



**DARRYL JOHN MALLET AND GINA STACEY
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**SUPPORTING INFORMATION FOR A CLEARING
PERMIT APPLICATION FOR THE FIVE MILE CREEK
PROJECT AT NULLAGINE**

AUGUST 2021

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Acronyms

BOM	Bureau of Meteorology
D and G Mallett	Darryl John Mallett and Gina Stacey Mallett
DBCA	Department of Biodiversity, Conservation and Attractions
DMIRS	Department of Mines, Industry Regulation and Safety
DPIRD	Department of Primary Industry and Regional Development
DPLH	Department of Planning, Lands and Heritage
Drilline	Drilline Pty Ltd
DWER	Department of Water and Environmental Regulation
ESA	Environmentally Sensitive Areas
GSWA	Geological Survey of Western Australia
IBRA	Interim Biogeographic Regionalisation for Australia
MCF	Mosquito Creek Formation
MCP	Mine Closure Plan
MCP 67979	Mine Closure Plan Reg. Id 67979
MP	Mining Proposal
MP 44991	Mining Proposal Reg. Id. 44991
NVCP	Native Vegetation Clearing Permit
PEC	Priority Ecological Community
The Project	Five Mile Creek Sand Project
PDWSA	Public Drinking Water Source Areas
TEC	Threatened Ecological Community

Units of measurement

ha	hectare
m	metres
km	kilometre
°C	degree Celsius
tpa	tonnes per annum

1 BACKGROUND INFORMATION

The Five Mile Creek Sand Project ('the Project') is located on M46/524 and L46/113 in the East Pilbara region near Nullagine. The Project involves the production of sand for construction purposes with material being excavated from Five Mile Creek and then screened to meet aggregate sizing requirements.

Both M46/524 and L46/113 were transferred to Darryl John Mallett and Gina Stacey Mallett ('D and G Mallett'), the owners of Drilline Pty Ltd ('Drilline'), on 29/09/2020. Drilline has been the site operator since early 2018 under an agreement with the previous lessee Redstone Minerals Pty Ltd. In this NVCP application, the proponents are D and G Mallett operating under the name Drilline.

Site photographs are provided in Plates 1 to 6.

The regional location of the Project is displayed in Figure 1. The Project is located in the East Pilbara region of Western Australia. The locality map for the Project is provided in Figure 2. M46/524 and L46/113 occur approximately 7.5km east of the town of Nullagine (Figure 2). M46/524 occurs along the Five Mile Creek and is connected to the Skull Springs Road via L46/113 (Figure 2). Both Project tenements are contained within the Nullagine Common (Reserve 2804), vested with the Shire of East Pilbara.

The Project operates under Mining Proposal ('MP') Registered ID 44991 ('MP 44991') that was approved by the Department of Mines, Industry Regulation and Safety ('DMIRS') on 25/06/2014. MP 44991 was submitted along with a Mine Closure Plan ('MCP') that was approved under the same authorisation letter from DMIRS. The MCP was updated in 2017 under Reg. Id. MCP 67979. MCP 67979 was approved on 27/06/2017 and is due for its third update in May 2022.

No mining has occurred on site since 2015 although Drilline is now looking at recommencing operations later in 2021. To this end, Drilline has lodged an updated mining proposal to accompany this NVCP application. The site layout for the Project is provided as Figure 3 and the close-up of the proposed areas under the new MP as Figure 4.

The areas of disturbance specified in the MP 44991 from 2014 are provided in Table 1.

Table 1: Areas of disturbance specified in MP 44991

Description of mining disturbances	M46/524 (ha)
Mining areas	40
Screening plant site & hardstand areas	0.5
Access roads	1.5
Total	42

Although a map of the area of disturbance was not provided in MP 44991, the area of open sandbank calculates to approximately 40ha, as mapped by GIS and displayed in Figure 3. This creekbed sandbank is thus considered as representing the 40ha of mining area referred to in MP 44991. Currently, there are no signs of sand mining having occurred on M46/524 as the creekbed naturally rehabilitates itself following rainfall events (Plate 2). The only

disturbance on site is the historical track that runs through some of L46/113 and M46/524 (Figure 3).

Under the new MP, it is proposed that up to 6.88ha of additional area on the embankment will be developed, as specified in Table 2 and displayed in Figure 4.

Table 2: Areas of disturbance proposed under the new MP

Mining Activity Type	Mining Activity Reference	Area (ha)
Basic raw material extraction processing equipment or stockpile associated with basic raw material extraction	Screening stockpiling area	6.82
Transport or service infrastructure corridor	Access road to creekbed	0.06
Total		6.88

The Five Mile Creek area has previously been the subject of biological surveys as part of the development of the Millennium Gold Project. The Mulgara and Bilby have been recorded in the general area (Bamford 2017). Drilline commissioned Zootopia Environmental Services in December 2020 to undertake a targeted fauna survey of the proposed new MP areas. The location of the targeted fauna survey in relation to the new MP area is displayed in Figure 5. No evidence of either of the Mulgara and Bilby was detected during the survey. The targeted fauna survey occurred over the ground to be developed as the screening stockpiling area.

From examination of the Department of Water and Environmental Regulation ('DWER') Native Vegetation Map Viewer, the Project is not in a "Section 4. Non-permitted area" pursuant to Schedule 1 of the *Environmental Protection (Clearing of Native Vegetation) Regulations 2004*. However, recent hydrological spatial data purchased from DWER places much of M46/542 in the Nullagine Public Drinking Water Source Areas (Figure 2). This differs from the DWER Native Vegetation Map Viewer. Additionally, Five Mile Creek itself would qualify as a "Non-permitted area" under the category "Section 4(1)(g) - an area covered by the riparian vegetation of a wetland or watercourse".

On the basis of the water reserve and riparian vegetation, Drilling has submitted this Native Vegetation Clearing Permit ('NVCP') application for both the proposed areas under the new MP (screening stockpiling area and access road to creekbed) as well as the areas covered under MP 44991 (creekbed sand resource and the current access road). The location of the NVCP application is displayed in Figure 6. The Project was a formally subject to CPS 8707/1 that would have become invalid when the tenements were transferred from Redstone Minerals Pty Ltd to D and G Mallett on 29/09/2020.

This NVCP application is a purpose permit that covers a total envelope area of 55.63ha. The spatial extent is provided along with this application by way of the shapefile entitled:

- "NVCP_Application_Five_Mile_Creek_Nullagine.shp"

It is intended to clear up to a designated 48.38ha within the purpose permit envelope, as outlined in Table 3. It should be noted that the actual area cleared is likely to be much lesser in extent as the creekbed that is included in the NVCP is mostly devoid of vegetation (refer to Plates 2 to 4). Additionally, the access track is already cleared (Plate 1) and just requires edge grading for a slight widening or maintenance.

Table 3: Intended clearing area and purpose

MP	Clearing purpose	Area (ha)
MP 44991 (Table 1)	Creekbed mining area	40
	Access road (edge grading)	1.5
New MP (Table 2)	Screening stockpiling area and access road to creek	6.88
Total		48.38

The Project is also subject to Works Approval W6183/2018/1 for a Category 12 Prescribed Premise. A Category 12 Prescribed Premise is defined as:

- Screening etc. of material: premises (other than premises within category 5 or 8) on which material extracted from the ground is screened, washed, crushed, ground, milled, sized or separated (50,000 tonnes or more per year).

A licence to operate will be applied for later in 2021 for a maximum tonnage of 100,000 tonnes per annum ('tpa'). The new MP also specifies a tonnage of 100,000 tpa.

1.1 Mining Overview

The Project consists of a small creekbed sand mining operation that operates on a campaign basis to produce construction material for use in infrastructure projects in the Pilbara region. The sand is excavated from the creekbed using a wheel loader to feed a mobile screening plant that produces several products lines (different particle sizings). Product maybe temporarily stockpiled on site in the creekbed or trucked directly to delivery locations. The run-of-mine material is a medium grained silica sand with a 10% to 20% oversize river shingle fraction (small pebblestone sizing). The product ranges are manufactured sizings to meet individual contract specifications, nominally:

- Bedding sand -8mm.
- River shingle +8mm to -10mm.
- River shingle 20mm.
- River shingle +20mm.

Mining operations consist of a simple load, screen and cart operation. Equipment used on site typically consists of:

- 36t excavator.
- 30t moxy semi-articulated dump truck.
- 35t wheel loader.
- A mobile screening plant.
- 4WD ute or service truck with self-bunded fuel tanks.

- Single tipper or a road train double or triple trailer combination.

Material is excavated from the creek bed as a shallow quarrying operation to a depth of approximately 0.6m. No clearing is required as sand extraction is restricted to areas of barren creek bed devoid of vegetation. In order to avoid impacts to significant vegetation in the creek bed and banks, buffer zones are established around large trees within the creek bed and the banks themselves, particularly in the wider sections of the creek. MP 44991 specifies that mining activities will not occur within the area defined as the "drip-line" of the vegetation within the creekbed and a buffer of at least 2m is employed from the banks of the creek (other than areas where access ramps are located). This ensures that the vegetation within the creek including the root systems are undisturbed and the creekbed is not destabilised by mining activities.

All mining excavations occur entirely in the loose alluvial sand and do not extend into the underlying basement material. The underlying basement material has no commercial value.

The site observations from the one and only mining campaign in 2015 were that the creekbed excavations completely refill after one wet season (refer to Plate 2). Drilline aims to create a consistent floor level as opposed to deep isolated holes, as this facilitates an even replenishment of sand resource. The creek flow will not be blocked in anyway during mining operations. This will be facilitated by locating stockpiles on the embankment rather than in the creekbed (as per the new MP).

A Terex Finlay 683 Supertrak mobile screening plant (or equivalent) will be used to screen sand and shingle to the required specifications. Various sand and shingle product lines are produced: from -8mm sand to +20mm shingle. No tailings is generated by the operation. Any undersize or oversize reject material from the mobile screening plant is returned to the creekbed excavation as backfill. The screening operation is subject to works approvals W6183/2018/1 for a Category 12 prescribed premise (screening of material etc.) that was issued on 24/01/2019. A licence to operate will be lodged in the near future once the screening plant has been commissioned.

To date, one mining campaign was undertaken in 2015 in which 3,228t of material was excavated. The site then remained dormant to present due to the industry downturn. This situation is likely to change in the near future with a number of major projects that are due to commence or have commenced.

On the basis of creekbed area and assuming a 0.6m depth, the resource has been calculated at 180,000m³ or 288,000t of material available from M46/524 in the following proportions:

- 144,000m³ sand;
- 230,400t sand;
- 36,000 m³ shingle; and
- 57,600t shingle.

In the new MP, the annual rate will be specified at 100,000tpa to facilitate the capacity for Drilline to tender for large "one-off" large contracts. The actual long term average rate of production is much less than this.

The resource also self-replenishes, and from site observations, this occurs quickly over a few rainfall seasons as observed at the 2015 excavation site.

No fuels are stored on site. The mobile plant is refueled as required from a tank on a 4WD ute. Refueling only occurs on the embankment outside of the creekbed. Standard spill kits are used in the event of spillages.

There is no infrastructure required or installed on site apart from the screening plant that is removed at the end of each campaign. The workforce is accommodated in Nullagine. Normally, two operators are required and a truck driver. There are no other special regional resource requirements for the Project.

Access to the Project area is via the Skull Springs Road (aka Woodie Woodie Road), from Nullagine for approximately 8km, then along an existing track through L46/113 heading north for approximately 1.2km to link with M46/524. The track is historical and pre-existed the Project. Hence, no new roads were required for the Project. The track was in good condition prior to Project commencement and will be graded and maintained as required by Drilline.

The Project operates under Drilline's "Five Mile Creek Sand Project Dust Management Plan".



Plate 1: Access track on L46/113



Plate 2: Area previously mined at M46/524 in 2015, excavations naturally refilled



Plate 3: View of potential creekbed mining areas in M46/524, no vegetation



Plate 4: View of entry point to creekbed mining areas at M46/524



Plate 5: Close-up of river sand showing particle sizings



Plate 6: Potential shingle material in the creekbed mining areas in M46/524



Drilline
CIVIL & HAULAGE

Five Mile Creek Sand Project

Authored: R Sharpe	Drawn: C Newland
Date: 26/05/2021	Print Size: A4
Map Name: Figure 1 Regional Location Five Mile Creek Sand Project.mxd	

Figure 1: Regional location of the Five Mile Creek Sand Project

Legend

- Mining Tenements
- National Parks
- Regional Towns
- Highway
- Primary Road
- Rivers

