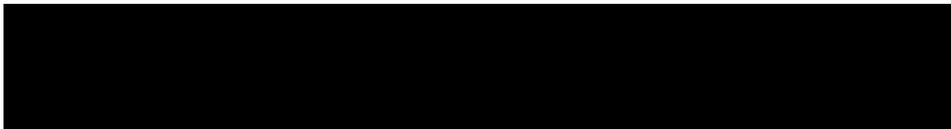


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Attachment 1: Supporting information

Attachment 2: Aerial photograph of proposed site layout



**ATTACHMENT 1
SUPPORTING INFORMATION**



BEEBYN-W11 IRON ORE PROJECT

CPS 10636/1 AMENDMENT APPLICATION
SUPPORTING INFORMATION

Tenements: M51/869, L20/92

Revision: 1

Date: 5 November 2025



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APPENDICES (Provided as a separate document)**Appendix 1:** Flora and Fauna Reports

1a: Beebyn Flora, Vegetation and Fauna Assessment – APM 2024

1b: W11 Targeted Biological Survey – Ecotec 2024a

Appendix 2: Hydrogeology and Hydrology Assessment - Pentium Water 2025

1 OVERVIEW

Fenix Resources Ltd has commenced development of the Beebyn-W11 Iron Ore Project (the Project), located in the Weld Range, approximately 60 km north-west of Cue and approximately 510 km by road from Geraldton, in the Mid-West Region of Western Australia (Figure 1.1). Fenix Beebyn Pty Ltd (Fenix Beebyn) is a wholly owned subsidiary of Fenix Resources Pty Ltd.

The project is partially located on mining lease M51/869, held by Sinosteel Midwest Corporation Ltd (Sinosteel). Development of the project is undertaken by Fenix under an agreement with SMC. Miscellaneous Licence L20/92, held by Fenix Beebyn Pty Ltd, connects the Beebyn-W11 project to the Iron Ridge Project (owned and operated by Fenix), approximately 20 km to the west of Beebyn-W11.

Stage 1 of the project, which commenced in June 2025, involves mining of approximately 3.9 million tonnes (Mt) of high-grade iron ore over a four year mine life. The second stage of the project (under assessment by DMPE) will produce an additional 10.5 Mt of ore at an increased crushing and screening rate of 3 Mtpa. Ore is crushed on site using a semi-mobile crushing plant, then trucked to Geraldton for export to overseas customers.

Stage 1 will produce an expected 13.7 Mt of waste rock, with some being used for construction of pads and road surfaces, and the remainder deposited into south waste dump adjacent to the pit on M51/869. Stage 2 will result in an additional 36.1 Mt of waste, which is proposed to be deposited on the previously approved south waste dump or the new north waste dump.

The workforce operates on a fly-in, fly-out (FIFO) roster and is accommodated at Fenix's existing Iron Ridge facility, approximately 20 km to the west of the proposed Beebyn-W11 mine site.

Fenix Beebyn lodged a Mining Proposal and Mine Closure Plan in May 2024 detailing Stage 1 of the project. Approval was granted by the Department of Mines, Petroleum and Exploration (DMPE) in February 2025. A Mining Development and Closure Proposal (MDCP) detailing Stage 2 of the project was lodged in September 2025 and is currently under assessment by DMPE.

Works Approval W6941/2024/1 has been granted for the project for the prescribed activities Category 5 (crushing and screening) and Category 6 (mine dewatering).

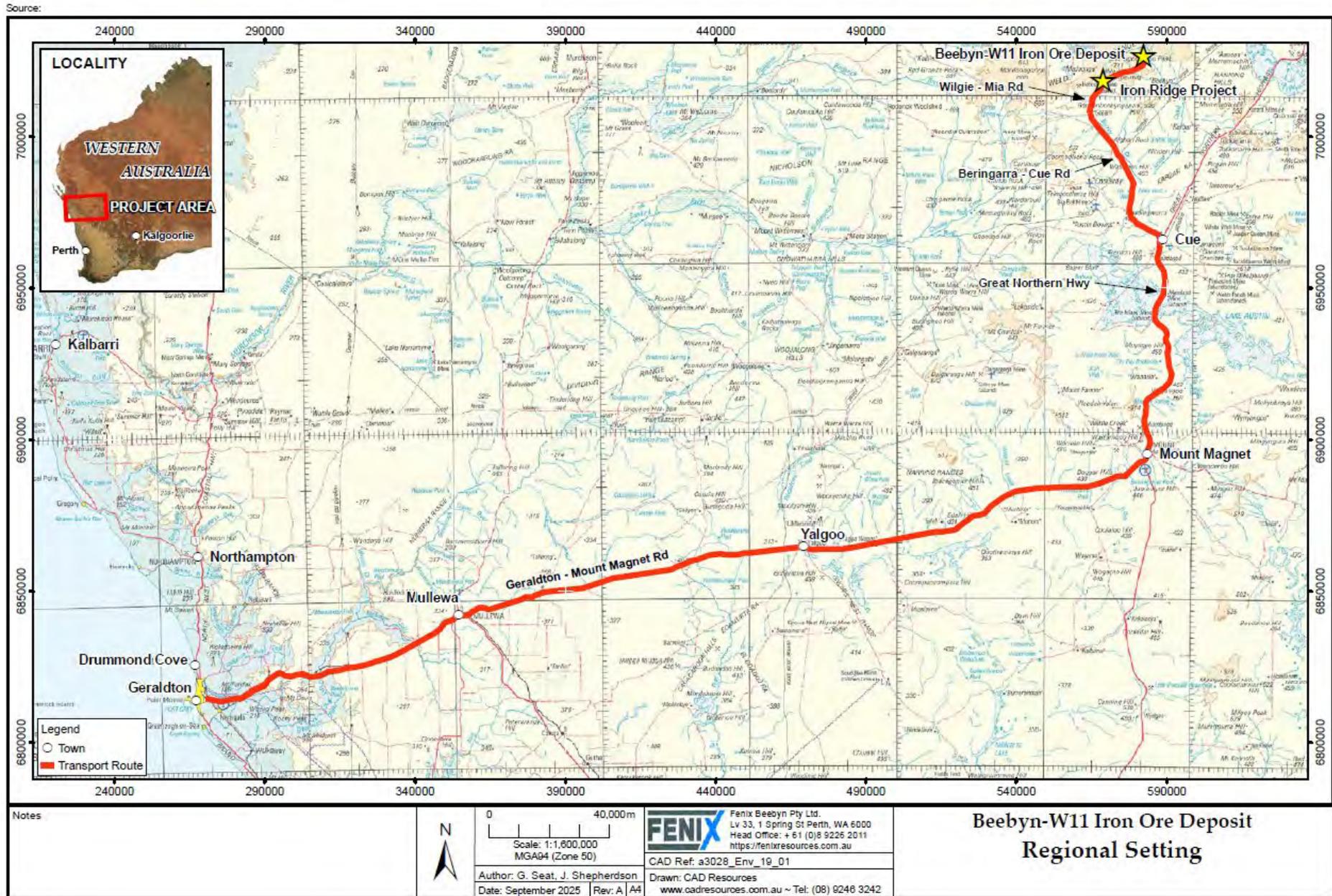


Figure 1.1: Beebyn-W11 Iron Ore Project regional location and transport route.

2 MINE ACTIVITY DETAILS

Clearing will be undertaken for a variety of Key Mining Activities and Other Mine Activities, as defined by DMPE (2025). Under the existing Clearing Permit (10636-1) and Mining Proposal (Reg ID 126744), the project is approved for 262.1 ha of disturbance. A Mining Development and Closure Proposal (MDCP) submitted in September 2025 (currently under assessment by DMPE), proposes to increase the disturbance to 382.6 ha.

Future expansion of the project (final design currently in preparation) is estimated to require a project total disturbance of 572 ha.

Figure 2.1 provides the Activity Envelope for the project and all disturbance will occur within the defined Activity Envelope. Figure 2.2 provides the proposed site layout.

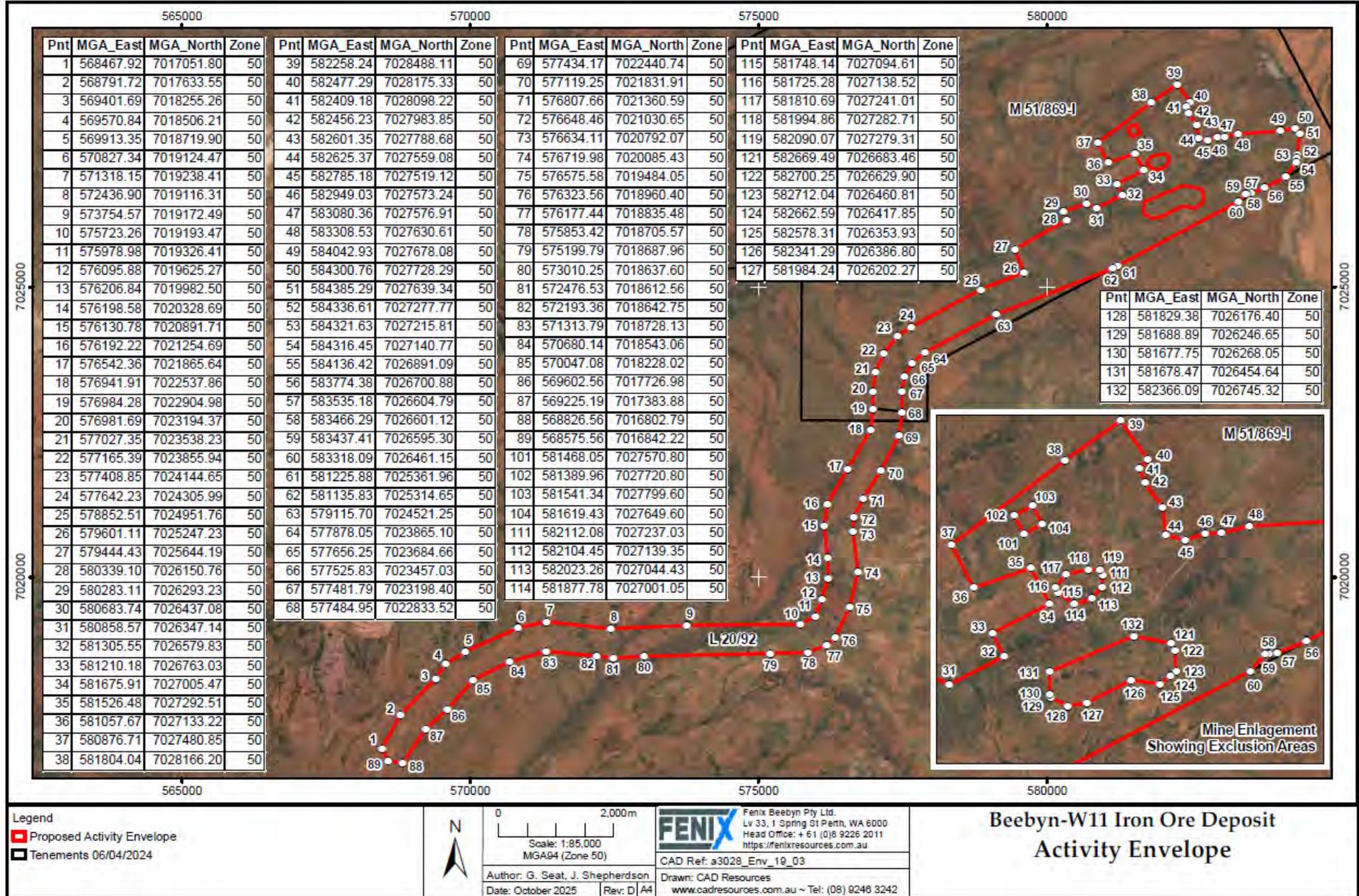


Figure 2.1: Beebyn-W11 Project Activity Envelope.

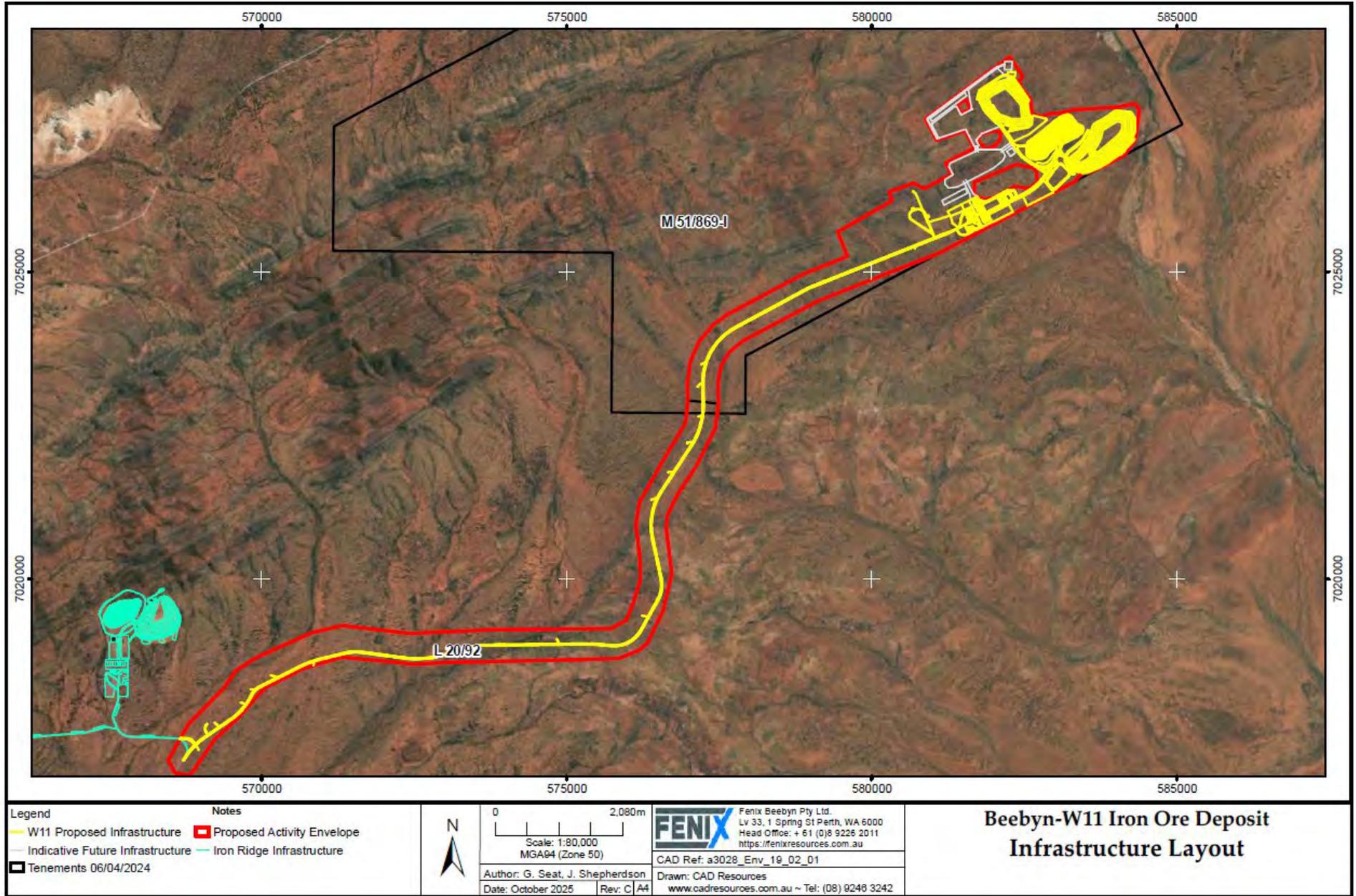


Figure 2.2: Proposed site layout.

3 BASELINE ENVIRONMENTAL DATA

3.1 IBRA 7 Biogeographic subregions

The Interim Biogeographic Regionalisation for Australia (IBRA) classifies the Australian continent into regions or bioregions on the basis of similar geology, landform, vegetation, fauna and climate characteristics. The project area is situated within the Murchison Region according to IBRA 7, which is further divided into two subregions: Eastern Murchison and Western Murchison (DAWE 2019). The study area is situated within the Western Murchison subregion (MUR2).

The West Murchison subregion is in the northern end of the Yilgarn Craton, which experiences an arid climate with bimodal rainfall that usually falls in the winter months. The Western Murchison subregion is characterised by Mulga low woodlands on outcrop and fine textured Quaternary alluvial and eluvial surfaces mantling granitic and greenstone strata (Desmond et al. 2001). Quaternary plains contain hummock grasslands, saltbush shrublands on calcareous soils and Halosarcia low shrublands on saline alluvia.

3.2 Landscape

The Beebyn-W11 Project is located within the Murchison Bioregion of the Interim Biogeographic Regionalisation of Australia (IBRA) and is situated in the Western Murchison subregion (MUR2), close to the boundary of the Eastern Murchison subregion (MUR1).

The MUR2 subregion is described by Desmond et. al. (in DAWE 2019) as follows:

“Mulga low woodlands, often rich in ephemerals (usually with bunch grasses), on outcrop and fine textured Quaternary alluvial and eluvial surfaces (extensive hardpan wash plains that dominate and characterise the subregion) mantling granitic and greenstone strata of the northern part of the Yilgarn Craton. Surfaces associated with the occluded drainage occur throughout with hummock grasslands on Quaternary sandplains, saltbush shrublands on calcareous soils and Halosarcia low shrublands on saline alluvia. Contains the headwaters of the Murchison and Wooramel Rivers, which drain the subregion westwards to the coast. Arid climate with bimodal rainfall that usually falls in winter. The subregional area is 7,847,996 ha.” (DAWE 2019).

Laterite or silcrete mesas are usually found at the top of the landscape in areas of granitic basement. These mesas have lateritic breakaways, kaolinised footslopes (often saline) and are surrounded by gently sloping plains. There are also some low hills, domes and tor fields of granite, gneiss and quartz found in upper parts of the landscape. The bulk of the terrain consists of gently undulating wash plains and sandplains sitting below the mesas and hills. Although wash plains are most common in the north-west, they occur throughout the province with the exception of its eastern margin. These wash plains consist of very gently inclined alluvial surfaces that carry sheet flows. Typically, an almost continuous cemented layer of red-brown hardpan has formed in these deposits. There are often small sandy banks and groves across the wash plains and gravelly mantles are sometimes present. Narrow saline drainage tracts may also be found (Tille 2006).

Soils on the plains are typically red loamy earths and red-brown hardpan shallow loams. Red sandy soils are found along the significant drainage channels. Shallow loams and sands and stony soils are found on the hills and mesas with sandy soils more common on granitic hills. Salt lake soils are found on the valley floors (Tille 2006).

3.3 Biological surveys

Flora and fauna surveys have been completed in and around the project area and the wider Weld Range. The project area and surrounds have been quite extensively covered by prior biological surveys.

A summary of the surveys relevant to the project changes proposed in this Clearing Permit amendment are presented in Table 3.1. More details are provided in the following sections.

Table 3.1: Flora and fauna surveys in the project area.

Survey type and location.	Year	Consultants
Beebyn 11 Weld Range Flora and Fauna Survey	2023	Animal Plant Mineral (APM)
Beebyn W11 Targeted Biological Survey	2024	Ecotec (WA) Pty Ltd (Ecotec)
Beebyn W11 Targeted Biological Survey	2025	

The BIF ranges of the Mid West and Goldfields regions are generally considered to have significant biodiversity value because of their unique geology, soils and relative isolation. The values of the ranges are related to the presence of endemic plant species, threatened and restricted plant species, highly restricted and distinct plant communities and ecological communities. The ranges also exhibit very distinct features in their regional landscape and in many cases possess outstanding landscape values. They also have fauna conservation values although these are less well documented than for flora. There are, however, differences between the various BIF ranges in terms of their biodiversity conservation and mineral prospectively/resource values.

The Midwest BIF ranges are considered to be under represented in the State’s reserve system (Department of Environment and Conservation [DEC] 2007) however, in the report *Banded Ironstone Formation Ranges of the Midwest and Goldfields - Interim Status Report - Biodiversity Values and Conservation Requirements* by DEC (now DBCA), the Weld Range was described as being a “lower biodiversity value site, although still providing refugial habitats with localised species and vegetation communities” (DEC 2007).

The Beebyn-W11 Project partly coincides with the Priority 1 Priority Ecological Community (PEC) “Weld Range vegetation complexes (banded ironstone formation)” and the 500 m administrative buffer that surrounds it. Rather than being defined by a specific plant community, the extent of the Weld Range PEC has been determined on the basis of its extent over the banded iron formation of the Weld Range (*ecologia* 2020a).

3.4 Native flora

Database searches indicated that a total of 28 conservation significant flora taxa have been recorded within a 30 km area around the project site. No Threatened flora species have been recorded in the area. Figure 3.1 provides the recorded locations of Priority listed flora within a 30 km radius of the project.

Ecologia Environment Pty Ltd (*ecologia*) were commissioned by Sinosteel to carry out a Level 2 flora and vegetation survey of the project area and surrounds over four surveys between 2006 and 2009 (*ecologia* 2010b); as well as a targeted conservation significant flora survey of a number of proposed exploration drill lines in the area. The surveys recorded 393 vascular flora taxa from 57 families and 140 genera within the Beebyn-W11 area and surrounding region; including six introduced species and 24 Priority listed flora species. No Threatened species were recorded.

Animal Plant Mineral Pty Ltd (APM) undertook a detailed flora and vegetation survey of the proposed Beebyn-W11 area during 2023 (APM 2024), recording 77 vascular flora taxa from 21 families and 40 genera. The reduction in taxa recorded when compared to the earlier surveys is primarily due to the region having been in drought conditions for several years and the prevalence of goats, which have had a significant impact on the vegetation.

No Threatened species were recorded; however, a single potential record of the Priority 3 listed species *Hibiscus krichauffianus* was recorded. Insufficient material was available to definitively determine the species, due to seasonal conditions. *Hibiscus krichauffianus* is common in the central parts of Australia and the Queensland mid coast. The nearest known record is approximately 250 km north west of the project area, with most records in WA from the Pilbara. The species has not previously been recorded in the Murchison Region (APM 2024).

Ecotec undertook a vegetation and targeted conservation significant flora survey of the project area in August 2024 (Ecotec 2024a). No Threatened species were recorded, however five Priority listed flora species were recorded. The Ecotec report is included in Appendix 1. No *Hibiscus ?krichauffianus* individuals were recorded in the project area during the Ecotec (2024a) survey. It is likely that the individuals of this species previously recorded by APM have since senesced or were misidentified due to lack of reproductive material present at the time of the APM survey. Prior to the Ecotec survey in August 2024, the project area had received average rainfall for the year, with the flora in good condition and many species reproductive (flowering, fruiting) and therefore more easily identifiable (Ecotec 2024a).

A vegetation and targeted conservation significant flora survey of proposed disturbance areas not covered by previous surveys was undertaken by Ecotec in August 2025. No Threatened species were recorded, however four Priority listed flora species were recorded. *Stenanthemum mediale* (P1) identified by Ecotec during the 2024 survey, was subsequently confirmed to be *S. petraeum* (no conservation significance) during the 2025 survey (Ecotec 2025).

Table 3.2 provides a summary of the conservation significant flora recorded during survey work, as well as those species considered to be possible inhabitants of the immediate project area. Except for *Acacia dilloniorum*, all taxa listed have distributions extending over 100 km, consistent with observations by Markey and Dillon (2008) that most species are not endemic to the Weld Ranges (*ecologia* 2010b). Species that were considered as unlikely to occur following the survey are not included in this summary table. Full discussion is included in the APM report (APM 2024), provided in Appendix 1.

The distribution of Priority species recorded in the Ecotec (2024a and 2025) surveys in relation to the proposed development infrastructure is shown on Figure 3.2 and Figure 3.3.

Table 3.2: Conservation significant flora recorded and potentially occurring in the project area.

Species	Conservation Status	Likelihood of occurrence
<i>Acacia dilloniorum</i>	P1	Possible – suitable habitat exists in the project area, no known records in immediate vicinity.
<i>Beyeria lapidicola</i>	P1	Recorded (<i>ecologia</i> 2010b, Ecotec 2024a, Ecotec 2025)
<i>Euphorbia sarcostemmoides</i>	P1	Recorded (Ecotec 2024a)
<i>Acacia burrowsiana</i>	P3	Possible – suitable habitat exists in the project area
<i>Hemigenia virescens</i>	P3	Possible - suitable habitat exists in the project area, no known records in immediate vicinity.
<i>Hibiscus ?krichauffianus</i>	P3	Recorded (APM 2024)
<i>Homalocalyx echinulatus</i>	P3	Possible - suitable habitat exists in the project area, previous records in immediate vicinity (<i>ecologia</i> 2010b)
<i>Micromyrtus placoides</i>	P3	Recorded (Ecotec 2024a, Ecotec 2025)
<i>Prostanthera petrophila</i>	P3	Recorded (<i>ecologia</i> 2010b, Ecotec 2024a, Ecotec 2025)
<i>Sauropus</i> sp. Woolgorong (M. Officer s.n. 10/8/94)	P3	Possible - suitable habitat exists in the project area, no known records in immediate vicinity
<i>Verticordia jamiesonii</i>	P3	Recorded (<i>ecologia</i> 2010b, Ecotec 2024a)
<i>Acacia speckii</i>	P4	Recorded (<i>ecologia</i> 2010b, Ecotec 2024a, Ecotec 2025)
<i>Dodonaea amplisemina</i>	P4	Recorded (<i>ecologia</i> 2010b)
<i>Grevillea inconspicua</i>	P4	Possible - suitable habitat exists in the project area, no known records in immediate vicinity.

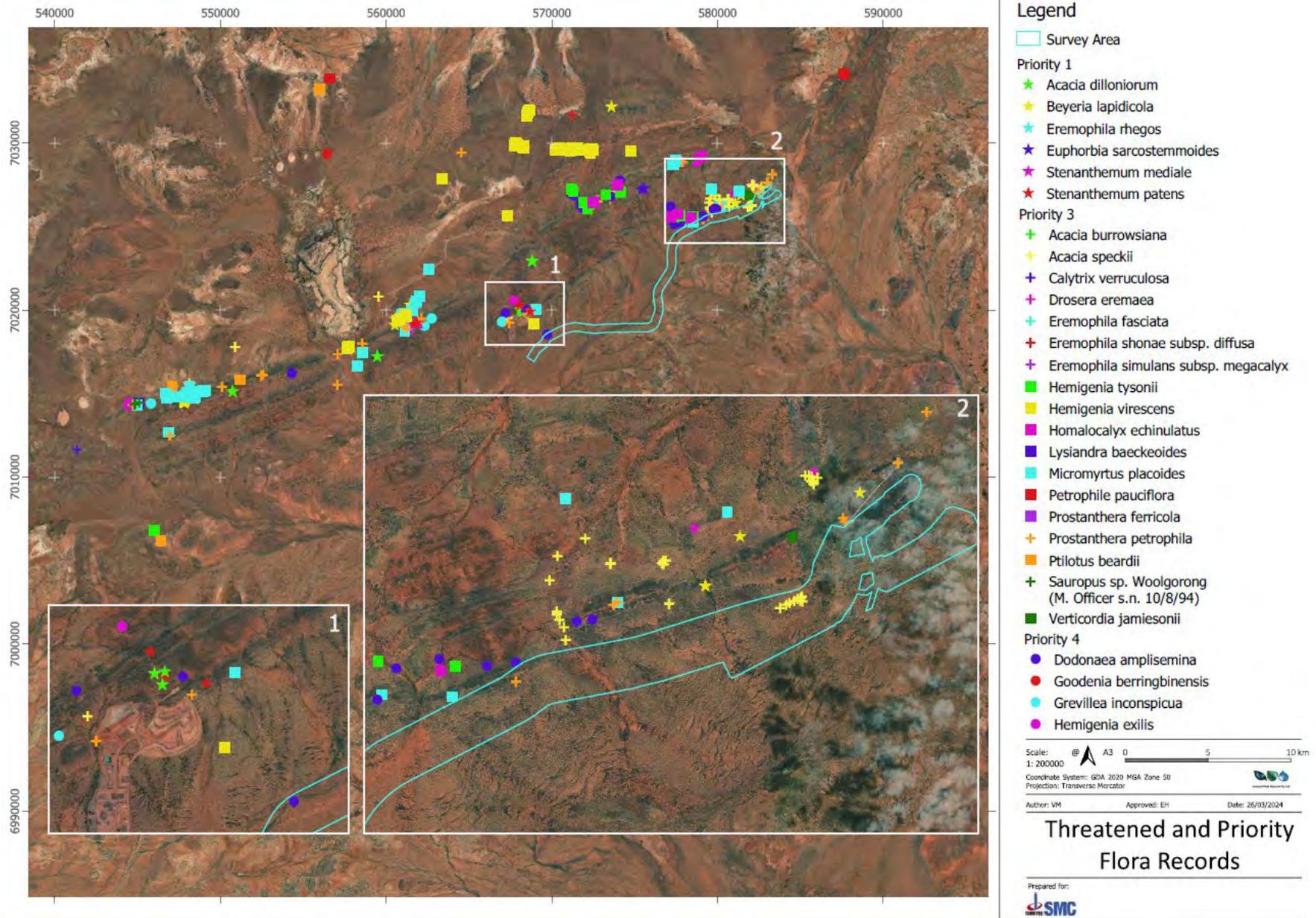


Figure 3.1: Priority flora records within 30 km of the project area.

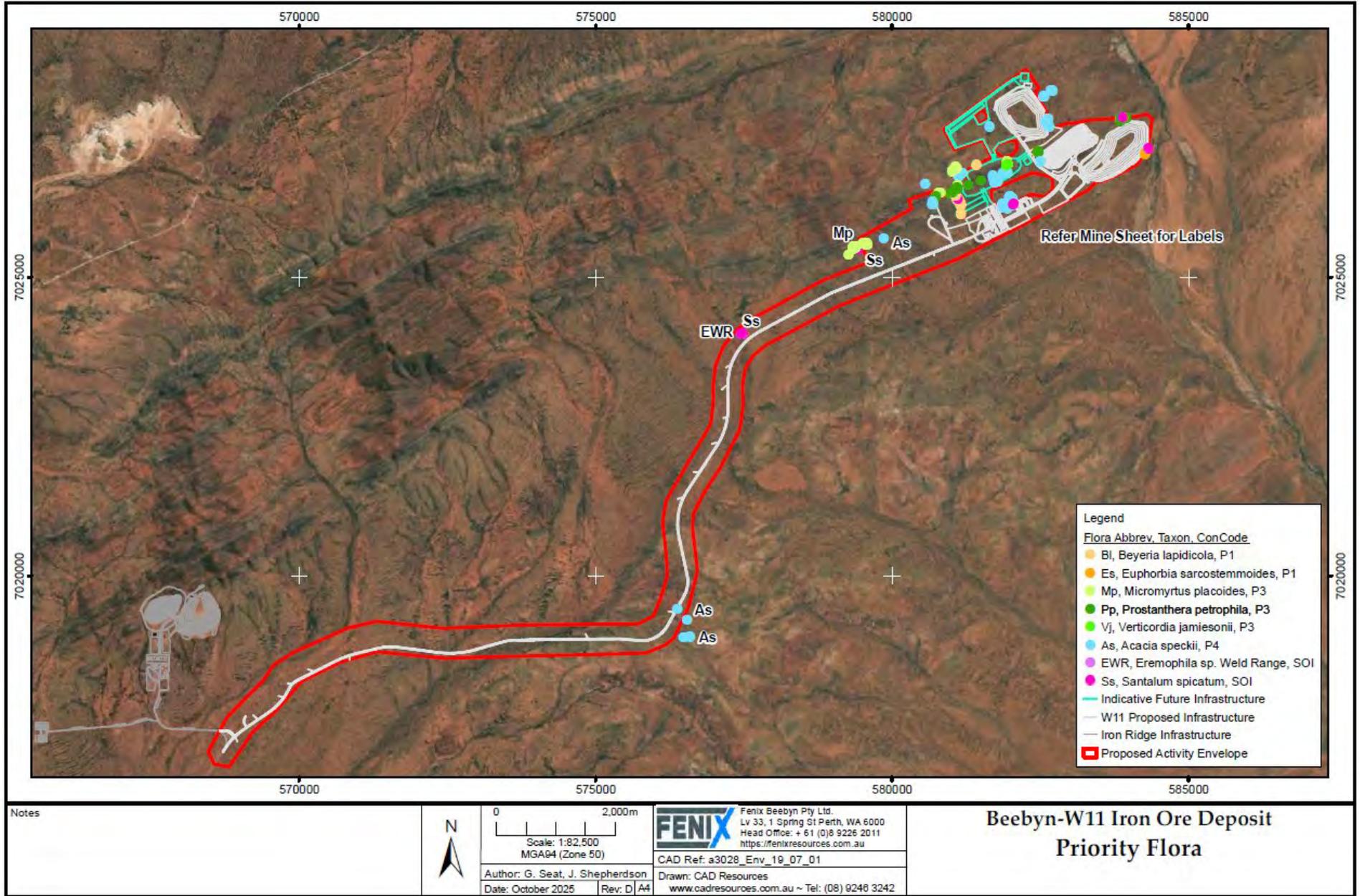


Figure 3.2: Priority flora within the proposed Beebyn-W11 area.

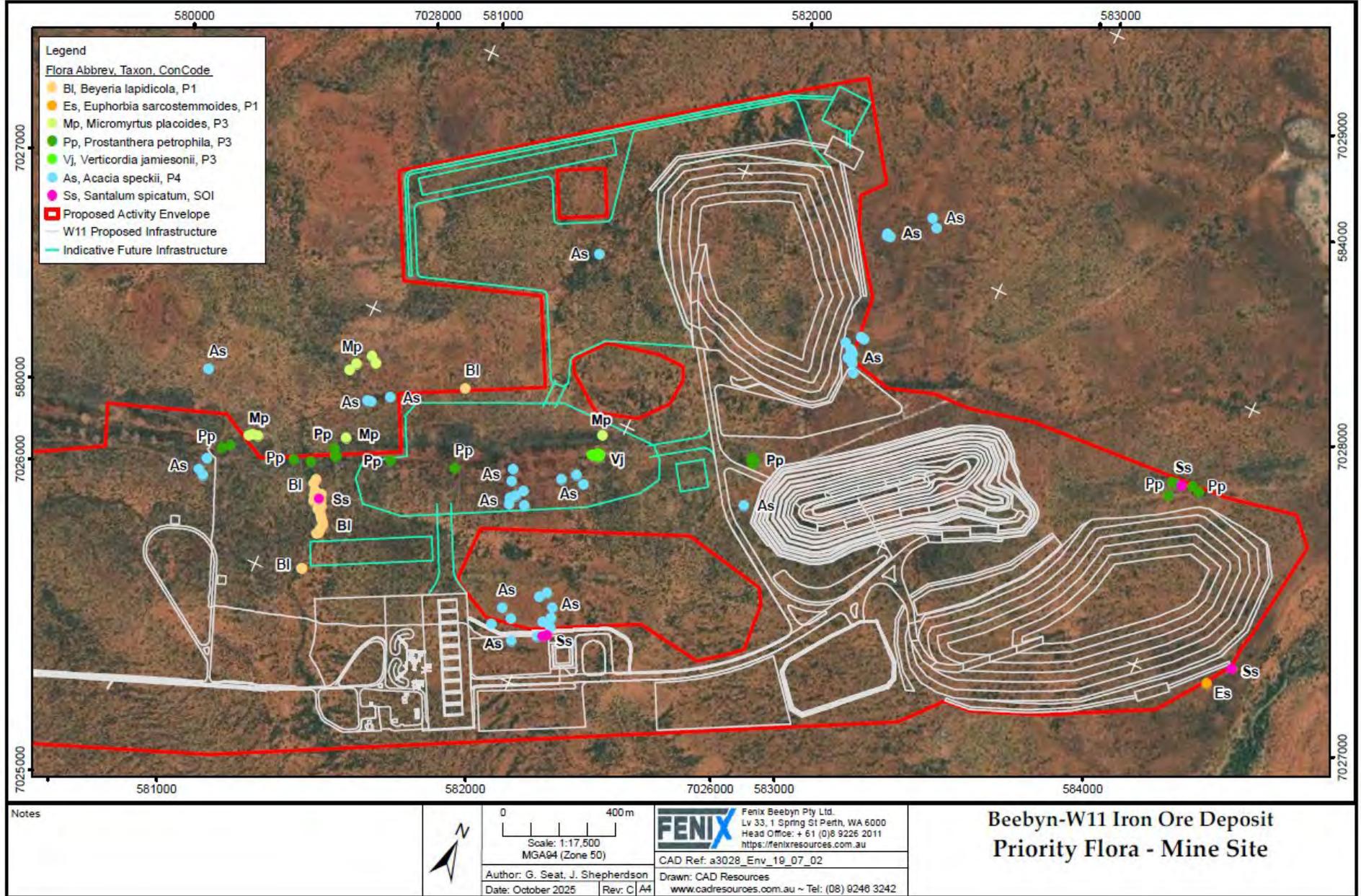


Figure 3.3: Priority flora within the proposed Beebyn-W11 infrastructure area.

Following the surveys undertaken by Ecotec (2024a and 2025), individuals of four Priority species recorded will be impacted by the proposed development (Figure 3.3). *Stenanthemum mediale* (P1) identified by Ecotec during the 2024 survey, was subsequently confirmed to be *S. petraeum* (no conservation significance) during the 2025 survey (Ecotec 2025). Table 3.3 details the known records of Priority species and the number of individuals to be impacted.

Table 3.3: Priority species records within proposed infrastructure envelope.

Taxon	Known number of individuals at Weld Range	Individuals recorded within proposed disturbance footprint
Priority 3		
<i>Micromyrtus placoides</i>	239,861 (<i>ecologia</i> 2012) 33,724 (<i>ecologia</i> 2020d) 1,663 (Ecotec 2024a and 2025)	195
<i>Prostanthera petrophila</i>	2,184 (<i>ecologia</i> 2012) 113 (Ecotec 2024a and 2025)	19
<i>Verticordia jamiesonii</i>	9,998 (<i>ecologia</i> 2012) 147 (Ecotec 2024a and 2025)	147
Priority 4		
<i>Acacia speckii</i>	1,193 (<i>ecologia</i> 2012) 108 (Ecotec 2024a and 2025)	53

3.4.1 Vegetation

The 2024 Ecotec survey recorded 16 vegetation types within the project area, which generally corresponded with the floristic communities described by Markey and Dillon (2008). The 2025 survey found the vegetation aligned with that previously recorded at the project by Ecotec in 2024. The vegetation types described at the project are listed in Table 3.4 and have been recorded over the length of the Weld Range in the DEC survey (Markey and Dillon 2008). Figure 3.4 to Figure 3.6 show the distribution of vegetation types within the project area.

Vegetation condition ranged from ‘Very Good’ to ‘Completely Degraded’. Most of the disturbance was a result of moderate to heavy grazing impact from goats and euro, and historically heavy grazing by sheep that has degraded the land and made it compacted and susceptible to sheet erosion. Historical pastoral grazing has also resulted in the loss of palatable shrubs, grasses and forbs, and a low recruitment of perennial species.

Further detail can be found in the Ecotec (2024a) report, included in Appendix 1.

Table 3.4: Vegetation types identified in the project area.

Vegetation Code	Description	Mapped area of Activity Envelope (ha)	Area of Disturbance Footprint (ha)
1	<p><i>Acacia pruinocarpa</i> open woodland or isolated trees over <i>Acacia aptaneura</i>, <i>A. caesaneura</i>, <i>A. craspedocarpa</i> tall sparse shrubland over <i>Eremophila fraseri</i> subsp. <i>fraseri</i>, <i>Acacia tetragonophylla</i>, <i>Rhagodia eremaea</i>, <i>Teucrium teucriiflorum</i> sparse shrubland over <i>Ptilotus obovatus</i>, <i>Menkea villosula</i>, <i>Goodenia tenuiloba</i> low sparse to open shrubland; understory denser under pockets of trees.</p> <p>Not representative of PEC.</p>	71.4	41.7
2	<p><i>Acacia pruinocarpa</i> mostly absent; <i>Harnieria kempeana</i> subsp. <i>muelleri</i>, <i>Acacia</i> sp. Weld Range occasional <i>Acacia incurvaneura</i>, <i>A. pteraneura</i>, <i>Acacia aptaneura</i>, <i>Grevillea berryana</i> tall open shrubland over <i>A. ramulosa</i> var. <i>linophylla</i>, <i>Ptilotus rotundifolius</i>, <i>Eremophila fraseri</i> subsp. <i>fraseri</i>, <i>E. glutinosa</i>, <i>E. forrestii</i> subsp. <i>forrestii</i> sparse shrubland over <i>Eragrostis eriopoda</i>, <i>Ptilotus aervoides</i>, <i>Erodium cygnorum</i>, low sparse tussock grassland.</p> <p>Representative of PEC – aligns with Community 3 identified by Markey & Dillion (2008)</p>	37.1	27.2
3	<p><i>Acacia ramulosa</i> var. <i>linophylla</i>, <i>A. rhodophloia</i> isolated tall shrubs over <i>Eremophila forrestii</i> subsp. <i>forrestii</i>, <i>E. latrobei</i> subsp. <i>latrobei</i>, <i>Acacia ramulosa</i> var. <i>linophylla</i>, <i>Harnieria kempeana</i> subsp. <i>muelleri</i>, <i>Sida</i> sp. Golden calyces glabrous open shrubland over <i>Erodium cygnorum</i>, <i>Goodenia tenuiloba</i></p> <p>Representative of PEC – aligns with Community 5 identified by Markey & Dillion (2008)</p>	97.6	71.7
4	<p><i>Acacia pruinocarpa</i>, <i>A. incurvaneura</i> isolated trees over <i>Eremophila latrobei</i> subsp. <i>latrobei</i>, <i>Dodonaea pachyneura</i>, <i>Philotheca brucei</i> subsp. <i>brucei</i>, <i>Prostanthera petrophila</i>, <i>Tribulus suberosus</i> open shrubland over <i>Ptilotus obovatus</i>, <i>Micromyrtus sulphurea</i>, <i>Eremophila latrobei</i> subsp. <i>latrobei</i>, <i>Dysphania rhadinostachya</i> subsp. <i>rhadinostachya</i>, <i>Stylidium longibracteatum</i>, <i>Goodenia tenuiloba</i>, <i>Hysterobaeckea occlusa</i> low open shrubland/ low open forbland.</p> <p>Representative of PEC – aligns with Communities 1b and 2 identified by Markey & Dillion (2008)</p>	19.9	12.3
5	<p><i>Acacia incurvaneura</i> low open woodland/ tall sparse shrubland over <i>Acacia</i> sp. Weld Range, <i>Eremophila macmillaniana</i> tall sparse shrubland over <i>Eremophila macmillaniana</i>, <i>Senna glaucifolia</i>, <i>Ptilotus rotundifolius</i> open shrubland over <i>Eremophila forrestii</i> subsp. <i>forrestii</i>, <i>E. macmillaniana</i>, <i>Hibiscus sturtii</i> low sparse shrubland over <i>Maireana melanocoma</i>, <i>Ptilotus aervoides</i>, <i>Goodenia tenuiloba</i> low sparse chenopod shrubland.</p> <p>Representative of PEC – aligns with Community 5 identified by Markey & Dillion (2008)</p>	52.8	36.6
6	<p><i>Acacia incurvaneura</i>, <i>A. pruinocarpa</i>, <i>A. fuscaneura</i> low woodland over <i>Acacia ramulosa</i> var. <i>linophylla</i>, <i>Psydrax latifolia</i> tall open shrubland over <i>Eremophila forrestii</i> subsp. <i>forrestii</i>, <i>E. georgei</i>, <i>Rhagodia eremaea</i>, <i>Senna artemisioides</i> subsp. <i>xsturtii</i>, <i>S. glutinosa</i> subsp. <i>xluerssenii</i> shrubland over <i>Erodium cygnorum</i>, <i>Tetragonia cristata</i>, <i>Isoetopsis graminifolia</i>, <i>Menkea villosula</i>, <i>Cheilanthes sieberi</i> subsp. <i>sieberi</i> low forbland.</p> <p>Not representative of PEC.</p>	6: 94.2 6b: 1.9	59.1 6b: 0.04
7	<p><i>Acacia incurvaneura</i>, <i>A. sp.</i> Weld Range, <i>A. speckii</i> tall sparse shrubland over <i>Ptilotus rotundifolius</i>, <i>Eremophila fraseri</i>, <i>E. latrobei</i>,</p>	48.3	23.2

Vegetation Code	Description	Mapped area of Activity Envelope (ha)	Area of Disturbance Footprint (ha)
	<i>Senna artemisioides</i> subsp. <i>helmsii</i> sparse shrubland over <i>Sida ectogama</i> , <i>Ptilotus aervoides</i> , <i>P. schwartzii</i> , <i>Erodium cygnorum</i> low sparse shrubland. Representative of PEC – aligns with Community 6 identified by Markey & Dillion (2008)		
8	<i>Acacia incurvaneura</i> , <i>A. pruinocarpa</i> tall open shrubland over <i>Acacia ramulosa</i> , <i>Eremophila latrobei</i> , <i>Scaevola spinescens</i> , <i>Senna glaucifolia</i> , sparse shrubland over <i>Eremophila latrobei</i> , <i>Stenanthemum mediale</i> , <i>Sida ectogama</i> , <i>Micromyrtus sulphurea</i> low sparse shrubland. Representative of PEC – aligns with Community 2 identified by Markey & Dillion (2008)	104.7	85.7
9	<i>Acacia pruinocarpa</i> low woodland/ <i>Acacia incurvaneura</i> , <i>A. ramulosa</i> tall open shrubland over <i>Eremophila simulans</i> , <i>E. georgei</i> , <i>E. forrestii</i> open shrubland patches in tall open shrubland of <i>Acacia incurvaneura</i> and <i>A. ramulosa</i> . Not representative of PEC.	233.5	81.5
10	<i>Acacia incurvaneura</i> , <i>A. caesaneura</i> , <i>A. pruinocarpa</i> , <i>A. ramulosa</i> var. <i>linophylla</i> , <i>Grevillea berryana</i> , low open woodland/ tall open shrubland over <i>Eremophila forrestii</i> subsp. <i>forrestii</i> , <i>Senna artemisioides</i> subsp. <i>filifolia</i> , <i>Acacia</i> spp. open shrubland over <i>Eremophila jucunda</i> subsp. <i>jucunda</i> , <i>E. forrestii</i> subsp. <i>forrestii</i> , <i>E. simulans</i> subsp. <i>simulans</i> , <i>Sida ectogama</i> , <i>S. sp.</i> Golden calyces glabrous, <i>Ptilotus schwartzii</i> , <i>Eragrostis eriopoda</i> low sparse shrubland. Not representative of PEC.	180.1	61.3
11	<i>Acacia pruinocarpa</i> , <i>A. incurvaneura</i> open forest over <i>Glycine canescens</i> , <i>Santalum spicatum</i> , <i>Psydrax latifolia</i> vineland/ <i>Acacia ramulosa</i> , <i>Glycine canescens</i> , <i>Psydrax latifolia</i> , <i>Eremophila forrestii</i> var. <i>hastieana</i> open shrubland over <i>Sida ectogama</i> , <i>Ptilotus obovatus</i> , <i>Rhagodia eremaea</i> low shrubland. Not representative of PEC.	11.3	1.7
12	<i>Acacia incurvaneura</i> , <i>A. caesaneura</i> , <i>A. pruinocarpa</i> low woodland/ <i>A. tetragonophylla</i> , <i>A. craspedocarpa</i> , <i>Psydrax latifolia</i> tall open shrubland/ <i>Eremophila forrestii</i> var. <i>forrestii</i> or var. <i>hastieana</i> , <i>A. ramulosa</i> , <i>Eremophila georgei</i> shrubland/ <i>Sida ectogama</i> , <i>Cheilanthes sieberi</i> low shrubland. Not representative of PEC.	89.2	7.2
13	<i>Acacia pruinocarpa</i> low isolated trees over <i>Acacia incurvaneura</i> , <i>A. tetragonophylla</i> tall sparse shrubland over <i>Acacia ramulosa</i> var. <i>linophylla</i> , <i>A. incurvaneura</i> , <i>Eremophila forrestii</i> subsp. <i>forrestii</i> , <i>E. latrobei</i> subsp. <i>latrobei</i> , <i>E. georgei</i> open shrubland over <i>Eremophila georgei</i> , <i>E. foliosissima</i> , <i>Ptilotus schwartzii</i> , <i>Stenopetalum filifolium</i> , <i>Menkea villosula</i> , <i>Isoetopsis graminifolia</i> low open forbland Not representative of PEC.	410.3	39.2
14	<i>Acacia aptaneura</i> , <i>A. grasbyi</i> low open woodland over <i>Eremophila pantonii</i> , <i>Acacia aptaneura</i> , <i>Senna glaucifolia</i> sparse shrubland over <i>Maireana thesioides</i> , <i>M. triptera</i> , <i>Senna glaucifolia</i> low open chenopod shrubland. Not representative of PEC.	9.4	1.1

Vegetation Code	Description	Mapped area of Activity Envelope (ha)	Area of Disturbance Footprint (ha)
15	<i>Acacia aneura</i> , <i>A. sp. Weld Range</i> tall isolated shrubs over <i>Eremophila macmillaniana</i> , <i>Acacia sp. Weld Range</i> , <i>Acacia speckii</i> sparse shrubland over <i>Cephalopterum drummondii</i> , <i>Sida ectogama</i> , <i>Aristida contorta</i> low sparse forbland. Representative of PEC – aligns with Community 6 identified by Markey & Dillion (2008)	43.5	3.5
16	<i>Acacia pteraneura</i> , <i>A. fuscaneura</i> tall open shrubland over <i>Acacia fuscaneura</i> , <i>Grevillea deflexa</i> , <i>Eremophila fraseri</i> subsp. <i>fraseri</i> sparse shrubland over <i>Calytrix desolata</i> , <i>Grevillea deflexa</i> low sparse shrubland over <i>Calytrix desolata</i> , <i>Grevillea deflexa</i> low sparse shrubland over <i>Cymbopogon ambiguus</i> low sparse tussock grassland. Not representative of PEC.	24.2	2.3
CL	Cleared areas	27.8	16.7
Total		1,290.6	571.9

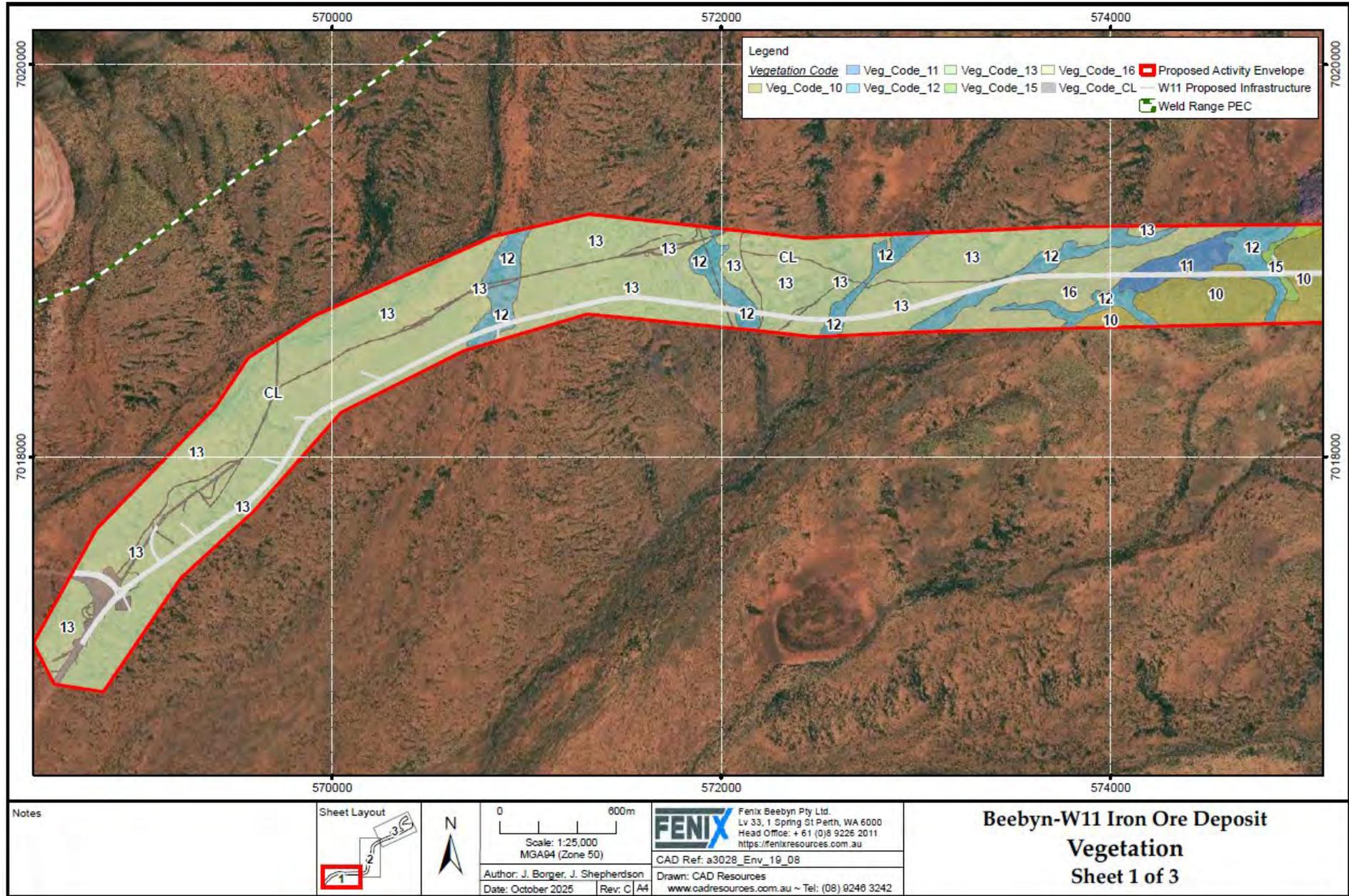


Figure 3.4: Vegetation types associated with the project area – map 1 of 3.

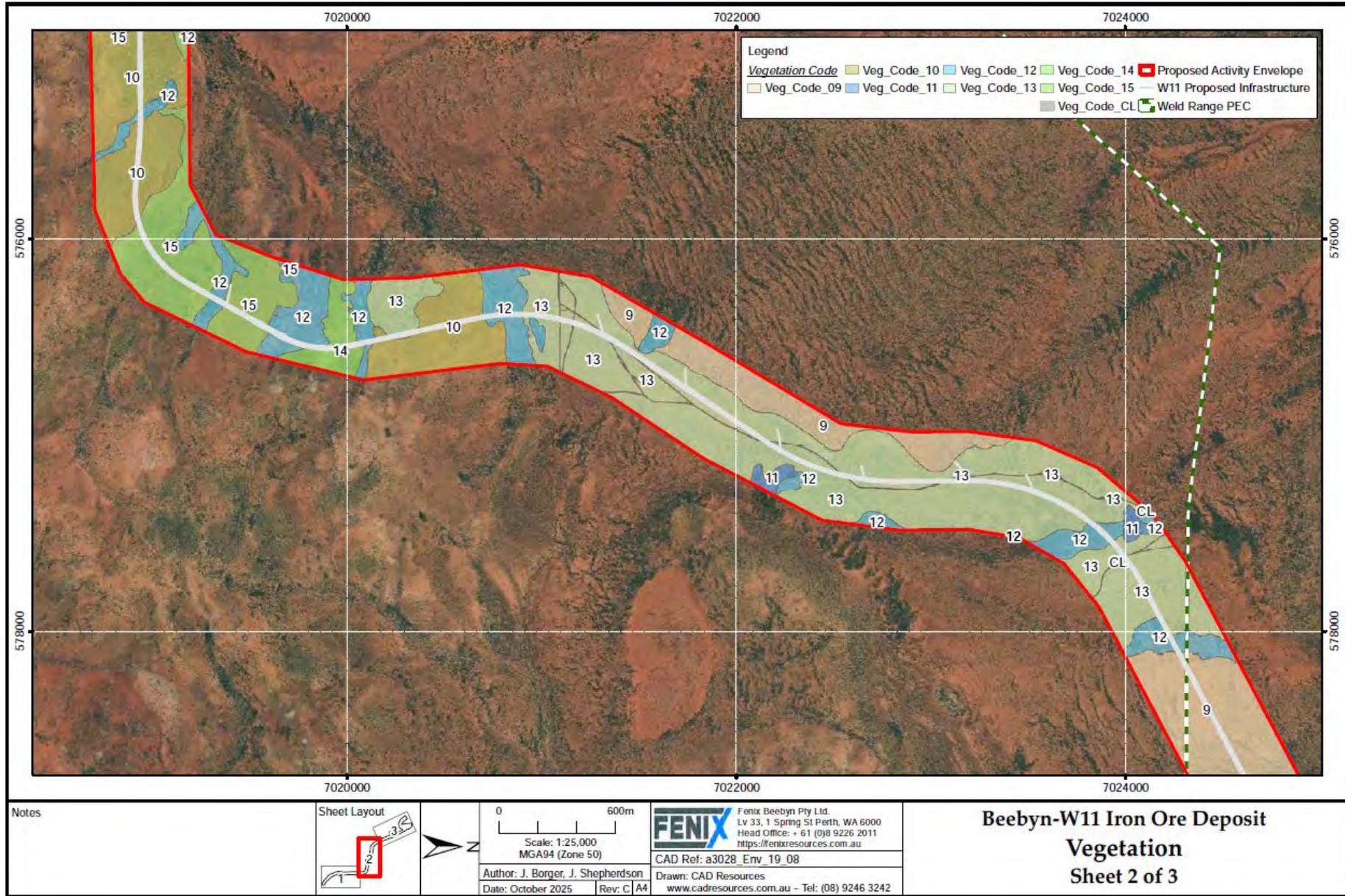


Figure 3.5: Vegetation types associated with the project area – map 2 of 3.

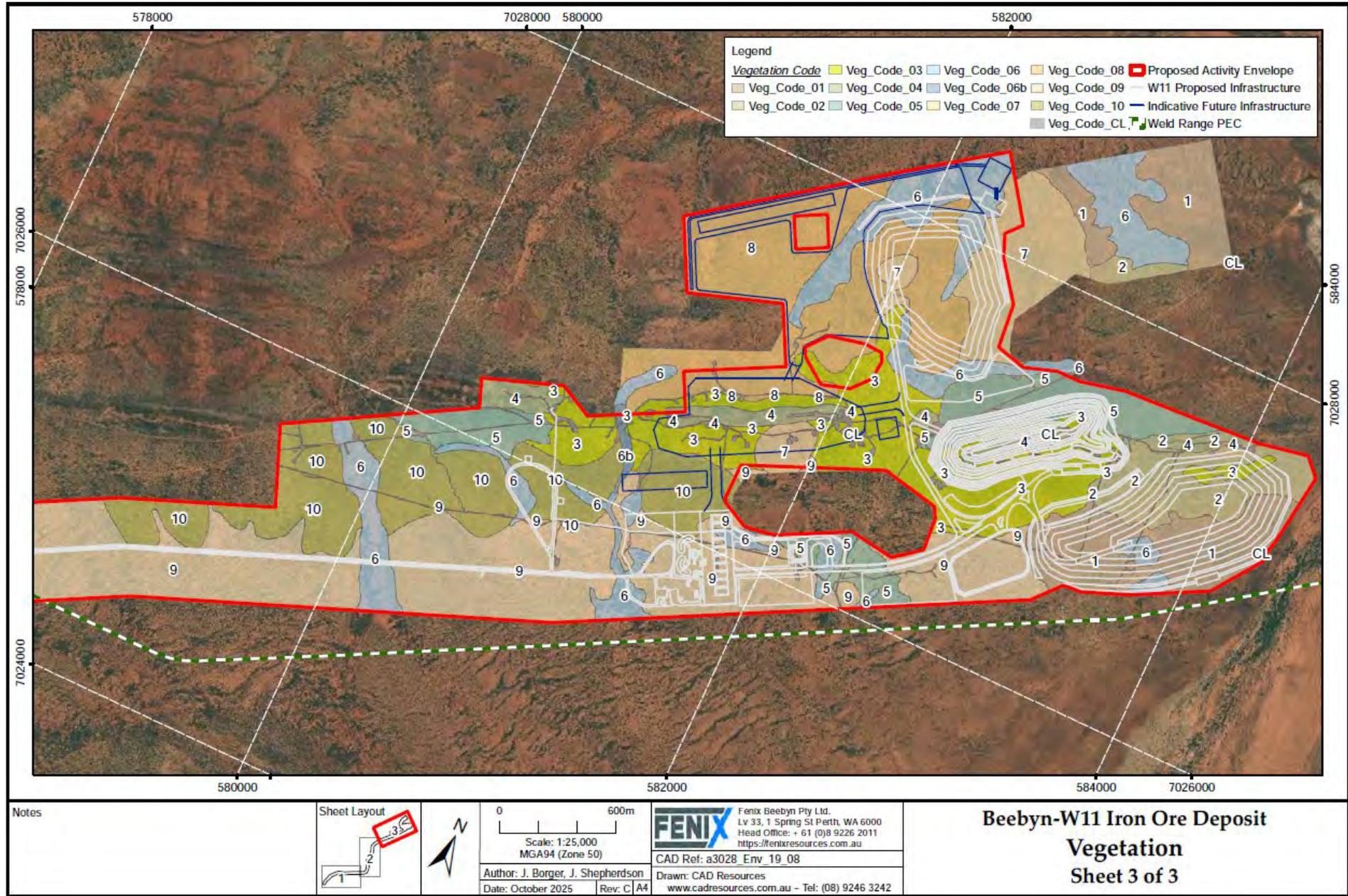


Figure 3.6: Vegetation types associated with the project area – map 3 of 3.

3.5 Significant vegetation and ecological systems

No State (DBCA) or Commonwealth (EPBC Act) listed Threatened Ecological Communities (TECs) occur within the project area.

The project area partly coincides with the Priority 1 Priority Ecological Community (PEC) Weld Range Vegetation Complexes (banded ironstone formation). Figure 3.4 to Figure 3.6 show the PEC boundary and vegetation in relation to the proposed project layout. The PEC boundary defined by DBCA includes a 500 m “administrative buffer”, which includes some vegetation types that do not align with the PEC description. The Weld Range PEC occupies an area of 20,073 ha, with the project area (excluding existing exploration disturbance) coinciding with less than 3.7% of this area.

Vegetation types 2, 3, 4, 5, 7, 8 and 15, as identified by Ecotec (2024a) correspond to the PEC as delineated by DBCA (2019), with 260.2 ha of disturbance proposed for the project occurring within the PEC, inclusive of the buffer zone (Table 3.5).

Table 3.5: Proportion of project area in PEC (excluding existing disturbance).

Vegetation Code	Approved Disturbance Footprint in PEC (ha)	Proposed project Disturbance Footprint in PEC (ha)
2	30.0	27.2
3	45.4	71.7
4	5.7	12.3
5	29.5	36.6
7	3.7	23.2
8	1.8	85.7
15	-	3.5
Total	116.1	260.2

3.6 Introduced flora

No introduced flora were recorded in the project area during the survey by APM (2024); however, Ecotec (2024a) recorded one during the August survey (*Oxalis ?corniculata*). No additional weed species were recorded during the 2025 survey (Ecotec 2025).

None of the weed species recorded at the project are Weeds of National Significance (Centre for Invasive Species Solutions 2025) or Declared Pests on the Western Australian Organism List (DPIRD 2025). However, ruby dock is an invasive species that can rapidly colonise disturbed areas. The seeds are salt tolerant and form a persistent seed bank within the soil that can last for many years (Schatral and Osborne 2006). While not previously recorded in the Beebyn-W11 project area, *Rumex vesicarius* has been recorded at the Iron Ridge project (Ecotec 2022).

Table 3.6 lists the weed species known from the surrounding area.

Table 3.6: Weed species recorded and potentially occurring in the project area.

Scientific name	Common name	Known occurrence
<i>Lysimachia arvensis</i>	Pimpernel	Iron Ridge (Ecotec 2024b)
<i>Brassica napus</i>	Canola	Iron Ridge (Ecotec 2022)
<i>Cenchrus ciliaris</i>	Buffel grass	Surrounding area (<i>ecologia</i> 2010b)
<i>Centaurea melitensis</i>	Maltese cockspur	Iron Ridge (Ecotec 2022)
<i>Cuscuta epithymum</i>	Lesser dodder	Surrounding area (<i>ecologia</i> 2010b)
<i>Cuscuta planiflora</i>	Small seeded dodder	Iron Ridge (Ecotec 2024b)
<i>Oxalis ?corniculata</i>	Yellow wood sorrel	Project area (Ecotec 2024a)
<i>Portulaca oleracea</i>	Purslane	Surrounding area (<i>ecologia</i> 2010b)
<i>Rostraria pumila</i>	Rough cats' tail	Iron Ridge (Ecotec 2021)
<i>Rumex vesicarius</i>	Ruby dock	Iron Ridge (Ecotec 2024b)
<i>Solanum nigrum</i>	Black berry nightshade	Surrounding area (<i>ecologia</i> 2010b)
<i>Sonchus asper</i>	Rough sow thistle	Iron Ridge (Ecotec 2024b)
<i>Sonchus oleraceus</i>	Common sow thistle	Iron Ridge (Ecotec 2024b), surrounding area (<i>ecologia</i> 2010b)
<i>Sisymbrium irio</i>	London rocket	Iron Ridge (Ecotec 2024b)

3.7 Fauna and habitat

ecologia (2010a) undertook a Level 2 vertebrate survey of the project area and surrounds over four site visits between 2006 and 2007; recording 148 vertebrate species in and around the project area, including 80 bird species, 44 reptiles, 23 mammals (17 native and six introduced) and one amphibian.

Twenty vertebrate fauna species and two invertebrate species of conservation significance were identified from database searches of a 30 km radius from the study area including seven mammals, 11 birds and two reptiles (APM 2024). Species listed as Marine or species not known to inhabit terrestrial environments are considered very unlikely to inhabit the project area and have been excluded from further discussion. Table 3.7 provides a summary of those conservation significant species occurring or likely to occur within the Project area. Previously recorded locations of conservation significant fauna are presented in Figure 3.7.

At the Weld Range, the long-tailed dunnart has been recorded on exposed rock and stony soils with hummock grasses and shrubs, flat-topped hills, lateritic plateaus, sandstone ranges and breakaways, generally with a vegetation of sparse mulga over spinifex (*ecologia* 2009a). Within the project area, APM (2024) found suitable habitat exists in the Banded Ironstone and Drainage Line habitats.

A habitat and targeted conservation significant fauna survey of proposed disturbance areas not covered by previous surveys (including the proposed north waste dump and surrounds) was undertaken by Ecotec in August 2025. The report is in preparation and will be provided to DMPE when complete. Two possible extinct (long unused and unlikely to be used again, low and flat profile without a peak or crater) malleefowl mounds were recorded during the 2025 survey, bringing the total possible extinct mounds in the project area to eleven (Figure 3.8). While it is considered reasonably likely that the structures observed are long-extinct mounds, it is possible that some are former rabbit warrens or even geologic formations. If they were

constructed by malleefowl they have not been used for decades (Ecotec 2024a) and removal of these for project development would have no impact on malleefowl.

The project area is likely to have supported malleefowl in the past but is now at the northern extent of the species' range. Suitable habitat requirements include dense vegetation with abundant leaf litter, which is used to fill the mounds to incubate the eggs as it composts. The survey area now lacks much of the understorey biomass that was once present (as a result of grazing on the pastoral station) and is therefore lacking in leaf litter, food resources and cover provided by denser vegetation. It was concluded that malleefowl are unlikely to occur in the project area (Ecotec 2024a).

The project area contains some large trees that may be suitable for development of hollows by the Southern whiteface (a bird listed as Vulnerable); however, the area is previously disturbed with grazing impacts from both Beebyn Station and feral goats, and historic clearing for mining exploration. The understorey is sparse and the litter layer sparse to absent, but thicker in narrow bands around the drainage lines. Due to the poor condition of the understorey, the area is unlikely to host habitat critical to the survival of the Southern whiteface (APM 2024).

Suitable foraging habitat for the grey falcon is present within the area; however no suitable nesting habitat is present and preferred nesting habitat is not available in the surrounding local area. Known records are more than 50 km away and whilst the grey falcon may occasionally visit the locality, it is unlikely to provide an important habitat for this species (APM 2024).

The Western spiny-tailed skink typically resides in family groups in coarse woody debris, such as fallen log piles (Bradley et. al 2022) or, in inland areas, burrows under boulders and exfoliated sheets of granite (*ecologia* 2010; Ecotec 2024a). This species is generally easy to detect as the animals use a communal latrine which persists for many months even when the animals are concealed or absent. The species was not recorded in the project area during the recent fauna surveys (APM 2024; Ecotec 2024a and 2025).

The West Coast mulga slider has been recorded in Weld Range including locations close to the project area; however, APM (2024) found the habitats within the project area were generally of poor quality. Leaf litter is scarce within the project area and soils are degraded and likely poor for burrowing. Higher quality microhabitats occur in the Drainage Line habitat; however, soils may be too stony to be suitable.

Biologic Environmental Survey Pty Ltd (Biologic) undertook a status review of the species in April 2019 and confirmed that the trapdoor spider found in the Weld Range area is now regarded as *Idiosoma clypeatum*, a Priority 3 species under the WA Biodiversity Conservation Act (Biologic 2019).

Ecotec (2024a) found that shield-back trapdoor spider burrows in this region are associated with drainage lines and denser stands of Acacia where the soil has a higher moisture content. The amount and type of leaf litter present appears to be an important factor. Typically, burrows are located beneath Acacia trees and shrubs in areas where there is evidence of surface water sheet flow or in denser vegetation adjacent to ephemeral drainage. There is abundant suitable habitat in the surrounding region and *I. clypeatum* is known to be widespread across the Murchison and Yalgoo bioregions (Ecotec 2024a).

Ecotec undertook searches of the main areas of Drainage Line habitat, which is present from the western end of the W11 infrastructure area and along the haul road route. Eleven active and five abandoned *Idiosoma clypeatum* burrows were recorded during the 2024 survey. None were located within the proposed disturbance footprint. No additional burrows were recorded during the 2025 survey.

The location of recorded *I. clypeatum* burrows in relation to the proposed disturbance is presented in Figure 3.9. The proposed Beebyn-W11 project avoids disturbance to all known burrows (as recorded by Ecotec 2024a). The Ecotec report is included in Appendix 1.

Table 3.7: Conservation significant fauna likelihood of occurrence in the Activity Envelope.

Common name	Scientific name	EPBC status	WA status	Comments	Likelihood of occurrence
Mammals					
Bilby	<i>Macrotis lagotis</i>	VU	VU	The local record has a low level of certainty and was recorded in 1984.	Unlikely
Black-flanked rock-wallaby	<i>Petrogale lateralis lateralis</i>	EN	EN	Historical local record is a fossilised specimen	Unlikely
Brush-tailed mulgara	<i>Dasyercus blythi</i>		P4	Historical local record is a fossilised specimen	Unlikely
Ghost bat	<i>Macroderma gigas</i>	VU	VU	Historical local record is a fossilised specimen	Unlikely
Gould's mouse	<i>Pseudomys gouldii</i>	VU	VU	Historical local record is a fossilised specimen	Unlikely
Greater stick-nest rat	<i>Leporillus conditor</i>	VU	CD	Historical local record is a fossilised specimen	Unlikely
Long-tailed dunnart	<i>Antechinomys longicaudata</i>		P4	Suitable habitat present in the BIF	Possible
Birds					
Curlew sandpiper	<i>Calidris ferruginea</i>	CR, MI	CR	No suitable habitat present	Unlikely
Fork-tailed swift	<i>Apus pacificus</i>	MI	IA	All habitats suitable, predominantly a coastal non-breeding visitor to Australia. Project area is outside of likely habitat range.	Unlikely
Grey falcon	<i>Falco hypoleucos</i>	VU	VU	Suitable foraging habitat present. No suitable nesting habitat.	Possible
Grey wagtail	<i>Motacilla cinerea</i>	MI	MI	No suitable habitat present	Unlikely
Malleefowl	<i>Leipoa ocellata</i>	VU	VU	Inactive mounds have been recorded	Possible
Night parrot	<i>Pezoporus occidentalis</i>	EN	CR	No suitable habitat present	Unlikely
Pectoral sandpiper	<i>Calidris melanotos</i>	MI	IA	No suitable habitat present	Unlikely
Peregrine falcon	<i>Falco peregrinus</i>		OS	Foraging habitat present	Possible
Sharp-tailed sandpiper	<i>Calidris acuminata</i>	VU, MI	IA	No suitable habitat present	Unlikely
Southern whiteface	<i>Aphelocephala leucopsis</i>	VU	VU	All habitats suitable, project area unlikely to host habitat critical to survival.	Possible
Yellow wagtail	<i>Motacilla flava</i>	MI	MI	No suitable habitat present	Unlikely
Reptiles					
West coast mulga slider	<i>Lerista eupoda</i>		P1	Suitable habitat is present in the Mulga Woodland on Hill Slope habitat.	Possible
Western spiny-tailed skink	<i>Egernia stokesii badia</i>	EN	VU	Suitable habitat in this region appears to be restricted to granite outcropping. No such habitat is present within the project area.	Unlikely
Invertebrate					
Northern shield-backed trapdoor spider	<i>Idiosoma clypeatum</i>		P3	Recorded within the study area, then identified as <i>I. nigrum</i>	Recorded
Shield-backed trapdoor spider	<i>Idiosoma nigrum</i>	VU	EN	All specimens in the Murchison region determined to be <i>I. clypeatum</i>	Unlikely

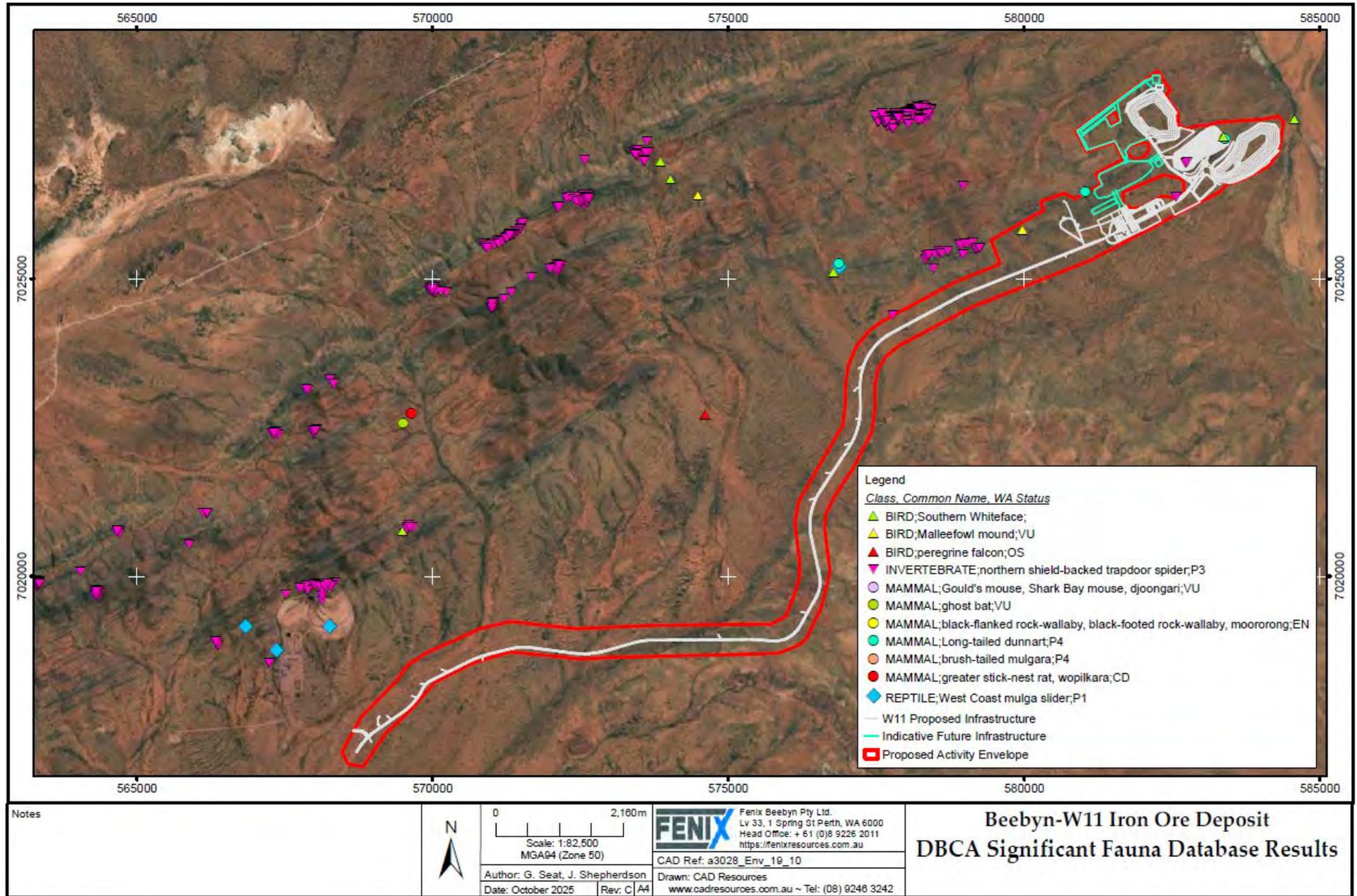


Figure 3.7: Database search records of conservation significant fauna within 30 km of the project area.

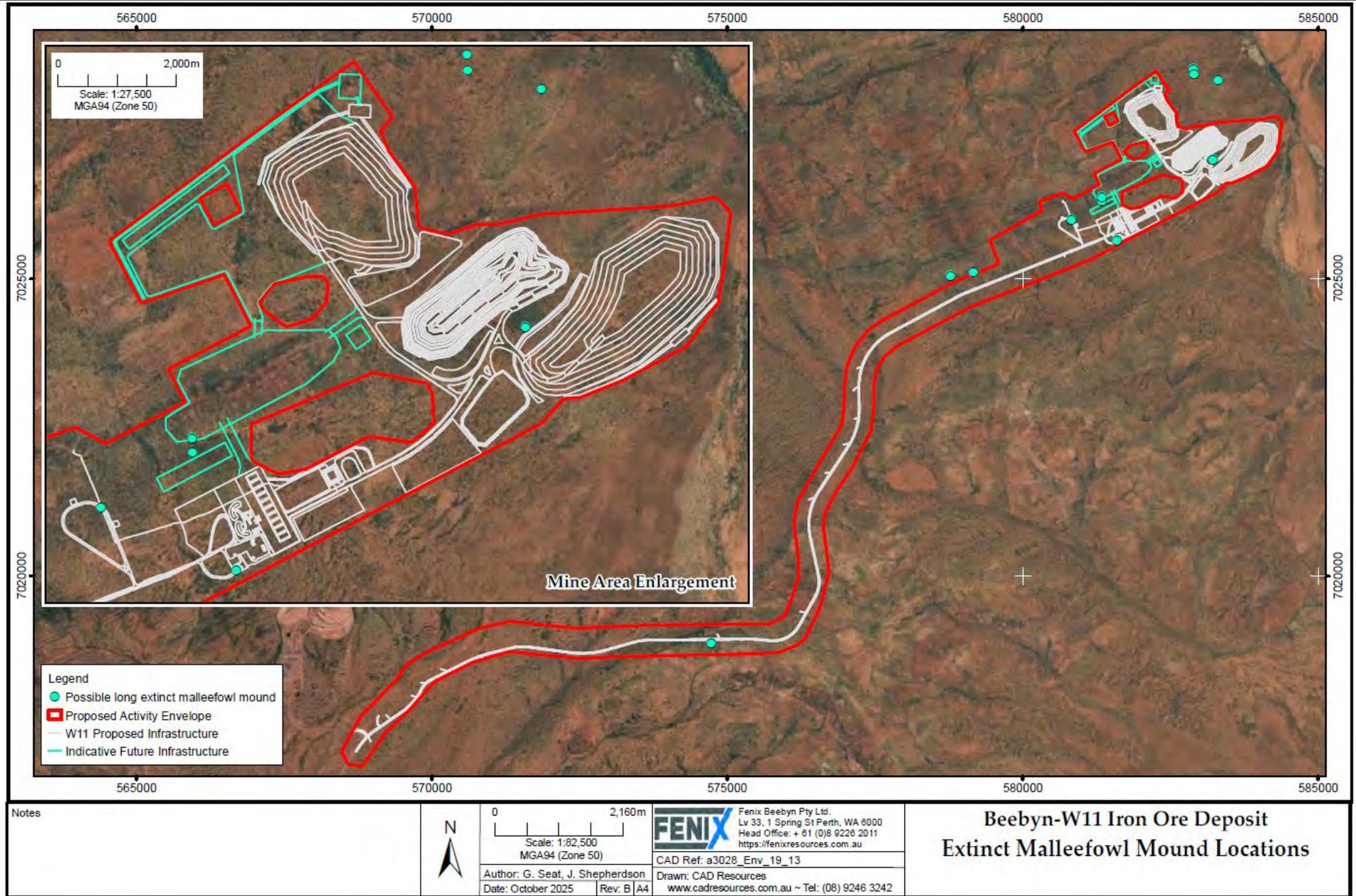


Figure 3.8: Possible extinct malleefowl mounds recorded in the project area.

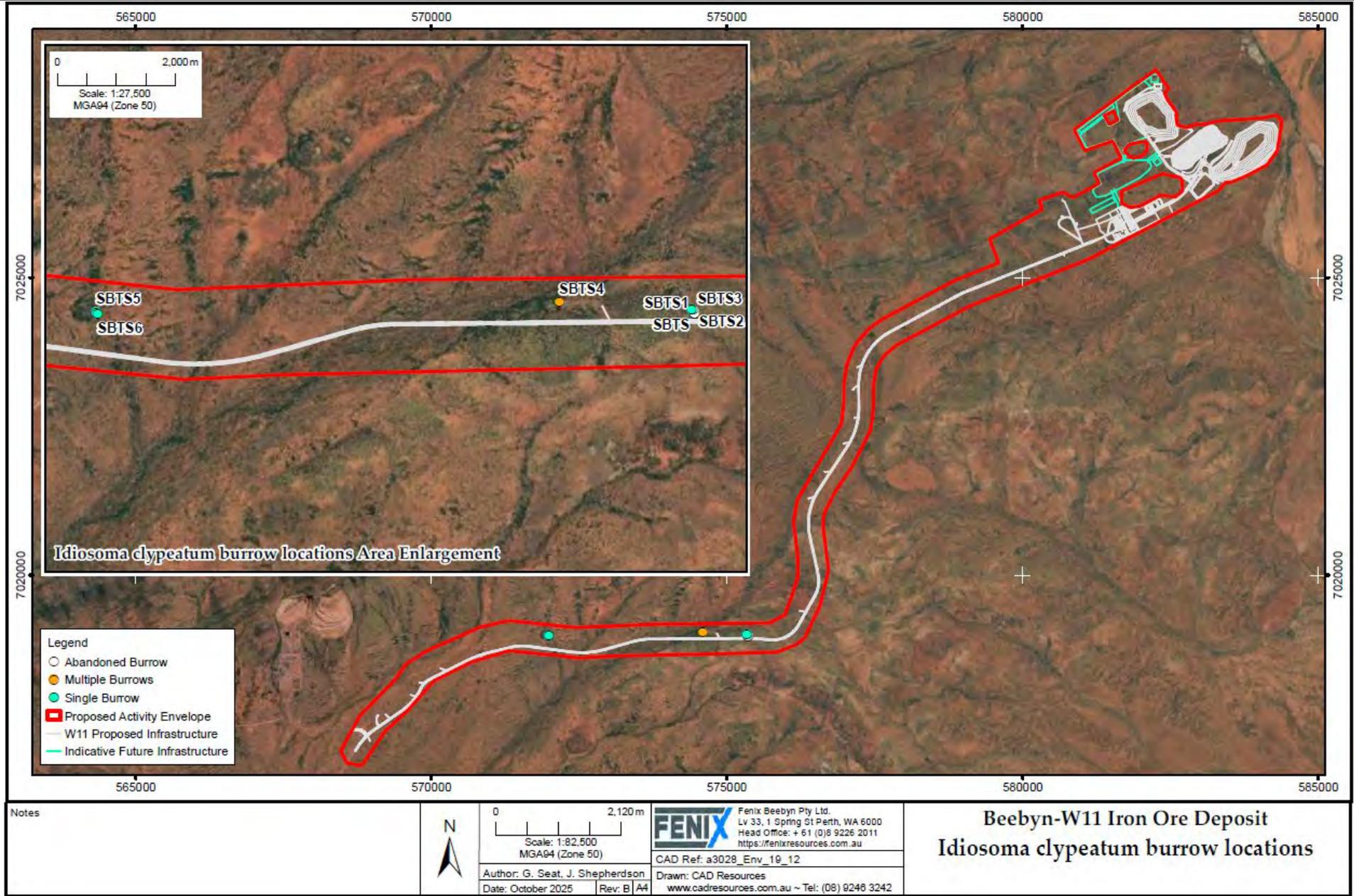


Figure 3.9: Recorded *Idiosoma clypeatum* locations in the Beebyn-W11 project area.

The 2025 survey (Ecotec 2025) found the fauna habitat types aligned with those described by APM (2024) and Ecotec (2024a) for Stage 1 of the Beebyn-W11 Project, described in Table 3.8 and shown on Figure 3.10. The habitat types are similar to those identified at the nearby Iron Ridge project (*ecologia* 2020a).

Table 3.8: Fauna habitat recorded in the study area.

Habitat type	Activity Envelope (ha)	Disturbance Footprint (ha)	Beebyn-W11 impact to local area (%)
Acacia Sand Plains	711.6	126.5	17.8
Rocky ridge or outcrop	235.1	158.9	67.6
Drainage Line	196.7	68.0	34.6
Acacia (Mulga) on Hill Slope	386.2	201.9	52.3
Disturbed	27.8	16.7	60.1

Acacia Sand Plains habitat occurs predominantly on the lower slopes of the study area, where the haul road has been developed. Associated soils include sandy to lightly rocky clay loam. The project will result in localised impact to this habitat.

Mulga Woodland on Hill Slope habitat is dominated by *Acacia pruinocarpa* trees and *Acacia aneura* shrublands over on sandy or stony clay loam on hill slopes and is the most widespread habitat present in the area. This habitat type provides suitable substrates, vegetation and habitat to support the Priority 3 (BC Act) northern shield-backed trapdoor spider. This habitat is considered widespread in the Weld Range area. Most disturbance associated with the project will occur in this habitat type; therefore, impact to a localised area will result from the proposed development.

Drainage Line habitat provides suitable habitat for the west coast mulga slider. Known from the arid interior of the Midwest of WA and endemic to the Murchison bioregion, this species has previously been recorded within Weld Range in leaf litter fringing drainage lines. The project will result in localised impact to this habitat.

Rocky ridge or outcrop habitat occurs in a small portion in the north of the project area and is the least widespread habitat present in the area. The long-tailed dunnart has been recorded from widely scattered localities in the arid zone where it inhabits rugged, rocky areas, such as this habitat type. It typically occurs on plateaus near breakaways and scree slopes, and on rugged boulder-strewn scree slopes. Widely separated populations occur in the Pilbara, Murchison, Gibson Desert, southern Carnarvon Basin and in the Western MacDonnell Ranges (Northern Territory). The species was once considered rare but has recently been shown to be relatively common and widespread within rocky habitats, especially banded iron formation ranges within the Midwest. The project will result in localised impact to this habitat.

3.8 Introduced fauna

Seven species of introduced mammal have previously been recorded around the project area. These include the dog, European red fox, feral cat, rabbit, house mouse, goat and cow. Goats, both feral and raised as pastoral stock, are known to generate high grazing pressure on the native vegetation of parts of the Weld Range.

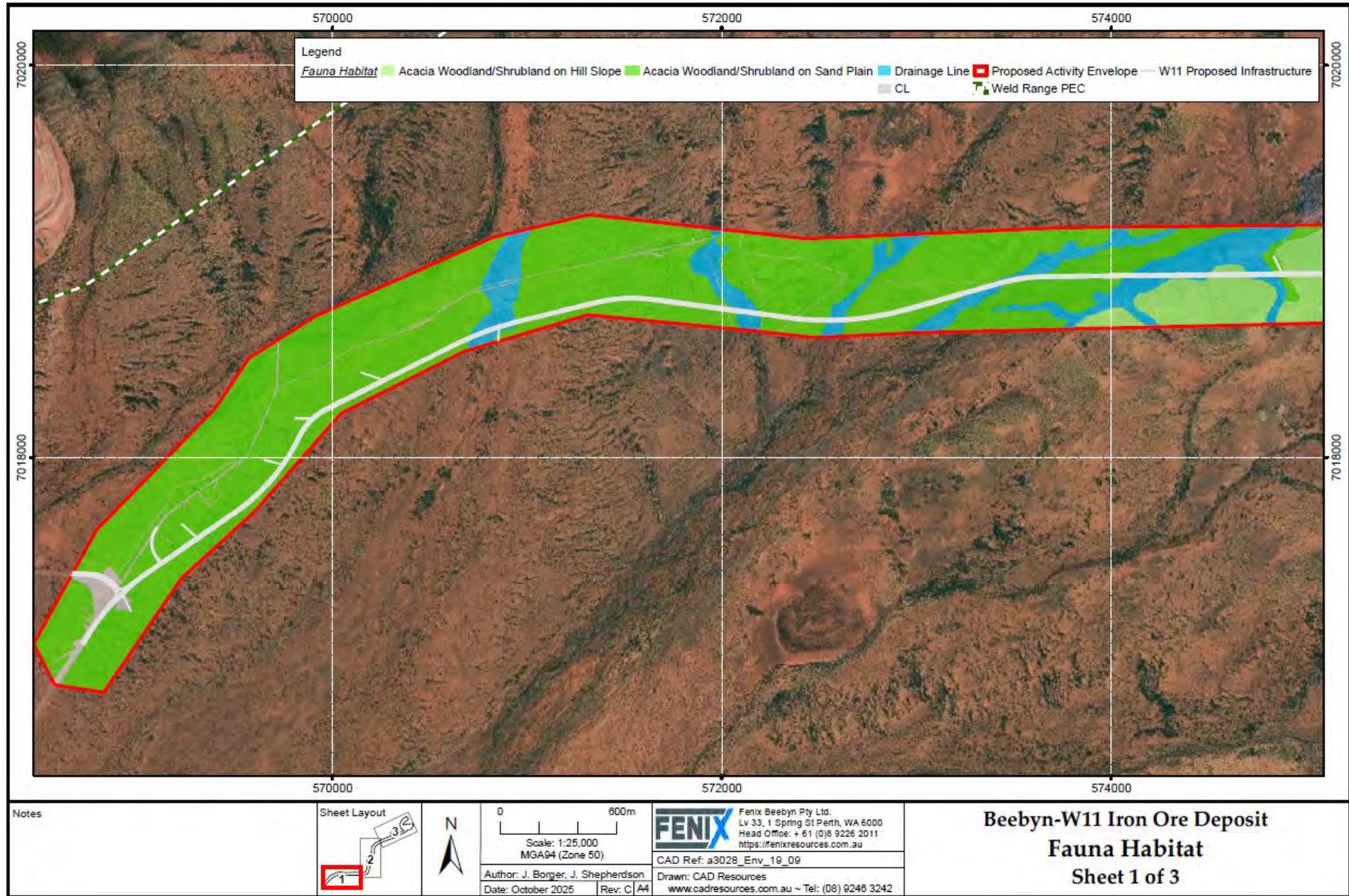


Figure 3.10: Fauna habitat in the project area – map 1 of 3.

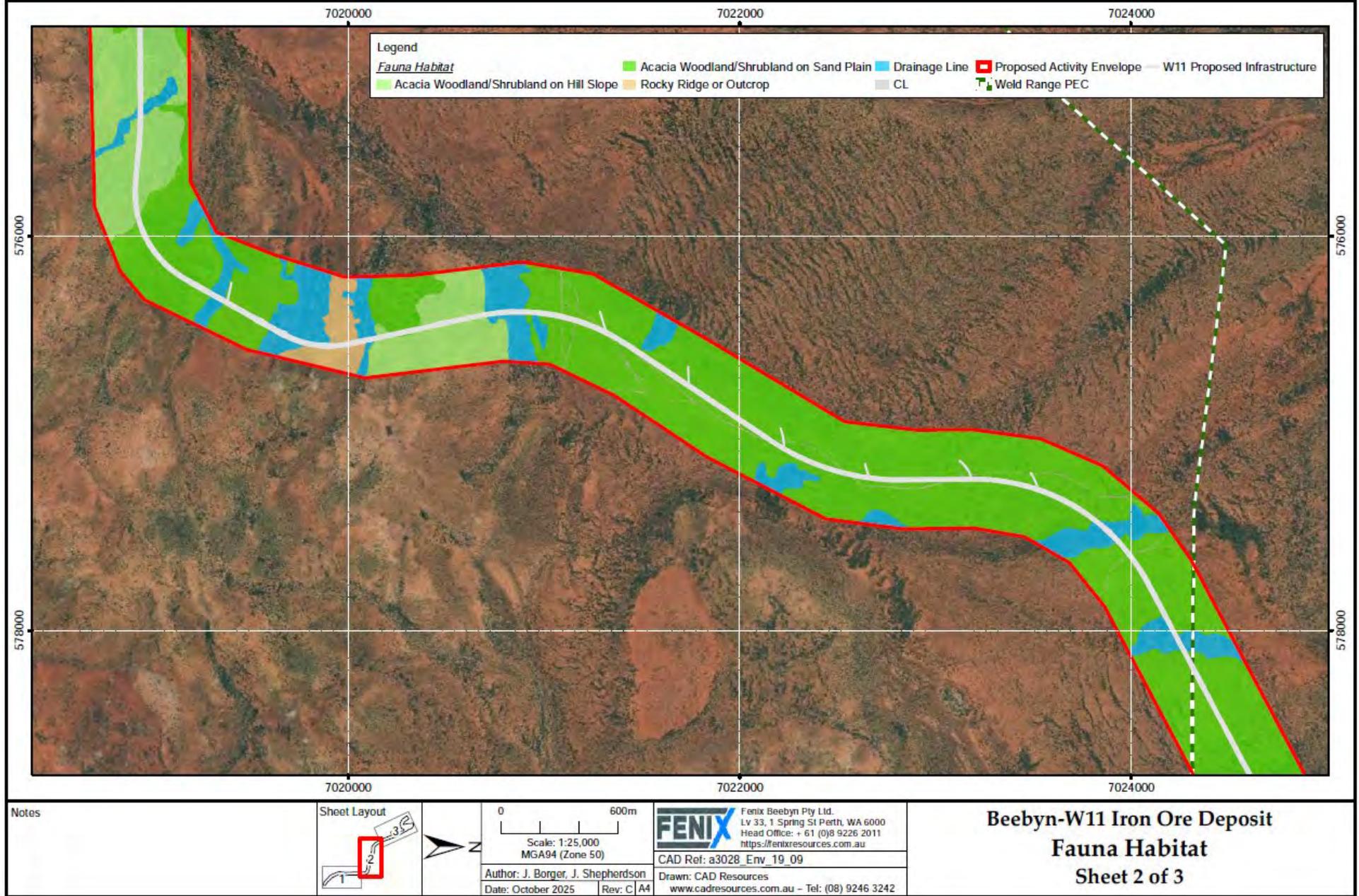


Figure 3.11: Fauna habitat in the project area – map 2 of 3.

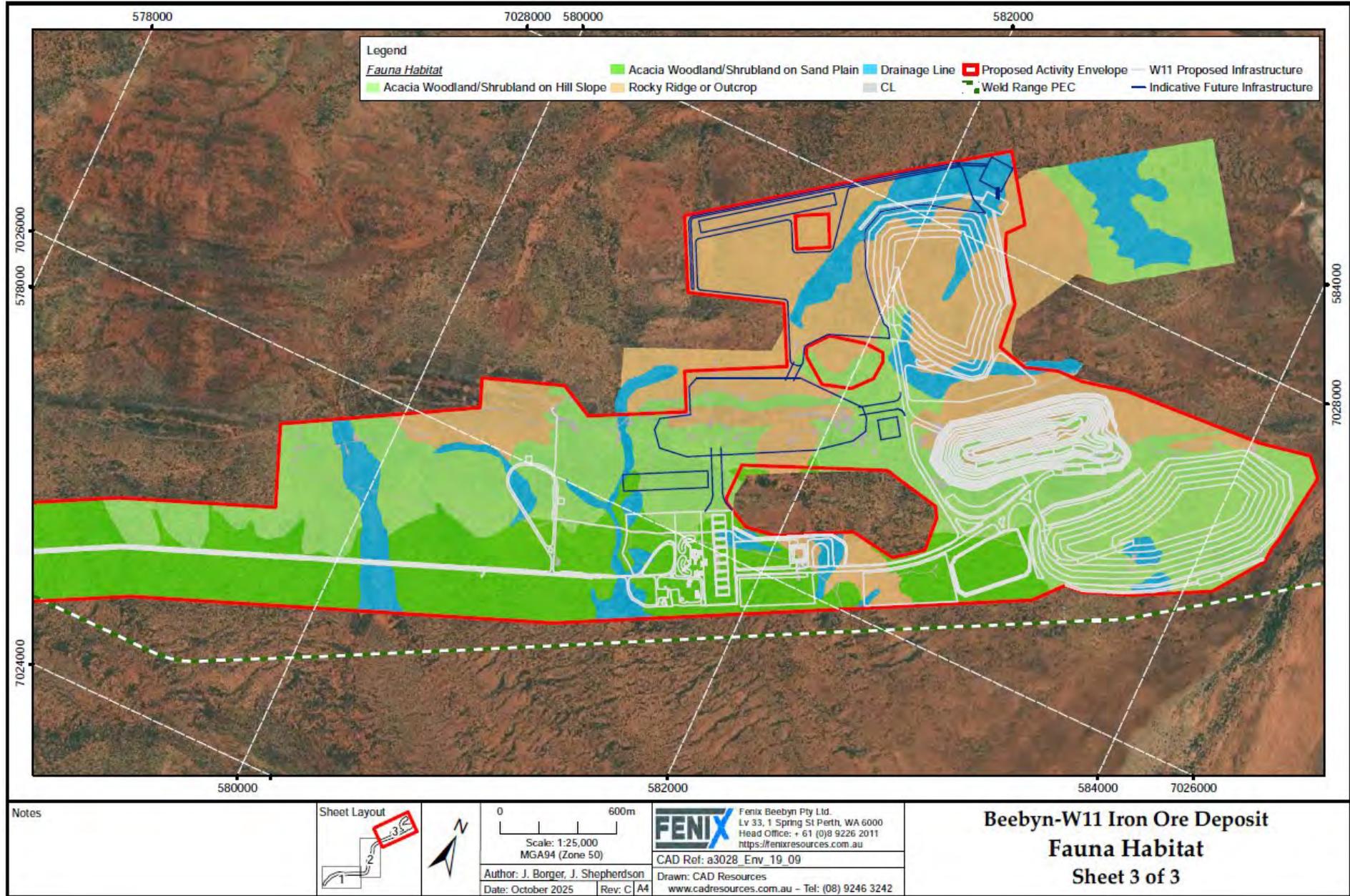


Figure 3.12: Fauna habitat in the project area – map 3 of 3.

3.9 Short-range endemics and subterranean fauna

There are no changes to impacts to short-range endemics (SREs) or subterranean fauna relevant to this Clearing Permit Amendment from that approved under existing Permit 10636/1.

Short-range endemics (SREs) are fauna that have a naturally small range of less than 10,000 km². In addition, these species possess similar ecological traits including poor powers of dispersal, confinement to specialised often discontinuous habitats, slow growth and low fecundity (*ecologia* 2020b).

In 2009 *ecologia* conducted a baseline stygofauna survey at Weld Range and surrounding pastoral land, which included sampling 84 drill holes (26 at Beebyn-W11, 40 at Madoonga and 18 at the surrounding pastoral land outside the proposed area of impact), laboratory identifications and reporting, interpretation of the potential impacts and an associated risk assessment of the various project components on stygofauna communities or species (*ecologia* 2010a and 2020b).

No stygobitic species or communities were identified during the stygofauna survey within the Beebyn-W11 impact area or in the regional pastoral bores, although stygophylic representatives of two crustacean orders (Ostracoda and Copepoda) and one annelid sub-class were recorded from nine pastoral wells. The results of the 2009 survey suggest that the groundwater habitat in and around the Beebyn impact area is depauperate of true stygofauna and therefore no risk assessment or management recommendations were necessary (*ecologia* 2010a and 2020b).

Ecologia also conducted a two phase troglofauna study of the project area and surrounds in 2007 and 2008, sampling 143 bore holes (50 at Beebyn-W11, 51 at Madoonga and 42 outside the then proposed area of impact).

A single centipede specimen (likely from the Cryptopidae family) was collected from a single bore within the Beebyn-W11 area. Cryptopids have been collected elsewhere in Western Australia; however, no records exist near Weld Range or other ranges in the Midwest region (*ecologia* 2011). The presence of this species was not confirmed elsewhere in the survey despite a comprehensive number of bores being sampled. Furthermore, no other troglobitic species were found in the survey area.

Examination of the bore hole with the troglofauna record showed that the hole contained at least two geological strata with voids suitable for troglofauna habitation. The most common stratum was dolerite, and this habitat has been classified as 'suitable' due to its common fractures. The other stratum was Banded Iron Formation (BIF), which showed some degree of porosity but was mostly located below the water table and thus its use for troglofauna was assessed as not suitable. The suitable troglobitic habitat (dolerite) is widespread throughout the range. Additionally, both dolerite and BIF strata are continuous to the west from the project area and also occur in the Wilgie Mia Aboriginal Reserve. Impact on the potential troglofauna habitat at Weld Range as a result of the Beebyn-W11 project is expected to be low.

3.10 Hydrology

3.10.1 Surface water

Weld Range rises above the centre of a drainage basin that is surrounded in the north by topographically higher flat - topped breakaways. The main drainage lines converge at the southeastern part of the basin on its western path to form the Sanford River, a tributary of the Murchison River. The major drainage line (Berhing Creek) drains through the Weld Range to the west of the proposed project area (*ecologia* 2010a). The project is situated to the west of Beebyn Creek, a tributary of Jungar Creek, which drains towards the south-southeast (Pentium 2025).

Rainwater falling in the area drains quickly off the Weld Range ridges through narrow channels which widen substantially as the water drains onto the flatter areas, in some cases forming pans. In the flatter areas the flow of water can become ambiguous with streams dividing, in some cases the divisions flow in quite different directions. The bed conditions of the main channels of all watercourses comprise of coarse sand, rocks and cobbles; whilst the banks comprise silty sand which is easily eroded.

Pentium Water Pty Ltd (Pentium) was commissioned by Fenix to update the previous hydrogeological and hydrological assessment (Pentium 2024) to support the proposed pit expansion and development of the north waste dump. The surface water assessment reviewed the potential impact of flood flows on the mining area to determine any bunding and drainage requirements for the mining area and infrastructure (Pentium 2025).

The infrastructure area lies on the southern end of one major catchment (Beebyn Creek) with an area of approximately 225 km² (Figure 3.13). The ephemeral watercourse draining this catchment area flows south through Beebyn Gap (Pentium 2025).

Detailed flood flows using the HECRAS model found the Beebyn Creek comprised one main channel running south past the eastern side of the Beebyn-W11 infrastructure. Critical duration for the Beebyn Creek was 36 hours (Pentium 2025). The estimated 20, 50 and 100 year average recurrence interval (ARI) design peak flows are shown in Table 3.9.

Table 3.9: Adopted design flows from HECRAS modelling.

ARI (years)	Adopted design flows (m ³ /sec)
20	150
50	235
100	312

Analysis of the impact of a 1% AEP rainfall event found that Beebyn Creek floods to about 1 m deep as it flows past the Beebyn-W11 project site but does not impact mine infrastructure. The 1% AEP flood extent encroaches to within approximately 30 m of the pit and waste dump (Figure 3.14).

The mine generally lies near the top of a ridge, and catchments and surface water flows impacting site infrastructure are relatively small. A standard pit bund will be sufficient to prevent surface water flows from entering the pit (Pentium 2025). The pit is outside of any major flooding.

Minor flow paths run through the site and the proposed pit, waste dump and plant boundaries; therefore, these areas will require drainage management to prevent ponding. The diversion channel and bunds required are all minor. Ponding against the south waste dump may occur, however, given the short mine life, Pentium concluded this ponding to be acceptable as in the operational phase, water will evaporate and infiltrate in situ (Pentium 2025). Provision has been made for a diversion channel in this area if required.

The proposed north waste dump outline blocks a minor flow path that drains to the north across the dumps north-western corner and ponding up to 0.6 m may occur during the 1% AEP rainfall event. A minor catchment intercepts the dumps southern boundary as it flows from west to east towards Beebyn Creek, with ponding up to 0.3 m potentially occurring at the southern end of this waste dump during the 1% AEP rainfall event. Pentium concluded no surface water management is required for the north waste dump, given the short mine life and that ponded water will dissipate quickly by evaporation and infiltration (Pentium 2025).

The Pentium report is included in Appendix 2.

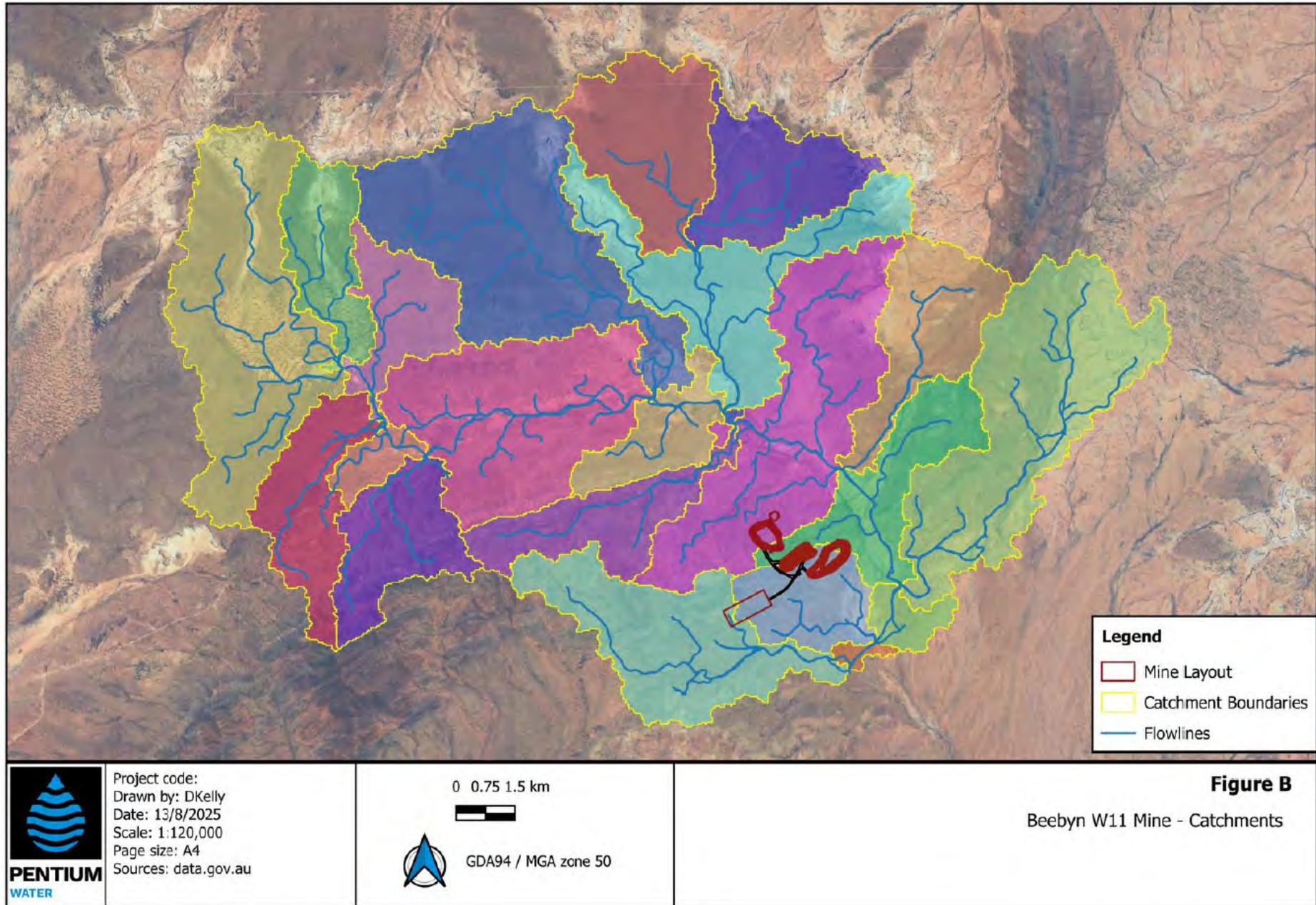


Figure 3.13: Surface water catchments of the infrastructure area.

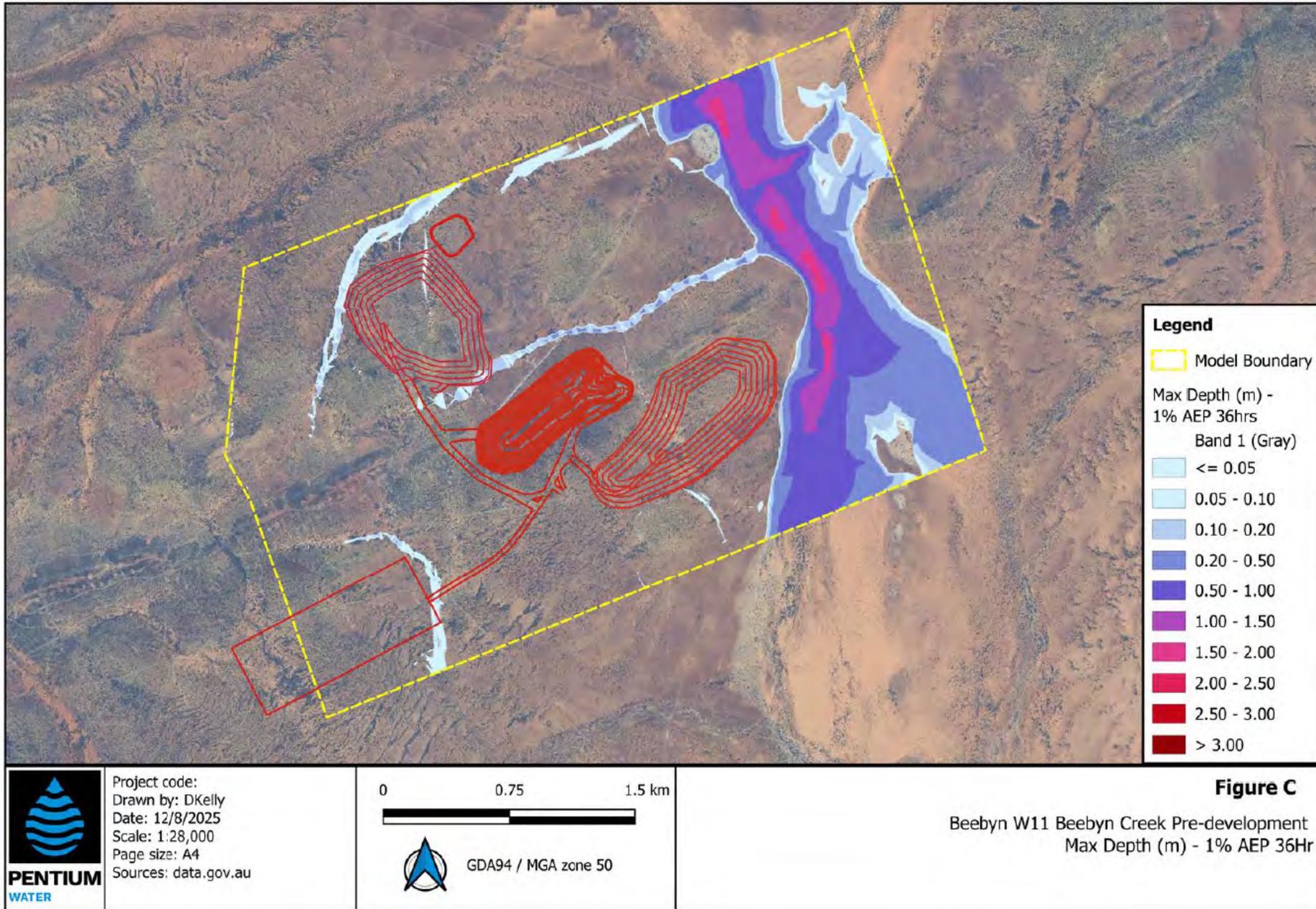


Figure 3.14: Beebyn-W11 project flood risk (infrastructure area) for a 1 in 100-year AEP.

3.10.2 Groundwater

The Weld Range is located in the East Murchison groundwater management unit. The groundwater in this area is characterised by fractured-rock and palaeochannel aquifers, alluvium and localised calcrete aquifers. Groundwater from fractured-rock aquifers can vary widely in terms of quality and quantity. At Weld Range, groundwater occurs at relatively shallow depths (typically 5 – 50 m below ground level (bgl)) beneath the alluvial plain and occurs within the bedrock sequence that forms Weld Range. The groundwater is fresh to slightly brackish in the BIF and shallow alluvial aquifers and is highly saline in alluvium and the palaeochannel aquifer west and south of the project area (*ecologia* 2010a).

The main aquifers in the region are alluvium and colluvium with a tertiary palaeochannel passing through the Weld Range. The Banded Iron Formation (BIF) strata which include the Beebyn-W11 deposit are commonly fractured, jointed and vuggy, and constitute aquifers of moderate to high permeability. The granitic and greenstone basement rocks (other than BIF) are generally of low permeability, including the dolerite associated with the BIF. The groundwater is recharged by the infiltration of rainfall and streamflow following high rainfall events. In the project area, groundwater throughflow is anticipated to be limited and preferentially occur along strike of the mineralised BIF. North-westerly striking faults have offset the BIF locally, displacing it against low permeability dolerite – it is anticipated that this would reduce connectivity between the faulted units, limiting throughflow (Pentium 2025).

Existing groundwater extraction in the area consists of water for domestic use and stock watering at homesteads and on stations, and dewatering associated with the Iron Ridge project to the west. The closest bore is Limestone Bore, approximately 1.6 km to the north-northeast of Beebyn-W11.

The three bores constructed for water abstraction encountered the water table between 29.6 m (hole ID B_WB2_01) and 49.7 m (hole ID B_WB2_02). The water level in the project area was found to be around 480 m RL, with salinity of 690 – 1,400 mg/L TDS and neutral to slightly alkaline pH between 7.6 and 8.6. Table 3.10 summarises the water quality.

The Pentium report is included in Appendix 2.

Table 3.10: Laboratory analysis of water samples from the project area.

Analyte	Unit	B_LTM_03	B_LTM_04	B_WB2_01	B_WB2_02	Livestock drinking water trigger value
Date Sampled		15/7/2019	16/7/2019	17/7/2009	18/7/2019	
Acidity	pH	7.8	7.6	8.6	7.6	
Electrical Conductivity @ 25°C	µS/cm	1200	1400	2300	1600	
Total Dissolved Solids @180°C	mg/L	690	830	1400	950	4000
Total Hardness as CaCO ₃	mg/L	250	330	500	310	
Carbonate, CO ₃	mg/L	<1	<1	14	<1	
Bicarbonate, HCO ₃	mg/L	290	370	380	370	
Chloride, Cl	mg/L	180	220	450	260	
Sulphate, SO ₄	mg/L	88	130	190	160	1000
Nitrate, NO ₃	mg/L	55	28	<0.2	14	
Sodium, Na	mg/L	170	180	190	230	
Potassium, K	mg/L	11	14	180	12	
Calcium, Ca	mg/L	37	45	50	39	1000
Magnesium, Mg	mg/L	38	54	92	52	Not toxic
Soluble Iron, Fe	mg/L	<0.02	<0.02	<0.02	<0.02	
Fluoride, F	mg/L	0.4	0.3	0.5	0.3	

Analyte	Unit	B_LTM_03	B_LTM_04	B_WB2_01	B_WB2_02	Livestock drinking water trigger value
Free Cyanide	mg/L	<0.01	<0.01	<0.01	<0.01	
Aluminium, Al	mg/L	<0.02	<0.02	<0.02	<0.02	0.04
Arsenic, As	mg/L	0.005	<0.002	0.24	<0.002	
Manganese, Mn	mg/L	0.007	0.007	0.074	0.29	Not toxic
Lead, Pb	mg/L	<0.005	<0.005	<0.005	<0.005	
Cadmium, Cd	mg/L	<0.001	<0.001	<0.001	<0.001	
Copper, Cu	mg/L	<0.005	<0.005	<0.005	<0.005	
Antimony, Sb	mg/L	<0.0005	<0.0005	0.05	<0.05	
Mercury, Hg	mg/L	<0.05	<0.05			
Silver, Ag	mg/L	<0.005	<0.005	<0.005	<0.005	
Boron, B	mg/L	1	0.9	0.7	1.2	
Barium, Ba	mg/L	<0.005	<0.005	0.02	<0.01	
Beryllium, Be,	mg/L	<0.005	<0.005	<0.005	<0.005	
Cobalt, Co	mg/L	<0.01	<0.01	<0.01	<0.01	
Chromium, Cr	mg/L	<0.005	<0.005	<0.005	<0.005	
Molybdenum, Mo	mg/L	<0.01	<0.01	<0.01	<0.01	
Nickel, Ni	mg/L	0.007	0.005	0.06	0.008	

3.10.3 Groundwater Dependent Ecosystems

Potential groundwater dependent ecosystems have been identified and mapped on a national scale by the Bureau of Meteorology (BoM), using coarse resolution satellite and remote sensing data that has not been ground-truthed or confirmed with field assessment. BoM’s Groundwater Dependent Ecosystems (GDE) database indicates that potential terrestrial GDEs have been identified on the alluvial flood plains and surrounding hard pans of the low-lying terrain near W11 (Pentium 2025); however, no Groundwater Dependent Ecosystems (GDE’s) have been identified within the project area and no vegetation considered to be groundwater dependent has been recorded in the various surveys completed (APM 2024, *ecologia* 2010a). Phreatophytic vegetation types were recorded by *ecologia* (2010a) approximately 10 km north east and 20 km south west of the proposed project, outside the disturbance area and extent of predicted drawdown associated with the proposal.

