



Application for Works Approval

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

Works Approval Number W6831/2023/1

Applicant Image Resources NL

ACN 063 977 579

File number DER2023/000415

Premises Atlas Project
Munbinea Road
NAMBUNG WA 6521

Part of mining tenement M 70/1305
As defined by the premises maps attached to the issued works approval

Date of report 03 July 2024

Proposed Decision Works approval granted

MANAGER, RESOURCES INDUSTRIES

INDUSTRY REGULATION (STATEWIDE DELIVERY)

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 W6831/2023/1 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 26 June 2023, the applicant submitted an application for a works approval to the department under section 54 of the *Environmental Protection Act 1986* (EP Act).

The application is to undertake construction works relating to the development of a mineral sands mine at the premises. The premises is approximately 18 kilometres east of Cervantes and 850 metres east of Nambung National Park.

The premises relates to the categories and assessed production capacity under Schedule 1 of the *Environmental Protection Regulations 1987* (EP Regulations) which are defined in works approval W6831/2023/1. 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 W6831/2023/1.

2.2.1 Overview of the Atlas Project

The applicant is seeking to develop a greenfield mineral sands open pit mine and processing plant at the premises. The mining area will require dewatering of up to 1.1 gigalitres of groundwater to allow for dry mining of the ore using mobile earthmoving equipment. This will include a dozer, two excavators, a grader and four haul trucks. The mine will be developed in three stages, beginning in the south area, as outlined in Figure 1 (below). The final footprint of the pit will be 2.8 km long, up to 600 m wide and up to 16 m deep.

Topsoil and overburden will be removed to access the ore and will be stockpiled adjacent to the mining area. The topsoil stockpiles will be retained for progressive rehabilitation work, and the overburden stockpiles will be backfilled to the mine voids when areas become available.

The ore contains naturally occurring radioactive material (NORMs) and elevated arsenic and zinc levels. A leachable metals analysis indicated that low levels of barium, boron, manganese and zinc may be released from the material under acidic conditions.

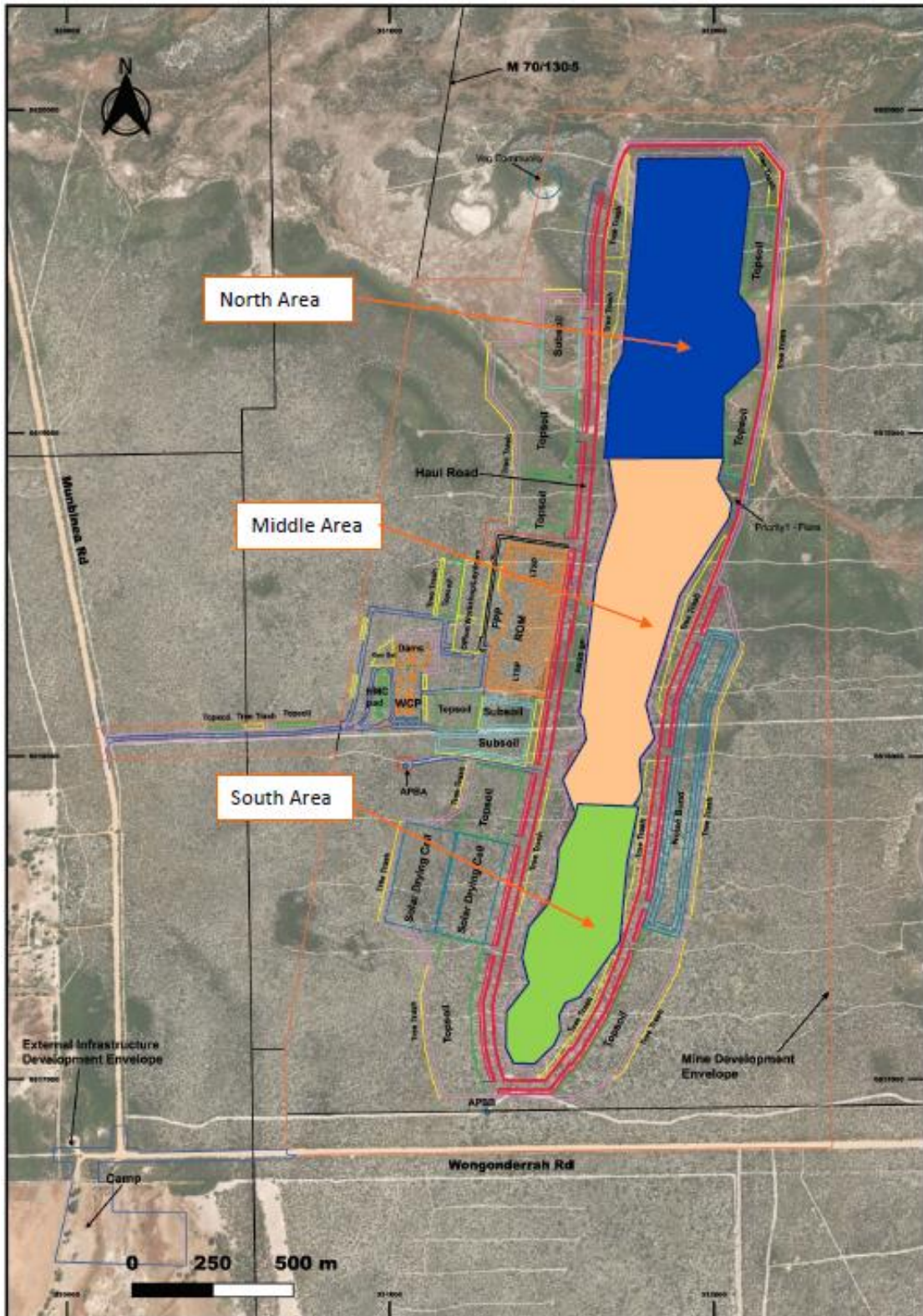


Figure 1: Stages of mining at the Atlas Project

The ore will be delivered using a loader to a Feed Preparation Plant (FPP) located to the west of the active mining area where the ore will be screened and slurried and then pumped to the Wet Concentrator Plant (WCP). The oversized fraction will be returned to the mine void. Water for this process will be sourced from dewatering of the mining area and from off-site sources.

The WCP will be located to the west of the active mining area and will be processed via wet gravity separation to produce a heavy metal concentrate (HMC). The HMC will be stockpiled to allow it to drain for a short period of time before being trucked off-site. Two waste streams are

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formed at the WCP – a coarse or sand tailings stream and a fine or slimes tailings stream. Flocculants FLOPAM EM 532 and Magnafloc LT27 AG may be added to the tailings.

Sand tailings will be deposited using cyclone stackers back into the mining voids. The applicant has indicated that sufficient void space will be available for tailings deposition prior to processing commencing, and therefore ex-pit deposition of tailings will not be required. Clarified water will be recovered from the desliming circuit and will be decanted back to the processing circuit while the remaining slimes will be disposed of to the solar drying ponds (SDP's). After drying, the fines will also be returned to the mine voids. A process flow diagram is included in Figure 2 (below).

