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Westgold Resources Limited: Tuckabianna Project Area; Flora and Vegetation Reconnaissance and Targeted Flora Survey, March 2021




19 July 2021

Version 1

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This document describes the results of combined vegetation and flora reconnaissance and targeted flora survey carried out by Maia Environmental Consultancy (Maia) at Westgold Resources Limited's (Westgold) Tuckabianna project area in March 2021.

Photographs on front page taken in the Survey Area.

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Acronyms and Abbreviations

BAM Act	*Biosecurity and Agriculture Management Act 2007*
BC Act	*Biodiversity Conservation Act 2016*
BoM	Bureau of Meteorology
CSF	Conservation significant flora
DAWE	Department of Agriculture, Water and Environment (Federal)
DBCA	Department of Biodiversity Conservation and Attractions
DEC	Former Department of Environment and Conservation (current DBCA)
DotE	Former Department of the Environment (current DAWE)
DPaW	Former Department of Parks and Wildlife (current DBCA)
DPIRD	Department of Primary Industries and Regional Development
DWER	Department of Water and Environmental Regulation
EPA	Environmental Protection Authority
EPBC Act	*Environment Protection and Biodiversity Conservation Act 1999*
ESA	Environmentally sensitive area
ESCAVI	Executive Steering Committee for Australian Vegetation Information
Fl, Fr	Flowering, fruiting
GDA94	Geocentric Datum of Australia, 1994
GDE	Groundwater dependent ecosystem
GoWA	Government of Western Australia
GPS	Global Positioning System
IBRA	Interim Biogeographic Regionalisation for Australia
indet.	Indeterminate, could not be identified to species, usually due to lack of fertile material
IUCN	International Union for Conservation of Nature
LS	Land system
Maia	Maia Environmental Consultancy Pty Ltd
MGA50	Map Grid of Australia zone 50
NVE	Native vegetation extent
NVIS	National Vegetation Information System
OppColl	Opportunistic collection
P (1-4)	Priority (1 to 4) flora species
PEC	Priority ecological community
PMST	Protected Matters Search Tool
sp.	Species -single
spp.	Species - multiple
subsp.	Subspecies
T	Threatened flora species
TEC	Threatened ecological community
TPFL	Threatened and Priority Flora database

VA	Vegetation association
var.	Variety
VSA	Vegetation system association
WA	Western Australia
WAH / WA Herb	Western Australian Herbarium
WAOL	Western Australian Organism List
WoNS	Weed of National Significance
*****	After species indicates a weed species
?	Queried / unconfirmed genus or species

Summary

Background and Methods

- Westgold Resources Limited (Westgold) engaged Maia Environmental Consultancy Pty Ltd (Maia) to carry out a combined reconnaissance and targeted flora survey over a section of its Tuckabianna project area, located in the Shire of Cue in Western Australia (WA).
- A desktop assessment was carried out before the survey, and the combined reconnaissance and targeted flora survey was carried out in March 2021 (autumn).

Desktop Study Results

- One threatened flora species listed under both the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) and *Biodiversity Conservation Act 2016* (BC Act) has been located within 50 km of the Survey Area – *Eremophila rostrata* subsp. *rostrata* (Critically Endangered). However, the closest record is approximately 9 km away and its typical habitat does not occur in the Survey Area. Thirty-one priority (P) flora species that have been recorded within 50 km of the Survey Area (seven P1, two P2, 18 P3 and four P4). Eleven of the 31 species have been recorded previously in Westgold project areas surveyed by Maia, and therefore some of the 31 priority species could occur in the Survey Area.
- Two Weeds of National Significance (WoNS) and pest plants declared in WA (DPP) have been located previously in the surrounding area (*Opuntia stricta* (Prickly Pear) and *Tamarix aphylla* (Tamarisk)). One potential DPP was located in an area surveyed in September 2019 - *Argemone ?mexicana* (?Mexican Poppy). Twenty-eight general weed species were collated from the desktop study and 17 of them have been recorded during surveys carried out by Maia at Tuckabianna and in the surrounding area. Seven of the 17 weed species located by Maia are listed as having high ecological impact and rapid invasiveness ratings.
- The Survey Area does not lie in a threatened or a priority ecological community (TEC or PEC).
- The Survey Area does not intersect an environmentally sensitive area, or areas managed by, or of interest to, the Department of Biodiversity Conservation and Attractions (DBCA); neither does it intersect a Schedule 1 area.

Survey Results - Flora

- Ninety-seven (97) taxa from 47 genera and 28 families were recorded in the Survey Area (87% perennial and 13% annual).
- Four priority flora species were located – two P3 species (*Drummondita miniata* and *Sida picklesiana*) and two P4 species (*Acacia speckii* and *Dodonaea amplisemina*).
- *Drummondita miniata* is a bioregional endemic, as it only has records in the Murchison bioregion.
- Ten range extension or gap filler species were located in the Survey Area.
- Sandalwood (*Santalum spicatum*) was recorded at two locations in the Survey Area.
- No WoNS or DPP species were located, and one general weed species was recorded (*Citrullus amarus*), which has low ecological impact rating and rapid invasiveness rating.

Survey Results - Vegetation

- Six vegetation types were mapped in the Survey Area – one *Acacia aptaneura* tall sparse shrubland, one *Acacia* tall open shrubland to low open woodland, three *Acacia* tall sparse shrublands, and one mixed low sparse shrubland. The habitats were banded iron formation and non-banded ironstone hills and outcrops, plains with exposed granite outcrop, undulating plains, minor drainage channels, broad drainage channels and depressions.
- The most extensive vegetation types were A**TSSL** (1) and A**TSSL** (2), mapped over 66% of the Survey Area on undulating plains and minor drainage channels, while the least extensive were mapped over 12% of the Survey Area collectively (M**LSSL**, *Aa***TSSL**, *A***TOSL** and *A***TSSL** (3)), on rocky plains or hills, and drainage channels or lower lying areas.
- Vegetation condition was assessed as mostly very good (71%) and excellent (7%), while 22% was degraded to completely degraded.

Ecological Communities, Groundwater and Sheet Flow Dependent Ecosystems

- None of the Survey Area lies over a TEC or PEC and none of the vegetation types are similar to a currently listed TEC or PEC.
- Small sections of vegetation along the western and eastern boundaries of the Survey Area are mapped as having low potential to be groundwater dependent.
- The level to gently undulating plains with mantles of abundant ironstone and quartz pebbles and cobbles and level to gently inclined lower plains with mantles of ironstone pebbles of the Violet LS can be subject to sheet flow. Alteration to sheet flow in these areas (e.g., by construction of tracks) could affect the health of the mulga, particularly down slope of structures altering the sheet flow.

Conservation Significance

- The most significant section of the Survey Area is the south-western section where most of the conservation significant flora species were located, and where three of the four least extensive vegetation types occur.
- The remaining extent of the three land systems and one vegetation association mapped in the Survey Area is more than 97% in the Eastern Murchison subregion, and between 77% and 100% of the originally mapped extent of the VSA and land systems currently remains in the Survey Area. Based on this information the VSA and land systems of the Survey are not currently regionally or locally significant.

Recommendations

- Impact to the CSF species located in the Survey Area should be avoided or minimised.
- Impact to the vegetation in the south-western section of the Survey Area should be avoided or minimised because that was the area where most of the conservation significant flora species were located, and because some of the vegetation types were only mapped in that area.
- *Santalum spicatum* is a valuable resource and impact to this species should be avoided whenever possible. If the trees are to be cut down and passed on for processing relevant licences should be applied for.
- As only one weed species was located in the Survey Area, every effort should be made to prevent the spread of weeds from and between Westgold's different project areas and to prevent the introduction of new weed species into this relatively weed free Tuckabianna Survey Area.
- Drainage should be managed to minimise impact to any areas of groved / banded mulga in areas that will not be cleared for the project.
- Clearing of vegetation along watercourses should be avoided or minimised.

