Application for Works Approval

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

Works Approval Number	W6751/2022/1
Applicant	Anax Metals Limited
ACN	106 304 787
File number	DER2022/000520
Premises	Whim Creek Copper Project Mining Leases M47/236, M47/237, M47/238, M47/443 North Coastal Highway WHIM CREEK WA 6718 As defined by the coordinates in Schedule 1 of the works approval As defined by the premises maps attached to the issued works approval
Date of report	25/05/2023
Decision	Works approval granted

Alana Kidd

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Alana Kidd
Manager, Resource Industries
an officer delegated under section 20 of the *Environmental Protection Act 1986* (WA)

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1. Decision summary

This decision report documents the assessment of potential risks to the environment and public health from emissions and discharges during the construction and operation of the premises. As a result of this assessment, works approval W6751/2022/1 has been granted.

2. Scope of assessment

2.1 Regulatory framework

In completing the assessment documented in this decision report, the Department of Water and Environmental Regulation (the department; DWER) has considered and given due regard to its regulatory framework and relevant policy documents which are available at https://dwer.wa.gov.au/regulatory-documents.

2.2 Application summary and overview of premises

On 03 October 2022, the applicant submitted an application for a works approval to the department under section 54 of the *Environmental Protection Act 1986* (EP Act).

The premises is located approximately 84 km east of Roebourne. The Whim Creek Copper Project is undergoing construction in two stages, Stage 1 and Stage 2.

The application is to undertake construction works for a Conventional Floatation Processing Plant and a three cell In-Pit Tailings Storage Facility (In-Pit TSF) at the premises, which is Stage 2.

This is a brownfields site and is currently in Care and Maintenance. Information on the Environmental Protection Notice (EPN) issued for this site is shown in Section 3.

The Applicant proposes to construct and commission metallic ore processing facilities, In-Pit TSF and support infrastructure to produce separate copper, lead and zinc concentrates.

This works approval is for Stage 2, which includes the following activities:

- Installation of a Conventional Flotation Processing Plant (400,000 tpa) (Concentrator) which will produce separate copper, lead and zinc concentrates;
- A three-cell In-Pit TSF;
- Installation of a pipeline to deliver tailings to the TSF and to deliver tailings decant water back to the processing plant for use in processing;
- Installation of a pipeline to deliver water from dewatering the Whim Creek open pit to the processing plant for use in processing; and
- Infrastructure upgrades to the Processing Plant and refurbishment of support facilities.

The premises relates to the categories and assessed production / design capacity under Schedule 1 of the *Environmental Protection Regulations 1987* (EP Regulations) which are defined in works approval W6751/2022/1. The infrastructure and equipment relating to the premises category and any associated activities which the department has considered in line with *Guideline: Risk Assessments* (DWER 2020) are outlined in works approval W6751/2022/1.

Works Approval W6707/2022/1 Stage 1

On 29 April 2022, the applicant submitted an application for a works approval to the department under section 54 of the *Environmental Protection Act 1986* (EP Act).

Works Approval W6707/2022/1 was issued on the 18 November 2022 and is for the following

activities:

- Crushing, sorting and agglomeration of ore;
- Placing the agglomerated ore on the heap leach pad;
- Refurbishment of the existing crushing circuit, including agglomerator;
- Refurbishment of the existing Solvent Extraction and Electrowinning (SX-EW) circuit;
- Installation of ore sorters to produce a high-grade copper pre-concentrate;
- Construction of a new 120-room accommodation village and installation of an associated Wastewater Treatment Plant (WWTP);
- Construction of a landfill in the Whim Creek Waste Rock Landform (WRL);
- Infrastructure upgrades to the processing plant and refurbishment of support facilities; and
- Installation of a pipeline to deliver water from dewatering the Mons Cupri Pit to the plant for use in processing.

Stage 1 infrastructure is not included in this works approval assessment as it has been assessed under W6707/2022/1.

The following infrastructure is assessed under this works approval and is included as Stage 2.

2.2.1 Concentrator

The Concentrator is designed to process up to 400,000 tonnes per annum of ore to produce separate copper, lead and zinc concentrates and up to 300,000 tonnes per annum dry of a barren tailings stream.

Refer to Figure 1 for the Whim Creek Process Flowsheet and Figure 2 for the Concentrator Process Flowsheet.

Flotation

The flotation circuit is configured to sequentially recover copper, lead and zinc sulphide concentrates. In the sequential stages, chalcopyrite (copper bearing minerals) will be separated from the galena, sphalerite, pyrite and gangue minerals. In the second stage, galena (lead bearing minerals) will be separated from the sphalerite, pyrite and gangue minerals and in the third stage sphalerite (zinc bearing minerals) will be separated from the pyrite and gangue minerals.

The flotation circuit will be elevated to maximise gravity flow of slurry between cells while minimising pumping requirements. The bunded concrete floor for each flotation circuit will be sloped to either of two pump sumps to aid clean up. The pumps will direct recovered material to either the tailings thickener or copper and zinc conditioning tanks.

Final copper, lead and zinc concentrates from the copper, lead and zinc cleaner flotation cells will be pumped to the copper, lead and zinc concentrate filter feed tanks and tailings will report to the copper, lead and zinc circuits, respectively.

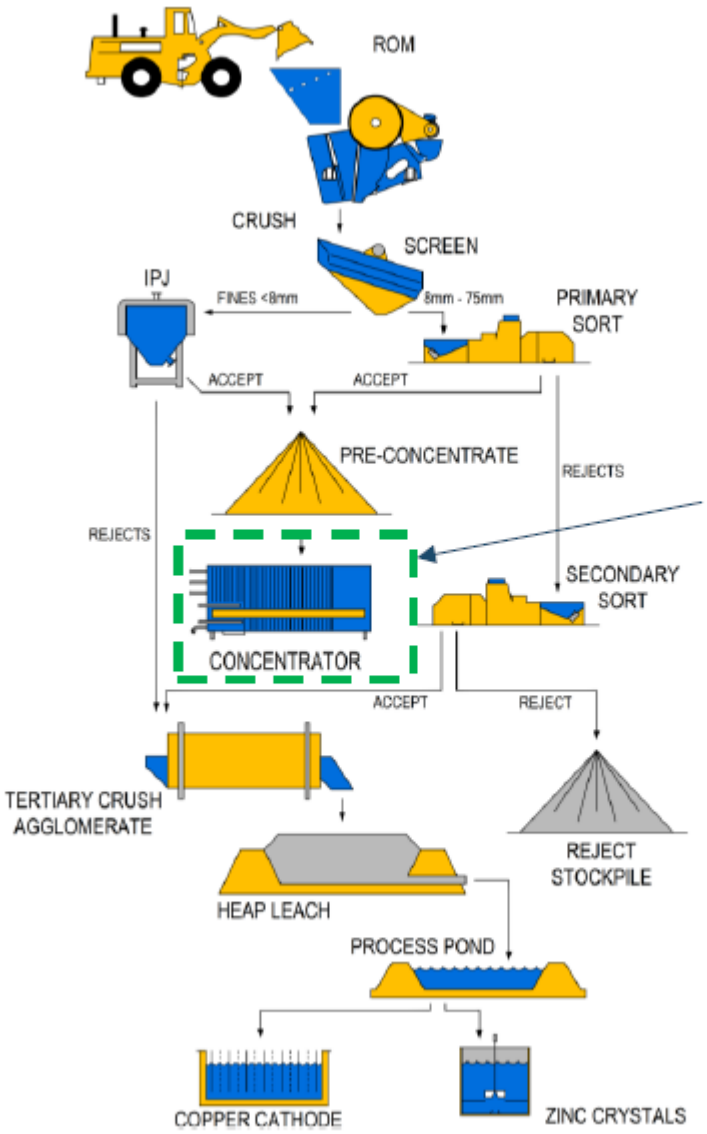

Figure 2

Figure 1: Whim Creek Process Flowsheet

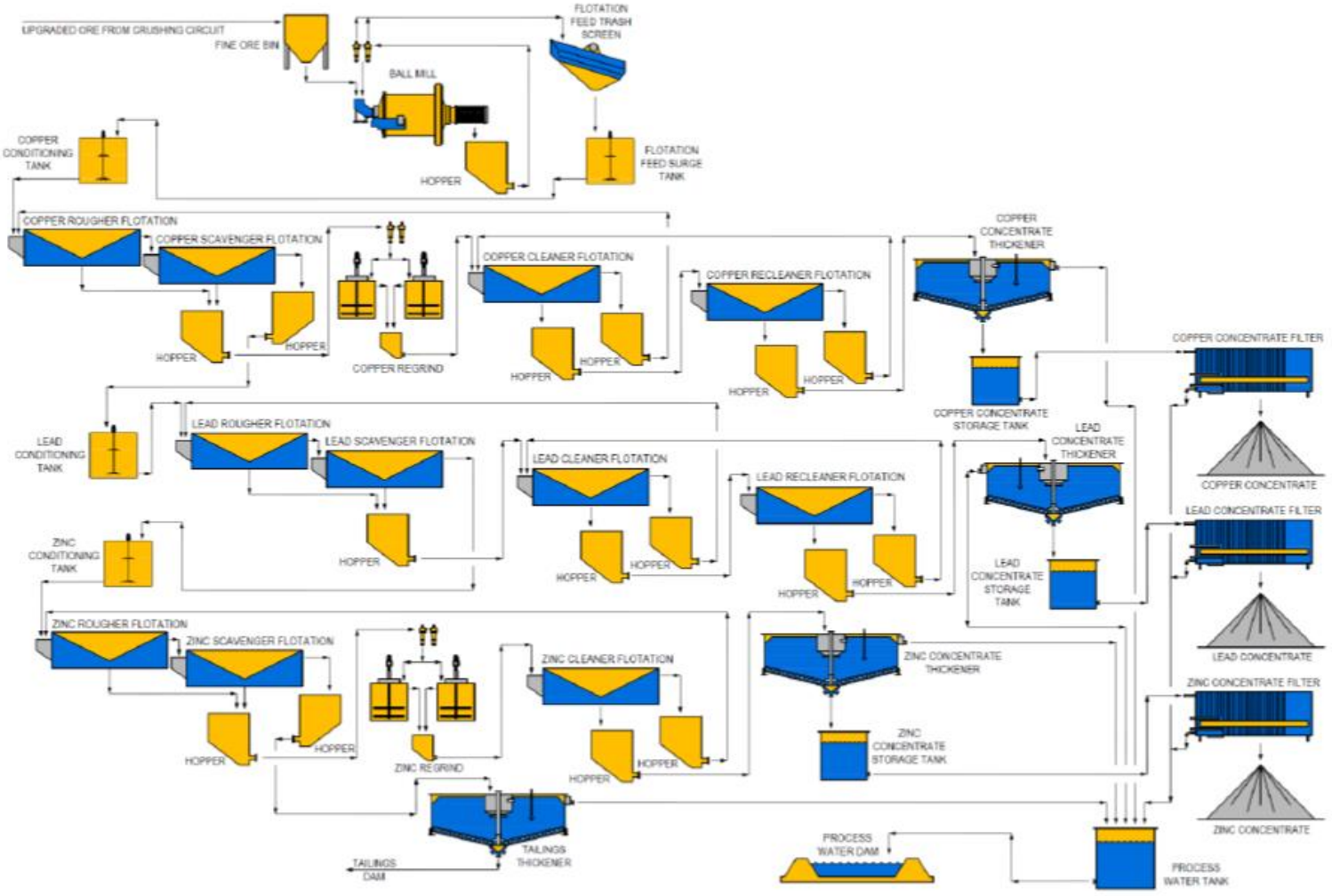

Figure 2: Concentrator Process Flowsheet

Concentrate Thickening

Copper, lead and zinc concentrate slurry from each clean circuit will be mixed with flocculant and then pumped to a high-rate thickener. Thickener underflow from each circuit will be pumped at 60 - 65% solids by weight to an agitated copper, lead and zinc concentrate storage tank. The copper, lead and zinc overflow will gravitate to each circuit water tank for recycling to the copper, lead and zinc flotation circuit. Surplus water will be returned to the process water tank.

Reagents and Services

A number of reagents will be used within the Concentrator, and these are shown in Table 1.

Table 1: Reagents used in the Concentrator

Reagents	Concentrator Use
Hydrated Lime	Supplied in bulk tankers and transferred pneumatically into a 250-tonne capacity silo. This will be mixed to 15% slurry and pumped via a ring main for distribution to the plant
Sodium Metabisulphite	Supplied in 1 tonne bulk bags. This will be mixed with raw water to a 15% solution and transferred from the mixing tank to a storage and distribution tank for distribution to the processing circuit by a controlled dosing system.
A3894 Copper Collector	Received in 1 m^3 IBCs and distributed by a controlled dosing system to the copper flotation circuit.
Methyl Isobutyl Carbinol	Methyl Iso Butyl Carbinol will be supplied in 1 m^3 IBCs as a 100% concentrated solution. This will be distributed by a dosing system to the copper and zinc flotation circuits
Sodium Iso Butyl Xanthate (Zinc Collector)	Supplied in 900 kg bulk bags. This will be mixed to a 15% solution and transferred from the mixing tank to a storage tank and then distributed by a controlled dosing system
Copper Sulphate (Activator)	Supplied in 1,200 kg bulk bags in crystal form. This will be mixed to a 15% solution and transferred from the mixing tank to a storage and distribution tank for controlled distribution to the processing circuit
Flocculant	Supplied in powder form in 25 kg bags. The flocculant mixing system will be a packaged plant consisting of a dry flocculant hopper feed and wetting system, mixing tank, transfer pump and storage tank. Flocculant will be mixed with raw water on a batch basis and distributed to the thickeners
Caustic (sodium hydroxide)	Supplied in 1 tonne bulk bags, mixed to a 50% solution and pumped to the process water treatment plant. Sulphuric acid. If required for water treatment will be supplied in 1 m^3 IBCs.