Newland Environmental

Figure 1: Regional location of the Five Mile Creek Sand Project

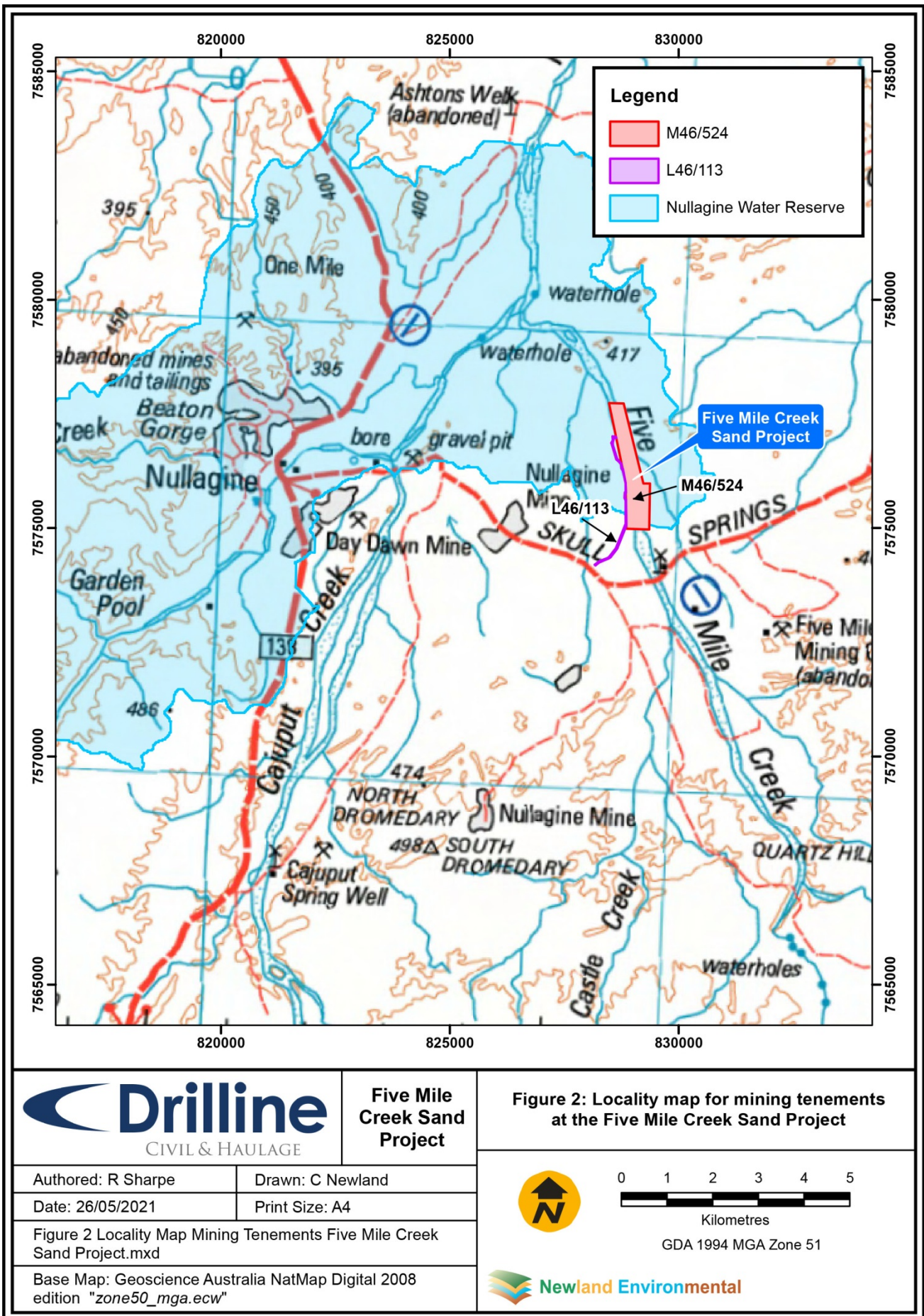
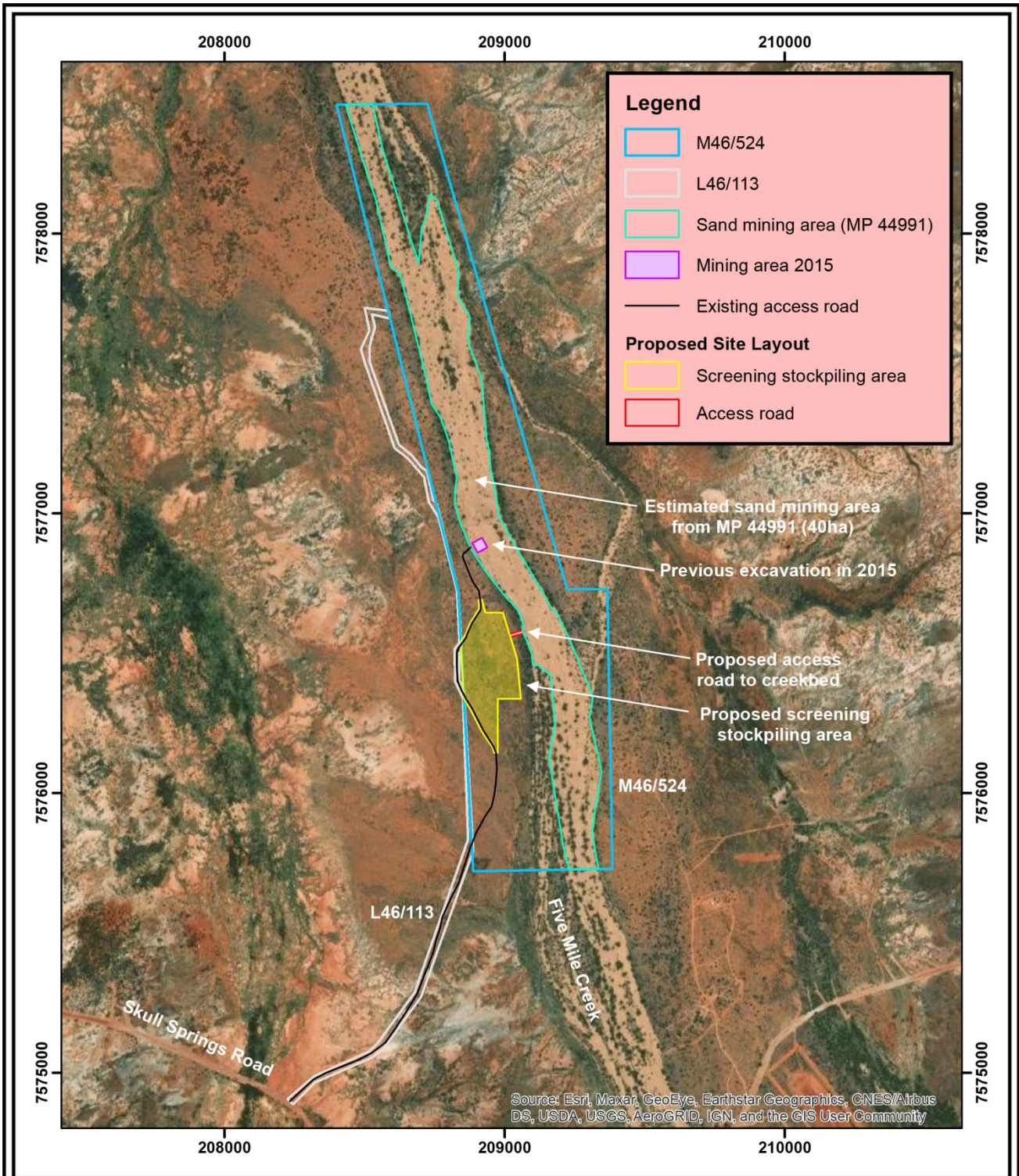


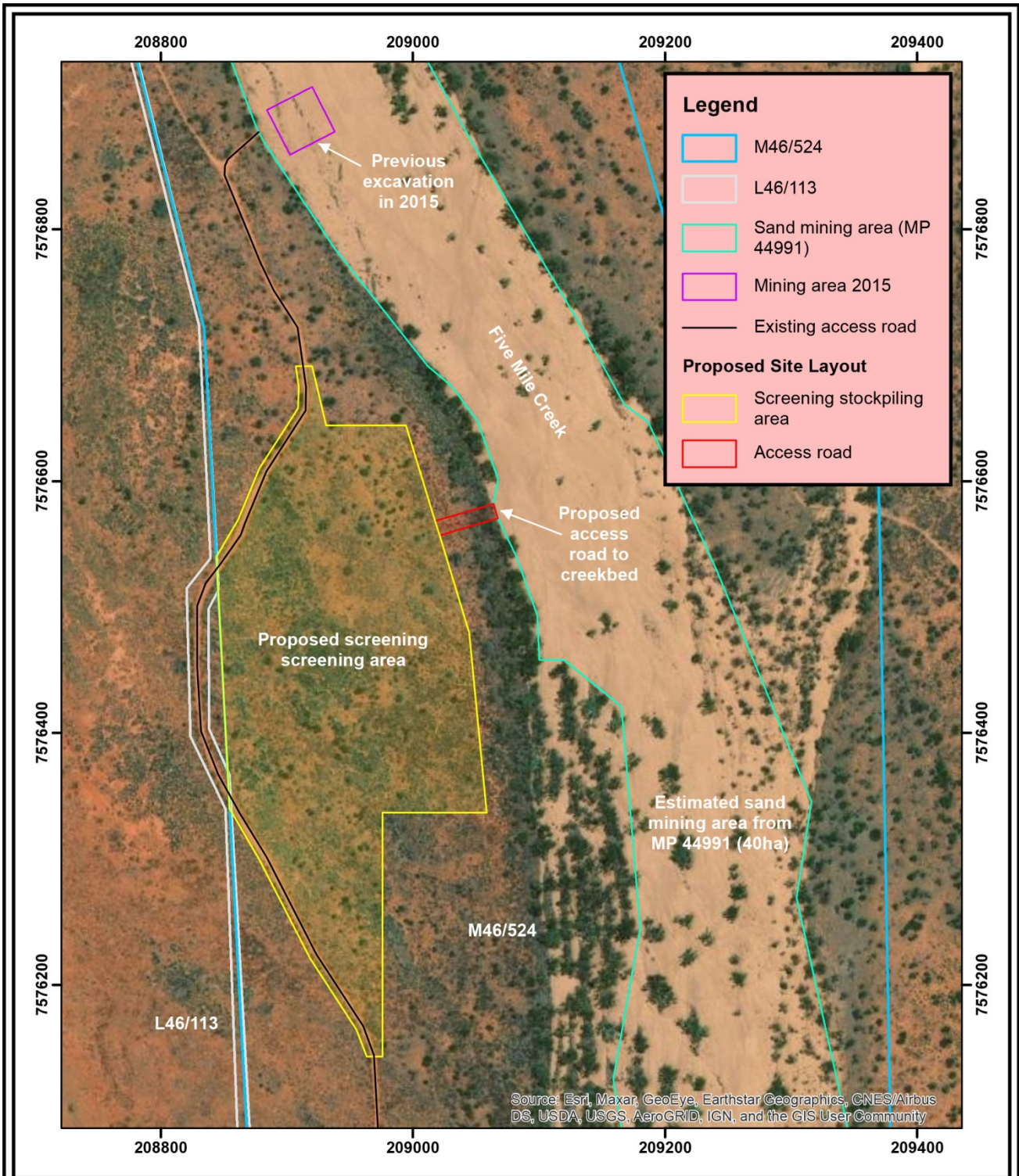
Figure 2: Locality map for mining tenements at the Five Mile Creek Sand Project



Source: Esri, Maxar, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community

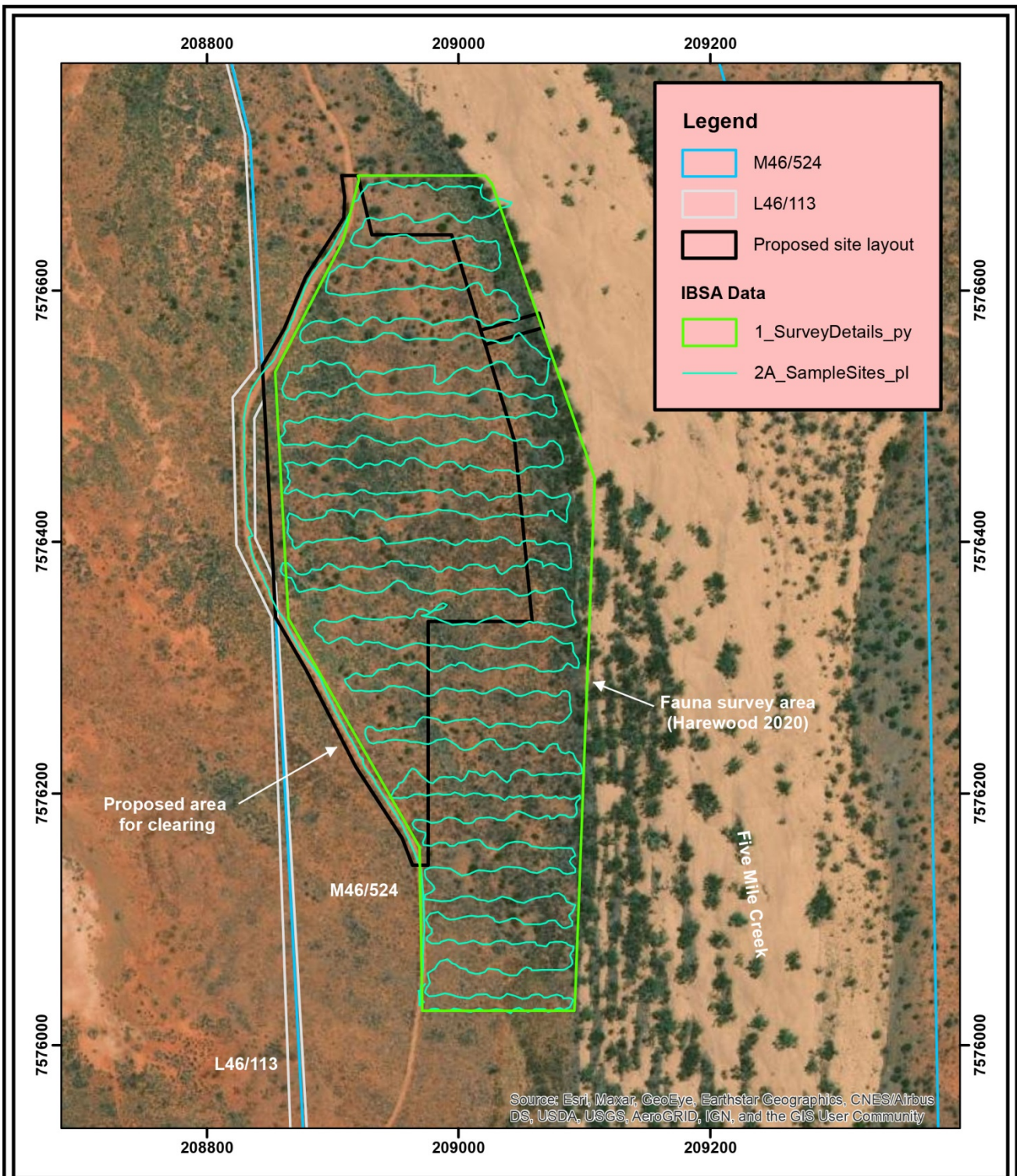
		Five Mile Creek Sand Project		Figure 3: Site layout for the Five Mile Creek Sand Project	
Authored: R Sharpe		Drawn: C Newland		 GDA 1994 MGA Zone 51	
Date: 26/05/2021		Print Size: A4			
Map Name: Figure 3 Site Layout Five Mile Creek Sand Project.mxd					
Base Map: ESRI Basemap "World Imagery" image date 08/12/2019					

Figure 3: Site layout for the Five Mile Creek Sand Project



		Five Mile Creek Sand Project		Figure 4: Proposed site layout for the Five Mile Creek Sand Project	
				 GDA 1994 MGA Zone 51	
Authored: R Sharpe		Drawn: C Newland			
Date: 26/05/2021		Print Size: A4			
Map Name: Figure 4 Proposed Site Layout Five Mile Creek Sand Project.mxd					
Base Map: ESRI Basemap "World Imagery" image date 08/12/2019					

Figure 4: Proposed site layout for the Five Mile Creek Sand Project



		Five Mile Creek Sand Project		Figure 5: Location of the fauna survey at the Five Mile Creek Sand Project	
Authored: R Sharpe		Drawn: C Newland		 GDA 1994 MGA Zone 51	
Date: 26/05/2021		Print Size: A4			
Map Name: Figure 5 Location Fauna Survey Five Mile Creek Sand Project.mxd					
Base Map: ESRI Basemap "World Imagery" image date 08/12/2019					

Figure 5: Location of the fauna survey at the Five Mile Creek Sand Project

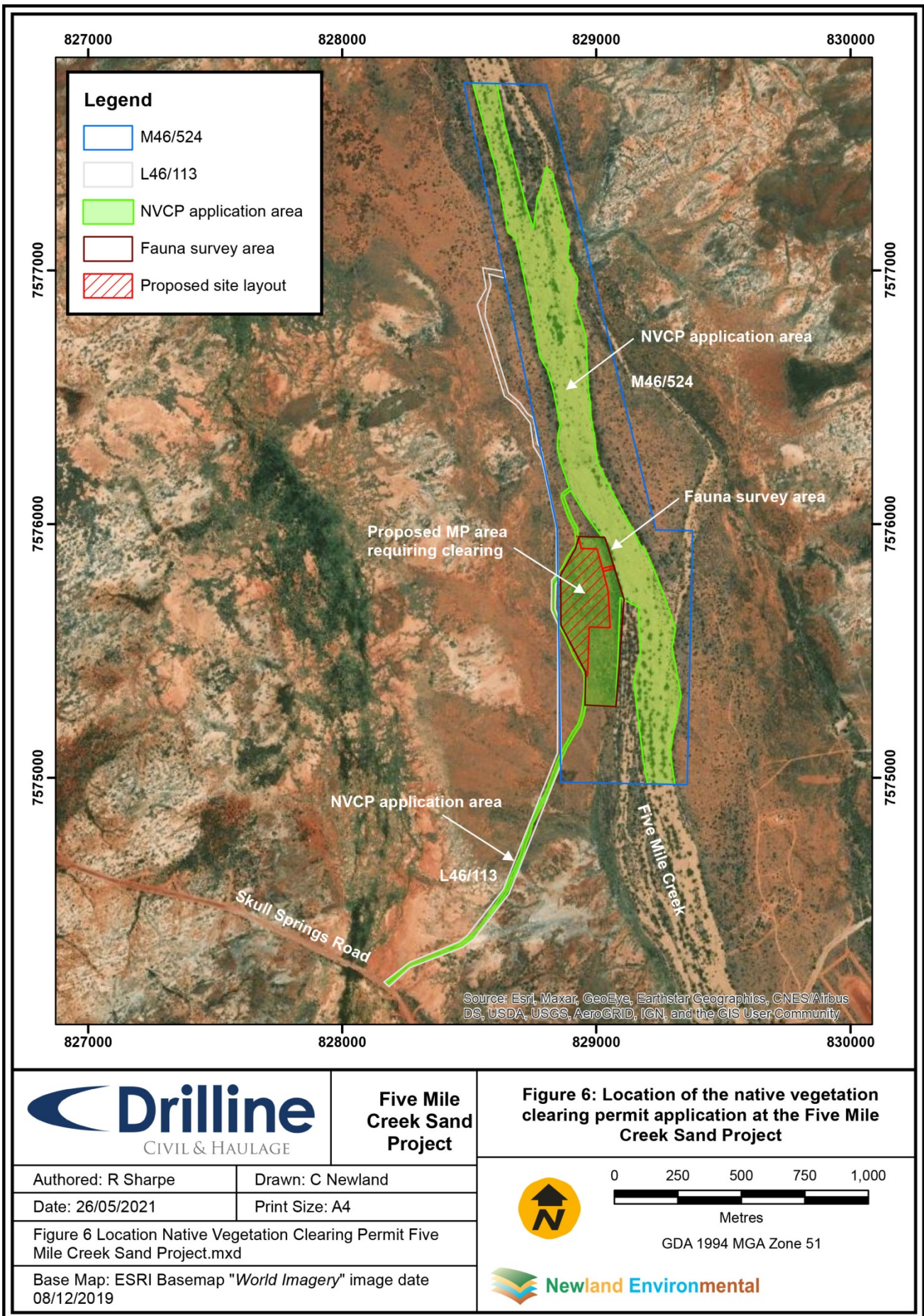


Figure 6: Location of the NVCP application at the Five Mile Creek Sand Project

2 BIOLOGICAL AND ENVIRONMENTAL INFORMATION

2.1 Climate

Weather data from the Bureau of Meteorology ('BOM') for Nullagine (BOM Station No 4027) is presented in Table 4 (BOM 2021). Mean monthly rainfall and temperature data is displayed in Figure 7.