Westgold Resources Limited: Tuckabianna Project Area;

Flora and Vegetation Reconnaissance and Targeted Flora Survey, March 2021

1 Introduction

1.1 Scope of Work

Westgold Resources Limited (Westgold) engaged Maia Environmental Consultancy Pty Ltd (Maia) to carry out a combined reconnaissance and targeted flora survey over a section of its Tuckabianna project area (the Survey Area; **Map 1, Section 11**). The area surveyed surrounds two areas previously assessed by Coffey (2012a) and Maia (2020). Maia was asked to walk traverses and assess some sites in the Coffey survey area to collect information to be able to combine the vegetation mapping for the new and old survey areas. This report presents the results of a desktop study carried out for the Survey Area, the results of the field survey and a discussion of the significance of the flora and vegetation of the Survey Area.

1.2 Survey Area Location and Size

The Survey Area is in the Shire of Cue approximately 23 kilometres (km) east of Cue (**Map 1**), and it covers approximately 1,441 hectares (ha); however, already disturbed areas are included in that area.

2 Background Information

2.1 Bioregional Setting

Information on the bioregion, sub-region, geology, soil landscape units, land systems, pre-European vegetation associations is included in Table 1, along with the main findings of any earlier surveys carried out in or in the vicinity of the Survey Area (including conservation significant flora (CSF) species). Information on groundwater dependent ecosystems (GDE), sheet flow dependent vegetation, environmentally sensitive areas (ESA), conservation estate, Schedule 1 areas, former leasehold areas, Environmental Protection Authority (EPA) Red Book areas and significant water bodies, rivers and drainage lines and any other significant ecosystems is also summarised in **Table 1**.

Table 1: Background information

Background information on the Survey Area	
Bioregion and subregion (**Map 2A, Section 11**)	The study Area is located in the Murchison bioregion (MUR) and East Murchison subregion (MUR01) (Department of the Environment (DotE), 2012).

Background information on the Survey Area	
Geology (**Map 2B, Section 11**)	The surface geology of the Survey Area is mapped as five units (Stewart *et al*., 2008): • Agh: Monzogranite, granodiorite, tonalite, quartz monzonite; in places recrystallised and foliated; some mixed granite and country rock assemblages; high-Ca granite. • Afy: Felsic volcanic and volcaniclastic rocks, locally amygdaloidal or fragmental; dacite, quartz-feldspar porphyry, tuff, agglomerate, andesitic lava, quartz-muscovite schist, felsic schist, felsic gneiss. • Aty: Amphibolite, mafic schist, mafic rock intercalated with granite, para-amphibolite; metabasalt, metagabbro, metapyroxenite and metadolerite; Youanmi Terrane. • Czl: Pisolitic, nodular or vuggy ferruginous laterite; some lateritic soils; ferricrete; magnesite; ferruginous and siliceous duricrusts and reworked products, calcrete, kaolinised rock, gossan; residual ferruginous saprolite. • Qrc: Colluvium, sheetwash, talus; gravel piedmonts and aprons over and around bedrock; clay-silt-sand with sheet and nodular kankar; alluvial and aeolian sand-silt-gravel in depressions and broad valleys in Canning Basin; local calcrete, reworked laterite.
Soil-landscape units	The Survey Area lies in the Murchison Province of the Western Region (Tille, 2006). The Murchison Province is described as hardpan wash plains and sandplains (with some stony plains, hills, mesas and salt lakes) on the granitic rocks and greenstone of the Yilgarn Craton. The Murchison Province is divided into seven soil-landscape zones and the Survey Area lies in the Yalgoo Plains zone (273), which is located in the south-western Murchison from Paynes Find to Cue and Twin Peaks Station. The Yalgoo Plains zone is described as Hardpan wash plains (with some sandplains, stony plains, mesas and granite outcrops) on granitic rocks (with some greenstone) of the Yilgarn Craton (Murchison Domain). The soils are Red loamy earths and Red shallow loams (often with hardpans) with Red deep sands and Red shallow sands and some Red shallow sandy duplexes. Mulga shrublands with bowgada shrublands (and some halophytic shrublands) (Tille, 2006).
Land systems (**Map 2C, Section 11)**	The Survey Area lies over three land systems (LS) (Department of Primary Industries and Regional Development (DPIRD), 2019a): • Sherwood: Breakaways, kaolinised footslopes and extensive gently sloping plains on granite supporting mulga shrublands and minor halophytic shrublands. • Violet: 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. Stony plains; acacia shrublands and halophytic shrublands. • Wiluna: 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.
Pre-European vegetation associations and system associations (**Map 2D, Section 11**)	One of Beard's vegetation associations (VA) and system associations (VSA) is mapped in the Survey Area (DPIRD, 2019b): • VA 18, VSA 18; Low woodland, open low woodland, or sparse woodland. Mulga *Acacia aneura* and associated species. The pre-European and current extent of the vegetation association and system association in the Murchison bioregion and East Murchison subregion are listed in **Table 2** along with the amount in reserves. Cowan (2001) listed vegetation association 18 as having moderate reservation priority in the Murchison bioregion.

Background information on the Survey Area	
Conservation significant flora species located during previous botanical surveys carried out within the last 10 years in the vicinity of the Survey Area	Central Murchison Gold Project (Big Bell, City of Chester, Cuddingwarra and Day Dawn): No CSF recorded (Outback Ecology, 2012). Tuckabianna: No CSF recorded (Coffey, 2012a). Big Bell Haul Road (Option 1): 8 CSF species in the haul road corridor surveyed – *Hibiscus krichauffianus*, *Prostanthera ferricola*, *Ptilotus beardii*, *Ptilotus luteolus*, *Sauropus* sp. Woolgorong (M. Officer s.n. 10/8/94) (all Priority (P) 3), *Acacia speckii*, *Dodonaea amplisemina* and *Grevillea inconspicua* (all P4) (Maia, 2018). Big Bell Haul Road Corridor, Alignment 2: 8 CSF species in the haul road corridor surveyed – *Drummondita miniata, Prostanthera ferricola*, *Ptilotus beardii*, *Ptilotus luteolus*, *Sida picklesiana* (all Priority (P) 3), *Acacia speckii*, *Dodonaea amplisemina* and *Grevillea inconspicua* (all P4) (Maia, 2019). Tuckabianna West: One CSF species - *Calotis* sp. Perrinvale Station (R.J. Cranfield 7096) (P3) (Maia, 2020a). Crème d'Or, Racecourse and Mt Fingall: One CSF species – *Drummondita amplisemina* (P4) (Maia, 2020b). City of Sydney and Fleece Pool: Five CSF species – *Ptilotus beardii*, *P. luteolus* and *Tecticornia fimbriata* (all P3), and *Dodonaea amplisemina* and *Grevillea conspicua* (both P4) (Maia, 2020c).
Protected and significant areas (**Map 3, Section 11**)	**DBCA Legislated Lands and Waters**: No legislated lands and waters lie within 50 km of the Survey Area (DBCA, 2021a). **DBCA Lands of Interest**: The Survey Area does not intersect with any lands of interest (Department of Biodiversity, Conservation and Attractions (DBCA), 2021b). The closest is Lakeside and its closest boundary is approximately 30 km south-west of the Survey Area. **Environmental Protection Authority (EPA) Redbook areas**: No EPA Redbook areas are within 50 km of the Survey Area (DBCA, 2021c). **Environmentally Sensitive Area (ESA)**: No ESA occurs within the Survey Area; the closest ESAs are approximately 22 km north north-west of the Survey Area and they are *Eremophila rostrata* (Threatened (T)) locations (Department of Water and Environment Regulation (DWER), 2021a). **Schedule 1** area: There are no schedule one areas in or close to the Survey Area, the closest is approximately 10 km to the west (DWER, 2021b).
Significant water bodies, rivers and drainage lines Protected and significant areas (**Map 4, Section 11**)	No Ramsar wetland (DBCA, 2021d) or wetlands on the Directory of Important Wetlands (DBCA, 2021e) occur in the Survey Area. No named perennial rivers occur in the Survey Area (Geoscience Australia, 2006). A number of non-perennial / ephemeral water courses / drainage lines occur in the Survey Area.
Sheet flow dependent vegetation	Patches of groved / banded mulga can be seen in the western and eastern sections of the Survey Area: groved and weakly groved mulga is mentioned in the Violet land system vegetation description (this table, above).
Terrestrial GDE (**Map 4, Section 11**)	Small sections of the western and eastern boundaries of the Survey Area lie over an area mapped as having low potential to be a terrestrial GDE based on national assessment (BoM, 2021a).