2.2.2 Tailings Storage Facility

The TSF will be located within the existing Mons Cupri mining area and will consist of three distinct tailings cells, as shown in Figure 3:

- The existing Mons Cupri Pit (MCIPTSF1);
- The existing Mons Cupri Northwest Pit (MCIPTSF2); and
- The embankment be constructed and the New Mons Cupri Pit (MCIPTSF3).

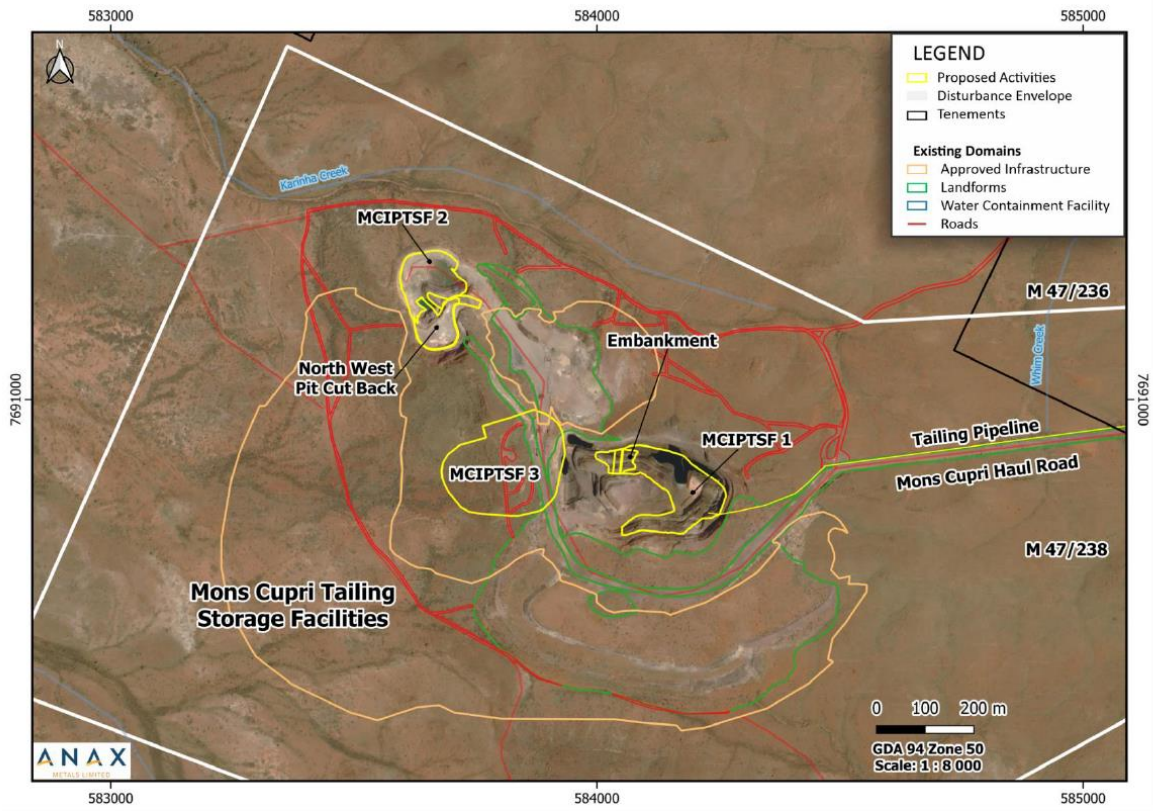

Figure 3: Mons Cupri TSF Location (MCIPTSF1, MCIPTSF2, MCIPTSF3)

The design of MCIPTSF1 and MCIPTSF2 comprises of two cells of approximately equal storage volumes to provide a tailings storage capacity of 300,000 tonnes in each cell (600,000 tonnes between the two cells).

MCIPTSF2 will be utilised initially during mining of the new Mons Cupri Pit, as no embankments are required for the pit to receive tailings. MCIPTSF1's 16.0 m embankment will be constructed during this time.

The embankment will be constructed on the northwest corner of the existing Mons Cupri Pit. The embankment will be zoned, comprising a HDPE liner over the upstream zone of low permeability roller compacted clayey borrow (Zone 1) with a downstream zone (Zone 2) of mine waste from the waste dump. The embankment foundation preparation will require removal of loose rock material on the pit walls and floor incorporates a cut-off trench excavated to a competent 'rock' layer, as directed on site in order to reduce seepage. Refer to Figure 4.

Vibrating Wire Piezometers will be installed in the embankment to monitor trends in pore pressure which can reflect seepage through the embankment. Four (4) Survey prisms will be installed on the downstream crest of the TSF embankment, which are to be monitored daily for movement.

MCIPTSF1 has been designed, and progressive construction of the embankments will be managed, to ensure rainfall from a 1 in 100 year, 72 hour event will be contained within the structure during the operational phase. The embankment has been designed with a downstream slope of approximately 22° or 1:2.5 (v:h). The downstream slopes constructed at this angle with mine waste should be resistant to erosion. Drawings of the pipeline and spigot setup are shown in Figure 5.

Once the 300,000 tonnes capacity of MCIPTSF2 has been reached, tailings will be directed to MCIPTSF1.

This site is within the long-term hydraulic capture zone of the open pit. Seepage will report to

the new Mon Cupri Sulphide Pit and the hydrogeological modelling suggests the pit will be a sink in perpetuity after the cessation of mining.

Mining at the newly proposed Mons Cupri Sulphide Pit will conclude approximately 2¼ years after the commencement of processing. At this point, tailings would be placed at the base of the newly completed Mons Cupri Sulphide Pit (MCIPTSF3) for the remainder of the operation.

Pipelines and Spigots

Thickened tailings will be pumped from the Concentrator via overland pipeline to the TSF. The deposition of tailings into MCIPTSF1 will be primarily from the northern embankment of MCIPTSF1, while MCIPTSF2 tailings deposition will be undertaken from the southern wall of MCIPTSF2. Tailings will be deposited into MCIPTSF3 from the eastern end of the new Mons Cupri Pit.

Decant Recovery

Decant water will be removed by pontoon mounted pumps and pumped to the Concentrator Process Water Pond.

Seepage Minimisation and Recovery

The volumes and quality of seepage intercepted downstream of the TSF will be monitored monthly when in production. Three monitoring bores will be installed to bedrock around the perimeter of the TSF and will be monitored for groundwater level monthly and water quality at quarterly intervals. Refer to Figure 6 TSFMW01, TSFMW02, TSFMW03.

The Applicant has determined that seepage is expected to be low and any potential seepage will report to the new Mon Cupri Sulphide Pit. The Applicant does not anticipate that seepage recovery bores will be required during operations. Trigger levels will be developed from baseline water quality sampling to detect groundwater quality changes resulting from seepage. These may be incorporate into the licensing phase. If monitoring of groundwater identifies groundwater quality changes, then further assessment by a qualified specialist will be undertaken to determine if seepage from the TSF is responsible for the changes in groundwater quality. If the assessment determines that the groundwater quality changes are a result of seepage, then a number of trigger actions will be implemented which may include the installation of new monitoring wells and/or seepage recovery bores.

Note that vegetation monitoring, in accordance with the Whim Creek Vegetation Monitoring Plan is required under condition 1 of works approval W6707/2022/1.

Note that ambient groundwater monitoring, in accordance with the Whim Creek Groundwater Monitoring Plan is required under condition 2 of works approval W6707/2022/1.