3.10.4 Pit lake formation

Once mining is completed, the water level in the pit will rapidly rise for the first five years, followed by a slower recovery over time until a balance is established between the groundwater inflows plus rainfall accumulation and evaporation losses. The pit will extend down from ground levels of approximately 520 m AHD to a base elevation of 340 m AHD, 180 m below the average natural ground level.

The water recharge predicted post mining is given in Table 3.11. The water level in the pit lake will rise up to approximately 410 m RL post mining (Pentium 2025).

Groundwater modelling indicates that the pit will function as a sink, with groundwater flowing towards it. Therefore, there would be no flow from the pit lake to groundwater and so there is no potential for groundwater contamination.

The concentration of solutes within the pit lakes will increase over time due to high evaporation and low

precipitation in the area. The salinity of the pit water would gradually increase from about 1,000 mg/L TDS when the pit first begins to fill with water, to about 14,000 mg/L TDS 100 years after the end of mining (Pentium 2025).

The Pentium report is included in Appendix 2.

Table 3.11: Pit recharge water balance.

Time post mining (yr)	Pit lake water level (m RL)
1	340
10	360
25	390
100	410

3.11 Heritage

Mining Lease M51/869 and the associated infrastructure tenure is located within the Wajarri Yamaji Native Title Claim. A Native Title Mining Agreement with the Wajarri Yamaji Native Title group was fully executed in early 2025.

The Weld Range Complex contains several places of Aboriginal Heritage significance, several of which are located close to the Beebyn-W11 project area (Figure 3.15 and Figure 3.16). Aboriginal Heritage site “Weld - QAS-0722” (#28784, artefact scatter) was lodged with the WA Department of Planning, Lands and Heritage (DPLH) in May 2010 and is located within the proposed Beebyn-W11 pit, as is Aboriginal Heritage site ‘Weld-A-09189 (quarry)’. An application for S18 consent to disturb these two sites was submitted to the Minister for Aboriginal Affairs in August 2025. Fenix have consulted with the Wajarri Yamaji Aboriginal Corporation regarding the section 18 and WYAC do not object to the Minister for Aboriginal Affairs granting section 18 consent.

Wilgie-Mia Reserve (16670) is located approximately 10km south west of the project and will not be impacted.

Full archaeological and ethnographical surveys have been undertaken for the project (previously provided to DMPE under Reg ID 126744) and 88 culturally significant locations have been identified in the project area and surrounds during these surveys. All but four of these were recorded during the survey undertaken by the University of WA in 2010. Most of the 88 sites are artefact scatters and quarry sites indicative of the use of the land over thousands of years. Other site types include modified trees, water sources and several places where cultural objects were stored for safe keeping. All sites have been recorded to a site identification and Section 18 standard and provide accurate detail of their location and importance to living Wajarri Yamaji People. Appropriate buffer zones as recommended by the heritage survey reports will be implemented.

Fenix has established a working relationship with the Wajarri Yamaji People and the WYAC through the successful development and operation of the Iron Ridge mine.

A Mining Agreement between SMC and the Wajarri Yamaji Native Title group was fully executed in 2015. In compliance with the Native Title and Heritage Sustainable Benefits Agreement between WY and SMC.

Deed of Covenant to the Native Title Mining Agreement with the Wajarri Yamaji Native Title group was fully executed by Fenix in early 2025. Fenix agree to be bound by specific terms of the Native Title and Heritage Sustainable Benefits Agreement and gain informed consent for mining activities outlined in this Mining Proposal.

The Aboriginal Cultural Heritage Inquiry System (ACHIS) that is administered by the Department of Planning, Lands and Heritage (DPLH), shows that there are two Aboriginal sites listed on the Mining Proposal land. These sites are DPLH ID 32728 (Weld-QASA-0842) and DPLH ID 11181 (Wilgie Creek). Both these sites are displayed in dithered or expanded boundaries on the ACHIS and mask the actual location of

each site.

DPLH ID 32728 was recorded by Eureka Consulting and WYAC members in 2010. The site features three stone structures that indicate the locations of 3 potential burial sites, a stone quarry and an artefact scatter. Fenix has the exact GPS coordinates for this site from the heritage survey report it commissioned. The reason DPLH has masked the location of the site using a dithered boundary is because of the potential burial sites that may be present. This DPLH mapping protocol is designed to limit unwanted visitation to sites that have sensitive cultural values such as burials. Fenix confirms that the actual location of DPLH ID 32728 is not within the project disturbance footprint.

DPLH ID 11181 is a small artefact scatter that was recorded in 1969. The DPLH has mapped the site using a large box on the ACHIS because accurate GPS coordinates were not available at the time of the original recording in 1969. Fenix has reviewed the original recording and the sketch drawings and confirms that the actual location of the site is not within the proposed disturbance footprint. Additional Aboriginal heritage surveys were undertaken through the WYAC in June and July 2024 and confirmed the location of DPLH ID 11181 is not within the project disturbance footprint.

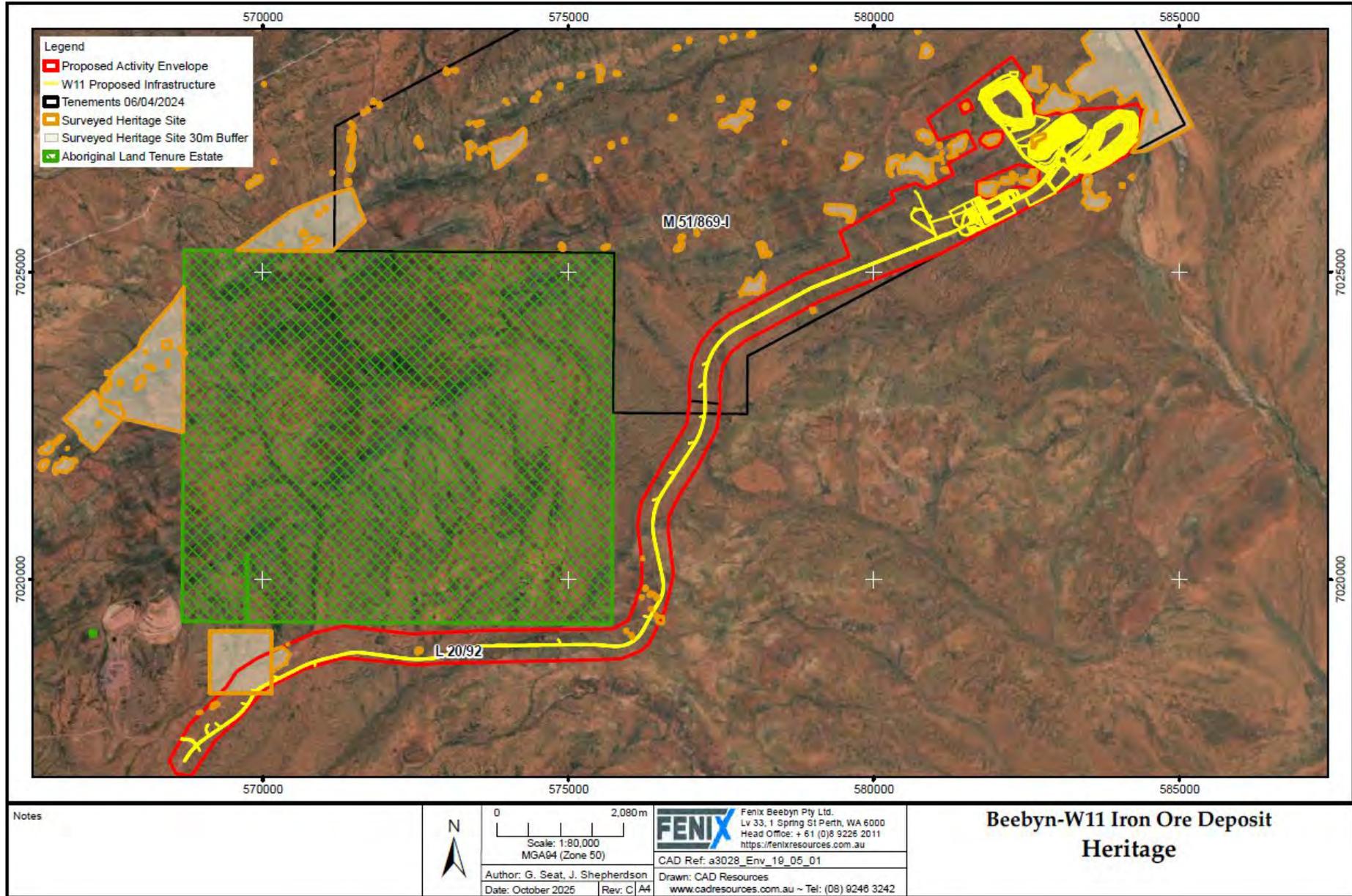


Figure 3.15: Heritage areas in the Beebyn-W11 project area.

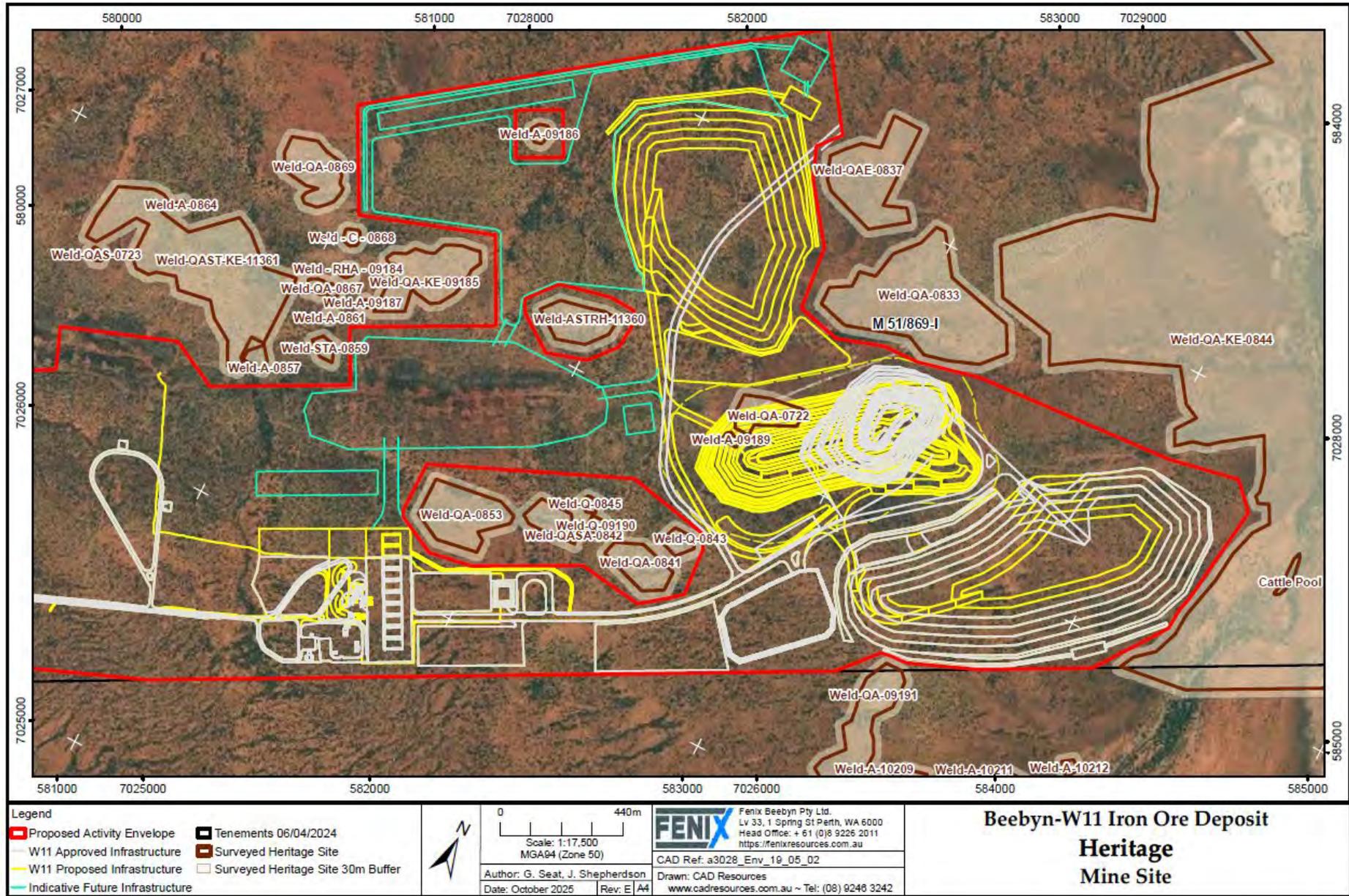


Figure 3.16: Heritage areas in the Beebyn-W11 mining area.

4 IMPACTS AND MANAGEMENT

4.1 Impact to conservation significant flora

Eight Priority listed flora species have been recorded in and around the project area. Based on the surveys by Ecotec (2024a and 2025), individuals from four of the Priority species recorded will be impacted by the proposed development. Impact to these species from the proposed development is expected to be minimal, and all species are widespread and well represented in the Weld Range and surrounding area.

4.1.1 Management actions

To minimise potential impacts to Priority flora species, Fenix will:

- implement a Site Disturbance Permit system with strict survey controls and requiring sign off by the Registered Manager prior to clearing commencing.
- clearly delineate areas to be cleared using survey pegs and coloured flagging tape and record (“pick up”) cleared areas on completion.
- maintain records of clearing undertaken.
- provide information to site personnel by way of induction and specific training where necessary to identify conservation significant species and highlight the importance of clearing protocols.

4.2 Impact to conservation significant vegetation and ecological systems

No State (BC Act) or Commonwealth (EPBC Act) listed Threatened Ecological Communities (TECs) occur within the project area. A portion of the Beebyn-W11 Project area coincides with the Priority 1 PEC Weld Range Vegetation Complexes (banded ironstone formation) (*ecologia* 2020a). Ecotec (2024a) determined that vegetation units 2, 3, 4, 5, 7, 8 and 15 correspond to the PEC as delineated by DBCA (2019) (refer to Section 3.5).

The Priority 1 PEC Weld Range Vegetation Complexes (banded ironstone formation) occupies an area of 20,318 ha.

Table 4.1 summarises the significance of each of the vegetation types in the project area that are associated with the PEC and the planned area of disturbance to each. The area of project disturbance (excluding existing disturbance in the area) to vegetation associated with the Weld Range PEC equates to less than 1.3% of the PEC (20,318 ha) and is therefore not considered to be a significant impact.

Table 4.1: Impact to PEC vegetation.

Vegetation Code	Approved Activity Envelope in PEC (ha)	Proposed Activity Envelope in PEC (ha)
2	30.0	27.2
3	45.4	71.7
4	5.7	12.3
5	29.5	36.6
7	3.7	23.2

Vegetation Code	Approved Activity Envelope in PEC (ha)	Proposed Activity Envelope in PEC (ha)
8	1.8	85.7
15	-	3.5
Total	116.1	260.2
Impact to PEC	0.57%	1.28%

4.2.1 Management actions

To minimise further impact to vegetation associated with the Weld Range PEC, Fenix will:

- implement a Site Disturbance Permit system with strict survey controls and requiring sign off by the Registered Manager prior to clearing commencing.
- clearly delineate areas to be cleared using survey pegs and coloured flagging tape and record (“pick up”) cleared areas on completion.
- maintain records of clearing undertaken.
- provide information to site personnel by way of induction and specific training where necessary to identify conservation significant vegetation and highlight the importance of clearing protocols.

4.3 Introduced flora species

The vegetation in the vicinity of the Beebyn-W11 Project is in good condition. Minor occurrences of existing weed species have been recorded in the area (refer to Section 3.6).

Weed seeds can be transported in soil and vegetative material attached to the machinery and equipment. Weeds can be introduced to site via machinery and equipment that has come from weed infested areas without being cleaned.

4.3.1 Management actions

To minimise the potential for new (and potentially invasive) weed species to be introduced to the site, Fenix will require that:

- machinery and equipment is thoroughly cleaned prior to being mobilised to site.
- contractors provide a weed hygiene certificate for each item of machinery brought to site.
- machinery and equipment that arrives on site will be inspected. Machinery that does not meet the hygiene requirements will require removal and additional cleaning in an appropriate location.

The potential spread of weed species and establishment of new weed populations will be minimised by:

- regular monitoring of disturbed areas and road verges to identify weeds
- identifying weeds species, abundance and cover during rehabilitation monitoring
- control of weed outbreaks using herbicide or manual removal
- preventing stock access to rehabilitated areas
 - educating site personnel by way of the site induction.

4.4 Impact to conservation significant fauna or their habitat

Clearing of vegetation for development of project infrastructure will remove a portion of habitat types suitable for a number of Priority fauna species.

The proposed site layout avoids impact to known locations of *Idiosoma clypeatum* (P3). The species is widespread in the surrounding region.

Disturbance to some suitable habitat in the project area for *Lerista eupoda* (P1) will occur where creek crossings are constructed for access roads. There is a limited extent of habitat (Drainage line) within the project area suitable for *Lerista eupoda* (P1) (refer to Figure 3.10 - Figure 3.12).

A limited extent of habitat (Rocky ridge or outcrop) potentially suitable for *Antechinomys longicaudata* (P4) exists around the project area and additional habitat occurs across the Weld Range.

There is no suitable habitat (granite outcropping) in the project area for the western spiny-tailed skink.

4.4.1 Management actions

To minimise further impact to fauna habitat, Fenix will:

- ensure clearing is undertaken in accordance with the approved Clearing Permit
- implement a Site Disturbance Permit system with strict survey controls and requiring sign off by the Registered Manager prior to clearing commencing
- undertake clearing in a progressive manner and kept to the minimum required for the project
- clearly delineate areas to be cleared using survey pegs and coloured flagging tape and record (“pick up”) cleared areas on completion
- maintain records of clearing undertaken
- provide information to site personnel by way of an induction and specific training where necessary to identify conservation significant fauna and highlight the importance of clearing protocols.

5 ASSESSMENT AGAINST THE 10 CLEARING PRINCIPLES

(1) Native vegetation should not be cleared if it comprises a high level of biological diversity.

The survey of the project area by APM (2024) recorded 77 vascular plant taxa from 21 families and 40 genera. The survey prior (*ecologia* 2010b) recorded 393 vascular flora taxa from 57 families and 140 genera within the Beebyn-W11 area and surrounding region; including six introduced species and 24 Priority listed flora species.

The Ecotec (2024a and 2025) surveys recorded 16 vegetation types within the project area, which generally corresponded with the floristic communities described by Markey and Dillon (2008) and have been recorded over the length of the Weld Range in the DEC survey (Markey and Dillon 2008).

The Priority 1 Weld Range PEC occurs within the area.

While BIF ranges in general are considered to have significant biodiversity value because of their unique geology, soils and relative isolation, the Weld Range was described as being a “lower biodiversity value site, although still providing refugial habitats with localised species and vegetation communities” (DEC 2007).

Less than 1.3% of vegetation associated with the Weld Range PEC will be impacted by the development.

Clearing of native vegetation within the area is not considered to be at variance to this principle.

(2) 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.

Although areas of suitable habitat for several species of conservation-significant fauna occurs within the project area, the area is not considered to provide habitat necessary for the survival of these species. The fauna habitat to be impacted by the project is represented in the surrounding area and accounts for a very small proportion of available habitat.

The proposed site layout avoids impact to known locations of *Idiosoma clypeatum* (P3). The species is widespread in the surrounding region (refer to Figure 3.8).

There is a limited extent of habitat (Drainage line) outside the project area suitable for *Lerista eupoda* (P1) (refer to Figure 3.10) and disturbance will occur where creek crossings are constructed for access roads.

A limited extent of habitat (Rocky ridge or outcrop) potentially suitable for *Antechinomys longicaudata* (P4) exists around the project area and additional habitat occurs across the Weld Range.

There is no suitable habitat (granite outcropping) in the project area for the western spiny-tailed skink.

Clearing of native vegetation within the area is not considered to be at variance to this principle.

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

The area does not coincide with any previously recorded Rare flora taxa, and no Rare flora species are listed as potentially occurring in the area. Accordingly, the area is not considered necessary for the continued existence of Rare flora.

Eight Priority listed flora species have been recorded in and around the project area. Based on the survey by Ecotec (2024a and 2025), individuals from four of the Priority species recorded will be impacted by the proposed development. Impact to this species from the proposed development is expected to be minimal, and all species are widespread and well represented in the Weld Range and surrounding area.

Clearing of native vegetation within the area is not considered to be at variance to this principle.

(4) 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.

The project area does not coincide with any Threatened Ecological Communities listed under the *Environment Protection and Biodiversity Conservation Act 1999* (C'th). Accordingly, the area is not considered necessary for the maintenance of a Threatened Ecological Community.

Development of the project will result in impact to less than 1.3% of vegetation associated with the Priority 1 Priority Ecological Community "Weld Range vegetation complexes (banded ironstone formation)".

Clearing of native vegetation within the area is not considered to be at variance to this principle.

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

The project area supports 16 distinct vegetation types, none of which have been extensively cleared nor can be considered remnant vegetation.

Clearing of native vegetation within the area is not considered to be at variance to this principle.

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

The project area does not contain native vegetation that is within or associated with any significant watercourse or wetland. The nearest significant surface water feature is Lake Austin, more than 50 km from the site.

Several minor ephemeral drainage lines pass through the area. The project has been designed to avoid these in the majority. Road crossings will be required at several locations but disturbance to vegetation will be minimal.

Clearing of native vegetation within the area is not considered to be at variance to this principle.

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

None of the vegetation in the area is associated with land that is recognised as being particularly susceptible to land degradation. Appropriate surface water drainage and containment around cleared areas will minimise the potential for surface water erosion. Land degradation resulting from clearing of vegetation is considered unlikely.

Clearing of native vegetation within the area is not considered to be at variance to this principle.

(8) 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.

The project area partly coincides with Priority 1 PEC "Weld Range vegetation complexes (banded ironstone formation)". Approximately 260.2 ha (excluding existing disturbance in the area) of disturbance proposed for the project will occur within the PEC, inclusive of the buffer zone. This equates to less than 1.3% of the buffered Weld Range PEC (20,318 ha).

Clearing of native vegetation within the area is not considered to be at variance to this principle.

(9) 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.

The project has been designed to minimise impact to a number of small ephemeral drainage lines. Drainage and containment structures incorporated into the development areas will ensure surface water runoff is controlled and minimise the potential for contaminants and sediment to enter the surface water system.

Clearing of vegetation is not anticipated to have any impact on the groundwater system. Clearing of native vegetation within the area is not considered to be at variance to this principle.

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

The project area is elevated with surface water runoff flowing generally in a southerly direction. Runoff from cleared areas will be directed toward the perimeter where appropriate drainage and containment structures will be in place. Flooding of the area is considered very unlikely.

Clearing of native vegetation within the area is not considered to be at variance to this principle.

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Beebyn 11
Weld Range
Biological Survey
Murchison, Western Australia

Prepared for
Sinosteel Midwest Corporation Limited by
Animal Plant Mineral Pty Ltd.

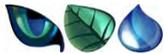


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EXECUTIVE SUMMARY

Animal Plant Mineral Pty Ltd (**APM**) was commissioned by Sinosteel Midwest Corporation Limited (**SMC**) to undertake a Detailed flora and vegetation and Basic terrestrial fauna survey for a section of the Weld Range Iron Ore Project, located 72 kilometres (**km**) west southwest of Meekatharra and 60 km northwest of Cue in the Midwest region of Western Australia. The area under investigation is referred to herein as Beebyn 11 or as the Survey Area. The Survey Area totals 1056 hectares (**ha**) and is within Mining Lease (**ML**) 51/869.

The field survey was conducted between the 15th and 17th of November 2023. Winter rainfall in the season preceding the survey was below average, however annual rainfall was above average, with high falls in March and April 2023. The low rainfall preceding survey and the survey timing was a minor constraint to the completeness of the flora survey.

The flora and vegetation of the Weld Range have been well surveyed with studies conducted by Markey and Dillon (2008) and Ecologia (2009a) across the range.

Three vegetation types are described for the Survey Area. Vegetation of conservation significance was recorded as vegetation that occurs within the Weld Range Priority Ecological Community (**PEC**), excluding Disturbed areas, which totals 201 ha or 1.0% of the Weld Range PEC. The current extent of regional vegetation units present in the Survey Area is close to pre-European extent. Vegetation is in Good condition with the main disturbances being high intensity grazing leading to soil degradation and vegetation clearing for station roads and mining exploration activities. Completely Degraded areas comprise 31 ha or 3% of the Survey Area.

No Threatened (**T**) flora was recorded in the Survey Area or is known to occur in the local area. One specimen that may be a Priority (**P**) species *Hibiscus ?krichauffianus* was recorded but insufficient material was available to definitively determine the species. If confirmed, this would represent a significant range extension for the poorly known species. An additional three species were determined as present based upon historic survey records and 11 assessed as Likely to occur based upon the proximity of known locations and the availability of suitable habitat. Targeted search for these species would be required to determine the currency and abundance of presence within the Survey Area. Periods of fertility for these species, and therefore suitable timing for targeted search is in winter and early spring.

No Declared weeds or Weeds of National Significance were recorded or are known to occur in the local area.

Four fauna habitats are described for the Survey Area. Acacia Sand Plain is the most common habitat present covering 500 ha (47%) of the Survey Area. Mulga Woodland on Hill Slope is the next most common covering 333 ha (32%) of the Survey Area. Drainage Line and Banded Ironstone Ridge habitats are also present which cover 186 ha (18%) and 6 ha (0.6%) of the Survey Area respectively.

The literature review identified 22 species of conservation significant fauna that were assessed for likelihood of occurrence within the Survey Area. Of these, one is present, four are likely to occur and four are possibly occurring, with the remainder considered unlikely to occur due to lack of suitable habitat and/or age of record.

Conservation significant fauna that have previously been recorded within the Survey Area are:

- Northern shield-backed trapdoor spider (P3) is known to occur in the Weld Range, including within the Survey Area. Suitable habitat occurs in the Mulga Woodland on Hill Slope habitat.

Conservation significant fauna that were assessed as Likely to occur include:

- Southern whiteface has recently been listed as T under the Commonwealth Environmental Protection and Biodiversity Conservation Act 1999 (**EPBC Act**) but remains unlisted under Western Australian (**WA**) legislation. The species has been recorded commonly in the Weld Range and surrounding local habitats. It is unknown whether the sedentary species occurs within the Survey Area and the habitats are of poor quality due to a degraded understory and litter layer. Confirmation of species presence through targeted survey is required to unequivocally determine the presence of critical habitat;
- The Fork-tailed swift is a Migratory (**Mi**) species and due to the proximity of local records and the broad use of habitats, is considered likely to occur. The species rarely comes to land however and the Survey Area is not expected to be important habitat for the species;
- The West Coast mulga slider has been recorded in the Weld Range including in locations close to the Survey Area. The fossorial species is most likely to be found in areas where litter is prevalent and whilst the Survey Area is likely to be within the species broader area of occupation, the habitats within the Survey Area are generally of poor quality. Leaf litter is scarce within the Survey Area, and soils are degraded and likely poor for burrowing. Higher quality microhabitats occur in the Drainage Line habitat however soils may be too stony to be suitable.
- The Long-tailed dunnart is known from the Weld Range recorded on exposed rock and stony soils with hummock grasses and shrubs, flat-topped hills, lateritic plateaus, sandstone ranges and breakaways, generally with a vegetation of sparse mulga over spinifex Ecologia (2009b). In the Survey Area, suitable habitat is in the Banded Ironstone Ridge habitats, and rocky Drainage Lines between ridges.

Conservation significant fauna assessed as Possibly occurring include Grey falcon (T), Western spiny-tailed skink (T), Malleefowl (T) and Peregrine falcon (other specially protected).

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PROJECT TERMS

Abbreviation	Meaning
The Project	Beebyn 11 deposit at the Weld Range Iron Ore Project
Survey Area	The 1056 ha area that is the subject of this survey, also called Beebyn 11 and is a section of the Weld Range Project.

UNITS OF MEASURE

Unit	Measure
%	Percentage
°C	Degrees Celsius
ha	Hectare
km	Kilometre
m	Metre
mm	Millimetre

LIST OF ABBREVIATIONS

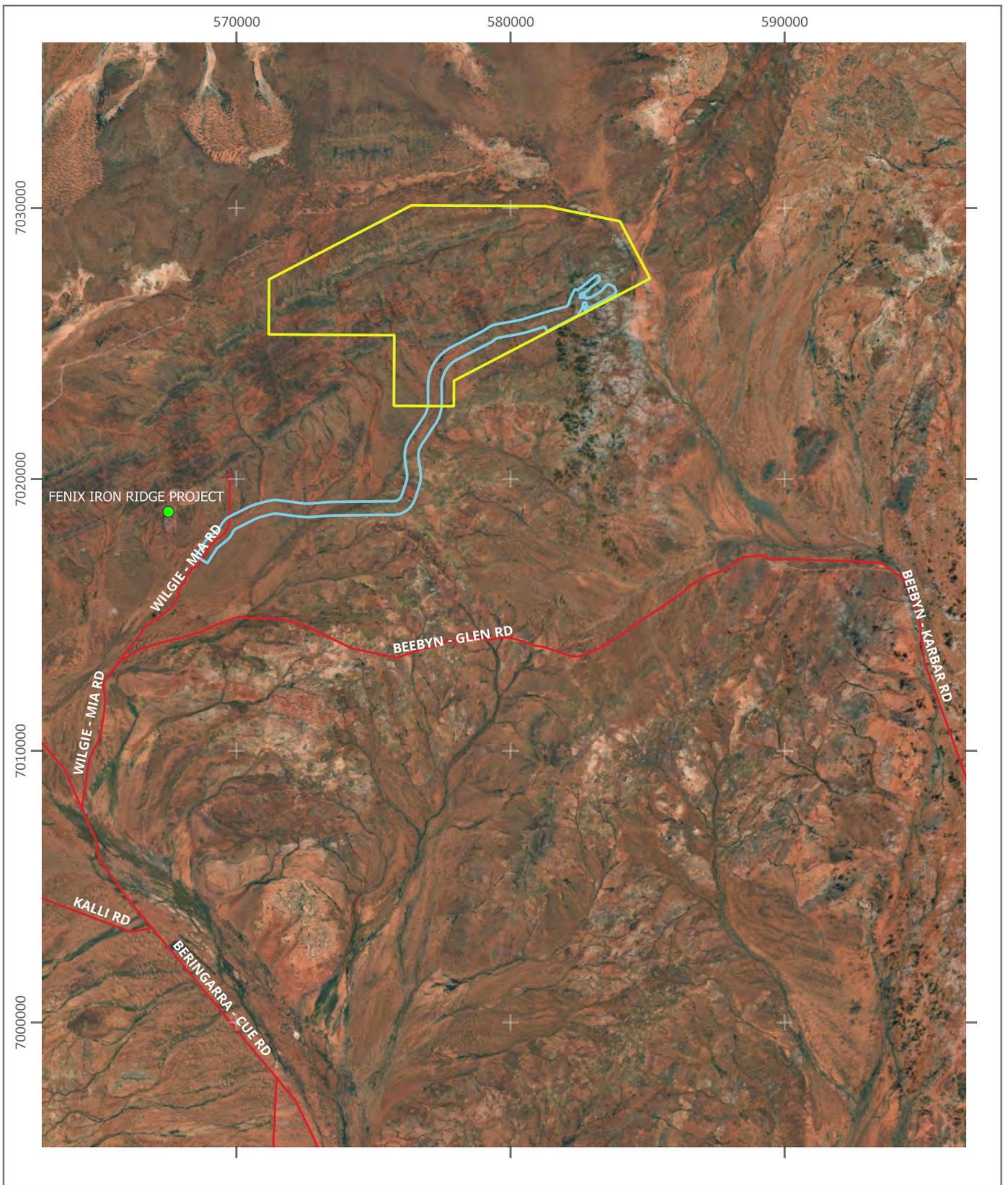
Abbreviation	Meaning
APM	Animal Plant Mineral Pty Ltd
BAM Act	<i>Biosecurity and Agriculture Management Act 2007</i>
BC Act	<i>Biodiversity Conservation Act 2016</i>
BIF	Banded Iron Formation
BoM	Bureau of Meteorology
CD	Conservation Dependent
DBCA	Department of Biological Conservation and Attractions
DCCEEW	Department of Climate Change, Energy, the Environment and Water
DEE	Department of Energy and the Environment
DWER	Department of Water and Environment Regulation
DPIRD	Department of Primary Industries and Regional Development
EN	Endangered
EPA	Environmental Protection Authority
EPBC Act	<i>Environment Protection and Biodiversity Conservation Act 1999</i>
ESA	Environmentally Sensitive Areas
GDE	Groundwater Dependent Ecosystems

Abbreviation	Meaning
GPS	Global Positioning System
IBRA	Interim Biogeographic Regionalisation for Australia
IBSA	Index of Biodiversity Surveys for Assessment
MI	Migratory
MNES	Matters of National Environmental Significance
NDVI	Normalised Difference Vegetation Index
OS	Other Specifically Protected
PEC	Priority Ecological Community
P	Priority
PMST	Protected Matters Search Tool
SMC	Sinosteel Midwest Corporation Limited
TEC	Threatened Ecological Community
T	Threatened
VU	Vulnerable
WA	Western Australia
WONS	Weeds of National Significance

1 INTRODUCTION

1.1 PROJECT AND LOCATION

Animal Plant Mineral Pty Ltd (**APM**) was commissioned by Sinosteel Midwest Corporation Limited (**SMC**) to undertake a Detailed flora and vegetation and Basic terrestrial fauna survey for the Beebyn 11 deposit within the Weld Range Iron Ore Project, located 72 kilometres (**km**) west southwest of Meekatharra and 60 km northwest of Cue in the Midwest region of Western Australia (**WA**). The area under investigation is referred to herein as Beebyn 11 or as the Survey Area. The Survey Area totals 1056 hectares (**ha**) and occurs partially within M 51/869 (Figure 1-1).



Author: VM Approved: EH Date: 26/03/2024

Project Location

Prepared for:



Figure 1-1

Scale: @ A4 0 2 4 km
 1: 200,000

Coordinate System: GDA 2020
 Zone 50 Projection: Transverse Mercator



Legend

- Survey Area □
- Tenement M51/869-1 □
- Main Roads —



1.2 SCOPE OF WORK

The scope of work includes a Detailed flora and vegetation and Basic terrestrial fauna survey. Survey data accompanies this report in a format suitable for submission to the Index of Biodiversity Surveys for Assessment (**IBSA**) online portal.

1.2.1 Flora and Vegetation

The flora and vegetation survey was conducted in accordance with the Environmental Protection Authority's (**EPA**) *Technical Guidance – Terrestrial Flora and Vegetation Surveys for Environmental Impact Assessment* (2016) at a Detailed level of assessment.

The aims of the desktop study were to:

- Establish vegetation associations previously determined for the site;
- Identify threatened (**T**) and priority (**P**) flora and ecological communities (**PECs** and **TECs**) previously recorded on site;
- Identify weed species previously determined as present on site, in particular any Declared weeds; and
- Identify potentially suitable habitat for conservation significant flora known from the region, using publicly available regional datasets such as geological, land system, surface water and Groundwater Dependent Ecosystems (**GDE**) mapping products.

The aims of the field survey were to:

- Describe and map the vegetation types present and provide comparisons to locally described types;
- Compile an inventory of flora taxa encountered; and
- Identify conservation significant features of the flora and vegetation.

1.2.2 Terrestrial Fauna

The scope of work was to conduct a basic terrestrial fauna survey in accordance with the EPA's fauna guidelines: *Technical Guidance – Terrestrial Vertebrate Fauna Surveys for Environmental Impact Assessment* (2020).

The aims of the desktop study were to:

- Identify T and P Fauna species previously determined as present on-site;
- Identify habitat types previously determined as present on-site regarded as suitable for T and P fauna; and
- Identify introduced species previously determined as present on-site.

The aims of the field survey were to describe habitat availability for Conservation Significant fauna and the quality or condition of available habitats.

2 BACKGROUND AND SUPPORTING INFORMATION

2.1 RELEVANT LEGISLATION AND GUIDANCE

2.1.1 Commonwealth Government EPBC Act

The Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* (**EPBC Act**) is administered by the Department of Climate Change, Energy, the Environment and Water (**DCCEEW**). It provides a legal framework to protect and manage nationally and internationally important flora, fauna, ecological communities and heritage places, defined in the EPBC Act as Matters of National Environmental Significance (**MNES**).

If a project has the potential to significantly impact on MNES it is to be referred to the DCCEEW for determination on whether the matter is a 'controlled action' and therefore requiring assessment.

The EPBC Act provides for the identification and listing of species under several categories listed in Appendix A. The EPBC Act also provides for the development of conservation advice and recovery plans, development of a register of critical habitat, recognition of key threatening processes and the development of threat abatement plans.

2.1.2 Western Australia BC Act

The *Biodiversity Conservation Act 2016* (**BC Act**) provides a statutory basis for the listing of T species, specially protected species, extinct species, TECs, collapsed ecological communities, critical habitat and key threatening processes in WA. The BC Act provides for the listing of T flora and fauna species and ecological communities under specified conservation categories listed in Appendix A. Species and communities listed under the BC Act are protected and require authorisation by the Minister to take or disturb.

Species may also be listed as being of special conservation interest if they have a naturally low population, restricted natural range, are subject to or recovering from a significant population decline or reduction of range or are of special interest to science. Species of special conservation interest, migratory species and species subject to international agreements are known as Specially Protected Species in the BC Act.

2.1.3 Western Australia Priority species and communities

Flora and fauna species and communities are listed by the Department of Biodiversity, Conservation and Attractions (**DBCA**) as P when they are considered to have a greater level of significance than other native species and communities. This generally occurs where populations are geographically restricted or threatened by local processes, or where there is insufficient information to formally assign them to T species and communities categories. Whilst P species and communities are not specifically listed in the BC Act, all flora and fauna are protected in WA following the provisions in Part 10 of the BC Act. This protection applies even when a species is not listed as T or specially protected. The categories covering P species and communities are listed in Appendix A.

2.1.4 BAM Act

Plants may be 'Declared' by the Agriculture Protection Board under the *Biosecurity and Agriculture Management Act 2007* (WA) (**BAM Act**). Declared Plants are gazetted under three categories (C1-C3) which define the action required. Details of the definitions of these categories are provided in Appendix A. A declaration may apply to the whole State, to districts, individual properties or even to single paddocks. If a plant is 'Declared', landholders are obliged to control that plant on their properties.

2.1.5 Weeds of National Significance

The DCCEEW, along with the State and Territory governments, has endorsed 32 Weeds of National Significance (**WONS**). Four major criteria were used in determining WONS:

- The invasiveness of a weed species;
- A weed's impact;
- The potential for spread of a weed; and
- Socio-economic and environmental values.

Each WONS has a national strategy and a national coordinator, responsible for implementing the strategy. WONS are regarded as the worst weeds in Australia because of their invasiveness, potential for spread, and economic and environmental impacts (DAWE 2020).

2.1.6 Guidelines

The terrestrial biological assessment was conducted in accordance with the above Commonwealth and State legislation, as well as EPA requirements for environmental surveys as outlined below:

- *Technical Guidance: Terrestrial Vertebrate Fauna Surveys for Environmental Impact Assessment* (EPA 2020); and
- *Technical Guidance – Flora and Vegetation Surveys for Environmental Impact Assessment* (EPA 2016).

Relevant guidance for the preparation of spatial datasets to accompany this report are:

- Guidelines for biological survey and mapped data (Department of the Environment and Energy (**DEE**) 2018); and
- Instructions for the preparation of data packages for IBSA (EPA 2021).

2.2 LAND USE

The Survey Area lies within the Beebyn pastoral lease (N049894).

Active mining operations occur within the Fenix Iron Ridge Project, with the main mining and processing area 16 km to the southwest.

Exploration activity occurs at Mount Ridley's Weld Range West Project Madoonga and Wilgie Mia Formations 40 km to the southwest.

The Wilgie Mia Aboriginal Ochre Mine lies north of the road alignment included in the Survey Area. A 2000 ha area including the Ochre Mine was included on the National Heritage List on the 24 February 2011.

2.3 CLIMATE

The Weld Range is in the Midwest Region of WA, approximately 72 km west south-west of Meekatharra. The region experiences hot, dry summers and mild winters. Rainfall occurs predominantly between January and July. The nearest Bureau of Meteorology (**BoM**) weather station with a long historical record is at Meekatharra Airport (BoM Site Number: 007045), approximately 77 km east northeast of the Survey Area. Meekatharra Airport has recorded rainfall from 1944 (80 years), and temperature from 1950 (74 years). The average climate data recorded for the region over these periods is shown in Figure 2-1. Monthly mean maximum temperature ranges from 38.4°C in January to 19.3°C in July. Monthly mean rainfall ranges from 36.1 mm in February to 4.9 mm in September, with a mean annual rainfall of 233.8 mm (BoM 2023).

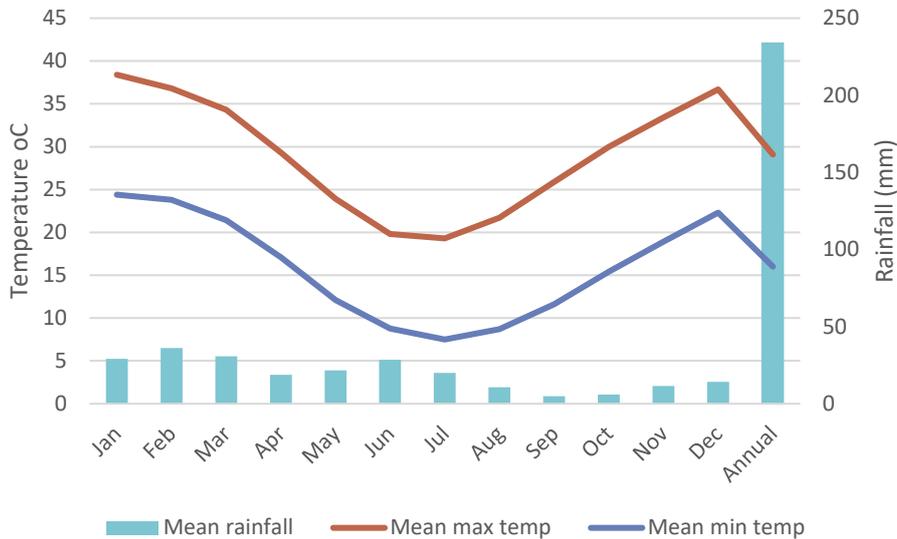


Figure 2-1. Temperature and rainfall averages for Meekatharra Airport weather station (Station No. 007045) (BoM 2023)

2.4 BIOGEOGRAPHIC REGIONALISATION

The Interim Biogeographic Regionalisation for Australia (**IBRA**, version 7) classifies the Australian continent into regions (bioregions) of similar geology, landform, vegetation, fauna, and climate characteristics (Thackway and Cresswell 1995). The mapping completed by Beard (1975) provides the basis for the IBRA bioregions. IBRA mapping (Version 7), places the Project within the Murchison Bioregion.

The Murchison Bioregion has low hills and mesas separated by flat colluvium and alluvial plains. Vegetation is predominantly low mulga woodlands. Other vegetation types include saltbush shrubland on calcareous soils, saline areas with samphire, and hummock grassland on red sandplain (Bastin *et al.* 2008).

The Murchison Bioregion is further subdivided into the Eastern Murchison (MUR1) and Western Murchison (MUR2) Sub-regions. The Project lies entirely within the Western Murchison Sub-region of the Murchison Bioregion.

The Western Murchison is the Murchison Terrains part of the Yilgarn Craton, and contains the headwaters of the Murchison and Wooramel Rivers, which drain the subregion westwards to the coast. The region is made up of mulga low woodlands (usually with bunch grasses and often rich in ephemerals) on outcrop, and fine textured Quaternary alluvial and eluvial surfaces (extensive hardpan washplains that dominate and characterise the subregion) mantling granitic and greenstone strata. Surfaces associated with the occluded drainage occur throughout, with hummock grasslands on Quaternary sandplains, saltbush shrublands on calcareous soils and halosarcia low shrublands on saline alluvia.

2.5 LAND SYSTEMS, GEOLOGY AND SOILS

Land Systems of the Murchison region are described by Curry *et al.* (1994). Mapping of Land Systems is available from Department of Primary Industry and Regional Development (**DPIRD**, 2022). The Survey Area falls within five soil landscape systems, as listed in Table 2-1 and illustrated in Figure 2-2.

Table 2-1. Land Systems

Land System	Geology	Description
Jundee	Cemented Quaternary alluvium derived mainly from greenstone	Hardpan plains with variable gravelly mantles and minor sandy banks supporting weakly groved mulga shrublands.
Violet	Archaean greenstone, Upper Proterozoic basalt, Tertiary laterite and veneers of Quaternary alluvium and colluvium.	Gently undulating gravelly plains on greenstone, laterite and hardpan, with low stony rises and minor saline plains; supporting groved mulga and bowgada shrublands and occasionally chenopod shrublands.
Weld	Archaean metamorphic rocks, mainly metasedimentary types; hematitic jaspilite, banded ironstone with quartzite wacke and schistose hornblende.	Rugged ranges and ridges of banded ironstone and quartzite, supporting acacia shrublands.

Wiluna	Archaean amphibolite, basalt and schistose rocks with Tertiary laterite capping; Quaternary colluvium on slopes and Quaternary alluvium on lowlands.	Low greenstone hills with occasional lateritic breakaways and broad stony slopes, lower saline stony plains and broad drainage tracts; supporting sparse mulga and other acacia shrublands with patches of halophytic shrubs.
Yarrameedie	Archaean metamorphic rocks with Quaternary colluvium	Undulating stony interfluves, drainage floors and pediment (foothill) plains below major ranges of crystalline rocks (mainly Weld land system) supporting sparse mulga shrublands.

The topography of the area is dominated by the Weld Range – a long band of steep ridges that run southwest to northeast and extend for 60 km and are 3-5 km wide. The range rises up to 250 metres (**m**) above the surrounding plains. The slope angles around the Weld Range vary from less than 5% to greater than 90%. Away from the ridges the topography is very flat.

There are some deeply incised valleys with drainage channels within Weld Range, however the land to the north has only a few well-defined channels and is characterised by numerous mud flats and salt pans.

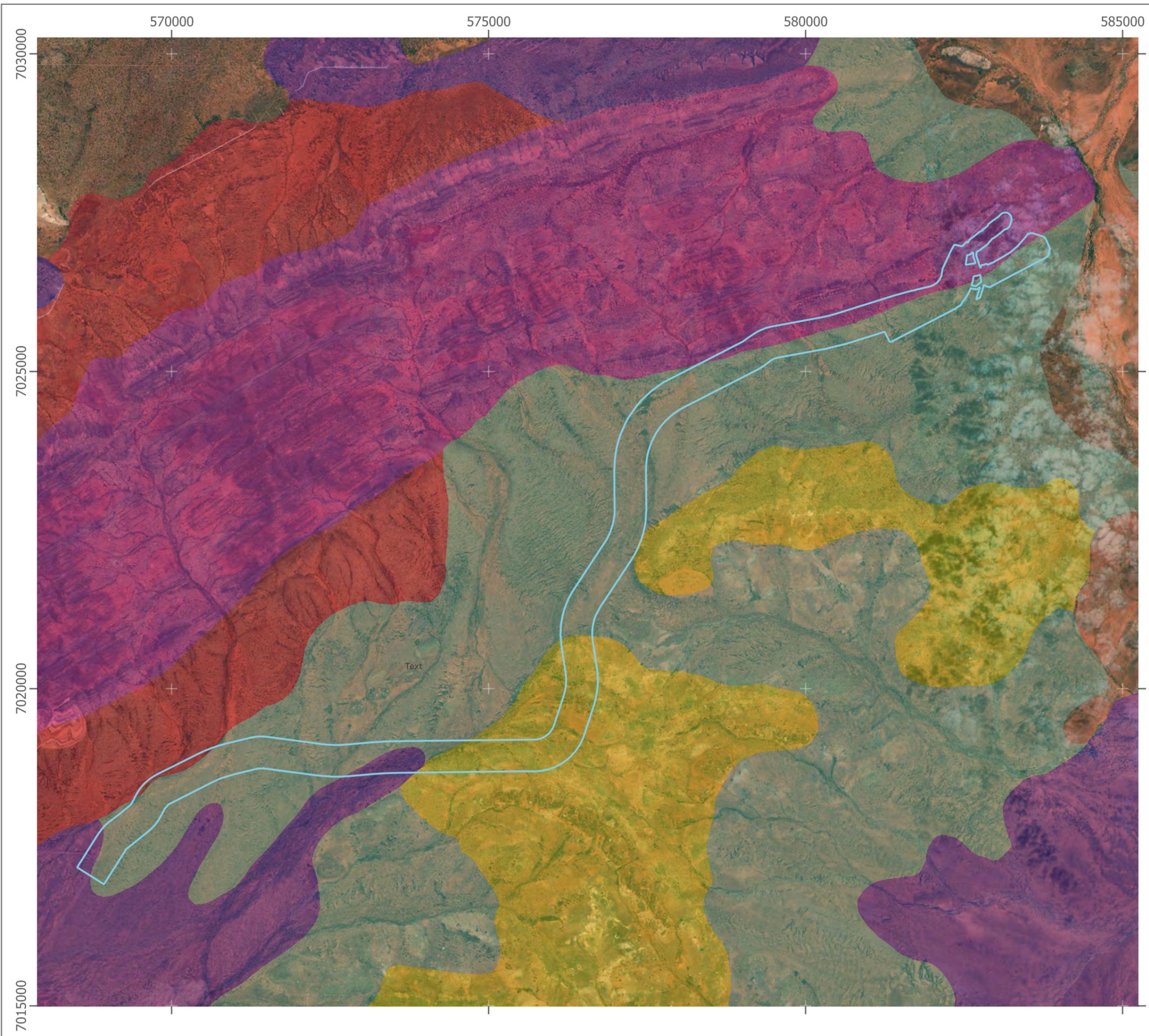
The Weld Range greenstone belt is predominantly composed of metabasites showing mainly doleritic and minor basaltic and gabbroic textures (Duuring *et al.* 2012). Exposures of these lithologies occur between the ridges which are defined by weathered, steeply dipping beds of resistant banded iron formation (**BIF**) which form less than 10% of the thickness of the sequence. Poorly exposed, very fine-grained clastic metasediments are only a very minor part of the sequence. Metamorphism is relatively low grade, varying from lowermost greenschist facies in the north to approximately greenschist-amphibolite transition facies in the south.

High grade iron mineralisation in the Weld Range area occurs as a series of outcrops of massive goethite-haematite lodes.

Geomorphology of the Weld Land System is of erosional surfaces; mountain ranges of strike belts and ridges with peaks 200 m or more above the new plateau plains; lower, rounded hill spurs flanking major ranges; steep hillslopes with extensive loose mantling and rock outcrop; lateritised ridges with caves; valley floors and undulating interfluves often intensely dissected by narrow rectangular drainage tracts with incised channels; sheds most colluvium and drainage to pediment Yarrameedie land system.

Geomorphology of the Violet system is of erosional surfaces; remnants of old plateau as gravelly sand plains above gently undulating outcrops of laterite and weathered greenstones; broad, lower stony plains on greenstone or red-brown hardpan, often densely mantled by pebbles of mixed lithology and with sluggish, occasionally channelled, drainage floors; relief mostly < 10 m.

Soil landscapes are mapped by Tille (2006) with the Survey Area occurring in the Upper Murchinson zone. These soils are described as hardpan wash plains (with stony plains, sandplains, hills and mesas) on granite and gneiss of the Yilgarn Craton (Narryer Terrane and Murchison Domain). Red-brown hardpan shallow loams and Red shallow loams with Red loamy earths and Red deep and some Red shallow sands and Red deep sandy duplexes. Vegetation is of Mulga shrublands (with some halophytic shrublands).



Legend

Land Systems

- Jundee Land System
- Violet Land System
- Weld Land System
- Wiluna Land System
- Yarrameedie Land System

Scale: @ A3 0 1 2 km
 1: 60,000
 Coordinate System: GDA 2020 MGA 50
 Projection: Transverse Mercator
 Author: VM Approved: EH Date: 26/03/2024

Land Systems

Prepared for:



Figure: 2-2

2.6 REGIONAL VEGETATION

Vegetation communities and land systems of the Weld Range were described by Speck and Mabbut *et al.* (1963) respectively as part of a regional survey of the Wiluna to Meekatharra area.

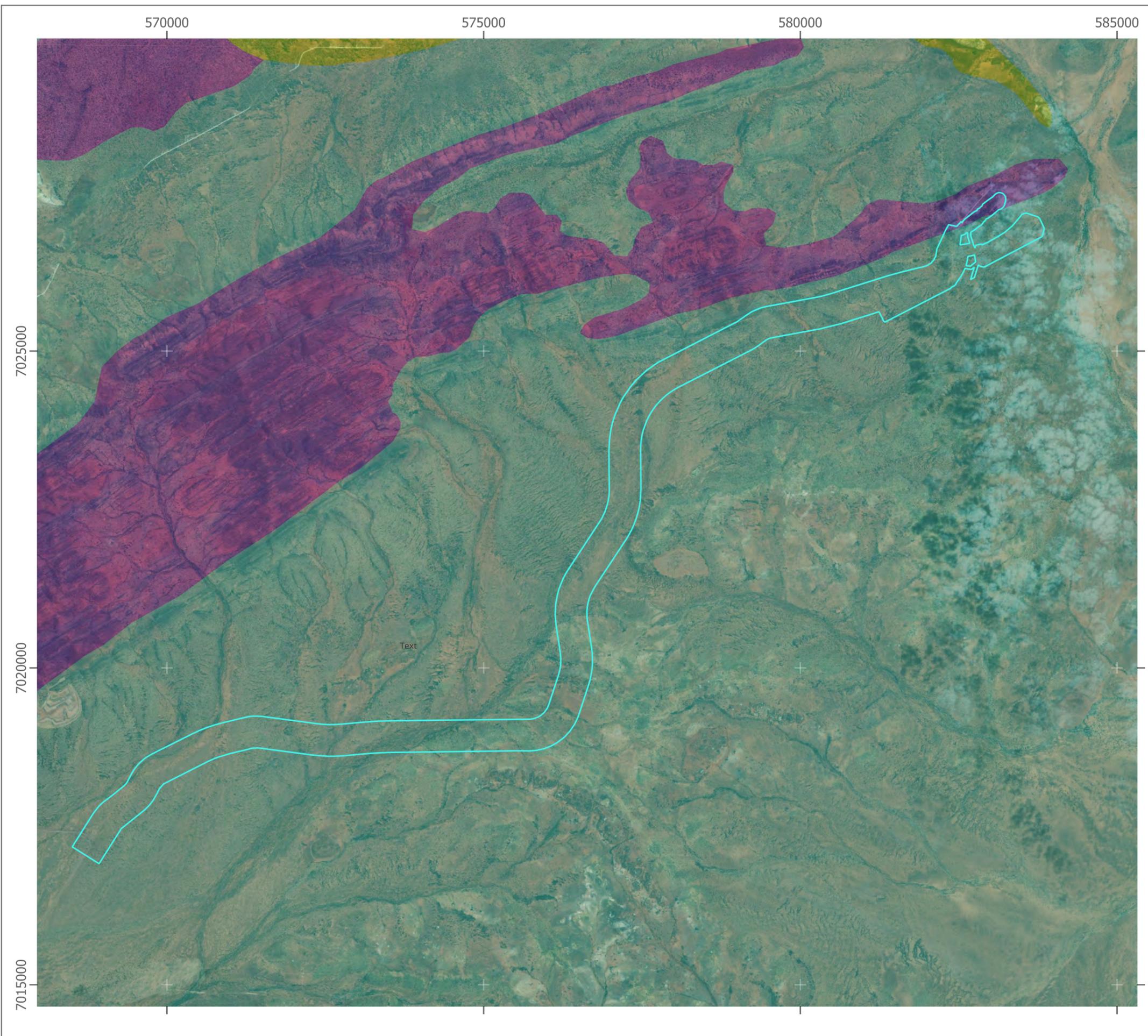
The vegetation communities of the area were mapped by Beard (1976) in his regional survey of the Murchison at a scale of 1: 1 000 000, describing the region as providing optimum conditions for the presence of mulga (*Acacia aneura*) woodlands. The Survey Area is located within the Murchison Botanical District of the Eremaean Botanical Province and contains two pre-European Beard vegetation associations of the Upper Murchison System as shown in Figure 2-3 (DPIRD 2019). The remaining extent of these vegetation associations is outlined in the most recent DBCA Statewide Vegetation Statistics table dated 2018 and summarised in Table 2-2 below.

Table 2-2 Pre-European Beard Vegetation Associations

Unit	Vegetation Description	Pre-European Extent (ha)	Current Extent (ha)	Pre-European Extent Remaining (%)	Current Extent within DBCA Managed Lands (%)
18	Low woodland, open low woodland or sparse woodland of <i>Acacia aneura</i> (Mulga) and associated species.	19,890,667	19,842,830	99.76	2.13
202	Scrub, open scrub or sparse scrub of <i>Acacia</i> spp. <i>Melaleuca</i> spp.	448,529	448,344	99.96	0.39

Beard vegetation associations that occur within the Survey Area have over 99% pre-European Vegetation extent remaining.

A finer-scale survey of the vegetation was undertaken by Curry *et al.* (1994), using the land systems of Mabbut *et al.* as part of their regional survey of rangelands within the Murchison River Catchment. The vegetation communities of the greenstone ranges of Weld Range (the Weld Land System) were surveyed between 1985 and 1988 and were reported to be dominated by *Acacia* species and rocky hill mixed shrublands, stony mulga mixed shrublands, and creekline shrublands.



Legend

- Survey Area
- Pre-European Beard Vegetation Associations
- 8
- 15
- 48

Scale: @ A3 0 1 2 km
 1: 60,000
 Coordinate System: GDA 2020 MGA Zone 50
 Projection: Transverse Mercator
 Author: VM Approved: EH Date: 26/03/2024

**Pre-European
 Beard Vegetation
 Associations**

Prepared for:



Figure: **2-3**

2.7 SIGNIFICANT AREAS

2.7.1 Conservation Estate

The Western Australian Conservation Estate includes land and waters vested in the Conservation and Parks Commission under the *Conservation and Land Management Act 1984*. The Conservation Estate is managed by the Parks and Wildlife Service of DBCA to protect WA's biodiversity, and includes National Parks, Nature Reserves, Conservation Reserves, and other areas managed primarily for biodiversity conservation (DEE 2016).

A search of the Collaborative Australian Protected Area Database returned no conservation estates located within 50 km of the Survey Area. The nearest gazetted terrestrial conservation estate is Lakeside National Park and Lakeside Conservation Park 82 km and 75 km south of the Survey Area respectively.

2.7.2 Environmentally Sensitive Areas

Environmentally Sensitive Areas (**ESA**) are areas that are defined by the Department of Water and Environment Regulation (**DWER**) (2019) as:

- A declared World Heritage property as defined in s.13 of the EPBC Act;
- An area that is included on the Register of the National Estate, because of its natural heritage value under the *Australian Heritage Council Act 2003*;
- A defined wetland and the area within 50 m of the wetland;
- The area covered by vegetation within 50 m of T flora, to the extent to which the vegetation is continuous with the vegetation in which the T flora is located;
- The area covered by a TEC;
- A Bush Forever site;
- Areas covered by the Gngangara Mound Crown Land Policy and Western Swamp Tortoise Policy;
- Areas covered by lakes, wetlands, and fringing vegetation of the Swan Coastal Plain Lakes Policy, including Southwest Agricultural Zone Wetlands Policy and Swan and Canning Rivers Policy; and
- Protected wetlands as defined in the *Environmental Protection (Southwest Agricultural Zone Wetlands) Policy 1998*.

Environmentally Sensitive Areas are available on the DWER (2021) clearing regulations spatial layer. There are no ESAs within the Survey Area.

The Australian Wetlands Database includes nationally significant wetlands (as listed in the directory of important wetlands), wetlands listed under the Ramsar convention, wetlands that are representative, rare or unique, or wetlands that are considered of international importance (DEE 2021). The nearest wetlands listed in the Directory of Important Wetlands to the Survey Area is Lake Annean, 35 km east. Lake Annean is a large saline brackish lake and marsh with numerous islands and peninsulas which is a significant breeding area for gull-billed terns and whiskered terns and other waterbirds.

2.7.3 National Heritage List

Wilgie Mia, a 2000 ha area immediately north of the road alignment, is listed under the EPBC Act as a National Heritage Place.

3 METHODOLOGY

3.1 DESKTOP STUDY

The desktop study provides background information on the known attributes of flora, vegetation, and fauna of the Survey Area, and in the local surrounding area.

3.1.1 Database Searches

A search for EPBC Act MNES was undertaken using the DCCEE Protected Matters Search Tool (**PMST**). The PMST identifies EPBC listed flora and fauna species and communities based on predicted distributions of the species and/or their habitat, in conjunction with species records. The PMST may predict the occurrence of a species or community in an area where there are no documented records, or documented records are historic. For this search, the Survey Area was imported into the PMST viewer as the feature area and a buffer of 30 km applied. The conservation codes are described in Appendix A. The results of the PMST search are included in Appendix B.

The DBCA maintains databases for records of T and P species and communities. A request was made for a search of DBCA databases for T and P flora and fauna and the presence of TECs or PECs. A 30 km buffer was applied to the search results.

Flora and Fauna Inventory, including records for Introduced flora and fauna from within 30 km, were obtained from the Dandjoo Biodiversity Data Repository hosted by the DBCA Biodiversity Office (DBCA 2023a).

Table 3-1 lists the database searches conducted for the desktop study.

Attribute	Search Area	Database	Location
Threatened and Priority Ecological Communities	30 km radius	DBCA	Figure 4-2; Section 4.1.1
	30 km radius	PMST	Appendix B
Significant Communities	Feature Area	GDE Atlas	Section 4.1.2
Threatened Flora	30 km radius	DBCA	Figure 4-1; Section 4.1.1
	30 km radius	PMST	Appendix B
Introduced Flora	30 km radius	Dandjoo	Section 4.1.3
Threatened Fauna	30 km radius	DBCA	Figure 5-1; Section 5.1.1
	30 km radius	PMST	Appendix B
Introduced Fauna	30 km radius	Dandjoo	Section 5.1.2

3.1.2 Literature Review

The Weld Range Project has been assessed by the EPA at the level of Public Environmental Review. A Scoping Document was agreed on the 4th November 2008, the EPA report on Assessment published on the 18th June 2012 and the project approved through Ministerial Statement 908 on 29th August 2012.

The project as approved in 2012 had a land disturbance area of 3589 ha, so baseline studies performed for the Project included the extent of tenement M 51/869-I and a much larger surrounding area, covering 53 km length of the Weld Range at up to 15 km width. Within this area flora, vegetation and fauna surveys were conducted to describe baseline conditions.

Table 3-2 describes the studies and reports generated for the Weld Range Project, and a summary of the findings.

Table 3-2. Weld Range biological surveys and reports

Reference	Description	Outcomes
Markey and Dillon 2008	Conducted in late August 2005. Flora and vegetation survey with assessment of distribution in relation to environmental factors.	Eight floristic community types (six types, two of these subdivided into two subtypes each) were identified and described for the Weld Range, with the primary division in the classification separating a dolerite-associated floristic community from those on BIF. Floristic communities occurring on BIF were found to be associated with topographic relief, underlying geology and soil chemistry. There did not appear to be any restricted communities within the landform, but some communities may be geographically restricted to the Weld Range, and all communities on the Weld Range are closely associated with topography and substrate.
Ecologia (2009a)	Summarises the 22 flora surveys conducted in three seasons: <ul style="list-style-type: none"> • Spring phase – November 2006; • Autumn phase – April 2007; and • Winter phases – July 2008 and June 2009 	Quadrat based survey established 239 sites and transect based survey conducted 1053 traverses. Resulted in the description of 17 vegetation types and mapping of 14 units as units 1a, 1b, 2a and 2b were unable to be clearly distinguished on the ground or on aerial imagery. Vegetation was primarily in Good condition (77%), with 14% in Very Good condition and 9% in Poor condition. Disturbances were heavy grazing pressure by livestock and feral goats, clearing for pastoral and mining exploration activity, and low weeds. 25 Conservation significant flora.
Ecologia (2009b)	Level 2 Survey conducted in four phases: <ul style="list-style-type: none"> • Spring – September 2006 • Autumn – March 2007 • Autumn – April 2007 • Spring – September 2007 Infrastructure area Level 1 survey: <ul style="list-style-type: none"> • September 2008 • August 2009 	Total survey effort consisted of 231 person days. Ten main fauna habitats were identified within the Project area. These include acacia sandplain, banded ironstone ridge, drainage lines, eucalypt sandplain, granite outcrops, lateritic breakaway, mulga drainage line, mulga woodland on hill slopes, rocky rise (ironstone) and rocky rise (quartz). Seven additional habitats of low spatial extent were also described as large rocky breakaway, massive breakaway complex, chenopod floodplain, dense eucalypt woodland, mulga woodlands and soft wandrie country, limestone bore and spinifex.
Ecologia (2009c)	Summarises studies conducted for Short Range Endemic (SRE) and T and P invertebrates. Madoonga, Beebyn and Hampton Hill were surveyed from August 2006 to November 2006, while Weld Range North was surveyed five months later from April 2007 to August 2007.	Systematic pitfall trapping and opportunistic foraging at 29 sites at Weld Range South and a further 15 sites were selected at Weld Range North (i.e. total 44 sites).

3.1.3 Likelihood of Occurrence

Threatened and Priority flora, fauna and communities returned from the database searches and literature review were assessed for their likelihood of occurrence within the Survey Area using the likelihood of occurrence criteria listed in Table 3-3.

Table 3-3. Likelihood of occurrence criteria

Likelihood of occurrence	Criteria
Present	Identified from database records or field survey as occurring within the Survey Area, and conditions are remain suitable for persistence.
Likely	Suitable habitat is present in the Survey Area and the species has previously been recorded within 15 km within recent times.
Possible	Suitable habitat is present within the Survey Area and the species has previously been recorded between 15 – 30 km of the Survey Area
Unlikely	No suitable habitat is present in the Survey Area, or records are historic and the species is no longer considered to occur in the region.

3.2 FIELD SURVEY

3.2.1 Survey Personnel and Timing and Conditions

The survey was carried out from the 15th to 17th of November by Dr Eleanor Hoy with the assistance of a field technician. Dr Hoy has 15 years industry experience and is the Biological Sciences Manager at APM.

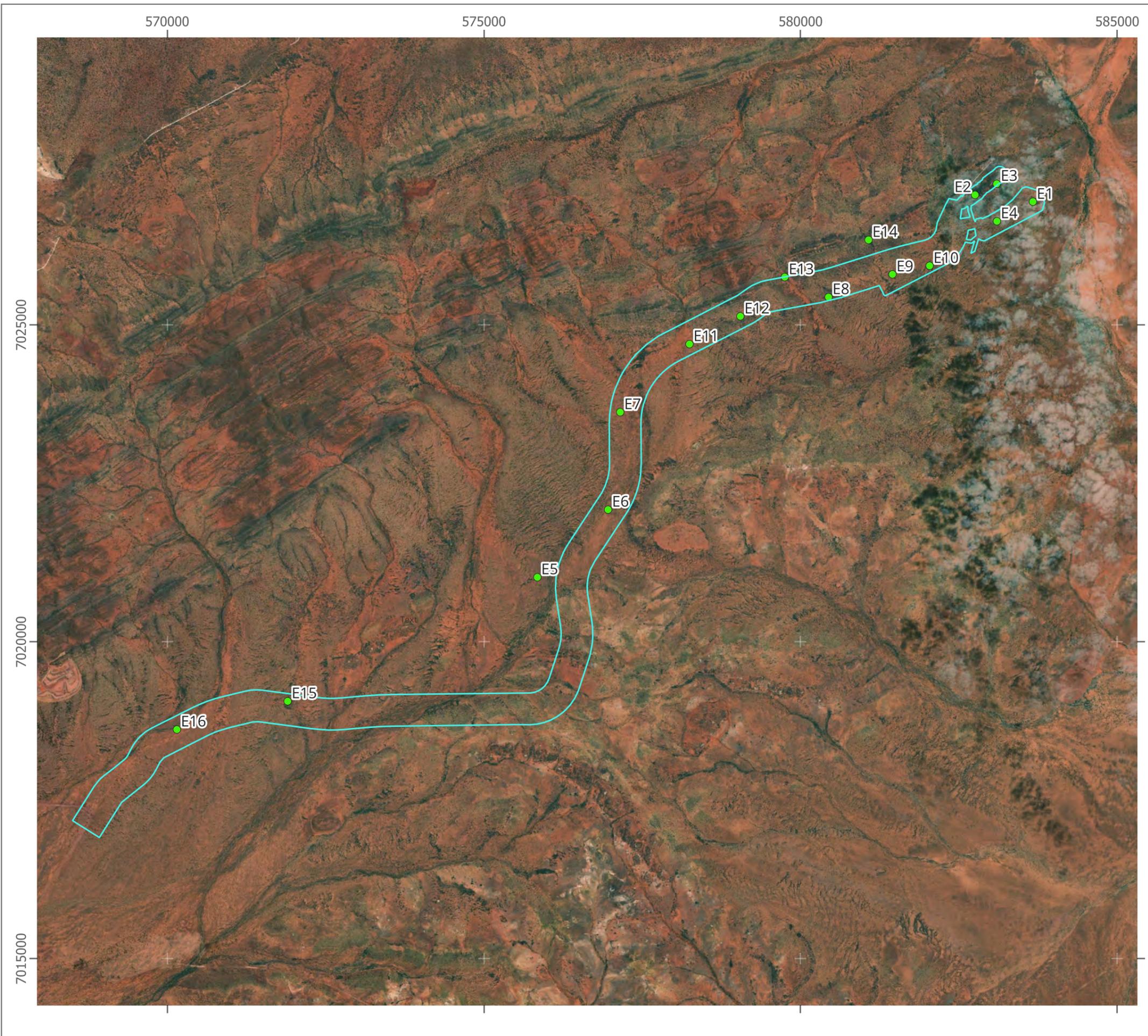
The total annual rainfall prior to survey (1st January 2023 to 15th November 2023) averaged at 213.8 mm compared to the long-term average of 206.4 mm (BoM 2023). This is due to a very large rainfall in March 2023, with a monthly total of 124.4 mm. Winter and spring rainfall was very low with 14.2 mm falling between May and October, compared to a long-term average of 91.5 mm for the same period.

The Survey Area is within the Eremaean botanical province. Recommended timing for flora and vegetation survey is 6-8 weeks post wet season (March – June) for Primary survey, and a Dry season survey (after winter rainfall if available) for Supplementary survey (EPA 2016). The timing of the field survey is outside of the period recommended for flora and vegetation survey in the region.

Due to the large rainfall in March, survey conditions were good. The Normalised Difference Vegetation Index (**NDVI**) for Beebyn Station, which shows how green the property is at any given time, is reported by DPIRD (2023a). In November 2023 the value was near to the 90th percentile for the property. Whilst soils were dry, the vegetation was in good condition, and annual/herbaceous flora contributed 29% of the total species richness.

3.2.2 Flora and Vegetation

A Detailed survey was conducted for flora and vegetation. Vegetation was sampled using 16 quadrats of 20 x 20 m (Figure 3-1). Quadrats are vegetation survey plots which are accurately measured out as 20 x 20 m (or an area equivalent to 2500 m²) and marked at each corner using a handheld Global Positioning System (**GPS**) unit.



Legend

- Survey Area
- Flora quadrats

Scale: @ A3 0 1 2 km
 1: 60000

Coordinate System: GDA 2020 MGA Zone 50
 Projection: Transverse Mercator

Author: VM Approved: EH Date: 26/03/2024

Flora Survey Sites

Prepared for:



Figure: **3-1**

Field data at each survey site was recorded on a pro-forma data sheet and included the parameters listed in Table 3-4. The attributes of Detailed survey sites are provided in Appendix C.

Table 3-4. Parameters recorded at each Detailed site

Variable	Parameters
Collection attributes	Personnel/recorder; date, quadrat dimensions and marking method, site code and georeferenced photographs of the quadrat.
Physical features	Landform, slope, aspect, soil attributes, ground surface cover, litter, rock type and physical attributes.
Location	Coordinates recorded using a hand-held GPS (Garmin) to accuracy approximately ± 5 m.
Vegetation	Dominant growth form, height, cover, and species for the three traditional strata (upper, mid and ground) compatible with NVIS Level V (ESCAVI 2003).
Vegetation condition	Vegetation condition was assessed using the condition rating scale devised by Trudgen (1988).
Disturbance	Level and nature of disturbances (<i>e.g.</i> weed presence, fire, and time since last fire, impacts from grazing, vegetation clearing, erosion).
Flora	List of all species within the quadrat including weeds and listing species average height and cover.

A flora inventory was compiled from taxa listed in Detailed survey sites and from opportunistic floristic collections throughout the Survey Area, with at least one collection made for every taxon encountered. Specimens were identified by an experienced botanical taxonomist in the Western Australia Herbarium (**WAH**) using published reference material. The nomenclature applied is consistent with Florabase (WAH 1998-).

The conservation status of all recorded flora was determined from the T and P Flora List (DBCA 2023c), and the EPBC Act List of T Flora (DCCEEW 2023a). The Western Australian Organisms List database was consulted to determine if any are BAM Act Declared Plants (DPIRD 2023b), and the Weeds of National Significance list to determine any WONS (DAWE 2020).

The vegetation types were described based on their structure and species composition, as defined by quadrat data, and field observations. Vegetation was mapped in the field using handheld GPS units and aerial photographs, then digitised using GIS software. Vegetation is described at the association level (ESCAVI 2003) and referred to as Vegetation Types (EPA 2016).

Vegetation Condition was assigned using the scale developed for the Eremaean and Northern Botanical Provinces adapted from Trudgen (1988) as recommended in EPA (2016). Table 3-5 lists the six potential categories.

Table 3-5. Vegetation Condition Scale

Vegetation Condition	Eremaean and Northern Botanical Provinces adapted from Trudgen (1988)
Excellent	Pristine or nearly so, no obvious signs of damage caused by human activities since European settlement
Very Good	Some relatively slight signs of damage caused by human activities since European settlement. For example, some signs of damage to tree trunks caused by repeated fire, the presence of some relatively non-aggressive weeds, or occasional vehicle tracks.
Good	More obvious signs of damage caused by human activity since European settlement, including some obvious impact on the vegetation structure such as that caused by low levels of grazing or slightly aggressive weeds.
Poor	Still retains basic vegetation structure or ability to regenerate it after very obvious impacts of human activities since European settlement, such as grazing, partial clearing, frequent fires or aggressive weeds.
Degraded	Severely impacted by grazing, very frequent fires, clearing or a combination of these activities. Scope for some regeneration but not to a state approaching good condition without intensive management. Usually with a number of weed species present including very aggressive species.
Completely Degraded	Areas that are completely or almost completely without native species in the structure of their vegetation; <i>i.e.</i> areas that are cleared or 'parkland cleared' with their flora comprising weed or crop species with isolated native trees or shrubs

Data analysis was applied through the preparation of a species by site matrix using the complete suite of species recorded. The Primer 7 (Clarke and Gorley, 2015), software was used to perform floristic composition vegetation classification. Two transformation types were applied, a presence/absence and a square root transformation applied to the projected foliage cover value. Resemblance matrices were constructed for each transformed data set using the Bray Curtis similarity measure. Cluster analysis was performed for each transformed data set using group averages. The SIMPROF routine was used to test the hypothesis that the species and/or abundances are different at each group of sites using 999 permutations and a significance level of 5%.

The analysis applying the square root transformation was found to be more consistent with the previous survey conducted by Ecologia (2009a) where the main vegetation community was subdivided into subcommunities based upon vegetation density.

The completeness of the survey was tested using a species accumulation curve and applying the Michaelis-Menton model to estimate the species richness of the Survey Area.

3.2.3 Fauna

Fauna habitat assessments were performed at flora quadrat locations. Descriptive data was recorded including soil type, landform, presence of microhabitats, disturbances and images were recorded.

3.2.4 Constraints

Several limitations may arise during field survey EPA (2016). These potential survey limitations are listed below in Table 3-6 with comments on the constraint to the outcomes of the survey.

Table 3-6. Survey Constraints

Factor	Impact of survey outcomes
Access problems	<p>Moderate constraint.</p> <p>A 5 km section (25%) of the Access Road is not along existing tracks and was not visited. This area has not previously been surveyed.</p>
Experience levels	<p>Not a constraint.</p> <p>The personnel were suitably qualified.</p>
Scope: Flora and vegetation	<p>Not a constraint.</p> <p>Survey was carried out at a Detailed level of assessment. No Targeted searches for conservation significant flora were conducted.</p>
Scope: Fauna	<p>Not a constraint.</p> <p>The survey was carried out at a Basic level of assessment. With the large survey effort conducted in 2007/08 this level of assessment is suitable to assess habitat availability and quality and inform any requirements for further Targeted survey.</p>
Timing, weather, season, cycle	<p>Minor constraint.</p> <p>The Survey Area is within the Eremaean Botanical district. Rainfall in the calendar year prior to survey was average, however winter and spring rainfall was below average. The Flora and Vegetation survey was conducted outside of the recommended survey period (EPA 2016). The large rainfall in March was sufficient to provide stored soil water into the late spring as seen by NDVI values near the 90th percentile (DPIRD 2023a).</p>
Sources of information	<p>Not a constraint.</p> <p>Previous biological reports and database records are available for the locality and region.</p>
Completeness: Flora and vegetation	<p>Minor constraint.</p> <p>Due to low rainfall preceding the survey, the presence of annual species was restricted to areas receiving runoff and/or with higher moisture retention, and modelling indicated the survey captured 77% of the species richness of the area. Nine specimens were unable to be identified to species level, including one specimen that may constitute a significant range extension for a P3 species.</p> <p>Compared to previous survey conducted by Markey and Dillon (2008) the richness per quadrat was lower than expected, however it was within the range recorded by Ecologia (2009a) for the same vegetation types. Annual/herbaceous species contributed 29% of the total species richness and the NDVI was in the 90th percentile for the property.</p> <p>No species of conservation significant flora that have been previously recorded or are considered likely to occur are annual/herbaceous species.</p>
Completeness: Fauna	<p>Not a constraint.</p> <p>The scope was completed.</p>

4 FLORA AND VEGETATION RESULTS

4.1 DESKTOP STUDY

4.1.1 Significant Flora

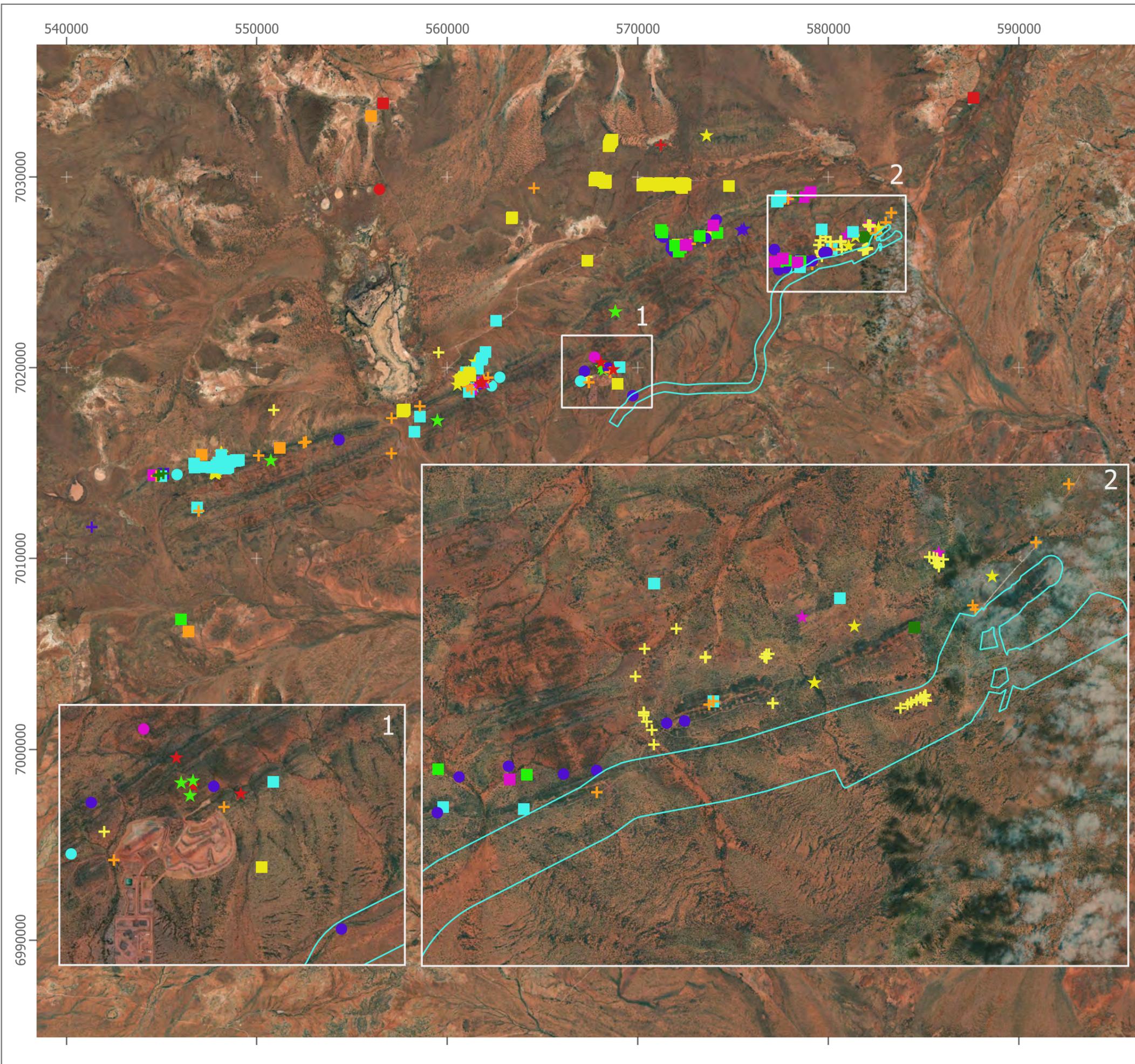
No T Flora listed under the BC Act and/or EPBC Act have been previously recorded within the Survey Area, or within 30 km. No T species were returned from the PMST or literature review.

The DBCA database contained two P species that have previously been recorded in the Survey Area. The P3 *Prostanthera petrophila* and P4 *Dodonaea amplisemina* have been recorded within the Fenix Access Road. Additionally, five P1, seventeen P3, and four P4 species have records within 30 km of the Survey Area.

The Literature review identified one additional P species occurring within the Survey Area – *Acacia speckii* (P4); and seven additional P species that have been recorded at the Weld Range. These are *Indigofera gilesii* P3, *Euphorbia sarcostemmoides* P1, *Goodenia lyrata* P3, *Eremophila arachnoides* subsp. *Arachnoides* P3, *Mirbelia stipitata* P3, *Ptilotus luteolus* P3, and *Tecticornia cymbiformis* P3.

P flora returned from the DBCA database with records within 30 km of the Survey Area are shown in Figure 4-1. Records identified in the literature review are also shown.

An assessment of the likelihood of occurrence of these 34 species within the Survey Area was performed using the criteria listed in Table 3-3. The results of the assessment are listed in Table 4-1.



Legend

Survey Area

Priority 1

- ★ *Acacia dilloniorum*
- ★ *Beyeria lapidicola*
- ★ *Eremophila rhegos*
- ★ *Euphorbia sarcostemmoides*
- ★ *Stenanthemum mediale*
- ★ *Stenanthemum patens*

Priority 3

- + *Acacia burrowsiana*
- + *Acacia speckii*
- + *Calytrix verruculosa*
- + *Drosera eremaea*
- + *Eremophila fasciata*
- + *Eremophila shonae* subsp. *diffusa*
- + *Eremophila simulans* subsp. *megacalyx*
- *Hemigenia tysonii*
- *Hemigenia virescens*
- *Homalocalyx echinulatus*
- *Lysiandra baeckeoides*
- *Micromyrtus placoides*
- *Petrophile pauciflora*
- *Prostanthera ferricola*
- *Prostanthera petrophila*
- *Ptilotus beardii*
- + *Sauropus* sp. *Woolgorong* (M. Officer s.n. 10/8/94)
- *Verticordia jamiesonii*

Priority 4

- *Dodonaea amplisemina*
- *Goodenia berringbinensis*
- *Grevillea inconspicua*
- *Hemigenia exilis*

Scale: 1: 200000 @ A3 0 5 10 km

Coordinate System: GDA 2020 MGA Zone 50
Projection: Transverse Mercator



Author: VM

Approved: EH

Date: 26/03/2024

Threatened and Priority Flora Records

Prepared for:



Figure: 4-1

Table 4-1. Threatened and Priority Flora Likelihood of Occurrence

Species	P	Preferred Habitat	Likelihood of Occurrence
<i>Acacia burrowsiana</i>	3	Red-brown loams with ironstone rubble on surface, calcrete soils, laterite, quartz. Flats adjacent to watercourses, crests of low rises, breakaways.	Likely. Suitable habitat present in 3a and 3b
<i>Acacia dilloniorum</i>	1	Foot slopes and gullies of dolerite hills and mid-slopes of the Weld Range on red-brown silty clay loam.	Likely. Suitable habitat in the upper 3b areas
<i>Acacia speckii</i>	4	Rocky soils over granite, basalt or dolerite. Rocky hills or rises. It has been observed to occur across the mid-sloped rocky hills and near drainage lines of Weld Range.	Present. Suitable habitat in the upper 3b areas
<i>Beyeria lapidicola</i>	1	Callitris-Acacia woodlands or mulga woodland in sandy loams or on banded ironstone hills.	Likely. Suitable habitat in 2a and 3b.
<i>Calytrix verruculosa</i>	3	Sandy clay. Plains.	Possible. Suitable habitat in 3b.
<i>Dodonea amplisemina</i>	4	Open shrublands with Acacia, Eremophila and other low shrubs on red-brown sandy clay soils over basalt or banded ironstone.	Present. Suitable habitat in 3b.
<i>Drosera eremaea</i>	3	Heavy red loam. Seepage areas amongst granite outcrops.	Unlikely. No suitable habitat.
<i>Eremophila arachnoides</i> subsp. <i>Arachnoides</i>	3	Open shrublands or mulga woodland in shallow loams over limestone, but locally on gently undulating terrain, low in the landscape, on red-brown loamy soil with some calcrete pebbles or on calcrete outcrops.	Possible. Some small calcrete patches in the easternmost extent of 3b.
<i>Eremophila fasciata</i>	3	Hillside, gullies. Brown / red ironstone gravel.	Possible. Suitable habitat 3b
<i>Eremophila rhegos</i>	1	Skeletal stony loam over granite.	Unlikely. No suitable habitat.
<i>Eremophila shonae</i> subsp. <i>Diffusa</i>	3	Stony yellow or red sandy soils.	Possible. Suitable habitat in 3b.
<i>Eremophila simulans</i> subsp. <i>Megacalyx</i>	3	Rangeland plain. Road verge with red, sandy gravel laterite.	Possible. Suitable habitat in 3a.
<i>Euphorbia sarcostemmoides</i>	1	Sandstone ridges, quartzite hills, and banded ironstone with red brown shallow sandy loam soils. However, at Weld range it has been observed on flat plains.	Likely. Suitable habitat in 2a, 3a and 3b.
<i>Goodenia berringbinensis</i>	4	Red sandy loam along watercourses, lakes, drainage lines, dams and claypans.	Unlikely. Drainage limited to rocky gullies.
<i>Goodenia lyrata</i>	3	Mulga woodlands on red sandy loam often in or near claypans	Unlikely. No claypans present.
<i>Grevillea inconspicua</i>	4	Drainage lines and on rocky outcrops tending to favour loamy soils. It is also found to occur on moderately inclined midslopes with fragments of banded ironstone and chert.	Likely. Suitable habitat in 2a and 3b.
<i>Hemigenia exilis</i>	4	Laterite. Breakaways, slopes.	Unlikely. No suitable habitat.
<i>Hemigenia tysonii</i>	3	Red sand, sandy clay and lateritic sand on flats, as well as on sand dunes and hills. It is also found on ridgelines with laterite, dolerite, conglomerate and chert.	Unlikely. No suitable habitat.
<i>Hemigenia virescens</i>	3	Hillsides, in rangelands, in low and high shrublands and on sandy banks. Soil types are commonly yellow-red sandy clay, brown ironstone gravel and brown rocky sand.	Likely. Suitable habitat in 3b.

<i>Homalocalyx echinulatus</i>	3	Gently inclined slopes with fragments of banded ironstone. It has also been recorded to occur on stony plateaus, breakaways and rangelands.	Likely. Suitable habitat in 3b.
<i>Indigofera gilesii</i> subsp. <i>Gilesi</i>	3	Pebbly loams and hill slopes amongst boulders and outcrops, banded iron hills, granite and sandstone, creeklines and sand plains. The substrate is often ironstone gravel amongst brown/red loam.	Possible. Suitable habitat in 2a, 3a and 3b.
<i>Lysiandra baeckeoides</i>	3	Ironstone ridges/ breakaways with dry, orange sandy clay soils. At Weld Range it has been recorded on gently inclined lower hillslopes to flats of banded ironstone with red brown soils.	Possible. Suitable habitat in 2a and upper 3b.
<i>Micromyrtus placoides</i>	3	Red-orange or orange-yellow sandy clay, coarse gravel, banded ironstone, laterite, quartz and basalt. Landforms can be gently undulating plains, dry creek beds, hillcrests or ridges of brown loam, dolerite, ironstone or granite.	Likely. Broad habitat suitability. All habitats suitable.
<i>Mirbelia stipitata</i>	3	Plains on red sandy loam.	Possible. Plains suitable.
<i>Petrophile pauciflora</i>	3	Decaying and dissected granite breakaways.	Unlikely. No suitable habitat.
<i>Prostanthera ferricola</i>	3	Sparse <i>Acacia aneura</i> shrublands on gently inclined upper slopes and crests of banded ironstone formations. It is occasionally found in gullies or on quartz.	Possible. Suitable habitat in 2a
<i>Prostanthera petrophila</i>	3	Lateritic soils, ironstone slopes and foothills on red-orange sandy clay with ferrous stones and boulders.	Present. Suitable habitat in 2a and upper 3a and 3b
<i>Ptilotus beardii</i>	3	Red/orange/brown sandy-clayey soils, saline flats, flood plains and low breakaways.	Possible. Suitable habitat in 3a and 3b.
<i>Ptilotus luteolus</i>	3	Rocky hill slopes and crests, often in red sandy soils. It has also been found on low sandstone (sandy siltstone) and rises in red powdery loam.	Possible. Suitable habitat in 2a.
<i>Sauropus</i> sp. Woolgorong (M. Officer s.n. 10/8/94)	3	Red sand plains in open Acacia – Eremophila woodlands but has been found on moderately rocky hill crests and slopes on the Weld Range.	Likely. Suitable habitat in 2a.
<i>Stenanthemum mediale</i>	1	Red clayey sand.	Likely. Suitable habitat in 3 and 3b.
<i>Stenanthemum patens</i>	1	Rocky basalt and banded ironstone hillsides as well as on sandy loam and clay slopes	Possible. Suitable habitat in 3a and 3b.
<i>Tecticornia cymbiformis</i>	3	Saline areas along floodplains, creeklines, lakes or sloping areas leading to saline habitats. It can be found on red-brown sandy clays	Unlikely. No suitable habitat.
<i>Verticordia jamiesonii</i>	3	Quartzite or laterite breakaways, hill slopes, ridgelines, or on weathered granite within pockets of small sandy clay in depressions	Likely. Suitable habitat in 2a and 3b.

4.1.2 Significant Vegetation

There are no TECs listed under the BC Act or EPBC Act known to occur within the Survey Area. The Survey Area is partially within the Weld Range P1 Ecological Community (Figure 4-2).

The Weld Range and other Banded Iron Formation Ranges are important landforms in the Murchison region. Although representing a very small proportion of the total area of the Murchison Bioregion, their unique geology, soils and relative isolation have produced distinctive vegetation communities, many of which have restricted distributions in the region. Many of the BIF ranges support threatened, and in some instances locally endemic, species. Consequently, they are considered to have very significant biodiversity values.

Vegetation types of the Weld Range have been described by Dillon and Markey (2006) and Ecologia (2009a). Community characteristics are listed in Table 4-2.



Author: VM Approved: EH Date: 26/03/2024

Threatened and Priority Ecological Communities

Prepared for:



Figure 4-2

Scale: @ A4 0 2.5 5 km
1: 150,000

Coordinate System: GDA 2020 MGA Zone 50

Projection: Transverse Mercator



Legend

Weld Range BIF Priority 1



Table 4-2. Characteristics of vegetation described for the Weld Range

Landscape position	Code	Description	Species richness
Dillon and Markey (2006)			
Hillslopes with moderately inclined gradients, very rocky terrain and outcropping of BIF. This vegetation type occurred across the topographical profile of the range, from the lower slopes to hill tops, but was located mostly on the mid – upper slopes.	1a	Open shrubland of <i>Acacia aneura</i> , <i>A. ramulosa</i> var <i>linophylla</i> , and / or <i>Acacia</i> sp. Weld Range (A. Markey & S. Dillon 2994) over a sparse shrub cover of <i>Eremophila glutinosa</i> , <i>Eremophila latrobei</i> subsp. <i>Latrobei</i> and <i>Santalum spicatum</i>	All taxa 32.7±1.0 Annuals 19.3±2.7
This community occurs mostly on rocky, gentle – moderate inclines, on higher slopes than type 1a.	1b	Open shrublands and sparse shrublands of <i>Acacia aneura</i> , <i>Acacia</i> sp. Weld Range (A. Markey & S. Dillon 2994), and <i>Grevillea berryana</i> over <i>Eremophila georgei</i> , <i>E. latrobei</i> subsp. <i>Latrobei</i> , <i>E. glutinosa</i> and, <i>Thryptomene decussata</i> . <i>Ptilotus schwartzii</i> , <i>Ptilotus obovatus</i> , <i>Grevillea berryana</i> , <i>Eremophila georgei</i> and <i>Thysanotus manglesianus</i> , <i>Prostanthera petrophila</i> and <i>Cheilanthes sieberi</i> subsp. <i>Sieberi</i>	All taxa 39.2±5.9 Annuals 23.6±5.0
Outcrops and rocklands of BIF on moderate – steep hillslopes. Crevices and fissures formed in exposed outcrops of bedrock	2	Sparse to open shrublands of <i>Acacia aneura</i> and <i>A. incurvaneura</i> over <i>Thryptomene decussata</i> , <i>Philotheca brucei</i> subsp. <i>Brucei</i> , <i>Eremophila</i> spp. <i>Micromyrtus sulphurea</i> , and <i>Dodonaea pachyneura</i> over <i>Cheilanthes adiantoides</i> , <i>Stylidium longibracteatum</i> , <i>Ptilotus obovatus</i> subsp. <i>Obovatus</i> and <i>Harnieria kempeana</i> subsp. <i>Muelleri</i>	All taxa 43.9±6.4 Annuals 25.4±7.2
Lower hillslopes	3	Open shrubland of <i>Acacia aneura</i> over isolated shrub species such as <i>Solanum ashbyae</i> and <i>Tribulus suberosus</i> and <i>Cheilanthes sieberi</i> subsp. <i>Pseudovellea</i>	All taxa 20.5±3.5 Annuals 15.0±2.8
Upper slope on steep, rocky hillslopes with relatively high levels of exposed bedrock with fractured rocky substrates	4	Scattered <i>Acacia pruinoarpa</i> over open shrublands of <i>Acacia aneura</i> with <i>Philotheca brucei</i> subsp. <i>Brucei</i> and <i>Eremophila</i> spp, and <i>Abutilon oxycarpum</i> , <i>Dodonaea pachyneura</i> and <i>Enneapogon caerulescens</i>	All taxa 32.7±7.2 Annuals 22.0±6.9

Landscape position	Code	Description	Species richness
Mostly on lower slopes and outwashes of ironstone colluvium	5a	Open tall shrublands of <i>Acacia pruinocarpa</i> , <i>Acacia aptaneura</i> and <i>Acacia ramulosa</i> var. <i>linophylla</i> with <i>Acacia ceasaneura</i> .	All taxa 27.9±5.2
			Annuals 17.2±4.5
Moderately inclined lower hillslopes and outwash plains.	5b	Sparse open shrubland of <i>Acacia aneura</i> , <i>Acacia aptaneura</i> , <i>A. effusifolia</i> over sparse shrubs of <i>Senna glaucifolia</i> and <i>Tribulus suberosus</i> . With <i>Hibiscus sturtii</i> , <i>Enneapogon caerulescens</i> and <i>Sida</i> sp. Dark green fruits (S. van Leeuwen 2260).	All taxa 36.2±3.4
			Annuals 21.8±5.1
Dolerite substrates including a hillcrest of exposed volcanic rocks, mid –lower slopes, footslopes and a colluvial fan	6	Sparse to open shrubland of <i>Acacia</i> sp. Weld Range (A. Markey & S. Dillon 2994), <i>Acacia aneura</i> and <i>Acacia speckii</i> over sparse mid-stratum of <i>Eremophila macmillaniana</i> , <i>Eremophila mackinlayi</i> subsp. <i>Spathulata</i> and <i>Senna glaucifolia</i> with <i>Sida</i> sp. Dark green fruits (S. van Leeuwen 2260), <i>Maireana georgei</i> and <i>Euploca ovalifolium</i>	All taxa 49.8±3.7
			Annuals 30.3±4.2
Ecologia (2009a)			
BIF mid to upper slopes and outcropping	1a	<i>Acacia aneura</i> low open woodland over <i>Acacia</i> sp. Weld Range (A. Markey & S. Dillon 2994), <i>A. ramulosa</i> var. <i>linophylla</i> and <i>Thryptomene decussata</i> open mid shrubland over mixed <i>Eremophila</i> spp. Low shrubland.	13±3.52
			14±2.89
BIF upper slopes and outcropping	1b	<i>Acacia aneura</i> low open woodland over <i>Acacia cockertoniana</i> open mid shrubland over mixed mid shrubland over <i>Ptilotus obovatus</i> low shrubland.	11±3.30
Ridge tops of BIF ranges	2a	Scattered <i>Acacia pruinocarpa</i> trees over <i>A. aneura</i> mid sparse shrubland / scattered shrubs over <i>Ptilotus obovatus</i> low shrubland with <i>Cymbopogon ambiguus</i> tussock grasses.	17±3.86
Mid to upper slopes and broad ridge tops of BIF ranges and ridge tops of breakaways	2b	<i>Acacia aneura</i> sparse shrubland over mixed sparse mid shrubland over <i>Micromyrtus sulphurea</i> and <i>Ptilotus obovatus</i> low open shrubland	

Landscape position	Code	Description	Species richness
Sandy outwash and gravelly plains and footslopes of BIF ranges	3a	+/- <i>Corymbia lenziana</i> scattered medium trees over <i>Acacia ramulosa</i> var. <i>linophylla</i> and <i>A. aneura</i> sparse tall shrubland over mixed <i>Eremophila</i> spp. Open mid shrubland over scattered low shrubs of <i>Ptilotus obovatus</i> over mixed open tussock grassland.	16±3.42
Drainage lines and low-lying areas on sandy outwash plains	3b	+/- <i>Acacia pruinocarpa</i> scattered trees over <i>A. aneura</i> woodland over <i>A. ramulosa</i> var. <i>linophylla</i> and <i>A. aneura</i> shrubland over mixed <i>Eremophila</i> spp. Closed shrubland over <i>Ptilotus obovatus</i> open low shrubland.	17±5.26
Sandy plains	3c	Scattered <i>Eucalyptus</i> mallees / trees over <i>Acacia ramulosa</i> var. <i>linophylla</i> open shrubland over <i>Rhagodia eremaea</i> , <i>Eremophila forrestii</i> subsp. <i>Forrestii</i> shrubland over <i>Ptilotus obovatus</i> open low shrubland.	19±1.26
Gravelly plains and low hills	3d	<i>Acacia aneura</i> and <i>A. cockertoniana</i> open moderate shrubland over <i>Eremophila simulans</i> subsp. <i>Simulans</i> and <i>Aluta aspera</i> subsp. <i>Hesperia</i> low open shrubland.	9±2.65
Undulating scree plains and mid to low slopes of granite and dolerite	4a	<i>Acacia</i> sp. Weld Range and <i>A. incurvaneura</i> open tall shrubland over <i>Eremophila macmillaniana</i> and mixed <i>Senna</i> spp. Open mid shrubland over <i>Ptilotus obovatus</i> open low shrubland.	15±3.75
Minor drainage areas, creek lines and midslope of low dolerite and granite hills	4b	<i>Acacia</i> sp. Weld Range and <i>Acacia speckii</i> (P4) shrubland over mixed <i>Senna</i> spp sparse shrubland over <i>Grevillea inconspicua</i> (P4) and <i>Dodonaea amplisemina</i> . (P4) open shrubland over <i>Cymbopogon ambiguus</i> sparse tussock grassland	17±5.77
Ridge tops and upper slopes of BIF ridges, low lying semi-saline flats, riparian areas and ironstone scree flat plains.	5a	<i>Acacia craspedocarpa</i> open tall shrubland over <i>Solanum ashbyae</i> / <i>lasiophyllum</i> and <i>Ptilotus obovatus</i> low shrubland over mixed low tussock grassland.	16±5.56
Flat plain adjoining seasonally inundated wetland	5b	+/- <i>Grevillea striata</i> low isolated trees over <i>Acacia craspedocarpa</i> and <i>A. aneura</i> tall open shrubland over <i>Scaevola spinescens</i> sparse mid shrubland over <i>Austrostipa elegantissima</i> and <i>Eriachne flaccida</i> low open tussock grassland.	16±3.61
Mainly occurring in and around seasonally inundated areas and salt affected drainage lines	6a	Scattered <i>Acacia</i> spp. Shrubs over mixed <i>Senna</i> spp. Open mid shrubland over <i>Ptilotus obovatus</i> sparse shrubland over mixed <i>Maireana</i> spp. Chenopod shrubland	20±4.43

Landscape position	Code	Description	Species richness
Undulating plains with a surface layer of gypsum and calcrete	6b	Scattered mixed <i>Acacia</i> spp. Over <i>Rhagodia eremaea</i> and <i>Scaevola spinescens</i> sparse mid to low shrubland over <i>Ptilotus obovatus</i> , <i>Maireana georgei</i> and <i>Sclerolaena diacantha</i> low chenopod shrubland.	13±3.12
Seasonally inundated salt pan	6c	<i>Eremophila maculata</i> subsp. <i>Brevifolia</i> low open shrubland over <i>Sclerolaena diacantha</i> low chenopod shrubland over <i>Enneapogon cylindricus</i> low tussock grassland.	6.0±1.0
Seasonally inundated claypan	7a	<i>Melaleuca stereophloia</i> and <i>Cratystylis subspinescens</i> low shrubland over <i>Tecticornia</i> spp. low samphire shrubland over <i>Frankenia laxiflora</i> low shrubland.	18±2.08
Fringe of seasonally inundated wetland	7b	<i>Eucalyptus carnei</i> and <i>Eucalyptus trivalva</i> woodland over <i>Cratystylis subspinescens</i> and <i>Duma florulenta</i> low sparse shrubland over mixed low tussock grasses.	19±2.89

Other significant vegetation that has the potential to occur in the Survey Area is GDE.

The Bureau of Meteorology (**BoM**) GDE Atlas provides information to support the recognition and identification of GDEs in natural resource management, including water planning and environmental impact assessment. It indicates where ecosystems potentially interact with groundwater, and some of the characteristics of those ecosystems that may be useful in determining water requirements.

The GDE Atlas shows general areas where groundwater interaction may occur. It does not imply that an entire mapped ecosystem is using groundwater, but rather groundwater interaction may be occurring somewhere within the mapped ecosystem.

For WA, the Atlas contains information about two types of ecosystems:

- Aquatic ecosystems that rely on the surface expression of groundwater—this includes surface water ecosystems which may have a groundwater component, such as rivers, wetlands and springs; and
- The terrestrial GDE layer expresses the potential for groundwater and mapped vegetation communities across Australia to interact. It shows the vegetation communities that interact with groundwater from the water table or in the capillary zone.

The closest aquatic system is Lake Annean, 35 km east of the Survey Area. The Atlas identifies moderate potential terrestrial GDE intersecting the Survey Area. The feature is described as 'Gently undulating gravelly plains on greenstone, laterite and hardpan, with low stony rises and minor saline plains, supporting groved mulga and bowgada; within Sandplains and hardpan wash plains with outgoing drainage and salt lakes, broken by ridges of metamorphic rocks and granite'.

Ecologia (2009a) assessed the likelihood of GDE at Weld Range and identified vegetation types 7a and 7b as potentially groundwater dependent. Communities 7a and 7b do not occur within the Beebyn deposit area and reported that no species known to be phreatophytic have been recorded in the communities present within the Beebyn deposit area.

4.1.3 Introduced Flora Species

Dandjoo returned nine introduced flora species. Six introduced flora species have been recorded locally by previous surveys. Table 4-3 lists these introduced flora species.

Table 4-3. Introduced Flora Records within 30 km of the Survey Area

Species	Common Name
<i>Cenchrus ciliaris</i>	Buffel grass
<i>Cleretum papulosum</i> subsp. <i>papulosum</i>	-
<i>Cucumis myriocarpus</i>	Prickly paddy-melon
<i>Cuscuta epithymum</i>	Lesser dodder
<i>Hypochaeris glabra</i>	Smooth Cats-ear
<i>Lysimachia arvensis</i>	Pimpernel
<i>Pentameris airoides</i> subsp. <i>airoides</i>	False hairgrass
<i>Rostraria pumila</i>	Tiny bristle-grass
<i>Sisymbrium erysimoides</i>	Smooth mustard
<i>Solanum nigrum</i>	Black berry nightshade
<i>Sonchus oleraceus</i>	Common sowthistle

No Declared pests under the BAM Act or WONS have been recorded within 30 km of the Survey Area.

4.2 FIELD SURVEY

4.2.1 Flora

A total of 77 species of flora were recorded within the Survey Area, comprising all native species. Nine specimens were unable to be identified to species level due to a lack of diagnostic material.

The *Fabaceae* (pea family, 15 species), *Poaceae* (grass family, 10 species) and *Scrophulariaceae* (figwort family, 10 species) were the most species-rich families recorded. Twenty-one families represented by 40 genera were recorded across the Survey Area.

The complete list of plant species recorded within the Survey Area is presented in Appendix D. The mean species richness was 14.75 species per quadrat. The average species diversity recorded per quadrat is lower than other surveys conducted in the nearby area. Dillon and Markey (2008) recorded a floristic richness of between 20.5 and 49.8, with the proportion of annual flora ranging from 58-73% of total species richness (Section 4.1.2). Ecologia (2009a) reported 19.7% annuals and 80.4% perennials.

The number of annuals present at the time of survey was 22 or 29%, which is higher than recorded by Ecologia (2009a) but lower than recorded by Markey and Dillon (2008).

A species accumulation curve (Appendix D) was performed, returning a modelled Michaelis-Menton species richness of 100, indicating that the floristic survey was approximately 77% complete.

Floristic groups identified in the cluster analysis (Appendix D) were organised into vegetation types and are discussed in the following section.

4.2.2 Vegetation Types

Three vegetation types are described for the Survey Area, as summarised in Table 4-4 and detailed below.

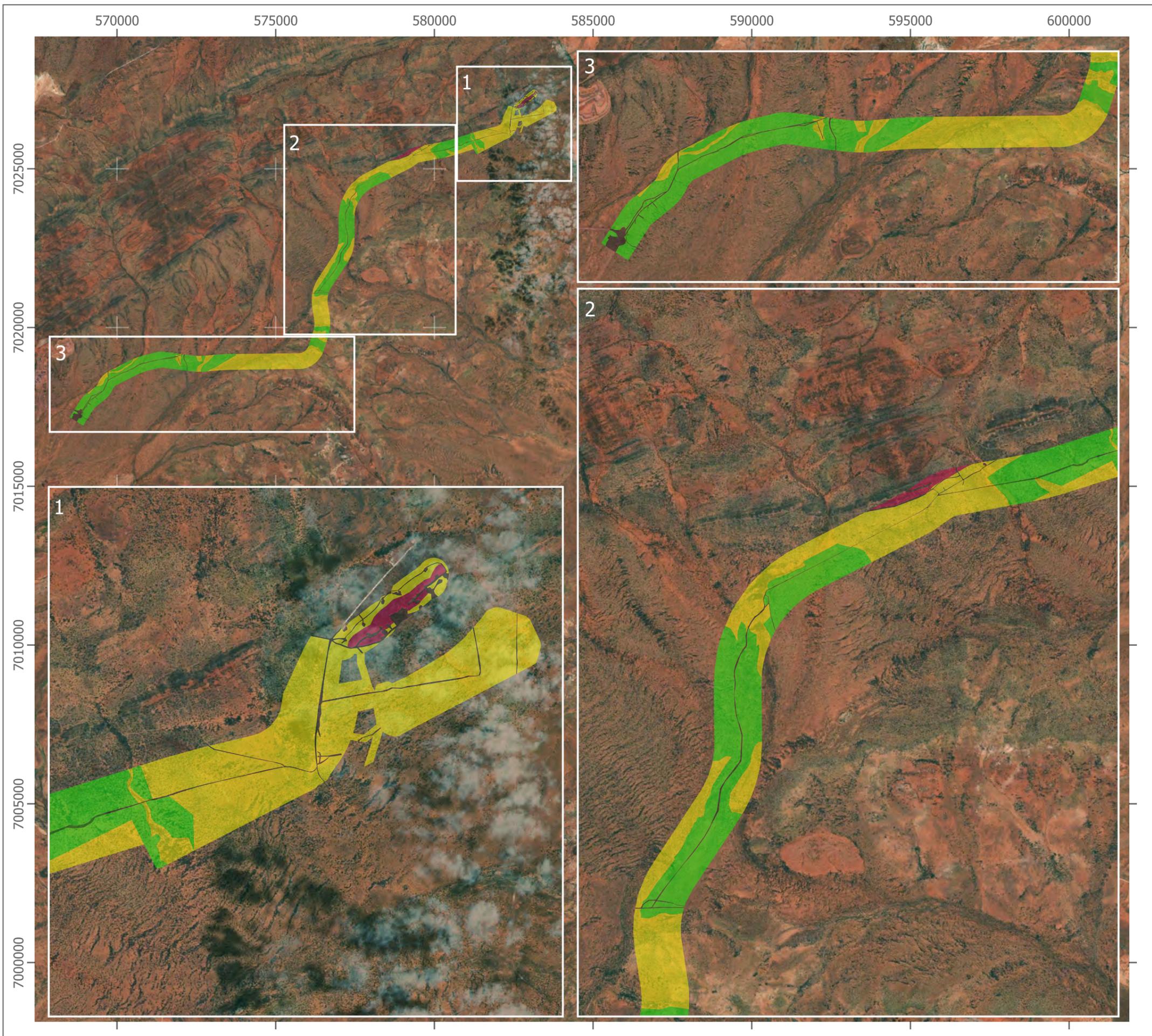
Table 4-4. Vegetation Types

Code	Landform	Vegetation Description	ha	%
2a	BIF outcrops	Scattered low <i>Acacia aneura</i> , <i>Psyrdrax latifolia</i> and <i>Acacia pruinocarpa</i> over <i>Eremophila latrobei</i> subsp. <i>latrobei</i> , <i>Thryptomene decussata</i> and <i>Philotheca brucei</i> mid sparse shrubland with <i>Ptilotus obovatus</i> <i>Dodonaea pachyneura</i> and <i>Dysphania rhadinostachya</i> low sparse shrubland.	14.6	1.4
3a	Gravelly plains	<i>Acacia aneura</i> , <i>A. ramulosa</i> subsp. <i>linophylla</i> and <i>Acacia mulganeura</i> tall sparse shrubland over <i>Eremophila punicea</i> , <i>Eremophila forrestii</i> subsp. <i>forrestii</i> and <i>Eremophila margarethae</i> mid sparse shrubland with <i>Ptilotus obovatus</i> , <i>Eragrostis eriopoda</i> and <i>?Swainsona purpurea</i> scattered low groundcover.	469.3	44.4
3b	Sandy outwash plains	<i>Acacia aneura</i> , <i>Acacia pruinocarpa</i> and <i>Acacia ramulosa</i> var <i>linophylla</i> low open woodland over <i>Eremophila forrestii</i> ssp <i>forrestii</i> , <i>Eremophila latrobei</i> and <i>Grevillea obliquistigma</i> mid open shrubland and <i>Ptilotus obovatus</i> , <i>Sida calyxhymenia</i> and <i>Abutilon cryptopetalum</i> sparse low shrubs.	541.8	51.2
D	-	Disturbed – clear of vegetation	30.4	3.0

Vegetation types are described below and are compared to those previously recorded for the Weld Range using structural comparison and common species assemblages. Where communities share a high level of similarity, the vegetation code previously applied has been used here and a discussion of similarity presented.

Disturbed areas constitute 3% of the Survey Area. These areas are composed of two types of areas, those maintained in a state that is clear of vegetation for exploration and station tracks; and drill pads for exploration activities, some of which have been rehabilitated but for which regeneration has not yet successfully established.

Distribution of vegetation types at a scale of 1:30,000 (inset 1), 1:40,000 (inset 2) and 1:60,000 (inset 3) is shown in Figure 4-3. The dendrogram resulting from the cluster analysis is shown in Appendix C, followed by the site data sheets and photos.



Legend

- Vegetation Types
- 2a
 - 3a
 - 3b
 - Disturbed

Scale: @ A3 1: 120,000
 Inset 1 scale 1:25,000
 Inset 2 scale 1:40,000
 Inset 3 scale 1: 60,000



Coordinate System: GDA 2020 MGA Zone 50
 Projection: Transverse Mercator



Author: VM Approved: EH Date: 26/03/2024

Vegetation Types

Prepared for:

Figure: **4-3**

Landform: BIF Outcrops

Vegetation Type: 2a

Scattered low *Acacia aneura*, *Psyrdrax latifolia* and *Acacia pruinocarpa* over *Eremophila latrobei* subsp. *latrobei*, *Thryptomene decussata* and *Philotheca brucei* mid sparse shrubland with *Ptilotus obovatus* *Dodonaea pachyneura* and *Dysphania rhadinostachya* low sparse shrubland.

This vegetation type occurs on outcrops and rocklands of BIF on moderate to steep hillslopes. Crevices and fissures formed in exposed outcrops of bedrock are present. Soil is a light red sandy clay loam occurring in crevices and cracks.

This vegetation type has been allocated the numeral 2 to reflect the synonymy with vegetation types described by Markey and Dillon (2008), who identified the presence of *Dodonaea pachyneura* and *Philotheca brucei* to be important indicators in determining this vegetation type and *Ptilotus obovatus* as also being common. It is also the same as Ecologia (2009a) vegetation type 2a that has *Acacia pruinocarpa* in the upper strata.

This vegetation type was not differentiated in the cluster analysis (Appendix C) but has been distinguished here in line with the previous vegetation surveys and the suitability of habitat features for specific conservation significant flora.