Table 2: Pre-European vegetation association and system association

	Murchison Bioregion	East Murchison Subregion	Shire of Cue
Vegetation association (VA)			
Pre-European extent (ha)			
18	12,403,172.30	10,269,896.44	881,735.81
Current extent (ha)			
18	12,363,252.47	10,234,838.22	878,817.46
Remaining (%)			
18	99.68	99.66	99.67
Current extent of VA protected (IUCN 1-4) for conservation (proportion of pre-European extent) (%)			
18	0.36	0.44	0
Vegetation system association (VSA) – Wiluna system			
Pre-European extent (ha)			
18	4,307,945.85	4,273,509.57	573,325.81
Current extent (ha)			
18	4,290,204.46	4,256,038.04	570,689.86
Remaining (%)			
18	99.59	99.59	99.54
Current extent of VSA protected (IUCN 1-4) for conservation (proportion of pre-			
18	1.05	1.05	0
Source: GoWA, 2019.			

3 Desktop Assessment

3.1 Flora

Appendix 1 provides information on conservation significance of flora and vegetation and **Appendix 2** information on the classification of weeds.

Information on the flora species and ecological communities of the Survey Area was gathered from the sources listed in **Table 3**. A 20 km buffer was used around a point coordinate (118 º 08 13 E, 27 º 27 06 S). for the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) Protected Matters Search Tool search and a 40 km buffer for the NatureMap search (using the same point). Results from DBCA database searches requested in 2019 were used along with the results of surveys carried out by Maia and others within 50 km of the coordinates for the centre of the Survey Area to collate a list of conservation significant species that could occur in the Survey Area.

Table 3: Databases searched, and literature used

Database / literature	Reference or reference number	Buffer(s) (km)
EPBC Act Protected Matters Search Tool (PMST)	DAWE (2021a)	20 km
DBCA's NatureMap	DBCA (2007-)	40 km
DBCA's Threatened and Priority Flora database (TPFL)	DBCA 2019c, Reference #07-1219FL)	50 km
The Western Australian Herbarium (WA Herb) – for threatened and priority flora species opportunistically collected in the area of interest		
DBCA's Threatened Ecological Communities database	DBCA 2019d, Reference # 08-01212EC)	35 km
Co-ordinates used for EPBC Act and NatureMap searches: 118 ° 08 13 E, 27 ° 27 06 S. The search results are included as **Table 16, Appendix 3.** **Coordinates for the DBCA Threatened Flora / Threatened Ecological Community searches:** 50 km / 35 km buffer around the central coordinate 588,290 mE and 6,969,924 mN (Geocentric Datum of Australia, 1994 (GDA94), Map Grid of Australia, zone 50 (MGA50))**.**		
Tuckabianna West	Maia, 2020a	Surveys previously carried out for Westgold within approximately 50 km of the Survey Area (and sometimes overlapping the Survey Area)
Crème d'Or, Racecourse and Mt Fingall	Maia, 2020b	
City of Sydney and Fleece Pool	Maia, 2020c	
Big Bell Haul Road Corridor, Alignment 2 (L20/79)	Maia, 2019	
Big Bell Haul Road (Option 1)	Maia, 2018	
Central Murchison Gold Project	Outback Ecology, 2012	
Tuckabianna	Coffey, 2012a	
Yellow Taxi	Outback Ecology, 2005	
Comet, Silver Lake	Coffey, 2012b	
Comet, Silver Lake	Coffey, 2012c	
Reedys	MWH, 2015	

3.1.1 Significant Flora

3.1.1.1 THREATENED AND PRIORITY FLORA

3.1.1.2 THREATENED FLORA

Two flora species protected by the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) have been recorded within 50 km of the Survey Area – *Eremophila rostrata* subsp. *rostrata* and *Minuria tridens* (listed as Critically Endangered and Vulnerable respectively (**Appendix 3** and codes described in **Appendix 1**). *Eremophila rostrata* subsp. *rostrata* is also protected by the *Biodiversity Conservation Act 2016* (BC Act) and is ranked as Critically Endangered (**Appendix 3**) (Smith & Jones, 2018), while *Minuria tridens* is not listed as a threatened species in WA under the BC Act. *Eremophila rostrata* subsp. *rostrata* locations are shown on **Map 5, Section 11**.

These threatened species were not listed in the results of the EPBC Act Protected Matters Search Tool (PMST) search (PMST_8IV3M1; DAWE, 2021a; **Appendix 3**), while *Eremophila rostrata* subsp. *rostrata* was listed in the NatureMap (DBCA, 2007-) search results as Threatened and *Minuria tridens* as Priority (P) One (**Appendix 3**).

3.1.1.3 PRIORITY FLORA

A list of 31 Priority species resulted from the database searches (**Table 16, Appendix 3**) – seven P1 species, two P2 species, 18 P3 species and four P4 species. Eleven of the 31 priority species have been recorded during surveys carried out by Maia in some of Westgold's project areas (**Table 16, Appendix 3**).

Map 5, Section 11 shows locations of conservation significant flora (CSF) in the DBCA search results and those recorded by Maia in the search area previously.

3.1.1.4 ENDEMIC FLORA

Three endemic species were indicated in the NatureMap species report for the search area (DBCA, 2007-): *Angianthus uniflorus, Eremophila rostrata* subsp. *rostrata* and *Minuria tridens*.

3.1.2 Weeds

The database and literature searches resulted in a list of 30 weed species (**Table 17, Appendix 3**), and they are discussed below.

3.1.2.1 NATIONAL WEEDS LISTS

- No weed species (or their potential habitat) on any of the national weeds lists were listed in the EPBC Act PMST search results (DAWE, 2021a). One WoNS was listed in the NatureMap search results – *Opuntia stricta*, and this species has been located in the vicinity of the Survey Area (Maia, 2018 and 2019). *Tamarix aphylla* (Athel Pine) has also been located within 50 km of the Survey Area (Maia, 2018).
- *Opuntia* ?*stricta* was also recorded by Outback Ecology (2012) in the Big Bell survey area and *Opuntia* sp. was recorded by Maia just outside of the alignment 1 corridor (Maia, 2018).