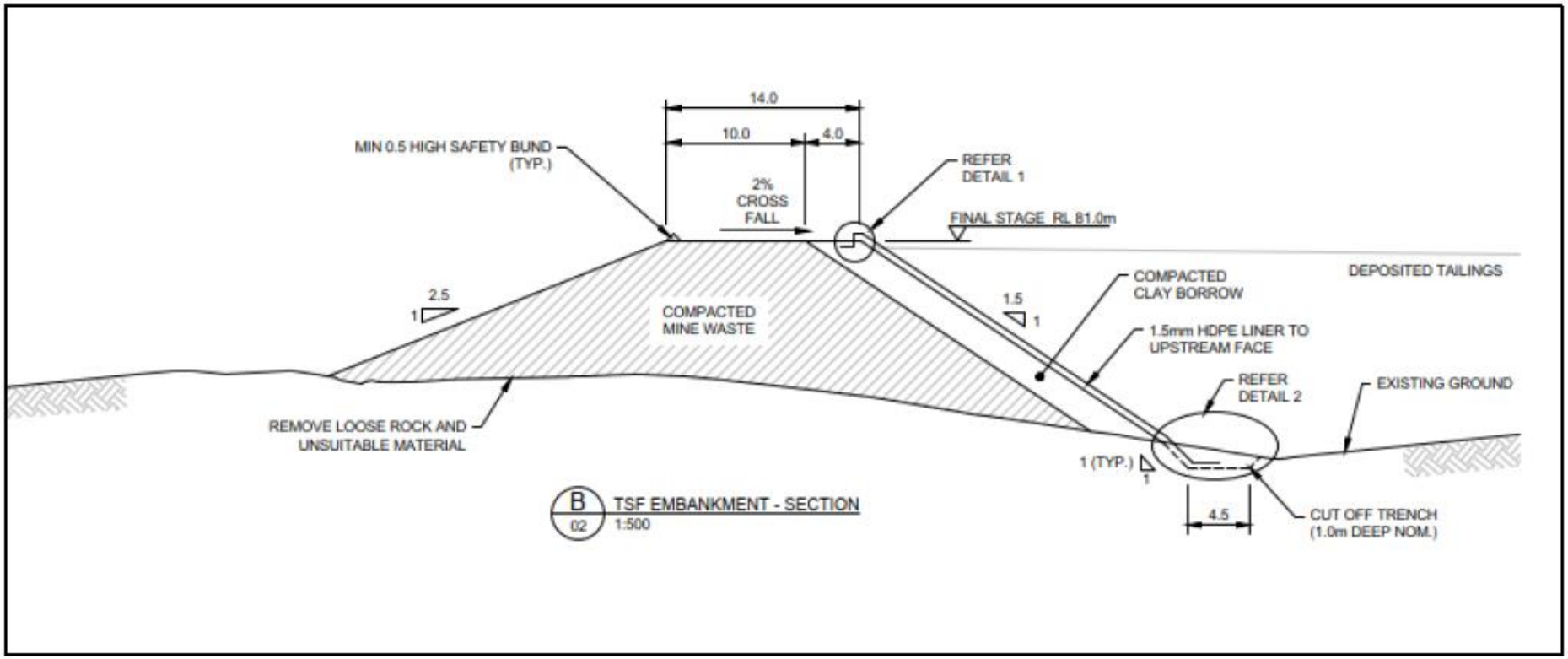

Figure 4: Typical Cross Section TSF Embankment

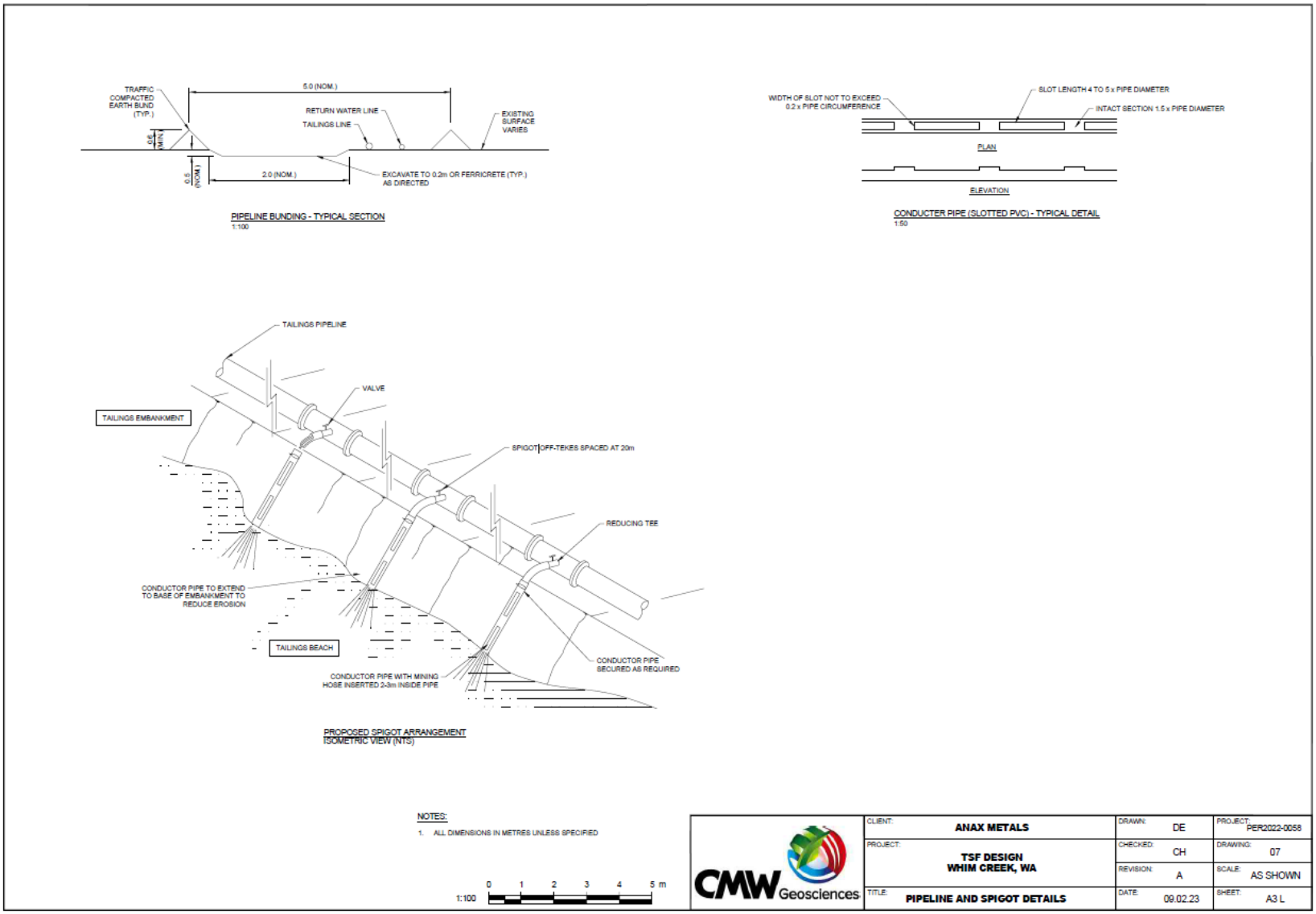

Figure 5: Pipeline and spigot details

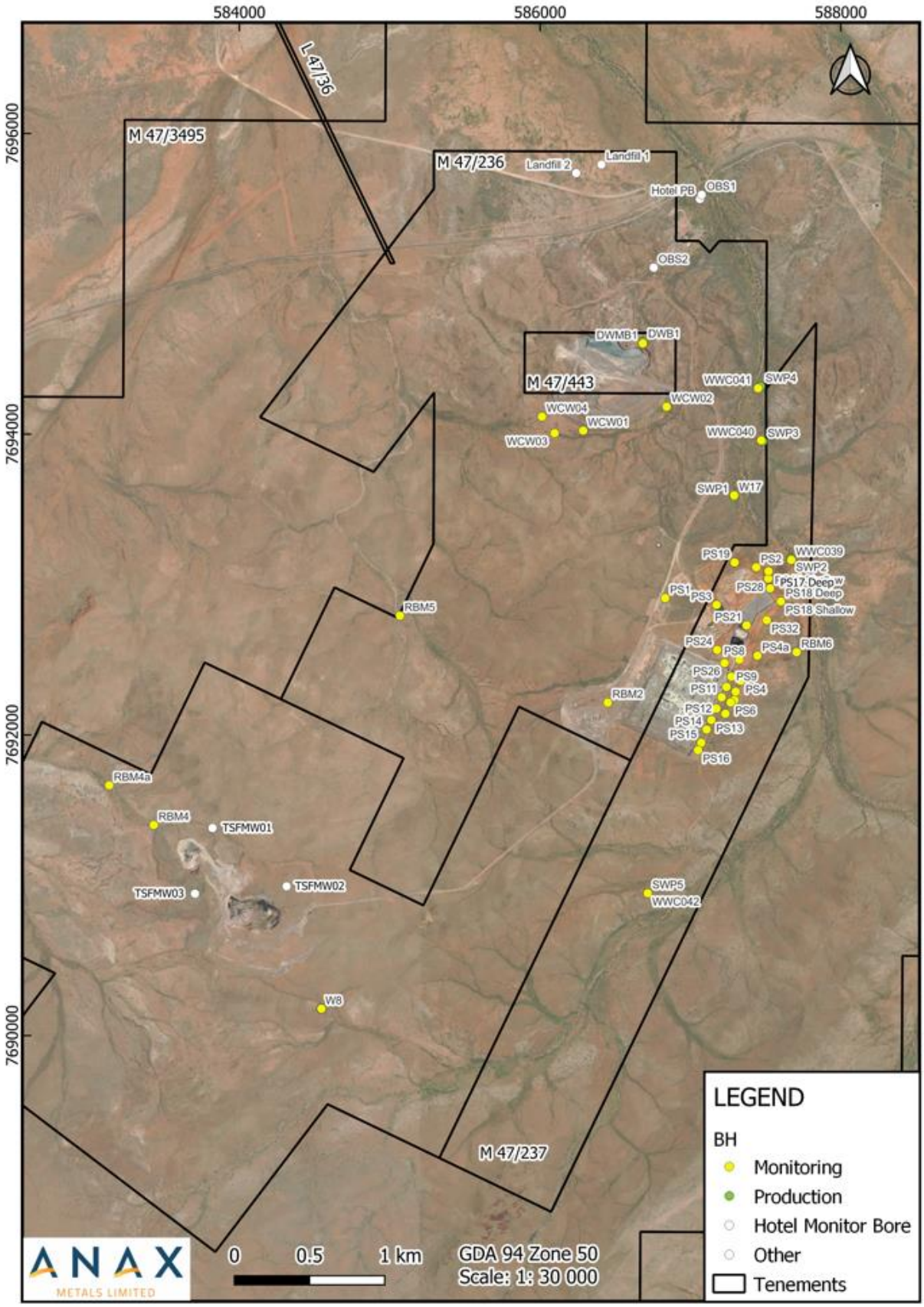

Figure 6: Project Production and Monitoring Bores

Tailings Geochemical and Physical Characterisation

Mining will occur from the Mons Cupri and Whim Creek pits resulting in two different tailings types produced, as shown in Table 2.

Table 2: Tailings Geochemical and Physical Characterization

Mons Cupri Tailings	Whim Creek Tailings
• Tailings slurry delivered to the TSF from the tailings thickener will be neutral-to-alkaline (pH 7-8) with brackish salinity of TDS 2,000 mg/L; • One tailings sample was classified as Non-Acid Forming (NAF); • One tailings sample was classified as Potentially Acid Forming – Low Capacity; • Weathering testing undertaken on a tailings sample indicated that that the moist (unsaturated) tailings solids for sample remained circumneutral (pH 6+) over the course of three months corresponding to temperatures within the range 20-30 ^{o}C; • The Mons Cupri tailings-solids samples were variously enriched in copper, zinc, cadmium, lead, silver, bismuth, arsenic, antimony, selenium and molybendum; • The tailings is classified as a low plasticity sandy clay/sandy silt and are classified as CL-ML, according to Table 10, Classification of Fine-Grained Soils in AS 1726:2017, Geotechnical Site Investigations; • The tailings had a % fines content of 90.2% and a hydraulic conductivity for the settled, consolidated tailings in the range of 10^{-8} m/s to 10^{-9} m/s; • Supernatant water release from the tailings slurry is relatively fast with the majority released within one day; and • The final in-situ dry densities are likely to be in the range of 1.60 to 1.80 t/m^3.	• Tailings slurry delivered to the TSF from the tailings thickener will be neutral-to-alkaline (pH 7-8) at TDS approximately 1,000 mg/L; • Tailings samples were classified as NAF; • The Whim Creek tailings-solids samples were variously enriched in variously enriched in arsenic, antimony, selenium, molybdenum and bismuth; • The tailings had a % fines content of 80.5% and a hydraulic conductivity for the settled, consolidated tailings in the range of 10^{-8} m/s to 10^{-9} m/s; • Supernatant water release from the tailings slurry is relatively fast with the majority released within one day; and • The final in-situ dry densities are likely to be in the range of 1.60 to 1.80 t/m^3.

Only Mons Cupri tailings are intended to be stored in MCIPTSF1 and MCIPTSF2, with all tailings produced from the processing of Whim Creek ore deposited below groundwater level in the newly created Mons Cupri Open Pit.

2.2.3 Concentrator Process Water Pond

The Concentrator Process Water Pond will be a 1.5 mm HDPE lined pond with a storage capacity of 5,000 m^3. It will receive water from the tailings thickener overflow, tailings decant return and surplus water from the copper, lead and zinc process water circuits. Raw water will be used to supplement the process water to meet demand as required. The water will be used for process dilution and plant cleaning duties in the grinding and tailings areas, including tailings line flushing. The Concentrator Process Water Pond will also receive mine dewatering water

and is located adjacent to the Concentrator.

2.2.4 Concentrate Storage & Loading Enclosed Shed

The final processing stage at the filtering tanks produces a concentrate filter cake containing minimally 10% moisture by weight. This stage occurs within the Concentrate Storage & Loading Enclosed Shed. The concentrate is then removed from the beneath the filter tanks by the Front End Loader (FEL) and stockpiled on the relevant concentrate stockpile.

Separate copper, lead and zinc concentrates will be stored within a shed constructed on a concrete bunded area. Concentrate will be loaded by FEL into stockpiles in the Concentrate Storage & Loading Enclosed Shed.

A rotainer service provider will be engaged for transport of the concentrate from Whim Creek to Port Hedland. The containers are placed on the back of suitably heavily rated vehicles. The containers are then loaded onsite in the concentrate storage shed and sealed prior to exiting the concentrate storage shed. The loaded heavy vehicles then travel through a wheel wash prior to exiting site.

The concentrate haulage route is shown in Figure 8.

2.2.5 Ambient Air Quality Monitoring

Ambient air quality monitoring will be conducted to assess air quality at the site and at the Whim Creek Hotel. The following monitoring is proposed:

- 2 x E-sampler PM_{10} dust monitors (nephelometers) named Station 1 and Station 2 to be installed. Refer to Figure 7:
  - Station 1 located between the Whim Creek pit and the Whim Creek Hotel, as close as possible to the Whim Creek Hotel; and
  - Station 2 located southeast of the Whim Creek pit, approximately 300 m from the road, to collect background data;
- Dust monitors will be light scattering units measuring PM_{10} (particulate matter 10 micrometers or less in diameter) and Station 1 will be equipped with a Speed/Direction sensor;
- Sampling of ambient air quality will comply with AS/NZS 3580.1.1.:2016 Methods for sampling and analysis of ambient air, Part 1.1: Guide to siting air monitoring equipment;
- Nephelometers will be automated, will run 24 hours a day 7 days a week, and will be equipped with their own power source;
- Nephelometers will be operated according to the manufacturer's specifications and industry best practices;
- The data will be collected electronically in real time via 4G telemetry and will be available and stored on a secure portal accessed via the internet, including meteorological data;
- The nephelometers have the ability to collect a sample on a 47mm filter. The filter will be collected monthly and analysed for metals (including Copper, Lead and Zinc) at a NATA accredited laboratory;
- Frequency of sample collection may be revised dependent on dust collection levels and limits of detection;
- Prior to commissioning of the Concentrator, real time continuous data will be collected for six months to gauge seasonal variation in wind conditions and to establish trigger levels. A three-monthly service and calibration schedule will be implemented to maintain data accuracy; and

- During commissioning and time limited operations, dust monitoring will be conducted until air quality monitoring demonstrates that air quality levels at the Whim Creek Hotel are acceptable.

Trigger levels will be established using the following methods:

- Background air quality data will be collected prior to producing concentrate to adequately determine a significant trigger level;
- Field data will be collected once the production and haulage of concentrate commences, and trigger levels will be adjusted if required; and
- Data from field sampling and lab analysis will be analysed to determine appropriate trigger levels.

Date collection:

- The E-sampler flow is calibrated every 3 months using a primary standard and is kept constant at 2 litres/minute;
- The volume of air which has passed through the filter can be calculated using the flow rate and the exposure time; and
- The filter is then analysed in the lab using the modified AS/NZS 3580.10.1:2003 Methods for sampling and analysis of ambient air Determination of particulate matter - Deposited matter - Gravimetric method (Reconfirmed 2014) method for Copper, Lead and Zinc.

Management actions in the event an exceedance of trigger levels:

- Incident investigation to confirm trigger level exceedances is valid and caused by operational activities. Investigation will focus on:
  - Collating of available weather data including wind speed and direction;
  - A site inspection will be undertaken to identify the source(s) of the elevated results relative to wind conditions, mining and haulage activities and/or inactive exposed areas at the time. The presence of non-operational dust generating activities will also be checked; and
  - Inspection of haul road and concentrate storage shed to determine if concentrate is stored and handled correctly;
- Suspension of concentrate haulage campaign if investigation determines that trigger level exceedance is likely to have been caused by haulage of concentrate;
- Water carts will be deployed as necessary;
- Exceedance registered as an in incident on the sites incident reporting system if it is determined the exceedance was likely caused by site related activities; and
- Reactivation of concentrate haulage once dust concentrations at dust monitors return to acceptable level.