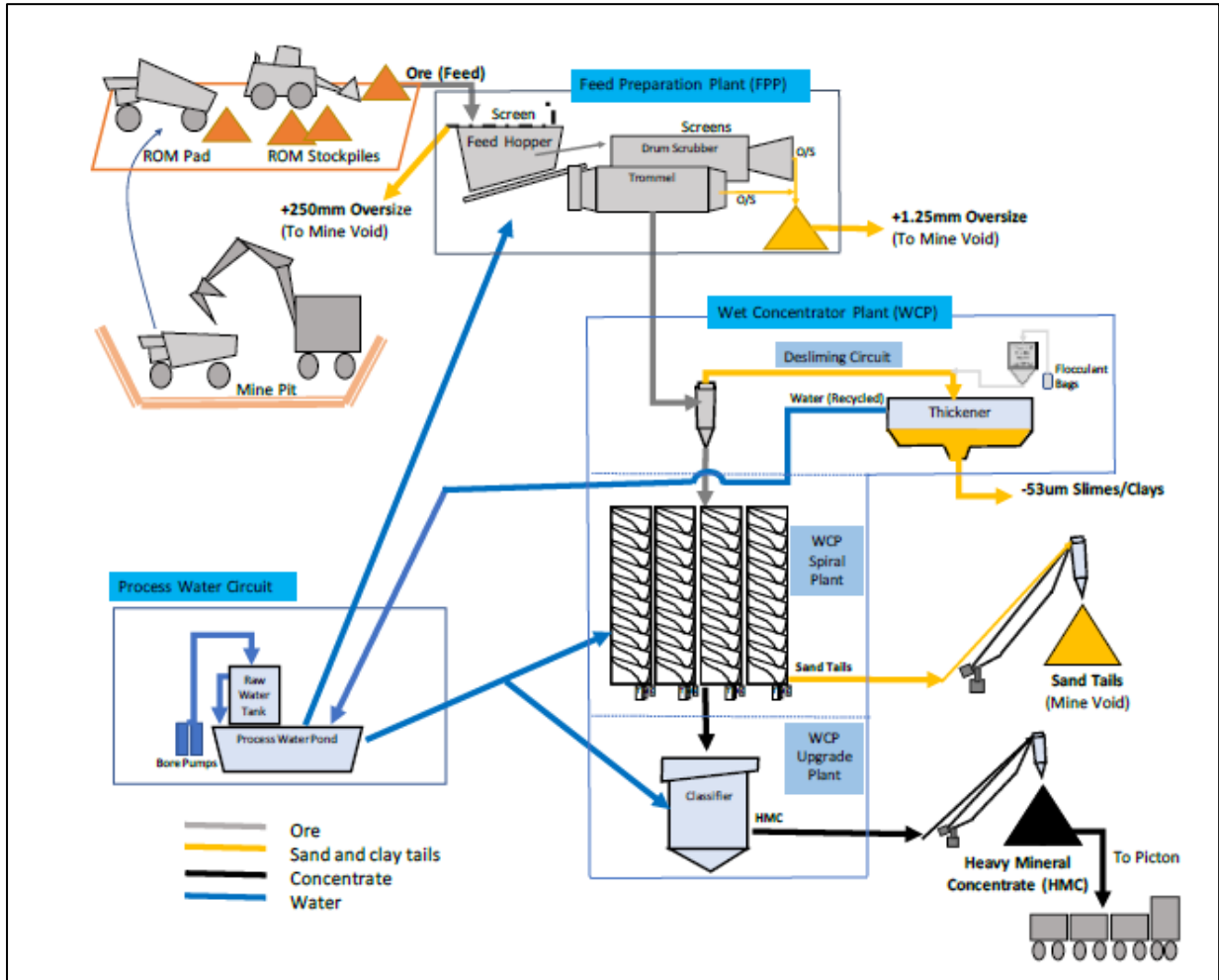


Figure 2: Atlas Project process flow diagram

Supporting infrastructure will include diesel generator sets, a water cart, hydrocarbon storage and refuelling infrastructure, workshops, storage areas, stockpile areas, administration buildings and access roads. A workers' camp will be built for the project outside the prescribed premises boundary. No landfill will be required as all non-processing wastes will be disposed of off-site.

The applicant has indicated that power generation and the volume of hydrocarbons stored on site will be below the thresholds that trigger a prescribed premises under Schedule 1 of the *Environmental Protection Regulations 1987*. The Delegated Officer has determined that they will not be included as categories on the works approval.

2.2.2 Siting and environment

Location

The prescribed premises is 18 km inland from Cervantes on mining tenure and is surrounded by pastoral leases. This land is held by the Yued People and is within the Yued Native Title (1997) determination area. The project lies entirely within a Priority 3 Threatened Ecological

Community and is less than one kilometre east of Nambung National Park (commonly known as The Pinnacles) and about one kilometre west of environmentally sensitive wetlands, refer to Figure 3 (below). The area receives about 700mm of rainfall per annum, falling mainly during the winter months (May – September). The strongest winds occur in summer, from a predominantly southerly direction, with autumn being dominated by more easterly winds.

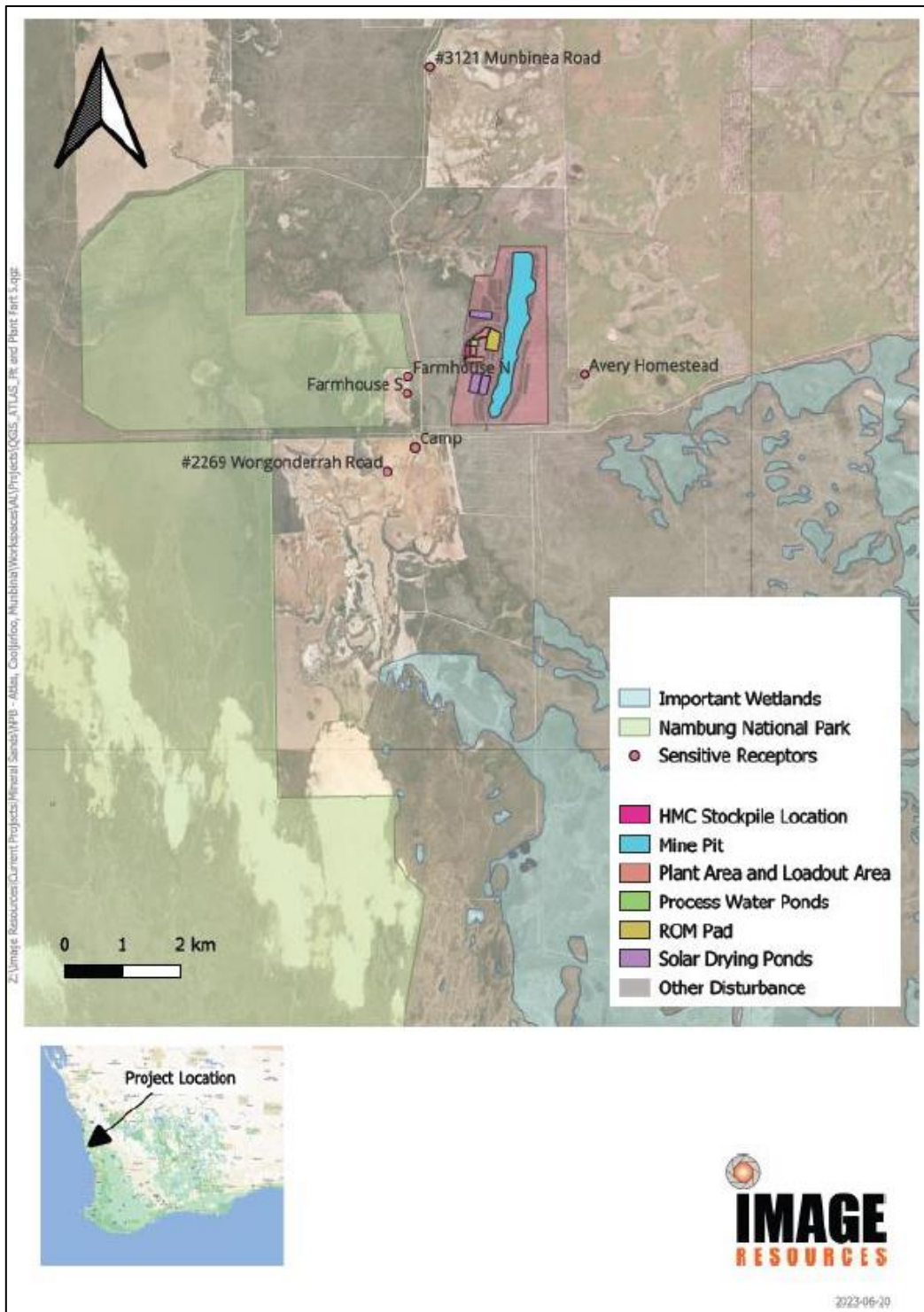


Figure 3: Atlas Project location map with sensitive receptors (note: the Avery homestead and Camp depicted on the map are not considered sensitive residential receptors).

Noise impacts

There are four residences within 5 kms of the prescribed premises that the applicant has identified as having the potential to be impacted by noise and dust emissions from the operation

(refer to Figure 3, above).

An environmental noise assessment undertaken by the applicant investigated the potential impacts of noise from the project at the four nearby residential receptors. It classified the four receptors as highly sensitive premises under the *Environmental Protection (Noise) Regulations 1997* (Noise Regulations), with a zero influencing factor applicable. This means that the baseline assigned levels of the Noise Regulations apply, as set out in Table 1.

Table 1: Baseline assigned noise level limits for the nearest receptors

Premises Receiving Noise	Time of day	Assigned level (dB)		
		L _{A10}	L _{A1}	L _{Amax}
Noise sensitive premises: highly sensitive area	0700 to 1900 hours Monday to Saturday (Day)	45	55	65
	0900 to 1900 hours Sunday and public holidays (Sunday)	40	50	65
	1900 to 2200 hours all days (Evening)	40	50	55
	2200 hours on any day to 0700 hours Monday to Saturday and 0900 hours Sunday and public holidays (Night)	35	45	55

Modelling indicates that noise from the processing activities is predicted to reach 35dB_{A10} (equal to the nighttime noise limit) at the nearest receptor, and noise from mining at the southern end of the pit and processing activities, in combination with the processing activities, will reach 45dB_{A10} (equal to the Monday – Saturday daytime noise limit) at the nearest receptor. It is noted that this would not be compliant with evening or Sunday noise levels.