3.1.2.2 PLANT PESTS DECLARED IN WESTERN AUSTRALIA

- No declared pest plants (DPP) were listed in the results of the EPBC Act PMST search (DAWE, 2021a; DPIRD, 2021).
- *Tamarix aphylla* is a DPP and it has been located by Maia in one of Westgold's project areas (Maia, 2018). It is declared for the whole of the state (DPIRD, 2021); similarly, *Opuntia stricta* was recorded by Maia (Maia, 2019) and it is declared for the whole of WA.
- Maia located 10 plants that could potentially be the DPP *Argemone mexicana* at the Mt Fingall project area (Maia, 2020b).
- One potential DPP – *Opuntia* ?*stricta* was recorded by Outback Ecology (2012) at Big Bell and *Opuntia* sp. was recorded by Maia (Maia, 2018).

3.1.2.3 GENERAL WEEDS

Twenty-eight general weed species have been located in the search area previously, and 17 of the 28 have been recorded in Westgold project areas surveyed by Maia within 50 km of the current Survey Area.

The Midwest Region species prioritisation process 2014 impact and invasiveness ratings spreadsheet, lists 324 weed species for which impact and invasiveness have been rated, and a further seven weed species that have been listed as priority alert species (Department of Parks and Wildlife (DPaW), 2014). The ecological impact and

invasiveness rankings for the 28 general weed species identified are listed in **Table 17**, **Appendix 3**. Seven of the species located by Maia in Westgold project areas have both high ecological impact and rapid invasiveness ratings: *Brassica tournefortii, Cenchrus ciliaris, C. setiger, Centaurea melitensis, Cynodon dactylon, Malvastrum americanum* and *Rumex vesicarius.*

3.1.3 Significant Ecological Communities

Map 6 (Section 11) shows the locations of conservation significant ecological communities within the database search area (threatened and priority ecological communities (TECs and PECs)).

- No federally protected TECs were listed in the EPBC Act PMST search results as likely to occur within the database search area (DAWE, 2021a).
- No state-listed TECs were in the results of the DBCA ecological community search carried out over the wider area (DBCA, 2019d; search reference number 08-01212EC).
- Five PECs were listed in the results of the DBCA ecological community search and none of the buffers intersect with the Survey Area.
- The five PECs are:

  1) 'Lake Austin vegetation complexes (banded ironstone formation)' P1 PEC;

  2) 'Lake Austin calcrete groundwater assemblage type on Murchison palaeodrainage on Austin Downs Station' P1 PEC;

  3) 'Taincrow calcrete groundwater assemblage type on Murchison palaeodrainage on Taincrow Station' P1 PEC;

  4) 'Austin Land System' P3 PEC; and,

  5) 'Trillbar Land System' P3 PEC.

Current TEC and PECs were checked on NationalMap (Australian Government, 2021) and NatureMap (DBCA, 2007-). The NationalMap layer is the same as the data on **Map 6**, while the NatureMap layer does not show the Austin Land System P3 PEC occurrences.

4 RAINFALL

The closest weather station recording climate statistics is Cue (Bureau of Meteorology (BoM) station number 7017). Cue's long-term mean rainfall for each month and each year for all recording years and total monthly rainfall for January 2020 to March 2021 are listed in **Table 4** (BoM, 2021b).

Total average rainfall recorded at Cue over the three full months before the March 15 to 18 survey (December 2020, January and February 2021) was 84.5mm, 22.2 mm higher than the long-term mean total for those three months (72.3 mm).

According to BoM's WA rainfall deciles map for December 1 2020 to February 28 2021, the Survey Area is in an area that received average rainfall over the three months before the survey (**Figure 1**, the approximate location of the Survey Area is indicated by the black spot; BoM, 2021c). Based on these data the condition of the vegetation could have been average when the survey was carried out.

Table 4: Long-term and 2020 and 2021 total monthly and annual rainfall (mm) – Cue

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Annual
Cue (station number 7017; long-term (l-t) data collected between 1894 and 2021													
2020 (mm)	100.6	18	7.8	0.4	0.6	1.3	6.2	16.8	0	3.2	8.4	16.0	179.3
2021 (mm)	17.7	50.8	20.4										
L-t (mm)	27.8	29.5	24.2	18.7	24.1	27.9	25	16.7	6.6	6.5	9.4	15.0	232.6

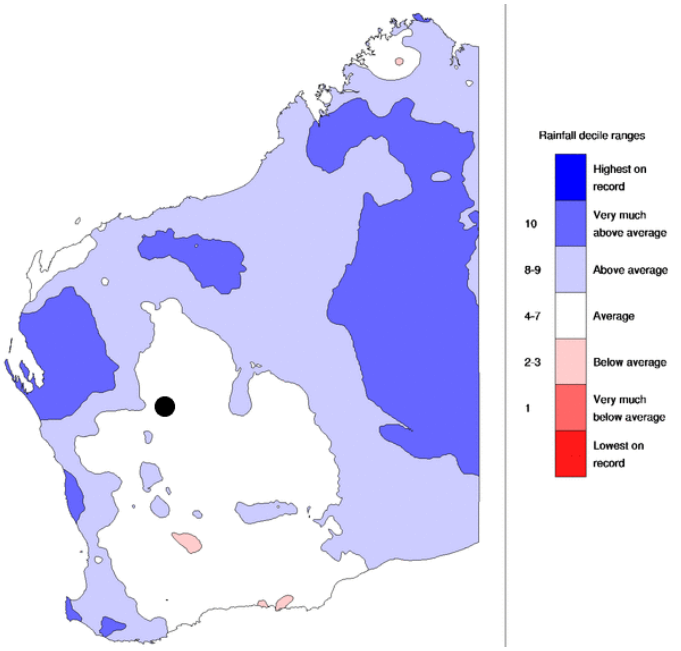


Figure 1: Western Australian rainfall deciles, 1st Dec 2020 to 28th Feb 2021 (BoM, 2020c)

5 Methods – Survey, Taxonomy and Vegetation Mapping

5.1 Field Survey

The survey methodology was developed to comply with the following:

- Environmental Factor Guideline: Flora and Vegetation (EPA, 2016a); and,
- Technical Guidance: Flora and Vegetation Surveys for Environmental Impact Assessment (EPA, 2016b).

The Survey Area was assessed by one botanist between March 15th and 18th, 2021.

Relevés (approximately 20 m x 20 m) were assessed, and traverses were walked in the Survey Area. CSF species known to occur in the area and surrounds, any novel species and introduced species were targeted while walking. The botanist surveyed a band of vegetation approximately 20 m wide while walking from site to site. Relevés were also assessed in the area previously surveyed by Coffey (2012a) in order to collate that area with vegetation types mapped by Maia at Tuckabianna.

The vegetation of the Survey Area was mapped using the flora and vegetation information collected at 39 relevé sites assessed. Relevé locations were selected before the survey using aerial imagery and Survey Area boundaries. Relevés were placed to capture each habitat visible on the aerial imagery and the pre-European vegetation and

land systems mapped in the Survey Area. The final placement of the relevés was selected while the botanist was carrying out the survey, and additional relevés were assessed in any habitats that appeared different and was not visible on the aerial image.

The following parameters were recorded at each relevé site:

- Location details including Global Positioning System (GPS) co-ordinates (GDA94).
- Site parameters such as soil description, topography and general habitat description, rock type and cover.
- A photograph of the site.
- Vegetation condition using the scale and criteria in EPA, 2016b.
- Notes on any disturbance to the vegetation.
- Fire history.
- A description of the vegetation structure including the height, percentage cover and dominant species within each stratum.
- The name, height, percentage cover and any other significant recording details for any other species located at the relevé.