Nullagine experiences a semi-arid climate, influenced by summer sub-tropical rainfall events and a prolonged winter dry season. Cyclonic and monsoonal activity is a significant weather factor the summer months. The average annual rainfall at Nullagine is 327.5mm with 90% falling between December and June. Annual rainfall patterns tend to be bimodal in distribution as can be seen in Figure 7; peaking in January and February with a slight second rise in June. The summer rains are usually from cyclones or monsoons and the mid-year falls are localised patterns or extensions of southern troughs. Major deluge events can occur during cyclones with the highest recorded daily rainfall being 192mm and the wettest month experiencing 298.5mm of rain.

The mean maximum temperature is 32.9°C and the mean minimum temperature is 16.6°C. Temperatures are hot to very hot in the summer months from November to March (ranging from approximately 36°C to 39°C) with the highest recorded temperature being 46.7°C.

The winter period from April to October from is still warm to hot (ranging from approximately 24°C to 35°C). Given the inland location that can result in a continental effect, temperatures can descend to below freezing for short periods near dawn in mid-winter with the lowest recorded temperature being -2.2°C.

Five Mile Creek remains dry for most of the year with river flows occurring only during large rainfall events. Creek flows tend to occur as flash flood events with water levels rising very quickly with overflow onto the surrounding floodplains. Water levels can then rapidly fall with a few days with ponding remaining in the lower levels of the creekbed.

The Newman average annual evaporation rate is between 3,200mm and 3,600mm per year (BOM 2021).

Table 4: Climate averages for Nullagine BOM Station No 4027

Statistic Element*	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
Mean maximum temperature (°C)	39.4	38.3	36.7	33.1	28.0	24.2	24.0	26.8	31.3	35.0	38.3	39.7	32.9
Highest temperature (°C)	46.7	46.0	43.3	40.2	37.6	33.3	33.2	35.6	38.5	43.1	44.7	46.4	46.7
Mean minimum temperature (°C)	24.2	23.7	21.9	17.3	12.5	8.9	7.5	9.3	12.7	16.9	21.1	23.3	16.6
Lowest temperature (°C)	17.0	15.0	13.9	8.9	3.1	0.5	-2.2	1.4	3.4	6.1	9.4	12.5	-2.2
Mean rainfall (mm)	69.0	69.4	50.3	23.4	20.4	24.5	11.2	6.8	1.6	4.2	12.4	38.7	325.7
Highest rainfall (mm)	298.5	235.0	255.4	183.8	156.7	185.1	91.0	76.6	36.1	80.8	95.5	263.3	693.0
Lowest rainfall (mm)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	45.3
Highest daily rainfall (mm)	144.8	105.2	192.0	153.2	73.7	95.8	73.7	50.0	30.0	37.6	54.9	147.3	192.0
Mean number of days of rain	6.6	6.3	4.2	2.0	2.4	2.3	1.4	1.1	0.3	0.6	1.8	4.1	33.1

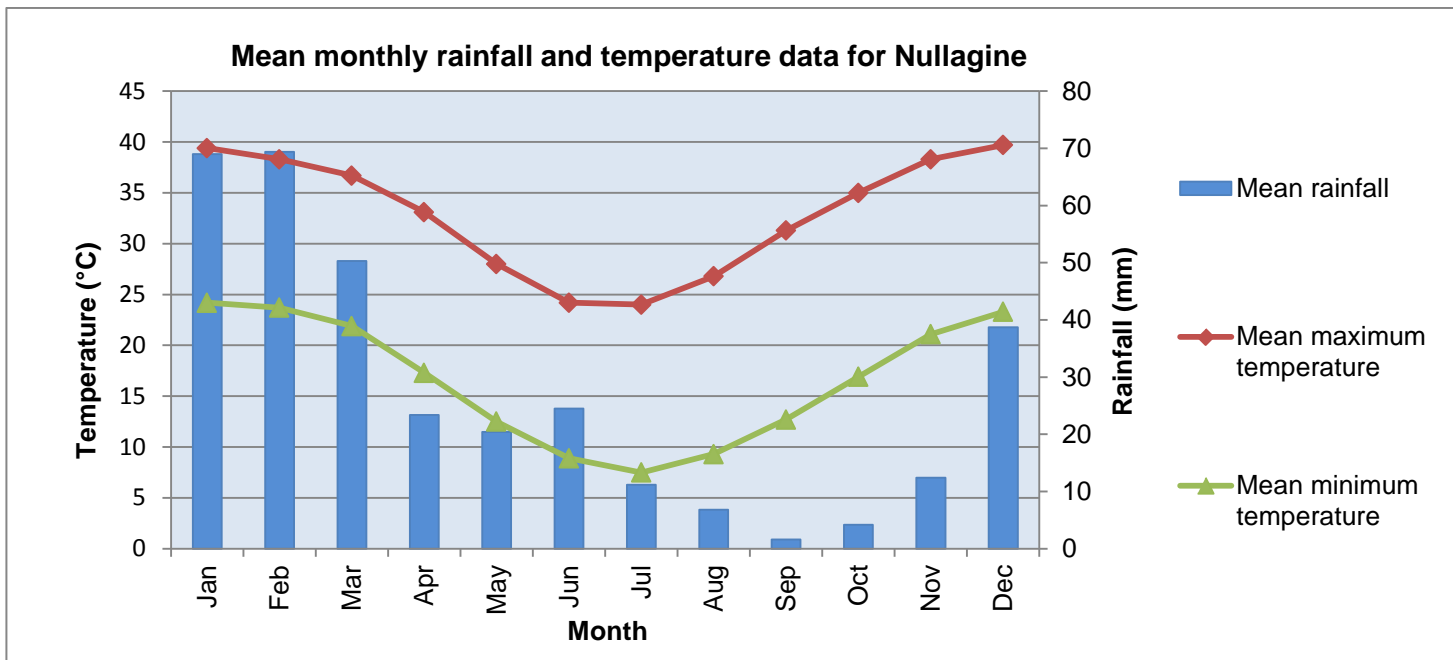


Figure 7: Mean monthly rainfall and temperature data for Nullagine BOM Station No 4027

2.2 Regional Setting

Under the Interim Biogeographical Revision of Australia ('IBRA'), the Pilbara has been divided into four IBRA subregions (May and McKenzie 2002). The Project area is contained within the Pilbara 1 – Chichester Subregion (DAWE 2018); described by Kendrick and McKenzie (2011) as:

“The Chichester subregion (PIL 1) comprises the northern section of the Pilbara Craton. Undulating Archaean granite and basalt plains include significant areas of basaltic ranges. Plains support a shrub steppe characterised by *Acacia inaequilatera* over *Triodia wiseana* (formerly *Triodia pungens*) hummock grasslands, while *Eucalyptus leucophloia* tree steppes occur on ranges. The climate is Semi-desert-tropical and receives 300mm of rainfall annually. Drainage occurs to the north via numerous rivers (e.g. De Grey, Oakover, Nullagine”.

The Chichester Subregion area is 9,044,560ha (Kendrick and McKenzie 2011).

2.3 Local Topography

Five landforms occur in the M46/524 locality:

- Drainage channels with sand and gravel alluvium;
- Floodplains with creekbed embankments;
- Plains;
- Undulating low schistose ridges; and
- Historical tracks.

M46/524 is located on the Five Mile Creek drainage channels and floodplains. L46/113 occurs on plains.

2.4 Hydrology

Five Mile Creek is an ephemeral watercourse that is dry for much of the year and only flows following significant rainfall events such as monsoonal depressions and cyclones. The creek is a tributary of the Nullagine River with the confluence located approximately 3km downstream from M46/524. Five Mile Creek starts below Mount Maggie at an elevation of 523m and ends at an elevation of 368m at the Nullagine River, dropping 155m over its 31.4km length. The creekbed width varies from approximately 130m to 240m within M46/524. There are no waterholes or pools along the stretch of creekbed near the Project area as the creek is free flowing with no barriers or sand bars. The creekbed is depicted in Plates 2 and 4. From Plate 2 it can be seen that the creekbed can return to its pre-mining condition as a result of alluvial depositional and refilling during creek flows.

The relative width of the creekbed compared to the small size and shallow depth of extraction areas means that mining activities are unlikely to interrupt or disrupt creek flow. Additionally, mining has no potential to affect water quality as there are no pollution sources associated with the quarrying activities that could impact on waterways.

Based on an average annual evaporation rate of 3,200 to 3,600mm, any surface water resulting from rainfall events is likely to be relatively short lived.

The Project area is not contained within any water reserves. The Nullagine Water Reserve is situated approximately 1.4km to the west of the Project area (DWER 2020). The Project area is contained in the Nullagine River Catchment that forms part of the De Grey River basin (DWER 2020).

2.5 Geology

The Project area is underlain by the structurally complex Mosquito Creek Formation ('MCF') (Hickman 1978, Bagas 2005) which crops out in an easterly-trending rectangular region approximately 60km long and 30km wide and is interpreted as a refolded and faulted synclinorium.

Rocks of the MCF are well cleaved and tightly folded, and consist of interbedded conglomerate and coarse-grained sandstone, with interbedded sandstone, siltstone, and shale displaying graded bedding. Outcrops of the MCF typically form lightly timbered rubble-strewn low strike-ridges, with the freshest exposures found in incised creeks. At least six phases of deformation are recognized in the MCF.

Figure 8 displays the physiography of the Nullagine Region from the Nullagine 1:100,000 geological report, Western Australia Geological Survey (Babas 2005). On the 1:100,000 map sheet (2954), M46/524 occurs in Quaternary sediments code 'Qaa' with the description:

- Qaa: Alluvial sand and gravel in rivers and creeks; clay, silt, and sand in channels on floodplains.

Quaternary sand and gravel sediments are abundant along the Five Mile Creek.

The sand resource can be seen in Plates 5 and 6. The material is a medium grained silica sand with a 10% to 20% oversize river shingle fraction (small pebblestone sizing). The river shingle consists of an assortment of local rock types (alluvial debris). The products lines are construction materials and consist of variety of screened bedding sands and shingles (-8mm to +20mm). There is no waste generated as all material excavated is product or reject (undersize or oversize) to be returned to the creek excavation areas as backfill.

2.6 Soils

With reference to Van Vreeswyk *et al.* (2004) and Figure 9, the Project area is contained within two land systems:

- River Land System; and
- Mosquito Land System.

Van Vreeswyk *et al.* (2004) defined fourteen land surface types in the Pilbara grouped primarily on whether they represent erosional or depositional surfaces and secondly on the genesis of soil and drainage features.

The River Land System is defined as "*Flood plains and river terraces subject to fairly regular overbank flooding from major channels and watercourses, sandy banks and poorly defined levees and cobble plains. Banks, levees and slightly higher upper terraces receive less regular flooding than lower terraces and flood plains*". River flood plains are depositional surfaces and are more or less active and associated with the major rivers of the area. They

receive run-on from adjacent higher surfaces and are subject to fairly regular over-bank flooding from major river channels. Soils are both non-saline and saline (predominantly non-saline) duplex (texture contrast) types and clays (Van Vreeswyk *et al.* 2004).

The Mosquito Land System is defined as “*Erosional surfaces; stony plains and pediments with prominent ridges and hills with steep upper slopes and short more gently inclined footslopes, moderately spaced tributary flow lines and channels. Relief up to 100m*” The stony plains and hills are erosional surfaces of gently undulating plains, pediments and rises characterized by mantles of lag and colluvium and low hills, ridges and associated footslopes. Quartz is widespread as a mantle component. Ironstone, basalt, sandstone, shale, decomposing granite and silcrete are commonly dominant as mantles depending on underlying geology. Relief is mostly low (30-90 m) (Van Vreeswyk *et al.* 2004).

2.7 Land Systems

With reference to the Department of Primary Industry and Regional Development (‘DPIRD’) land systems and Van Vreeswyk *et al.* (2004), M46/524 and most of L46/116 are contained within the River Land System (DPIRD 2011). The land systems occurring at the Project locality are displayed in Figure 9.

The River Land System is described as “*Active flood plains and major rivers supporting grassy eucalypt woodlands, tussock grasslands and soft spinifex grasslands*”. As mapped by Van Vreeswyk *et al.* (2004) and Payne *et al.* (1998), there is 491,700ha of River Land System occurring in the Ashburton and Pilbara regions.

The southern-most extension of L46/116 occurs within the Mosquito Land System, described as “*Stony plains and prominent ridges of schist and other metamorphic rocks supporting hard spinifex grasslands*”. The Mosquito Land System is confined to the Nullagine region. As mapped by Van Vreeswyk *et al.* (2004), there is 184,000ha of Mosquito Land System occurring in the East Pilbara region.

2.8 State Level Vegetation Associations

Mapping of the pre-European vegetation within Western Australia was conducted at a 1:250,000 scale by J S Beard from 1964 to 1981 (Beard 1975, Beard *et al.* 2013). The type, status, pre-European area (based on Beard’s mapping) and remaining extent of native vegetation for the entire state has been assessed by the Department of Biodiversity, Conservation and Attractions (‘DBCA’) and DPIRD using remote sensing techniques and GIS analysis to produce a statistical compendium called the ‘Comprehensive, Adequate and Representative Reserves system (Shepherd *et al.* 2002). Data has been updated on a regular basis with the information from the latest update being the “2018 Statewide Vegetation Statistics” (Government of Western Australia 2019). The 2018 Statewide Vegetation Statistics are provided spatially by Data WA as “Pre_EuropeanVegetationDPIRD_006.shp” (Data WA 2021a), refer to Figure 9. From examination of the above shapefile, the Project area occurs within a single vegetation sub-association:

- **Abydos Plain – Chichester Vegetation Association 190.1:** ‘Hummock grassland with sparse shrubs *Triodia* spp. *Acacia* spp.’

Information on the occurrence of Vegetation Associations 190.1 is provided in Table 5 (Government of Western Australia 2019). There is 99.91% of pre-European vegetation remaining in Western Australia (Government of Western Australia 2019). Although this association has no representation within internationally recognised conservation estates (IUCN Reserve classes 1 to 4¹), there is a considerable extent of Vegetation Association 190.1 remaining (169,051.00ha).

Table 5: Information on the extent of Vegetation Association 190.1

Pre-European Extent	Current Extent	Percentage Remaining	Percentage Pre-European in IUCN Class I-IV Reserves ¹
ha	ha	%	ha
169,199.72	169,051.00	99.91	0

2.9 Conservation Areas and Ecological Communities

The proximity of conservation areas in relation to the Project area was assessed using various datasets.

