



Mount Gibson Gold Project

Works Approval Supporting Document

Prepared for
Crimson Metals Pty Ltd

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1 PROJECT OVERVIEW

1.1 Location

Crimson Metals Pty Ltd (Crimson) is proposing to develop infrastructure in support of an approved accommodation camp at its Mount Gibson Gold Project (MGGP) in the Avon Wheatbelt region of Western Australia.

The MGGP is located approximately 280 km northeast of Perth and is accessed from the Great Northern Highway and less than 10 km of private mine road. The location of the MGGP is shown in Figure 1.



Figure 1: MGGP regional location.

1.2 Ownership

The MGGP is located on Unallocated Crown Land under the Land Administration Act 1997 (WA), underlying Mining Tenements granted under the Mining Act 1978. The MGGP is located within the tenements listed in Table 1. Crimson Metals Pty Ltd is a wholly owned subsidiary of Capricorn Metals Ltd.

Table 1: Ownership Details

Tenement	Tenement Holder	Expiry Date
M59/772	Crimson Metals Pty Ltd	08/06/2043
L59/53	Crimson Metals Pty Ltd	15/02/2027
G59/72	Crimson Metals Pty Ltd	11/12/2044

2 PREMISES MAPS (ATTACHMENT 2)

The Prescribed Premises Boundary is defined by the coordinates in **Figure 2**. The Prescribed Premises layout is presented in **Figure 3**.

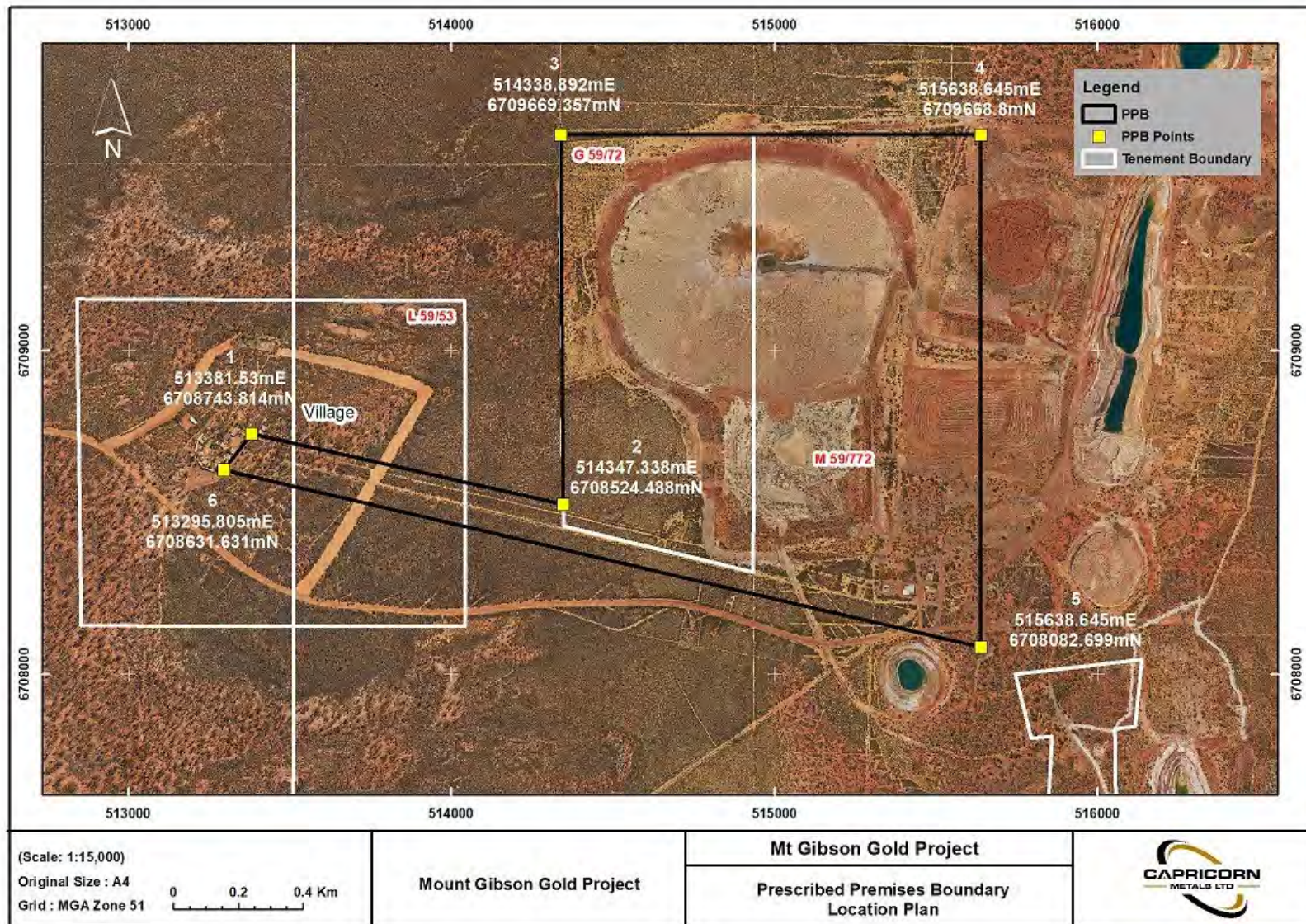


Figure 2: MGGP Prescribed Premises Boundary.

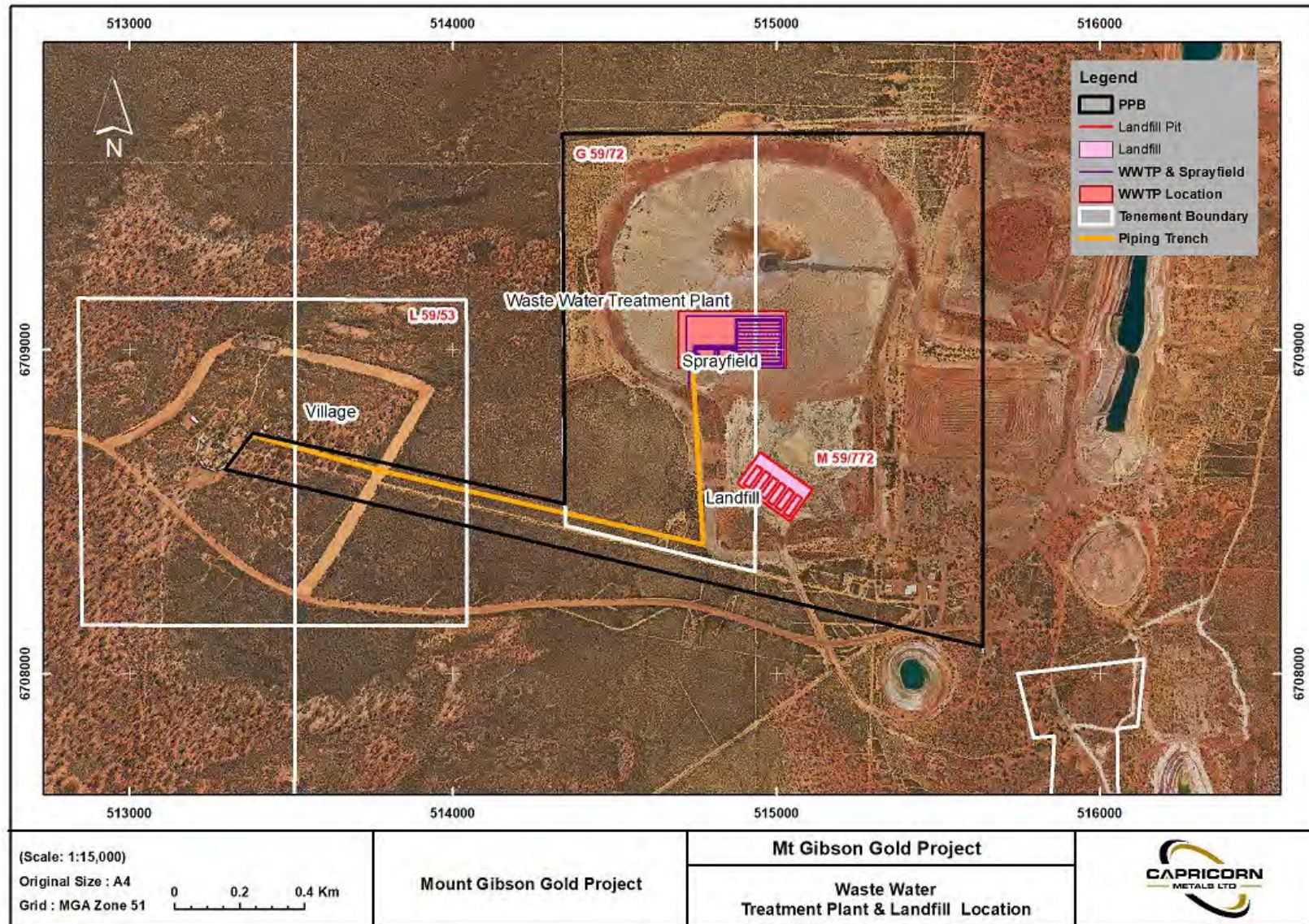


Figure 3: MGGP Prescribed Premises Layout.

3 PROPOSED ACTIVITIES DETAIL (ATTACHMENT 3B)

Figure 4 outlines the arrangement of the proposed activity details described in Sections 3.1 and 3.2.

3.1 Category 85: Sewage Facility

A waste water treatment plant (WWTP) will be installed on the inactive Tailings Storage Facility currently under rehabilitation to service the accommodation camp (Figure 4). Raw sewage from the camp will be plumbed to pump pits, where macerator pumps will transfer the sewage to a larger sewage transfer station, which will subsequently pump to the WWTP via a suitably sized HDPE pipeline placed in an open trench.

A sewage transfer station will also be located at the site administration facility, which will also pump to the WWTP via a suitably sized HDPE pipeline placed in an open trench.