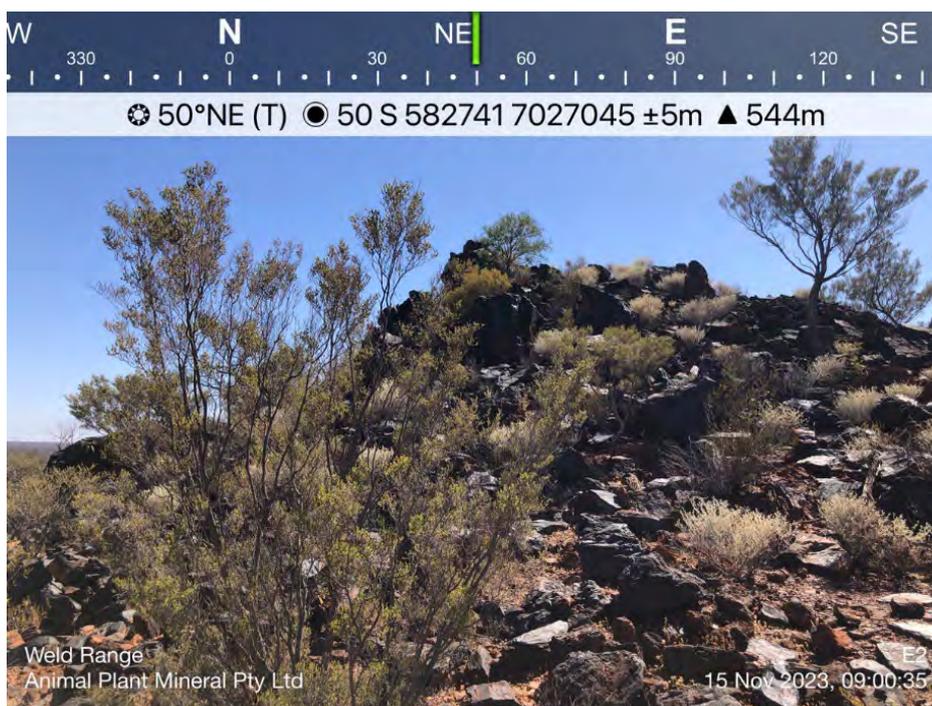


Plate 4-1. 2a BIF Outcrops

Detailed sites: E2 Total richness: 16 species. Introduced/exotic flora: None recorded

Condition: Good. Species richness is roughly one third of that recorded by Markey and Dillon (2008) who recorded 43.9 ± 6.4 species per quadrat, of which 25.4 ± 7.2 were annuals. Ecologia (2009a) recorded 11 ± 3.3 species in this vegetation type. Evidence of moderate grazing is present (predominantly goats and euro) and frequent clearing for mining exploration activities is present. The low species count is in some part due to seasonal timing however 18% of recorded species were annuals and therefore season

is unlikely to be the sole explanation. This part of the range is low and, on the periphery of the BIF outcropping and of very narrow and limited extent.

Conservation significant flora: none recorded in current survey. *Verticordia jamiesonii* (P3) recorded within this vegetation in DBCA database, in a location that is currently disturbed.

Landform: Gravelly plains

Vegetation Type: 3a

Acacia aneura, *A. ramulosa* subsp. *linophylla* and *Acacia mulganeura* tall sparse shrubland over *Eremophila punicea*, *Eremophila forrestii* subsp. *forrestii* and *Eremophila margarethae* mid sparse shrubland with *Ptilotus obovatus*, *Eragrostis eriopoda* and *?Swainsona purpurea* scattered low groundcover.

Occurs on sandy outwash and gravelly plains and footslopes of BIF ranges, on gentle mid and lower slopes on soils of red to red-brown clay loam to sandy clay loam with ironstone gravel to small stones at the surface. This vegetation type is labelled 3a by Ecologia (2009a). Vegetation types 3a and 3b have similar floristic assemblages, but the density of vegetation in 3b is higher. This is a component of the vegetation type 5a described by Markey and Dillon (2008).

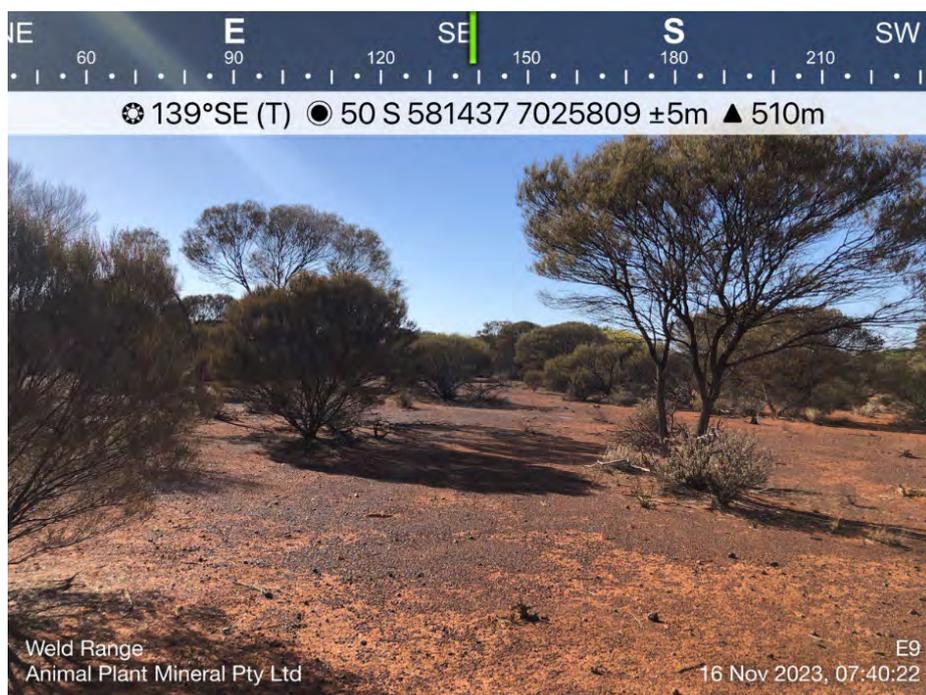


Plate 4-3. 3a Gravelly plains

Detailed sites: E5, E6, E7, E9, E11 and E16.

Total species richness: 34 Average species richness: 11.8

Introduced/exotic flora: None recorded

Conservation significant flora: None recorded in current survey, or in previous surveys.

Condition: Good. Species richness in community 5a described by Markey and Dillon (2008) was 27.9 ± 5.2 for all species, of which annuals were 17.2 ± 4.5 . Ecologia (2009a) recorded an average species richness of 16 ± 3.42 in community 3a. During the current survey species richness was lower than expected, in part due to seasonal conditions. However, there is also evidence of grazing and of historic overgrazing leading to soil compaction and sheetwash erosion and a vegetation cover lower than expected in many areas of this vegetation type.

Landform: Sandy outwash plains

Vegetation Type: 3b

Acacia aneura, *Acacia pruinocarpa* and *Acacia ramulosa* var *linophylla* tall sparse shrubs over *Eremophila forrestii* ssp *forrestii*, *Eremophila latrobei* and *Grevillea obliquistigma* mid open shrubland and *Ptilotus obovatus*, *Sida calyxhymenia* and *Abutilon cryptopetalum* sparse low shrubs.

This vegetation type occurs on the lower slopes and outwashes of ironstone colluvium. Drainage lines and low-lying areas on sandy outwash plains.

This vegetation type is the same as Ecologia (2009a) vegetation type 3b that has *Acacia pruinocarpa* in the upper strata. This is a component of the vegetation type 5a described by Markey and Dillon (2008). The species composition is similar to 3a but with a denser upper and mid shrub layer.

Quadrats E04 and E08 were separated on the cluster analysis. This is due to the similarity with 3a and the density of vegetation in these sites being somewhere midway between the 3a and 3b types. They have been included here as aerial imagery identifies them to have greater similarity to 3b. E03 was also separated however the difference is as a result of poor condition in this location.

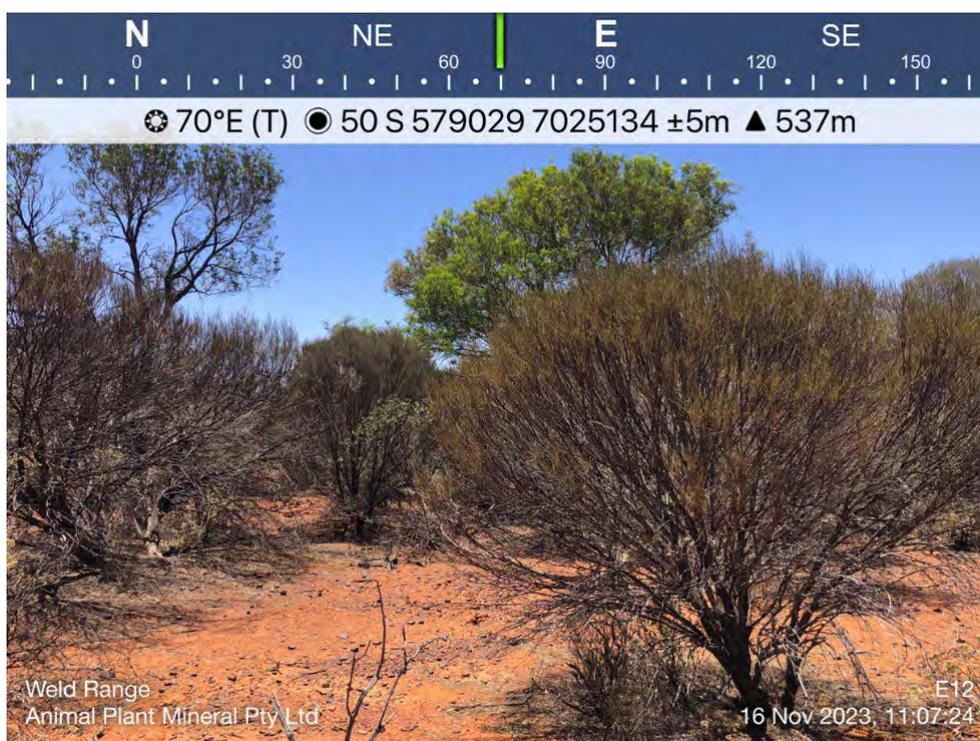


Plate 4-2. 3b Sandy outwash plains

Detailed sites: E01, E03, E04, E08, E10, E12, E13, E14, E15.

Total richness: 58 species. Average richness: 16.5 species Introduced/exotic taxa: none recorded

Condition: Good. Species richness is 84% of that recorded by Markey and Dillon (2008) who recorded 20.5±3.5 species per quadrat, of which 15.0±2.8 were annuals. Species richness is within the range reported by Ecologia (2009a), who reported a species richness of 17±5.26. Evidence of heavy grazing is

present (predominantly goats and euro) and frequent clearing for pastoral station and mining exploration activities is present. Evidence of soil compaction and sheet erosion is present.

Conservation significant species: A single individual was recorded that has the potential to be *Hibiscus krichauffianus* (P1), however definitive determination was not possible from the material available. *Prostanthera petrophila* (P3) and *Acacia speckii* (P3) were recorded in this vegetation type by Ecologia (2009a). *Beyeria lapidicola* (P1) was recorded in this vegetation type on the DBCA database in a location that is currently cleared.

4.2.3 Vegetation Condition

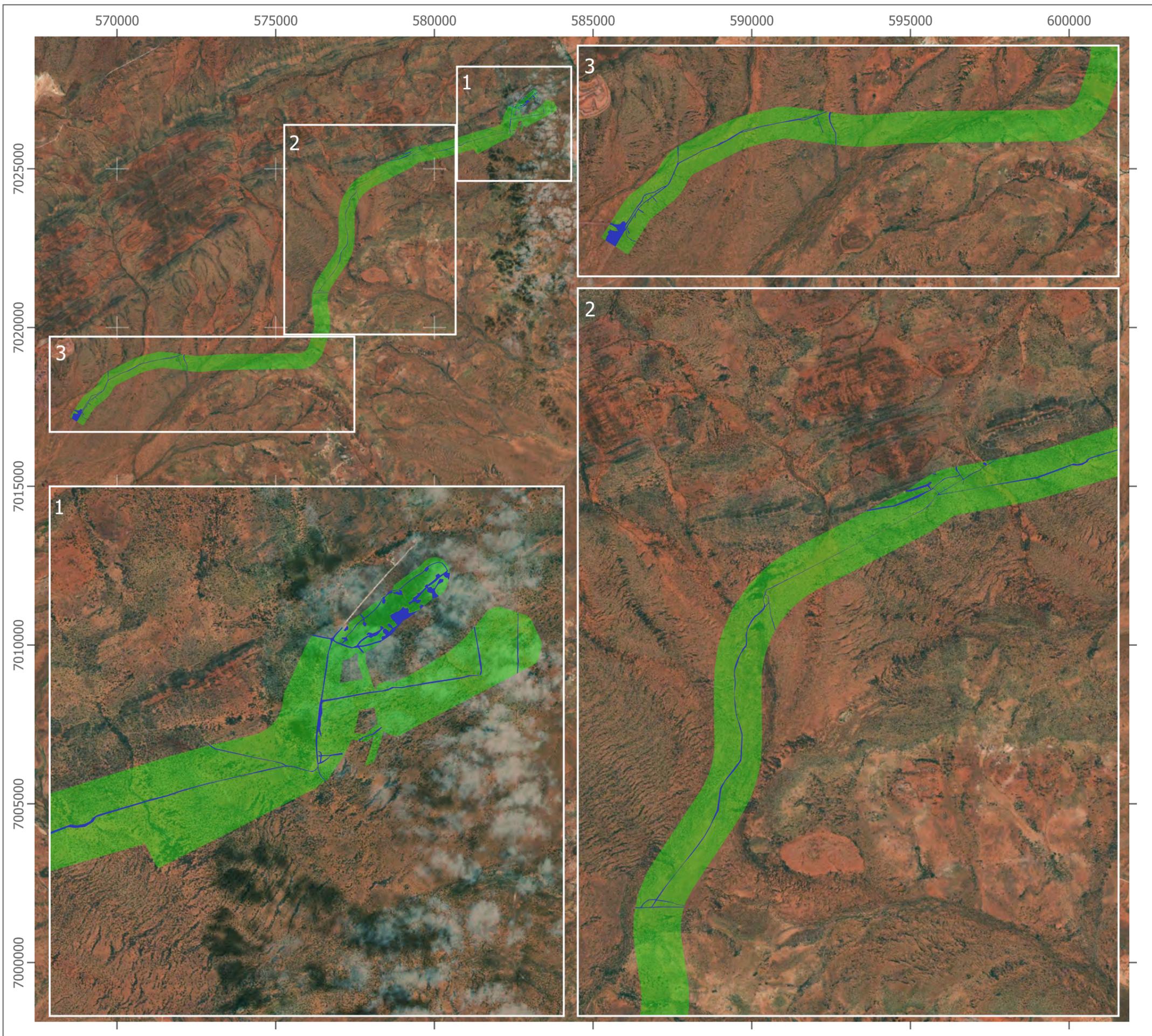
Vegetation condition across the Survey Area was within the categories Good and Completely Degraded, with most of the Survey Area in Good condition (Table 4-5; Figure 4-4).

Table 4-5. Vegetation condition within the Survey Area

Vegetation Condition	Area (ha)	Area (%)
Good	1024.6	97.0
Completely Degraded	31.2	3.0

The primary sources of disturbance on-site are moderate to heavy grazing impact from goats and euro but historically heavy grazing by sheep that has degraded the land and made it compacted and susceptible to sheet erosion. A lower vegetation cover than expected is present, particularly in the groundcover. Whilst seasonal conditions were not optimal for annual and ephemeral species, the large rainfall in March should have promoted high growth and the senesced plants would still be visible. No sheep were seen to be currently stocked on Beebyn Station, however they may have been present earlier in the year, or the poor condition may be a consequence of historic grazing that has not yet recovered due to the degradation of the soil profile.

The other major disturbance is the clearing of vegetation for station tracks, exploration tracks and drill pads. Some of these areas have been rehabilitated or regrowth has occurred due to long periods without use. Regeneration is limited to a few shrubs of a few species and therefore remains in a degraded condition.



Legend

- Vegetation Condition
- Good
 - Completely Degraded

Scale: @ A3 1: 120,000 0 2.5 5 km

Inset 1 - 1:25,000
 Inset 2 - 1:40,000
 Inset 3 - 1:60,000

Coordinate System: GDA 2020 MGA Zone 50
 Projection: Transverse Mercator

Author: VM Approved: EH Date: 26/03/2024



Vegetation Condition

Prepared for:

Figure: **4-4**

4.2.4 Significant Flora

No species listed as T under the EPBC Act or BC Act were recorded during the survey.

One specimen that has the potential to be the P3 *Hibiscus krichauffianus* was recorded during the survey. Insufficient material was available to definitively determine the species, due to seasonal conditions.

Hibiscus krichauffianus is a low or ascending shrub, 0.2-0.7 m high. Flowers are purple-pink and occur in March or October. Preferred habitat is red sandy soils.

The species is common in the central parts of Australia and the Queensland mid coast. Distribution within WA is sparse (ALA 2024), with the closest record in the Talling Subregion, and most records are from the Pilbara. The species has not previously been recorded in the Murchison Region.

Four P flora have previously been recorded in the Survey Area, and another ten are considered Likely to occur based on the location of known populations and the availability of suitable habitat. Targeted search to confirm the presence and abundance of these species was not conducted throughout the Survey Area due to the seasonal conditions. Table 4-6 lists the species known or likely to occur and the known periods of fertility.

Table 4-6. Known periods of fertility

Species	P	Likelihood of Occurrence	Period of fertility
<i>Acacia burrowsiana</i>	3	Likely. Suitable habitat present in 3a and 3b	Flowering Oct - Nov
<i>Acacia dilloniorum</i>	1	Likely. Suitable habitat in the upper 3b areas	Flowers Aug.; mature pods late Oct.
<i>Acacia speckii</i>	4	Present. Suitable habitat in the upper 3b areas	Mature pods present on a specimen collected in September
<i>Beyeria lapidicola</i>	1	Likely. Suitable habitat in 2a and 3b.	Fruits present on holotype collected in August
<i>Dodonaea amplisemina</i>	4	Present. Suitable habitat in 3b.	Flowers recorded in August. Fruits begin to mature from late August to October.
<i>Euphorbia sarcostemmoides</i>	1	Likely. Suitable habitat in 2a, 3a and 3b.	Not available for WA. Fruits present on holotype collected in August in Northern Territory.
<i>Grevillea inconspicua</i>	4	Likely. Suitable habitat in 2a and 3b.	Flowers June to August
<i>Hemigenia virescens</i>	3	Likely. Suitable habitat in 3b.	Flowers recorded July and August
<i>Hibiscus krichauffianus</i>	3	Possible. Suitable habitat in 3b.	Flowers in March or October
<i>Homalocalyx echinulatus</i>	3	Likely. Suitable habitat in 3b.	Flowers June to September
<i>Micromyrtus placoides</i>	3	Likely. Broad habitat suitability. All habitats suitable.	Flowers recorded in August and September
<i>Prostanthera petrophila</i>	3	Present. Suitable habitat in 2a and upper 3a and 3b	Flowers in August

Species	P	Likelihood of Occurrence	Period of fertility
<i>Sauropus</i> sp. Woolgorong (M. Officer s.n. 10/8/94)	3	Likely. Suitable habitat in 2a.	Flowers in June
<i>Stenanthemum mediale</i>	1	Likely. Suitable habitat in 3 and 3b.	Flowers April to August
<i>Verticordia jamiesonii</i>	3	Likely. Suitable habitat in 2a and 3b.	Flowers September to October

4.2.5 Significant Vegetation

Approximately half the Survey Area is within the Weld Range PEC. Vegetation types recorded during the survey are consistent with vegetation types described previously for the Weld Range PEC by Markey and Dillon (2008) and Ecologia (2009a). Markey and Dillon (2008) did not map the extent of each vegetation type. Ecologia (2009a) mapped vegetation types across a large area, both within and outside of the PEC, but not containing the entire PEC.

The proportion of these vegetation types within the Survey Area compared to that mapped over the broader Weld Range PEC as surveyed by Ecologia (2009a) is listed in Table 4-7.

Table 4-7. Proportion of Survey Area in PEC

Veg Type	Survey Area in PEC (ha)	Total mapped by Ecologia (2009a) in PEC	Proportion (%)
2a	14.6	1360.0	1.1
3a	51.6	462.0	11.2
3b	135.2	666.0	20.3
Total	201.4	2488.0	

The Survey Area contains less than 20% of the mapped distribution of these vegetation types within the Weld Range PEC. The Weld Range PEC is 20,073 ha and therefore the undisturbed parts of the Survey Area constitute 1.0% of the Weld Range PEC.

4.2.6 Introduced Flora

No introduced flora were recorded in the Survey Area.

5 TERRESTRIAL VERTEBRATE FAUNA RESULTS

5.1 DESKTOP STUDY

5.1.1 Significant Fauna

The DBCA database returned nine species of significant fauna that have previously been recorded within 30 km of the Survey Area. Of these, one is Conservation Dependent (**CD**), one is listed as Endangered (**EN**), three are listed as Vulnerable (**VU**), three are considered P in WA and one as Other Specifically Protected (**OS**). This includes five species that are known only from fossil records at Wilgie Mia and the locality is no longer within the current known range of the species. Record locations of significant fauna in relation to the Survey Area are shown in Figure 5-1.

Database records for one species of P fauna occurs within the Survey Area. Ten records of *Idiosoma clypeatum* recorded in 2010 are within the pit boundary and haul road. Another 38 records of this species occur within 500 m of the Survey Area, predominantly north of the Haul Road to the Fenix Iron Ridge Project.

The PMST returned 13 additional species, six T, five MI and two that are both T and MI. These are species that do not have DBCA records within 30 km but where modelling has identified that suitable habitat is known to occur or may occur.

The literature review returned one additional conservation significant species recorded during the Ecologia (2009b) survey of the greater Weld Range area *Antechinomys longicaudata* (Long-tailed Dunnart) P4, additional locations of *Lerista eupoda* (West Coast mulga slider) P1, and a nearby long inactive malleefowl mound. These record locations are outside the Survey Area.

Database search results of T, P and MI fauna within 30 km of the Survey Area are listed in Table 5-1, with the outcome of the likelihood of occurrence assessment. The complete assessment including the preferred habitat relative to those available in the Survey Area and a summary of records in the local area is included in Appendix E. Seven T and P species are assessed as present, likely to occur or possibly occurring. These species are discussed in detail in relation to the Survey Area in section 5.2.2.

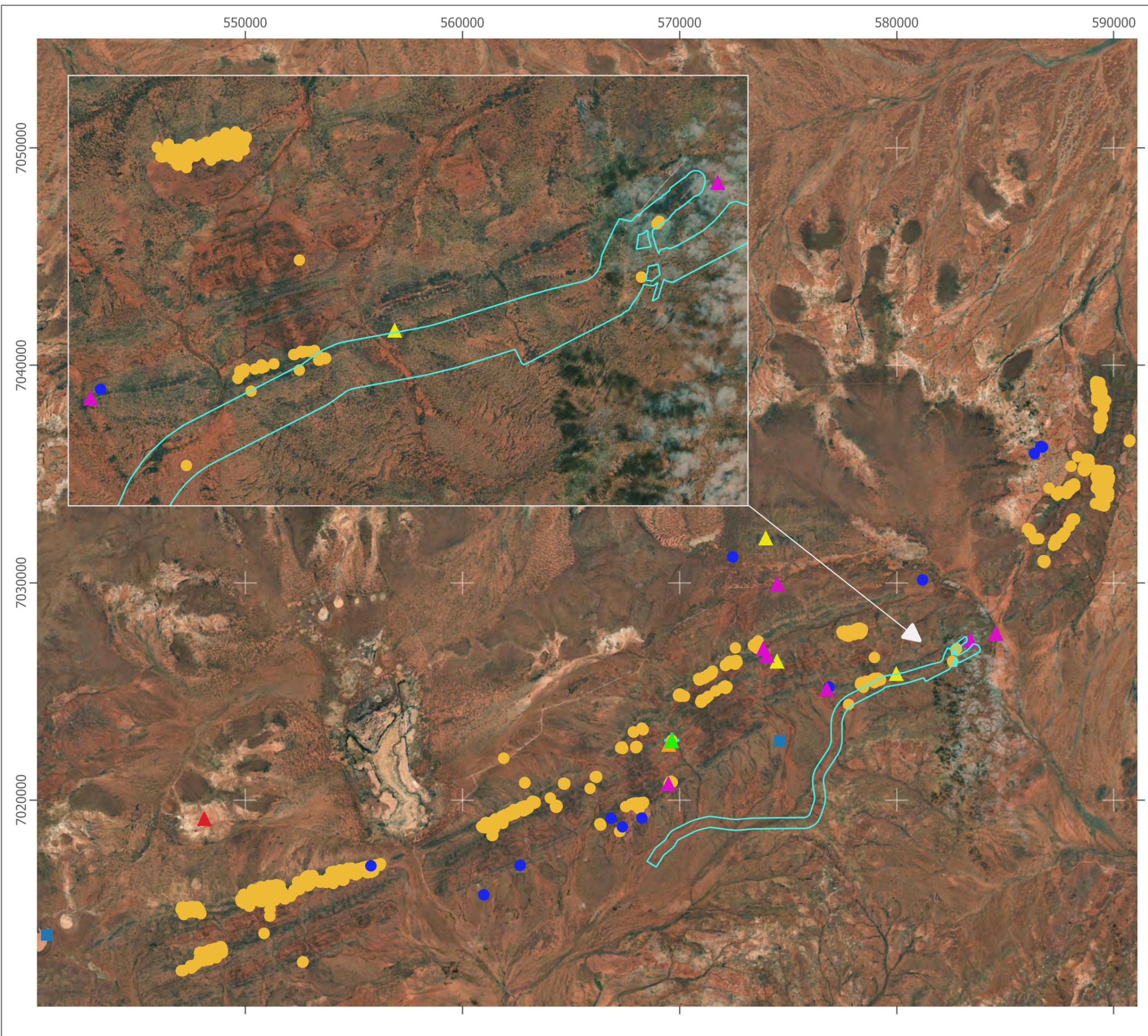
5.1.2 Introduced Fauna

No introduced fauna were returned from the Dandjoo database.

Seven species of introduced mammal were recorded at Weld Range by Ecologia (2009b), being:

- Dog (*Canis lupus familiaris*);
- European Red Fox (*Vulpes vulpes*);
- Feral Cat (*Felis catus*);
- Rabbit (*Oryctolagus cuniculus*);
- House Mouse (*Mus musculus*);
- Goat (*Capra hircus*); and
- Cow (*Bos taurus*).

Large numbers of feral goats were observed across the range, with high grazing pressure evident on the native vegetation.



Legend

- Survey Area
- Threatened**
- ▲ Aphelocephala leucopsis (VU)
- ▲ Leporillus conditor (VU)
- ▲ Macroderma gigas (VU)
- ▲ Macrotis lagotis (VU)
- ▲ Malleefowl mound (VU)
- + Petrogale lateralis lateralis (EN)
- ▲ Pseudomys gouldii (VU)
- Priority**
- Dasyercus blythi (P4)
- Idiosoma clypeatum (P3)
- Lerista eupoda (P1)
- Sminthopsis longicaudata (P4)
- Migratory and Other**
- Falco peregrinus (OS)

Scale: @ A3 0 5 10 km
 1: 175,000

Coordinate System: GDA 2020 MGA Zone 50
 Projection: Transverse Mercator

Author: VM Approved: EH Date: 26/03/2024

Significant Fauna Database Records

Prepared for:



Figure: 5-1

Table 5-1. Significant fauna database records and likelihood of occurrence

	Species	Common Name	Cons. Code		Assessment of Occurrence
			BC Act	EPBC Act	
birds	<i>Aphelocephala leucopsis</i>	Southern whiteface	-	VU	Likely. All habitats are suitable.
	<i>Apus pacificus</i>	Fork-tailed swift	MI	MI	Likely. All habitats are suitable.
	<i>Calidris acuminata</i>	Sharp-tailed sandpiper	MI	VU, MI	Unlikely. No suitable habitat.
	<i>Calidris ferruginea</i>	Curlew sandpiper	CR	CR, MI	Unlikely. No suitable habitat.
	<i>Calidris melanotos</i>	Pectoral sandpiper	MI	MI	Unlikely. No suitable habitat.
	<i>Falco hypoleucos</i>	Grey falcon	VU	VU	Possible. Suitable foraging habitat. No suitable nesting habitat.
	<i>Falco peregrinus</i>	Peregrine falcon	OS	-	Possible. Foraging habitat present.
	<i>Leipoa ocellata</i>	Malleefowl	VU	VU	Possible. Inactive mounds have been recorded.
	<i>Motacilla cinerea</i>	Grey wagtail	MI	MI	Unlikely. No suitable habitat.
	<i>Motacilla flava</i>	Yellow wagtail	MI	MI	Unlikely. No suitable habitat.
	<i>Pezoporus occidentalis</i>	Night parrot	CR	EN	Unlikely. No suitable habitat.
mammals	<i>Antechinomys longicaudata</i>	Long-tailed dunnart	P4		Likely. Suitable habitat in the Banded Ironstone Formation.
	<i>Dasyercus blythi</i>	Brush-tailed mulgara	P4	-	Unlikely. The local record is a fossilised specimen.
	<i>Leporillus conditor</i>	Greater stick-nest rat	CD	VU	Unlikely. The local record is a fossilised specimen.
	<i>Macroderma gigas</i>	Ghost bat	VU	VU	Unlikely. The local record is a fossilised specimen.
	<i>Macrotis lagotis</i>	Bilby	VU	VU	Unlikely. The local record has a low level of certainty and was recorded in 1984.
	<i>Petrogale lateralis</i>	Black-flanked rock-wallaby	EN	EN	Unlikely. The local record is a fossilised specimen.

Species	Common Name	Cons. Code		Assessment of Occurrence	
		BC Act	EPBC Act		
<i>Pseudomys gouldii</i>	Gould's mouse, Shark Bay mouse	VU	VU	Unlikely. The local record is a fossilised specimen.	
reptiles	<i>Egernia stokesii badia</i>	Western spiny-tailed skink	VU	EN	Possible. No granite outcrops are present but suitable habitat may be present in the BIF outcrops.
	<i>Lerista eupoda</i>	West Coast mulga slider	P1		Likely. Suitable habitat is present in the Mulga Woodland on Hill Slope habitat.
invertebrates	<i>Idiosoma clypeatum</i>	Northern shield-backed trapdoor spider	P3	-	Present. Suitable habitat in the Mulga Woodland on Hill Slope habitat.
	<i>Idiosoma nigrum</i>	Shield-backed trapdoor spider	EN	VU	Unlikely. All specimens in the Murchison region determined to be <i>I. clypeatum</i>

5.2 FIELD SURVEY

5.2.1 Fauna Habitats

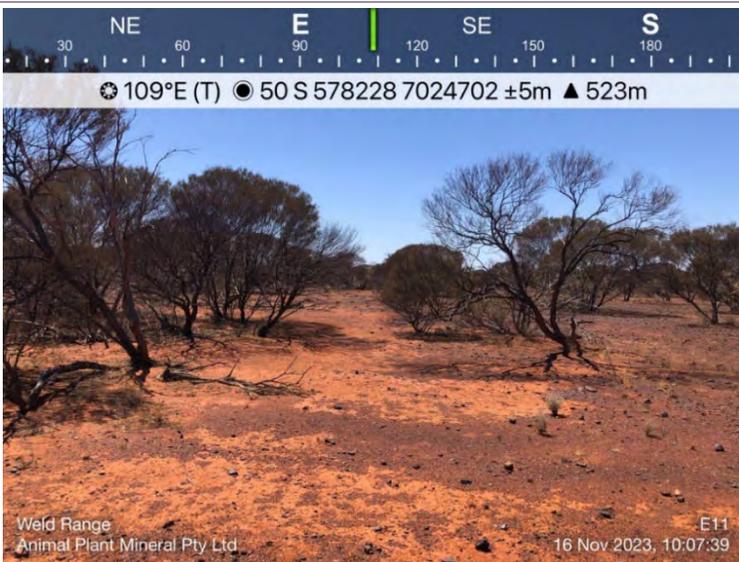
Four fauna habitats are described for the Survey Area and are summarised in Table 5-2 and described below.

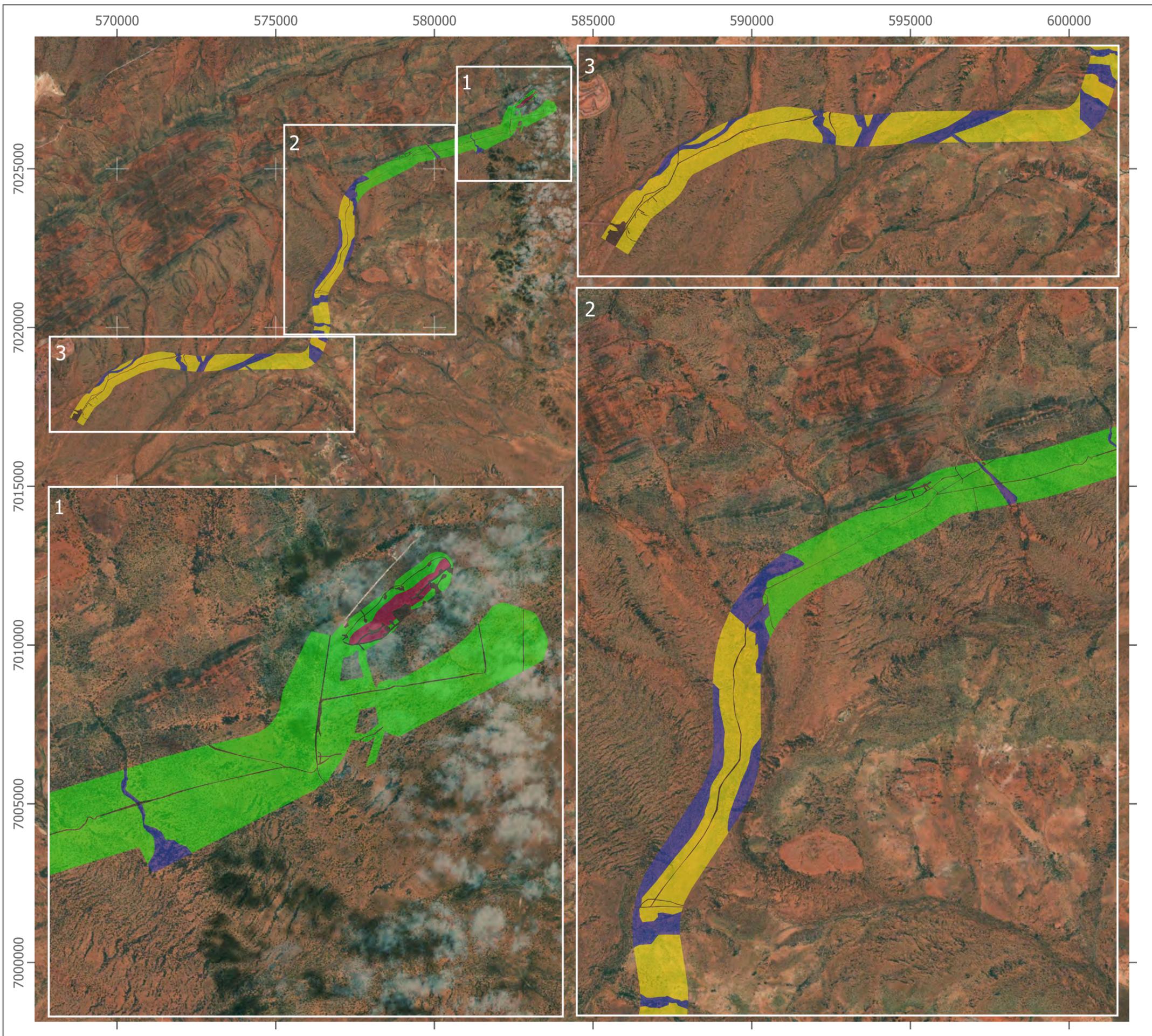
Table 5-2. Fauna Habitats within the Survey Area

Name	Area (ha)	Proportion (%)
Acacia Sand Plains	500.5	47.4
Banded Ironstone Ridge	6.1	0.6
Drainage Line	186.1	17.6
Mulga Woodland on Hill Slope	333.0	31.5
Disturbed	30.5	2.9

The distribution of fauna habitats is shown in Figure 5-2.

<p>Acacia sand plains</p>	<p>Occasional <i>Acacia pruinoarpa</i> low trees with <i>A. aneura</i> (mulga) and <i>Acacia ramulosa</i> var. <i>linopylla</i> tall shrubs, over medium to low mixed shrubs predominantly of <i>Eremophila</i> spp., over sparse grasses and perennial herbs, on a sandy to lightly rocky clay loam.</p>	<p>Weld Range Animal Plant Mineral Pty Ltd 15 Nov 2023, 11:18:31 E4</p>
<p>Banded Ironstone Ridge</p>	<p>Occasional <i>Acacia pruinoarpa</i> low trees and/or <i>Acacia aneura</i> (mulga) tall shrubs, over medium to low mixed shrubs, over sparse grasses, on an ironstone and clayey loam.</p>	<p>Weld Range Animal Plant Mineral Pty Ltd 15 Nov 2023, 09:00:35 E2</p>

<p>Drainage line</p>	<p>Open <i>Acacia pruinocarpa</i> and <i>Acacia aneura</i> low trees over low to medium mixed shrubs, over sparse to dense grasses on a stony sandy and clayey soil.</p>	
<p>Mulga woodland on hill slope</p>	<p>Open <i>Acacia pruinocarpa</i> low trees over <i>Acacia aneura</i> high shrubs, over mixed medium shrubs, over sparse grasses and herbs on a sandy or stony clay loam.</p>	



Legend

- Fauna Habitat
- Acacia Sand Plains
 - Banded Ironstone Ridge
 - Disturbed
 - Drainage Line
 - Mulga Woodland on Hill Slope

Scale: @ A3 0 2.5 5 km
 1: 120,000
 Coordinate System: GDA 2020 MGA Zone 50
 Projection: Transverse Mercator
 Author: VM Approved: EH Date: 26/03/2024

Fauna Habitat

Prepared for:

5.2.2 Conservation Significant Fauna

5.2.2.1 Southern whiteface

Southern whiteface occur across most of mainland Australia south of the tropics, from the north-eastern edge of the Western Australian wheatbelt, east to the Great Dividing Range (Schodde and Mason 1999). Two subspecies are recognised under the 2023 EPBC Act listing: *A. l. leucopsis* (South-east southern whiteface), the nominate subspecies found throughout south-eastern and central Australia; and *A. l. castaneiventris* (South-west southern whiteface) found in central and southern WA.

As the species is not listed as T in WA, no location records were included in the DBCA database search. Record locations shown in Figure 5-1 were extracted from the Atlas of Living Australia (ALA 2024), originating from the Birds Australia database. Ecologia (2009b) recorded the species at the Weld Range project, however as the species was not listed as conservation significant at the time, the specific location is not reported, and may not have been within the current Survey Area.

Southern whitefaces live in a wide range of open woodlands and shrublands where there is an understorey of grasses or shrubs, or both. These areas are usually in habitats dominated by acacias or eucalypts on ranges, foothills and lowlands, and plains (Higgins and Peter 2002). Southern whitefaces are considered sedentary; however, atlas records indicate that individuals may move into wetter areas outside of their normal range during drought years (Higgins and Peter 2002). Southern whiteface forage almost exclusively on the ground, favouring habitat with low tree densities and an herbaceous understorey litter cover. Birds mainly feed on insects, spiders, and seeds, largely gleaned from the bare ground or leaf litter (Higgins and Peter 2002). Although the species typically forages in small groups of 2–8 individuals, birds may congregate in larger flocks during the non-breeding season, with as many as 70 birds recorded in foraging parties in winter (Higgins and Peter 2002). The species often participates in mixed species feeding flocks, particularly with other whiteface and thornbill species.

Breeding takes place from July to October throughout most of the species' range, however, the timing of breeding can be affected by rainfall in arid regions (Higgins and Peter 2002). Birds may breed outside of their usual season following sufficient rainfall or may not breed at all during drought. Birds build large bulky domed nest of grass, bark and roots, usually in a hollow or crevice, although sometimes in low bushes (Higgins and Peter 2002).

Habitat critical to the survival of the Southern whiteface (DCCEEW 2023) includes areas of:

- relatively undisturbed open woodlands and shrublands with an understorey of grasses or shrubs, or both;
- habitat with low tree densities and an herbaceous understorey litter cover which provides essential foraging habitat;
- living and dead trees with hollows and crevices which are essential for roosting and nesting.

The Survey Area contains some large trees that may be suitable for development of hollows, however the area is previously disturbed with grazing impacts from both the Beebyn Station and feral goats and clearing for mining exploration activity. The understorey is sparse and the litter layer sparse to absent, but thicker in narrow bands around the Drainage Lines. Due to the poor condition of the understorey, the Survey Area is unlikely to host habitat critical to the survival of the Southern whiteface, however, this would need to be confirmed by targeted survey for the presence of birds.

5.2.2.2 Grey falcon

The Grey falcon occurs in most of the drier parts of Australia (Schoenjahn 2018). Its distribution is centred on inland drainage systems where there is an average annual rainfall of less than 500 mm. Its main habitat is timbered lowland plains, particularly Acacia shrublands that are crossed by tree-lined watercourses. It generally occurs at low densities across inland Australia (BirdLife International 2019).

The Grey falcon hunts far out into tussock grassland and open woodland. It nests in old nests made by other birds, usually in the tallest trees along watercourses, particularly river red gum (TSSC 2020). Prey species include doves, pigeons, small parrots and cockatoos, and finches, but a variety of other bird prey species have been recorded, as well as mammals and lizards (TSSC 2020).

Local records are more than 50 km away. All habitats in the Survey Area are suitable foraging habitat for this species. No trees suitable for nesting are present in the Survey Area, however there may be occasional tall trees of species other than red gum present in the drainage features within foraging range of the Survey Area.

5.2.2.3 Malleefowl

The Survey Area is on the northernmost extent of Malleefowl distribution at this longitude in WA, and the ALA lists the closest records over 50 km to the south. Ecologia (2009b) reported the presence of old, inactive mounds within the Weld Range habitats, but noted that better, unburnt habitat was present in areas outside of their study boundaries, and conclude it was not expected to be resident at Weld Range but may persist in surrounding areas.

Malleefowl are generalist feeders consisting of the seeds, flowers and fruits of shrubs (especially legumes), herbs, invertebrates, tubers and fungi. Malleefowl diet is characteristically variable and different foods are important at different times and locations (Benshemesh 2007). A sandy substrate and abundance of leaf litter are clear requirements for the construction of the birds' incubator-nests (Benshemesh 2007). Soils in the Survey Area have a reasonably high clay content and litter was sparse to absent, except in the narrow Drainage Lines. The quality of the habitat for foraging and nest building are generally low, however there is a possibility of Malleefowl occurring in small patches of higher quality habitat in or near the larger drainage features low in the plains.

5.2.2.4 Long-tailed dunnart

Long-tailed dunnart is known from remote and disparate locations throughout the arid zone and in association with rocky habitats. While records of this species are few and far between, it has been found to be reasonably abundant when a known population is sampled. Due to the highly patchy nature of Long-tailed dunnart records and the distance between populations the dispersal ability of this species is potentially very poor.

Its long tail is muscular at the base and is highly mobile, allowing the dunnart to move with agility in rocky habitats utilising the long tail and striated foot-pads to assist with climbing. They feed on a variety of invertebrates.

Breeding occurs in October and November and the female can bear up to six young. Young disperse in March-April in the Murchison area (Western Australian Museum Collections 2023).

At the Weld Range the species has been recorded on exposed rock and stony soils with hummock grasses and shrubs, flat-topped hills, lateritic plateaus, sandstone ranges and breakaways, generally with a vegetation of sparse mulga over spinifex Ecologia (2009b). In the Survey Area, suitable habitat is in the Banded Ironstone Ridge habitats, and rocky Drainage Lines between ridges.

5.2.2.5 Western spiny-tailed skink

Egernia stokesii badia was widely distributed up until the 1960s through semi-arid areas of southwestern WA from Minnivale (150 km ENE of Perth) north to Mullewa and east to Perenjori and south of Yalgoo but excluding coastal areas. There are two forms of *E. stokesii badia*: a reddish-brown form in the northern and central wheatbelt; and a wholly black form in the Murchison Region (Ecologia 2010). Surveys for the black form between 2006 and 2009 identified 96 locations in the Murchison Region (Ecologia 2010) and the area of occupancy is approximately 4,000 km² in extent (Department of Environment and Conservation 2012).

The Survey Areas occur in the Murchison Region where the wholly black form is distributed. Habitat differences are apparent between the forms, where the Wheatbelt reddish-brown form inhabits hollow logs and the Murchison wholly black form inhabits crevices, predominantly in areas of granite outcropping. Whilst there is no granite outcropping in the Survey Area, habitat suitability is poorly known (Department of Sustainability, Environment, Water, Population and Communities [DSEWPAC] 2011) and may be present in the BIF outcropping.

E. stokesii badia is one of the larger subspecies of *Egernia stokesii*, growing to 194 mm (snout to vent length). Its skin is coloured with heavily keeled scales. It has a short, flattish, distinctively spiny tail (Chapple 2003; Wilson and Swan 2023) which it uses as anchorage within crevices when defending itself (Chapple 2003).

E. stokesii badia live in spatially and temporally stable groups of up to 17 individuals and has a distinctive behaviour of depositing faecal droppings outside of refuges in a pile or cluster (How *et al.* 2003) referred to as a communal toilet area, scat piling, or latrine.

Whilst granite outcropping with crevices is generally the observed habitat, it is possible the Banded Ironstone Ridge contains suitable crevices.

5.2.2.6 West Coast mulga slider

The West Coast mulga slider is restricted to the arid southern interior between Cue and Meekatharra. Suitable habitat has been described as occurring in open mulga on red loams and sandy loams (Smith 1996).

Local records are in lower slopes/upper plain habitats, often near drainage lines.

The *Lerista* genus are burrowing species that thrive in arid conditions. More commonly, and as is the case for *L. eupoda*, they are unspecialised inhabitants of leaf litter. In the case of *L. eupoda*, the species appears more restricted to the open mulga areas on loamy soils (Wilson and Swan 2023).

They tend to be most easily located in groves of Acacia where they emerge from just under the surface to fossick in the leaf litter for invertebrate prey. In cooler months they are most easily located in the more exposed litter layers close to the surface, retreating deeper under the soil within thicker Acacia groves as temperatures increase and humidity decreases. They are prone to desiccation, hence their

fossorial / semi-subterranean habit. In addition to leaf litter habitat, they are often found in the detrital layers of rotting logs, in abandoned termitaria and in abandoned stick-ant nests (Bush *et al.*, 2007).

Suitability of habitat within the Survey Area is limited by the sparse presence of litter. Higher litter loads are present near to and within drainage features but are of limited extent.

5.2.2.7 Northern shield-backed trapdoor spider

Northern shield-backed trapdoor spider has a widespread distribution in WA's inland arid zone, principally throughout the Yalgoo and Murchison Bioregions where it is the only known species in the *nigrum*-group (excluding a population of *I. formosum* from the southern Yalgoo). It extends from near Paynes Find, the Blue Hill Range, Kadji Kadji Nature Reserve, and Karara in the south, north and north-east to at least Coolcalalaya Homestead, Jack Hills, Albion Downs, Yakabindie, and Yeelirrie.

This distribution seems to be strongly correlated with annual rainfall of less than 250 mm (Rix *et al.* 2018).

Idiosoma clypeatum was for a long time misidentified as *I. nigrum*, and the 2013 threatened species assessment of *I. nigrum* prepared under the EPBC Act conflated the identification of these two species. Specimens collected at the Weld Range by Ecologia (2009b) were identified as *I. nigrum* at the time but have since been reassigned to *I. clypeatum* (Rix *et al.* 2018). Ellis (2015) summarises aspects of the biology of this species based on observations at the Weld Range where burrows are adorned with a 'moustache-like' arrangement of twig-lines. Males have been collected wandering in search of females in late autumn, winter and spring, with a peak of activity in winter.

Database records indicate the species occurs most frequently in the mid to lower slopes of the Weld Range, including within the Survey Area and immediate surrounds. Targeted searches for shield-backed trapdoor spider were conducted in 2009 and targeted search is appropriate within the Survey Area to determine the current status of species presence.

6 CONCLUSIONS

6.1 FLORA

The flora and vegetation survey recorded a total of 77 taxa within the Survey Area. The average species diversity recorded per quadrat (14.75) is less than that reported by Markey and Dillon (20.5 - 49.8) but comparable with that of Ecologia (2009a) for the same vegetation types.

Modelled species richness indicated that the floristic survey was approximately 77% complete. Season of survey and seasonal conditions are a minor constraint for the completeness of the survey, and it is expected that a higher species richness in annual/ephemeral taxa would be recorded during the recommended survey period following average or above average rainfall. This is only a minor constraint as the local area is well surveyed (Markey and Dillon 2008, Ecologia 2009a) and conditions were sufficient to describe vegetation types, which are dominated by perennial vegetation in this bioregion. Whilst occurring outside of the recommended survey period, the remotely captured NDVI index indicates that greenness in the Beebyn Station was near to the 90th percentile in November 2023, compared to long term datasets (DPIRD 2023a).

The flora and vegetation of the Survey Area is generally typical of the Weld Range, of the Land Systems present in the Survey Area and of the adjacent lands surrounding the Survey Area.

6.2 FLORA OF CONSERVATION SIGNIFICANCE

No T flora was recorded in the Survey Area. One specimen that may be a P3 species was recorded.

Hibiscus? krichauffianus was recorded at one location, quadrat E14, at 0.01% cover. Insufficient material was available to definitively determine the species, due to seasonal conditions. If confirmed, this would be a significant range extension for the species. Whilst occurring in the broadly distributed vegetation type 3b, the specific location was limited to a narrow drainage gully.

An additional four species were determined as present based upon historic survey records and ten assessed as Likely to occur based upon the proximity of known locations and the availability of suitable habitat. Targeted search for these species would be required to determine the currency and abundance of presence within the Survey Area. Periods of fertility for these species, and therefore suitable timing for targeted search is in winter and early spring.

6.3 INTRODUCED FLORA

No weeds Declared under the BAM Act or classed as WoNS were recorded in the Survey Area or are known to occur in the local area.

6.4 VEGETATION OF CONSERVATION SIGNIFICANCE

Approximately half the Survey Area is within the Weld Range PEC. Vegetation types recorded during the survey are consistent with vegetation types described previously for the Weld Range PEC by Markey and Dillon (2008) and Ecologia (2009a).

The amount of each vegetation type within the Survey Area as a proportion of that mapped within the Weld Range PEC by Ecologia (2009a) is 1.1% of 2a, 11.2% of 3a, and 20.3% of 3b.

Regional Vegetation Associations within the Survey Area as described by Beard (1975) have over 99% pre-European Vegetation extent remaining.

6.5 FAUNA OF CONSERVATION SIGNIFICANCE

The Southern whiteface has recently been determined as a T species under the EPBC Act. The species was previously widespread across temperate mainland Australia, but has suffered sharp declines in population numbers, chiefly due to habitat loss and degradation. The species is not currently listed as Threatened under the BC Act. Southern whiteface has been recorded in the Weld Range and in the surrounding landscapes. The habitats available in the Survey Area are highly likely to be part of the species historic range. The current quality of available habitat is low due to a loss of undergrowth due to heavy grazing pressure from native animals, station stocking and feral goats. Land clearing for station tracks and mining exploration has also impacted the quality of the habitat. Due to the low quality of the understory, it is unlikely that the Survey Area constitutes Critical habitat (DCCEEW 2023), however determination of current use by the species is required to unequivocally verify this. Optimal survey period is July to October during the breeding season; however, the species is sedentary (outside of drought periods) and therefore can be surveyed in any season.

Suitable foraging habitat for the Grey falcon is present within the Survey Area, however no suitable nesting habitat is present and preferred nesting habitat is not available in the surrounding local area. Occurrence records are more than 50 km away and whilst Grey falcon may occasionally visit the locality, it is unlikely to provide an important habitat for this species.

The Survey Area is likely part of the historic range of the malleefowl, as evidenced by the presence of long inactive mounds recorded during baseline surveys. Mounds may last decades after abandonment, and the presence of inactive mounds is not a reliable indication of current presence. Malleefowl males begin nest construction in autumn and breeding between September and January. Survey for active mounds, is therefore possible from late autumn through to mid-summer.

Presence of the Long-tailed dunnart was confirmed in the Weld Range by the Ecologia (2009b) baseline surveys, including within the Survey Area. Suitable habitat occurs in the Banded Ironstone Ridges and the small gullies that occur between the ridges. There are no seasonal restrictions on the survey of mammals in the Eremean climatic district (EPA 2020).

The Western spiny-tailed skink has not previously been recorded in BIF; however, the species is poorly known (DSEWPAC 2011), and crevices are present in the Banded Ironstone Ridge habitat. The species is sedentary and searching crevice habitats for skinks and their distinctive latrine piles can be conducted in any season however, animals are likely to be least active in winter and most active in spring (DSEWPA 2011).

The West Coast mulga slider has been recorded in Weld Range including locations close to the Survey Area. Whilst the Survey Area is likely to be within the species broader area of occupation, the habitats within the Survey Area are generally of poor quality. Leaf litter is scarce within the Survey Area, and soils are degraded and likely poor for burrowing. Higher quality microhabitats occur in the Drainage Line habitat however, soils may be too stony to be suitable. Survey period for reptiles in the Eremean climatic district is September to April.

The Northern shield-backed trapdoor spider is known to occur in the Weld Range including within the Survey Area. The species present in the Weld Range was previously determined to be the T species *I. nigrum*, however taxonomic revision of the group led to a reassignment to *I. clypeatum* and a reduction in conservation ranking to P. Targeted survey can occur in any season as the spiders are sedentary and the burrow entrances are detectable. Suitable habitat occurs in the Mulga Woodland on Hill Slope habitat. Geographic isolation of the Northern shield-backed trapdoor spider in the region means spiders can be assigned to a species through burrow detection and without harvesting individuals.

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APPENDICES

APPENDIX A: CONSERVATION AND DECLARED CATEGORIES

Conservation Categories for Flora, Fauna and Ecological Communities, and Categories
for Introduced Flora - Appendix A

Conservation categories for threatened species and communities protected under Federal legislation are defined under the *Environment Protection and Biodiversity Conservation Act 1999* and the *Environment Protection and Biodiversity Conservation Regulations 2000* are listed in Tables A.1. and A.2.

Table A.1: Categories and definitions for threatened flora and fauna species listed under the *Environment Protection and Biodiversity Conservation Act 1999*.

Conservation Category	Definition
Extinct	Taxa with no reasonable doubt that the last member of the species has died.
Extinct in the wild	Taxa known to survive only in cultivation, in captivity or as a naturalised population well outside its past range; or it has not been recorded in its known and/or expected habitat, at appropriated seasons, anywhere in its past range, despite exhaustive surveys over a time frame appropriate to its life cycle and form.
Critically Endangered (CR)	Taxa facing an extremely high risk of extinction in the wild in the immediate future, as determined in accordance with the prescribed criteria.
Endangered (E)	Taxa are not critically endangered; and are facing a very high risk of extinction in the wild in the near future, as determined in accordance with the prescribed criteria.
Vulnerable (V)	Taxa are not critically endangered or endangered; and are facing a high risk of extinction in the wild in the medium-term future, as determined in accordance with the prescribed criteria.
Conservation dependent (CD)	<p>Taxa are the focus of a specific conservation program the cessation of which would result in the species becoming vulnerable, endangered or critically endangered; or the following subparagraphs are satisfied:</p> <ul style="list-style-type: none"> i) the taxa is a species of fish; ii) the taxa is the focus of a management plan that provides management actions necessary to stop the decline of, and support the recovery of, the taxa so that its chances of long term survival in nature are maximized; iii) the management plan is in force under a law of the Commonwealth or of a State or Territory; and iv) Cessation of the management plan would adversely affect the conservation status of the taxa. <p>Fish includes all taxa of bony fish, sharks, rays, crustaceans, molluscs and other marine organisms, but does not include marine mammals/reptiles.</p>

Table A.2: Definitions for Threatened Ecological Communities under the *Environment Protection and Biodiversity Conservation Act 1999*.

Conservation Category	Definition
Critically endangered	If, at that time, it is facing an extremely high risk of extinction in the wild in the immediate future, as determined in accordance with the prescribed criteria.
Endangered	If, at that time, it is not critically endangered and is facing a very high risk of extinction in the wild in the near future, as determined in accordance with the prescribed criteria.
Vulnerable	If, at that time, it is not critically endangered or endangered, and is facing a high risk of extinction in the wild in the medium-term future, as determined in accordance with the prescribed criteria.

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For Section 182 of the EPBC Act and 179 of the EPBC Act Threatened Ecological Communities and Native species are in the Critically Endangered, Endangered or Vulnerable category if they meet any of the criteria for the category mentioned in Table A.3:

Table A.3: Criteria for listing Threatened Species and Threatened Ecological Communities under the *Environment Protection and Biodiversity Conservation Regulations 2000*

Threatened Species				
Item	Criterion	Category		
		Critically Endangered	Endangered	Vulnerable
1	It has undergone, is suspected to have undergone, or is likely to undergo in the immediate future:	A very severe reduction in numbers	A severe reduction in numbers	A substantial reduction in numbers
2	Its geographic distribution is precarious for the survival of the species and is:	Very restricted	Restricted	limited
3	The estimated total number of mature individuals is: And: (a) Evidence suggests that the number will continue to decline at: or (b) The number is likely to continue to decline and its geographic distribution is:	Very low	Low	limited
		A very high rate	A high rate	A substantial rate
		Precarious for its survival	Precarious for its survival	Precarious for its survival
4	The estimated total number of mature individuals is:	Extremely low	Very low	low
5	The probability of its extinction in the wild is at least:	50% in the immediate future	20% in the near future	10% in the medium term future
Threatened Ecological Communities				
Item	Criterion	Category		
		Critically Endangered	Endangered	Vulnerable
1	Its decline in geographic distribution is:	Very severe	Severe	substantial
2	Its geographic distribution is: And the nature of its distribution makes it likely that the action of a threatening process could cause it to be lost in:	Very restricted	restricted	limited
		The immediate future	The near future	The medium term future
3	For a population of a native species that is likely to play a major role in the community, there is a: To the extent that restoration of the community is not likely to be possible in:	Very severe decline	Severe decline	Substantial decline
		The immediate future	The near future	The medium term future
4	The reduction in its integrity across most of its geographic distribution is: As indicated by degradation of the community or its habitat, or disruption of important community processes, that is:	Very severe	severe	substantial
		Very severe	severe	substantial

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5	<p>The rate of continuing detrimental change is: As indicated by</p> <p>(a) A rate of continuing decline in its geographic distribution, or a population of a native species that is believed to play a major role in the community, that is: or</p> <p>(b) Intensification, across most of its geographic distribution, in degradation, or disruption of important community processes, that is:</p>	Very severe	severe	substantial
	(a)	Very severe	severe	serious
	(b)	Very severe	severe	serious
6	A quantitative analysis shows that its probability of extinction, or extreme degradation over all its geographic distribution, is:	At least 50% in the immediate future	At least 20% in the near future	At least 10% in the medium term future

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In Western Australia, the *Biodiversity Conservation Act 2016* (BC Act) provides for the statutory listing of Threatened Ecological Communities, under the categories listed in Table A.4.

Table A.4: Definitions and criteria for Presumed Totally Destroyed, Critically Endangered, Endangered and Vulnerable Ecological Communities. Department of Environment and Conservation (2013).

PD : Presumed Totally Destroyed
<p>An ecological community that has been adequately searched for but for which no representative occurrences have been located. The community has been found to be totally destroyed or so extensively modified throughout its range that no occurrence of it is likely to recover its species composition and/or structure in the foreseeable future.</p> <p>An ecological community will be listed as presumed totally destroyed if there are no recent records of the community being extant and either of the following applies (A or B):</p> <p>A) Records within the last 50 years have not been confirmed despite thorough searches of known or likely habitats or</p> <p>B) All occurrences recorded within the last 50 years have since been destroyed.</p>
CR : Critically Endangered
<p>An ecological community that has been adequately surveyed and found to have been subject to a major contraction in area and/or that was originally of limited distribution and is facing severe modification or destruction throughout its range in the immediate future, or is already severely degraded throughout its range but capable of being substantially restored or rehabilitated.</p> <p>An ecological community will be listed as Critically Endangered when it has been adequately surveyed and is found to be facing an extremely high risk of total destruction in the immediate future. This will be determined on the basis of the best available information, by it meeting any one or more of the following criteria (A, B or C):</p> <p>A) The estimated geographic range, and/or total area occupied, and/or number of discrete occurrences since European settlement have been reduced by at least 90% and either or both of the following apply (i or ii):</p> <p>i) geographic range, and/or total area occupied and/or number of discrete occurrences are continuing to decline such that total destruction of the community is imminent (within approximately 10 years);</p> <p>ii) modification throughout its range is continuing such that in the immediate future (within approximately 10 years) the community is unlikely to be capable of being substantially rehabilitated.</p> <p>B) Current distribution is limited, and one or more of the following apply (i, ii or iii):</p> <p>i) geographic range and/or number of discrete occurrences, and/or area occupied is highly restricted and the community is currently subject to known threatening processes which are likely to result in total destruction throughout its range in the immediate future (within approximately 10 years);</p> <p>ii) there are very few occurrences, each of which is small and/or isolated and extremely vulnerable to known threatening processes;</p> <p>iii) there may be many occurrences but total area is very small and each occurrence is small and/or isolated and extremely vulnerable to known threatening processes.</p> <p>C) The ecological community exists only as highly modified occurrences that may be capable of being rehabilitated if such work begins in the immediate future (within approximately 10 years).</p>
En : Endangered
<p>An ecological community that has been adequately surveyed and found to have been subject to a major contraction in area and/or was originally of limited distribution and is in danger of significant modification throughout its range or severe modification or destruction over most of its range in the near future.</p> <p>An ecological community will be listed as Endangered when it has been adequately surveyed and is not Critically Endangered but is facing a very high risk of total destruction in the near future. This will be determined on the basis of the best available information by it meeting any one or more of the following criteria (A, B, or C):</p> <p>A) The geographic range, and/or total area occupied, and/or number of discrete occurrences have been reduced by at least 70% since European settlement and either or both of the following apply (i or ii):</p> <p>i) the estimated geographic range, and/or total area occupied and/or number of discrete occurrences are continuing to decline such that total destruction of the community is likely in the short term future (within approximately 20 years);</p> <p>ii) modification throughout its range is continuing such that in the short term future (within approximately</p>

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20 years) the community is unlikely to be capable of being substantially restored or rehabilitated.
B) Current distribution is limited, and one or more of the following apply (i, ii or iii):
i) geographic range and/or number of discrete occurrences, and/or area occupied is highly restricted and the community is currently subject to known threatening processes which are likely to result in total destruction throughout its range in the short term future (within approximately 20 years);
ii) there are few occurrences, each of which is small and/or isolated and all or most occurrences are very vulnerable to known threatening processes;
iii) there may be many occurrences but total area is small and all or most occurrences are small and/or isolated and very vulnerable to known threatening processes.
C) The ecological community exists only as very modified occurrences that may be capable of being substantially restored or rehabilitated if such work begins in the short-term future (within approximately 20 years).

VU : Vulnerable

An ecological community that has been adequately surveyed and is found to be declining and/or has declined in distribution and/or condition and whose ultimate security has not yet been assured and/or a community that is still widespread but is believed likely to move into a category of higher threat in the near future if threatening processes continue or begin operating throughout its range.

An ecological community will be listed as Vulnerable when it has been adequately surveyed and is not Critically Endangered or Endangered but is facing a high risk of total destruction or significant modification in the medium to long-term future. This will be determined on the basis of the best available information by it meeting any one or more of the following criteria (A, B or C):

A) The ecological community exists largely as modified occurrences that are likely to be capable of being substantially restored or rehabilitated.

B) The ecological community may already be modified and would be vulnerable to threatening processes, is restricted in area and/or range and/or is only found at a few locations.

C) The ecological community may be still widespread but is believed likely to move into a category of higher threat in the medium to long term future because of existing or impending threatening processes.

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In Western Australia, possible Threatened Ecological Communities that do not meet survey criteria or that are not adequately defined are added to the Priority Ecological Community Lists under Priorities 1, 2 and 3. Ecological communities that are adequately known, and are rare but not threatened or meet criteria for Near Threatened, or that have been recently removed from the threatened list, are placed in Priority 4. These ecological communities require regular monitoring. Conservation Dependent ecological communities are placed in Priority 5 (Table A.4).

Table A.5: Definitions and criteria for Priority Ecological Communities Department of Environment and Conservation (2013).

P1: Priority One – Poorly-known ecological communities
Ecological communities that are known from very few occurrences with a very restricted distribution (generally ≤ 5 occurrences or a total area of ≤ 100 ha). Occurrences are believed to be under threat either due to limited extent, or being on lands under immediate threat (e.g. within agricultural or pastoral lands, urban areas, active mineral leases) or for which current threats exist. May include communities with occurrences on protected lands. Communities may be included if they are comparatively well-known from one or more localities but do not meet adequacy of survey requirements, and/or are not well defined, and appear to be under immediate threat from known threatening processes across their range.
P2: Priority Two – Poorly-known ecological communities
Communities that are known from few occurrences with a restricted distribution (generally ≤ 10 occurrences or a total area of ≤ 200 ha). At least some occurrences are not believed to be under immediate threat of destruction or degradation. Communities may be included if they are comparatively well known from one or more localities but do not meet adequacy of survey requirements, and/or are not well defined, and appear to be under threat from known threatening processes.
P3: Priority Three – Poorly-known ecological communities
(i) Communities that are known from several to many occurrences, a significant number or area of which are not under threat of habitat destruction or degradation or: (ii) communities known from a few widespread occurrences, which are either large or within significant remaining areas of habitat in which other occurrences may occur, much of it not under imminent threat, or; (iii) communities made up of large, and/or widespread occurrences, that may or not be represented in the reserve system but are under threat of modification across much of their range from processes such as grazing by domestic and/or feral stock, and inappropriate fire regimes. Communities may be included if they are comparatively well known from several localities but do not meet adequacy of survey requirements and/or are not well defined, and known threatening processes exist that could affect them.
P4: Priority Four
Ecological communities that are adequately known, rare but not threatened or meet criteria for Near Threatened, or that have been recently removed from the threatened list. These communities require regular monitoring. (i) Rare. Ecological communities known from few occurrences that are considered to have been adequately surveyed, or for which sufficient knowledge is available, and that are considered not currently threatened or in need of special protection, but could be if present circumstances change. These communities are usually represented on conservation lands. (ii) Near Threatened. Ecological communities that are considered to have been adequately surveyed and that do not qualify for Conservation Dependent, but that are close to qualifying for Vulnerable. (iii) Ecological communities that have been removed from the list of threatened communities during the past five years.
P5: Priority Five – Conservation dependent ecological communities
Ecological communities that are not threatened but are subject to a specific conservation program, the cessation of which would result in the community becoming threatened within five years.

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In Western Australia, the Wildlife Conservation (Specially Protected Fauna) Notice 2018 and the Wildlife Conservation (Rare Flora) Notice 2018 have been transitioned under regulations 170, 171 and 172 of the Biodiversity Conservation Regulations 2018 to be the lists of Threatened, Extinct and Specially Protected species under Part 2 of the *Biodiversity Conservation Act 2016*.

Categories of Threatened, Extinct and Specially Protected fauna and flora are listed in Table A.6.

The definition of flora includes algae, fungi and lichens. The definition of Species includes all taxa (plural of taxon - a classificatory group of any taxonomic rank, e.g. a family, genus, species or any infraspecific category i.e. subspecies or variety, or a distinct population).

Table A.6: Conservation codes for Western Australian flora and fauna under the *Biodiversity Conservation Act 2016* (DBCA 2019).

Code	Conservation Category	Definition
Threatened species		
Listed by order of the Minister as Threatened in the category of critically endangered, endangered or vulnerable under section 19(1), or is a rediscovered species to be regarded as threatened species under section 26(2) of the Biodiversity Conservation Act 2016 (BC Act). Threatened fauna is that subset of 'Specially Protected Fauna' listed under schedules 1 to 3 of the Wildlife Conservation (Specially Protected Fauna) Notice 2018 for Threatened Fauna. Threatened flora is that subset of 'Rare Flora' listed under schedules 1 to 3 of the Wildlife Conservation (Rare Flora) Notice 2018 for Threatened Flora. The assessment of the conservation status of these species is based on their national extent and ranked according to their level of threat using IUCN Red List categories and criteria as detailed below.		
CR	Critically Endangered	Threatened species considered to be "facing an extremely high risk of extinction in the wild in the immediate future, as determined in accordance with criteria set out in the ministerial guidelines". Listed as critically endangered under section 19(1)(a) of the BC Act in accordance with the criteria set out in section 20 and the ministerial guidelines. Published under schedule 1 of the Wildlife Conservation (Specially Protected Fauna) Notice 2018 for critically endangered fauna or the Wildlife Conservation (Rare Flora) Notice 2018 for critically endangered flora.
EN	Endangered	Threatened species considered to be "facing a very high risk of extinction in the wild in the near future, as determined in accordance with criteria set out in the ministerial guidelines". Listed as endangered under section 19(1)(b) of the BC Act in accordance with the criteria set out in section 21 and the ministerial guidelines. Published under schedule 2 of the Wildlife Conservation (Specially Protected Fauna) Notice 2018 for endangered fauna or the Wildlife Conservation (Rare Flora) Notice 2018 for endangered flora
VU	Vulnerable	Threatened species considered to be "facing a high risk of extinction in the wild in the medium-term future, as determined in accordance with criteria set out in the ministerial guidelines". Listed as vulnerable under section 19(1)(c) of the BC Act in accordance with the criteria set out in section 22 and the ministerial guidelines. Published under schedule 3 of the Wildlife Conservation (Specially Protected Fauna) Notice 2018 for vulnerable fauna or the Wildlife Conservation (Rare Flora) Notice 2018 for vulnerable flora.
Extinct species		
Listed by order of the Minister as extinct under section 23(1) of the BC Act as extinct or extinct in the wild.		

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EX	Extinct	Species where “there is no reasonable doubt that the last member of the species has died”, and listing is otherwise in accordance with the ministerial guidelines (section 24 of the BC Act). Published as presumed extinct under schedule 4 of the Wildlife Conservation (Specially Protected Fauna) Notice 2018 for extinct fauna or the Wildlife Conservation (Rare Flora) Notice 2018 for extinct flora.
EW	Extinct in the Wild	Species that “is known only to survive in cultivation, in captivity or as a naturalised population well outside its past range; and it has not been recorded in its known habitat or expected habitat, at appropriate seasons, anywhere in its past range, despite surveys over a time frame appropriate to its life cycle and form”, and listing is otherwise in accordance with the ministerial guidelines (section 25 of the BC Act). Currently there are no threatened fauna or threatened flora species listed as extinct in the wild. If listing of a species as extinct in the wild occurs, then a schedule will be added to the applicable notice.
Specially protected species		
Listed by order of the Minister as specially protected under section 13(1) of the BC Act. Meeting one or more of the following categories: species of special conservation interest; migratory species; cetaceans; species subject to international agreement; or species otherwise in need of special protection. Species that are listed as threatened species (critically endangered, endangered or vulnerable) or extinct species under the BC Act cannot also be listed as Specially Protected species.		
MI	Migratory Species	Fauna that periodically or occasionally visit Australia or an external Territory or the exclusive economic zone; or the species is subject of an international agreement that relates to the protection of migratory species and that binds the Commonwealth; and listing is otherwise in accordance with the ministerial guidelines (section 15 of the BC Act). Includes birds that are subject to an agreement between the government of Australia and the governments of Japan (JAMBA), China (CAMBA) and The Republic of Korea (ROKAMBA), and fauna subject to the Convention on the Conservation of Migratory Species of Wild Animals (Bonn Convention), an environmental treaty under the United Nations Environment Program. Migratory species listed under the BC Act are a subset of the migratory animals, that are known to visit Western Australia, protected under the international agreements or treaties, excluding species that are listed as Threatened species. Published as migratory birds protected under an international agreement under schedule 5 of the Wildlife Conservation (Specially Protected Fauna) Notice 2018.
CD	Species of special conservation interest (conservation dependent fauna)	Fauna of special conservation need being species dependent on ongoing conservation intervention to prevent it becoming eligible for listing as threatened, and listing is otherwise in accordance with the ministerial guidelines (section 14 of the BC Act). Published as conservation dependent fauna under schedule 6 of the Wildlife Conservation (Specially Protected Fauna) Notice 2018.
OS	Other Specially protected species	Fauna otherwise in need of special protection to ensure their conservation, and listing is otherwise in accordance with the ministerial guidelines (section 18 of the BC Act). Published as other specially protected fauna under schedule 7 of the Wildlife Conservation (Specially Protected Fauna) Notice 2018.

Conservation Categories for Flora, Fauna and Ecological Communities, and Categories
for Introduced Flora - Appendix A

Possibly threatened species that do not meet survey criteria, or are otherwise data deficient, are added to the Priority Fauna or Priority Flora Lists under Priorities 1, 2 or 3. These three categories are ranked in order of priority for survey and evaluation of conservation status so that consideration can be given to their declaration as threatened fauna or flora.

Species that are adequately known, are rare but not threatened, or meet criteria for near threatened, or that have been recently removed from the threatened species or other specially protected fauna lists for other than taxonomic reasons, are placed in Priority 4. These species require regular monitoring.

Assessment of Priority codes is based on the Western Australian distribution of the species, unless the distribution in WA is part of a contiguous population extending into adjacent States, as defined by the known spread of locations.

Table A.7: Priority species under Western Australian *Biodiversity Conservation Act 2016*.

P1: Priority One – Poorly known taxa
Species that are known from one or a few locations (generally five or less) which are potentially at risk. All occurrences are either: very small; or on lands not managed for conservation, e.g. agricultural or pastoral lands, urban areas, road and rail reserves, gravel reserves and active mineral leases; or otherwise under threat of habitat destruction or degradation. Species may be included if they are comparatively well known from one or more locations but do not meet adequacy of survey requirements and appear to be under immediate threat from known threatening processes. Such species are in urgent need of further survey.
P2: Priority Two – Poorly known taxa
Species that are known from one or a few locations (generally five or less), some of which are on lands managed primarily for nature conservation, e.g. national parks, conservation parks, nature reserves and other lands with secure tenure being managed for conservation. Species may be included if they are comparatively well known from one or more locations but do not meet adequacy of survey requirements and appear to be under threat from known threatening processes. Such species are in urgent need of further survey.
P3: Priority Three – Poorly known taxa
Species that are known from several locations, and the species does not appear to be under imminent threat, or from few but widespread locations with either large population size or significant remaining areas of apparently suitable habitat, much of it not under imminent threat. Species may be included if they are comparatively well known from several locations but do not meet adequacy of survey requirements and known threatening processes exist that could affect them. Such species are in need of further survey.
P4: Priority Four: Rare, near threatened and other taxa in need of monitoring
<p>(a) Rare. Species that are considered to have been adequately surveyed, or for which sufficient knowledge is available, and that are considered not currently threatened or in need of special protection but could be if present circumstances change. These species are usually represented on conservation lands.</p> <p>(b) Near Threatened. Species that are considered to have been adequately surveyed and that are close to qualifying for vulnerable but are not listed as Conservation Dependent.</p> <p>(c) Species that have been removed from the list of threatened species during the past five years for reasons other than taxonomy.</p>

Conservation Categories for Flora, Fauna and Ecological Communities, and Categories for Introduced Flora - Appendix A

The management of introduced species in Western Australia is regulated through the *Biosecurity and Agriculture Management Act 2007* (BAM Act). The BAM Act seeks to establish a biosecurity regulatory scheme to prevent serious animal and plant pests from entering the State and becoming established, and to minimise the spread and impact of any that are already present within the State.

The list of declared pests is provided under the BAM Act. Declared animal and plant pests fall into three categories as Gazetted under the *Biosecurity and Agriculture Management Regulations 2013*. These categories are outlined in Table A.7.

Table A.8: Declared pests control categories as gazetted under the *Biosecurity and Agriculture Management Regulations 2013*.

Category	Description
C1 (Exclusion)	Pests will be assigned to this category if they are not established in Western Australia and control measures are to be taken, including border checks, in order to prevent them entering and establishing in the State.
C2 (Eradication)	Pests will be assigned to this category if they are present in Western Australia in low enough numbers or in sufficiently limited areas that their eradication is still a possibility.
C3 (Management)	Pests will be assigned to this category if they are established in Western Australia but it is feasible, or desirable, to manage them in order to limit their damage. Control measures can prevent a C3 pest from increasing in population size or density or moving from an area in which it is established into an area which currently is free of that pest.

References

Department of Biodiversity Conservation and Attractions (2019) Conservation Codes for Western Australian Flora and Fauna. Last updated 3 January 2019. Accessed 25/04/20. <https://www.dpaw.wa.gov.au/images/documents/plants-animals/threatened-species/Listings/Conservation%20code%20definitions.pdf>

Department of Environment and Conservation (2013). Definitions, categories and criteria for threatened and priority ecological communities. Accessed 25/04/20 https://www.dpaw.wa.gov.au/images/plants-animals/threatened-species/definitions_categories_and_criteria_for_threatened_and_priority_ecological_communities.pdf

APPENDIX B: PMST SEARCH RESULTS



Australian Government

Department of Climate Change, Energy,
the Environment and Water

EPBC Act Protected Matters Report

This report provides general guidance on matters of national environmental significance and other matters protected by the EPBC Act in the area you have selected. Please see the caveat for interpretation of information provided here.

Report created: 24-Jan-2024

[Summary](#)

[Details](#)

[Matters of NES](#)

[Other Matters Protected by the EPBC Act](#)

[Extra Information](#)

[Caveat](#)

[Acknowledgements](#)

Summary

Matters of National Environment Significance

This part of the report summarises the matters of national environmental significance that may occur in, or may relate to, the area you nominated. Further information is available in the detail part of the report, which can be accessed by scrolling or following the links below. If you are proposing to undertake an activity that may have a significant impact on one or more matters of national environmental significance then you should consider the [Administrative Guidelines on Significance](#).

World Heritage Properties:	None
National Heritage Places:	None
Wetlands of International Importance (Ramsar)	None
Great Barrier Reef Marine Park:	None
Commonwealth Marine Area:	None
Listed Threatened Ecological Communities:	None
Listed Threatened Species:	8
Listed Migratory Species:	7

Other Matters Protected by the EPBC Act

This part of the report summarises other matters protected under the Act that may relate to the area you nominated. Approval may be required for a proposed activity that significantly affects the environment on Commonwealth land, when the action is outside the Commonwealth land, or the environment anywhere when the action is taken on Commonwealth land. Approval may also be required for the Commonwealth or Commonwealth agencies proposing to take an action that is likely to have a significant impact on the environment anywhere.

The EPBC Act protects the environment on Commonwealth land, the environment from the actions taken on Commonwealth land, and the environment from actions taken by Commonwealth agencies. As heritage values of a place are part of the 'environment', these aspects of the EPBC Act protect the Commonwealth Heritage values of a Commonwealth Heritage place. Information on the new heritage laws can be found at <https://www.dcceew.gov.au/parks-heritage/heritage>

A [permit](#) may be required for activities in or on a Commonwealth area that may affect a member of a listed threatened species or ecological community, a member of a listed migratory species, whales and other cetaceans, or a member of a listed marine species.

Commonwealth Lands:	None
Commonwealth Heritage Places:	None
Listed Marine Species:	10
Whales and Other Cetaceans:	None
Critical Habitats:	None
Commonwealth Reserves Terrestrial:	None
Australian Marine Parks:	None
Habitat Critical to the Survival of Marine Turtles:	None

Extra Information

This part of the report provides information that may also be relevant to the area you have

State and Territory Reserves:	None
Regional Forest Agreements:	None
Nationally Important Wetlands:	None
EPBC Act Referrals:	4
Key Ecological Features (Marine):	None
Biologically Important Areas:	None
Bioregional Assessments:	None
Geological and Bioregional Assessments:	None

Details

Matters of National Environmental Significance

Listed Threatened Species

[\[Resource Information \]](#)

Status of Conservation Dependent and Extinct are not MNES under the EPBC Act.
Number is the current name ID.

Scientific Name	Threatened Category	Presence Text	Buffer Status
BIRD			
Aphelocephala leucopsis Southern Whiteface [529]	Vulnerable	Species or species habitat known to occur within area	In feature area
Calidris acuminata Sharp-tailed Sandpiper [874]	Vulnerable	Species or species habitat may occur within area	In feature area
Calidris ferruginea Curlew Sandpiper [856]	Critically Endangered	Species or species habitat may occur within area	In feature area
Falco hypoleucos Grey Falcon [929]	Vulnerable	Species or species habitat may occur within area	In feature area
Leipoa ocellata Malleefowl [934]	Vulnerable	Species or species habitat likely to occur within area	In feature area
Pezoporus occidentalis Night Parrot [59350]	Endangered	Species or species habitat may occur within area	In feature area
REPTILE			
Egernia stokesii badia Western Spiny-tailed Skink, Baudin Island Spiny-tailed Skink [64483]	Endangered	Species or species habitat likely to occur within area	In buffer area only

SPIDER

Scientific Name	Threatened Category	Presence Text	Buffer Status
-----------------	---------------------	---------------	---------------

[Idiosoma nigrum](#)

Shield-backed Trapdoor Spider, Black
Rugose Trapdoor Spider [66798]

Vulnerable

Species or species
habitat known to
occur within area

In feature area

Listed Migratory Species

[\[Resource Information \]](#)

Scientific Name	Threatened Category	Presence Text	Buffer Status
-----------------	---------------------	---------------	---------------

Migratory Marine Birds

[Apus pacificus](#)

Fork-tailed Swift [678]

Species or species
habitat likely to occur
within area

In buffer area only

Migratory Terrestrial Species

[Motacilla cinerea](#)

Grey Wagtail [642]

Species or species
habitat may occur
within area

In feature area

[Motacilla flava](#)

Yellow Wagtail [644]

Species or species
habitat may occur
within area

In feature area

Migratory Wetlands Species

[Actitis hypoleucos](#)

Common Sandpiper [59309]

Species or species
habitat may occur
within area

In feature area

[Calidris acuminata](#)

Sharp-tailed Sandpiper [874]

Vulnerable

Species or species
habitat may occur
within area

In feature area

[Calidris ferruginea](#)

Curlew Sandpiper [856]

Critically Endangered

Species or species
habitat may occur
within area

In feature area

[Calidris melanotos](#)

Pectoral Sandpiper [858]

Species or species
habitat may occur
within area

In feature area

Other Matters Protected by the EPBC Act

Listed Marine Species [\[Resource Information \]](#)

Scientific Name	Threatened Category	Presence Text	Buffer Status
-----------------	---------------------	---------------	---------------

Bird

Scientific Name	Threatened Category	Presence Text	Buffer Status
Actitis hypoleucos Common Sandpiper [59309]		Species or species habitat may occur within area	In feature area
Apus pacificus Fork-tailed Swift [678]		Species or species habitat likely to occur within area overfly marine area	In buffer area only
Calidris acuminata Sharp-tailed Sandpiper [874]	Vulnerable	Species or species habitat may occur within area	In feature area
Calidris ferruginea Curlew Sandpiper [856]	Critically Endangered	Species or species habitat may occur within area overfly marine area	In feature area
Calidris melanotos Pectoral Sandpiper [858]		Species or species habitat may occur within area overfly marine area	In feature area
Chalcites osculans as Chrysococcyx osculans Black-eared Cuckoo [83425]		Species or species habitat known to occur within area overfly marine area	In feature area
Merops ornatus Rainbow Bee-eater [670]		Species or species habitat may occur within area overfly marine area	In feature area
Motacilla cinerea Grey Wagtail [642]		Species or species habitat may occur within area overfly marine area	In feature area
Motacilla flava Yellow Wagtail [644]		Species or species habitat may occur within area overfly marine area	In feature area
Thinornis cucullatus as Thinornis rubricollis Hooded Plover, Hooded Dotterel [87735]		Species or species habitat may occur within area overfly marine area	In buffer area only

Extra Information

EPBC Act Referrals [[Resource Information](#)]

Title of referral	Reference	Referral Outcome	Assessment Status	Buffer Status
Controlled action				
Oakajee Rail Development	2010/5500	Controlled Action	Post-Approval	In feature area
Not controlled action				
Improving rabbit biocontrol: releasing another strain of RHDV, sthrn two thirds of Australia	2015/7522	Not Controlled Action	Completed	In feature area
Jack Hills Expansion Project	2011/5853	Not Controlled Action	Completed	In buffer area only
Weld Range Iron Ore Project	2011/6030	Not Controlled Action	Completed	In feature area

Caveat

1 PURPOSE

This report is designed to assist in identifying the location of matters of national environmental significance (MNES) and other matters protected by the Environment Protection and Biodiversity Conservation Act 1999 (Cth) (EPBC Act) which may be relevant in determining obligations and requirements under the EPBC Act.

The report contains the mapped locations of:

- World and National Heritage properties;
- Wetlands of International and National Importance;
- Commonwealth and State/Territory reserves;
- distribution of listed threatened, migratory and marine species;
- listed threatened ecological communities; and
- other information that may be useful as an indicator of potential habitat value.

2 DISCLAIMER

This report is not intended to be exhaustive and should only be relied upon as a general guide as mapped data is not available for all species or ecological communities listed under the EPBC Act (see below). Persons seeking to use the information contained in this report to inform the referral of a proposed action under the EPBC Act should consider the limitations noted below and whether additional information is required to determine the existence and location of MNES and other protected matters.

Where data are available to inform the mapping of protected species, the presence type (e.g. known, likely or may occur) that can be determined from the data is indicated in general terms. It is the responsibility of any person using or relying on the information in this report to ensure that it is suitable for the circumstances of any proposed use. The Commonwealth cannot accept responsibility for the consequences of any use of the report or any part thereof. To the maximum extent allowed under governing law, the Commonwealth will not be liable for any loss or damage that may be occasioned directly or indirectly through the use of, or reliance

3 DATA SOURCES

Threatened ecological communities

For threatened ecological communities where the distribution is well known, maps are generated based on information contained in recovery plans, State vegetation maps and remote sensing imagery and other sources. Where threatened ecological community distributions are less well known, existing vegetation maps and point location data are used to produce indicative distribution maps.

Threatened, migratory and marine species

Threatened, migratory and marine species distributions have been discerned through a variety of methods. Where distributions are well known and if time permits, distributions are inferred from either thematic spatial data (i.e. vegetation, soils, geology, elevation, aspect, terrain, etc.) together with point locations and described habitat; or modelled (MAXENT or BIOCLIM habitat modelling) using

Where little information is available for a species or large number of maps are required in a short time-frame, maps are derived either from 0.04 or 0.02 decimal degree cells; by an automated process using polygon capture techniques (static two kilometre grid cells, alpha-hull and convex hull); or captured manually or by using topographic features (national park boundaries, islands, etc.).

In the early stages of the distribution mapping process (1999-early 2000s) distributions were defined by degree blocks, 100K or 250K map sheets to rapidly create distribution maps. More detailed distribution mapping methods are used to update these distributions

4 LIMITATIONS

The following species and ecological communities have not been mapped and do not appear in this report:

- threatened species listed as extinct or considered vagrants;
- some recently listed species and ecological communities;
- some listed migratory and listed marine species, which are not listed as threatened species; and
- migratory species that are very widespread, vagrant, or only occur in Australia in small numbers.

The following groups have been mapped, but may not cover the complete distribution of the species:

- listed migratory and/or listed marine seabirds, which are not listed as threatened, have only been mapped for recorded
- seals which have only been mapped for breeding sites near the Australian continent

The breeding sites may be important for the protection of the Commonwealth Marine environment.

Refer to the metadata for the feature group (using the Resource Information link) for the currency of the information.

Acknowledgements

This database has been compiled from a range of data sources. The department acknowledges the following custodians who have contributed valuable data and advice:

- [-Office of Environment and Heritage, New South Wales](#)
- [-Department of Environment and Primary Industries, Victoria](#)
- [-Department of Primary Industries, Parks, Water and Environment, Tasmania](#)
- [-Department of Environment, Water and Natural Resources, South Australia](#)
- [-Department of Land and Resource Management, Northern Territory](#)
- [-Department of Environmental and Heritage Protection, Queensland](#)
- [-Department of Parks and Wildlife, Western Australia](#)
- [-Environment and Planning Directorate, ACT](#)
- [-Birdlife Australia](#)
- [-Australian Bird and Bat Banding Scheme](#)
- [-Australian National Wildlife Collection](#)
- Natural history museums of Australia
- [-Museum Victoria](#)
- [-Australian Museum](#)
- [-South Australian Museum](#)
- [-Queensland Museum](#)
- [-Online Zoological Collections of Australian Museums](#)
- [-Queensland Herbarium](#)
- [-National Herbarium of NSW](#)
- [-Royal Botanic Gardens and National Herbarium of Victoria](#)
- [-Tasmanian Herbarium](#)
- [-State Herbarium of South Australia](#)
- [-Northern Territory Herbarium](#)
- [-Western Australian Herbarium](#)
- [-Australian National Herbarium, Canberra](#)
- [-University of New England](#)
- [-Ocean Biogeographic Information System](#)
- [-Australian Government, Department of Defence](#)
- [Forestry Corporation, NSW](#)
- [-Geoscience Australia](#)
- [-CSIRO](#)
- [-Australian Tropical Herbarium, Cairns](#)
- [-eBird Australia](#)
- [-Australian Government – Australian Antarctic Data Centre](#)
- [-Museum and Art Gallery of the Northern Territory](#)
- [-Australian Government National Environmental Science Program](#)
- [-Australian Institute of Marine Science](#)
- [-Reef Life Survey Australia](#)
- [-American Museum of Natural History](#)
- [-Queen Victoria Museum and Art Gallery, Inveresk, Tasmania](#)
- [-Tasmanian Museum and Art Gallery, Hobart, Tasmania](#)
- Other groups and individuals

The Department is extremely grateful to the many organisations and individuals who provided expert advice and information on numerous draft distributions.

Please feel free to provide feedback via the [Contact us](#) page.

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APPENDIX C: DETAILED FLORA AND VEGETATION SURVEY SITES

Beebyn 11 Weld Range -Detailed Flora and Vegetation Survey
 Appendix C – Detailed Flora and Vegetation Sites

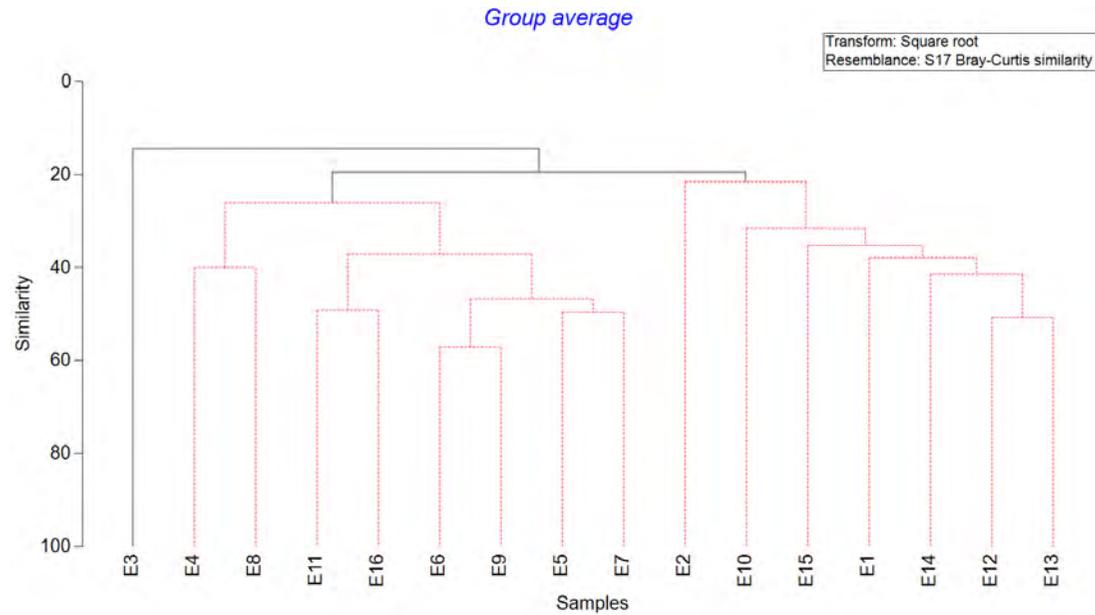


Figure C-1. Dendrogram resulting from the cluster analysis of detailed vegetation sites

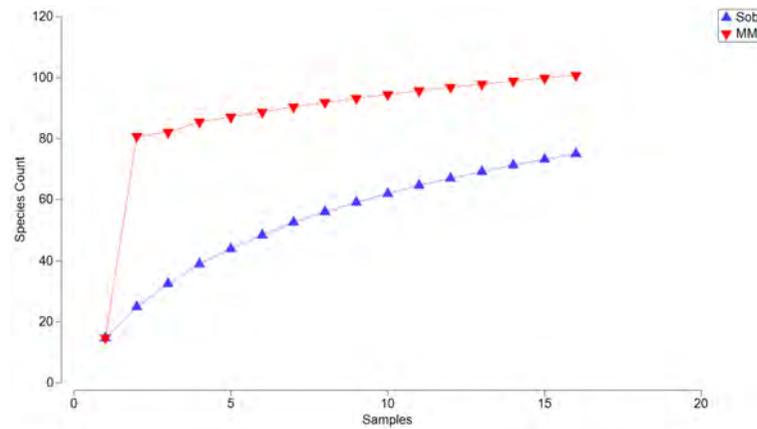


Figure C-2. Species accumulation curve. Sobs=Sample observations; MM= Michaelis Menton modelled richness

Beebyn 11 Weld Range -Detailed Flora and Vegetation Survey
Appendix C – Detailed Flora and Vegetation Sites

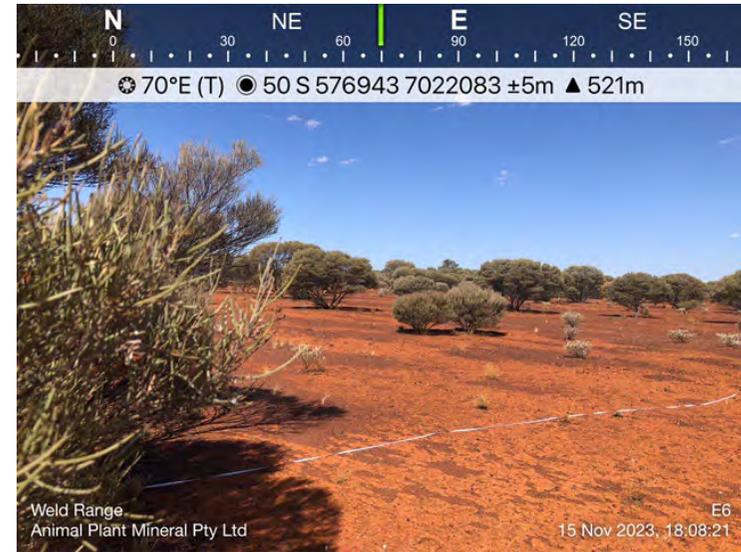
Site: E1				WP-NW-(E) 583661		(N) 7026955		Site: E2				WP-NW-(E) 582754		(N) 7027066	
Date: 15/11/2023				WP-NE-(E) 583679		(N) 7026952		Date: 15/11/2023				WP-NE-(E) 582767		(N) 7027053	
Botanist: EH				WP-SE-(E) 583679		(N) 7026937		Botanist: EH				WP-SE-(E) 582758		(N) 7027036	
Site Type / Size: Quadrat, 20 x 20 m				WP-SW-(E) 583660		(N) 7026936		Site Type / Size: Quadrat, 20 x 20 m				WP-SW-(E) 582744		(N) 7027050	
															
Seasonal Conditions:		Dry - rain 2 days ago <5mm. Soil is dry		Age Since Last Fire:		>10 years		Seasonal Conditions:		Dry - recent low rain Dry soil		Age Since Last Fire:		>10 years	
Soil Type:		Clay loam with gravel		Soil Colour:		Red		Soil Type:		Sandy clay loam		Soil Colour:		Light red	
Surface Rocks Size/Shape:		2-5cm		Surface Rock Cover (%):		1%		Surface Rocks Size/Shape:		40-100cm/blocky		Surface Rock Cover (%):		95%	
Rock Type:		Ironstone		Rock Type:		Ironstone		Rock Type:		Ironstone		Rock Type:		Ironstone	
Landform		Plain		Landform		Crest of BIF ridge		Landform		Crest of BIF ridge		Landform		Crest	
Slope aspect		Very gentle slope to south, range to north		Slope aspect		Crest		Slope aspect		Crest		Slope aspect		Crest	
Vegetation Description		A. aneura low open woodland, E. forrestii mid open shrubland, sparse tussock grasses		Vegetation Description		Sparse tall shrubland A. aneura. Open low shrubland		Vegetation Description		Sparse tall shrubland A. aneura. Open low shrubland		Vegetation Description		Sparse tall shrubland A. aneura. Open low shrubland	
Condition		Good		Condition		Good		Condition		Good		Condition		Good	
Disturbances		Grazing, cow and goat high intensity, occasional tracks and fences		Disturbances		Moderate to heavy goat grazing, frequent tracks and clearing		Disturbances		Moderate to heavy goat grazing, frequent tracks and clearing		Disturbances		Moderate to heavy goat grazing, frequent tracks and clearing	
Strata	Height (m)	Cover (%)	Species	Strata	Height (m)	Cover (%)	Species	Strata	Height (m)	Cover (%)	Species	Strata	Height (m)	Cover (%)	Species
Overstorey	4.5	10	<i>A.aneura, Acacia craspedocarpa</i>	Overstorey	3.5	0.5	<i>A. aneura, A. pruinocarpa</i>	Overstorey	3.5	0.5	<i>A. aneura, A. pruinocarpa</i>	Overstorey	3.5	0.5	<i>A. aneura, A. pruinocarpa</i>
Midstorey	1.1	10	<i>E. forrestii ssp. forrestii, Exocarpos aphyllus</i>	Midstorey	2.2	5	<i>A. aneura, Thyrtomene decussata</i>	Midstorey	2.2	5	<i>A. aneura, Thyrtomene decussata</i>	Midstorey	2.2	5	<i>A. aneura, Thyrtomene decussata</i>
Understorey	0.3	0.1		Understorey	0.6	20	<i>Ptilotus obovatus, Dodonaea pachyneura</i>	Understorey	0.6	20	<i>Ptilotus obovatus, Dodonaea pachyneura</i>	Understorey	0.6	20	<i>Ptilotus obovatus, Dodonaea pachyneura</i>
Conservation Significant Flora: none				Conservation Significant Flora: none				Conservation Significant Flora: none				Conservation Significant Flora: none			

Beebyn 11 Weld Range -Detailed Flora and Vegetation Survey
Appendix C – Detailed Flora and Vegetation Sites

Site:	WP-NW-(E)	(N)	Site:	WP-NW-(E)	(N)		
E3	583087	7027232	E4	583087	7026640		
Date: 15/11/2023	WP-NE-(E) 583105	(N) 7027240	Date: 15/11/2023	WP-NE-(E) 583104	(N) 7026650		
Botanist: EH	WP-SE-(E) 583109	(N) 7027221	Botanist: EH	WP-SE-(E) 583115	(N) 7026630		
Site Type / Size: Quadrat, 20 x 20 m	WP-SW-(E) 583090	(N) 7027213	Site Type / Size: Quadrat, 20 x 20 m	WP-SW-(E) 583096	(N) 7026624		
							
Seasonal Conditions:	Dry	Age Since Last Fire:	>10 years	Seasonal Conditions:	Dry	Age Since Last Fire:	>10 years
Soil Type:	Sandy clay loam	Soil Colour:	Light red	Soil Type:	Clay loam with gravel	Soil Colour:	Red brown
Surface Rocks Size/Shape:	20-50cm blocky	Surface Rock Cover (%):	70%	Surface Rocks Size/Shape:	1-2cm	Surface Rock Cover (%):	1%
Rock Type:	Ironstone			Rock Type:	Ironstone		
Landform	Midslope			Landform	Plain		
Slope aspect	South			Slope aspect	Very gentle to south		
Vegetation Description	Tall open shrubland, sparse mid shrubland			Vegetation Description	Isolated snakewood, low woodland, A. aneura tall open shrubland		
Condition	Good			Condition	Good		
Disturbances	Moderate to heavy goat grazing, exploration clearing frequent			Disturbances	Heavy grazing, occasional tracks, many senesced shrubs		
Strata	Height (m)	Cover (%)	Species	Strata	Height (m)	Cover (%)	Species
Overstorey	2.7	5	<i>A.aneura</i>	Overstorey	10	1	<i>Acacia pruinocarpa</i>
Midstorey	1.1	1	<i>Eremophila latrobei ssp. latrobei</i>	Midstorey	3	15	<i>Acacia aneura, A sibina</i>
Understorey	0.3	2	<i>Maireana villosa, Ptilotus obovatus, Aristida holathera</i>	Understorey	1	1	<i>Eremophila forrestii ssp. forrestii</i>
Conservation Significant Flora: none				Conservation Significant Flora: none			

Beebyn 11 Weld Range -Detailed Flora and Vegetation Survey
Appendix C – Detailed Flora and Vegetation Sites

Site: E5	WP-NW-(E) 575901	(N) 7021026	Site: E6	WP-NW-(E) 576962	(N) 7022100
Date: 15/11/2023	WP-NE-(E) 575856	(N) 7021028	Date: 15/11/2023	WP-NE-(E) 576977	(N) 7022085
Botanist: EH	WP-SE-(E) 575855	(N) 7021008	Botanist: EH	WP-SE-(E) 576963	(N) 7022069
Site Type / Size: Quadrat, 20 x 20 m	WP-SW-(E) 575833	(N) 7021009	Site Type / Size: Quadrat, 20 x 20 m	WP-SW-(E) 576948	(N) 7022082



Seasonal Conditions:	Dry	Age Since Last Fire:	>10 years	Seasonal Conditions:	Dry	Age Since Last Fire:	>10 years
Soil Type:	Clay loam with gravel	Soil Colour:	Red brown	Soil Type:	Clay loam with gravel	Soil Colour:	Red brown
Surface Rocks Size/Shape:	2-5cm angular	Surface Rock Cover (%):	25%	Surface Rocks Size/Shape:	2-5cm	Surface Rock Cover (%):	20%
Rock Type:	Ironstone			Rock Type:	Ironstone		
Landform	Plain			Landform	Plain		
Slope aspect	Very gentle to south			Slope aspect	Very gentle to south		
Vegetation Description	Tall sparse shrubland, low sparse shrubland, isolated tussock grasses			Vegetation Description	Sparse tall shrubland, sparse low shrubland, isolated tussock grasses		
Condition	Good			Condition	Good		
Disturbances	Occasional tracks, moderate grazing, sheet erosion			Disturbances	Moderate to high grazing intensity, sheet erosion		
Strata	Height (m)	Cover (%)	Species	Strata	Height (m)	Cover (%)	Species
Overstorey	2.5	5	<i>A.aneura</i>	Overstorey	2.5	2	<i>A. aneura</i> , <i>A. sclerosperma</i> , <i>A. aneura wider leaf</i>
Midstorey	0.4	1	<i>Eremophila punicea</i>	Midstorey	0.45	0.5	<i>Eremophila punicea</i>
Understorey	0.15	0.1	<i>Aristida holathera</i>	Understorey	0.2	0.2	<i>Aristida holathera</i> , <i>Ptilotus schwartzii</i>
Conservation Significant Flora: none				Conservation Significant Flora: none			

Beebyn 11 Weld Range -Detailed Flora and Vegetation Survey
Appendix C – Detailed Flora and Vegetation Sites

Site: E7	WP-NW-(E) 577136	(N) 7023624	Site: E8	WP-NW-(E) 580433	(N) 7025448		
Date: 15/11/2023	WP-NE-(E) 577158	(N) 7023640	Date: 16/11/2023	WP-NE-(E) 580452	(N) 7025448		
Botanist: EH	WP-SE-(E) 577169	(N) 7023623	Botanist: EH	WP-SE-(E) 580448	(N) 7025428		
Site Type / Size: Quadrat, 20 x 20 m	WP-SW-(E) 577156	(N) 7023605	Site Type / Size: Quadrat, 20 x 20 m	WP-SW-(E) 580430	(N) 7025433		
							
Seasonal Conditions:	Dry	Age Since Last Fire:	>10 years	Seasonal Conditions:	Dry - recent low rain Dry soil	Age Since Last Fire:	>10 years
Soil Type:	Clay loam with gravel	Soil Colour:	Red brown	Soil Type:	Clay loam with gravel	Soil Colour:	Red brown
Surface Rocks Size/Shape:	2-7cm blocky	Surface Rock Cover (%):	25%	Surface Rocks Size/Shape:	2-5cm blocky	Surface Rock Cover (%):	5%
Rock Type:	Ironstone			Rock Type:	Ironstone		
Landform	Plain			Landform	Plain		
Slope aspect	Very gentle to south			Slope aspect	Very gentle to south		
Vegetation Description	Sparse mid shrubland, sparse low shrub			Vegetation Description	Tall open shrubland <i>A.aneura</i> , <i>G.striata</i> , <i>A. silvery</i> . Mid shrubland <i>A. assimilis</i> , <i>Eremophila forrestii</i> , Isolated tussock grasses		
Condition	Good			Condition	Good		
Disturbances	Moderate to heavy grazing. Sheet erosion, occasional tracks.			Disturbances	Moderate grazing, occasional tracks		
Strata	Height (m)	Cover (%)	Species	Strata	Height (m)	Cover (%)	Species
Overstorey	0	0	<i>Acacia aneura</i> <i>Acacia mulganeura</i>	Overstorey	4	10	<i>A. aneura</i> , <i>G. obliquistigma</i>
Midstorey	1.6	1	<i>Eremophila punicea</i> , <i>E. latrobei</i> subsp. <i>latrobei</i>	Midstorey	2.2	5	<i>A.assimilis</i> , <i>E. forrestii</i>
Understorey	0.3	0.5	<i>Ptilotus obovatus</i> , <i>Aristida holathera</i> , <i>Swainsona purpurea</i>	Understorey	0.6	20	<i>Ptilotus calostachyus</i> , <i>Eriachne pulchella</i> , <i>Eragrostis eriopoda</i>
Conservation Significant Flora: none				Conservation Significant Flora: none			

Beebyn 11 Weld Range -Detailed Flora and Vegetation Survey
Appendix C – Detailed Flora and Vegetation Sites

Site: E9	WP-NW-(E) 581443	(N) 7025809	Site: E10	WP-NW-(E) 582029	(N) 7025941		
Date: 16/11/2023	WP-NE-(E) 581463	(N) 7025806	Date: 16/11/2023	WP-NE-(E) 582055	(N) 7025936		
Botanist: EH	WP-SE-(E) 581463	(N) 7025783	Botanist: EH	WP-SE-(E) 582047	(N) 7025919		
Site Type / Size: Quadrat, 20 x 20 m	WP-SW-(E) 581440	(N) 7025785	Site Type / Size: Quadrat, 20 x 20 m	WP-SW-(E) 582029	(N) 7025919		
Seasonal Conditions:	Dry	Age Since Last Fire:	>10 years	Seasonal Conditions:	Dry	Age Since Last Fire:	>10 years
Soil Type:	Clay loam	Soil Colour:	Red brown	Soil Type:	Clay loam with gravel	Soil Colour:	Red brown
Surface Rocks Size/Shape:	2-5cm blocky	Surface Rock Cover (%):	2%	Surface Rocks Size/Shape:	2-3cm	Surface Rock Cover (%):	1%
Rock Type:	Ironstone			Rock Type:	Ironstone		
Landform	Plain			Landform	Plain		
Slope aspect	Very gentle to south			Slope aspect	Very gentle to south		
Vegetation Description	Sparse tall shrubland, sparse low shrubland, isolated tussock grasses			Vegetation Description	Tall open shrubland, Mid sparse shrubland, Isolated tussock grasses		
Condition	Good			Condition	Good		
Disturbances	Moderate grazing, occasional tracks			Disturbances	Heavy grazing, occasional tracks		
Strata	Height (m)	Cover (%)	Species	Strata	Height (m)	Cover (%)	Species
Overstorey	4	5	<i>A. aneura</i>	Overstorey	3	40	<i>A. aneura, Grevillea obliquistigma, Acacia ramulosa var linophylla</i>
Midstorey	0.4	2.5	<i>E. forestii subsp. forestii, E. punicea</i>	Midstorey	1	10	<i>Ptilotus obovatus, E. forrestii, Rhagodia eremaea</i>
Understorey	0.3	1	<i>Ptilotus obovatus, Marieana villosa, ?Swainsona purpurea</i>	Understorey	0.3	1	<i>Eragrostis eriopoda, Ptilotus calostachyus, Eriachne pulchella</i>
Conservation Significant Flora: none				Conservation Significant Flora: none			

Beebyn 11 Weld Range -Detailed Flora and Vegetation Survey
Appendix C – Detailed Flora and Vegetation Sites

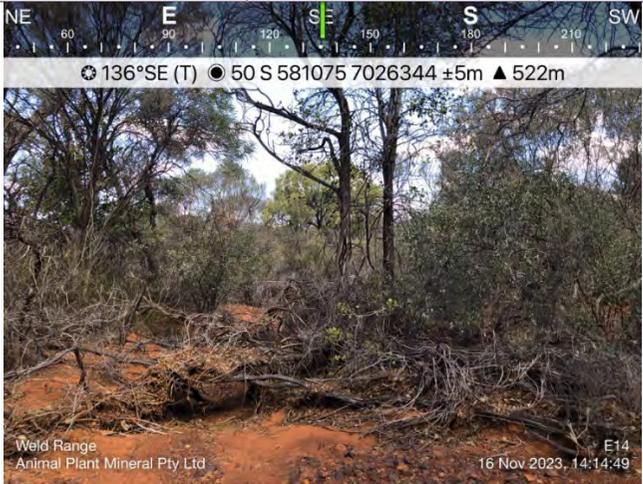
Site: E11	WP-NW-(E) 578232	(N) 7024708	Site: E12	WP-NW-(E) 579038	(N) 7025138
Date: 16/11/2023	WP-NE-(E) 578255	(N) 7024714	Date: 16/11/2023	WP-NE-(E) 579051	(N) 7025147
Botanist: EH	WP-SE-(E) 578264	(N) 7024688	Botanist: EH	WP-SE-(E) 579064	(N) 7025136
Site Type / Size: Quadrat, 20 x 20 m	WP-SW-(E) 578248	(N) 7024673	Site Type / Size: Quadrat, 20 x 20 m	WP-SW-(E) 579048	(N) 7025125

<p>☀️ 109°E (T) 📍 50 S 578228 7024702 ±5m ▲ 523m</p>	
<p>Weld Range Animal Plant Mineral Pty Ltd E11 16 Nov 2023, 10:07:39</p>	

<p>☀️ 70°E (T) 📍 50 S 579029 7025134 ±5m ▲ 537m</p>	
<p>Weld Range Animal Plant Mineral Pty Ltd E12 16 Nov 2023, 11:07:24</p>	

Seasonal Conditions:	Dry	Age Since Last Fire:	>10 years	Seasonal Conditions:	Dry	Age Since Last Fire:	>10 years
Soil Type:	Clay loam with gravel	Soil Colour:	Red brown	Soil Type:	Clay loam with gravel	Soil Colour:	Red brown
Surface Rocks Size/Shape:	3-10cm blocky	Surface Rock Cover (%):	5%	Surface Rocks Size/Shape:	2-10cm	Surface Rock Cover (%):	5%
Rock Type:	Ironstone			Rock Type:	Ironstone		
Landform	Plain			Landform	Upper plain/lower slope		
Slope aspect	Very gentle southerly slope			Slope aspect	Gentle southerly slope		
Vegetation Description	Tall sparse shrubland, Mid sparse shrubland, Isolated tussock grasses			Vegetation Description	Isolated low trees, tall open shrubland, mid open shrubland		
Condition	Good			Condition	Good		
Disturbances	Heavy grazing occasional tracks			Disturbances	Heavy grazing		
Strata	Height (m)	Cover (%)	Species	Strata	Height (m)	Cover (%)	Species
Overstorey	3.5	6	<i>A. aneura</i> , <i>A. ramulosa</i> var <i>linophylla</i>	Overstorey	10	2	<i>Acacia pruinocarpa</i>
Midstorey	0.9	0.5	<i>Eremophila forrestii</i> subsp. <i>forrestii</i> , <i>E. georgei</i> , <i>Psydrax l</i>	Midstorey	2.5	12	<i>Acacia ramulosa</i> var <i>linophylla</i> , <i>A. aneura</i>
Understorey	0.3	0.5	? <i>Swainsona atropurpurea</i> , <i>Eragrostis eriopoda</i> , <i>Ptilotus exaltatus</i>	Understorey	1.2	15	<i>Eremophila forrestii</i> subsp <i>forrestii</i>
Conservation Significant Flora: none				Conservation Significant Flora: none			

Beebyn 11 Weld Range -Detailed Flora and Vegetation Survey
Appendix C – Detailed Flora and Vegetation Sites

Site: E13				WP-NW-(E) 579751		(N) 7025768		Site: E14				WP-NW-(E) 581063		(N) 7026343			
Date: 16/11/2023				WP-NE-(E) 579768		(N) 7025761		Date: 16/11/2023				WP-NE-(E) 581076		(N) 7026352			
Botanist: EH				WP-SE-(E) 579752		(N) 7025741		Botanist: EH				WP-SE-(E) 581083		(N) 7026339			
Site Type / Size: Quadrat, 20 x 20 m				WP-SW-(E) 579738		(N) 7025755		Site Type / Size: Quadrat, 20 x 20 m				WP-SW-(E) 581076		(N) 7026330			
																	
Seasonal Conditions:		Dry		Age Since Last Fire:		>10 years		Seasonal Conditions:		Dry		Age Since Last Fire:		>10 years			
Soil Type:		Sandy gravel/clay loam		Soil Colour:		Red brown		Soil Type:		Sandy gravel/clay loam		Soil Colour:		Red brown			
Surface Rocks Size/Shape:		5-20cm blocky ironstones, rounded granite		Surface Rock Cover (%):		30%		Surface Rocks Size/Shape:		5-20cm		Surface Rock Cover (%):		30%			
Rock Type:		Ironstone and granite		Rock Type:		Ironstone		Rock Type:		Ironstone		Rock Type:		Ironstone			
Landform		Ephemeral creek		Landform		Ephemeral creek		Landform		Ephemeral creek		Landform		Ephemeral creek			
Slope aspect		Gentle slope to south		Slope aspect		Gentle slope to south		Slope aspect		Gentle slope to south		Slope aspect		Gentle slope to south			
Vegetation Description		Low open woodland, mid shrubland, isolated tussock grassland		Vegetation Description		Low open woodland, mid shrubland, isolated tussock grassland		Vegetation Description		Low open woodland, mid shrubland, isolated tussock grasses		Vegetation Description		Low open woodland, mid shrubland, isolated tussock grasses			
Condition		Good		Condition		Good		Condition		Good		Condition		Good			
Disturbances		Moderate to heavy grazing, frequent clearing		Disturbances		Moderate to heavy grazing, frequent clearing		Disturbances		Moderate to heavy grazing, frequent clearing		Disturbances		Moderate to heavy grazing, frequent clearing			
Strata	Height (m)	Cover (%)	Species			Strata	Height (m)	Cover (%)	Species			Strata	Height (m)	Cover (%)	Species		
Overstorey	6	15	<i>A. aneura</i> , <i>A. ramulosa</i> var <i>linophylla</i> , <i>A. pruinocarpa</i>			Overstorey	6	15	<i>A. aneura</i> , <i>A. pruinocarpa</i> , <i>A. mulganeura</i>			Overstorey	6	15	<i>A. aneura</i> , <i>A. pruinocarpa</i> , <i>A. mulganeura</i>		
Midstorey	1.5	20	<i>E. forrestii</i> ssp. <i>forrestii</i> , <i>E. latrobei</i> ssp. <i>latrobei</i> , <i>E. eriocalyx</i>			Midstorey	1.5	20	<i>E. latrobei</i> ssp. <i>latrobei</i> , <i>E. forrestii</i> ssp. <i>forrestii</i> , <i>E. georgei</i>			Midstorey	1.5	20	<i>E. latrobei</i> ssp. <i>latrobei</i> , <i>E. forrestii</i> ssp. <i>forrestii</i> , <i>E. georgei</i>		
Understorey	0.4	10	<i>Aristida contorta</i> , <i>Cymbopogon ambiguus</i> , <i>Euploca ovalifolia</i>			Understorey	0.4	<1	<i>Gastrolobium laytonii</i> , <i>Cymbopogon ambiguus</i> , <i>Eragrostis eriopoda</i>			Understorey	0.4	<1	<i>Gastrolobium laytonii</i> , <i>Cymbopogon ambiguus</i> , <i>Eragrostis eriopoda</i>		
Conservation Significant Flora: none								Conservation Significant Flora: <i>Hibiscus ?krichauffianus</i> (P3)									

Beebyn 11 Weld Range -Detailed Flora and Vegetation Survey
Appendix C – Detailed Flora and Vegetation Sites

Site: E15	WP-NW-(E) 571896	(N) 7019071	Site: E16	WP-NW-(E) 570143	(N) 7018629		
Date: 16/11/2023	WP-NE-(E) 571912	(N) 7019071	Date: 16/11/2023	WP-NE-(E) 570169	(N) 7028626		
Botanist: EH	WP-SE-(E) 571915	(N) 7019052	Botanist: EH	WP-SE-(E) 570165	(N) 7018601		
Site Type / Size: Quadrat, 20 x 20 m	WP-SW-(E) 571891	(N) 7019052	Site Type / Size: Quadrat, 20 x 20 m	WP-SW-(E) 570150	(N) 7018605		
Seasonal Conditions:	Dry	Age Since Last Fire:	>10 years	Seasonal Conditions:	Dry	Age Since Last Fire:	>10 years
Soil Type:	Clay loam	Soil Colour:	Red brown	Soil Type:	Clay loam	Soil Colour:	Red brown
Surface Rocks Size/Shape:	2-10cm blocky	Surface Rock Cover (%):	3%	Surface Rocks Size/Shape:	2-10cm blocky	Surface Rock Cover (%):	2%
Rock Type:	Ironstone			Rock Type:	Ironstone		
Landform	Drainage or plain			Landform	Plain		
Slope aspect	Very gently to south			Slope aspect	Very gently to south		
Vegetation Description	Isolated mid trees, tall open shrubland, mid open shrubland			Vegetation Description	Sparse tall shrubland, sparse mid shrubland, isolated tussock grasses		
Condition	Good			Condition	Good		
Disturbances	Moderate grazing			Disturbances			
Strata	Height (m)	Cover (%)	Species	Strata	Height (m)	Cover (%)	Species
Overstorey	15	5	<i>Acacia pruinocarpa</i>	Overstorey	3	3	<i>A. aneura</i>
Midstorey	4	20	<i>A. aneura</i>	Midstorey	0.4	1	<i>E. punicea</i>
Understorey	1	20	<i>Eremophila latrobei</i> , <i>E. georgei</i> , <i>Sida calyxhymenia</i>	Understorey	0.5	0.5	<i>Eragrostis eriopoda</i>
Conservation Significant Flora: none				Conservation Significant Flora: none			

APPENDIX D: SPECIES BY SITE MATRIX - FLORA

Biological Survey - Beebyn 11 - Weld Range
Appendix D - Flora Species by Site

Species	Status	E1	E2	E3	E4	E5	E6	E7	E8	E9	E10	E11	E12	E13	E14	E15	E16	Op Col
Acanthaceae																		
<i>Harnieria kempeana</i>	NT				0.1													
Amaranthaceae																		
<i>Ptilotus roei</i>	NT							0.01	0.1			0.1					0.05	
<i>Ptilotus exaltatus</i>	NT											0.5		0.1			0.1	x
<i>Ptilotus ?calostachyus</i>	NT					0.01												
<i>Ptilotus obovatus</i>	NT	1	10	0.3				0.2		1	1	0.1	1	1		2		
<i>Ptilotus rotundifolius</i>	NT			0.1							0.1							
<i>Ptilotus schwartzii</i>	NT			0.05			0.1		1	0.1	0.1				0.1			x
Apocynaceae																		
<i>Cynanchum floribundum</i>	NT										0.01			0.1		0.1		
Asteraceae																		
<i>Cephalopterum drummondii</i>	NT								0.01					0.4				x
<i>Pluchea dentex</i>	NT													0.1			0.1	x
Boraginaceae																		
<i>Euploca ovalifolia</i>	NT													2				
Brassicaceae																		
<i>Lepidium oxytrichum</i>	NT			0.01														
<i>Stenopetalum filifolium</i>	NT							0.1			0.1			1				
Chenopodiaceae																		
<i>Dysphania rhadinostachya</i>	NT		0.5															
<i>Enchylaena tomentosa</i>	NT											0.02				0.5		
<i>Eriochiton sclerolaenoides</i>	NT				0.01	0.1	0.1			0.05	0.01	0.1				1.1		
<i>Maireana villosa</i>	NT	0.1	0.01	1	0.1					0.6		0.02						x
<i>Rhagodia eremaea</i>	NT										8							x
<i>Sclerolaena densiflora</i>	NT					0.01												
Convolvulaceae																		
<i>Duperreya commixta</i>	NT												0.01		0.01			
Fabaceae																		
<i>?Swainsona purpurea</i>	NT					0.1	0.1	0.1	0.1	0.1		0.5		0.3				
<i>Acacia aneura</i>	NT	0.1	0.5		8	0.6	2	0.5	5	5	24	4	5.1	10	3.2	10	3	
<i>Acacia craspedocarpa</i>	NT	2											0.1					

Appendix D - Flora Species by Site Matrix

<i>Acacia mulganeura</i>	NT						0.5					0.5		5			
<i>Acacia pruinocarpa</i>	NT	4	0.1	1									5	6	5		
<i>Acacia pteraneura</i>	NT	4															
<i>Acacia ramulosa var linophylla</i>	NT								5	2	6	5	0.2		0.5	x	
<i>Acacia rhodophloia</i>	NT															x	
<i>Acacia sclerosperma</i>	NT					0.3											
<i>Acacia sibina</i>	NT			6	0.5			15								x	
<i>Acacia tetragonophylla</i>	NT	0.1	0.1												0.2		
<i>Gastrolobium laytonii</i>	NT													3			
<i>Senna artemisioides ssp helmsii</i>	NT															0.1	
<i>Senna artemisioides ssp sturtii</i>	NT										1						x
<i>Senna glutinosa ssp chatelainia</i>	NT		0.5								0.7						
Goodeniaceae																	
<i>Goodenia mimuloides</i>	NT		0.1	0.1													
<i>Goodenia tenuiloba</i>	NT									0.01		0.1					
Lamiaceae																	
<i>Dicrastylis ?sessilifolia</i>	NT		0.1														
<i>Teucrium teucriiflorum</i>	NT			0.01				0.01							1		
Malvaceae																	
<i>Abutilon cryptopetalum</i>	NT	0.1		0.1						0.1			0.1		1		
<i>Hibiscus ?krichauffianus</i>	P3													0.01			
<i>Sida calyxhymenia</i>	NT	0.11													5	0.01	x
<i>Sida ectogama</i>	NT				0.01						0.01						
<i>Sida sp</i>	NT	0.01		0.01	0.05					0.01							
Myrtaceae																	
<i>Thryptomene decussata</i>	NT		4.5														
Poaceae																	
<i>Aristida contorta</i>	NT												5				
<i>Aristida holathera</i>	NT			0.2	0.1	0.1	0.1		0.01		0.02						
<i>Cymbopogon ambiguus</i>	NT												2	0.2			
<i>Eragrostis eriopoda</i>	NT	0.1			0.01	0.01	0.01	0.1	1	0.1	0.1	0.5		0.1	0.2		0.3
<i>Eragrotis sp</i>														0.1		0.1	
<i>Eriachne ?mucronata</i>	NT		0.1												0.1	0.1	0.1

Appendix D - Flora Species by Site Matrix

<i>Eriachne pulchella</i>	NT	0.01						0.1	0.01	0.1					0.1	0.1	
<i>Monachather paradoxus</i>	NT	0.05			0.01						0.02		0.2				
<i>Paspalidium clementii</i>	NT		0.01														
<i>Thyridolepis multiculmis</i>	NT														0.2		
Proteaceae																	
<i>Grevillea obliquistigma</i>	NT							5		10							
Pteridaceae																	
? <i>Cheilanthes</i>	NT			0.01											0.1		
Rubiaceae																	
<i>Psydrax latifolia</i>	NT	0.1	0.1	0.3						1		2.1	1	6	0.4		
<i>Psydrax suaveolens</i>	NT	0.01						0.5		0.1	0.1	0.02	0.1				
Rutaceae																	
<i>Philotheca brucei</i>	NT		1														
Santalaceae																	
<i>Exocarpos aphyllus</i>	NT	0.5															
<i>Santalum spicatum</i>	NT													2			
Sapindaceae																	
<i>Dodonaea pachyneura</i>	NT		1														
Scrophulariaceae																	
<i>Eremophila compacta</i>	NT									0.5							
<i>Eremophila eriocalyx</i>	NT												1				
<i>Eremophila foliosissima</i>	NT				0.1												
<i>Eremophila forrestii ssp forrestii</i>	NT	8						15	1		0.52	10	15	5	0.5		
<i>Eremophila georgei</i>	NT									0.2	0.02		0.1	0.1	5		x
<i>Eremophila glutinosa</i>	NT	0.3										0.2					
<i>Eremophila latrobei subsp. latrobei</i>	NT	0.2	5	0.5	0.1		0.05			0.5		0.1	1	5.1	5.5		
<i>Eremophila margarethae</i>	NT				0.3												
<i>Eremophila punicea</i>	NT				1	0.5	0.3		0.5							1	
<i>Eremophila serrulata</i>	NT	0.1										3	0.5				
Solanaceae																	
<i>Solanum lasiophyllum</i>	Mixed										0.01					0.1	x
Indet. climber															0.1		

APPENDIX E: FAUNA LIKELIHOOD OF OCCURRENCE ASSESSMENT - FAUNA

Species	Common Name	Conservation Code		Relevant Habitat Preference	Assessment of Occurrence
		BC Act	EPBC Act		
-- Birds --					
<i>Aphelocephala leucopsis</i>	Southern whiteface	-	VU	<p>Most of mainland Australia south of the tropics, from the north-eastern edge of the Western Australian wheatbelt, east to the Great Dividing Range (DCCEEW 2023b).</p> <p>Open woodlands and shrublands where there is an understorey of grasses or shrubs, or both. These areas are usually in habitats dominated by acacias or eucalypts on ranges, foothills and lowlands, and plains (Higgins and Peter 2002).</p>	<p>Likely. 10 records within 15 km between 2001 and 2009. All habitats are suitable; however habitat quality is low due to lack of groundcover.</p>
<i>Apus pacificus</i>	Fork-tailed Swift	MI	MI	<p>Broadly distributed aerial species that is not specifically limited to any particular habitat type.</p> <p>Aerial: over open country, from semi-arid deserts to coasts, islands; sometimes over forests, cities (Pizzey and Knight, 2012).</p> <p>Occurs over dry or open habitats comprising of riparian woodland, low scrub, heathland, or saltmarsh, also grasslands and sandplains with spinifex (Morcombe, 2011).</p>	<p>Likely. Listed by the PMST as Likely to occur, but no records available within 30 km.</p> <p>This species is distributed across Australia. It is an aerial species that rarely comes to land. Individuals would not be specifically dependant on any habitats present in the Survey Area.</p>
<i>Calidris acuminata</i>	Sharp-tailed Sandpiper	MI	VU, MI	<p>Scarce to moderately common (much more plentiful near coasts than in interior) (Johnstone and Storr, 1998).</p> <p>Tidal mudflats, saltmarshes, mangroves; shallow fresh, brackish or saline inland wetlands; floodwaters, irrigated pastures and crops; sewage ponds, saltfields. Widespread summer migrant to coastal and inland Australia (Pizzey and Knight, 2012).</p>	<p>Unlikely. No suitable habitat.</p> <p>No records in the local area. PMST considers the species May occur.</p>
<i>Calidris ferruginea</i>	Curlew Sandpiper	CR	CR, MI	<p>Mainly shallows of estuaries and near-coastal saltlakes (including saltwork ponds) and drying near-coastal freshwater</p>	<p>Unlikely. No suitable habitat.</p>

Species	Common Name	Conservation Code		Relevant Habitat Preference	Assessment of Occurrence
		BC Act	EPBC Act		
				lakes and swamps. Also beaches and near-coastal sewage ponds (Johnstone and Storr, 1998) Tidal mudflats; saltmarsh, saltfields; fresh, brackish or saline wetlands; sewage ponds (Pizzey and Knight, 2012).	No records in the local area. PMST considers the species May occur.
<i>Calidris melanotos</i>	Pectoral Sandpiper	MI	MI	Mainly fresh waters (swamps, lagoons, river pools, irrigation channels and sewage ponds); also, samphire flats around estuaries and saltlakes (Johnstone and Storr, 1998). Shallow fresh waters, often with low grass or other herbage; swamp margins, flooded pastures, sewage ponds, occasionally tidal areas, saltmarshes (Pizzey and Knight, 2012).	Unlikely. No suitable habitat. No records in the local area. PMST considers the species May occur.
<i>Falco hypoleucos</i>	Grey Falcon	VU	VU	Mainly lightly wooded and coastal riverine flats (Johnstone and Storr, 1998). Lightly treed and inland plains; gibber deserts, sandridges, pastoral lands, timbered watercourses; seldom in driest deserts (Pizzey and Knight, 2012).	Possible. The Survey Area contains potentially suitable foraging habitat. No suitable nesting habitat is present or nearby. Listed by EPBC as May Occur in the feature area. No records occur on the DBCA database within 30 km, the ALA lists a few records within 50 km however they are undated and of low spatial accuracy.
<i>Falco peregrinus</i>	Peregrine Falcon	OS	-	Mainly about cliffs along coasts, rivers and ranges, and about wooded watercourses and lakes (Johnstone and Storr, 1998). Cliffs, gorges, timbered watercourses, environs of rivers, wetlands, plains, open woodlands, pylons, spires, buildings (Pizzey and Knight, 2012).	Possible. Habitats in the Weld Range are suitable. Two local records from 1979 and 2001. Foraging habitat present.
<i>Leipoa ocellata</i>	Malleefowl	VU	VU	Semi-arid to arid shrublands and low woodlands, especially those dominated by mallee and/or acacias. A sandy substrate and abundance of leaf litter are required for breeding.	Possible. PMST considers likely to occur, however species records are 50 km or more to the south, and groundcover/litter is sparse with clay soils so habitat

Species	Common Name	Conservation Code		Relevant Habitat Preference	Assessment of Occurrence
		BC Act	EPBC Act		
				Densities of the birds are generally greatest in areas of higher rainfall and on more fertile soils where habitats tend to be thicker and there is an abundance of food plants (Benshemesh, 2007).	quality poor for nest construction. Ecologia (2009) reported old inactive mounds present.
<i>Motacilla cinerea</i>	Grey Wagtail	MI	MI	<p>Mainly banks and rocks in fast-running fresh water habitats; rivers, creeks, streams and around waterfalls, both in forest and open country; but occurs almost anywhere during migration. Flits from rock to rock, and often enters water after insects (or performs flycatcher sallies after them) (Johnstone and Storr, 2004).</p> <p>In Australia, near running water in disused quarries; sandy, rocky streams in escarpments and rainforests; sewage ponds, ploughed fields, airfields (Pizzey and Knight, 2012).</p>	<p>Unlikely. No suitable habitat.</p> <p>No records in the local area. PMST considers the species May occur.</p>
<i>Motacilla flava</i>	Yellow Wagtail	MI	MI	Damp short-grass flats: rice stubbles and edge of swamps, sewage ponds, bore overflows, grazed or mowed grass and irrigated areas (Johnstone and Storr, 2004).	<p>Unlikely. No suitable habitat.</p> <p>No records in the local area. PMST considers the species May occur.</p>
<i>Pezoporus occidentalis</i>	Night Parrot	CR	EN	<p>Treeless or sparsely wooded spinifex <i>Triodia</i> spp. near water (including artesian bores) (Johnstone and Storr, 1998).</p> <p>Seeding spinifex on stony rises, breakaway country, sandy lowlands; shrubby glasswort, chenopods; succulents on flats around salt lakes; flooded claypans saltbush, bluebush, bassia associations (Pizzey and Knight, 2012).</p>	Unlikely. No local records. Habitat modelling includes the Survey Area at the extremity of the species potential extent and PMST list as May occur. Foraging resources are limited, no spinifex mounds are present.
-- Mammals --					
<i>Antechinomys longicaudata</i>	Long-tailed Dunnart	P4		A specialist rock dwelling species (Freeland <i>et al.</i> 1988). It prefers exposed rock and stony soils with hummock grasses	Present. Suitable habitat in the Banded Ironstone Ridge habitat and Drainage Lines between ridges.