- ArcGIS shapefiles downloaded from Data WA for Land Clearing Regulations Schedule 1 Areas, Environmentally Sensitive Area ('ESA's), Ramsar Sites and DBCA Managed Lands (Data WA 2021b).
- ArcGIS shapefiles purchased from DBCA for Threatened Ecological Communities ('TEC's) and Priority Ecological Communities ('PEC's) occurring in the Pilbara Region (DBCA 2011).
- Data WA WMS layer "Threatened Ecological Communities (DBCA-038)" (Data WA 2021c).
- Protected Matters Search Tool (DAWE 2021a).
- TEC listings for the Pilbara (DBCA 2018).
- PEC listings for the Pilbara (DBCA 2021).
- Tengraph (DMIRS 2021).

In summary:

- There are no National Parks, Nature Reserves or DBCA Managed Lands occurring near the Project area. The closest DBCA Managed Land is the Karijini National Park, located approximately 155km to the west-southwest. Karlamilyi National Park, located approximately 158km to the east-southeast. Ex-Meentheena pastoral leasehold purchased by DBCA is located approximately 54m to the northeast.

¹The International Union of Conservation ('IUCN') reserve classes 1 to 4 are used as an indicator of areas protected under conservation estate.

- There are no State of Federally listed TECs occurring near the Project area. One PEC occurs partially over the Project area. TECs and PECs are discussed in below.

The two Pilbara TECs (TEC 46 - *Themeda* grasslands and TEC 78 - Ethel Gorge aquifer stygobiont community) are located more than 150km from the Project area.

There is one PEC located in the Five Mile Creek locality:

“PEC 23: Stony saline plains of the Mosquito Land System (Priority 3iii)

“*Triodia longiceps* grassland with scattered *Maireana melanocoma* and *Sclerolaena* spp. and includes Priority flora taxa *Atriplex spinulosa* (P1) and *Ptilotus wilsonii* (P1). Dissected by drainage lines. Dominated by (but not limited to) *Melaleuca eleuterostachya* and *Acacia bivenosa* occurring on saline red brown non-cracking clays with a mantle of quartz gravel and neutral subsurface soil material on level to undulating plains. Largely restricted to an area east of Nullagine.

Threats: preferential grazing (livestock and feral herbivores), clearing for mining and associated activity”. (DBCA 2021a)

Information from DMIRS indicates that this PEC represents Unit 4 of the Mosquito Land System, described by Van Vreeswyk *et al.* (2004) as patchy hummock grasslands of *Triodia longiceps* with isolated scattered shrubs of *Acacia*, *Senna* and *Maireana* spp., on stony saline plains (DMIRS 2015).

In the Clearing Decision Report assessment for the Project (CPS 6184/1), DMIRS stated that “*The application area sits within the buffer of the Priority Ecological Community (PEC) ‘Stony saline plains of the Mosquito Land System’ (Priority 3) (GIS Database). Advice from DBCA suggests that the PEC is unlikely to be present within the application area and that the proposed activities will not directly impact the PEC*” (DMIRS 2014).

The above assessment from DMIRS and DBCA was confirmed using GIS to examine the Project tenements in relation to the land systems shapefile provided by DPIRD (DPIRD 2011). The land systems for the Project area are displayed in Figure 9. It can be seen in Figure 9 that M46/524 and most of L46/113 occur within the River Land System.

The access track in the southern section of L46/113 occurs on plains, albeit little further clearing is required as this historical track pre-existed the Project. This historical track pre-existed the Project (Plate 1). The access track could be subject to occasional maintenance grading and possibly a slight widening.

2.10 EPBC Act 1999 Listings

A Protected Matters Search Report was generated for listings under the *EPBC Act 1999* based on a 20km radial buffer from a point in the middle of the Project area (120° 11' 00" E, 21° 53' 14" S) (DAWE 2021a).

There are no *EPBC Act 1999* listings for World Heritage Properties, National Heritage Properties, Wetlands of International Importance, Listed TECs. There are listings for Threatened, Migratory and Marine species. These listings are discussed in the Flora and Fauna sections that follow.

2.11 Conservation Listed Flora

A NatureMap search (DBCA 2021b) was conducted for all flora occurring within a 20km radial buffer centred on a point in the middle of the Project area (120° 11' 00" E, 21° 53' 14" S). There were 273 flora taxa listed within the search area including 10 Priority Flora. It should be noted that no Threatened Flora pursuant to the *Biodiversity and Conservation Act 2016* were reported in the search. The NatureMap conservation listed flora search results are provided in Appendix A.

Information on the conservation listed flora from the search is provided in Table 6. The NatureMap map of the location of conservation listed flora is provided in Appendix A. No DBCA listed conservation listed flora were recorded in the immediate Project locality. *Goodenia nuda* (Priority 4) has been added to Table 6 as although not in the NatureMap search, it was recorded along Five Mile Creek by Waters and Chalwell (2017). The Waters and Chalwell (2017) survey was commissioned by Millennium Minerals Limited as a priority flora study for the Mosquito Land System. Although not undertaken as part of the studies for this NVCP application, Waters and Chalwell (2017) covered the Project area (M46/524 and L46/113). A copy of Waters and Chalwell (2017) is provided along with this NVCP application.

An assessment was undertaken of the likelihood of occurrence in Project area of the conservation listed flora based on known habitat types (Table 6). The assessment also draws heavily on the targeted Priority Flora survey conducted throughout the Mosquito Land Systems at Nullagine by Waters and Chalwell (2017). The Waters and Chalwell comprehensive survey area extended north to adjoin the southern-most boundary of M46/524. From Table 6, only *Acacia fecunda* (P1) and *Eucalyptus rowleyi* (P3) were considered as having a possibility of occurring in the habitat types within M46/524 (sandy creekbed and floodplains). Additionally, *Goodenia nuda* (P4) was not in the NatureMap search, however it was recorded by Waters and Chalwell (2017) along Five Mile Creek.

Acacia fecunda is described in the Nuytsia journal article by Maslin and van Leeuwen (2008) as being confined to the Pilbara region where it is known from a few disjunct populations east of Nullagine. The distribution map using data sourced from the Atlas of Living Australia (ALA 2021) is displayed in Figure 10. *Acacia fecunda* has been recorded in a 94km stretch running east-west from the confluence of the Davis and Oakover Rivers to near Five Mile Creek (Figure 10). It has also been recorded in the Central Pilbara (Figure 10). Maslin and van Leeuwen (2008) consider that further surveys in the region could discover additional populations. *Acacia fecunda* has been recorded on the Mosquito Creek sedimentary rocks and although not expected to have a particularly extensive geographic range, it can be common locally (Maslin and van Leeuwen 2008). It is reported to favour water harvesting sites (Maslin and van Leeuwen 2008).

In the Waters and Chalwell (2017) survey, *Acacia fecunda* was mapped as occurring across much of the Mosquito Land System, however, to the east of Five Mile Creek. It was recorded in 50% of the 325 minor/intermediate channels surveyed but in none of the 14 major channels in the Mosquito Land System. *Acacia fecunda* was not recorded in the Five Mile Creek locality and this included the M46/524 locality; refer to Figure 3.11 in Waters and Chalwell (2017). Waters and Chalwell (2017) reported that it tends to form dense shrublands along minor drainage lines in upland areas and as the dominant shrub species.

As *Acacia fecunda* has not been recorded within M46/524 or in the Five Mile Creek area in general, it is considered improbable that the Project operations will have any impact on this species. As reported by Waters and Chalwell (2017), this species was absent from the 14 major channel systems that were surveyed (such as Five Mile Creek).

Eucalyptus rowleyi (P3) is a tall mallee reaching 3m in height and can occur on red sandy loams on plains and very minor and broad flood-out plains (Nicolle and French 2012). *Eucalyptus rowleyi* has a mapped distribution extending from near Mt Bruce in the central Pilbara and extending 350km east to the Little Sandy Desert (Figure 10). Nicolle and French (2012) noted three main populations, viz. east of Nullagine, south of Roy Hill and north-east of Balfour Downs Station, and that other populations are likely to occur in this remote and poorly surveyed area.

Table 6: Conservation listed flora for the NatureMap 20km search area

Species Name	Status	FloraBase (Western Australian Herbarium 2021) habitat, if available	Likelihood of occurrence
<i>Acacia aphanoclada</i>	P1	Skeletal stony soils. Rocky hills, ridges & rises.	Unlikely
<i>Acacia cyperophylla</i> var. <i>omearana</i>	P1	Stony & gritty alluvium. Along drainage lines.	Unlikely
<i>Acacia fecunda</i>	P1	Quartzite gibbers over grey-red skeletal soil. Along shallow creeks and drainage lines, hills, road verges.	Possible
<i>Atriplex spinulosa</i>	P1	No description in FloraBase It is reported as occurring on the stony saline plains in association with <i>Triodia longiceps</i> in the Nullagine region in the Priority Flora survey undertaken by Waters and Chalwell (2017). <i>Atriplex spinulosa</i> occurs sporadically in different regions (ALA 2021).	Unlikely
<i>Eucalyptus rowleyi</i>	P3	No description in FloraBase. Red sandy loams on plains and very minor and broad flood-out plains (Nicolle and French 2012)	Possible
<i>Indigofera ixocarpa</i>	P2	Skeletal red soils over massive ironstone	Unlikely
<i>Lepidium catapycnon</i>	P4	Skeletal soils. Hillsides.	Unlikely
<i>Ptilotus mollis</i>	P4	Stony hills and screes	Unlikely
<i>Ptilotus wilsonii</i>	P1	Stony gravelly soils. Rocky hills.	Unlikely
<i>Solanum</i> sp. Mosquito Creek (A.A. Mitchell <i>et al.</i> AAM 10795)	P1	No description in FloraBase. Located on schistose hillsides (Andrew Mitchell pers. comm.)	Unlikely
<i>Goodenia nuda</i>	P4	Not in the NatureMap search, however, recorded in the Waters and Chalwell (2017) survey along Five Mile Creek	Recorded on site

In the Waters and Chalwell (2017) survey, *Eucalyptus rowleyi* was mapped as occurring across much of the Mosquito Land System on flats and intermediate drainage lines with clay substrates. Waters and Chalwell (2017) reported that it was abundant as the dominant tree strata to the east of Five Mile Creek but rarely occurred to the west. *Eucalyptus rowleyi* was recorded in 28% of the 325 minor/intermediate channels surveyed, at seven flats locations but in none of the 14 major channels (Waters and Chalwell 2017). It was not recorded in the Five Mile Creek locality as displayed in Figure 3.12 of Waters and Chalwell (2017).

As *Eucalyptus rowleyi* has not been recorded within M46/524 or in Five Mile Creek area in general, it is improbable that the Project operations will have any impact on this species. *Eucalyptus rowleyi* also has a distribution that extends well beyond the Nullagine region (Figure 10).

Goodenia nuda (P4) was recorded in the survey conducted by Waters and Chalwell (2017) on the banks on either side of Five Mile Creek on sandy soils overlaying clays. It was absent in the NatureMap search. The *Goodenia nuda* distribution area occurs across the entire Pilbara and extends south into the Ashburton region and east to the Little Sandy Desert (Figure 10). The total distribution area for this species is possibly >15,000,000ha. It is unlikely that the Project will have any impact on the overall conservation status of *Goodenia nuda*. Some individual plants may be removed during clearing on the embankments.

2.12 Conservation Listed Fauna

A NatureMap search was conducted for all fauna occurring within a 20km radial buffer centred on a point in the middle of the Project area (120° 11' 00" E, 21° 53' 14" S). There were 224 fauna taxa recorded within the search area including nine conservation listed fauna. The NatureMap conservation listed fauna search results are provided in Appendix B. Information on the conservation listed fauna from the search area is provided in Table 7.

Millennium Minerals Limited has conducted nearly 30 fauna studies across the Nullagine area as part of environmental impact assessments and this included a section of Five Mile Creek that contains M46/524 (Bamford 2017). Bamford (2017) conducted a review of all of the previous fauna surveys and compiled data on the total species assemblage with a focus on conservation significant fauna. The location of recorded conservation listed fauna in relation to Five Mile Creek as listed by Bamford (2017) is displayed in Figure 11. It should be noted that only two conservation listed fauna species were recorded near Five Mile Creek, these being the:

- Bilby; and
- Brush-tailed Mulgara.

Although not actually recorded in M46/524, evidence of both the Bilby and the Brush-tailed Mulgara (here after called 'Mulgara') has been found nearby on embankment areas (Figure 11 (Bamford 2017).

Drilline commissioned Zootopia Environmental Services ('Zootopia') in December 2020 to undertake a targeted fauna survey of the proposed new MP areas (Zootopia 2020). A copy of the Zootopia report and IBSA data is provided along with this report. The location of the targeted fauna survey in relation to the new MP area is displayed in Figure 5. No evidence of either of the Mulgara and Bilby was detected during the survey.

Zootopia (2020) concluded that:

- “No evidence of either of the two target species was detected during the survey period. It is the Authors opinion that the level of survey is sufficient to draw that conclusion that neither the bilby or the brush-tailed mulgara are currently utilising the proposed working area. Given that neither species appears likely to be present no specific fauna management recommendations relating to these species are required for implementation during the proposed site works.”

An assessment of the likely occurrence and impact from the Project on the DBCA listed conservation fauna is provided in Table 7.

Of the nine conservation listed fauna, six were assessed as being unlikely to be impacted by the Project on the basis of:

- Not likely to occur in the Project tenements due to a lack of suitable habitat (Pin-striped Fine-snout Skink, Ghost Bat, Western Pebble-mound Mouse and Pilbara Leaf-nosed Bat).
- Seasonal occurrence only during rainfall periods when the creek is flowing and hence when mining cannot occur (Sharp-tailed Sandpiper and Wood Sandpiper).

The three conservation listed fauna that could occur within the Project tenements were the Bilby, Mulgara, and Northern Quoll. As mentioned above, the Bilby and Mulgara, or evidence of their occurrence, were not recorded in the Zootopia (2020) targeted fauna survey. On this basis, it is considered that the Project is highly unlikely to have any impact on the Bilby or Mulgara.

The Northern Quoll's preferred rocky habitat types are not present along Five Mile Creek although it can also be associated with woodlands along major watercourses. However, the riverine woodlands with taller trees in the creekbed could potentially provide Northern Quoll habitat. Where trees are located in the creek, these areas are excluded from mining under MP 44991 with the “no-mining” buffer defined by the “drip-line” of the vegetation. On the basis of a lack of suitable rocky habitat types and the avoidance of creekline vegetation by mining operations, it is considered that the Northern Quoll will not be impacted by the Project.

In summary, it is considered unlikely that the Project will have any significant impact on conservation listed fauna for the following reasons:

- **Regional or national distributions:** The conservation listed fauna have regional, national or global distributions. The minor ground disturbance from the Project is unlikely to have any significant impact on the extent of remaining habitat suitable for these species, see dot-point below.
- **Minimal loss of habitat:** The Project is a low impact sand operation with minimal surface impact. The creekbed excavation areas are likely to self-rehabilitate after each major creek flow event. This Project area is considered minor compared to the full mapped extent of the River Land System; 491,700ha occurring in the Ashburton and Pilbara regions (Van Vreeswyk *et al.* 2004 and Payne *et al.* 1998).
- **No restricted, unique or specialized fauna habitats:** The Project area is generally devoid of restricted, isolated, relictual or unique habitats associated with conservation significant fauna. The riverine landscape is a specialized habitat, albeit well represented both locally and regionally as part of the extensive River Land System.
- **Fauna mobility:** The conservation significant fauna are mobile and have the ability to egress from operational areas.