The WWTP will consist of a coarse solids separation tank which will discharge into HDPE-lined stabilisation ponds. A weir in the primary stabilisation pond will allow effluent to overflow into the secondary stabilisation pond. Effluent will be periodically discharged into an evaporation area by means of a pump and system of irrigation sprays.

Camp occupancy will vary depending on site activities however, the actual daily volume to be treated at the WWTP is likely to be approximately 70 m³ per day. The WWTP has been designed to treat wastewater to produce effluent meeting the parameters listed in Table 2.

Table 2: Treated effluent parameters

Description	Target Value	Units
BOD Concentration	30	mg/L
TSS Concentration	40	mg/L
Total N Concentration	30	mg/L
Total P Concentration	7.5	mg/L
pH	6.5-8.5	pH units
E. coli	100,000	cfu/100ml
Chlorine Residual	0.2-2	mg/L
TDS	1,000	mg/L

The 2.4 ha spray field has been designed to distribute the treated effluent discharge over an area sufficient to maximise infiltration and evaporation, therefore minimising the potential for soil saturation and ponding noting that the spray field is wholly located on tailings placed in the 1990's, as well as ensure nutrient loading is within the required limits.

Comparing data for similar facilities at other mine sites, the expected concentrations of Nitrogen and Phosphorus are approximately 30 mg/L and 7.5 mg/L respectively. Based on the nutrient loading recommended in *Water Quality Protection Note (WQPN) #22 - Irrigation with nutrient-rich waste water* (Department of Water 2008), the spray field area required for discharge of 70 m³ per day at the quality targets of 30 mg/L Nitrogen and 7.5 mg/L Phosphorus is 1.6 ha (refer to Table 3).

Table 3: Nutrient loading calculations

Phosphorus	Nitrogen
Target output = 7.5 mg/L	Target output = 30 mg/L
Output vol = 70,000 L/day	Output vol = 70,000 L/day
⇒ 525,000 mg/day	⇒ 2,100,000 mg/day
÷1,000,000	÷1,000,000
⇒ 0.53 kg/day	⇒ 2.10 kg/day
x 365	x 365
⇒ 191.63 kg/year	⇒ 766.50 kg/year
Recommended loading = 120 kg/ha/yr*	Recommended loading = 480 kg/ha/yr*
191.63 ÷ 120 = 1.60 ha to achieve target.	766.50 ÷ 480 = 1.60 ha to achieve target

*based on soil type (consolidated sandy-clay) that determines the eutrophication risk to be low – Risk Category D.

Therefore, the proposed spray field of 2.4 ha is considered adequate and allows some contingency should N and P concentrations fluctuate up to 45 mg/L and 10 mg/L respectively. However, it should be noted that these calculated limits are based on discharges to the natural environment rather than to the surface of a decommissioned TSF. Annual net evaporation (39,692 kL) greatly exceeds the treated water discharge from the stabilisation ponds for the same period (13,557 kL), allowing sufficient capacity for the hydraulic loading. There may be some temporary local pooling during the winter months.

Considering the above information, and the location of the proposed WWTP (on the historical TSF with consolidated tailings), the risk of discharge to the environment is considered negligible.

The WWTP design report is included as Attachment 8A to this submission.

3.2 Category 64: Class II or III Landfill

A Class II landfill will be constructed on the historical, inactive and inert MGGP Southern TSF and will accept putrescible and inert waste generated from the village.

It will be operated as a series of trenches, (70 mL x 20 mW x 4 mD, **Figure 3**) developed one at a time that are progressively backfilled as waste is deposited. The landfill will be surrounded by a 1.8 m high ring-lock fence and an earthen bund created by the material excavated for the trench. The bund will be at least 2 m tall on three sides to minimise wind-blown rubbish as well as prevent surface water runoff entering the trench. The landfill has been designed with a capacity of 340 tonnes per annum, with an estimated 258 tonnes expected to be deposited annually. Weekly inspections will be undertaken of the landfill and any rubbish in the surrounding area will be collected at least on a monthly basis.

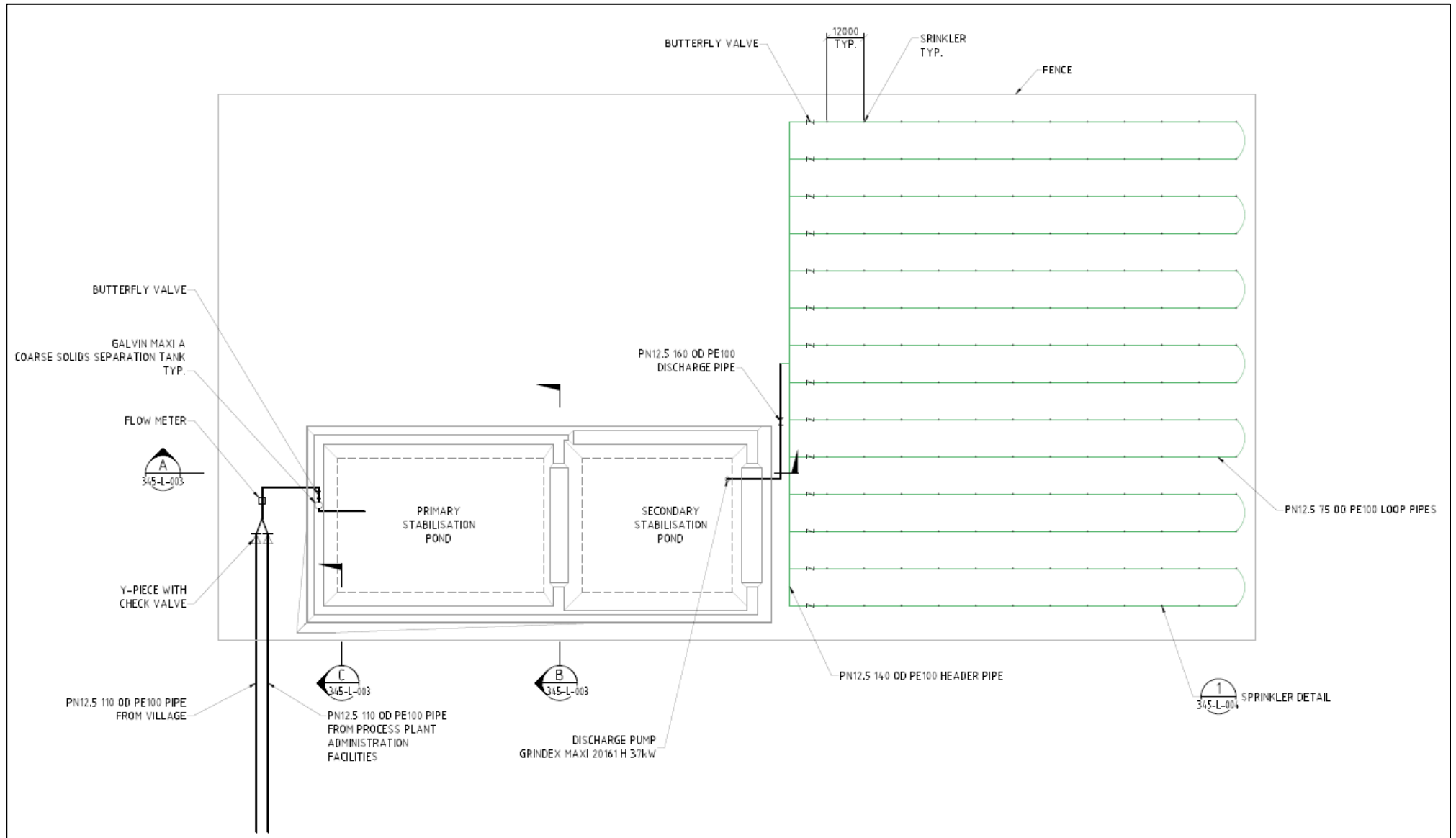


Figure 4: Proposed WWTP layout

4 OTHER APPROVALS AND CONSULTATION (ATTACHMENT 5)

A Small Mining Proposal and Mine Closure Plan (Reg. ID 123454) were submitted to the Department of Mines, Energy, Industry, Regulation and Safety (DEMIRS) on 1 March 2024 and is currently under assessment.

A record of consultation relevant to the MGGP is provided in **Table 4**.

Table 4: Stakeholder Consultation Register

Stakeholder	Who	Date (2024)	Method	Topic/Outcome
DEMIRS	Tony White (DEMIRS) Mathew Lyons (Crimson) James Hesford (Tetris)	7 March	In person meeting on site at MGGP	Discussion and review of proposed MGGP WWTP and Landfill siting, no issues of concern raised by DEMIRS.
DWER	Alana Kidd (DWER) James Hesford (Tetris)	18 April	Phone call	Introduction of proposed MGGP WWTP and Landfill, utilisation of existing disturbed land (TSF), DWER encouraged by proposal utilising existing disturbed land.

5 EMISSIONS AND DISCHARGES (ATTACHMENT 6A)

5.1 Potential Emissions

As indicated in the Works Approval application, potential emissions arising from the development of constructing primary and secondary stabilisation pond's in the sewage disposal system are:

- Dust emissions to the air during construction of the wastewater treatment plant (WWTP)
- Noise emissions to the air during construction of the WWTP
- Spillage/discharge of wastewater to land.

5.2 Environmental Risk and Management Summary

Using the risk assessment matrix used by DWER (Table 5), a summary of the potential environmental risks relevant to the MGGP Works Approval application and management measures to be implemented to reduce these risks to an acceptable level, is summarised in Table 6.