The botanist also took extra photographs while walking from site to site.

5.2 Taxonomy and Nomenclature

Plant specimens collected from the Survey Area were identified by Conrad Slee.

Species names used in this report are those adopted by the WA Herbarium, and they have been checked against current FloraBase records (WA Herbarium (WAH), 1998-). Undescribed taxa are referred to in the report and listed in the species list as "sp." (species), subspecies as subsp. and varieties as var.. Specimens that could not be determined to either genus or species level are indicated as indet..

5.3 Vegetation Mapping

Aerial imagery captured in May 2018 (Landgate, 2021) was used to map the vegetation types ranging in scale from 1:500 to 1:5,000. Vegetation types were described according to the dominant species in each structural class. Data collected by the botanist at relevés and photo points were used to delineate the boundaries of each type. Statistical analyses were not carried out to define the vegetation types of the area surveyed.

Vegetation types are described using the current National Vegetation Inventory System (NVIS) methodology at the association level (Level 5). At this level up to three strata and a maximum of three taxa per stratum are used to describe an association (Executive Steering Committee for Australian Vegetation Information (ESCAVI), 2003). The NVIS structural formation terminology is outlined in **Appendix 4**; it utilises growth forms (**Table 18**), height classes (**Table 19**) and foliage cover characteristics (**Table 20**).

Vegetation condition was mapped using data collected at relevés and photo points, notes recorded while walking from site to site and any disturbance visible on aerial imagery. The vegetation condition scale used is that for the Eremaean and Northern Botanical Provinces indicated in EPA (2016b) (**Table 5**).

Table 5: Vegetation condition scale (EPA, 2016b)

Vegetation condition	Eremaean and Northern Botanical Provinces
Pristine	
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.e., areas that are cleared or 'parkland cleared' with their flora comprising weed or crop species with isolated native trees or shrubs.

6 Survey Results

6.1 Survey Effort

Thirty-nine relevé sites were assessed and approximately 61.2 ha (30.6 linear km) of the Survey Area was assessed via traverses walked (**Map 7, Section 11**). The information collected at each relevé is provided in **Appendix 5**. Coverage achieved along traverses is calculated by buffering the traverses in ArcGIS by 20 m, which is the approximate width of the band of vegetation that the botanist was able to survey while walking traverses in the Survey Area. Approximately 4.2% of the Survey Area was assessed during the March 2021 survey.

6.2 Flora

6.2.1 General Flora

The following information was collated on the general flora of the Survey Area:

- Ninety-seven (97) taxa (including hybrids, crosses and queries) were recorded from 47 genera and 28 families (87% perennial and 13% annual).
- The most common families were Fabaceae (18), Scrophulariaceae (17) and Malvaceae (10).
- The most common genera were *Eremophila* (17), *Acacia* (15) and *Sida* (6).
- At the time of the survey 29% of the 97 taxa were flowering, 6% were fruiting and 6% were both flowering and fruiting i.e., approximately 41% of the species list was determined from specimens collected with reproductive material.
- The identity of three taxa could not be confirmed beyond genus due to lack of flowering or fruiting material – *Calandrinia* sp. indet., *Sclerolaena* ?*cornishiana* and *Sida* ?sp. Excedentifolia (J.L. Egan 1925). One affinity was recorded – *Eriachne* aff. *helmsii*. These have all been included in the species list and counts.

- Three taxa were not included in the counts and the species list as the specimens could not be identified to or beyond family level - ?*Hemigenia* sp. indet., ?*Phyllanthus* sp. indet. and Asteraceae sp. indet..
- *Acacia caesaneura* (narrow phyllodes variant) and *Acacia ramulosa* are listed in the species list but have not been included in the counts as they are already in the list as a species or variety.

A list of the flora taxa recorded is included as **Table 22, Appendix 6**.

A comparison of the flora recorded in the Survey Area with that recorded in the surrounding areas is included in **Table 6**. Fewer species were recorded from a larger area surveyed in the current Survey Area than in the Tuckabianna West survey area (Maia, 2020a). This possibly reflects the time of year the survey was carried out – autumn in 2021 compared with spring in 2019.

Table 6: Taxa of the Survey Area and surrounds

Survey area	Survey type	All taxa / natives / weeds	Survey timing (season)	No. of quadrats or relevés (km of traverses walked)	Area walked or surveyed (ha)	Source
Tuckabianna	Reconnaissance & TFS	97 / 96 / 1	March 2021 (autumn)	39 / (30.6 km)	62.1	This report
Tuckabianna West	Reconnaissance & TFS	110 / 107 /3	September 2019 (spring)	20 (23.5 km)	47.1	Maia (2020a)
Crème d'Or, Racecourse & Mt Fingall	Reconnaissance & TFS	176 / 161 / 15	June 2019 (winter; Crème d'Or south), and September 2019 (spring; Crème d'Or north, Racecourse and Mt Fingall)	46 / (49.1 km)	122.8	Maia (2020b)
City of Sydney and Fleece Pool	Reconnaissance & TFS	207 / 203 / 4	September 2019 (spring)	60 (31.2 km)	62.3	Maia (2020c)
Big Bell haul road alignment 2	Reconnaissance & TFS	252 / 245 / 7	October 2018 (spring)	63 relevés (including the 12 November 2017 relevés) (183 km including 28 km in November 2017)	274.5	Maia (2019)
Big Bell haul road alignment 1	Reconnaissance	198 / 194 / 4	November 2017 (spring)	51 relevés (12 within the current Survey Area) (116.9 km)	175.4	Maia (2018)
Tuckabianna	Level 1	44 / 43 / 1	January 2012 (summer)	10 quadrats (none)	0.4	Coffey (2012a)
Yellow Taxi	Targeted flora survey	41 / 36 / 5	November 2005 (spring)	Not available	10.0	Outback Ecology (2005)

Survey area	Survey type	All taxa / natives / weeds	Survey timing (season)	No. of quadrats or relevés (km of traverses walked)	Area walked or surveyed (ha)	Source
Reedys	Level 1	101 / 98 / 3	April 2015 (autumn)	19 relevés	Not available	MWH (2015)
Comet	Level 1	41 / 41 / 0	January 2012	10 quadrats (none)	0.4	Coffey (2012b)
Comet	Monitoring	55 / 55 / 0	April 2012	10 quadrats (not noted)	0.4	Coffey (2012c)

Note: the numbers in this table are for the whole of each survey area; the area surveyed is the area of quadrats / relevés or traverses assessed and not of the whole project area.

6.2.2 Significant Flora

The following sections address any significant flora recorded in the Survey Area.

6.2.2.1 THREATENED AND PRIORITY FLORA

Threatened Flora

No species protected by the EPBC Act were recorded in the Survey Area.

No species protected by the BC Act were recorded in the Survey Area.

Priority Flora

Four Priority species were located in the Survey Area: *Drummondita miniata* (P3), *Sida picklesiana* (P3), *Acacia speckii* (P4) and *Dodonaea amplisemina* (P4).

Photographs of the four species are included in **Appendix 7** and their locations are shown on **Map 8, Section 11**. The coordinates have been supplied to Westgold electronically, and they are not included in this report.

6.2.2.2 ENDEMIC SPECIES

Drummondita miniata (P3) has records in one bioregion (Murchison) and two subregions (Western and Eastern Murchison). This species is therefore endemic to the Murchison bioregion.

