF foundations, as shown on drawing PER2021-0141-08 in Appendix A. The VWPs will be installed within a trench and will be located adjacent to the upstream embankment toe and within the embankment. The VWPs will provide early warning of seepage.

No spillways will be required during operations or at closure. During operations, stormwater from large storm events will be disposed of by pumping to the plant for re-use in the process. At closure, rainfall falling on the top of the TSFs will be disposed of by evaporation and evapo-transpiration from the 'store and release' cover.

Stability analyses was undertaken by CMW (2021) to assess the stability of the TSFs perimeter and dividing embankments up to a maximum crest height of RL348.5 m (i.e. 9 m maximum embankment height). The analyses were undertaken in general accordance with ANCOLD (2019) and is presented in Appendix A (Section 3.3.1, pg 15). The stability analyses indicate adequate factors of safety for the drained, undrained and pseudo-static conditions when compared with the recommended minimum factors of safety in ANCOLD (2019).

Seepage analyses were undertaken to estimate the position of the phreatic surface for the perimeter and dividing embankment designs at the crest RL 348.0 m (9 m maximum embankment height) using the groundwater module of the Slide software package (Appendix A, pg 20-21). Seepage from the TSFs is expected to be very low. In order to mitigate seepage the following has been included in the design:

- The in-situ clay materials will be roller compacted to provide a low permeable layer at the base of the TSFs.
- A cut-off trench, to nominally 1.0 m below ground level in the surficial clay layer has been included in both the perimeter and dividing embankments design to minimise horizontal seepage losses.
- An underdrainage system has been included in the design to further reduce the phreatic surface within the tailings, hence enhancing stability and minimising seepage losses.
- All drill holes over the TSF area will be sealed before construction commences.

It should be noted that the above design inclusions are in keeping with DMIRS and ANCOLD guidelines. It should be further noted that total elimination of seepage from a TSF is not possible (i.e. even artificially lined facilities leak). The seepage mitigation measures have been assessed considering the sensitivity of the downstream environment and environmental impact. The project area ground water is hyper-saline and the ultimate environmental receptor is a salt lake system. The above seepage mitigation measures will ensure negligible impact to downstream vegetation and surface water catchments.

7.7.2 TSF pipeline and return water containment

The tailings and return water lines will be installed in bunded corridors/below ground open trenches that will ensure containment of either tails or return water in accordance with the following considerations for calculating volume containment in the event of full loss of primary containment:

- The secondary containment will capture and contain within this containment a volume of tails or water released from the time of the event occurring to the time of detection and/or shutting down pumping (whichever is the longer time period).

- In addition, the secondary containment will capture and contain within this containment the volume of tails/return water in the line that could be released after shutdown;

Tailings lines will have telemetry installed allowing real time monitoring of the line with both auto shut off at given triggers of flow discrepancy or manual shut down by the operating staff on shift.

The TSF return water lines will have telemetry installed allowing remote monitoring to detect leakages or other loss of containment.

7.7.3 Dam Break Assessment

A Dam Break Assessment was undertaken on the final embankment crest levels of RL 348.5 m and is provided in Appendix I of the TSF Design Report (Appendix A).

If a TSF embankment breach were to occur, tailings would only be partially released from the storage impoundment, as the majority of the tailings beaches would have dried back. In addition, remobilised tailings will behave as a thickened slurry, with some shear strength and therefore will not be as free flowing as water, which has no shear strength.

As reported in CMW (2021), the result from breach modelling indicates that the maximum (peak) run out flow from a 'dam break' under 'worst-case' (PMP) rainy day conditions will be approximately 96 to 512 m3/s (TSF1) and 101 to 526 m3/s (TSF2) over 2 hours. As the flow in the project area is via sheet flow (i.e. drainage lines are not well defined), flow from a breach is likely to spread out over the terrain e.g. 250 m wide, with a flow depth of 1.0 m.

Flow towards the plant and the pits on the southeast and east of the TSFs, respectively, is considered highly unlikely as such a flood would need to pass through higher elevations over approximate distances of 550 m (Plant Site), 600 m (Imperial Pit) and 950 m (Majestic Pit).

A dam break is unlikely to inundate the underground portals at the base of Imperial Pit and Majestic Pit, which are located well away and with a mineralised waste stockpile, a process plant, and an abandonment bund in between the pits and the TSFs. CMW (2021) produced an Inundation Plan which shows the expected tailings flow in the event of a dam break (Figure 16).

An emergency response plan and protocols for clean-up will be developed by the company as a part of its operational integrated management system.

7.7.4 Geotechnical Assessment

The TSF geotechnical investigation report completed by CMW is provided as Appendix A in Appendix A (TSF Design report – pg 37 - 93).

The encountered subsurface profiles across the proposed TSF site can be generalised to the sequence of the following units:

RESIDUAL SOIL Retrieved as gravelly clay to clay; red brown; low to medium plasticity, from depths of between 1.0 m and 2.3 m.

EW GRANITE Retrieved as gravelly/cobbly clay to clay; gravels and cobbles fine to coarse, angular; Extremely Weathered Granite.

DW-SW GRANITE Distinctly to Slightly Weathered Granite from depths of between 2.0 m and 6.0 m. It must be noted that not all units are present in all locations.

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

- Following topsoil stripping to approximately 0.15 m depth, excavation for clay materials is to be undertaken to depths as indicated on drawing PER2020-0419-05 for use in embankment construction;
- Ensure a minimum of 0.5 m of clay materials are left in place, above the weathered rock layers below the clay horizon;
- The in-situ clay materials will be roller compacted to provide a low permeable layer at the base of the TSF;
- A cut-off trench, to nominally 1.0 m below ground level in the surficial clay layer has been included in the embankment design to reduce horizontal seepage losses. The cut-off trench has also been designed as part of the dividing embankment wall between TSF1 and TSF2.

7.7.5 Site preparation and Construction

The TSF design report includes a Scope of Works to construct the TSF and technical specification for the embankment construction materials and includes a description of (Appendix D of Appendix A):

- Survey;
- Clearing and Establishment works;
- Foundation preparation;
- Fill and Compaction – including upstream/downstream embankment earthworks and cut-off trench;
- Decant system;
- Supplementary works.

The TSF construction materials and outline of the placement of material for each zone during construction are detailed in Appendix D of the TSF Design Report (Appendix A, pg 109 – 111 and pg 114 – 117 respectively).

CMW (2021) has estimated that up to 122,000 m3 of clay materials can be won from the borrow within the TSF footprint, which will have a minimum offset of 20 m from the upstream toe of the perimeter embankment. Earthworks will comprise:

- Upstream (or inner) clay zone embankment construction utilising 99,000 m3 (compacted) of material from within the TSF.
- Downstream (or outer) mine waste zone embankment construction using 113,000 m3 of waste from the northern section of the Imperial Pit.

Construction is expected to commence in Q4 2021 subject to all necessary approvals being in place. The vegetation will be cleared, and a compacted pad +300m above natural surface will be installed prior to construction of the Plant and TSF.

The TSF will have a zoned embankment and raised in one stage. Construction of the embankment is likely to utilise a civil contractor. The TSF embankment will be constructed out of in-situ clay materials excavated from within the TSF storage area, and waste sourced from mining operations. The embankment will be zoned with an upstream zone of clay and a downstream zone of mine waste.

The clay materials to be used in the upstream zone will be predominantly clay to silty clay of low to medium plasticity, trace silt of gravels, found above the weathered granite formation. Assessment of the clay materials indicate they are non-dispersive and likely to be stable when immersed in water (non-dispersive).

The clay to silty clay materials are considered unlikely to liquefy from dynamic loadings or seismic activities. In-situ and laboratory tests to determine strength parameters inferred a hard consistency of the clay materials.

As part of preparation works, the footprint of the facility will be cleared of vegetation. The topsoil from the footprint, approximately 0.15 m in thicknesses, will be stripped and stockpiled for use in rehabilitation. The vegetation and topsoil will be stockpiled separately.

The earthworks will comprise upstream (or inner) clay zone embankment construction utilising 125,000 m3 (compacted) of material from within the TSF and downstream (or outer) mine waste zone embankment construction using 87,000 m3 of waste from the northern section of the Imperial Pit that is located approximately 1 km from the TSF centroid.

Construction of the rock ring decant filter will be completed using the centreline method, using well graded select filter rock material, 75 mm to 300 mm size with a low fines content (<3 % passing 75 µm) and free of oversize (100 % passing 300 mm).

Provision for the TSF construction works will include a water cart on location to provide dust suppression as required.

7.7.6 Operations

To ensure the TSF is safely operated, Black Cat will ensure:

- Liberated water is continually removed from the surface of the tailings.
- Tailings deposition is cycled around the facility to maximise tailings density and therefore the storage volume.

- The water recovery system will have a capacity of ≥100 tph excluding the additional capacity to recover water from design storm events.
- TSF will be operated in accordance with the details contained in the Operations Manual. This includes implementation of the TSF operation, management inspection and maintenance procedures.

The TSF Operations Manual (Appendix L in Appendix A (TSF Design Report), pages 214-238) outlines the operating procedures, inspection criteria, monitoring requirements and log sheets for the TSF. This will include the following routine inspection (2 inspections per day shift) which will cover:

- Pipelines (tailings delivery line and water return lines) to and from the TSF;
- Leak detection;
- Pumps;
- Valves;
- Discharge locations;
- Decant and return water pumps;
- General integrity of the embankment i.e. any new cracking (daily);
- Seepage downstream of the TSF;
- Any changes to existing cracking or seepage.

This will be supplemented by a monthly inspection undertaken by senior site management and an annual audit undertaken by an independent suitably experienced and qualified engineer to review the operational and geotechnical aspects of the facility.

Monitoring of the TSF bores will be undertaken monthly to record the SWL during operations, and quarterly for groundwater quality analyses. Review of groundwater monitoring data will be undertaken in order to identify any changes in groundwater quality or depth. The changes in groundwater depth can lead to impacts on surrounding vegetation and it is generally accepted that a standing water level limit of four (4) mbgl will prevent impacts to native vegetation. Black Cat will develop a Groundwater Recovery Plan if the standing water level reaches six (6) mbgl.

An hydrogeological assessment of the proposed TSF was completed by CMW (2021b) and is summarised in Section 11.8.3.

7.7.7 Tailings Characterisation

Graeme Campbell and Associates (GCA 2021) completed geochemical characterisation of two tailings-slurry samples considered representative of the expected ore to be processed from Myhree which makes up the majority of the ore feed, and hence tailings, for the first two years of operation:

- Oxide-Ore-Tailings - derived from a 50:50 blend of Oxide-Ores and Transition-Ores;
- Primary-Ore-Tailings - derived from a blend of fresh Primary-Ores.

The GCA (2021) report is attached as Appendix K in Appendix A (TSF Design Report, pg 164-213). The ore from Myhree is considered representative of the ore from gold deposits to be processed at the KEGP.

Both tailings-solids samples are classified as Non-Acid Forming (NAF). The NAF classification for the Oxide-Ore-Tailings sample, reflects 'negligible sulphides', corresponding to a Cr(II)-Reducible-S (CRS) value less than 0.005 %. The Primary-Ore-Tailings sample recorded a CRS value of 0.741 % (as pyrite-S) in a gangue that is appreciably calcareous associated with dolomites, with the tailings-gangue having an excess of 'carbonate-alkalinity' forms for circum-neutral buffering as the pyrite decomposes over time during weathering (GCA 2021).

Both tailings-solids samples were characterised by major/minor-element contents either less than, or close to, those typically recorded for soils, regoliths and bedrocks derived from non-mineralised terrain with slight enrichments recorded for As and Cr for the Oxide-Ore-Tailings sample (GCA 2021). These fall within the range generally observed for tailings-solids derived from oxide and fresh ores at gold deposits located on the Yilgarn block (Campbell, unpublished results since the late-1980s).

Both tailings-slurry-water samples were mildly-alkaline (pH 8.7-9.1) and hypersaline. For both tailings-slurry-water samples, Cu and Ni were the chief cyanide-complexing metals in solution.

GCA (2021) concluded that "the lithochemistry and mineralogy of the Myhree ores are such that no environmental geochemistry concerns are foreseen for the resulting streams of process tailings discharged to the IPTSF. In this regard, the "Myhree-tailings" are no different from the tailings produced at many gold mines throughout the WA Goldfields".

Table 8: TSF construction and operational requirements summary

Infrastructure	Design and construction requirement/installation requirement
TSF Embankment	Two cell, approximately 46 ha footprint with storage capacity of 2Mt of tailings. The maximum embankment height of TSF1 and TSF2 is 9 m at final crest levels of RL 348.5 m AHD and RL 345.5 m Design slopes of 1(V):2(H) upstream and 1(V):3(H) downstream, with a minimum crest width of 6 m. A cut-off trench, to nominally 1.0 m below ground level in the surficial clay layer - moisture content at the time of placement is within -2 %, +2 % of the optimum moisture content (OMC). Each layer is compacted to achieve a density ratio greater than 95 % of standard maximum dry density (SMDD). Upstream embankment. Ensure clay material -2% to +2% of the OMC. Roller compacted section as per design drawings to achieve density >95% SMDD Freeboard. Designed to contain a 1 in 100-year AEP, 72-hour duration storm rainfall event. Decant return system to incorporate: • Central rock-ring decant filter; • 1.5 mm HDPE liner will be installed on the upstream embankment batter in the decant area to reduce erosion; • Return water will be pumped to the plant for reuse via a runoff sump.
Tailings and decant return pipeline	HDPE tailings slurry and decant return water pipelines situated within bunded open trenches (v-drains). Fitted with flow meters and telemetry.
TSF monitoring bores	A total of eight bores to be installed as per layouts provided in line with cell construction timetable. Designed and constructed in accordance with ASTM D5092/D5092M-16: Standard practice for design and installation of groundwater monitoring bores.
Infrastructure	**Operational requirements**
Tailings slurry pipes and pumps Decant return lines and pumps	HDPE Situated within bunded open trenches to contain spillage. Fitted with flow meters and telemetry.
TSF	Maintain a minimum freeboard of 0.7m.
TSF Decant Tower	Independent decant pump located within decant tower for recovery of decant water. Pump placed at the northeast corner of the TSF and has a minimum capacity for a water recovery system of not less than 90 tph.
Spigots for tailings deposits	Located on the upstream edge of the crest of the southern and western TSF perimeter embankment. Tailings slurry will be discharged into the TSF by a nominally 6" diameter HDPE pipework, with the ring main be flanged (nominal 12-20 m spacings) and split (Y-piece) at points around the TSF. Each ring main will comprise four nominally 2" diameter spigots.
TSF monitoring	SWL recorded monthly. Groundwater quality analyses undertaken quarterly. Twice daily inspections for parameters as outlined in Section 6.7.4.

7.8 Confirmation of Works

7.8.1 Environmental Compliance Report

Following construction of the dewatering pipeline, processing plant and TSF, Black Cat will submit an Environmental Compliance Report to confirm the infrastructure has been constructed in accordance with the Works Approval conditions. The TSF report will include a Critical Containment Infrastructure Report (CCIR).

Given the short construction time for the dewatering pipeline, it is expected this report will be submitted first.

7.8.2 Critical Containment Infrastructure Report

Following construction of the TSF, Black Cat will submit a Critical Containment Infrastructure Report (CCIR) for the TSF to confirm the infrastructure has been constructed in accordance with the Works Approval conditions. This will be prepared by a suitably qualified and experienced professional.

The Works approval will set out the timing for the DWER CCIR assessment period, during which no operations can occur.

Commissioning and Time Limited operations are described in Section 6 (Attachment 3A).

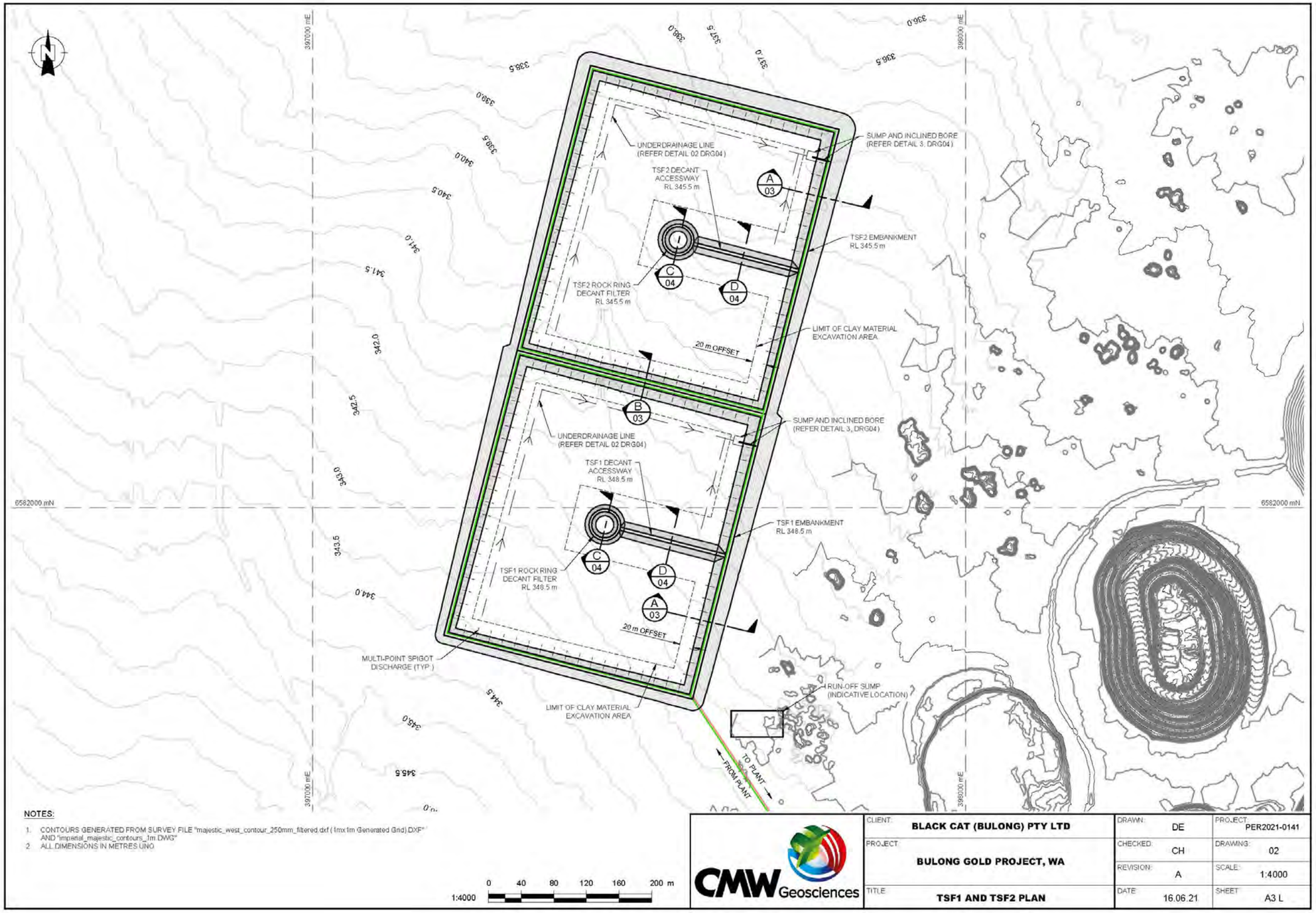


Figure 12: TSF Plan (from CMW 2021)