Table 7: Conservation listed fauna for the NatureMap 20km search area

Threatened Taxon	Status	Distribution and Habitat	Likelihood of occurrence and potential impacts from the proposed mining operations
<p><i>Calidris acuminata</i></p> <p>Sharp-tailed Sandpiper</p>	<p>BC Act 2016 International Agreement</p> <p>EPBC Act 1999 Migratory (Bonn, CAMBA, JAMBA, ROKAMBA) and Marine</p>	<p>The Sharp-tailed Sandpiper is a migratory species with a global distribution. It breeds in northern Siberia and then migrates to various locations throughout the world including Australia where it can inhabit both inland and coastal locations, and in both freshwater and saline habitats (DAWE 2021b).</p> <p>The habitat types include brackish wetlands, mud flats, saltmarsh with low vegetation, lagoons, swamps, lakes and pools near the coast, dams, waterholes, soaks, bore drains, saltpans, hypersaline saltlakes, saltworks and sewage farms (DAWE 2021b).</p>	<p>The Five Mile Creek bed that remains dry for much of the year would not appear to be habitat that the Sharp-tailed Sandpiper would utilise unless following rainfall when the creek flows. In the wet season when ponding occurs, mining operations are suspended.</p> <p>The Sharp-tailed Sandpiper is a highly mobile with the ability to egress from areas being disturbed.</p> <p>The small area of disturbance associated with the Project is considered negligible in relation to the huge area of potentially better wetland habitat occurring nationally and globally.</p> <p>Assessment outcome:</p> <p>On the basis of lack of ideal habitat, mining only during dry periods when this wetland species is unlikely to be present, the small area of disturbance and its mobility, it is considered highly unlikely that the Sharp-tailed Sandpiper would be impacted by the Project.</p>
<p><i>Ctenotus nigrilineatus</i></p> <p>Pin-striped Fine-snout Skink, Black-lined Ctenotus</p>	<p>Priority 1</p>	<p><i>Ctenotus nigrilineatus</i> has been recorded from only four localities, Tom Price, Meenthen Station, Woodstock and Nullagine (ALA 2021), over a distance of 325km between the furthest records (Tom Price to Meenthen Station).</p> <p>Little is known about the habitat preferences, spinifex and granite outcrops on hills (Wilson and Swan 2008, Storr <i>et. al</i> 1999). Populations have been confirmed at Nullagine (Bamford 2017). The 11 recorded Nullagine locations are associated with low rolling hills with clay or sandy soils or upland drainage lines with <i>Acacia trachycarpa</i> (Bamford 2017). <i>Ctenotus nigrilineatus</i> has not been recorded near M46/524 and is not associated with riverine areas.</p>	<p><i>Ctenotus nigrilineatus</i> has been recorded at Nullagine on low rolling hills and upland drainage lines. It has not been associated with the alluvial floodplain and riverine areas found at M46/524.</p> <p>Assessment outcome:</p> <p>On the basis of a lack habitat associated with <i>Ctenotus nigrilineatus</i>, it is considered unlikely that this species would occur at M46/524 and hence would not be impacted by the Project.</p>

Threatened Taxon	Status	Distribution and Habitat	Likelihood of occurrence and potential impacts from the proposed mining operations
<p><i>Dasyercus blythi</i></p> <p>Brush-tailed Mulgara, Ampurta</p>	Priority 4	<p>Unlike the Crest-tailed Mulgara, which prefers dune systems (Van Dyck and Strahan 2008), the Brush-tailed Mulgara can be found in most arid sandy habitats, especially sandy habitats where <i>Triodia</i> grasslands form the dominant component of the understorey (Van Dyck and Strahan 2008). The Brush-tailed Mulgara has been recorded at Nullagine and specifically along Five Mile Creek near M46/524 (Bamford 2017). The species is a common resident on sandplains throughout Nullagine area (Bamford 2017).</p>	<p>Evidence of the Brush-tailed Mulgara had been found on embankment areas along Five Mile Creek by Bamford (2017), refer to Figure 11. Given that it was not located in the proposed screening stockpiling area by Zooptopia (2020), the Project operations are therefore considered as being unlikely to have any impact on this species.</p> <p>The barren sandy creekbed areas where excavation will occur are not considered as affording habitat that the Mulgara would utilise.</p> <p>Assessment outcome: On the basis of Zooptopia (2020) survey on the embankment, and the mining along barren creekbed areas, it is considered that the Project is unlikely to have any impact on the Mulgara.</p>
<p><i>Dasyurus hallucatus</i></p> <p>Northern Quoll</p>	<p><i>BC Act 2016</i> Threatened (Endangered)</p> <p><i>EPBC Act 1999</i> Endangered</p>	<p>In the Pilbara region, the Northern Quoll has been recorded on basalt hills, mesas (and buttes of limonites), high and low plateaux, lower slopes, occasional tor fields and stony plains supporting either hard or soft spinifex grasslands, sandstone and dolomite hills and ridges, shrublands, sandy plains, clay plans and tussock grasslands and coastal fringes including dunes islands and beaches (DAWE 2021b, Van Dyck and Strahan 2008).</p> <p>The Northern Quoll has been recorded in the Nullagine area with affinity to dissected, rocky habitat and major drainage lines (Bamford 2017). No Northern Quolls have been recorded near M46/524, however, there is one recorded sighting approximately 8.6km south in the upper reaches of Five Mile Creek.</p>	<p>The Northern Quoll's preferred rocky habitat types are not present along Five Mile Creek. The Northern Quoll is also associated with woodlands along major watercourses. The embankment floodplains are unlikely to provide sheltering and foraging habitat due to the lack of trees. Where trees are located in the creek, these areas are excluded from mining under the self-imposed 3m drip-line buffer under the mining proposal. All creekline vegetation is avoided under the mining proposal.</p> <p>Assessment outcome: On the basis of a lack of suitable rocky habitat types and the avoidance of creekline vegetation, it is considered that the Northern Quoll will not be impacted by the Project.</p>

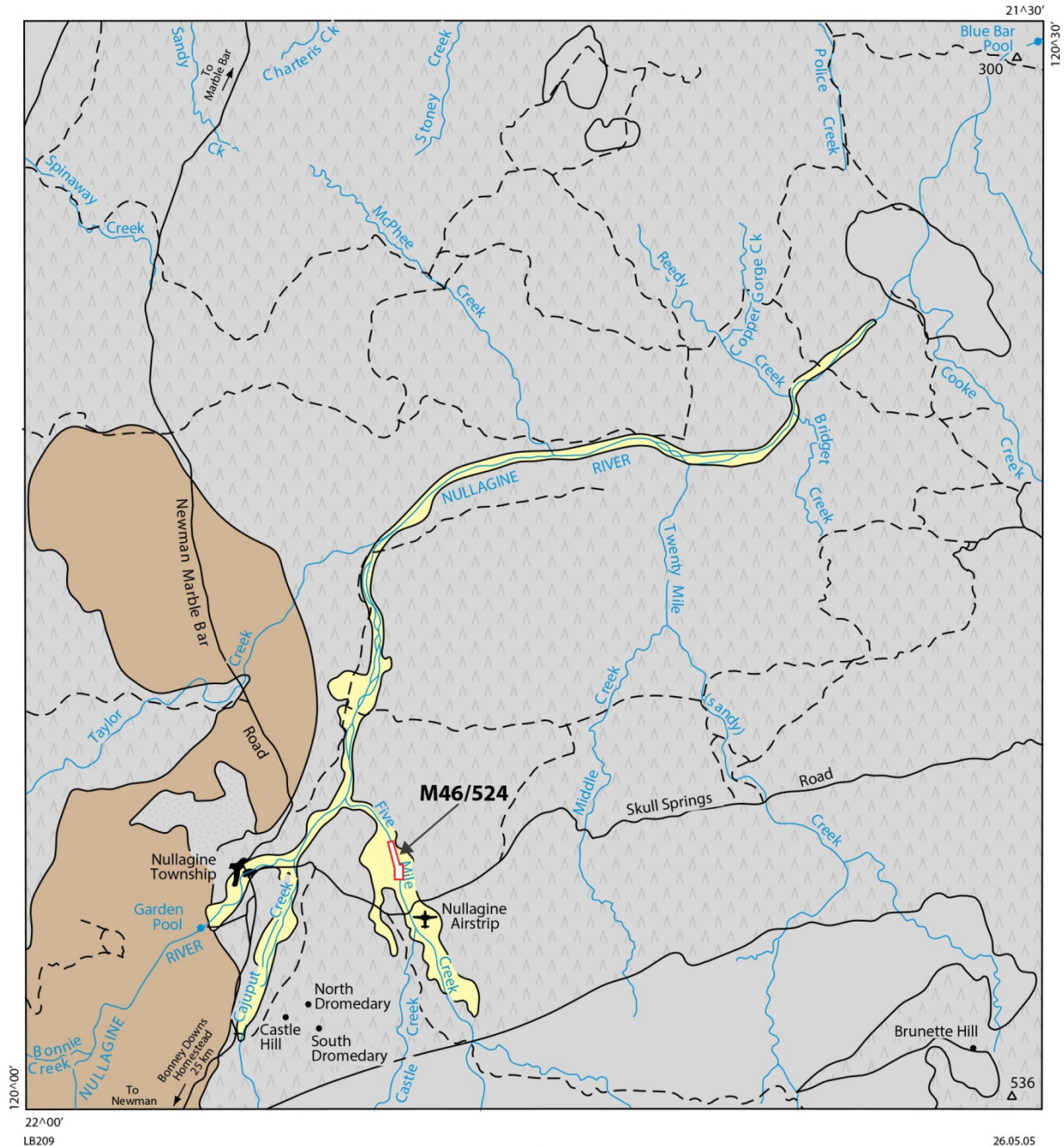
Threatened Taxon	Status	Distribution and Habitat	Likelihood of occurrence and potential impacts from the proposed mining operations
<p><i>Macroderma gigas</i></p> <p>Ghost Bat</p>	<p>BC Act 2016 Threatened (Vulnerable)</p> <p>EPBC Act 1999 Vulnerable</p>	<p>The Ghost Bat requires roost sites that include caves, rock crevices and disused mine shafts (DAWE 2021b, Van Dyck and Strahan 2008).</p> <p>The Ghost Bat has been recorded in the Nullagine area on numerous occasions since 1956 where it has specificity for abandoned underground mine workings (Bamford 2017).</p>	<p>The Ghost Bat is unlikely to occur in M46/524 except for nocturnal foraging excursions. M46/524 is totally devoid of the underground mine workings that is utilises for diurnal roosts.</p> <p>Assessment outcome:</p> <p>On the basis of lack of roosting sites and possible occurrence only during nocturnal hours when mining is not occurring, it is considered highly unlikely that Ghost Bat would be impacted by the Project.</p>
<p><i>Macrotis lagotis</i></p> <p>Bilby, Greater Bilby</p>	<p>BC Act 2016 Threatened (Vulnerable)</p> <p>EPBC Act 1999 Vulnerable</p>	<p>The Bilby inhabits a range of habits including tussock grassland on uplands and hills, <i>Acacia aneura</i> woodland / shrubland on ridges and rises, and hummock grassland in plains and alluvial areas (DAWE 2021b, Van Dyck and Strahan 2008).</p> <p>The Bilby has been recorded at Nullagine and specifically along Five Mile Creek near M46/524 (Bamford 2017). In the Nullagine area, the Bilby has been associated with the margins of drainage systems and the adjacent sandy plains (Bamford 2017).</p> <p>The species is highly nomadic with many active and disused burrows within an animal's home range (Dziminski and Carpenter 2017). Populations can fluctuate widely with animal densities generally being low (Dziminski and Carpenter 2017).</p>	<p>The Bilby had been found on embankment areas along Five Mile Creek by Bamford (2017) and Dziminski and Carpenter (2017), refer to Figure 11. Given that it was not located in the proposed screening stockpiling area by Zootopia (2020), the Project operations are therefore considered as being unlikely to have any impact on this species.</p> <p>The barren sandy creekbed areas where excavation will occur are not considered as affording habitat that the Bilby would utilise.</p> <p>Assessment outcome:</p> <p>On the basis of Zootopia (2020) survey on the embankment, and the mining along barren creekbed areas, it is considered that the Project is unlikely to have any impact on the Bilby.</p>

Threatened Taxon	Status	Distribution and Habitat	Likelihood of occurrence and potential impacts from the proposed mining operations
<p><i>Pseudomys chapmani</i></p> <p>Western Pebble-mound Mouse, Ngadji</p>	Priority 4	<p>The Western Pebble-mound Mouse inhabits gentler slopes of hills and rocky ranges that are covered in small-sized stony scree that it requires to build its subterranean nests (Van Dyck and Strahan 2008).</p> <p>The Western Pebble-mound Mouse has been recorded previously at Nullagine (Bamford 2017). However, the lack of active mounds suggests it may be locally extinct (Bamford 2017). The M46/524 alluvial and riverine landscape is totally devoid of the scree covered hills that is associated with the Western Pebble-mound Mouse.</p>	<p>The Western Pebble-mound Mouse's required habitat substrate of stony scree is not present in the Project area.</p> <p>Assessment outcome: On the basis of lack of suitable habitat type, it is considered highly unlikely that the Western Pebble-mound Mouse would occur in the Project area.</p>
<p><i>Rhinonictoris aurantia</i></p> <p>Pilbara Leaf-nosed Bat</p>	<p>BC Act 2016 (Threatened) Vulnerable</p> <p>EPBC Act 1999 Vulnerable</p>	<p>The Pilbara Leaf-nosed Bat roosts in caves and abandoned, deep and partially flooded mines that trap pockets of warm, humid air. This species relies on underground roosting sites supporting warm, high humidity microclimates. Only relatively deep, complex caves and disused underground mines contain such conditions (DAWE 2021b).</p> <p>The Pilbara Leaf-nosed Bat has been recorded from the Nullagine area and may inhabit scattered underground mine workings that possess the right combination of factors such as suitable microclimates and close-by waterholes (Bamford 2017).</p>	<p>The Pilbara Leaf-nosed Bat is unlikely to occur in the Project area except for nocturnal foraging excursions. The Project area is devoid of roosting and denning habitat for daytime sheltering.</p> <p>Assessment outcome: On the basis of lack of roosting sites and possible occurrence only during nocturnal hours when mining is not occurring, it is considered highly unlikely that Pilbara Leaf-nosed Bat would be impacted by the Project.</p>

Threatened Taxon	Status	Distribution and Habitat	Likelihood of occurrence and potential impacts from the proposed mining operations
<p><i>Tringa glareola</i></p> <p>Wood Sandpiper</p>	<p><i>BC Act 2016</i> International Agreement</p> <p><i>EPBC Act 1999</i> Migratory (BONN, CAMBA, JAMBA and ROKAMBA) and Marine</p>	<p>The Wood Piper is a global species that breeds in summer the Northern Hemisphere and migrates south to Southeast Asia and Africa to avoid the northern winter. A small proportion of the global population reaches Australia, possibly from Siberia (DAWE 2021b).</p> <p>The Wood Sandpiper inhabits well-vegetated, shallow, freshwater wetlands, such as swamps, billabongs, lakes, pools and waterholes (DAWE 2021b).</p>	<p>The creekbed that remains dry for much of the year would not appear to be habitat that the Wood Sandpiper would utilise. In the wet season when creek flows and ponding could occur, mining operations are suspended. .</p> <p>The Wood Sandpiper is a highly mobile with the ability to egress from areas being disturbed.</p> <p>The small area of disturbance associated with the Project is considered negligible in relation to the huge area of potentially better wetland habitat occurring nationally and globally.</p> <p>Assessment outcome:</p> <p>On the basis of lack of ideal habitat, mining only during dry periods when this wetland species is unlikely to be present, the small area of disturbance and its mobility, it is considered highly unlikely that the Wood Sandpiper would be impacted by the Project.</p>

2.13 Aboriginal Heritage

The Department of Planning, Lands and Heritage ('DPLH') Heritage Inquiry System search results are provided in Appendix C (DPLH 2021). There are no 'Registered Aboriginal Sites' recorded for M46/524 or L46/113.



- | | | |
|--------------------------------------|---|-------------------------------------|
| Depositional | Valley, mixed alluvial and colluvial deposits | Road (unsealed except at Nullagine) |
| Erosional | Low hills, rock outcrops and pavements | Track (unsealed four-wheel drive) |
| Range, strike-controlled ridges | | Drainage |
| Rugged hills with dendritic drainage | | Spot height (m), highest and lowest |
| Relict land surface | Dissected plateau | Airstrip |

Map source:
 Bagas L (2005). Geology of the Nullagine 1:100000 sheet:
 Western Australia Geological Survey, 1:100 000 Geological
 Series Explanatory Notes.