6.2.2.3 NEW SPECIES OR UNUSUAL SPECIES

None of the plants collected were new or potentially new species.

6.2.2.4 QUERIED TAXA

Three taxa in the species list are queried - *Calandrinia* sp. indet., *Sclerolaena* ?*cornishiana* and *Sida* ?sp. Excedentifolia (J.L. Egan 1925). Three additional taxa not listed in the counts and species list could not be confirmed beyond family level - ?*Hemigenia* sp. indet., ?*Phyllanthus* sp. indet. and Asteraceae sp. indet.. The specimens collected could not be identified because they were either sterile or not in good enough condition to be determined to species or genus level.

Twenty-six *Calandrinia* species are known to occur within the Eastern Murchison subregion, three are listed as conservation significant (WAH, 1998-); however, the closest record for any of the three conservation significant species is more than 200 km from the Survey Area, and it is highly unlikely that the *Calandrinia* species collected from the Survey Area is conservation significant. None of the 25 *Sclerolaena* species known to occur in the Eastern Murchison are conservation significant (WAH, 1998-). The *Sida* ? sp. Excedentifolia (J.L. Egan 1925) would not be conservation significant if confirmed to be that taxon.

It is unlikely that the three taxa that could not be confirmed beyond family are conservation significant. Two of the 10 *Hemigenia* species that occur in the Eastern Murchison are listed as conservation significant (*Hemigenia exilis* (P4) and *H. tysonii* (P3)) and their typical habitats do not occur in the Survey Area – lateritic breakaways and slopes. One of the two *Phyllanthus* species known to occur in the Eastern Murchison is listed as conservation significant (*Phyllanthus baeckeoides* (P3); WAH, 1998-), and its typical habitat does not occur in the Survey Area – lateritic breakaways. Fourteen Asteraceae species were located at Tuckabianna West (Maia, 2020a) and one of them was conservation significant (*Calotis* sp. Perrinvale Station (P3)). While it is possible that the Asteraceae sp. collection could be conservation significant, based on the number of non-conservation significant taxa recorded at Tuckabianna West, it is most likely that it is not conservation significant.

6.2.2.5 RANGE EXTENSION AND RANGE GAP FILLER SPECIES

Species have a typical range which is indicated by their known distribution records. Sometimes species are recorded during a survey and their distribution records show that they have not been located in the area previously. The new records can either extend the range of a species out from its known distribution or fill a gap in the distribution records. The new distribution records can be a result of few surveys having been carried out in an area, or of low survey effort in an area, or the time of year of survey with respect to flowering season for a species. However, range extensions and gap fillers can also reflect a lack of submission of flora records to the WA Herbarium, as relatively common species or those not classified as significant are frequently not submitted.

Using 100 km as the minimum distance from an existing record to define a range extension or gap filler, 10 species (including *Sclerolaena* ?*cornishiana*) were collected from the Survey Area (**Table 7**). *Enchylaena tomentosa* has been located during previous surveys conducted by Maia for Westgold; however, the records are not yet on FloraBase. None of the 10 species is conservation significant (i.e., threatened or priority).

Table 7: Range extension or gap filler species located in the Survey Area

Species	Closest NatureMap (NM) record (bioregion)	Distance & direction from closest NM record to Survey Area	Range extension of gap filler
Centipeda minima	Yalardy Station (Carnarvon)	305 km north-west	Extension
Enchylaena tomentosa	Lake Mason Station Conservation Area (Murchison)	125 km east-south-east	Gap filler (but also located in alignment 1 & 2 corridor (Maia, 2018 & 2019), Tuckabianna West (Maia, 2020a), Crème d'Or, Mount Fingall and Racecourse (Maia, 2020b), City of Sydney and Fleece Pool (Maia, 2020c))
Eremophila compacta	Yalgoo (Yalgoo)	170 km south-west	Extension
Hibiscus burtonii	Belele Station (Murchison)	120 km north	Extension
Nicotiana rotundifolia	Belele Station (Murchison)	120 km north	Gap filler
Philotheca brucei	Burnerbinmah Station (Yalgoo)	155 km south-west	Extension
Phyllanthus maderaspatensis	Belele Station (Murchison)	120 km north	Extension
Salicornia quinqueflora	Mongers Lake (Avon Wheatbelt)	300 km south-west	Extension

Species	Closest NatureMap (NM) record (bioregion)	Distance & direction from closest NM record to Survey Area	Range extension of gap filler
Sclerolaena ?cornishiana	Killara Station (Murchison)	140 km north-east	Extension, if it was *Sclerolaena cornishiana*
Sida sp. L (A.M. Ashby 4202)	Gidgee Station (Murchison)	130 km north-east	Extension

6.2.3 Sandalwood

Santalum spicatum (Sandalwood) was recorded in the Survey Area – at two locations, one tree at each.

6.2.4 Introduced Flora

6.2.4.1 NATIONAL WEEDS LISTS

- No weeds on any of the national weeds lists were recorded in the Survey Area.

6.2.4.2 PLANT PESTS DECLARED IN WESTERN AUSTRALIA

- No weeds listed as Declared Pests in WA were recorded in the Survey Area.

6.2.4.3 GENERAL WEEDS

One general environmental weed species was recorded in the Survey Area – *Citrullus amarus,* one plant. Its location is shown on **Map 9 (Section 11)**. *Citrullus amarus* (previously known as *C. lanatus*) was rated in the Midwest region weeds list as having low ecological impact and rapid invasiveness (DBCA 2014). Its location has been supplied to Westgold electronically and its coordinates are not listed in this report.

6.3 VEGETATION

6.3.1 Vegetation Types

Six vegetation types were mapped over the Survey Area. The area and cover of each is listed in **Table 8**, the vegetation types are described in **Table 9** and their distribution is shown on **Map 10 (Section 11)**. Areas already cleared (for existing roads, tracks, dumps and pits) are mapped as disturbed.

The information collected at relevés is included as **Appendix 5** and a site by vegetation type matrix as **Table 24, Appendix 8**.

Table 8: Vegetation types of the Survey Area – code: broad floristic formation, area and cover

Vegetation type code: broad floristic formation	Mapped in the Survey Area	
	Area (ha)	Cover (%)
*Aa***TSSL**: *Acacia aptaneura* Tall Sparse Shrubland	23.91	1.66
*A***TOSL**: *Acacia* Tall Open Shrubland to Low Open Woodland	50.24	3.49
*A***TSSL** (1): *Acacia* Tall Sparse Shrubland	569.05	39.49
*A***TSSL** (2): *Acacia* Tall Sparse Shrubland	378.28	26.25
*A***TSSL** (3): *Acacia* Tall Sparse Shrubland	98.48	6.83
M**LSSL**: Mixed Low Sparse Shrubland	3.11	0.22
Disturbed	317.84	22.06
Total area (ha) / Cover (%)	1,440.90	100

Table 9 provides the following information on each vegetation type:

- Its broad floristic formation,
- A detailed description,
- Its habitats,
- Its associated species,
- The relevés assessed in the vegetation type,
- The average vegetation condition based on quadrat vegetation condition.

In order to correlate with broad floristic formation descriptions, vegetation type descriptions have been ordered using the dominant cover class as the indicator and not the dominant stratum e.g., Tall Sparse Shrubland of *Acacia aptaneura* with a Sparse Shrubland of *Thryptomene decussata* and a Low Sparse Shrubland of *Ptilotus obovatus* and *P. schwartzii*.