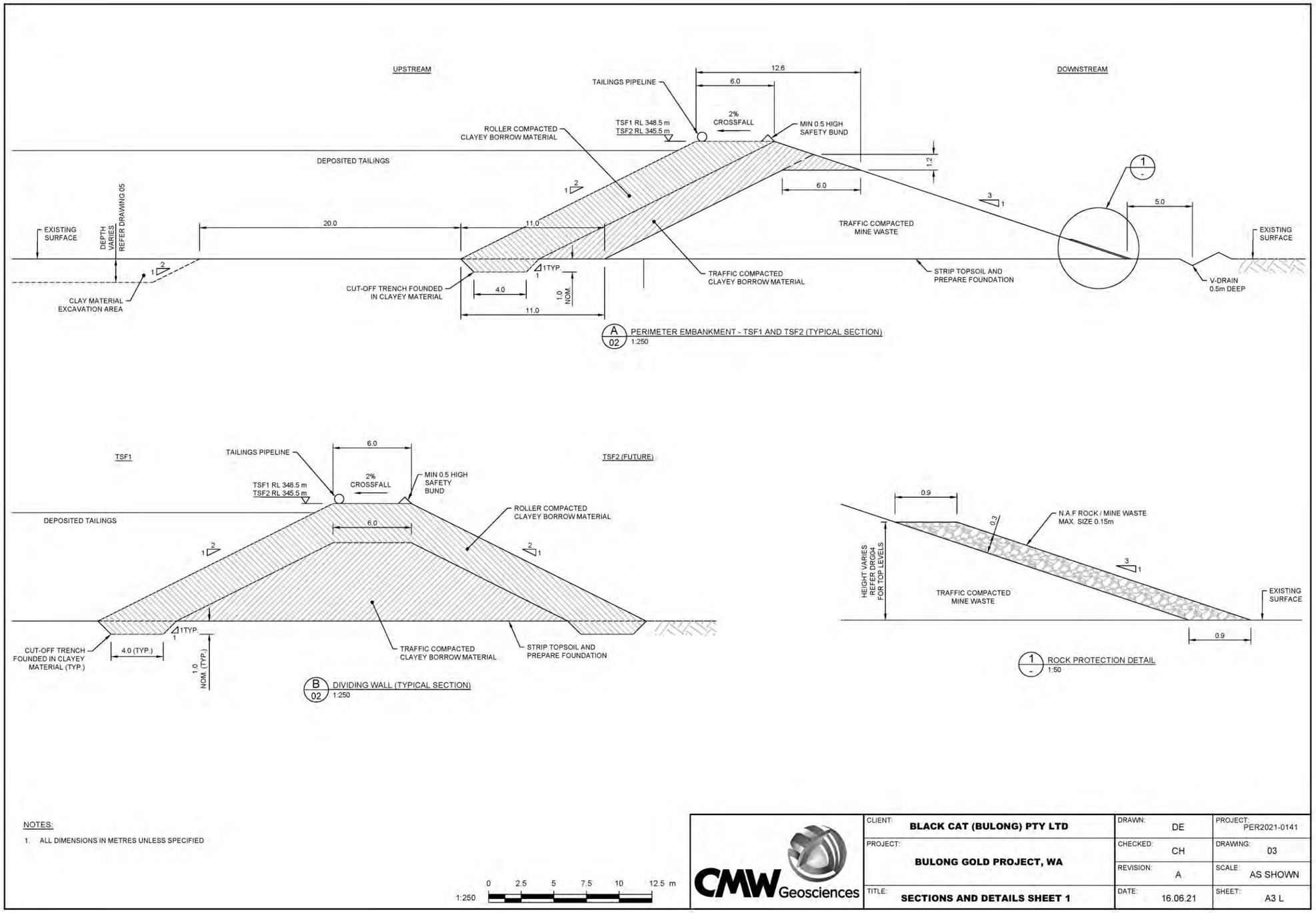


Figure 13: TSF1 and TSF2 Plan – sections and details sheet 1 (from CMW 2021)

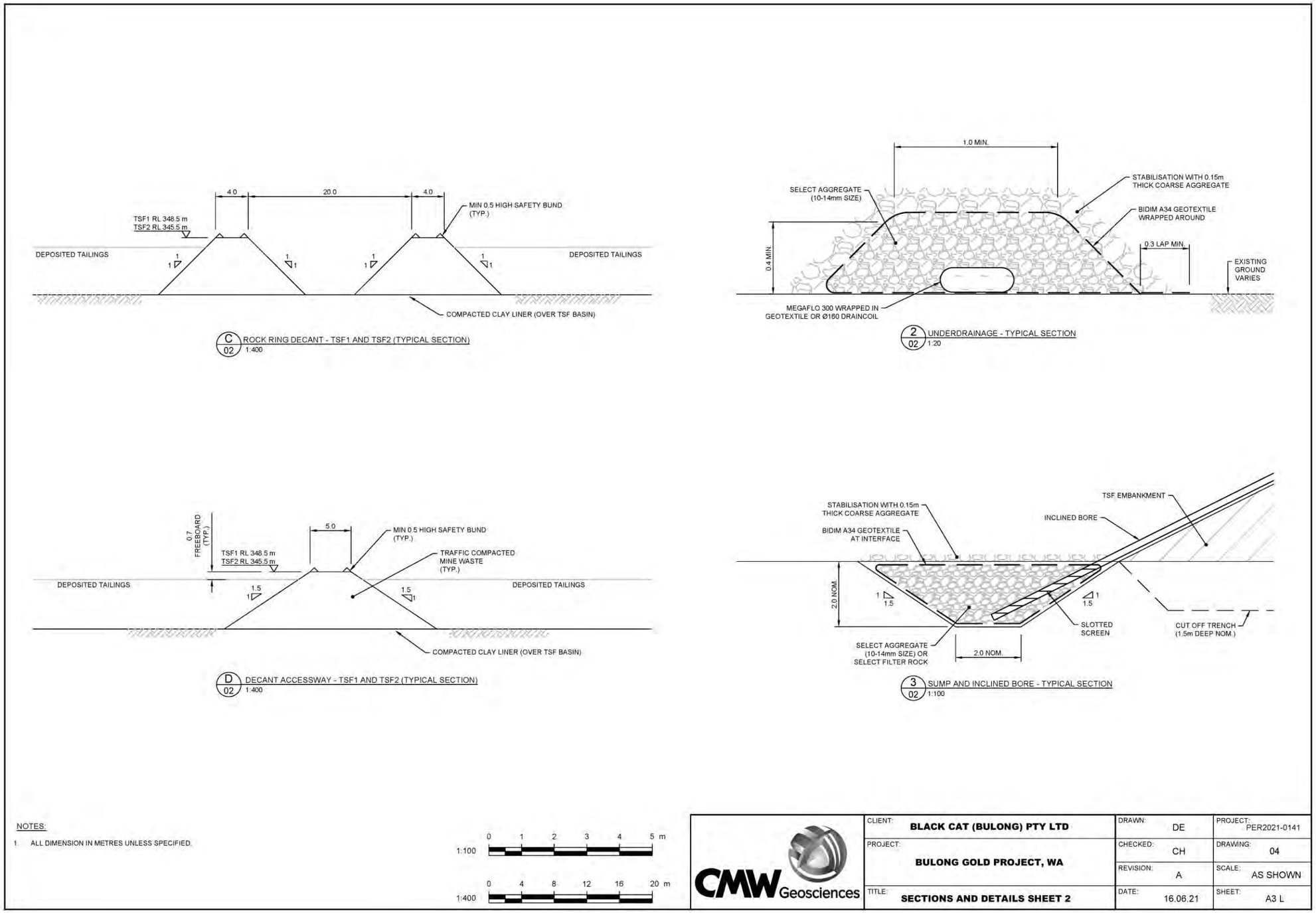
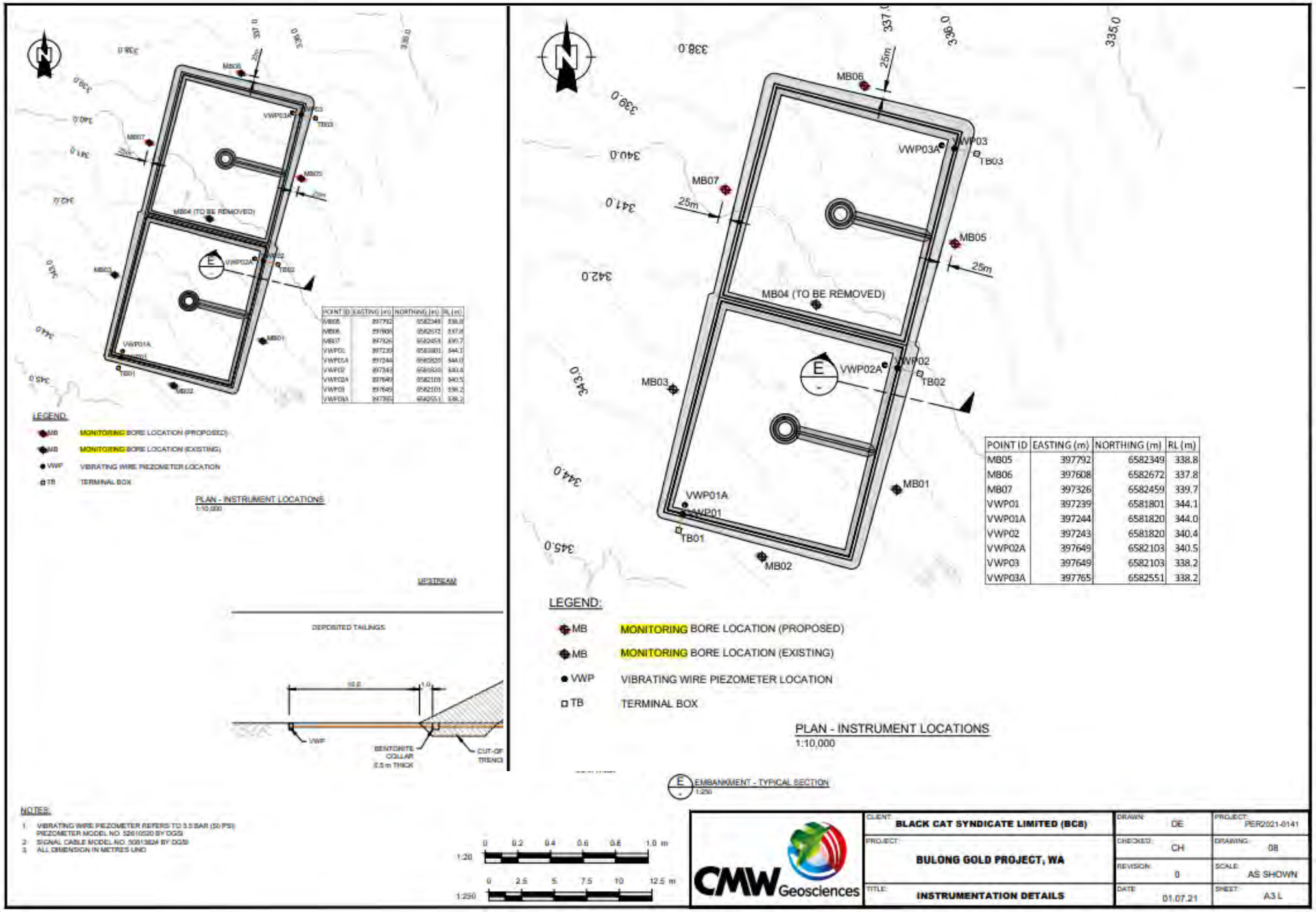


Figure 14: TSF1 and TSF2 Plan – sections and details sheet 2 (from CMW 2021)



POINT ID	EASTING (m)	NORTHING (m)	RL (m)
MB05	397792	6582349	338.8
MB06	397608	6582672	337.8
MB07	397326	6582459	339.7
VWP01	397239	6581801	344.1
VWP01A	397244	6581820	344.0
VWP02	397243	6581820	340.4
VWP02A	397649	6582103	340.5
VWP03	397649	6582103	338.2
VWP03A	397765	6582551	338.2

Figure 15: TSF Monitoring Bores

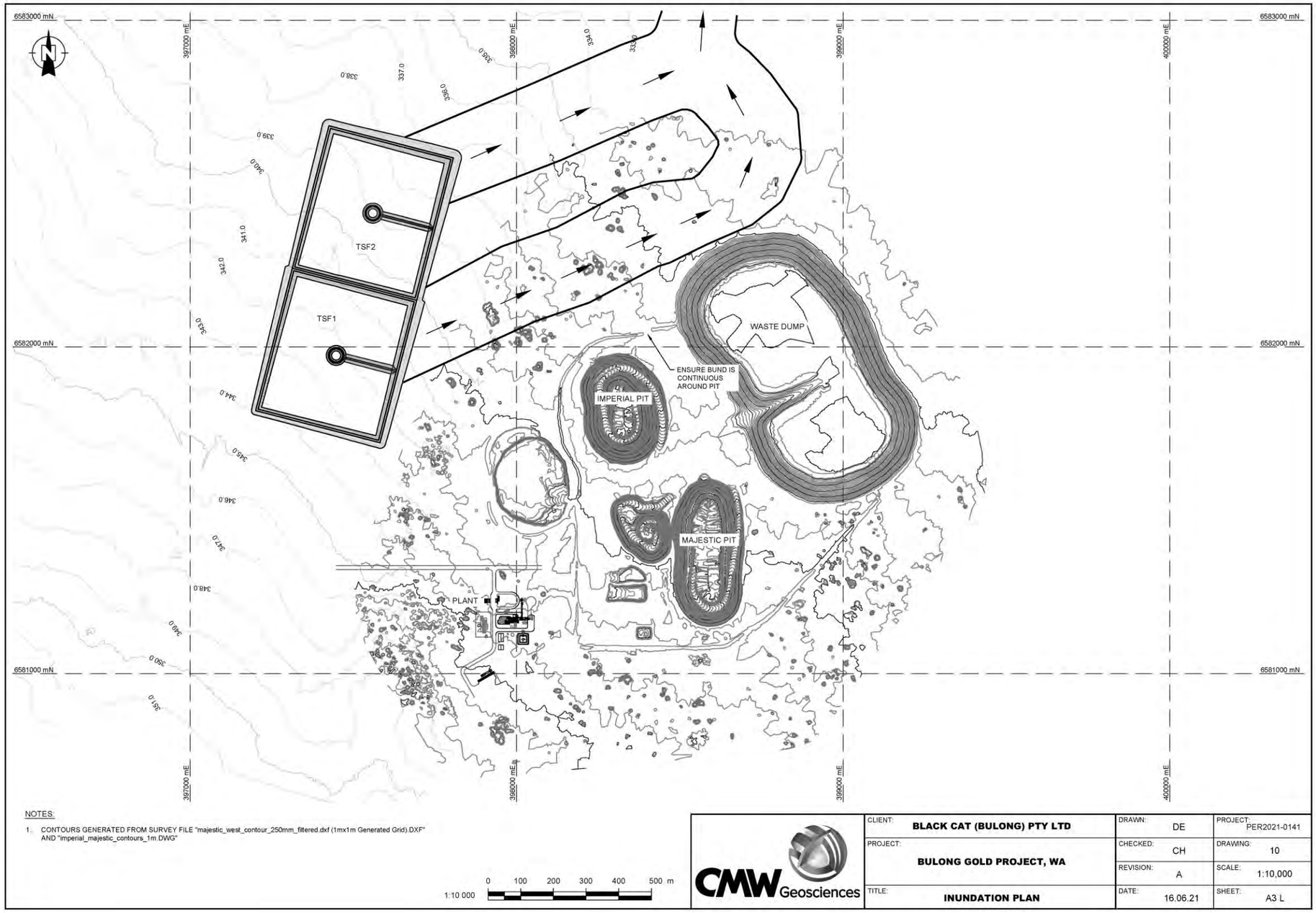


Figure 16: TSF1-TSF2 inundation plan (from CMW 2021)

8. ATTACHMENT 3A – COMMISSIONING PLAN AND TIME LIMITED OPERATIONS

8.1 Overview of proposed commissioning

The prescribed premises will be constructed and commissioned in different stages as shown in Table 9. This schedule is subject to construction completion dates and is provided as an estimate of timing to define the transition period from the construction/commissioning phase to the prescribed premise becoming operational.

The Majestic-Imperial dewatering pipeline is designed to be completed within a three-month construction window and construction of the plant and TSF will take approximately 8-10 months, with commissioning following for a period of approximately three months. It is anticipated that full operations will commence in late Q3 2022.

Time limited operations are proposed to commence immediately upon the completion of commissioning. It is requested that a six-month Time Limited Operation be undertaken under the Works Approval, to allow for the assessment and determination of a Licence application. Conditions are proposed to be included in the Works Approval to regulate the proposed tailing deposition during the time limited operational phase.

Table 9: Proposed construction, commissioning and operations (time-limited) schedule

Premise	Sep 21	Oct 21	Nov 21	Dec 21	Jan 22	Feb 22	Mar 22	April 22	May 22	Jun 22	Jul 22	Aug 22	Sep 22	Oct 22	Nov 22	Dec 22	Jan 23	Feb 23	Mar 23
DEWATERING PIPELINE																			
Construction																			
Commissioning																			
Operations (TLO)					TLO	TLO	TLO	TLO	TLO	TLO									
PLANT																			
Construction																			
Pre-commissioning																			
Dry Commissioning																			
Wet Commissioning																			
Ore Commissioning																			
Operations (TLO)															TLO	TLO	TLO	TLO	TLO
TSF																			
Construction																			
Commissioning																			
Operations															TLO	TLO	TLO	TLO	TLO

TLO – time limited operations

8.2 Commissioning Phases

8.2.1 Dewatering pipeline

Following construction of the dewatering pipeline and associated infrastructure (pumps, gauges) commissioning will involve commencement of pumping to test integrity of pipeline and testing of flow and any pressure gauges.

8.2.2 Processing plant

The commissioning process for the processing plant will involve the following phases:

- Pre-commissioning – static checks on unpowered equipment to confirm the infrastructure has been constructed to design specifications.
- Dry commissioning – testing of individual components without addition of any mill feed or water. Includes progressive testing and commissioning of electrical systems.
- Wet commissioning – testing operation of plant components with water.

- Ore commissioning – testing operation of plant components with mill feed, reagents, water and air. The initial feed rate will be low and gradually increased to the design capacity (800,000 tpa) over a period of several weeks.

8.2.3 TSF

The commissioning process for the TSF will involve the following phases:

- Wet commissioning - test pumping of tailings pipeline and return water pipeline with water;
- Tailings commissioning – introduction of tailings to the TSF.

8.3 Emissions and Discharges

The emissions and discharges relating to commissioning and time limited operations, with the proposed controls are provided in Attachment 6A, Section 8.

8.4 Management and Monitoring

The potential impacts and management associated with the commissioning of the prescribed premises are included in Table 14 in Section 8.

Monitoring to be undertaken during commissioning, which is consistent with that proposed to be undertaken during operations, is summarised in Table 10. The results of these inspections will be maintained in a log-book at site.

Table 10: Monitoring to be completed during commissioning

Infrastructure	Monitoring
Dewatering pipeline	Twice daily inspection of dewatering pipeline corridor aligned to day and night shift roster.
Plant	Daily inspections and record of the following: • Dust generation at crusher and transfer points. Records of any excessive dust generation observed; • Integrity of bunds in chemical and reagent storage areas; • Integrity of all reagent and process water lines and location within bunding; • Any leaks or spills outside of containment areas; • Process water pond freeboard maintained. Records of: • Ore processed; • Product produced; • Metred water use; • Reagent use; • Tailings volumes discharged to TSF; • Tailings density.
TSF	Twice daily (day and night shift roster) inspections of all components including: • Freeboard of 0.7m maintained; • pipelines (tailings delivery line and water return lines) to and from the TSF; • leak detection; • pumps; • valves; • discharge locations; • decant and return water pumps; • general integrity of the embankment i.e. any new cracking (daily); • seepage downstream of the TSF; • Fauna entrapment; TSF bore monitoring: • Monthly SWL; • Groundwater quality analyses 2 months after tailings commissioning, then quarterly groundwater quality analyses.