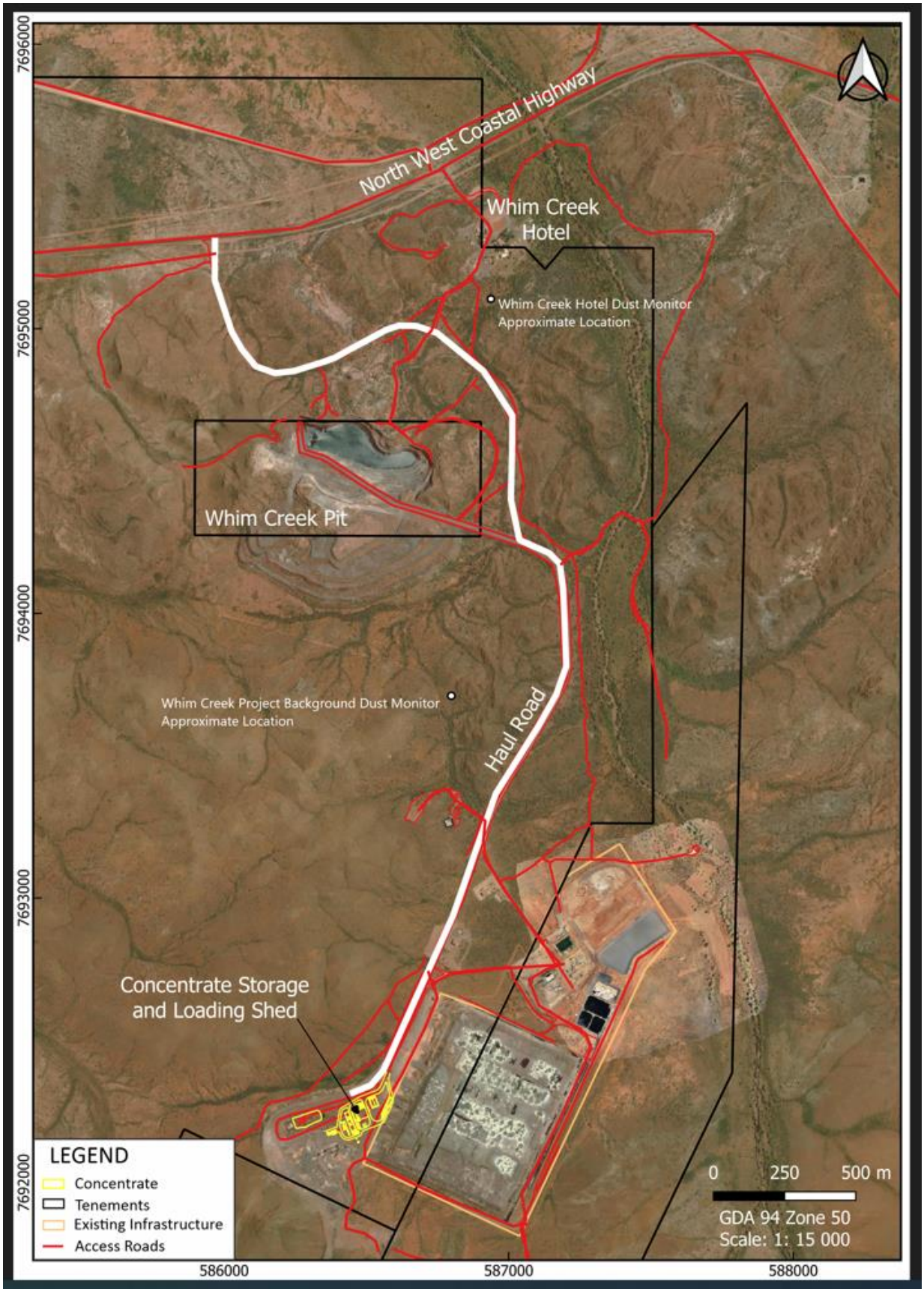

Figure 7: Locations of Ambient Air Quality Monitoring

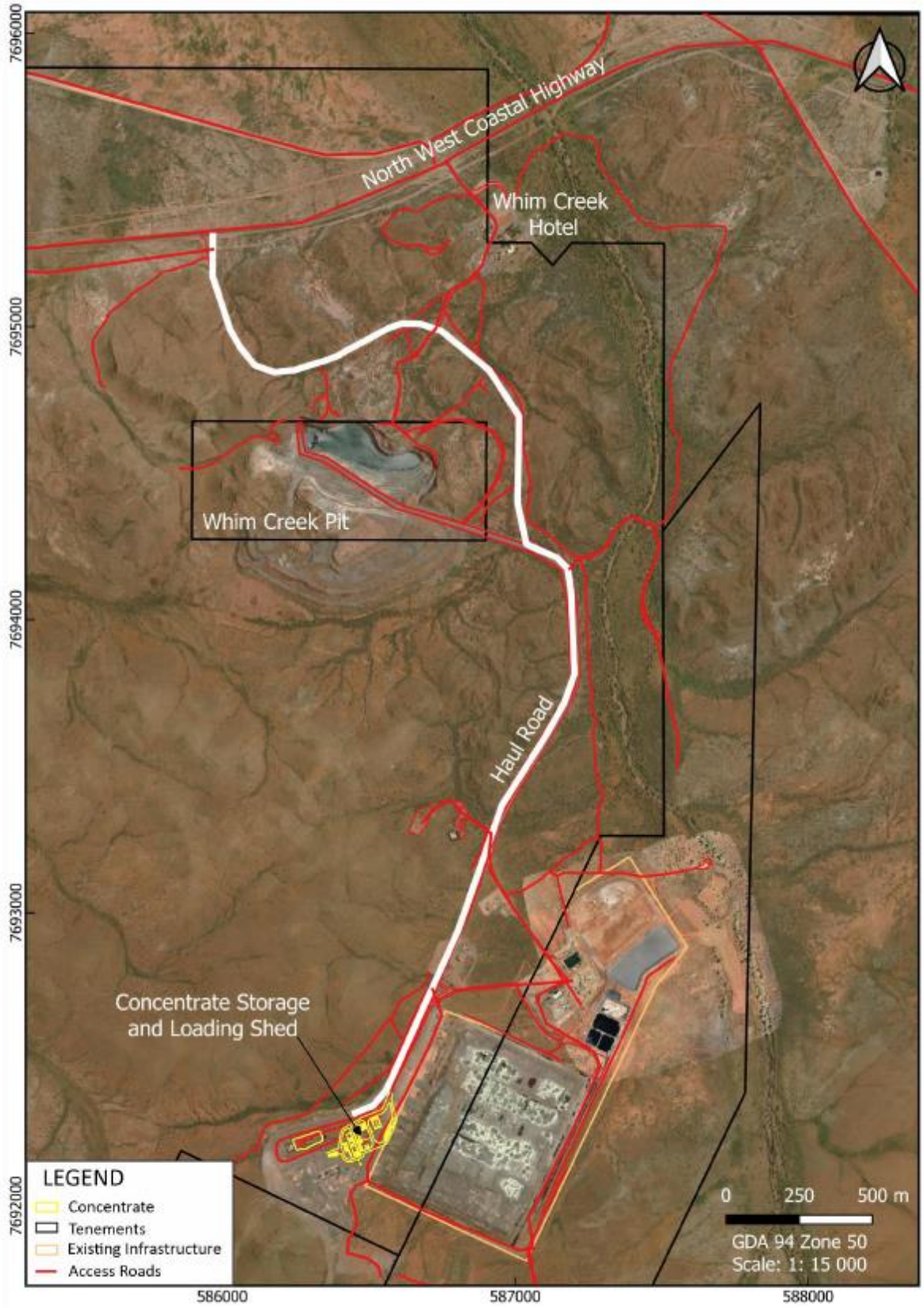

Figure 8: Concentrate Haulage Route

3. Environmental Protection Notice

In April 2019, DWER issued an Environmental Protection Notice (EPN) Reference No: DWERDG804/19 as there was *"reason to suspect emissions of heavy metals and highly acidic process waters have caused or likely to cause pollution, being a direct alteration of the environment to its detriment".*

An EPN is a statutory notice under s.65 of the *Environmental Protection Act 1986* given where it is suspected that there is, or is likely to be, an emission that has caused, or is likely to cause, pollution or environmental harm (ongoing). The EPN may require the persons served (being the owner or occupier or both) to take necessary measures in a specific time period to investigate, prevent and control the emissions from the premises.

The EPN required the following management plans be implemented:

- Heap Leach Facility Management Plan;
- Permeability Management Plan;
- Stormwater Management Plan;
- Groundwater Monitoring Plan; and
- Vegetation Monitoring Plan.

The Concentrator and TSF are proposed new infrastructure so are not the subject of the EPN.

As the requirements of the EPN have been met, the EPN is in the process of revocation. Monitoring requirements for vegetation and ambient groundwater that were enforced under the EPN have been transferred across to works approval W6707/2022/1.

4. Hydrogeological Assessment

1. The number of samples of tailings materials that were collected for assessing the variability of their geotechnical properties is lower than international best practice. Further tailings samples are required to assess and confirm compaction and settlement of tailings during operations (as per design assumptions).
2. It is recommended that additional saturated column kinetic testing is undertaken on tailings materials during the operations of the TSF to determine the leaching potential of these materials after mine closure when the water table has rebounded.
3. The accuracy of the water balance assessment is likely to have been compromised through the use of evaporation data from a remote meteorological monitoring site. It is recommended that onsite measurements of evaporation are made on the surface of the In-Pit TSF to better quantify the rate of seepage from the facility.

   A private meteorological station was installed onsite in January 2021 and collects rainfall and temperature data. When the site is operational a backward-looking water balance will be undertaken to confirm the validity of the initial water balance.

   Recommendation of ongoing monitoring of tailings slurry deposition and decant water recovery volumes and reviewing effectiveness of water return to concentrator so the predicted water balance can be validated throughout operations. Visual observation and hydrogeological measurement and analysis will be required to monitor seepage.
4. The number and spatial distribution of monitoring bores for the proposed In-Pit TSF is reasonable. Confirmation that bores are suitably located on structural features that are likely to be the main conduits for groundwater flow near this facility.

   The bore locations were sited to monitor key potential seepage pathways and located on regional structures as interpreted from aerial photography and topography (along

liner feature, creeks etc.). Prior to drilling and installation, project geologists will review the most recent geology / structure / air photography as well as access conditions and confirm precise collar locations.

Recommendation that baseline groundwater levels and comprehensive chemical analysis are collected from monitoring bores within the aquifer hosting Mons Cupri pits (future TSF cells) **before dewatering commences** at Mons Cupri. Siting of the bores needs to consider structural features (preferential flow pathways) and be away from creek beds to minimise surface water recharge impacting hydro-geochemistry (where possible, noting creek lines often follow structural weakness/fractures). Bores should be of sufficient depth with suitable screen length installed to allow for sampling / measurement during operations (e.g., considering maximum likely drawdown).

5. It is considered that the proposed TSF could be operated in a manner that would not cause significant environmental impacts. There are no concerns with the stability of the facility, however further information will be required by DMIRS regarding potential stability concerns related to productive blasting impacting the embankment for Cell 1.

5. Department of Mines, Industry Regulation and Safety

DMIRS has completed a geotechnical review of the In-Pit TSFs, along with the Mining Proposal and Mine Closure Plan. DMIRS will be following up with the Applicant on the following aspects:

- Impacts of production blasting on embankment stability as well as liquefaction assessment;
- Blast vibration monitoring;
- Pipeline and spigot array;
- Design and construction of abandonment bunding; and
- Design and recommendations followed to ensure safe construction, operation and closures.

DMIRS also noted contingency measures for managing excess water from rare to extreme weather and the potential refuge / habitat of the northern Quoll *Dasyurus hallacatus.*

6. Risk assessment

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

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

6.1 Source-pathways and receptors

6.1.1 Emissions and controls

The key emissions and associated actual or likely pathway during premises construction / operation which have been considered in this decision report are detailed in Table 3 below. Table 3 also details the control measures the applicant has proposed to assist in controlling these emissions, where necessary.

Table 3: Proposed applicant controls

Emission	Sources	Potential pathways	Proposed controls
Construction			
Dust	Vehicle and machinery activity on disturbed ground and unsealed roads Blasting and earthmoving associated with constructing the Concentrator and In-Pit TSF Wind-driven dust lift off from disturbed areas and stockpiles	Air / windborne pathway	• Visual monitoring of airborne dust levels and effectiveness of dust extraction and suppression measures to ensure they are adequately maintained and working efficiently; • Dust suppression using dedicated water carts; • Ground disturbance planning to minimise open areas (progressive clearing); • Sprinkler infrastructure on ROM pad stockpiles; • Application of speed limits; and • Visual monitoring of airborne dust levels and effectiveness of dust extraction and suppression measures to ensure they are adequately maintained and working efficiently.
Noise		Air / windborne pathway	• Standard noise suppression on machinery and plant. Additional attenuation, where warranted, to meet occupational noise standards; and • Noise will be managed by scheduling the highest noise generating activities (blasting, clearing etc) to occur during daytime hours. It is anticipated that once full-scale mining begins, noise impacts will be largely mitigated by the pit walls.
Hydrocarbons / chemicals	Fuel and other hydrocarbons / chemicals used during construction	Leaks / spills	• All hydrocarbon storage areas will be designed and constructed in accordance with Australian Standards AS1940 and AS1692; • The bunded areas will incorporate a collection sump to recover spillage; • Fuel bowsers and fuel delivery inlets will be located on concrete or HDPE-lined pads to contain any drips and spills; • Spill kits in strategic positions with materials and equipment to contain and collect/recover hydrocarbon spills; • Personnel trained in use of spill kits; and • Monthly inspections of storage and refuelling areas.