Figure 8: Geology of Nullagine (GSWA)

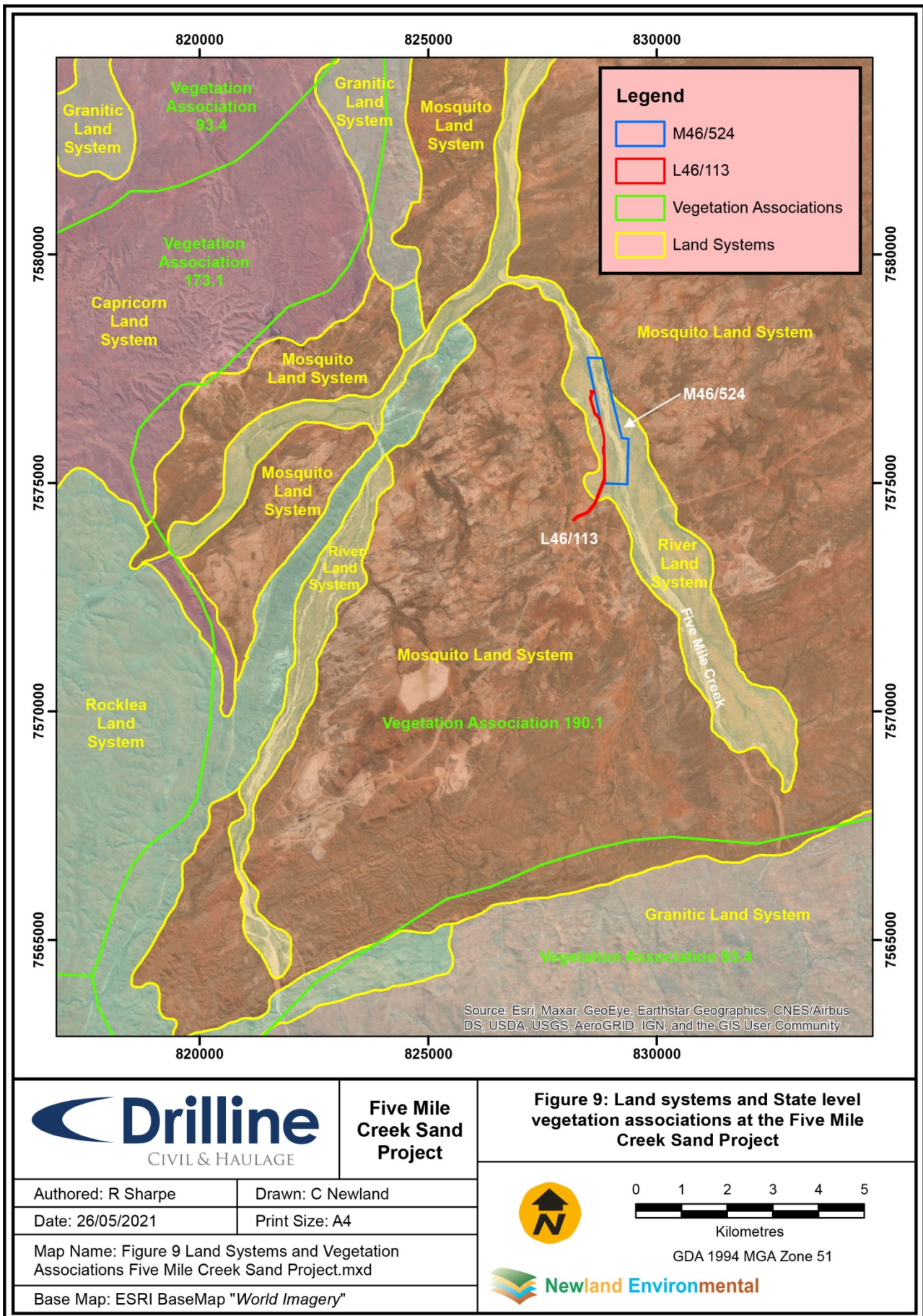


Figure 9: Land systems and State level vegetation associations at the Five Mile Creek Sand Project

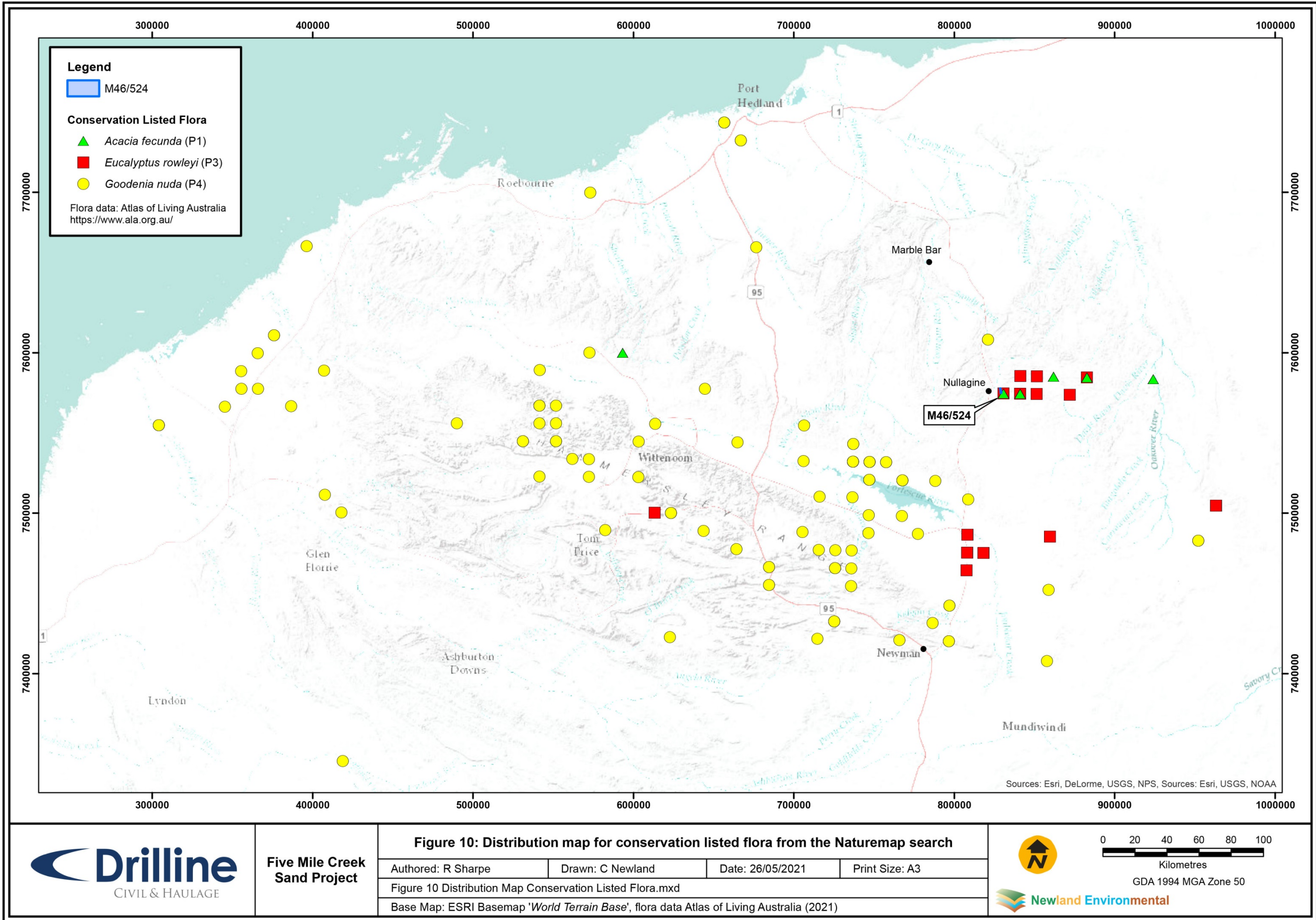


Figure 10: Distribution map for conservation listed flora

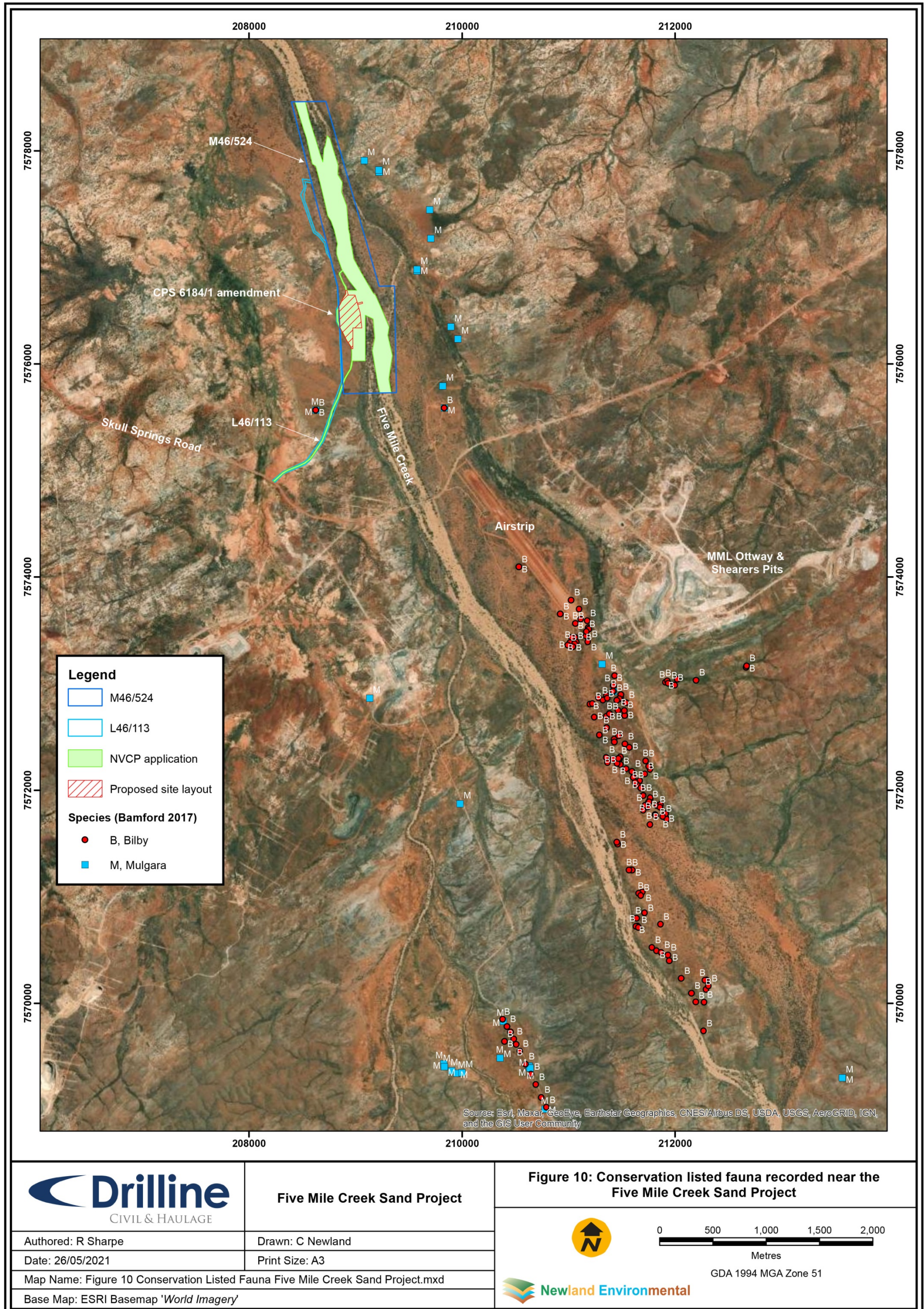


Figure 11: Conservation listed fauna recorded near the Five Mile Creek Sand Project



Five Mile Creek Sand Project

Author: R Sharpe

Drawn: C Newland

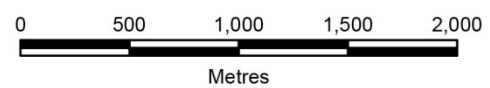
Date: 26/05/2021

Print Size: A3

Map Name: Figure 10 Conservation Listed Fauna Five Mile Creek Sand Project.mxd

Base Map: ESRI Basemap 'World Imagery'

Figure 10: Conservation listed fauna recorded near the Five Mile Creek Sand Project



GDA 1994 MGA Zone 51



3 MINE CLOSURE PLAN

In regards to mine closure, the requirements are considered as being relatively simple and straight forward. The aim is to return disturbed areas to a pre-mining natural condition. For detailed environmental and mine closure information please refer to the document entitled:

- *Mine Closure Plan for the Five Mile Creek Sand Project on M46/5243 and L46/113, May 2017, Version 2 Revision 0 (MCP 67979)*

Under MCP 67979, there are six primary objectives for the closure of post-mining landforms. Post-mining landforms must be:

- Stable;
- Erosion resistant;
- Non-polluting;
- Consistent with local landscape aesthetics;
- Revegetated with native vegetation; and
- Safe.

The three operational areas (MCP domains) consist of:

- Creekbed excavation areas;
- Roads; and
- Hardstand area.

The 'post-mining land use' and 'specific closure objective' from the MCP are outlined below:

There is one post-mining land use proposed for the Project:

- **Native Ecosystem** - As there are no other post mining land uses for the Project at this stage, the default objective is the return of rehabilitated areas to a functioning native ecosystem. This post-mining land use is applicable to all mining areas or MCP domains.

There is one specific closure objective for the Project:

- **Restoration of the Pre-mining Riverine Environment** - The endpoint landform is to restore creekbed excavations, laydown working areas and roads to a natural environment similar to the pre-mining condition. The creekbed excavations will naturally rehabilitate after creek flows. The laydown working areas will have all stockpiled material removed and the entire area landscaped back to original contours. The roads will have windrows graded back in and the entire area landscaped back to original contours. In the event that the creekbed excavations do not naturally rehabilitate, backfilling and landscaping will occur. The restoration of pre-mining riverine environment is applicable to all MCP domains.

The proposed post-mining land use and closure objective are considered as being acceptable options for the Project and are unlikely to create any subsequent environmental issues. There are no alternative post-mining land use and endpoint landform scenarios at this stage. Drilline will consult with all relevant stakeholders and seek approval from DMIRS for any proposed changes to the above post-mining land use and closure objective.

The proposed post-mining land use and endpoint landform objectives are considered as being acceptable options for the Project and are unlikely to create any subsequent environmental issues.

4 STATEMENT AGAINST EACH OF THE 10 CLEARING PRINCIPLES

The statement against each of the 10 clearing principles is provided in Sections 4.1 to 4.10 below.

With the exception of Principle F (watercourses and wetlands), the assessed outcomes were that clearing was either not at variance or unlikely to be at variance with the clearing principles. In regard to Principle F (*Native vegetation should not be cleared if it is growing in, or in association with, an environment associated with a watercourse or wetland*), mining activities will occur within a watercourse and hence are at variance. However, the impact on the Five Mile Creek watercourse is minimised by the following:

- Sand excavation is restricted to areas of barren creek bed devoid of vegetation.
- Material is excavated from the creekbed as a shallow quarrying operation to a depth of approximately 0.6m.
- MP 44991 specifies that mining activities will not occur within the area defined as the "drip-line" of the vegetation within the creekbed and a buffer of at least 2m is employed from the banks of the creek (other than areas where access ramps are located). This ensures that the vegetation within the creek including the root systems are undisturbed and the creekbed is not de-stabilised by mining activities.
- The excavation areas in the creekbed self-rehabilitate after creek flows and are replenished with redeposited sand material (Plate 2).

The overall impact on the watercourse from the proposed clearing is thus considered as being minimal and temporary.

4.1 Principle A

Native vegetation should not be cleared if it comprises a high level of biological diversity

The application area occurs within the Pilbara 1 – Chichester Subregion (DAWE 2018); described by Kendrick and McKenzie (2011) as by plains supporting a shrub steppe of *Acacia inaequilatera* over *Triodia wiseana* hummock grasslands, while *Eucalyptus leucophloia* tree steppes occur on the ranges.