Table 5: Risk matrix and criteria

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

Likelihood		Consequence		
The following criteria has been used to determine the likelihood of the risk / opportunity occurring.		The following criteria has been used to determine the consequences of a risk occurring:		
		Environment	Public Health* and Amenity (such as air and water quality, noise, and odour)	
Almost Certain	The risk event is expected to occur in most circumstances	Severe	<ul style="list-style-type: none"> • on-site impacts: catastrophic • off-site impacts local scale: high level or above • off-site impacts wider scale: mid level or above • Mid to long term or permanent impact to an area of high conservation value or special significance[^] • Specific Consequence Criteria (for environment) are significantly exceeded 	<ul style="list-style-type: none"> • Loss of life • Adverse health effects: high level or ongoing medical treatment • Specific Consequence Criteria (for public health) are significantly exceeded • Local scale impacts: permanent loss of amenity
Likely	The risk event will probably occur in most circumstances	Major	<ul style="list-style-type: none"> • on-site impacts: high level • off-site impacts local scale: mid level • off-site impacts wider scale: low level • Short term impact to an area of high conservation value or special significance[^] • Specific Consequence Criteria (for environment) are exceeded 	<ul style="list-style-type: none"> • Adverse health effects: mid level or frequent medical treatment • Specific Consequence Criteria (for public health) are exceeded • Local scale impacts: high level impact to amenity
Possible	The risk event could occur at some time	Moderate	<ul style="list-style-type: none"> • on-site impacts: mid level • off-site impacts local scale: low level • off-site impacts wider scale: minimal • Specific Consequence Criteria (for environment) are at risk of not being met 	<ul style="list-style-type: none"> • Adverse health effects: low level or occasional medical treatment • Specific Consequence Criteria (for public health) are at risk of not being met • Local scale impacts: mid level impact to amenity

Likelihood		Consequence		
The following criteria has been used to determine the likelihood of the risk / opportunity occurring.		The following criteria has been used to determine the consequences of a risk occurring:		
		Environment	Public Health* and Amenity (such as air and water quality, noise, and odour)	
Almost Certain	The risk event is expected to occur in most circumstances	<ul style="list-style-type: none"> • on-site impacts: catastrophic • off-site impacts local scale: high level or above • off-site impacts wider scale: mid level or above • Mid to long term or permanent impact to an area of high conservation value or special significance^ • Specific Consequence Criteria (for environment) are significantly exceeded 	<ul style="list-style-type: none"> • Loss of life • Adverse health effects: high level or ongoing medical treatment • Specific Consequence Criteria (for public health) are significantly exceeded • Local scale impacts: permanent loss of amenity 	
Unlikely	The risk event will probably not occur in most circumstances	<ul style="list-style-type: none"> • on-site impacts: low level • off-site impacts local scale: minimal • off-site impacts wider scale: not detectable • Specific Consequence Criteria (for environment) likely to be met 	<ul style="list-style-type: none"> • Specific Consequence Criteria (for public health) are likely to be met • Local scale impacts: low level impact to amenity 	
Rare	The risk event may only occur in exceptional circumstances	<ul style="list-style-type: none"> • on-site impact: minimal • Specific Consequence Criteria (for environment) met 	<ul style="list-style-type: none"> • Local scale: minimal to amenity • Specific Consequence Criteria (for public health) met 	

Table 6: Emission risk and management summary

Risk Event	Type and Quantity	Pathway	Receptor	Potential Impact	Controls	Consequence on Receptor	Likelihood of Consequence	Level of Risk	Monitoring Required under Works Approval and/or Licence
Emissions to air: <ul style="list-style-type: none"> Dust emissions during WWTP construction 	Not calculated	Direct emissions to air – wind dispersion	Vegetation	<ul style="list-style-type: none"> Reduced amenity in Project area Reduced air quality for employees Decline in vegetation health and productivity Impacts limited to site 	<ul style="list-style-type: none"> Construction works will be of short duration Watering of roads and surfaces Halting works during extremely high winds 	Slight	Possible	Low	Yes Visual monitoring
Emissions to air: <ul style="list-style-type: none"> Noise during WWTP construction (Mobile equipment) 	Not calculated	Direct emissions to air – wind dispersion	Fauna	<ul style="list-style-type: none"> Increased noise levels in the vicinity of the Project Impacts limited to site 	<ul style="list-style-type: none"> Construction works will be of short duration Mobile equipment will be maintained per manufacturers specifications 	Slight	Possible	Low	No
Emissions to land: <ul style="list-style-type: none"> Uncontrolled discharge of treated wastewater Spillage of wastewater Discharge of treated wastewater that exceeds anticipated quality Discharge of treated wastewater promotes weed growth Stabilisation pond lining deteriorating and breaking 	Class C effluent, treatment capacity of 70 m ³ /day	Soils	Vegetation Soils	<ul style="list-style-type: none"> Contamination of soils Vegetation deaths Weed establishment 	<ul style="list-style-type: none"> Irrigation area located on historical, inactive TSF under rehabilitation, elevated away from native vegetation and drainage lines The WWTP will include low and high level alarms in the macerator and rising main pits, indicated by a revolving red light Routine maintenance and inspection of pipelines and discharge points will occur Effluent discharge quality to the irrigation area will meet criteria listed in the DWER Environmental Protection Act Licence Effluent discharge will be managed to ensure there is no surface ponding or runoff from the irrigation area Irrigation areas will be fenced off with a 1.8 m high wire mesh fence to restrict access Proposed stabilisation ponds will be lined with 1.6 mm HDPE liner which exceed the permeability requirement in WQPN39 and has an approximate UV lifetime of 20 years Weed control undertaken as required 	Slight	Possible	Low	Yes <ul style="list-style-type: none"> Monitoring of treated wastewater quality prior to discharge to the irrigation field Overall monthly measurement of flows at the discharge points to be taken Weekly inspections of the stabilisation pond bank and HDPE liner Routine inspection of transfer pipeline and discharge points

6 SITING AND LOCATION (ATTACHMENT 7)

6.1 Environmental Siting

6.1.1 Climate

The region has a semi-arid, warm Mediterranean climate, experiencing hot, dry summers with mild, wet winters (Beecham 2001). According to the Bureau of Meteorology (BoM), the mean maximum daily temperature in Paynes Find (approximately 70 km north east of the Proposal, BoM weather station 007139) is 28°C, with a mean minimum daily temperature of 13°C. The hottest month is January, with a mean maximum temperature of 37.4°C. The coldest month is July, with a mean minimum temperature of 5.5°C and mean maximum of 18.6°C. **Figure 5** provides climatic data relevant to the survey area (BoM 2024a).

The mean annual rainfall from the Paynes Find weather station (operating since 1919) is 290.2 mm and the mean number of days with rainfall is 24. Average annual evaporation ranges from 2000 to 2400mm (BoM 2024b).

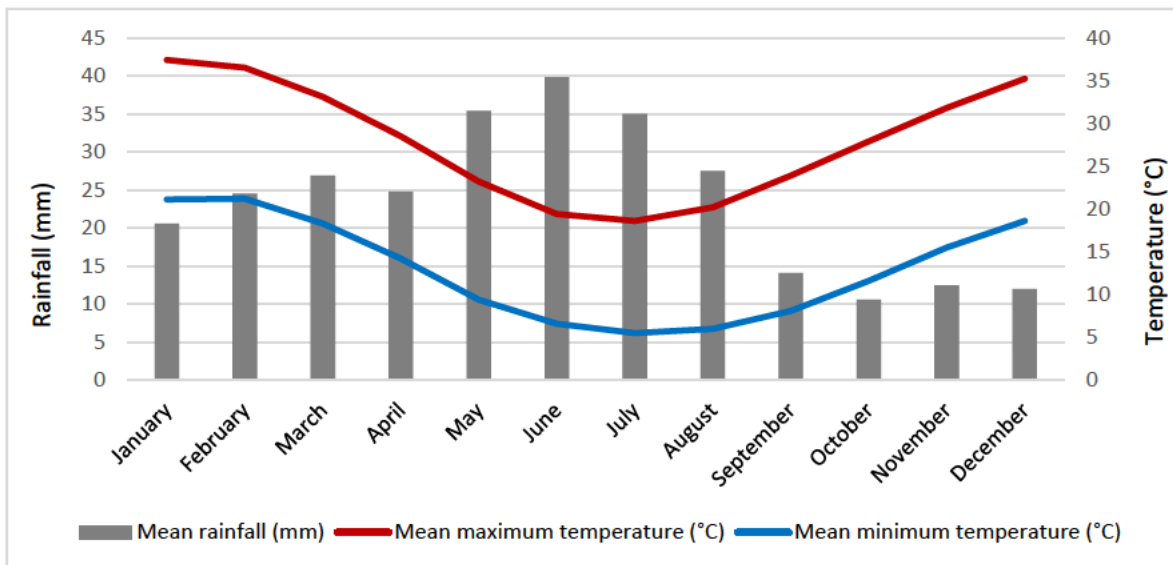


Figure 5: Climatic data of the survey area

Table 7 provides the results of an Intensity-Frequency-Duration (IFD) query for the Proposal site (BOM 2024c). The table provides the expected volume of rainfall over a given period of time for a given frequency. The data set for the Proposal area shows that for a 1% (1 in 100 year) Annual Exceedance Probability (AEP), 72 hour rainfall event, 178 mm could be expected.

Table 7: Intensity-Frequency-Duration data for the MGGP.

Duration	Annual Exceedance Probability (AEP)						
	63.2%	50%#	20%*	10%	5%	2%	1%
1 hour	12.7	15.1	23.2	29.3	35.6	44.7	52.2
1.5 hour	14.6	17.3	26.5	33.4	40.6	51.0	59.7
2 hour	16.1	19.0	29.1	36.6	44.5	55.9	65.5
3 hour	18.5	21.8	33.0	41.5	50.6	63.6	74.7
4.5 hour	21.3	24.9	37.6	47.2	57.5	72.5	85.3
6 hour	23.5	27.4	41.2	51.6	62.9	79.6	93.8
9 hour	26.8	31.2	46.7	58.6	71.5	90.7	107
12 hour	29.3	34.1	50.9	63.8	78.0	99.3	117
18 hour	32.8	38.1	56.9	71.6	87.8	112	133
24 hour	35.2	40.9	61.2	77.2	94.7	121	144
30 hour	36.9	42.9	64.4	81.3	100.0	128	152
36 hour	38.1	44.4	66.8	84.6	104	133	159
48 hour	39.9	46.6	70.3	89.2	110	141	168
72 hour	42.1	49.1	74.3	94.4	116	149	178
96 hour	43.6	50.9	76.6	96.9	119	153	183
120 hour	45.0	52.3	78.1	98.2	121	155	185
144 hour	46.5	53.8	79.2	98.8	121	155	186
168 hour	48.1	55.3	80.2	99.2	121	155	187

Wind roses for Paynes Find demonstrate that the prevailing wind direction is typically easterly to north-easterly in the morning and vary between westerly to north-westerly and easterly to south-easterly in the afternoon. Wind speeds are typically between 10 and 20 km/hr. **Figure 6** provides the 9 am and 3 pm wind roses for the BoM monitoring site at Paynes Find (BoM 2024a).