Noise from mining is predicted to reduce slightly at the receptors (to a maximum of 40 dB_{A10}) as the mining moves northward. The investigation recommends follow up work to be conducted once the operation begins, to confirm the modelling predictions and to assess potential tonal impacts. If the noise generated at the operation is observed to be tonal, a penalty would apply which would result in the operation exceeding the assigned noise levels.

Modelling was also completed to assess the impact of the movement of HMC trucks entering and leaving site along the access road. For the purposes of the modelling, it was assumed that 3 trucks would be present on site during any 4-hour period, and they would travel at 25km/hr while using the access road. Under this scenario, the noise from the HMC trucks is predicted to reach 43dB_{A1} at the nearest receptor, which is compliant with the assigned noise levels at all times.

The applicant is proposing to operate the processing facilities 24 hours per day (day and night shift) and restrict mining and earthworks activities to daytime hours on Monday to Saturday (dayshift only) as this is likely to result in the project complying with the assigned noise levels. Additional noise controls that the applicant intends to undertake are outlined in section 3.1.1, Table 2.

Key finding: Noise modelling indicates that the applicant’s proposal to operate the processing facilities 24 hours per day will be on the cusp of the assigned nighttime noise levels at the nearest receptor, if all modelled controls are implemented. It also suggests that full operations (mining and processing) will be on the cusp of the daytime (Monday to Saturday) noise limits at the nearest receptor but will not meet Sunday and evening assigned noise levels. The modelling does not account for any potential tonal impacts. If tonal impacts are present, the operation is likely to exceed the assigned noise levels and further noise mitigation actions would be required.

Dust impacts

The applicant undertook a dust assessment for the project, which included modelling of total suspended particulate (TSP), PM₁₀ and PM_{2.5} dust emissions and the predicted impacts on the closest receptors. The assessment identified topsoil and overburden stripping, hauling (ie wheel generated dust) and stockpiling of material as the highest risk activities for dust generation. These activities were considered likely to exceed the *National Environment Protection (Ambient Air Quality) Measure (NEPM)* 24-hour PM₁₀ air quality standard of 50 µg/m³ (24 hour average), if controls were not implemented. Dust generation is likely to be higher during the windy, dry, summer months (October to April) as rainfall during the winter months is likely to significantly inhibit dust liftoff.

The modelling accounted for the dust controls outlined in section 3.1.1, Table 2 being fully implemented at the operation, then modelled both dayshift only mining and day and nightshift mining. Dust from processing activities is likely to be minimal, as the material is wet throughout the process. The modelling compared emissions against the DWER standards set out in the *Guideline Dust Emissions (draft), 2021*. It is noted that the applicant has committed to dayshift only mining operations to ameliorate noise impacts, which will also have positive outcomes for dust impacts.

The results for dayshift only mining at the project indicated that when added to estimated background levels, PM₁₀ emissions would only reach about 33% of the 24-hour standard and 46% of the annual standard at the nearest receptors. The modelling suggested that PM_{2.5} emissions are expected to reach 26% of the 24-hour standard and 54% of the annual standard. Refer to Table 3, below.

Table 2: Modelled PM₁₀ and PM_{2.5} dust emission levels at the nearest receptors compared to the guideline standard, (Image Resources Atlas Project, Air Quality Impact Assessment (2022))

Table 10: Cumulative GLCs for 24-hour and Annual Average Periods

Pollutant	Averaging Period	Guideline (µg/m ³) ¹	Concentration (µg/m ³) ¹					% Of Guideline				
			R1	R2	R3	R4	R5	R1	R2	R3	R4	R5
Day Shift Operations Scenario												
PM ₁₀	24 hr	50	14.3	14.8	16.3	13.1	13.0	29%	30%	33%	26%	26%
	Annual	25	11.0	11.5	11.4	10.9	11.0	44%	46%	46%	44%	44%
PM _{2.5}	24 hr	25	5.3	6.0	6.5	4.9	4.7	21%	24%	26%	20%	19%
	Annual	8	4.1	4.3	4.3	4.1	4.1	52%	54%	53%	51%	51%

Modelled TSP levels for the project only reached 5% of the standard of 2g/m²/month, as outlined in the *DWER Guideline Dust Emissions (draft), 2021* at the nearest receptor.

The applicant has also proposed to monitor dust emissions to ensure that dust controls are effective. The proposed dust monitoring program will utilise real-time air quality monitors for PM₁₀ and PM_{2.5} emissions, linked to alerts for operating staff when elevated levels are recorded. This monitor does not meet the relevant Australian Standards (AS) but would be calibrated against a second dust monitor on site that will meet AS 3580.9.6.

Chemically, the dust is expected to be largely benign, however, it is noted that the ore contains monazite. Monazite is known to contain low levels of radionuclides, and this is likely to primarily report to the HMC and be transported offsite. The applicant has proposed to undertake a dust composition analysis.

Key finding: A dust investigation indicated that dust from mining activities were likely to exceed the 24-hour PM₁₀ air quality standard, if no dust controls were implemented. With dust controls fully implemented, including mining during dayshift only, PM₁₀ dust levels are only likely to reach 46% of the annual standard at the nearest receptors. The applicant intends to implement dust monitoring to ensure that dust controls are implemented effectively.

Hydrology

The Atlas Project lies within the Nambung River catchment area but does not intersect any permanent creek lines. The nearest creeks are Bibby Creek and Mt Jetty Creek, which lie 2 kms and 200 m, respectively, to the north of the mining area, and both flow into the Nambung River. The area of the catchment where the prescribed premises is located may be prone to flooding during extreme rainfall events, such as a 1 in 100-year rainfall event. During these events, mining in this floodplain has the potential to significantly impact the water quality of the creeks through sedimentation or contamination.

The applicant has proposed to construct an earthen bund around the northern extent of the mining area which will isolate it from any potential seasonal flooding, including up to a 1 in 100-year flood event. An assessment of potential surface water impacts from the project found that if the earthen bund is constructed as outlined in their Surface Water Management Plan, it would effectively prevent stormwater impacts to the water quality in the Nambung River system during these occasional events.

Key finding: With no controls in place, impacts from mining to the local creeks may be significant during rare, extremely heavy, rainfall events. However, with the installation of an earthen bund around the mining area to prevent water ingress during high rainfall events, the water quality and the quality of flow in the Nambung River system are likely to be effectively protected.

Geology and Hydrogeology

The Atlas Project is situated on the Swan Coastal Plain, within a geological formation known as the Bassendean Dune System. The upper layers comprise of dune sands, with clay and silt layers present at greater depth. The Bassendean Dune System is known to contain a type of acid sulfate soils (ASS) characterised by highly reactive pyrite, coupled with a poor buffering capacity, making it prone to acidification when exposed to oxidising conditions. When undisturbed, these soils pose very little environmental risk, however, dewatering and excavation for mining is likely to cause these soils to oxidise and release acid which will necessitate selective handling and/or neutralisation.

The project area is within the Jurien Groundwater Area, proclaimed under the *Rights in Water and Irrigation Act, 1914* (RIWI Act). The groundwater below the mining area is brackish and shallow, between 2 and 8 metres below the ground level (mbgl). The pH of the groundwater around the prescribed premises has been measured between 6.8 and 7.6, indicating that very little acidification has occurred from the undisturbed, in-situ soils. It is likely that the groundwater is currently preventing the oxidation of the sulfide containing Bassendean Dune Sands that lie below the water table. The applicant intends to mine to depths of up to 16 mbgl which will necessitate dewatering of the pit area.

An investigation by the applicant has confirmed that acid sulfate soils (ASS) and potential acid sulfate soils (PASS) are present at the premises and in the mining area. These soils are typically dark coloured and clayey. The investigation screened 245 samples from 26 drillholes within and around the mining area. Of these:

- one sample returned a pH of less than 4, indicating that acid is currently being formed (AASS) in one small, localised area;
- another 5 samples returned a pH of between 4 and 5, indicating a strong potential for acid formation (PASS); and
- 34 samples returned a pH of less than 3 when oxidised with hydrogen peroxide (pH_{FOX}), indicating a strong potential for acid formation when exposed to oxidising conditions (PASS).

Following the screening analysis, 72 samples were selected for further (Suite 2) analysis, using the *Chromium Suite for Acid Sulfate Soils* (CRS suite analysis) methodology. The CRS suite

gives a more reliable indication of the potential for acid formation and can be used to determine which soil samples will require neutralisation treatment and special handling to reduce the potential impacts of acid formation. This data is also necessary to determine the amount of neutralisation treatment which will be required to treat the soil. For Bassendean Dune Sands, samples that return a pH_{FOX} of less than 3 and have a Chromium Reducible Sulfur (S_{Cr}) content greater than 0.01% require selective handling and neutralisation for PASS.