Species	Common Name	Conservation Code		Relevant Habitat Preference	Assessment of Occurrence
		BC Act	EPBC Act		
				and shrubs, on flat-topped hills, lateritic plateaus, sandstone ranges and breakaways.	
<i>Dasyercus blythi</i>	Brush-tailed Mulgara	P4	-	Inhabits spinifex grasslands and burrows on the flats between low sand dunes (Van Dyck and Strahan, 2008).	Unlikely. No suitable habitat. The local record is a fossilised specimen described from Wilgie Mia (Baynes 1984).
<i>Leporillus conditor</i>	greater stick-nest rat	CD	VU	The Northern Quoll will usually den in hollow tree trunks (Hill and Ward, 2010) or in small caves and crevices in rocky outcrops.	Unlikely. The species is conservation dependent in WA. The local record is a fossilised specimen described from Wilgie Mia (Baynes 1984)..
<i>Macroderma gigas</i>	Ghost Bat	VU	VU	Their distribution is influenced by the availability of suitable caves and mines for roost sites (Churchill 2008). They prey on large insects, frogs, birds, lizards and small mammals including other bats. They swoop on their prey killing with powerful bites, then fly to a feeding site to eat (Australian Museum 2023).	Unlikely. The database record is a fossilised bat and a scat (Baynes 1984) of unreported age. The species is not known to persist in the Murchison.
<i>Macrotis lagotis</i>	Bilby	VU	VU	Occupy a variety of inland habitats including grass and stony downs country on cracking clays, desert sandplains and dune fields of laterite with hummock grassland and massive red earths with <i>Acacia</i> shrubland (Van Dyck and Strahan, 2008).	Unlikely. The local record has a low level of certainty and was recorded in 1984. Modelled current species distribution does not predict it to occur in the Survey Area (DCCEEW 2024b).
<i>Petrogale lateralis lateralis</i>	black-flanked rock-wallaby	EN	EN	Occur where suitable shelter and food co-exist. During the daytime they shelter under deep shade in rocky areas such as caves, cliffs, screes and rockpiles, and emerge at dusk to feed on grasses, forbs, shrubs and occasionally seeds and fruits. Feeding occurs as near to shelter as possible, especially where exotic predators are present (TSSC 2016).	Unlikely. Habitat at the Weld Range is likely suitable, however modelling of the current range of the species does not include the Survey Area. The local record is a fossilised specimen described from Wilgie Mia (Baynes 1984), and presence in the region is historic only.
<i>Pseudomys gouldii</i>	Gould's mouse, Shark Bay mouse	VU	VU	Current distribution restricted to offshore islands.	Unlikely. The current range of the species does not include the Survey Area. The local record is a fossilised specimen described from Wilgie Mia

Species	Common Name	Conservation Code		Relevant Habitat Preference	Assessment of Occurrence
		BC Act	EPBC Act		
					(Baynes 1984), and presence in the region is historic only.
-- Reptiles --					
<i>Egernia stokesii badia</i>	Western Spiny-tailed Skink	VU	EN	In the Murchison the black form inhabits rock crevices, predominantly in granite whalebacks and outcrops (Ecologia 2010).	Possible. Modelled as likely to occur in the buffer area only. Records 40 km to the west from 2006 and 2010. No granite outcrops are present but suitable habitat may be present in the BIF outcrops.
<i>Lerista eupoda</i>	West Coast mulga slider	P1		Restricted to the arid southern interior between Cue and Meekatharra, in open mulga on red loams and sandy loams (Smith 1996). Local records are in lower slopes/upper plain habitats, often near drainage lines.	Likely. Multiple records from nearby and suitable habitat is present in the lower slopes/upper plains habitat.
-- Invertebrates --					
<i>Idiosoma clypeatum</i>	northern shield-backed trapdoor spider	P3	-	Widespread in the Murchison and Yalgoo regions,	Present. The distribution of the population occurs across the length of the Weld Range, with the majority of individuals being concentrated at the northern end of the range.
<i>Idiosoma nigrum</i>	Shield-backed Trapdoor Spider		VU	Has a restricted distribution in the central and central-western Wheatbelt bioregion of south-western Australia (Rix et al 2018). Generally found in microhabitats associated with low-lying woodlands or bush vegetation (Main 2003).	Unlikely. The PMST considers that the species is known to occur in the feature area, however Rix et al (2018) taxonomic revision determine all specimens in the Murchison region to be <i>I. clypeatum</i>

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Disclaimer

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BEEBYN-W11 IRON ORE PROJECT TARGETED BIOLOGICAL SURVEY

JULY 2024

Revision 0



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APPENDICES

Appendix 1: Conservation codes for Western Australian flora and fauna

Appendix 2: Flora species recorded during the survey

Appendix 3: Vegetation site descriptions

1.0 INTRODUCTION

Fenix Beebyn Pty Ltd (Fenix) is proposing to develop the Beebyn-W11 Iron Ore Project (the Project), approximately 600 km north-east of Perth and 85 km south-west of Meekatharra in the Mid-West Region of Western Australia (Figure 1.1 and Figure 1.2).

Sinosteel Midwest Corporation Limited (SMC) is the registered holder of Mining Lease 51/869. In October 2023, Fenix signed a binding agreement with SMC securing the exclusive right to mine and export up to 10 million dry metric tonnes of iron ore from the high-grade Beebyn-W11 iron ore deposit in the Weld Range (Fenix 2023).

Flora and fauna surveys have been completed in and around the project area and the wider Weld Range. The project area and surrounds have been quite extensively covered by prior biological surveys. The most recent survey, undertaken by Animal Plant Mineral (APM) in November 2023, included flora and vegetation and basic terrestrial fauna survey of most of the project area (APM 2024); however, did not cover the full project area due to revisions of the proposed disturbance footprint after that survey was completed.

Prior to the APM survey, Ecologia Environment Pty Ltd (*ecologia*) conducted Level 2 flora and vegetation surveys of the project area and surrounds between 2006 and 2009 (*ecologia* 2010a); as well as a targeted conservation significant flora survey of exploration drilling in the area.

Fenix engaged Ecotec (WA) Pty Ltd (Ecotec) to undertake a targeted flora, vegetation and fauna habitat survey of the project area. The purpose of the survey was to:

- undertake a targeted survey for conservation significant flora and fauna habitat within the project area
- confirm the presence and identity of *Hibiscus ?krichauffianus*
- refine the vegetation mapping as defined by APM (2024) and *ecologia* (2010a)
- undertake a targeted survey for *Idiosoma clypeatum* burrows within the project area
- refine the fauna habitat mapping as defined by APM (2024)
- prepare a report outlining the findings of the assessment.

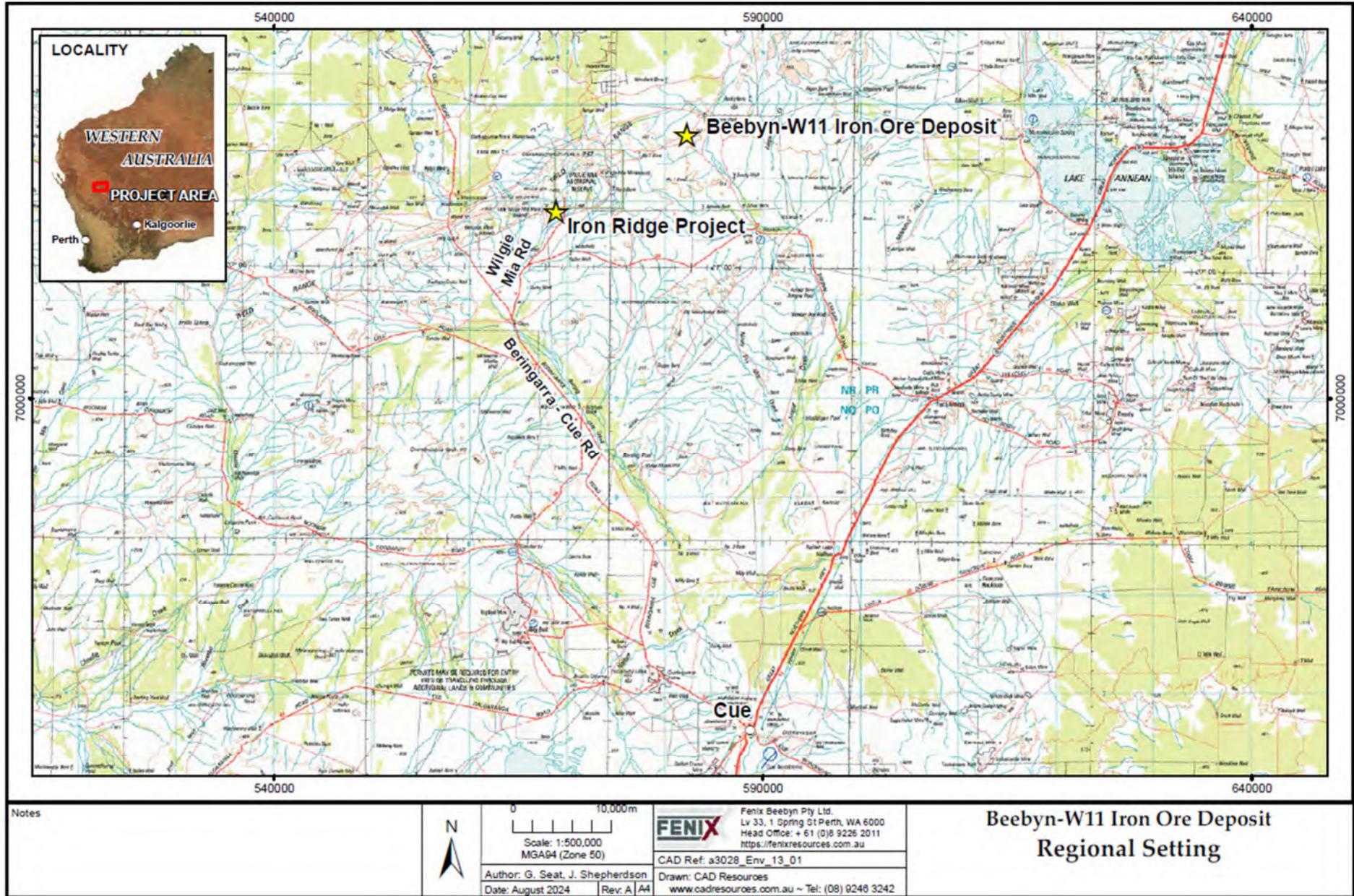


Figure 1.1: The Beebyn W11 Project location.

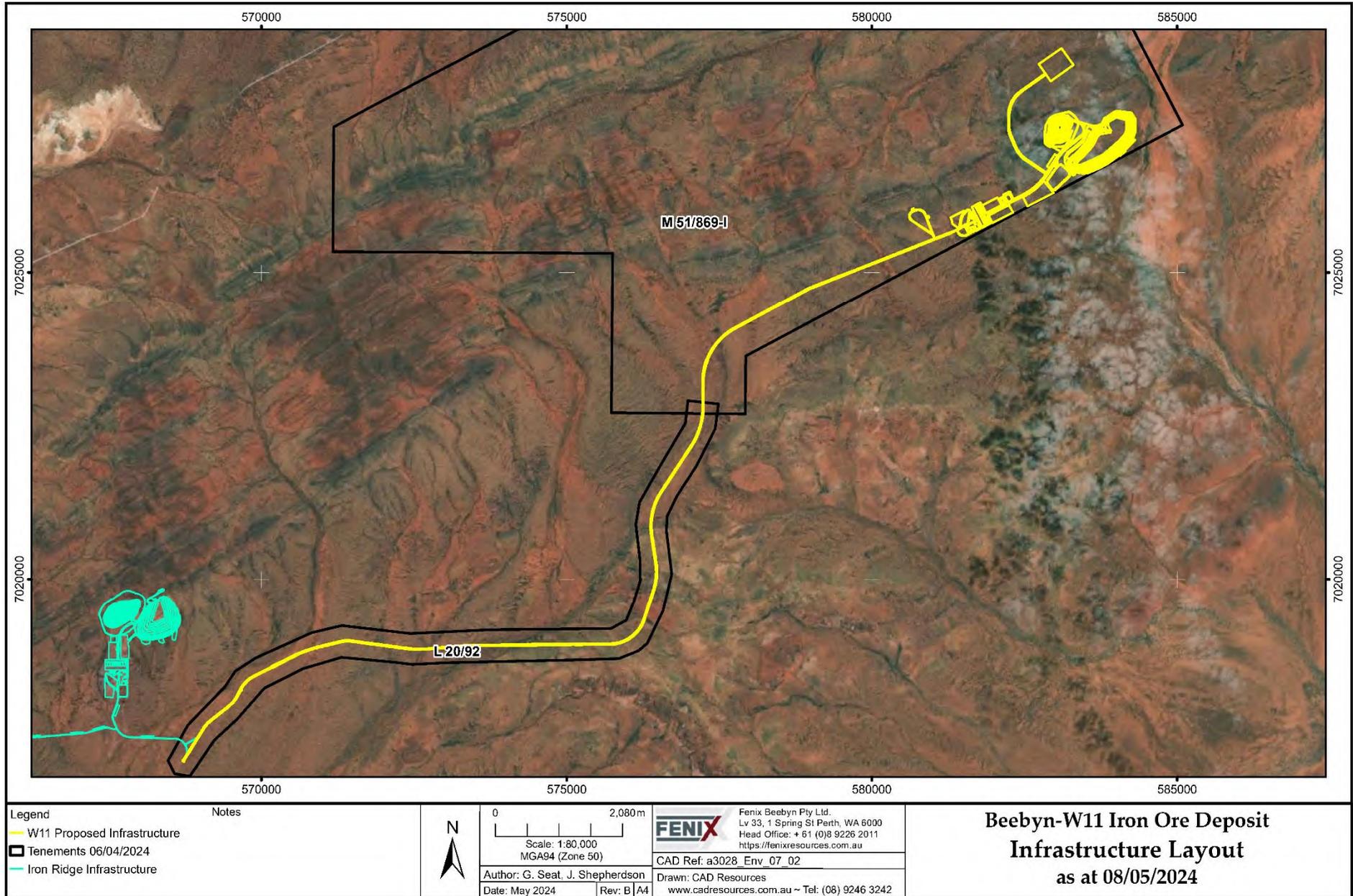


Figure 1.2: The proposed layout of the Beebyn W11 Project.

2.0 EXISTING ENVIRONMENT

2.1 Climate

The Project is located in the arid climatic region of Western Australia, characterised by low rainfall and high evaporation. According to the Bureau of Meteorology (BoM), the mean maximum daily temperature in Meekatharra (approximately 73 km north-east of the Project area) is 36.7°C, with a mean minimum daily temperature of 22.3°C. The hottest month is January, with a mean maximum temperature of 38.4°C. The coldest month is July with a mean minimum temperature of 7.5°C and a mean maximum of 19.3°C.

The mean annual rainfall (1948 – 2023) at Meekatharra Airport (BoM weather station # 7045) is 232.2 mm. Average annual evaporation ranges from 2800 mm to 3200 mm (BoM 2024).

Figure 2.1 provides climatic data relevant to the project area (BoM 2024).

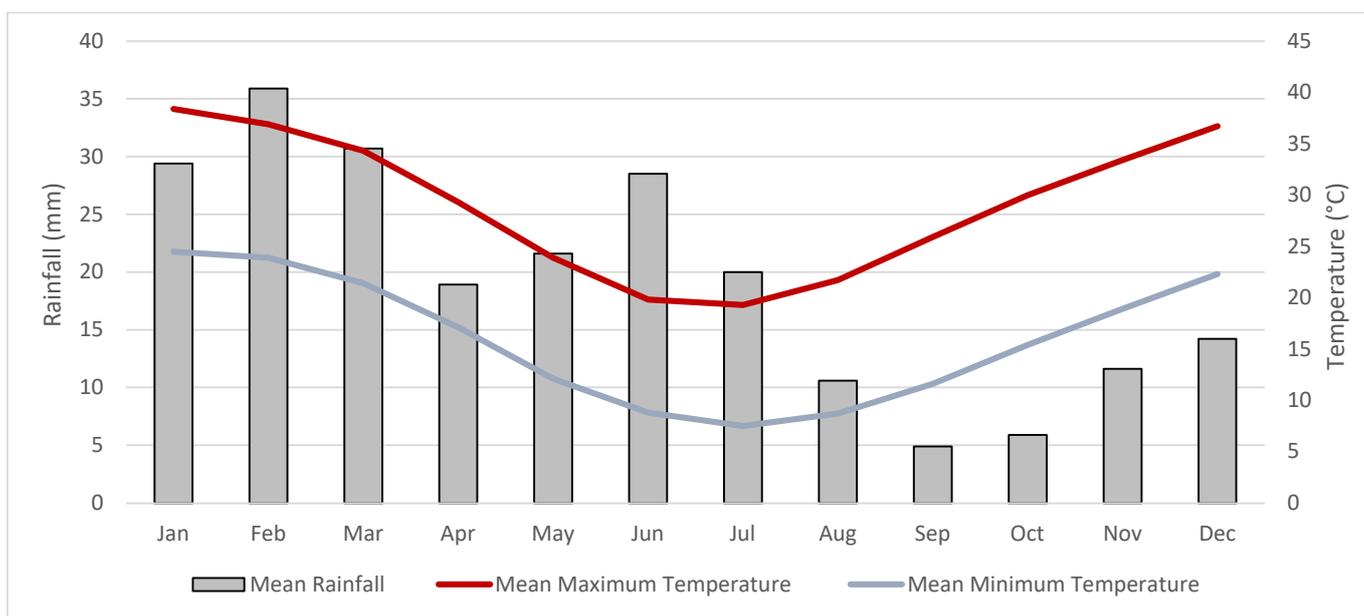


Figure 2.1: Climatic data for the project area.

Rainfall recorded during 2024 up to the time of survey is presented in Figure 2.2. A total of 196 mm of rainfall was recorded to July 2024, marginally above the long term average of 185.2 mm for the same period.

Annual rainfall had been well below the mean from 2019-2021 resulting in widespread die off of vegetation across the region. Rainfall in 2022 was above average and then marginally below average in 2023, however the rainfall patterns were not typical, with much of the rainfall occurring at different times to usual. 2024 appears to be following this atypical rainfall pattern with higher than usual rainfall during the winter months.

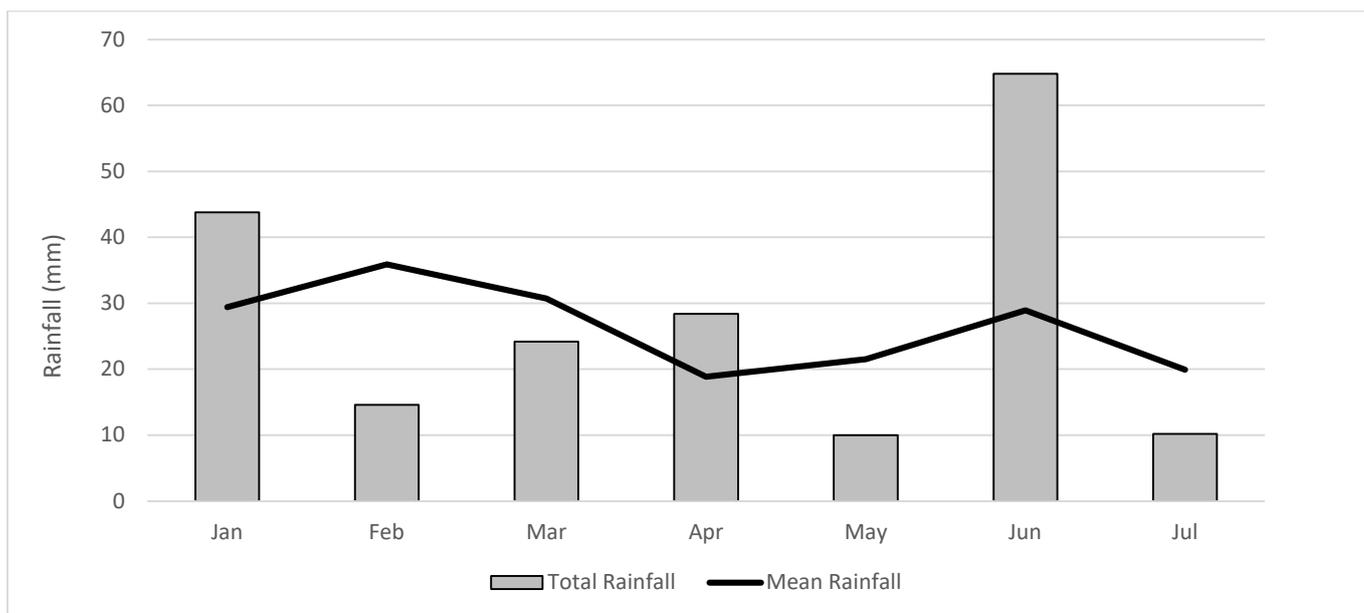


Figure 2.2: Rainfall data for the project area during 2024.

2.2 Interim Biogeographic Regionalisation for Australia

The Interim Biogeographic Regionalisation for Australia (IBRA) classifies the Australian continent into regions or bioregions on the basis of similar geology, landform, vegetation, fauna and climate characteristics. The project area is situated within the Murchison Bioregion according to IBRA 7 and is situated in the Western Murchison subregion (MUR2), close to the boundary of the Eastern Murchison subregion (MUR1).

The MUR2 subregion is described by Desmond et. al. (in DAWE 2019) as follows:

“Mulga low woodlands, often rich in ephemerals (usually with bunch grasses), on outcrop and fine textured Quaternary alluvial and eluvial surfaces (extensive hardpan wash plains that dominate and characterise the subregion) mantling granitic and greenstone strata of the northern part of the Yilgarn Craton. Surfaces associated with the occluded drainage occur throughout with hummock grasslands on Quaternary sandplains, saltbush shrublands on calcareous soils and Halosarcia low shrublands on saline alluvia. Contains the headwaters of the Murchison and Wooramel Rivers, which drain the subregion westwards to the coast. Arid climate with bimodal rainfall that usually falls in winter. The subregional area is 7,847,996 ha.” (DAWE 2019b).

The West Murchison subregion is in the northern end of the Yilgarn Craton, which experiences an arid climate with bimodal rainfall that usually falls in the winter months. The Western Murchison subregion is characterised by Mulga low woodlands on outcrop and fine textured Quaternary alluvial and eluvial surfaces mantling granitic and greenstone strata (Desmond et al. 2001, in DAWE 2019). Quaternary plains contain hummock grasslands, saltbush shrublands on calcareous soils and *Halosarcia* low shrublands on saline alluvia.

2.3 Flora and Vegetation

2.3.1 Flora

Previous database searches indicate that a total of 28 conservation significant flora taxa have been recorded within a 30 km area around the project site. The database search results indicate that no Threatened flora species have been recorded in the area. Definitions of the conservation codes used in the table are included as Appendix 1.

The surveys undertaken by *ecologia* recorded 393 vascular flora taxa from 57 families and 140 genera within the Beebyn-W11 area and surrounding region; including six introduced species and 24 Priority listed flora species, as listed by the Department of Biodiversity and Conservation (DBCA).

No Threatened species were recorded (*ecologia* 2010a).

APM (2024) recorded 77 vascular flora taxa from 21 families and 40 genera. The reduction in taxa recorded when compared to the earlier surveys is due to timing of the survey, the region having been in drought conditions for several years and the prevalence of goats, which have had a significant impact on the vegetation.

No Threatened species were recorded; however, a single potential record of the Priority 3 listed species *Hibiscus krichauffianus* was recorded. Due to seasonal conditions, insufficient material was available to definitively determine the species. *Hibiscus krichauffianus* is common in the central parts of Australia and the Queensland mid coast. The nearest known record is approximately 250 km south west of the project area, with most records in WA from the Pilbara. The species has not previously been recorded in the Murchison Region (APM 2024).

Table 2.1 provides a summary of the conservation significant flora recorded during survey work, as well as those species considered to be possible inhabitants of the immediate project area. Species that were considered as unlikely to occur following the survey by APM (2024) are not included in this summary table.

Table 2.1: Conservation significant flora recorded and potentially occurring in the project area.

Species	Conservation Status	Likelihood of occurrence
<i>Acacia dilloniorum</i>	P1	Possible – suitable habitat exists in the project area, no known records in immediate vicinity.
<i>Beyeria lapidicola</i>	P1	Recorded (<i>ecologia</i> 2010b)
<i>Euphorbia sarcostemmoides</i>	P1	Possible – suitable habitat exists in the project area
<i>Stenanthemum mediale</i>	P1	Possible - suitable habitat exists in the project area, no known records in immediate vicinity.
<i>Stenanthemum patens</i>	P1	Recorded (<i>ecologia</i> 2010b)
<i>Acacia burrowsiana</i>	P3	Possible – suitable habitat exists in the project area
<i>Hemigenia virescens</i>	P3	Possible - suitable habitat exists in the project area, no known records in immediate vicinity.
<i>Hibiscus ?krichauffianus</i>	P3	Tentative record (APM 2024)
<i>Homalocalyx echinulatus</i>	P3	Possible - suitable habitat exists in the project area, previous records in immediate vicinity (<i>ecologia</i> 2010b)
<i>Micromyrtus placoides</i>	P3	Recorded (<i>ecologia</i> 2010b)
<i>Prostanthera petrophila</i>	P3	Recorded (<i>ecologia</i> 2010b)
<i>Sauropus</i> sp. Woolgorong (M. Officer s.n. 10/8/94)	P3	Possible - suitable habitat exists in the project area, no known records in immediate vicinity
<i>Tribulus adelacanthus</i>	P3	Possible - previous records known from the Northern extent of the Weld Range
<i>Verticordia jamiesonii</i>	P3	Recorded (<i>ecologia</i> 2010b)
<i>Acacia speckii</i>	P4	Recorded (<i>ecologia</i> 2010b)
<i>Dodonaea amplisemina</i>	P4	Recorded (<i>ecologia</i> 2010b)
<i>Grevillea inconspicua</i>	P4	Possible - suitable habitat exists in the project area, no known records in immediate vicinity.

The distribution of Priority species recorded historically and in the APM (2024) survey in relation to the proposed development infrastructure is shown on Figure 2.3 and Figure 2.4.

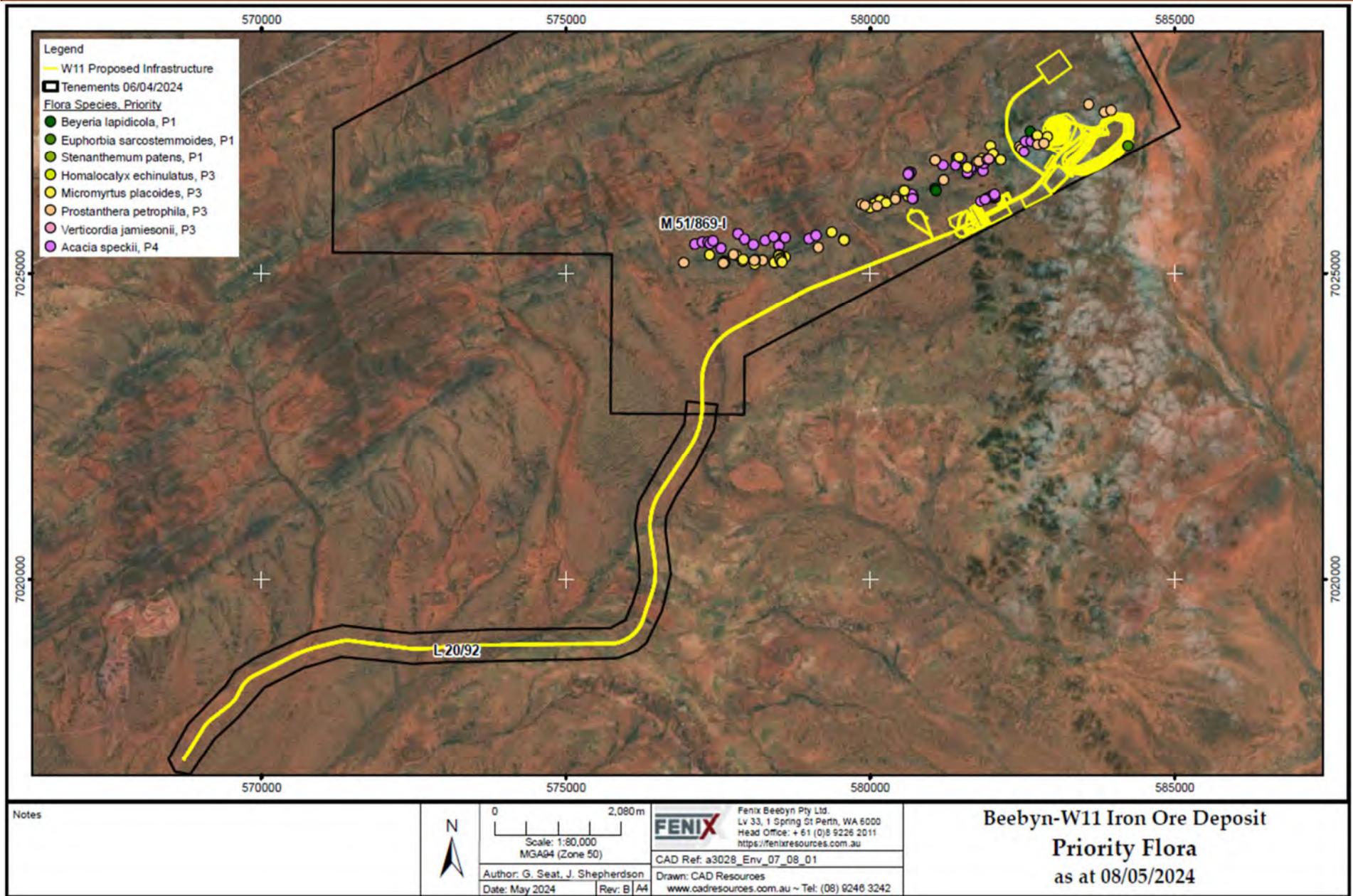


Figure 2.3: Previously recorded Priority flora locations within the proposed Beebyn-W11 project area.

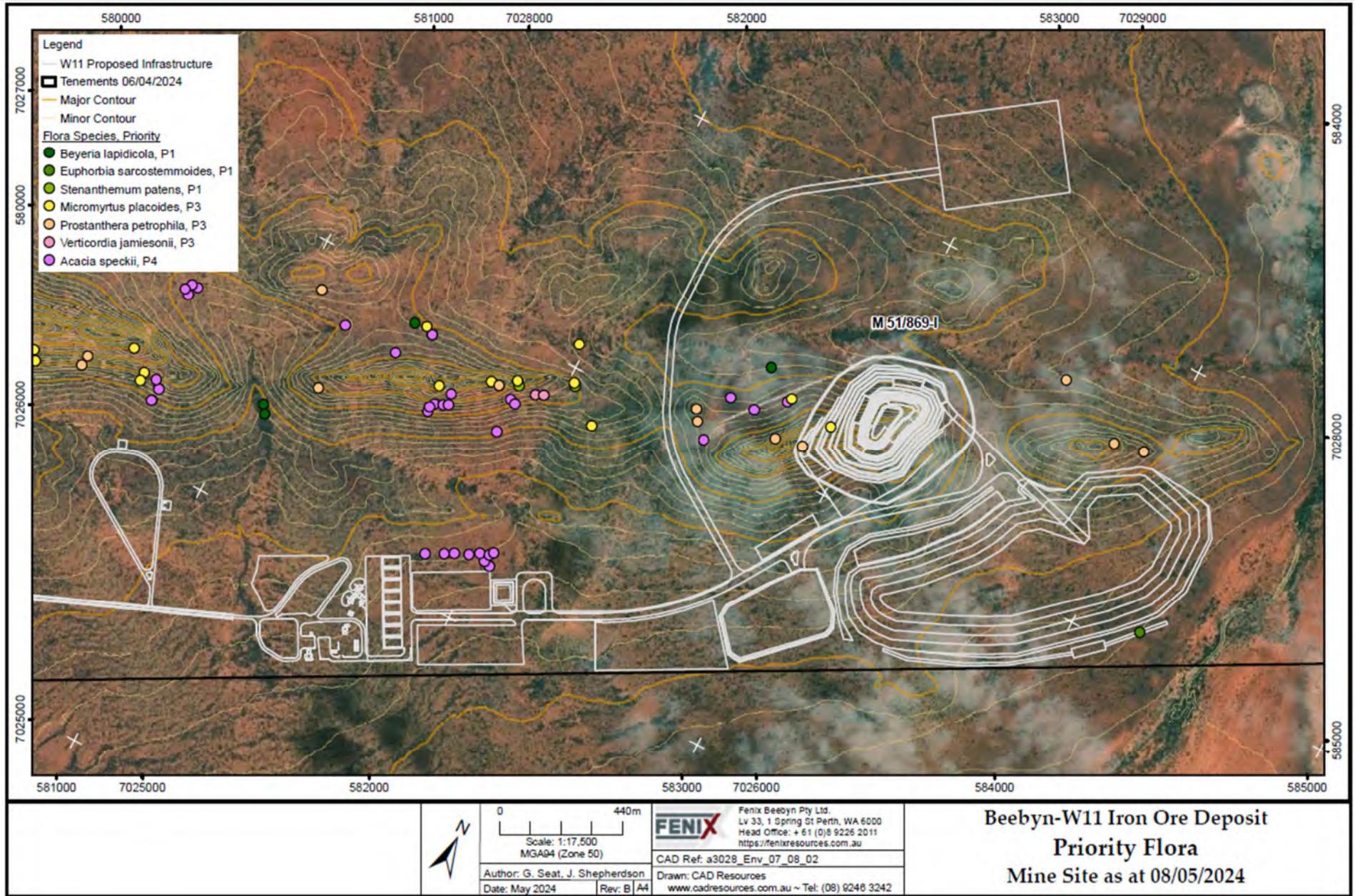


Figure 2.4: Previous Priority flora records within the proposed Beebyn-W11 infrastructure area.

2.3.2 Vegetation

APM (2024) recorded three vegetation types within the project area, which generally corresponded with the floristic communities described by Markey and Dillon (2008) and *ecologia* (2009a). The vegetation types described in the APM report are listed in Table 2.2 and have been recorded over the length of the Weld Range in the DEC survey (Markey and Dillon 2008). Figure 2.5 and Figure 2.6 show the distribution of vegetation types within the project area.

No State (DBCA) or Commonwealth (EPBC Act) listed Threatened Ecological Communities (TECs) occur within the project area. The project area partly coincides with the Priority 1 Priority Ecological Community (PEC) Weld Range Vegetation Complexes (banded ironstone formation) (DBCA 2019). Figure 2.5 shows the PEC boundary and vegetation in relation to the proposed project layout. The PEC boundary defined by DBCA includes a 500 m “administrative buffer”, which includes some vegetation types that do not align with the PEC description. The Weld Range PEC occupies an area of 20,073 ha, with the project area (excluding existing exploration disturbance) coinciding with less than 1.1% of this area.

ecologia (2009a) identified Communities 1 and 2 as being of conservation significance due to their restricted occurrence outside the area identified as a PEC, and of local significance due to the high number of taxa which were locally restricted to them. These communities predominantly occurred on BIF ridges. The APM (2024) mapped vegetation type 2a aligns with Community 2 as identified by *ecologia*.

Table 2.2: Vegetation types identified in the project area.

Code	Landform	Description	Soil type and surface geology
2a ²	BIF outcrops	Scattered low <i>Acacia aneura</i> , <i>Psyrdrax latifolia</i> and <i>Acacia pruinocarpa</i> over <i>Eremophila latrobei</i> subsp. <i>latrobei</i> , <i>Thryptomene decussata</i> and <i>Philotheca brucei</i> mid sparse shrubland with <i>Ptilotus obovatus</i> , <i>Dodonaea pachyneura</i> and <i>Dysphania rhadinostachya</i> low sparse shrubland.	Light red sandy clay loam; BIF outcrops and rocklands on moderate to steep hillslopes.
3a ²	Gravelly plains	<i>Acacia aneura</i> , <i>A. ramulosa</i> subsp. <i>linophylla</i> and <i>Acacia mulganeura</i> tall sparse shrubland over <i>Eremophila punicea</i> , <i>Eremophila forrestii</i> subsp. <i>forrestii</i> and <i>Eremophila margarethae</i> mid sparse shrubland with <i>Ptilotus obovatus</i> , <i>Eragrostis eriopoda</i> and ? <i>Swainsona purpurea</i> scattered low groundcover.	Red to red-brown clay loam to sandy clay loam with ironstone gravel to small stones at the surface; sandy outwash and gravelly plains and footslopes of BIF ranges, on gentle mid and lower slopes.
3a ¹	Sandy outwash plains	+/- <i>Corymbia lenziana</i> scattered medium trees over <i>Acacia. ramulosa</i> var. <i>linophylla</i> and <i>A. aneura</i> sparse tall shrubland over mixed <i>Eremophila</i> spp. open mid shrubland over scattered low shrubs of <i>Ptilotus obovatus</i> over mixed open tussock grassland.	Sandy outwash and gravelly plains and footslopes of BIF ranges.
3b ²	Sandy outwash plains	<i>Acacia aneura</i> , <i>Acacia pruinocarpa</i> and <i>Acacia ramulosa</i> var <i>linophylla</i> low open woodland over <i>Eremophila forrestii</i> ssp <i>forrestii</i> , <i>Eremophila latrobei</i> and <i>Grevillea obliquistigma</i> mid open shrubland and <i>Ptilotus obovatus</i> , <i>Sida calyxhymenia</i> and <i>Abutilon cryptopetalum</i> sparse low shrubs.	Lower slopes and outwashes of ironstone colluvium; drainage lines and low-lying areas on sandy outwash plains.
3b ¹	Sandy outwash plains	<i>Acacia pruinocarpa</i> scattered trees over <i>A. aneura</i> woodland over <i>A. ramulosa</i> var. <i>linophylla</i> and <i>A. aneura</i> shrubland over mixed <i>Eremophila</i> closed shrubland over <i>Ptilotus obovatus</i> var. <i>obovatus</i> open low shrubland.	Drainage lines and low lying areas on sandy and outwash plains.
4a ¹	Granite/dolerite slopes and plains	<i>Acacia</i> sp. Weld Range and <i>A. aneura</i> var. <i>microcarpa</i> open tall shrubland over <i>Eremophila macmillaniana</i> and mixed <i>Senna</i> spp. open mid shrubland over <i>Ptilotus obovatus</i> var. <i>obovatus</i> open low shrubland.	Undulating scree plains and mid to low slopes of granite and dolerite.
5a ¹	Various	<i>Acacia</i> low woodland over <i>Solanum ashbyae</i> / <i>lasiophyllum</i> and <i>Ptilotus obovatus</i> var. <i>obovatus</i> low shrubland over mixed low tussock grassland.	Ridge tops and upper slopes of BIF ridges, low lying semi saline flats, riparian areas and ironstone scree flat plains.
D	Disturbed – clear of vegetation		

¹ - ecologia (2010b)² – APM (2024)

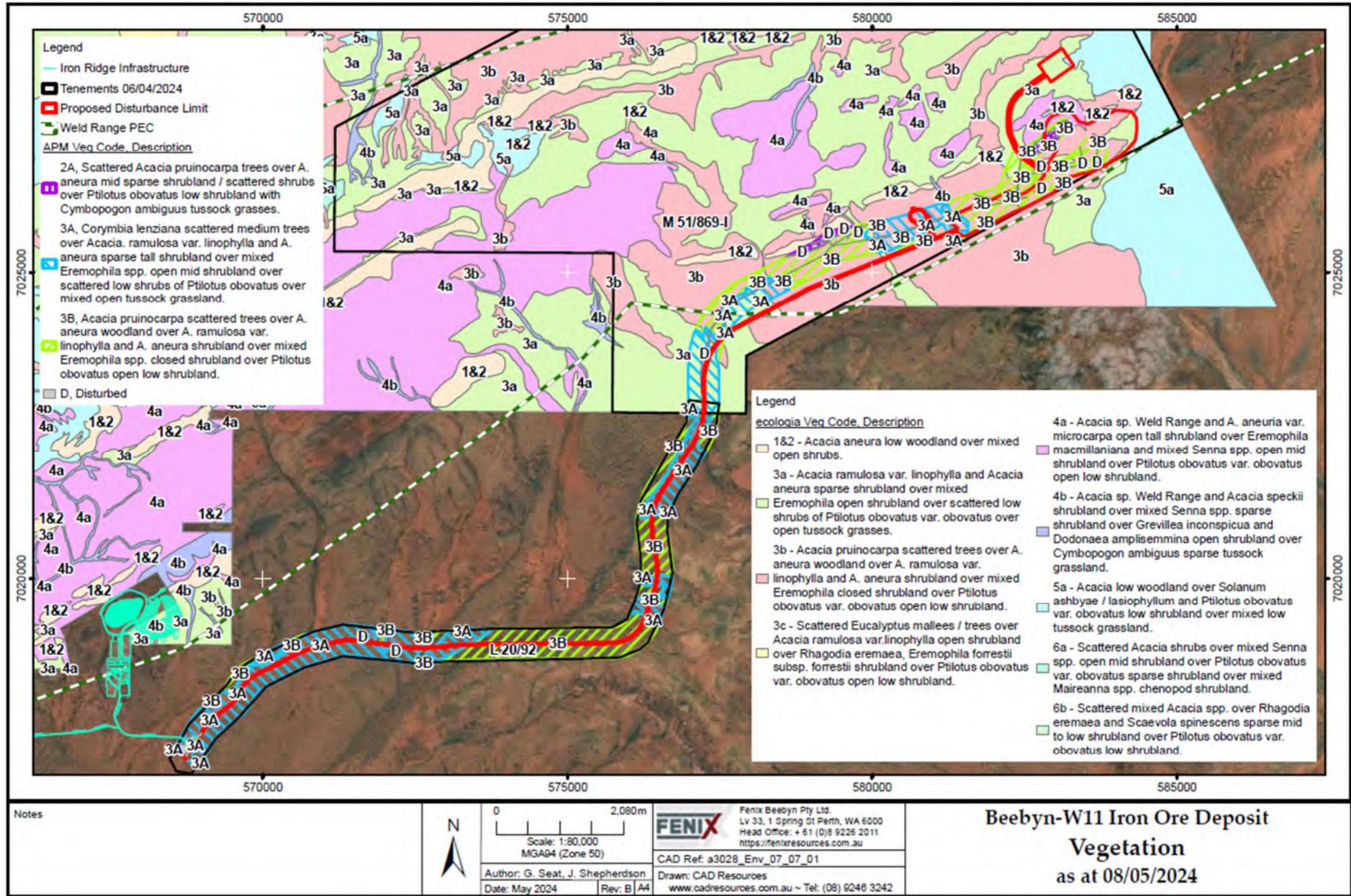


Figure 2.5: Previously recorded vegetation types associated with the project area.

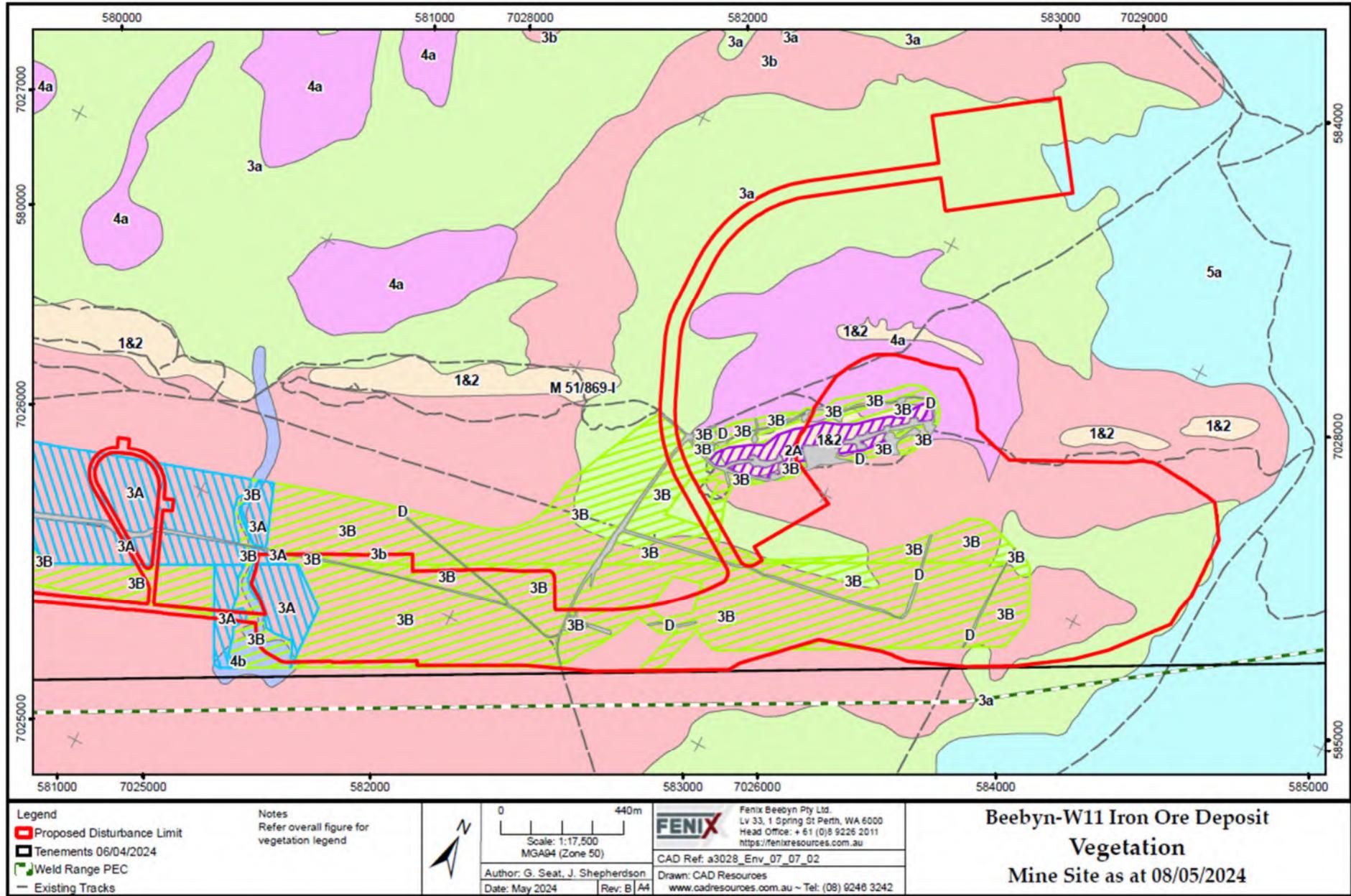


Figure 2.6: Previously recorded vegetation types associated with the infrastructure area.

2.4 Fauna

The surveys undertaken by *ecologia* (2010a) recorded 148 vertebrate species in and around the project area, including 80 bird species, 44 reptiles, 23 mammals (17 native and six introduced) and one amphibian.

Twenty vertebrate fauna species and two invertebrate species of conservation significance were identified from database searches of a 30 km radius from the study area including seven mammals, 11 birds and two reptiles (APM 2024). Species listed as Marine or species not known to inhabit terrestrial environments are considered very unlikely to inhabit the project area and have been excluded. Table 2.4 provides a summary of those conservation significant species occurring or likely to occur within the Project area. Previously recorded locations of conservation significant fauna are presented in Figure 2.7.

At the Weld Range, the long-tailed dunnart has been recorded on exposed rock and stony soils with hummock grasses and shrubs, flat-topped hills, lateritic plateaus, sandstone ranges and breakaways, generally with a vegetation of sparse mulga over spinifex (*ecologia* 2010a). Within the project area, APM (2024) found suitable habitat exists in the Banded Ironstone and Drainage Line habitats.

Old, inactive malleefowl mounds have been recorded in the project area; however, mounds may last decades after abandonment and the presence of inactive mounds is not a reliable indication of current presence. The species is not expected to be a resident at Weld Range but may persist in surrounding areas of dense unburnt habitat (APM 2024).

The project area is on the northernmost extent of malleefowl distribution at this longitude in WA, and the closest records are over 50 km to the south. A sandy substrate and abundance of leaf litter are clear requirements for the construction of the birds' incubator-nests (Benshemesh 2007, in APM 2024). Soils in the disturbance footprint have a reasonably high clay content and litter was sparse to absent, except in the narrow Drainage Lines. The quality of the habitat for foraging and nest building are generally low, except in small patches of higher quality habitat in or near the larger drainage features low in the plains (APM 2024).

The project area contains some large trees that may be suitable for development of hollows by the Southern whiteface (a bird listed as Vulnerable); however, the area is previously disturbed with grazing impacts from both the Beebyn Station and feral goats, and historic clearing for mining exploration. The understory is sparse and the litter layer sparse to absent, but thicker in narrow bands around the drainage lines. Due to the poor condition of the understory, the area is unlikely to host habitat critical to the survival of the Southern whiteface (APM 2024).

Suitable foraging habitat for the grey falcon is present within the area, however no suitable nesting habitat is present and preferred nesting habitat is not available in the surrounding local area. Known records are more than 50 km away and whilst the grey falcon may occasionally visit the locality, it is unlikely to provide an important habitat for this species (APM 2024).

The Western spiny-tailed skink typically resides in family groups in coarse woody debris, such as fallen log piles (Bradley et. al 2022) or burrows under boulders and exfoliated sheets of granite. This species is generally easy to detect as the animals use a communal latrine which persists for many months even when the animals are concealed or absent. The species was not recorded in the project area during the fauna survey undertaken by APM (2024).

The West Coast mulga slider has previously been recorded in the Weld Range, including locations close to the project area; however, APM (2024) found the habitats within the project area were generally of poor quality. Leaf litter is scarce within the project area and soils are degraded and likely poor for burrowing. Higher quality microhabitats occur in the Drainage Line habitat however, soils may be too stony to be suitable.

ecologia conducted a targeted *Idiosoma nigrum* survey at Weld Range (*ecologia* 2010b), which included a collection of detailed data on the spider's demography, population structure and habitat preference. A total of 76 ha was surveyed for *Idiosoma nigrum*, with 1,708 burrows found, all within the boundaries of drainage lines and underneath Acacia vegetation, predominately on the southern face of hill slopes. Within the Beebyn-W11 project area, 393 burrows were recorded, with an estimated population size of 274 ± 197 individuals (*ecologia* 2010b).

Biologic Environmental Survey Pty Ltd (Biologic) undertook a status review of the species in April 2019 and confirmed that the trapdoor spider found in the Weld Range area is now regarded as *Idiosoma clypeatum*, a Priority 3 species under the WA Biodiversity Conservation Act (Biologic 2019).

Intensive targeted surveys have previously been conducted throughout the Weld Range when the northern shield-backed trapdoor spider was regarded as *I. nigrum* and listed as a Vulnerable species under the *WA Wildlife Conservation Act 1950*. Over 1800 trapdoor burrows have been identified from database searches, the majority of which are from within the Weld Range. Biologic (2012) estimated the population size of *I. clypeatum* across the Weld Range to be more than 14,000 individuals.

2.4.1 Fauna habitat

APM (2024) identified four main habitat types in the project area, described in Table 2.3 and shown on Figure 2.8. The habitat types are similar to those identified at the nearby Iron Ridge project (*ecologia* 2020a).

Table 2.3: Fauna habitat recorded in the study area.

Habitat type	APM study area (ha)	Project area (ha)
Acacia Sand Plains	500.5	28.9
Banded Ironstone Ridge	6.1	3.3
Drainage Line	186.1	7.0
Mulga Woodland on Hill Slope	333.0	91.6
Disturbed	30.5	8.7
Not mapped (portion of M51/869)	-	122.6
Total	1,056.2	262.1

Acacia Sand Plains habitat occurs predominantly on the lower slopes of the study area, where the haul road is proposed to be developed. Associated soils include sandy to lightly rocky clay loam.

Mulga Woodland on Hill Slope habitat is dominated by *Acacia pruinocarpa* trees and *Acacia aneura* shrublands over on sandy or stony clay loam on hill slopes and is the most widespread habitat present in the area. This habitat type provides suitable substrates, vegetation and habitat to support the Priority 3 (BC Act) northern shield-backed trapdoor spider. This habitat is considered widespread in the Weld Range area.

Drainage Line habitat provides suitable habitat for the west coast mulga slider. Known from the arid interior of the Midwest of WA and endemic to the Murchison bioregion, this species has previously been recorded within Weld Range in leaf litter fringing drainage lines.

Banded Ironstone Ridge habitat occurs in a small portion in the north of the project area and is the least widespread habitat present in the area. The long-tailed dunnart has been recorded from widely scattered localities in the arid zone where it inhabits rugged, rocky areas, such as this habitat type. It typically occurs on plateaus near breakaways and scree slopes, and on rugged boulder-strewn scree slopes. Widely separated populations occur in the Pilbara, Murchison, Gibson Desert, southern Carnarvon Basin and in the Western MacDonnell Ranges (Northern Territory). The species was once considered rare but has recently been shown to be relatively common and widespread within rocky habitats, especially banded iron formation ranges within the Midwest.

Approximately 122 ha were not covered in the survey undertaken by APM; however, based on the surveyed area, this unmapped portion was expected to be *Mulga Woodland on Hill Slope* habitat.

Table 2.4: Conservation significant fauna likelihood of occurrence.

Common name	Scientific name	EPBC status	WA status	Comments	Likelihood of occurrence
Mammals					
Bilby	<i>Macrotis lagotis</i>	VU	VU	The local record has a low level of certainty and was recorded in 1984.	Unlikely
Black-flanked rock-wallaby	<i>Petrogale lateralis lateralis</i>	EN	EN	Historical local record is a fossilised specimen	Unlikely
Brush-tailed mulgara	<i>Dasyercus blythi</i>		P4	Historical local record is a fossilised specimen	Unlikely
Ghost bat	<i>Macroderma gigas</i>	VU	VU	Historical local record is a fossilised specimen	Unlikely
Gould's mouse	<i>Pseudomys gouldii</i>	VU	VU	Historical local record is a fossilised specimen	Unlikely
Greater stick-nest rat	<i>Leporillus conditor</i>	VU	CD	Historical local record is a fossilised specimen	Unlikely
Long-tailed dunnart	<i>Antechinomys longicaudata</i>		P4	Suitable habitat present in the BIF	Recorded
Birds					
Curlew sandpiper	<i>Calidris ferruginea</i>	CR, MI	CR	No suitable habitat present	Unlikely
Fork-tailed swift	<i>Apus pacificus</i>	MI	IA	Potential to overfly the area	Possible
Grey falcon	<i>Falco hypoleucos</i>	VU	VU	Suitable foraging habitat present. No suitable nesting habitat.	Possible
Grey wagtail	<i>Motacilla cinerea</i>	MI	MI	No suitable habitat present	Unlikely
Malleefowl	<i>Leipoa ocellata</i>	VU	VU	Inactive mounds have been recorded	Possible
Night parrot	<i>Pezoporus occidentalis</i>	EN	CR	No suitable habitat present	Unlikely
Pectoral sandpiper	<i>Calidris melanotos</i>	MI	IA	No suitable habitat present	Unlikely
Peregrine falcon	<i>Falco peregrinus</i>		OS	Foraging habitat present	Possible
Sharp-tailed sandpiper	<i>Calidris acuminata</i>	VU, MI	IA	No suitable habitat present	Unlikely
Southern whiteface	<i>Aphelocephala leucopsis</i>	VU	-	All habitats suitable, project area unlikely to host habitat critical to survival.	Possible
Yellow wagtail	<i>Motacilla flava</i>	MI	MI	No suitable habitat present	Unlikely
Reptiles					
West coast mulga slider	<i>Lerista eupoda</i>		P1	Suitable habitat is present in the Mulga Woodland on Hill Slope habitat.	Possible
Western spiny-tailed skink	<i>Egernia stokesii badia</i>	EN	VU	Suitable habitat may be present	Possible
Invertebrate					
Northern shield-backed trapdoor spider	<i>Idiosoma clypeatum</i>		P3	Recorded within the study area, then identified as <i>I. nigrum</i>	Recorded
Shield-backed trapdoor spider	<i>Idiosoma nigrum</i>	VU	EN	All specimens in the Murchison region determined to be <i>I. clypeatum</i>	Unlikely

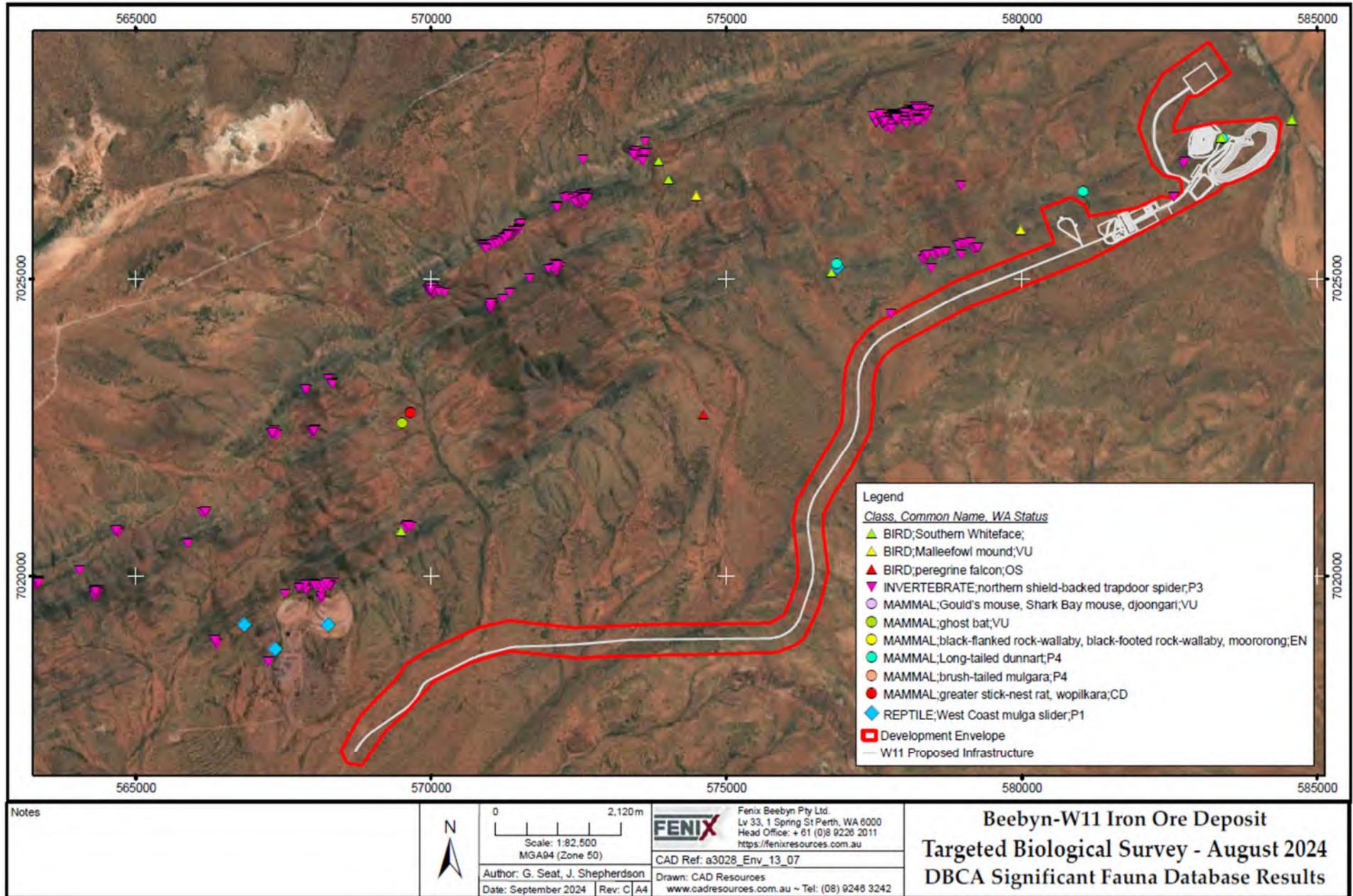


Figure 2.7: Database search records of conservation significant fauna within 30 km of the project area.

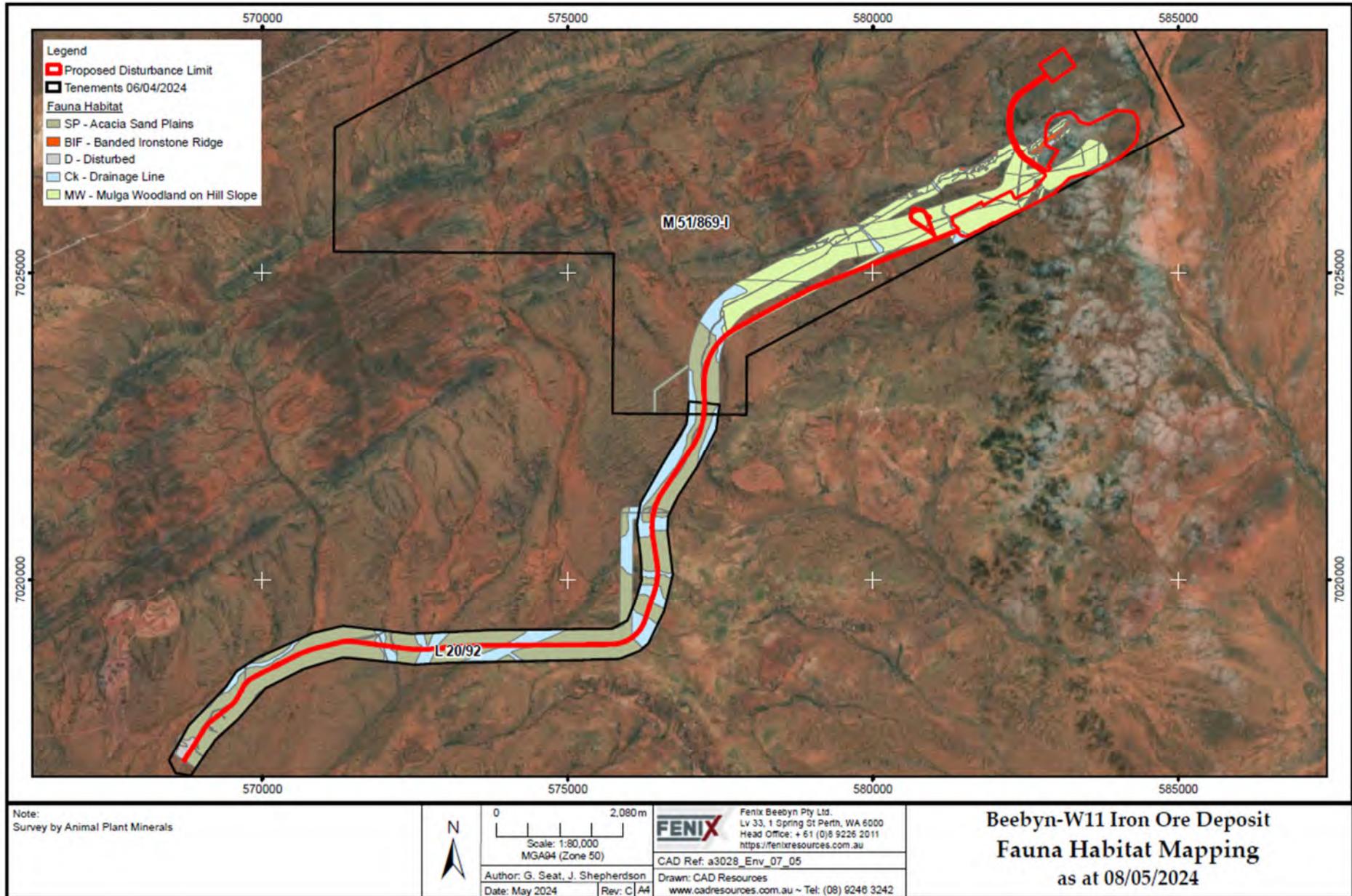


Figure 2.8: Fauna habitat in the project area (APM 2023).

3.0 METHODOLOGY

3.1 Personnel

The survey work was undertaken by botanist Jenny Borger and biologist/environmental consultant Jeremy Shepherdson.

Jenny has more than 20 years' experience as a botanist and specialises in flora of the Midwest Region. She has undertaken and been involved in numerous surveys of the Weld Range and surrounding region for clients including Sinosteel Midwest Corporation Ltd, Fenix Resources and DBCA. Jenny is very familiar with the flora of this area, including each of the conservation significant species that have been previously recorded.

Jeremy has over 25 years' experience as a biologist and environmental consultant across Western Australia. He has extensive experience in biological surveys, including targeted surveys for conservation significant species such as the malleefowl, spiny-tailed skink and shield-backed trapdoor spiders. He is competent in identification of flora, fauna and fauna habitat with considerable experience in the Midwest Region.

3.2 Desktop review

Prior to undertaking this survey, available information from previous surveys and database searches was reviewed, the results of which are detailed in Sections 2.3 and 2.4.

Descriptions and photos of each of the previously recorded Priority flora were printed for reference in the field if needed. Previous vegetation mapping and recorded locations of Priority flora was loaded into hand held GPS units for ground truthing.

3.3 Field survey

The field survey was undertaken from the 29th July to 3rd August 2024 and involved:

- a targeted survey for conservation significant flora within the project area
- confirming the presence and identity of *Hibiscus ?krichauffianus*
- refining and expanding the vegetation mapping as defined by APM (2024) and *ecologia* (2010a)
- a targeted survey for conservation significant fauna within the project area, including *Idiosoma clypeatum* burrows and malleefowl (*Leipoa ocellata*) mounds
- refining and expanding the fauna habitat mapping as defined by APM (2024)

72 survey points (20 x 20 m quadrats and relevés) were used for vegetation sampling. At each point, the following information was recorded:

- GPS location and survey date
- physical features (landform, elevation, soil type, ground surface cover, litter, rock type)
- vegetation condition as described for the Eremaean province (EPA 2016)
- dominant growth form, height, cover, and species for each strata (upper, mid and ground) compatible with NVIS Level 6 (ESCAVI 2003)
- level and nature of disturbances (e.g. weed presence, fire, and time since last fire, impacts from grazing, vegetation clearing, erosion)
- list of all species within the quadrat including weeds and listing species average height and cover.

Plants unable to be determined in the field were collected for later identification using relevant taxonomic keys and/or compared against specimens at the WA Herbarium.

The locations of previously recorded conservation significant flora and fauna were revisited and a species search and population count (if species present) undertaken. Areas of suitable habitat (as identified in Table 2.1 and Table 2.4) were also targeted for each conservation significant species with a possible or higher likelihood (as identified in Table 2.1 and Table 2.4) of occurring in the survey area.

Fauna habitat assessments were performed at each vegetation survey point. Descriptive data was recorded including soil type, landform and disturbances.

3.4 Limitations

An assessment of survey-specific issues and limitations for flora (EPA 2016) and fauna (EPA 2020) is detailed in Table 3.1.

Table 3.1: Study limitations.

Aspect	Constraint?	Comment
Availability of contextual information at a regional and local scale (EPA 2016 and 2020)	No	Detailed surveys have been undertaken in the project area (APM 2024, <i>ecologia</i> 2010a and b, <i>ecologia</i> 2009) and surrounds (<i>ecologia</i> 2020a and b, Biologic 2012, Bamford 2009). This information was adequate to provide appropriate contextual information for the current survey.
Competency/experience of the team carrying out the survey, including experience in the bioregion surveyed (EPA 2016 and 2020)	No	The survey personnel have more than 20 years' experience undertaking surveys in Western Australia and have worked in the Murchison Bioregion since 2005.
Scope of the survey, e.g. were faunal groups excluded from the survey (EPA 2020)	No	The fauna scope was to target conservation significant fauna (including <i>Idiosoma clypeatum</i>) and verify fauna habitat mapping. This aspect was not a limitation.
Proportion of flora recorded and/or collected, any identification issues (EPA 2016)	No	Climatic conditions prior to the survey were average, with 75 mm rainfall received in the two months prior to the survey, resulting in many species flowering and easily identifiable. A minor number of specimens were not identified to the species level due to being sterile, none of these are expected to be flora of conservation significance.
Was the appropriate area fully surveyed (effort and extent) (EPA 2016 and 2020)	No	The area was surveyed fully.
Access restrictions within the survey area (EPA 2016 and 2020)	No	The survey area was accessible by vehicle and foot.
Survey timing, rainfall, season of survey (EPA 2016 and 2020)	No	The survey was undertaken in late Winter, and most perennials were flowering. The survey area is within the Eremaean botanical province. Recommended timing for flora and vegetation survey is 6-8 weeks post wet season (March – June) for primary survey, and a dry season survey (after winter rainfall if available) for supplementary survey (EPA 2016). The timing of the field survey is within the period recommended for supplementary surveys and coincides with the flowering period of many of the regions flora. Rainfall at Meekatharra during 2024 was above average (185.2 mm), with 196 mm received up to the time of survey,

Aspect	Constraint?	Comment
		including 75 mm in the two months prior to the survey (June and July). The overall condition of the vegetation was quite healthy.
Disturbance that may have affected the results of survey such as fire, flood or clearing (EPA 2016 and 2020)	No	Some historical disturbance was noted throughout the survey area; however, did not affect the results of the survey.
Problems with data and analysis, including sampling biases (EPA 2020)	No.	There were no data problems and this aspect was not a limitation.

4.0 RESULTS

4.1 Flora

A total of 151 species of flora were recorded within the survey area, from 35 Families and 77 Genera. One introduced (weed) species, *Oxalis ?corniculata* was recorded in one location (Site 49, Figure 4.4). The full list of species recorded is presented in Appendix 2.

Prior locations of Priority flora were investigated to determine whether the previously recorded individuals were still present. In some locations no specimens of the previously recorded Priority species could be located. On the exposed upper portions of BIF ridge there was evidence of vegetation death, likely resulting from several years of low rainfall, and it was considered likely that the previously recorded individuals had died. In other locations plant species very similar in appearance were located but the Priority species could not be. It is possible that the similar species were mistakenly identified as the Priority species if there were no flowering parts present at the time of the previous surveys.

The survey recorded seven DBCA Priority listed species in the project area, as outlined in Table 4.1 and shown in Figure 4.1 and Figure 4.2. No Threatened flora were recorded. Definitions of the conservation codes used in the table are included as Appendix 1.

Track logs of the surveyed area are presented in Figure 4.3.

Table 4.1: Priority flora recorded during the survey.

Species	Conservation Code	Number of locations	Number of individuals
<i>Beyeria lapidicola</i>	P1	2	100
<i>Euphorbia sarcostemmoides</i>	P1	1	1
<i>Stenanthemum mediale</i>	P1	102	264
<i>Micromyrtus placoides</i>	P3	61	1,075
<i>Prostanthera petrophila</i>	P3	18	108
<i>Verticordia jamiesonii</i>	P3	8	147
<i>Acacia speckii</i>	P4	25	51

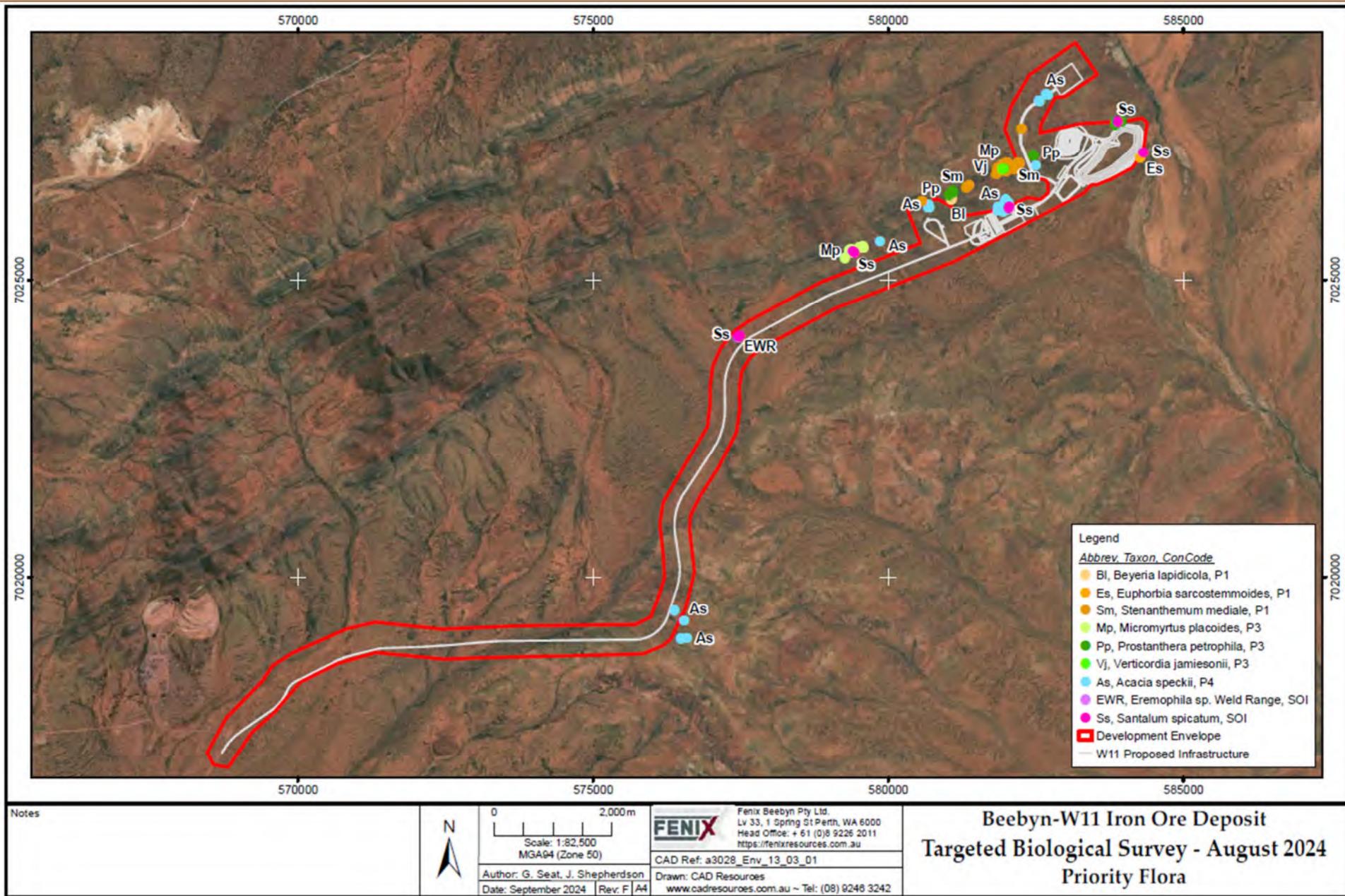


Figure 4.1: Priority flora recorded during the survey - overview.

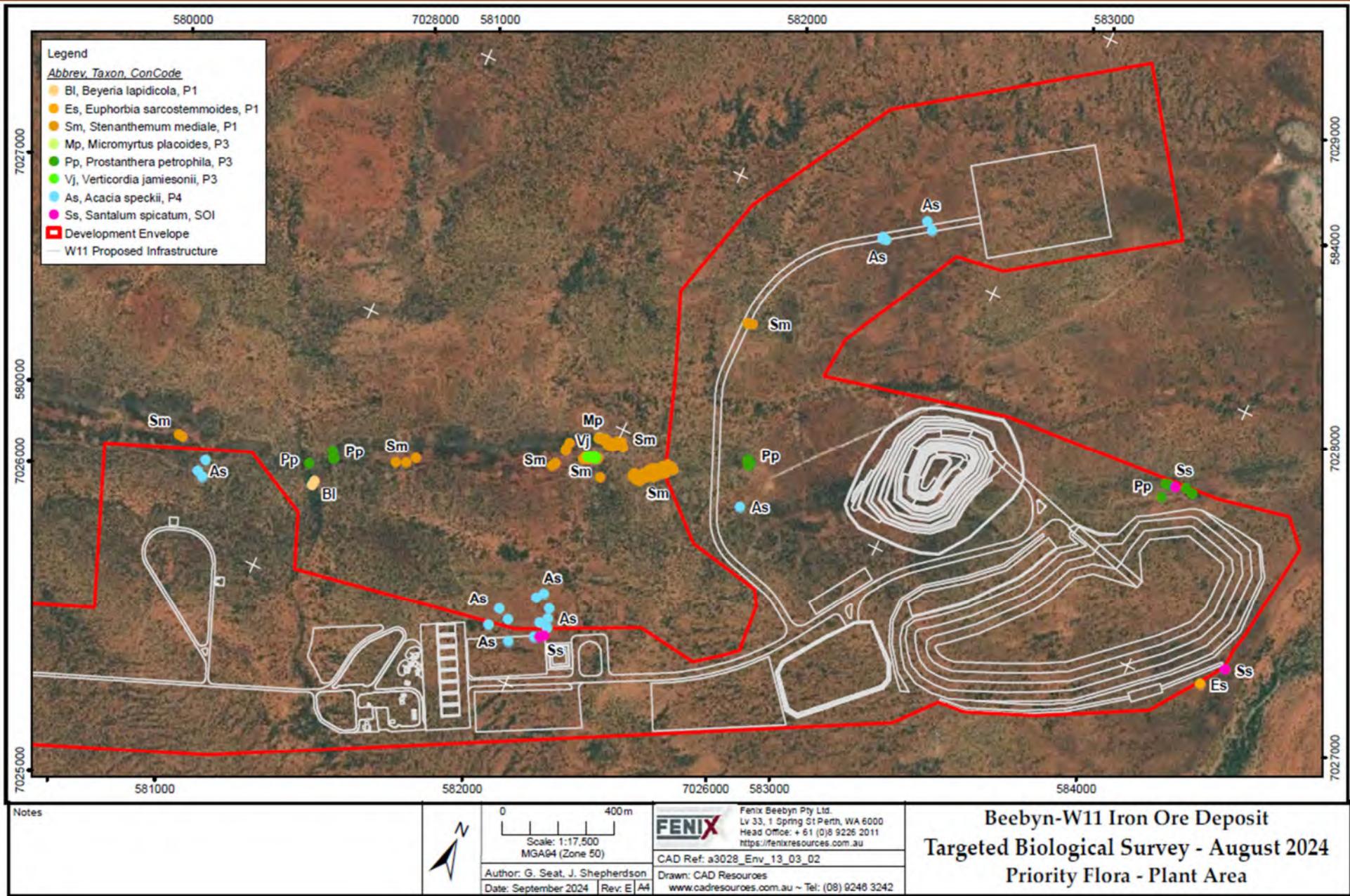


Figure 4.2: Priority flora recorded during the survey – mine area.

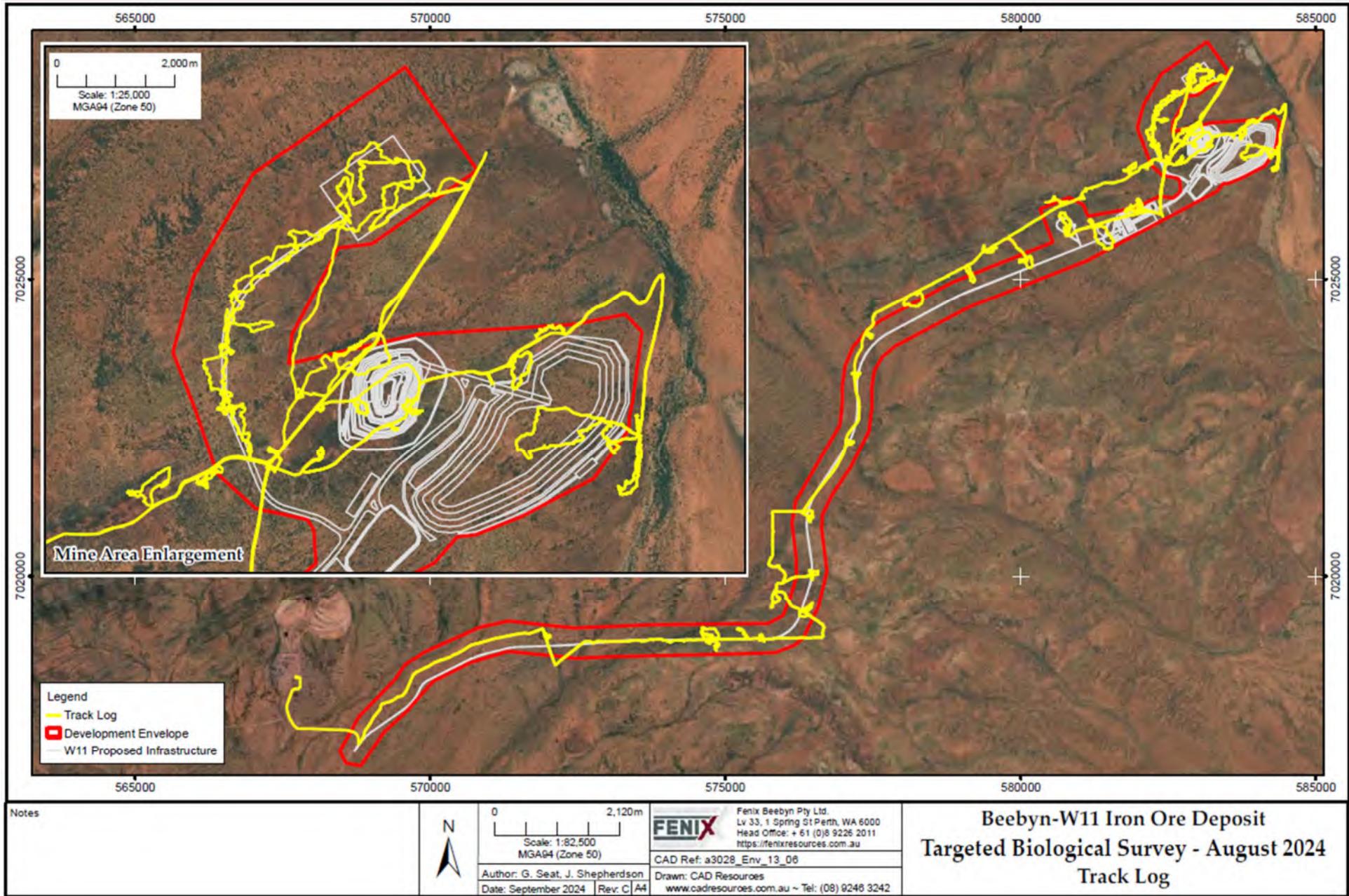


Figure 4.3: Track logs of the survey area.

4.1.1 *Beyeria lapidicola* – Priority 1

Beyeria lapidicola is a much branched shrub growing to 1.6 m high with resinous and sticky stems and leaves. The branches are pale, yellow-green becoming grey or black and leaves are narrow oblong, have three ribs on the under surface and are hairy between the ribs (*ecologia* 2012). This species has a known range of approximately 450 km (Western Australian Herbarium 1998–) and typically occurs on sand over banded ironstone or dry creek beds with sandy clay and fine gravel.

Prior recorded locations of *B. lapidicola* were investigated and in most cases plants were found to be dead or absent. A large previously recorded population in a creek line to the north (upstream) of the proposed infrastructure area was found to be healthy with more than 100 individuals present.

Within the Beebyn-W11 project area, no individuals were recorded within the proposed disturbance footprint with more than 100 plants present outside the development envelope. It is quite likely that *Beyeria lapidicola* will be present in other larger creek lines in the surrounding area. These are avoided by the proposed development.



Photograph 4.1: Numerous dead shrubs in the vicinity of one of the previously recorded *B. lapidicola* locations.



Photograph 4.2: *B. lapidicola* and its preferred habitat.

4.1.2 *Euphorbia sarcostemmoides* – Priority 1

Euphorbia sarcostemmoides is an erect, multi-stemmed, semi-succulent shrub growing to 2 m high. The preferred habitat for this species is sandstone ridges and quartzite hills (Western Australian Herbarium 1998–), however has been recorded on flat plains at Weld Range (ecologia 2012). *Euphorbia sarcostemmoides* has been recorded in both Western Australia and the Northern Territory, over a range of approximately 1,200 km.

A single individual was recorded in the W11 area during previous surveys and was found alive during this survey on the flat plain to the south of the proposed footprint (Photograph 4.3). A search of the surrounding area failed to find any additional specimens. The single individual is located close to, but outside the proposed footprint of a topsoil stockpile.



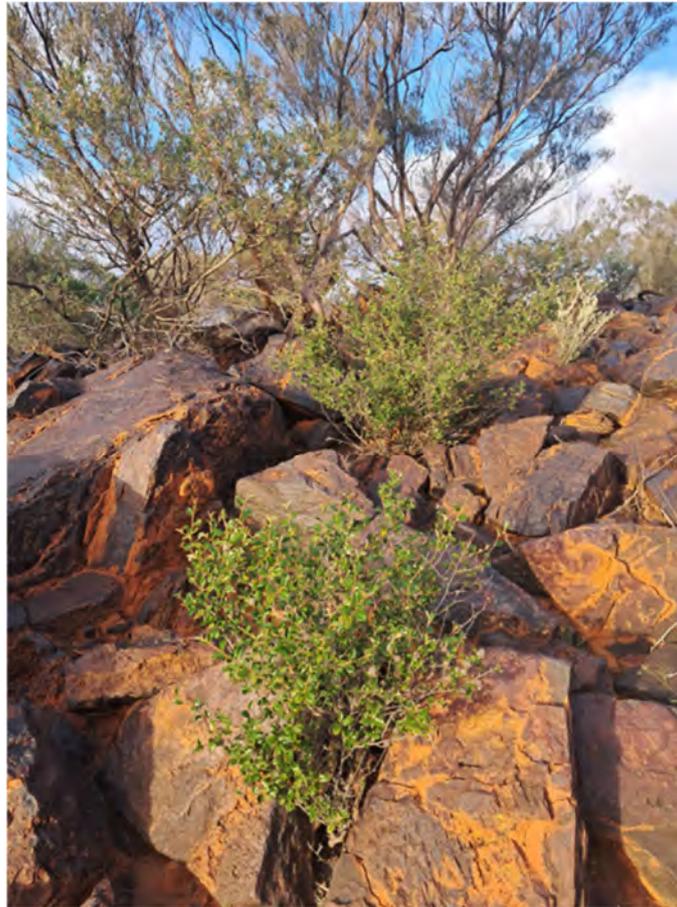
Photograph 4.3: The single *E. sarcostemmoides* plant, found growing within a dead shrub.

4.1.3 *Stenanthemum mediale* – Priority 1

Stenanthemum mediale is a shrub growing to 0.35 m high and has a known range of over 250 km (Western Australian Herbarium 1998–). The leaves are small, egg shaped with hairs on the under surface. This species can be confused with the more common *S. patens*, which has hairs on the upper surface, or both surfaces, of the leaf. The flowers of *S. mediale* are white, small, hairy tubular flowers primarily flowering in April – August.

Previously recoded locations of *S. patens* were investigated and found to be *S. mediale*, which was found to be abundant but quite localised along the ridge to the south-west of the proposed pit.

Within the Beebyn-W11 project area, more than 250 individuals were recorded, four of which will be impacted by the proposed development.



Photograph 4.4: *Stenanthemum mediale* growing on ridge habitat.

4.1.4 *Micromyrtus placoides* – Priority 3

Micromyrtus placoides is a shrub growing to 2.3 m, sometimes widely spreading with several stems or branches from the base (Western Australian Herbarium 1998–), occurring within the Murchison and Yalgoo IBRA bioregions (Eastern Murchison, Western Murchison and Talling subregions). It has a relatively restricted distribution from near Cue (Weld Range), south-west to Talling Peak. It occurs extensively across Weld Range in a variety of habitats including undulating plains, dry creek beds, hill slopes and ridges, on red-orange or orange-yellow sandy clay, coarse gravel, BIF, laterite, quartz and basalt (Western Australian Herbarium 1998–).

A targeted survey undertaken in 2020 estimated 33,724 individuals occur at Weld Range (*ecologia* 2020c). Over 25,000 individuals have also been recorded at Talling Peak (*ecologia* 2020b), around 250 km south-west of the project area.

Prior locations of recorded *M. placoides* in the vicinity of the proposed W11 project were investigated and in several instances the plants were found to be dead (Photograph 4.5) or no longer present, particularly on the higher and more exposed positions on the BIF ridges. In some locations *Micromyrtus sulphurea* (Photograph 4.6) appears to have been mistakenly recorded as *M. placoides*. The two species are very similar without buds or flowers.

Several new locations of healthy and flowering *M. placoides* were recorded during the survey including patches of young plants (Photograph 4.7) and individuals having emerged in rehabilitated exploration disturbance (Photograph 4.8).

Within the Beebyn-W11 project area, over 1000 individuals were recorded, all outside the proposed disturbance footprint.



Photograph 4.5: Dead vegetation at a previously recorded *M. placoides* location on an exposed section of BIF ridge.



Photograph 4.6: *Micromyrtus sulphurea* may have been mistakenly recorded as *M. placoides* in some locations.



Photograph 4.7: One of the locations recorded during this survey with more than 90 *M. placoides* plants growing beneath an Acacia shrub.



Photograph 4.8: *M. placoides* growing in rehabilitated exploration disturbance.

4.1.5 *Prostanthera petrophila* – Priority 3

Prostanthera petrophila is a spreading shrub growing to 1.5 m high with densely hairy branches and white flowers usually produced in August. This species typically grows on lateritic soils and has a known distribution of approximately 350 km (Western Australian Herbarium 1998–).

In several locations previously recorded *P. petrophila* were dead or no longer present. In some locations individuals appeared to have died off and were recovering (Photograph 4.9) following rainfall in the months before the survey, and in other locations *P. petrophila* individuals were healthy, in good numbers and flowering (Photograph 4.10).

Within the Beebyn-W11 project area, 108 individuals were recorded from 18 locations, with 17 individuals located within the proposed disturbance footprint.



Photograph 4.9: Dead *Prostanthera petrophila* plants around a recovering plant on BIF ridge.



Photograph 4.10: *Prostanthera petrophila* in flower.

4.1.6 *Verticordia jamiesonii* – Priority 3

Verticordia jamiesonii is a shrub growing to 0.6 m high with white/pink flowers between September and October. The preferred habitat for this species is sand or clay on lateritic breakaways and it has a known range of over 350 km (Western Australian Herbarium 1998–).

The previously recorded population was located and appeared to be in good health, although not flowering at the time of this survey.

Within the Beebyn-W11 project area, all 147 individuals were recorded outside the proposed disturbance footprint.

4.1.7 *Acacia speckii* – Priority 4

Acacia speckii is a bushy, rounded shrub or tree growing up to 3 m high, on rocky soils over granite, basalt or dolerite (Western Australian Herbarium 1998–). At Weld Range, this species has been observed to occur across the mid-sloped rocky hills and near drainage lines (ecologia 2012). *Acacia speckii* has a known range of over 150 km, between Meekatharra and Cue, with disjunct populations recorded further south in Yalgoo.

Many of the previously recorded locations of *Acacia speckii* appear to have been misidentification of *Acacia ramulosa* var. *linophylla*, which is very similar in appearance and more common in the area. Within the Beebyn-W11 project area, 25 individuals were recorded within the proposed disturbance footprint and 26 outside.

4.1.8 Other species of interest

Despite searches being undertaken in the areas of previous *Hibiscus ?krichauffianus* records (as recorded by APM), this species was not found during the survey, nor were any species that are similar in appearance.

Santalum spicatum (Sandalwood) is a slow-growing, long-lived small woody tree or shrub, with a known range extending across most of Western Australia (Western Australian Herbarium 1998–). Sandalwood is economically valuable and is commercially harvested for the aromatic oils contained in the heartwood. As the heartwood extends throughout the tree, the whole tree (including roots) is removed and processed. This commercial use is considered a threat to populations and therefore, Sandalwood is listed as a Vulnerable species on the IUCN Red List (International Union for the Conservation of Nature 2024).

27 individuals of Sandalwood were recorded during the survey, two of which occur within the proposed disturbance footprint.

Eremophila sp. Weld Range is a dense, hairy, grey shrub growing to 1.5 m high with flattened, shortly hairy leaves to and mauve to purple flowers. This species is known from a range of approximately 150 km, including at the Weld Range on upper slopes and drainage lines of rocky hills (Brown and Buirchell, 2021). *Eremophila* sp. Weld Range is not of conservation significance, however, has a relatively restricted distribution and is only known from three lodged specimens within WA (FloraBase 1998-).

Two *Eremophila* sp. Weld Range individuals were recorded during the survey (Photograph 4.11), in a single location in a drainage depression in *Acacia pruinocarpa* and mulga forest (vegetation type 12), outside of the proposed disturbance footprint.



Photograph 4.11: *Eremophila* sp. Weld Range.

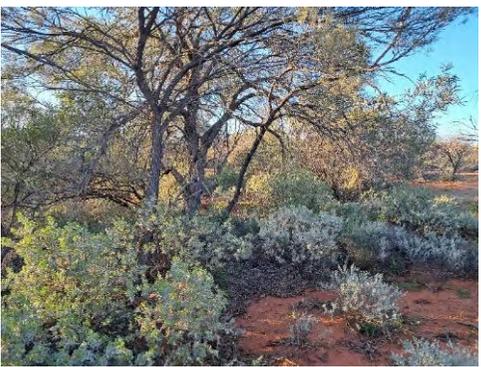
4.2 Vegetation

A total of 72 survey points were used for vegetation mapping and their locations are shown in Figure 4.4. Vegetation site descriptions are included in Appendix 3.

The survey refined the six vegetation types recorded by APM (2024) into 16 vegetation types, described in Table 4.2 and shown in Figure 4.5 to Figure 4.18. Vegetation condition of the survey area was considered 'Good' with historically disturbed areas (generally the western end and central survey areas) considered 'Poor' or 'Completely Degraded'.

Table 4.2: Vegetation types recorded during the survey.