Dust will be visually assessed on a daily basis. If excessive dust generation is observed, the source will be investigated and remedial actions implemented as required. Water trucks will be utilised at the site to control dust during construction and commissioning works, and will continue to be utilised during the operational phase.

8.5 Environmental Targets and Limits

Black Cat's target for commissioning and time limited operations in in Table 11.

Table 11: Commissioning limits/targets

Infrastructure	Commissioning/Time limited operations Targets
Dewatering pipeline	Target – no spill/leaks from pipeline outside of v-drain.
Plant	Target - no excessive dust generation observed from the plant. Target – no water or tailings outside of containment infrastructure.
TSF	Target – no water or tailings outside of containment infrastructure. Limits: WAD CN – 50 mg/L target in decant return water (and not exceeding 100 mg/L noting saline nature of pond water) pH 6-9.5 in decant return.

8.6 Contingencies

If water or tailings is released outside of the pipelines or containment structures (i.e. to surrounding vegetation), the source will be investigated, and remedial actions implemented as required.

If excessive dust generation is observed in the crushing/screening plant, the source will be investigated and remedial actions implemented as required.

8.7 Management of Malfunctions

During the commissioning phase, malfunction of pumping equipment may occur. If a failure occurs, then the system will be shut down until the fault is rectified.

8.8 Reporting

All incidents will be recorded and investigated under an internal incident reporting system in place at the Project. Reporting of incidents other than minor incidents shall follow the requirements set out in s72 of the Environmental Protection Act 1986.

Should any of the emission targets (stated above) be exceeded during the final stages of commissioning with the possibility that the targets may need to be amended, Black Cat will provide the DWER with the following information:

- The non-conforming emission / discharge and extent to which the target value was exceeded.
- Management responses to the exceedance and their effect on the emission / discharge.
- An explanation as to why the exceedance may have occurred and any corrective actions taken to minimise the risk of a re-occurrence.

8.9 Commissioning Report

Upon completion of commissioning activities, a Commissioning Report will be submitted to the DWER in accordance with the Works Approval conditions (when issued).

9. ATTACHMENT 5 - OTHER APPROVALS AND CONSULTATION

9.1 Other statutory approvals

Table 12 summarises the relevant environmental approvals and statutory requirements relevant to the environmental management of the prescribed premises.

Table 12: Statutory approvals required

Relevant Legislation	Environmental Factor regulated/affected	Relevant approval requirement
APPROVALS		
Aboriginal Heritage Act 1972	Aboriginal Heritage	Nil – no Aboriginal sites to be impacted.
Biodiversity Conservation Act 2016	Biodiversity	Nil – no biodiversity impacts are expected.
Environment Protection and Biodiversity Conservation Act 1999	Biodiversity Land and Soils	Nil – no known MNES are expected to be impacted.
Environmental Protection Act 1986 (EP Act) Part IV (and Administrative Procedures 2012)	Biodiversity Land and Soils	Nil.
Environmental Protection Act 1986 (Part V)	Water Resources Land and Soils	This submission covers this aspect.
Environmental Protection Act 1986 (Part V) Environmental Protection (Clearing of Native Vegetation) Regulations 2004	Biodiversity	A clearing permit is in place (CPS5295/3 – Expiry 5/01/2023).
Health Act 1911	Land and soils Water resources	Nil.
Mining Act 1978 and Mining Regulations 1981	Biodiversity Land and Soils Rehabilitation and Mine Closure	The historical activities at this location are covered under the approved MP (Reg ID 64139) issued to Silver Lake Resource's. Black Cat received approval for the Imperial-Majestic Underground Mining & Process Plant Construction on M25/350 on 31st May 2021. Approval for the TSF construction and operation of the entire facility is subject to an amendment to the above mining proposal which is being submitted and progressed in parallel with this works approval application.
Rights in Water and Irrigation Act 1914	Water resources	Black Cat has 2 DWER Licences to take water in relation to this proposal: GWL 181140. GWL 176418.

9.2 Consultation

Black Cat has ongoing consultation with key project stakeholders and a summary of the consultation undertaken to date is presented in Table 13.

Black Cat will continue to liaise with stakeholders during operations and in relation to closure during the life of the project and will provide updates on closure developments on an ongoing basis.

Consultation with stakeholders will continue throughout the life of the Project to ensure stakeholder concerns and objectives are accounted for and the Register will be updated to reflect further input from stakeholders.

Table 13: Stakeholder consultation undertaken by Black Cat to date

Date	Description of Engagement	Stakeholders	Discussion topics	Stakeholder comments/issues	Proponent response and/or resolution
9/07/2020	Face to Face	Alistair Thornton Carmen Standring (DWER Broome)	Imperial in-pit TSF and associated water usage	Radionucleotides (will investigate whether relevant to area) Suppressed water table effect on Timber Reserve Ensure Works Approval Guidelines reviewed	Radionucleotides not relevant Water table on timber reserve will not be suppressed
16/07/2020	Face to Face	Alistair Thornton Chris Lane (LMGSPL) Katherine Hope (DPaW)	Plant Proximity to Majestic Timber reserve M25/360 on timber reserve Existing in-pit TSFs on the Timber Reserve (Baguss, Futi)	Cover risks in management plan Mining okay with an approved Conservation Management Plant Rehabilitation looks impressive	
16/07/2020	Face to Face	Alistair Thornton Chris Lane (LMGSPL) Bijay Suwal (CKB) Multiple others (CKB)	Bulong - Majestic haulage	\Investigate miscellaneous licence over road Refer to road as a formed carriageway Increase in traffic on Trans Access Road and maintenance	Okay Okay BC8 will notify CKB at commencement
2/09/2020	Email	Alistair Thornton Robert Connor Gerard Sherlock	Bulong - Curtin Road better as a public road than covered under an ML	CKB would conditionally support Black Cat upgrading the road Contact Main Roads to include on RAV network	Okay
9-12/10/20	Email Face to Face	Alistair Thornton (email only) Murray Perkasky Brendan Jones (Saltbush)	Informed about request to upgrade Site visit to assess upgrade requirements	Application form for inclusion on RAV network included	Request submitted to Main Roads
21/10/2020	Face to Face	John Jones, Matt Hardisty Gareth Solly, Dave Sanders Alistair Thornton	Access Agreement terms Bulong - Majestic haul road and Majestic mill and underground mining at the base of each pit	Agreement must protect the homestead Access to the plant will require upgrades to the road okay	Agreed
24/11/2020	Face to Face	John Jones Gareth Solly	Underground mining at the base of each pit with minimal clearing requirements Process plant and TSF size and location on M25/350 Miscellaneous licence application (L25/64) to Trojan Pit Use of existing public road between Bulong - Trans Access Road	Concerns over condition of existing dump Topics of ongoing access agreement negotiation	Existing dump is included in the mining proposal for additional rehab okay
24/11/2020	Email	Rory O'Connor Alistair Thornton	Enquired about Central East Group (CEG) Contact	Provided details of contacts at the CEG Confirmed no heritage or possible sites exist	Okay
24/11/2020	Email and phone	Joanna Kiddie David Berg Alistair Thornton	Scope in which Black Cat intends to use SLR infrastructure Progress of Majestic Timber Reserve CMP Heritage surveys conducted to date	Okay Okay Sent to Black Cat	
24/11/2020	Email	Sumaia Aziz (MIA rep) Alistair Thornton	L25/0064 application to pump pit water to M26/104, and access agreement	MMTS will approach MIA with the information	Okay
30/11/2020	Email and phone	Lawson Brandis Alistair Thornton	Process plant construction approval Silver Lake ownership of infrastructure and tenure IBSA files not available from original surveys	Include process plant and underground in one doc. Include letter of authority and letter of consent Provide original reports. IBSA files nice but not essential	Okay
1/12/2020	Email and phone	Dennis Forrest Alistair Thornton	Recommence mining at Majestic Imperial (underground) Constructing a processing plant and TSF L25/53 and L25/64 will need surveys	Permission to prospect M25/24, M25/129, M25/091, P25/2286	Okay

Date	Description of Engagement	Stakeholders	Discussion topics	Stakeholder comments/issues	Proponent response and/or resolution
4/12/2020	Email	Brendan Jones Lachlan Jones Alistair Thornton	Any concerns with haul road and pipeline proximity to the pastoral dam on M26/417 (90m).	No concerns	N/A
11/1/21	Presentation	Brendan Jones Lachlan Jones Alistair Thornton	Shared a presentation detailing all upcoming pits and projects	No concerns.	N/A
1/2/21	Email	Burchell Jones Alistair Thornton	Using the Hampton Hill Station shearing quarters for a 40 - 90 day period during mill construction civil works	Okay – come and have a look at the facilities.	N/A
9/2/21	Meeting	Burchell Jones Alistair Thornton Wayne Gaiter	Majestic-Imperial underground update	Previous clearing by Silver Lake was larger than expected	Mining does not include a dump so footprint increase is limited (excluding processing plant)
			Majestic TSF size, shape and location limited by hydrology	Good grazing pasture but understand limitations based on creek locations	Final footprint ~23Ha. Rehabilitation at closure will return the area to grazing land
			Majestic Process Plant location limits additional clearing	Okay	
			Process plant construction timeline	Okay	
			Maintenance needs on the Bulong-Curtin Rd	Needs reassessing after the current rain event	Okay
30/3/21	Phone	Jan De Lange Alistair Thornton	Black Cat advised that they're preparing a MP for a new TSF at Imperial-Majestic for submission.	Jan advised that unless we have a specific query/concern regarding the TSF Jan is not interested in reading the document and providing feedback until an MP is submitted.	

10. ATTACHMENT 6A – EMISSIONS, DISCHARGES AND WASTE

10.1 Potential Emissions

Potential emissions arising from the construction, commissioning and time-limited operations of the prescribed premises are summarised in Table 14.

The management measures and controls to be implemented are summarised in the risk assessment presented in Table 14.

10.2 Risk Assessment and Management Summary

A summary of the potential environmental risks relevant to the Works Approval application and the associated environmental management measures to be implemented to reduce these risks to an acceptable level, are summarised in Table 14.

Based on Black Cat's assessment of the Project siting (Attachment 7), it is considered that fauna, soil and groundwater (no groundwater users) are the only receptors. The closest residence dwelling (pastoralist) is >11km away and the closest town is Kalgoorlie (approximately 45 km away) from the prescribed premises. The are no significant environmental values of interest within the project area.

The residual risk assessment ratings are consistent with the risk assessment matrix used by DWER as shown in (Table 15).

Table 14: Risk assessment and management summary for the plant, TSF and dewatering pipeline

Activity	Potential Emission Type and Source	Potential Receptors	Potential Pathway	Potential adverse Impacts	Impact Assessment/ Proposed Controls	Residual Risk		
						LIKELIHOOD	CONSEQUQ	PRIORITY
CONSTRUCTION								
Construction of all facilities	Noise – Equipment, machinery and vehicles used during construction works	Local fauna No sensitive receptors	Air / wind dispersion	Noise may disrupt nocturnal foraging behaviour.	Construction activities will be during dayshift only. No sensitive receptors in proximity to the Project.	Unlikely	Slight	Low
	Fugitive Dust as a result of - Earthworks associated with construction and vehicle movements	Vegetation	Air / wind dispersion	Vegetation health.	Any dust generated during construction will be short term and unlikely to result in significant emissions. The nearby area is devoid of vegetation due to previous mining activities, therefore dust is unlikely to impact on vegetation health. Water carts will be utilised to manage dust during construction works if required. Implementation of speed limits for all vehicles. Minimisation of unnecessary movement of vehicles. Restriction of access to existing tracks.	Unlikely	Slight	Low
	Light emissions	Local fauna	Air dispersion.	Light spill may disrupt nocturnal foraging behaviour.	No sensitive receptors in proximity to the Project. Construction activities will be during dayshift only.	Unlikely	Slight	Low
COMMISSIONING/TIME-LIMITED OPERATIONS - PLANT								
Crushing circuit	Crushing of material and movement of ore	Vegetation and soil Groundwater of beneficial use – none, groundwater is hypersaline	Air/wind dispersion	Soil contamination inhibiting vegetation growth and survival, and health impacts to fauna. Groundwater contamination	Water trucks will be utilised on haul roads and the ROM to control dust as required. Daily inspection of plant area will include observation of dust assessment and walking of site perimeter.	Unlikely	Minor	Medium
Process Water Pond	Overtopping of process water pond	Groundwater of beneficial use – none, groundwater is hypersaline Vegetation and soil	Direct discharge to land and infiltration to soil.	Soil contamination inhibiting vegetation growth and survival, and health impacts to soil fauna. Contamination of groundwater.	Location will be predominantly surrounded by cleared areas. Freeboard markers installed. Daily inspections to ensure minimum 300mm freeboard to be maintained at all times – this correlates with 77mm rainfall.	Unlikely	Minor	Medium
	Seepage of saline water from the process water pond	Surrounding vegetation	Lateral movement of process water to groundwater table	Potential impacts to vegetation through inundation of roots.	Location will be predominantly surrounded by cleared areas. Process water pond will be HDPE lined to prevent any leaks from the facility. Daily inspections will include visual inspection at base of structure to identify any evidence of lateral movement of saline water.	Unlikely	Minor	Medium

Activity	Potential Emission Type and Source	Potential Receptors	Potential Pathway	Potential adverse Impacts	Impact Assessment/ Proposed Controls	Residual Risk		
						LIKELIHOOD	CONSEQUQ	PRIORITY
Hydrocarbon/ Chemical Storage in Plant Area	Hydrocarbon or chemical release outside of containment area	Vegetation Groundwater of beneficial use – none, groundwater is hypersaline	Movement of hydrocarbons or chemicals to land and infiltration to groundwater	Soil contamination inhibiting vegetation growth and survival, and health impacts to fauna. Groundwater contamination.	There are no Groundwater Dependant Ecosystems in the vicinity. Bunding of hydrocarbon and chemical storage facilities. Regular visual inspection of hydrocarbon and chemical containment structures and pipelines. Ensure drip trays adequately sized and positioned to capture drips. Hazardous materials stored in bunded areas or bunded containers. Storage and refuelling of vehicles will occur on concreted areas. Liquid reagents and fuels will be stored in bunded areas with the capacity to hold 110 % of the largest vessel according to Australian Standards AS1940-2004 Storage and handling of flammable and combustible liquids and AS1692-2006 Steel tanks for flammable and combustible liquids. Fuel and reagent tanks will have high level alarms to prevent overflow. Waste oil and other hydrocarbons will be collected and stored in a waste oil tank that meets the requirements for the storage of dangerous goods, prior to removal from site by an approved contractor for re-use or other approved form of disposal. Controlled wastes will be transported by licenced contractors and disposed offsite at a licenced facility. Drip trays will be utilised whilst refuelling. Servicing will be conducted at workshops wherever possible. Black Cat will develop standard work procedures for reagent and fuel handling, and spill response procedures based on relevant product safety data sheets (SDS), and locate appropriate spill kits at reagent and hydrocarbon storages. If necessary, earthmoving equipment on site will be commandeered to assist with containment and recovery of major spills. Investigate, identify cause, report and remediate spills and non-compliance with procedures (all spills will be reported as an incident report) Any release which is likely to cause pollution or environmental harm will be reported to the DWER in accordance with Section 72 of the EP Act.	Unlikely	Minor	Medium
Rainfall events in the vicinity of the plant	Contaminated stormwater	Vegetation and soil	Direct discharge to surrounds	Soil contamination inhibiting vegetation growth and survival, and health impacts to fauna. Groundwater contamination.	A surface water diversion bund was constructed as part of former mining operations to divert water to the east of the site. This bund will be extended to the west and ensure flows are diverted away from infrastructure areas. The topography to the east of the plant Thus, the catchment area for the plant is small. Plant area will be constructed to ensure no external surface flows enter the process plant pad area. Process plant pad catchment will be directed to a storm water pond designed for the 1 in 100, 72-hour rainfall event. Only clean water will be discharged to the environment. Process areas located within bunded facilities which drain to sumps with sump pumps to recover the material back to the processing circuit. Rainfall runoff from the Mine Yard/Workshops area including roads, building roofs, laydown yards etc. will be captured in open drains sized for peak of the 10% AEP (minimum). Runoff from fuel storage and dispensing areas, truck wash and workshops will be captured n open drains that report to an oily water separator. All washdown water/spillages generated from the power station will be channelled to a triple oily water interceptor.	Unlikely	Minor	Medium
Plant operations	Noise – Equipment, machinery and vehicles used during operations	Local fauna No sensitive receptors	Air / wind dispersion	Noise may disrupt nocturnal foraging behaviour.	No conservation significant fauna at the Project. No sensitive receptors.	Unlikely	Slight	Low

Activity	Potential Emission Type and Source	Potential Receptors	Potential Pathway	Potential adverse Impacts	Impact Assessment/ Proposed Controls	Residual Risk		
						LIKELIHOOD	CONSEQUQ	PRIORITY
	Gaseous emissions from smelting furnace, carbon regeneration kiln, power station.	Local air No sensitive receptors	Air / wind dispersion		Furnace and kiln constructed and operated as per design specifications. Equipment and machinery installed conforms to relevant Australian Standards and to manufacturer's specifications. Regular maintenance and servicing of the power station units.	Unlikely	Slight	Low
	Light emissions	Local fauna No sensitive receptors	Air dispersion	Light spill may disrupt nocturnal foraging behaviour.	No conservation significant fauna at the Project. No sensitive receptors.	Unlikely	Slight	Low
COMMISSIONING/TIME-LIMITED OPERATIONS – TAILINGS STORAGE FACILITY								
Operation of the TSF	Overtopping of TSF releasing tailings to the surrounds	Groundwater of beneficial use – none, groundwater is hypersaline Vegetation and soil contamination	Direct discharge to land and infiltration to soil	Soil contamination inhibiting vegetation growth and survival, and health impacts to soil fauna. Contamination of groundwater.	TSF have been designed to manage the expected throughputs and any rainfall events. Daily routine inspections of TSF to ensure minimum freeboard of 0.7m is maintained. The minimum capacity of the water recovery system will not be less than 90 tph including the additional capacity to recover water from design storm events.	Unlikely	Moderate	Medium
	Seepage from TSF resulting in increase in groundwater levels close to ground level	Groundwater of beneficial use – none, groundwater is 17.3-18.9 m bgl Vegetation and soil contamination	Infiltration through base and embankments of TSF	Soil contamination inhibiting vegetation growth and survival, and health impacts to soil fauna. Contamination of groundwater.	A cut-off trench, to nominally 1.0 m below ground level in the surficial clay layer has been included in the embankment design to reduce horizontal seepage losses. Liberated water will be continually removed from the surface of the tailings. Tailings deposition will be cycled around the facility to maximise tailings density and therefore the storage volume. Return of water to the plant will be maximised - the water recovery system will have a capacity of ≥90 tph excluding the additional capacity to recover water from design storm events. TSF will be operated in accordance with the details contained in the Operations Manual. This includes implementation of the TSF operation, management inspection and maintenance procedures.	Possible	Moderate	Medium
	Dust generation from tailings beaches	Soil Vegetation	Air/wind transfer to surrounds	Surrounding vegetation.	Dust generation from the tailings beaches is not expected as the tailings are hypersaline and a crust is likely to form on the beaches, binding the tailings surface and reducing the potential for dusting. If dust generation becomes an issue (i.e. in periods the TSF may be inactive), the tailings beaches could be irrigated (i.e. with sprinklers or similar) or tailings deposition managed such that beach areas do not dry back to such that dust generation occurs.	Unlikely	Moderate	Medium
Transfer of tailings	Spillage of tailings during transfer to TSF resulting in tailings discharging to environment	Soil Vegetation	Direct discharge to land and infiltration to soil.	Soil contamination, reduction in vegetation health and habitat.	Daily inspections of pipeline to detect failures. Pipelines are fitted with flow meters and telemetry pressure transmitters to allow remote monitoring and flow control. The tailings delivery line from the process plant to the TSF's and the return water line will be situated within bunds which act to contain any spillage of materials resulting from leaks or lines that burst during operation. A spill is unlikely as flows will be monitored by flow meters positioned at the start and end of the tailings delivery line, with readouts displayed on the PCS.	Unlikely	Moderate	Medium
	Overflow of TSF decant return water from the TSF.	Soil Vegetation	Direct discharge to land and infiltration to soil.	Soil contamination, reduction in vegetation health and habitat.	Daily routine inspections of to ensure minimum freeboard of 0.7m is maintained. Installation of freeboard markers. The water recovery system will have a capacity of >90 tph including the additional capacity to recover water from design storm events.	Unlikely	Moderate	Medium
COMMISSIOINING/TIME LIMITED OPERATIONS – DEWATERING PIPELINE								