Emission	Sources	Potential pathways	Proposed controls
Commissioning, Time Limited Operations and Operations			
Concentrator			
Dust	Stockpiling of pre concentrate from the ore crushing and screening circuit (assessed via Works Approval W6707/2022/1)	Air / windborne pathway	• Operations 24 hours a day, 7 days a week. Emissions during the night-time period are expected to be minimal and will be managed similar to daytime operations. Dust emissions during the night-time will be limited and will be controlled via water carts. High dust generating activities will be scheduled for daytime only where possible to facilitate identification and control of visible dust impact; • Visual monitoring of airborne dust levels and effectiveness of dust extraction and suppression measures to ensure they are adequately maintained and working efficiently; • Dust suppression using dedicated water carts; • Ground disturbance planning to minimise open areas (progressive clearing); • Sprinkler infrastructure on ROM pad stockpiles; and • Application of speed limits.
Noise	Running of machinery / equipment in processing of ores	Air / windborne pathway	• Standard noise suppression on machinery and plant. Additional attenuation, where warranted, to meet occupational noise standards; and • Noise will be managed by scheduling the highest noise generating activities (blasting, clearing etc) to occur during daytime hours. It is anticipated that once full-scale mining begins, noise impacts will be largely mitigated by the pit walls.
Processing slurry	Processing of ores	Direct discharges	• All tanks will be fitted with high level alarm systems which report to a centralised monitoring room (Process Control Room) which will be manned at all times during operations; and • The flooring of the Conventional Flotation Processing Plant and Tailings Thickening areas are designed to be constructed from sealed concrete, therefore, any spillages to ground will be collected on this sealed floor via sump pumps or manually and returned to the process water circuit. Spillages from the processing area are expected to be minimal and the result of pipeline or hose

Emission	Sources	Potential pathways	Proposed controls
			failures. Flotation: • The bunded concrete floor for each flotation circuit will be sloped to either of two pump sumps to aid clean up; Concentrate Thickening: • The concentrate thickener and filter storage tanks will be bunded and provided with sump pumps to aid area clean up; • Clean up will be directed back to the thickener feed or optionally to the appropriate filter feed tank; • Wet processing areas concrete bunded and graded to sumps where liquids are returned to process; and • Separation through bunding, drainage diversion and infrastructure, of plant area drainage and surrounding, uncompromised runoff. Tailings Thickening: • Final tailings from the flotation plant will be pumped to a 12 m diameter high-rate tailings thickener. The tailings may be mixed with flocculant and coagulant to increase settling rate and underflow density. The thickener underflow will be pumped, at 60 - 65% solids by weight, to the TSF; and • Thickener overflow will report to the process water tank.
Contaminated stormwater	Rainfall within processing areas	Direct discharges from rainfall ingress to processing areas	• Diversions for stormwater in place to ensure entire site is designed to maintain a capacity to contain a 1 in 100 year 72 hour rainfall event.
Hydrocarbons / chemicals	Fuel and other hydrocarbons / chemicals used within processing areas	Leaks / spills	• All liquid chemical reagents will be stored within tanks in appropriately bunded facilities whereby 110% of the largest vessel is contained and 25% of the total volume is contained according to Australian Standards AS1940 and AS1692. Stocks of reagents in solid form will be stored in a designated reagent shed; • All hydrocarbon storage areas will be designed and constructed in accordance with Australian Standards AS1940 and AS1692;

Emission	Sources	Potential pathways	Proposed controls
			• Plant site drainage directed to HDPE lined stormwater pond with capacity for 1 in 100 year, 72 hour event; • Captured stormwater directed to process water circuit/treatment plant; • Workshops and washdown bays to have concrete floors and sides (as appropriate) and runoff to be directed to oil water separators / clean water recovery systems; • Self-bunded bulk fuel storage; • Above ground tanks and pipework; • Designated refuelling bays / designated hydrocarbon and chemical storage areas / designated vehicle and equipment service areas; • The bunded areas will incorporate a collection sump to recover spillage; • Fuel bowsers and fuel delivery inlets will be located on concrete or HDPE-lined pads to contain any drips and spills; • Spill kits in strategic positions with materials and equipment to contain and collect/recover hydrocarbon spills; • Personnel trained in use of spill kits; and • Monthly inspections of storage and refuelling areas.
Concentrate Storage & Loading Enclosed Shed			
Dust	Stockpiled concentrate	Air / windborne pathway	• Operations 24 hours a day, 7 days a week. Emissions during the night-time period are expected to be minimal and will be managed similar to daytime operations. Dust emissions during the night-time will be limited and will be controlled via water carts. High dust generating activities will be scheduled for daytime only where possible to facilitate identification and control of visible dust impacts; • Visual monitoring of airborne dust levels and effectiveness of dust extraction and suppression measures to ensure they are adequately maintained and working efficiently; • Separate copper, lead and zinc concentrate filters will be housed in a shed constructed on a concrete bunded area; • Loading of trucks will occur on the loading pad. A drive through wheel wash facility will

Emission	Sources	Potential pathways	Proposed controls
			be constructed outside of the loading exit point. The facility will include a sump pump, which will discharge to either the copper thickener feed hopper, zinc thickener feed or the flotation feed conditioning tank; • Concentrate will be loaded by FEL into closed, containers fitted with lids or fully enclosed and sealed side tipper trailers for transport; • Outside of regular maintenance, the FEL will be stored within the concentrate storage shed, when not in use; • Concentrate storage & loading undertaken in enclosed shed; • Concentrate loaded out from stockpile in damp, spadable condition; • Loading of trucks will occur inside the concentrate storage shed in the designated loading area; • The shed will have designated entry and exit points for trucks; • The shed will be equipped with an air/dust extraction filter system to meet Occupational Health and Safety standards; • The shed will not be pressurized as dust generation within the shed will be minimal due to the moisture content of the concentrate; • Visual monitoring of airborne dust levels and effectiveness of dust extraction and suppression measures to ensure they are adequately maintained and working efficiently; and • A ceiling-mounted sprinkler network will not be installed in the shed as the moisture content of the concentrate will be between 10% to 15% mitigating any potential dust emissions.
Concentrate	Stockpiled concentrate	Direct discharges via spillage	• The separate copper, lead and zinc concentrate filters will be housed in a shed constructed on a concrete bunded area; • The Concentrate Storage Shed will be constructed on relatively flat area of ground, on a constructed hardstand pad. An earthen bund and small diversion drain will be constructed around the perimeter of the Concentrate Storage Shed to divert stormwater runoff around the facility; • The truck wheel wash is designed to be

Emission	Sources	Potential pathways	Proposed controls
			approximately 15m long x 5m wide; • The truck wheel wash operates as a drive-through wheel wash. As the trucks drive onto the wheel wash, sensors are activated which engage water sprayers. The sprayers spray down the underside of the truck and wheels removing any spilled concentrate. Concentrate from the wheel wash reports to a drive-in sump which is serviced by a front-end loader. The loader removes concentrate collected in the sump and dumps the material on the heap leach pad. The wastewater reports to a sump where it is then pumped through an Oily Water Separator. Post removal of hydrocarbons the water is then added to the process water circuit; • To prevent clean stormwater ingress into the wheel wash, the wheel wash will be raised and bunded, with bunded directed stormwater flows around the wheel wash; • The design for water ingress includes Low, High, High-High and High-High-High level float switches in the wash water sump. High level float switch will start the duty sump pump. High-High level float switch will start both duty and standby sump pumps. Low level float switch will stop the pumps. High-High-High level will alarm at the control room should the level reach the upper limits of the bunded area. • The catchment area is relatively small at circa 4 m x 8 m; • Visual monitoring will be undertaken of the truck undercarriage to ensure all concentrate is effectively removed from the truck prior to leaving the wheel wash. Daily inspections of the wheel wash will be undertaken when in use by site staff to ensure its working correctly; • During concentrate haulage campaigns, daily visual inspections will be undertaken of the site haulage route to identify and confirm that the route is not contaminated by concentrate spillage; and • In the event any spill to ground of concentrate is identified on the haulage route within the site, haulage will be suspended and the spillage removed.
Stormwater	Rainfall ingress to concentrate storage	Direct discharges	• The Concentrate Storage Shed will be constructed on relatively flat area of ground, on a constructed hardstand pad.

Emission	Sources	Potential pathways	Proposed controls
	area		An earthen bund and small diversion drain will be constructed around the perimeter of the Concentrate Storage Shed to divert stormwater runoff around the facility; • The Concentrate Storage Shed will be constructed on a relatively flat area of ground, on a constructed hardstand pad; • An earthen bund and small diversion drain will be constructed around the perimeter of the Concentrate Storage Shed to divert stormwater runoff around the facility; and • Rainfall that falls within the shed area will be directed to a sump. Water collected in the sump will be added to the process water circuit.
Three Cell In Pit TSF			
Dust	TSF surface	Air / windborne pathway	• TSF siting in steep sided valley; • In-Pit TSF design (limits tailings surface area); and • Cycling tailings discharge to maintain wet tailings surface as per TSF Operating Manual.
Tailings / Decant Water Neutral to alkaline, brackish salinity, potentially enriched with copper, zinc, cadmium, lead, silver, bismuth, arsenic, antimony, selenium and molybdenum	Pipelines	Pipeline ruptures of the pipeline from the Conventional Flotation Processing Plant to the TSF or from the Decant Pond back to the Conventional Flotation Processing Plant	• Bunded tailings pipelines and sumps (where possible) to contain spillage; • Pipeline alignment to utilise topography for spillage containment; • Pressures sensors along pipeline(s) and auto pump shut-off in event of significant pressure drop; • Tailings containment and recovery within 24 hours, if safe to do so, following any spillage incident; and • Minimum daily (each shift) inspections of pipelines, valves, pumps and the return water operations system.
	TSF embankments	Overtopping of the TSF cells	• TSF siting in confining stable geological in land use structures, upstream of mine pit; • Adherence to operating manual – maintenance of design freeboard, deposition management; • Minimum daily (each shift) inspections of embankment condition; • The minimum freeboard for the TSF under normal operating conditions is 1.0 m, which includes an allowance for the temporary

Emission	Sources	Potential pathways	Proposed controls
			storage of the 1:100 years or 1% average exceedance probability (AEP) storm event of 72-hour duration whilst maintaining the required total freeboard; and • MCIPTSF1 has been designed, and progressive construction of the embankments will be managed, to ensure rainfall from a 1 in 100 year, 72 hour event will be contained within the structure during the operational phase.
	TSF base and embankments	Seepage through the base and embankments of the TSF cells	• Minimise volume of tailings stored above ground (optimise underground tailings storage). Utilising the existing pits at the Whim Creek site for tailings disposal removes the risk associated with the construction, operation and closure of an above ground standalone tailings storage facility; • Deposition will take place via multiple spigots located on the upstream embankment crest of the northern and southern embankments of Cell 1. Tailings deposition is to be carried out such that the supernatant pond is maintained at the decant pump deployed from the eastern end of the pit; • Maximising water recovery from the TSF via the decant system; • Construction of embankment cut-offs and foundation preparation; • Construction of an upstream low permeability clay zone and installation of an HDPE on the upstream batter; • The thickener underflow will be pumped, at 60 - 65% solids by weight, to the TSF; • Appropriate siting (exhausted open pit); • Seepage within the catchment of the mine pit (un-intercepted seepage caught in dewatering (operations) and pit lake perpetual sink (postclosure); • Cut off trenches at base of upstream embankments; • Seepage detection, monitoring and potentially contingency seepage recovery; • The embankment foundation preparation will require removal of loose rock material on the pit walls and floor incorporates a cut-off trench excavated to a competent ‘rock’ layer, as directed on site in order to reduce

Emission	Sources	Potential pathways	Proposed controls
			seepage; • The embankment will be zoned, comprising an HDPE liner over the upstream zone of low permeability roller compacted clayey borrow (Zone 1) with a downstream zone (Zone 2) of mine waste from the waste dump; • Vibrating Wire Piezometers (VWP) will be installed in the embankment to monitor trends in pore pressure which can reflect seepage through the embankment; • Four (4) Survey prisms will be installed on the downstream crest of the TSF embankment, which are to be monitored daily for movement; • Location and size of the Decant Pond will be visually monitored and maintained by changing the active spigots; • Minimum daily (each shift) inspections of: ➢ Pipelines, valves, pumps; ➢ Initial deposition and behaviour of tailings; ➢ Decant Pond formation, location and size; ➢ Return water operations system; ➢ Embankment condition; and ➢ Seepage detection (VWP's) and recovery systems; and • Monthly production parameters – tailings deposited (dry tonnes), slurry density, water return to plant); • Monthly sampling and analysis of seepage water quality; • Monthly level monitoring of TSF perimeter bores (TSF1, TSF2 and TSF3); and • Quarterly sampling of TSF perimeter bores (TSF1, TSF2 and TSF3). • The Applicant has stated that the risk of seepage migration much beyond the TSFs is minimal; • The potential impact of any seepage that might migrate away from the TSFs is also minimal; • The bore locations as shown are nominal (subject to confirmation) but were sited to: ➢ Monitor key potential seepage