From the NatureMap search (Appendix A) and a review of local survey reports (Waters and Chalwell 2017), 11 priority flora are associated with the Project area and 20km buffer (Table 6).

An assessment of the likelihood of occurrence in the Project area of conservation listed flora based on known habitat types is provided in Table 6. *Acacia fecunda* (P1) and *Eucalyptus rowleyi* (P3) were considered as having a possibility of occurring in the habitat types within M46/524 (sandy creekbed and floodplains). Additionally, *Goodenia nuda* (P4) was not in the NatureMap search, however it was recorded by Waters and Chalwell (2017) along Five Mile Creek. No Threatened Flora pursuant to the *Biodiversity and Conservation Act 2016* were reported in the search area.

Acacia fecunda has been recorded in a 94km stretch running east-west from the confluence of the Davis and Oakover Rivers to near Five Mile Creek (Figure 10). In the Waters and Chalwell (2017) survey, *Acacia fecunda* was mapped as occurring across much of the Mosquito Land System, however, to the east of Five Mile Creek. It was not recorded within the M46/524 area or in the Five Mile Creek area in general (Waters and Chalwell 2017). As reported by Waters and Chalwell (2017), this species was absent from the 14 major channel systems that were surveyed (such as Five Mile Creek). It is therefore considered improbable that the Project operations will have any impact on *Acacia fecunda*.

Eucalyptus rowleyi has a mapped distribution extending from near Mt Bruce in the central Pilbara and extending 350km east to the Little Sandy Desert (Figure 10). In the Waters and Chalwell (2017) survey, *Eucalyptus rowleyi* was mapped as occurring across much of the Mosquito Land System on flats and intermediate drainage lines with clay substrates. However, it was not recorded in the Five Mile Creek locality in Waters and Chalwell (2017). As *Eucalyptus rowleyi* has not been recorded within M46/524 or in Five Mile Creek area in general, it is considered improbable that the Project operations will have any impact on this species.

Goodenia nuda (P4) was recorded in the survey conducted by Waters and Chalwell (2017) on the banks on either side of Five Mile Creek on sandy soils overlaying clays. It has a large distribution area that extends across the Pilbara, south to the Ashburton region and east to the Little Sandy Desert (Figure 10). It is unlikely that the Project will have any impact on the overall conservation status of *Goodenia nuda* or on individual plants as mining occurs on the barren creekbed sands.

Nine conservation listed fauna were reported in the NatureMap search (Appendix B) as listed in Table 7. Of the nine conservation listed fauna, six were assessed as being unlikely to be impacted by the Project on the basis of:

- Not likely to occur in the Project tenements due to a lack of suitable habitat (Pin-striped Fine-snout Skink, Ghost Bat, Western Pebble-mound Mouse and Pilbara Leaf-nosed Bat).
- Seasonal occurrence only during rainfall periods when the creek is flowing and hence when mining cannot occur (Sharp-tailed Sandpiper and Wood Sandpiper).

The three conservation listed fauna that could occur within the Project tenements were the Bilby, Mulgara, and Northern Quoll.

The Northern Quoll's preferred rocky habitat types are not present along Five Mile Creek although it can also be associated with woodlands along major watercourses. However, the riverine woodlands with taller trees in the creekbed could potentially provide Northern Quoll habitat. Where trees are located in the creek, these areas are excluded from mining under MP 44991 with the "no-mining" buffer defined by the "drip-line" of the vegetation. On the basis of a lack of suitable rocky habitat types and the avoidance of creekline vegetation by mining operations, it is considered that the Northern Quoll will not be impacted by the Project.

Bamford (2017) conducted a review of all previous fauna surveys for Millennium Minerals Limited and compiled data on the total species assemblage with a focus on conservation significant fauna. The location of recorded conservation listed fauna in relation to Five Mile Creek as listed by Bamford (2017) is displayed in Figure 11. Only two conservation listed fauna species were recorded near Five Mile Creek, these being the:

- Bilby; and
- Brush-tailed Mulgara ('Mulgara').

No evidence of either of the Mulgara and Bilby was detected during the survey in the targeted fauna survey conducted by Zootopia (2020).

Zootopia (2020) concluded that:

- “No evidence of either of the two target species was detected during the survey period. It is the Authors opinion that the level of survey is sufficient to draw that conclusion that neither the bilby or the brush-tailed mulgara are currently utilising the proposed working area. Given that neither species appears likely to be present no specific fauna management recommendations relating to these species are required for implementation during the proposed site works.”

The Mulgara and Bilby are unlikely to have any habitat usage for the barren creekbed where mining will occur. On the basis of Zootopia (2020) survey on the embankment, and the mining along barren creekbed areas, it is considered that the Project is unlikely to have any impact on the Bilby or Mulgara.

Overall it is considered unlikely that the Project will have any significant impact on conservation listed fauna.

- Extensive regional or national distributions of the relevant conservation listed fauna.
- Minimal loss of habitat due to the small size of the project.
- No restricted, unique or specialized fauna habitats associated with conservation listed fauna.
- Fauna mobility to egress from operational areas.
- No conservation listed fauna were actually recorded on site in the targeted survey.

Assessed Outcome: Based on the above, the proposed clearing is not at variance with Principle A (flora, fauna or biological diversity).

4.2 Principle B

Native vegetation should not be cleared if it comprises the whole or a part of, or is necessary for the maintenance of, a significant habitat for fauna indigenous to Western Australia

The Project occurs along of Five Mile Creek, a major non-perennial local watercourse. Riverine habitat provides important resources for many species of fauna, and may be used for foraging, breeding, roosting and denning by various species. This type of riverine habitat is common in the surrounding landscape (River Land System) and the portion of habitat which occurs within the proposed clearing is unlikely to be significant on a local or regional scale (riverbed). As mapped by Van Vreeswyk *et al.* (2004) and Payne *et al.* (1998), there is 491,700ha of River Land System occurring in the Ashburton and Pilbara regions.

The Project is a low impact sand operation with minimal surface impact. The excavation areas in the creekbed have self-rehabilitated river flows, as displayed in Plate 2.

As discussed in Principle A, there are no restricted, unique or specialized fauna habitats associated with conservation listed fauna occurring in the area under clearing permit. Also, no conservation listed fauna were actually recorded on site in the targeted survey.

As discussed in Principle A, it is considered unlikely that the Project will have any significant impact on conservation listed fauna.

Assessed Outcome: Based on the above, the proposed clearing is not at variance with Principle B (significant fauna habitat).

4.3 Principle C

Native vegetation should not be cleared if it includes, or is necessary for the continued existence of, rare flora

No Threatened Flora pursuant to Section 23F(2) of the *BC Act 2016* were recorded in the NatureMap search area.

As discussed in Principle A, three Priority Flora are associated with the Project area; *Acacia fecunda* (P1), *Eucalyptus rowleyi* (P3) and *Goodenia nuda* (P4). *Acacia fecunda* and *Eucalyptus rowleyi* were not recorded along Five Mile Creek by Waters and Chalwell (2017). *Goodenia nuda* occurs on the embankment areas but is unlikely to grow on the river sands in the mining area. All three Priority Flora have distributions that extend well beyond the Project area.

Assessed Outcome: Based on the above, the proposed clearing is not at variance with Principle C (existence of rare flora).

4.4 Principle D

Native vegetation should not be cleared if it comprises the whole or a part of, or is necessary for the maintenance of a threatened ecological community

As discussed in the preceding section “**Conservation Areas and Ecological Communities**”:

- There are no State or Federally listed TECs occurring near the Project area. The two Pilbara TECs (TEC 46 - *Themeda* grasslands and TEC 78 - Ethel Gorge aquifer stygobiont community) are located more than 150km from the Project area.
- One PEC occurs partially over the Project area – “**PEC 23: Stony saline plains of the Mosquito Land System**”

PEC 23 is described by DBCA as:

- “*Triodia longiceps* grassland with scattered *Maireana melanocoma* and *Sclerolaena* spp. and includes Priority flora taxa *Atriplex spinulosa* (P1) and *Ptilotus wilsonii* (P1). Dissected by drainage lines. Dominated by (but not limited to) *Melaleuca eleuterostachya* and *Acacia bivenosa* occurring on saline red brown non-cracking clays with a mantle of quartz gravel and neutral subsurface soil material on level to undulating plains. Largely restricted to an area east of Nullagine.” (DBCA 2021a).

The land systems for the Project area are displayed in Figure 9. It can be seen in Figure 9 that M46/524 and most of L46/113 occurs within the River Land System. From GIS assessment, M46/524 is therefore not part of the Mosquito Land System PEC (refer to the above PEC description that does not fit with the alluvial riverine environment).

The access track in the southern section of L46/113 occurs on plains, albeit little further clearing is required as this historical track pre-existed the Project. This historical track pre-existed the Project (Plate 1). The access track could be subject to occasional maintenance grading and possibly a slight widening.

Assessed Outcome: Based on the above, the proposed clearing is unlikely to be at variance with Principle D (threatened conservation areas).

4.5 Principle E

Native vegetation should not be cleared if it is significant as a remnant of native vegetation in an area that has been extensively cleared

As displayed in Figure 9, the project tenements are contained entirely within:

- **Abydos Plain – Chichester Vegetation Association 190.1:** ‘Hummock grassland with sparse shrubs *Triodia* spp. *Acacia* spp.’

Information on the occurrence of Vegetation Associations 190.1 is provided in Table 5. There is 99.91% of pre-European vegetation remaining in Western Australia (Government of Western Australia 2019). Although this association has no representation within internationally recognised conservation estates (IUCN Reserve classes 1 to 4²), there is a considerable extent of Vegetation Association 190.1 remaining (169,051.00ha).

In regards to clearing of remnant vegetation, the target areas consist of barren creekbed that naturally self-rehabilitate. Principle E would appear not applicable in this situation, given the large intact extent of the Vegetation Associations 190.1 (as well as the River Land System), and the small mining areas that are a temporary surface disturbance.

Assessed Outcome: Based on the above, the proposed clearing is not at variance with Principle E (remnant vegetation).

4.6 Principle F

Native vegetation should not be cleared if it is growing in, or in association with, an environment associated with a watercourse or wetland

There are no wetlands in the Project area.

²The International Union of Conservation (‘IUCN’) reserve classes 1 to 4 are used as an indicator of areas protected under conservation estate.

Five Mile Creek is a major local watercourse and therefore considered to represent riparian vegetation. The vegetation association for Five Mile Creek is described in Waters and Chalwell (2017) as a tree layer of *Eucalyptus victrix* (always present) with scattered *Eucalyptus camaldulensis*, *Acacia coriacea* subsp. *pendens*, *Melaleuca bracteata* over a shrub layer of scattered *Atalaya hemiglauca*, *Flueggea virosa* subsp. *melanthesoides*, *Gossypium robinsonii* over a grass layer of *Triodia angusta* and *Eulalia aurea*.

Mining does occur within a watercourse, however, the environmental impact is minimised by the following:

- Sand excavation is restricted to areas of barren creek bed devoid of vegetation.
- Material is excavated from the creekbed as a shallow quarrying operation to a depth of approximately 1m.
- MP 44991 specifies that mining activities will not occur within the area defined as the "drip-line" of the vegetation within the creekbed and a buffer of at least 2m is employed from the banks of the creek (other than areas where access ramps are located). This ensures that the vegetation within the creek including the root systems are undisturbed and the creekbed is not de-stabilised by mining activities.
- The excavation areas in the creekbed self-rehabilitate after creek flows and are replenished with redeposited sand material (Plate 2).

Assessed Outcome: Based on the above, the proposed clearing may be at variance with Principle F (watercourse but not wetland). However, the impact on the Five Mile Creek watercourse is minimised by the activities described above and the ability of the creek to self-rehabilitate.

4.7 Principle G

Native vegetation should not be cleared if the clearing of the vegetation is likely to cause appreciable land degradation

The mining area occurs within the River Land System that consist of active flood plains and major rivers supporting grassy eucalypt woodlands, tussock grasslands and soft spinifex grasslands (Van Vreeswyk *et al.* 2004). This land system experience massive river flow and flood events following cyclonic and monsoonal rainfall.

The River Land System is the product of these climatic events and are stable in the context that after the flood waters have subsided and some reshuffling of alluvial bedloads has occurred, the overall landscape remains the same. The impact from clearing associated with the Project is considered to be relatively minimal compared to natural events. The flood level could be several metres above the creekbed as evidenced by the tree line debris heights. The creekbed excavations are small in area, shallow (typically 0.6m) and result in a quarry floor that is similar to original surface; sand and shingle alluvium. These excavations are refilled during creek flows. The minimal areas of disturbance that refill with alluvium are unlikely to create any appreciable land degradation.

Assessed Outcome: Based on the above, the proposed clearing is not at variance with Principle G (appreciable land degradation).

4.8 Principle H

Native vegetation should not be cleared if the clearing of the vegetation is likely to have an impact on the environmental values of any adjacent or nearby conservation area

As discussed in the preceding Section 2.9, there are no National Parks, Nature Reserves or DBCA Managed Lands occurring near the Project area. The closest DBCA Managed Lands is the Karijini National Park, located approximately 155km to the west-southwest. Karlamilyi National Park, located approximately 158km to the east-southeast. Ex-Meentheena pastoral leasehold purchased by DBCA is located approximately 54m to the northeast.

Assessed Outcome: Based on the above, the proposed clearing is not at variance with Principle H (conservation areas).

4.9 Principle I

Native vegetation should not be cleared if the clearing of the vegetation is likely to cause deterioration in the quality of surface or underground water

Five Mile Creek is an ephemeral system that only flows in the event of significant rainfall such as monsoonal depressions, cyclones and southern lows. Based on an average annual evaporation rate of 3,200mm to 3,600mm (BOM 2021 - Newman), any surface water resulting from rainfall events is likely to be relatively short lived.

The Project area is not contained within any water reserves. The Nullagine Water Reserve is situated approximately 1.4km to the west of the Project area (DWER 2020).

Site observations have shown that the shallow mining excavations refill to natural creekbed contours after significant water flows. The creekbed width varies from approximately 130m to 240m within M46/524. There are no waterholes or pools along the stretch of creekbed near the Project area as the creek is free flowing, relatively level and with no barriers or sand bars. The relative width of the creekbed compared to the small size of extraction area (quarry area 40m across or less) means that mining activities are unlikely to interrupt or disrupt creek flow.

Additionally, mining has no potential to affect water quality as there are no significant potential pollution sources from the quarrying activities. No fuels are stored on site. The mobile plant is refueled as required from a tank on a 4WD ute. Refueling only occurs on the embankment outside of the creekbed. Standard spill kits are used in the event of spillages. Volumes of hydrocarbons are moderate given the small size of the mobile fleet. There are no chemicals stored or used on site.

Assessed Outcome: Based on the above, the proposed clearing is not at variance with Principle I (surface and ground water).

4.10 Principle J

Native vegetation should not be cleared if clearing the vegetation is likely to cause, or exacerbate, the incidence or intensity of flooding

The application area experiences an arid climate with bimodal rainfall patterns. The annual rainfall is approximately 325.7mm (BOM 2021) and a magnitude higher annual evaporation rate (3,200mm to 3,600mm per year). . The mining area is located in Five Mile Creek and any runoff is transported directly downstream.

The creekbed excavation areas will experience flooding on a regular basis following massive rainfall events. The flood events may be several metres above the creekbed level and with massive intensity (flash floods). The shallow creekbed excavations are considered unlikely to exacerbate the natural massive flood events that can push out onto the surrounding plains.

Given the location of most of the application area within the creek bed, and the size of the area to be cleared (18.7ha) compared to the size of the Nullagine River catchment area (722,582ha) (DWER 2020), it is not likely that the proposed clearing will lead to an appreciable increase in run off, and subsequently cause or exacerbate the incidence or intensity of flooding.

Therefore, the proposed clearing is not therefore likely to alter the incidence or intensity of flooding within the Project area or surrounds.

Assessed Outcome: Based on the above, the proposed clearing is not at variance with Principle J (flooding).