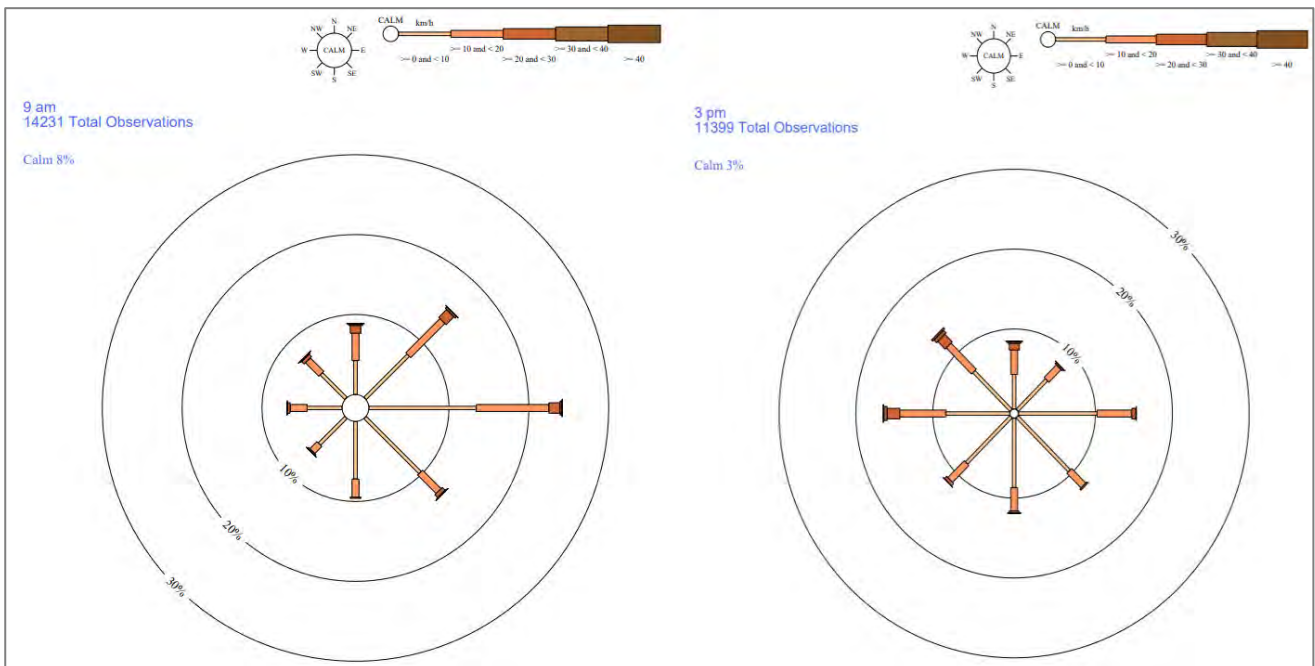


Figure 6: Wind roses for 9am and 3pm observations at Paynes Find.

6.1.2 Geology, Topography and Soils

Greenstone belts comprised of mafic to ultramafic lithology are present throughout the Yilgarn. These greenstone belts are Archaean to Proterozoic in age, surrounded by granite and gneiss and typically highly deformed, faulted and folded. The MGGP area is located at the southern end of the Retaliation Greenstone Belt (Anand and Smith 2005). Much of the mineralisation for the deposit is hosted within a meta basalt sequence which has been metamorphosed to amphibolite facies conditions.

The Archaean basement is dominantly volcanic and intrusive mafic and felsic rocks and their sheared equivalents, which have been metamorphosed to the mid-amphibolite facies. Rare metasedimentary rocks consist of thin, discontinuous, interflow ferruginous cherts.

The basement is overlain by a deep regolith dominated by differential erosion. Saprolite thickness depends on the lithology, the intensity of shearing and the degree of truncation of the weathered profile. The MGGP area is weathered to about 60 m, whereas mafic volcanics to the east are weathered to about 20 m. Foliated metasedimentary or metavolcanic rocks are strongly mottled (EMM 2024).

The saprolite is overlain by discontinuous alluvium, colluvium, lake sediments, lateritic residuum (an eroding basement palaeosurface), ferricrete of pisolitic nature and calcrete within Paleogene-Neogene sediments. The Paleogene-Neogene sediments are covered with a veneer of alluvial quartz sands with sporadic granite-greenstone subcrop and outcrop being increasingly exposed in the south of the Proposal area (EMM 2024).

The Works Approval application area occurs on the 'Yellow sand sandplains' geological unit (Czs), as mapped by the Geological Survey of Western Australia and described as "*Sandplain - yellow sand; commonly reworked by wind; includes red colluvial sand on plateau remnants*".

The topography of the MGGP area is characterised by minor topographical relief with a grade of approximately 2%. The elevations range from approximately RL 350 m on the south to RL 326 m on the north. Surface undulation is generally minimal except at some localities of granite mounds where gradients are as steep as 5% (CMW 2023).

The Proposal is located within the Northern Zone of Ancient Drainage soil-landscape zone, described by Tille (2006) as:

"Gently undulating terrain (with some sandplains and salt lakes chains) on deeply weathered mantle and alluvium over granitic rocks of the Yilgarn Craton. Sandy earths (mostly yellow and red), Loamy earths (often calcareous), Sandy duplexes, Loamy duplexes, Deep sands and Ironstone gravelly soils. Salmon gum-gimlet-morrel-wandoo-York gum woodlands with mallee scrub (and some acacia-casuarina thickets, scrub-heath and samphire flats). Located in the eastern Wheatbelt between Quairading, Hyden, Bullfinch, Bonnie Rock, Lake Moore, Carnamah and Wongan Hills".

The Works Approval application area intersects one soil landscape as defined by the Department of Primary Industries and Regional Development (DPIRD 2024):

"Joseph (258Jo) – undulating yellow sandplain supporting dense mixed shrublands with patchy mallees – total area in the Avon Wheatbelt Bioregion is 143,797 ha".

6.1.3 Hydrology

The proposed Prescribed Premises is outside of any *Rights in Water and Irrigation Act 1914* (RIWI Act) Proclaimed Surface Water or Public Drinking Water Source Areas (EMM 2024).

There are no wetlands of national importance or significant surface water drainage features in the vicinity of the MGGP. The closest wetland listed in the Directory of Important Wetlands (DCCEW 2019) is the Thundelarra Lignum Swamp (100 km north of the MGGP).

The MGGP area is located in the Moore-Hill Rivers drainage basin between the extensive playa systems of Lake Monger and Lake Moore, approximately 25 km west of Lake Moore, specifically within the Lake Moore catchment, along or close to the ridgeline separating the Lake Monger and Lake Moore surface water systems. Two smaller playa features are located approximately 3.5 km and 9 km to the east of the MGGP, the larger of which is Lake Karpa. Lake Karpa is the terminus of a surface water catchment of about 500 km². These and other smaller playa systems located to the east of the MGGP are unlikely to represent receptors for any surface water impacts due to the elevation of the WWTP and landfill above natural surface level.

The regional topography comprises gently undulating plains with flat valleys marked with playas and large salt lakes of the Moore-Monger drainage system. The predominant low gradient and high storage capacity within the landscape and drainage system means that surface water features do not exhibit a clear or connected hydrological response unless major summer rainfall events or a prolonged wet winter occurs. Surface water drainage systems of this nature are characterised by sluggish and predominantly internal drainage (EMM 2024).

At a local scale, intermittent and short duration runoff can be expected following large rainfall events. The absence of defined drainage channels in the area indicates sheet flows are the dominant hydrological flow response. High evaporation and low relief play a major role in the local hydrological response, limiting opportunities for the concentration of surface flows. High evaporation rates and low rainfall-recharge rates support the formation of salt lakes and saline groundwater within the wider area (EMM 2024).

Advisian completed a baseline surface water assessment of the MGGP area (Advisian 2022), followed by detailed hydrological and hydraulic modelling (Advisian 2023). Four main catchments contributing to runoff were identified:

- CAT-A: Largest catchment flowing to the site, with an approximate area of 67 km². The waterways in this catchment can be described as wide floodplains, with low to moderate vegetation and poorly defined banks. The main waterway flows along the northern edge of the site from west to east, towards the topographical depression to the north-east before draining to the lake further north-east.
- CAT-B: Approximately 17 km² with similar characteristics to CAT-A. The waterways in this catchment flow in a south-easterly direction, intersecting the southern part of the site.
- CAT-C and CAT-D: Gently graded and drain floodwater to the salt lake located north-east of the site.
- CAT-E: Internally draining due to the presence of existing mining infrastructure.

The Works Approval application area is located within CAT-E on historically disturbed land elevated above the natural surface levels. As the TSF still has an adequate freeboard (~1 m) with a hardened consolidated tails/silt surface, any direct rainfall on the TSF will be retained within the TSF, where it will evaporate. Therefore, no changes to surface water flows or quality are expected as a result of this works.

6.1.4 Hydrogeology

The Proposal is within the Meekatharra area of East Murchison proclaimed Groundwater Water Management Area (EMM 2024).