Emission	Sources	Potential pathways	Proposed controls
			pathways; and ➢ Located on reginal structures as interpreted from aerial photography and topography (i.e., along linear features – creeks etc.); and • Prior to drilling and installation, project geologists will review the most recent geology/structure/air photography as well as access conditions and confirm precise collar locations.
Concentrator Process Water Pond			
Process water	Tailings thickener overflow, tailings decant return, surplus water from the copper, lead and zinc process water circuits and raw water	Overtopping	• Design freeboard of the Concentrator Process Pond to be maintained at 0.5m; • Minimum daily (each shift) inspections; • Inspected to ensure that the water from the TSF water return pipes is clear and the level of the water in the pond is at or below the design level; • Minimum twice daily (each shift) inspections; • The design includes High and High-High level float switches on the pond that send control signals back to the supply line pumps and valves to shutdown equipment and alarm on a dam high level condition. To ensure functionality is assured the float switches are duplicated and have dedicated cable signal to the control room; and • High water levels, above the design water level, must be reported.
		Seepage through the base and embankments	• 1.5 mm HDPE lined pond; • Visual inspections to check for any visible outer damage of HDPE liners to the Concentrator Process Water Pond; and • Ambient groundwater monitoring bores in the vicinity.
Hydrocarbon storage areas			
Hydrocarbons / chemicals / reagents	Refer to Table 1 for reagents used within the concentrator	Direct discharges	• All liquid chemical reagents will be stored within tanks in appropriately bunded facilities whereby 110% of the largest vessel is contained and 25% of the total volume is contained according to Australian Standards AS1940 and AS1692. Stocks of reagents in solid form

Emission	Sources	Potential pathways	Proposed controls
			will be stored in a designated reagent shed; • All hydrocarbon storage areas will be designed and constructed in accordance with Australian Standards AS1940 and AS1692; • Plant site drainage directed to HDPE lined stormwater pond with capacity for 1 in 100 year, 72 hour event; • Captured stormwater directed to process water circuit/treatment plant; • Workshops and washdown bays to have concrete floors and sides (as appropriate) and runoff to be directed to oil water separators / clean water recovery systems; • Self-bunded bulk fuel storage; • Above ground tanks and pipework; • Designated refueling bays / designated hydrocarbon and chemical storage areas / designated vehicle and equipment service areas; • The bunded areas will incorporate a collection sump to recover spillage; • Fuel bowsers and fuel delivery inlets will be located on concrete or HDPE-lined pads to contain any drips and spills; • Spill kits in strategic positions with materials and equipment to contain and collect/recover hydrocarbon spills; • Personnel trained in use of spill kits; and • Monthly inspections of storage and refueling areas.

6.1.2 Receptors

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

Table 4 and Figure 9 below provides a summary of potential human and environmental receptors that may be impacted as a result of activities upon or emission and discharges from the prescribed premises *(Guideline: Environmental Siting* (DWER 2020)).

Table 4: Sensitive human and environmental receptors and distance from prescribed activity

Human receptors	Distance from prescribed activity
Whim Creek Hotel	2.4 km north of the premises

	Distance from the Concentrate Storage & Loading Enclosed Shed to the Whim Creek Hotel is approximately 3.1 km
Mallina Homestead	20 km east of the premises
Sherlock Homestead	20 km west of the premises
Roebourne	84 km west of the premises
Environmental receptors	**Distance from prescribed activity**
Threatened and/or priority fauna Northern Quoll and Ghost Bat	500 m outside the development area
Flora and Vegetation	According to Venturex Resources Limited, (2016) the Premises lie within the Abydos Plain subregion of the Fortescue Botanical District of the Eremean Botanical Province (Beard, 1975). The Premises is located in a vegetation type classified by Beard, (1975) as Mosaic: Hummock grasslands, shrub-steppe / Hummock grasslands, grass steppe. The shrub-steppe generally occurs in valleys and is dominated by Kanji Acacia pyrifolia over Soft Spinifex *Triodia epactia*, whilst the grass-steppe is dominated by Soft Spinifex *Triodia epactia* and Hard *Spinifex Triodia* wiseana. Within the general vegetation type, variations are evident, including drainage lines, southern slopes and creek lines. A flora survey was completed in September 2005 following a wet year, which interrupted several years of low rainfall. Consequently, during the survey, annual plants were abundant, and many plants were in flower or seed. No Declared Rare Flora (DRF) or Threatened Ecological Communities (TEC's) have been found within the Project area. Vegetation in established areas is generally considered to be in very good to excellent condition.
Aboriginal and other heritage sites Four registered sites are located within the Whim Creek Project area, including: • Site 160 Balla River 02 (Legacy ID P07595) – Artefacts / Scatter • Site 161 Balla River 03 (Legacy ID P07596) – Artefacts / Scatter, Mythological, Water Source • Site 109 (Legacy ID P07601) Mons Cupri Hill – Mythological Site 6141 (Legacy ID P06978) Mt Brown – Artefacts / Scatter	3 sites within prescribed premises boundary.
Rivers, lakes, oceans, and other bodies of surface	250m from Environmental Pond North eastern

water, etc. Balla Balla River Hyporheic fauna and riparian vegetation	edge of Premise Boundary 20m from Balla Balla River.
Contaminated Sites Site registered as 'Possibly contaminated – investigation required	Groundwater contamination onsite from previously operations. Groundwater SWL is 3 mbgl to 15 mbgl.

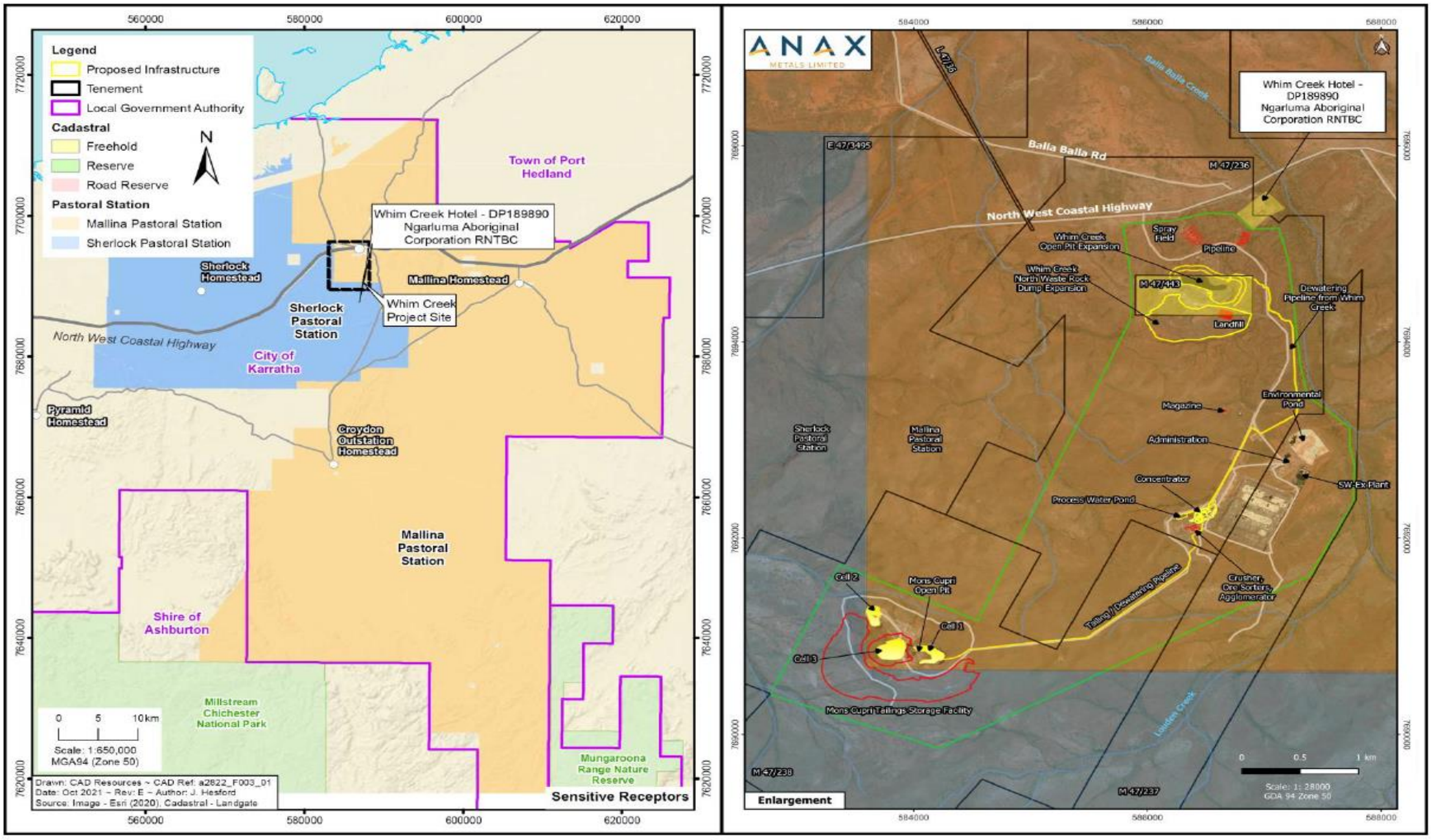

Figure 9: Distance to sensitive receptors

6.2 Risk ratings

Risk ratings have been assessed in accordance with the *Guideline: Risk Assessments* (DWER 2020) for each identified emission source and takes into account potential source-pathway and receptor linkages as identified in Section 6.1. Where linkages are in-complete they have not been considered further in the risk assessment.

Where the applicant has proposed mitigation measures/controls (as detailed in Section 6.1), these have been considered when determining the final risk rating. Where the delegated officer considers the applicant's proposed controls to be critical to maintaining an acceptable level of risk, these will be incorporated into the works approval as regulatory controls.

Additional regulatory controls may be imposed where the applicant's controls are not deemed sufficient. Where this is the case the need for additional controls will be documented and justified in Table 5.

Works approval W6751/2022/1 that accompanies this decision report authorized construction, commissioning and time-limited operations. The conditions in the issued works approval, as outlined in Table 5 have been determined in accordance with *Guidance Statement: Setting Conditions* (DER 2015).

A licence is required following the time-limited operational phase authorized under the works approval to authorise emissions associated with the ongoing operation of the premises i.e. Category 5 activities. A risk assessment for the operational phase has been included in this decision report, however licence conditions will not be finalised until the department assesses the licence application.

Table 5: Risk assessment of potential emissions and discharges from the premises during construction, commissioning and operations

Risk events					Risk rating [1] C = consequence L = likelihood	Applicant controls sufficient?	Conditions [2] of works approval	Justification for additional regulatory controls
Sources / activities	**Potential emission**	**Potential pathways and impact**	**Receptors**	**Applicant controls**				
Construction								
Vehicle and machinery activity on disturbed ground and unsealed roads Blasting and earthmoving associated with constructing the Concentrator and In Pit TSF Wind-driven dust lift off from disturbed areas and stockpiles	Dust	Air / windborne pathway causing impacts to health and amenity	Whim Creek Hotel 2.4 km north of the premises	Refer to Section 6.1	C = Minor L = Possible **Medium Risk**	Y	N/A	N/A
	Noise			Refer to Section 6.1	C = Minor L = Unlikely **Medium Risk**	Y	N/A	N/A
	Hydrocarbons / chemicals	Direct discharges	Soils, vegetation, groundwater	Refer to Section 6.1	C = Minor L = Unlikely **Medium Risk**	Y	N/A	N/A
Commissioning and Operation (including time-limited-operations operations)								
Concentrator	Dust	Air/windborne pathway causing impacts to health and amenity	Whim Creek Hotel 2.4 km north of the premises	Refer to Section 6.1	C = Minor L = Unlikely **Medium Risk**	Y	Condition 1, Table 1 Design and construction / installation requirements Requires dust controls	N/A
	Noise	Air/windborne pathway causing impacts to health and amenity	Whim Creek Hotel 2.4 km north of the premises	Refer to Section 6.1	C = Slight L = Unlikely **Low Risk**	Y	N/A	N/A
	Processing slurry	Direct discharges	Soils, vegetation, groundwater	Refer to Section 6.1	C = Minor L = Unlikely **Medium Risk**	Y	Condition 1, Table 1 Design and construction / installation requirements Requires bunded concrete floor with pump sumps,	N/A
	Contaminated	Direct discharges	Soils,	Refer to	C = Minor	Y	Condition 1, Table 1 Design	N/A