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6 APPENDICES

Appendix A: Department of Biodiversity, Conservation and Attractions NatureMap search for conservation listed flora near the Project area

Appendix B: Department of Biodiversity, Conservation and Attractions NatureMap search for conservation listed fauna near the Project

Appendix C: Searches using the Aboriginal Heritage Inquiry System for M46/524 and L46/113

6.1 Appendix A

Department of Biodiversity, Conservation and Attractions NatureMap search for conservation listed flora near the Project area

Parameters:	Plantae, Conservation Taxon
Method:	Circle
Centre:	120° 11' 00" E, 21° 53' 14" S
Buffer:	20km
Date:	09/08/2021



NatureMap Species Report

Created By Guest user on 09/08/2021

Kingdom Plantae
Conservation Status Conservation Taxon (T, X, IA, S, P1-P5)
Current Names Only Yes
Core Datasets Only Yes
Method 'By Circle'
Centre 120° 11' 00" E, 21° 53' 14" S
Buffer 20km

Name ID	Species Name	Naturalised	Conservation Code	¹ Endemic To Query Area
1.	13073 <i>Acacia aphanoclada</i>		P1	
2.	14087 <i>Acacia cyperophylla</i> var. <i>omearana</i>		P1	
3.	23522 <i>Acacia fecunda</i>		P1	
4.	2477 <i>Atriplex spinulosa</i>		P1	
5.	20264 <i>Eucalyptus rowleyi</i>		P3	
6.	14329 <i>Indigofera ixocarpa</i>		P2	
7.	3022 <i>Lepidium catapyconon</i> (<i>Hammersley Lepidium</i>)		P4	
8.	2744 <i>Ptilotus mollis</i>		P4	
9.	2767 <i>Ptilotus wilsonii</i>		P1	
10.	48446 <i>Solanum</i> sp. <i>Mosquito Creek</i> (A.A. Mitchell et al. AAM 10795)		P1	

Conservation Codes
 T - Rare or likely to become extinct
 X - Presumed extinct
 IA - Protected under international agreement
 S - Other specially protected fauna
 1 - Priority 1
 2 - Priority 2
 3 - Priority 3
 4 - Priority 4
 5 - Priority 5

¹ For NatureMap's purposes, species flagged as endemic are those whose records are wholly contained within the search area. Note that only those records complying with the search criterion are included in the calculation. For example, if you limit records to those from a specific datasource, only records from that datasource are used to determine if a species is restricted to the query area.



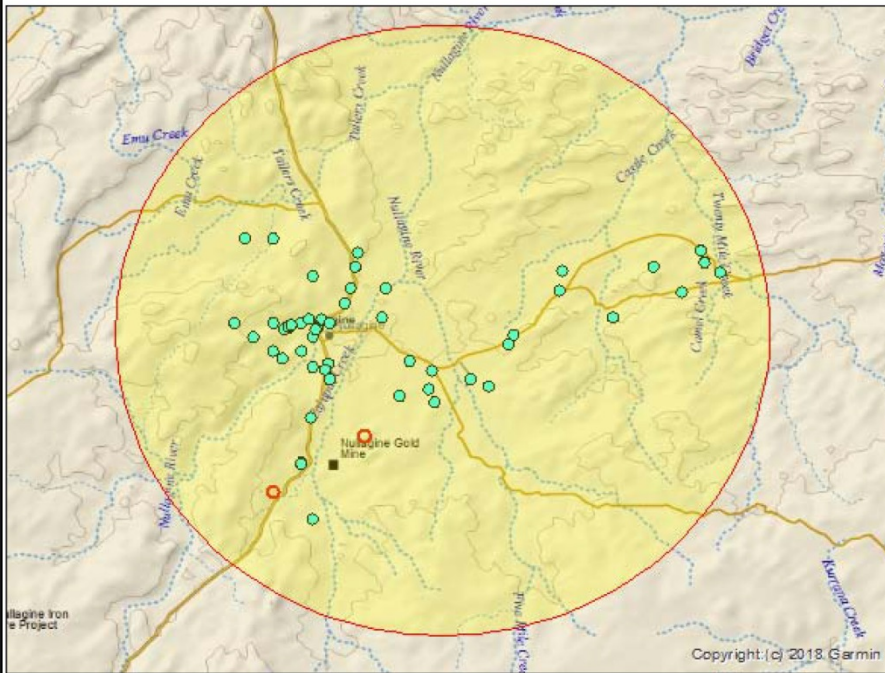
NatureMap

Mapping Western Australia's biodiversity

Conservation Listed Flora 20km

Printed by Guest user on 9/8/2021

Query details : Kingdom=Plantae; Conservation Status=Conservation Taxon (T, X, IA, S, P1-P5); Current Names Only=Yes; Core Datasets Only=Yes; Method='By Circle'; Centre=120° 11' 00" E, 21° 53' 14" S; Buffer=20km;



Search Results

Selected

- Selected Species

All Results

- Default
- Confirmed
- Corrected
- Reported

Reference Layers

- Major WA Towns
- Major WA Towns
- Major WA Towns
- State Borders



NatureMap is a collaborative project of the Department of Biodiversity, Conservation and Attractions, Western Australia, and the Western Australian Museum.

6.2 Appendix B

Department of Biodiversity, Conservation and Attractions NatureMap search for conservation listed fauna near the Project area

Parameters:	Animalia, Conservation Taxon
Method:	Circle
Centre:	120° 11' 00" E, 21° 53' 14" S
Buffer:	20km
Date:	09/08/2021



NatureMap Species Report

Created By Guest user on 09/08/2021

Kingdom Animalia
Conservation Status Conservation Taxon (T, X, IA, S, P1-P5)
Current Names Only Yes
Core Datasets Only Yes
Method 'By Circle'
Centre 120° 11' 00" E, 21° 53' 14" S
Buffer 20km

Name ID	Species Name	Naturalised	Conservation Code	¹ Endemic To Query Area
1.	24779 <i>Calidris acuminata</i> (Sharp-tailed Sandpiper)		IA	
2.	25058 <i>Ctenopus nigrilineatus</i> (Pin-striped Fine-snout Skink, Black-lined Ctenopus)		P1	
3.	30903 <i>Dasyercus blythi</i> (Brush-tailed Mulgara, Ampurta)		P4	
4.	24093 <i>Dasyurus hallucatus</i> (Northern Quoll)		T	
5.	24180 <i>Macroderma gigas</i> (Ghost Bat)		T	
6.	24168 <i>Macrotis lagotis</i> (Bilby, Dalgyte, Ninu)		T	
7.	24233 <i>Pseudomys chapmani</i> (Western Pebble-mound Mouse, Ngadjji)		P4	
8.	43368 <i>Rhinonicteris aurantia</i> (Orange Leaf-nosed bat)		P4	
9.	24806 <i>Tringa glareola</i> (Wood Sandpiper)		IA	

Conservation Codes
 T - Rare or likely to become extinct
 X - Presumed extinct
 IA - Protected under international agreement
 S - Other specially protected fauna
 1 - Priority 1
 2 - Priority 2
 3 - Priority 3
 4 - Priority 4
 5 - Priority 5

¹ For NatureMap's purposes, species flagged as endemic are those whose records are wholly contained within the search area. Note that only those records complying with the search criterion are included in the calculation. For example, if you limit records to those from a specific datasource, only records from that datasource are used to determine if a species is restricted to the query area.

NatureMap is a collaborative project of the Department of Biodiversity, Conservation and Attractions and the Western Australian Museum.



Department of Biodiversity,
Conservation and Attractions



6.3 Appendix C

Searches using the Aboriginal Heritage Inquiry System for M46/524 and L46/113

M46/524



Aboriginal Heritage Inquiry System

List of Registered Aboriginal Sites

For further important information on using this information please see the Department of Planning, Lands and Heritage's Disclaimer statement at <https://www.dplh.wa.gov.au/about-this-website>

Search Criteria

No Registered Aboriginal Sites in Mining Tenement - M 46/524

Disclaimer

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Coordinate Accuracy

Coordinates (Easting/Northing metres) are based on the GDA 94 Datum. Accuracy is shown as a code in brackets following the coordinates.

M46/524



Aboriginal Heritage Inquiry System

List of Registered Aboriginal Sites

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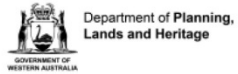
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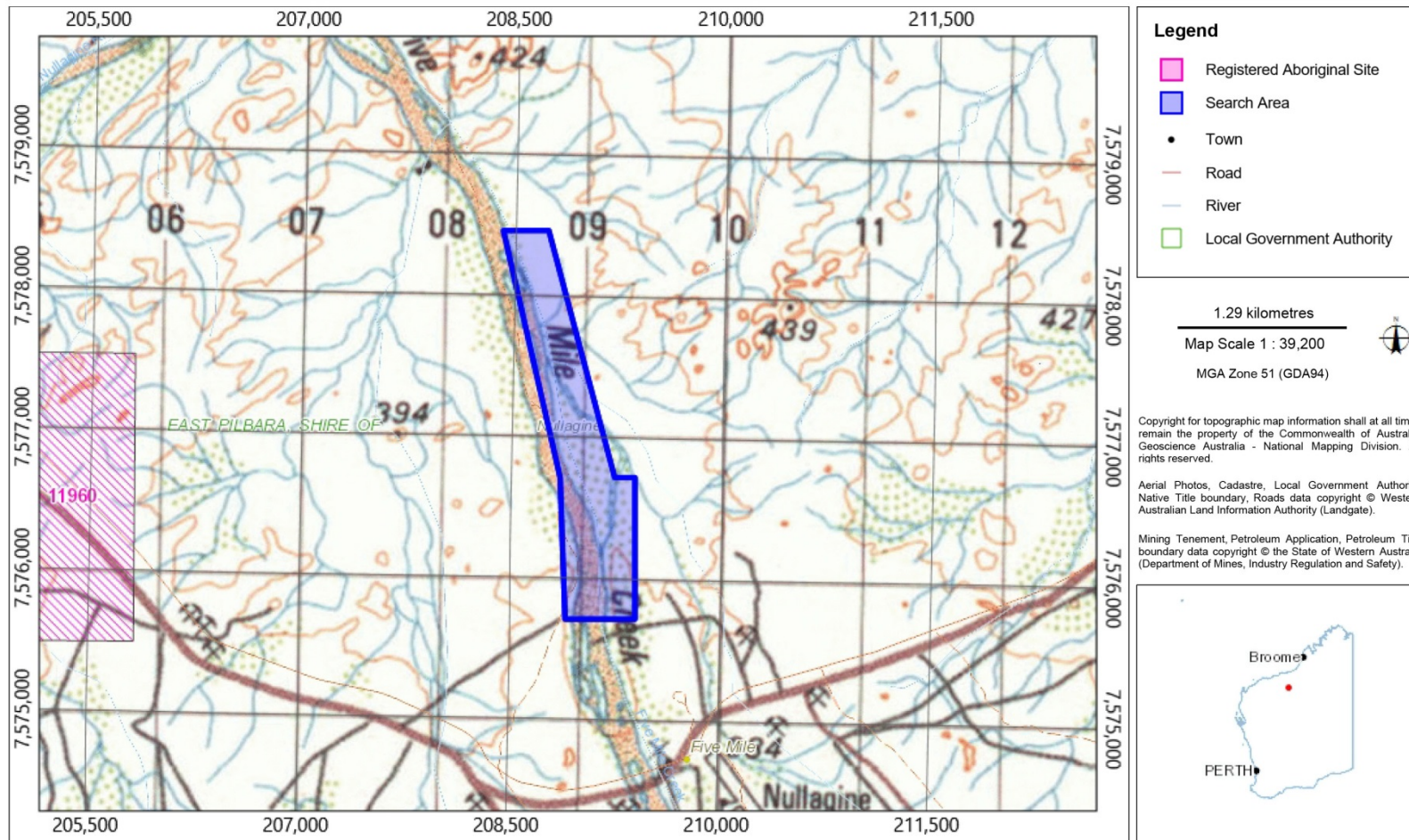
M46/524



Aboriginal Heritage Inquiry System

Map of Registered Aboriginal Sites

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L46/113



Aboriginal Heritage Inquiry System

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Search Criteria

No Registered Aboriginal Sites in Mining Tenement - L 46/113

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L46/113



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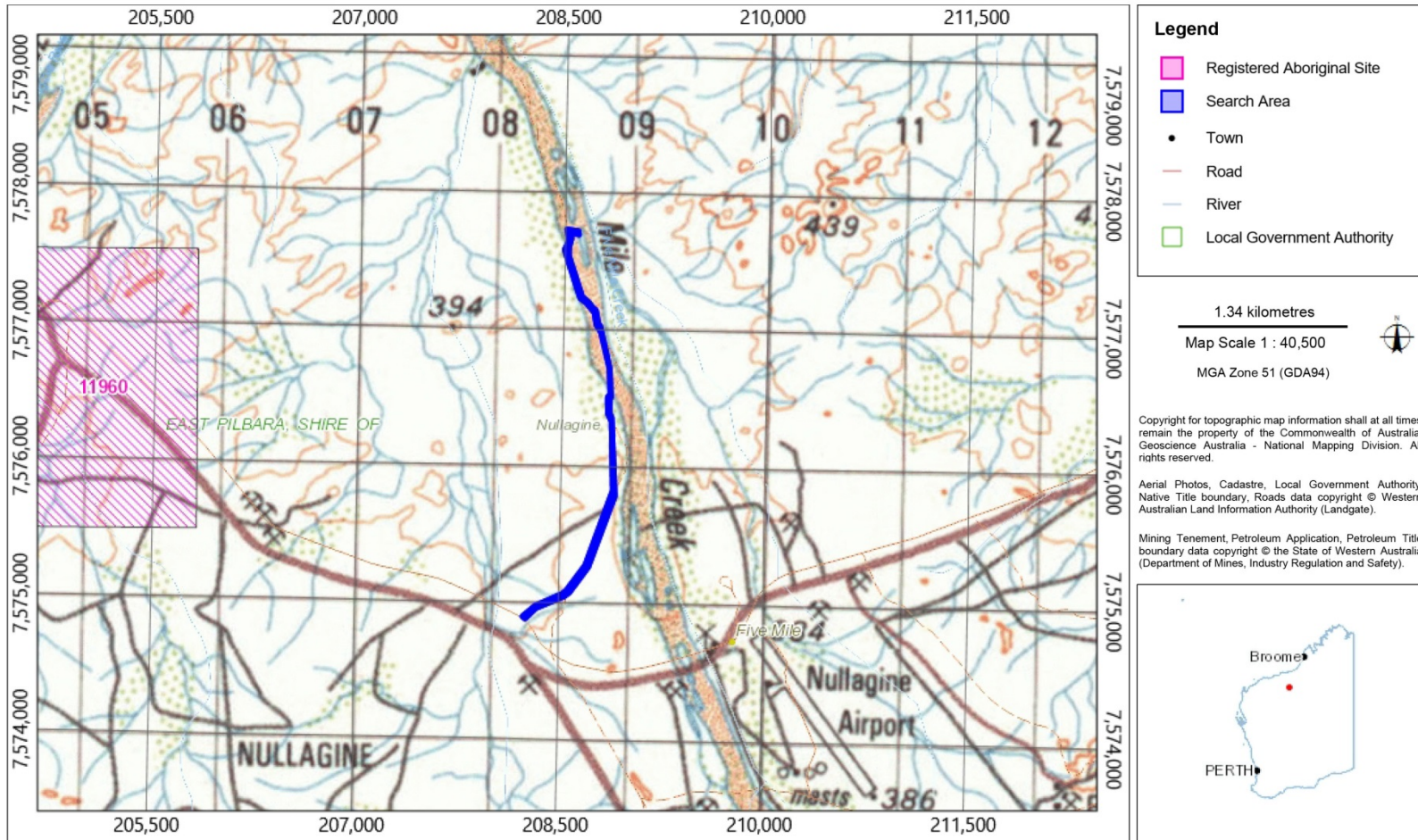
L46/113



Aboriginal Heritage Inquiry System

Map of Registered Aboriginal Sites

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