Activity	Potential Emission Type and Source	Potential Receptors	Potential Pathway	Potential adverse Impacts	Impact Assessment/ Proposed Controls	Residual Risk		
						LIKELIHOOD	CONSEQUQ	PRIORITY
Operation of the dewatering pipeline(s)	Discharge of saline water as a result of pipeline leak	Soil adjacent to the area Groundwater of beneficial use – none, groundwater in this area is hypersaline	Direct discharge to land and infiltration to groundwater. Infiltration to soil.	Soil contamination inhibiting vegetation growth and survival, and health impacts to fauna.	There are no Groundwater Dependant Ecosystems in the vicinity. The quality of the groundwater is hypersaline with TDS of 42,000 – 70,000 mg/L. No other groundwater users identified. The pipelines will be hydrotested prior to commissioning to ensure the pipelines integrity. The water pipelines will be fitted with flow meters for remote monitoring-drain will contain any potential spills/leaks from the pipeline, which will be graded so any spills will be directed towards the Imperial pit. Daily inspections of the pipeline route will be undertaken during operations. Any release which is likely to cause pollution or environmental harm will be reported to the DWER in accordance with Section 72 of the EP Act.	Possible	Slight	Low
	Potential mounding of the water table in the vicinity of the Imperial pit.	Surrounding vegetation	Lateral movement of pit lake water to groundwater table	Potential impacts to vegetation through inundation of roots.	As the pit was mined below the water table, the pit is considered a groundwater sink and intact bedrock has low permeability. The Imperial pit water level is not expected to come within 10m of the surface. Mine dewater discharge from Majestic-Imperial is short-term (3.5 years). Water sourced from the Imperial pit will be used as process water in the 800,000 tpa processing plant. Eventually all discharged water will be utilised and pit water sourced from groundwater inflows only. At this time, process water will have to supplemented from the bore field.	Unlikely	Minor	Medium
	Overtopping of the Imperial pit releasing hypersaline water to the surrounds	Soil adjacent to the area Surrounding vegetation	Direct discharge via overtopping	Soil contamination inhibiting vegetation growth and survival, and health impacts to fauna	Imperial pit is surrounded by existing disturbed areas. The Imperial pit has a minimum available storage volume of 1.86 M m3(kL) (including a 300 mm freeboard at the pit rim) which is adequate to store the 600,000 kL required to be discharged from the Majestic pit.	Unlikely	Minor	Medium

Table 15: Risk Criteria

Likelihood	Consequence				
	Slight	Minor	Moderate	Major	Severe
Almost Certain	Medium	High	High	Extreme	Extreme
Likely	Medium	Medium	High	High	Extreme
Possible	Low	Medium	Medium	High	Extreme
Unlikely	Low	Medium	Medium	Medium	High
Rare	Low	Low	Medium	Medium	High

Likelihood	
The following criteria has been used to determine the likelihood of the risk / opportunity occurring.	
Almost Certain	The risk event is expected to occur in most circumstances
Likely	The risk event will probably occur in most circumstances
Possible	The risk event could occur at some time
Unlikely	The risk event will probably not occur in most circumstances

Consequence		
The following criteria has been used to determine the consequences of a risk occurring:		
	Environment	Public Health* and Amenity (such as air and water quality, noise, and odour)
Severe	on-site impacts: catastrophic off-site impacts local scale: high level or above off-site impacts wider scale: mid-level or above Mid to long term or permanent impact to an area of high conservation value or special significance^ Specific Consequence Criteria (for environment) are significantly exceeded	Loss of life Adverse health effects: high level or ongoing medical treatment Specific Consequence Criteria (for public health) are significantly exceeded Local scale impacts: permanent loss of amenity
Major	on-site impacts: high level off-site impacts local scale: mid-level off-site impacts wider scale: low level Short term impact to an area of high conservation value or special significance^ Specific Consequence Criteria (for environment) are exceeded	Adverse health effects: mid-level or frequent medical treatment Specific Consequence Criteria (for public health) are exceeded Local scale impacts: high level impact to amenity
Moderate	on-site impacts: mid-level off-site impacts local scale: low level off-site impacts wider scale: minimal Specific Consequence Criteria (for environment) are at risk of not being met	Adverse health effects: low level or occasional medical treatment Specific Consequence Criteria (for public health) are at risk of not being met Local scale impacts: mid-level impact to amenity
Minor	on-site impacts: low level off-site impacts local scale: minimal off-site impacts wider scale: not detectable Specific Consequence Criteria (for environment) likely to be met	Specific Consequence Criteria (for public health) are likely to be met Local scale impacts: low level impact to amenity

Likelihood	
The following criteria has been used to determine the likelihood of the risk / opportunity occurring.	
Almost Certain	The risk event is expected to occur in most circumstances
Rare	The risk event may only occur in exceptional circumstances

Consequence		
The following criteria has been used to determine the consequences of a risk occurring:		
	Environment	**Public Health* and Amenity (such as air and water quality, noise, and odour)**
Severe	on-site impacts: catastrophic off-site impacts local scale: high level or above off-site impacts wider scale: mid-level or above Mid to long term or permanent impact to an area of high conservation value or special significance^ Specific Consequence Criteria (for environment) are significantly exceeded	Loss of life Adverse health effects: high level or ongoing medical treatment Specific Consequence Criteria (for public health) are significantly exceeded Local scale impacts: permanent loss of amenity
Slight	on-site impact: minimal Specific Consequence Criteria (for environment) met	Local scale: minimal to amenity Specific Consequence Criteria (for public health) met

11. ATTACHMENT 7 – SITING AND EXISTING ENVIRONMENT

11.1 Receptors

The distances to sensitive land uses are summarised in Table 16.

Table 16: Receptors and distance from activity boundary

Sensitive Land Uses	Distance from Prescribed Activity
Residential premises	Nearest Pastoral Lease/homestead is located >11 km from the Project. Kalgoorlie is located approximately 45 km to the northeast.

11.2 Specified Ecosystems

DWER's Guidance Statement: Environmental Siting (November 2016) lists Specified Ecosystems and Designated Areas and relevant databases which are considered in risk assessments undertaken by DWER. The distances to specified ecosystems are summarised in Table 17.

Table 17: Specified Ecosystems and Designated Areas

Specified ecosystems	Distance from the Premises
Ramsar Sites	None identified within 100 km.
DBCA Managed Lands and Water	The nearest conservation area is the Majestic Timber Reserve (DBCA managed land) which is located 400m south of the proposed prescribed premises boundary (900m south of plant and 1.5 km southeast of the TSF). The closest nature reserve is Karlurla National Park (45 kms east).
Ecological communities (TECs and PECs)	There are no TECs or PECs in the prescribed premises area.
Biological Component	**Distance from Premises**
Threatened/ Priority Flora	No Threatened or Priority flora recorded at the Project. No GDE recorded at the Project.
Threatened/Priority Fauna	No threatened fauna recorded at the Project.
Hydrography WA 250K – Surface Water Polygons	Some minor non perennial watercourses in the area. The Lake Yindarlgooda drainage system lies approximately 5.5 km to the east of the project, whilst Lake Yindarlgooda is located 7km north. No rivers, lakes or significant surface water bodies at the Project area.
Contaminated Sites	None recorded in DWER's Contaminated Sites database.
Other relevant ecosystem values	**Distance from the Premises**
Potential groundwater dependent ecosystems	None identified within 25 km of the premises.
Groundwater and water sources	**Distance from the Premises**
Public Drinking Water Source Areas	None within 50 km.
RIWI Act	Premises is not located within a Groundwater Management Area The Premise is located in the Salt Lake Basin Surface Water Area. The Premise is not located within a Proclaimed Surface Water Management Area.

11.3 Climate

The climate of the Eastern Murchison subregion is characterised as an arid climate with mainly winter rainfall and annual rainfall of approximately 200mm (Beard, 1990; Cowan, 2001). The nearest weather station is the Kalgoorlie-Boulder Airport weather station (#12038), which is located approximately 45km west of the survey area and commenced operation in 1939. Relevant metrological data from the Kalgoorlie-Boulder Airport weather station is summarised below and in Table 18 below (BoM, 2020).

11.3.1 Temperature

The mean annual maximum temperature is 25.3oC and mean annual minimum 16.7oC. Daily maximums above 30oC are usual from December to February. Diurnal temperature variations are commonly high throughout the year.

11.3.2 Rainfall

The area is semi-arid and has an average annual rainfall of 266.4 mm. Most of the rain falls from January to March but the amount varies greatly both seasonally and annually. The highest daily rainfall recorded was 177 mm in February 1948. The region can receive high intensity rainfall from degenerating cyclonic low pressure systems and thunderstorms.

The low, highly erratic rainfall provides many challenges for the successful rehabilitation of disturbed areas. Even during the latter part of the dominant winter growing season, there is still less than a 40% chance (i.e. less than 4 out of 10 years) of receiving sufficient rainfall to generate a significant germination event.

An estimate has been made of the magnitude of 72 hour duration, 100 year return interval rainfall event (assumed to be cyclonic). During such an event, 100 mm of rainfall can be anticipated during a 72 hour event, with a 10% annual exceedance probability (GRM 2019).

11.3.3 Winds

The average wind speeds at Kalgoorlie-Boulder vary throughout the year from 11.8–17.1 km/h in the morning to 13.7-17.8 km/h in the afternoon. Morning wind is predominantly from the east (NE-SE) varying in direction in the afternoon.

11.3.4 Evaporation

Evaporation is high, particularly in the summer months (December to February inclusive) and the average mean daily evaporation rate is 7.2 mm (annual calculated rate is 2,628 mm).

11.3.5 Humidity

Humidity levels vary considerably both daily and yearly. The mean monthly 9.00 am relative humidity varies from a low of 43% in December to a high of 74% in June. The mean monthly 3.00 pm relative humidity varies from a low of 24% in December and January to a high of 48% in June.

Table 18: Meteorological data for Kalgoorlie-Boulder Airport (Station Number 12038) (BOM 2020)

Statistic Element	Jan	Feb	March	April	May	June	July	Aug	Sep	Oct	Nov	Dec	Annual
Mean maximum temperature (°C)	33.7	32.1	29.5	25.3	20.7	17.6	16.8	18.7	22.4	26	29.1	32.1	25.3
Mean minimum temperature (°C)	18.3	17.9	16.1	12.7	8.7	6.3	5.1	5.7	8.1	11.2	14.2	16.7	11.8
Mean rainfall (mm)	27.4	31.6	25	20.2	24.6	27.1	24.2	21.3	13.7	15.8	18.7	16.5	266.1
Highest rainfall (mm)	185.9	307.8	197	98.6	110.2	185.7	82.6	74	98.3	84.4	115.4	88.6	530.8
Highest daily rainfall (mm)	154.4	177.8	70	49.8	45.2	57.2	28.6	49.6	44.2	45.6	77	50.6	177.8
Decile 1 (median) rainfall (mm)	0.6	1.2	0.6	1.3	2.4	5.2	5.4	4.1	1.5	1.1	0.5	1.3	149.3
Decile 5 (median) rainfall (mm)	11.2	14.5	10.1	12.7	18.6	18.6	20	16.2	10.7	10.2	15.3	12.4	254
Decile 9 (median) rainfall (mm)	83.2	79.2	68.5	54.6	47.3	54.6	49	44	29.5	34	40.4	39.9	395.1
Mean number of days of rain ≥ 1 mm	2.5	3.1	2.7	3.3	3.8	4.7	4.8	4	2.9	2.7	2.6	2.5	39.6
Mean number of days of rain ≥ 10 mm	0.7	0.9	0.6	0.6	0.7	0.7	0.6	0.5	0.3	0.4	0.5	0.6	7.1
Mean number of clear days	15.7	13.1	13.4	10.2	10.3	9.1	10.1	12.8	14.1	13.9	12.9	15.5	151.1
Mean number of cloudy days	5.6	6.3	6.9	9.2	10.2	10.4	9.7	7	6.2	5.9	6.5	5.3	89.2
Mean 9am temperature (°C)	23.8	22.8	21	17.9	13.9	11	9.9	11.6	14.8	17.9	20.6	22.7	17.3
Mean 9am relative humidity (%)	45	51	54	60	67	74	73	65	54	47	45	43	57
Mean 9am wind speed (km/h)	16.6	16.4	15.7	14.4	11.8	11.8	12.4	14.3	16.2	17.1	17.1	16.3	15
Mean 3pm temperature (°C)	32.3	30.9	28.6	24.3	19.9	16.8	16	17.8	21.3	24.7	27.8	30.7	24.3
Mean 3pm relative humidity (%)	24	30	32	38	44	48	46	39	31	27	25	24	34
Mean 3pm wind speed (km/h)	15.1	15.1	14.2	13.7	14.1	15.7	16.6	17.2	17.8	17.6	17.2	16	15.9
Mean daily evaporation (mm)	12.5	10.8	8.6	5.8	3.6	2.6	2.8	3.8	5.8	8.4	10.3	12	7.2

11.4 Regional Setting

11.4.1 IBRA Region

The Interim Biogeographic Regionalisation for Australia (IBRA) divides the Australian continent into 89 bioregions and 419 subregions (DAWE, 2020a). The project is located within the Eastern Goldfields Subregion and the Eastern Murchison Subregion (refer Figure 17 below).

As defined in the IBRA, the Project is located in the Eastern Goldfields, a subregion of the Coolgardie bioregion, within south-western Australia (McKenzie et al. 2003). The Project lies within the Archaean Yilgarn Craton, characterised by gently undulating topography. Surface material is deeply weathered, with scattered breakaways, dry creeks and low-lying hills of relatively fresh rock (Clarke 1994). Topographic lows are marked by salt lakes and associated dune systems, the largest being Lake Lefroy (Clarke 1994).

Many of the soil and vegetation descriptions of the north-east Goldfields are similar to those that occur in the southern Goldfields (Pringle et al. 1994). Dominant vegetation comprises woodlands and shrublands with ancient drainage valleys, low-lying chenopods along salt lakes, low or mid shrublands on hillsides and, stony plains and hardpan plains with Eucalyptus and Acacia woodlands. Soil types found in this region include calcareous loamy earths, red loamy earths associated with salt lakes and some red to brown hard pan shallow loams and red sandy duplexes (Tille 2006).

11.4.2 Land Systems

Based on the land-type classifications provided by Pringle et al. (1994), the Project area comprises:

- Woodlands/shrublands with ancient drainage valleys;
- Chenopod low or mid shrublands on hillsides and stony plains; and
- Hardpan plains with Eucalypt and Acacia woodlands.

The Project area is situated between two extensive salt-lake systems. Lake Yindarlgooda and Lake Lefroy are approximately 6 km north and 30 km south of the Project area respectively. The majority of runoff from the Project surrounds is likely to drain into Lake Yindarlgooda. There are a number of braided drainage channels with very low relief which dissect the Project area. There are localised areas of relatively dense woodlands, particularly to the south-western parts of the Project area.

11.4.3 Soil-Landscape Zone

The project is located within the Kambalda soil-landscape zone of the Kalgoorlie Province (Tille 2006). This zone covers 35,825 km2 and comprises flat to undulating plains (with hills, ranges and some salt lakes and stony plains) on greenstone and granitic rocks of the Yilgarn Craton. Calcareous loamy earths and red loamy earths with salt lakes soils and some red-brown hardpan shallow loams and red sandy duplexes.

Figure 17: IBRA Regions

11.5 Geology

The Majestic deposit is located within the Eastern Goldfields at the southern end of the Kunalpi Terrane (formerly the Gindalbie Terrane), on the western limb of the Bulong Anticline. It is located below the D1 thrust surfaces that contain mineralisation mined at the Sudden Jerk / Mt Monger Mining Centre. Gold mineralisation at the Project occurs within a small granitic pluton just west of the larger Juglah Monzogranite. The Monzogranite has an oval shape and was emplaced into a sequence of felsic to intermediate volcanic and volcaniclastic rocks. The outer contact of the granitic bodies against the felsics lithology's is not well exposed, nor can it be clearly seen on the magnetic images due to the poor contrast between the granite and surrounding country rocks.

A major east-west trending Proterozoic dyke cuts through the granites just to the south of the Majestic project area. A mafic sequence lies to the west, interpreted to have overlain both the granite and felsic country rocks, but has since been largely removed by erosion.

Two main areas of outcropping rock are recognised within the project area. To the west lies a northerly trending mafic sequence. Further east near the old Majestic mine and at the Herald and Randell Timber Reserve prospects the granitic rock is easily recognised. Surrounding areas are highly weathered with a deep regolith profile and some transported material. This transported cover masks geological contacts between the Majestic stock and surrounding felsic country rocks.

A significant north-south trending structure has been interpreted from aeromagnetic images to lie just west of the Majestic project. It may have acted as a conduit for mineralised fluids to flow into the area and be represented by the mineralised shear zone recognised at the Majestic Timber Reserve and Herald prospects (to the south-west and west, respectively), with alteration similar to that at Majestic.

Significant lineations interpreted from aeromagnetic data, combined with geochemical information suggests, larger north east structures as contributing to fluid flow into the area. The smaller-scale north-west dilatational structures correspond to discrete zones of strong foliation within the granodiorite and appear to control the development of brittle north south orientated fractures hosting the copper gold mineralisation at Majestic – Discovery Zone.

The majority of the primary gold mineralisation at the Majestic deposit is associated with north-south trending west dipping brittle fracturing of the host granodiorite. Some mineralisation is also associated with north-west trending, south-west dipping planes of ductile foliation within the granodiorite.

There appears to be a geometric relationship between the sheared felsic dykes and the majority of economic gold mineralisation, with the mineralisation being hosted in the non-foliated granodiorite, between and around the margins of, two parallel strongly sheared north south trending porphyritic dykes. To the north and south, this mineralisation appears to terminate against the previously mentioned northwest trending zones of foliation. The marked change in texture of the granodiorite, and the presence of some mineralisation within these shear zones suggests that they are part of the structural controls that were active at the time of mineralisation.

Secondary supergene mineralisation occurs along the fresh rock to saprolite interface. This mineralisation is gold rich – silver, copper and bismuth poor - mineralisation associated with the weathering front. Gold grades for this zone are generally below 2 g/t, which can form considerable distances away from economic bedrock mineralisation. Higher grade supergene mineralisation is found directly above the high-grade primary mineralisation. Grades for this mineralisation can run to over 10 g/t gold, with copper values typically below 500 ppm.