Risk events					Risk rating [1] C = consequence L = likelihood	Applicant controls sufficient?	Conditions [2] of works approval	Justification for additional regulatory controls
Sources / activities	**Potential emission**	**Potential pathways and impact**	**Receptors**	**Applicant controls**				
	stormwater	from rainfall ingress to processing areas	vegetation, groundwater	Section 6.1	L = Unlikely **Medium Risk**		and construction / installation requirements Requires diversions in place.	
	Hydrocarbons / chemicals	Leaks / spills	Soils, vegetation, groundwater	Refer to Section 6.1	C = Minor L = Possible **Medium Risk**	Y	Condition 1, Table 1 Design and construction / installation requirements Requires storage to Australian Standards, bunding, sumps etc.	N/A
Concentrate Storage & Loading Enclosed Shed	Dust	Air/windborne pathway causing impacts to health and amenity	Whim Creek Hotel 2.4 km north of the premises	Refer to Section 6.1	C = Minor L = Possible **Medium Risk**	Y	Condition 1, Table 1 Design and construction / installation requirements Requires enclosed loading shed, trucks to be enclosed, concentrate damp and visual monitoring and Ambient Air Quality Monitoring Condition 7, Table 3 Environmental commissioning requirements Requires visual monitoring of dust levels and Ambient Air Quality Monitoring Condition 14, Table 4 Infrastructure and equipment requirements during time limited operations Requires visual monitoring of dust levels and Ambient Air Quality Monitoring	N/A
	Concentrate	Direct discharges via spillage to surrounding areas	Soils, vegetation	Refer to Section 6.1	C = Minor L = Possible **Medium Risk**	Y	Condition 1, Table 1 Design and construction / installation requirements Requires wheel wash facility with sump pump Condition 7, Table 3 Environmental commissioning requirements Requires visual monitoring of	N/A

Risk events					Risk rating [1] C = consequence L = likelihood	Applicant controls sufficient?	Conditions [2] of works approval	Justification for additional regulatory controls
Sources / activities	**Potential emission**	**Potential pathways and impact**	**Receptors**	**Applicant controls**				
							the trucks and the truck wheel wash to ensure concentrate is collected and wastewater is contained. Condition 14, Table 4 Infrastructure and equipment requirements during time limited operations Requires visual monitoring of the trucks and the truck wheel wash to ensure concentrate is collected and wastewater is contained.	
	Stormwater contaminated with concentrate	Direct discharges during rainfall events	Soils, vegetation, groundwater	Refer to Section 6.1	C = Minor L = Possible **Medium Risk**	Y	Condition 1, Table 1 Design and construction / installation requirements Requires wheel wash to be raised / bunded and Concentrate Storage Shed be bunded with diversion drain.	N/A
In-Pit TSF	Dust	Air/windborne pathway causing impacts to health and amenity	Whim Creek Hotel 2.4 km north of the premises	Refer to Section 6.1	C = Minor L = Possible **Medium Risk**	Y	Condition 1, Table 1 Design and construction / installation requirements Requires wet tailings surface	N/A
	Tailings / Decant Water Neutral to alkaline, brackish salinity, potentially enriched with copper, zinc, cadmium, lead, silver, bismuth, arsenic,	Pipeline ruptures of the pipeline from the Concentrator to the TSF or from the Decant Pond back to the Concentrator	Soils, vegetation, groundwater, Balla Balla River	Refer to Section 6.1	C = Moderate L = Unlikely **Medium Risk**	Y	Condition 1, Table 1 Design and construction / installation requirements Requires pipeline alignment, pressure sensors, automatic pump shut-off, bunded tailings pipelines and sumps Condition 7, Table 3 Environmental commissioning requirements Requires inspections Condition 14, Table 4 Infrastructure and equipment	N/A

Risk events					Risk rating [1] C = consequence L = likelihood	Applicant controls sufficient?	Conditions [2] of works approval	Justification for additional regulatory controls
Sources / activities	**Potential emission**	**Potential pathways and impact**	**Receptors**	**Applicant controls**				
	antimony, selenium and molybdenum						requirements during time limited operations Requires inspections and monitoring	
		Overtopping of the TSF cells	Soils, vegetation, groundwater, Balla Balla River	Refer to Section 6.1	C = Moderate L = Unlikely **Medium Risk**	Y	Condition 1, Table 1 Design and construction / installation requirements Requires minimum freeboard and rainfall events containment Condition 7, Table 3 Environmental commissioning requirements Requires minimum freeboard and rainfall events containment, inspections Condition 14, Table 4 Infrastructure and equipment requirements during time limited operations Requires minimum freeboard and rainfall events containment	N/A
		Seepage through the base and embankments of the TSF cells	Soils, vegetation, groundwater, Balla Balla River	Refer to Section 6.1	C = Moderate L = Possible **Medium Risk**	Y	Condition 1, Table 1 Design and construction / installation requirements Requires HDPE liner, permeability requirements, thickener underflow 60 – 65% solids, cut-off trenches, seepage detection, monitoring, vibrating wire piezometers, survey prisms Condition 2, Table 2 Infrastructure requirements – groundwater monitoring wells Requires that groundwater monitoring network be	N/A

Risk events					Risk rating [1] C = consequence L = likelihood	Applicant controls sufficient?	Conditions [2] of works approval	Justification for additional regulatory controls
Sources / activities	**Potential emission**	**Potential pathways and impact**	**Receptors**	**Applicant controls**				
							installed around the TSF Condition 7, Table 3 Environmental commissioning requirements Requires visual monitoring of dust levels Requires thickener underflow 60 – 65% solids, inspections, Decant Pond monitoring, groundwater monitoring Condition 8, Table 7 Monitoring of ambient concentrations during environmental commissioning and time limited operations Requires groundwater monitoring during commissioning Condition 14, Table 4 Infrastructure and equipment requirements during time limited operations Requires thickener underflow 60 – 65% solids, vibrating wire piezometers, survey prisms Condition 16, Table 7 Monitoring of ambient concentrations during environmental commissioning and time limited operations Requires groundwater monitoring during time limited operations	
Concentrator Process Water Pond	Process water	Overtopping	Soils, vegetation, groundwater	Refer to Section 6.1	C = Minor L = Unlikely **Medium Risk**	Y	Condition 1, Table 1 Design and construction / installation requirements Requires freeboard	N/A

Risk events					Risk rating [1] C = consequence L = likelihood	Applicant controls sufficient?	Conditions [2] of works approval	Justification for additional regulatory controls
Sources / activities	**Potential emission**	**Potential pathways and impact**	**Receptors**	**Applicant controls**				
							Condition 7, Table 3 Environmental commissioning requirements Requires inspections and reporting of high water levels Condition 14, Table 4 Infrastructure and equipment requirements during time limited operations Requires inspections and reporting of high water levels	
		Seepage through the base and embankments	Soils, vegetation, groundwater	Refer to Section 6.1	C = Minor L = Unlikely **Medium Risk**	Y	Condition 1, Table 1 Design and construction / installation requirements Requires HDPE lining Condition 7, Table 3 Environmental commissioning requirements Requires inspections Condition 14, Table 4 Infrastructure and equipment requirements during time limited operations Requires inspections Condition 15 requires water balance	N/A
Hydrocarbon storage areas	Refer to Table 1 for reagents used within the concentrator	Direct discharges from leaks / spills	Soils, vegetation, groundwater	Refer to Section 6.1	C = Minor L = Possible **Medium Risk**	Y	Condition 1, Table 1 Design and construction / installation requirements Requires compliance with Australian Standards Condition 7, Table 3 Environmental commissioning requirements Requires visual inspections of storage and refuelling areas, spill kits, training Condition 14, Table 4	N/A

Risk events					Risk rating [1] C = consequence L = likelihood	Applicant controls sufficient?	Conditions [2] of works approval	Justification for additional regulatory controls
Sources / activities	Potential emission	Potential pathways and impact	Receptors	Applicant controls				
							Infrastructure and equipment requirements during time limited operations Requires inspections of storage and refuelling areas Condition 14, Table 4 Infrastructure and equipment requirements during time limited operations Requires inspections, spill kits and training	

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

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

7. Consultation

Table 6 provides a summary of the consultation undertaken by the department.

Table 6: Consultation

Consultation method	Comments received	Department response
Application advertised on the department's website on 28 November 2022	None received	N/A
Local Government Authority advised of proposal on 22 November 2022	City of Karratha replied on 06 December 2022 stating that *"should the works listed within the Works Approval, to be approved by DMIRS, be located within the boundaries of a granted mining tenement, then under the City's Local Planning Scheme No. 8 (LPS8), the works are exempt from requiring development approval under the City's Local Planning Scheme No.8.* *The City in this instance has no objection to the proposal under this application."*	Noted.
Department of Mines, Industry Regulation and Safety (DMIRS) advised of proposal 22 November 2022	Technical advice received on 12 January 2023.	Refer to Section 5.
Ngarluma Aboriginal Corporation advised of proposal on 22 November 2022. Several emails sent and phone calls made.	None received. A written letter of support from Ngarluma Aboriginal Corporation, dated 17 February 2023, has been provided to DWER.	N/A
Applicant was provided with draft documents on 30 March 2023	Refer to Appendix 1	Refer to Appendix 1

8. Conclusion

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

References

1. Department of Environment Regulation (DER) 2015, *Guidance Statement: Setting Conditions*, Perth, Western Australia.
2. Department of Water and Environmental Regulation (DWER) 2020, *Guideline: Environmental Siting*, Perth, Western Australia.
3. DWER 2020, *Guideline: Risk Assessments*, Perth, Western Australia.
4. Anax Metals Ltd, WCM_WA_20220928 Works Approval Application (Rev 0) 03/10/2022, West Perth, Western Australia.
5. Anax Metals Ltd, RE: NOTIFICATION :APPLICATION FOR A WORKS APPROVAL (W6751/2022/1) - REQUEST FOR FURTHER INFORMATION - Attn: Dan O'Hara 13/01/2023, West Perth, Western Australia.
6. Anax Metals Ltd, RE: NOTIFICATION :APPLICATION FOR A WORKS APPROVAL (W6751/2022/1) - REQUEST FOR FURTHER INFORMATION - Attn: Dan O'Hara 10/02/2023, West Perth, Western Australia.
7. Anax Metals Ltd, RE: W6751 Whim Creek Works Approval 21/02/2012, West Perth, Western Australia.
8. Anax Metals Ltd, RE: W6751 Whim Creek 20/03/2023, West Perth, Western Australia.
9. Anax Metals Ltd, RE: NOTIFICATION : APPLICATION FOR A WORKS APPROVAL W6751/2022/1 - DRAFT INSTRUMENT AND DECISION REPORT - Attn: Dan O'Hara 21/04/2023, West Perth, Western Australia.
10. Anax Metals Ltd, RE: NOTIFICATION : APPLICATION FOR A WORKS APPROVAL W6751/2022/1 – DRAFT INSTRUMENT AND DECISION REPORT – Attn: Dan O'Hara 01/05/2023, West Perth, Western Australia.
11. Anax Metals Ltd, RE: APPLICATION FOR AN WORKS APPROVAL (W6751/2022/1) – AMBIENT AIR QUALITY MONITORING - FURTHER INFORMATION REQUIRED 15/05/2023, West Perth, Western Australia.

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

Condition	Summary of applicant's comment	Department's response
Decision Report		
Decision Report, Page 14 Applicant to advice how the concentrate gets into the shed.	The final processing stage at the filtering tanks (Page 90 of WA application) produces a concentrate filter cake containing nominally 10% moisture by weight. This stage occurs within the structure of the Concentrate Storage Shed (Grid H2 and H3 of Figure 4, Page 27 of Draft Works Approval). The concentrate is then removed from the beneath the filter tanks by Front End Loader and stockpile on the relevant concentrate stockpile inside the concentrate storage shed. All of the above occurs within the concentrate storage shed.	Updated.
Decision Report, Page 14 Map of truck transport route from site past the Whim Creek Hotel	Figure of Concentrate Haulage Route provided.	Updated.
Decision Report, Page 14 Distance of the shed to the Whim Creek Hotel	Distance from the Concentrate Storage & Loading Enclosed Shed to the Whim Creek Hotel is approximately 3.1km. Figure of Concentrate Haulage Route provided.	Updated.
Decision Report, Page 14 DWER suggests that an ambient air quality monitoring network be installed with dust monitors onsite and near the Whim Creek Hotel, until monitoring demonstrates that air quality levels are acceptable. Please advise a suitable ambient air quality monitoring programme that can be included into the works	Ambient air quality monitoring will be undertaken to assess air quality at the site and the Whim Creek Hotel. The following will be undertaken: 1. Two static dust monitors will be employed. • Station 1 - located between the Whim Creek pit and the Whim Creek Hotel, as close as possible to the hotel. • Station 2 - located southeast of the Whim Creek pit, approximately 300m from the road, to collect background data. Note: Exact dust monitor locations will be dependent on access and site	Updated.