Groundwater occurs within the fractured and weathered bedrock, the palaeodrainage valley sediments and overlying surficial cover. Groundwater flow is likely very slow given the subdued topography and flat hydraulic gradients within nearby palaeovalleys. The fresh bedrock contains relatively low volumes of stored groundwater, except within open fractures.

A Moore – Monger palaeovalley system exists within the greater MGGP region however there are sparse data regarding its stratigraphy and lithological sequence. It is estimated that up to 100 m of basal Eocene fluvial sand is overlain by up to 40 m of lacustrine, kaolinitic clay units, which in turn is overlain by up to 20 m of slope wash alluvium and valley calcrete. The palaeovalley sediment infill comprises 10–40 m of basal fine-to coarse-grained sand which increases in thickness, width and grain size downstream (EMM 2024).

Part of the palaeovalley is about 60–80 m deep and of variable width (average of 600 m wide), with a low gradient of 0.004. The palaeovalley sediments are heterogenous and consist of sand, silt and clay layers; sandy aquifers are discontinuous but commonly hydraulically connected. However, the basal channel sediments are mostly clay rich. Dark grey-brown aquifer sands with magnetite, gravel and secondary silcrete and calcrete occur mainly in the central and upper parts of the infill profile. The aquifer sands are generally confined by upper clays and silts which extend 5–10 m below the water table. A palaeovalley appears to exist along the northern extension of the Mt Gibson mineralisation corridor (EMM 2024).

Four aquifer types have been identified in the MGGP area (EMM 2024):

- Aquifer Type A – weathered saprolite and basal transition zone above fresh bedrock. The aquifer is somewhat discontinuous owing to erosional surfaces and preferential weathering of host volcanic rocks.
- Aquifer Type B – main ore body shear zone, a highly heterogeneous aquifer, somewhat continuous along strike.
- Aquifer Type C – comprising of deep fractures found within the fresh bedrock at depths greater 90 m below ground level (bgl). The fractures have no predictable trend and are generally of low permeability and likely low storage.
- Aquifer Type D – fracture pattern associated with south dipping faults that are infilled with pegmatites and potentially dolerite dykes, the fault width being limited to 3 m.

Groundwater associated with fractured rock aquifers tend to be limited in extent with water supplies generally contained in localised structurally controlled zones with limited storage. Groundwater is generally more abundant within the lower saprolite and transitional weathered zone of the basement rocks where weathering has enhanced secondary permeability.

The basal aquifer within the palaeochannel of Moore – Monger palaeodrainage and tributaries is thought to be the most permeable aquifer in the area. It is incised through the weathered bedrock and thus forms a continuous, narrow strip aquifer. The direction of hydraulic gradient (indicative of groundwater flow) closely mimics surface topography. Hence groundwater passes from areas of high relief comprising fresh to weathered bedrock down to valley floors and palaeodrainage associated with salt lake systems (EMM 2024).

Groundwater quality in the MGGP area is saline to hypersaline. Groundwater in the palaeochannel aquifer is predominantly saline (4,000–36,000 milligrams per litre (mg/L)) in bores and hypothesised to be hypersaline (>200,000 mg/L) near Lake Monger at the downstream end of the palaeovalley. Groundwater salinity varies irregularly rather than increasing progressively downstream (Magee 2009, in EMM 2024).

Due to historical mining of the area, pre-mining groundwater levels are not available. Current groundwater levels are estimated to be 46 – 51 m bgl. EMM (2024) estimated that pit lake evaporation in the order of 240 ML/year currently occurs.

6.2 Sensitive Land Uses

The nearest human receptors to the project area are a rarely occupied prospector camp, approximately 3.75 km to the north west, and the Mummaloo Iron Ore mine site (currently in care and maintenance) over 8 km to the north east. The nearest town is Wubin, approximately 70 km to the south west.

6.3 Environmentally Sensitive Receptors

As outlined in Section 10.2 of the Application Form, distances to Specified Ecosystems and Designated Areas relevant to the premises location are detailed in **Table 8**. Only those relevant to the proposed premises have been described in further detail in the following sections.

Table 8: Nearby environmentally sensitive receptors and aspects.

Type / classification	Description	Distance + direction to premises boundary	Proposed controls to prevent or mitigate adverse impacts (if applicable)
Environmentally Sensitive Areas	Nil	-	-
Threatened Ecological Communities	Nil	-	-
Threatened and/or priority flora	16 species of Threatened or Priority occur in surrounding region.	Numerous records surrounding premise. Closest records approximately 1.5 km east.	No records occur on prescribed premise. Locations in surrounding area are known and will be avoided. Procedure for management of clearing activity will be implemented.
Threatened and/or priority fauna	Malleefowl (<i>Leipoa ocellata</i>) Peregrine Falcon (<i>Falco peregrinus</i>) Central long-eared bat (<i>Nyctophilus major tor</i>) Lake Goorly Shield Backed Trapdoor Spider (<i>Idiosoma kopejtkorum</i>)	Numerous records surrounding premise. Closest records approximately 200 m north.	No Threatened or priority fauna or suitable habitat will be impacted. Locations in the surrounding area are known and will be avoided. Procedure for management of clearing activity to be implemented. Fauna sightings register to be implemented. Landfill covered regularly to prevent attraction of feral fauna. Feral fauna control undertaken as required.
Aboriginal and other heritage sites	Several artefact scatter and culturally significant locations recorded around the project.	Closest records approximately 900 m west.	No sites occur on premise boundary. Sites in surrounding project area are known and will be avoided. Procedure for management of clearing activity will be implemented.
Public drinking water source areas	Nil	-	-
Rivers, lakes, oceans, and other bodies of surface water, etc.	Nil	-	-
Acid sulfate soils	Nil	-	-
Other	Nil	-	-

6.3.1 Threatened and Priority Flora

Focused Vision Consulting (FVC) undertook a detailed flora and vegetation assessment of the wider MGGP area during Spring 2021 and 2022 (FVC 2023). Numerous other surveys have been conducted in the local area to support exploration programmes and to search for conservation significant flora species and vegetation communities in the local area (Table 9).

Table 9: Additional flora surveys conducted for the MGGP

Year	Date	Survey Area	Survey Scope	Company	Survey Effort
2022	February	Eastern Hydrogeological exploration,	Targeted TEC/PEC survey	FVC	Targeted traverses
	February	Southern RC exploration	Targeted conservation significant flora and TEC/PEC survey	JBBC/Tetris	Targeted traverses
	May	Northern Hydrogeological exploration	Targeted conservation significant flora and TEC/PEC survey	JBBC/Ecotec	Targeted traverses
	May/June	Resource sterilisation drill lines	Targeted conservation significant flora and TEC/PEC survey	JBBC/FVC	Targeted traverses
	June	Northern RC drilling	Sterilisation Lines, North RD Drilling targeted conservation significant and TEC/PEC survey	FVC	Targeted traverses
	July	Regional	Regional targeted <i>Philothea nutans</i> and TEC/PEC survey	JBBC/Tetris	Targeted traverses
	September	Airstrip	Targeted conservation significant flora and TEC/PEC survey	FVC	Targeted traverses
2023	March	2022 phase 2 survey area	Targeted <i>Eremophila viscida</i> , <i>Philothea nutans</i> , <i>Lepidosperma</i> sp. Blue Hills and <i>Acacia synoria</i> survey	FVC/Tetris	Targeted traverses
	June	Northern RC and Hydrogeological exploration	Targeted conservation significant flora and TEC/PEC survey	FVC	Targeted traverses
	June	Existing Mine Disturbance	Targeted weed survey	Tetris	Targeted traverses
	October	Regional	Desktop groundwater dependent vegetation (GDV) survey to determine the likelihood of GDV within the predicted zone of groundwater drawdown, follow up field survey to confirm the predictions of the desktop GDV survey	Ecotec/Tetris	Targeted relevés
	October/ November	MGGP area	Refine previous vegetation mapping, additional targeted <i>Philothea nutans</i> survey	Ecotec/Tetris	Quadrats and relevés
October/ November	Airstrip	Reconnaissance survey of revised airstrip location	Ecotec/Tetris	Quadrats and relevés	

A total of 491 flora taxa from 57 families and 185 genera were recorded during the FVC surveys, including 15 species of conservation significance (FVC 2023). No conservation significant species occur within or adjacent to the area proposed in this Works Approval, with the nearest record approximately 1.5km east of the Prescribed Premises Boundary. The conservation significant species recorded in the surrounding area are shown in **Figure 7 - Figure 10**.