The Imperial deposit lithology is similar to the Majestic deposit. The host granodiorite and weathering profiles are essentially the same, with similar ratio of minerals. In fresh rock this is an albite altered quartz granodiorite with very minor quartz, carbonate and gypsum.

The mineralisation at Imperial contains the same pyrite and chalcopyrite sulphides as noted at Majestic. For both deposits all test work for sulphides within the ore ranges from 1-4 % and within waste rock 0-1% (averaging <0.2%).

11.6 Soils

A baseline soil resources assessment was completed during November 2010. Further soils studies have been undertaken by Landloch in relation to the suitability and application of the WRD design and rehabilitation. Recommendations identified during this study guided the WRD design and rehabilitation.

The Project area is dominated by flat areas (viz. hardpan plain with Eucalypt and Acacia woodland) and is dissected by minor drainage lines. The area has isolated groves of Acacia aneura and there is sparse ground cover within the intervening areas.

A total of 12 soil sampling sites were investigated within mining tenement M25/350. The sites were selected to encompass representative landform and vegetation units within the survey area.

The results of the survey indicate that the soil material is generally stable and is relatively benign. A limited number of samples from the 'flat' areas were classed as extremely saline (particularly at depth) and / or sodic and dispersive.

The potential impact of high salinity levels and sodic material can be largely mitigated if the material is appropriately handled and deposited.

The majority of soil materials were classed as sandy clay loams, clay loams or light to medium clays.

Surface topsoil layers ranged from 0 to 80 cm in depth, underlain by a layer of calcareous soil material. Low Rises were characterised by a shallower layer of red topsoil with a gravelly mantle at the surface.

Structural stability testing showed several samples with dispersive soil materials that have the potential to become problematic (e.g. hardsetting, erodible), particularly following severe disturbance. The majority of the Project soil samples however, were not hardsetting:

- The majority of soil samples were classed as neutral to moderately alkaline, (pH 5.3 to 8.4);
- Most sites were classed as non-saline at the surface, with salinity levels typically increasing with depth at all sites. The 'flat' area sites were observed to be very saline to extremely saline with increasing depth;
- Soil organic matter showed organic carbon (SOC) percentage within the majority of the soils sampled as low to moderate (0.1 to 0.5%) and decreased with depth;
- The majority of the soils were identified as being non-sodic. Only one sample, located in the 'flat' area, was reported to be highly sodic (Exchangeable sodium percentage > 15%);
- Soils typically low in plant-available nutrients; and
- Concentrations of metals Cr, Cu, Ni, Pb and Zn were detected, with elevated concentrations of Ni and Cr.

Table 19: Soil-Landscape Units within the Project Area

Soil-Landscape Name (Mapping Unit)	Description
M1	Minor drainage line – Hardpan plan Eucalypt and Acacia woodland
M2	Flat areas - Hardpan plan Eucalypt and Acacia woodland
M3	Major drainage line – Hardpan plan Eucalypt and Acacia woodland
M4	Flat areas - Hardpan plan Eucalypt and Acacia woodland
M5	Flat areas – Woodland/shrublands with ancient drainage valleys
M6	Flat areas – Woodland/shrublands with ancient drainage valleys
M7	Flat areas - Hardpan plan Eucalypt and Acacia woodland
M8	Mixed areas – Mixed halophytic low shrublands on depositional plains
M9	Minor drainage line – Hardpan plan Eucalypt and Acacia woodland
M10	Flat areas - Hardpan plan Eucalypt and Acacia woodland
M11	Flat areas – Woodland/shrublands with ancient drainage valleys
M12	Low rise – Woodlands/ shrublands with ancient drainage valleys

11.7 Surface Hydrology

11.7.1 Regional Surface Hydrology

There are no significant river systems or watercourses in the vicinity of the Project, the only noteworthy local hydrological feature being Lake Yindarlgooda located about 7 km to the north, as shown in Figure 18. This endorheic salt lake has a surface area of some 470 km2, approximately half of which comprises islands of low relief of up to about 10 m high.

The lake catchment area is about 4,125 km2, with the lake situated roughly centrally within this area. The lake is normally dry except following periods of significant rainfall-runoff when up to several hundred millimetres of water may be stored in discrete parts of the lake, before being lost to evaporation and seepage.

11.7.2 Local Hydrology

The nominal surface elevation in the vicinity of the proposed TSF at the is about 342 mAHD, while the local topographic high at Hawke Hill located some 23 km southeast of the Project has an elevation of about 425 mAHD. Natural ground gradients in the immediate vicinity of the Project are relatively flat, sloping towards the northeast at about 0.7%.

Inspection of the available topographical data and imagery indicates the proposed project area is situated in the upper headwaters of the regional catchment and, in effect, has a relatively modest upstream catchment area.

Hyd20 Hydrology (2012) completed a surface water assessment of the Project area in 2012 to provides estimates of 100 year ARI peak flows, flood levels and flood mapping for the watercourses in the vicinity of the Project to ensure maintenance of surface water flows and to protect the site from flooding during major events. The report is attached as Appendix B.

The assessment identified three main watercourses in close proximity which have been previously mapped by DoW (now DWER) which were referenced as Eastern Creek, Mine Creek and Western Creek with the catchments shown in Figure 19.

One of these drainage lines, Mine Creek, drained through the centre of the Project and has a catchment area of 10.7 km2.

A site inspection completed by H2d20 of these drainage lines identified them as typically broad shallow depressions, typically 20-30 cm in depth.

Hydraulic flood modelling was completed for the site taking into account the impact of the Trans Australia railway, road and culverts installed at the road/railway. The modelling did not assess Eastern Creek (located 5.5 km east of the Project) as it was not considered a flood risk by Hyd20 based on the topographic data. The modelling of estimated 100 year flood levels determined:

- Mine Creek – maximum depth of flow across the main channel from 0.28 – 0.66m with flooded width ranging from 140m – 180m. Flows are in a northerly direction breakout flow from larger events results in a shallow sheet flow in a north-easterly direction.
- Western Creek – maximum depth of flow from 0.26 – 0.97m with flooded width up to 800m. The 100 year floodplain is located outside of the Project area (Figure 19). Two culverts of Western Creek, may direct flows toward the site, however, assessment of survey data indicated the presence of an elevated ridge to the east of the culvert discharge location, thus it is considered likely these flows are diverted away from the site.

The topography in the vicinity of the Project generally falls to the northeast, and Hyd20 considered shallow sheet flow may occur from local catchments west of the Project flowing toward the mine in this area.

Based on their assessment Hyd20 Hydrology recommended:

- Diversion of Mine Creek the east of the site with placement of a bund – this bund was constructed by SLR and joins with the eastern side of the WRD as recommended;
- Consideration for bunding along the western boundary of the Project to divert local flows to the main Mine Creek channel downstream of the site. Use of the Abandonment Bund, if constructed at the commencement of mining, was considered suitable for this purpose ('hyd2o' Hydrology 2012). While this is not practical based on the current layout, Black Cat will ensure there is bunding along the western edge of mine infrastructure, in particular the plant area.

Black Cat commissioned Groundwater Resource Management in 2020 to undertake a further hydrology assessment of the Project, which included a reassessment of the site catchments (Figure 20). A copy of the report is attached as Appendix C. GRM (2020) confirmed the findings of the original assessment and identified runoff from natural surface reports downstream as shallow sheet flow with no discernible channels identified in the vicinity of the Project; and natural ground gradients in the immediate vicinity as flat, sloping towards the northeast at ~0.7%.

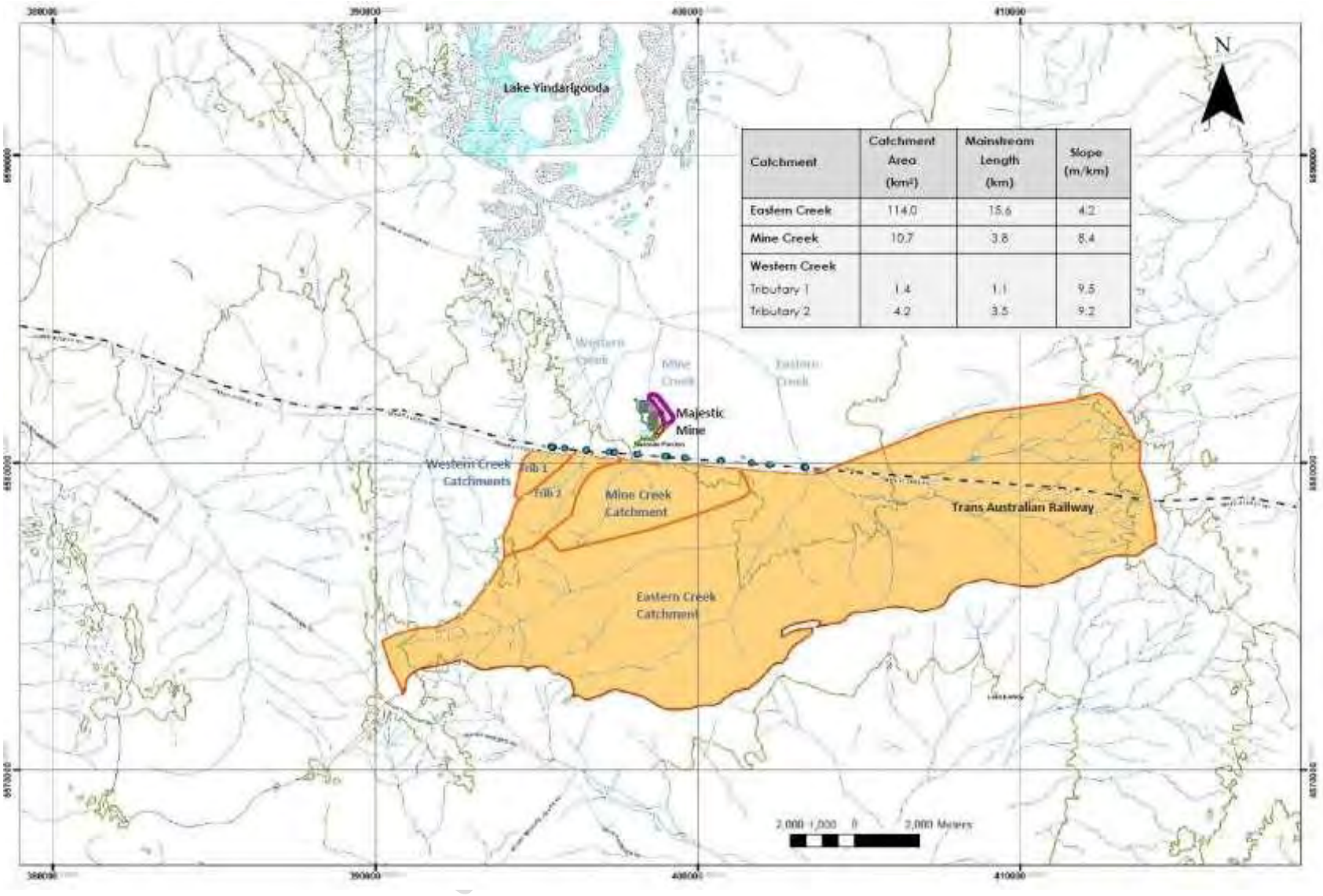
Consistent with Hyd20 (2012) assessment, GRM identified three local drainages and catchments upstream of the Project (Figure 20):

- West – upstream catchment of 10.8 km2.
- Central – upstream catchment of 4.6 km2.
- East – upstream catchment of 7.9 km2.

GRM (2020) noted that minimal surface water runoff is expected to report to Project facilities from upstream areas.

The assessment also assessed and identified modifications required to the existing flood bund which will ensure water flow is diverted. GRM (2020) confirmed the surface water management strategy employed during open pit mining was successful and that the main risk of flooding was from direct precipitation rather than flooding from the nearby watercourses.

Any modifications to the existing flood bund footprint, will be completed in advance of mining activities in order to provide protection at start-up.



Catchment	Catchment Area (km²)	Mainstream Length (km)	Slope (m/km)
Eastern Creek	114.0	15.6	4.2
Mine Creek	10.7	3.8	8.4
Western Creek			
Tributary 1	1.4	1.1	9.5
Tributary 2	4.2	3.5	9.2

Figure 18: Water catchments in the Majestic area

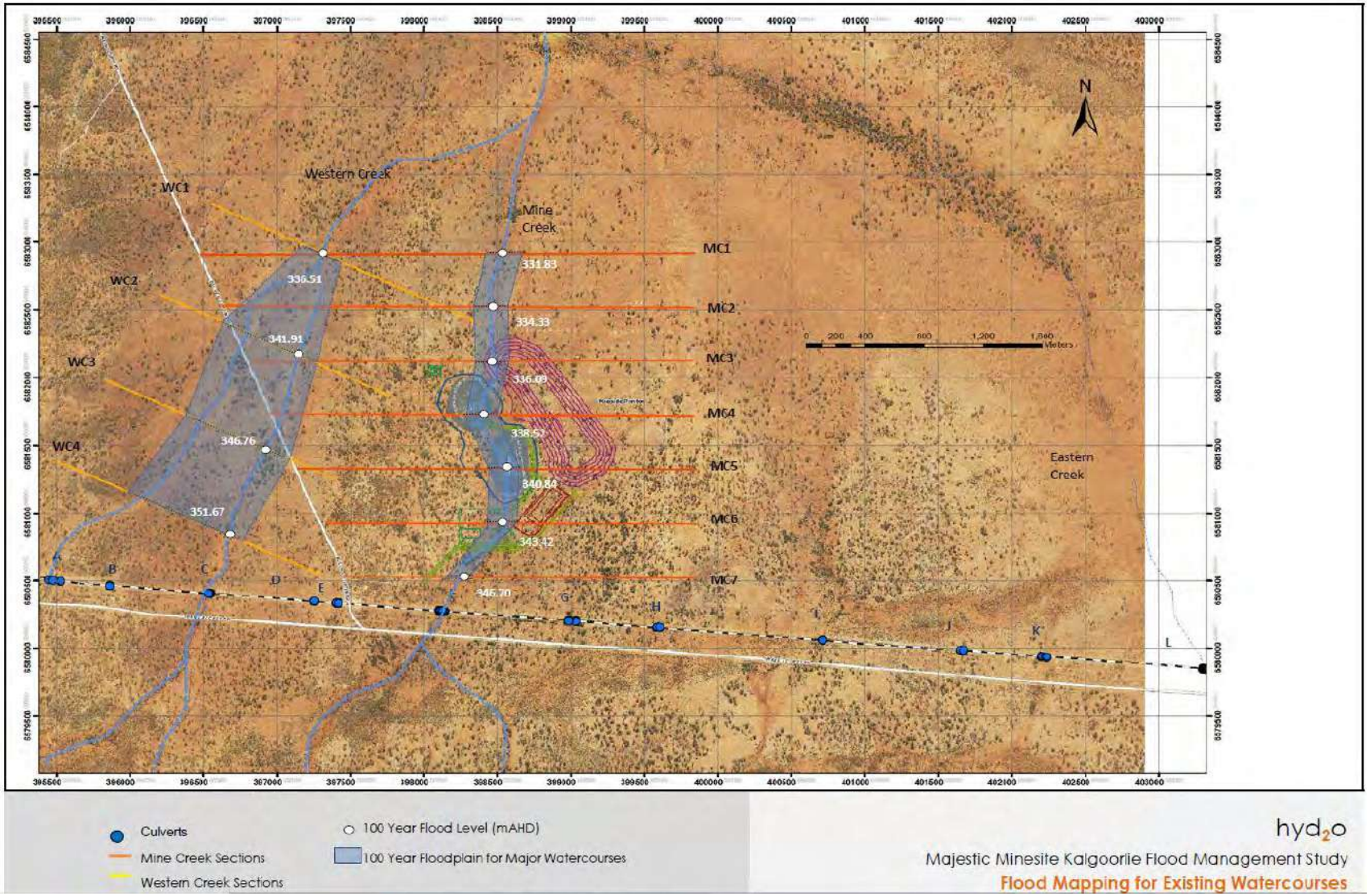


Figure 19: Flood mapping assessed by Hyd20 (2012)

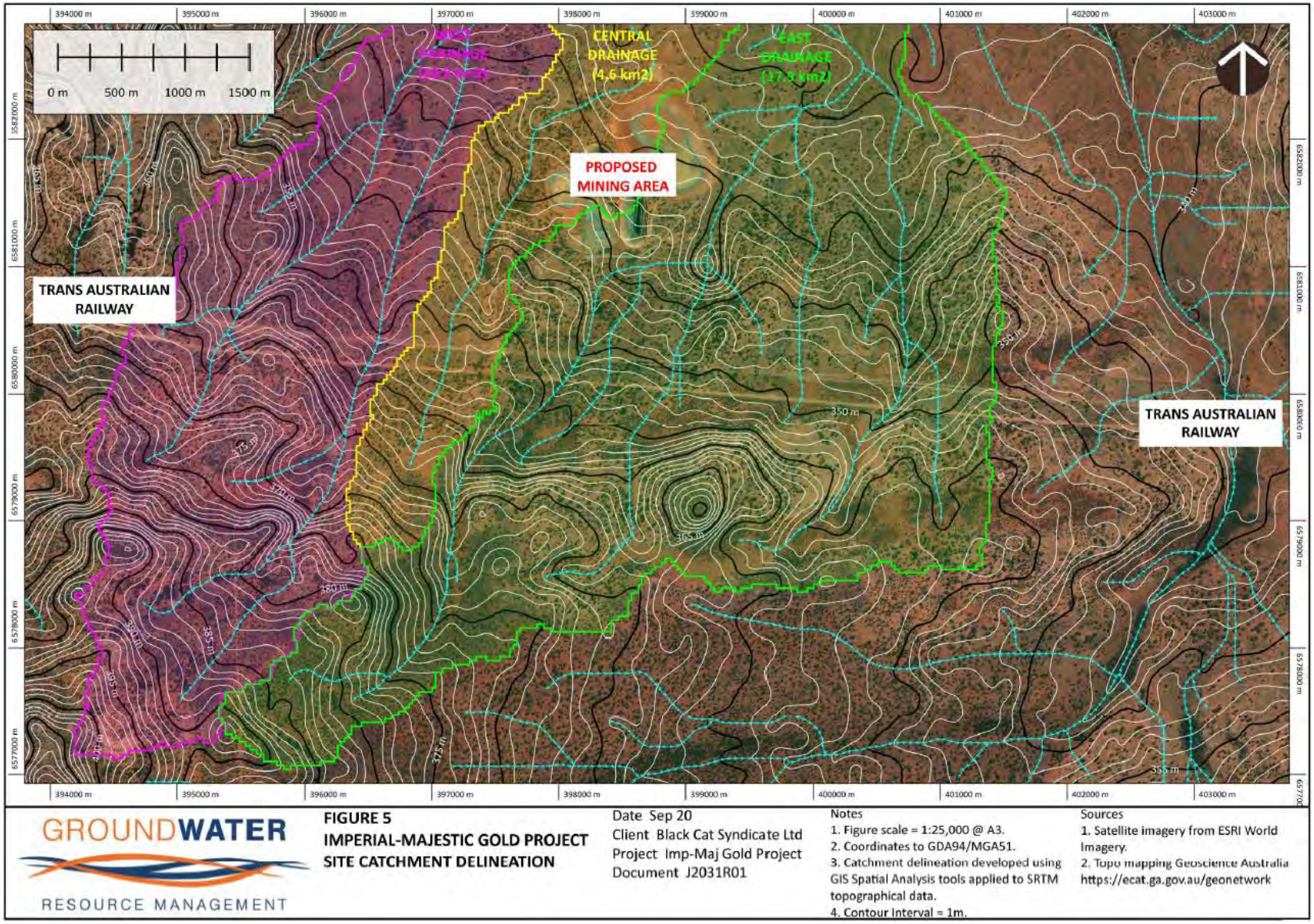


Figure 20: Surface water catchments assessed by GRM (2020)

11.7.3 TSF hydraulic study

The proposed TSF site is situated in an area of low relief between two existing drainage lines and GRM (2021) completed a hydrologic analysis and developed a hydraulic model to assess the potential risks to the proposed TSF and to advise on any protection measures required. The report is attached as (Appendix D) GRM's (2021) inspection of the available topographical data and imagery indicated three local drainages in the vicinity of the proposed TSF (Figure 21):

- East - upstream catchment area of 2.5 km2 (consistent with 'Central' identified in GRM (2020));
- West 1 - upstream catchment area of 5.9 km2;
- West 2 - upstream catchment area of 4.1 km2 (West 1 & West 2 consistent with 'West' catchment identified by GRM (2020)).