Vegetation Code	Description	Area of Development Envelope (ha)	Area of Disturbance Footprint (ha)	Photo
1	<p><i>Acacia pruinocarpa</i> open woodland or isolated trees over <i>Acacia aptaneura</i>, <i>A. caesaneura</i>, <i>A. craspedocarpa</i> tall sparse shrubland over <i>Eremophila fraseri</i> subsp. <i>fraseri</i>, <i>Acacia tetragonophylla</i>, <i>Rhagodia eremaea</i>, <i>Teucrium teucriiflorum</i> sparse shrubland over <i>Ptilotus obovatus</i>, <i>Menkea villosula</i>, <i>Goodenia tenuiloba</i> low sparse to open shrubland; understory denser under pockets of trees.</p> <p>Landform: Stony plains and lower slopes</p> <p>CSF: <i>Euphorbia sarcostemmoides</i> P1</p> <p>Not representative of PEC.</p>	71.4	48.4	
2	<p><i>Acacia pruinocarpa</i> mostly absent; <i>Harnieria kempeana</i> subsp. <i>muelleri</i>, <i>Acacia</i> sp. Weld Range occasional <i>Acacia incurvaneura</i>, <i>A. pteraneura</i>, <i>Acacia aptaneura</i>, <i>Grevillea berryana</i> tall open shrubland over <i>A. ramulosa</i> var. <i>linophylla</i>, <i>Ptilotus rotundifolius</i>, <i>Eremophila fraseri</i> subsp. <i>fraseri</i>, <i>E. glutinosa</i>, <i>E. forrestii</i> subsp. <i>forrestii</i> sparse shrubland over <i>Eragrostis eriopoda</i>, <i>Ptilotus aervoides</i>, <i>Erodium cygnorum</i>, low sparse tussock grassland.</p> <p>Landform: lower to upper midslopes on south facing colluvial outwash slopes; stony and gravel mantles</p> <p>Representative of PEC – aligns with Community 3 identified by Markey & Dillion (2008)</p>	37.1	30.0	
3	<p><i>Acacia ramulosa</i> var. <i>linophylla</i>, <i>A. rhodophloia</i> isolated tall shrubs over <i>Eremophila forrestii</i> subsp. <i>forrestii</i>, <i>E. latrobei</i> subsp. <i>latrobei</i>, <i>Acacia ramulosa</i> var. <i>linophylla</i>, <i>Harnieria kempeana</i> subsp. <i>muelleri</i>, <i>Sida</i> sp. Golden calyces glabrous open shrubland over <i>Erodium cygnorum</i>, <i>Goodenia tenuiloba</i></p> <p>Landform: Hills; mostly mid to upper slopes; south aspect</p> <p>Representative of PEC – aligns with Community 5 identified by Markey & Dillion (2008)</p>	62.2	45.4	

Vegetation Code	Description	Area of Development Envelope (ha)	Area of Disturbance Footprint (ha)	Photo
4	<p><i>Acacia pruinocarpa</i>, <i>A. incurvaneura</i> isolated trees over <i>Eremophila latrobei</i> subsp. <i>latrobei</i>, <i>Dodonaea pachyneura</i>, <i>Philotheca brucei</i> subsp. <i>brucei</i>, <i>Prostanthera petrophila</i>, <i>Tribulus suberosus</i> open shrubland over <i>Ptilotus obovatus</i>, <i>Micromyrtus sulphurea</i>, <i>Eremophila latrobei</i> subsp. <i>latrobei</i>, <i>Dysphania rhadinostachya</i> subsp. <i>rhadinostachya</i>, <i>Stylidium longibracteatum</i>, <i>Goodenia tenuiloba</i>, <i>Hysterobaeckea occlusa</i> low open shrubland/ low open forbland.</p> <p>Representative of PEC – aligns with Communities 1b and 2 identified by Markey & Dillion (2008)</p>	8.4	5.7	
5	<p><i>Acacia incurvaneura</i> low open woodland/ tall sparse shrubland over <i>Acacia</i> sp. Weld Range, <i>Eremophila macmillaniana</i> tall sparse shrubland over <i>Eremophila macmillaniana</i>, <i>Senna glaucifolia</i>, <i>Ptilotus rotundifolius</i> open shrubland over <i>Eremophila forrestii</i> subsp. <i>forrestii</i>, <i>E. macmillaniana</i>, <i>Hibiscus sturtii</i> low sparse shrubland over <i>Maireana melanocoma</i>, <i>Ptilotus aervoides</i>, <i>Goodenia tenuiloba</i> low sparse chenopod shrubland.</p> <p>Landform: Hill; BIF ridge and upper slopes, moderate to steep slopes; > 80 % rock, boulders, rock outcrops</p> <p>CSF: <i>Acacia speckii</i> P4</p> <p>Representative of PEC – aligns with Community 5 identified by Markey & Dillion (2008)</p>	46.3	29.5	
6	<p><i>Acacia incurvaneura</i>, <i>A. pruinocarpa</i>, <i>A. fuscaneura</i> low woodland over <i>Acacia ramulosa</i> var. <i>linophylla</i>, <i>Psydrax latifolia</i> tall open shrubland over <i>Eremophila forrestii</i> subsp. <i>forrestii</i>, <i>E. georgei</i>, <i>Rhagodia eremaea</i>, <i>Senna artemisioides</i> subsp. <i>xsturtii</i>, <i>S. glutinosa</i> subsp. <i>xluerssenii</i> shrubland over <i>Erodium cygnorum</i>, <i>Tetragonia cristata</i>, <i>Isoetopsis graminifolia</i>, <i>Menkea villosula</i>, <i>Cheilanthes sieberi</i> subsp. <i>sieberi</i> low forbland.</p> <p>Landform: Drainage lines and depressions; lower to midslopes; water gaining areas</p> <p>Not representative of PEC.</p>	60.1	24.3	

Vegetation Code	Description	Area of Development Envelope (ha)	Area of Disturbance Footprint (ha)	Photo
7	<p><i>Acacia incurvaneura</i>, <i>A. sp.</i> Weld Range, <i>A. speckii</i> tall sparse shrubland over <i>Ptilotus rotundifolius</i>, <i>Eremophila fraseri</i>, <i>E. latrobei</i>, <i>Senna artemisioides</i> subsp. <i>helmsii</i> sparse shrubland over <i>Sida ectogama</i>, <i>Ptilotus aervoides</i>, <i>P. schwartzii</i>, <i>Erodium cygnorum</i> low sparse shrubland.</p> <p>Landform: Hill; Midslopes; dolerite; very rocky, minor outcrops</p> <p>CSF: <i>Acacia speckii</i> P4</p> <p>Representative of PEC – aligns with Community 6 identified by Markey & Dillion (2008)</p>	37.5	3.7	
8	<p><i>Acacia incurvaneura</i>, <i>A. pruinocarpa</i> tall open shrubland over <i>Acacia ramulosa</i>, <i>Eremophila latrobei</i>, <i>Scaevola spinescens</i>, <i>Senna glaucifolia</i>, sparse shrubland over <i>Eremophila latrobei</i>, <i>Stenanthemum mediale</i>, <i>Sida ectogama</i>, <i>Micromyrtus sulphurea</i> low sparse shrubland.</p> <p>Landform: Low hill; minor outcrops</p> <p>CSF: <i>Stenanthemum mediale</i> P1</p> <p>Representative of PEC – aligns with Community 2 identified by Markey & Dillion (2008)</p>	16.7	1.8	
9	<p>a) Patches of <i>Acacia pruinocarpa</i> low woodland over <i>Acacia incurvaneura</i>, <i>A. ramulosa</i> var. <i>linophylla</i> tall open shrubland over <i>Eremophila simulans</i> subsp. <i>simulans</i>, <i>E. georgei</i>, <i>E. forrestii</i> subsp. <i>forrestii</i> open shrubland over <i>Eragrostis eriopoda</i>, <i>Paspalidium basicladum</i>, <i>Ptilotus obovatus</i> low sparse tussock grassland.</p> <p>b) Tall open shrubland of <i>Acacia incurvaneura</i> and <i>A. ramulosa</i> var. <i>linophylla</i> over sparse shrubland over low sparse tussock grassland</p> <p>c) Mulga low woodlands further away from disturbance areas</p> <p>Landform: Hardpan plain lower catchment</p> <p>Not representative of PEC.</p>	231.0	66.3	

Vegetation Code	Description	Area of Development Envelope (ha)	Area of Disturbance Footprint (ha)	Photo
10	<p><i>Acacia incurvaneura</i>, <i>A. caesaneura</i>, <i>A. pruinocarpa</i>, <i>A. ramulosa</i> var. <i>linophylla</i>, <i>Grevillea berryana</i>, low open woodland/ tall open shrubland over <i>Eremophila forrestii</i> subsp. <i>forrestii</i>, <i>Senna artemisioides</i> subsp. <i>filifolia</i>, <i>Acacia</i> spp. open shrubland over <i>Eremophila jucunda</i> subsp. <i>jucunda</i>, <i>E. forrestii</i> subsp. <i>forrestii</i>, <i>E. simulans</i> subsp. <i>simulans</i>, <i>Sida ectogama</i>, <i>S. sp.</i> Golden calyces glabrous, <i>Ptilotus schwartzii</i>, <i>Eragrostis eriopoda</i> low sparse shrubland.</p> <p>Landform: Low gravel hills Not representative of PEC.</p>	129.5	9.1	
11	<p>a) <i>Acacia pruinocarpa</i>, <i>A. incurvaneura</i> open forest over <i>Glycine canescens</i>, <i>Santalum spicatum</i>, <i>Psyrax latifolia</i> vineland over <i>Acacia ramulosa</i> var. <i>linophylla</i>, <i>Glycine canescens</i>, <i>Psyrax latifolia</i>, <i>Eremophila forrestii</i> subsp. <i>hastieana</i>, <i>E. georgei</i> open shrubland over <i>Sida ectogama</i>, <i>Ptilotus obovatus</i>, <i>Glycine canescens</i>, <i>Rhagodia eremaea</i> low shrubland</p> <p>b) <i>Acacia pruinocarpa</i>, <i>A. incurvaneura</i> open forest over <i>Psyrax suaevoleus</i> low open woodland over <i>Eremophila forrestii</i> subsp. <i>hastieana</i>, <i>E. georgei</i>, <i>Sida ectogama</i>, <i>Glycine canescens</i> shrubland over <i>Ptilotus obovatus</i>, <i>Eremophila georgei</i>, <i>Acacia incurvaneura</i> low open shrubland.</p> <p>Landform: Alluvial plain; broad unincised drainage line. Not representative of PEC.</p>	11.3	1.6	
12	<p><i>Acacia incurvaneura</i>, <i>A. caesaneura</i>, <i>A. pruinocarpa</i> low woodland/ <i>A. tetragonophylla</i>, <i>A. craspedocarpa</i>, <i>Psyrax latifolia</i> tall open shrubland/ <i>Eremophila forrestii</i> var. <i>forrestii</i> or var. <i>hastieana</i>, <i>A. ramulosa</i>, <i>Eremophila georgei</i> shrubland/ <i>Sida ectogama</i>, <i>Cheilanthes sieberi</i> low shrubland.</p> <p>Landform: Drainage lines lower catchment, plains; often associated with VC11 Not representative of PEC.</p>	89.2	6.6	

Vegetation Code	Description	Area of Development Envelope (ha)	Area of Disturbance Footprint (ha)	Photo
13	<p>Groves: <i>Acacia pruinocarpa</i> low isolated trees over <i>Acacia incurvaneura</i>, <i>A. tetragonophylla</i> tall sparse shrubland over <i>Acacia ramulosa</i> var. <i>linophylla</i>, <i>A. incurvaneura</i>, <i>Eremophila forrestii</i> subsp. <i>forrestii</i>, <i>E. latrobei</i> subsp. <i>latrobei</i>, <i>E. georgei</i> open shrubland over <i>Eremophila georgei</i>, <i>E. foliosissima</i>, <i>Ptilotus schwartzii</i>, <i>Stenopetalum filifolium</i>, <i>Menkea villosula</i>, <i>Isoetopsis graminifolia</i> low open forbland</p> <p>Stony plain: <i>Acacia aptaneura</i> tall sparse shrubland over <i>Acacia tetragonophylla</i>, <i>A. ramulosa</i> var. <i>linophylla</i> <i>Eremophila fraseri</i> subsp. <i>fraseri</i> sparse shrubland over <i>Eremophila jucunda</i> subsp. <i>jucunda</i> or <i>E. compacta</i> or <i>E. punicea</i>, <i>Ptilotus schwartzii</i>, <i>Solanum lasiophyllum</i>, <i>Eragrostis eriopoda</i>, <i>Monachather paradoxus</i> low isolated to sparse shrubs and grass tussocks.</p> <p>Landform: Ironstone gravel plain</p> <p>Not representative of PEC.</p>	410.3	33.7	
14	<p><i>Acacia aptaneura</i>, <i>A. grasbyi</i> low open woodland over <i>Eremophila pantonii</i>, <i>Acacia aptaneura</i>, <i>Senna glaucifolia</i> sparse shrubland over <i>Maireana thesioides</i>, <i>M. triptera</i>, <i>Senna glaucifolia</i> low open chenopod shrubland.</p> <p>Not representative of PEC.</p>	9.4	0.7	

Vegetation Code	Description	Area of Development Envelope (ha)	Area of Disturbance Footprint (ha)	Photo
15	<p><i>Acacia aneura</i>, <i>A. sp. Weld Range</i> tall isolated shrubs over <i>Eremophila macmillaniana</i>, <i>Acacia sp. Weld Range</i>, <i>Acacia speckii</i> sparse shrubland over <i>Cephalopterum drummondii</i>, <i>Sida ectogama</i>, <i>Aristida contorta</i> low sparse forbland.</p> <p>CSF: <i>Acacia speckii</i> P4</p> <p>Representative of PEC – aligns with Community 6 identified by Markey & Dillion (2008)</p>	43.5	3.5	
16	<p><i>Acacia pteraneura</i>, <i>A. fuscaneura</i> tall open shrubland over <i>Acacia fuscaneura</i>, <i>Grevillea deflexa</i>, <i>Eremophila fraseri</i> subsp. <i>fraseri</i> sparse shrubland over <i>Calytrix desolata</i>, <i>Grevillea deflexa</i> low sparse shrubland over <i>Calytrix desolata</i>, <i>Grevillea deflexa</i> low sparse shrubland over <i>Cymbopogon ambiguus</i> low sparse tussock grassland.</p> <p>Not representative of PEC.</p>	24.2	2.2	
CL	Cleared areas	20.9	8.8	-
Total		1,309.2	321.4	-

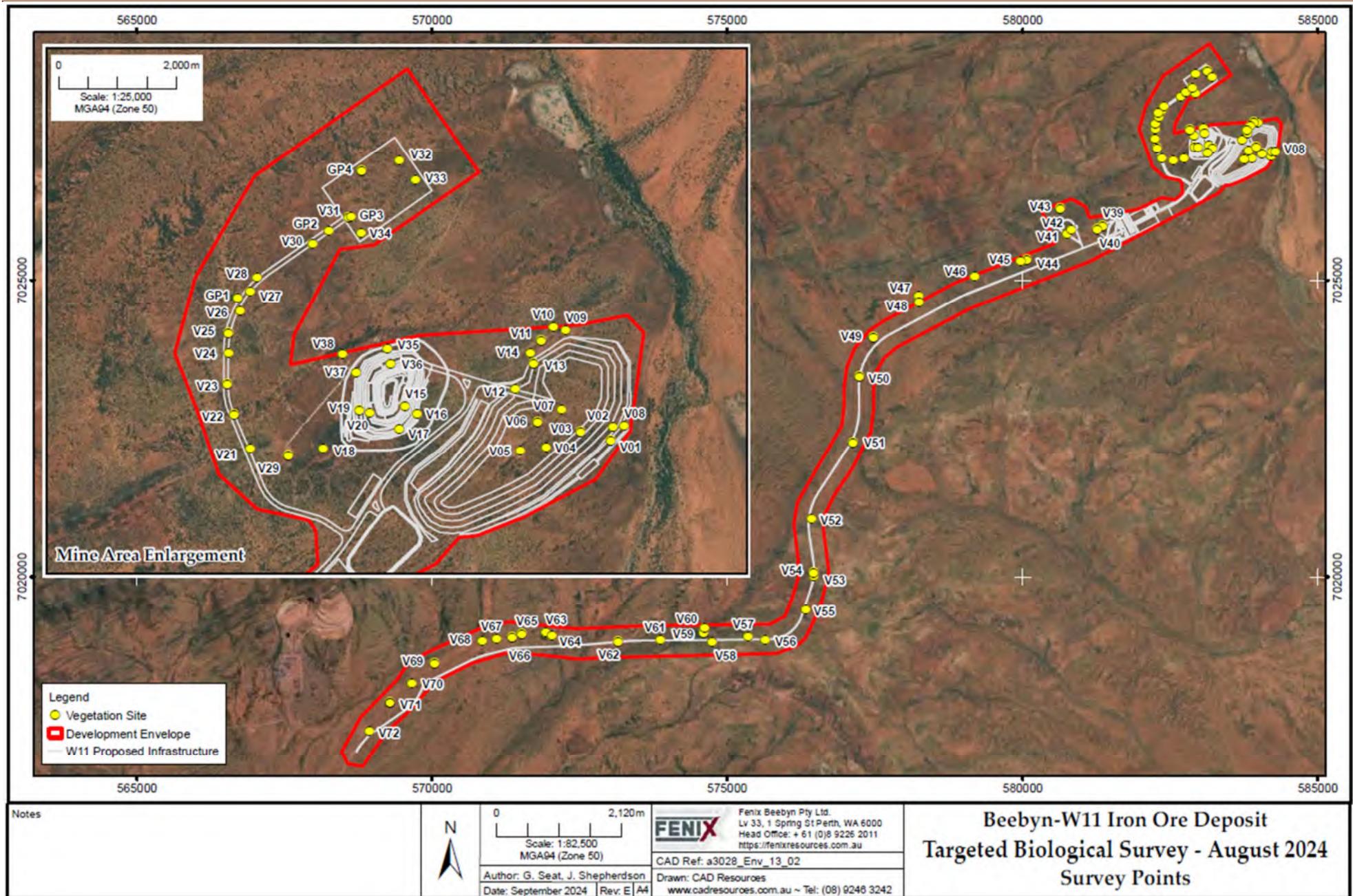


Figure 4.4: Vegetation mapping survey points.

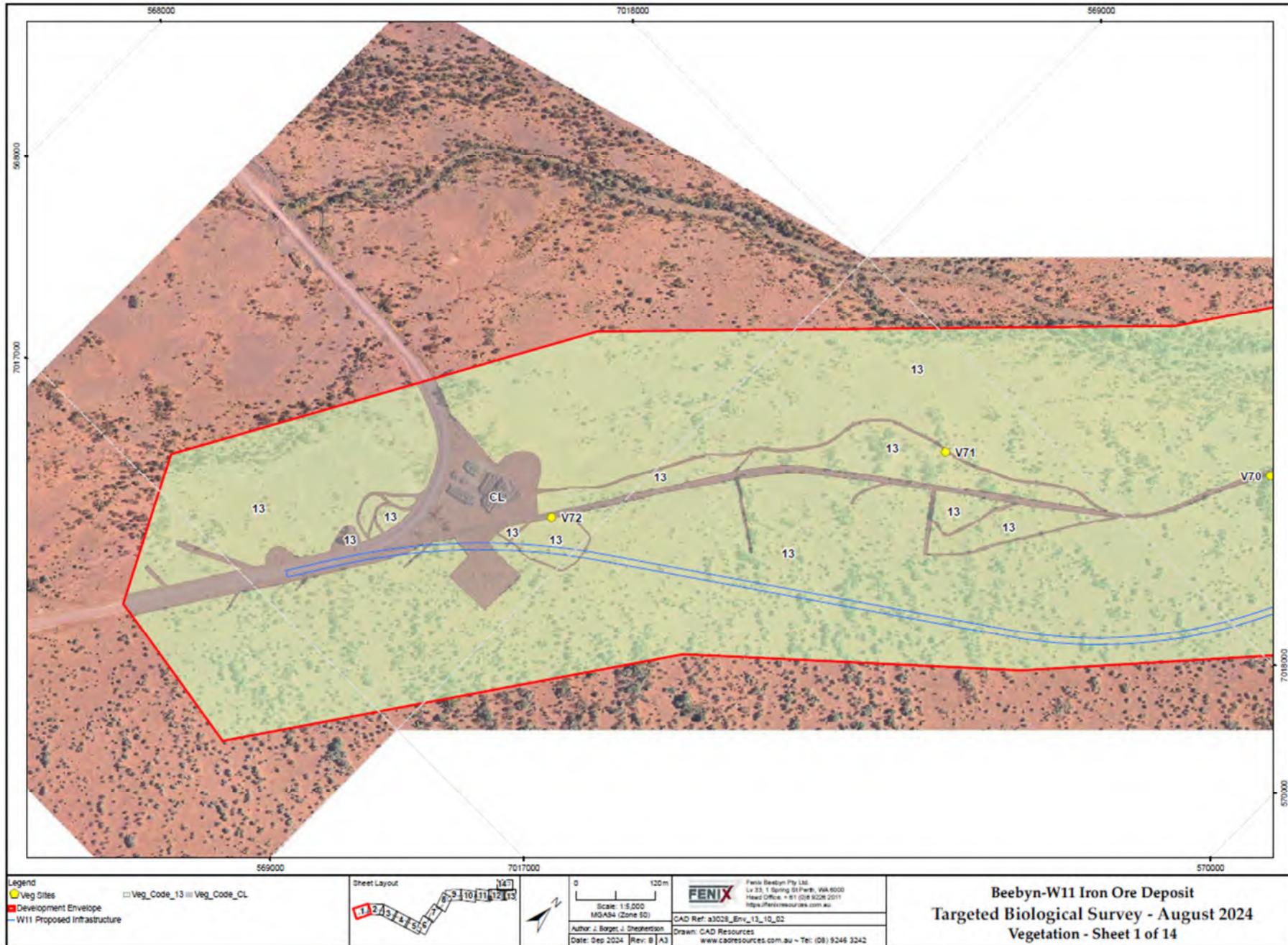


Figure 4.5: Vegetation types mapped within the survey area – map 1 of 14.

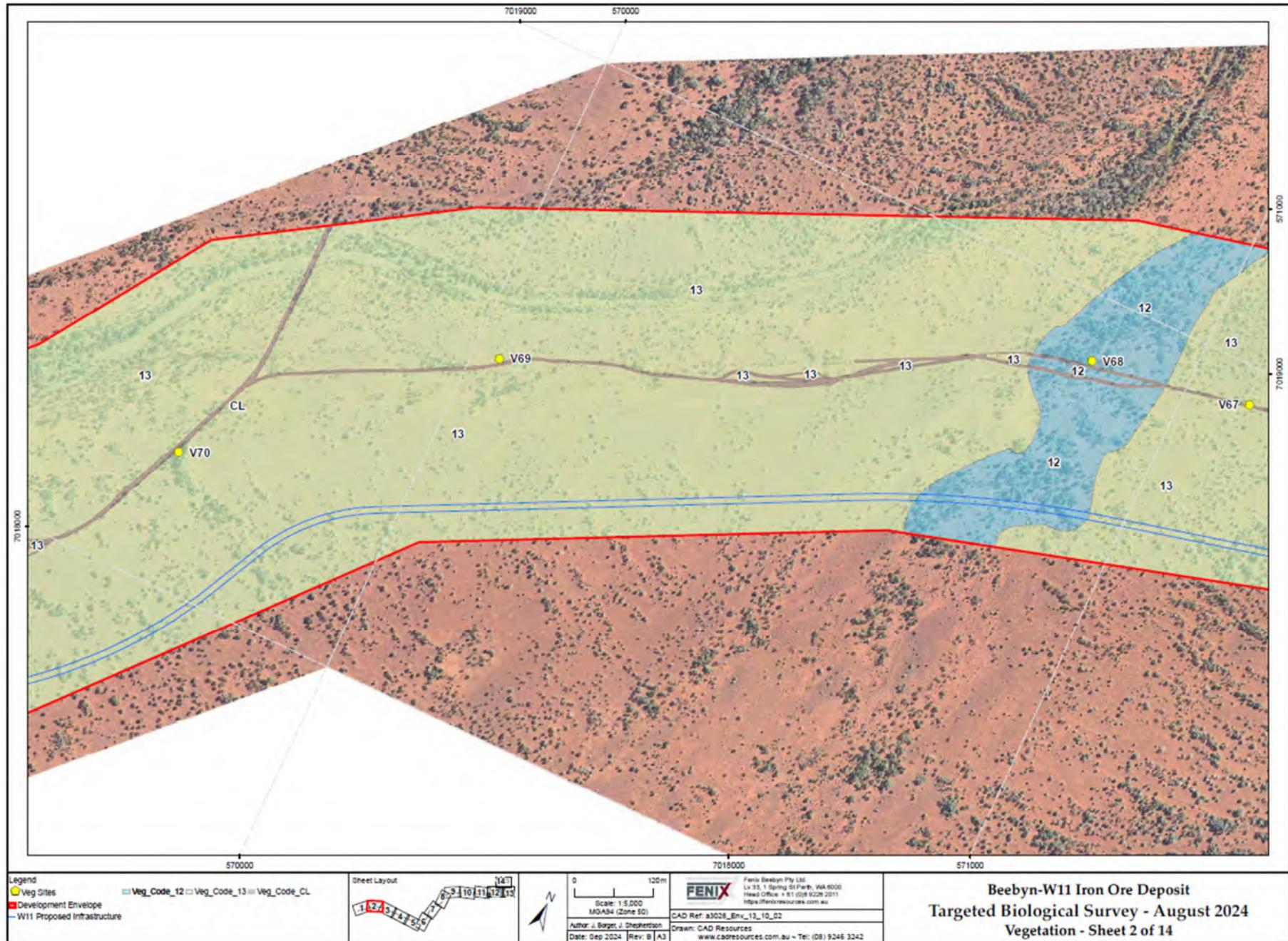


Figure 4.6: Vegetation types mapped within the survey area – map 2 of 14.

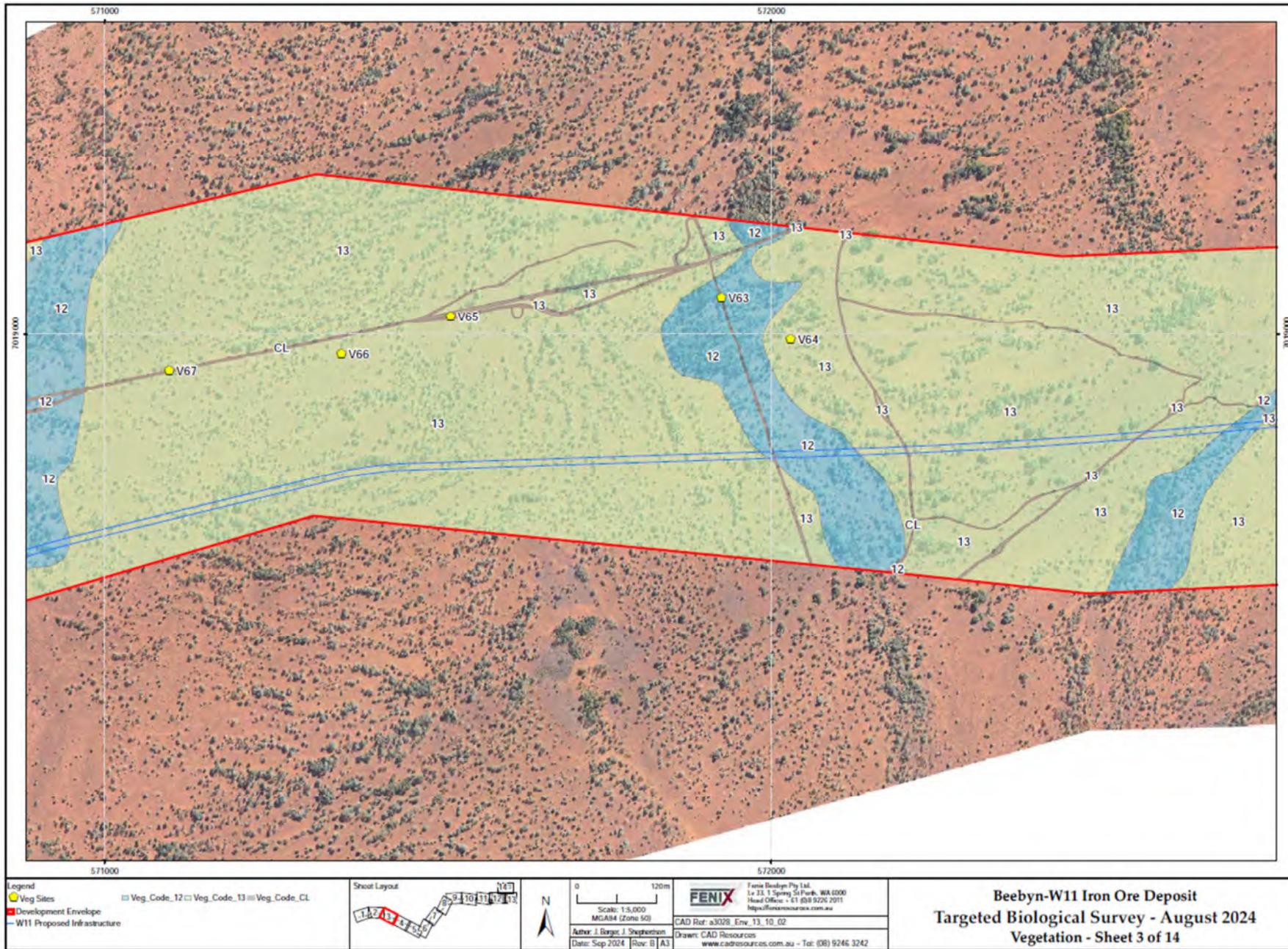


Figure 4.7: Vegetation types mapped within the survey area – map 3 of 14.

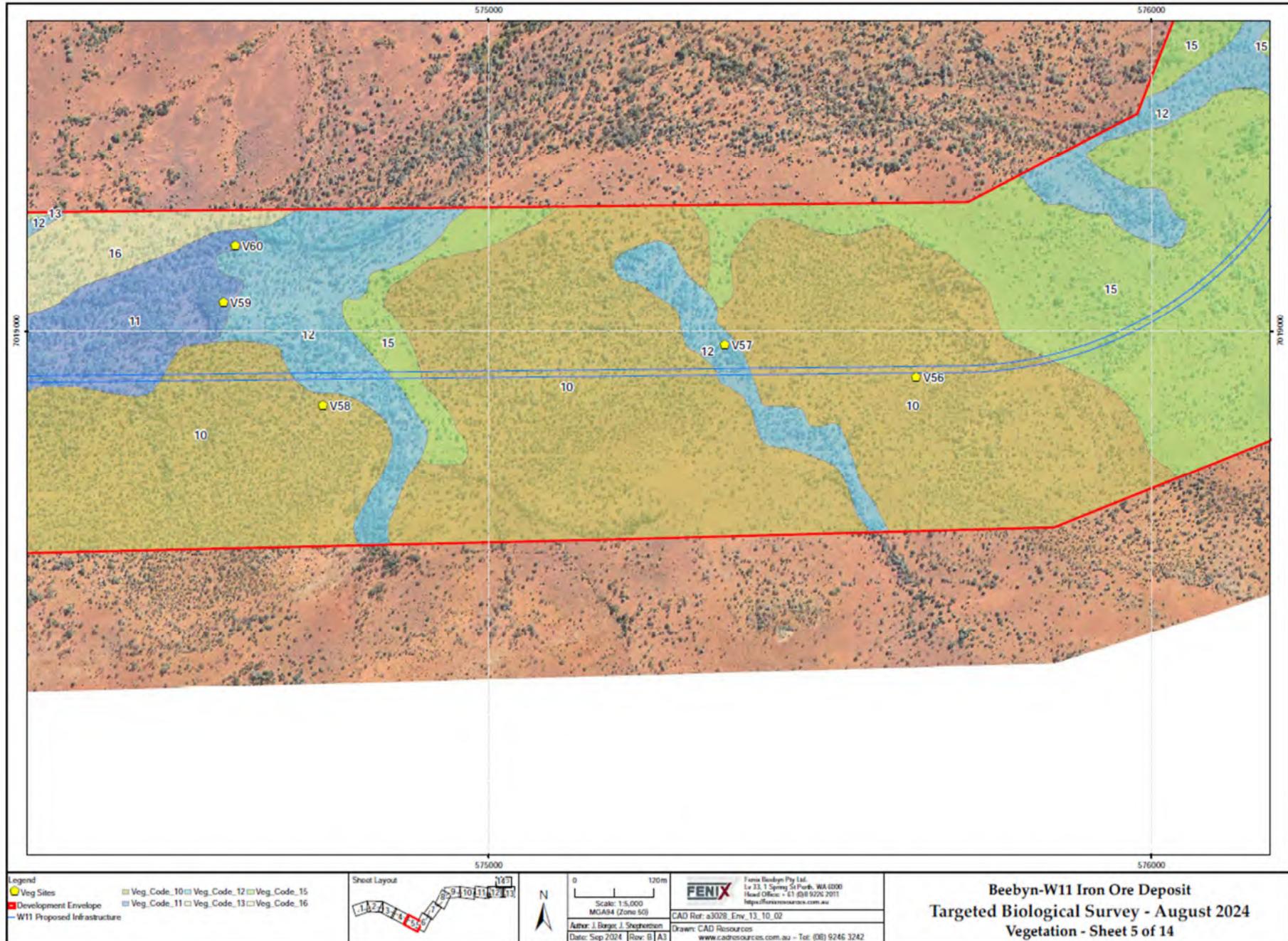


Figure 4.9: Vegetation types mapped within the survey area – map 5 of 14.

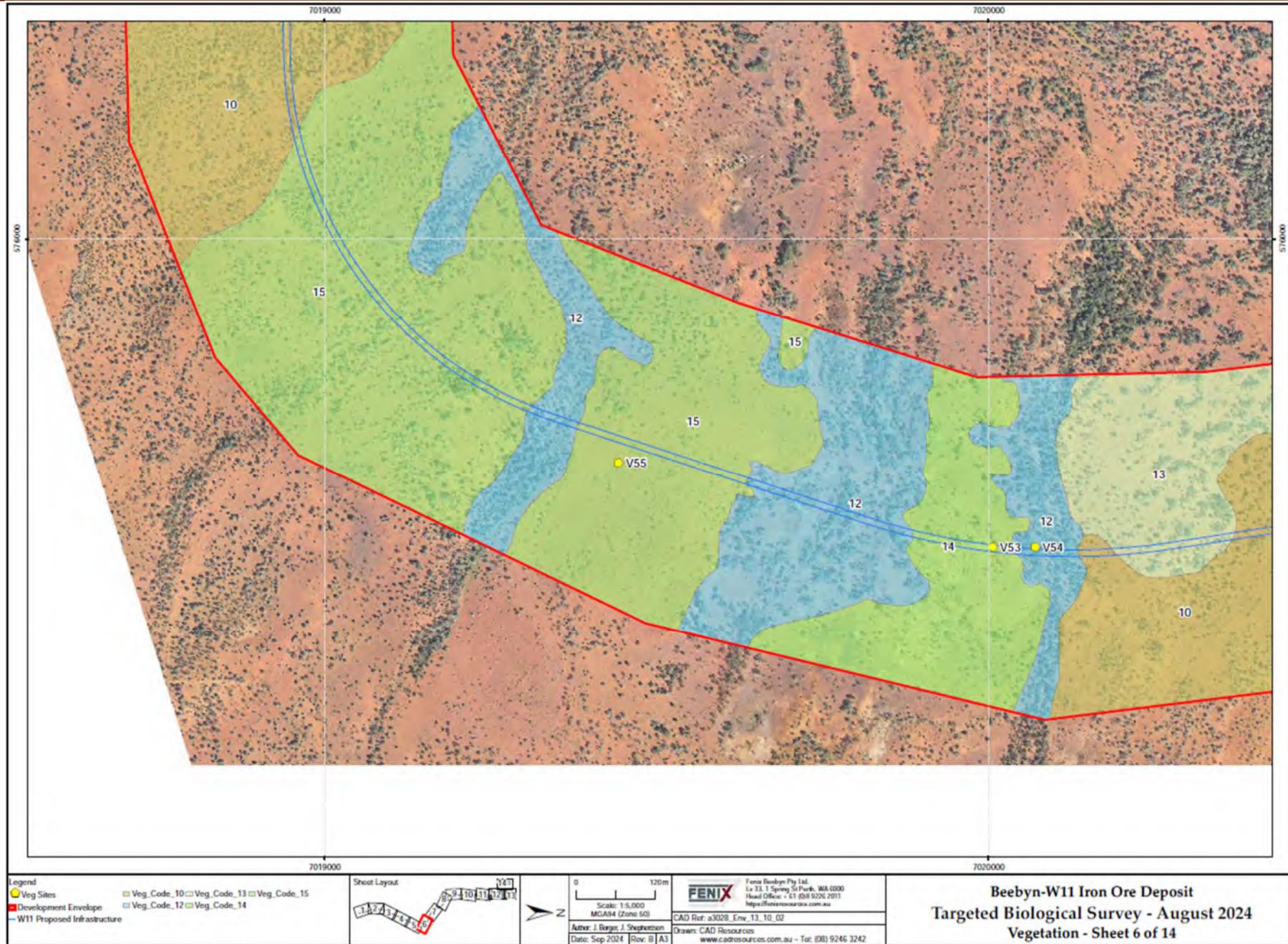


Figure 4.10: Vegetation types mapped within the survey area – map 6 of 14.

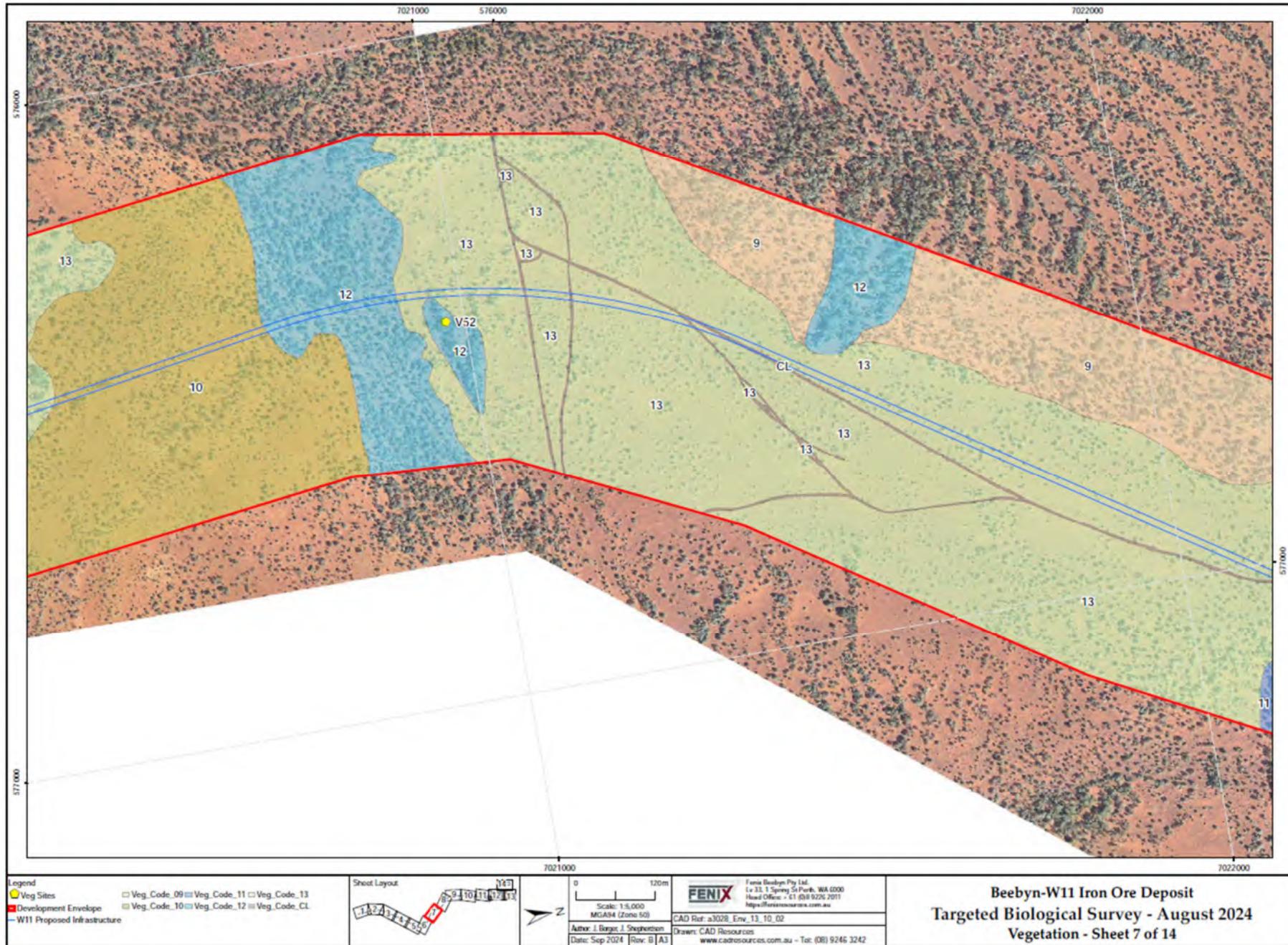


Figure 4.11: Vegetation types mapped within the survey area – map 7 of 14.

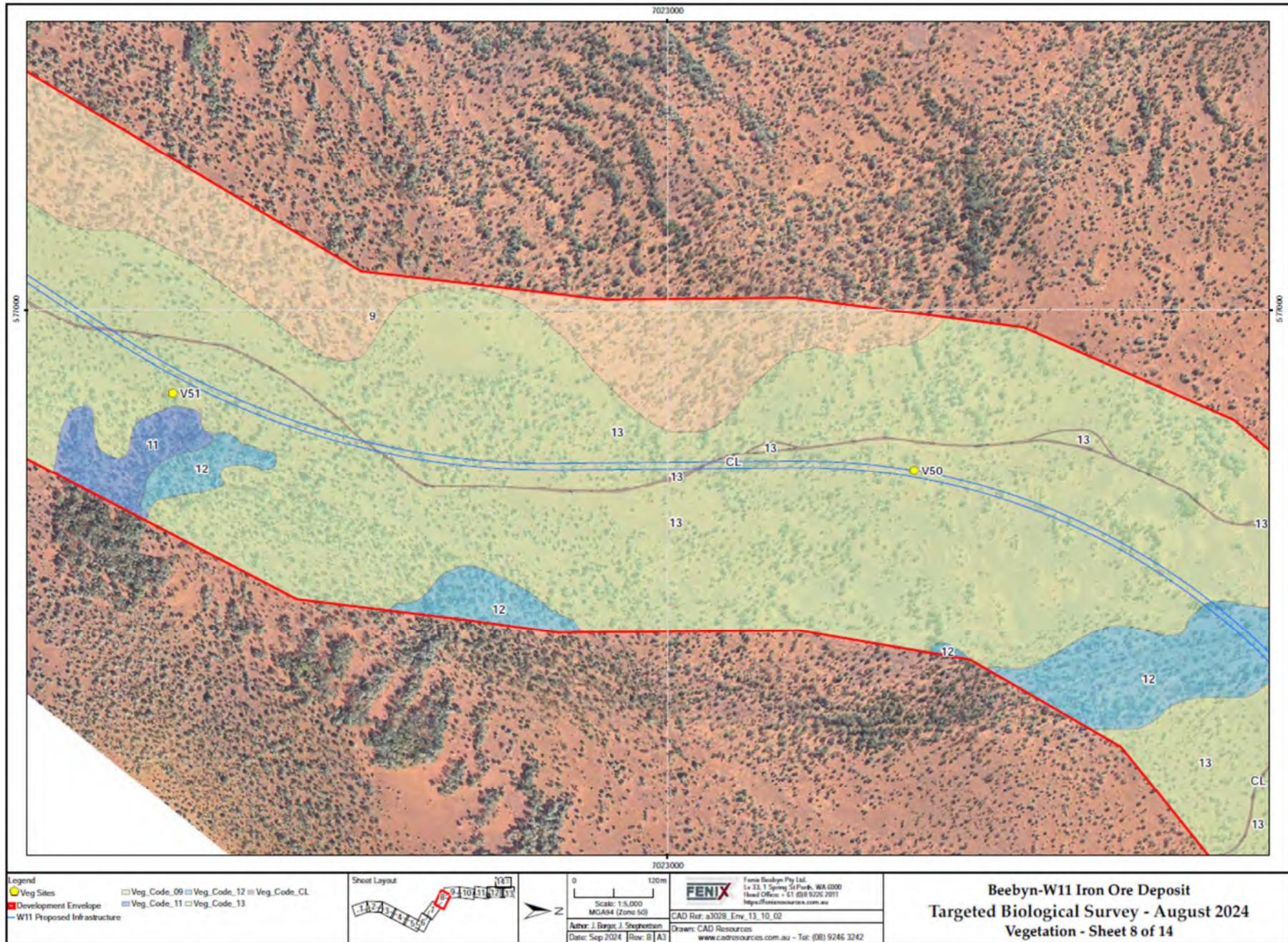


Figure 4.12: Vegetation types mapped within the survey area – map 8 of 14.

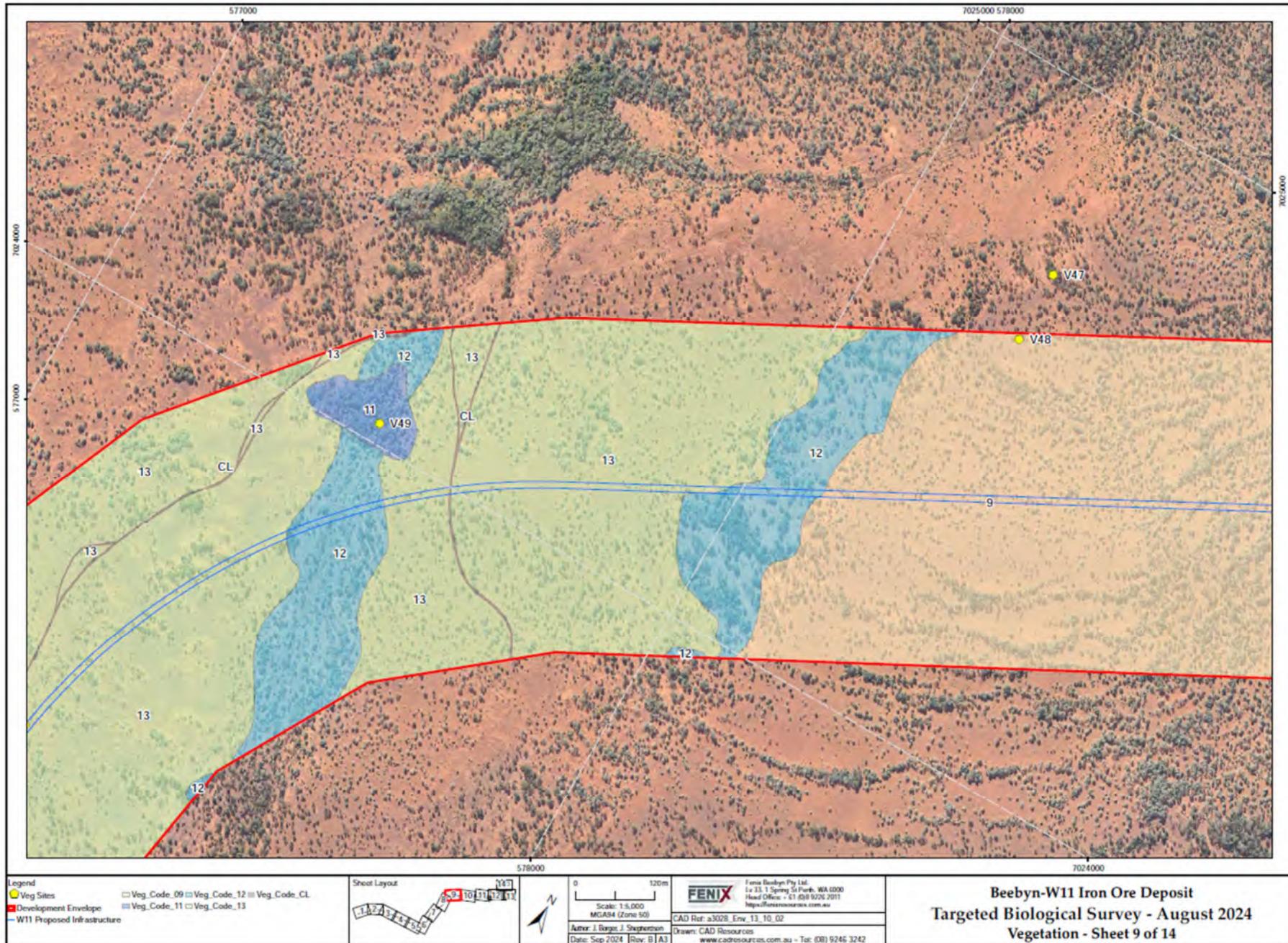


Figure 4.13: Vegetation types mapped within the survey area – map 9 of 14.

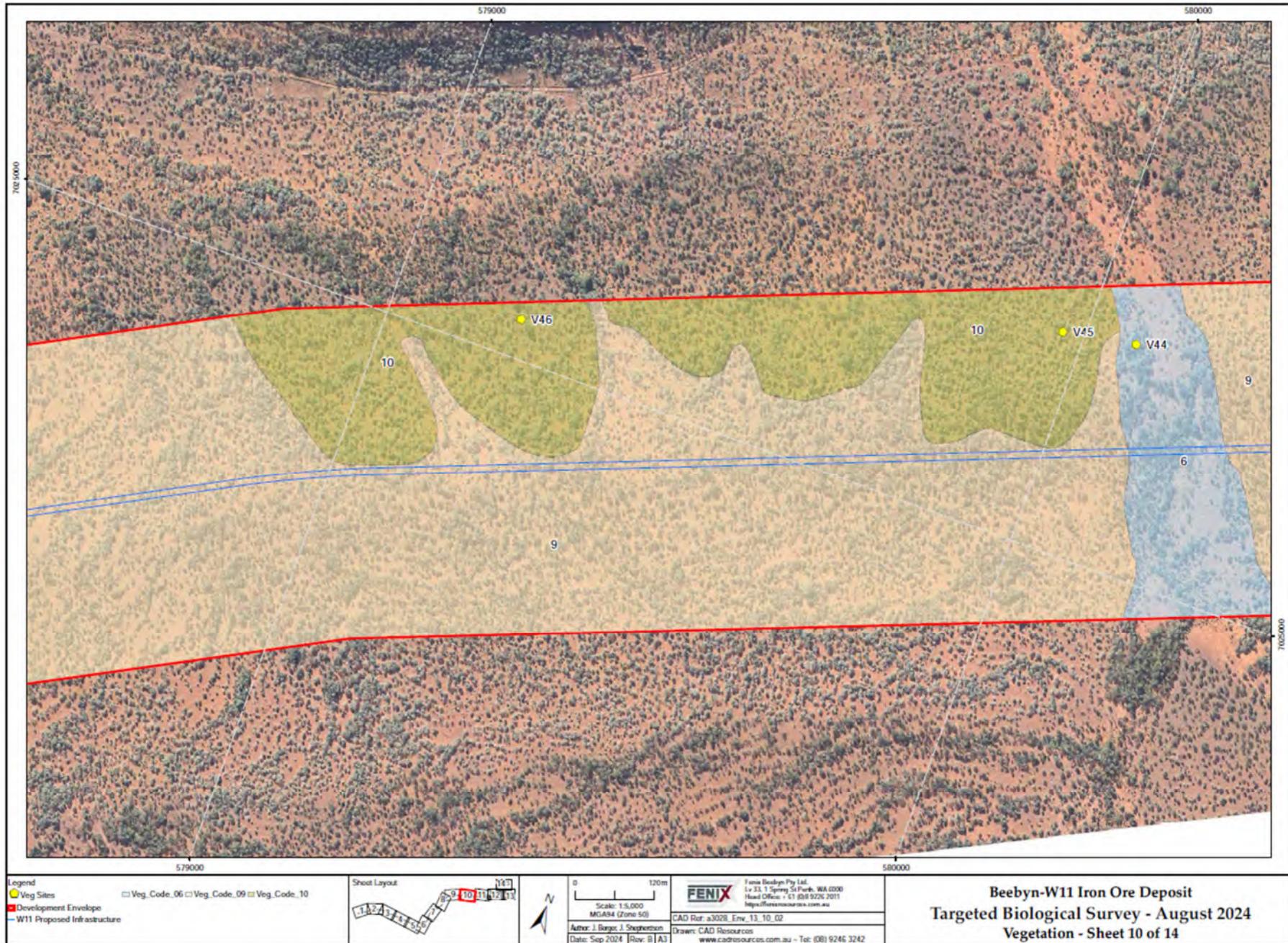


Figure 4.14: Vegetation types mapped within the survey area – map 10 of 14.

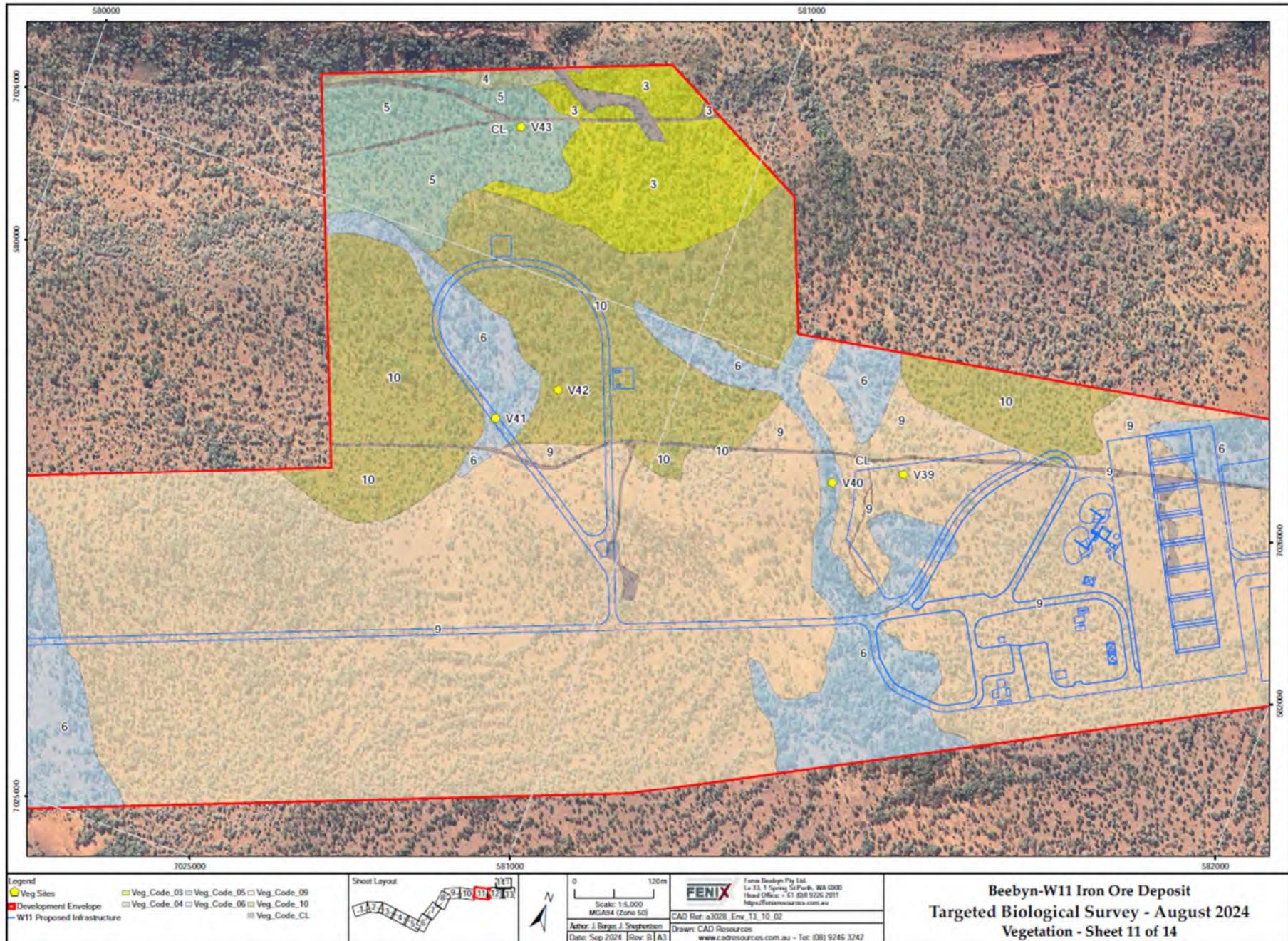


Figure 4.15: Vegetation types mapped within the survey area – map 11 of 14.

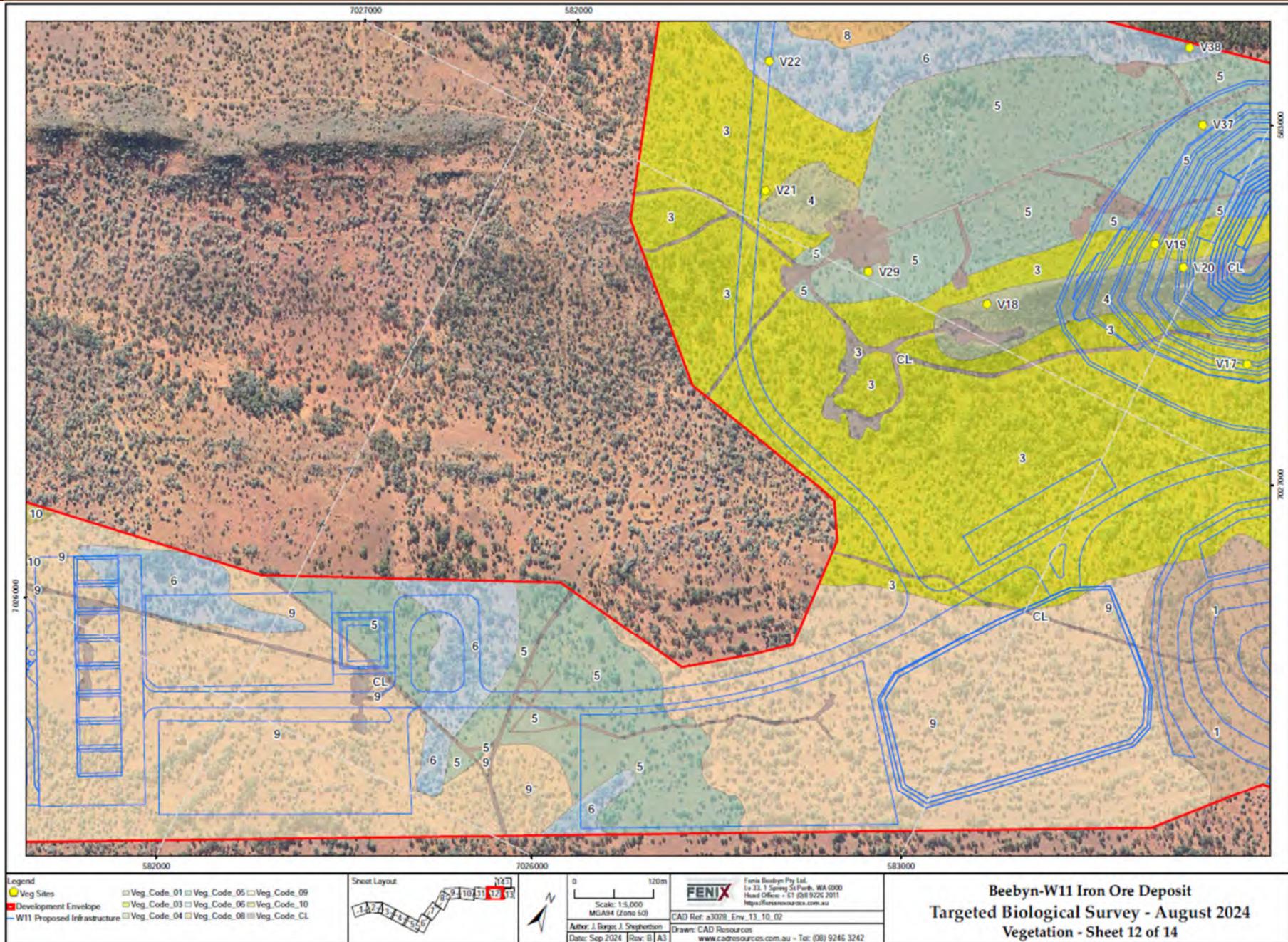


Figure 4.16: Vegetation types mapped within the survey area – map 12 of 14.

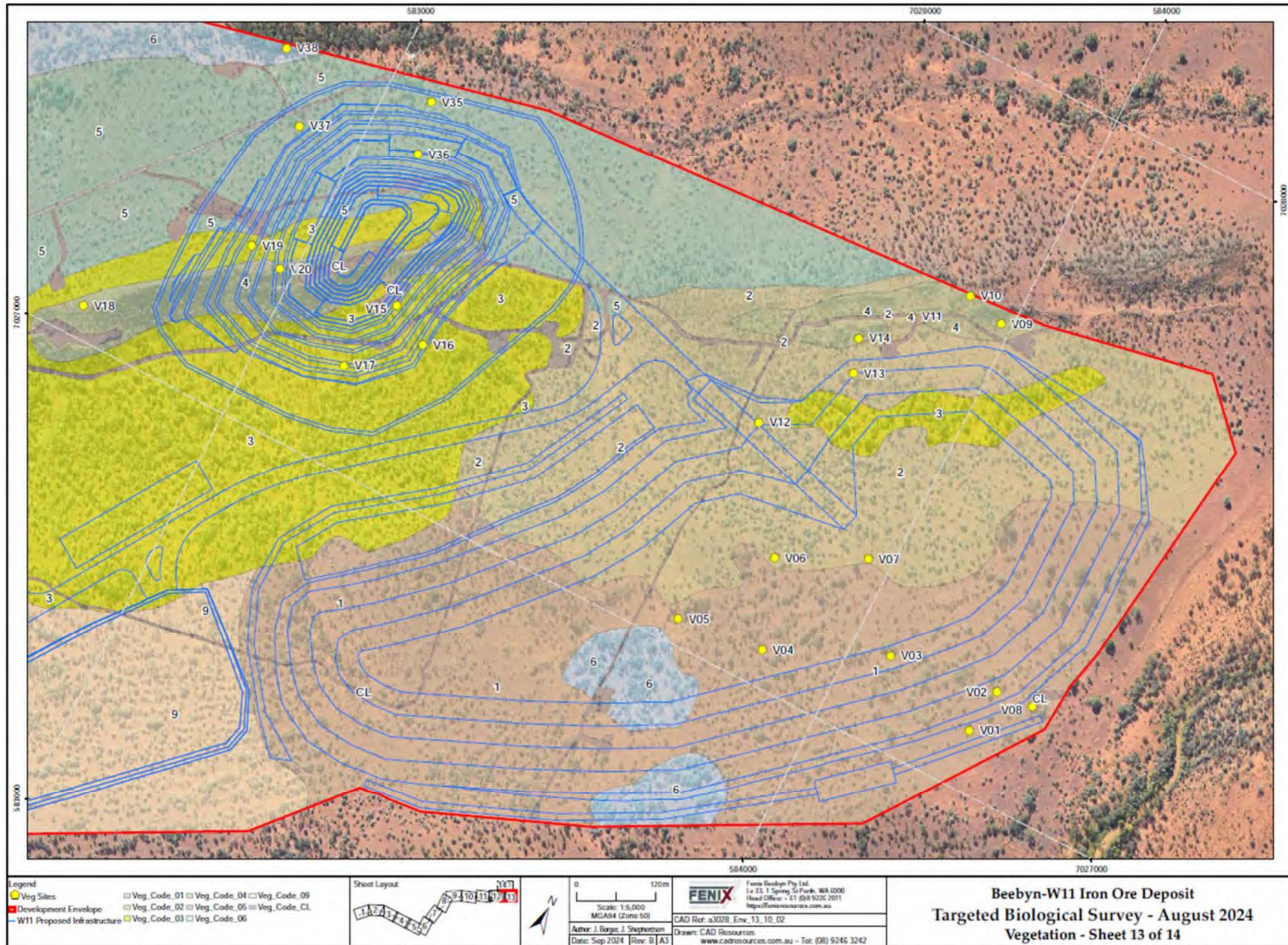


Figure 4.17: Vegetation types mapped within the survey area – map 13 of 14.

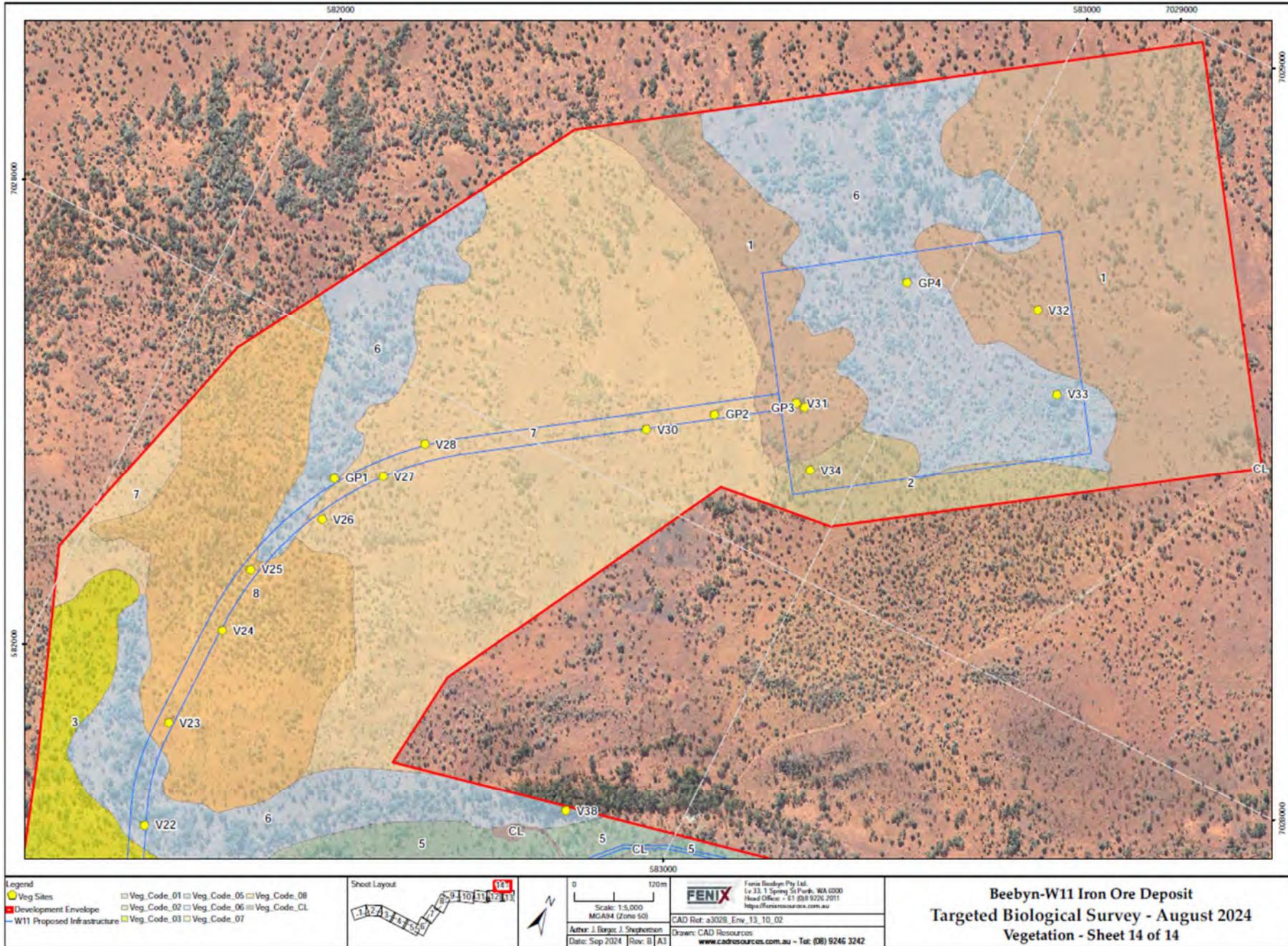


Figure 4.18: Vegetation types mapped within the survey area – map 14 of 14.

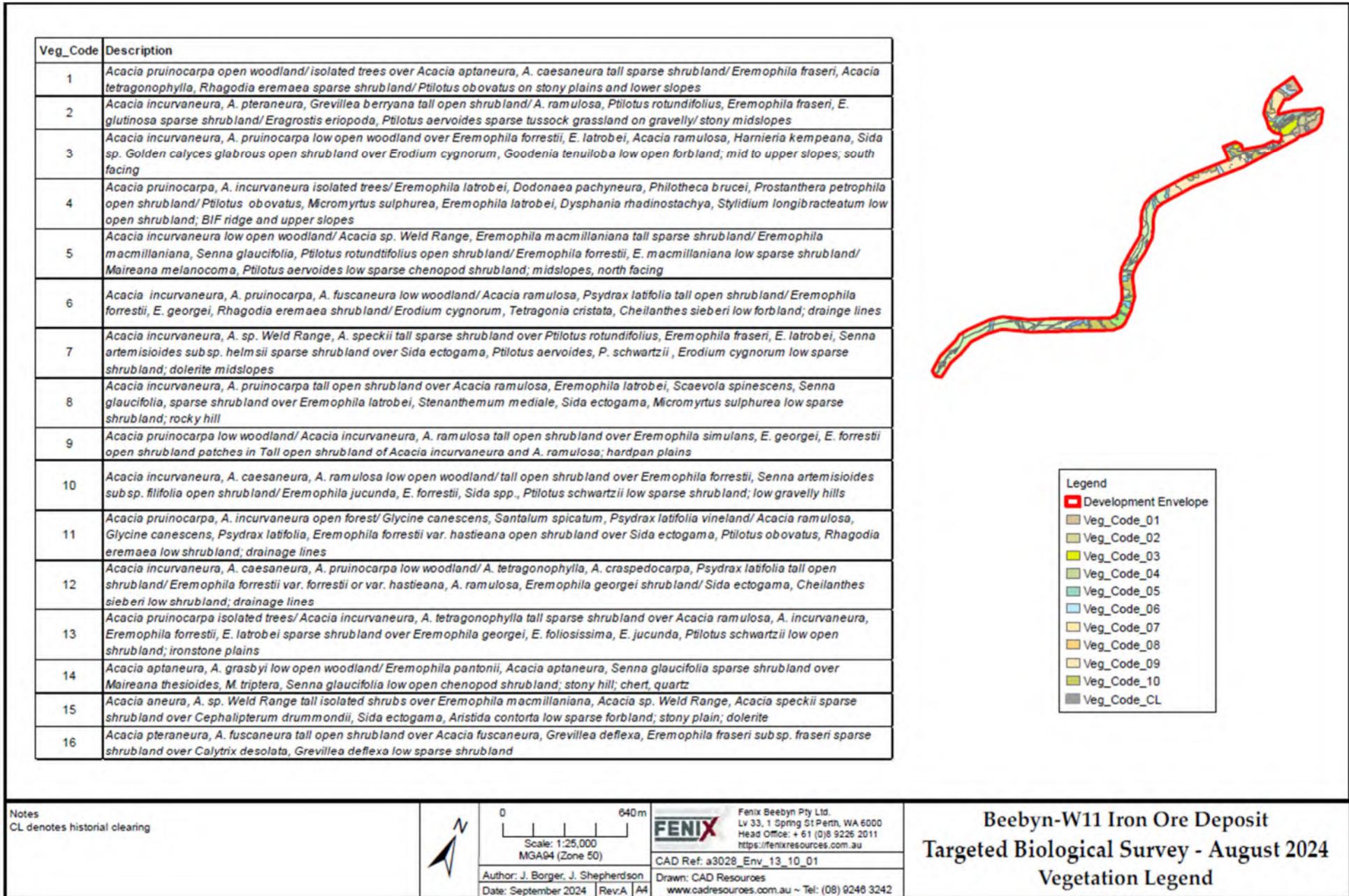


Figure 4.19: Vegetation types mapped within the survey area – vegetation descriptions.

4.3 Fauna and habitat

Fauna habitat mapping aligned with that recorded by APM (2024). The approximately 122 ha of the proposed disturbance footprint not surveyed by APM was assessed in this survey and determined to align with the Mulga Woodland on Hill Slope and Acacia Sand Plain habitat as described by APM (2024) and detailed in Section 2.4.1.

4.3.1 Shield-backed trapdoor spider

A number of previous records of, then *Idiosoma nigrum*, now *I. clypeatum* exist within the footprint and are associated mainly with south-facing slopes. These areas were investigated and no sign of trapdoor burrows could be located at the time of the survey.

Recent experience has found that shield-back trapdoor spider burrows in this region are associated with drainage lines and denser stands of Acacia where the soil has a higher moisture content. The amount and type of leaf litter present appears to be an important factor. Typically, burrows are located beneath Acacia trees and shrubs in areas where there is evidence of surface water sheet flow (Photograph 4.12), or in denser vegetation adjacent to ephemeral drainage (Photograph 4.13).

Searches were undertaken of each of the main areas of Drainage Line habitat, which is present from the western end of the W11 infrastructure area and along the haul road route. Eleven active and five abandoned *Idiosoma clypeatum* burrows were recorded during the survey. None were located within the proposed disturbance footprint. The location of recorded burrows in relation to the proposed disturbance is presented in Figure 4.20.

Shield-back trapdoor spider burrows are very difficult to find and it is highly likely that many more burrows are present in suitable habitat across the project area. There is abundant suitable habitat in the surrounding region and *I. clypeatum* is known to be widespread across the Murchison and Yalgoo bioregions.



Photograph 4.12: Evidence of sheet flow. Trapdoor burrows were found beneath the trees in the background.



Photograph 4.13: Acacia thicket adjacent to a drainage line. Numerous trapdoor burrows were found in this area.



Photograph 4.14: An active trapdoor burrow found adjacent to the proposed haul road route.

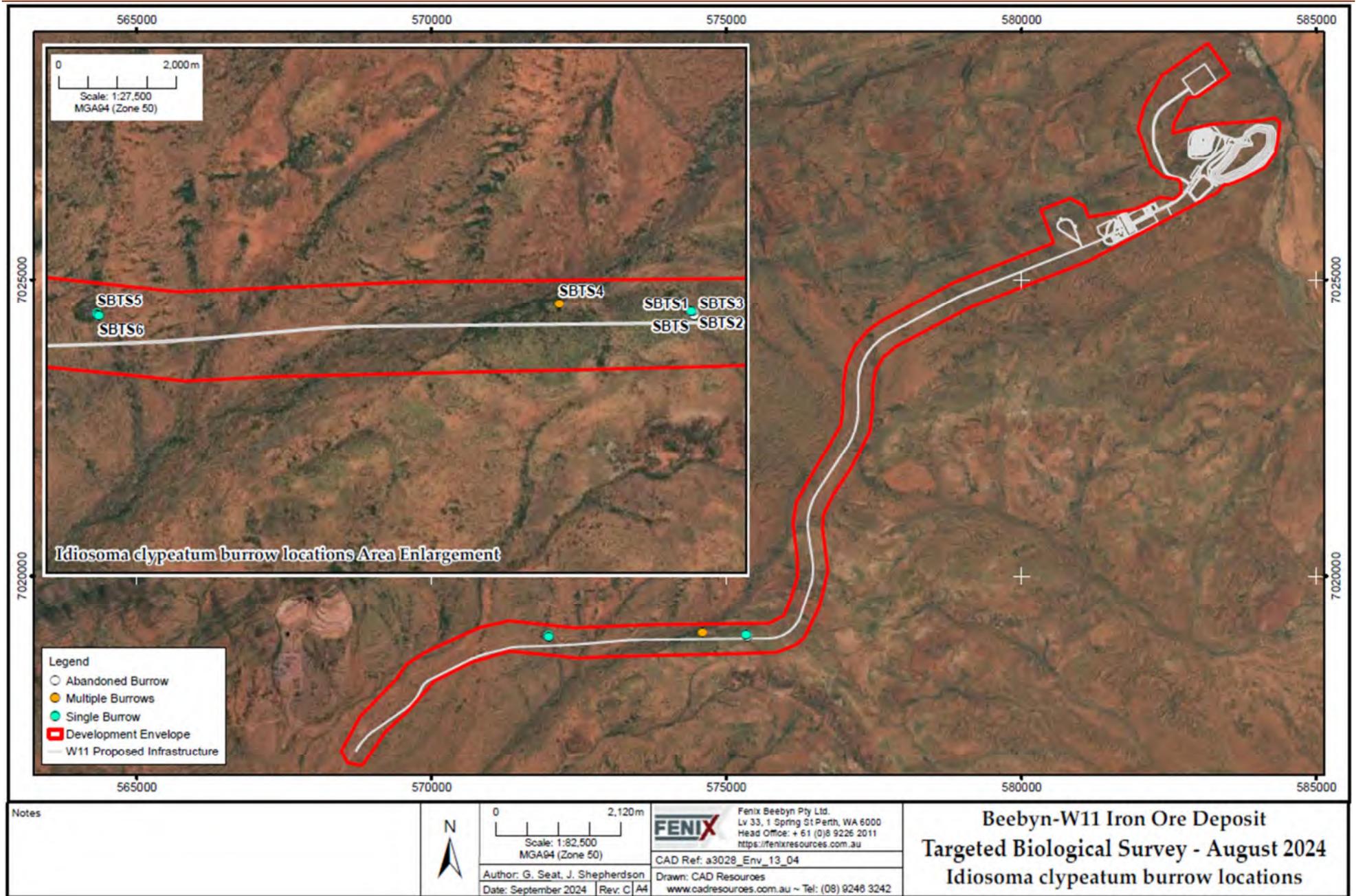


Figure 4.20: Locations of *Idiosoma clypeatum* burrows recorded during the survey.

4.3.2 Malleefowl

Database searches have returned several records of malleefowl (*Leipoa ocellata*) mounds in the vicinity of the W11 project. Nine possible extinct (long unused and unlikely to be used again) malleefowl mounds were recorded during the survey (Figure 4.21). While it is considered reasonably likely that the structures observed are long-extinct mounds, it is possible that some are former rabbit warrens or even geologic formations. If they were constructed by malleefowl they have not been used for decades.

The W11 project area is likely to have supported malleefowl in the past but is now at the northern extent of the species' range. Suitable habitat requirements include dense vegetation with abundant leaf litter, which is used to fill the mounds to incubate the eggs as it composts. The survey area now lacks much of the understorey biomass that was once present and is therefore lacking in leaf litter, food resources and cover provided by denser vegetation. Photograph 4.15 and Photograph 4.16 show two of the possible former mounds with open vegetation and near absence of leaf litter in the surrounding area.



Photograph 4.15: A possible long-extinct malleefowl mound at the eastern end of the project area.



Photograph 4.16: A possible long-extinct malleefowl mound at the central part of the project area.

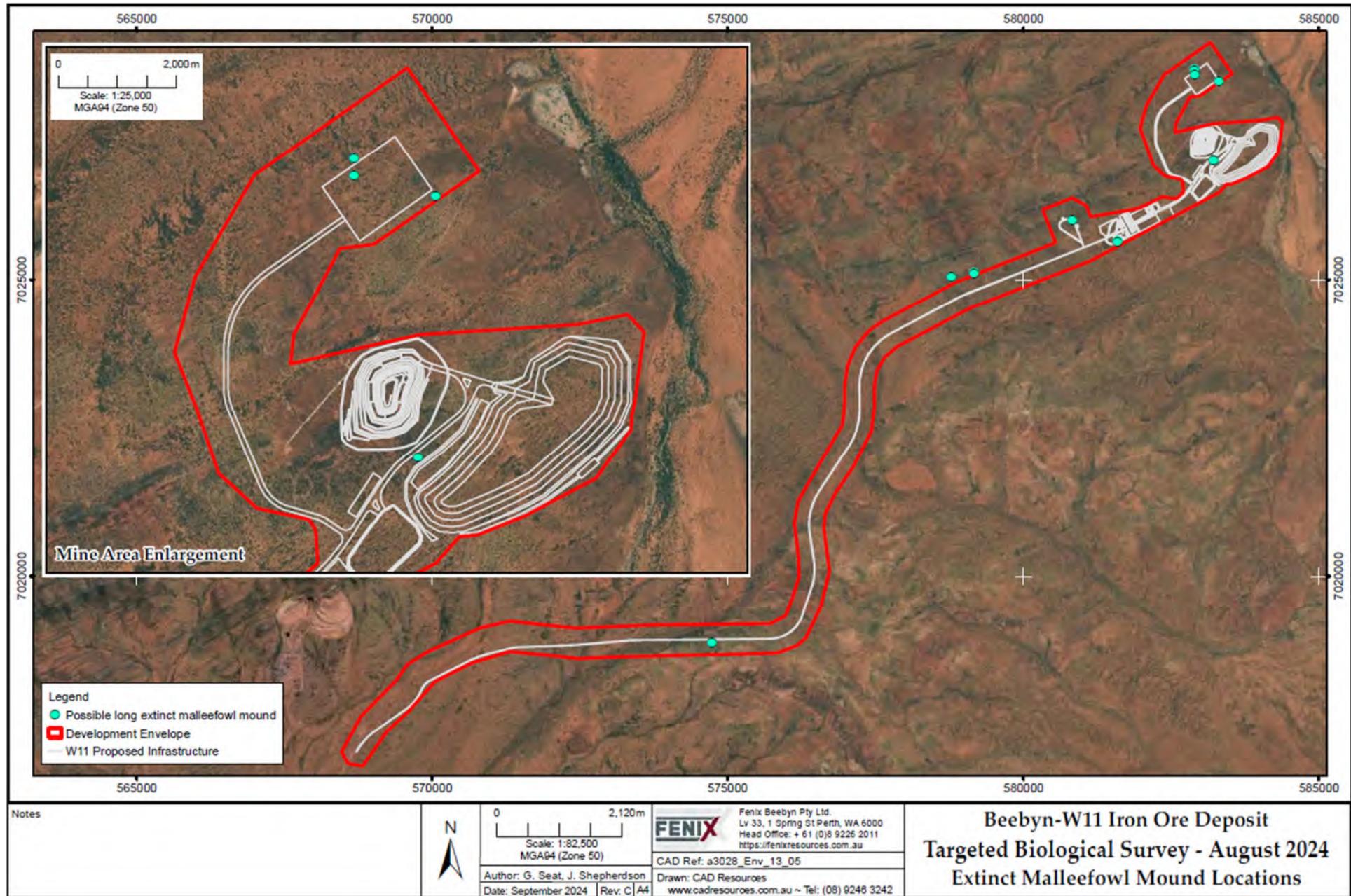


Figure 4.21: Locations of Malleefowl mounds recorded during the survey.

5.0 DISCUSSION

5.1 Flora and vegetation

Seven species of Priority flora were recorded during the survey, all of which have a known distribution of at least 150 km. Of these, three will be impacted by the proposed development:

- *Stenanthemum mediale* (P1)
- *Prostanthera petrophila* (P3)
- *Acacia speckii* (P4)

Impact to these species from the proposed development is expected to be minimal, with four individuals of *Stenanthemum mediale*, 17 individuals of *Prostanthera petrophila* and 25 individuals of *Acacia speckii* occurring within the proposed disturbance footprint. As discussed in Section 4.1, all three species have a wide distribution and it is likely that additional individuals also occur elsewhere across the Weld Range, including the unsurveyed areas adjacent to the development envelope.

Although rainfall for 2024 up to the time of survey was slightly above average, rainfall in the region has been below average for much of the previous eight years (BoM 2024). This has likely resulted in the loss of *Prostanthera petrophila* and *Micromyrtus placoides* individuals on the BIF ridges, with previous records not located. There were many long dead, low shrubs present in these areas that were likely *Micromyrtus placoides*, however were unable to be identified due to lack of vegetative material.

No *Hibiscus ?krichauffianus* individuals were recorded during the survey. It is likely that the individuals of this species previously recorded by APM (2024) have since senesced or were misidentified due to lack of reproductive material present at the time of the APM survey. Prior to the survey described in this report, the project area had received average rainfall for the year (refer to Section 2.1), with the flora in good condition and many species reproductive (flowering, fruiting) and therefore more easily identifiable.

The vegetation types recorded during the survey are typical of the Weld Range area and align with those described by Markey and Dillon (2008). Vegetation types 2, 3, 4, 5, 7, 8 and 15 correspond to the known Priority 1 Weld Range Vegetation Complexes (banded ironstone formation) PEC, as delineated by DBCA (2019). As discussed in Section 2.3.2, the PEC boundary defined by DBCA includes a 500 m “administrative buffer”, which includes some vegetation types that do not align with the PEC description. The Weld Range PEC occupies an area of 20,073 ha, with the project area (excluding existing exploration disturbance) coinciding with less than 1.1% of this area.

Vegetation condition ranged from ‘Very Good’ to ‘Completely Degraded’. Most of the disturbance was a result of moderate to heavy grazing impact from goats and euro, and historically heavy grazing by sheep that has degraded the land and made it compacted and susceptible to sheet erosion. Historical pastoral grazing has also resulted in the loss of palatable shrubs, grasses and forbs, and a low recruitment of perennial species.

5.2 Fauna and habitat

Fauna habitat mapping generally aligned with that recorded by APM (2024). The approximately 122 ha of the proposed disturbance footprint not surveyed by APM was determined to align with the Mulga Woodland on Hill Slope and Acacia Sand Plain habitat as described by APM (2024) and detailed in Section 2.4.1.

Eleven active and five abandoned *Idiosoma clypeatum* burrows were recorded during the survey, all within Drainage Line habitat and outside the proposed disturbance footprint. Previous records of *I. clypeatum* (then *Idiosoma nigrum*) were investigated and no sign of trapdoor burrows could be located at the time of the survey.

As outlined in Section 4.3.1, recent experience has found that shield-back trapdoor spider burrows in this region are associated with drainage lines and denser stands of Acacia where the soil has a higher moisture content. The amount and type of leaf litter present appears to be an important factor. Typically, burrows are located beneath Acacia trees

and shrubs in areas where there is evidence of surface water sheet flow or in denser vegetation adjacent to ephemeral drainage.

Shield-back trapdoor spider burrows are very difficult to find and it is highly likely that many more burrows are present in suitable habitat across the project area. There is abundant suitable habitat in the surrounding region and *I. clypeatum* is known to be widespread across the Murchison and Yalgoo bioregions.

The malleefowl mounds recorded in the project area are extinct and unlikely to be used again. A sandy substrate and abundance of leaf litter are clear requirements for the construction of the birds' incubator-nests (Benshemesh 2007, in APM 2024). Soils in the disturbance footprint have a reasonably high clay content and litter was sparse to absent, except in the narrow Drainage Lines. The quality of the habitat for foraging and nest building are generally low, except in small patches of higher quality habitat in or near the larger drainage features low in the plains (APM 2024). No mounds were recorded in this habitat and malleefowl are unlikely to occur in the project area, given the lack of suitable understorey available for foraging and predator protection, primarily as a result of heavy grazing from goats when the pastoral station was stocked.

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Appendix 1

Conservation Codes and Definitions

Conservation codes for Western Australian flora and fauna (BC Regulations 2018).

Code	Definition
T	<p>Threatened species</p> <p>Listed by order of the Minister as Threatened in the category of critically endangered, endangered or vulnerable under section 19(1), or is a rediscovered species to be regarded as threatened species under section 26(2) of the Biodiversity Conservation Act 2016 (BC Act).</p> <p>Threatened fauna is that subset of ‘Specially Protected Fauna’ listed under schedules 1 to 3 of the Wildlife Conservation (Specially Protected Fauna) Notice 2018 for Threatened Fauna.</p> <p>Threatened flora is that subset of ‘Rare Flora’ listed under schedules 1 to 3 of the Wildlife Conservation (Rare Flora) Notice 2018 for Threatened Flora.</p> <p>The assessment of the conservation status of these species is based on their national extent and ranked according to their level of threat using IUCN Red List categories and criteria as detailed below.</p>
CR	<p>Critically endangered species</p> <p>Threatened species considered to be “facing an extremely high risk of extinction in the wild in the immediate future, as determined in accordance with criteria set out in the ministerial guidelines”.</p> <p>Listed as critically endangered under section 19(1)(a) of the BC Act in accordance with the criteria set out in section 20 and the ministerial guidelines. Published under schedule 1 of the Wildlife Conservation (Specially Protected Fauna) Notice 2018 for critically endangered fauna or the Wildlife Conservation (Rare Flora) Notice 2018 for critically endangered flora.</p>
EN	<p>Endangered species</p> <p>Threatened species considered to be “facing a very high risk of extinction in the wild in the near future, as determined in accordance with criteria set out in the ministerial guidelines”.</p> <p>Listed as endangered under section 19(1)(b) of the BC Act in accordance with the criteria set out in section 21 and the ministerial guidelines. Published under schedule 2 of the Wildlife Conservation (Specially Protected Fauna) Notice 2018 for endangered fauna or the Wildlife Conservation (Rare Flora) Notice 2018 for endangered flora.</p>
VU	<p>Vulnerable species</p> <p>Threatened species considered to be “facing a high risk of extinction in the wild in the medium-term future, as determined in accordance with criteria set out in the ministerial guidelines”. Listed as vulnerable under section 19(1)(c) of the BC Act in accordance with the criteria set out in section 22 and the ministerial guidelines. Published under schedule 3 of the Wildlife Conservation (Specially Protected Fauna) Notice 2018 for vulnerable fauna or the Wildlife Conservation (Rare Flora) Notice 2018 for vulnerable flora.</p>
	<p>Extinct species</p> <p>Listed by order of the Minister as extinct under section 23(1) of the BC Act as extinct or extinct in the wild.</p>
EX	<p>Presumed extinct species</p> <p>Species where “there is no reasonable doubt that the last member of the species has died”, and listing is otherwise in accordance with the ministerial guidelines (section 24 of the BC Act).</p> <p>Published as presumed extinct under schedule 4 of the Wildlife Conservation (Specially Protected Fauna) Notice 2018 for extinct fauna or the Wildlife Conservation (Rare Flora) Notice 2018 for extinct flora.</p>
EW	<p>Extinct in the wild species</p> <p>Species that “is known only to survive in cultivation, in captivity or as a naturalised population well outside its past range; and it has not been recorded in its known habitat or expected habitat, at appropriate seasons, anywhere in its past range, despite surveys over a time frame appropriate to its life cycle and form”, and listing is otherwise in accordance with the ministerial guidelines (section 25 of the BC Act).</p>

	<p>Currently there are no threatened fauna or threatened flora species listed as extinct in the wild. If listing of a species as extinct in the wild occurs, then a schedule will be added to the applicable notice.</p>
	<p><u>Specially protected species</u></p> <p>Listed by order of the Minister as specially protected under section 13(1) of the BC Act. Meeting one or more of the following categories: species of special conservation interest; migratory species; cetaceans; species subject to international agreement; or species otherwise in need of special protection.</p> <p>Species that are listed as threatened species (critically endangered, endangered or vulnerable) or extinct species under the BC Act cannot also be listed as Specially Protected species.</p>
MI	<p>Migratory species</p> <p>Fauna that periodically or occasionally visit Australia or an external Territory or the exclusive economic zone; or the species is subject of an international agreement that relates to the protection of migratory species and that binds the Commonwealth; and listing is otherwise in accordance with the ministerial guidelines (section 15 of the BC Act).</p> <p>Includes birds that are subject to an agreement between the government of Australia and the governments of Japan (JAMBA), China (CAMBA) and The Republic of Korea (ROKAMBA), and fauna subject to the Convention on the Conservation of Migratory Species of Wild Animals (Bonn Convention), an environmental treaty under the United Nations Environment Program. Migratory species listed under the BC Act are a subset of the migratory animals that are known to visit Western Australia, protected under the international agreements or treaties, excluding species that are listed as Threatened species.</p> <p>Published as migratory birds protected under an international agreement under schedule 5 of the Wildlife Conservation (Specially Protected Fauna) Notice 2018.</p>
CD	<p>Species of special conservation interest (conservation dependent fauna)</p> <p>Fauna of special conservation need being species dependent on ongoing conservation intervention to prevent it becoming eligible for listing as threatened, and listing is otherwise in accordance with the ministerial guidelines (section 14 of the BC Act).</p> <p>Published as conservation dependent fauna under schedule 6 of the Wildlife Conservation (Specially Protected Fauna) Notice 2018.</p>
OS	<p>Other specially protected species</p> <p>Fauna otherwise in need of special protection to ensure their conservation, and listing is otherwise in accordance with the ministerial guidelines (section 18 of the BC Act).</p> <p>Published as other specially protected fauna under schedule 7 of the Wildlife Conservation (Specially Protected Fauna) Notice 2018.</p>
	<p><u>Priority species</u></p> <p>Possibly threatened species that do not meet survey criteria, or are otherwise data deficient, are added to the Priority Fauna or Priority Flora Lists under Priorities 1, 2 or 3. These three categories are ranked in order of priority for survey and evaluation of conservation status so that consideration can be given to their declaration as threatened fauna or flora.</p> <p>Species that are adequately known, are rare but not threatened, or meet criteria for near threatened, or that have been recently removed from the threatened species or other specially protected fauna lists for other than taxonomic reasons, are placed in Priority 4. These species require regular monitoring.</p> <p>Assessment of Priority codes is based on the Western Australian distribution of the species, unless the distribution in WA is part of a contiguous population extending into adjacent States, as defined by the known spread of locations.</p>
P1	<p>Priority 1: Poorly-known species</p> <p>Species that are known from one or a few locations (generally five or less) which are potentially at risk. All occurrences are either: very small; or on lands not managed for conservation, e.g. agricultural or pastoral lands, urban areas, road and rail reserves, gravel reserves and active mineral leases; or otherwise under threat of habitat destruction or degradation. Species may be included if they are comparatively well known from one or more</p>

	locations but do not meet adequacy of survey requirements and appear to be under immediate threat from known threatening processes. Such species are in urgent need of further survey.
P2	<p>Priority 2: Poorly-known species</p> <p>Species that are known from one or a few locations (generally five or less), some of which are on lands managed primarily for nature conservation, e.g. national parks, conservation parks, nature reserves and other lands with secure tenure being managed for conservation. Species may be included if they are comparatively well known from one or more locations but do not meet adequacy of survey requirements and appear to be under threat from known threatening processes. Such species are in urgent need of further survey.</p>
P3	<p>Priority 3: Poorly-known species</p> <p>Species that are known from several locations, and the species does not appear to be under imminent threat, or from few but widespread locations with either large population size or significant remaining areas of apparently suitable habitat, much of it not under imminent threat. Species may be included if they are comparatively well known from several locations but do not meet adequacy of survey requirements and known threatening processes exist that could affect them. Such species are in need of further survey.</p>
P4	<p>Priority 4: Rare, Near Threatened and other species in need of monitoring</p> <p>(a) Rare. Species that are considered to have been adequately surveyed, or for which sufficient knowledge is available, and that are considered not currently threatened or in need of special protection but could be if present circumstances change. These species are usually represented on conservation lands.</p> <p>(b) Near Threatened. Species that are considered to have been adequately surveyed and that are close to qualifying for vulnerable but are not listed as Conservation Dependent.</p> <p>(c) Species that have been removed from the list of threatened species during the past five years for reasons other than taxonomy.</p>

Conservation codes for species listed under the Environmental Protection and Biodiversity Conversation Act 1999

Status	Definition
Extinct	There is no reasonable doubt that the last member of the species has died.
Extinct in the wild	It is known only to survive in cultivation, in captivity or as a naturalised population well outside its past range, or It has not been recorded in its known and/or expected habitat, at appropriate seasons, anywhere in its past range, despite exhaustive surveys over a time frame appropriate to its life cycle and form.
Critically Endangered	It is facing an extremely high risk of extinction in the wild in the immediate future, as determined in accordance with the prescribed criteria.
Endangered	It is not critically endangered; and It is facing a very high risk of extinction in the wild in the near future, as determined in accordance with the prescribed criteria.
Vulnerable	It is not critically endangered or endangered; and It is facing a high risk of extinction in the wild in the medium-term future, as determined in accordance with the prescribed criteria.
Conservation dependant	The species is the focus of a specific conservation program the cessation of which would result in the species becoming vulnerable, endangered or critically endangered; or The following subparagraphs are satisfied: - The species is a species of fish - The species is the focus of a plan of management that provides for management actions necessary to stop the decline of, and support the recovery of, the species so that its chances of long term survival in nature are maximised - The plan of management is in force under a law of the Commonwealth or of a State or Territory - Cessation of the plan of management would adversely affect the conservation status of the species.
Threatened Ecological Communities	
Critically Endangered	If, at that time, an ecological community is facing an extremely high risk of extinction in the wild in the immediate future (indicative timeframe being the next 10 years).
Endangered	If, at that time, an ecological community is not critically endangered but is facing a very high risk of extinction in the wild in the near future (indicative timeframe being the next 20 years).
Vulnerable	If, at that time, an ecological community is not critically endangered or endangered, but is facing a high risk of extinction in the wild in the medium-term future (indicative timeframe being the next 50 years).

Appendix 2

Flora species list

Family	Scientific Name	Status
Acanthaceae	<i>Harnieria kempeana subsp. muelleri</i>	
Aizoaceae	<i>Tetragonia cristata</i>	
Amaranthaceae	<i>Ptilotus aevroides</i>	
	<i>Ptilotus exaltatus</i>	
	<i>Ptilotus obovatus</i>	
	<i>Ptilotus polystachyus</i>	
	<i>Ptilotus rotundifolius</i>	
	<i>Ptilotus schwartzii</i>	
Apocynaceae	<i>Leichhardtia australis</i>	
	<i>Vincetoxicum lineare</i>	
Asparagaceae	<i>Arthropodium sp.</i>	
	<i>Thysanotus manglesianus</i>	
Asteraceae	<i>Brachyscome iberidifolia</i>	
	<i>Calotis multicaulis</i>	
	<i>Cephalipterum drummondii</i>	
	<i>Chthonocephalus pseudevax</i>	
	<i>Helipterum craspedioides</i>	
	<i>Isoetopsis graminifolia</i>	
	<i>Lawrencella davenportii</i>	
	<i>Panaetia lessonii</i>	
	<i>Rhodanthe ?sterilescens (in bud)</i>	
	<i>Rhodanthe sp.</i>	
	<i>Waitzia acuminata</i>	
Brassicaceae	<i>Lepidium oxytrichum</i>	
	<i>Menkea villosula</i>	
	<i>Stenopetalum anfractum</i>	
	<i>Stenopetalum filifolium</i>	
Celastraceae	<i>Stackhousia muricata</i>	
Chenopodiaceae	<i>Dysphania rhadinostachya subsp. rhadinostachya</i>	
	<i>Enchylaena tomentosa</i>	
	<i>Eriochiton sclerolaenoides</i>	
	<i>Maireana carnosa</i>	
	<i>Maireana georgei</i>	
	<i>Maireana melanocoma</i>	
	<i>Maireana sp.</i>	
	<i>Maireana thesioides</i>	
	<i>Maireana triptera</i>	
	<i>Rhagodia eremaea</i>	
	<i>Sclerolaena diacantha</i>	
	<i>Sclerolaena eurotioides</i>	
	<i>Sclerolaena fusiformis</i>	
	<i>Sclerolaena sp.</i>	
Crassulaceae	<i>Crassula colorata var. acuminata</i>	
Euphorbiaceae	<i>Euphorbia boophthona</i>	
	<i>Euphorbia sarcostemmoides</i>	
	<i>Beyeria lapidicola</i>	P1

Family	Scientific Name	Status
Fabaceae	<i>Acacia aneura</i>	
	<i>Acacia aptaneura</i>	
	<i>Acacia caesaneura</i>	
	<i>Acacia craspedocarpa</i>	
	<i>Acacia fuscaneura</i>	
	<i>Acacia grasbyi</i>	
	<i>Acacia incurvaneura</i>	
	<i>Acacia mulganeura</i>	
	<i>Acacia pruinocarpa</i>	
	<i>Acacia pteraneura</i>	
	<i>Acacia ramulosa</i> var. <i>linophylla</i>	
	<i>Acacia rhodophloia</i>	
	<i>Acacia sclerosperma</i> subsp. <i>sclerosperma</i>	
	<i>Acacia</i> sp. <i>Weld Range</i>	
	<i>Acacia speckii</i>	P4
	<i>Acacia tetragonophylla</i>	
	<i>Chorizema genistoides</i>	
	<i>Glycine canescens</i>	
	<i>Senna artemisioides</i> subsp. <i>artemisioides</i>	
	<i>Senna artemisioides</i> subsp. <i>filifolia</i>	
<i>Senna artemisioides</i> subsp. <i>helmsii</i>		
<i>Senna artemisioides</i> subsp. <i>xsturtii</i>		
<i>Senna glaucifolia</i>		
<i>Senna glutinosa</i> subsp. <i>chatelainiana</i>		
<i>Senna glutinosa</i> subsp. <i>xluerssenii</i>		
<i>Senna</i> sp. <i>Meekatharra</i>		
<i>Senna symonii</i>		
Geraniaceae	<i>Erodium cygnorum</i>	
Goodeniaceae	<i>Goodenia berardiana</i>	
	<i>Goodenia tenuiloba</i>	
	<i>Scaevola spinescens</i>	
Haloragaceae	<i>Haloragis odontocarpa</i>	
Lamiaceae	<i>Prostanthera petrophila</i>	
	<i>Teucrium teucriiflorum</i>	
Malvaceae	<i>Abutilon</i> sp.	
	<i>Androcalva luteiflora</i>	
	<i>Brachychiton gregorii</i>	
	<i>Hibiscus</i> sp.	
	<i>Hibiscus sturtii</i>	
	<i>Sida calyxhymenia</i>	
	<i>Sida ectogama</i>	
<i>Sida</i> sp. <i>Golden calyces glabrous</i>		
Marsileaceae	<i>Marsilea hirsuta</i>	
Montiaceae	<i>Calandrinia</i> sp.	
Myrtaceae	<i>Calytrix desolata</i>	
	<i>Hysterobaeckea occlusa</i>	

Family	Scientific Name	Status
Myrtaceae	<i>Micromyrtus placoides</i>	P3
	<i>Micromyrtus sulphurea</i>	
	<i>Thryptomene decussata</i>	
	<i>Verticordia jamiesonii</i>	P3
Oxalidaceae	<i>Oxalis ?corniculata*</i>	Weed
Pittosporaceae	<i>Pittosporum angustifolium</i>	
Poaceae	<i>Amphipogon caricinus</i> var. <i>caricinus</i>	
	<i>Aristida contorta</i>	
	<i>Austrostipa elegantissima</i>	
	<i>Cymbopogon ambiguus</i>	
	<i>Eragrostis dielsii</i>	
	<i>Eragrostis eriopoda</i>	
	<i>Eragrostis falcata</i>	
	<i>Monachather paradoxus</i>	
	<i>Paspalidium basicladum</i>	
	<i>Thyridolepis multiculmis</i>	
	Portulacaceae	<i>Portulaca oleracea</i>
Proteaceae	<i>Grevillea berryana</i>	
	<i>Grevillea deflexa</i>	
	<i>Hakea lorea</i>	
	<i>Hakea preissii</i>	
Pteridaceae	<i>Cheilanthes lasiophyllum</i>	
	<i>Cheilanthes sieberi</i> subsp. <i>sieberi</i>	
	<i>Cheilanthes</i> sp.	
Rhamnaceae	<i>Stenanthemum mediale</i>	P1
Rubiaceae	<i>Psydrax latifolia</i>	
	<i>Psydrax rigidula</i>	
	<i>Psydrax suaveolens</i>	
Rutaceae	<i>Philothea brucei</i> subsp. <i>brucei</i>	
Santalaceae	<i>Santalum spicatum</i>	R
Sapindaceae	<i>Dodonaea pachyneura</i>	
Scrophulariaceae	<i>Eremophila compacta</i>	
	<i>Eremophila eriocalyx</i>	
	<i>Eremophila exilifolia</i>	
	<i>Eremophila foliosissima</i>	
	<i>Eremophila forrestii</i> subsp. <i>forrestii</i>	
	<i>Eremophila forrestii</i> subsp. <i>hastieana</i>	
	<i>Eremophila fraseri</i> subsp. <i>fraseri</i>	
	<i>Eremophila georgei</i>	
	<i>Eremophila gilesii</i>	
	<i>Eremophila glutinosa</i>	
	<i>Eremophila granitica</i>	
	<i>Eremophila jucunda</i> subsp. <i>jucunda</i>	
	<i>Eremophila latrobei</i> subsp. <i>latrobei</i>	
	<i>Eremophila mackinlayi</i> subsp. <i>spathulata</i>	
<i>Eremophila macmillaniana</i>		

Family	Scientific Name	Status
Scrophulariaceae	<i>Eremophila pantonii</i>	
	<i>Eremophila punicea</i>	
	<i>Eremophila serrulata</i>	
	<i>Eremophila simulans subsp. simulans</i>	
	<i>Eremophila sp. Weld Range</i>	
	<i>Eremophila spathulata</i>	
Solanaceae	<i>Nicotiana obliqua</i>	
	<i>Nicotiana rosulata</i>	
	<i>Solanum lasiophyllum</i>	
Stylidiaceae	<i>Stylidium longibracteatum</i>	
Zygophyllaceae	<i>Roepera lobulata</i>	
	<i>Roepera sp.</i>	
	<i>Tribulus suberosus</i>	

Appendix 3

Vegetation site descriptions

Fenix Beebyn-W11 Haul Road, Pit, WRD and Gravel Pit site descriptions

NVIS foliage cover codes.

Cover Characteristics					
Foliage cover	70 – 100	30 – 70	10 – 30	< 10	~ 0 (<2)
Crown cover	>80	50 – 80	20 – 50	0.25 – 20	<0.25
% cover	>80	50 – 80	20 – 50	0.25 - <20	<0.25
Cover code	d	c	i	r	bi

Height classes defined for the NVIS.

Height		Growth Form				
Height Class	Height Range (m)	Tree	Shrub, chenopod shrub	Tree mallee, mallee shrub	Tussock grass	Bryophyte, lichen
8	>30	Tall	N/A	N/A	N/A	N/A
7	10 – 30	Mid	N/A	Tall	N/A	N/A
6	< 10	Low	N/A	Mid	N/A	N/A
5	<3	N/A	N/A	Low	N/A	N/A
4	>2	N/A	Tall	N/A	Tall	N/A
3	1 – 2	N/A	Mid	N/A	Tall	N/A
2	0.5 – 1	N/A	Low	N/A	Mid	Tall
1	< 0.5	N/A	Low	N/A	Low	Low

Summary of NVIS strata codes.

NVIS stratum code	NVIS sub-stratum	Description	Growth forms	Height classes
U	U1	Tallest stratum	Tree, tree mallees (mallee shrubs)	8, 7, 6, (5)
	U2	Sub-canopy layer, second tree layer		
	U3	Sub-canopy layer, third tree layer		
M	M1	Tallest shrub layer	Shrubs, low trees, mallee shrubs, low shrubs, vines	(6), 5, 4, 3
	M2	Next shrub layer		
	M3	Third shrub layer		
G	G1	Tallest ground species	Grasses, forbs, sedges, rushes, vines, lichens, low shrubs	(4, 3), 2, 1
	G2	Ground		

Growth Form Codes used in descriptions

T	Tree	U	Samphire shrub	F	Forb
M	Mallee	Z	Heath shrub	E	Fern
S	Shrub	G	Tussock grass	L	Vine
R	Rush	V	Sedge	B	Bryophyte (moss, liverwort)
C	Chenopod shrub	K	Epiphyte	N	Lichen

V 1 30/07/2024 WRD area			
GPS: 584216 E/ 7027089 N Elevation: 499 m		Landform: Stony plain, very gentle slope aspect east Proposed WRD east end	
Land surface: Yellowish red silty clay loam; surface rock (BIF, quartz 2 – 10 cm, 30 – 40 %; gravel 20 – 30 %); litter 2 – 10 %			
Condition & disturbances: Poor; pastoral impacts – grazing, tracks; active erosion			
NVIS 6: U1^ <i>Acacia pruinocarpa</i> \Acacia\ ^tree\7\bi; U2^ <i>Acacia aptaneura</i> , <i>A. pruinocarpa</i> \Acacia\ ^tree\6\l; M1^ <i>Acacia aptaneura</i> , <i>A. craspedocarpa</i> , <i>Eremophila fraseri</i> subsp. <i>fraseri</i> \Acacia\ ^shrub, tree\4\l; M2^ <i>Eremophila fraseri</i> subsp. <i>fraseri</i> , <i>Senna symonii</i> , <i>Eremophila mackinlayi</i> subsp. <i>spathulata</i> , <i>Sida ectogama</i> \Eremophila\ ^shrub\2\bi; G1^ <i>Ptilotus obovatus</i> , <i>Enchylaena tomentosa</i> , <i>Goodenia tenuiloba</i> , <i>Erodium cygnorum</i> , <i>Eragrostis eriopoda</i> \Ptilotus\ ^shrub, chenopod shrub, forb\1\i			
Vegetation: <i>Acacia pruinocarpa</i> isolated trees over <i>Acacia aptaneura</i> , <i>A. pruinocarpa</i> low open woodland over <i>Acacia aptaneura</i> , <i>A. craspedocarpa</i> , <i>Eremophila fraseri</i> subsp. <i>fraseri</i> tall sparse shrubland over <i>Ptilotus obovatus</i> , <i>Enchylaena tomentosa</i> , <i>Goodenia tenuiloba</i> low sparse shrubland			
Height (m)	Crown cover %	Habit	Species
8 – 12	< 2	T	<i>Acacia pruinocarpa</i>
4 – 8	2 – 10	T	<i>Acacia aptaneura</i> , <i>A. pruinocarpa</i>
2 – 4	2 – 10	S, T	<i>Acacia aptaneura</i> , <i>A. craspedocarpa</i> , <i>Eremophila fraseri</i> subsp. <i>fraseri</i>
0.5 – 1	< 2	S	<i>Eremophila fraseri</i> subsp. <i>fraseri</i> , <i>Senna symonii</i> , <i>Eremophila mackinlayi</i> subsp. <i>spathulata</i> , <i>Sida ectogama</i>
< 0.5	10 – 20	S, C, F	<i>Ptilotus obovatus</i> , <i>Enchylaena tomentosa</i> , <i>Goodenia tenuiloba</i> , <i>Erodium cygnorum</i> , <i>Eragrostis eriopoda</i>
Other species: <i>Acacia caesaneura</i> , <i>A. incurvaneura</i> , <i>A. tetragonophylla</i> , <i>Euphorbia sarcostemmoides</i> , <i>Monachather paradoxus</i> , <i>Rhagodia eremaea</i>			
<i>Acacia aptaneura</i> <i>Acacia caesaneura</i> <i>Acacia craspedocarpa</i> <i>Acacia incurvaneura</i> <i>Acacia pruinocarpa</i> <i>Acacia tetragonophylla</i> <i>Enchylaena tomentosa</i> <i>Eragrostis eriopoda</i> <i>Eremophila fraseri</i> subsp. <i>fraseri</i> <i>Eremophila mackinlayi</i> subsp. <i>spathulata</i> <i>Erodium cygnorum</i> <i>Euphorbia sarcostemmoides</i> P1 <i>Goodenia tenuiloba</i> <i>Monachather paradoxus</i> <i>Ptilotus obovatus</i> <i>Rhagodia eremaea</i> <i>Senna symonii</i> (sterile; tentative) <i>Sida ectogama</i>			

V 2 30th July 2024 WRD area

GPS: 584227 E/ 7027159 N
Elevation: 499 m

Landform: Stony plain; denser patch of vegetation

Land surface: Yellowish red silty clay loam

Condition & disturbances: Good; many germinating forbs; pastoral impacts

NVIS 6: U1+^ *Acacia pruinocarpa* \Acacia\^tree\6\i; M1^ *Acacia tetragonophylla*, *A. caesaneura*, *A. aptaneura* \Acacia\^shrub\4\i; M2^ *Eremophila fraseri* subsp. *fraseri*, *Acacia tetragonophylla* \Eremophila\^shrub\3\i; G1^ *Ptilotus obovatus*, *Sida ectogama*, *Rhagodia eremaea*, *Acacia tetragonophylla*, *Eremophila fraseri* subsp. *fraseri* \Ptilotus\^shrub, chenopod shrub\1\c; G2^ *Menkea villosula*, *Crassula colorata* var. *acuminata*, *Stenopetalum anfractum*, *Aristida contorta*, *Leichhardtia australis* \Menkea\^forb, tussock grass, climber\1\c

Vegetation: *Acacia pruinocarpa* open woodland over *Acacia tetragonophylla*, *A. caesaneura*, *A. aptaneura* tall sparse shrubland over *Eremophila fraseri* subsp. *fraseri*, *Acacia tetragonophylla* sparse shrubland over *Ptilotus obovatus*, *Sida ectogama*, *Rhagodia eremaea* low open shrubland over *Menkea villosula*, *Crassula colorata* var. *acuminata*, *Stenopetalum anfractum* low forbland

Height (m)	Crown cover %	Habit	Species
8 – 10	10 – 30	T	<i>Acacia pruinocarpa</i>
2 – 3	2 – 10	S	<i>Acacia tetragonophylla</i> , <i>A. caesaneura</i> , <i>A. aptaneura</i>
1 – 2	2 – 10	S	<i>Eremophila fraseri</i> subsp. <i>fraseri</i> , <i>Acacia tetragonophylla</i>
0.3 – 0.6	20 – 30	S, C	<i>Ptilotus obovatus</i> , <i>Sida ectogama</i> , <i>Rhagodia eremaea</i> , <i>Acacia tetragonophylla</i> , <i>Eremophila fraseri</i> subsp. <i>fraseri</i>
< 0.2	40 – 60	F, G, L	<i>Menkea villosula</i> , <i>Crassula colorata</i> var. <i>acuminata</i> , <i>Stenopetalum anfractum</i> , <i>Aristida contorta</i> , <i>Leichhardtia australis</i>

Acacia aptaneura
Acacia caesaneura
Acacia pruinocarpa
Acacia tetragonophylla
Aristida contorta
Crassula colorata var. *acuminata*
Eremophila fraseri subsp. *fraseri*
Leichhardtia australis
Menkea villosula
Ptilotus obovatus
Rhagodia eremaea
Stenopetalum anfractum
Sida ectogama



V3 30 th July 2024 7.56 am WRD area Relevé	
GPS: 584060 E/ 7027134 N Elevation: 501 m	Landform: Gently sloping stony plain; aspect east
Land surface: Yellowish red silty clay loam; surface rock 10 – 30 %	
Condition & disturbances: Good within patch; poor to degraded in surrounding areas	
Vegetation: <i>Acacia pruinocarpa</i> , <i>A. aptaneura</i> low open woodland over <i>Acacia pruinocarpa</i> , <i>A. aptaneura</i> , <i>A. tetragonophylla</i> tall sparse shrubland over <i>Acacia caesaneura</i> , <i>A. tetragonophylla</i> , <i>Eremophila fraseri</i> subsp. <i>fraseri</i> isolated shrubs over <i>Ptilotus obovatus</i> , <i>Maireana</i> sp., <i>Enchylaena tomentosa</i> , <i>Ptilotus schwartzii</i> low sparse shrubland	
Other species: <i>Scaevola spinescens</i> , <i>Acacia sclerosperma</i> subsp. <i>sclerosperma</i> , <i>Ptilotus rotundifolius</i>	
	
Low woodland patch within sparse shrubland area	
<i>Acacia aptaneura</i> <i>Acacia caesaneura</i> <i>Acacia pruinocarpa</i> <i>Acacia sclerosperma</i> subsp. <i>sclerosperma</i> <i>Acacia tetragonophylla</i> <i>Enchylaena tomentosa</i>	<i>Eremophila fraseri</i> subsp. <i>fraseri</i> <i>Maireana</i> sp. <i>Ptilotus obovatus</i> <i>Ptilotus rotundifolius</i> <i>Ptilotus schwartzii</i> <i>Scaevola spinescens</i>

V4 30th July 2024 8.09 am WRD area

GPS: 583884 E/ 7027054 N
Elevation: 504 m

Landform: Low rise; stony, gentle slope; aspect east

Land surface: Yellowish red silty clay loam; surface rock 2 – 10 cm (BIF, chert, quartz, 10 – 20 %); gravel (30 – 40 %); litter < 5 %; fallen timber < 2 %

Condition & disturbances: Poor; lacking understory; pastoral impacts

NVIS 6: U1^ *Acacia pruinocarpa*\Acacia\ ^tree\6\bi; M1+^ *Acacia aptaneura*, *A. pruinocarpa*\Acacia\ ^shrub, tree\4\i; M2^ *Acacia tetragonophylla*, *A. pruinocarpa*, *Eremophila fraseri* subsp. *fraseri*\Acacia\ ^shrub\3\bi; G1^ *Acacia pruinocarpa*, *Eremophila fraseri* subsp. *fraseri*, *Acacia aptaneura*, *Ptilotus obovatus*, *P. schwartzii*\Acacia\ ^shrub\2\r

Vegetation: *Acacia pruinocarpa* isolated trees over *Acacia aptaneura*, *A. pruinocarpa* tall open shrubland over *Acacia tetragonophylla*, *A. pruinocarpa*, *Eremophila fraseri* subsp. *fraseri* isolated shrubs over *Acacia pruinocarpa*, *Eremophila fraseri* subsp. *fraseri*, *Acacia aptaneura* low sparse shrubland

Height (m)	Crown cover %	Habit	Species
10	< 2	T	<i>Acacia pruinocarpa</i>
3 – 8	10 – 20	S, T	<i>Acacia aptaneura</i> , <i>A. pruinocarpa</i>
1 – 2	< 2	S	<i>Acacia tetragonophylla</i> , <i>A. pruinocarpa</i> , <i>Eremophila fraseri</i> subsp. <i>fraseri</i>
< 1	2 – 10	S	<i>Acacia pruinocarpa</i> , <i>Eremophila fraseri</i> subsp. <i>fraseri</i> , <i>Acacia aptaneura</i> , <i>Ptilotus obovatus</i> , <i>P. schwartzii</i>

Other species: *Acacia craspedocarpa*

Acacia aptaneura
Acacia craspedocarpa
Acacia pruinocarpa
Acacia tetragonophylla
Eremophila fraseri subsp. *fraseri*
Ptilotus obovatus
Ptilotus schwartzii



V5 30 th July 2024 8.20 am WRD area Relevé	
GPS: 583750 E/ 7027038 N Elevation: 506 m	Landform: Low hill; lower slope; colluvial outwash; aspect south
Land surface: Yellowish red silty clay loam; surface rock < 10 %	
Condition & disturbances: Good; lot of pastoral disturbances; erosion active	
Vegetation: <i>Acacia aneura</i> tall open shrubland over <i>Eremophila forrestii</i> subsp. <i>forrestii</i> low isolated shrubs (0.5 – 1 m) over <i>Maireana</i> sp., <i>Enchylaena tomentosa</i> , <i>Eragrostis eriopoda</i> , <i>Erodium cygnorum</i> low sparse chenopod shrubland	
<i>Acacia aneura</i> <i>Enchylaena tomentosa</i> <i>Eragrostis eriopoda</i> <i>Eremophila forrestii</i> subsp. <i>forrestii</i> <i>Erodium cygnorum</i> <i>Maireana</i> sp.	