Of the 72 samples taken, 18 samples from 7 drill holes (25% of samples) exceeded the PASS action criteria for Bassendean Dune Sands (i.e. they are confirmed PASS), as seen in Figure 4. The soils that have been confirmed PASS will require selective handling and neutralisation as soon as they are mined. Acid generation from this material is likely to begin as soon as these areas are dewatered. It is noted that most of the PASS that has been detected so far is located in the southern and central regions of the pit, which will be mined first.

Overall, the distribution of PASS appears variable, both laterally and with depth, and does not appear to be correlated with any particular zones of the orebody. There does not appear to be a strong correlation between soil profile stratigraphy, soil texture, soil colour and PASS materials. The PASS appears to be distributed in relatively isolated, inconsistent depths within the soil profile. The investigation has not attempted to quantify the volume of PASS within the mining area, so the amount of PASS that will require management and treatment remains unknown at this stage.

It is noted that dewatering of the mining area in the areas where there is confirmed PASS is likely to cause acidification of the soils and groundwater even if no earthworks are undertaken immediately. Careful management of the dewatering process, as well as the handling of soils, will be required to ensure that acidification of the soils and groundwater is prevented.

The applicant has prepared an ASS Management Plan that outlines how this material will be managed to prevent potential environmental impacts. A detailed risk assessment of PASS at the project can be found in section 3.3.2.

Key finding: Potential acid sulfate soils (PASS) has been confirmed within the mining area. When mined, these soils will immediately require selective handling and management to ensure that acidification of the groundwater and surrounding soils is prevented. Quantification of the PASS within the mining area has not yet been undertaken, so the full extent of PASS on site remains unknown. Dewatering of the mining areas with confirmed PASS will need to be managed carefully.

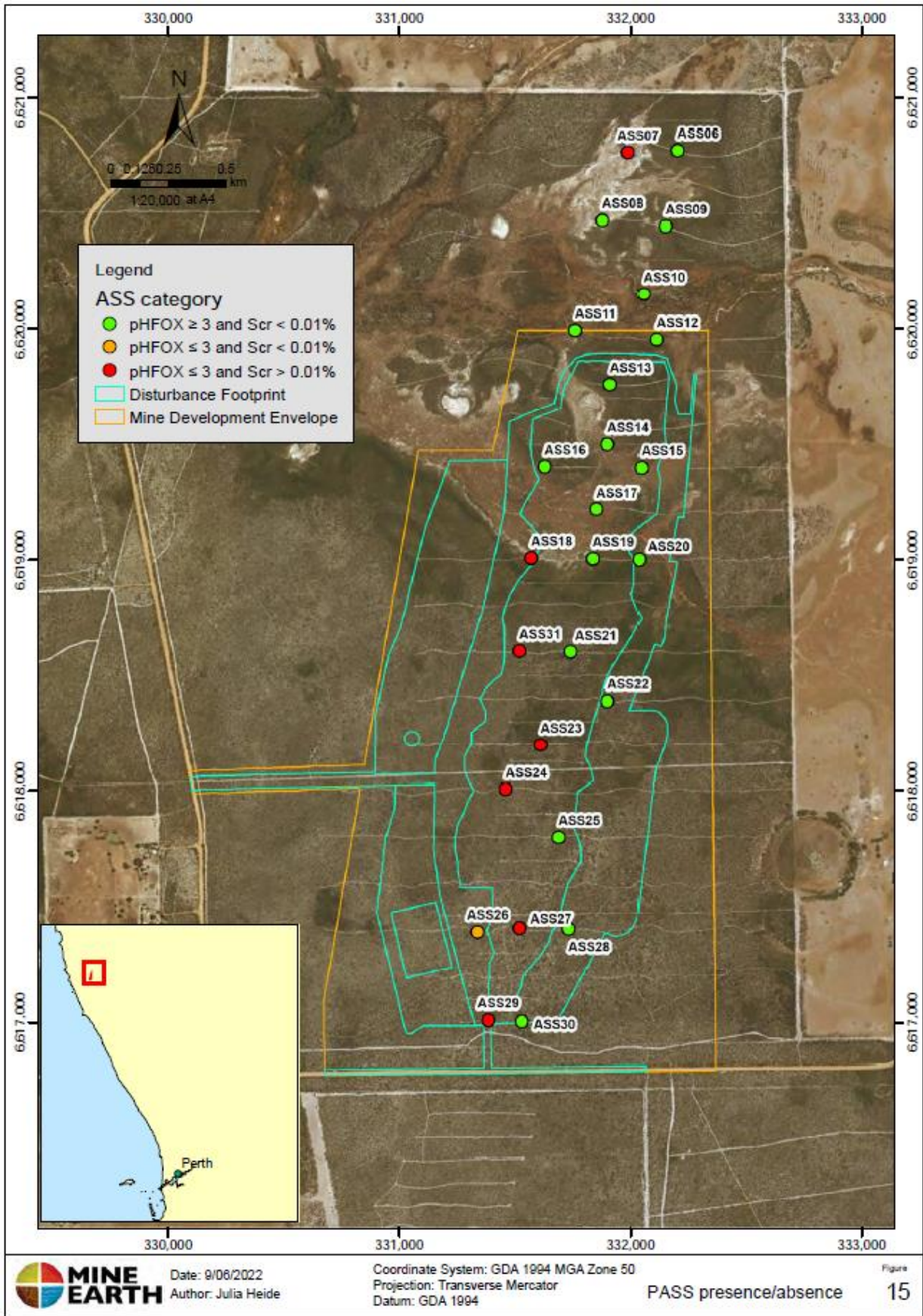


Figure 4: Red drill holes containing PASS that will require selective handling and neutralisation when disturbed by dewatering or excavation.

2.3 Part IV of the EP Act

The Atlas Project was referred to the Environmental Protection Authority (EPA) on 3 September 2021. The EPA decided to assess the proposal at the level of a Public Environmental Review with a six-week public review period under Part IV of the EP Act.

It was also assessed and determined to be a “controlled action” under the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) on the basis of potential impacts to endangered Banksia Woodlands of the Swan Coastal Plain and conservation significant fauna. The WA EPA assessed these matters in accordance with the bilateral agreement between Western Australia and the Australian Government.

Report number 1759 was issued in March 2024 relating to the proposal, which identified flora and vegetation, terrestrial fauna and inland waters as key environmental factors for the project. Figure 5 shows the approved mine development envelope and key exclusion areas for the project under Ministerial Statement 1220 for the project. Impacts to fauna and vegetation, such as clearing, rehabilitation and the management of groundwater drawdown to minimise potential impacts to the nearby groundwater dependent vegetation are managed under MS 1220 and will not be considered in this assessment.

The EPA assessment considered the direct impacts (such as clearing) to areas of cultural significance to the Yued people. This assessment under Part V of the EP Act will take into consideration the potential impacts from emissions and discharges from the project to the same areas of cultural significance to the Yued People.

The EPA report explicitly states that it expects the works approval assessed under Part V of the EP Act to regulate construction and operations at the premises to ensure that there are no adverse impacts from the disturbance of acid sulfate soils, noise generation and dust generation.

The Delegated Officer has taken into consideration that a Groundwater Operating Strategy and Drawdown Management Plan is required to be implemented under MS 1220 to manage impacts from drawdown of the water table from mine dewatering on the nearby groundwater dependent vegetation. This management plan will require monitoring of the groundwater levels and quality; and will manage the discharge of water to infiltration ponds to minimise groundwater drawdown impacts.

It is noted that the dewatering of the area for mining, and the subsequent discharge of water to the infiltration ponds, while typically regulated under a Part V instrument, has in this case been assessed and regulated under MS 1220. For this reason, category 6 (*mine dewatering: premises on which water is extracted and discharged into the environment to allow mining of ore*) has not been risk assessed and will not be included on the works approval.

Groundwater monitoring will primarily be regulated under MS 1220, however, some specific groundwater monitoring parameters to detect impacts from acid sulfate soils management and tailings management will be considered in this assessment.

Key finding: There is some regulatory overlap between Part IV and Part V of the EP Act with regards to dewatering, discharges to groundwater and groundwater monitoring for this project. The Delegated Officer considers the management of groundwater drawdown to protect the groundwater dependent vegetation to be regulated entirely under MS 1220. For this reason, discharges to the infiltration ponds will not be considered in this assessment as the primary purpose of the discharge is to manage impacts to vegetation from the abstraction of groundwater. Some complementary groundwater monitoring will be considered as it relates to acid sulfate soils and tailings management at the premises.