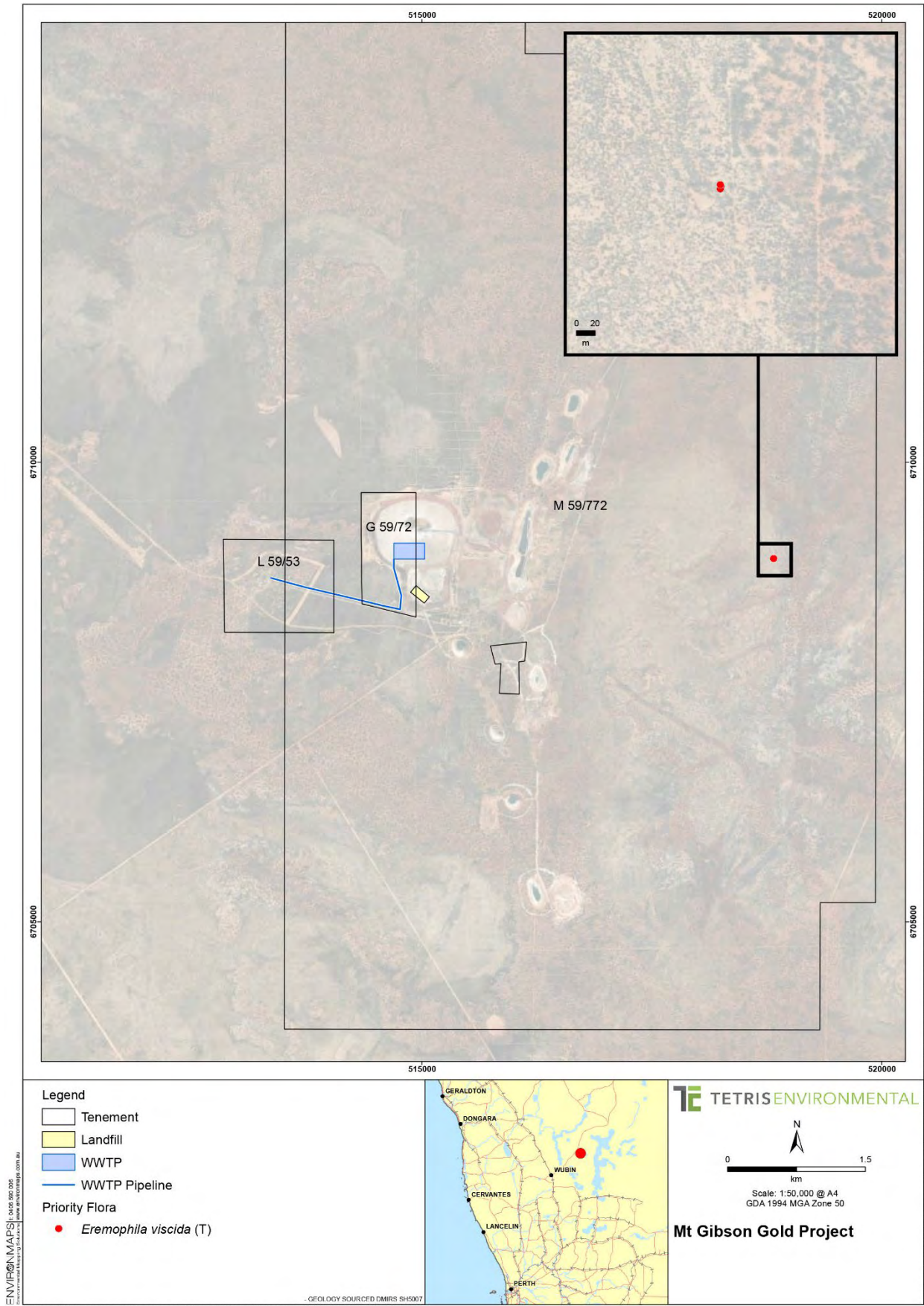


Figure 7: Threatened flora recorded near the proposed Prescribed Premises.

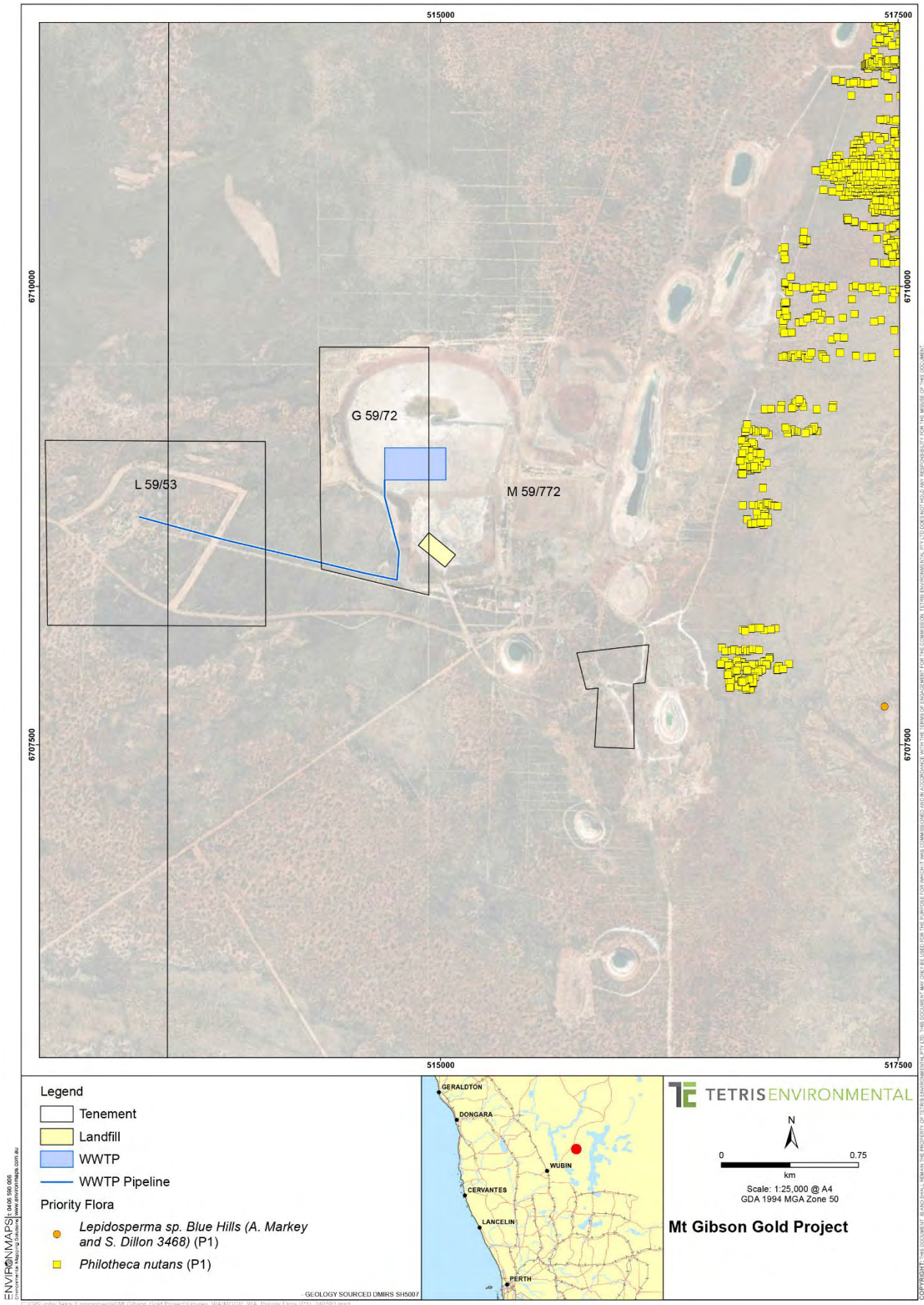


Figure 8: Priority 1 flora recorded near the proposed Prescribed Premises.

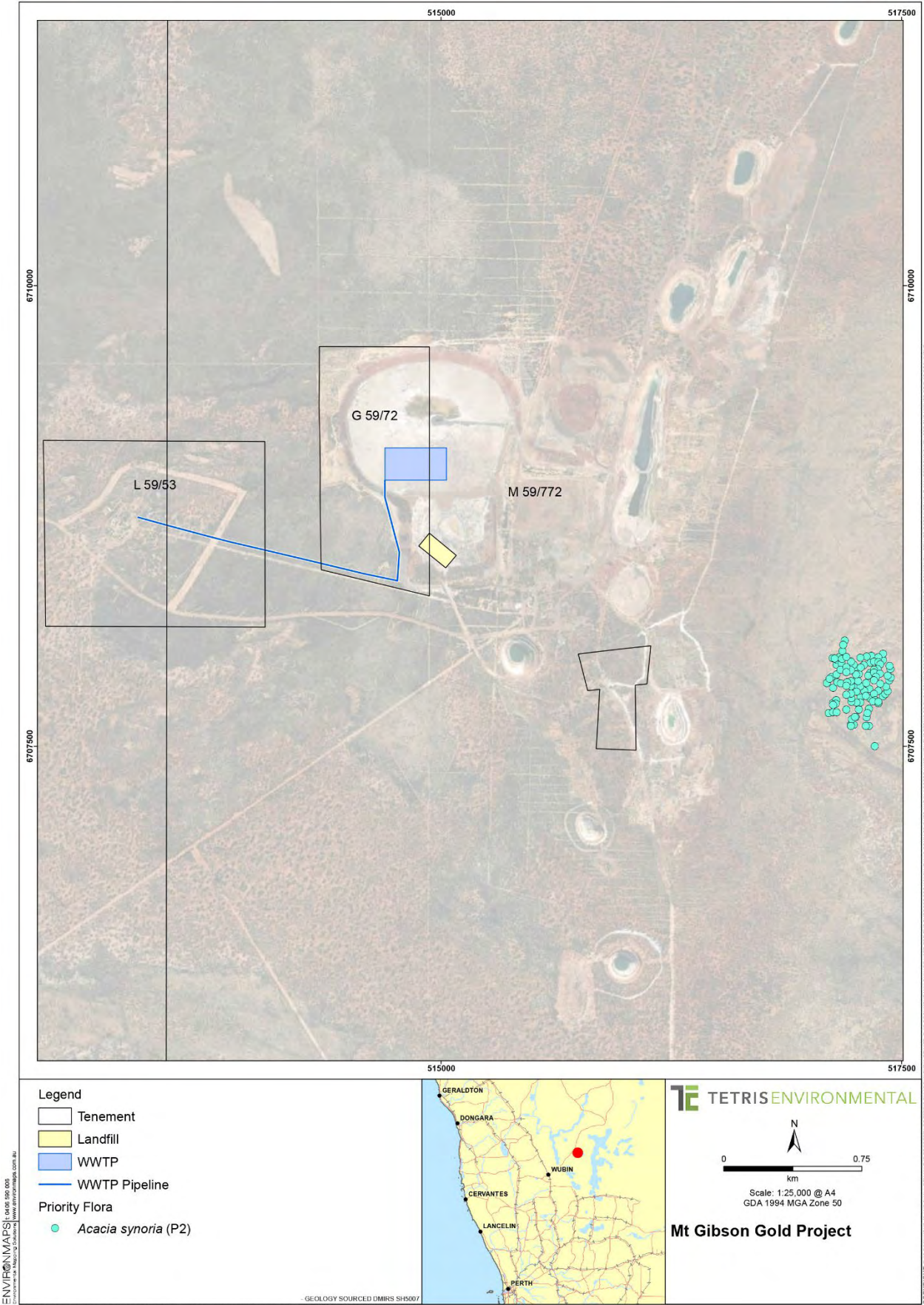


Figure 9: Priority 2 flora recorded near the proposed Prescribed Premises.