The vegetation type codes include the first letter of the genus and species of the dominant taxon or taxa in the vegetation type along with the first letters of the dominant stratum in bold font e.g., *Aa***TSSL** is *Acacia aptaneura* Tall Sparse Shrubland. The vegetation types are suffixed by a number to distinguish between multiples e.g., for the Acacia Tall Sparse Shrublands – *A***TSSL** (1), *A***TSSL** (2) and *A***TSSL** (3).

Table 9: Vegetation types of the Survey Area

Code	Broad floristic formation, vegetation type and associated information		Photograph
*Aa***TSSL**	**Broad floristic formation**: *Acacia aptaneura* Tall Sparse Shrubland. **Vegetation type**: Tall Sparse Shrubland of *Acacia aptaneura* with a Sparse Shrubland of *Thryptomene decussata* and a Low Sparse Shrubland of *Ptilotus obovatus* and *P. schwartzii.*	**Associated species:** *Acacia caesaneura* (narrow phyllode variant), *A. incurvaneura*, *A. quadrimarginea*, *A. ramulosa* var. *linophylla*, *Eremophila forrestii* subsp. *forrestii*, *Eriachne mucronata*, *Ptilotus aervoides*, *Senna glaucifolia.* **Relevé:** TWR024, TWR041.	
	Habitat: Banded iron formation and non-banded ironstone rolling hills and outcropping.	**Vegetation condition:** Very Good. Grazing and exploration activities.	
*A***TOSL**	**Broad floristic formation**: *Acacia* Tall Open Shrubland to Low Open Woodland. Mixed Tall Open Shrubland to Low Open Woodland mainly of *Acacia aptaneura, A. pteraneura* and *A. pruinocarpa* with an Open shrubland of *A. tetragonophylla* and *A. craspedocarpa* (hybrid) and a Low Sparse mixed Shrubland mainly of *Eremophila forrestii* subsp. *forrestii*, E. *simulans* subsp. *simulans* and *E. punicea.*	**Associated species:** *Cheilanthes sieberi* subsp. *sieberi, Erodium cygnorum, Paspalidium basicladum, Ptilotus obovatus, Sida* ?sp. Excedentifolia (J.L. Egan 1925), *Vincetoxicum lineare.* **Relevés:** TWR033, TWR034, TWR035, TWR036, TWR039.	
	Habitat: Broad drainage areas and depressions.	**Vegetation condition:** Very Good. Grazing, exploration and mining activities.	

Code	Broad floristic formation, vegetation type and associated information		Photograph
*A***TSSL** (1)	**Broad floristic formation**: *Acacia* Tall Sparse Shrubland. **Vegetation type**: Mixed Tall Sparse Acacia Shrubland mainly of *Acacia aptaneura*, *A. ramulosa* var. *ramulosa* and *A. caesaneura* x *incurvaneura* with a mixed Isolated Shrubs mainly of *Ptilotus schwartzii*, *Eremophila simulans* subsp. *simulans* and *E. lachnocalyx* with +/- Low Isolated Trees of *Acacia pruinocarpa*.	**Associated species:** *Acacia craspedocarpa* (hybrid), *A. incurvaneura*, *Eremophila latrobei* subsp. *latrobei.* **Relevés:** TWR001, TWR002, TWR004, TWR010, TWR012, TWR013, TWR014, TWR015, TWR016, TWR017, TWR048, TWR050, TWR052	
	Habitat: Undulating plains and minor drainage channels.	**Vegetation condition:** Very Good. Grazing, exploration and mining activities.	
*A***TSSL** (2)	**Broad floristic formation**: *Acacia* Tall Sparse Shrubland. **Vegetation type**: Tall Sparse Shrubland of *Acacia aptaneura*, *A. ramulosa* var. *linophylla* and *A incurvaneura* with a mixed Sparse Shrubland mainly of *Eremophila galeata*, *E. latrobei* subsp. *latrobei* and *E. simulans* subsp. *simulans* and a mixed Low Sparse Shrubland mainly of *Ptilotus obovatus*, *P. schwartzii* and *Solanum lasiophyllum*.	**Associated species:** *Acacia* caesaneura (narrow phyllode variant), *A. pruinocarpa, A. tetragonophylla, Enchylaena tomentosa, Teucrium teucriiflorum, Vincetoxicum lineare.* **Relevés:** TWR005, TWR006, TWR007, TWR031, TWR032, TWR037, TWR038, TWR040, TWR043, TWR046, TWR049	
	Habitat: Undulating plains.	**Vegetation condition:** Very Good. Grazing, exploration and mining activities.	

Code	Broad floristic formation, vegetation type and associated information		Photograph
*A***TSSL** (3)	**Broad floristic formation**: *Acacia* Tall Sparse Shrubland. **Vegetation type**: Tall Sparse Shrubland of *Acacia craspedocarpa* (hybrid) *A. caesaneura* (narrow phyllode variant) and *A. tetragonophylla* with a Sparse Shrubland mainly of *Eremophila galeata* and *E. clarkei* and a Low Sparse Shrubland of *Ptilotus obovatus* and or *Eremophila lachnocalyx*.	**Associated species:** *Abutilon cryptopetalum*, *Duperreya commixta*, *Eremophila georgei*, *E. punicea*, *Lepidium oxytrichum*, *Leichhardtia australis*, *Rhagodia eremaea*, *Santalum acuminatum*, *Teucrium teucriiflorum*. **Relevés:** TWR011, TWR026, TWR028, TWR029, TWR030, TWRX02	
	Habitat: Undulating plains and minor drainage channels and depressions.	**Vegetation condition:** Excellent. Grazing, and exploration activities.	
M**LSSL**	**Broad floristic formation**: Mixed Low Sparse Shrubland **Vegetation type**: Mixed Low Sparse Shrubland mainly of *Eremophila latrobei* subsp. *latrobei*, ***Drummondita miniata*** **(P3)** and *Hemigenia* sp. Yalgoo (A.M. Ashby 2624) with Isolated Tall shrubs of *Acacia aulacophylla* and / or *A. pteraneura* and Isolated Tussock Grasses of *Eriachne mucronata*.	**Associated species:** *Acacia ramulosa* var. *ramulosa*, *A. quadrimarginea*, *Tripogonella loliiformis*, *Eremophila exilifolia*. **Relevés:** TWR025, TWRX01	
	Habitat: Plains with exposed granite bedrock.	**Vegetation condition:** Excellent. Grazing.	

6.3.2 Vegetation Condition

Survey Area vegetation condition ratings (**Table 10** and **Map 11**) were derived using a selection of different information (data collected at relevés and photo points, notes recorded while walking from site to site, any disturbance visible on aerial imagery and the weeds located in the different areas); they are not the same as those in **Table 9**, which indicate vegetation condition at the relevés only.

The dominant vegetation condition rating in the Survey Area is Very Good (71%). Areas mapped as Excellent comprise 7% of the Survey Area and those mapped as Degraded and Completely Degraded 22% of the Survey Area. Additional comments on vegetation condition in the Survey Area are included in **Table 10**.

Table 10: Vegetation condition in the Survey Area

Vegetation condition	Area (ha) / cover (%) in the Survey Area	Vegetation communities	Comments
Excellent	101.59 / 7.05	A**TSSL** (3), M**LSSL**	Areas mapped as Excellent have little to no signs of disturbance. These areas were generally away from the mine and exploration areas.
Very Good	1,021.48 / 70.89	*Aa***TSSL**, *A***TOSL**, *A***TSSL** (1), *A***TSSL** (2)	The majority of the Survey Area is mapped as Very Good. There is low density of cleared drill lines throughout these areas, and they also include larger patches of vegetation between infrastructure. There was evidence of grazing and vegetation trampling by goats in some areas.
Degraded to Completely Degraded	317.84 / 22.06	Not applicable	Areas adjacent to existing mining operations, areas cleared for infrastructure, tracks and larger cleared areas such as pits are mapped as Degraded to Completely Degraded. Some native vegetation remains, and regrowth may be evident, but these areas are mostly cleared.