The assessment included hydrological calculations to estimate peak runoff values for the TSF East, West 1 and West 2 Drainages and hydraulic modelling to assess potential flow depths and velocities along the East and West drainages before and after construction of the TSF using HEC-RAS software (GRM 2021). GRM (2021) developed two hydraulic models to assess both Existing and Proposed conditions and the resulting flood extents, flow depth and velocity were obtained.

As reported in GRM (2021), Figure 22 shows that the maximum water depths at the southeast, southwest and northwest corners of the proposed TSF location are approximately 0.5, 0.3 and 0.5 m respectively for the 1% AEP event under existing conditions (pre TSF construction). The flow depth at the northeast corner of the facility is less than 0.1 m under existing conditions. Figure 23 shows that peak velocities in the order of 0.3 to 0.4 m/s were obtained at the corners of what would be the proposed TSF location.

This result is not surprising given the very low relief of the local topography. Flows along the natural East, West 1 and West 2 drainage lines spread out across a 400 to 500 m width of relatively shallow slow-moving water under peak 1% AEP event conditions.

Figure 24 shows that the maximum water depths at the southeast, southwest and northwest corners of the proposed TSF embankment are approximately 0.6, 0.4 and 0.6 m respectively for the 1% AEP event under proposed conditions (post TSF construction). Figure 25 shows that peak velocities in the order of 0.3 to 0.6m/s were obtained at the corners and along the sides of the proposed TSF embankment. There is zero flow at the northeast corner as it is "sheltered" by the remainder of the facility.

These values indicate that for the "1% AEP design event" for the operational period of the project there was a very modest increase in flow depths (typically about 0.1 m) and velocities (typically less than 0.2 m/s) as a result of constructing the TSF embankment.

Consequently GRM (2021) consider significant erosion of natural in-situ surfaces is not anticipated and that the maximum flow velocities are of such low magnitude that scouring of the proposed TSF embankment compacted fill material is highly unlikely under operating conditions. To ensure no erosion of the lower batters, Black Cat intend to armour the toe of the TSF embankments.

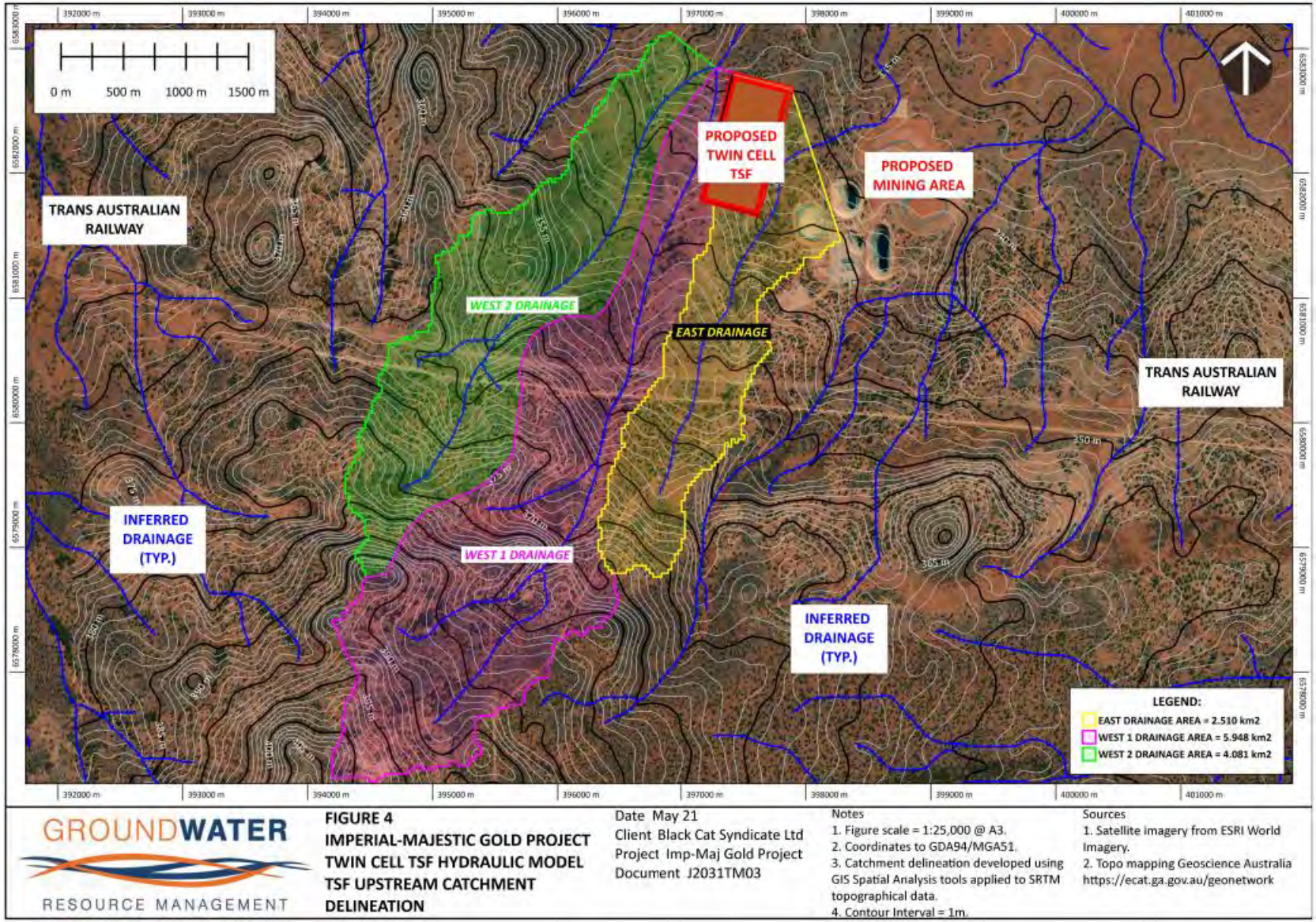


Figure 21: Surface water catchments in proximity to the proposed TSF assessed by GRM (2021)

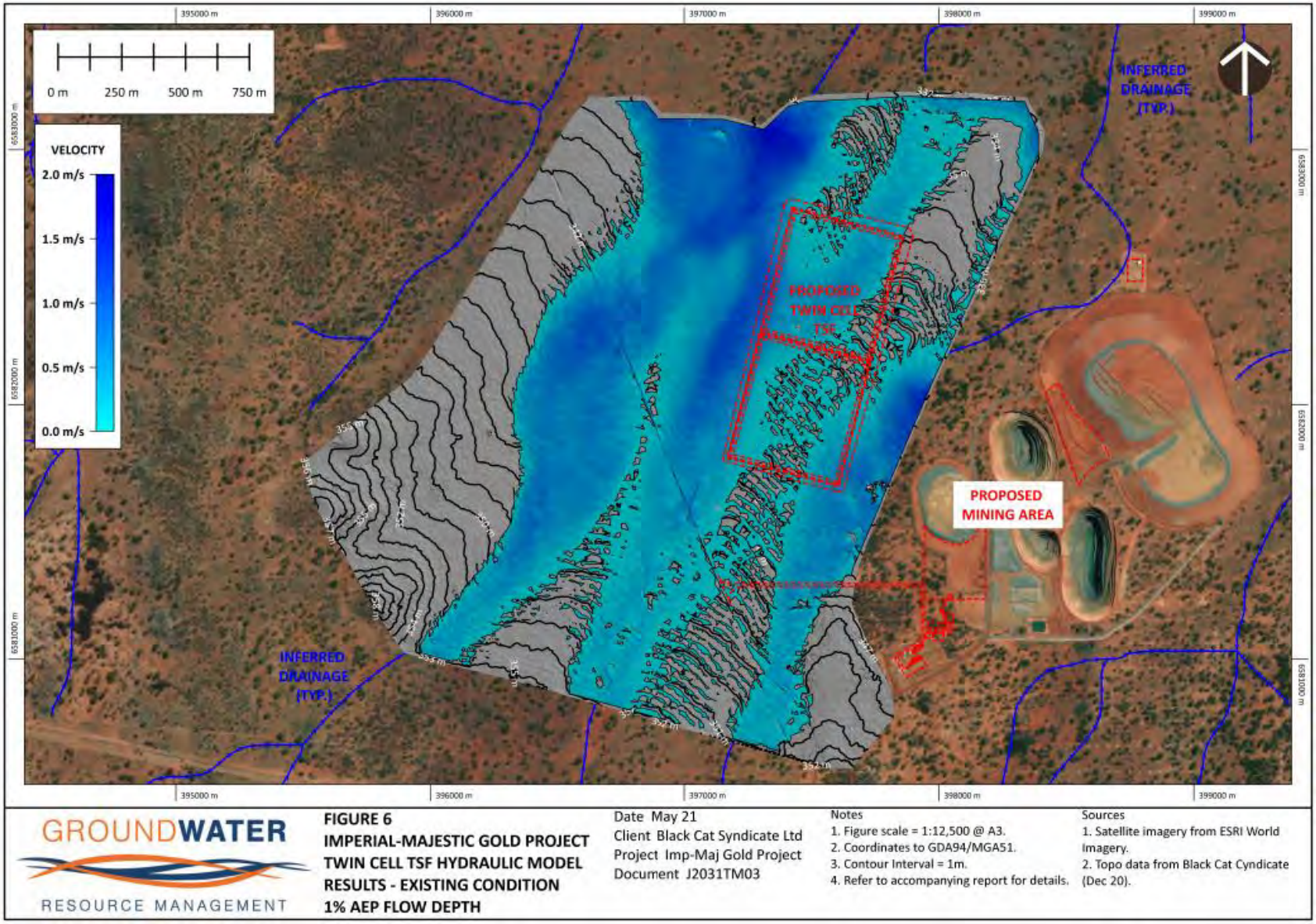


Figure 22: TSF Hydraulic Model – 1% AEP Depth pre TSF construction (from GRM 2021)

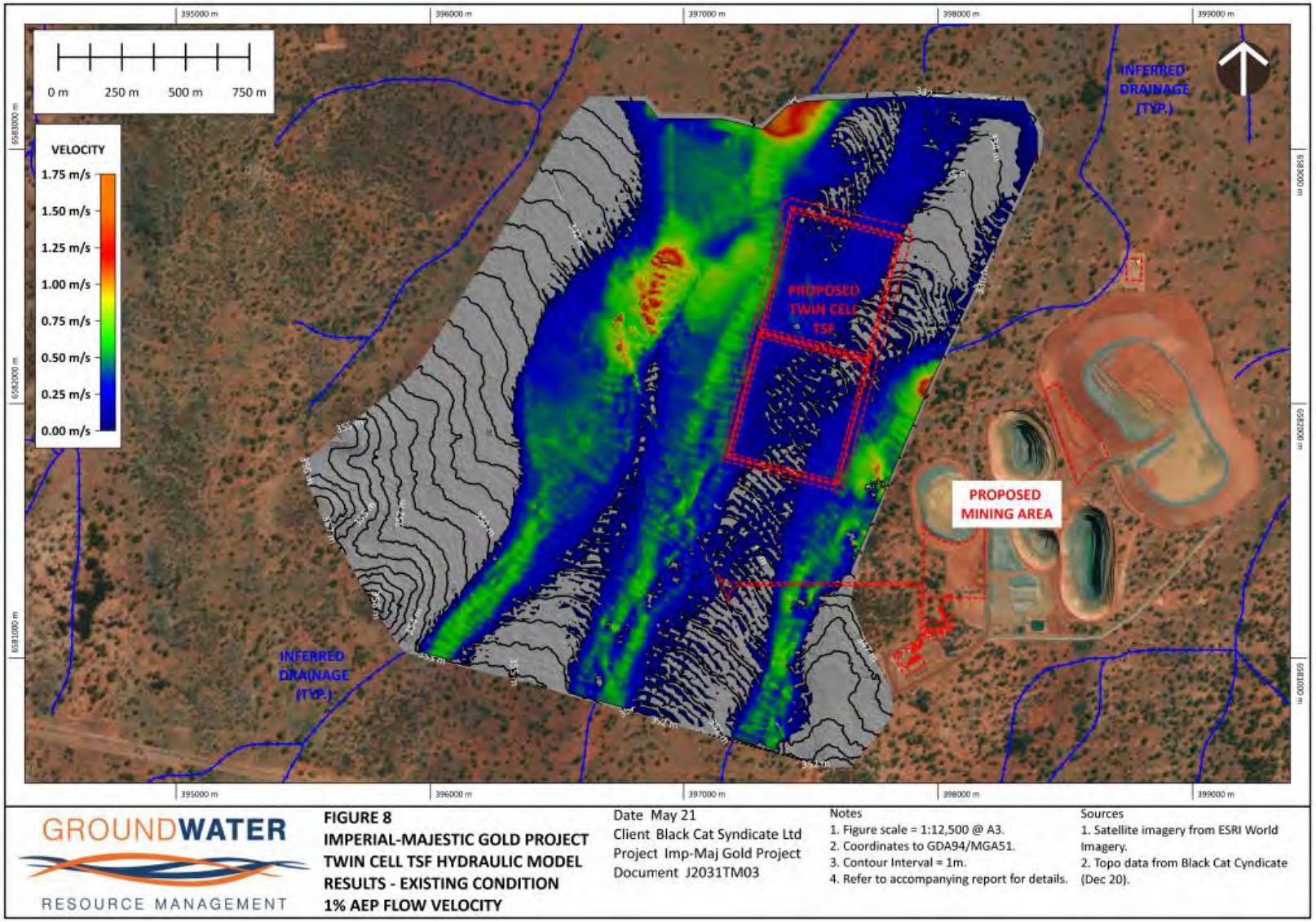


Figure 23: TSF Hydraulic Model – 1% AEP Flow Velocity pre TSF construction (from GRM 2021)

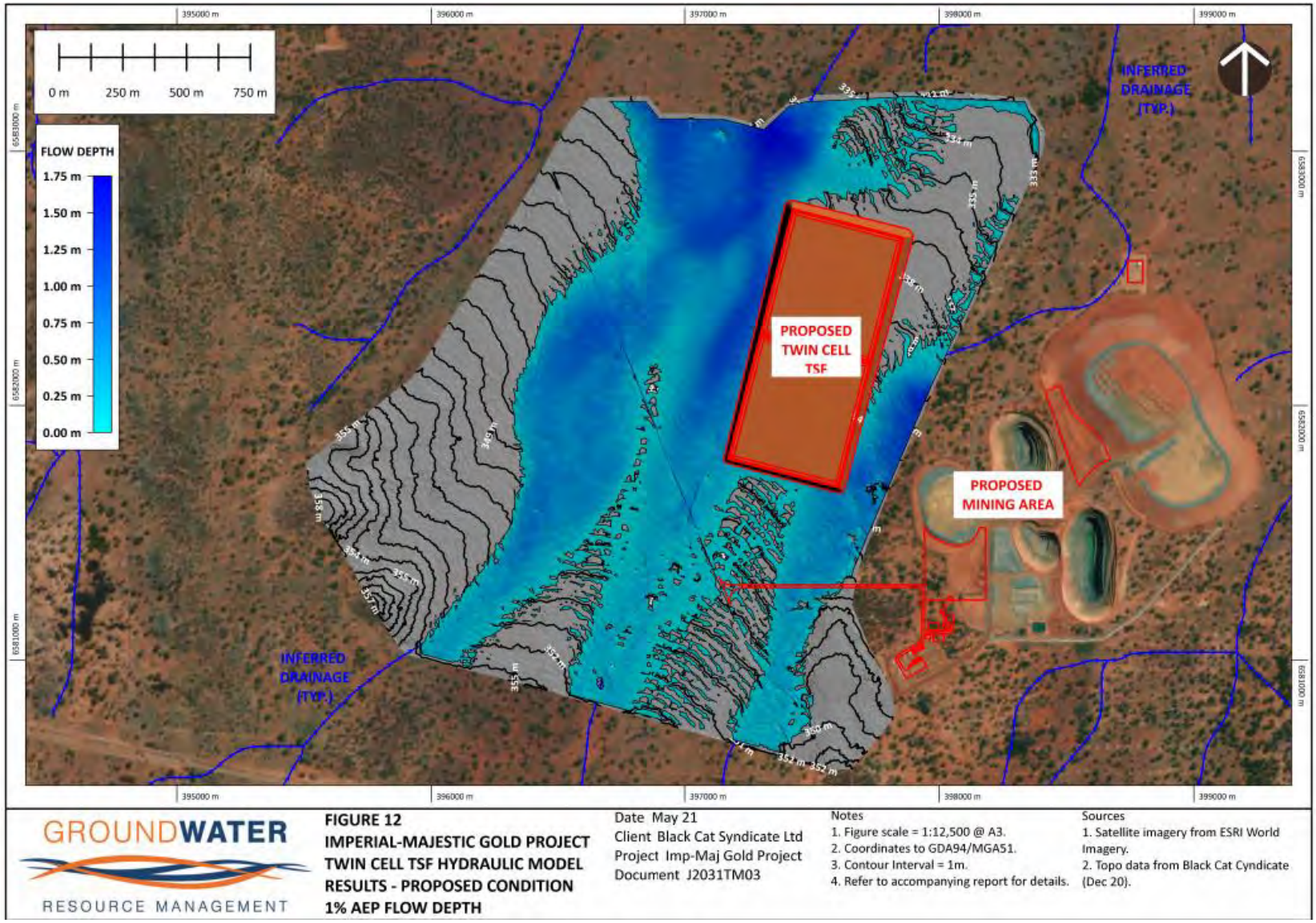


Figure 24: TSF Hydraulic Model – 1% AEP Depth post TSF construction (from GRM 2021)