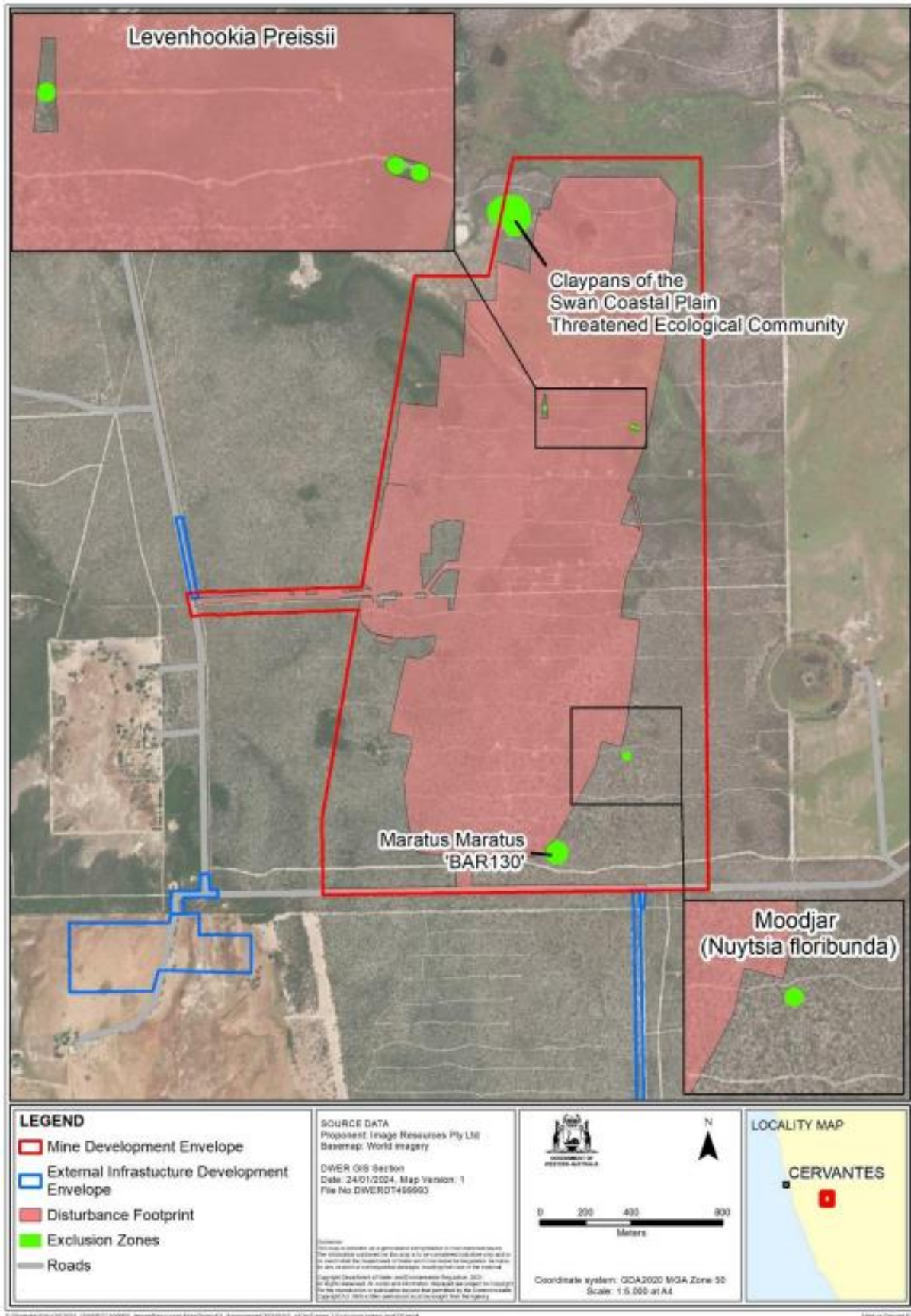


Figure 5: Atlas Project development envelope and exclusion zones, from EPA report 1759.

3. 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.

3.1 Source-pathways and receptors

3.1.1 Emissions and controls

The key emissions and associated actual or likely pathway during premises construction and operation which have been considered in this decision report are detailed in Table 1 below. Table 1 also details the control measures the applicant has proposed to assist in controlling these emissions, where necessary.

Table 1: Proposed applicant controls

Emission	Sources	Potential pathways	Proposed controls
Construction			
Dust	Vehicle movements, lift-off from stockpiles and/or cleared areas, earthworks etc.	Air / windborne pathway	<p>Minimise clearing.</p> <p>Watercart to be used for dust suppression on open areas and stockpiles.</p> <p>Use of chemical dust suppressant when required.</p> <p>Compaction, grading and wetting down of the construction area during works.</p> <p>Minimise earthworks during high wind (dusty) conditions.</p> <p>Speed limits for vehicles on site.</p>
Noise	Earthworks, clearing, construction and installation of buildings and equipment, vehicle movements.	Air / windborne pathway	Restriction of topsoil and overburden stripping to daytime only.
Sediment laden stormwater	Clearing, earthworks, stockpiling of material.	Stormwater runoff to surface water and vegetation	<p>Minimise clearing.</p> <p>Compaction, grading and wetting down of the construction area during works.</p>
Operation			
Noise	Operation of mobile machinery for mining, operation of fixed machinery for processing, use of	Air / windborne pathway	<p>Nighttime activities restricted to processing only.</p> <p>Topsoil and overburden stripping and mining activities to be restricted to daytime only with a</p>

Emission	Sources	Potential pathways	Proposed controls
	generators and pumps.		limited mining fleet. Broadband start-up alarms and reversing alarms to be utilised. Pump placement to attenuate noise. Pumps to be enclosed if required. Generator sets to be enclosed to attenuate noise. Speed limit of 25km/hr for HMC trucks on site. Monitoring at the nearest receiver to verify that noise limits are met.
Dust	Erosion of cleared areas and stockpiles during high winds Mining and earthworks Wheel generated dust Materials handling	Air / windborne pathway	Restriction of mining activities to daytime only. Watercart and sprinklers to be used for dust suppression. Compaction, grading and wetting down of the operational processing areas. Minimise earthworks during high wind (dusty) conditions. Speed limits of 50km/hr for haul trucks on site. Mulching and progressive rehabilitation. Wet processing of ore.
Sediment laden stormwater	High rainfall events	Stormwater runoff to surface water and vegetation	Construction of a bund to 42 m AHD around the north of the mining area to divert high levels of runoff around the open pit during high rainfall events. Construction of a toe drain along the eastern side of the bund. Stormwater from the mining and processing areas to be directed to sediment basins or the open pit. Sediment sumps to be sized to contain at least 25 mm of water from across the catchment area. Maintain the ability to pump water from the open pit to the mine water circuit.
Hydrocarbon contamination	Direct discharge from spills	Spill to soils and vegetation	Installation of an oily/water separator at the workshop. Vehicle washdown, workshops and refuelling areas will be compacted or hardstand areas.
Process water	Overtopping of process water pond or solar drying ponds Pipeline spills	Spill to soils and vegetation	Pipelines to be constructed in bunding or with leak detection systems. Daily inspections of pipelines, solar drying ponds and process water ponds Process water pond and solar drying ponds to be operated with a 1 m freeboard

Emission	Sources	Potential pathways	Proposed controls
Seepage from tailings or process water facilities	Seepage from solar drying ponds, process water ponds or tailings deposition areas (mine voids)	Seepage to groundwater	Process water pond to be lined with a HDPE liner to prevent seepage. Deposition of clay slimes into solar drying ponds will eventually form a low permeability layer to reduce seepage. Decant water from tailings to be returned to the process water circuit.
Tailings	Pipeline spills Overtopping of mine voids	Spills	Pipelines to be constructed in bunding or with leak detection systems. Daily inspections of pipelines
Acidification of groundwater or soils	Naturally occurring acid sulfate soils within the mining area	Acidification of soils and groundwater	On-going sampling and analysis of overburden and ore for PASS. Selective handling of PASS materials, including burial in the open pit with a neutralising agent. Neutralisation of PASS with limestone and confirmation testing for effectiveness. Lining of selected areas of pit with limestone prior to burial of PASS overburden material. Construction of a limestone treatment pad for handling PASS material Monthly testing of process water and neutralisation if pH <4 Routine testing of tailings and slimes for PASS Neutralisation of tailings, if required.