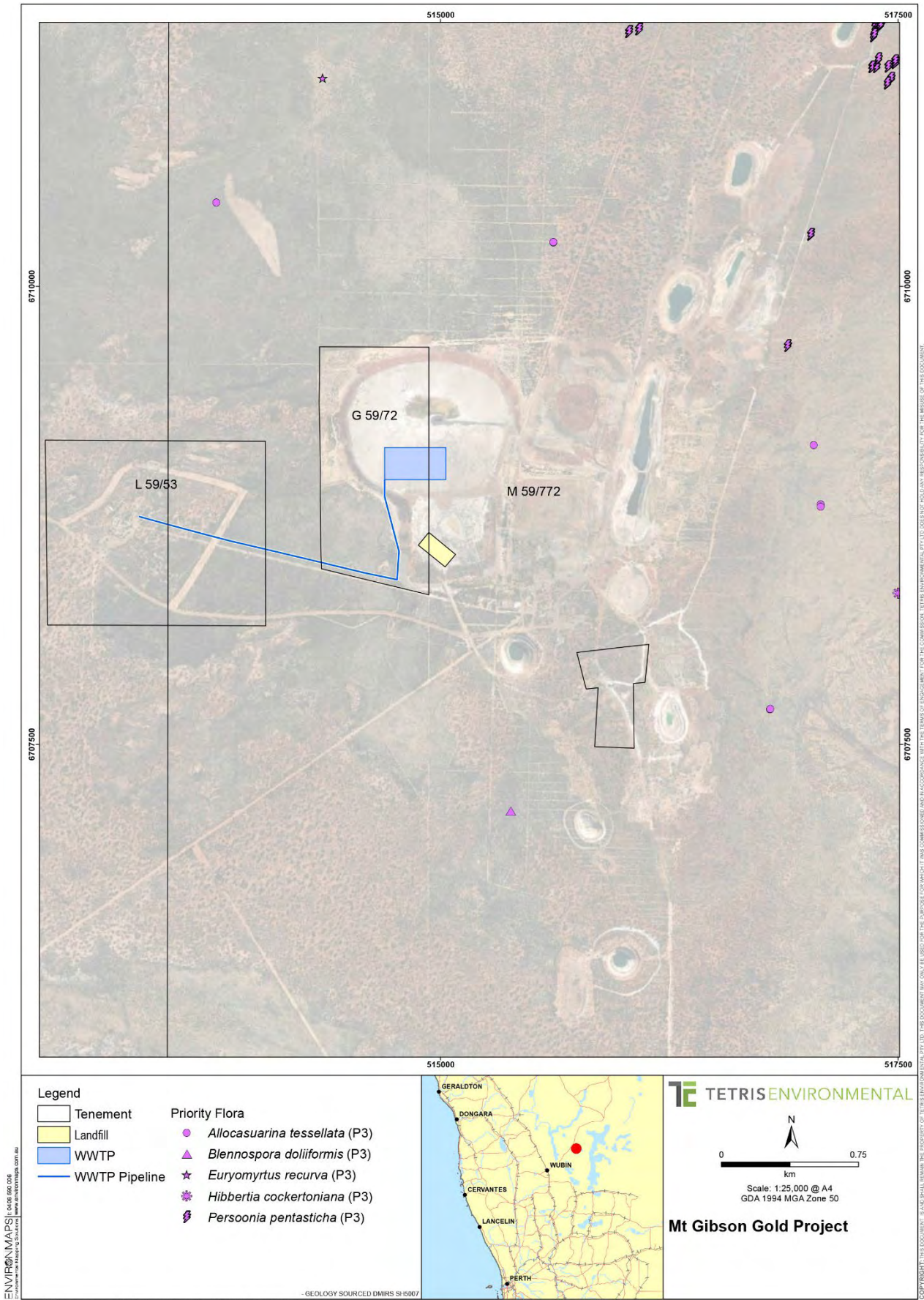


Figure 10: Priority 3 flora recorded near the proposed Prescribed Premises.

6.3.2 Threatened and Priority Fauna

Biota Environmental Sciences (Biota) undertook basic and targeted fauna surveys of the MGGP area and surrounds in November 2021 and November 2022 (Biota 2022 and 2023). Bamford Consulting Ecologists (Bamford) undertook a detailed and targeted fauna assessment of the area in November 2023 (Bamford 2024).

Fauna habitat

Biota identified three broad fauna habitats during the surveys (**Figure 11**):

- mixed shrubland
- eucalypt woodland
- previously cleared habitat

The area associated with the Works Approval application was mapped as 'previously cleared habitat'.

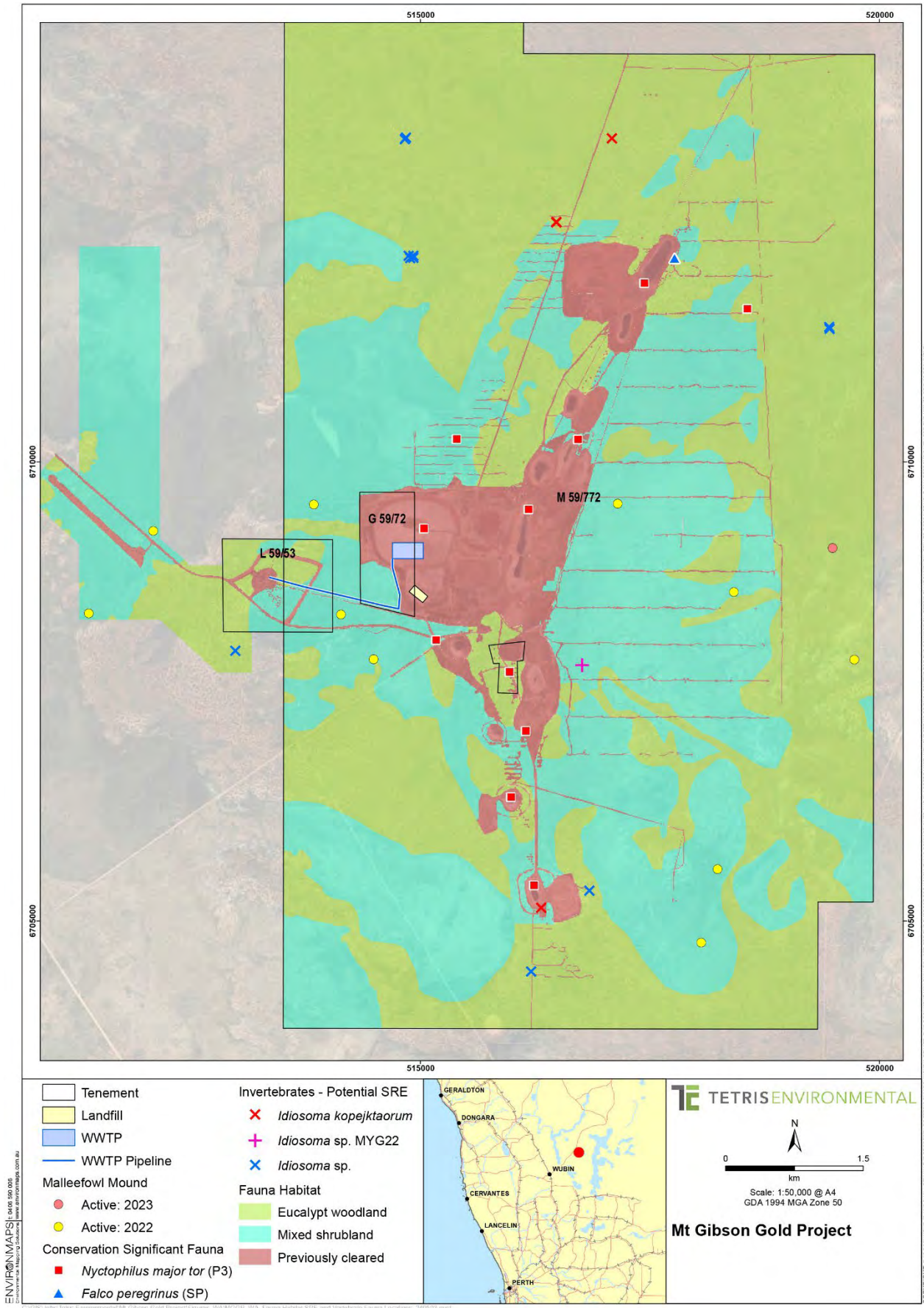


Figure 11: Fauna habitat and recorded conservation significant fauna near the proposed Prescribed Premises.

Terrestrial fauna

Biota conducted a basic fauna survey, including low intensity sampling on general faunal values; followed by foot traverses and targeted searches and sampling for conservation significant fauna. Two vertebrate and one invertebrate species were recorded during the surveys undertaken by Biota (Biota 2022 and 2023).

Bamford (2024) further refined the fauna assemblage, recording 90 vertebrate species; of which 24 were reptiles, 59 were birds and seven were mammals. An additional five species were recorded opportunistically outside in the wider Proposal area. One additional vertebrate of conservation significance not recorded by Biota, was recorded during the survey by Bamford. **Table 10** outlines the conservation significant fauna recorded from all surveys.

Table 10: Conservation significant fauna recorded in the MGGP area

Common name	Species	Conservation status	
		State	Commonwealth
Birds			
Malleefowl	<i>Leipoa ocellata</i>	Vulnerable	Vulnerable
Peregrine Falcon	<i>Falco peregrinus</i>	Specially Protected	-
Mammals			
Central long-eared bat	<i>Nyctophilus major tor</i>	Priority 3	-
Invertebrates			
Lake Goorly Shield Backed Trapdoor Spider	<i>Idiosoma kopejtkaorum</i>	Endangered	-

Malleefowl (*Leipoa ocellata*) are listed as Threatened (Vulnerable) species under both State (*Biodiversity Conservation Act 2016*) and Commonwealth legislation (*EPBC Act 1999*). 65 Malleefowl mounds were recorded in by Biota (2023), ten of which were deemed active at the time of survey. All active mounds were recorded in the mixed shrubland habitat and no mounds were recorded in the Works Approval application area (**Figure 11**). Some opportunistic sightings of Malleefowl have occurred in the local area, however have all been some distance from the proposed works and in remnant vegetation.