Condition	Summary of applicant's comment	Department's response
approval commissioning and time limited operational phases (note this will also provide a defence)	conditions. 2. Dust monitors will be light scattering units measuring PM10 and Station 1 will be equipped with a Speed/Direction sensor. 3. Prior to commissioning the concentrator, real time continuous data will be collected for six months to gauge seasonal variation in wind conditions and to establish trigger levels. A three-monthly service and calibration schedule will be implemented to maintain data accuracy. 4. During commissioning and time limited operations dust monitoring will be undertaken until air quality monitoring demonstrates that air quality levels at the Whim Creek Hotel are acceptable.	
Decision Report, Page 14 Update on Traditional Owner stakeholder consultation.	Anax Metals are in regular contact with the Ngarluma Aboriginal Corporation (NAC), particularly around the refurbishment works associated with the Whim Creek Hotel. To facilitate the work Anax undertakes weekly meetings with NAC members. On 17th February 2023, NAC provided a written letter of support for the Whim Creek Copper Project.	Updated.
Table 3, Page 8 Dust-Stockpiled concentrate: Applicant to advise if the Front-End Loader will be stored within the shed when not in use.	Outside of regular maintenance, the Front-End Loader will be stored within the concentrate storage shed, when not in use.	Updated.
Table 3, Page 8 Dust-Stockpiled concentrate: Applicant to advise if the shed is pressurised.	The shed will not be pressurised. The risk assessment undertaken indicates that dust generation within the shed will be minimal due to the moisture content of the concentrate.	Updated. Should issues be identified, additional controls can be conditioned at a later date.
Table 3, Page 9 Concentrate--Stockpiled concentrate: Applicant to advise of high-level alarms and overflow	The design for water ingress includes Low, High, High-High and High-High-High level float switches in the wash water sump. High level float switch will start the duty sump pump. High-High level float switch will start both duty and standby sump pumps. Low level float switch will stop the pumps. High-High-High level will alarm at the control room should the level reach the upper limits of the bunded area.	Updated.

Condition	Summary of applicant's comment	Department's response
contingencies	The catchment area is relatively small at circa 4 x 8 metres.	
Table 3, Page 10 Tailings / Decant Water – Pipelines: Tailings containment and recovery as soon as practicable following any spillage incident; APPLICANT TO ADVISE OF A TIMEFRAME RATHER THAN AS SOON AS PRACTICABLE	Changed to read: Tailings containment and recovery to occur within 24hrs following any spillage incident, if safe to do so.	Updated.
Table 3, Page 11 Tailings / Decant Water - TSF base and embankments: Applicant to provide additional information on the underdrainage capture measures and where the collected liquid is transferred to.	Underdrainage capture is only relevant to the Heap Leach Facility. The underdrainage capture mentioned in Table 2 of the Environmental Commissioning Plan is a typo. The initial risk assessment for the TSF included an evaluation of underdrainage capture but post assessment it was not required and as a result it does not feature in the TSF Design Report Rev 3. The reasoning for no underdrainage capture is explained below: i) Underdrainage systems are high risk in terms of installation (risk to personnel working in the pit) and operation and they tend to block very quickly. ii) The underdrainage systems that worked returned less than 1% of the over-all water return and they have little or no impact on the final consolidation of the tailings. Typically, where high water recovery >80% of the supernatant water is removed during operation self-weight consolidation of the tailings is the major driver of settlement and secondary consolidation at the end of the operation, and post closure are very small. iii) The majority of underdrainage systems which were installed failed, mostly at start-up.	Updated.
Table 4, Page 15 Whim Creek Hotel: Applicant to advise Distance from shed to Whim Creek	Distance from the Concentrate Storage & Loading Enclosed Shed to the Whim Creek Hotel is approx. 3.1km. A number of hills exist between the Whim Creek Hotel and the shed, including the Whim Creek pit.	Updated.

Condition	Summary of applicant's comment	Department's response
Hotel		
Works Approval		
Table 1, Page 7 Three Cell In Pit TSF: Pontoon-mounted decant pump to return water to the Concentrator Process Water Pond. APPLICANT TO ADVISE OF ANY SPARE / STANDBY PUMPS	Standby/spare decant pumps will be installed to ensure the adequate freeboard is maintained at the TSF.	Updated.
Table 1, Page 8 Dust-Stockpiled concentrate: Applicant to advise if the shed is pressurised.	The shed will not be pressurised. The risk assessment undertaken indicates that dust generation within the shed will be minimal due to the moisture content of the concentrate.	Updated.
Table 1, Page 8 Concentrate--Stockpiled concentrate: Applicant to advise of high-level alarms and overflow contingencies	The design for water ingress includes Low, High, High-High and High-High-High level float switches in the wash water sump. High level float switch will start the duty sump pump. High-High level float switch will start both duty and standby sump pumps. Low level float switch will stop the pumps. High-High-High level will alarm at the control room should the level reach the upper limits of the bunded area. The catchment area is relatively small at circa 4 x 8 metres.	Updated.
Table 1, Page 9 Hydrocarbon storage areas: APPLICANT TO ADVISE OF OILY WATER SEPARATORS DESIGN CRITERIA	Oily Water Separator. Product data sheet included.	Updated.
Table 1, Page 10 Dust controls: ADDITIONAL AIR QUALITY	Ambient air quality monitoring will be undertaken to assess air quality at the site and the Whim Creek Hotel. The following will be undertaken:	Updated.

Condition	Summary of applicant's comment	Department's response
CONDITIONS TO BE INCLUDED AS PER DECISION REPORT	1. Two static dust monitors will be employed. • Station 1 - located between the Whim Creek pit and the Whim Creek Hotel, as close as possible to the hotel. • Station 2 - located southeast of the Whim Creek pit, approximately 300m from the road, to collect background data. Note: Exact dust monitor locations will be dependent on access and site conditions. 2. Dust monitors will be light scattering units measuring PM10 and Station 1 will be equipped with a Speed/Direction sensor. 3. Prior to commissioning the concentrator, real time continuous data will be collected for six months to gauge seasonal variation in wind conditions and to establish trigger levels. A three-monthly service and calibration schedule will be implemented to maintain data accuracy. 4. During commissioning and time limited operations dust monitoring will be undertaken until air quality monitoring demonstrates that air quality levels at the Whim Creek Hotel are acceptable.	
Table 3, Page 14 Concentrator Process Water Pond: High water levels, above the design water level monitored; APPLICANT TO ADVISE OF HIGH LEVEL ALARMS	The design includes High and High-High level float switches on the pond that send control signals back to the supply line pumps and valves to shutdown equipment and alarm on a dam high level condition. To ensure functionality is assured the float switches are duplicated and have dedicated cable signal to the control room.	Updated.
Table 3, Page 15 Hydrocarbon storage areas: Spill kits in strategic positions with materials and equipment to contain and collect/recover hydrocarbon spills; APPLICANT TO ADVISE OF OILY WATER SEPARATORS	Oily Water Separator. Product data sheet included.	Updated.

Condition	Summary of applicant's comment	Department's response
Other comments		
Works Approval Draft Page 4 Tailings Thickening: • 3 x 12 m diameter high-rate tailings thickener for copper, lead and zinc;	Latest design includes one tailings thickener. Should read: • 1 x 12 m diameter high-rate tailings thickener for copper, lead and zinc;	Updated.
Works Approval Draft Page 5 Decision Report Page 10 TSF siting in steep sided valley.	Remove. TSF is sited in exhausted pits at Mons Cupri Hill.	Updated.
Works Approval Draft Page 9 Plant site drainage directed to HDPE lined stormwater pond with capacity for 1 in 100 year, 72 hour event;	Unsure if this point is required. Control for stormwater runoff is captured in the following bullet point "Captured stormwater directed to process water circuit/treatment plant".	Retained.
Works Approval Draft Page 13 Location and size of the Decant Pond will be visually monitored and maintained by changing the active spigots;	Control measure has been doubled up.	Control measure is for commissioning and time limited operations.
Works Approval Draft Page 15 Application of speed limits;	Control measure has been doubled up.	Control measure is for commissioning and time limited operations.
Works Approval Draft Page 17 Location and size of the Decant Pond will be visually monitored and maintained by changing the active spigots;	Control measure has been doubled up.	Control measure is for commissioning and time limited operations.

Condition	Summary of applicant's comment	Department's response
Works Approval Draft Page 19 Application of speed limits;	Control measure has been doubled up.	Control measure is for commissioning and time limited operations.

Appendix 2: Application validation summary

SECTION 1: APPLICATION SUMMARY					
Application type					
Works approval	☒				
Licence	☐	Relevant works approval number:		None	☐
		Has the works approval been complied with?		Yes ☐ No ☐	
		Has time limited operations under the works approval demonstrated acceptable operations?		Yes ☐ No ☐ N/A ☐	
		Environmental Compliance Report / Critical Containment Infrastructure Report submitted?		Yes ☐ No ☐	
		Date Report received:			
Renewal	☐	Current licence number:			
Amendment to works approval	☐	Current works approval number:			
Amendment to licence	☐	Current licence number:			
		Relevant works approval number:		N/A	☐
Registration	☐	Current works approval number:		None	☐
Date application received		03/10/2022			
Applicant and Premises details					
Applicant name/s (full legal name/s)		Anax Metals Limited			
Premises name		Whim Creek Copper Project			
Premises location		Mining Leases M47/236, M47/237, M47/238, M47/443 North Coastal Highway WHIM CREEK WA 6718			
Local Government Authority		City of Karratha			
Application documents					
HPCM file reference number:		DWERDT6677389 and A2129458			
Key application documents (additional to application form):		Application Form Supporting Documents			
Scope of application/assessment					

Summary of proposed activities or changes to existing operations.	Works approval Construction and Operation of: • Installation of a conventional flotation processing plant (400,000tpa) which will produce separate copper, lead and zinc concentrates; • A three-cell 'In Pit' Tailings Storage Facility (TSF); • Installation of a pipeline to deliver tailings to the TSF and to deliver tailings decant water to the processing plant for use in processing; • Installation of a pipeline to deliver water from dewatering the Whim Creek open pit to the processing plant for use in processing; and • Infrastructure upgrades to the processing plant and refurbishment of support facilities.

Category number/s (activities that cause the premises to become prescribed premises)

Table 1: Prescribed premises categories

Prescribed premises category and description	Proposed production or design capacity	Proposed changes to the production or design capacity (amendments only)
Category 5: Processing or beneficiation of metallic or non-metallic ore	Processing Plant to process up to 400,000 tonnes per annum ROM to produce separate copper and zinc concentrates and up to 300, 000 tonnes per annum dry barren tailings stream TSF two cells of equal storage volumes to provide tailings storage capacity of 600,000 tonnes	*Is there a proposed change to the previously assessed production or design capacity?*

Legislative context and other approvals

Has the applicant referred, or do they intend to refer, their proposal to the EPA under Part IV of the EP Act as a significant proposal?	Yes ☐ No ☒	Referral decision No: Managed under Part V ☐ Assessed under Part IV ☐
Does the applicant hold any existing Part IV Ministerial Statements relevant to the application?	Yes ☐ No ☒	Ministerial statement No: EPA Report No:
Has the proposal been referred and/or assessed under the EPBC Act?	Yes ☐ No ☒	Reference No:
Has the applicant demonstrated occupancy (proof of occupier status)?	Yes ☒ No ☐	Certificate of title ☐ General lease ☐ Expiry: Mining lease / tenement ☐ Expiry: Other evidence ☐ Expiry:

Has the applicant obtained all relevant planning approvals?	Yes ☐ No ☐ N/A ☒	Approval: Expiry date: If N/A explain why?
Has the applicant applied for, or have an existing EP Act clearing permit in relation to this proposal?	Yes ☒ No ☐	CPS No: CPS9355/1 60ha (Native Vegetation Clearing permit 9355/1 - Attachment 3C) - Mons Cupri Pit Expansion 35ha (Native Vegetation Clearing permit 9829/1 - Attachment 3C) – Whim Creek Pit Expansion Minor clearing in accordance with the 10 hectare/tenement/financial year clearing exemption, under the Environmental Protection (Clearing of Native Vegetation) Regulations 2004 (WA).
Has the applicant applied for, or have an existing CAWS Act clearing licence in relation to this proposal?	Yes ☐ No ☒	Application reference No: N/A Licence/permit No: N/A
Has the applicant applied for, or have an existing RIWI Act licence or permit in relation to this proposal?	Yes ☒ No ☐	Application reference No: Licence/permit No: GWL95745(9) GWL95745(9) allows for 900,000 kLpa.
Does the proposal involve a discharge of waste into a designated area (as defined in section 57 of the EP Act)?	Yes ☐ No ☐	Name: N/A Type: N/A Has Regulatory Services (Water) been consulted? Yes ☐ No ☐ N/A ☐ Regional office: N/A
Is the Premises situated in a Public Drinking Water Source Area (PDWSA)?	Yes ☐ No ☒	Name: N/A Priority: N/A Are the proposed activities/ landuse compatible with the PDWSA (refer to WQPN 25)? Yes ☐ No ☐ N/A ☐

Is the Premises subject to any other Acts or subsidiary regulations (e.g. *Dangerous Goods Safety Act 2004, Environmental Protection (Controlled Waste) Regulations 2004, State Agreement Act xxxx*)	Yes ☐ No ☒	N/A
Is the Premises within an Environmental Protection Policy (EPP) Area?	Yes ☐ No ☒	N/A
Is the Premises subject to any EPP requirements?	Yes ☐ No ☒	N/A
Is the Premises a known or suspected contaminated site under the *Contaminated Sites Act 2003*?	Yes ☒ No ☐	Classification: possibly contaminated – investigation required (PC–IR) Date of classification: Managed under EPN