V6 30 th July 2024 WRD area 8.30 am Relevé	
GPS: 583838 E/ 7027185 N Elevation:	Landform: Lower slope of outwash slope; colluvium
Land surface: Yellowish red silty clay loam; surface rock 2 – 10 cm 10 – 20 %, gravel 10 – 20 %; litter < 10 %; fallen timber < 2 %	
Condition & disturbances: Poor; moderate to high pastoral impacts, old tracks; rabbits, regeneration very low	
Vegetation: <i>Acacia aptaneura</i> , <i>A. incurvaneura</i> , <i>A. caesaneura</i> tall open shrubland over <i>Eremophila fraseri</i> subsp. <i>fraseri</i> , <i>Acacia ramulosa</i> var. <i>linophylla</i> isolated shrubs over <i>Helipterum craspedioides</i> , <i>Erodium cygnorum</i> , <i>Eragrostis eriopoda</i> , <i>Acacia caesaneura</i> low sparse forbland	
V6 & V7 species list <i>Acacia aptaneura</i> <i>Acacia caesaneura</i> <i>Acacia incurvaneura</i> <i>Acacia ramulosa</i> var. <i>linophylla</i> <i>Eragrostis eriopoda</i> <i>Eremophila fraseri</i> subsp. <i>fraseri</i> <i>Erodium cygnorum</i> <i>Helipterum craspedioides</i> <i>Ptilotus aevroides</i> (V7) <i>Ptilotus rotundifolius</i> (V7)	

V7 30 th July 2024 WRD area Relevé	
GPS: 583984 E/ 7027248 N Elevation:	Landform: Plain; gentle slope aspect south east WRD area
Land surface:	
Condition & disturbances: Poor; pastoral impacts; erosion moderate	
Vegetation: <i>Acacia aptaneura</i> , <i>A. caesaneura</i> tall sparse shrubland over <i>Acacia aptaneura</i> , <i>A. ramulosa</i> var. <i>linophylla</i> , <i>Ptilotus rotundifolius</i> sparse shrubland over <i>Eragrostis eriopoda</i> , <i>Ptilotus aervoides</i> low open tussock grassland	

V8 30 th July 2024 rehabilitation site WRD area			
GPS: 584284 E/ 7027164 N Elevation: 500		Landform: Plain; gentle slope; aspect south east	
Land surface: Yellowish red gritty clay loam; surface rock (hardpan, other) 60 – 80 %; bare ground < 20 %			
Condition & disturbances: Good; historic drill location that has been rehabilitated (ripped); recruitment and growth good			
NVIS 6: G1+^ <i>Ptilotus obovatus</i> , <i>Rhagodia eremaea</i> , <i>Acacia pruinocarpa</i> , <i>Enchylaena tomentosa</i> , <i>Cymbopogon ambiguus</i> \Ptilotus\^shrub, chenopod shrub, tussock grass\2\i; G2^ <i>Cephalopterum drummondii</i> , <i>Maireana triptera</i> , <i>Menkea villosula</i> , <i>Ptilotus obovatus</i> \Cephalopterum\^forb, chenopod shrub, shrub\1\bi			
Vegetation: <i>Ptilotus obovatus</i> , <i>Rhagodia eremaea</i> , <i>Acacia pruinocarpa</i> low open shrubland over <i>Cephalopterum drummondii</i> , <i>Maireana triptera</i> , <i>Menkea villosula</i> isolated low forbs and chenopod shrubs			
Height (m)	Crown cover %	Habit	Species
0.2 – 0.8	20 – 30	S, C, G	<i>Ptilotus obovatus</i> , <i>Rhagodia eremaea</i> , <i>Acacia pruinocarpa</i> , <i>Enchylaena tomentosa</i> , <i>Cymbopogon ambiguus</i>
< 0.2	< 2	F, C, S	<i>Cephalopterum drummondii</i> , <i>Maireana triptera</i> , <i>Menkea villosula</i> , <i>Ptilotus obovatus</i>
Other species (outside/ edges): <i>Acacia aneura</i> , <i>Cheilanthes</i> sp., <i>Eremophila fraseri</i> subsp. <i>fraseri</i> , <i>Psyrax latifolia</i> , <i>Santalum spicatum</i>			
<i>Acacia aneura</i> (edge) <i>Acacia pruinocarpa</i> <i>Cephalopterum drummondii</i> <i>Cheilanthes</i> sp. (edge) <i>Cymbopogon ambiguus</i> <i>Enchylaena tomentosa</i> <i>Eremophila fraseri</i> subsp. <i>fraseri</i> (edge) <i>Maireana triptera</i> <i>Menkea villosula</i> <i>Psyrax latifolia</i> (edge) <i>Ptilotus obovatus</i> <i>Rhagodia eremaea</i> <i>Santalum spicatum</i> R (edge)			

V8b 30 th July 2024 Relevé WRD area	
GPS: 584261 E/ 7026852 N Elevation: 498 m	Landform: Stony plain; south side of WRD area Area searched for <i>Euphorbia sarcostemmoides</i>
Land surface: Yellowish red silty clay loam; surface rock (BIF, chert, quartz) 10 – 20 %; litter < 5 %; fallen timber < 2 %	
Condition & disturbances: Poor; pastoral impacts high; sheet erosion; rabbits; many drought deaths and part crown deaths; condition of woodland patches – good	
Vegetation: Woodland patch – <i>Acacia pruinosa</i> , <i>Acacia aptaneura</i> low woodland over <i>Teucrium teucriflorum</i> , <i>Vincetoxicum lineare</i> , <i>Senna glutinosa</i> subsp. <i>xluerssenii</i> , <i>Psyrax suaveolens</i> shrubland over <i>Maireana georgei</i> low open chenopod shrubland over <i>Lepidium oxytrichum</i> , <i>Erodium cygnorum</i> , <i>Menkea villosula</i> , <i>Goodenia tenuiloba</i> , <i>Isoetopsis graminifolia</i> low forbland	
Vegetation: Stony plain – <i>Acacia aptaneura</i> low isolated trees over <i>Acacia ramulosa</i> var. <i>linophylla</i> , <i>Eremophila fraseri</i> subsp. <i>fraseri</i> , <i>Senna glaucifolia</i> sparse shrubland over <i>Ptilotus aervoides</i> , <i>Goodenia tenuiloba</i> , <i>Erodium cygnorum</i> low sparse forbland	
Stony plain <i>Acacia aptaneura</i> <i>Acacia ramulosa</i> var. <i>linophylla</i> <i>Eremophila fraseri</i> subsp. <i>fraseri</i> <i>Erodium cygnorum</i> <i>Goodenia tenuiloba</i> <i>Ptilotus aervoides</i> <i>Senna glaucifolia</i>	
Woodland patch <i>Acacia aptaneura</i> <i>Acacia pruinocarpa</i> <i>Erodium cygnorum</i> <i>Goodenia tenuiloba</i> <i>Isoetopsis graminifolia</i> <i>Lepidium oxytrichum</i> <i>Maireana georgei</i> <i>Menkea villosula</i> <i>Psyrax suaveolens</i> <i>Senna glutinosa</i> subsp. <i>xluerssenii</i> <i>Teucrium teucriflorum</i> <i>Vincetoxicum lineare</i>	No image

V9 30th July 2024 WRD east area

GPS: 583983 E/ 7027651 N		Landform: Hill; ridge, upper slope; aspect south	
Elevation: 515 m		Rocky scree slope	
Land surface: Shallow yellowish red silty clay loam; surface rock (BIF, chert) 60 – 80 %			
Condition & disturbances: Very good; pastoral impacts lower; forbs – many germinating			
NVIS 6: U1+^ <i>Acacia aptaneura</i> \Acacia\^shrub\4\i; M1^ <i>Eremophila latrobei</i> subsp. <i>latrobei</i> , <i>E. glutinosa</i> , <i>E. spathulata</i> , <i>Acacia aptaneura</i> , <i>Ptilotus rotundifolius</i> \Eremophila\^shrub\3\i; G1^ <i>Helipterum craspedioides</i> , <i>Cheilanthes sieberi</i> subsp. <i>sieberi</i> , <i>Nicotiana rosulata</i> \Helipterum\^forb, fern\1\i			
Vegetation: <i>Acacia aptaneura</i> tall open shrubland over <i>Eremophila latrobei</i> subsp. <i>latrobei</i> , <i>E. glutinosa</i> , <i>E. spathulata</i> open shrubland over <i>Helipterum craspedioides</i> , <i>Cheilanthes sieberi</i> subsp. <i>sieberi</i> , <i>Nicotiana rosulata</i> low sparse forbland			
Height (m)	Crown cover %	Habit	Species
4 – 6	10 – 20	S	<i>Acacia aptaneura</i>
0.9 – 1.5	20 – 30	S	<i>Eremophila latrobei</i> subsp. <i>latrobei</i> , <i>E. glutinosa</i> , <i>E. spathulata</i> , <i>Acacia aptaneura</i> , <i>Ptilotus rotundifolius</i>
< 0.2	2 – 10	F, E	<i>Helipterum craspedioides</i> , <i>Cheilanthes sieberi</i> subsp. <i>sieberi</i> , <i>Nicotiana rosulata</i>
<i>Acacia aptaneura</i> <i>Cheilanthes sieberi</i> subsp. <i>sieberi</i> <i>Eremophila latrobei</i> subsp. <i>latrobei</i> <i>Eremophila glutinosa</i> <i>Eremophila spathulata</i> <i>Nicotiana rosulata</i> <i>Ptilotus rotundifolius</i>			

V10 30th July 2024 Relevé

GPS: 583922 E/ 7027668 N
Elevation: 524 m

Landform: BIF Ridge; massive BIF outcrops; moderate to steep slopes north and south
North edge of Beebyn Prescribed area

Land surface: Skeletal yellowish red silty clay loam; surface rock > 90 %; litter < 10 %

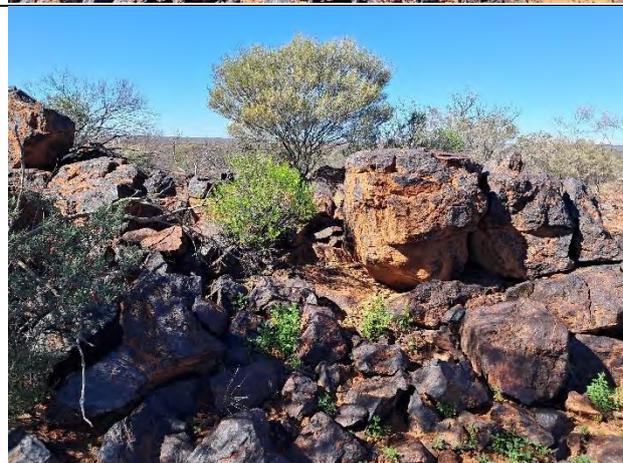
Condition & disturbances: Very good to excellent; low pastoral impacts; drought impacts – several deaths of small shrubs; healthy new growth from recent rains

Vegetation: *Acacia incurvaneura* isolated tall shrubs over *Thryptomene decussata*, *Eremophila latrobei* subsp. *latrobei*, *Eremophila glutinosa*, *Dodoniaea pachyneura*, *Acacia incurvaneura* open shrubland over *Micromyrtus sulphurea*, *Prostanthera petrophila*, *Hysterobaeckea occlusa*, *Thryptomene decussata* low open shrubland over *Stylidium longibracteatum*, *Dysphania rhadinostachya* subsp. *rhadinostachya*, *Cheilanthes lasiophyllum* low open forbland

Other species: *Santalum spicatum* (low tree), *Acacia pruinocarpa* (low tree), *Brachyscome iberidifolia*, *Amphipogon caricinus* var. *caricinus*

Acacia incurvaneura
Acacia pruinocarpa
Amphipogon caricinus var. *caricinus*
Brachyscome iberidifolia
Cheilanthes lasiophyllum
Dodoniaea pachyneura
Dysphania rhadinostachya subsp. *rhadinostachya*
Eremophila glutinosa
Eremophila latrobei subsp. *latrobei*
Hysterobaeckea occlusa
Micromyrtus sulphurea
Prostanthera petrophila
Santalum spicatum
Stylidium longibracteatum
Thryptomene decussata

Bottom image: *Prostanthera petrophila* habitat; massive BIF outcrop



V11 11.30 am 30th July 2024

GPS: 583701 E/ 7027463 N Elevation: 523 m	Landform: Hill; upper slope; aspect south east; colluvial outwash slope, moderate slope
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Land surface: Yellowish red silty clay loam; surface rock 30 – 40 %; litter < 5 %; fallen timber < 2 %

Condition & disturbances: Poor to good; pastoral Impacts; drought impacts – few deaths

NVIS 6: U1+^ *Acacia fuscaneura*, *A. pteraneura*, *A. sp. Weld Range*, *Thryptomene decussata*\Acacia\
^shrub\4\; M1^ *Acacia pteraneura*, *Eremophila latrobei* subsp. *latrobei*, *Senna glaucifolia*,
Thryptomene decussata\Acacia\<^shrub\3\; M2^ *Eremophila glutinosa*, *E. forrestii* subsp. *forrestii*,
Ptilotus obovatus, *Harnieria kempeana* subsp. *muelleri*\Eremophila\2\; G1^ *Erodium cygnorum*,
Helipterum craspedioides, *Monachather paradoxus*, *Harnieria kempeana* subsp. *muelleri*\Erodium\
^forb, tussock grass, shrub\1\bi

Vegetation: *Acacia fuscaneura*, *A. pteraneura*, *A. sp. Weld Range* tall open shrubland over *Acacia pteraneura*, *Eremophila latrobei* subsp. *latrobei*, *Senna glaucifolia* sparse shrubland over *Eremophila glutinosa*, *E. forrestii* subsp. *forrestii*, *Ptilotus obovatus* low sparse shrubland

Height (m)	Crown cover %	Habit	Species
2 – 6	10 – 30	S	<i>Acacia fuscaneura</i> , <i>A. pteraneura</i> , <i>A. sp. Weld Range</i> , <i>Thryptomene decussata</i>
1 – 2	2 – 10	S	<i>Acacia pteraneura</i> , <i>Eremophila latrobei</i> subsp. <i>latrobei</i> , <i>Senna glaucifolia</i> , <i>Thryptomene decussata</i>
0.2 – 1	2 – 10	S	<i>Eremophila glutinosa</i> , <i>E. forrestii</i> subsp. <i>forrestii</i> , <i>Ptilotus obovatus</i> , <i>Harnieria kempeana</i> subsp. <i>muelleri</i>
< 0.2	< 2	F, G, S	<i>Erodium cygnorum</i> , <i>Helipterum craspedioides</i> , <i>Monachather paradoxus</i> , <i>Harnieria kempeana</i> subsp. <i>muelleri</i>

Other species: *Grevillea berryana*, *Philotheca brucei* subsp. *brucei* (on minor BIF outcrop), *Acacia tetragonophylla*

- Acacia fuscaneura*
- Acacia pteraneura*
- Acacia sp. Weld Range*
- Acacia tetragonophylla*
- Eremophila forrestii* subsp. *forrestii*
- Eremophila glutinosa*
- Eremophila latrobei* subsp. *latrobei*
- Erodium cygnorum*
- Grevillea berryana*
- Harnieria kempeana* subsp. *muelleri*
- Helipterum craspedioides*
- Monachather paradoxus*
- Philotheca brucei* subsp. *brucei*
- Ptilotus obovatus*
- Senna glaucifolia*
- Thryptomene decussata*



V12 30th July 2024 WRD area north

GPS: 583725 E/ 7027355 N
Elevation: 514 m

Landform: Hill; lower midslope; colluvium; aspect south

Land surface: Surface rock (mostly gravel, 2 – 5 % 2 – 10 cm) 10 – 20 %; cryptogams (lichen) 50 – 60 %

Condition & disturbances: Poor; pastoral impacts moderate to high; active erosion

NVIS 6: U1+^ *Acacia fuscaneura*, *A. pteraneura*\Acacia\^shrub, tree\4\i; M1^ *Acacia ramulosa* var. *linophylla*, *A. fuscaneura*\Acacia\^shrub\3\i; G1^ *Solanum lasiophyllum*, *Ptilotus obovatus*, *Eragrostis eriopoda*\Solanum\^shrub, tussock grass\1\bi

Vegetation: *Acacia fuscaneura*, *A. pteraneura* tall open shrubland over *Acacia ramulosa* var. *linophylla*, *A. fuscaneura* sparse shrubland

Height (m)	Crown cover %	Habit	Species
2 – 6	10 – 30	S, T	<i>Acacia fuscaneura</i> , <i>A. pteraneura</i>
1 – 2	2 – 10	S	<i>Acacia ramulosa</i> var. <i>linophylla</i> , <i>A. fuscaneura</i>
< 0.5	< 2	S, G	<i>Solanum lasiophyllum</i> , <i>Ptilotus obovatus</i> , <i>Eragrostis eriopoda</i>

Other species: *Ptilotus rotundifolius*, *Eremophila glutinosa*

Acacia fuscaneura
Acacia pteraneura
Acacia ramulosa var. *linophylla*
Eragrostis eriopoda
Eremophila glutinosa
Ptilotus obovatus
Ptilotus rotundifolius
Solanum lasiophyllum



V13
GPS: 583819 E/ 7027484 N
isolated Acacia pruinocarpa starting, towards east

Several *Harnieria kempeana*, *Goodenia tenuiloba*, *Isoetopsis graminifolia*

V14
GPS: 583802 E/ 7027535 N
Landform: Hill; minor BIF outcrop; upper slope; aspect south
Condition: good; several drought deaths

Acacia fuscaneura low isolated trees over *Acacia fuscaneura*, *A. rhodophloia* tall sparse shrubland over *Eremophila latrobei* subsp. *latrobei*, *Philotheca brucei* subsp. *brucei*, *Grevillea berryana* sparse shrubland over *Brachyscome iberidifolia* low sparse forbland



V15 30th July 2024 Pit area

GPS: 583160 E/ 7027264 N
Elevation: 538 m

Landform: Hill; BIF; colluvial outwash slope; aspect south east;
BIF ridge to north

Land surface: Yellowish red silty clay loam; surface rock – variable (due to level of disturbance)

Condition & disturbances: Degraded with good patches; significant areas disturbed through historic mining activities; erosion active in some areas

Vegetation: *Acacia pruinocarpa* isolated trees over *Acacia pteraneura*, *A. aptaneura* tall open shrubland over *Dodonaea pachyneura* sparse shrubland over *Eremophila latrobei* subsp. *latrobei*, *Ptilotus obovatus*, *Harnieria kempeana* subsp. *muelleri*, *Sida* sp. Golden calyces, *Maireana* sp. low sparse to open shrubland

Other species: *Eremophila forrestii* subsp. *forrestii*

Acacia aptaneura
Acacia pruinocarpa
Acacia pteraneura
Dodonaea pachyneura
Eremophila forrestii subsp. *forrestii*
Eremophila latrobei subsp. *latrobei*
Harnieria kempeana subsp. *muelleri*
Maireana sp.
Ptilotus obovatus
Sida sp. Golden calyces glabrous



V16 30th July 2024 Pit area

GPS: 583222 E/ 7027228 N
Elevation: 532 m

Landform: Hill; midslope; moderate slope; aspect SE

Land surface: Yellowish red silty clay loam; surface rock 60 – 70 % (2 – 10 cm BIF, quartz, chert – 10 – 20 %; gravel 40 – 60 %); litter < 10 %; fallen timber < 2 %

Condition & disturbances: Good; pastoral and mining impacts; erosion active; drought impacts; low shrubs and groundcover grasses, forbs mainly under groups of taller shrubs or trees

NVIS 6: U1[^] *Acacia pruinocarpa* \Acacia\^tree\6\bi; M1+[^] *Acacia aptaneura*, *A. rhodophloia*, *A. pruinocarpa* \Acacia\^shrub\4\i; M2[^] *Thryptomene decussata*, *Acacia ramulosa* var. *linophylla*, *A. pruinocarpa* \Thryptomene\^shrub\3\r; G1[^] *Sida* sp. *Golden calyces*, *Harnieria kempeana* subsp. *muelleri*, *Thyridolepis multiculmis*, *Eragrostis eriopoda*, *Goodenia tenuiloba* \Sida\^shrub, tussock grass, forb\2\r

Vegetation: *Acacia pruinocarpa* low isolated trees over *Acacia aptaneura*, *A. rhodophloia*, *A. pruinocarpa* tall open shrubland over *Thryptomene decussata*, *Acacia ramulosa* var. *linophylla*, *A. pruinocarpa* sparse shrubland over *Sida* sp. *Golden calyces*, *Harnieria kempeana* subsp. *muelleri*, *Thyridolepis multiculmis* low sparse shrubland

Height (m)	Crown cover %	Habit	Species
8 – 10	< 2	T	<i>Acacia pruinocarpa</i>
3 – 6	10 – 30	S	<i>Acacia aptaneura</i> , <i>A. rhodophloia</i> , <i>A. pruinocarpa</i>
1 – 2	2 – 10	S	<i>Thryptomene decussata</i> , <i>Acacia ramulosa</i> var. <i>linophylla</i> , <i>A. pruinocarpa</i>
< 1	2 – 10	S, G, F	<i>Sida</i> sp. <i>Golden calyces</i> , <i>Harnieria kempeana</i> subsp. <i>muelleri</i> , <i>Thyridolepis multiculmis</i> , <i>Eragrostis eriopoda</i> , <i>Goodenia tenuiloba</i>

Other species: *Grevillea berryana*, *Eremophila glutinosa*

Acacia aptaneura
Acacia pruinocarpa
Acacia ramulosa var. *linophylla*
Acacia rhodophloia
Eragrostis eriopoda
Eremophila glutinosa
Goodenia tenuiloba
Grevillea berryana
Harnieria kempeana subsp. *muelleri*
Sida sp. *Golden calyces* glabrous
Thryptomene decussata
Thyridolepis multiculmis



V17 30th July 2024 Pit area 1.45 pm

GPS: 583130 E/ 7027147 N
Elevation: 527 m

Landform: Hill; midslope; gentle slope; aspect SE

Land surface: Yellowish red fine sandy clay loam; surface rock 10 – 20 %; litter < 10 %; fallen timber < 5 %; bare ground – patches of washed sand/ sandy loam 10 – 30 %

Condition & disturbances: Good – pastoral impacts; moderate mining impacts in broader area – some sedimentation from erosion along track; grasses mostly absent; some larger cleared areas adjacent

NVIS 6: U1+ ^ Acacia incurvaneura \Acacia\ ^tree, shrub\6\; M1^ Acacia ramulosa var. linophylla, A. rhodophloia \Acacia\ ^shrub\4\; M2^ Eremophila forrestii subsp. forrestii, E. latrobei subsp. latrobei, Harnieria kempeana subsp. muelleri, Eremophila fraseri subsp. fraseri, Abutilon sp. \Eremophila\ ^shrub\3\; G1^ Brachyscome iberidifolia, Erodium cygnorum, Goodenia tenuiloba, Cheilanthes sieberi subsp. sieberi

Vegetation: Acacia incurvaneura low woodland over Acacia ramulosa var. linophylla, A. rhodophloia isolated tall shrubs over Eremophila forrestii subsp. forrestii, E. latrobei subsp. latrobei, Harnieria kempeana subsp. muelleri open shrubland over Brachyscome iberidifolia, Erodium cygnorum, Goodenia tenuiloba, Cheilanthes sieberi subsp. sieberi low open forbland

Height (m)	Crown cover %	Habit	Species
6 – 9	25 – 30	T, S	Acacia incurvaneura
2 – 4	< 2	S	Acacia ramulosa var. linophylla, A. rhodophloia
0.5 – 1.5	20 – 30	S	Eremophila forrestii subsp. forrestii, E. latrobei subsp. latrobei, Harnieria kempeana subsp. muelleri, Eremophila fraseri subsp. fraseri, Abutilon sp.
< 0.3	10 – 20	F, E	Brachyscome iberidifolia, Erodium cygnorum, Goodenia tenuiloba, Cheilanthes sieberi subsp. sieberi

Other species: Acacia pruinocarpa, Ptilotus rotundifolius

Abutilon sp.
Acacia incurvaneura
Acacia pruinocarpa
Acacia ramulosa var. linophylla
Acacia rhodophloia
Brachyscome iberidifolia
Cheilanthes sieberi subsp. sieberi
Eremophila forrestii subsp. forrestii
Eremophila fraseri subsp. fraseri
Eremophila latrobei subsp. latrobei
Erodium cygnorum
Goodenia tenuiloba
Harnieria kempeana subsp. muelleri
Ptilotus rotundifolius



V18 30 th July 2024 Pit area			
GPS: 582740 E/ 7027049 N Elevation: 555 m		Landform: BIF ridge; upper slope; aspect north/ south steep sides; gentle to west; very steep to east > crest	
Land surface: Skeletal soils; surface rock (BIF, quartz) small rocks to boulders, 80 – 90 %			
Condition & disturbances: Very good; some mining activities on lower slope – clearing for drill locations and access tracks; signs of rabbits in broader area			
NVIS 6: M1 [^] <i>Thryptomene decussata</i> , <i>Acacia pruinocarpa</i> \Thryptomene\^shrub, tree\4\; M2 [^] <i>Acacia aptaneura</i> , <i>Thryptomene decussata</i> \Acacia\^shrub\3\; M3 [^] <i>Eremophila latrobei</i> subsp. <i>latrobei</i> , <i>Ptilotus obovatus</i> , <i>Dodonaea pachyneura</i> , <i>Tribulus suberosus</i> \Eremophila\^shrub\2\; G1 [^] <i>Dysphania rhadinostachya</i> subsp. <i>rhadinostachya</i> , <i>Erodium cygnorum</i> , <i>Helipterum craspedioides</i> , <i>Goodenia tenuiloba</i> , <i>Stenopetalum anfractum</i> \Dysphania \^forb\1\i			
Vegetation: <i>Thryptomene decussata</i> , <i>Acacia pruinocarpa</i> tall isolated shrubs over <i>Acacia incurvaneura</i> , <i>Thryptomene decussata</i> isolated shrubs over <i>Eremophila latrobei</i> subsp. <i>latrobei</i> , <i>Ptilotus obovatus</i> , <i>Dodonaea pachyneura</i> , <i>Tribulus suberosus</i> low open shrubland over <i>Dysphania rhadinostachya</i> subsp. <i>rhadinostachya</i> , <i>Erodium cygnorum</i> , <i>Helipterum craspedioides</i> low open forbland			
Height (m)	Crown cover %	Habit	Species
2 – 4	2 – 10	S, T	<i>Thryptomene decussata</i> , <i>Acacia pruinocarpa</i>
1 – 2	2 – 10	S	<i>Acacia incurvaneura</i> , <i>Thryptomene decussata</i>
0.3 – 1	10 – 30	S	<i>Eremophila latrobei</i> subsp. <i>latrobei</i> , <i>Ptilotus obovatus</i> , <i>Dodonaea pachyneura</i> , <i>Tribulus suberosus</i>
< 0.3	20 – 30	F, S, G	<i>Dysphania rhadinostachya</i> subsp. <i>rhadinostachya</i> , <i>Erodium cygnorum</i> , <i>Helipterum craspedioides</i> , <i>Goodenia tenuiloba</i> , <i>Stenopetalum anfractum</i> , <i>Micromyrtus sulphurea</i> , <i>Monachather paradoxus</i>
Other species: <i>Eremophila glutinosa</i> , <i>Philotheca brucei</i> subsp. <i>brucei</i> , <i>Senna glutinosa</i> subsp. <i>chatelainiana</i>			
<i>Acacia incurvaneura</i> <i>Acacia pruinocarpa</i> <i>Dodonaea pachyneura</i> <i>Dysphania rhadinostachya</i> subsp. <i>rhadinostachya</i> <i>Eremophila glutinosa</i> <i>Eremophila latrobei</i> subsp. <i>latrobei</i> <i>Erodium cygnorum</i> <i>Goodenia tenuiloba</i> <i>Helipterum craspedioides</i> <i>Micromyrtus sulphurea</i> <i>Monachather paradoxus</i> <i>Philotheca brucei</i> subsp. <i>brucei</i> <i>Ptilotus obovatus</i> <i>Senna glutinosa</i> subsp. <i>chatelainiana</i> <i>Stenopetalum anfractum</i> <i>Tribulus suberosus</i> <i>Thryptomene decussata</i>			
		Image > east	
			
		Image > west; gently sloping platform	

V19 30th July 2024 Pit area

GPS: 582925 E/ 7027244 N
Elevation: 547 m

Landform: BIF ridge; upper slope; moderate to steep slope;
rocky scree slope; aspect north

Land surface: Shallow yellowish red silty clay loam; surface rock (BIF, quartz, chert) ^ 40 cm, > 80 %;
litter < 10 %; fallen timber < 2 %

Condition & disturbances: Very good; historic mining activities adjacent – drill location, tunnel

NVIS 6: U1+^ *Acacia incurvaneura*, *A. pruinocarpa* \Acacia\^tree, shrub\6\i; M1^ *Eremophila latrobei* subsp. *latrobei*, *Tribulus suberosus*, *Psydrax latifolia*, *Ptilotus obovatus*, *Eremophila macmillaniana* \Eremophila\^shrub\2\i; G1^ *Erodium cygnorum*, *Dysphania rhadinostachya* subsp. *rhadinostachya*, *Lepidium oxytrichum*, *Goodenia tenuiloba*, *Paspalidium basicladum* \Erodium\^forb, tussock grass \1\i

Vegetation: *Acacia incurvaneura*, *A. pruinocarpa* low woodland over *Eremophila latrobei* subsp. *latrobei*, *Tribulus suberosus*, *Psydrax latifolia* low open shrubland over *Erodium cygnorum*, *Dysphania rhadinostachya* subsp. *rhadinostachya*, *Lepidium oxytrichum* low open forbland

Height (m)	Crown cover %	Habit	Species
5 – 9	20 – 30	T, S	<i>Acacia incurvaneura</i> , <i>A. pruinocarpa</i>
0.5 – 1.2	10 – 30	S	<i>Eremophila latrobei</i> subsp. <i>latrobei</i> , <i>Tribulus suberosus</i> , <i>Psydrax latifolia</i> , <i>Ptilotus obovatus</i> , <i>Eremophila macmillaniana</i>
< 0.3	10 – 15	F, G, S	<i>Erodium cygnorum</i> , <i>Dysphania rhadinostachya</i> subsp. <i>rhadinostachya</i> , <i>Lepidium oxytrichum</i> , <i>Goodenia tenuiloba</i> , <i>Paspalidium basicladum</i> , <i>Ptilotus obovatus</i>

Acacia incurvaneura
Acacia pruinocarpa
Dysphania rhadinostachya subsp. *rhadinostachya*
Eremophila latrobei subsp. *latrobei*
Eremophila macmillaniana
Erodium cygnorum
Goodenia tenuiloba
Lepidium oxytrichum
Paspalidium basicladum
Psydrax latifolia
Ptilotus obovatus
Tribulus suberosus



V20 30th July 2024 Pit area

GPS: 582979 E/ 7027232 N Elevation: 559 m	Landform: Hill, BIF ridge; outcrops; hill trends NE – SW; aspect NW, SE; steep upper slopes and narrow ridge
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Land surface: Skeletal pockets of reddish yellow silty clay loam; surface rock – outcrop and boulders > 90 %

Condition & disturbances: Excellent; low impacts

NVIS 6: U1[^] *Acacia pruinocarpa*, *A. incurvaneura* \Acacia\^tree, shrub\6\bj; M1+[^] *Eremophila latrobei* subsp. *latrobei*, *Dodonaea pachyneura*, *Philotheca brucei* subsp. *brucei* \Eremophila\^shrub\3\i; G1[^] *Ptilotus obovatus*, *Eremophila latrobei* subsp. *latrobei*, *Goodenia tenuiloba*, *Dysphania rhadinostachya* subsp. *rhadinostachya*, *Erodium cygnorum* \Ptilotus\^shrub, forb\1\c

Vegetation: *Acacia pruinocarpa*, *A. incurvaneura* low isolated trees to low open woodland over *Eremophila latrobei* subsp. *latrobei*, *Dodonaea pachyneura*, *Philotheca brucei* subsp. *brucei* open shrubland over *Ptilotus obovatus*, *Eremophila latrobei* subsp. *latrobei*, *Goodenia tenuiloba* low shrubland

Height (m)	Crown cover %	Habit	Species
6 – 9	2 (– 5)	T, S	<i>Acacia pruinocarpa</i> , <i>A. incurvaneura</i>
1 – 2	10 – 30	S	<i>Eremophila latrobei</i> subsp. <i>latrobei</i> , <i>Dodonaea pachyneura</i> , <i>Philotheca brucei</i> subsp. <i>brucei</i>
< 0.5	30 – 40	S, F, G	<i>Ptilotus obovatus</i> , <i>Eremophila latrobei</i> subsp. <i>latrobei</i> , <i>Goodenia tenuiloba</i> , <i>Dysphania rhadinostachya</i> subsp. <i>rhadinostachya</i> , <i>Erodium cygnorum</i> , <i>Sclerolaena</i> sp., <i>Paspalidium basicladum</i> , <i>Harnieria kempeana</i> subsp. <i>muelleri</i>

Acacia incurvaneura
Acacia pruinocarpa
Dodonaea pachyneura
Dysphania rhadinostachya subsp. *rhadinostachya*
Erodium cygnorum
Eremophila latrobei subsp. *latrobei*
Goodenia tenuiloba
Harnieria kempeana subsp. *muelleri*
Paspalidium basicladum
Philotheca brucei subsp. *brucei*
Ptilotus obovatus
Sclerolaena sp.



V21 31st July 2024 Gravel pit access

GPS: 582366 E/ 7027049 N
Elevation: 524 m

Landform: Hill; midslope, valley; gentle slope, aspect NNE

Land surface: Yellowish red silty clay loam; surface rock (BIF, quartz) 2 – 5 %; litter 20 – 30 % (under shrubs); fallen timber 2 – 4 %

Condition & disturbances: Very good; historic mining and recent pastoral impacts; old track, overgrown; sheet erosion

NVIS 6: U1^ *Acacia incurvaneura*, *A. caesaneura*, *A. pruinocarpa*, *A. craspedocarpa* \Acacia\ ^tree, shrub\6\; M1+^ *Acacia incurvaneura*, *A. ramulosa* var. *linophylla*, *Senna glaucifolia* \Acacia\ ^shrub\ 4\; M2^ *Eremophila forrestii* subsp. *forrestii*, *Tribulus suberosus*, *Eremophila georgei* \Eremophila\ 3\; G1^ *Erodium cygnorum*, *Eragrostis eriopoda*, *Monachather paradoxus* \Erodium\ ^forb, tussock grass\1\

Vegetation: *Acacia incurvaneura*, *A. caesaneura*, *A. pruinocarpa* low open woodland over *Acacia incurvaneura*, *A. ramulosa* var. *linophylla*, *Senna glaucifolia* tall open shrubland over *Eremophila forrestii* subsp. *forrestii*, *Tribulus suberosus*, *Eremophila georgei* open shrubland over *Erodium cygnorum*, *Eragrostis eriopoda*, *Monachather paradoxus* low open forbland

Height (m)	Crown cover %	Habit	Species
4 – 7	2 – 10	T, S	<i>Acacia incurvaneura</i> , <i>A. caesaneura</i> , <i>A. pruinocarpa</i> , <i>A. craspedocarpa</i>
2 – 4	10 – 30	S	<i>Acacia incurvaneura</i> , <i>A. ramulosa</i> var. <i>linophylla</i> , <i>Senna glaucifolia</i>
1 – 2	10 – 30	S	<i>Eremophila forrestii</i> subsp. <i>forrestii</i> , <i>Tribulus suberosus</i> , <i>Eremophila georgei</i>
< 0.3	10 – 30	F, G	<i>Erodium cygnorum</i> , <i>Eragrostis eriopoda</i> , <i>Monachather paradoxus</i>

Acacia caesaneura
Acacia craspedocarpa
Acacia incurvaneura
Acacia pruinocarpa
Acacia ramulosa var. *linophylla*
Eragrostis eriopoda
Eremophila forrestii subsp. *forrestii*
Eremophila georgei
Erodium cygnorum
Monachather paradoxus
Senna glaucifolia
Tribulus suberosus



V22 31st July 2024 Gravel pit access

GPS: 582283 E/ 7027224 N
Elevation: 523 m

Landform: Hill; midslope, unincised drainage line

Land surface: Yellowish red fine sandy clay loam; surface rock < 1 %; litter ^ 20 cm, 40 – 50 %; fallen timber < 1 %

Condition & disturbances: Very good; pastoral impacts; overgrown track; erosion (low) and sedimentation; rabbits

NVIS 6: U1+ ^ *Acacia fuscaneura*, *A. pruinocarpa* \ *Acacia* ^ tree, shrub \ 6 \ i; M1 ^ *Acacia ramulosa* var. *linophylla*, *Senna glutinosa* subsp. *xluerssenii*, *Psydrax latifolia* \ *Acacia* ^ shrub, tree \ 4 \ i; M2 ^ *Eremophila forrestii* subsp. *forrestii*, *E. georgei*, *Rhagodia eremaea*, *Eremophila gilesii*, *E. latrobei* subsp. *latrobei* \ *Eremophila* ^ shrub \ 3 \ c; G1 ^ *Erodium cygnorum*, *Isoetopsis graminifolia*, *Menkea villosula*, *Cheilanthes sieberi* subsp. *sieberi*, *Chthonocephalus pseudevax* \ *Erodium* ^ forb \ 1 \ c

Vegetation: *Acacia fuscaneura*, *A. pruinocarpa* low woodland over *Acacia ramulosa* var. *linophylla*, *Senna glutinosa* subsp. *xluerssenii*, *Psydrax latifolia* tall open shrubland over *Eremophila forrestii* subsp. *forrestii*, *E. georgei*, *Rhagodia eremaea* shrubland over *Erodium cygnorum*, *Isoetopsis graminifolia*, *Menkea villosula* low forbland

Height (m)	Crown cover %	Habit	Species
5 – 8	20 – 30	T, S	<i>Acacia fuscaneura</i> , <i>A. pruinocarpa</i>
2 – 4	20 – 30	S, T	<i>Acacia ramulosa</i> var. <i>linophylla</i> , <i>Senna glutinosa</i> subsp. <i>xluerssenii</i> , <i>Psydrax latifolia</i>
1 – 2	30 – 40	S	<i>Eremophila forrestii</i> subsp. <i>forrestii</i> , <i>E. georgei</i> , <i>Rhagodia eremaea</i> , <i>Eremophila gilesii</i> , <i>E. latrobei</i> subsp. <i>latrobei</i>
< 0.5	50 – 60	F, E, S	<i>Erodium cygnorum</i> , <i>Isoetopsis graminifolia</i> , <i>Menkea villosula</i> , <i>Cheilanthes sieberi</i> subsp. <i>sieberi</i> , <i>Chthonocephalus pseudevax</i> , <i>Panaetia lessonii</i> , <i>Eremophila latrobei</i> subsp. <i>latrobei</i>

Acacia fuscaneura
Acacia pruinocarpa
Acacia ramulosa var. *linophylla*
Cheilanthes sieberi subsp. *sieberi*
Chthonocephalus pseudevax
Eremophila forrestii subsp. *forrestii*
Eremophila georgei
Eremophila gilesii
Eremophila latrobei subsp. *latrobei*
Erodium cygnorum
Isoetopsis graminifolia
Menkea villosula
Panaetia lessonii
Psydrax latifolia
Rhagodia eremaea
Senna glutinosa subsp. *xluerssenii*



V23 31st July 2024 Gravel pit access 8.14 am

GPS: 582246 E/ 7027377 N		Landform: Low gravelly hill, midslope; gentle to moderate slope; aspect south	
Elevation: 526 m			
Land surface: Yellowish red silty clay loam; surface rock (gravel, chert, BIF, quartz) > 90 %; litter < 5 %; fallen timber < 1 %; bare ground < 2 %			
Condition & disturbances: Degraded to poor; pastoral impacts, rabbits			
NVIS 6: U1^ <i>Acacia aptaneura</i> , <i>A. pruinocarpa</i> \Acacia\^tree, shrub\6\r; M1^ <i>Senna glaucifolia</i> , <i>Scaevola spinescens</i> , <i>Acacia aptaneura</i> \Senna\^shrub\3\r; G1^ <i>Maireana melanocoma</i> , germinating forbs, <i>Eremophila forrestii</i> subsp. <i>forrestii</i> , <i>E. compacta</i> \Maireana\^chenopod shrub, forb, shrub\1\r			
Vegetation: <i>Acacia aptaneura</i> , <i>A. pruinocarpa</i> low open woodland over <i>Senna glaucifolia</i> , <i>Scaevola spinescens</i> , <i>Acacia aptaneura</i> sparse shrubland over <i>Maireana melanocoma</i> , germinating forbs, <i>Eremophila forrestii</i> subsp. <i>forrestii</i> low sparse chenopod shrubland			
Height (m)	Crown cover %	Habit	Species
4 – 8	2 – 10	T, S	<i>Acacia aptaneura</i> , <i>A. pruinocarpa</i>
1 – 1.5	2 – 10	S	<i>Senna glaucifolia</i> , <i>Scaevola spinescens</i> , <i>Acacia aptaneura</i>
0.1 – 0.3	2 – 10	C, F, S	<i>Maireana melanocoma</i> , germinating forbs, <i>Eremophila forrestii</i> subsp. <i>forrestii</i> , <i>E. compacta</i>
Other species: <i>Dodonaea pachyneura</i> , <i>Grevillea berryana</i> , <i>Sida ectogama</i> , <i>Micromyrtus sulphurea</i> , <i>Solanum lasiophyllum</i> , <i>Thryptomene decussata</i>			
<i>Acacia aptaneura</i> <i>Acacia pruinocarpa</i> <i>Dodonaea pachyneura</i> <i>Eremophila compacta</i> <i>Eremophila forrestii</i> subsp. <i>forrestii</i> <i>Grevillea berryana</i> <i>Maireana melanocoma</i> <i>Micromyrtus sulphurea</i> <i>Scaevola spinescens</i> <i>Senna glaucifolia</i> <i>Sida ectogama</i> <i>Solanum lasiophyllum</i> <i>Thryptomene decussata</i>			

V24 31st July 2024 Gravel pit access

GPS: 582255 E/ 7027536 N
Elevation: 529 m

Landform: Low hill; upper slope; gravelly hill; aspect north, gentle to moderate slope

Land surface: Yellowish red silty clay loam; surface rock (gravel) > 90 %

Condition & disturbances: Good; pastoral impacts, rabbits; minor erosion

NVIS 6: U1+^ *Acacia incurvaneura*, *A. pruinocarpa*, *A. aptaneura* \Acacia\ ^shrub, tree\4\i; M1^ *Acacia ramulosa* var. *linophylla*, *Eremophila latrobei* subsp. *latrobei*, *Acacia incurvaneura* \Acacia\ ^shrub\3\i; M2^ *Eremophila latrobei* subsp. *latrobei*, *Acacia incurvaneura*, *Senna glaucifolia*, *Stenanthemum patens*, *Eremophila compacta*, *Sida ectogama* \Eremophila\ ^shrub\2\i; G1^ *Ptilotus schwartzii*, *Eragrostis eriopoda* \Ptilotus\ ^shrub, tussock grass\1\i

Vegetation: *Acacia incurvaneura*, *A. pruinocarpa*, *A. aptaneura* tall open shrubland over *Acacia ramulosa* var. *linophylla*, *Eremophila latrobei* subsp. *latrobei*, *Acacia incurvaneura* sparse shrubland over *Eremophila latrobei* subsp. *latrobei*, *Acacia incurvaneura*, *Senna glaucifolia* low sparse shrubland

Height (m)	Crown cover %	Habit	Species
4 – 6	10 – 30	S, T	<i>Acacia incurvaneura</i> , <i>A. pruinocarpa</i> , <i>A. aptaneura</i>
1 – 2	2 – 10	S	<i>Acacia ramulosa</i> var. <i>linophylla</i> , <i>Eremophila latrobei</i> subsp. <i>latrobei</i> , <i>Acacia incurvaneura</i>
0.2 – 1	2 – 10	S	<i>Eremophila latrobei</i> subsp. <i>latrobei</i> , <i>Acacia incurvaneura</i> , <i>Senna glaucifolia</i> , <i>Stenanthemum patens</i> , <i>Eremophila compacta</i> , <i>Sida ectogama</i>
< 0.2	<2	S, G	<i>Ptilotus schwartzii</i> , <i>Eragrostis eriopoda</i>

Other species: *Eremophila glutinosa* (becoming dominant downslope), *Grevillea berryana*

Acacia aptaneura
Acacia incurvaneura
Acacia pruinocarpa
Acacia ramulosa var. *linophylla*
Eragrostis eriopoda
Eremophila compacta
Eremophila glutinosa
Eremophila latrobei subsp. *latrobei*
Grevillea berryana
Ptilotus schwartzii
Senna glaucifolia
Sida ectogama
Stenanthemum patens P1



V25 31st July 2024 Gravel pit access

GPS: 582252 E/ 7027637 N Elevation: 520 m	Landform: Hill; lower slope, valley with broad drainage line
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Land surface: Reddish yellow (7.5YR6/6) fine sandy clay loam; surface rock (gravel) 30 – 40 %;

Condition & disturbances:

NVIS 6: U1+^ *Acacia incurvaneura*, *A. fuscaneura*, *A. sp. Weld Range*, *Grevillea berryana*\Acacia\
^tree, shrub\6\i; M1^ *Eremophila forrestii* subsp. *forrestii*, *Acacia ramulosa* var. *linophylla*, *Senna glaucifolia*\Eremophila\
^shrub\3\i; M2^ *Eremophila forrestii* subsp. *forrestii*, *E. glutinosa*, *Sida ectogama*, *Solanum lasiophyllum*, *Thysanotus manglesianus*\Eremophila\
^shrub, climber\2\i; G1^ *Erodium cygnorum*, *Eragrostis eriopoda*\Erodium\
^forb, tussock grass

Vegetation: *Acacia incurvaneura*, *A. fuscaneura*, *A. sp. Weld Range* low woodland over *Eremophila forrestii* subsp. *forrestii*, *Acacia ramulosa* var. *linophylla*, *Senna artemisioides* subsp. *xsturtii* open shrubland over *Eremophila forrestii* subsp. *forrestii*, *E. glutinosa*, *Sida ectogama* low sparse shrubland over *Erodium cygnorum*, *Eragrostis eriopoda* low open forbland

Height (m)	Crown cover %	Habit	Species
4 – 8	10 – 30	T, S	<i>Acacia incurvaneura</i> , <i>A. fuscaneura</i> , <i>A. sp. Weld Range</i> , <i>Grevillea berryana</i>
1 – 2	10 – 30	S	<i>Eremophila forrestii</i> subsp. <i>forrestii</i> , <i>Acacia ramulosa</i> var. <i>linophylla</i> , <i>Senna artemisioides</i> subsp. <i>xsturtii</i>
0.3 – 1	2 – 10	S, L	<i>Eremophila forrestii</i> subsp. <i>forrestii</i> , <i>E. glutinosa</i> , <i>Sida ectogama</i> , <i>Solanum lasiophyllum</i> , <i>Thysanotus manglesianus</i>
< 0.3	10 – 20	F, G	<i>Erodium cygnorum</i> , <i>Eragrostis eriopoda</i>

Acacia fuscaneura
Acacia incurvaneura
Acacia ramulosa var. *linophylla*
Acacia sp. Weld Range
Eragrostis eriopoda
Eremophila forrestii subsp. *forrestii*
Eremophila glutinosa
Erodium cygnorum
Grevillea berryana
Senna artemisioides subsp. *xsturtii*
Sida ectogama
Solanum lasiophyllum
Thysanotus manglesianus



Downslope from description site – erosion moderate with erosion gullies, sheet erosion and areas of deposition

Other species:
Brachyscome iberidifolia
Psydrax latifolia
Psydrax suaveolens



V26 31st July 2024 8.55 am Gravel pit access

GPS: 582314 E/ 7027752 N Elevation: 522 m	Landform: Stony hill; midslope; aspect north; gentle slope
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Land surface: Yellowish red silty clay loam; surface rock (BIF, chert, quartz, 3 – 10 cm) 40 – 60 %; litter < 5 %; fallen timber < 1 %; bare ground 20 – 30 %

Condition & disturbances: Good; pastoral impacts, rabbits, sheet erosion; drought impacts – some deaths, and part crown deaths

NVIS 6: U1+ ^ *Acacia incurvaneura*, *A. sp. Weld Range* \ *Acacia* ^ \ *shrub* \ 4 \ r; M1 ^ *Ptilotus rotundifolius*, *Eremophila forrestii* subsp. *forrestii*, *Scaevola spinescens*, *Eremophila glutinosa*, *Acacia ramulosa* var. *linophylla* \ *Ptilotus* ^ \ *shrub* \ 3 \ r; G1 ^ *Ptilotus aervoides*, *P. schwartzii* , *Erodium cygnorum* , *Eremophila forrestii* subsp. *forrestii* \ *Ptilotus* ^ \ *shrub, forb* \ 1 \ bi

Vegetation: *Acacia incurvaneura*, *A. sp. Weld Range* tall sparse shrubland over *Ptilotus rotundifolius*, *Eremophila forrestii* subsp. *forrestii*, *Scaevola spinescens* sparse shrubland over *Ptilotus aervoides*, *P. schwartzii* , *Erodium cygnorum* low sparse shrubland

Height (m)	Crown cover %	Habit	Species
4 – 6	2 – 10	S	<i>Acacia incurvaneura</i> , <i>A. sp. Weld Range</i>
1 – 2	2 – 10	S	<i>Ptilotus rotundifolius</i> , <i>Eremophila forrestii</i> subsp. <i>forrestii</i> , <i>Scaevola spinescens</i> , <i>Eremophila glutinosa</i> , <i>Acacia ramulosa</i> var. <i>linophylla</i>
< 0.3	< 2	S, F	<i>Ptilotus aervoides</i> , <i>P. schwartzii</i> , <i>Erodium cygnorum</i> , <i>Eremophila forrestii</i> subsp. <i>forrestii</i>

Other species: *Senna artemisioides* subsp. *helmsii*, *S. artemisioides* subsp. *xsturtii*

Acacia incurvaneura
Acacia ramulosa var. *linophylla*
Acacia sp. Weld Range
Eremophila forrestii subsp. *forrestii*
Eremophila glutinosa
Erodium cygnorum
Ptilotus aervoides
Ptilotus rotundifolius
Ptilotus schwartzii
Scaevola spinescens
Senna artemisioides subsp. *helmsii*
Senna artemisioides subsp. *xsturtii*



Opportunistic site; downslope from V26
 GPS582302 E/ 7027815 N 520 m

Broad drainage line, unincised
Acacia incurvaneura woodland over
Eremophila georgei, *E. forrestii* subsp. *forrestii*,
Acacia ramulosa var. *linophylla* open
 shrubland over *Erodium cygnorum*,
Paspalidium basicladum low sparse forbland



V27 31st July 2024 Gravel pit access Relevé

GPS: 582366 E/ 7027851 N Elevation: 524 m	Landform: Hill, midslope; change from valley to stony slope; aspect NW
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Land surface: Surface rock 20 – 40 %

Condition & disturbances: Good; pastoral impacts; drought impacts

Vegetation: *Acacia pruinocarpa*, *A. caesaneura*, *A. incurvaneura*, *A. sp. Weld Range* tall open shrubland over *Eremophila latrobei* subsp. *latrobei*, *Ptilotus rotundifolius*, *E. fraseri* subsp. *fraseri*, *E. glutinosa*, *Senna artemisioides* subsp. *helmsii*, *Acacia tetragonophylla*, *Sida ectogama* sparse shrubland over *Hibiscus sturtii* low isolated shrubs

Eremophila fraseri subsp. *fraseri* becoming more common as changes to stony hillslope

<i>Acacia caesaneura</i> <i>Acacia incurvaneura</i> <i>Acacia pruinocarpa</i> <i>Acacia sp. Weld Range</i> <i>Acacia tetragonophylla</i> <i>Eremophila fraseri</i> subsp. <i>fraseri</i>	<i>Eremophila glutinosa</i> <i>Eremophila latrobei</i> subsp. <i>latrobei</i> <i>Hibiscus sturtii</i> <i>Ptilotus rotundifolius</i> <i>Senna artemisioides</i> subsp. <i>helmsii</i> <i>Sida ectogama</i>
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V28 31st July 2024 9.16 am Gravel pit access

GPS: 582432 E/ 7027922 N Elevation: 521 m	Landform: Hill, stony surface; gentle to moderate; aspect NW
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Land surface: Yellowish red silty clay loam; surface rock (BIF, dolerite, quartz, 2 – 10 cm) 40 – 60 %; litter < 2 %; fallen timber < 2 %

Condition & disturbances: Poor; pastoral impacts, drought impacts – *Acacia ramulosa* shrub died; patches of germinating forbs

NVIS 6: U1+[^]*Acacia incurvaneura*, *A. sp. Weld Range*\Acacia\^shrub\4\bi; M1[^] *Eremophila fraseri* subsp. *fraseri*, *A. speckii*\Eremophila\^shrub\3\bi; G1[^] *Goodenia tenuiloba*, *Ptilotus schwartzii*\Goodenia\^forb, shrub\1\r

Vegetation: *Acacia incurvaneura*, *A. sp. Weld Range* tall isolated shrubs over *Eremophila fraseri* subsp. *fraseri*, *A. speckii* isolated shrubs over *Goodenia tenuiloba*, *Ptilotus schwartzii* low sparse forbland

Height (m)	Crown cover %	Habit	Species
3 – 6	< 2	S	<i>Acacia incurvaneura</i> , <i>A. sp. Weld Range</i>
1 – 2	< 2	S	<i>Eremophila fraseri</i> subsp. <i>fraseri</i> , <i>A. speckii</i>
< 0.3	2 – 10	F, S	<i>Goodenia tenuiloba</i> , <i>Ptilotus schwartzii</i>

Acacia incurvaneura
Acacia speckii P4
Acacia sp. Weld Range
Eremophila fraseri subsp. *fraseri*
Goodenia tenuiloba
Ptilotus schwartzii



V29 31st July 2024 Gravel pit access

GPS: 582559 E/ 7028011 N Elevation: 519 m		Landform: Hill; stony with small outcrops of dolerite; gentle slope; aspect NW	
Land surface: Reddish brown clay loam; surface rock (dolerite – boulders, outcrop; BIF, chert rocks 2 – 20 cm) 60 – 80 %; litter < 10 %; fallen timber < 2 %			
Condition & disturbances: Pastoral impacts; drought impacts – deaths and part crown deaths; <i>Acacia speckii</i> with moderate to high crown death (2 deaths)			
NVIS 6: M1+^ <i>Acacia speckii</i> , <i>A. sp. Weld Range</i> , <i>Eremophila fraseri</i> subsp. <i>fraseri</i> \Acacia\ 4\i; M2^ <i>Eremophila latrobei</i> subsp. <i>latrobei</i> , <i>Ptilotus rotundifolius</i> \Eremophila\ ^shrub\3\; G1^ <i>Eremophila fraseri</i> subsp. <i>fraseri</i> , <i>E. compacta</i> , <i>Sida ectogama</i> \Eremophila\ ^shrub\2\; G2^ <i>Cephalopterum drummondii</i> , <i>Eremophila fraseri</i> subsp. <i>fraseri</i> , <i>Maireana georgei</i> \Cephalopterum\ ^forb, shrub, chenopod shrub\1\bi			
Vegetation: <i>Acacia speckii</i> , <i>A. sp. Weld Range</i> , <i>Eremophila fraseri</i> subsp. <i>fraseri</i> tall open shrubland over <i>Eremophila latrobei</i> subsp. <i>latrobei</i> , <i>Ptilotus rotundifolius</i> sparse shrubland over <i>Eremophila fraseri</i> subsp. <i>fraseri</i> , <i>E. compacta</i> , <i>Sida ectogama</i>			
Height (m)	Crown cover %	Habit	Species
2 – 3.5	10 – 20	S	<i>Acacia speckii</i> , <i>A. sp. Weld Range</i> , <i>Eremophila fraseri</i> subsp. <i>fraseri</i>
1 – 2	2 – 10	S	<i>Eremophila latrobei</i> subsp. <i>latrobei</i> , <i>Ptilotus rotundifolius</i>
0.2 – 0.8	2 – 10	S	<i>Eremophila fraseri</i> subsp. <i>fraseri</i> , <i>E. compacta</i> , <i>Sida ectogama</i>
< 0.2	< 2	F, S, C	<i>Cephalopterum drummondii</i> , <i>Eremophila fraseri</i> subsp. <i>fraseri</i> , <i>Maireana georgei</i>
<i>Acacia speckii</i> P4 <i>Acacia sp. Weld Range</i> <i>Cephalopterum drummondii</i> <i>Eremophila compacta</i> <i>Eremophila fraseri</i> subsp. <i>fraseri</i> <i>Eremophila latrobei</i> subsp. <i>latrobei</i> <i>Maireana georgei</i> <i>Ptilotus rotundifolius</i> <i>Sida ectogama</i>			

V30 31st July 2024 Gravel pit access

GPS: 582687 E/ 7028093 N
Elevation: 511 m

Landform: Hill; lower slope; gentle sloping stony plain with dolerite outcrops; aspect NNW

Land surface: Reddish brown clay loam; surface rock (dolerite boulders and outcrop; BIF, chert, quartz rocks) > 70 %; litter < 5%; fallen timber < 2 %

Condition & disturbances: Good; pastoral impacts; rabbits; drought impacts

NVIS 6: U1+^ *Acacia incurvaneura*, *A. aptaneura*\Acacia\^tree\6\; M1^ *Senna artemisioides* subsp. *helmsii*, *Eremophila fraseri* subsp. *fraseri*\Senna\^shrub\; G1^ *Sida ectogama*, *Eremophila latrobei* subsp. *latrobei*, *Maireana georgei*\Sida\^shrub, chenopod shrub\2\bi; G2^ *Erodium cygnorum*\Erodium\^forb\1\bi

Vegetation: *Acacia incurvaneura*, *A. aptaneura* low open woodland over *Senna artemisioides* subsp. *helmsii*, *Eremophila fraseri* subsp. *fraseri* sparse shrubland over *Sida ectogama*, *Eremophila latrobei* subsp. *latrobei*, *Maireana georgei* low isolated shrubs

Height (m)	Crown cover %	Habit	Species
4 – 6	2 – 10	T	<i>Acacia incurvaneura</i> , <i>A. aptaneura</i>
1 – 2	2 – 10	S	<i>Senna artemisioides</i> subsp. <i>helmsii</i> , <i>Eremophila fraseri</i> subsp. <i>fraseri</i>
0.2 – 0.8	< 2	S, C	<i>Sida ectogama</i> , <i>Eremophila latrobei</i> subsp. <i>latrobei</i> , <i>Maireana georgei</i>
< 0.2	< 2	F	<i>Erodium cygnorum</i>

Other species: *Acacia speckii*

Acacia aptaneura
Acacia incurvaneura
Acacia speckii P4
Eremophila fraseri subsp. *fraseri*
Eremophila latrobei subsp. *latrobei*
Erodium cygnorum
Maireana georgei
Senna artemisioides subsp. *helmsii*
Sida ectogama



Opportunistic site

GPS: 582768 E/ 7028160 N 509 m

Minor drainage line

Acacia incurvaneura, *A. craspedocarpa* tall open shrubland over *Eremophila georgei*, *E. fraseri* open shrubland

V31 Gravel pit area West			
GPS: 582870 E/ 7028230 N Elevation: 510 m		Landform: Change from stony plain/ lower slope of hill to alluvium/ hardpan plain; possible water discharge point	
Land surface: Yellowish red fine sandy clay loam; surface rock within depression/ wet area < 10 %			
Condition & disturbances: Very good; pastoral disturbances and rabbits; some drought impacts			
NVIS 6: U1+^ <i>Acacia pruinocarpa</i> , <i>Acacia incurvaneura</i> \Acacia\^tree, shrub\7\c; M1^ <i>Acacia craspedocarpa</i> , <i>Psyrax suaveolens</i> \Acacia\^shrub, tree\4\c; M2^ <i>Eremophila georgei</i> , <i>E. latrobei</i> subsp. <i>latrobei</i> , <i>E. forrestii</i> subsp. <i>forrestii</i> \Eremophila\^shrub\3\c; G1^ <i>Maireana georgei</i> , <i>Erodium cygnorum</i> \Maireana\^chenopod shrub, forb\1\bi			
Vegetation: <i>Acacia pruinocarpa</i> , <i>Acacia incurvaneura</i> woodland over <i>Acacia craspedocarpa</i> , <i>Psyrax suaveolens</i> tall isolated shrubs over <i>Eremophila georgei</i> , <i>E. latrobei</i> subsp. <i>latrobei</i> , <i>E. forrestii</i> subsp. <i>forrestii</i> shrubland over <i>Maireana georgei</i> , <i>Erodium cygnorum</i> low isolated chenopod shrubs			
Height (m)	Crown cover %	Habit	Species
8 – 12	30 – 40	T, S	<i>Acacia pruinocarpa</i> , <i>Acacia incurvaneura</i>
3 – 4	2 – 10	S, T	<i>Acacia craspedocarpa</i> , <i>Psyrax suaveolens</i>
1 – 1.5	30 – 40	S	<i>Eremophila georgei</i> , <i>E. latrobei</i> subsp. <i>latrobei</i> , <i>E. forrestii</i> subsp. <i>forrestii</i>
< 0.5	< 2	C, F	<i>Maireana georgei</i> , <i>Erodium cygnorum</i>
<i>Acacia craspedocarpa</i> <i>Acacia incurvaneura</i> <i>Acacia pruinocarpa</i> <i>Eremophila forrestii</i> subsp. <i>forrestii</i> <i>Eremophila georgei</i> <i>Eremophila latrobei</i> subsp. <i>latrobei</i> <i>Erodium cygnorum</i> <i>Maireana georgei</i> <i>Psyrax suaveolens</i>			

<p>Opportunistic site GP1</p> <p>GPS: 582884 E/ 7028230 N</p> <p>Hardan plain</p> <p>Condition: poor; pastoral impacts – moderate to high; lacks grasses, recruitment mostly absent</p> <p><i>Acacia incurvaneura</i> low isolated trees over <i>Eremophila forrestii</i> subsp. <i>forrestii</i> open shrubland over <i>Erodium cygnorum</i> low sparse forbland</p>	
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<p>Opportunistic site GP2 GPS: 582937 E/ 7028466 N Elevation: 508 m Hardpan plain; drainage area; alluvium Condition: poor; pastoral impacts; drought impacts moderate to high; recruitment/ regrowth of <i>Eremophila foliosissima</i> following wetter conditions <i>Acacia pruinocarpa</i>, <i>Acacia incurvaneura</i> low open woodland to low isolated trees over <i>Eremophila forrestii</i> subsp. <i>forrestii</i> sparse shrubland over <i>Eremophila foliosissima</i> low sparse shrubland over <i>Erodium cygnorum</i>, grass tussocks low open forbland</p>	
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V32 Gravel pit area NE			
GPS: 583130 E/ 7028519 N Elevation: 509 m		Landform: Stony plain with ironstone gravel; very gentle slope; aspect N - NE	
Land surface: Yellowish red fine sandy clay loam; surface rock – Ironstone gravel 30 – 40 %; rocks (BIF, chert, quartz) 30 – 40 %; litter < 5 %; fallen timber < 1 %			
Condition & disturbances: Poor; pastoral impacts – groundcover absent; little recruitment; drought impacts – several dead shrubs present			
NVIS 6: U1+^ <i>Acacia incurvaneura</i> , <i>A. pruinocarpa</i> , <i>A. mulganeura</i> \Acacia\^tree, shrub\6\; M1^ <i>Acacia incurvaneura</i> , <i>A. mulganeura</i> \Acacia\^shrub\3\; G1^ <i>Chenopod sp.</i> \Chenopod sp.\^chenopod shrub\1\			
Vegetation: <i>Acacia incurvaneura</i> , <i>A. pruinocarpa</i> , <i>A. mulganeura</i> low open woodland over <i>Acacia incurvaneura</i> , <i>A. mulganeura</i> isolated shrubs over <i>Chenopod sp.</i> low isolated chenopod shrubs			
Height (m)	Crown cover %	Habit	Species
4 – 7	2 – 10	T, S	<i>Acacia incurvaneura</i> , <i>A. pruinocarpa</i> , <i>A. mulganeura</i>
1 – 2	< 2	S	<i>Acacia incurvaneura</i> , <i>A. mulganeura</i>
< 1	< 2	S	<i>Chenopod sp.</i> (sterile, nearly dead)
<i>Acacia incurvaneura</i> <i>Acacia mulganeura</i> <i>Acacia pruinocarpa</i> <i>Chenopod sp.</i>			

V33 31st July 2024 10.46 am Gravel pit area East

GPS: 583213 E/ 7028420 N
Elevation: 509 m

Landform: Alluvial plain; depression/ partly incised drainage line

Land surface: Yellowish red fine sandy clay loam

Condition & disturbances: Good; pastoral impacts – many cattle tracks through area; rabbits; erosion; drought deaths – in particular one large tree (*A. pruinocarpa*); grasses absent

NVIS 6: U1+^ *Acacia pruinocarpa* \Acacia\^tree\7\i; M1^ *Acacia incurvaneura*, *A. fuscaneura*, *A. tetragonophylla* \Acacia\^shrub, tree\4\i; M2^ *Eremophila forrestii* subsp. *forrestii*, *Acacia pruinocarpa*, *Ptilotus obovatus* \Eremophila\^shrub\3\i; G1^ *Erodium cygnorum*, *Tetragonia cristata*, *Maireana ?tomentosa*, *Ptilotus polystachyus*, *Eremophila forrestii* subsp. *forrestii* \Erodium\^forb, chenopod shrub, shrub\1\i

Vegetation: *Acacia pruinocarpa* woodland over *Acacia incurvaneura*, *A. fuscaneura*, *A. tetragonophylla* tall open shrubland over *Eremophila forrestii* subsp. *forrestii*, *Acacia pruinocarpa*, *Ptilotus obovatus* open shrubland over *Erodium cygnorum*, *Tetragonia cristata*, *Eriochiton sclerolaenoides*, *Ptilotus polystachyus* low open forbland

Height (m)	Crown cover %	Habit	Species
> 10	20 – 30	T	<i>Acacia pruinocarpa</i>
2 – 5	10 – 30	S, T	<i>Acacia incurvaneura</i> , <i>A. fuscaneura</i> , <i>A. tetragonophylla</i>
1 – 1.5	20 – 30	S	<i>Eremophila forrestii</i> subsp. <i>forrestii</i> , <i>Acacia pruinocarpa</i> , <i>Ptilotus obovatus</i>
< 0.5	10 – 30	F, C, S	<i>Erodium cygnorum</i> , <i>Tetragonia cristata</i> , <i>Eriochiton sclerolaenoides</i> , <i>Ptilotus polystachyus</i> , <i>Eremophila forrestii</i> subsp. <i>forrestii</i>

Acacia fuscaneura
Acacia incurvaneura
Acacia pruinocarpa
Acacia tetragonophylla
Eremophila forrestii subsp. *forrestii*
Eriochiton sclerolaenoides
Erodium cygnorum
Paspalidium basicladum
Ptilotus obovatus
Ptilotus polystachyus
Senna sp. *Meekatharra*
Tetragonia cristata



Large *Acacia pruinocarpa* dead - ?drought impact

Regrowth under old crown extent – *Ptilotus obovatus*, *Eremophila forrestii* subsp. *forrestii* low open shrubland over *Erodium cygnorum*, *Tetragonia cristata* low forbland

Taller *Eremophila*, *Senna* sp. *Meekatharra* at edges



<p>Opportunistic site GP3 Alluvial plain/ hardpan GPS: 583196 E/ 7028436 N Elevation: 509 m Condition: degraded to poor; pastoral impacts (cattle) high; erosion – sheet wash and deposition</p> <p><i>Acacia incurvaneura</i>, <i>A. pruinocarpa</i>, <i>A. ramulosa</i> var. <i>linophylla</i> tall shrubland patches over <i>Eremophila forrestii</i> subsp. <i>forrestii</i> sparse shrubland over <i>Erodium cygnorum</i>, <i>Paspalidium basicladum</i>, <i>Eremophila forrestii</i> subsp. <i>forrestii</i> low open forbland</p>	
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V34 31 st July 2024 Gravel pit area SW			
GPS: 582934 E/ 7028150 N Elevation: 516 m		Landform: Stony gentle sloping plain; aspect NE	
Land surface: Yellowish red silty clay loam; surface rock – ironstone gravel 20 – 40 %; larger rocks 2 – 10 cm 20 – 40 %; litter < 5 %; fallen timber < 2 %			
Condition & disturbances: Poor; pastoral impacts, drought impacts – some deaths; sheet erosion			
NVIS 6: U1+^ <i>Grevillea berryana</i> , <i>Acacia aptaneura</i> \Grevillea\^tree\6\bi; M1^ <i>Acacia incurvaneura</i> , <i>A. ramulosa</i> var. <i>linophylla</i> , <i>Eremophila glutinosa</i> \Acacia\^shrub\3\bi; G1^ <i>Eragrostis eriopoda</i> , <i>Ptilotus aervoides</i> \Eragrostis\^tussock grass, forb\1\bi			
Vegetation: <i>Grevillea berryana</i> , <i>Acacia aptaneura</i> low isolated trees over <i>Acacia incurvaneura</i> , <i>A. ramulosa</i> var. <i>linophylla</i> , <i>Eremophila glutinosa</i> isolated shrubs over <i>Eragrostis eriopoda</i> , <i>Ptilotus aervoides</i> low isolated tussock grasses			
Height (m)	Crown cover %	Habit	Species
3 – 5	< 2	T	<i>Grevillea berryana</i> , <i>Acacia aptaneura</i>
1 – 2	< 2	S	<i>Acacia incurvaneura</i> , <i>A. ramulosa</i> var. <i>linophylla</i> , <i>Eremophila glutinosa</i>
< 0.2	< 2	G, F	<i>Eragrostis eriopoda</i> , <i>Ptilotus aervoides</i>
<i>Acacia aptaneura</i> <i>Acacia incurvaneura</i> <i>Acacia ramulosa</i> var. <i>linophylla</i> <i>Eragrostis eriopoda</i> <i>Eremophila glutinosa</i> <i>Grevillea berryana</i> <i>Ptilotus aervoides</i>			
Change to broad drainage line GPS: 583071 E/ 7028202 N Elevation: 514 m		<i>Acacia pruinosa</i> isolated trees over <i>Acacia incurvaneura</i> , <i>A. ramulosa</i> var. <i>linophylla</i> tall open shrubland over <i>Eremophila forrestii</i> subsp. <i>forrestii</i> open shrubland	

V35 31st July 2024 Pit area, north side

GPS: 583069 E/ 7027557 N
Elevation: 522 m

Landform: Colluvial outwash slope below BIF ridge; lower slope

Land surface: Surface rock (BIF, chert, quartz) 30 – 40 %

Condition & disturbances: Very good; pastoral impacts moderate

NVIS 6: U1[^] *Acacia incurvaneura*, *A. caesaneura* \Acacia\^tree, shrub\6\r; M1+[^] *Ptilotus rotundifolius*, *Senna glaucifolia*, *Acacia caesaneura*, *Eremophila forrestii* subsp. *forrestii*, *Acacia incurvaneura* \Ptilotus\^shrub\3\j; G1[^] *Ptilotus aevoides*, *Stenopetalum anfractum* \Ptilotus\^forb\1\bi

Vegetation: *Acacia incurvaneura*, *A. caesaneura* low open woodland over *Ptilotus rotundifolius*, *Senna glaucifolia*, *Acacia caesaneura* open shrubland over *Ptilotus aevoides*, *Stenopetalum anfractum* low isolated forbs

Height (m)	Crown cover %	Habit	Species
4 – 8	2 – 10	T, S	<i>Acacia incurvaneura</i> , <i>A. caesaneura</i>
1 – 2	10 – 20	S	<i>Ptilotus rotundifolius</i> , <i>Senna glaucifolia</i> , <i>Acacia caesaneura</i> , <i>Eremophila forrestii</i> subsp. <i>forrestii</i> , <i>Acacia incurvaneura</i> , <i>Eremophila latrobei</i> subsp. <i>latrobei</i>
< 0.3	< 2	F	<i>Ptilotus aevoides</i> , <i>Stenopetalum anfractum</i>

Acacia caesaneura
Acacia incurvaneura
Eremophila forrestii subsp. *forrestii*
Eremophila latrobei subsp. *latrobei*
Ptilotus aevoides
Ptilotus rotundifolius
Senna glaucifolia
Stenopetalum anfractum



V36 31st July 2024 Pit area, north side

GPS: 583086 E/ 7027479 N
Elevation: 527 m

Landform: Hill, colluvial outwash slope; moderate slope;
aspect NW

Land surface: Yellowish red silty clay loam; surface rock – fine gravel 30 – 40 %, BIF, chert rocks 5 – 20 cm 30 – 40 %; litter < 5 %; fallen timber < 1 %

Condition & disturbances: Very good; historic mining activities – tracks and drill locations; lower pastoral impacts

NVIS 6: U1+ ^ *Acacia incurvaneura*, *A. pruinocarpa*, *A. sp. Weld Range* \ *Acacia* \ ^ tree, shrub \ 6 \ r; M1 ^ *Eremophila macmillaniana*, *Senna glaucifolia*, *Eremophila fraseri* subsp. *fraseri*, *Ptilotus rotundifolius* \ *Eremophila* \ ^ shrub \ 3 \ r; M2 ^ *Ptilotus rotundifolius*, *Senna glaucifolia* \ *Ptilotus* \ ^ shrub \ 2 \ bi; G1 ^ *Maireana melanocoma*, *Ptilotus aervoides*, *Portulaca oleracea*, *Stenopetalum filifolium* \ *Maireana* \ ^ chenopod shrub, forb \ 1 \ bi

Vegetation: *Acacia incurvaneura*, *A. pruinocarpa*, *A. sp. Weld Range* tall open shrubland over *Eremophila macmillaniana*, *Senna glaucifolia*, *Eremophila fraseri* subsp. *fraseri* sparse shrubland over *Maireana melanocoma*, *Ptilotus aervoides*, *Portulaca oleracea* low isolated chenopod shrubs

Height (m)	Crown cover %	Habit	Species
3 – 8	10 – 20	T, S	<i>Acacia incurvaneura</i> , <i>A. pruinocarpa</i> , <i>A. sp. Weld Range</i>
1 – 2	2 – 10	S	<i>Eremophila macmillaniana</i> , <i>Senna glaucifolia</i> , <i>Eremophila fraseri</i> subsp. <i>fraseri</i> , <i>Ptilotus rotundifolius</i>
0.3 – 1	< 2	S	<i>Ptilotus rotundifolius</i> , <i>Senna glaucifolia</i>
< 0.3	< 2	C, F	<i>Maireana melanocoma</i> , <i>Ptilotus aervoides</i> , <i>Portulaca oleracea</i> , <i>Stenopetalum filifolium</i> , <i>Eragrostis eriopoda</i>

Other species: *Scaevola spinescens*

Acacia incurvaneura
Acacia pruinocarpa
Acacia sp. Weld Range
Eremophila fraseri subsp. *fraseri*
Eremophila macmillaniana
Maireana melanocoma
Ptilotus aervoides
Ptilotus rotundifolius
Portulaca oleracea
Senna glaucifolia
Stenopetalum filifolium
Scaevola spinescens



V37 31st July 2024 Gravel pit area north

GPS: 582908 E/ 7027436 N
Elevation: 524 m

Landform: Hill; colluvial outwash lower slope; moderate slope; aspect NW

Land surface: Yellowish red silty clay loam; surface rock (BIF, chert) 30 – 40 %

Condition & disturbances: Very good; access road (calcrete surfaced) to north, downslope

NVIS 6: U1+^ *Acacia incurvaneura*\Acacia\^tree\6\i; M1^ *Acacia sp. Weld Range, Eremophila macmillaniana*\Acacia\^shrub\4\i; M2^ *Eremophila macmillaniana, Senna glaucifolia, Psydrax latifolia, Senna artemisioides subsp. helmsii*\Eremophila\^shrub\3\i; M3^ *Eremophila forrestii subsp. forrestii, Psydrax latifolia, Hibiscus sturtii, Senna artemisioides subsp. helmsii*\Eremophila\ 2\i; G1^ *Maireana melanocoma, Ptilotus obovatus, Goodenia tenuiloba, Psydrax latifolia, Solanum lasiophyllum*\Maireana\^chenopod shrub, shrub, forb\1\i

Vegetation: *Acacia incurvaneura* low open woodland over *Acacia sp. Weld Range, Eremophila macmillaniana* tall sparse shrubland over *Eremophila macmillaniana, Senna glaucifolia, Psydrax latifolia* open shrubland over *Eremophila forrestii subsp. forrestii, Psydrax latifolia, Hibiscus sturtii* low sparse shrubland over *Maireana melanocoma, Ptilotus obovatus, Goodenia tenuiloba* low sparse chenopod shrubland

Height (m)	Crown cover %	Habit	Species
5 – 8	10 – 30	T	<i>Acacia incurvaneura</i>
2 – 4	2 – 10	S	<i>Acacia sp. Weld Range, Eremophila macmillaniana</i>
1 – 2	10 – 30	S	<i>Eremophila macmillaniana, Senna glaucifolia, Psydrax latifolia, Senna artemisioides subsp. helmsii</i>
0.3 – 1	2 – 10	S	<i>Eremophila forrestii subsp. forrestii, Psydrax latifolia, Hibiscus sturtii, Senna artemisioides subsp. helmsii</i>
< 0.3	2 – 10	C, S, F	<i>Maireana melanocoma, Ptilotus obovatus, Goodenia tenuiloba, Psydrax latifolia, Solanum lasiophyllum, Erodium cygnorum</i>

Acacia incurvaneura
Acacia sp. Weld Range
Eremophila forrestii subsp. forrestii
Eremophila macmillaniana
Erodium cygnorum
Goodenia tenuiloba
Hibiscus sturtii
Ptilotus obovatus
Maireana melanocoma
Psydrax latifolia
Senna artemisioides subsp. helmsii
Senna glaucifolia
Solanum lasiophyllum



V38 31st July 2024 Gravel pit area north/ outside

GPS: 582838 E/ 7027530 N Elevation: 520 m	Landform: Broad drainage line; very gentle slope; aspect ? west
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Land surface: Yellowish red fine sandy clay loam; surface rock < 5 %; litter 10 – 20 %; fallen timber 2 – 5 %

Condition & disturbances: Very good; pastoral impacts; sedimentation from erosion upslope – breach of road side bank

NVIS 6: U1+^ *Acacia incurvaneura*, *A. pruinocarpa*\Acacia\^tree\7\c; U2^ *Psyrax latifolia*\Psyrax\ 6\; M1^ *Eremophila forrestii* subsp. *forrestii*, *E. georgei*, *Rhagodia eremaea*\Eremophila\^shrub, chenopod shrub\3\; G1^ *Erodium cygnorum*, *Eremophila forrestii* subsp. *forrestii*, *Psyrax latifolia*, *Goodenia tenuiloba*, *Lepidium oxytrichum*\Erodium\^forb, shrub\2\c

Vegetation: *Acacia incurvaneura*, *A. pruinocarpa* open forest over *Psyrax latifolia* low open woodland over *Eremophila forrestii* subsp. *forrestii*, *E. georgei*, *Rhagodia eremaea* open shrubland over *Erodium cygnorum*, *Eremophila forrestii* subsp. *forrestii*, *Psyrax latifolia* low forbland

Height (m)	Crown cover %	Habit	Species
8 – 12 m	30 – 40	T	<i>Acacia incurvaneura</i> , <i>A. pruinocarpa</i>
4 – 7	2 – 10	T	<i>Psyrax latifolia</i>
1 – 2	20 – 30	S, C	<i>Eremophila forrestii</i> subsp. <i>forrestii</i> , <i>E. georgei</i> , <i>Rhagodia eremaea</i>
< 1	30 – 70	F, S, C, G	<i>Erodium cygnorum</i> , <i>Eremophila forrestii</i> subsp. <i>forrestii</i> , <i>Psyrax latifolia</i> , <i>Goodenia tenuiloba</i> , <i>Lepidium oxytrichum</i> , <i>Ptilotus obovatus</i> , <i>Maireana georgei</i> , <i>Crassula colorata</i> var. <i>acuminata</i> , <i>Monachather paradoxus</i> , <i>Tetragonia cristata</i> , <i>Acacia incurvaneura</i>

Acacia incurvaneura
Acacia pruinocarpa
Crassula colorata var. *acuminata*
Eremophila forrestii subsp. *forrestii*
Eremophila georgei
Erodium cygnorum
Goodenia tenuiloba
Lepidium oxytrichum
Maireana georgei
Monachather paradoxus
Psyrax latifolia
Ptilotus obovatus
Rhagodia eremaea
Tetragonia cristata



Opportunistic Site Pit01
 GPS: 582832 E/ 7027456 N Elevation: 522 m

Condition: degraded – active erosion (sheet, gully) from breach of road bank; calcrete road surface (white) washed downslope



V39 31st July 2024 2.30 pm Haul road and infrastructure

GPS: 581362 E/ 7025906 N
 Elevation: 518 m

Landform: Hardpan plain; alluvium; very gentle slope; aspect south; woodland patch

Land surface: Strong brown (7.5YR6/8) fine sandy clay loam; surface rock (very fine gravel) 10 – 20 %; litter 30 – 40 %; fallen timber 10 – 20 %; bare ground 10 – 30 %

Condition & disturbances: Very good within patch; degraded to poor in surrounding plain; pastoral impacts, rabbits; drought impacts

NVIS 6: U1+^ *Acacia pruinocarpa* \Acacia\^tree\6\; M1^ *Acacia incurvaneura*, *A. ramulosa* var. *linophylla* \Acacia\^shrub\4\; M2^ *Eremophila simulans* subsp. *simulans*, *E. georgei*, *E. forrestii* subsp. *forrestii*, *E. latrobei* subsp. *latrobei*, *Acacia tetragonophylla* \^shrub\3\; G1^ *Eragrostis eriopoda*, *Paspalidium basicladum*, *Ptilotus obovatus*, *Eremophila forrestii* subsp. *forrestii*, *Erodium cygnorum* \Eragrostis\^tussock grass, shrub, forb\1\

Vegetation: *Acacia pruinocarpa* low woodland over *Acacia incurvaneura*, *A. ramulosa* var. *linophylla* tall sparse shrubland over *Eremophila simulans* subsp. *simulans*, *E. georgei*, *E. forrestii* subsp. *forrestii* open shrubland over *Eragrostis eriopoda*, *Paspalidium basicladum*, *Ptilotus obovatus* low sparse tussock grassland

Height (m)	Crown cover %	Habit	Species
9 – 10	20 – 30	T	<i>Acacia pruinocarpa</i>
3 – 4	8 – 10	S	<i>Acacia incurvaneura</i> , <i>A. ramulosa</i> var. <i>linophylla</i>
1 – 2	10 – 20	S	<i>Eremophila simulans</i> subsp. <i>simulans</i> , <i>E. georgei</i> , <i>E. forrestii</i> subsp. <i>forrestii</i> , <i>E. latrobei</i> subsp. <i>latrobei</i> , <i>Acacia tetragonophylla</i>
< 0.5	2 – 10	G, S, F	<i>Eragrostis eriopoda</i> , <i>Paspalidium basicladum</i> , <i>Ptilotus obovatus</i> , <i>Eremophila forrestii</i> subsp. <i>forrestii</i> , <i>Erodium cygnorum</i>

Other species: *Maireana georgei*, *Psyrax latifolia*, *Senna glaucifolia*, *Helipterum craspedioides*

- Acacia incurvaneura*
- Acacia pruinocarpa*
- Acacia ramulosa* var. *linophylla*
- Acacia tetragonophylla*
- Eremophila forrestii* subsp. *forrestii*
- Eremophila georgei*
- Eremophila latrobei* subsp. *latrobei*
- Eremophila simulans* subsp. *simulans*
- Eragrostis eriopoda*
- Erodium cygnorum*
- Helipterum craspedioides*
- Maireana georgei*
- Paspalidium basicladum*
- Ptilotus obovatus*
- Psyrax latifolia*
- Senna glaucifolia*



Surrounding plain
 Condition: degraded to poor
 Active sheet erosion, hummocking, pedestalling

Tall open shrubland of *Acacia incurvaneura* and *A. ramulosa* var. *linophylla* over sparse shrubland over low sparse tussock grassland



V40 31 st July 2014 Relevé Haul road and infrastructure	
GPS: 581266 E/ 7025857 N Elevation: 517 m	Landform: Hardpan plain; minor drainage line, incised Aspect south
Land surface: Gravelly banks	
Condition & disturbances: Good; pastoral impacts along banks – some erosion; narrow strip of woodland/ tall shrubland	
Vegetation: <i>Acacia incurvaneura</i> , <i>A. pruinocarpa</i> open woodland over <i>Acacia ramulosa</i> var. <i>linophylla</i> , <i>A. incurvaneura</i> , <i>A. caesaneura</i> , <i>A. craspedocarpa</i> , <i>Psydrax latifolia</i> tall open shrubland over <i>Acacia tetragonophylla</i> sparse shrubland over <i>Cheilanthes sieberi</i> subsp. <i>sieberi</i> , Liverworts, grass tussocks low isolated ferns	
<p><i>Acacia caesaneura</i> <i>Acacia craspedocarpa</i> <i>Acacia incurvaneura</i> <i>Acacia pruinocarpa</i> <i>Acacia ramulosa</i> var. <i>linophylla</i> <i>Acacia tetragonophylla</i> <i>Psydrax latifolia</i> <i>Cheilanthes sieberi</i> subsp. <i>sieberi</i></p>	
<p>Adjacent plain, hardpan GPS: 581224 E/ 7025861 N Condition: degraded; high pastoral impacts, almost parkland cleared; severe erosion (sheet)</p> <p><i>Acacia incurvaneura</i> tall isolated shrubs to tall sparse shrubland over <i>Eremophila forrestii</i> subsp. <i>forrestii</i>, <i>A. ramulosa</i> var. <i>linophylla</i> isolated shrubs over <i>Eragrostis eriopoda</i> low sparse tussock grassland and <i>Erodium cygnorum</i> sparse forbs</p>	

V41 31st July 2024 3.30 pm Haul road – ROM and stockpile area

GPS: 580755 E/ 7025775 N
Elevation: 516 m

Landform: Outwash lower slope; drainage line; incised

Land surface: Yellowish red fine sandy clay loam; surface rock (gravel) < 20 %; litter 30 – 40 %; fallen timber 2 – 10 %; bare ground 20 – 30 %

Condition & disturbances: Very good; good diversity, recruitment; erosion along channel low to moderate; lower pastoral impacts than plain area

NVIS 6: U1+^ *Acacia incurvaneura*, *A. pruinocarpa* \Acacia\^tree\7\c; M1^ *Acacia ramulosa* var. *linophylla*, *Eremophila forrestii* subsp. *forrestii*, *Acacia pruinocarpa* \Acacia\^shrub, tree\4\r; M2^ *Eremophila forrestii* subsp. *forrestii*, *E. simulans* subsp. *simulans*, *Senna glaucifolia*, *Acacia pruinocarpa*, *A. ramulosa* var. *linophylla* \Eremophila\^shrub\3\c; G1^ *Senna artemisioides* subsp. *filifolia*, *Solanum lasiophyllum*, *Eremophila forrestii* subsp. *forrestii*, *Ptilotus schwartzii*, *Stenopetalum anfractum* \Senna\^shrub, forb\2\r

Vegetation: *Acacia incurvaneura*, *A. pruinocarpa* open forest over *Acacia ramulosa* var. *linophylla*, *Eremophila forrestii* subsp. *forrestii*, *Acacia pruinocarpa* tall sparse shrubland over *Eremophila forrestii* subsp. *forrestii*, *E. simulans* subsp. *simulans*, *Senna glaucifolia* shrubland over *Senna artemisioides* subsp. *filifolia*, *Solanum lasiophyllum*, *Eremophila forrestii* subsp. *forrestii* low sparse shrubland

Height (m)	Crown cover %	Habit	Species
8 – 12	30 – 40	T	<i>Acacia incurvaneura</i> , <i>A. pruinocarpa</i>
1.8 – 4	2 – 10	S, T	<i>Acacia ramulosa</i> var. <i>linophylla</i> , <i>Eremophila forrestii</i> subsp. <i>forrestii</i> , <i>Acacia pruinocarpa</i>
1 – 1.6	30 – 40	S	<i>Eremophila forrestii</i> subsp. <i>forrestii</i> , <i>E. simulans</i> subsp. <i>simulans</i> , <i>Senna glaucifolia</i> , <i>Acacia pruinocarpa</i> , <i>A. ramulosa</i> var. <i>linophylla</i> , <i>Eremophila latrobei</i> subsp. <i>latrobei</i>
< 1	2 – 10	S, F, G	<i>Senna artemisioides</i> subsp. <i>filifolia</i> , <i>Solanum lasiophyllum</i> , <i>Eremophila forrestii</i> subsp. <i>forrestii</i> , <i>Ptilotus schwartzii</i> , <i>Stenopetalum filifolium</i> , <i>Waitzia acuminata</i> , <i>Calotis multicaulis</i> , <i>Paspalidium basicladum</i> , <i>Lawrencella davenportii</i>

Acacia incurvaneura
Acacia pruinocarpa
Acacia ramulosa var. *linophylla*
Calotis multicaulis
Eremophila forrestii subsp. *forrestii*
Eremophila latrobei subsp. *latrobei*
Eremophila simulans subsp. *simulans*
Lawrencella davenportii
Paspalidium basicladum
Ptilotus schwartzii
Senna artemisioides subsp. *filifolia*
Senna glaucifolia
Solanum lasiophyllum
Stenopetalum filifolium
Waitzia acuminata



V42 31st July 2024 Haul road – ROM and stockpile area

GPS: 580829 E/ 7025847 N
Elevation: 519 m

Landform: Low rise between drainage lines; lower slope of range

Land surface: Yellowish red silty clay loam; surface rock (gravel) > 60 %;

Condition & disturbances: Very good; low pastoral impacts

NVIS 6: U1+ ^ *Acacia incurvaneura*, *A. pruinocarpa* \Acacia\ ^tree\6\; M1 ^ *Acacia incurvaneura*, *A. ramulosa* var. *linophylla*, *Grevillea berryana* \Acacia\ ^shrub, tree\4\; M2 ^ *Eremophila forrestii* subsp. *forrestii*, *Senna artemisioides* subsp. *filifolia*, *Acacia ramulosa* var. *linophylla* \Eremophila\ ^shrub\3\; G1 ^ *Eremophila forrestii* subsp. *forrestii*, *Ptilotus schwartzii*, *Eragrostis eriopoda*, *Eremophila jucunda* subsp. *jucunda* \Eremophila\ ^shrub, forb, tussock grass\1\

Vegetation: *Acacia incurvaneura*, *A. pruinocarpa* low open woodland over *Acacia incurvaneura*, *A. ramulosa* var. *linophylla*, *Grevillea berryana* tall open shrubland over *Eremophila forrestii* subsp. *forrestii*, *Senna artemisioides* subsp. *filifolia*, *Acacia ramulosa* var. *linophylla* open shrubland over *Eremophila forrestii* subsp. *forrestii*, *Ptilotus schwartzii*, *Eragrostis eriopoda* low sparse shrubland

Height (m)	Crown cover %	Habit	Species
5 – 8	2 – 10	T	<i>Acacia incurvaneura</i> , <i>A. pruinocarpa</i>
2 – 4	10 – 20	S, T	<i>Acacia incurvaneura</i> , <i>A. ramulosa</i> var. <i>linophylla</i> , <i>Grevillea berryana</i>
1 – 2	10 – 20	S	<i>Eremophila forrestii</i> subsp. <i>forrestii</i> , <i>Senna artemisioides</i> subsp. <i>filifolia</i> , <i>Acacia ramulosa</i> var. <i>linophylla</i>
< 0.5	2 – 10	S, F, G	<i>Eremophila forrestii</i> subsp. <i>forrestii</i> , <i>Ptilotus schwartzii</i> , <i>Eragrostis eriopoda</i> , <i>Eremophila jucunda</i> subsp. <i>jucunda</i>

Other species: *Hakea lorea*, *Eremophila simulans* subsp. *simulans*, *E. latrobei* subsp. *latrobei*

Acacia incurvaneura
Acacia pruinocarpa
Acacia ramulosa var. *linophylla*
Eragrostis eriopoda
Eremophila forrestii subsp. *forrestii*
Eremophila jucunda subsp. *jucunda*
Eremophila latrobei subsp. *latrobei*
Eremophila simulans subsp. *simulans*
Grevillea berryana
Hakea lorea
Ptilotus schwartzii
Senna artemisioides subsp. *filifolia*



V43 1st August 2024 11.35 am Haul road and infrastructure

GPS: 580642 E/ 7026199 N
Elevation: 545 m

Landform: Hill; midslope; colluvium;

Land surface: Yellowish red silty clay loam; surface rock (gravel and small rocks) > 80 %; litter < 10 % (mostly concentrated under larger shrubs); fallen timber < 2 %; bare ground < 10 %

Condition & disturbances: Good to very good; historic mining activities – old drill locations and rehab; current pastoral impacts; active erosion – rills, small gullies from run-off from access track; some drought deaths

NVIS 6: U1+ ^ *Acacia rhodophloia*, *A. incurvaneura* \ *Acacia* \ ^ *shrub, tree* \ 4 \ i; M1 ^ *Eremophila latrobei* subsp. *latrobei*, *Acacia incurvaneura* \ *Eremophila* \ ^ *shrub* \ 3 \ b; G1 ^ *Eremophila forrestii* subsp. *forrestii*, *E. latrobei* subsp. *latrobei*, *Goodenia tenuiloba*, *Erodium cygnorum*, *Cheilanthes sieberi* subsp. *sieberi* \ *Eremophila* \ ^ *shrub, forb, fern* \ 1 \ r

Vegetation: *Acacia rhodophloia*, *A. incurvaneura* tall open shrubland over *Eremophila latrobei* subsp. *latrobei*, *Acacia incurvaneura* isolated shrubs over *Eremophila forrestii* subsp. *forrestii*, *E. latrobei* subsp. *latrobei*, *Goodenia tenuiloba* low sparse shrubland

Height (m)	Crown cover %	Habit	Species
3 – 6	10 – 20	S, T	<i>Acacia rhodophloia</i> , <i>A. incurvaneura</i>
1 – 2	< 2	S	<i>Eremophila latrobei</i> subsp. <i>latrobei</i> , <i>Acacia incurvaneura</i>
< 0.6	2 – 10	S, F, E, G	<i>Eremophila forrestii</i> subsp. <i>forrestii</i> , <i>E. latrobei</i> subsp. <i>latrobei</i> , <i>Goodenia tenuiloba</i> , <i>Erodium cygnorum</i> , <i>Cheilanthes sieberi</i> subsp. <i>sieberi</i> , <i>Sida ectogama</i> , <i>Eragrostis eriopoda</i>

Other species: *Acacia speckii*

Acacia incurvaneura
Acacia rhodophloia
Acacia speckii P4
Cheilanthes sieberi subsp. *sieberi*
Eragrostis eriopoda
Eremophila forrestii subsp. *forrestii*
Eremophila latrobei subsp. *latrobei*
Erodium cygnorum
Goodenia tenuiloba
Sida ectogama



V44 1st August 2024 12.02 pm Haul road and infrastructure

GPS: 580077 E/ 7025341 N
Elevation: 529 m

Landform: Plain; alluvium; gentle slope; broad drainage line, channel to east; aspect SSE

Land surface: Yellowish red fine sandy clay loam; surface rock < 5 %; litter 20 – 30 %; fallen timber 10 – 20 %; bare ground < 10 %

Condition & disturbances: Good; moderate to high pastoral impacts; soil erosion in area; sheet wash and minor rills

NVIS 6: U1+ ^ Acacia fuscaneura, A. ramulosa var. linophylla \Acacia\ ^tree, shrub\6\; M1 ^ Acacia ramulosa var. linophylla, Rhagodia eremaea, Psydrax latifolia, Eremophila simulans subsp. simulans \Acacia\3\; M2 ^ Eremophila forrestii subsp. forrestii, Ptilotus obovatus \Eremophila\ ^shrub\2\; G1 ^ Tetragonia cristata, Erodium cygnorum, Maireana georgei, Stenopetalum filifolium, Calotis multicaulis \Tetragonia\ ^forb, chenopod shrub\1\c

Vegetation: Acacia fuscaneura, A. ramulosa var. linophylla low woodland over Acacia ramulosa var. linophylla, Rhagodia eremaea, Psydrax latifolia open shrubland over Eremophila forrestii subsp. forrestii, Ptilotus obovatus low open shrubland over Tetragonia cristata, Erodium cygnorum, Maireana georgei low forbland

Height (m)	Crown cover %	Habit	Species
5 – 10	10 – 30	T, S	Acacia fuscaneura, A. ramulosa var. linophylla
1 – 2	10 – 20	S, C	Acacia ramulosa var. linophylla, Rhagodia eremaea, Psydrax latifolia, Eremophila simulans subsp. simulans
0.3 – 0.9	10 – 20	S	Eremophila forrestii subsp. forrestii, Ptilotus obovatus
< 0.3	40 – 50	F, C, S, G, L	Tetragonia cristata, Erodium cygnorum, Maireana georgei, Stenopetalum filifolium, Calotis multicaulis, Calandrinia sp., Acacia fuscaneura, Monachather paradoxus, Vincetoxicum lineare, Lawrencella davenportii

Acacia fuscaneura
Acacia ramulosa var. linophylla
Calandrinia sp.
Calotis multicaulis
Eremophila forrestii subsp. forrestii
Eremophila simulans subsp. simulans
Erodium cygnorum
Lawrencella davenportii
Maireana georgei
Monachather paradoxus
Psydrax latifolia
Ptilotus obovatus
Rhagodia eremaea
Stenopetalum filifolium
Tetragonia cristata
Vincetoxicum lineare



V45 1st August 2024 12.15 pm Haul road and infrastructure

GPS: 579967 E/ 7025320 N
Elevation: 528 m

Landform: Low rise; gravelly, gentle slope; aspect south east

Land surface: Reddish yellow (7.5YR6/8) fine sandy clay loam; surface rock (gravel) > 50 %; litter

Condition & disturbances: Very good; lower pastoral impacts; some drought impacts

NVIS 6: U1+^ *Acacia caesaneura*, *A. fuscaneura*, *Grevillea berryana*\Acacia\^tree, shrub\6\i; M1^ *Acacia ramulosa* var. *linophylla*, *A. caesaneura*\Acacia\^shrub\4\i; M2^ *Eremophila forrestii* subsp. *forrestii*, *E. simulans* subsp. *simulans*, *E. latrobei* subsp. *latrobei*, *E. jucunda* subsp. *jucunda*\Eremophila\^shrub\3\i; G1^ *Eremophila jucunda* subsp. *jucunda*, *E. simulans* subsp. *simulans*, *Ptilotus schwartzii*, *Eragrostis eriopoda*, *Erodium cygnorum*\Eremophila\^shrub, tussock grass, forb\1\i

Vegetation: *Acacia caesaneura*, *A. fuscaneura*, *Grevillea berryana* low woodland over *Acacia ramulosa* var. *linophylla*, *A. caesaneura* tall sparse shrubland over *Eremophila forrestii* subsp. *forrestii*, *E. simulans* subsp. *simulans*, *E. latrobei* subsp. *latrobei* sparse shrubland over *Eremophila jucunda* subsp. *jucunda*, *E. simulans* subsp. *simulans*, *Ptilotus schwartzii* low sparse shrubland

Height (m)	Crown cover %	Habit	Species
4 – 7	20 – 30	T, S	<i>Acacia caesaneura</i> , <i>A. fuscaneura</i> , <i>Grevillea berryana</i>
2 – 3	2 – 10	S	<i>Acacia ramulosa</i> var. <i>linophylla</i> , <i>A. caesaneura</i>
0.5 – 1.2	2 – 10	S	<i>Eremophila forrestii</i> subsp. <i>forrestii</i> , <i>E. simulans</i> subsp. <i>simulans</i> , <i>E. latrobei</i> subsp. <i>latrobei</i> , <i>E. jucunda</i> subsp. <i>jucunda</i>
< 0.5	2 – 10	S, G, F	<i>Eremophila jucunda</i> subsp. <i>jucunda</i> , <i>E. simulans</i> subsp. <i>simulans</i> , <i>Ptilotus schwartzii</i> , <i>Eragrostis eriopoda</i> , <i>Erodium cygnorum</i> , <i>Goodenia berardiana</i> , <i>Sida</i> sp. <i>golden calyces</i>

Other species: *Helipterum craspedioides*

Acacia caesaneura
Acacia fuscaneura
Acacia ramulosa var. *linophylla*
Eragrostis eriopoda
Eremophila forrestii subsp. *forrestii*
Eremophila jucunda subsp. *jucunda*
Eremophila latrobei subsp. *latrobei*
Eremophila simulans subsp. *simulans*
Erodium cygnorum
Goodenia berardiana
Grevillea berryana
Helipterum craspedioides
Ptilotus schwartzii
Sida sp. *golden calyces* glabrous



V46 1st August 2024 2.26 pm Haul road and infrastructure

GPS: 579194 E/ 7025058 N
Elevation: 536 m

Landform: Low rise, gravelly colluvial outwash , gentle slope

Land surface: Strong brown (7.5YR6/8) silty clay loam; surface rock (gravel) > 70 %; litter – mostly < 1 % to > 90 % under tree

Condition & disturbances: Good to very good; pastoral impacts; historic mining impacts

NVIS 6: U1+^ *Acacia pruinocarpa*\Acacia\^tree\7r; M1^ *Acacia aptaneura*, *A. ramulosa* var. *linophylla*, *A. incurvaneura*\Acacia\^shrub\4i; M2^ *Eremophila forrestii* subsp. *forrestii*, *A. incurvaneura*, *A. aptaneura*, *Senna glaucifolia*, *Eremophila glutinosa*\Eremophila\^shrub\3r; G1^ *Erodium cygnorum*, *Goodenia berardiana*, *Stenopetalum filifolium*, *Eremophila forrestii* subsp. *forrestii*, *Eragrostis eriopoda*\Erodium\^forb, shrub, tussock grass\1bi

Vegetation: *Acacia pruinocarpa* isolated trees over *Acacia aptaneura*, *A. ramulosa* var. *linophylla*, *A. incurvaneura* tall open shrubland over *Eremophila forrestii* subsp. *forrestii*, *A. incurvaneura*, *A. aptaneura* sparse shrubland over *Erodium cygnorum*, *Goodenia berardiana*, *Stenopetalum filifolium* isolated forbs

Height (m)	Crown cover %	Habit	Species
10 – 12	2 – 10	T	<i>Acacia pruinocarpa</i>
3 – 6	10 – 20	S	<i>Acacia aptaneura</i> , <i>A. ramulosa</i> var. <i>linophylla</i> , <i>A. incurvaneura</i>
1 – 2	2 – 10	S	<i>Eremophila forrestii</i> subsp. <i>forrestii</i> , <i>A. incurvaneura</i> , <i>A. aptaneura</i> , <i>Senna glaucifolia</i> , <i>Eremophila glutinosa</i>
< 0.5	< 2	F, S, G	<i>Erodium cygnorum</i> , <i>Goodenia berardiana</i> , <i>Stenopetalum filifolium</i> , <i>Eremophila forrestii</i> subsp. <i>forrestii</i> , <i>Eragrostis eriopoda</i> , <i>Monachather paradoxus</i> , <i>Waitzia acuminata</i> , <i>Ptilotus schwartzii</i> , <i>Psyrdrax latifolia</i>

Acacia aptaneura
Acacia incurvaneura
Acacia pruinocarpa
Acacia ramulosa var. *linophylla*
Eragrostis eriopoda
Eremophila forrestii subsp. *forrestii*
Eremophila glutinosa
Erodium cygnorum
Goodenia berardiana
Monachather paradoxus
Psyrdrax latifolia
Ptilotus schwartzii
Senna glaucifolia
Stenopetalum filifolium
Waitzia acuminata



V47 1st August 2024 Haul road and infrastructure

GPS: 578245 E/ 7024730 N		Landform: Alluvial plain; broad drainage area with groves of mulga; unincised; almost level; aspect ?west	
Elevation: 535 m			
Land surface: Yellowish red clay loam; surface rock < 1 %; litter 20 – 30 %; fallen timber 5 – 10 %			
Condition & disturbances: Poor, some patches good; moderate to high pastoral impacts			
NVIS 6: U1+^ <i>Acacia incurvaneura</i> , <i>Psyrax latifolia</i> \Acacia\^tree\6i; M1^ <i>Eremophila forrestii</i> subsp. <i>forrestii</i> , <i>E. georgei</i> , <i>Brachychiton gregorii</i> , <i>Acacia incurvaneura</i> \Eremophila\^shrub\3c; G1^ <i>Eremophila forrestii</i> subsp. <i>forrestii</i> , <i>E. georgei</i> , <i>Maireana georgei</i> , <i>Stenopetalum filifolium</i> , <i>Thyridolepis multiculmis</i> \Eremophila\^shrub, chenopod shrub, forb, tussock grass\1r			
Vegetation: <i>Acacia incurvaneura</i> , <i>Psyrax latifolia</i> low woodland over <i>Eremophila forrestii</i> subsp. <i>forrestii</i> , <i>E. georgei</i> , <i>Brachychiton gregorii</i> shrubland over <i>Eremophila forrestii</i> subsp. <i>forrestii</i> , <i>E. georgei</i> , <i>Maireana georgei</i> low sparse shrubland			
Height (m)	Crown cover %	Habit	Species
4 – 9	10 – 30	T	<i>Acacia incurvaneura</i> , <i>Psyrax latifolia</i>
1 – 2	30 – 40	S	<i>Eremophila forrestii</i> subsp. <i>forrestii</i> , <i>E. georgei</i> , <i>Brachychiton gregorii</i> , <i>Acacia incurvaneura</i>
< 0.6	2 – 10	S, C, F, G	<i>Eremophila forrestii</i> subsp. <i>forrestii</i> , <i>E. georgei</i> , <i>Maireana georgei</i> , <i>Stenopetalum filifolium</i> , <i>Thyridolepis multiculmis</i> , <i>Ptilotus polystachyus</i> , <i>Erodium cygnorum</i>

Other species: *Eremophila granitica*

Acacia incurvaneura
Brachychiton gregorii
Eremophila forrestii subsp. *forrestii*
Eremophila georgei
Eremophila granitica
Erodium cygnorum
Maireana georgei
Psyrax latifolia
Ptilotus polystachyus
Stenopetalum filifolium
Thyridolepis multiculmis



V48 3.00 pm 1 st August 2024 Haul road and infrastructure			
GPS: 578249 E/ 7024621 N Elevation: 535 m		Landform: Stony hardpan plain, alluvium; almost level; aspect south	
Land surface: Yellowish red fine sandy clay loam; surface rock fine gravel 10 – 20 %, rocks 2 – 8 cm 20 – 30 %; litter < 5 %; fallen timber < 1 %			
Condition & disturbances: Poor; pastoral impacts; erosion – sheet, pedestalling			
NVIS 6: G1+^ <i>Eremophila jucunda</i> subsp. <i>jucunda</i> , <i>E. georgei</i> , <i>Ptilotus schwartzii</i> , <i>Eragrostis eriopoda</i> , <i>Eriochiton sclerolaenoides</i> \Eremophila\^shrub, tussock grass, chenopod shrub\1\r; G2^ <i>Erodium cygnorum</i> , <i>Ptilotus schwartzii</i> \Erodium\^forb, shrub\1\bi			
Vegetation: <i>Eremophila jucunda</i> subsp. <i>jucunda</i> , <i>E. georgei</i> , <i>Ptilotus schwartzii</i> low sparse shrubland over <i>Erodium cygnorum</i> , <i>Ptilotus schwartzii</i> low isolated forbs			
Height (m)	Crown cover %	Habit	Species
0.1 – 0.6	2 – 10	S, G, C	<i>Eremophila jucunda</i> subsp. <i>jucunda</i> , <i>E. georgei</i> , <i>Ptilotus schwartzii</i> , <i>Eragrostis eriopoda</i> , <i>Eriochiton sclerolaenoides</i>
< 0.1	< 2	F, S	<i>Erodium cygnorum</i> , <i>Ptilotus schwartzii</i>
Other species: <i>Acacia incurvaneura</i> , <i>A. tetragonophylla</i>			
<i>Acacia incurvaneura</i> <i>Acacia tetragonophylla</i> <i>Eragrostis eriopoda</i> <i>Eremophila georgei</i> <i>Eremophila jucunda</i> subsp. <i>jucunda</i> <i>Eriochiton sclerolaenoides</i> <i>Erodium cygnorum</i> <i>Ptilotus schwartzii</i>			

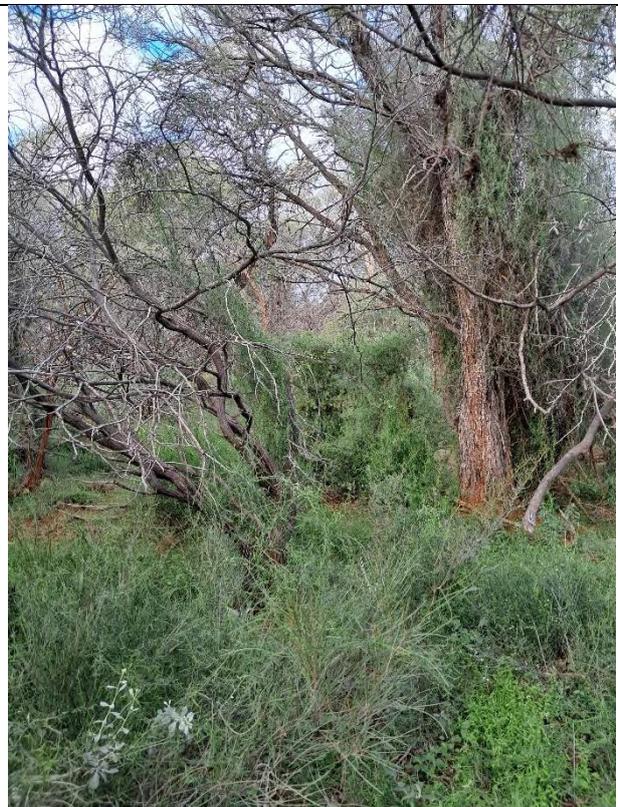
V49 1 st August 2024 3.25 pm Haul road and infrastructure	
GPS: 577478 E/ 7024031 N Elevation 528 m	Landform: Alluvial plain; broad unincised drainage line, depression; very gentle slope; aspect south
Land surface: Reddish brown clay loam; surface rock < 5 %; litter 20 – 30 %; fallen timber variable 2 – 20 %; bare ground < 10 %	
Condition & disturbances: Very good to excellent; more impacts (pastoral) around edges and within low forest with sparse understorey; vegetation variable with areas of dense vine thicket present; several sandalwood present, very healthy with excellent crop of fruit.	
Vine forest NVIS 6: U1+^ <i>Acacia pruinocarpa</i> , <i>A. incurvaneura</i> \Acacia\^tree\7\c; U2^ <i>Glycine canescens</i> , <i>Santalum spicatum</i> , <i>Psyrax latifolia</i> , <i>Acacia ramulosa</i> var. <i>linophylla</i> , <i>Acacia pruinocarpa</i> \Glycine\^vine, tree, shrub\4\c; M1^ <i>Acacia ramulosa</i> var. <i>linophylla</i> , <i>Glycine canescens</i> , <i>Psyrax latifolia</i> , <i>Acacia incurvaneura</i> , <i>A. tetragonophylla</i> \Acacia\^shrub, vine\3\i; G1^ <i>Sida ectogama</i> , <i>Glycine canescens</i> , <i>Rhagodia eremaea</i> , <i>Acacia ramulosa</i> var. <i>linophylla</i> , <i>Cheilanthes sieberi</i> subsp. <i>sieberi</i> \Sida\^shrub, vine, chenopod shrub, fern\2\c	
Vegetation vine forest area: <i>Acacia pruinocarpa</i> , <i>A. incurvaneura</i> open forest over <i>Glycine canescens</i> , <i>Santalum spicatum</i> , <i>Psyrax latifolia</i> vineland over <i>Acacia ramulosa</i> var. <i>linophylla</i> , <i>Glycine canescens</i> , <i>Psyrax latifolia</i> open shrubland over <i>Sida ectogama</i> , <i>Glycine canescens</i> , <i>Rhagodia eremaea</i> low shrubland	

Vine forest

Height (m)	Crown cover %	Habit	Species
8 – 12	30 – 50	T	<i>Acacia pruinocarpa</i> , <i>A. incurvaneura</i>
3 – 7	30 – 40	L, T, S	<i>Glycine canescens</i> , <i>Santalum spicatum</i> , <i>Psydrax latifolia</i> , <i>Acacia ramulosa</i> var. <i>linophylla</i> , <i>Acacia pruinocarpa</i> , <i>A. incurvaneura</i>
1 – 2	10 – 30	S, L	<i>Acacia ramulosa</i> var. <i>linophylla</i> , <i>Glycine canescens</i> , <i>Psydrax latifolia</i> , <i>Acacia incurvaneura</i> , <i>A. tetragonophylla</i>
< 1	30 – 40	S, L, C, E, F, G	<i>Sida ectogama</i> , <i>Glycine canescens</i> , <i>Rhagodia eremaea</i> , <i>Acacia ramulosa</i> var. <i>linophylla</i> , <i>Cheilanthes sieberi</i> subsp. <i>sieberi</i> , <i>Nicotiana obliqua</i> , <i>Teucrium teucriflorum</i> , <i>Thyridolepis multiculmis</i> , <i>Eremophila forrestii</i> subsp. <i>forrestii</i> , <i>Goodenia tenuiloba</i> , <i>Psydrax latifolia</i>

Other species: *Calotis multicaulis*, *Chorizema genistoides*, *Grevillea deflexa*, *Eremophila georgei*, *E. sp. Weld Range*, *Eragrostis falcata*, *Oxalis ?corniculata** (not in flower), *Ptilotus obovatus*

- Acacia incurvaneura*
- Acacia pruinocarpa*
- Acacia ramulosa* var. *linophylla*
- Acacia tetragonophylla*
- Calotis multicaulis*
- Cheilanthes sieberi* subsp. *sieberi*
- Chorizema genistoides*
- Eragrostis falcata*
- Eremophila forrestii* subsp. *forrestii*
- Eremophila georgei*
- Eremophila* sp. *Weld Range*
- Glycine canescens*
- Goodenia tenuiloba*
- Grevillea deflexa*
- Nicotiana obliqua*
- Oxalis ?corniculata**
- Psydrax latifolia*
- Ptilotus obovatus*
- Rhagodia eremaea*
- Santalum spicatum*
- Sida ectogama*
- Teucrium teucriflorum*
- Thyridolepis multiculmis*



Vegetation – more open woodland areas: *Acacia incurvaneura*, *A. pruinocarpa*, *Psydrax latifolia* low woodland over *Acacia ramulosa* var. *linophylla* tall open shrubland over *Acacia ramulosa* var. *linophylla*, *A. incurvaneura* sparse shrubland over *Eremophila forrestii* subsp. *forrestii*, *Acacia incurvaneura*, *Eremophila* sp. Weld range low sparse shrubland



Eremophila sp. Weld Range; very few records



More open woodland areas; vines sparse or absent



Chorizema genistoides – mostly on edges of woodland/ forest



Glycine canescens (vine) – dominant understorey in some areas

V50 2nd August 2024 7.15 am Haul road and infrastructure

GPS: 577241 E/ 7023373 N
Elevation: 520 m

Landform: Ironstone gravel plain; Very gentle slope; aspect
?west

Land surface: Strong brown (7.5YR5/8) silty clay loam; surface rock (fine ironstone gravel) > 70 %; litter < 5 %; fallen timber < 1 %

Condition & disturbances: Poor; pastoral impacts; drought impacts

NVIS 6: U1^ *Acacia pruinocarpa* \Acacia\^tree\6\bi; M1+^ *Acacia incurvaneura*, *A. tetragonophylla* \Acacia\^shrub\4\r; M2^ *Acacia incurvaneura*, *A. ramulosa* var. *linophylla*, *Eremophila latrobei* subsp. *latrobei*, *Acacia tetragonophylla* \Acacia\^shrub\3\r; M3^ *Eremophila forrestii* subsp. *forrestii*, *Acacia ramulosa* var. *linophylla*, *Eremophila georgei*, *Acacia incurvaneura*, *Solanum lasiophyllum* \Eremophila\^shrub\2\bi; G1^ *Stenopetalum filifolium*, *Menkea villosula*, *Isoetopsis graminifolia*, *Cephalopterum drummondii*, *Cheilanthes sieberi* subsp. *sieberi* \Stenopetalum\^forb, fern\1\i

Vegetation: *Acacia pruinocarpa* low isolated trees over *Acacia incurvaneura*, *A. tetragonophylla* tall sparse shrubland over *Acacia incurvaneura*, *A. ramulosa* var. *linophylla*, *Eremophila latrobei* subsp. *latrobei* sparse shrubland over *Stenopetalum filifolium*, *Menkea villosula*, *Isoetopsis graminifolia* low open forbland

Height (m)	Crown cover %	Habit	Species
9 – 10	< 2	T	<i>Acacia pruinocarpa</i>
3 – 6	2 – 5	S	<i>Acacia incurvaneura</i> , <i>A. tetragonophylla</i>
1 – 2	2 – 10	S	<i>Acacia incurvaneura</i> , <i>A. ramulosa</i> var. <i>linophylla</i> , <i>Eremophila latrobei</i> subsp. <i>latrobei</i> , <i>Acacia tetragonophylla</i>
0.3 – 1	< 2	S	<i>Eremophila forrestii</i> subsp. <i>forrestii</i> , <i>Acacia ramulosa</i> var. <i>linophylla</i> , <i>Eremophila georgei</i> , <i>Acacia incurvaneura</i> , <i>Solanum lasiophyllum</i> , <i>Ptilotus obovatus</i> , <i>P. schwartzii</i>
< 0.3	10 – 20	F, E	<i>Stenopetalum filifolium</i> , <i>Menkea villosula</i> , <i>Isoetopsis graminifolia</i> , <i>Cephalopterum drummondii</i> , <i>Cheilanthes sieberi</i> subsp. <i>sieberi</i> , <i>Ptilotus aevoides</i>

Acacia incurvaneura
Acacia pruinocarpa
Acacia ramulosa var. *linophylla*
Acacia tetragonophylla
Cephalopterum drummondii
Cheilanthes sieberi subsp. *sieberi*
Eremophila forrestii subsp. *forrestii*
Eremophila georgei
Eremophila latrobei subsp. *latrobei*
Isoetopsis graminifolia
Menkea villosula
Ptilotus aevoides
Ptilotus obovatus
Ptilotus schwartzii
Stenopetalum filifolium
Solanum lasiophyllum



V51 2nd August 2024 7.40 am Haul road and infrastructure

GPS: 577125 E/ 7022254 N Elevation: 520 m	Landform: Alluvial plain within ironstone plain; water gaining area; almost level, aspect south
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Land surface: Strong brown fine sandy clay loam; surface rock < 2 %; litter < 10 %; fallen timber 2 – 5 %; bare ground 40 – 60 %

Condition & disturbances: Good; structure mostly intact; historic mining activities adjacent to area – old tracks, drill locations and some rehabilitation (ripping). Pastoral impacts.

NVIS 6: U+^ *Acacia pruinocarpa*, *A. aptaneura*, *A. caesaneura* \Acacia\^tree, shrub\7\i; M1^ *Acacia ramulosa* var. *linophylla*, *A. caesaneura* \Acacia\^shrub\4\i; M2^ *Eremophila georgei*, *E. forrestii* subsp. *forrestii*, *Acacia aptaneura* \Eremophila\^shrub\3\i; G1^ *Eremophila georgei*, *E. foliosissima*, *Ptilotus schwartzii*, *Thyridolepis multiculmis*, *Ptilotus obovatus* \Eremophila\^shrub, tussock grass\ 1r

Vegetation: *Acacia pruinocarpa*, *A. aptaneura*, *A. caesaneura* open woodland over *Acacia ramulosa* var. *linophylla*, *A. caesaneura* tall sparse shrubland over *Eremophila georgei*, *E. forrestii* subsp. *forrestii*, *Acacia aptaneura* open shrubland over *Eremophila georgei*, *E. foliosissima*, *Ptilotus schwartzii* low sparse shrubland

Height (m)	Crown cover %	Habit	Species
6 – 14	10 – 20	T, S	<i>Acacia pruinocarpa</i> , <i>A. aptaneura</i> , <i>A. caesaneura</i>
2 – 5	2 – 10	S	<i>Acacia ramulosa</i> var. <i>linophylla</i> , <i>A. caesaneura</i>
1 – 2	20 – 30	S	<i>Eremophila georgei</i> , <i>E. forrestii</i> subsp. <i>forrestii</i> , <i>Acacia aptaneura</i>
< 0.5	2 – 10	S, G, E, F, C	<i>Eremophila georgei</i> , <i>E. foliosissima</i> , <i>Ptilotus schwartzii</i> , <i>Thyridolepis multiculmis</i> , <i>Ptilotus obovatus</i> , <i>Cheilanthes sieberi</i> subsp. <i>sieberi</i> , <i>Erodium cygnorum</i> , <i>Eragrostis eriopoda</i> , <i>Maireana georgei</i>

Other species: *Eremophila jucunda* subsp. *jucunda*

Acacia aptaneura
Acacia caesaneura
Acacia ramulosa var. *linophylla*
Acacia pruinocarpa
Cheilanthes sieberi subsp. *sieberi*
Eragrostis eriopoda
Eremophila foliosissima
Eremophila forrestii subsp. *forrestii*
Eremophila georgei
Eremophila jucunda subsp. *jucunda*
Erodium cygnorum
Maireana georgei
Ptilotus obovatus
Ptilotus schwartzii
Thyridolepis multiculmis



Adjacent open ironstone plain area
Acacia aptaneura tall open to sparse shrubland over *Eremophila jucunda* subsp. *jucunda*, *Ptilotus schwartzii* low isolated to sparse shrubland

APM site E6 within 200 m



V52 2nd August 2024 8.00 am Haul road and infrastructure

GPS: 576430 E/ 7020972 N
Elevation 509 m

Landform: Ironstone plain; almost level; drainage to south west;
narrow denser patch of vegetation within very sparse area

Land surface: Yellowish red fine sandy clay loam; surface rock (fine ironstone gravel) 40 – 50 %; litter

Condition & disturbances: Good; understory mostly intact under tree canopy.