3.1.2 Receptors

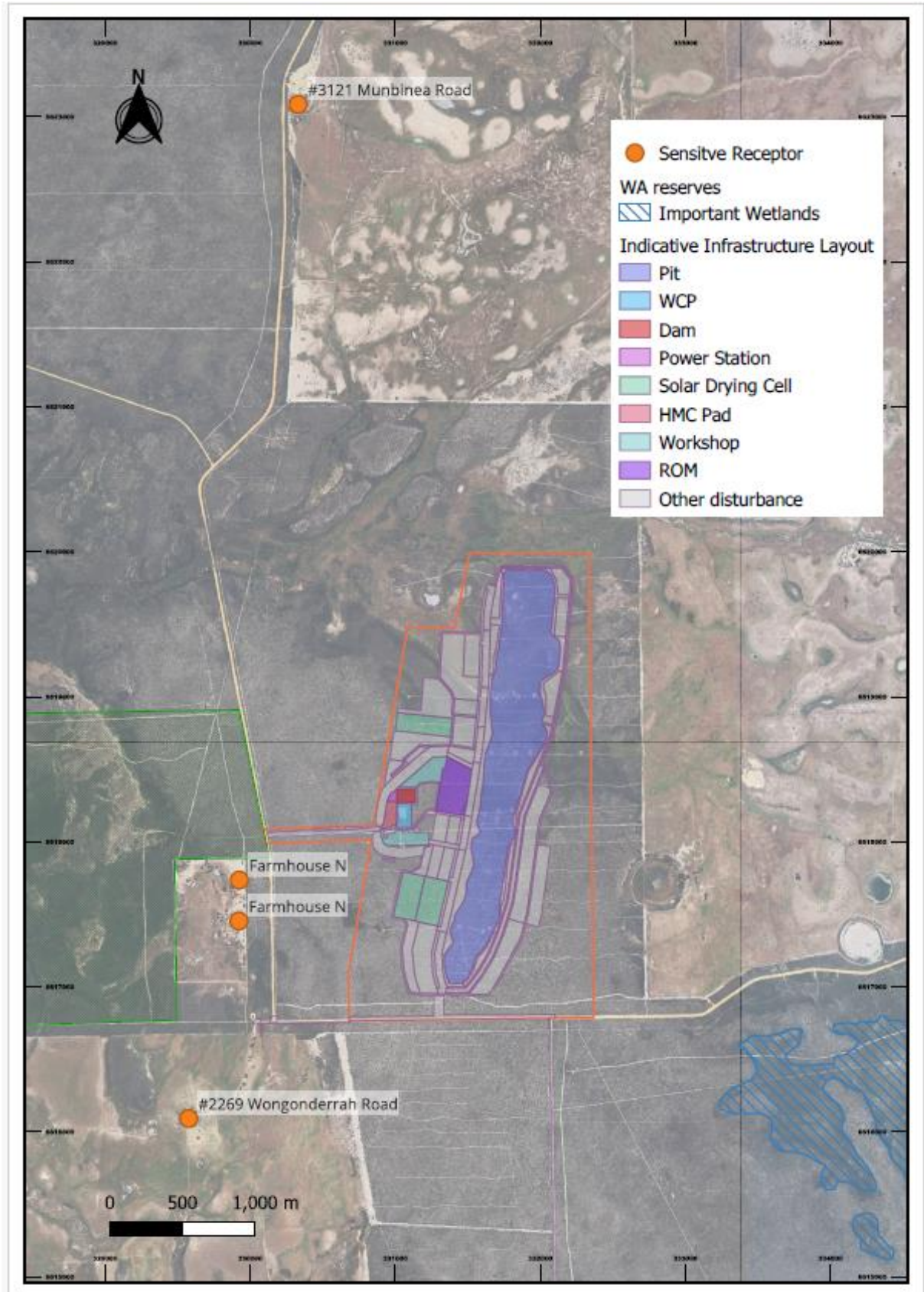
In accordance with the *Guideline: Risk Assessment* (DWER 2020), the Delegated Officer has excluded the applicant's employees, visitors, and contractors from its assessment. Protection of these parties often involves different exposure risks and prevention strategies and is provided for under other state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

Table 2 and Figure 6 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 2: Sensitive human and environmental receptors and distance from prescribed activity

Human receptors	Distance from prescribed activity
2269 Wongonderrah Road	1.3 km southwest of prescribed premises boundary 1.7 km southwest of mining area
3700 Munbinea Road	300 m southwest of haul road 860 m west of premises boundary

3672 Munbinea Road	500 m southwest of haul road 850 m west of premises boundary
3121 Munbinea Road	3.3 km northwest of premises boundary and mining area
Avery Homestead	The homestead is no longer habitable and has been screened out as a receptor
Workers' camp	The camp for Image Resources' workers has been excluded as a receptor, as legislation for worker health and safety applies.
Environmental receptors	Distance from prescribed activity
Nambung National Park	850 m west of the prescribed premises boundary. Visitor centre is about 10 kms southwest of the prescribed premises boundary.
Threatened Ecological Community – <i>Banksia Woodlands of the Swan Coastal Plain</i> (endangered) (groundwater dependent)	Premises is entirely within this vegetation community
Threatened Ecological Community – <i>Claypans of the Swan Coastal Plain</i> (critically endangered)	Within the prescribed premises boundary
Species of cultural interest – Moodjar (<i>Nuytsia floribunda</i>)	Within the prescribed premises boundary
17 priority flora species	Within the prescribed premises boundary
Carnaby's Cockatoo (endangered)	High value foraging habitat within the prescribed premises boundary
Mount Jetty creek line, which feeds the Nambung River.	About 200 m north of the mining area. Prescribed premises is within the creek catchment area.
Environmentally significant wetlands	1 km east-southeast of premises boundary
Groundwater: brackish at 2 to 8 m below ground level.	Site is within the prescribed Jurien Groundwater Area
Areas of Aboriginal cultural significance, including Moodjar trees and Bibby and Jetty Creeks. (Note that there are no registered Aboriginal Cultural Heritage Sites in the area)	Moodjar trees within the prescribed premises boundary but excluded from the disturbance footprint of MS 1220. Mount Jetty Creek 200 m north of the mining area Bibby Creek 2 kms north of the mining area



kjm

Figure 6: Distance to sensitive receptors

3.2 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 3.1. 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 3.1), 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 3.

Works approval W6831/2023/1 that accompanies this decision report authorises construction and time-limited operations. The conditions in the issued works approval, as outlined in Table 3 have been determined in accordance with *Guidance Statement: Setting Conditions* (DER 2015).

A licence is required following the time-limited operational phase authorised under the works approval to authorise emissions associated with the ongoing operation of the premises i.e. category 8 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 3: Risk assessment of potential emissions and discharges from the premises during construction and operation

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								
Topsoil and overburden stripping and stockpiling, including use of mobile equipment. Construction of wet concentrate plant (WCP), process water ponds, solar drying ponds and supporting infrastructure Construction of stormwater channels and stormwater sump.	Dust	Air / windborne pathway causing impacts to health and amenity	Residences 3.3km north and 800m west and 1.3km southwest of the premises	Refer to Section 3.1	C = Minor L = Unlikely Medium Risk	Y	Condition 2, 3, and 4.	Applicant controls have been conditioned on the works approval. Refer to detailed risk assessment in section 3.3.
	Noise			Refer to Section 3.1	C = Minor L = Unlikely Medium Risk	Y	Condition 5	Applicant controls have been conditioned on the works approval.
	Sediment laden stormwater	Contaminated run-off	Mt Jetty Creek 200m north of the premises Surrounding soil and priority vegetation	Refer to Section 3.1	C = Minor L = Rare Low Risk	Y	N/A	No regulatory controls required.
Construction of earthen bunds, solar drying ponds and process water dams from overburden	Acidic seepage or drainage	Disturbance and use of PASS materials causing contamination	Surrounding soils Groundwater	Refer to Section 3.1	C = Major L = Possible High Risk	N	<u>Condition 1</u>	Condition added requiring the screening of material used in construction for PASS. Refer to detailed risk assessment in section 3.4.
Operation (and time-limited-operations operations)								
Mining – overburden and ore removal and handling, vehicle movements,	Dust	Air / windborne pathway causing impacts to health and amenity	Residences 3.3km north and 800m west and 1.3km southwest of the premises	Refer to Section 3.1	C = Minor L = Unlikely Medium Risk	Y	Condition 15 and 21	Applicant controls and proposed dust monitoring has been conditioned on the works approval.