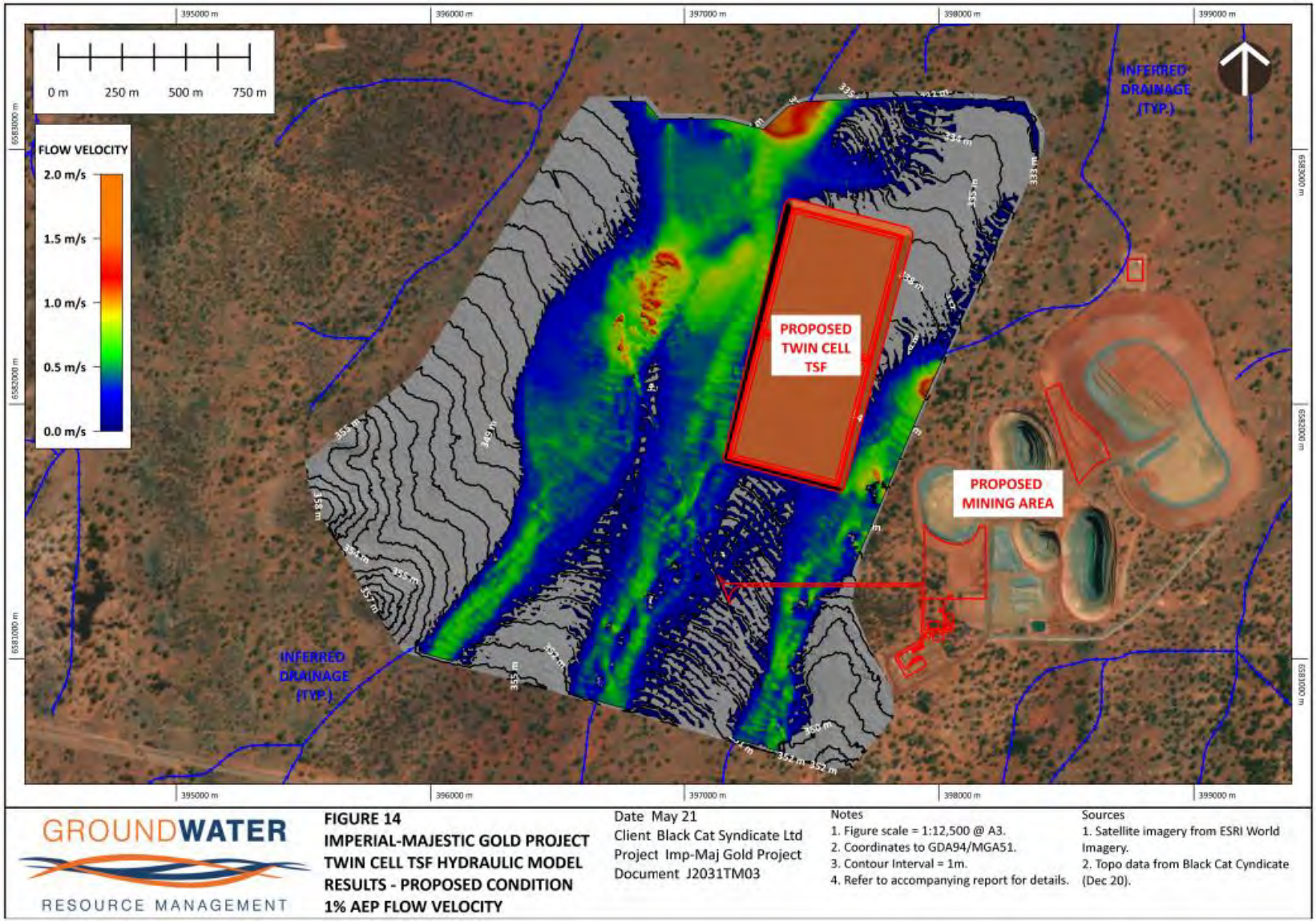


Figure 25: TSF Hydraulic Model – 1% AEP Flow Velocity post TSF construction (from GRM 2021)

11.7.4 Surface water management areas

The Project is located in the Salt Lake Basin Surface Water Area.

The Project area is not located within a Surface Water Proclamation Area.

11.7.5 Water quality characteristics

As there are no surface water bodies in the Project area, and only short-lived surface water accumulation after high intensity rainfall events, there is no surface water to sample on the Project site or surrounds.

11.8 Groundwater Hydrology

11.8.1 Regional Hydrogeology

As reported in CMW (2021b), fractured bedrock aquifers occur in the granitoid rocks due to secondary permeability resulting from tectonics and unloading, and enhanced by chemical dissolution along fracture lines. Bore yields are generally small. In the weathered zones of these rocks, the most permeable horizons may be the quartz grit horizons, where present.

Mafic and ultramafic dykes in the region are generally undeformed, typically lack open fractures, and possibly act as hydraulic barriers where they occur. In contrast, felsic (pegmatite) dykes tend to be fractured and may form small aquifers. In addition, isolated patches of granitoid eluvium can fill topographic depressions in granitoid rocks, giving rise to shallow ephemeral “soaks”.

Groundwater recharge is a very small proportion of rainfall, and recharge events likely occur only during heavy rainfall events, with direct recharge mainly occurring where bedrock outcrops.

Depth to groundwater ranges from less than 1 m in the vicinity of playa lakes (areas where groundwater discharge occurs) to greater than 50 m in elevated areas. Groundwater flow and salinity is closely related to topography.

11.8.2 Local Hydrogeology

A groundwater investigation was conducted in 2012 by Peter Clifton and Associates and the final report can be referenced in Appendix E. As the Project area is located within a relatively flat landscape, sheet flow plays an important role in the hydrogeology, resulting in alluvial material overlying weathered bedrock. The natural surface in the vicinity of the open pits slopes to the north east at gradients of between 8% and 10%.

Prior to the commencement of mining at the Project area, groundwater levels were recorded in the range 323.1 m AHD to 324.1 m AHD. The hydraulic gradient across the site is very small and generally <0.001 with the general direction of groundwater flow in the area is towards Lake Yindarlgooda (acting as the regional groundwater sink in the area). Depths to groundwater (pre-mining) across the site lie in the range 15 m below ground level (BGL) to 20 m BGL and groundwater was intersected in the Majestic and Imperial pits and mine dewatering was required.

The upper part of the local catchment of Lake Yindarlgooda that contains the Majestic and Imperial Open Pits will be an area of groundwater recharge and rates are expected to be very small (0.01% of average rainfall) (Peter Clifton & Associates 2012).

Monitoring bores were constructed by Integra at six sites near the proposed open pits, and two other boreholes have also been used for groundwater monitoring purposes in Figure 26.

GRM (2020b) completed a review and gap analysis of available hydrogeological data for the Project to inform future mine development. The assessment is attached as Appendix F and the summary of previous groundwater studies is presented in Table 2 (pg 3-4) of Appendix F.

This included a site visit to record groundwater level data and updated interpretations of fault and shear locations which are presented in Figure 27. As stated in GRM (2020b), the results of the assessment indicates:

- A significant barrier to groundwater flow exists between the Majestic and Majestic West pits which have water levels around 280 and 286 mRL respectively, compared to the Imperial pit water level, which is significantly lower at around 260 mRL, indicating the two pit areas are not in direct hydraulic connection.

- Groundwater levels vary significantly over relatively short distances in several bores around the Majestic pit (from 290.20 to 314.26 mRL), indicating aquifer compartmentalisation within the local groundwater system. This is probably due to some local fracture networks having only limited interconnection.
- Apart from the southern half of the north striking Majestic pit Shear, the other main structures in the Majestic area do not appear to carry significant permeability along them, based on the available data.

11.8.3 TSF Hydrogeological Assessment

An hydrogeological assessment of the proposed TSF area was completed by CMW (2021b) and is attached as Appendix G.

Field investigations included drilling of groundwater investigation bores and undertaking slug tests to assess hydraulic conductivity of the formation (CMW 2021b).

The proposed TSF with its natural contours of RL 340-350 m AHD is estimated to be approximately 20-30 m higher in elevation than Lake Yindarlgooda (7 km to the north). Four boreholes constructed as part of the CMW (2021) assessment (shown as TSF bores in Figure 15), recorded groundwater at depths ranging from 17.33 mbgl – 19.89 mbgl in February 2021 (323.07m - 323.85m AHD). Based on the logged geology (clay/weathered granite) the aquifer was interpreted as unconfined, hosted within variable but hydraulicly connected lithologies that include the weathered residual/eluvial profile and the underlying variably weathered granitoid rock.

Aquifer hydraulic tests were undertaken at four monitoring bores to assess hydraulic conductivity of the formation. The tests conducted were sequential falling and rising-head slug tests, utilising a solid slug, and with manual water level recovery monitoring.

The formation has generally low permeability, however the presence of fractures or shear zones (not identified during the field investigation) may result in locally higher permeability. Based on the slug test data, CMW (2021b) estimated the bulk hydraulic conductivity of the formation locally as approximately 0.007 m/day. Groundwater storage (specific yield) is expected to be low and in the range of 0.01 to 0.1.

As reported in CMW (2021b), based on topographic considerations, the regional groundwater flow in the site vicinity is indicated to the north with recharge occurring in the higher terrain areas to the south of the site. The high salinities recorded (saline and hypersaline groundwater up to 84,000 mg/L TDS) indicate that in the project area, rates of groundwater recharge are very low. Recharge will be episodic rather than regular, and tied to significant rainfall events. This is consistent with climate conditions whereby the regional potential evapotranspiration (1,150 mm/year) far exceeds the low (257 mm/year) annual rainfall, with most light rainfall events lost returned to atmosphere through the high rate of evaporation.

Groundwater flowing beneath the TSF site is inferred to ultimately discharge to Lake Yindarlgooda, (~7 km north). An estimate of the seepage time from the TSF site to Lake Yindarlgooda was calculated by CMW (2021b) using Darcy's Law of linear groundwater velocity. The groundwater linear velocity is estimated at 0.9 m/year, and the groundwater transport time from site to Lake Yindarlgooda is indicated to be approximately 7,000 years.

CMW (2021b) consider groundwater discharge at Lake Yindarlgooda is unlikely to occur as baseflow, rather groundwater will be lost through evapotranspiration at the playas (due to capillary rise) where the water table surface approaches the surface, leading to further concentration of transported salts, and salinities in the hundreds of thousands of mg/L TDS.

At the TSF site, some groundwater mounding may occur due to minor seepage through the low- permeability TSF liner. The groundwater mounding will locally result in a minor radial component of groundwater flow away from the mound due to the modified hydraulic gradients, however, in the context of overall flow, the regional groundwater flow to the north will nevertheless be preserved (CMW 2021b).

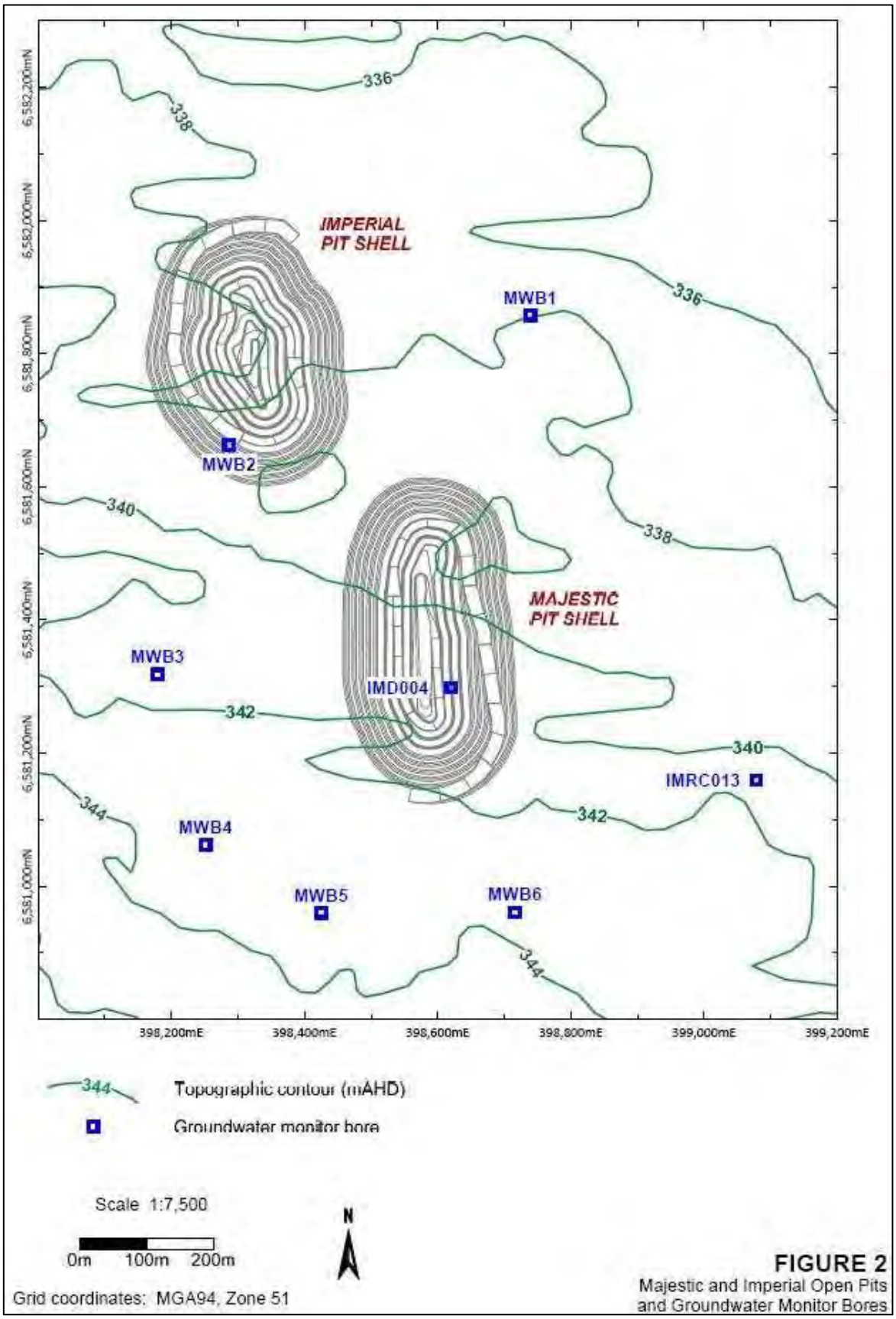


Figure 26: Location of the monitoring bores at Majestic

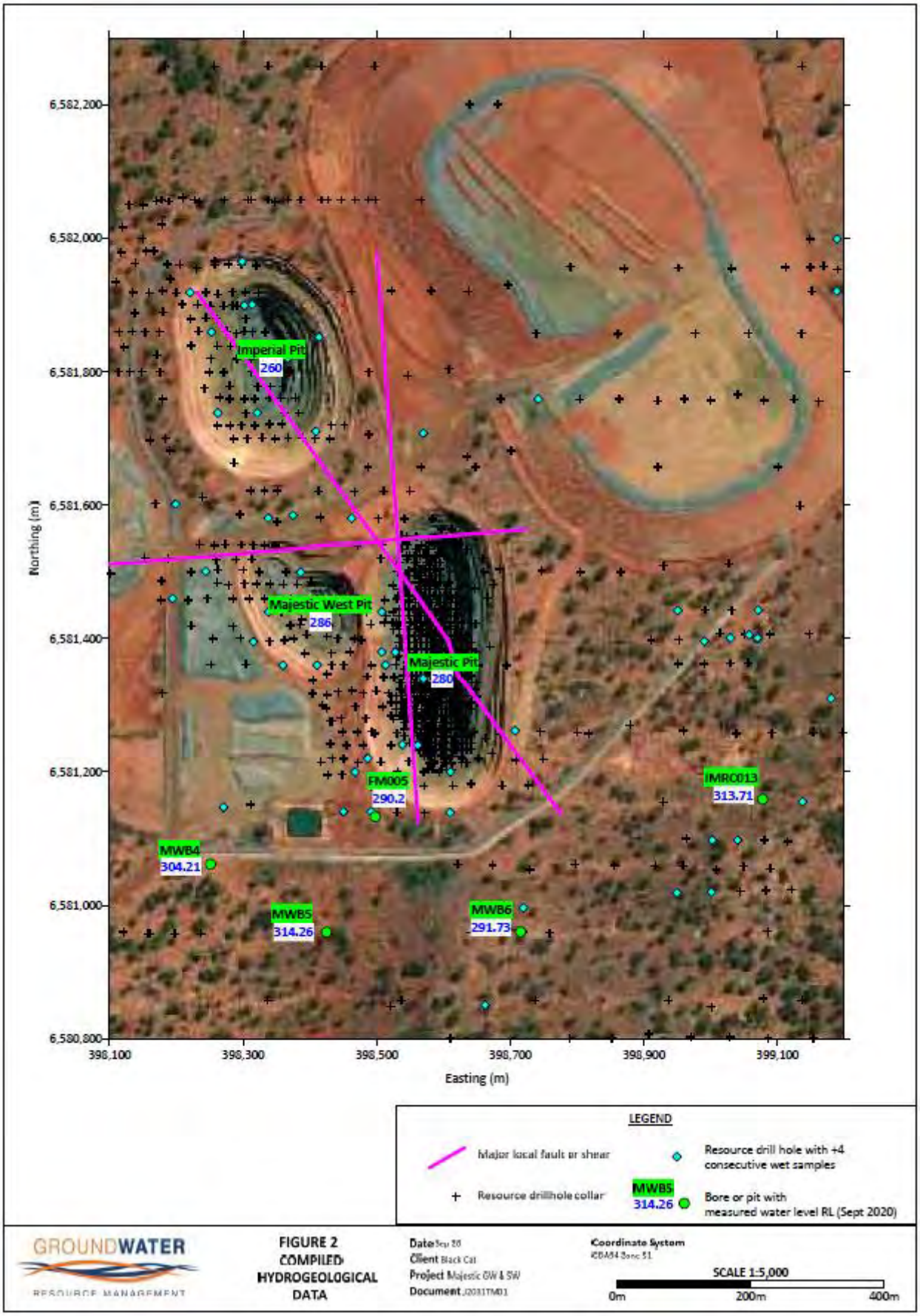


Figure 27: Monitoring Bore Data (from GRM 2020b)

11.8.4 Water Supply

11.8.4.1 Groundwater Quality

Groundwater quality analyses from the seven bores at the Project (as presented in Figure 27) sampled in 2012 (i.e. pre-mining) is shown in Table 19.

All of the groundwater samples are acidic, with pH in the range 3.5 to 6.2. TDS concentrations range between 42,000 mg/L and 70,100 mg/L.

While the groundwater from the Majestic and Imperial sites is saline, it is significantly less saline than the hypersaline groundwater associated with the Tertiary paleochannel aquifers to the north which is at least 200,000 mg/L (Commander et al. 1992).

Groundwater quality is not unusual for saline groundwater samples collected in the Eastern Goldfields. Notable results include:

- Relatively high aluminium concentrations in some samples (maximum 282 mg/L); and
- High ferrous ion concentration (148 mg/L) in the sample from IMRC013.

Groundwater quality from the Majestic and Imperial pits (from Reg ID 76251) is shown in Table 21Table .

Groundwater quality from the four boreholes constructed as part of the CMW (2021b) assessment is provided in Table 22.

Consistent with previous groundwater analyses, groundwater salinity is high, with TDS ranging from 34,600 mg/L (typical of seawater) to 84,000 mg/L, considered hypersaline. These high levels of salinity typify groundwater in many semi-arid and arid regions where recharge rates are low, and groundwater residence times within aquifers are very long.

Laboratory pH values vary significantly, from acidic through to basic, and it is noted that these results may be slightly affected by the necessary longer travel times from field to lab. However, taking into consideration regional variation (as reported in Kern, 2016) the range is not considered implausible.

Metals are generally low, and cyanide was not detected for all samples.

Petroleum hydrocarbon concentrations are low, and in all cases below 1 mg/L (1000 µg/L). Aromatic hydrocarbons (represented as BTEXN) were all below detect, except one instance of toluene (BH03) at 3 µg/L.