NVIS 6: U1+^ *Acacia pruinocarpa*, *A. caesaneura*, *A. aptaneura* \Acacia\^tree, shrub\6\i; M1^ *Eremophila forrestii* subsp. *forrestii*, *Acacia tetragonophylla*, *Sida ectogama*, *Rhagodia eremaea*, *Hibiscus* sp. \Eremophila\^shrub, chenopod shrub\3\i; M2^ *Ptilotus obovatus*, *Maireana georgei*, *Eremophila georgei*, *Sida ectogama*, *Enchylaena tomentosa* \Ptilotus\^shrub, chenopod shrub\2\i; G1^ *Erodium cygnorum*, *Eremophila georgei*, *Sida ectogama*, *Solanum lasiophyllum*, *Calandrinia* sp. \Erodium\^forb, shrub\1\i

Vegetation: *Acacia pruinocarpa*, *A. caesaneura*, *A. aptaneura* low woodland over *Eremophila forrestii* subsp. *forrestii*, *Acacia tetragonophylla*, *Sida ectogama* open shrubland over *Ptilotus obovatus*, *Maireana georgei*, *Eremophila georgei* low open shrubland over *Erodium cygnorum*, *Eremophila georgei*, *Sida ectogama* low sparse forbland

Height (m)	Crown cover %	Habit	Species
6 – 10	10 – 30	T, S	<i>Acacia pruinocarpa</i> , <i>A. caesaneura</i> , <i>A. aptaneura</i>
1 – 2	20 – 30	S, C	<i>Eremophila forrestii</i> subsp. <i>forrestii</i> , <i>Acacia tetragonophylla</i> , <i>Sida ectogama</i> , <i>Rhagodia eremaea</i> , <i>Hibiscus</i> sp., <i>Eremophila latrobei</i> subsp. <i>latrobei</i>
0.2 – 1	10 – 30	S, C, G	<i>Ptilotus obovatus</i> , <i>Maireana georgei</i> , <i>Eremophila georgei</i> , <i>Sida ectogama</i> , <i>Enchylaena tomentosa</i> , <i>Hibiscus</i> sp., <i>Eremophila latrobei</i> subsp. <i>latrobei</i> , <i>Austrostipa elegantissima</i>
< 0.2	2 – 10	F, S, L, C, E	<i>Erodium cygnorum</i> , <i>Eremophila georgei</i> , <i>Sida ectogama</i> , <i>Solanum lasiophyllum</i> , <i>Calandrinia</i> sp., <i>Leichhardtia australis</i> , <i>Maireana georgei</i> , <i>Cheilanthes sieberi</i> subsp. <i>sieberi</i> , <i>Thyridolepis multiculmis</i>

Other species: *Psyrdrax latifolia* (4 m), *Teucrium teucriiflorum*, *Eragrostis eriopoda*

Acacia aptaneura
Acacia caesaneura
Acacia pruinocarpa
Acacia tetragonophylla
Austrostipa elegantissima
Calandrinia sp.
Cheilanthes sieberi subsp. *sieberi*
Eragrostis eriopoda
Enchylaena tomentosa
Eremophila forrestii subsp. *forrestii*
Eremophila georgei
Eremophila latrobei subsp. *latrobei*
Erodium cygnorum
Hibiscus sp.
Leichhardtia australis
Maireana georgei
Psyrdrax latifolia
Ptilotus obovatus



Rhagodia eremaea
Sida ectogama
Solanum lasiophyllum
Teucrium teucriiflorum
Thyridolepis multiculmis

V53 2nd August 2024 8.50 am Haul road and infrastructure

GPS: 576462 E/ 7020007 N
Elevation 514 m

Landform: Low stony hill, minor chert outcrops; gentle slope; aspect north; patches of low trees, tall shrubs within shrubland

Land surface: Strong brown (7.5YR5/6) silty clay loam; surface rock (chert, quartz, other) > 95 %, 2 – 5 cm 80%; litter < 10 %; fallen timber 2 – 3 %; bare ground < 1 %

Condition & disturbances: Very good; pastoral impacts lower than valley areas; signs of cattle in area; drought impacts – vegetation recovering

NVIS 6: U1+^ *Acacia aptaneura*, *A. grasbyi* \Acacia\6\; M1^ *Acacia aptaneura*, *Senna glaucifolia*, *Eremophila forrestii* subsp. *forrestii*, *E. pantonii* \Acacia\^shrub\3\; G1^ *Maireana thesioides*, *M. triptera*, *Senna glaucifolia*, *Solanum lasiophyllum*, *Acacia aptaneura* \Maireana\^chenopod shrub, shrub\2\

Vegetation: *Acacia aptaneura*, *A. grasbyi* low open woodland over *Acacia aptaneura*, *Senna glaucifolia*, *Eremophila forrestii* subsp. *forrestii* sparse shrubland over *Maireana thesioides*, *M. triptera*, *Senna glaucifolia* low open chenopod shrubland

Height (m)	Crown cover %	Habit	Species
3 – 5	2 – 10	T, S	<i>Acacia aptaneura</i> , <i>A. grasbyi</i>
1 – 2	2 – 5	S	<i>Acacia aptaneura</i> , <i>Senna glaucifolia</i> , <i>Eremophila forrestii</i> subsp. <i>forrestii</i> , <i>E. pantonii</i>
< 0.9	10 – 20	C, S, F	<i>Maireana thesioides</i> , <i>M. triptera</i> , <i>Senna glaucifolia</i> , <i>Solanum lasiophyllum</i> , <i>Acacia aptaneura</i> , <i>Cephalopterum drummondii</i> , <i>Sclerolaena</i> sp.

Other species: *Calandrinia* sp., *Helipterum craspedioides*, *Ptilotus exaltatus*, *P. obovatus*, *Sida calyxhymenia*, *S. ectogama*, *Abutilon* sp., *Stenopetalum filifolium*. *Stackhousia muricata*

- Abutilon* sp.
- Acacia aptaneura*
- Acacia grasbyi*
- Calandrinia* sp.
- Cephalopterum drummondii*
- Eremophila forrestii* subsp. *forrestii*
- Eremophila pantonii*
- Helipterum craspedioides*
- Maireana thesioides*
- Maireana triptera*
- Ptilotus exaltatus*
- Ptilotus obovatus*
- Sclerolaena* sp.
- Senna glaucifolia*
- Sida calyxhymenia*
- Sida ectogama*
- Stenopetalum filifolium*
- Solanum lasiophyllum*
- Stackhousia muricata*



V54 2nd August 2024 9.15 am Haul road and infrastructure

GPS: 576461 E/ 7020071 N
Elevation 512 m

Landform: Valley; broad drainage line, slight channelling

Land surface: Strong brown clay loam; surface rock – gravel patches 10 – 20 %; small granitic rock outcrop at edge of vegetation; litter 10 – 20 %; fallen timber < 5 %

Condition & disturbances: Very good; pastoral impacts

NVIS 6: U1+^ *Acacia fuscaneura*, *A. incurvaneura*, *A. aptaneura* \Acacia\^tree\6\i; M1^ *Acacia grasbyi*, *A. tetragonophylla*, *A. craspedocarpa*, *A. fuscaneura*, *A. ramulosa* var. *linophylla* \Acacia\^shrub, tree\4\i; M2^ *Acacia ramulosa* var. *linophylla*, *Acacia fuscaneura*, *Eremophila forrestii* subsp. *forrestii*, *Acacia aptaneura*, *Sida ectogama* \Acacia\^shrub\3\i; G1^ *Roepora lobulata*, *Solanum lasiophyllum*, *Erodium cygnorum*, *Cheilanthes sieberi* subsp. *sieberi*, *Maireana triptera* \Roepora\^forb, shrub, fern, chenopod shrub\1\i

Vegetation: *Acacia fuscaneura*, *A. incurvaneura*, *A. aptaneura* low woodland over *Acacia grasbyi*, *A. tetragonophylla*, *A. craspedocarpa* tall open shrubland over *Acacia ramulosa* var. *linophylla*, *Acacia fuscaneura*, *Eremophila forrestii* subsp. *forrestii* open shrubland over *Roepora lobulata*, *Solanum lasiophyllum*, *Erodium cygnorum* low open forbland

Height (m)	Crown cover %	Habit	Species
5 – 9	20 – 30 (40)	T	<i>Acacia fuscaneura</i> , <i>A. incurvaneura</i> , <i>A. aptaneura</i>
2 – 5	20 – 30	S, T	<i>Acacia grasbyi</i> , <i>A. tetragonophylla</i> , <i>A. craspedocarpa</i> , <i>A. fuscaneura</i> , <i>A. ramulosa</i> var. <i>linophylla</i> , <i>Hakea preissii</i>
1 – 2	10 – 30	S	<i>Acacia ramulosa</i> var. <i>linophylla</i> , <i>Acacia fuscaneura</i> , <i>Eremophila forrestii</i> subsp. <i>forrestii</i> , <i>Acacia aptaneura</i> , <i>Sida ectogama</i> , <i>Eremophila pantonii</i>
< 0.6	10 – 30	F, S, E, C	<i>Roepora lobulata</i> , <i>Solanum lasiophyllum</i> , <i>Erodium cygnorum</i> , <i>Cheilanthes sieberi</i> subsp. <i>sieberi</i> , <i>Maireana triptera</i> , <i>M. georgei</i> , <i>Ptilotus obovatus</i>

- Acacia aptaneura*
- Acacia fuscaneura*
- Acacia grasbyi*
- Acacia incurvaneura*
- Acacia ramulosa* var. *linophylla*
- Acacia tetragonophylla*
- Cheilanthes sieberi* subsp. *sieberi*
- Eremophila forrestii* subsp. *forrestii*
- Eremophila pantonii*
- Erodium cygnorum*
- Hakea preissii*
- Maireana georgei*
- Maireana triptera*
- Ptilotus obovatus*
- Roepora lobulata*
- Sida ectogama*
- Solanum lasiophyllum*



V54 Rocky outcrop area – granitic



V55 2nd August 2024 10 am Haul road and infrastructure

GPS: 576334 E/ 7019443 N Landform: Stony plain at lower slope of low hills; gentle slope; aspect south; patches of open shrubland in very sparse vegetation
 Elevation: 507 m

Land surface: Reddish brown clay loam; surface rock (dolerite, quartz) 30 – 50 %; litter < 5 %; fallen timber < 1 %; bare ground 30 – 40 %

Condition & disturbances: Poor; pastoral impacts; drought impacts – few deaths of shrubs

NVIS 6: U1^ *Acacia ?aneura*, *A. sp. Weld Range* \Acacia\^shrub, tree\4\bi; M1+^ *Eremophila macmillaniana*, *Acacia sp. Weld Range*, *Acacia speckii*, *A. ?aneura*, *Ptilotus rotundifolius* \Eremophila\^shrub\r; G1^ *Cephalopterum drummondii*, *Sida ectogama*, *Aristida contorta*, *Eremophila macmillaniana*, *Maireana sp.* \Cephalopterum\^forb, shrub, tussock grass, chenopod shrub\1\r

Vegetation: *Acacia ?aneura*, *A. sp. Weld Range* tall isolated shrubs over *Eremophila macmillaniana*, *Acacia sp. Weld Range*, *Acacia speckii* sparse shrubland over *Cephalopterum drummondii*, *Sida ectogama*, *Aristida contorta* low sparse forbland

Height (m)	Crown cover %	Habit	Species
3 – 5	< 2	S, T	<i>Acacia ?aneura</i> , <i>A. sp. Weld Range</i>
1 – 2	2 – 10	S	<i>Eremophila macmillaniana</i> , <i>Acacia sp. Weld Range</i> , <i>Acacia speckii</i> , <i>A. ?aneura</i> , <i>Ptilotus rotundifolius</i>
< 0.5	2 – 10	F, S, G, C, E	<i>Cephalopterum drummondii</i> , <i>Sida ectogama</i> , <i>Aristida contorta</i> , <i>Eremophila macmillaniana</i> , <i>Maireana sp.</i> , <i>Sclerolaena diacantha</i> , <i>Helipterum craspedioides</i> , <i>Cheilanthes sieberi</i> subsp. <i>sieberi</i> , <i>Erodium cygnorum</i>

Other species: *Brachychiton gregorii*

- Acacia ?aneura*
- Acacia speckii* P4
- Acacia sp. Weld Range*
- Aristida contorta*
- Brachychiton gregorii*
- Cephalopterum drummondii*
- Cheilanthes sieberi* subsp. *sieberi*
- Eremophila macmillaniana*
- Erodium cygnorum*
- Helipterum craspedioides*
- Maireana sp.*
- Ptilotus rotundifolius*
- Sclerolaena diacantha*
- Sida ectogama*



V56 2nd August 2024 10.45 am Haul road and infrastructure

GPS: 575645 E/ 7018931 N
Elevation: 512 m

Landform: Gravelly low hills; gentle slope; aspect north
Potential gravel source

Land surface: Reddish yellow fine sandy clay loam; surface rock (lateritic gravel) 30 – 40 %; litter 5 – 10 %; fallen timber 1 – 2 %; bare ground 30 – 40 %

Condition & disturbances: Good; low recruitment; pastoral impacts; drought impacts

NVIS 6: U1^ *Acacia caesaneura*\Acacia\^shrub\4r; M1+^ *Acacia ramulosa* var. *linophylla*\Acacia\^shrub\3i; G1^ *Ptilotus schwartzii*, *Sida ectogama*, *Eremophila forrestii* subsp. *forrestii*\Ptilotus\^shrub\1\bi

Vegetation: *Acacia caesaneura* tall sparse shrubland over *Acacia ramulosa* var. *linophylla* open shrubland over *Ptilotus schwartzii*, *Sida ectogama*, *Eremophila forrestii* subsp. *forrestii* low isolated shrubs

Height (m)	Crown cover %	Habit	Species
3 – 4	2 – 4	S	<i>Acacia caesaneura</i> ?
1 – 2	20 – 30	S	<i>Acacia ramulosa</i> var. <i>linophylla</i>
< 0.5	< 1	S, G	<i>Ptilotus schwartzii</i> , <i>Sida ectogama</i> , <i>Eremophila forrestii</i> subsp. <i>forrestii</i>

Other species: *Maireana georgei*, *Eremophila latrobei* subsp. *latrobei*, *Acacia pruinocarpa* (low tree, upslope)

Acacia caesaneura ? – much insect damage to new shoots and phyllodes; new shoots not resinous, phyllodes with rounded tips

Acacia pruinocarpa

Acacia ramulosa var. *linophylla*

Eremophila forrestii subsp. *forrestii*

Eremophila latrobei subsp. *latrobei*

Maireana georgei

Ptilotus schwartzii

Sida ectogama



V57 2nd August 2024 11.03 am Haul road and infrastructure

GPS: 575356 E/ 7018979 N
Elevation: 505 m

Landform: Hill; minor drainage line
Trapdoor spiders present

Land surface: Yellowish red clay loam; surface rock < 10 %; litter 10 – 30 % (mostly under larger shrubs); fallen timber < 2 %; cryptogams (lichen, liverworts) 2 – 10 %; bare ground < 10 %

Condition & disturbances: Very good; pastoral impacts – moderate – cattle tracks, grazing, ground disturbances; drought impacts - some deaths – would have been tall shrubland now tall open shrubland, part crown deaths

NVIS 6: U1+^ *Acacia incurvaneura*, *A. tetragonophylla* \Acacia\^shrub, tree\4\i; M1^ *Eremophila forrestii* subsp. *hastieana*, *E. latrobei* subsp. *latrobei* \Eremophila\^shrub\3\i; G1^ *Waitzia acuminata*, *Erodium cygnorum*, *Panaetia lessonii*, *Cheilanthes sieberi* subsp. *sieberi*, *Helipterum craspedioides* \Waitzia\^forb, fern\1\c

Vegetation: *Acacia incurvaneura*, *A. tetragonophylla* tall open shrubland over *Eremophila forrestii* subsp. *hastieana*, *E. latrobei* subsp. *latrobei* open shrubland over *Waitzia acuminata*, *Erodium cygnorum*, *Panaetia lessonii* low forbland

Height (m)	Crown cover %	Habit	Species
3.5 – 5	10 – 30	S, T	<i>Acacia incurvaneura</i> , <i>A. tetragonophylla</i>
1 – 2	20 – 30	S	<i>Eremophila forrestii</i> subsp. <i>hastieana</i> , <i>E. latrobei</i> subsp. <i>latrobei</i>
< 0.5	50 – 70	F, E, G	<i>Waitzia acuminata</i> , <i>Erodium cygnorum</i> , <i>Panaetia lessonii</i> , <i>Cheilanthes sieberi</i> subsp. <i>sieberi</i> , <i>Helipterum craspedioides</i> , <i>Stenopetalum filifolium</i> , <i>Cephalopterum drummondii</i> , <i>Eragrostis dielsii</i> , <i>Euphorbia boophthona</i> , <i>Menkea villosula</i> , <i>Isoetopsis graminifolia</i>

Acacia incurvaneura
Acacia tetragonophylla
Cephalopterum drummondii
Cheilanthes sieberi subsp. *sieberi*
Eragrostis dielsii
Eremophila forrestii subsp. *hastieana*
Eremophila latrobei subsp. *latrobei*
Erodium cygnorum
Euphorbia boophthona
Helipterum craspedioides
Isoetopsis graminifolia
Panaetia lessonii
Stenopetalum filifolium
Waitzia acuminata



V58 2nd August 2024 Haul road and infrastructure

GPS: 574750 E/ 7018889 N
Elevation: 511 m

Landform: Low hills; mid slope; gentle slope; aspect north

Land surface: Reddish yellow (7.5YR6/6) fine sandy clay loam; surface rock (lateritic gravel) 60 – 70 %; litter 5 – 10 %; fallen timber 1 – 2 %; cryptogams – negligible; bare ground 10 – 20 %; erosion – sheet wash; drought impacts – some deaths and part crown deaths, ground cover very sparse

Condition & disturbances: Good; drought and pastoral impacts

NVIS 6: U1^ *Acacia incurvaneura*, *Psydrax latifolia* \Acacia\^tree, shrub\6\bi; M1+^ *Acacia ramulosa* var. *linophylla* \Acacia\^shrub\4\i; M2^ *Eremophila forrestii* subsp. *forrestii* \Eremophila\^shrub\3\bi; G1^ *Sida* sp. *Golden calyces glabrous*, *Ptilotus schwartzii*, *Eremophila forrestii* subsp. *forrestii*, *Waitzia acuminata*, *Erodium cygnorum* \Sida\^shrub, forb\1\r

Vegetation: *Acacia incurvaneura*, *Psydrax latifolia* low isolated trees over *Acacia ramulosa* var. *linophylla* tall open shrubland over *Sida* sp. *Golden calyces glabrous*, *Ptilotus schwartzii*, *Eremophila forrestii* subsp. *forrestii* low sparse shrubland

Height (m)	Crown cover %	Habit	Species
4 – 6	< 2	T, S	<i>Acacia incurvaneura</i> , <i>Psydrax latifolia</i>
2 – 3.5	10 – 20	S	<i>Acacia ramulosa</i> var. <i>linophylla</i>
1 – 2	< 2	S	<i>Eremophila forrestii</i> subsp. <i>forrestii</i>
< 0.6	2 – 10	S, F, L	<i>Sida</i> sp. <i>Golden calyces glabrous</i> , <i>Ptilotus schwartzii</i> , <i>Eremophila forrestii</i> subsp. <i>forrestii</i> , <i>Waitzia acuminata</i> , <i>Erodium cygnorum</i> , <i>Stenopetalum filifolium</i> , <i>Thysanotus manglesianus</i>

Other species: *Grevillea berryana* (4 – 8m), *Menkea villosula*

Acacia incurvaneura
Acacia ramulosa var. *linophylla*
Eremophila forrestii subsp. *forrestii*
Erodium cygnorum
Grevillea berryana
Menkea villosula
Psydrax latifolia
Ptilotus schwartzii
Sida sp. *Golden calyces glabrous*
Stenopetalum filifolium
Thysanotus manglesianus
Waitzia acuminata



Extinct mallee fowl mound
GPS: 574735 E/ 7018873 N
Elevation: 510 m



V59 2nd August 2024 12.38 pm Haul road and infrastructure

GPS: 574600 E/ 7019045 N Elevation: 508 m	Landform: Broad drainage line; unincised area; hardpan plain Almost level; aspect north; drains into incised drainage line (V60)
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Land surface: Reddish brown clay loam; surface rock (gravel) < 10 %; litter 10 %; fallen timber 2 – 10 %; bare ground 2 – 20 %; moist

Condition & disturbances: Very good to excellent; some pastoral impacts; structure appears mostly intact; grasses present but sparse

NVIS 6: U1+^ *Acacia pruinocarpa*, *A. incurvaneura* \Acacia\^tree\7\c; U2^ *Psyrax suaeveolens* \Psyrax\^tree\6\l; M1^ *Eremophila forrestii* subsp. *hastieana*, *E. georgei*, *Sida ectogama*, *Psyrax suaveolens*, *P. latifolia* \Eremophila\^shrub\3\c; G1^ *Ptilotus obovatus*, *Eremophila georgei*, *Acacia incurvaneura*, *Erodium cygnorum*, *Arthropodium* sp. \Ptilotus\^shrub, forb\1\i

Vegetation: *Acacia pruinocarpa*, *A. incurvaneura* open forest over *Psyrax suaeveolens* low open woodland over *Eremophila forrestii* subsp. *hastieana*, *E. georgei*, *Sida ectogama* shrubland over *Ptilotus obovatus*, *Eremophila georgei*, *Acacia incurvaneura* low open shrubland

Height (m)	Crown cover %	Habit	Species
9 – 12	30 – 50	T	<i>Acacia pruinocarpa</i> , <i>A. incurvaneura</i>
3 – 5	2 – 10	T	<i>Psyrax suaeveolens</i>
1 – 1.6	30 – 40	S	<i>Eremophila forrestii</i> subsp. <i>hastieana</i> , <i>E. georgei</i> , <i>Sida ectogama</i> , <i>Psyrax suaveolens</i> , <i>P. latifolia</i> , <i>Acacia incurvaneura</i>
< 0.6	10 – 30	S, F, G, L	<i>Ptilotus obovatus</i> , <i>Eremophila georgei</i> , <i>Acacia incurvaneura</i> , <i>Erodium cygnorum</i> , <i>Arthropodium</i> sp., <i>Brachyscome iberidifolia</i>

Other species: *Acacia craspedocarpa*, *Eragrostis eriopoda*, *Eremophila foliosissima*, *Helipterum craspedioides*, *Thyridolepis multiculmis*

- Acacia craspedocarpa*
- Acacia incurvaneura*
- Acacia pruinocarpa*
- Arthropodium* sp.
- Brachyscome iberidifolia*
- Eragrostis eriopoda*
- Eremophila foliosissima*
- Eremophila forrestii* subsp. *hastieana*
- Eremophila georgei*
- Erodium cygnorum*
- Helipterum craspedioides*
- Psyrax suaeveolens*
- Psyrax latifolia*
- Ptilotus obovatus*
- Sida ectogama*
- Thyridolepis multiculmis*



V60 2 nd August 2024 Relevé Haul road and infrastructure	
GPS: 574618 E/ 7019128 N Elevation 503 m	Landform: Hardpan plain; incised ephemeral drainage line; drainage to west; pools present, sandy banks and exposed hardpan
Land surface:	
Condition & disturbances: Good to very good; pastoral impacts; erosion	
Vegetation: <i>Acacia caesaneura</i> , <i>A. tetragonophylla</i> , <i>Hakea preissii</i> tall shrubland over <i>Acacia ramulosa</i> var. <i>linophylla</i> , <i>Eremophila fraseri</i> subsp. <i>fraseri</i> , <i>Acacia tetragonophylla</i> , <i>Glycine canescens</i> shrubland over <i>Chorizema genistoides</i> , <i>Hakea preissii</i> , <i>Grevillea deflexa</i> , low open shrubland	
	
Pools present to depth ~ 0.8 m; dense vegetation on creek banks with pockets of vegetation on islands; few aquatic plants present; many insects	Pockets of shrubland dominated by <i>Acacia</i> and <i>Hakea</i> spp., with understorey of <i>Chorizema genistoides</i> , <i>Grevillea deflexa</i> and <i>Glycine canescens</i> (vine)
<i>Acacia aptaneura</i> <i>Acacia caesaneura</i> <i>Acacia ramulosa</i> var. <i>linophylla</i> <i>Acacia tetragonophylla</i> <i>Aristida contorta</i> <i>Calandrinia</i> sp. (sterile) <i>Chorizema genistoides</i> <i>Cymbopogon ambiguus</i> <i>Dysphania rhadinostachya</i> subsp. <i>rhadinostachya</i> <i>Eremophila forrestii</i> subsp. <i>hastieana</i>	<i>Eremophila fraseri</i> subsp. <i>fraseri</i> <i>Eremophila georgei</i> <i>Glycine canescens</i> <i>Grevillea deflexa</i> <i>Haloragis odontocarpa</i> <i>Marsilea hirsuta</i> <i>Nicotiana obliqua</i> <i>Rhodanthe ?sterilescens</i> (in bud) <i>Sida ectogama</i>

V61 2nd August 2024 1.27 pm Relevé Haul road and infrastructure

GPS: 573866 E/ 7018932 N
Elevation 508 m

Landform: Broad, channelled drainage line with gravel banks;
signs of flooding, debris; aspect SW

Land surface: Deep gravel banks, scattered rocks

Condition & disturbances: Good; signs of high flows through area – main drainage line; erosion, old tracks; pastoral impacts

Vegetation: *Acacia pteraneura*, *A. fuscaneura* tall open shrubland (3 – 5 m) over *Acacia fuscaneura*, *Grevillea deflexa*, *Eremophila fraseri* subsp. *fraseri* sparse shrubland over *Calytrix desolata*, *Grevillea deflexa* low sparse shrubland

Acacia fuscaneura
Acacia pruinocarpa
Acacia pteraneura (tentative)
Acacia tetragonophylla
Androcalva luteiflora
Calandrinia sp. (sterile)
Calytrix desolata
Chorizema genistoides
Cymbopogon ambiguus
Eremophila forrestii subsp. *forrestii*
Eremophila forrestii subsp. *hastieana*
Eremophila fraseri subsp. *fraseri*
Grevillea deflexa
Hakea preissii
Ptilotus exaltatus



V62 2nd August 2024 Relevé 1.50 pm Haul road and infrastructure

GPS: 573149 E/ 7018896 N
Elevation: 508 m

Landform: Hardpan plain wit fine ironstone gravel mantle;
almost level; aspect SW

Land surface: Yellowish red fine sandy clay loam; surface rock (fine ironstone gravel) 60 – 70 %

Condition & disturbances: Degraded to poor; high pastoral impacts

Vegetation: *Acacia incurvaneura* isolated tall shrubs over *Acacia ramulosa* var. *linophylla* ,
Eremophila forrestii subsp. *forrestii* isolated shrubs over *Eremophila forrestii* subsp. *forrestii*, *E.*
latrobei subsp. *latrobei*, *Acacia tetragonophylla*, *Psyrax latifolia* low sparse shrubland

Acacia incurvaneura

Acacia ramulosa var. *linophylla*

Acacia tetragonophylla

Eremophila forrestii subsp. *forrestii*

Eremophila latrobei subsp. *latrobei*

Monachather paradoxus

Psyrax latifolia

Ptilotus aevroides



V63 2nd August 2024 2.05 pm Haul road and infrastructure

GPS: 571925 E/ 7019056 N
Elevation 502 m

Landform: Hardpan plain, alluvium; ephemeral drainage line/
depression; very gentle slope; aspect south

Land surface: Yellowish red fine sandy clay loam; surface rock < 5 %; litter 10 – 30 %; fallen timber 2 – 3 %; bare ground 30 – 40 %

Condition & disturbances: Very good; denser patch of woodland within sparsely vegetated ironstone plain; grasses absent; pastoral impacts more at edges; drought impacts – some deaths and part crown death; trapdoor spiders present

NVIS 6: U+^ *Acacia pruinocarpa* \Acacia\ ^tree\7i; U2^ *Acacia incurvaneura*, *A. ramulosa* var. *linophylla*, *A. tetragonophylla*, *Psyrax suaveolens*, *Acacia aptaneura* \Acacia\ ^shrub, tree\4c; M1^ *Eremophila forrestii* subsp. *forrestii*, *E. georgei*, *Acacia aptaneura*, *Psyrax latifolia* \Eremophila\ ^shrub\3c; G1^ *Sida ectogama*, *Cheilanthes sieberi* subsp. *sieberi*, *Erodium cygnorum*, *Eremophila georgei* \Sida\ ^shrub, fern, forb\1i

Vegetation: *Acacia pruinocarpa* woodland over *Acacia incurvaneura*, *A. ramulosa* var. *linophylla*, *A. tetragonophylla* tall shrubland over *Eremophila forrestii* subsp. *forrestii*, *E. georgei*, *Acacia aptaneura* shrubland over *Sida ectogama*, *Cheilanthes sieberi* subsp. *sieberi*, *Erodium cygnorum* low open shrubland

Height (m)	Crown cover %	Habit	Species
10 – 16	10 – 30	T	<i>Acacia pruinocarpa</i>
3 – 10	30 – 40	S, T	<i>Acacia incurvaneura</i> , <i>A. ramulosa</i> var. <i>linophylla</i> , <i>A. tetragonophylla</i> , <i>Psyrax suaveolens</i> , <i>Acacia aptaneura</i> , <i>A. craspedocarpa</i>
1 – 2	30 – 40	S	<i>Eremophila forrestii</i> subsp. <i>forrestii</i> , <i>E. georgei</i> , <i>Acacia aptaneura</i> , <i>Psyrax latifolia</i>
< 0.5	10 – 30	S, E, F	<i>Sida ectogama</i> , <i>Cheilanthes sieberi</i> subsp. <i>sieberi</i> , <i>Erodium cygnorum</i> , <i>Eremophila georgei</i>

Acacia aptaneura
Acacia craspedocarpa
Acacia incurvaneura
Acacia pruinocarpa
Acacia ramulosa var. *linophylla*
Acacia tetragonophylla
Cheilanthes sieberi subsp. *sieberi*
Eremophila forrestii subsp. *forrestii*
Eremophila georgei
Erodium cygnorum
Psyrax latifolia
Psyrax suaveolens
Sida ectogama



Edge of woodland/ tall shrubland patch – many deaths of medium to tall shrubs



V64 2 nd August 2024 Relevé Haul road and infrastructure	
GPS: 572029 E/ 7018992 N Elevation: 502 m	Landform: Plain, hardpan; alluvial; almost level; aspect south
Land surface: Yellowish red fine sandy clay loam; surface rock (fine ironstone gravel) 50 – 60 %	
Condition & disturbances: Poor; pastoral impacts high – many tracks, land surface disturbance; sheet erosion	
Vegetation: <i>Acacia aptaneura</i> , <i>A. incurvaneura</i> , <i>A. pruinocarpa</i> tall sparse shrubland over <i>Acacia incurvaneura</i> , <i>A. craspedocarpa</i> , <i>Eremophila forrestii</i> subsp. <i>forrestii</i> , <i>E. jucunda</i> subsp. <i>jucunda</i> sparse shrubland	
Other species: <i>Eremophila georgei</i> , <i>Erodium cygnorum</i> , <i>Calandrinia</i> sp., <i>Acacia ramulosa</i> var. <i>linophylla</i> , <i>Grevillea berryana</i> (4m)	
<i>Acacia aptaneura</i> <i>Acacia craspedocarpa</i> <i>Acacia incurvaneura</i> <i>Acacia pruinocarpa</i> <i>Acacia ramulosa</i> var. <i>linophylla</i> <i>Calandrinia</i> sp. <i>Eremophila forrestii</i> subsp. <i>forrestii</i> <i>Eremophila georgei</i> <i>Eremophila jucunda</i> subsp. <i>jucunda</i> <i>Erodium cygnorum</i> <i>Grevillea berryana</i>	

V65 2 nd August 2024 Relevé Haul road and infrastructure	
GPS: 571519 E/ 7019026 N Elevation 505 m	Landform: Stony hardpan plain; gentle slope; aspect south – SW
Land surface: Surface rock fine ironstone gravel 30 – 40 %; rocks (2 – 10 cm) 30 – 40 %; bare ground 10 %	
Condition & disturbances: Degraded; high pastoral impacts; drought impacts	
Vegetation: <i>Acacia aptaneura</i> , <i>A. incurvaneura</i> tall sparse shrubland to south; <i>Ptilotus rotundifolius</i> , <i>Eremophila jucunda</i> subsp. <i>jucunda</i> , <i>E. forrestii</i> subsp. <i>forrestii</i> low isolated shrubs	
<i>Acacia aptaneura</i> <i>Acacia incurvaneura</i> <i>Eragrostis eriopoda</i> <i>Eremophila forrestii</i> subsp. <i>forrestii</i> <i>Eremophila jucunda</i> subsp. <i>jucunda</i> <i>Ptilotus aevroides</i> <i>Ptilotus rotundifolius</i>	

V66 2nd August 2024 Relevé Haul road and infrastructure

GPS: 571243 E/ 7018975 N
Elevation: 499 m

Landform: Ironstone hardpan plain; almost level; aspect south

Land surface: Yellowish red silty clay loam; surface rock fine ironstone gravel 30 – 50 %; rocks (2 – 10 cm) 20 %; bare ground 20 – 30 %

Condition & disturbances: Poor; high pastoral impacts; sheet erosion, hummocking

Vegetation: *Eremophila punicea*, *Eragrostis eriopoda* low open shrubland

Acacia ramulosa var. *linophylla* (isolated shrub)

Eragrostis eriopoda

Eremophila jucunda subsp. *jucunda*

Eremophila punicea

Erodium cygnorum



The following are survey sites from October 2023

V67 22/10/2023 9.22 am Haul Road western end			
GPS: 571097 E/ 7018946 N Elevation: 504 m		Landform: Stony plain	
Land surface: Yellowish red clay loam; surface rock (ironstone gravel 40 – 50 %; BIF, quartz rocks 5 – 10 %) 40 – 60 %			
Condition & disturbances: Poor; pastoral impacts, timber cutting; erosion sheet wash – hardpan exposed			
NVIS 6: U1^ <i>Acacia aptaneura</i> , <i>A. pruinocarpa</i> \Acacia\^shrub\4\; M1^ <i>Acacia aptaneura</i> , <i>A. pruinocarpa</i> , <i>Eremophila fraseri</i> subsp. <i>fraseri</i> , <i>A. tetragonophylla</i> \Acacia\^shrub\3\; G1^ <i>Acacia aptaneura</i> , <i>Eremophila punicea</i> , <i>Ptilotus rotundifolius</i> , <i>Senna artemisioides</i> subsp. <i>helmsii</i> , <i>Ptilotus schwartzii</i> \Acacia\^shrub\2\bi			
Vegetation: <i>Acacia aptaneura</i> , <i>A. pruinocarpa</i> tall sparse shrubland over <i>Acacia aptaneura</i> , <i>A. pruinocarpa</i> , <i>Eremophila fraseri</i> subsp. <i>fraseri</i> sparse shrubland over <i>Acacia aptaneura</i> , <i>Eremophila punicea</i> , <i>Ptilotus rotundifolius</i> low isolated shrubs			
Height (m)	Crown cover %	Habit	Species
2 – 5	2 – 10	S	<i>Acacia aptaneura</i> , <i>A. pruinocarpa</i>
1 – 2	2 – 10	S	<i>Acacia aptaneura</i> , <i>A. pruinocarpa</i> , <i>Eremophila fraseri</i> subsp. <i>fraseri</i> , <i>A. tetragonophylla</i>
< 1	< 2	S	<i>Acacia aptaneura</i> , <i>Eremophila punicea</i> , <i>Ptilotus rotundifolius</i> , <i>Senna artemisioides</i> subsp. <i>helmsii</i> , <i>Ptilotus schwartzii</i>
Other species: <i>Eremophila foliosissima</i>			
<i>Acacia aptaneura</i> <i>Acacia pruinocarpa</i> <i>Acacia tetragonophylla</i> <i>Eremophila foliosissima</i> <i>Eremophila fraseri</i> subsp. <i>fraseri</i> <i>Eremophila punicea</i> <i>Ptilotus rotundifolius</i> <i>Ptilotus schwartzii</i> <i>Senna artemisioides</i> subsp. <i>helmsii</i>			

V 68 22/10/2023 9.00 am Haul Road western end

GPS: 570854 E/ 7018905 N
Elevation: 502 m

Landform: Plain, hardpan; low rise; aspect south to south west

Land surface: Yellowish red fine sandy clay loam; surface rock 0 %; litter 30 – 40 %; fallen timber < 2 %; cryptogams (lichen) 5 – 10 %

Condition & disturbances: Very good; pastoral impacts

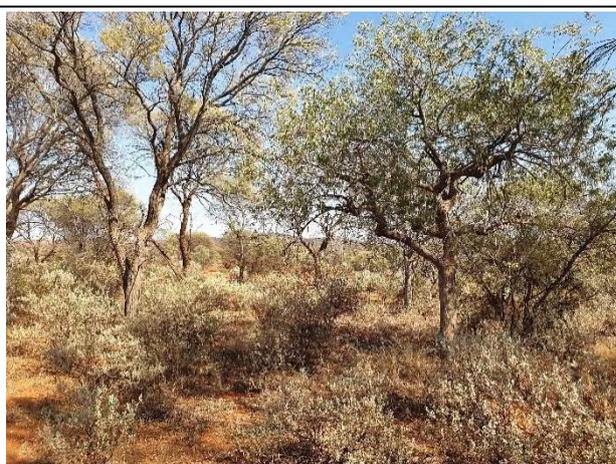
NVIS 6: U1+^ *Acacia aptaneura*, *A. caesaneura*, *Brachychiton gregorii*, *Hakea lorea*\Acacia\^tree\6\; M1^ *Brachychiton gregorii*, *Acacia tetragonophylla*, *Psyrax latifolia*, *Acacia caesaneura*\Brachychiton\^shrub, tree\4\; M2^ *Eremophila forrestii* subsp. *forrestii*, *Psyrax suaveolens*, *Pittosporum angustifolium*\Eremophila\^shrub\3\; G1^ *Eremophila forrestii* subsp. *forrestii*, *E. georgei*, *Eragrostis falcata*, *Ptilotus polystachyus*, *Stenopetalum filifolium*\Eremophila\^shrub, tussock grass, forb\2\c

Vegetation: *Acacia aptaneura*, *A. caesaneura*, *Brachychiton gregorii* low woodland over *Brachychiton gregorii*, *Acacia tetragonophylla*, *Psyrax latifolia* tall sparse shrubland over *Eremophila forrestii* subsp. *forrestii*, *Psyrax suaveolens*, *Pittosporum angustifolium* open shrubland over *Eremophila forrestii* subsp. *forrestii*, *E. georgei*, *Eragrostis falcata* low shrubland

Height (m)	Crown cover %	Habit	Species
8 – 10	20 – 30	T	<i>Acacia aptaneura</i> , <i>A. caesaneura</i> , <i>Brachychiton gregorii</i> , <i>Hakea lorea</i>
4 – 5	2 – 10	S, T	<i>Brachychiton gregorii</i> , <i>Acacia tetragonophylla</i> , <i>Psyrax latifolia</i> , <i>Acacia caesaneura</i>
0.7 – 1.5	10 – 20	S	<i>Eremophila forrestii</i> subsp. <i>forrestii</i> , <i>Psyrax suaveolens</i> , <i>Pittosporum angustifolium</i>
< 0.7	30 – 40	S, G, F, L	<i>Eremophila forrestii</i> subsp. <i>forrestii</i> , <i>E. georgei</i> , <i>Eragrostis falcata</i> , <i>Ptilotus polystachyus</i> , <i>Stenopetalum filifolium</i> , <i>Cephalopterum drummondii</i> , dried off forbs, <i>Ptilotus obovatus</i> , <i>Leichhardtia australis</i>

Other species: *Thysanotus manglesianus*, *Acacia ramulosa* var. *linophylla*, *Eremophila glutinosa*, *E. serrulata*, *Rhodanthe* sp., *Roepera* sp., *Hakea lorea* (0.5 m), *Ptilotus exaltatus*, *Teucrium teucriiflorum*

Acacia caesaneura
Acacia ramulosa var. *linophylla*
Acacia tetragonophylla
Brachychiton gregorii
Cephalopterum drummondii
Eragrostis falcata
Eremophila forrestii subsp. *forrestii*
Eremophila georgei
Eremophila glutinosa
Eremophila serrulata
Hakea lorea
Leichhardtia australis
Pittosporum angustifolium
Psyrax latifolia
Psyrax suaveolens
Ptilotus exaltatus
Ptilotus obovatus
Ptilotus polystachyus



Rhodanthe sp.
Roepera sp.
Stenopetalum filifolium
Teucrium teucriiflorum
Thysanotus manglesianus

V 69 22/10/2023 8.23 am Haul Road western end

GPS: 570041 E/ 7018530 N
Elevation: 501 m

Landform: Gravel plain with rocky patches

Land surface: Red (2.5YR4/8) clay loam; surface rock (gravel, rocks – BIF, dolerite, quartz; ironstone gravel) 50 – 70 %; litter < 2 %; fallen timber < 1 %; cryptogams (lichen) < 1 %; bare ground 5 – 20 %

Condition & disturbances: Degraded - Poor; high pastoral impacts; hard pan exposed; sheet erosion; rilling and back-cutting; pedestalling and hummocking

NVIS 6: U1^ *Acacia aptaneura* \Acacia\^shrub\4\bi; M1+^ *Senna artemisioides subsp. helmsii*, *Acacia ramulosa var. linophylla* \Senna\^shrub\3\r; G1^ *Eremophila compacta*, *Ptilotus polystachyus*, *Solanum lasiophyllum*, *Monachather paradoxus*, *Eragrostis eriopoda* \Eremophila\^shrub, tussock grass\2\r

Vegetation: *Acacia aptaneura* isolated tall shrubs over *Senna artemisioides subsp. helmsii*, *Acacia ramulosa var. linophylla* sparse shrubland over *Eremophila compacta*, *Ptilotus polystachyus*, *Solanum lasiophyllum* low sparse shrubland

Height (m)	Crown cover %	Habit	Species
3 – 5	< 2	S	<i>Acacia aptaneura</i>
1 – 2	2 – 4	S	<i>Senna artemisioides subsp. helmsii</i> , <i>Acacia ramulosa var. linophylla</i>
< 0.7	5 – 10	S, G	<i>Eremophila compacta</i> , <i>Ptilotus polystachyus</i> , <i>Solanum lasiophyllum</i> , <i>Monachather paradoxus</i> , <i>Eragrostis eriopoda</i> , <i>E. falcata</i> , <i>Ptilotus obovatus</i>

Other species: *Acacia incurvaneura*, *Amphipogon caricinus var. caricinus*, *Aristida contorta*, *Eremophila exilifolia*, *Maireana triptera*, *Ptilotus rotundifolius*, *Stenopetalum filifolium*, *Sclerolaena diacantha*

Acacia aptaneura
Acacia incurvaneura
Acacia ramulosa var. linophylla
Amphipogon caricinus var. caricinus
Aristida contorta
Eragrostis eriopoda
Eragrostis falcata
Eremophila compacta
Eremophila exilifolia
Maireana triptera
Monachather paradoxus
Ptilotus obovatus
Ptilotus polystachyus
Ptilotus rotundifolius
Sclerolaena diacantha
Senna artemisioides subsp. helmsii
Solanum lasiophyllum
Stenopetalum filifolium



V70 22/10/2023 7.59 am Woodland patch Haul Road western end			
GPS: 569661 E/ 7018198 N Elevation: 493 m		Landform: Plain, small grove of vegetation Gentle slope; aspect south	
Land surface: Red fine sandy clay loam; surface rock < 1 %; litter > 80 % ^ 3 – 4 cm; fallen timber 1 – 2 %			
Condition & disturbances: Very good; pastoral impacts, rubbish; vegetation mostly intact			
NVIS 6: U1+ ^ Acacia pruinocarpa \Acacia ^tree\7i; M1 ^ Acacia aptaneura, Pittosporum angustifolium, Psydrax latifolia \Acacia ^tree, shrub\6c; M2 ^ Sida ectogama, Pittosporum angustifolium, Eremophila georgei, Acacia tetragonophylla, Psydrax suaveolens \Sida ^shrub\3c; G1 ^ Sida ectogama, Psydrax latifolia, Acacia aptaneura, Pittosporum angustifolium, Eremophila georgei \Sida ^shrub			
Vegetation: Acacia pruinocarpa woodland over Acacia aptaneura, Pittosporum angustifolium, Psydrax latifolia low woodland over Sida ectogama, Pittosporum angustifolium, Eremophila georgei shrubland over Sida ectogama, Psydrax latifolia, Acacia aptaneura low open shrubland			
Height (m)	Crown cover %	Habit	Species
12	25 – 30	T	Acacia pruinocarpa
4 – 6	30 – 40	T, S	Acacia aptaneura, Pittosporum angustifolium, Psydrax latifolia
1 – 2	30 – 40	S	Sida ectogama, Pittosporum angustifolium, Eremophila georgei, Acacia tetragonophylla, Psydrax suaveolens
0.3 – 1	10 – 15	S, C	Sida ectogama, Psydrax latifolia, Acacia aptaneura, Pittosporum angustifolium, Eremophila georgei, Ptilotus obovatus, Enchylaena tomentosa, Teucrium teucriiflorum
Other species: Maireana triptera, M. georgei, Ptilotus polystachyus, Senna artemisioides subsp. filifolia, S. artemisioides subsp. artemisioides, Abutilon sp., Sclerolaena eurotioides, Leichhardtia australis, Ptilotus exaltatus			
<p><i>Abutilon sp.</i> <i>Acacia aptaneura</i> <i>Acacia pruinocarpa</i> <i>Acacia tetragonophylla</i> <i>Enchylaena tomentosa</i> <i>Eremophila georgei</i> <i>Leichhardtia australis</i> <i>Maireana georgei</i> <i>Maireana triptera</i> <i>Pittosporum angustifolium</i> <i>Psydrax latifolia</i> <i>Psydrax suaveolens</i> <i>Ptilotus exaltatus</i> <i>Ptilotus obovatus</i> <i>Ptilotus polystachyus</i> <i>Sclerolaena eurotioides</i> <i>Senna artemisioides subsp. artemisioides</i> <i>Senna artemisioides subsp. filifolia</i> <i>Sida ectogama</i> <i>Teucrium teucriiflorum</i></p>			

V 71 22/10/2023 7.33 am Haul Road western end			
GPS: 569290 E/ 7017878 N Elevation: 494 m		Landform: Plain; small patch of denser vegetation	
Land surface: Yellowish red (5YR5/6) fine sandy clay loam; surface rock (BIF, ironstone gravel, siltstone, quartz) 0.5 – 6 cm, 10 – 20 % with some denser patches			
Condition & disturbances: Good; less disturbances than surrounding plain			
NVIS 6: U1+^ Acacia aptaneura, Psydrax suaveolens, P. latifolia, Acacia tetragonophylla\Acacia \^tree, shrub\6\c; M1^ Eremophila georgei, E. forrestii subsp. forrestii, Sida ectogama, Leichhardtia australis, Acacia aptaneura\Eremophila\^shrub, climber\3\c; M2^ Ptilotus obovatus, Monachather paradoxus, Psydrax rigidula, Eremophila georgei, Psydrax suaveolens\Ptilotus\^shrub, tussock grass\2\i; G1^ Dried off forbs, Solanum lasiophyllum, Psydrax latifolia, Sclerolaena sp., Sida ectogama\Forbs\^forb, shrub\1\i			
Vegetation: Acacia aptaneura, Psydrax suaveolens, P. latifolia tall shrubland over Eremophila georgei, E. forrestii subsp. forrestii, Sida ectogama shrubland over Ptilotus obovatus, Monachather paradoxus, Psydrax rigidula low open shrubland over Dried off forbs, Solanum lasiophyllum, Psydrax latifolia low open forbland			
Height (m)	Crown cover %	Habit	Species
4 – 6	30 – 40	T, S	Acacia aptaneura, Psydrax suaveolens, P. latifolia, Acacia tetragonophylla
1 – 2.5	50 – 60	S, L	Eremophila georgei, E. forrestii subsp. forrestii, Sida ectogama, Leichhardtia australis, Acacia aptaneura, P. latifolia, Solanum lasiophyllum, Acacia tetragonophylla
0.2 – 1	10 – 30	S, G	Ptilotus obovatus, Monachather paradoxus, Psydrax rigidula, Eremophila georgei, Psydrax suaveolens
< 0.2	10 – 20	F, S	Dried off forbs, Solanum lasiophyllum, Psydrax latifolia, Sclerolaena sp., Sida ectogama
Other species: Acacia pruinocarpa low tree stand with A. caesaneura; Eremophila compacta, Senna artemisioides subsp. xsturtii, Eremophila ericalyx, E. foliosissima, Teucrium teucriiflorum			
Acacia aptaneura Acacia caesaneura Acacia pruinocarpa Acacia tetragonophylla Eremophila ericalyx Eremophila foliosissima Eremophila forrestii subsp. forrestii Eremophila georgei Leichhardtia australis Monachather paradoxus Psydrax latifolia Psydrax rigidula Psydrax suaveolens Ptilotus obovatus Sclerolaena sp. Senna artemisioides subsp. xsturtii		 Sida ectogama Solanum lasiophyllum Teucrium teucriiflorum	

V72 22/10/23 7.00 am Haul Road western end			
GPS: 568940 E/ 7017390 N Elevation: 488 m		Landform: Stony plain; almost level; aspect south	
Land surface: Yellowish red (5YR5/6) fine sandy clay loam; surface rock (BIF, ironstone gravel, siltstone, quartz) 0.5 – 6 cm, 10 – 50 %; litter < 5 %; bare ground 40 – 50 %			
Condition & disturbances: Degraded; tracks, roads, pastoral and mining impacts; erosion active – sheet, pedestalling and hummocking			
NVIS 6: U1^ <i>Acacia aptaneura</i> \Acacia\^tree\6\bi; M1^ <i>Eremophila fraseri</i> subsp. <i>fraseri</i> , <i>Acacia pruinocarpa</i> , <i>A. tetragonophylla</i> \Eremophila\^shrub\3\bi; G1+^ <i>Eremophila punicea</i> , <i>E. fraseri</i> subsp. <i>fraseri</i> , <i>Ptilotus schwartzii</i> , <i>P. obovatus</i> , <i>Amphipogon caricinus</i> \Eremophila\^shrub, tussock grass, forb\1\r			
Vegetation: <i>Acacia aptaneura</i> low isolated trees over <i>Eremophila fraseri</i> subsp. <i>fraseri</i> isolated shrubs over <i>Eremophila punicea</i> , <i>E. fraseri</i> subsp. <i>fraseri</i> , <i>Ptilotus schwartzii</i> low sparse shrubland			
Height (m)	Crown cover %	Habit	Species
> 2	< 2	T	<i>Acacia aptaneura</i>
0.9 – 1.5	< 2	S	<i>Eremophila fraseri</i> subsp. <i>fraseri</i> , <i>Acacia pruinocarpa</i> , <i>A. tetragonophylla</i>
< 0.6	2 – 10	S, G, F	<i>Eremophila compacta</i> , <i>E. fraseri</i> subsp. <i>fraseri</i> , <i>Ptilotus schwartzii</i> , <i>P. obovatus</i> , <i>Amphipogon caricinus</i> var. <i>caricinus</i> , <i>Monachather paradoxus</i> , <i>Sclerolaena eurotioides</i> , <i>S. fusiformis</i> , <i>Stenopetalum filifolium</i>
Other species: <i>Acacia craspedocarpa</i> , <i>A. fuscaneura</i> , <i>Eremophila forrestii</i> subsp. <i>forrestii</i> , <i>E. georgei</i> , <i>Maireana thesioides</i> , <i>M. georgei</i> , <i>M. carnosa</i> , <i>Psydrax suaeveolens</i>			
<i>Acacia aptaneura</i> <i>Acacia craspedocarpa</i> <i>Acacia fuscaneura</i> <i>Acacia pruinocarpa</i> <i>Acacia tetragonophylla</i> <i>Amphipogon caricinus</i> var. <i>caricinus</i> <i>Eremophila compacta</i> <i>Eremophila forrestii</i> subsp. <i>forrestii</i> <i>Eremophila fraseri</i> subsp. <i>fraseri</i> <i>Eremophila georgei</i> <i>Maireana carnosa</i> <i>Maireana georgei</i> <i>Maireana thesioides</i> <i>Monachather paradoxus</i> <i>Psydrax suaeveolens</i> <i>Ptilotus obovatus</i> <i>Ptilotus schwartzii</i> <i>Sclerolaena eurotioides</i> <i>Sclerolaena fusiformis</i> <i>Stenopetalum filifolium</i>			

PENTIUM
WATER



FENIX RESOURCES BEEBYN–W11 EXPANDED PIT

Hydrogeology and Hydrology Assessment

Rev 0
12/08/2025



Document Status

Version	Purpose of document	Author	Reviewed by	Review Date
Rev A	Draft for comment	GvB, RS	RS	31/07/25
Rev B	Changed Mine Plan	GvB, RS	RS	06/08/25
Rev C	Updated Hydrology	GvB, RS	RS	07/08/25
Rev 0	Update following comment	GvB, RS, DK		13/08/25

Approval for Issue

Name	Signature	Date
Rob Swift		13/08/25

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1. Introduction

1.1. Background

Fenix have secured the exclusive right to mine and export iron ore from the high-grade Beebyn-W11 iron ore deposit in the Weld Range. Beebyn-W11 is located approximately 20 km east of existing mining operations at Iron Ridge. Currently Fenix are looking to develop the Beebyn-W11 pit.

Resources WA are assisting Fenix with the development of the mine plan (MP) and closure mine plan (CMP) for the deposit. This document provides an assessment of the hydrogeology and hydrology associated with the Beebyn-W11 pit based on historical reports and data available for the site.

1.2. Locality

Beebyn-W11 pit is situated approximately 70 km west-southwest of Meekatharra and 50 km north-northwest of Cue in the Shire of Meekatharra (**Figure 1**).

1.3. Land Use

The major land use in the area is sheep and cattle grazing on pastoral leases.

1.4. Beebyn-W11 Development

The general layout of the area close to the Beebyn-W11 pit is shown in **Figure 2**. The pit is planned to progress to a depth of approximately 210 mbgl (~340 mAHD), over an approximate mine life of 6 to 7 years. This represents an increase in depth of ~65 m over a previously considered pit design (Pentium Water, 2024).

1.5. Scope of work

Pentium Water was commissioned by Fenix Resources to update the previous hydrogeological and hydrological assessments of the proposed Beebyn-W11 pit development to support the feasibility study of the new Beebyn-W11 pit. This included:

- Hydrogeology
 - Summarise test work and relevant data sources
 - Recommendations and commentary regarding:
 - Dewatering requirements
 - Monitoring and production bore location
 - Pit lake formation post-mining
- Hydrology
 - Assessment of the impacts on site hydrology with regards the proposed mine pit, waste dump layout, including recommendations regarding appropriate management strategies.
 - Flood risk assessment for the mine.



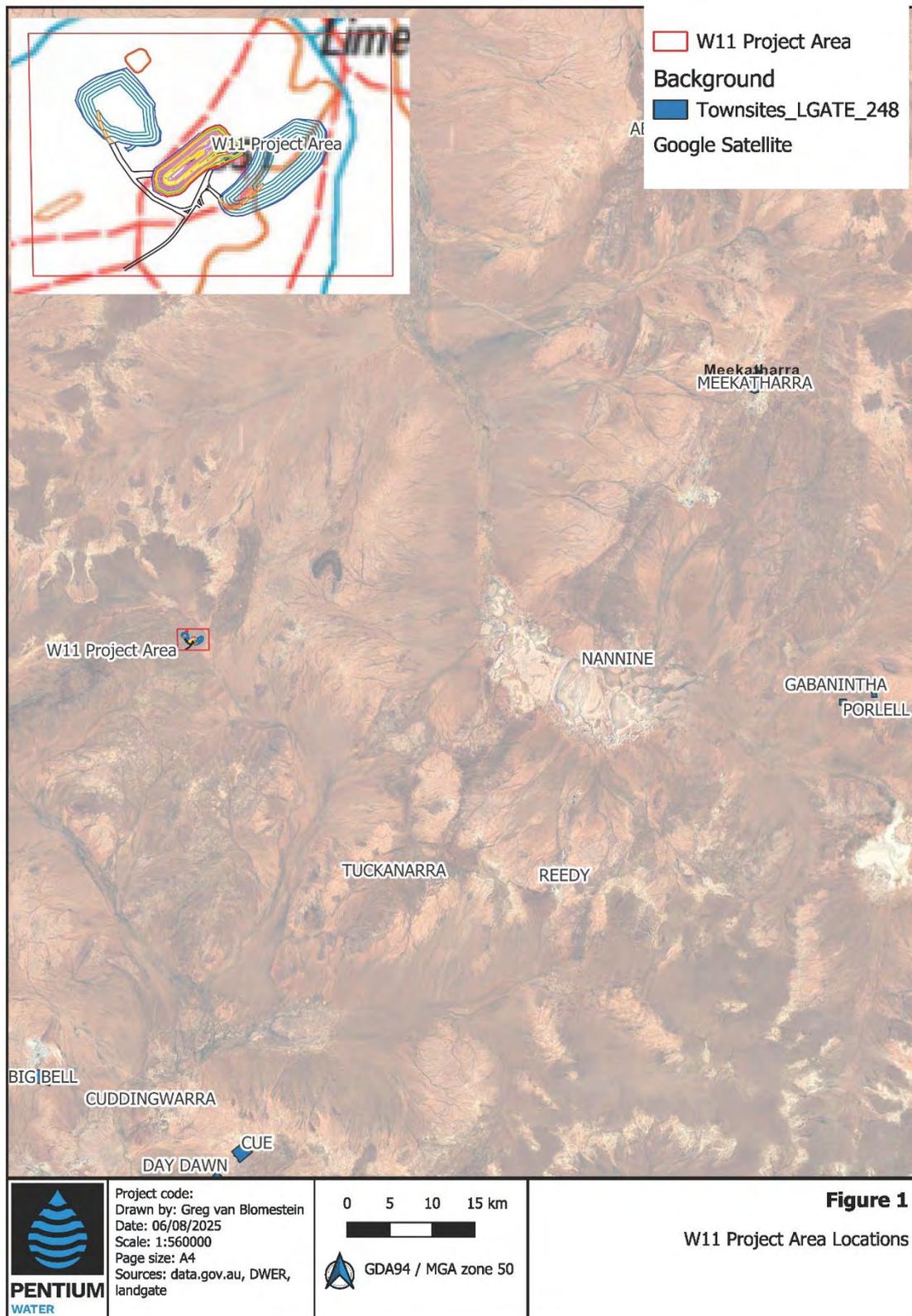


Figure 1 W11 location



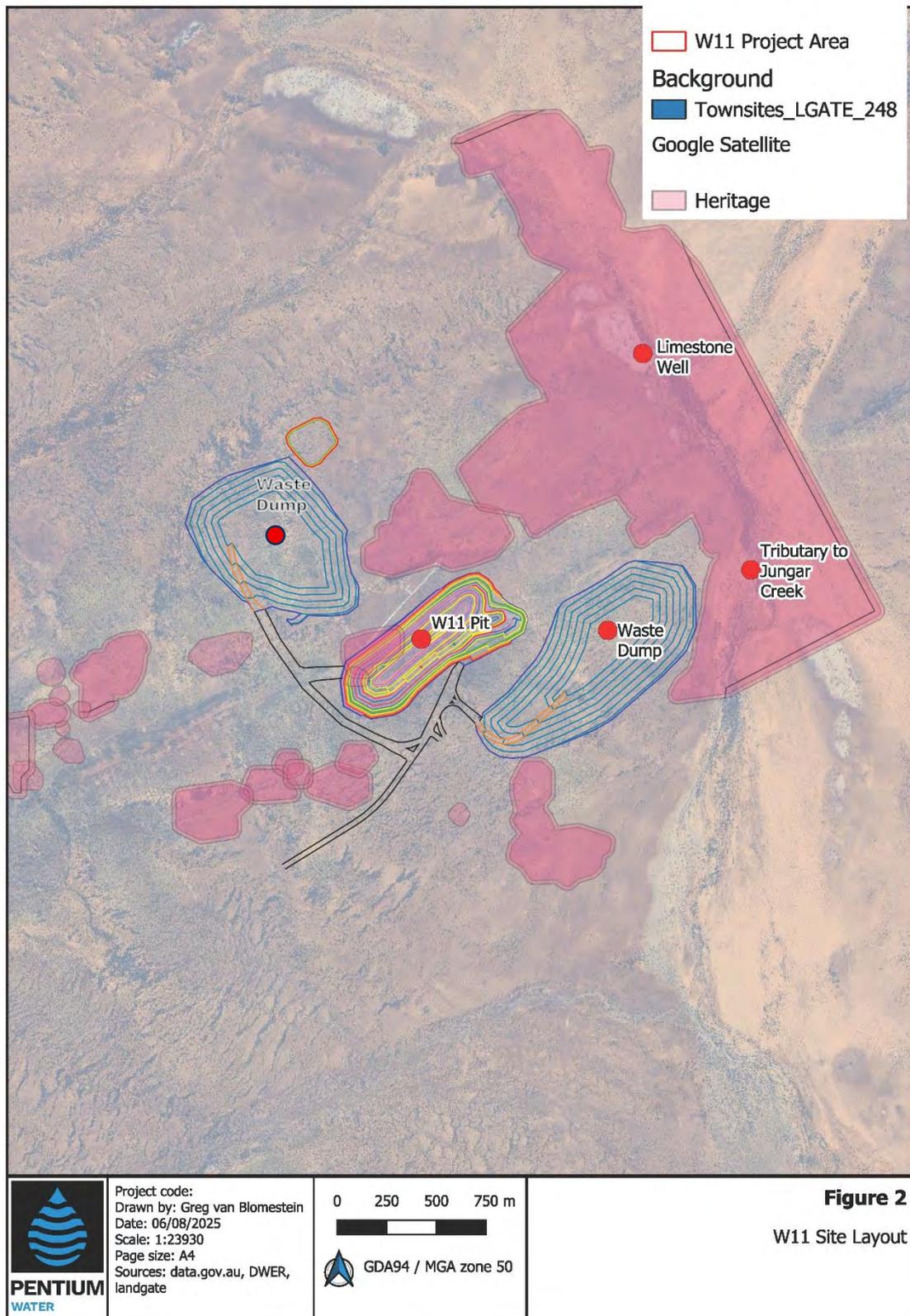


Figure 2 W11 general layout



2. Climate / rainfall

2.1. Climate

The region is semi-arid, characterised by low rainfall and high evaporation. Rainfall tends to be irregular and is greatly exceeded by evaporation. Winters are cool to mild; summers are hot and temperatures regularly exceed 40 °C. Monthly average rainfall and evaporation data from the Bureau of Meteorology's weather station at Meekatharra Airport (site number 007045) is presented in Figure 3.

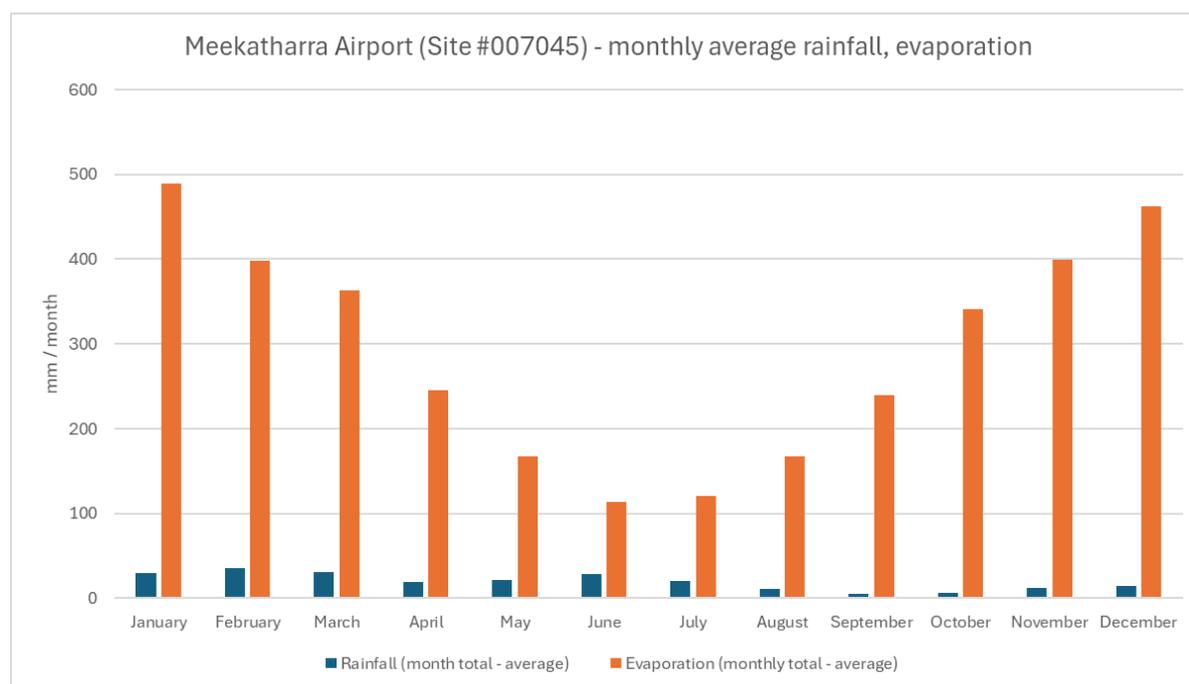


Figure 3 Meekatharra Airport summary rainfall and evaporation data (BOM station 007045)

Western Australia is already experiencing the impacts of climate change. All of WA has warmed, with an average temperature rise of 1.3°C since 1910. Rainfall has increased over most of WA, other than the far west and southwest where it has declined (at a rate faster than anywhere else in Australia). Projections are that WA will continue to get hotter, drier, extreme rain events will become more intense, and the number of tropical cyclones in north-west WA will continue to decrease.

However, the projected life of mine is sufficiently short that these projected changes will have no significant impact on the project.

2.2. Local hydrology

W11 is situated to the west of Beebyn Creek, a tributary of Jungar Creek, which drains towards the south-southeast (Figure 4). W11 lies at the crest close to the eastern end of the Weld Range, which rise locally to an elevation of 551 mAHD approximately 50 m above the surrounding gently sloping terrain of a broad alluvial valley.

Rainwater falling in the area drains quickly off the Weld Range ridges through narrow channels which widen substantially as the water drains onto the flatter areas. In the flatter areas, the flow of water can become ambiguous with streams dividing, in some cases the divisions flow in quite different directions. The beds of the main channels of the water courses comprise coarse sand, rocks and cobbles; with silty sand banks which are easily eroded.



The project lies on the southern end of one major catchment (Beebyn Creek). The ephemeral watercourse draining this catchment flows south through Beebyn Gap. The Beebyn-W11 site sits near the top of a ridgeline within the Beebyn Creek catchment, with elevations ranging from ~RL495m to RL550m.

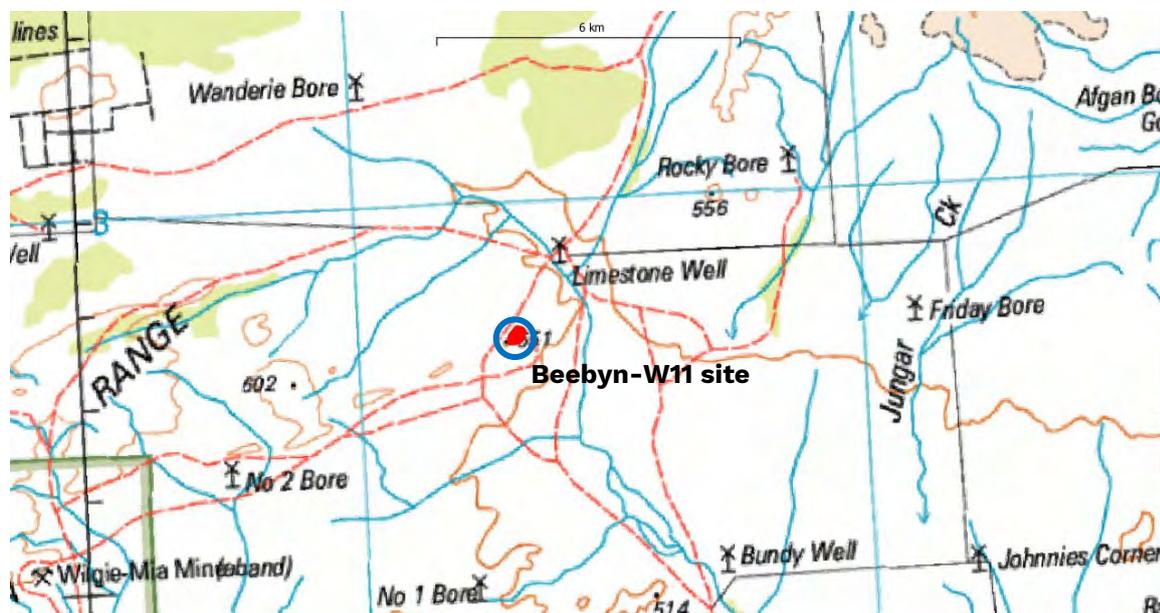


Figure 4 Beebyn-W11 site hydrology

Rainfall Intensity-Frequency-Depth

The Bureau of Meteorology (BoM) website provides probabilistic or statistically based Intensity Frequency Duration (IFD) rainfall characteristics. IFD rainfall depths represent design rainfalls for events of frequent and infrequent occurrence, for various annual exceedance probabilities (AEP). IFD data for the site and selected durations is shown in Table 1 (BOM, 2016). Design temporal rainfall distributions are available in the Australian Rainfall and Runoff (ARR) data hub and describe how rainfall falls over time.

Table 1: Intensity-Frequency-Duration (IFD) Rainfalls (mm)

Duration (hrs)	Annual Exceedance Probabilities (AEP)								
	63%	50%	20%	10%	5%	2%	1%	0.01%	PMP
1	13	16	25	32	40	51	61	122	305
4.5	22	26	41	52	65	83	99	198	495
12	31	37	58	74	91	114	134	268	670
24	38	46	73	92	113	140	162	324	810
36	42	51	81	103	126	156	179	358	895
72	48	59	94	119	144	177	202	404	1,010

It can be noted that 63% AEP is equivalent to 1 year ARI (average recurrence interval, the average period between exceedances); 50% AEP = 1.44-year ARI; 39% AEP = 2 year ARI, 18% AEP = 5 year ARI and so on up to 1% AEP = 100 year ARI.

Probable Maximum Precipitation

In addition, closure of mines requires consideration of rare storms that could occur at an undefined time after closure. The upper limit for extreme rainfalls can reasonably be



represented by the 10,000-year rainfalls, or up to the Probable Maximum Precipitation (PMP). The PMP is theoretically the greatest depth of precipitation meteorologically possible for a given duration over a defined size storm area, at that specific location – as a reasonable indication of the upper limit on rainfall that could be anticipated.

Based on statistical extrapolation, the 10,000-year rainfalls are ~2x 1% AEP rainfalls. By rule of thumb, the PMP is typically ~2-2.5x 10,000-year rainfalls i.e. ~5x 1% AEP rainfalls.

PMP estimates were also made using BOM deterministic methods, GTSMR (Generalised Tropical Storm Method, relevant for durations of 24 hours or more), and the GSDM (Generalised Short Duration Method, based on convective thunderstorms of 6 hours duration or less). The same PMP estimates are used over large areas of Australia, in more southern and inland locations, can tend to provide relatively larger rainfall intensities than statistical extrapolation suggests.

The adopted PMPs have been nominally taken as 5 x 1% AEP rainfalls.



3. Geology

Beebyn-W11 is situated on the northern extent of the Yilgarn Craton within the Meekatharra – Mount Magnet greenstone belt. Basement rock underlays extensive laterite which has in places been eroded along current and historical drainage lines. In such areas, the basal rock has been overlain by colluvial and alluvial deposits of sand and clay of up to 20 m thick (Water and Rivers Commission, 2001).

Beebyn-W11 is one of several identified lenses of iron ore mineralisation identified in the Weld Range (Figure 6). The Weld Range comprises a series of steeply dipping Banded Iron Formation / jaspilite interlayered with dolerite (Jones, 1962). On a regional scale, the Weld Range is an east-northeasterly striking greenstone belt, which forms part of the Archaean supra-crustal sequences of the Murchison Domain in the Yilgarn Craton which are intruded by granitic plutons and separated by extensive areas of massive to gneissic granite. Local geology is summarised in Table 2.

The Weld Range is segmented by a well-developed fault system, which is described by Jones (1962) as having ‘strongly affected the iron ore bodies’. Essentially, the BIF is offset, by up to 100 m, along its strike, leading to BIF abutting the surrounding dolerite in places.

Two main deposit areas have been named: Madoonga to the west and Beebyn to the east (Figure 5).

The Beebyn-W11 Deposit contains several steeply south-easterly dipping banded iron formations (BIFs) interlayered with dolerite. The mineralised units within the BIF comprise massive haematite, interbedded hematite-goethite, goethite and well-banded magnetite. At Beebyn-W11 the pit targets a Banded Iron Formation measuring approximately 30 m across

Table 2 Geology – Beebyn-W11 and surrounds (Based on GWSA, 1983)

Unit	Geology code	Description
Alluvium	Qa	Alluvium, unconsolidated sand, silt and gravel in drainage lines and adjacent floodplains.
Eolian sand	Czs	Eolian sand overlying laterite (Czl)
Jaspilite, Banded iron formation	Aij	Jaspilite, banded iron formation; red, black and white banded
Banded Iron Formation	Aiw	Banded iron formation, black and white banded
Dolerite	Add	Dolerite, medium grained, intruded between beds of Banded Iron Formation.
Granite	Agb	Biotite granite
Granodiorite	Agln	Biotite adamellite and granodiorite

The mineralised zones are offset by up to 100 m by sub-vertical north-west striking faults.



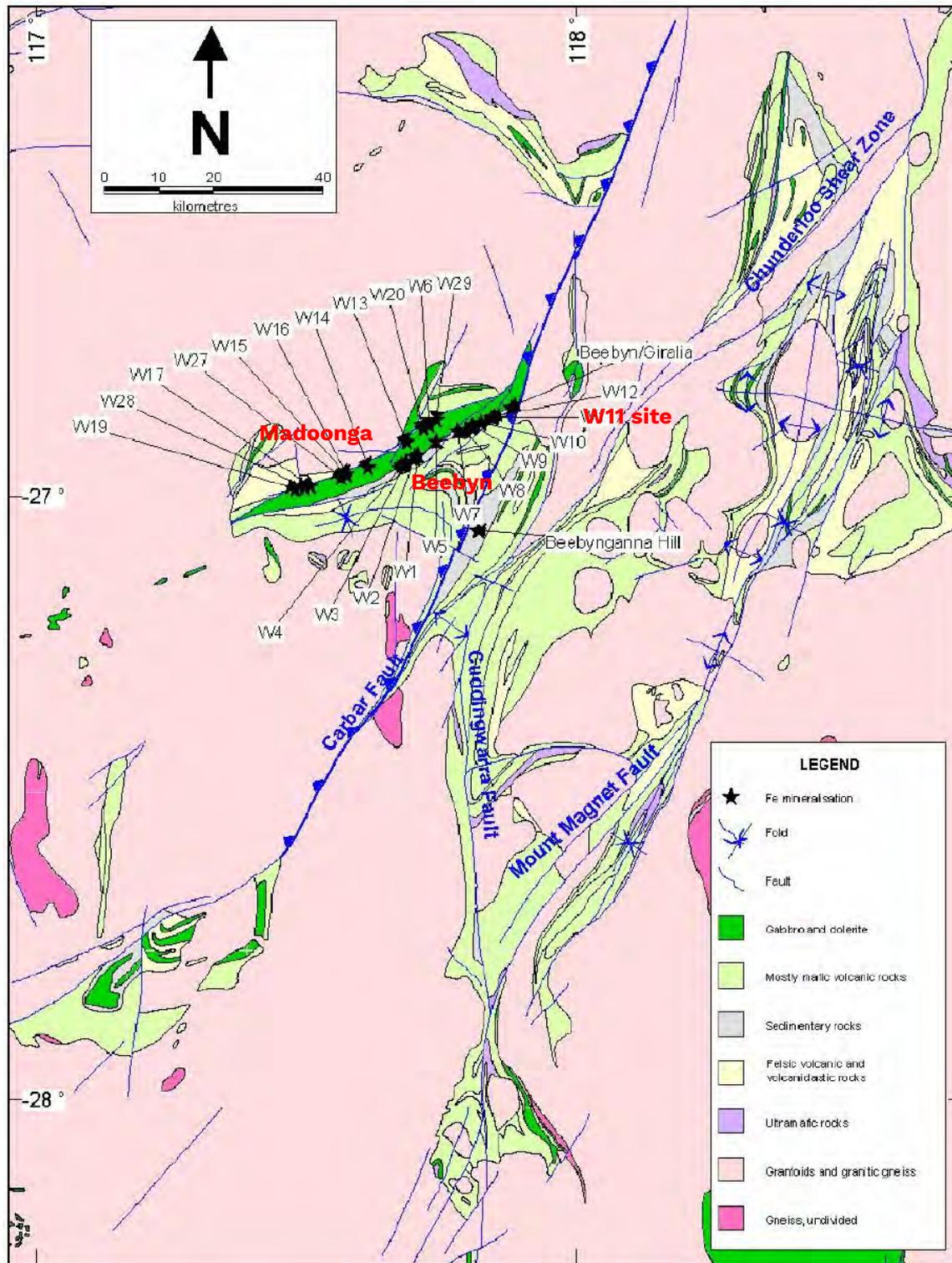


Figure 5 Regional geology of the Weld Range iron ore mineralisation (based on SRK, 2010)



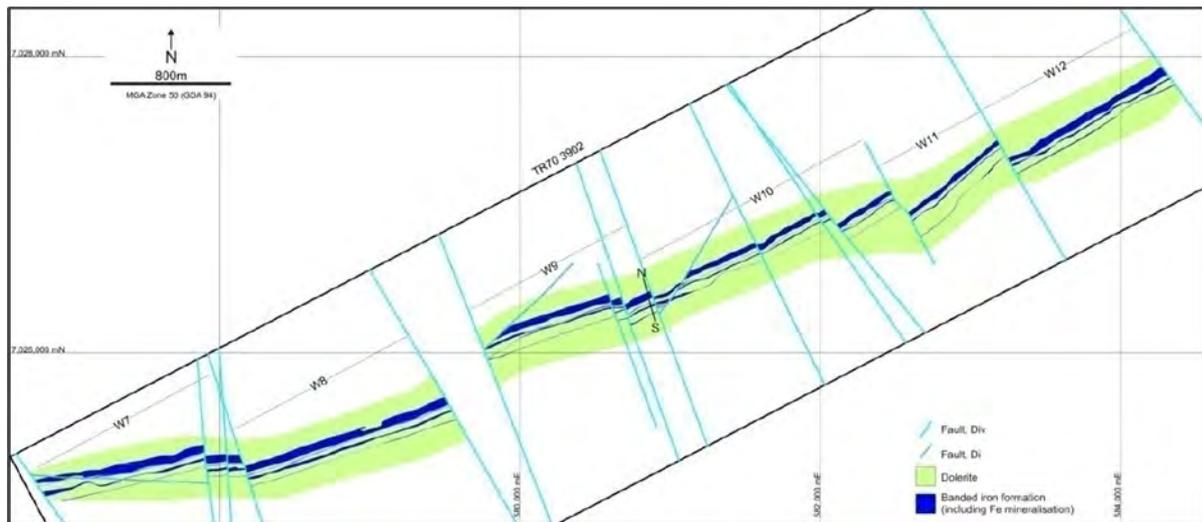


Figure 6 Faulting bisecting the BIF at Beebyn-W11 and along strike



Legend

NewPit_and_WasteDumps

— Waste Dump

— Sump

— Haul Road

— w11_wd03_north_v05_clip — entities

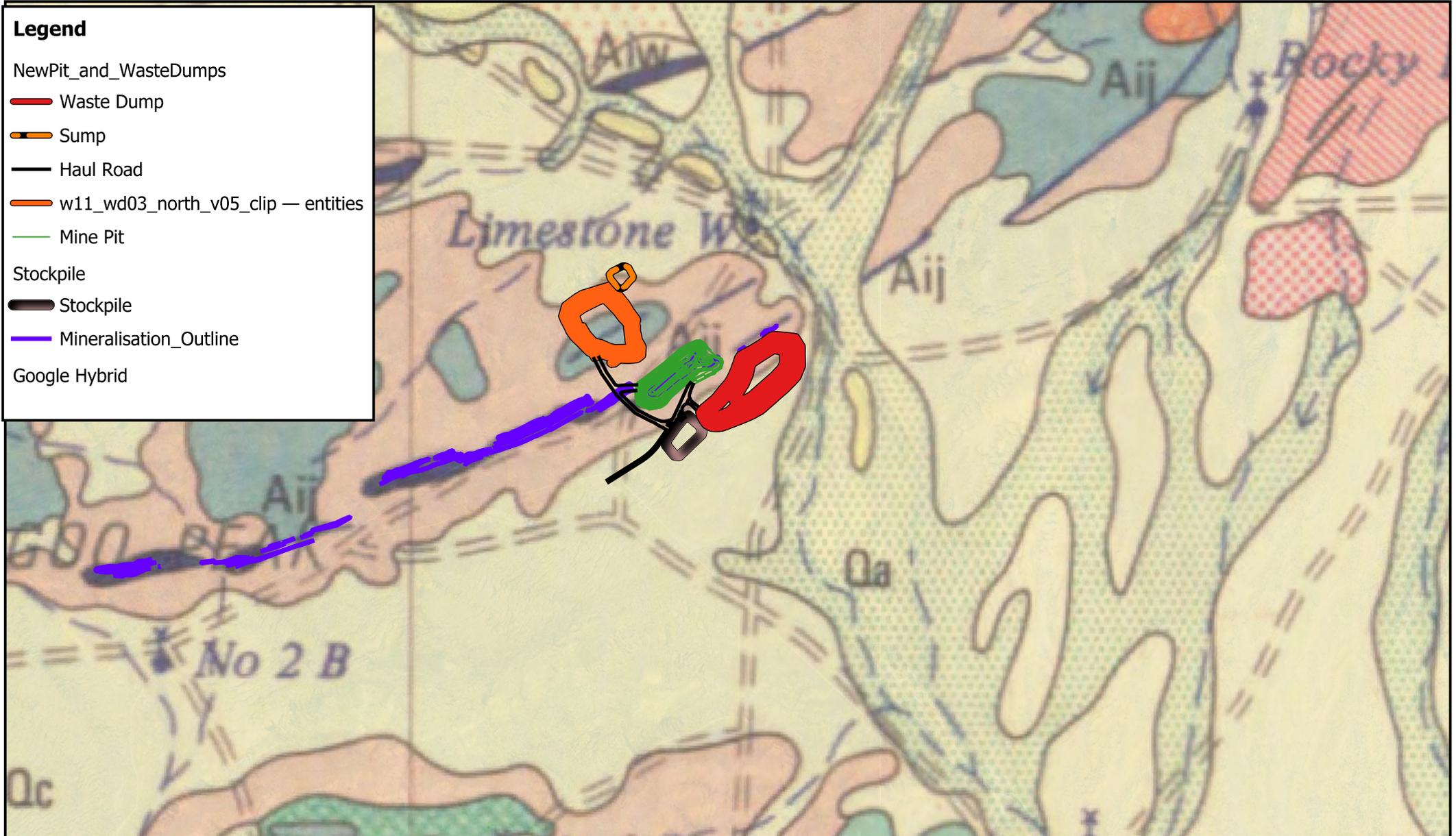
— Mine Pit

Stockpile

— Stockpile

— Mineralisation_Outline

Google Hybrid



Project code:
Drawn by: Greg van Blomestein
Date: 13/08/2025
Scale: 1:55000
Page size: A4
Sources: data.gov.au, DWER,
landgate

0 0.2 0.4 0.8 km



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Figure 7

Geology of Beebyn-W11 and surrounds (based on GSWA, 1983)

4. Hydrogeology

4.1. Aquifers

4.1.1. Overview

The Weld Range is situated within the East Murchison Groundwater Management unit. Groundwater typically is found at depths of between 5 to 50 mbgl beneath the alluvial plain surrounding the Weld Range. Groundwater is also encountered in bedrock material that forms the Weld Range. Close to Beebyn-W11 groundwater occurs at ~490 mAHD (B_WB_02, April 2024)

4.1.2. Beebyn-W11

At Beebyn-W11 mineralised Banded Iron Formation forms the most prospective aquifer and is surrounded by low permeability dolerite and saprock. Furthermore, north-westerly faults offset the BIF such that along strike it may form partially to completely isolated compartments.

Historically there has been limited drilling within the faulted compartment in which W11 sits as shown on Figure 12. B_WB2_01 has been subject to a 72-hour constant rate test, during which time it was able to sustain a yield of 0.99 L/s. B_WB2_03 was unable to sustain a significant yield and was installed as a monitoring bore. Noting the potentially compartmentalised nature of the orebodies it is considered that connectivity between orebodies may be limited.

Packer test data indicates generally low permeability units are encountered in the area, again suggesting that regional connectivity may be limited and that long term yields are likely to be low in bores installed into basement rock.

4.2. Groundwater recharge

Recharge to the system is anticipated to be limited, occurring from rainfall infiltration mainly along ephemeral creeks and direct recharge to outcrop.

4.3. Groundwater throughflow

In the Beebyn-W11 area, groundwater throughflow is anticipated to be limited and preferentially occur along strike of the mineralised BIF. North-westerly striking faults have offset the BIF locally, displacing it against low permeability dolerite – it is anticipated that this would reduce connectivity between the faulted units, limiting throughflow.

4.4. Groundwater users

Locally, groundwater is targeted by shallow wells or water supply bores for domestic or stock watering purposes. Existing bores are typically drilled along existing creek lines and are anticipated to be targeting the shallow alluvial aquifer. The closest bore is Limestone Bore, approximately 1.6 km to the north-northeast of Beebyn-W11.

SRK undertook a bore audit during 2008, the nearby results for which are summarised in Figure 8. The regional groundwater gradient is from northwest to southeast, broadly consistent with contemporary surface water drainage. Groundwater elevation close to Beebyn-W11 has been measured at approximately 490 mAHD, consistent with regional groundwater measurements.





Figure 8 Bores close to Beebyn-W11 - including results of a bore audit in 2008 (data from SRK, 2008)

4.5. Groundwater dependent ecosystems

Potential groundwater dependent ecosystems have been identified and mapped on a national scale by the Bureau of Meteorology (Doody, et. al, 2017). BOM's GDE database indicates that potential terrestrial GDEs have been identified on the alluvial flood plains and surrounding hard pans of the low-lying terrain near W11 (Figure 9).

- Low potential GDE (blue in Figure 9) –
 - identified along the alluvial flood plain /creek line associated with minor ephemeral creeks in the area; described as: flat hardpan wash plains;
 - supporting groved mulga shrublands and occasional wanderie grasses.
 - Approximately 1.3 km east of W11
- Medium potential GDE (green on Figure 9)
 - identified on the laterite / hardpan surface away from creeklines;
 - described as: gently undulating gravelly plains on greenstone, laterite and hardpan, with low stony rises and minor saline plains; supporting groved mulga and bowg
 - Approximately 350 m south of W11; and ~1 km north of W11.

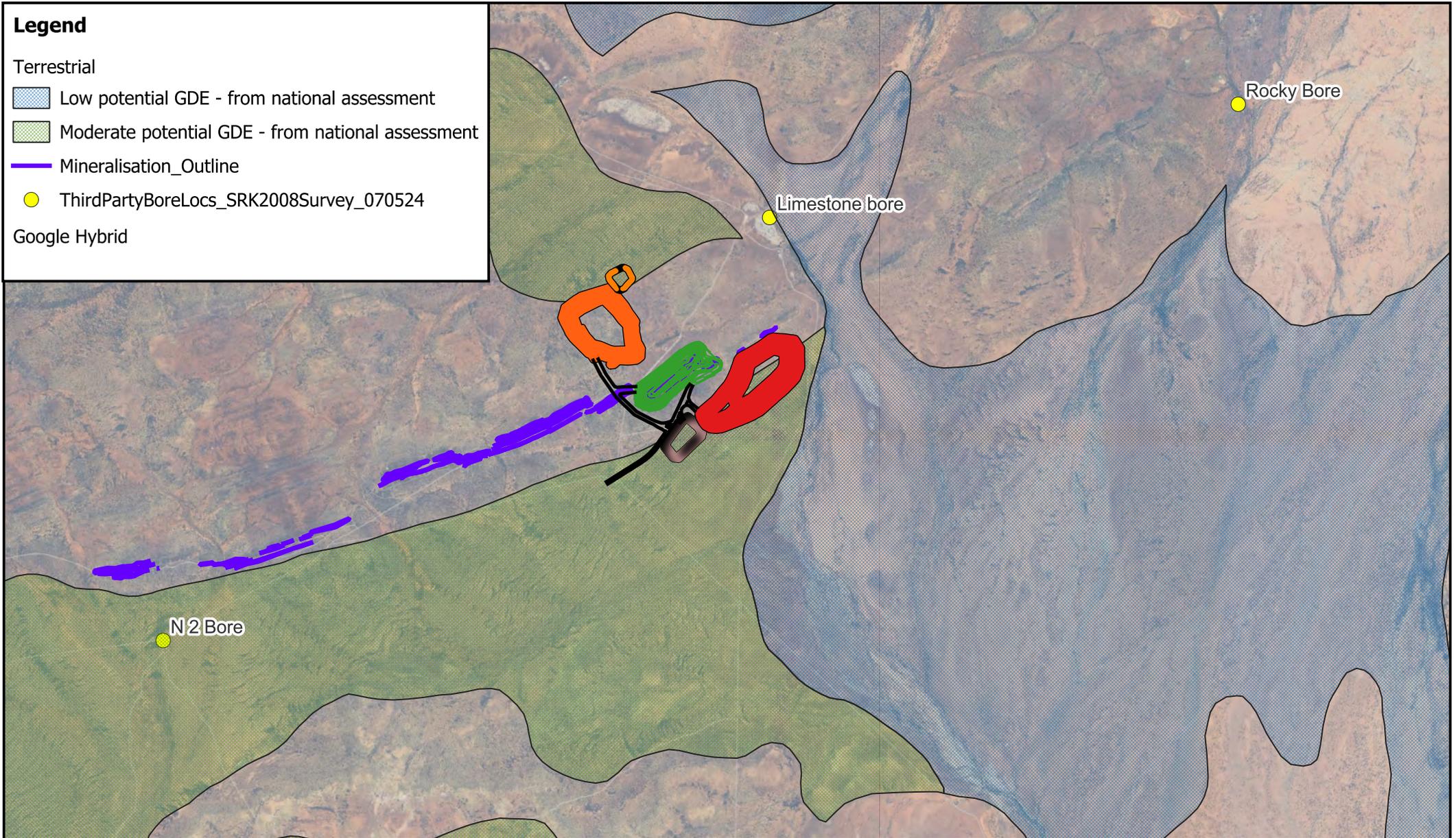


Legend

Terrestrial

-  Low potential GDE - from national assessment
-  Moderate potential GDE - from national assessment
-  Mineralisation_Outline
-  ThirdPartyBoreLocs_SRK2008Survey_070524

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Sources: data.gov.au, DWER,
landgate

0 0.2 0.4 0.8 km



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Figure 9

Potential groundwater dependent ecosystems near
Beebyn-W11 (based on BOM, 2024)

4.6. Previous Groundwater Investigations

4.6.1. Overview

There have been limited groundwater investigations in the immediate environs of the Beebyn-W11 Pit. Several studies have considered the broader Beebyn-W11 area. Relevant reports are summarised in Table 3.

Table 3 Summary of previous studies

Author	Title	Comment
Worley Parsons, 2008	Weld Range Iron Ore Pre-Feasibility Study – Mine Site Infrastructure Hydrology Study	Hydrology and surface water assessment of the then mine plan.
SRK, 2010	Weld Range Iron Ore Project – Bankable Feasibility Study (BFS) – Hydrogeological Investigation and Modelling	Regional scale model for Beebyn and Madoonga deposits; calibrated to single high yielding bore; indicative dewatering rates of up to ~2.7 GL/a and ~8.6 GL/a Reports that original (Pre-feasibility study) predictions for dewatering at Beebyn and Madoonga were ~11 GL/a and 20 GL/a Packer testing indicated hydraulic conductivities of key units as: Dolerite ~0.001 m/d Orebody ~0.01 m/d Saprock ~0.0004 m/d Saprolite ~0.001 m/d
SRK, 2012	Weld Range model rerun	Update on earlier model; still based on very high volumes
Rockwater, 2019	Iron Ridge Project – Bore Completion and Hydrogeological Assessment	Recent aquifer testing and modelling for the nearby Iron Ridge deposit. Broadly comparable, if slightly larger, to the W11 deposit. Estimated dewatering rates of ~10 L/s, for a period of approximately 7 years.

Noting the very high predicted dewatering volumes predicted at the pre-feasibility study and bankable feasibility study stage it is considered that although these values related to a much larger final pit, the values are nonetheless high for the hydrogeological setting and based on available drilling data from both Iron Ridge and W11 areas. The outcomes associated with recent testing and modelling at Iron Ridge are more consistent with what would be expected based on the hydrogeological setting – i.e., narrow BIF aquifers surrounded by low permeability dolerite or saprock.

Site specific investigation of the Beebyn-W11 area is recommended to confirm the current conceptualisation and further inform on dewatering and water management strategies.

4.6.2. Previous hydraulic testing

The results of 92 packer tests from 19 geotechnical bores drilled across the Beebyn and Madoonga areas are plotted in SRK, 2008 and summarised in Table 4.

Table 4 Packer testing results (based on SRK, 2010)

	Unit	Permeability (m/d)
Packer testing	Dolerite	0.001
	Orebody	0.01
	Saprock	0.0004
	Saprolite	0.001



4.6.3. Previous groundwater exploration

4.6.3.1. Beebyn-W11

Drilling of hydrogeological exploration bores in the environs of W11 are summarised in Table 5 and Figure 12. During previous studies, 5 production bores have been installed in the Beebyn area together with 6 long term monitoring bores. Available bore details are summarised in Table 5.

No hydrogeological investigation bores have successfully targeted the BIF in the environs of Beebyn-W11, with long term monitoring bores and the closest production bores being installed in low permeability saprock or dolerite.

B_WB02_03 was drilled targeting the BIF close to the planned Beebyn-W11 pit but did not encounter BIF until ~140 mbgl. B_WB02_03 was installed to ~113 mbgl, within saprolite material and yielded only 0.99 L/s during a pumping test of 72 hours duration.

Water chemistry data from the 2009/10 investigations is summarised in Table 5. The chemistries are broadly similar, and all representative of water within the dolerite surrounding W11. The water is fresh to brackish in nature, consistent with that observed during the regional monitoring undertaken in 2008 (SRK, 2008).

Overall, the available bore data indicates material surrounding Beebyn-W11 to be low permeability in nature.

Most recently, test pumping of the two pre-feasibility bores was undertaken completed in 2024, with yields broadly similar to those obtained in 2007, the results of which are summarised in Table 5. BBWB001 is currently being used to supply water to the initial mining operations – at approximately 12 L/s.

4.6.3.2. Iron Ridge

The nearby Iron Ridge deposit (~20 km west south-west, along strike of W11) was investigated in 2019 (Rockwater, 2019) and included two production bores targeting the BIF. Iron Ridge targets a similar orebody (steeply dipping BIFs flanked by dolerite) to that encountered at W11 – therefore is considered a suitable proxy. Key findings from Rockwater, 2019 include:

- IRPB01 (production bore)
 - drilled and installed within BIF; airlift development (post construction) yields of ~24 L/s; pumping testing at 33 L/s, results indicated that these rates were not sustainable and water levels would reach aquifer base after 180 days.
- IRPB02 (production bore)
 - Drilled and installed in BIF, air lift development (post construction) yields of ~3 L/s; pumping testing at 9 L/s was achieved.
- The site conceptualisation identifies that the BIF beds are moderately to highly permeable, whilst the surrounding dolerite is low permeability. This is consistent with the setting at Beebyn-W11.
- Dewatering rates of ~10 L/s are predicted over the approximately 7-year life of mine, as the mine approaches year 6 of operation dewatering volumes of between ~6 L/s and 16 L/s have been encountered.

Since commencement of abstraction at Iron Ridge, the two constructed water supply bores (MACA and Fenix) have been unable to sustain initial volumes, showing a declining trend with time (Figure 10). Water level data indicate similar declining trends (Figure 11).

The site setting at Iron Ridge is like that at Beebyn-W11, namely a unit of steeply dipping BIF surrounded by low permeability dolerite. It is considered that a similar response would be seen at Beebyn-W11, i.e., declining flows over time. The response reflects limited recharge and throughflow to the BIF aquifer.



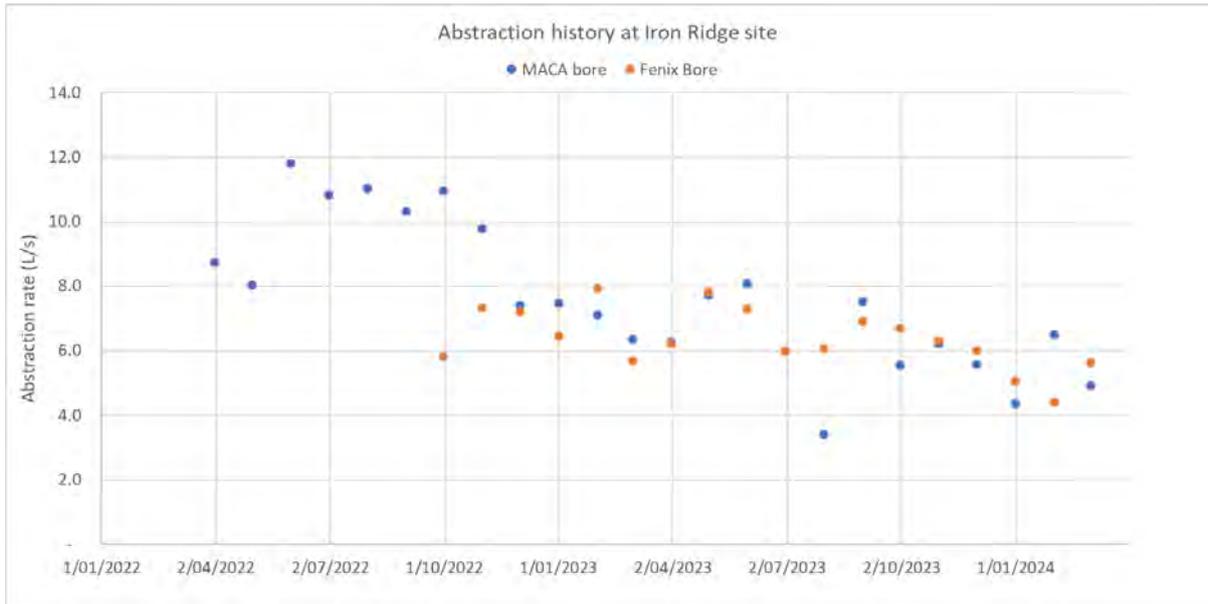


Figure 10 Abstraction history at Iron Ridge

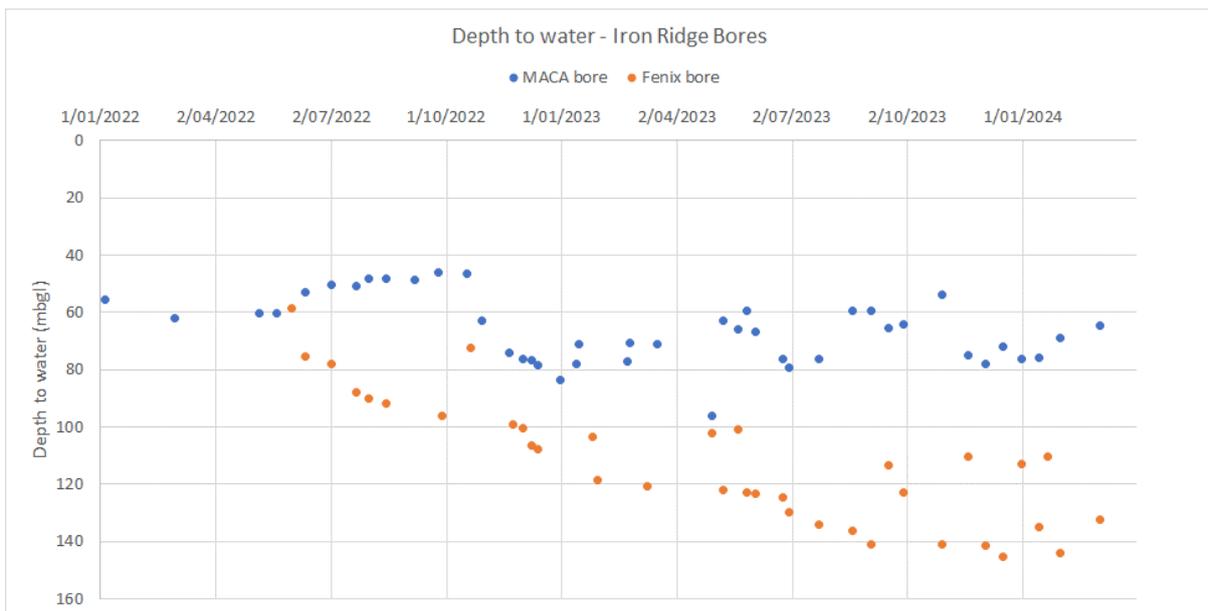


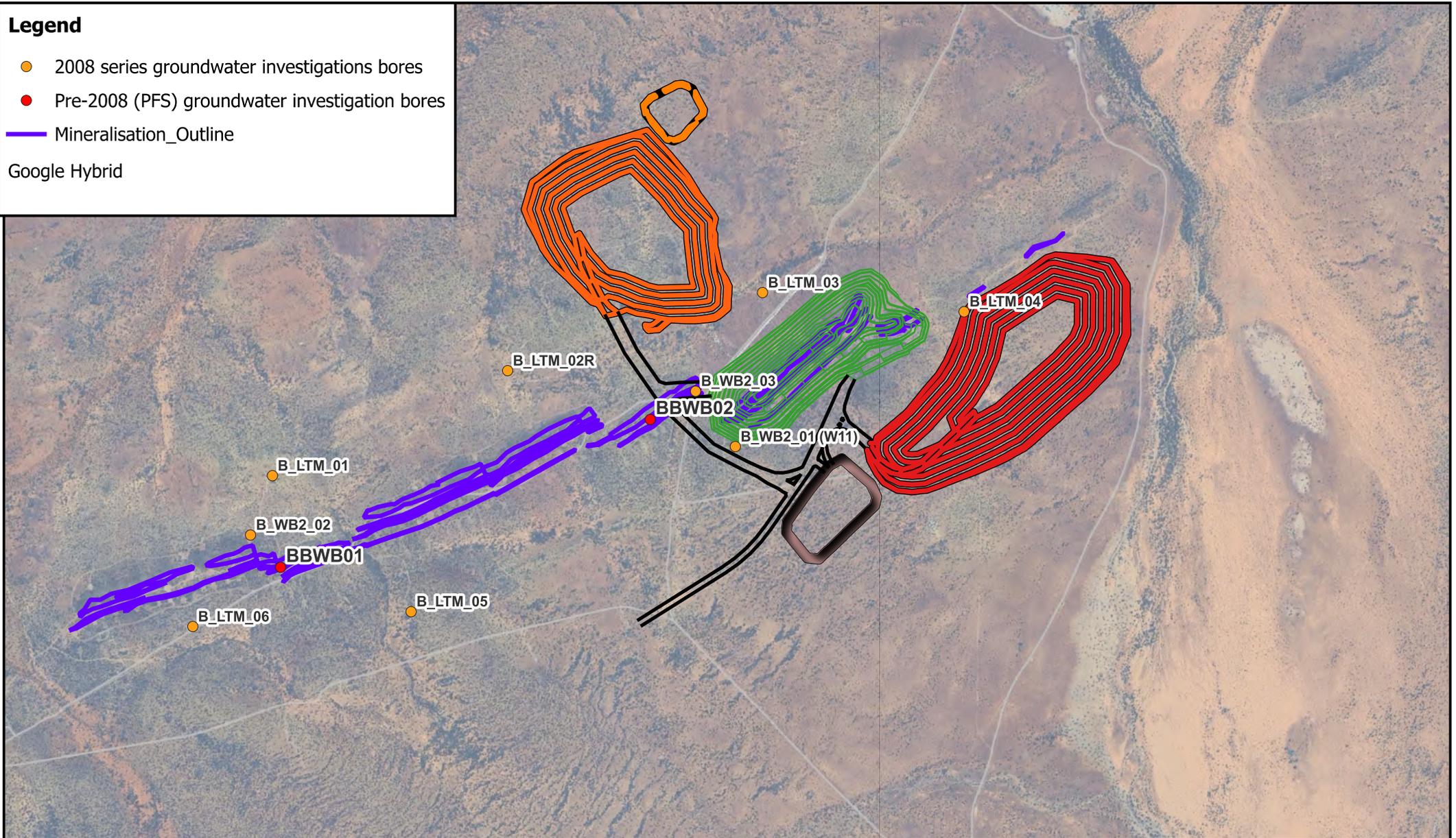
Figure 11 Depth to water time series (Iron Ridge bores)



Legend

- 2008 series groundwater investigations bores
- Pre-2008 (PFS) groundwater investigation bores
- Mineralisation_Outline

Google Hybrid



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landgate

0 0.2 0.4 0.6 0.8 km



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Figure 12

W11 pit, historical drilling and mineralised BIF

Table 5 Test production bores near W11 (from SRK, 2008)

Bore ID	Easting (MGA Z50)	Northing (MGA Z50)	Ground level (mAHD)	Collar height (magl)	Casing	Drilled depth (m)	Slotted interval (mbgl)	Geology encountered	Water level (mbtoc)	Water level (mAHD)	pH	Salinity (mg/L TDS)	Yield (L/s)		Transmissivity (m ² /d)	Commentary
									2024	2024	2009	2009	2009	2024		
Feasibility Study (2008)																
B_WB2_01 (W11)	582645.79	7026807.51	517.79	0.5	50 mm uPVC	148	120-144	0-14 canga; 14 -103 saprolite (clay); 103-150 (dolerite)	29.6	488.69	8.6	1400				Low yielding, originally planned as production bore but installed as monitoring bores.
B_WB2_02	580582.96	7026433.98	541.04	0.8	50 mm uPVC	150	108-114; 120-126; 132-138; 144-150	0-1 canga; 1-124 saprolite (clay); 124-150 (dolerite)	49.7	492.14	7.6	950				
B_WB2_03	582476.71	7027041.12	525.36	0.24	200 mm uPVC	150	47-113	0-9 canga; 9-109 saprolite (clay); 109-142 dolerite; 142-150 interbedded orebody and ultramafic	35.0	490.6	7.1	670	0.99 (pumping test)		0.9 (recovery data) (permeability ~0.01 m/d)	Limited yield; completed within dolerite.
Prefeasibility study bores																
BBWB01	580712	7026294	-	-	-	-	-	Bore log not sighted as part of this report [anticipated to be targeting BIF]	35.2	~490	-	-	12.4	~14	148	Likely targeting orebody.
BBWB02	582288	7026916	-	-	-	-	-	Bore log not sighted as part of this report [anticipated to be targeting BIF]	49.7	~490	-	-	1.79	~3	3.6	

Table 6 Long term monitoring bores near W11 (from SRK, 2008)

Bore ID	Easting (MGA Z50)	Northing (MGA Z50)	Ground level (mAHD)	Collar height (magl)	Casing	Drilled depth (m)	Slotted interval	Geology encountered	Water level (mbgl)	(mAHD)	pH	Salinity (mg/L TDS)	
Bores near W11										2024	2024	2009	2009
B_LTM_02R	581686	7027118	524.3	0.59	50 mm uPVC	84	44.5-80.5	0-4 canga; 4-52 saprolite (sand / silt) 52-84 dolerite	33.2	491.86	8.4	680	
B_LTM_03	582768	7027451	514.92	0.6	50 mm uPVC	90	47-83	0-1 canga; 1-21 saprolite 21-90 dolerite	25.9	489.62	7.8	690	
B_LTM_04	583631	7027376	508.47	0.46	50 mm uPVC	78	41-71	0-8 unconsolidated sediment 8-37 saprolite (clay) 37-78 dolerite	22.2	486.73	7.6	830	
Bores to the southeast													
B_LTM_01	580676	7026679	528.76	0.72	50 mm uPVC	108	71-101	0-28 saprolite (clay) 28-110 dolerite	37.7	491.78	8.9	1000	
B_LTM_05	518282	7026100	513.7	0.6	50 mm uPVC	90	48-84	0-2 canga 2-5 dolerite 5-20 saprolite 20-90 dolerite	22.8	491.5			
B_LTM_06	580335	7026038	524.69	0.6	50 mm uPVC	84	47-77	0-20 saprolite 20-73 dolerite 73-84 no return	32.8	492.49			



Table 7 Water quality samples near W11 (extracted from SRK, 2010)

Bore ID		B_LTM_03	B_LTM_04	B_WB2_01	B_WB2_02
Date		15/07/2009	16/07/2009	17/07/2009	18/07/2009
pH		7.8	7.6	8.6	7.6
Conductivity @ 25	uS/cm	1200	1400	2300	1600
TDS calculated	mg/L	690	830	1400	950
Hardness (as CaCO3)	mg/L	250	330	500	310
Carbonate, CO3	mg/L	<1	<1	14	<1
Bicarbonate, HCO3	mg/L	290	370	380	370
Chloride, Cl	mg/L	180	220	450	260
Sulphate, SO4	mg/L	88	130	190	160
Nitrate, NO3	mg/L	55	28	<0.2	14
Sodium, Na	mg/L	170	180	190	230
Potassium, K	mg/L	11	14	180	12
Calcium, Ca	mg/L	37	45	50	39
Magnesium, Mg	mg/L	38	54	92	52
Soluble Iron, Fe	mg/L	<0.02	<0.02	<0.02	<0.02
Fluoride, F	mg/L	0.4	0.3	0.5	0.3
Free Cyanide	mg/L	<0.01	<0.01	<0.01	<0.01
Aluminium, Al	mg/L	<0.02	<0.02	<0.02	<0.02
Arsenic, As	mg/L	0.005	<0.002	0.24	<0.002
Manganese, Mn	mg/L	0.007	0.007	0.074	0.29
Lead, Pb	mg/L	<0.005	<0.005	<0.005	<0.005
Cadmium, Cd	mg/L	<0.001	<0.001	<0.001	<0.001
Copper, Cu	mg/L	<0.005	<0.005	<0.005	<0.005
Antimony, Sb	mg/L	<0.0005	<0.0005	0.05	<0.05
Mercury, Hg	mg/L	<0.05	<0.05		
Silver, Ag	mg/L	<0.005	<0.005	<0.005	<0.005
Boron, B	mg/L	1	0.9	0.7	1.2
Barium, Ba	mg/L	<0.005	<0.005	0.02	<0.01
Beryllium, Be,	mg/L	<0.005	<0.005	<0.005	<0.005
Cobalt, Co	mg/L	<0.01	<0.01	<0.01	<0.01
Chromium, Cr	mg/L	<0.005	<0.005	<0.005	<0.005
Molybdenum, Mo	mg/L	<0.01	<0.01	<0.01	<0.01
Nickel, Ni	mg/L	0.007	0.005	0.06	0.008
Phosphorous, P	mg/L	0.08	0.25	<0.05	<0.05
Selenium, Se	mg/L	0.004	0.004	0.048	0.007
Sulphur, S	mg/L	28	41	64	52
Silicon, Si	mg/L	18	19	30	26
Tin, Sn	mg/L	<0.05	<0.05	<0.05	<0.05
Strontium, Sr	mg/L	0.25	0.32	0.45	0.28
Thallium, Tl	mg/L	<0.02	<0.02	<0.02	<0.02
Titanium, Ti	mg/L	<0.005	<0.005	<0.005	<0.005
Vandium, V	mg/L	<0.02	<0.01	0.03	<0.01
Zinc, Zn	mg/L	0.043	0.03	0.42	0.68



5. Pit progression

5.1. Pit progression

Beebyn-W11 is planned to progress to a depth of approximately 210 mbgl (excavation from ~550 mAHD to ~340 mAHD) over a period of 6 to 7 years (nominally between 2025 to 2032), as approximated in Table 8.

Table 8 W11 bench progression (estimated)

Pre-mining	Initial ground level	
Mine progression	~550 to 520 mAHD	
Year of operation	Lowest (mAHD)	bench
1	505	Above water table
2	470	Prevailing water level is ~490 mAHD
3	435	Below water table
4	405	
5	370	
6	340	

During year 1 mining progresses above the water table, no dewatering is required but water supply to support production is necessary.



6. Numerical modelling

6.1. Model software

A numerical groundwater flow model was constructed using Groundwater Vistas V6 graphical user interface (ESI, 2011) and run using the MODFLOW-USG code (Panday et al., 2013).

6.2. Model geometry

A model grid covering approximately 13 km (N-S) by 16 km (E-W) was constructed with regional grid cells measuring 200 m by 200 m. The grid was refined in the environs of the Beebyn-W11 pit to 40m by 40 m, and then further to 20m by 20m over the revised pit area.

6.3. Model layering and hydrostratigraphy

Model layers were constructed to represent the conceptual model, as summarised in Table 9. Layers 2 to 5 dip gently to the southeast, sympathetic to the prevailing groundwater gradient.

Table 9 Numerical model layers and hydrostratigraphic units

Layer	Hydrostratigraphy	Upper surface (mAHD)	Lower surface (mAHD)
1	Surficial deposits, Quaternary alluvium, outcrop of BIF, basement	Topographic surface	~470
2	Basement rocks – granite; dolerite; BIF (orebody)	~470	~430
3	Basement rocks – granite; dolerite; BIF (orebody)	~430	~390
4	Basement rocks – granite; dolerite; BIF (orebody)	~390	~350
5	Basement rocks – granite; dolerite; BIF	~350	~300

Geological units are distributed based on available geological mapping of the area. Detailed mapping in the immediate environs of the planned Beebyn-W11 pit has been incorporated, where the near vertical dipping Banded Iron Formation Units are juxtaposed against dolerite. The distribution of zones are summarised in Figure 13 (cross-section), Figure 14 (Layer 1) and Figure 15 (Layers 2 to 5).