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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				
	Noise	Air / windborne pathway causing impacts to amenity	Residences 3.3km north and 800m west and 1.3km southwest of the premises	Refer to Section 3.1	C = Moderate L = Unlikely Medium Risk	Y	Condition 5, 13, 14, 15, 22, 23, 24, and 25	Noise modelling shows the operation will be close to both day and nighttime noise limits (see section 2.2.2 for more details). Noise verification monitoring is required to verify that the operation does comply with the EP Noise Regulations at the closest residences. This has been proposed by the applicant and has been conditioned within the works approval.
	Sediment laden stormwater	Contaminated run-off	Mt Jetty Creek 200m north of the premises Surrounding soil and priority vegetation	Refer to Section 3.1	C = Minor L = Rare Low Risk	Y	Condition 1	Construction of a bund around the mining area to prevent potential impacts to Mt Jetty Creek during occasional flood events will prevent potential impacts.
	Acid drainage	Deterioration of soil quality and/or groundwater quality due to oxidation of PASS from dewatering and earthworks	Surrounding soil and priority vegetation Groundwater	Refer to Section 3.1	C = Major L = Rare Medium Risk	N	Condition 1 , 16 and 17	Requirement to construct treatment pad prior to mining and install groundwater monitoring bores. Refer to detailed risk assessment in section 3.4
Stockpiling of topsoil and overburden	Sediment laden stormwater	Overland runoff potentially causing ecosystem disturbance or impacting surface water quality	Mt Jetty Creek 200m north of the premises Surrounding soil and priority vegetation	Refer to Section 3.1	C = Minor L = Rare Low Risk	Y	N/A	No regulatory controls required.
	Dust	Air / windborne pathway causing impacts to health	Residences 3.3km north and 800m	Refer to Section 3.1	C = Minor	Y	Condition 15 and 21	Applicant controls have been conditioned on the works approval.

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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				
		and amenity	west and 1.3km southwest of the premises		L = Unlikely Medium Risk			Refer to detailed risk assessment in section 3.3
	Acid drainage (from overburden only)	Deterioration of groundwater quality due to acidic seepage	Surrounding soil and priority vegetation Groundwater	Refer to Section 3.1	C = Major L = Rare Medium Risk	N	Condition 1 , 16 and 17	Refer to detailed risk assessment in section 3.4
Transport of process water and tailings through pipelines	Tailings or process water	Spills	Surrounding soil and priority vegetation	Refer to Section 3.1	C = Minor L = Unlikely Medium Risk	Y	Condition 1 and 11	Leak detection and regular inspections will provide sufficient protection. Applicant controls have been conditioned on the works approval.
Processing of ore including operation of FPP and WCP	Noise	Air / windborne pathway causing impacts to amenity	Residences 3.3km north and 800m west and 1.3km southwest of the premises	Refer to Section 3.1	C = Moderate L = Possible Medium Risk	Y	Condition 13, 14, 15, 22, 23, 24, and 25	Noise modelling (see section 2.2.2 for more details) shows the operation will be close to both day and nighttime noise limits. Noise verification monitoring is required to verify that the operation does comply with the EP Noise Regulations at the closest residences. This has been proposed by the applicant and has been conditioned within the works approval
	Dust	Air / windborne pathway causing impacts to health and amenity	Residences 3.3km north and 800m west and 1.3km southwest of the premises	Refer to Section 3.1	C = Minor L = Rare Low Risk	Y	Condition 15 and 21	Applicant controls have been conditioned on the works approval
	Sediment laden stormwater	Contaminated run-off	Surrounding soil and priority vegetation	Refer to Section 3.1	C = Slight L = Unlikely Low Risk	Y	Condition 1	Applicant controls have been conditioned on the works approval

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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				
Stockpiling of ore and HMC	Sediment laden stormwater	Overland runoff potentially causing ecosystem disturbance or impacting surface water quality	Mt Jetty Creek 200m north of the premises Surrounding soil and priority vegetation	Refer to Section 3.1	C = Minor L = Rare Low Risk	Y	Condition 1	Applicant controls have been conditioned on the works approval
	Dust	Air / windborne pathway causing impacts to health and amenity	Residences 3.3km north and 800m west and 1.3km southwest of the premises	Refer to Section 3.1	C = Minor L = Unlikely Medium Risk	Y	Condition 15 and 21	Applicant controls have been conditioned on the works approval. Refer to detailed risk assessment in section 3.3
	Acid drainage	Deterioration of in situ soil and groundwater quality due to acidic seepage from stockpiles	Surrounding soil and priority vegetation Groundwater	Refer to Section 3.1	C = Major L = Rare Medium Risk	N	Condition 1 , 16 and 17	Requirement to construct treatment pad prior to mining. Refer to detailed risk assessment in section 3.4
Operation of process water ponds	Process water	Spills Overtopping of ponds	Surrounding soil and priority vegetation	Refer to Section 3.1	C = Minor L = Unlikely Medium Risk	Y	Condition 10 and 11	1 m freeboard and inspections will provide sufficient protection. Applicant controls have been conditioned on the works approval
	Seepage	Seepage from ponds causing groundwater mounding	Priority vegetation	Refer to Section 3.1	C = Minor L = Rare Low Risk	Y	Condition 1	Ponds will be HDPE lined. Applicant controls have been conditioned on the works approval
	Acidification of process water	Deterioration of process water quality due to acidification	Surrounding soil and priority vegetation Groundwater	Refer to Section 3.1	C = Minor L = Possible Medium Risk	Y	Condition 1, 16 and 17.	The applicant has proposed to monitor process water for acidification and treat if required. This has been conditioned within the works approval. Refer to detailed risk assessment

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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				
								in section 3.4.
Operation of solar drying ponds	Process water	Spills Overtopping of ponds	Surrounding soil and priority vegetation	Refer to Section 3.1	C = Minor L = Unlikely Medium Risk	Y	Condition 10 and 11	1 m freeboard and inspections will provide sufficient protection. Applicant controls have been conditioned on the works approval
	Seepage	Seepage from ponds causing groundwater mounding	Priority vegetation	Refer to Section 3.1	C = Slight L = Unlikely Low Risk	Y	N/A	Seepage from this structure is likely to assist with water infiltration objectives under the Ministerial Statement. No regulatory controls required
	Acid drainage	Deterioration of groundwater quality due to acidic seepage	Surrounding soil and priority vegetation Groundwater	Refer to Section 3.1	C = Minor L = Possible Medium Risk	Y	Condition 19	The applicant has proposed to monitor the pH of slimes tailings stream. This has been conditioned on the works approval, refer to detailed risk assessment in section 3.4.
Disposal of tailings to mine voids	Seepage	Seepage from mine voids causing groundwater mounding	Priority vegetation	Refer to Section 3.1	C = Slight L = Unlikely Low Risk	N/A	NA	Groundwater levels will be managed and monitored under the Ministerial Statement.
	Acid or metalliferous drainage	Deterioration of groundwater quality due to acidic or metalliferous seepage	Surrounding soil and priority vegetation Groundwater	Refer to Section 3.1	C = Major L = Unlikely Medium Risk	N	Condition 20 , 16 and 17	Applicant controls to manage acidification have been conditioned on the works approval. Additional requirement to monitor bores downstream of the open pits has been conditioned on the works approval. Refer to detailed risk assessment in section 3.4.

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.

3.3 Detailed risk assessment – Dust emission impacts on nearest residential receptor

3.3.1 Dust emissions and potential impacts

A dust investigation conducted by the applicant indicated that dust from mining activities is likely to exceed the *National Environment Protection (Ambient Air Quality) Measure (NEPM)* 24-hour PM₁₀ air quality standard of 50 µg/m³ (24 hour average), if no dust controls are implemented (see section 2.2.2). The applicant has outlined a series of procedural dust controls that have been conditioned on the works approval. With dust controls fully implemented, including mining during dayshift only, amenity dust impacts are likely to be infrequent and minor at the nearest receptors. The highest risk of dust impacts to neighbouring residences is likely to peak during the windy, dry, summer months (October to April) as rainfall during the winter months is likely to significantly inhibit dust liftoff.

The applicant has proposed to monitor dust emissions to ensure that dust controls are effective. The proposed dust monitoring program will utilise real-time air quality monitors for PM₁₀ and PM_{2.5} emissions, linked to alerts for operating staff when elevated levels are recorded. This monitor does not meet the relevant Australian Standards (AS), but would be calibrated against a second high-volume PM₁₀ dust monitor on site that will meet AS 3580.9.6. The applicant has also proposed to conduct an analysis of the composition of the dust to confirm that heavy metals in the dust are below hazardous levels.

3.3.2 Regulatory controls

The Delegated Officer agrees that dust monitoring will be important to ensure that the dust controls are effective, and has added conditions for monitoring that relate to the high-volume monitor that meets AS 3580.9.6, during time-limited operations. The Delegated Officer endorses the operational strategy relating to the use of real-time dust monitors, but notes that conditions relating to the installation of dust monitors that do not meet relevant AS are difficult to enforce, as results may be perceived as unreliable. The implementation of real-time monitoring as outlined in the applicant's Air Quality Management Plan is likely to be effective and is encouraged for operational purposes, however, it will not be conditioned on the works approval.