The Lake Goorly Shield-backed Trapdoor Spider (*Idiosoma kopejtkaorum* (Endangered – BC Act)), was recorded in three locations within the MGGP area, with an additional 12 *Idiosoma* sp. burrows recorded in eucalypt woodland habitat from seven sites (**Figure 11**). Based on previous records, the burrows likely represent either *I. kopejtkaorum* or the Ornate Shield-backed Trapdoor Spider (*Idiosoma formosum*), although only *I. kopejtkaorum* has been recorded in the Proposal area during recent surveys (Biota 2023).

The Peregrine Falcon and Central Long-Eared Bat may be transient visitors to the area; however, there is no suitable roosting or nesting habitat in the Works Approval application area.

Feral cats, foxes and dogs have been recorded in the surrounding region however, the Works Approval application is unlikely to increase their occurrence or potential threats to native fauna species.

6.3.3 Aboriginal and Other Heritage

Aboriginal Heritage

The MGGP area is not located within any Native Title Claim.

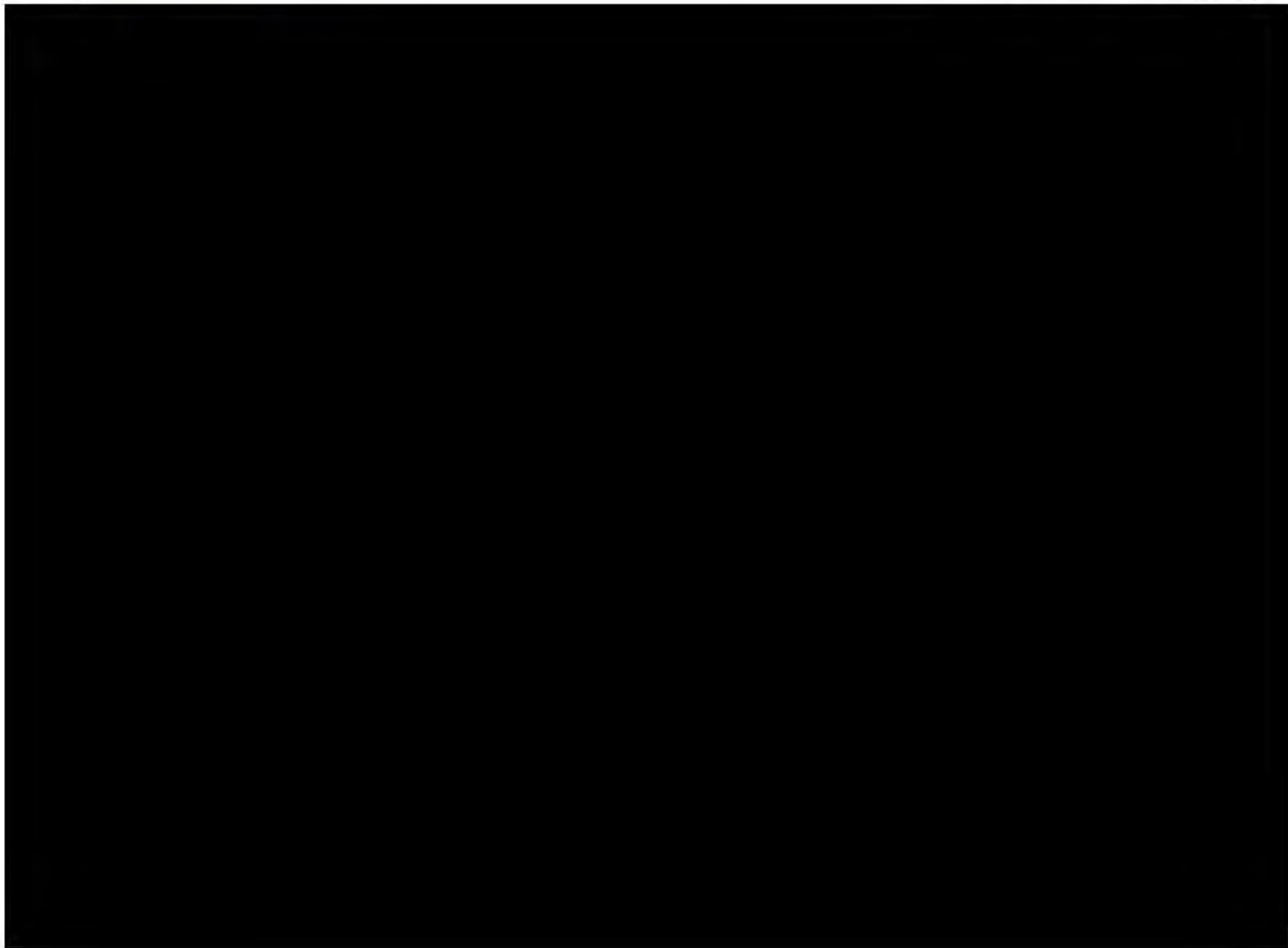
A search of the Aboriginal Sites or Heritage places (AHIS) Register identified two registered sites (Artefacts/scatter, site ID 39698 and 39699) surrounding the proposed MGGP. A rock hole (Registered site 39672) is located over 240m to the east of the MGGP.

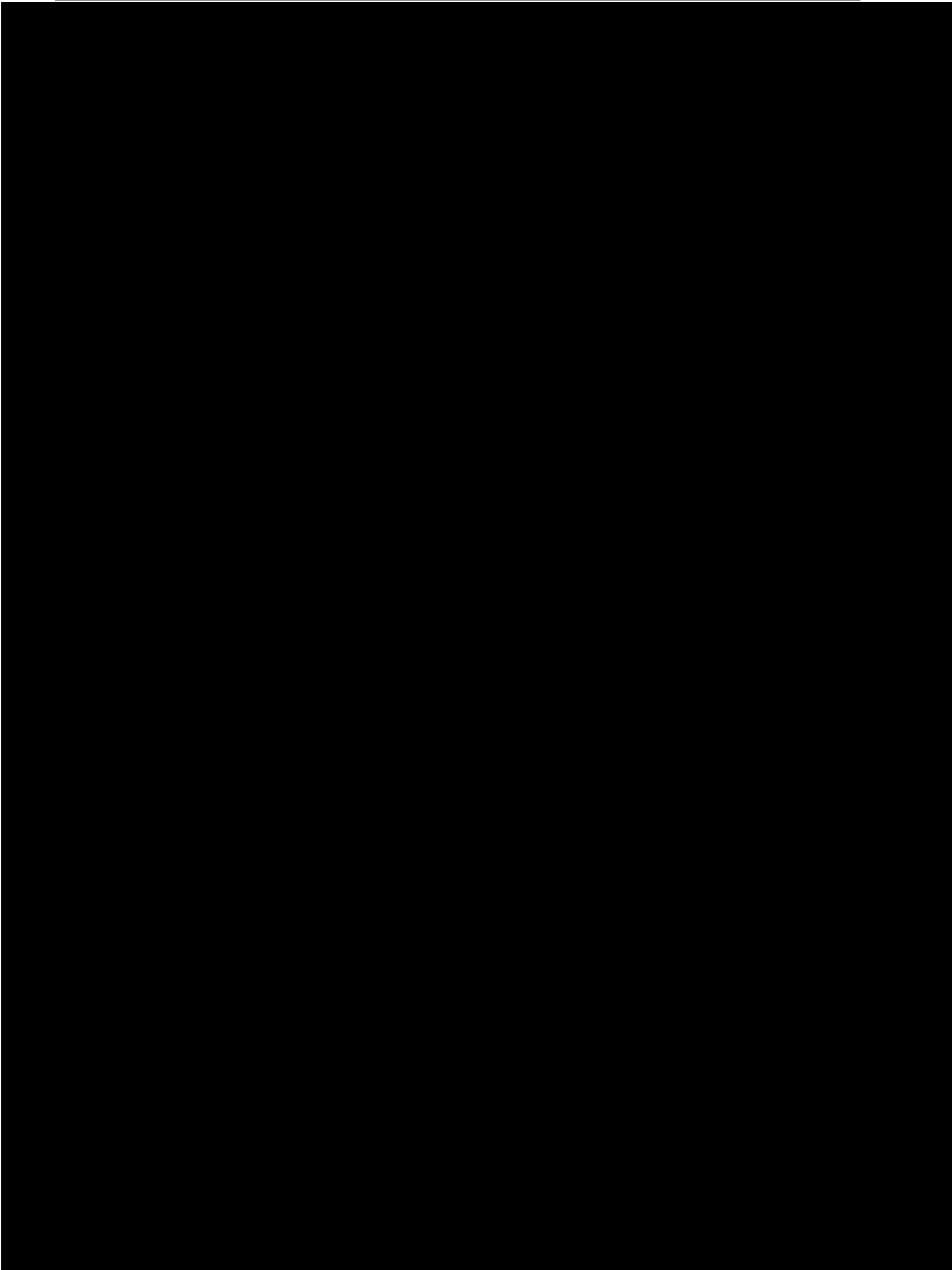
Full archaeological and ethnographical surveys of the wider MGGP area have been undertaken by the Badimia people (Badimia Land Aboriginal Corporation and Badimia Bandi Barna Aboriginal Corporation) and a number of culturally significant locations have been identified during these surveys. No sites occur within the proposed prescribed premise boundary. The survey reports are available on request but are not for public distribution.

A Heritage Agreement was reached with the Badimia people in June 2023.

7 ADDITIONAL INFORMATION (ATTACHMENT 8)

Attachment 8A – Wilshaw WWTP Design Report





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