Table 20: Results of Laboratory Analysis of Groundwater Samples (pre-mining)

Analyte grouping/Analyte	MWB1	MWB2	MWB3	MWB4	MWB5	MWB6	IMRC013
pH	4.28	3.49	4.19	3.75	3.58	6.16	4.12
Total Dissolved Salts @180°C (mg/L)	52500	56300	55700	59000	70100	51100	42000
Suspended Solids (mg/L)	5400	7820	632	11100	8880	3110	472
Sodium (mg/L)	14100	17700	17400	15800	20100	13000	13000
Potassium (mg/L)	79	94	138	125	115	94	78
Calcium (mg/L)	319	339	706	438	444	546	261
Magnesium (mg/L)	1380	1880	2060	1890	2400	1920	1440
Chloride (mg/L)	24000	28400	27500	28300	34700	23500	21900
Sulphate as SO4 Turbidimetric (mg/L)	2990	3710	3070	3520	3530	2620	2070
Carbonate Alkalinity as CaCO3 (mg/L)	<1	<1	<1	<1	<1	<1	<1
Bicarbonate Alkalinity as CaCO3 (mg/L)	<1	<1	<1	<1	<1	37	<1
Hydroxide Alkalinity as CaCO3 (mg/L)	<1	<1	<1	<1	<1	<1	<1
Total Alkalinity as CaCO3 (mg/L)	<1	<1	<1	<1	<1	37	<1
Nitrite as N (mg/L)	<0.01	<0.01	0.01	<0.01	<0.01	0.02	<0.01
Nitrate as N (mg/L)	0.01	0.01	0.06	0.03	0.15	3.34	0.05
Nitrite + Nitrate as N (mg/L)	0.01	0.01	0.07	0.03	0.15	3.36	0.05
Silicon (mg/L)	28.8	45.3	30.4	32.9	34.4	24.2	17.7
Reactive Phosphorus as P (mg/L)	0.01	0.06	<0.01	0.02	0.03	<0.01	0.02
Free Cyanide (mg/L)	<0.040	<0.020	<0.020	<0.040	<0.040	<0.020	<0.020
Ammonia as N (mg/L)	<0.10	0.18	0.29	0.28	0.39	<0.10	2.63
Aluminium (mg/L)	31.8	164	37.5	203	128	0.12	31.7
Arsenic (mg/L)	<0.010	<0.001	<0.001	<0.010	<0.001	<0.001	<0.001
Cadmium (mg/L)	0.0028	0.0007	0.0048	0.0056	0.0029	0.002	0.0005
Chromium (mg/L)	<0.010	0.003	<0.001	0.013	<0.001	<0.001	<0.001
Copper (mg/L)	0.295	1.4	0.305	0.703	0.297	0.034	0.074
Ferrous Iron (mg/L)	4.16	0.65	1.07	27	0.2	0.87	148
Lead (mg/L)	<0.010	0.01	0.009	0.036	0.021	<0.001	0.006
Manganese (mg/L)	14.7	1.84	19.6	24.4	5.03	5.15	0.995
Nickel (mg/L)	0.165	0.156	0.433	0.779	0.261	0.085	0.09
Selenium (mg/L)	<0.10	<0.01	<0.01	<0.10	<0.01	<0.01	<0.01
Uranium (mg/L)	<0.010	0.022	0.006	0.013	0.016	<0.001	0.001
Zinc (mg/L)	0.178	0.234	0.406	1.12	0.459	0.065	0.162
Mercury (mg/L)	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Total Anions (meq/L)	739	878	840	872	1050	718	661
Total Cations (meq/L)	745	944	965	868	1100	753	699
Ionic Balance (%)	0.36	3.58	6.94	0.23	2.06	2.36	2.79

Table 21: Groundwater quality from the Majestic and Imperial pits

Analyte grouping/Analyte	Majestic Pit	Imperial Pit
pH	6.8	7.4
TDS	106000	109000
CL	57300	54800
SO4	5760	5830
HCO3	203	225
Alkalinity	203	225
CaCO3	15000	13800
Al	BDL	BDL
As	BDL	BDL
Mn	1.64	1.27
Fe	BDL	BDL
Ca	958	817
Mg	3060	2860
Na	28300	25800
K	167	139
N	BL	BL
NO3	0.84	BL

BDL – below detection limit

Table 22: Groundwater quality from boreholes surrounding the proposed TSF

Analyte grouping/Analyte	BH01	BH02	BH03	BH04
pH	7.43	3.85	12.3	7.77
Total Dissolved Salts @180°C (mg/L)	75,400	64,700	34,600	84,000
Total Cyanide (CN) (mg/L)	<0.04	<0.04	<0.04	<0.04
Free CN (mg/L)	<0.04	<0.04	<0.04	<0.04
WAD CN (mg/L)	<0.04	<0.04	<0.04	<0.04
Sodium (mg/L)	22,600	16,600	13,200	23,700
Potassium (mg/L)	190	131	536	169
Calcium (mg/L)	736	579	745	747
Magnesium (mg/L)	2,710	2,840	<1	3,110
Chloride (mg/L)	32,800	27,900	19,300	36,000
Sulphate as SO4 (mg/L)	4,600	3,990	108	4,640
Carbonate Alkalinity as CaCO3 (mg/L)	<1	<1	509	<1
Bicarbonate Alkalinity as CaCO3 (mg/L)	237	<1	<1	110
Hydroxide Alkalinity as CaCO3 (mg/L)	<1	<1	1,460	<1
Total Alkalinity as CaCO3 (mg/L)	237	<1	1,970	110
Arsenic (mg/L)	<0.010	0.012	0.008	<0.010
Barium (mg/L)	0.115	0.123	6.69	0.083
Beyllium (mg/L)	<0.010	0.020	<0.005	<0.010
Boron (mg/L)	7.80	10.0	<0.25	9.02
Cadmium (mg/L)	<0.010	0.0035	<0.0005	0.002

Analyte grouping/Analyte	BH01	BH02	BH03	BH04
Chromium (mg/L)	<0.010	0.015	0.082	<0.010
Cobalt (mg/L)	<0.010	0.632	0.011	0.174
Copper (mg/L)	<0.010	0.090	0.058	0.056
Iron (mg/L)	<0.50	7.58	14.6	1.86
Lead (mg/L)	<0.010	0.017	0.012	<0.010
Manganese (mg/L)	1.61	13.5	0.548	12.0
Mercury (mg/L)	<0.0002	<0.0002	<0.0002	<0.0002
Nickel (mg/L)	<0.010	0.435	0.017	0.110
Selenium (mg/L)	<0.10	<0.10	<0.05	<0.10
Vanadium (mg/L)	<0.10	<0.10	0.06	<0.10
Zinc (mg/L)	<0.052	1.22	0.378	0.165
Total Recoverable Hydrocarbons (TRH)				
C6 – C10 (µg/L)	<20	30	880	<20
C6 – C10 minus BTEX (µg/L)	<20	30	880	<20
>C10 – C16 (µg/L)	<100	<100	460	<100
>C16 – C34 (µg/L)	<100	170	450	<100
>C34 – C40 (µg/L)	<100	<100	<100	<100
>C10 – C40 Sum (µg/L)	<100	170	910	<100
>C10 – C40 minus naphthalene (µg/L)	<100	<100	460	<100
BTEXN				
Benzene	<1	<1	<1	<1
Toluene	<2	<2	3	<2
Ethylbenzene	<2	<2	<2	<2
Meta and para xylene	<2	<2	<2	<2
Ortho-xylene	<2	<2	<2	<2
Total xylenes	<2	<2	<2	<2
Sum of BTEX	<1	<1	3	<1
Naphthalene	<5	<5	<5	<5

11.8.5 Environmental values and beneficial uses

A search of the DWER Water Information Reporting database indicates there are no users of the groundwater resources within 5 km of the open pits. There are two production bores located over 10 km to the northwest of the Project located in the southern-most palaeochannel aquifer near Lake Yindarlgooda and a GWL ~6km east of the Project. Both of these areas are located in different aquifers (palaeochannel – fractured rock) compared to the 'Combined - Fractured Rock West - Fractured Rock' of the Project area.

There are no known ecosystems that depend on the saline groundwater in the bedrock aquifer that occurs in the Imperial / Majestic Open Pits (Peter Clifton & Associates 2017).

The Majestic Timber Reserve (managed by DBCA) is located south of the Project. Given the saline groundwater quality, the only potential receptor is the Hampton Hill Pastoral station, which due to the hypersaline nature of the groundwater, sources water from pastoral dams located outside of the Project area.

11.9 Biodiversity

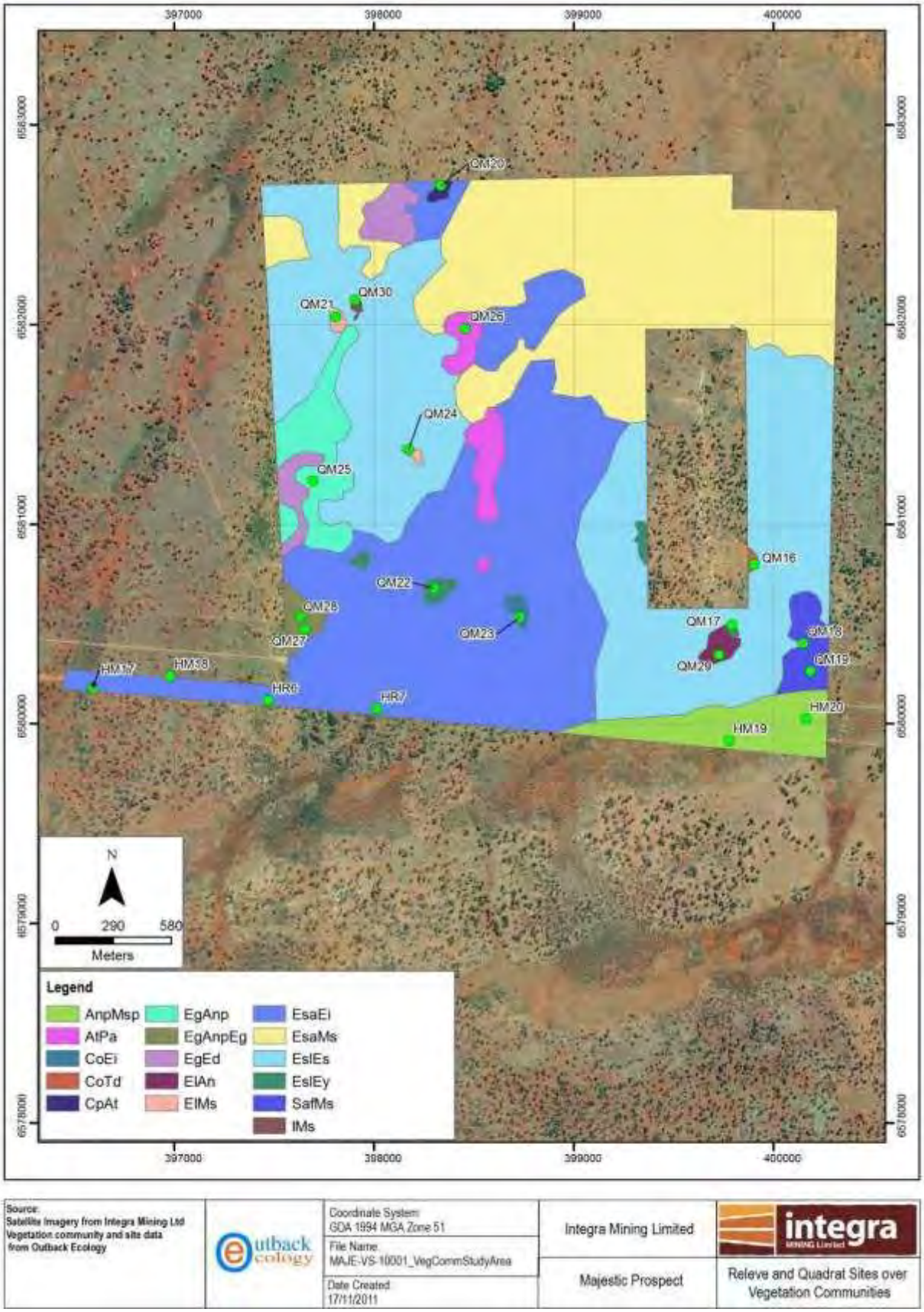
11.9.1 Vegetation

The Project area was identified as occurring in Beard Vegetation Association No. 468 – 'Medium woodland; salmon gum & goldfields blackbutt', which currently has approximately 100% of the pre- European extent remaining (Government of Western Australia 2010). The condition of the vegetation across the Study area was assessed using the Keighery (1994) Vegetation Condition Scale. Vegetation condition varied from 'Degraded' to 'Very Good' (majority of communities) to 'Excellent' with the upper storey structure generally remaining intact. Most of the Study area has been impacted by exploration drilling related activity, however, in most circumstances the vegetation condition was recorded as 'Very Good'.

Initial survey work completed in 2011 identified 27 vegetation associations recorded in the vicinity of the Majestic Prospect (Figure 28).

No Threatened Ecological Communities (TEC) or Priority Ecological Communities (PEC) were listed under the Environmental Protection and Biodiversity Conservation Act 1999 (Cth) (EPBC Act 1999) or with the Department of Environment and Conservation (now DPaW) were recorded in the Study area. No groundwater dependent ecosystems were identified during the vegetation and flora survey completed for the Project area (OES 2011b).

The entire Study Area has been affected by consistent heavy grazing from goats, sheep and rabbits, altering the vegetation composition and structure, particularly the shrub, herb and grass strata. There was evidence of historical timber harvesting in most of the Study area and this was particularly evident within the community EslEy (dominated by Eucalyptus salubris). A number of vehicle tracks also dissect the surveyed area (OES 2011b).



Source: Satellite Imagery from Integra Mining Ltd Vegetation community and site data from Outback Ecology	outback ecology	Coordinate System GDA 1994 MGA Zone 51 File Name MAJE-VS-10001_VegCommStudyArea Date Created 17/11/2011	Integra Mining Limited Majestic Prospect	integra MINING Limited Releve and Quadrat Sites over Vegetation Communities

Figure 28: Vegetation units – Majestic Project Area (Outback Ecology 2011)

11.9.2 Flora

A Level 2 flora and vegetation survey of the Project area and Level 1 vegetation and flora survey of the original haul road area (L25/23) was completed in 2011.

A total of 121 plant taxa (including subspecies and varieties) from 30 families and 65 genera were identified during the survey. This included four specimens that could not be identified to species level.

No Threatened or Priority Flora was recorded within the Study area (OES 2011b).

Eight weed species were recorded in the Study area – none of which are Weeds of National Significance. All naturalized taxa were recorded from the more disturbed areas of the Study area, particularly in roadside drainage (DEC 2011a; OES 2011b).

Only *Marrubium vulgare (Horehound) is currently listed as a C3 declared pest (s22) under the West Australian Organism List (under the Biosecurity and Agricultural Management Act, 2007). Pests assigned to this category are established in Western Australia and if it is feasible, or desirable, management is required in order to limit their damage. Control measures can prevent a C3 pest from increasing in population size or density or moving from an area in which it is established into an area which currently is free of that pest (Department of Agriculture & Food).

11.9.3 Terrestrial fauna

A terrestrial fauna survey was undertaken for the Project area by Terrestrial Ecosystems (2010).

The fauna survey identified one broad fauna habitat type for the Project area, which is described as 'open eucalypt woodland with a mixed understory of scattered shrub and chenopods'. There were variations in the densities of trees, shrubs and ground cover, but these differences were not sufficient to support a significantly different fauna habitat assemblage (Terrestrial Ecosystems 2010).

The majority of the Project area was in good condition. However, a portion of the central area has been extensively disturbed by recent exploration drilling. Although disturbed, it was considered reasonable to presume that the vertebrate fauna in this area would be similar to that in the adjacent surveyed area (Terrestrial Ecosystems 2010).

Twenty-three species are listed under the EPBC Act 1999 and/or the Wildlife Conservation Act 1950 (WA) (WC Act 1950), as potentially occurring within the bioregion. Eleven of these species are considered potentially or likely to occur in the vicinity of the Project area, though none were recorded in the field survey (Terrestrial Ecosystems 2010).

11.9.4 Short-Range Endemics (SRE)

A desktop assessment of SREs species within the Project area was completed by Bennelongia in 2011 following the collection of two potential SRE species (Urodacus 'majestic' and Aname 'MYG213') during the terrestrial fauna survey completed by Terrestrial Ecosystems (2010).

Increased moisture holding capacity and shade are the two features that represent more favourable habitat for SRE species. Watercourses at the Project are represented by first order tributaries of Boundary Creek. These watercourses will have greater moisture holding capacity than the surrounding land, particularly following rains. A key feature of watercourses is that the soil is softer and hence more appealing to burrowing species (i.e. the scorpion Urodacus and spider Aname), particularly when juveniles are establishing burrows. Shaded areas with leaf litter that occur under vegetation stands (which are favoured by these burrowing species) are ubiquitous in the surrounding areas for many tens of kilometres. Crucially, however, watercourses and vegetation stand are not restricted in the vicinity of the Project and occur for many kilometres beyond the tenement boundaries (Bennelongia 2011).

As both Urodacus 'majestic' and Aname `MYG213` belong to genera that are known to contain SREs and are very speciose, the status of these species as SREs cannot be confirmed or dismissed based on taxonomic classification. However based on the habitat in which the species were collected (continuous for many kilometres beyond the impact footprint), it is unlikely that these species have ranges restricted to the vicinity of the Project area, although they may qualify as SREs under current criteria and EPA guidelines for SREs (Harvey 2002; EPA 2009) (Bennelongia 2011).

Irrespective of the status of Urodacus 'majestic' and Aname `MYG213`, the spatial extent of the impacts associated with mining at the Majestic Prospect will be very small at the scale on which both species are likely to be distributed. Thus, the spatial extent of impact footprint is several orders of magnitude less than the likely range of SRE species. Harvey (2002) defined SREs as species with ranges <1,000,000 ha, although many species do have ranges considerably smaller than this (Bennelongia 2011).

No further SRE investigations, including field surveys, were recommended due to the low threat to SRE habitat and potential species existing in the Project area (Bennelongia 2011).

11.9.5 Subterranean fauna

A desktop assessment was undertaken to assess the potential for subterranean fauna to occur in the vicinity of the Project with the objective to assess the risk of the proposed mining operations to subterranean fauna. In order to address the objective, literature reviews and database searches were undertaken to characterise the subterranean fauna and potential habitat of the area (OES 2012a).

Previous subterranean fauna surveys in the southern and south-eastern Yilgarn region, specifically within the Coolgardie bioregion, have been limited. A pilot stygofauna survey was completed for the Randalls Project Area in July 2008. Of the surveys conducted, stygofauna have generally been absent or present in low diversities. The few troglofauna surveys carried out have typically yielded a low number of taxa (OES 2012a).

Stygofauna communities within the region appear to favour calcrete, alluvium and banded ironstone formations, all which are limited in the Project area, which is dominated by clays and granites. Based on the findings of these studies and the local hydrogeology, the probability of the Project area having significant stygofauna values is considered to be low. This can be attributed to the hypersaline, acidic groundwater coupled with the unsuitable geological characteristics within the saturated strata (OES 2012a).

Drill core lengths from the Project area appear to lack the required vugs and voids within the vadose zone that would support rich troglofaunal communities. The local geology predominately consists of clays and granite/tonalite rock content which does not represent significant troglofauna habitat due to the absence of interstitial spaces (OES 2012a).

[redacted]

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APPENDICES

Appendix A – TSF Design Report

Appendix B - Surface Hydrology Report (Hyd2o Hydrology 2012)

Appendix C - Surface Hydrology Report (Groundwater Resource Management 2020)

Appendix D – TSF Hydraulic Analyses (Groundwater Resource Management 2021)

Appendix E - Groundwater Hydrology Report (Peter Clifton & Associates 2012)

Appendix F - Groundwater Technical Memorandum (Groundwater Resource Management 2020)

Appendix G - Tailings Storage Facility Hydrogeological Assessment (CMW 2021b)

Appendix H – Third Party TSF Design Review

Appendix I – TSF Certification of Compliance