Results from the monitoring conducted during time-limited operations will need to be submitted with the subsequent licence application, when on-going dust controls and monitoring will be reviewed. The Delegated Officer encourages the applicant to also provide results of the real-time dust monitoring which may help the applicant to demonstrate the effectiveness of the dust controls that have been implemented.

The dust monitoring will only be required between October and May (inclusive) during operations, as it is acknowledged that impacts from dust during the wetter, winter months is likely to be minimal. The monitor should be positioned near the western boundary of the premises, closest to the receptors which the modelling indicated are the most likely to be impacted by elevated dust levels.

The applicant has also proposed to use the high-volume sampler to conduct a dust composition analysis, which has also been conditioned on the works approval, so that the results may better inform a subsequent licence assessment.

3.4 Detailed risk assessment – Potential acid sulfate soil emissions

3.4.1 Acid sulfate soil management

An investigation by the applicant has confirmed that acid sulfate soils (ASS) and potential acid

sulfate soils (PASS) are present at the premises and in the mining area (see section 2.2.2). PASS was found at depths between 2 and 10 mbgl and appears to be distributed in relatively isolated, inconsistent depths within the soil profile. Multiple PASS samples were found in the southern region of the mining area which will be mined first, some as shallow as 2-3mbgl. This PASS material will require selective handling and neutralisation immediately upon mining to prevent acid formation from the oxidation of the sulfides in the material. Effective management of this material depends on action being undertaken within very short timeframes. The applicant has prepared an Acid Sulfate Soils Management Plan (ASSMP) that is likely to be very effective in minimising the potential impacts from PASS at the premises, if fully implemented. The key controls for the management of PASS from the ASSMP have been conditioned on the works approval.

3.4.2 Regulatory controls

Handling of PASS material

The Delegated Officer notes that an attempt to quantify the volume of PASS in the mining area has not yet been undertaken. It is also noted that the ASSMP committed to “regular” screening of PASS material, however, a rate was not specified. It has been determined that a condition will be added to the works approval requiring a minimum screening rate of 2 samples per hectare, which is in line with the DWER guidance document *Identification and investigation of acid sulfate soils and acidic landscapes (2015)*.

A requirement to screen overburden material to be used in the construction of the earthen bund around the mining area, the process water ponds and the solar drying ponds has also been included. Due to the shallow depths at which PASS has been confirmed at the site, there is a reasonable likelihood that it may be present in the overburden that could be used during the construction stage, so the overburden will need to be screened accordingly. Should untreated PASS material be used in the construction of these structures, the structures may generate acid throughout the lifetime of the project. This would be difficult and probably very costly to remediate. Technical advice indicates that from the perspective of potential environmental impacts, PASS overburden material may be used for the construction of earthen structures if it is suitably neutralised. However, it remains the applicant’s responsibility to determine if such material is geotechnically suitable for the proposed use.

It is noted that the applicant had proposed constructing the limestone treatment pad for the handling of PASS material at a later stage of the project “when required”. The limestone treatment pad is a critical item of infrastructure for the selective handling and management of PASS material that will be necessary to prevent acidification of the surrounding soil and groundwater when PASS is encountered.

The results of the investigation into PASS at the site indicates that PASS will definitely be encountered, and it is likely to be encountered early in the mining schedule. Given that the volume of PASS has not been quantified, there is the potential for larger than anticipated volumes of PASS to be encountered. When PASS is encountered, it will immediately require the infrastructure to be in place for the appropriate handling and management of the material. For these reasons, it has been determined that a condition will be added to the works approval that requires a limestone treatment pad to be constructed at the premises prior to the mining of ore. The applicant will need to determine an operationally appropriate location for the treatment pad. It may form a permanent part of the ROM pad, or it may be a separate pad located on the mine path that can be relocated as the operation progresses. This may need to be reviewed when a licence application for the premises is submitted.

Groundwater monitoring

The Delegated Officer is aware that extensive groundwater monitoring will be undertaken across the premises in accordance with Ministerial Statement 1220 to ensure that there are no negative impacts from the drawdown of the water table on the local vegetation (high conservation value).

However, the ministerial statement does not regulate impacts from drawdown of the water table on PASS material or the potential for acidification of the groundwater from dewatering. As a result, it has been determined that it is necessary to condition monitoring for potential acidification of the groundwater from PASS material downstream of the open pit, and for the potential release of heavy metals from the tailings that will be returned to the mine voids.

Ambient groundwater monitoring has been conditioned for the relevant parameters that may be indicators of these impacts. The monitoring undertaken during time-limited operations may then be used to determine appropriate ongoing monitoring requirements in the future licence. It is likely that triggers levels for key parameters such as pH and total titratable acidity will need to be included on the future licence to ensure that a suitable level of groundwater protection is maintained. Further consultation with the DWER Water Branch, with regard to integration with the Drawdown Management Plan will be required to determine appropriate values.

4. Consultation

Table 4 provides a summary of the consultation undertaken by the department.

Table 4: Consultation

Consultation method	Comments received	Department response
Application advertised on the department's website on 17 August 2023	Member of the public replied on 27 August 2023 with concern about an endangered species of banksia potentially being present on site (DWER reference DWERDT826391)	This comment was relayed to the EPA as the management of endangered flora is regulated under the Ministerial Statement.
Local Government Authority advised of proposal on 22 August 2023	No comments received.	Noted.
Department of Mines, Industry Regulation and Safety (DMIRS) advised of proposal on 22 August 2023	DMIRS replied on 29 September 2023 advising that a geotechnical review of the proposal found that the process water ponds and that the Solar Drying Ponds comply with DMIRS guidelines. They also stated that the SDPs are approved to be 2m deep and are to be maintained with a 1m freeboard.	Noted.
3700 and 3672 Munbinea Road, Nambung advised of proposal on 22 August 2023	Replied on 8 September 2023 raising concerns about groundwater at the property being impacted or depleted. Also raised concerns that dust from the operation may impact their family with health conditions or contaminate their rainwater tanks.	Groundwater drawdown impacts will be regulated under the Ministerial Statement. The impacts of dust on the nearest neighbours have been assessed and dust controls and monitoring have been conditioned on the works approval.
1964 Wongonderrah Road advised of proposal on 22 August 2023	Replied on 6 September 2023, confirming that no one lives at the property on the eastern boundary of the premises. However, they explained that the bore on the property is used for cattle and any	This property was subsequently removed as a potential residential receptor. Groundwater drawdown impacts will be regulated under the Ministerial Statement.

	depletion of groundwater at the property would be a problem for them.	
Comment sought from the Yued Aboriginal Corporation on 3 May 2024	No comments received.	Noted.
Applicant was provided with draft documents on 7 June 2024	Comments received June 18 and 26. Refer to Appendix 1	Refer to Appendix 1

5. 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. DWER 2021, *Guideline Dust Emissions (Draft for external consultation)*, Perth, Western Australia.
5. DWER 2015, *Identification and investigation of acid sulfate soils and acidic landscapes*, Perth, Western Australia.
6. DWER 2015, *Treatment and management of soils and water in acid sulfate soil landscapes*, 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
Cover page	The registered business address has changed. ASIC documentation supplied.	Address updated.
Condition 1	Request to remove reporting requirements for the installation of broadband reversing alarms on vehicles as this would be onerous.	The Delegated Officer is satisfied that this can be managed as a stand-alone requirement. This requirement has been removed from the construction table and is now covered in condition 5.
Condition 1	Request to change timing requirement for the construction of the earthen bund around the mining area to when mining in the northern area. This will allow retention of the wetland area in the north for a longer period. Updated map provided.	The Delegated Officer is satisfied that the risk to surface water can be adequately managed through this proposed change. Condition modified accordingly.
Monitoring bore construction and reporting requirements	Five suitable monitoring bores have already been constructed – I01B I03B, I04B, I06B and I08B. A map of the monitoring bores and the bore construction reports was provided.	A review of the information provided showed that the bores were suitable. Construction and reporting requirements for the bores has been removed and the monitoring bores have been conditioned in the monitoring conditions.
Conditions 14 and 15	The conditions restricting certain activities to certain times is overly restrictive and is based on modelling of worst-case equipment and conditions. It is likely that quieter equipment may be procured for use on site which would result in lower noise emissions.	When updated modelling based on new information is available, or if noise monitoring during operations demonstrates that noise limits will be met at the nearest receptors, the works approval can be amended to alter these conditions. There is also an opportunity to amend the conditions when a licence application is assessed, and data gathered during time-limited operations can be used to demonstrate actual impacts from the operation.
Various	Minor wording changes for clarity.	Wording amended.