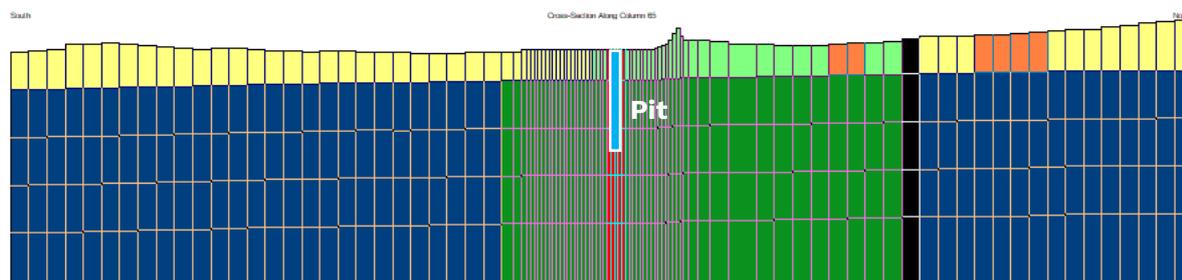


Figure 13 Model geometry (Column 65 - South to North) (see Figure 15 for legend)



Numerical model zone – legend (Figures 14, 15, 16)

- Surficial deposits
- Quaternary Alluvial (Beebyn Creek)
- Banded Iron Formation (250 k mapping)
- Banded Iron Formation (Fenix geology model)
- Dolerite / Saprock (near surface)
- Dolerite / Saprock (subcrop)
- Basement outcrop (granite, mafic)
- Basement subcrop (granite, mafic)

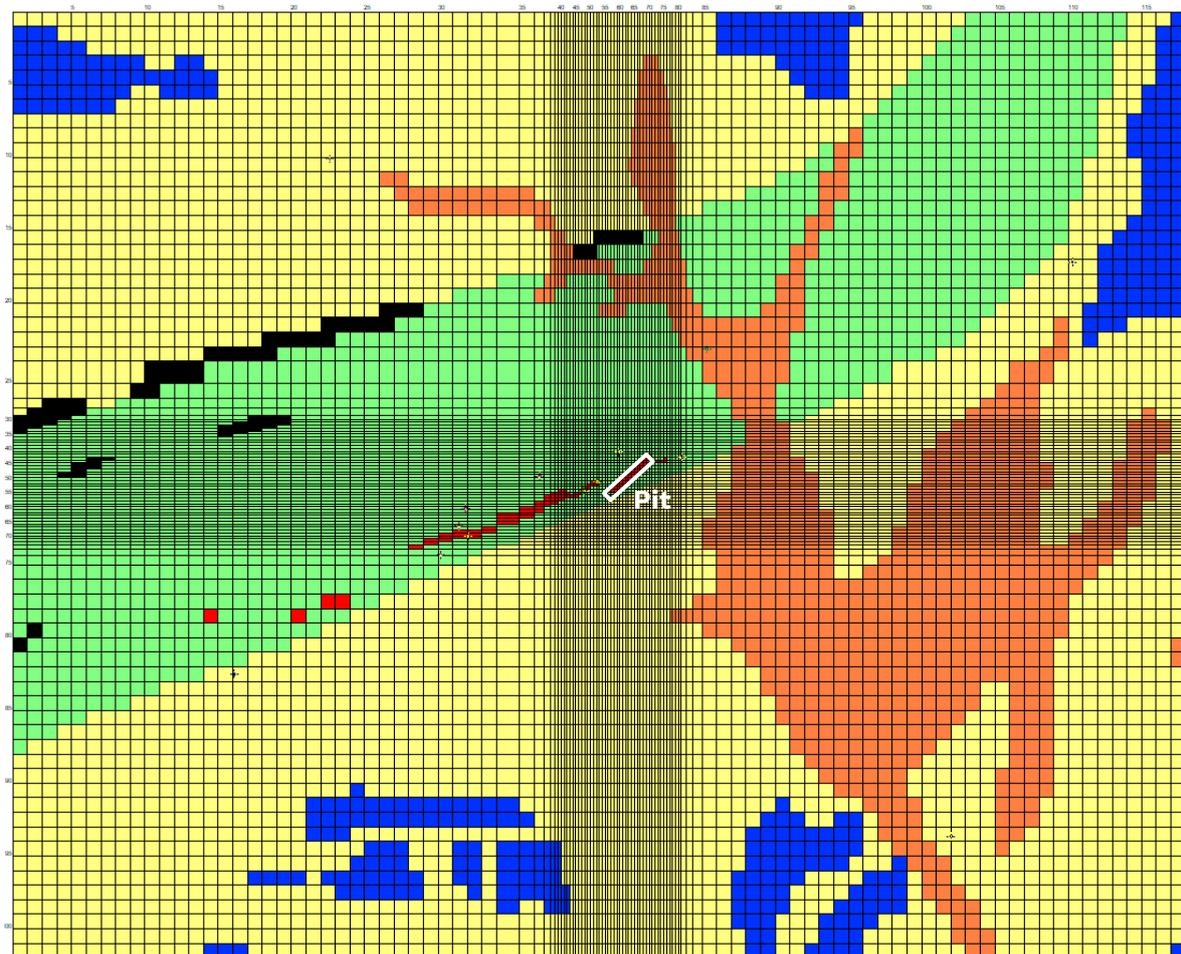


Figure 14 Layer 1 model geometry



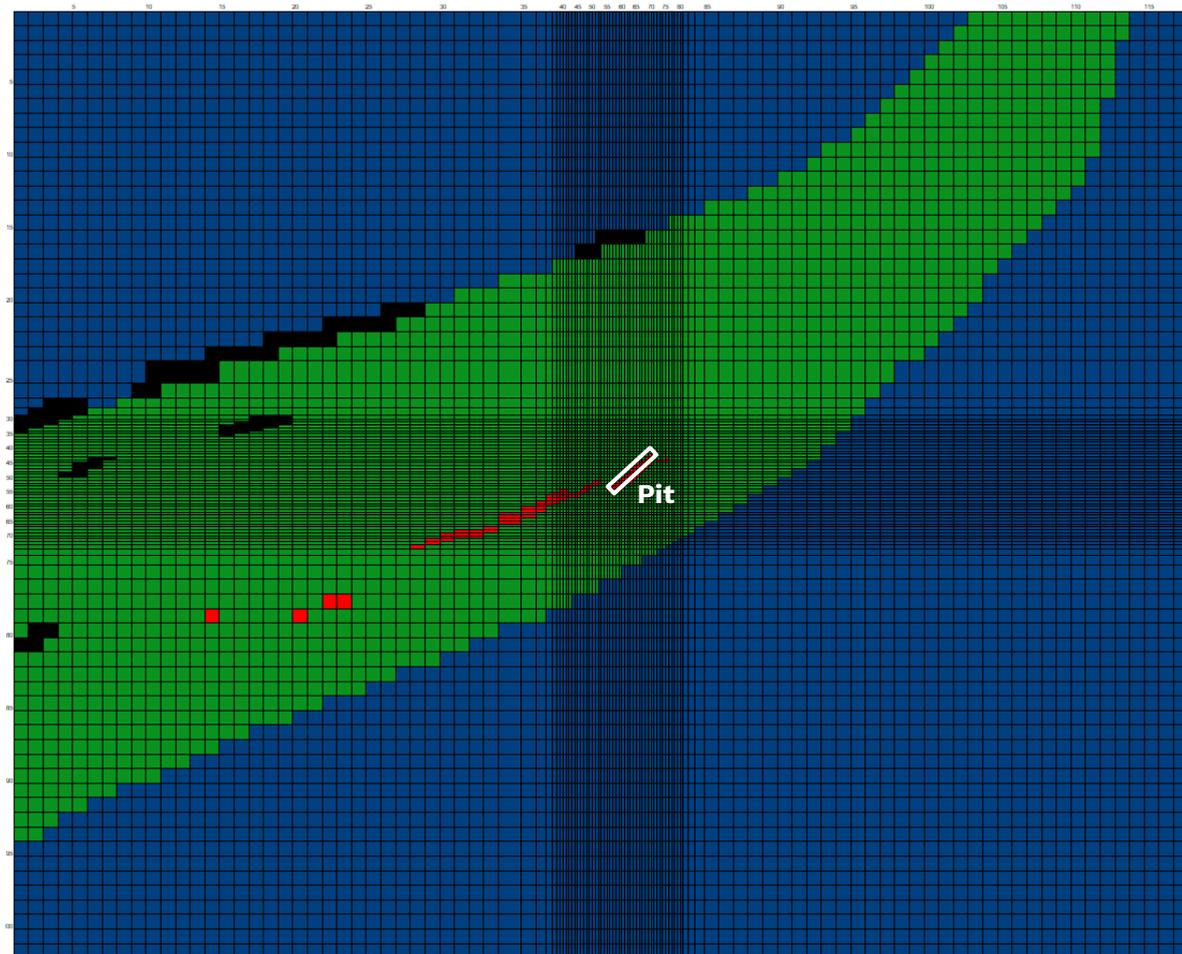


Figure 15 Model geometry (Layers 2 to 5)

6.4. Model boundary conditions

To represent the prevailing groundwater conditions, constant head boundaries were applied in Layer 1 as shown on Figure 16. These were adjusted to approximately calibrate the model in terms of historical water levels, noting that recent water level data are generally focussed on the immediate environs of the Beebyn-W11 deposit. Regional water level data, collected in 2008, (SRK, 2008) covers areas further from the orebody.



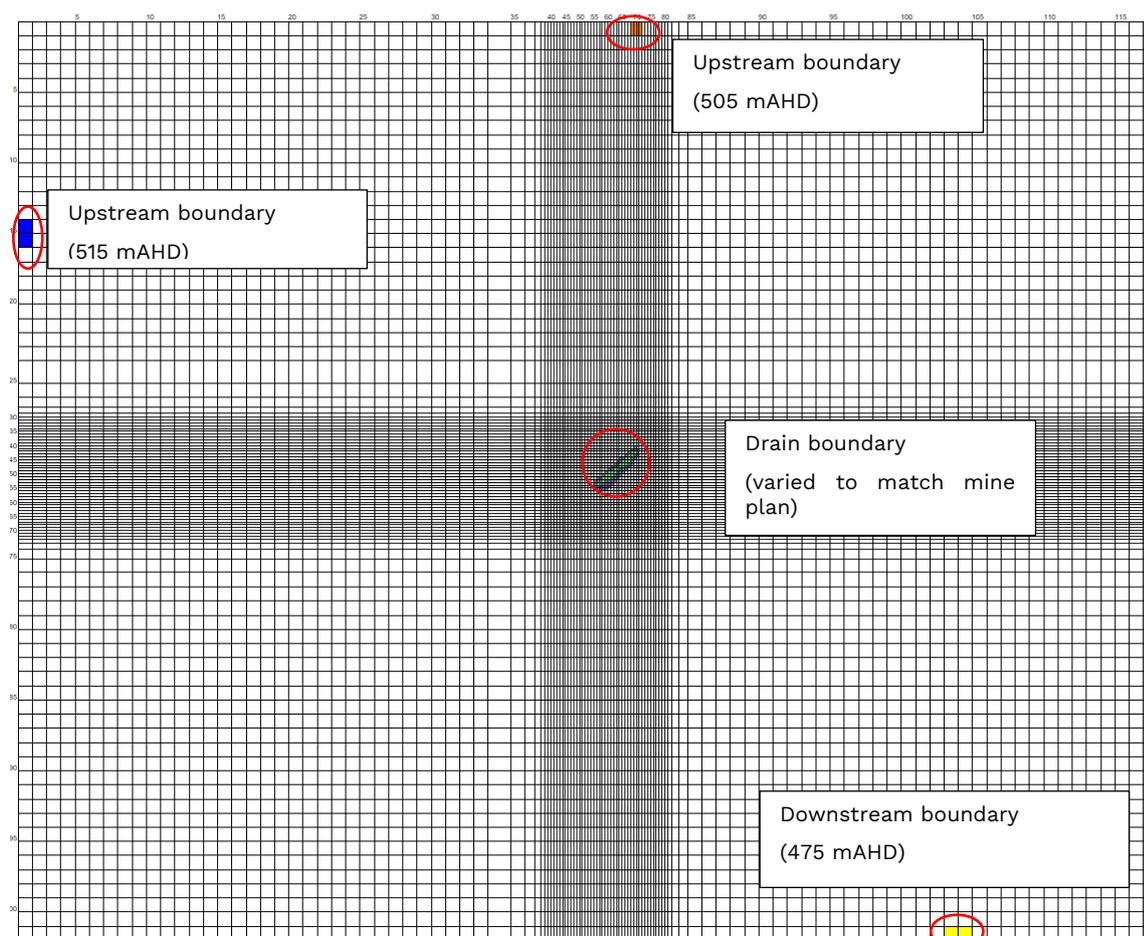


Figure 16 Model grid and boundaries (grid size (13 km north-south, 16 km east-west))

6.5. Model Parameters and calibration

No long-term test pumping or abstraction has been undertaken in the environs of Beebyn-W11, consequently definition of the aquifer parameters is limited. Nearby Iron Ridge deposit is in a similar hydrogeological setting and targeting the same type of orebody approximately 20 km along strike (west) – achieving yields of between 6 and 16 L/s over the 6-year operational life of Iron Ridge to date.

Based on the current conceptualisation, and using Iron Ridge as a proxy, model parameters were assigned (Table 10) to achieve a reasonable match with available water level data near Beebyn-W11 and reflect the observations during dewatering from the nearby Iron Ridge site.

Table 10 Model parameters

Unit	K (m/d)	Specific (v/v)	Yield (Sy)	Distribution
Surficial cover	0.25	0.1		
Quaternary Alluvium (creek lines)	0.5	0.1		Along main creek line to east of W11 deposit
BIF	0.05	0.03		
Dolerite	0.0005	0.01		SW-NE oriented basement
Weathered dolerite / saprolite	0.005	0.01		SW-NE outcrop / subcrop – layer 1
Basement (granite, mafics)	0.0005	0.01		Subcrop



Using the above parameters a reasonable match of historical water level data (a combination of data from 2008 and 2024) was achieved and considered representative of the groundwater environment. The comparison between measured and modelled water levels is summarised in Figure 17.

Storativity and specific yield parameters are required for transient modelling of the system, noting a lack of long-term test pumping or abstraction to define these, in particular relating to the Banded Iron Formation, values have been assigned based on the nature of the materials, and findings from studies at Iron Ridge, as summarised in Table 10.

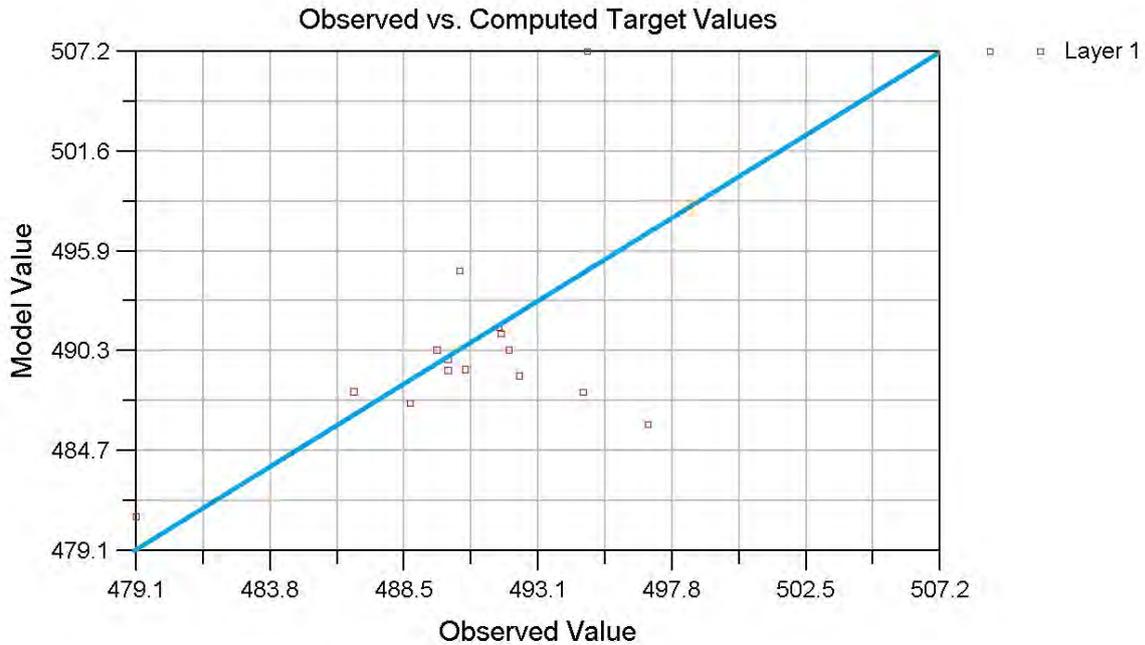


Figure 17 Observed vs. modelled target values

6.6. Mine plan

The progression of the Beebyn-W11 pit was modelled using drains, acting to remove water to a depth of 5 m below the pit progression. The progression is summarised in Table 11.

Table 11 Mine plan and associated target water levels

Year	Mine bench elevation (mAHD)	Target groundwater elevation (i.e., drain elevation) (mAHD)
1	505	n/a - above water table
2	470	465
3	435	430
4	405	400
5	370	365
6	340	335



7. Model Results

7.1. Overview

The model is based on limited site-specific data and consequently is considered a Class 1 type model suitable for initial assessment of indicative dewatering volumes and identifying potential impacts.

Bearing the above in mind, the following results are consistent with the current conceptualisation and provide an indication of potential impacts of planned dewatering. The conceptual and numerical models should be revisited and updated as and when additional site-specific data become available.

7.2. Base case

The available data indicates that the orebody (BIF) comprises several discreet, laterally discontinuous units separated by north-westerly trending fault structures which have displaced the BIF against low permeability dolerite. This is reflected in the numerical model setup, and observed in the model outputs:

- Drawdown predominantly occurs within the BIF, with the zone of influence propagating a short distance laterally through the surrounding dolerite.
- As the pit progresses to depth, late time dewatering volumes are anticipated to decline slightly, a reflection of the low permeability surrounds and a reducing pit profile at depth.
- The key uncertainty is the nature of the connectivity of the BIF orebody aquifer and surrounding units – which are considered of low permeability.

Outputs from the base case model are summarised in Figure 18 (dewatering volumes) and Figure 19 (drawdown). Overall, volumes of water of ~7.3 L/s are predicted across the life of mine. Initial peaks in dewatering volume are reflective of water being removed from storage in the immediate environs of the pit as the model drains are lowered at the start of the respective timestep – these peaks could be smoothed out by advanced dewatering ahead of pit progression.

By the end of mining (year 6), the cone of depression (to 0.5 m drawdown) has extended approximately 1.5 km from the orebody. Further investigation is recommended – in particular drilling and testing of a production bore within the W11 BIF (orebody) to allow for a detailed assessment of potential impacts – including validation of the conceptual model documented herein. The closest receptors include:

- Limestone Well, approximately 1.3 km to the northeast
- The Beebyn-Creek, approximately 1.2 km to the east
- Potential groundwater dependent ecosystem, approximately 350 m to the south

The modelled drawdown cone (Figure 19) does not reach Limestone Well to the northeast of the pit nor Beebyn Creek to the southeast. The drawdown cone does extend partially beneath the moderate potential GDE identified to the south,



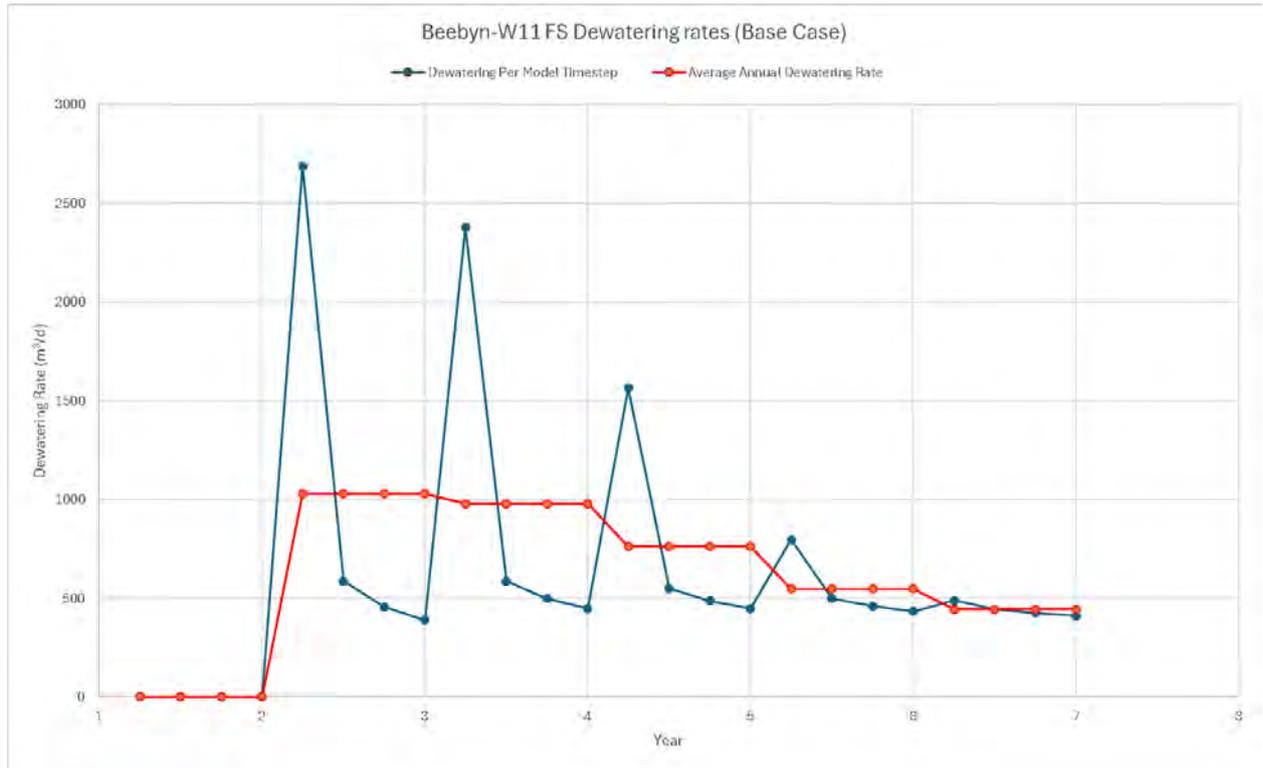
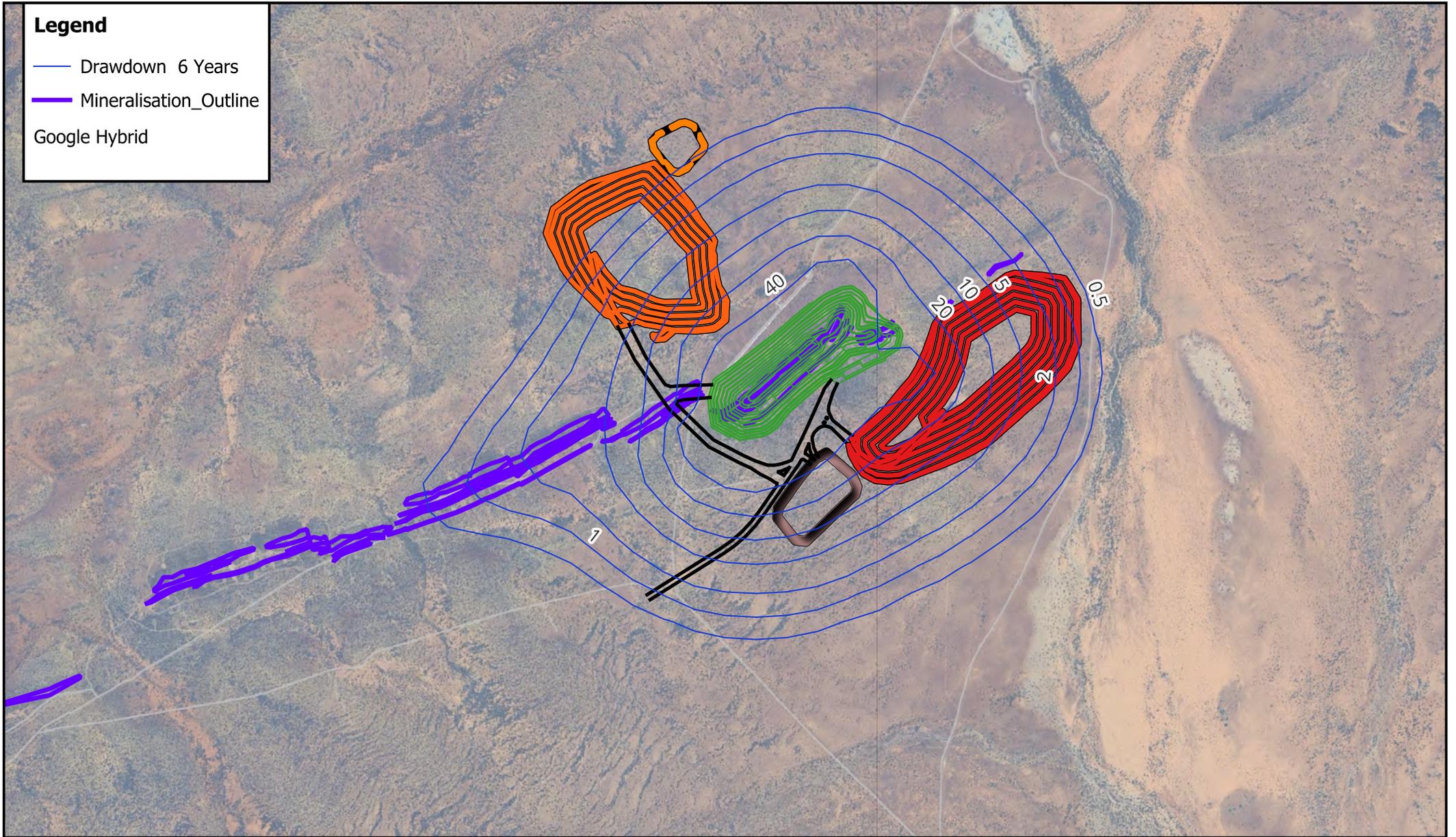


Figure 18 Dewatering volumes (base case scenario)



Legend

- Drawdown 6 Years
- Mineralisation_Outline
- Google Hybrid



Project code:
Drawn by: Greg van Blomestein
Date: 13/08/2025
Scale: 1:24876
Page size: A4
Sources: data.gov.au, DWER,
landgate

0 0.2 0.4 0.6 0.8 km



GDA94 / MGA zone 50

Figure 19

Beebyn W11 Mine - Drawdown (m) at end of mining (Yr6)
- Base case scenario

7.3. Sensitivity

Noting uncertainty regarding site-specific long-term testing to determine hydraulic parameters, a broad sensitivity has been undertaken.

The base parameters (permeability, specific yield) have been doubled (high case) and halved (low case) compared to the base case to assess model sensitivity. This keeps the parameters within a reasonable range of the expected values.

As permeability of the surrounding units is increased, connectivity between the BIF (i.e. the pit) and the surroundings increases, and dewatering volumes increase accordingly. Similarly increases in available water (e.g., specific yield) result in increasing dewatering volumes – reflective of a more substantial available water resource. Conversely, with lower permeability and specific yields, connectivity and available water are lower, leading to lower anticipated dewatering volumes. The lack of site-specific testing (e.g., test pumping, long term pumping) needs to be resolved to test the conceptualisation and validate model predictions. The model should be revisited once additional site-specific data are available.

The various sensitivity scenarios considered are as follows:

- Base case – base scenario
- 1A – high permeability, testing increased connectivity of the surrounding basement
- 1B – low permeability, testing reduced connectivity of the surrounding basement
- 2A – high specific yield (Sy), testing increased water availability
- 2B – low Sy, testing reduced water availability

Table 12 Variables - sensitivity runs

Unit	Permeability, k (m/d) (base)	1A (high permeability basement)	1B (low permeability basement)	Specific yield (Sy) (base)	2A (high Sy)	2B (low Sy)
Surficial cover	0.25	0.5	0.125	0.1	0.2	0.05
Quaternary Alluvium (creek lines)	0.5	0.001	0.00025	0.01	0.02	0.005
BIF	0.05	1	0.25	0.1	0.2	0.05
Dolerite	0.0005	0.1	0.025	0.03	0.06	0.015
Weathered dolerite/saprolite(Layer 1)	0.005	0.001	0.00025	0.01	0.02	0.005
Basement (granite, mafics)	0.0005	0.001	0.00025	0.01	0.02	0.005

Table 13 Dewatering volume - sensitivity scenarios (L/s)

Year	Base Case	1A (higher k basement)	1B (lower k basement)	2A (high Sy)	2B (low Sy)
1	0.0	0.0	0.0	0.0	0.0
2	11.9	15.8	9.6	13.2	8.4
3	11.3	15.0	9.2	15.7	8.1
4	8.8	12.3	6.9	11.6	6.7
5	6.3	9.7	4.6	7.4	5.3
6	5.1	8.3	3.5	5.4	4.3

Predicted average flowrates range between ~10.2 L/s (0.32 GL/a) and ~5.5 L/s (0.17 GL/a) (base case being ~7.3 L/s (0.23 GL/a)) over the life of the mine.



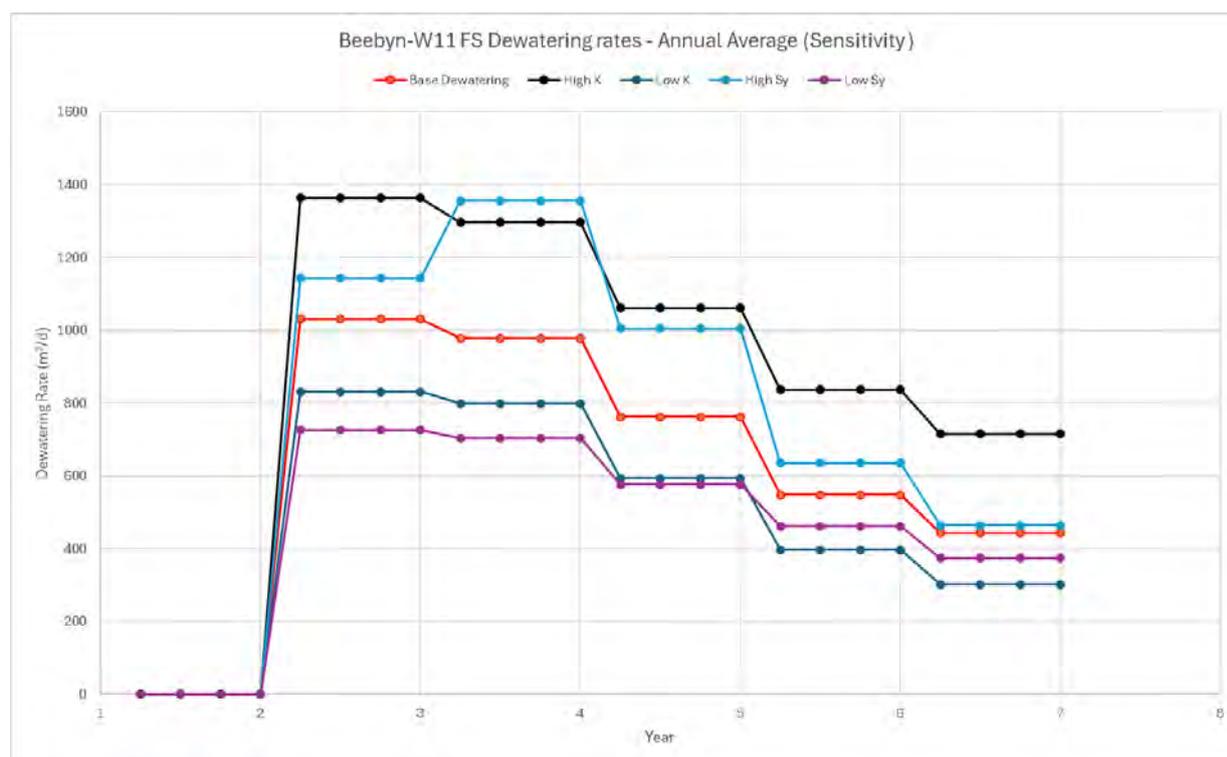


Figure 20 Sensitivity analysis comparison of model runs

The sensitivity analysis indicates a potential variability in terms of yields obtained from the dewatering activity.

If yields are consistently high, exceeding demand, then consideration would need to be given to management of surplus water.

If yields are low, then alternative water supply sources may need to be considered (e.g., in BIF aquifer(s) along strike from the orebody) with additional bores supplementing supply from dewatering.

7.4. Dewatering bores

The Banded Iron Formation is considered to form the main aquifer unit in the environs of the Beebyn-W11 pit. Dewatering to achieve dry mining conditions would be most effectively achieved through bores targeting the BIF unit. It may be that sump pumping could also be considered to supplement / replace bore(s) as required but would likely need to be considered when developing the mine plan noting the relatively narrow nature of the planned pit.

7.5. Water supply

The first year of mining is above water table, consequently, there will not be a need for active dewatering. However, there will be a requirement for water supply for operational purposes (e.g., dust suppression). A scenario was run in which a production bore abstracting to test the potential impact. This is detailed further in Section 8. It is considered that water supply from the Beebyn-W11 pit area would assist with reducing peak volumes from the dewatering – acting as advanced dewatering, so further consideration of this is recommended.



8. Water balance and wayer supply options

8.1. Water balance

Based on the base case scenario, a high-level water balance for the Beebyn-W11 deposit is summarised in Table 14.

A water balance for the Beebyn-W11 deposit is summarised in Table 14 (based on “W11_WaterBalance_2405.xls” provided by Fenix and L.Romero Pers. Comms. (11/08/25), with a demand requirement of approximately 12 L/s anticipated. Demand is essentially driven by dust suppression and other local operational water requirements.

Table 14 Annual water balance for operations near W11 pit

Year	Demand (L/s)	Dewatering (base case) (L/s)	Comment
Construction	< 1		BBWB01 providing initial water
Y1	~12	0.0	
Y2	~12	11.9	
Y3	~12	11.3	
Y4	~12	8.8	Dewatering bores + BBWB01 as required.
Y5	~12	6.3	
Y6	~12	5.1	

Modelling indicates that there may be a demand for water once below water table mining progresses to depth, in particular from year 3 onwards. BBWB01 could be used to supplement supply in later years.

It is understood that a groundwater licence for 0.75 GL/a is being sought. The current ‘base case’ model (based on very limited site-specific hydrogeological drilling or testing data) indicates potential dewatering volumes below this (~0.3 GL/a). Site specific investigation is recommended to obtain site specific data to better inform the current conceptual understanding and associated modelling

8.2. Water supply options

The initial development of the Beebyn-W11 pit is being supplied by water from BBWB01, which is reported to be delivering ~12 L/s. Once dewatering of the Beebyn-W11 pit commences, the dewatering bores are anticipated to be able to meet the water demand requirements, supplemented as required by water from BBWB01.



9. Surface water

9.1. Hydrology

9.1.1. General

XP-RAFTS was used to estimate design flows from catchments external to the mine site. RAFTS is a nonlinear rainfall - runoff program, with the relevant catchments subdivided into sub-catchments with routing links between with appropriate input data (terrain slopes, roughness, rainfall data and rainfall losses). Rainfall losses were calculated using the SCS method based on sandy clay loam soils, with brush vegetation at <50% ground cover. The program then simulates design rainfall with time over a catchment, removing losses to calculate rainfall excess or runoff, and then routes this runoff through the links, to generate flood runoff hydrographs at specified nodes across the watershed.

9.1.2. Beebyn Creek

Beebyn Creek flows southeast, before turning south and along the east side of the proposed mine site. Catchment delineation was undertaken (refer Fig. B (at back of report)) and a catchment area of 225km² estimated. A 1% AEP peak flow of 312 m³/s was calculated (critical duration 36 hr). The 5% and 2% AEP flows are 150 m³/s and 235 m³/s.

Hydraulic modelling was carried out using the hydraulic model, HECRAS. The model simulates hydraulic flow behaviour within a 2D grid domain based on topography (i.e. based on a digital terrain model). Flow hydrographs for external peak flows were exported out of RAFTS and applied as input to the edges of the model; coupled with direct rainfall or RoG (rain-on-grid) modelling over the local area of the survey (refer Fig. B). A RoG model is a distributed model where the runoff processes are simulated by applying rainfall to each cell in the 2D grid or mesh, and the 2D hydraulic solver is used to route the water down the catchment.

The modelling shows that Beebyn Creek floods to about 1 m deep, and the 1% AEP flood extents do not impact mine infrastructure (encroach to within ~30 m). Refer Fig. C & Fig. D.

9.1.3. Mine Area – Local Flooding

The mining area generally lies near the top of a ridge and on the edge of catchment boundaries (refer Figure B). As a result, catchments impacting site infrastructure are relatively small.

RoG modelling (1% AEP 4.5hr duration) was carried out over the mining area using HECRAS 2D, for pre-development (existing conditions), post development (proposed infrastructure in place, blocking off flow paths) and closure where the Probably Maximum Flood (PMF) was modelled. The resulting flooding is shown in Fig. C – L.

Most of the mine site flooding is shallow sheet flow <50mm (not shown on the figures) with some natural shallow waterways across the site. One flow path runs west to east between the northern waste dump and the pit towards Beebyn Creek and flows to a maximum depth of 0.2m.

The modelling shows minor flow paths that impact the processing area and both the northern and southern waste dumps. Surface water flows from the north of the Processing Area and subsequently ponds against the Processing Area at a maximum depth ~0.5 m, before flowing to the southwest. Surface water also ponds with a max depth ~1.2m at a trapped low point on the northern side of the southern waste dump. At the northern waste dump two minor flow paths intercept the waste dumps boundary creating minor ponding ranging between 0.3 – 0.6 m in the 1% AEP event (greater detail provided below). The pit is outside of any major flooding.



9.2. Surface Water Management

9.2.1. General and Sediment Control

Objectives for water quality are outlined in “Water Quality Protection Guidelines”, Department of Water and Environment, 2000. This is a series of 11 guidelines for water quality management in mining and mineral processing (those relating to water, water quality monitoring, stormwater, mechanical servicing and workshop facilities, laboratory waste, and fuelling chemical storage are relevant to this project). Various other guidelines and standards may be applicable, including for example DWER Guidelines and ANZECC Guidelines for Fresh and Marine Water Quality.

Heavy rainfall over disturbed land (due to mining and construction activities) brings the risk of erosion, particularly from waste dumps and stockpiles. Surface water management requires consideration of each drainage path to prevent sediment and other contaminants from washing into natural flow paths. Stormwater run-off from disturbed mining infrastructure can be captured behind demarcation bunds, collected in evaporation ponds, or captured in sedimentation basins.

9.2.2. Mine Area

9.2.2.1. Pit

Based on modelling, there are no major surface water impacts on the pit, a standard pit bund will be sufficient to prevent minor surface water flows from entering the pit.

Some minor ponding in the far southeastern corner of the pit is likely to occur in the 1% AEP (4.5Hr) event to a maximum depth of 0.3m. Given high evaporation rates in the area this degree of ponding is considered acceptable.

9.2.2.2. Southern Waste Dump

Flows in the vicinity of the southern waste dump are shallow and not well defined. The proposed southern waste dump outline blocks a shallow natural flow path to the south (refer Fig. G), here surface water ponds between the pit and dump a central low point to a depth of ~1.2m deep in the 1% AEP rainfall event (refer Fig. G). The catchment could be diverted to the southwest via a minor channel, under the waste dump access ramp and the back onto its natural flow path to the south. This would significantly reduce the ponding against the waste dump. However, given the short Life of Mine (LOM), this ponding is considered acceptable, noting a lower chance of a 1% AEP rainfall event, and less ponding. The ponded water will dissipate by evaporation and infiltration. Duration of ponding can be determined at detailed design phase.

Noting waste dumps need to be shaped to drain internally, with crest bunds to retain water on the top and reduce run-off and erosion down the batter faces. Where run-off from the dump sides can escape into the environment, then a capture bund should be installed at the toe of the dump to retain (sediment laden) dirty water runoff.

9.2.2.3. Northern Waste Dump

The proposed northern waste dump outline blocks a minor flow path that drains to the north across the dumps north-western corner (refer Fig. G), In the 1% AEP rainfall event, ponding is to a maximum depth of approximately 0.6 m deep (refer Fig. G). The minor catchment could be diverted to the northeast via a minor channel that starts at an elevation of 513 mAHD and daylights at 510 m AHD at the dumps northern boundary. Similarly, a minor catchment intercepts the dumps southern boundary as it flows from west to east towards Beebyn Creek. During the 1% AEP event maximum flood depths reach 0.3 m at the dumps southern tip. Management of these flows is not deemed necessary due to the low risk associated with the mines short LOM. As with the southern waste dump the ponded water will dissipate quickly by evaporation and infiltration. Duration of ponding can be determined at detailed design phase.

9.2.2.4. Processing Area

The Processing Area occupies an area of approximately 25ha, resides on the slopes of a mild ridgeline grading south and interacts with two catchments to the north, namely CS_17



and CS_18. Minor flow paths from the north run through the proposed processing area and in a 1% AEP rainfall event, there is a buildup of water to a maximum height of 0.5 m (refer Fig. G). To prevent inundation during major events the Processing Area will use minor diversion drains to redirect surface water flows around the facility and back on its natural course to the south of the facility.

The access road that joins the Processing Area to the mining area runs downhill to the west. Natural flow paths up to 0.2m deep (1% AEP) cross the road alignment (see Figure G). The lowest point in the road is adjacent to the Processing Area, where drainage would be directed across the road. Given minimal flooding in major events Pentium does not recommend any flood mitigation for the access road.

9.3. Closure

9.3.1. General

Mining is a temporary land use and rehabilitation need to be consistent with projected future land use (such as pastoralism and heritage conservation). The objective is to ensure an effective planning process is in place over the life of mine, so closure is achieved in an environmentally sustainable manner, and without unacceptable liability to the State (refer “Mine Closure Plan Guidance”, Department of Mines, Industry Regulation and Safety, 2020).

DMIRS MCP guidance includes desirable mine closure principles, such as no adverse impact on surface and groundwater hydrological patterns, water quality, water levels and water chemistry; and no long-term reduction in base flows and availability of water to meet local environmental values.

It is not proposed to backfill the pit as part of the closure plan. The pit and waste dump landforms will therefore remain after mine closure, while the rest of the site will be decommissioned. This includes removal of infrastructure, and rehabilitation of disturbed areas (including tanks, wastes, contaminated soil, compacted surfaces such as old roadways, site compounds, etc). The area is graded to direct surface water off site, into natural drainage paths, and leaving no water trapped upstream of final landforms.

Post closure surface water modelling results are shown in Figures I, J, K & L.

9.3.2. Waste Dumps

Waste dumps can consist of unconsolidated, dispersive, and erodible materials, which when combined with steep or long slopes, result in a potential for erosion and sediment run-off. The main rehabilitation consideration is the projected land use and long-term stability of landforms - with visual amenity, erodibility, stability and dust management as the key drivers, while biophysical appearance and vegetation (endemic plant communities that approximate the natural surrounds) a secondary driver.

Outer exposed surfaces should be provided with a rocky substate to prevent erosion on slopes (gullying, loss of surface material and vegetation). The waste dump surfaces may be designed to hold water on the top, to prevent it running down the sides, or include cross slope berm cell bunds to retain water on the dump sides.

Externally surface water run-off ponds against both waste dumps. Along the northern waste dump water ponds in two locations; the northern and southern toes to maximum depths of 3.5 and 3.6 m respectively (in a PMP event). The construction of an open drain at these locations that collects and redirects ponded water back onto its natural course is recommended.

At the southern waste dump surface water drains from the north towards the southern waste dump and ultimately ponds between the pit and southern waste dump to a maximum depth of 2.8 m in the PMP event. Construction of open excavated drains around the northern end of the southern waste dump could be considered to ensure the ponding is fully drained. Other options at closure include filling the impacting catchment area with waste, shaped to a finished free draining surface; or changing the final alignment of the northern edge to better follow natural surface contours, and allowing free surface drainage toward the west. At closure, the waste dump will be configured to prevent ponding against the toe.



9.3.3. Pit Abandonment Bund

As the pit will remain open at closure (i.e. will not be backfilled), the method generally preferred to minimise inadvertent public access involves the construction of an abandonment bund wall around the perimeter of the open pit void, 10m outside the area designated as being susceptible to wall collapse (refer “Safety Bund Walls Around Abandoned Open Pit Mines”, DMIRS, Doc No: ZMA048HA, Dec. 1997). DMIRS (Figure 4) (shown in Figure 21, below) defines pit wall stability, relating to walls excavated in unweathered or weathered rock, or both.

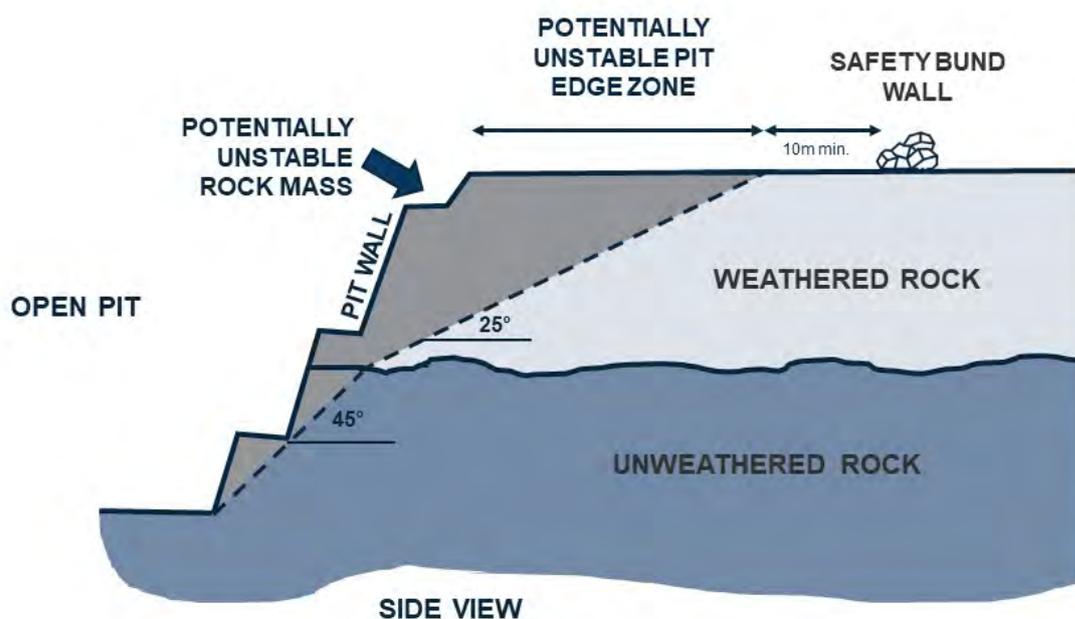


Figure 21 Pit wall excavated in weathered and unweathered rock (from Resources WA, 2024, based on DMIRS, 1997)

The bund is required to have minimum dimensions of 2 m high, 5 m base width. As the pit is located towards the top of a ridge line, there is no requirement for the abandonment bund to also act as a flood bund against external flooding. The bunds are subject to raindrop erosion and fresh competent rock, for example, is preferred, as this determines the long-term integrity of the structure (expected to remain functional for hundreds of years). Materials are best produced before excavation equipment is removed from the site, and final blasting provides a source of suitable unweathered material. Where oxide or weathered material only is available, a larger cross-sectional area of bund is required.



10. Pit water balance post closure

10.1. Overview

The pit is planned to remain as a pit void at closures. The pit is surrounded by low permeability units, in an area of high evaporation and low rainfall – therefore it is considered likely that the pit would form a terminal pit lake. To evaluate the likely response of water within the pit post-closure a simple analytical model was setup.

10.2. Model setup

The post-closure pit water balance was developed using GoldSim, with the pit characterised using the stage curve below (Figure 22).

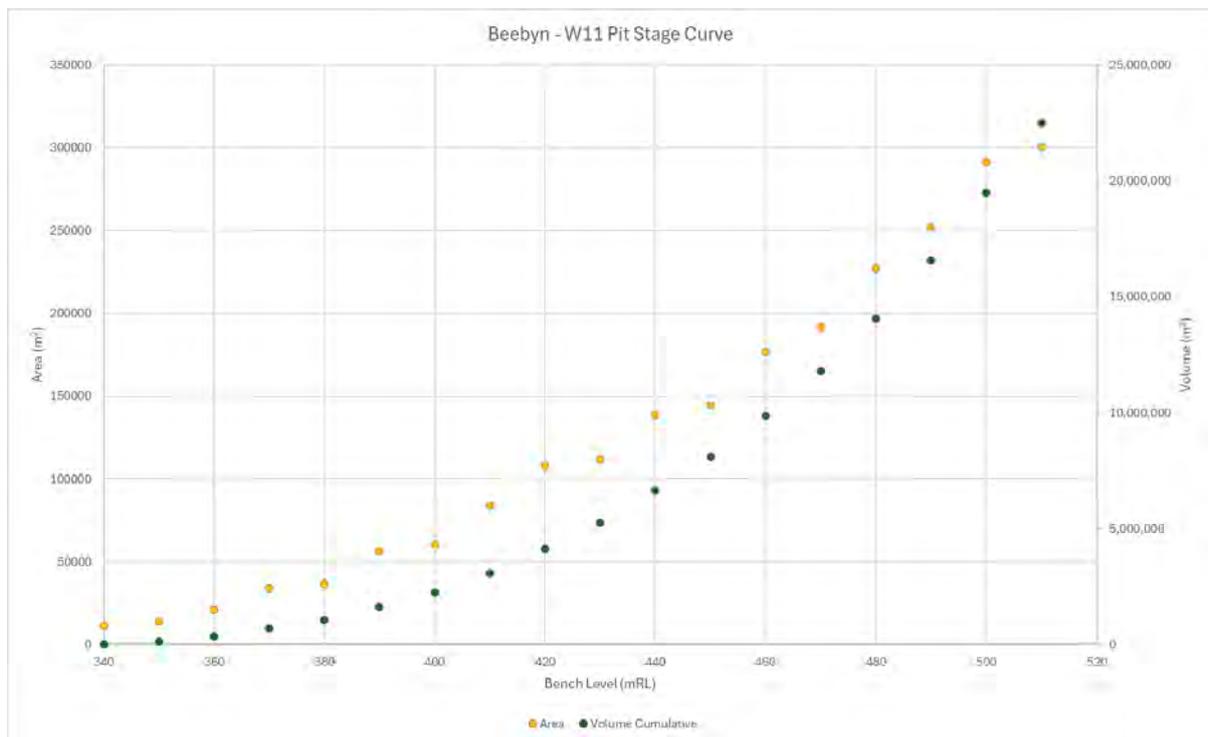


Figure 22 W11 stage curve

Groundwater inflow to the pit was calculated based on analytical flow calculations combining inflow to a trench (i.e., the side of the pit) and radial flow to a point (i.e., the two ends of the pit), as per Figure 23 and Equation 1, below.



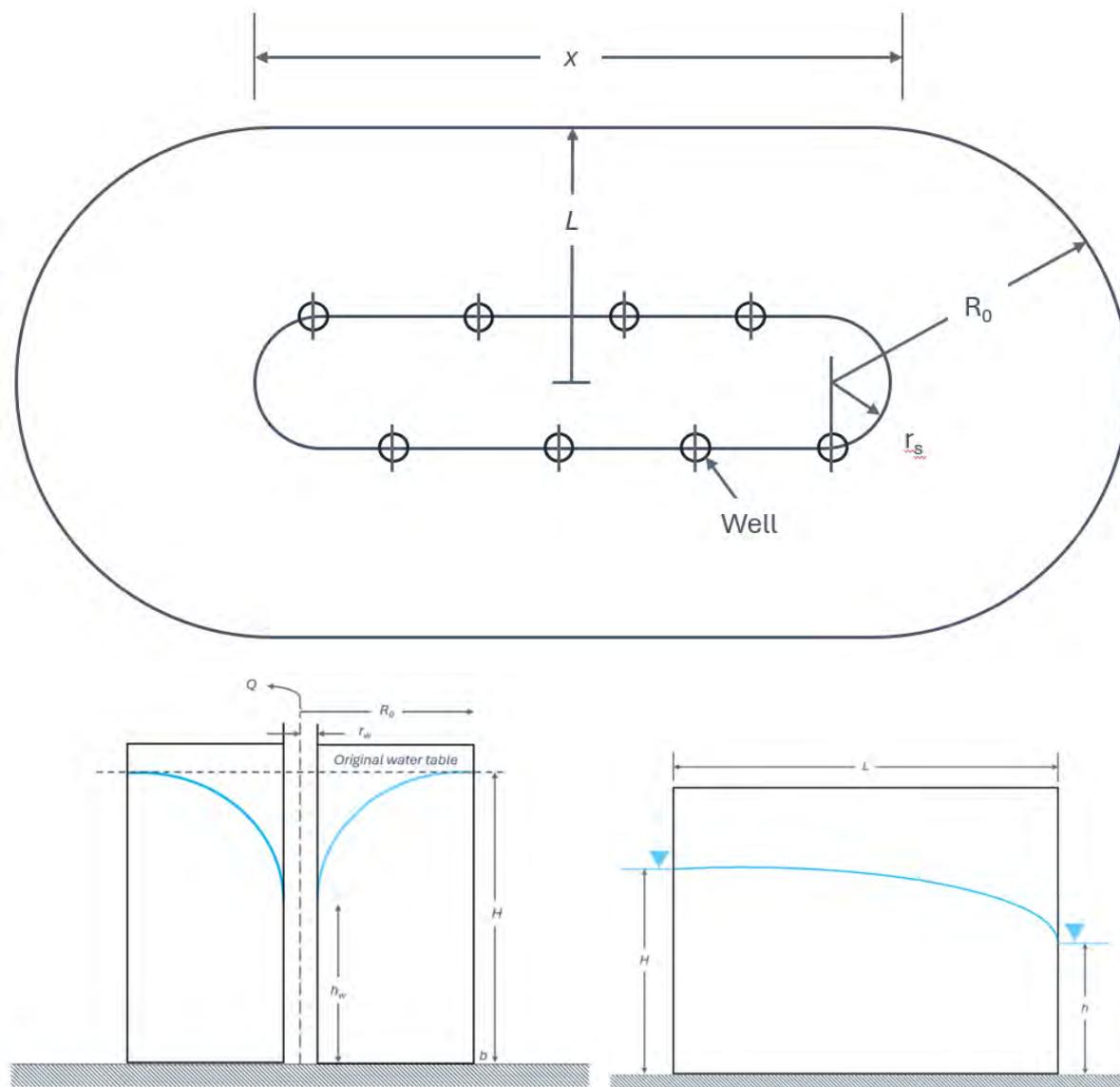


Figure 23 Analytical solution geometry (from Powers et al., 2007)

Equation 1:

$$Q = \frac{\pi K(H^2 - h^2)}{\ln R_o/r_s} + 2\left(\frac{xK(H^2 - h^2)}{2L}\right)$$

The water balance for the pit was developed using GoldSim considering a range of permeabilities (K) for the surrounding bedrock (0.01, 0.02 and 0.005m/d) – i.e. the local groundwater system, and with the pit characterised using the stage curve below (Figure 22).

Annual average rainfall was applied to the pit area, with annual average evapotranspiration applied to the pit lake area (based on data from the nearby BOM Meekatharra weather station).

10.3. Results

The results show that even with high permeability surrounds (which are unlikely based on the low permeability nature of the dolerite that surrounds the BIF orebody) water levels do not fully recover – a reflection of the high evaporation rates anticipated in the area. Based on available data, which indicates the dolerite surrounds to be of low permeability, then recovery is only partial – achieving ~465 mAHD for a permeability of surrounding units 0.01



m/d and lower still (408 mAHD) for a permeability of 0.005 m/d (which is higher than that noted during geotechnical testing at the site).

Since the only outflow of water from the pit is evaporation, over time the water becomes increasingly saline – as shown in Figure 25. Under the modelled scenario concentrations of approximately 14,000 mg/L TDS are predicted after ~100 years, compared to prevailing concentrations of ~1,000 mg/L (from bores in the nearby surrounds).

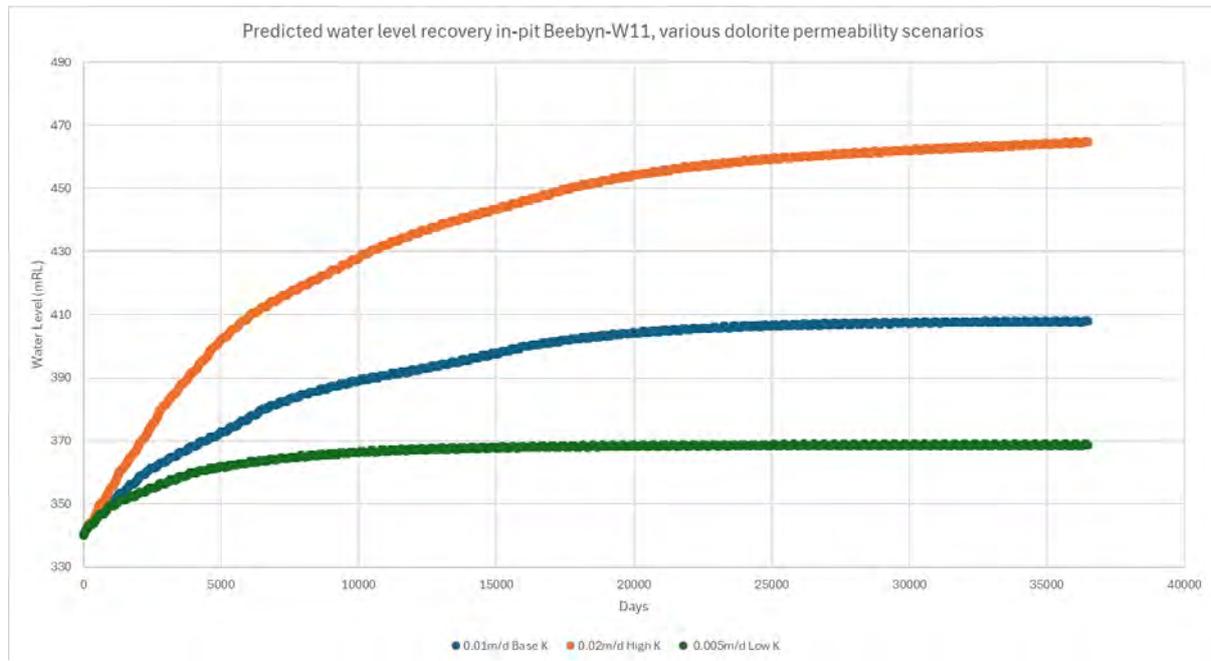


Figure 24 Water level recovery (various scenarios) at Beebyn-W11 pit



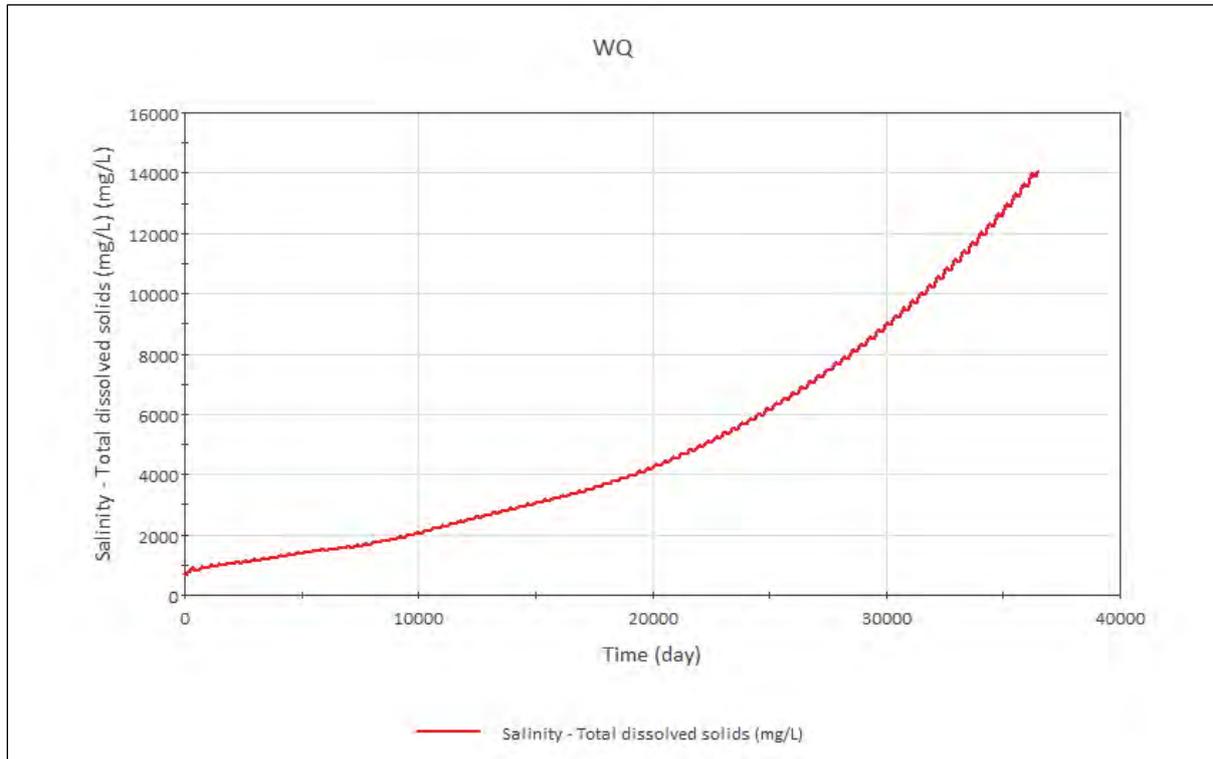


Figure 25 W11 post-closure salinity – increasing over time (0.01 m/d scenario)



11. Conclusions and recommendations

11.1. Groundwater

- Beebyn-W11 pit is planned to progress to a base elevation of ~340 mAHD, approximately 150 m below prevailing water table (~490 mAHD) in a narrow-banded iron formation aquifer surrounded by a low permeability aquifer.
- Although there are no site-specific hydrogeological testing of the banded iron formation encountered in the Beebyn-W11 pit, historical dewatering data at the nearby Iron Ridge deposit provides a useful proxy.
- The assessment undertaken provides an indication of potential groundwater responses, but further investigation is required to obtain site specific data and test the assumptions made herein.
 - Further investigation is a planned as part of the development of a small dewatering bore network, which will further inform the conceptualisation.
- Dewatering requirements over the life of the mine are anticipated to be up to ~11.9L/s (~0.375 GL/a) (base case model), assuming connectivity beyond the orebody is limited and the surrounding units are of low permeability.
- Drawdown is anticipated to be constrained by low permeability dolerite that surrounds the BIF orebody, modelling indicates it may propagate towards potential receptors including:
 - Beebyn Creek ~1.2 km to the east
 - Limestone bore ~1.3 km to the northeast.
 - Unnamed GDE (potential) ~350 m to the south
- Of the surrounding potential receptors, drawdown may extend into the moderate GDE to the south, so further consideration of potential impacts to this receptor is recommended (e.g., nature of the GDE) – in particular obtaining some site-specific data to be able to better inform the conceptual understanding and modelling.
- At closure it is understood that no backfilling of the pit is proposed. Consequently, the pit is anticipated to become a saline pit lake, with water becoming increasingly saline over time. The pit is anticipated to act as a groundwater sink, such that there is no groundwater outflow from the pit.

11.2. Hydrology

- 1% EAP 24-hour rainfall in the area estimated as 162 mm, the 24-hour PMP is about 800 mm
- Beebyn Creek has a catchment area of 225 km², and flows past the site, but does not impact mine infrastructure. The mine generally lies near the top of a ridge and catchments and surface water flows impacting site infrastructure are relatively small.
- Infrastructure
 - Minor inflows run through the site and the proposed pit, waste dumps and stockpile and processing area boundaries
 - Infrastructure in this area needs to be bunded off and stormwater diverted through or around as required, to prevent ponding.
 - Diversion channels and bunds required are generally minor.
 - A standard bund will be sufficient to prevent surface water flows from entering the pit.
 - Ponding against the northern side of the northern waste dump and the northern and southern edges of the southern waste dump may occur, depending on the ultimate development and configuration of the water dumps, and in the operational phase will be permitted to evaporate an infiltrate in-situ.
- Adherence to surface water protection principles and implementation of environmental control measures is required to mitigate risk of erosion and sedimentation from construction and mining activities.
- Mining is a temporary land use and after closure of the mine the area requires rehabilitation consistent with future land uses and not adversely impact surface and



groundwater hydrological patterns and water quality. Waste dumps and sloping surfaces need to be stabilised against erosion as a potential source of sediment.

- Extreme rainfall in Beebyn Creek and over the mine site will cause shallow flooding around remnant mining infrastructure (pit abandonment bund and the southern waste dump). The final abandonment bund and waste dump should be configured such that surface run-off is not trapped behind these landforms, but that the site requires free draining characteristics including permanent diversion drains where required

11.3. Further investigation recommendations

11.3.1. Beebyn-W11 Pit dewatering

The collection of site-specific data relating to the Beebyn-W11 pit is important with regards:

- Validating dewatering yields and to confirm water supply sustainability across the life of the mine

This will also assist in:

- Assessing local groundwater response to pumping to understand impacts on nearby receptors
- Validating the current conceptualisation – e.g., connectivity within the BIF, nature of connectivity with surrounding dolerite, nature of faulting that has potentially disconnected units of the BIF along strike.
- Inform post-closure groundwater recovery rates.

To obtain site specific data and improve understanding regarding the dewatering and water supply potential of the Beebyn-W11 deposit a hydrogeological investigation program, incorporating 1 test production bore, is recommended, as summarised in Table 15 and Figure 26.

Table 15 Proposed hydrogeological investigation bore locations

Label	Easting	Northing	Target depth (mbgl)	Nominal completion diameter	Anticipated geology	Objective
Monitoring Bores						
PW_2024_MB01_FS	582954	7026815	~base of pit (~200m)	50 mm uPVC	BIF	In-pit – targeting main unit of BIF (exploration for dewatering bore(s))
PW_2024_MB02_FS	583303	7027041	~base of pit (~200m)	50 mm uPVC	BIF	In-pit – targeting main unit of BIF (exploration for dewatering bore(s))
Test Production Bores						
PW_2024_TPB03_FS	582852	7027121	~base of pit (~200m)	204 mm ID (8")	BIF	Potential test production bore; within the main unit of BIF targeted by the pit (and near the centre of the pit)

11.3.2. Supplementary monitoring bores

There are several historical monitoring bores surrounding the pit, the need to supplement these should be reviewed depending on the findings of dewatering bore investigation outlined above. Locations of interest are summarised in Table 16 and shown on Figure 26.

Table 16 Proposed hydrogeological investigation targets - between W11 pit and potential groundwater receptors

Label	Easting	Northing	Target depth (mbgl)	Nominal completion diameter	Anticipated geology	Objective
Monitoring Bores						
PW_2024_MB03_FS	583139	7026821	~130	50 mm uPVC	Dolerite	Ex-pit; south of the pit – between W11 and potential GDE



PW_2024_MB04_FS	583259	7027638	~130	50 mm uPVC	Dolerite	Ex-pit; northeast of pit, between W11 and Beebyn Creek and Limestone Bore
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11.3.3. Test pumping

Test pumping of the production bore(s) is recommended to obtain site specific hydraulic parameters and inform on the conceptualisation, for example connectivity between the BIF (orebody) and the surrounding dolerite. The recommended test pumping program for each production bore comprises:

- Step testing
 - 5 x 80-minute steps at different rates to inform on likely bore performance and to select an appropriate rate for the constant rate test (CRT)
- Constant rate test
 - 24-to-72-hour test at a constant rate, monitoring of nearby monitoring bores to inform on connectivity within and between different hydrostratigraphic units at W11.
- Recovery test
 - Monitoring of water levels post-CRT – obtain further information on the hydraulic parameters and aquifer connectivity.

As part of the testing program, monitoring of nearby monitoring bores will help with the understanding of connectivity (or lack-thereof) between the BIF and the surrounding groundwater environment.



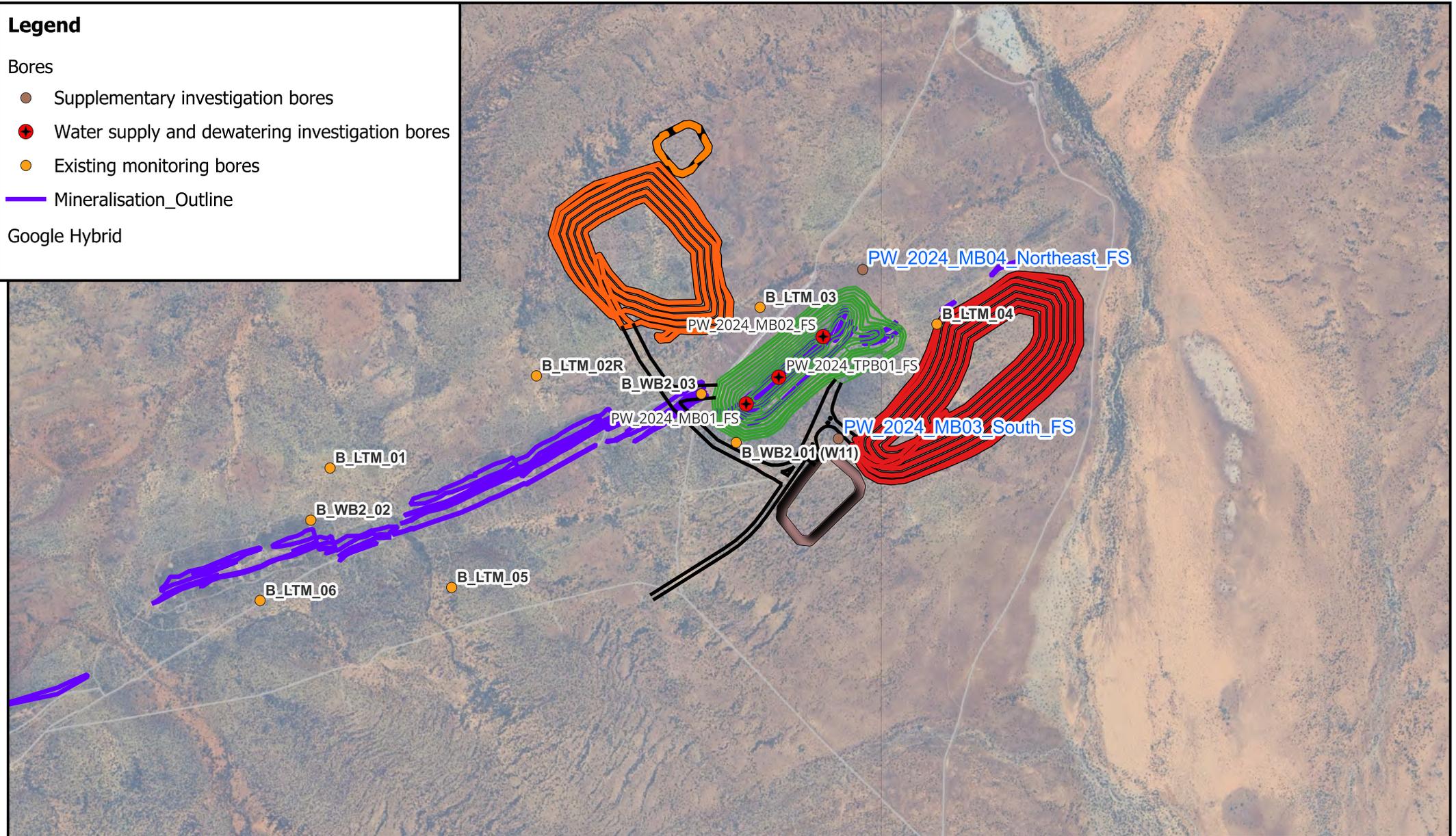
Legend

Bores

- Supplementary investigation bores
- Water supply and dewatering investigation bores
- Existing monitoring bores

— Mineralisation_Outline

Google Hybrid



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Sources: data.gov.au, DWER,
landgate

0 0.2 0.4 0.6 0.8 km



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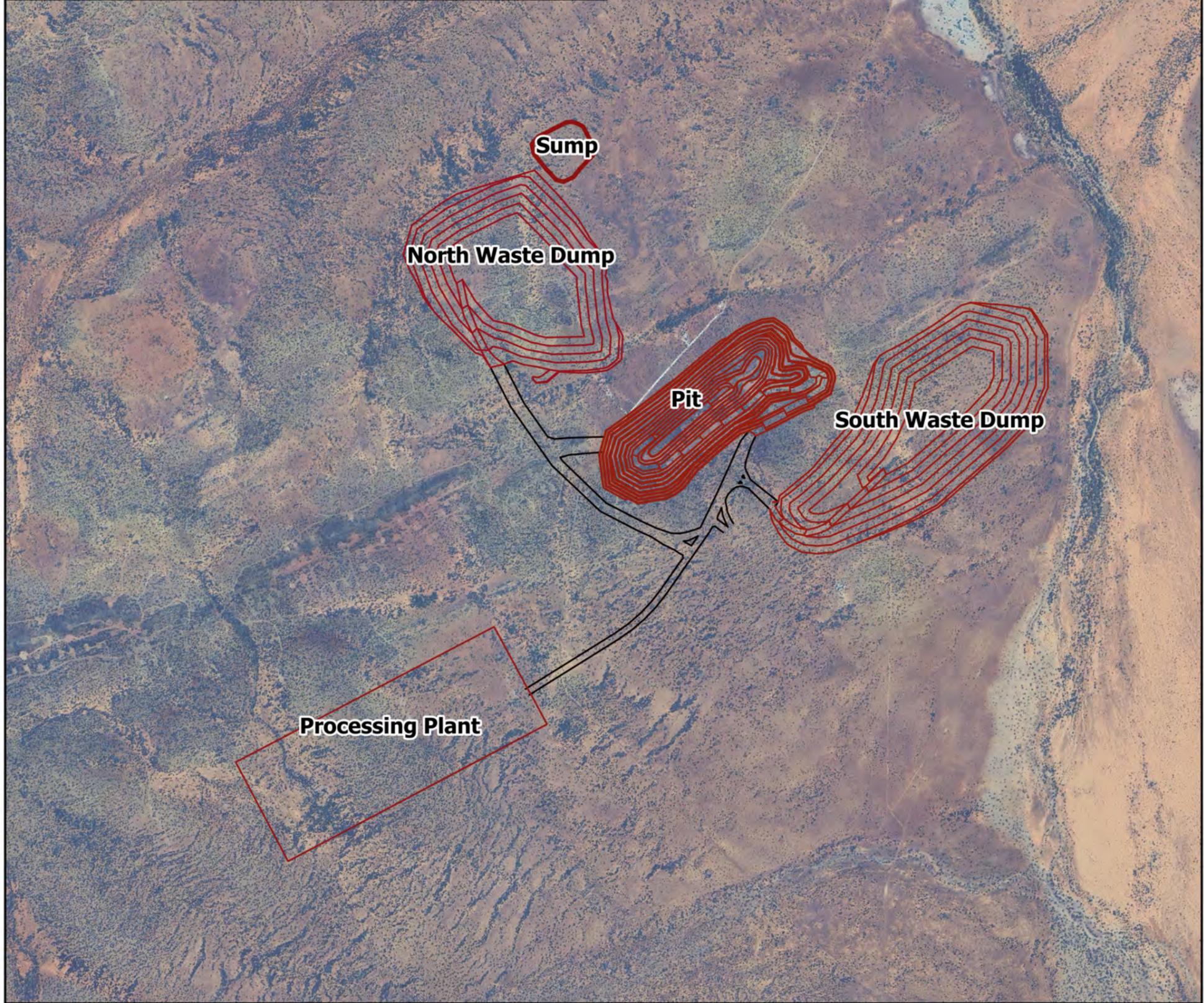
Figure 26

Hydrogeological investigation bores (proposed)

12. References

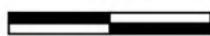
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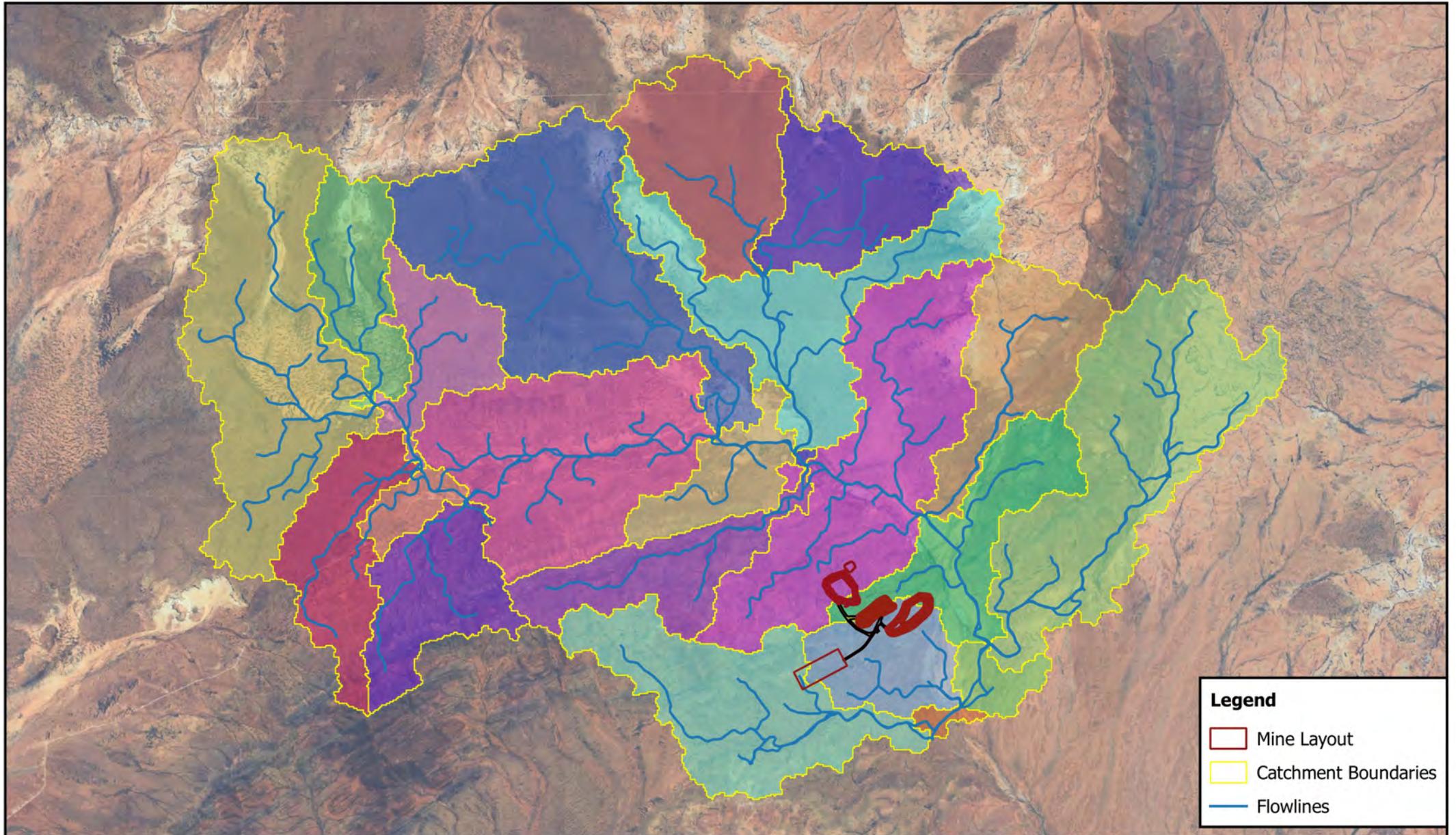
0 250 500 m



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Figure A

Beebyn W11 Mine - Site location



Legend

-  Mine Layout
-  Catchment Boundaries
-  Flowlines



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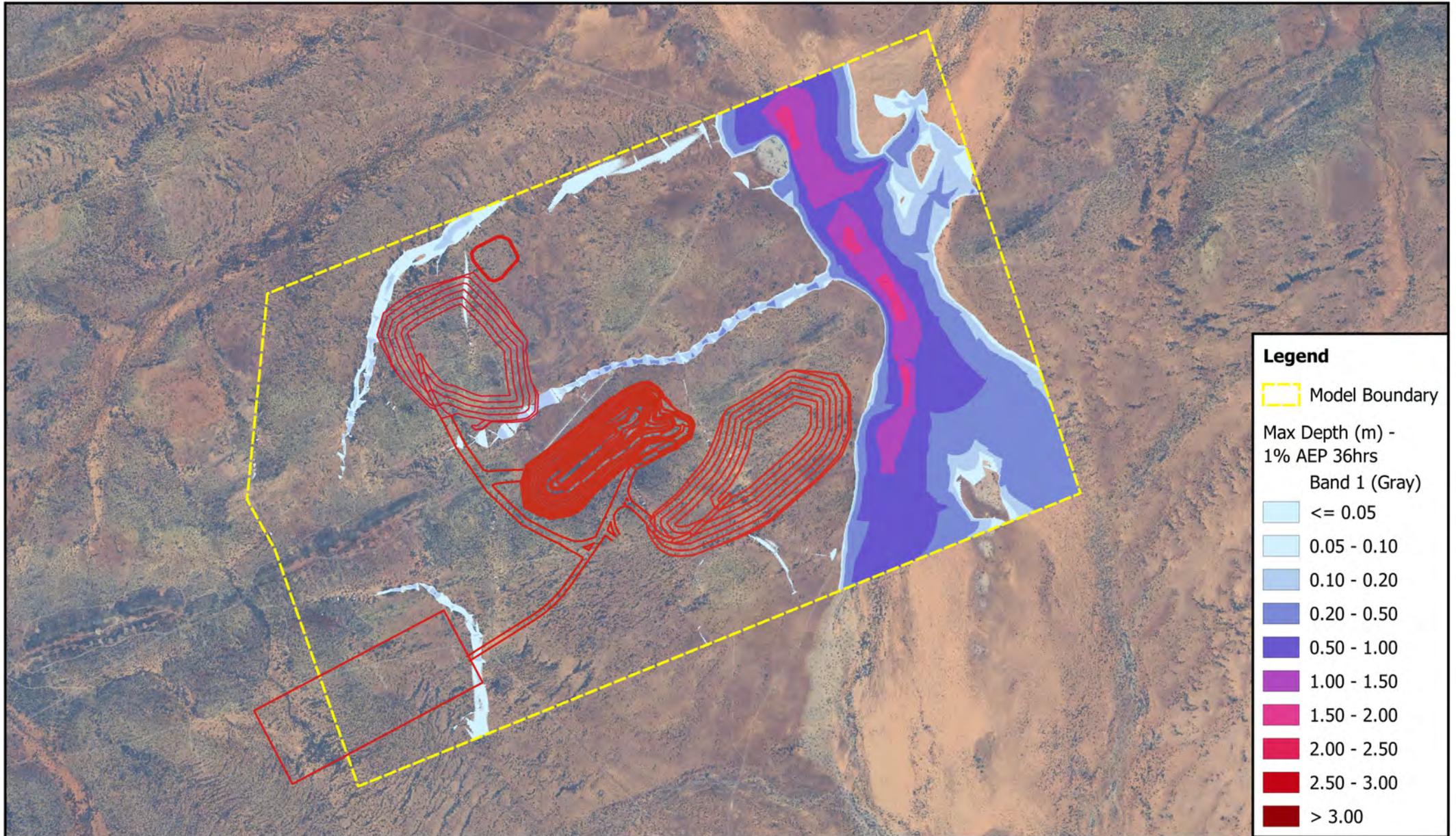
0 0.75 1.5 km



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Figure B

Beebyn W11 Mine - Catchments



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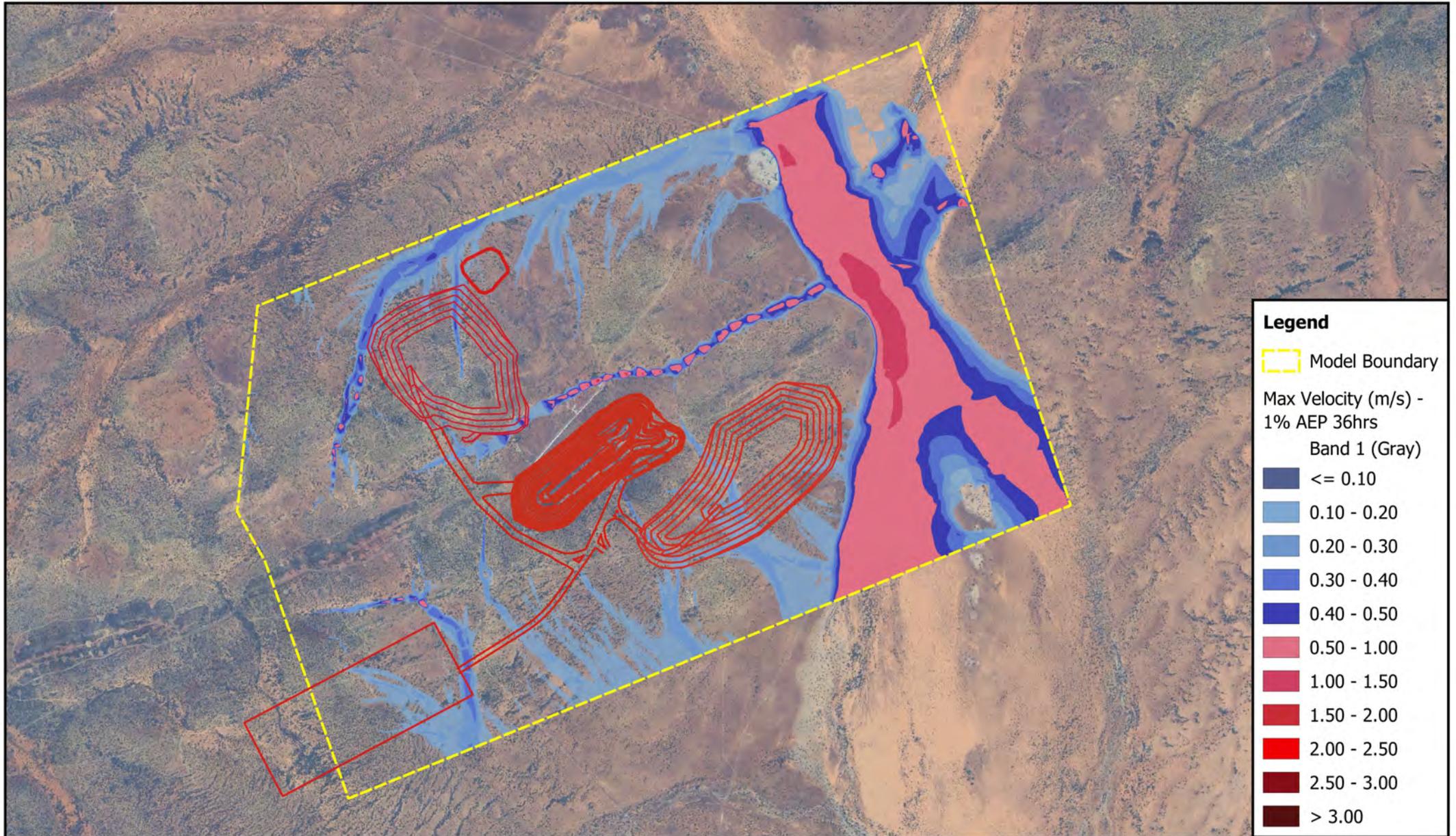
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Figure C

Beebyn W11 Beebyn Creek Pre-development
 Max Depth (m) - 1% AEP 36Hr



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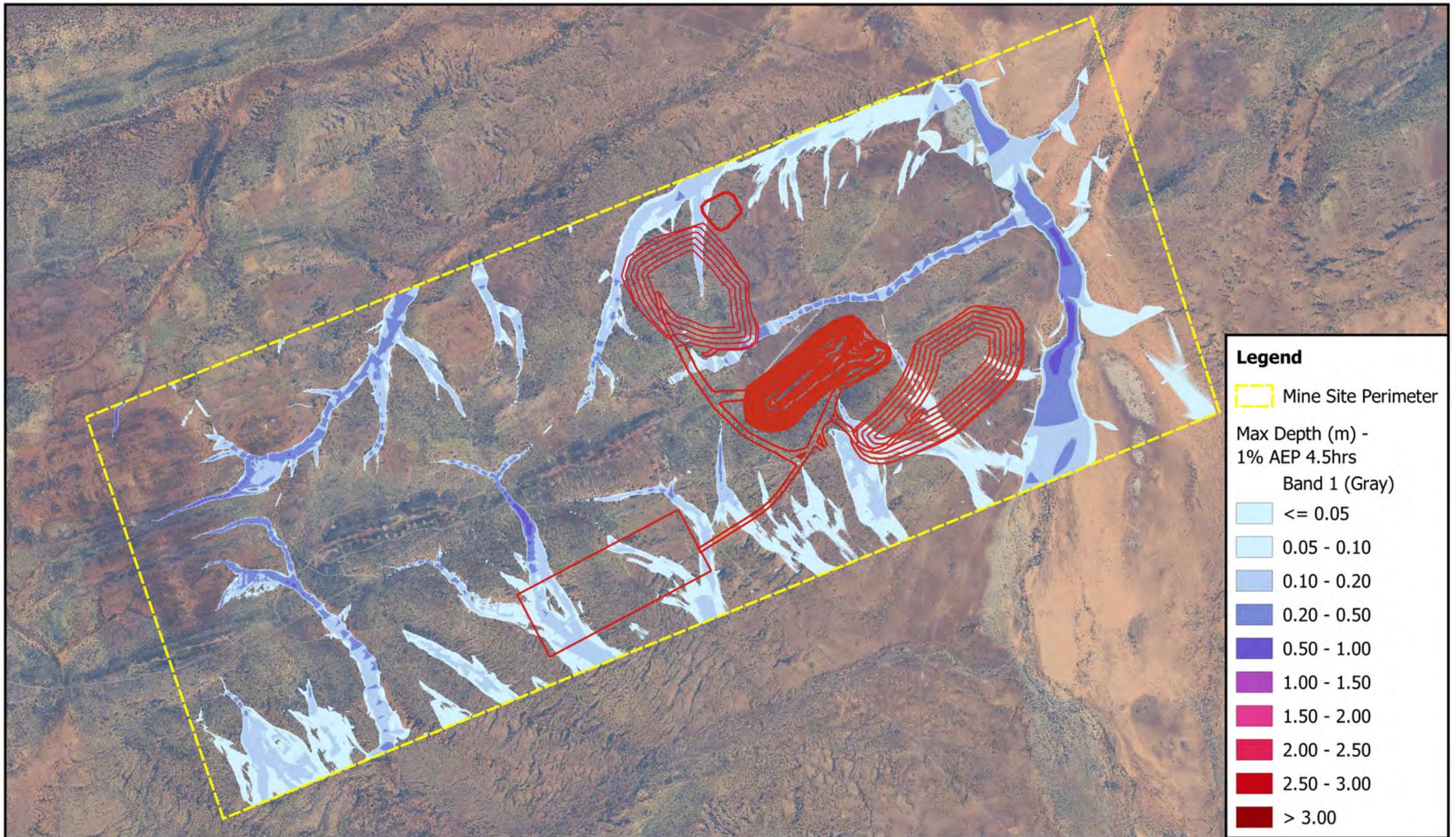
0 0.75 1.5 km



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Figure D

Beebyn W11 - Beebyn Creek Predevelopment
 Max Velocity (m) 1% AEP 36Hr



Legend

- Mine Site Perimeter
- Max Depth (m) - 1% AEP 4.5hrs
- Band 1 (Gray)
- <= 0.05
- 0.05 - 0.10
- 0.10 - 0.20
- 0.20 - 0.50
- 0.50 - 1.00
- 1.00 - 1.50
- 1.50 - 2.00
- 2.00 - 2.50
- 2.50 - 3.00
- > 3.00



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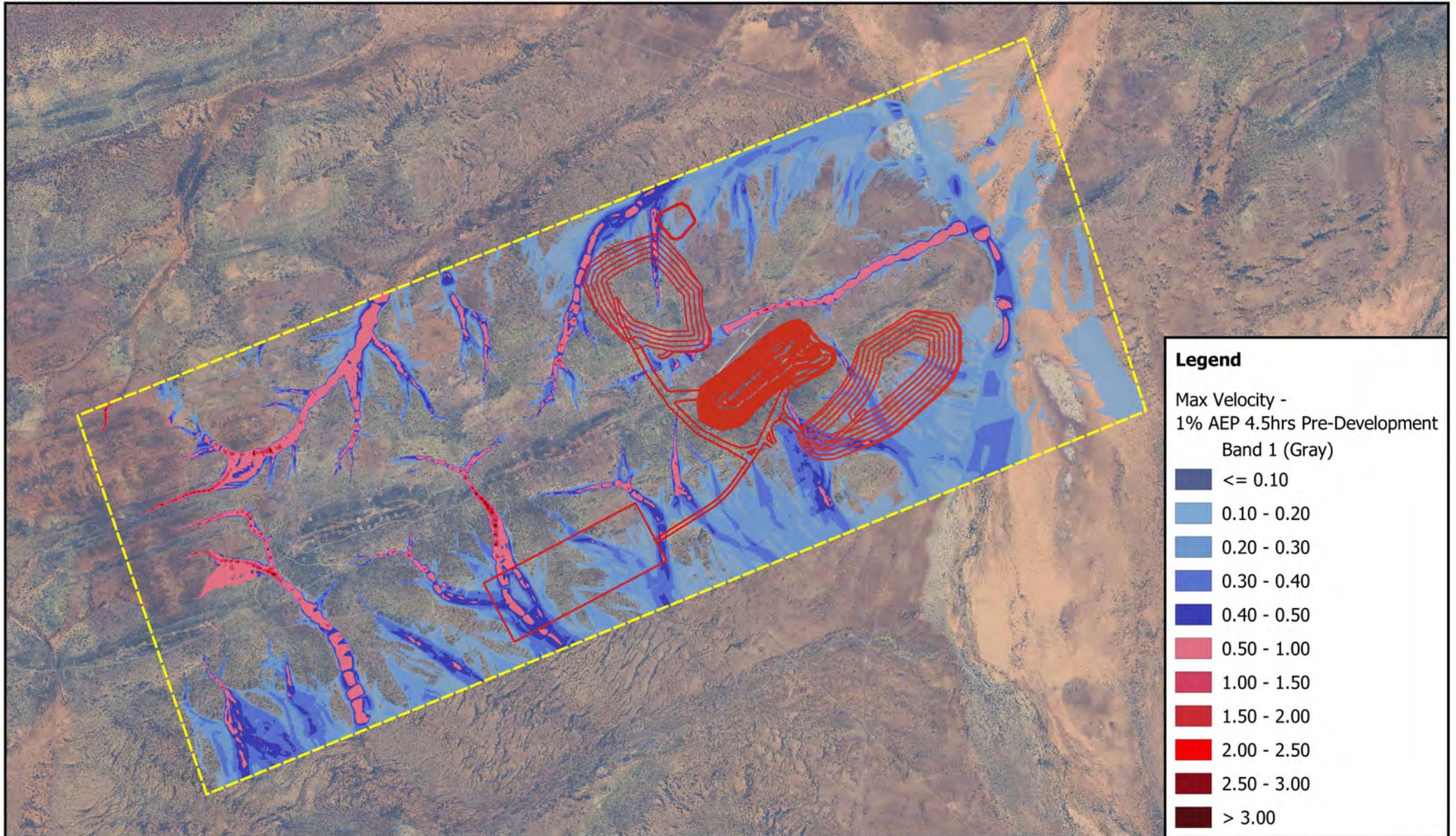
0 0.75 1.5 km



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Figure E

Beebyn W11 Mine Site Pre-development
 Max Depth (m) - 1% AEP 4.5Hr



Project code:
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 Scale: 1:35,000
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 Sources: data.gov.au

0 0.75 1.5 km



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Figure F

Beebyn W11 Mine Site Predevelopment 1% AEP 4.5Hr
 Max Velocity (m/s)



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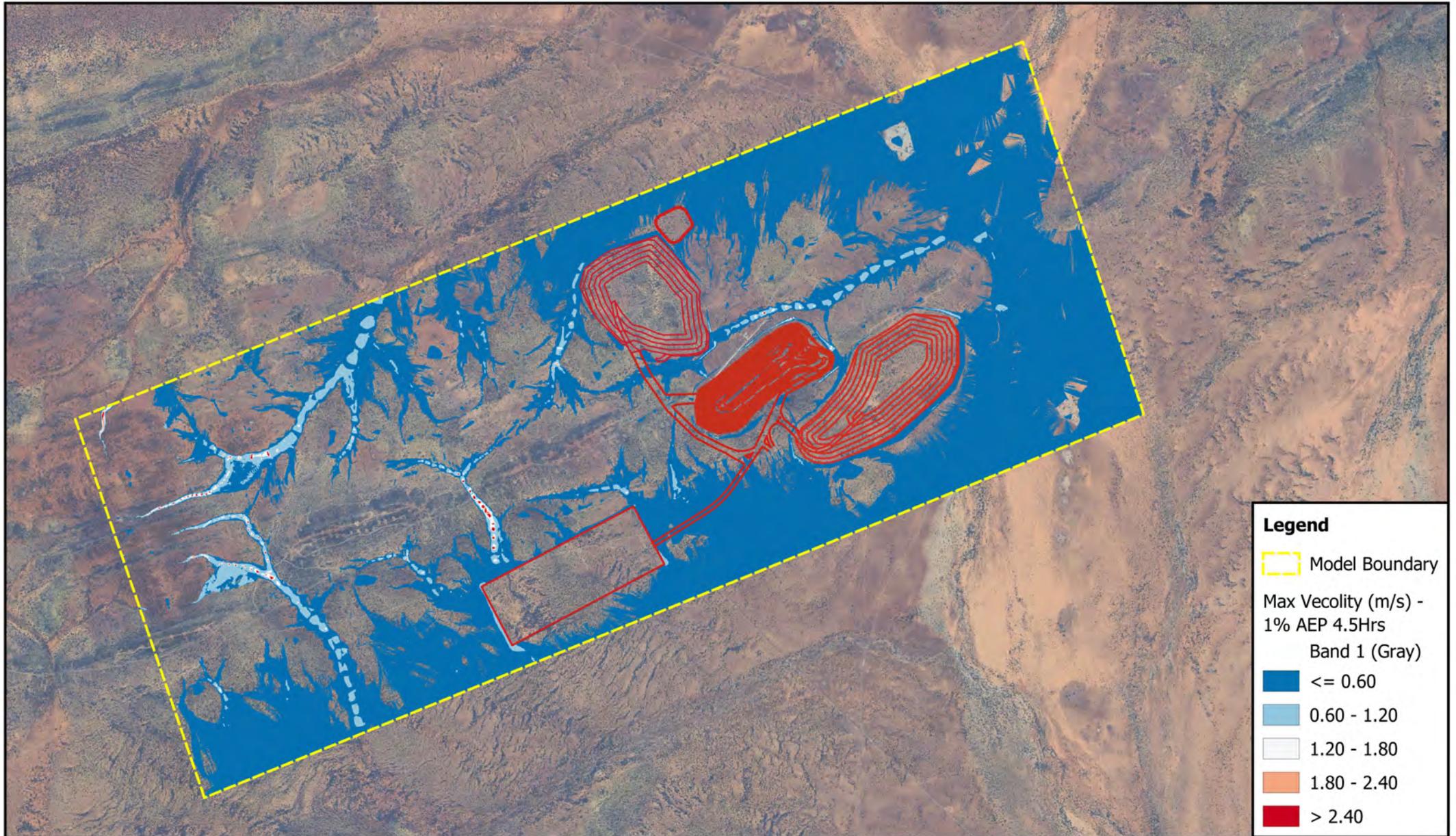
0 0.75 1.5 km



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Figure G

Beebyn W11 Mine Site Post-development
 Max Depth (m/s) - 1% AEP 4.5Hr



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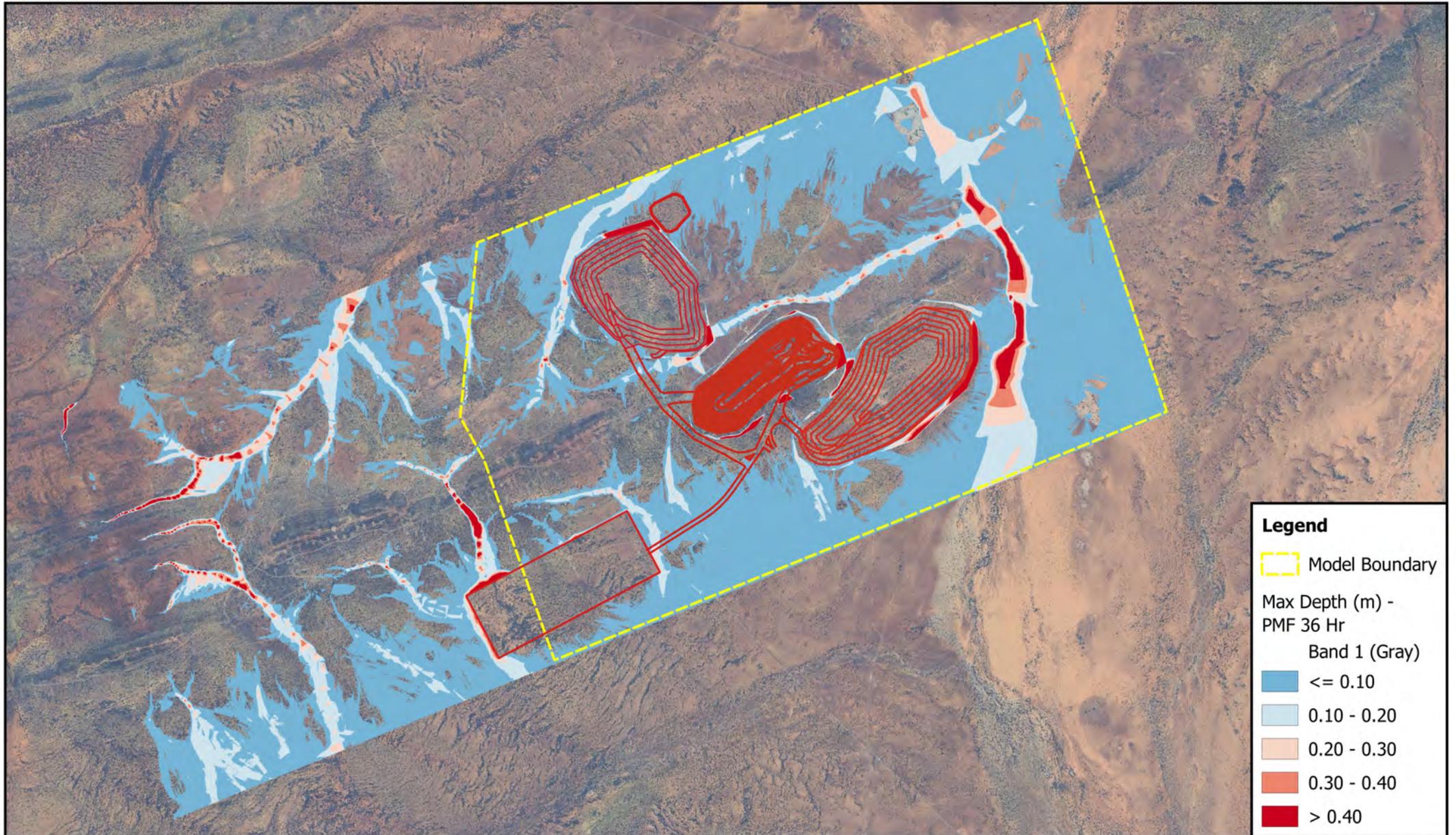
0 0.75 1.5 km



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Figure H

Beebyn W11 Mine Site Post-development
 Max Velocity (m/s) - 1% AEP 4.5Hr



Legend

Model Boundary

Max Depth (m) - PMF 36 Hr

Band 1 (Gray)

Blue	<= 0.10
Light Blue	0.10 - 0.20
Light Orange	0.20 - 0.30
Orange	0.30 - 0.40
Red	> 0.40



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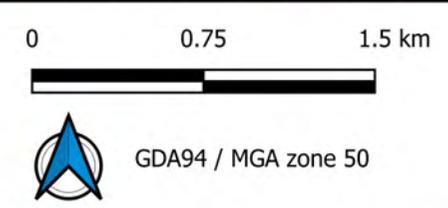
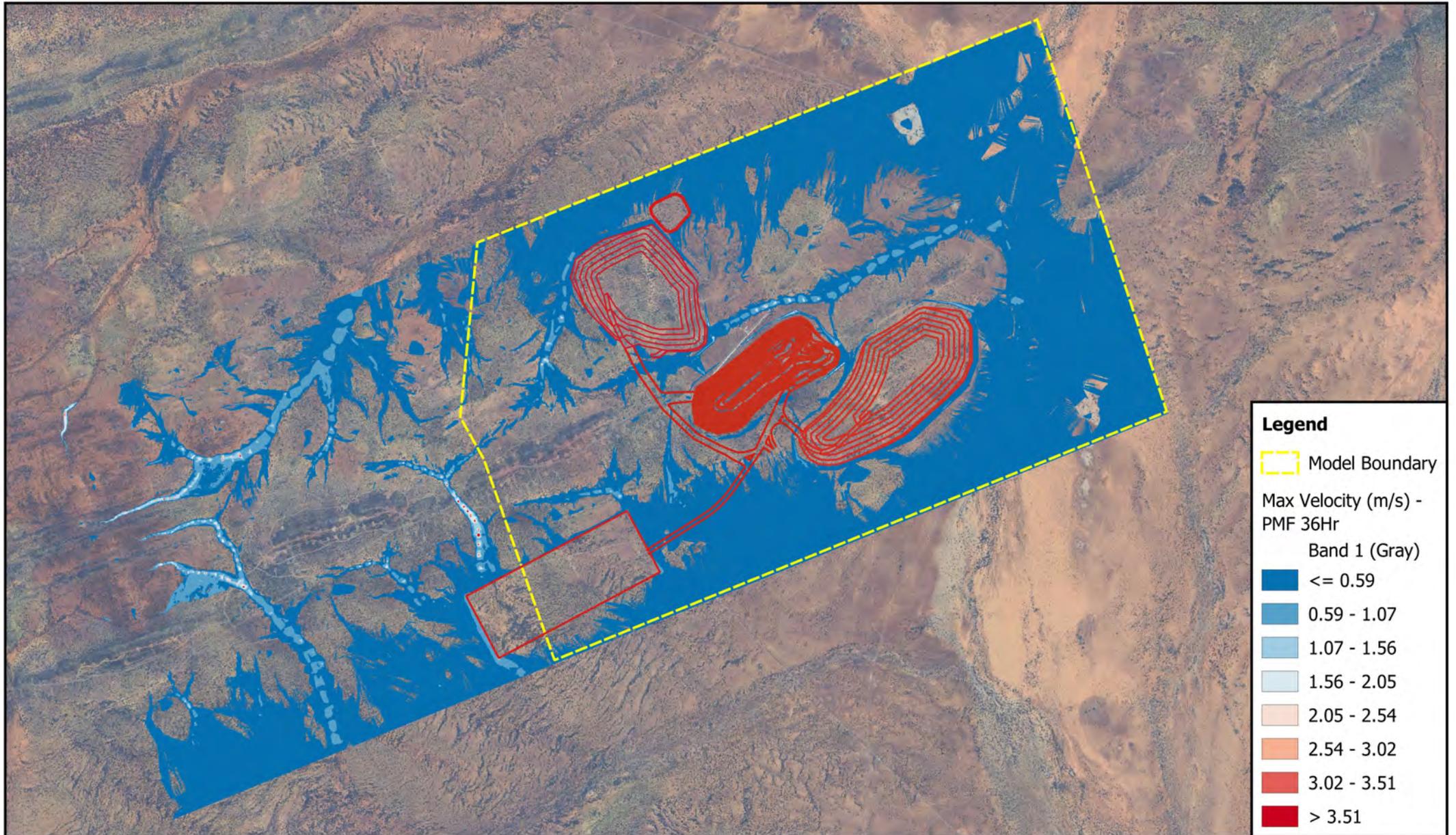


Figure I
 Beebyn W11 Beebyn Creek Closure
 Max Depth (m/s) - PMF 36Hr



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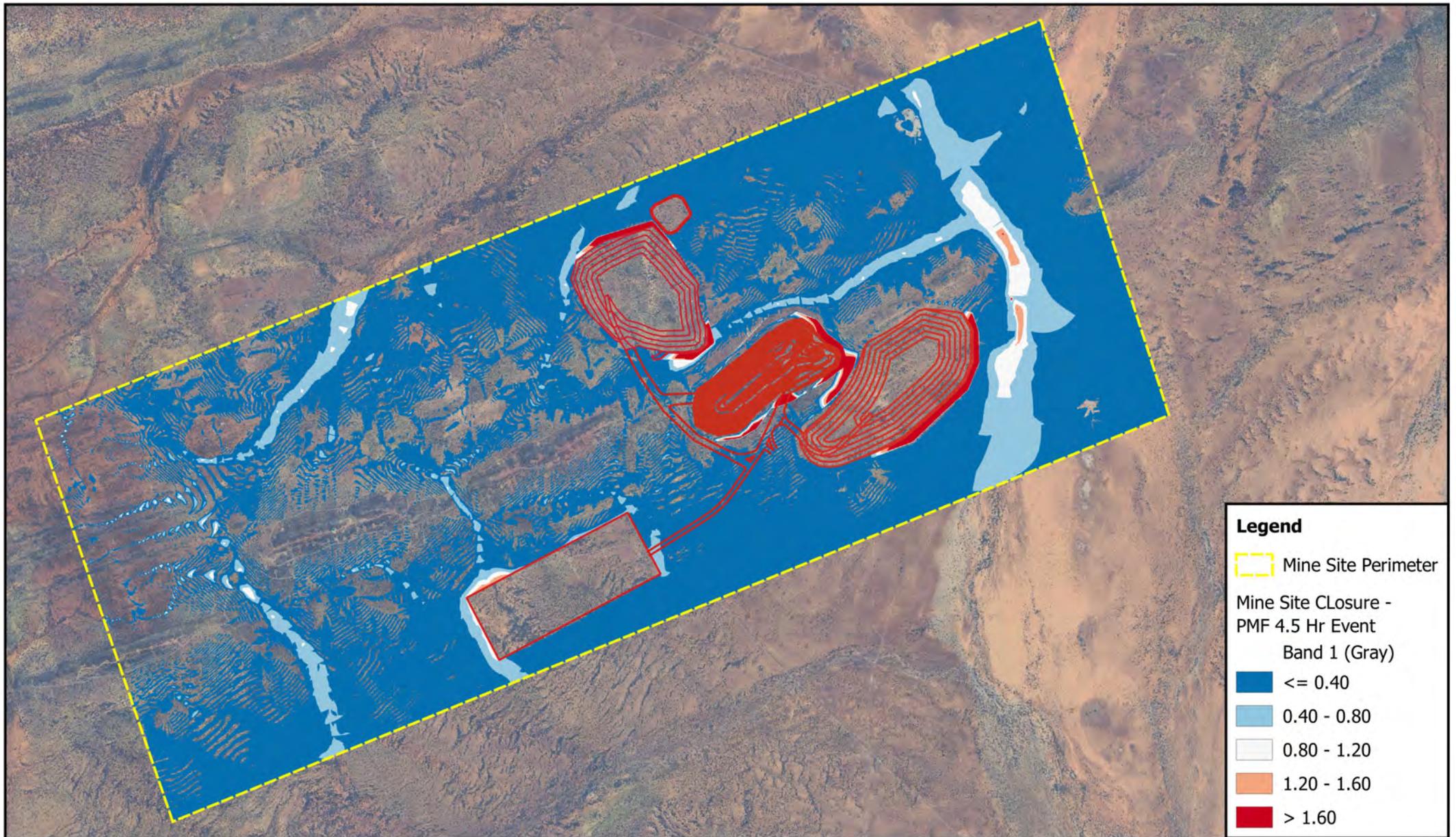
0 0.75 1.5 km



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Figure J

Beebyn W11 Beebyn Creek Closure
 Max Velocity (m/s) - PMF 36Hr



Legend

-  Mine Site Perimeter
- Mine Site Closure - PMF 4.5 Hr Event Band 1 (Gray)
-  ≤ 0.40
-  0.40 - 0.80
-  0.80 - 1.20
-  1.20 - 1.60
-  > 1.60



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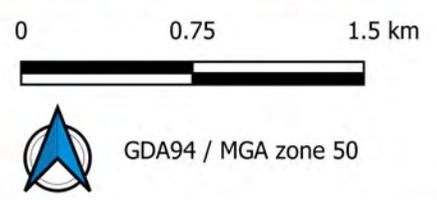
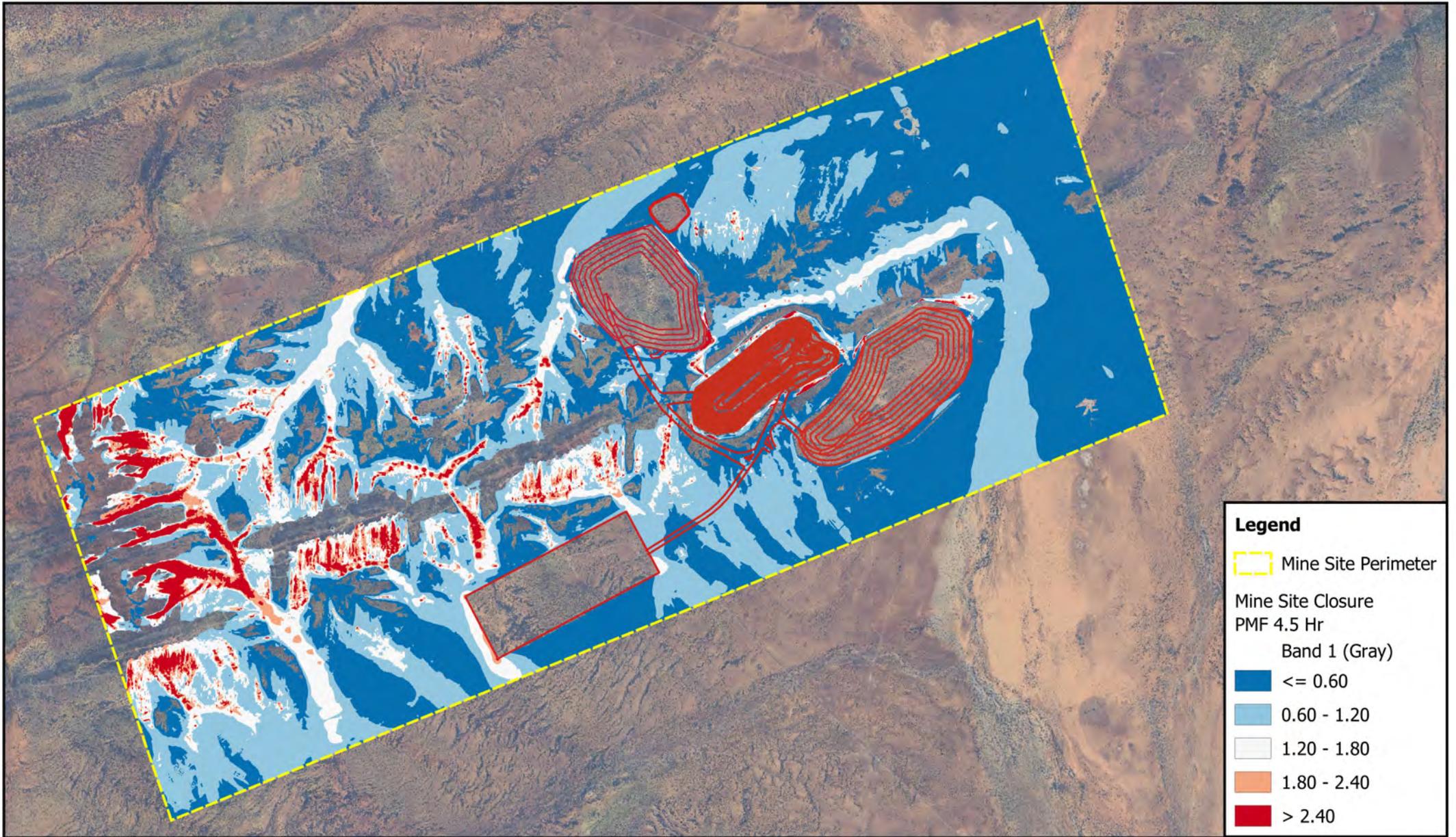


Figure K
 Beebyn W11 Mine Site Closure
 Max Depth (m) - PMF 4.5 Hr



Legend

- Mine Site Perimeter
- Mine Site Closure
PMF 4.5 Hr
- Band 1 (Gray)
- ≤ 0.60
- 0.60 - 1.20
- 1.20 - 1.80
- 1.80 - 2.40
- > 2.40



Project code:
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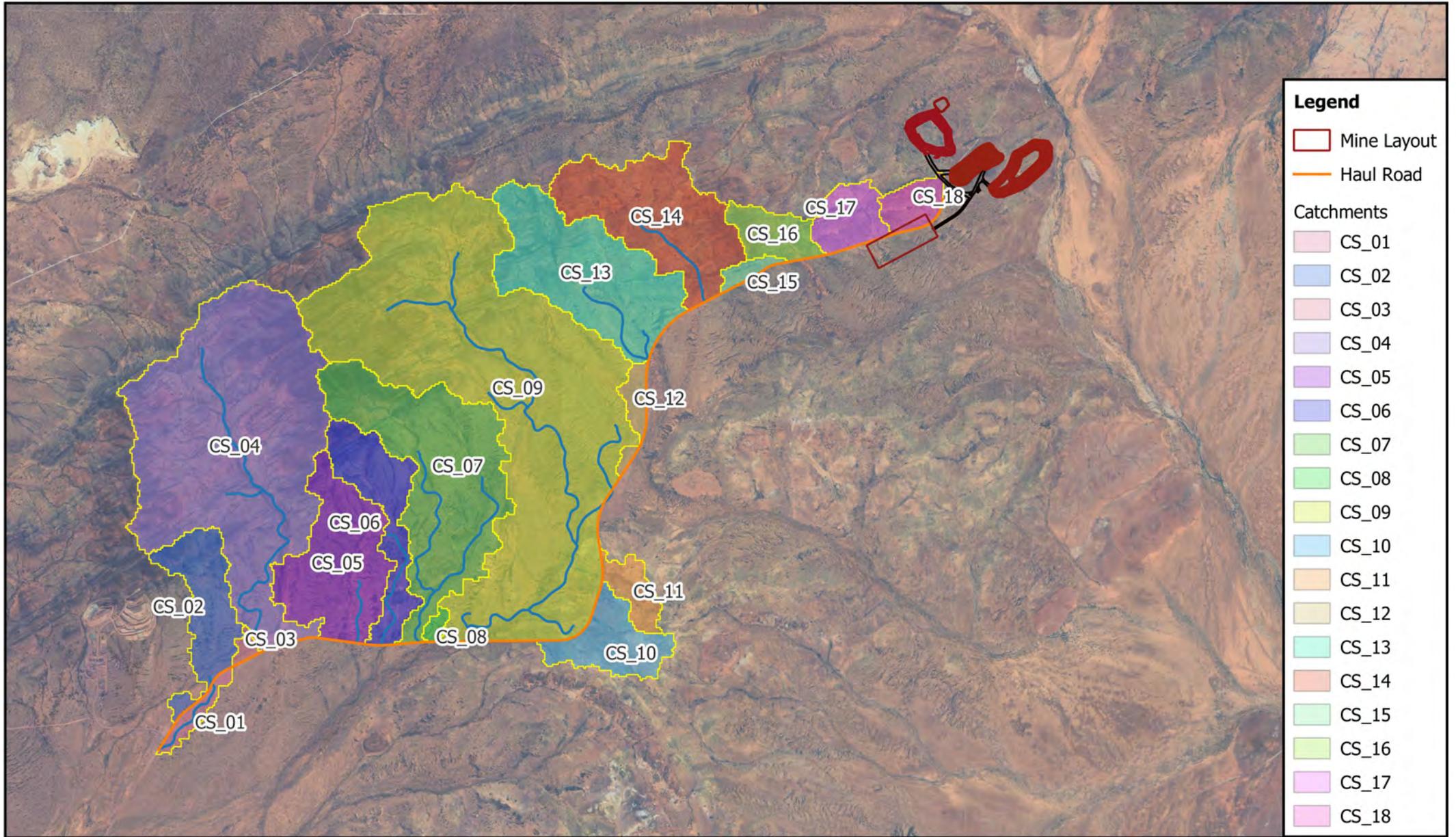
0 0.75 1.5 km



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Figure L

Beebyn W11 Mine Site Closure
 Max Veolcity (m/s) - PMF 4.5 Hr



Project code:
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 Date: 12/8/2025
 Scale: 1:90,000
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 Sources: data.gov.au

0 0.75 1.5 km



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Figure M

Beebyn W11 Mine - Road Train Haul Road

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ATTACHMENT 2**AERIAL IMAGE OF THE SITE**