7 Discussion

A discussion of the conservation significance of the flora and vegetation of the Survey Area follows. As per the vegetation and flora technical guidance (EPA, 2016b), significance at both regional and local scales is commented on.

7.1 Flora of Conservation Significance

The main points regarding the flora of the Survey Area follow:

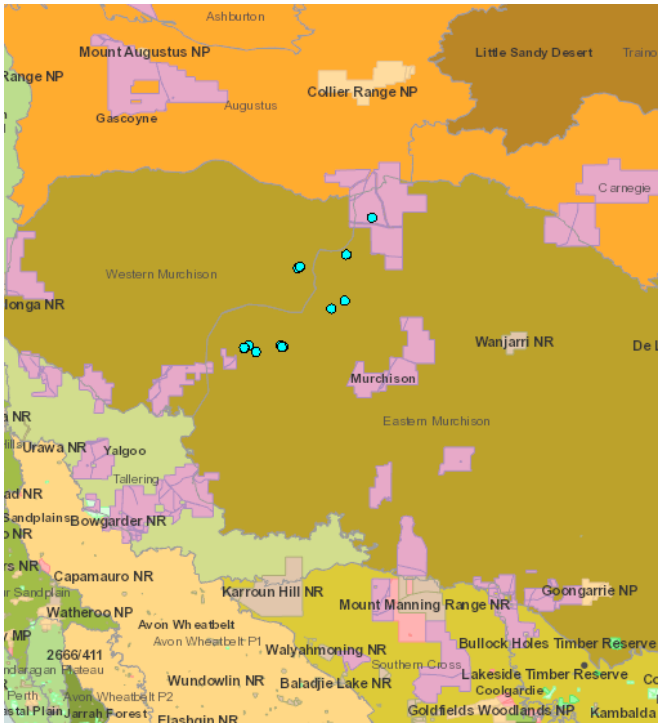
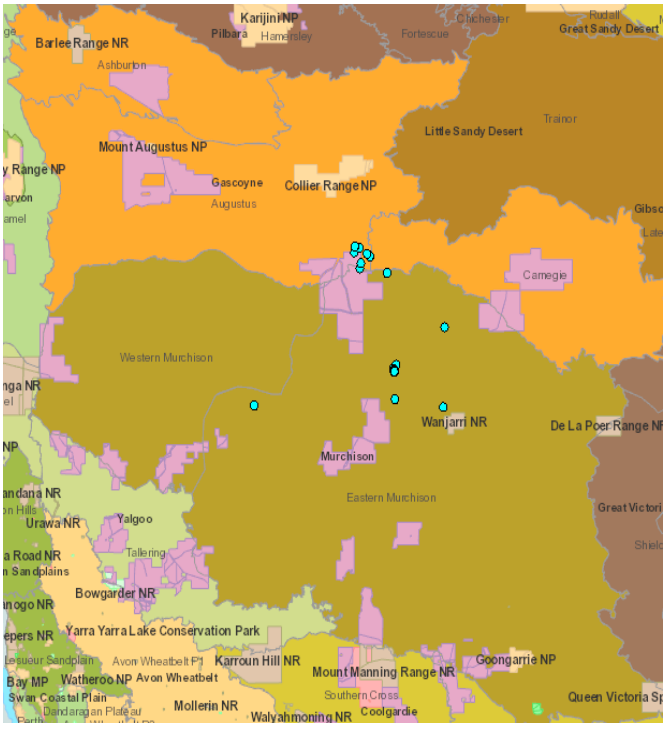
- No Threatened flora species were located.
- Four Priority flora species were located - *Drummondita miniata* (P3), *Sida picklesiana* (P3), *Acacia speckii* (P4) and *Dodonaea amplisemina* (P4).
- One species endemic to the Murchison bioregion was located – *Drummondita miniata*. It is not endemic to the Eastern Murchison subregion, as it occurs in both Murchison subregions.
- No new species were collected from the area.
- Ten range extension or gap filler species were collected from the Survey Area.

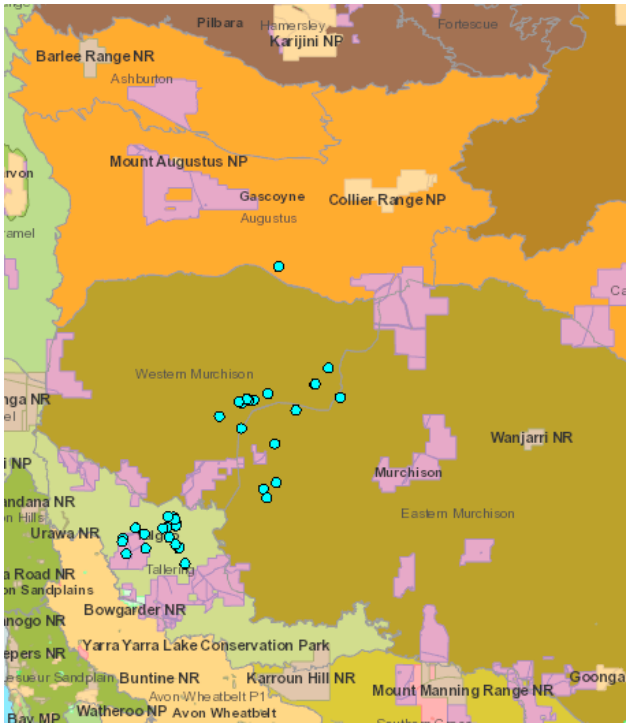
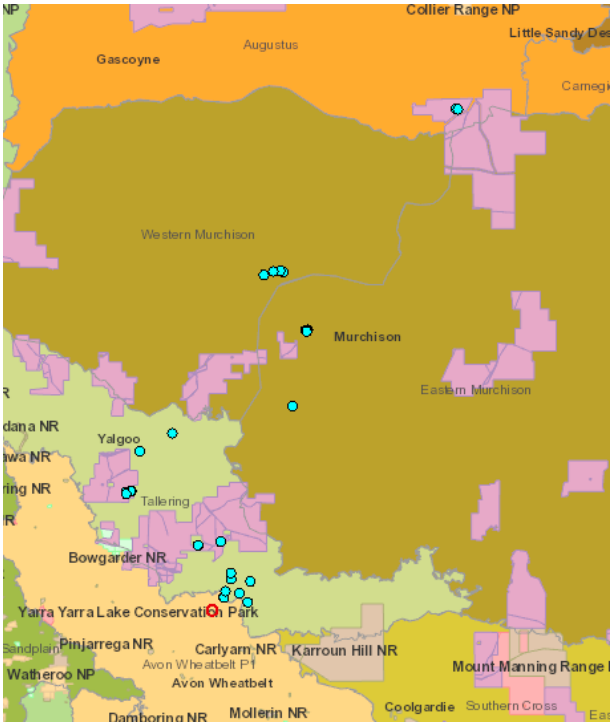
7.1.1 Priority Flora - Regional and Local Significance

The regional significance of the four Priority listed flora species recorded in the Survey Area is indicated by their current priority listing i.e., two P3 species (*Drummondita miniata* and *Sida picklesiana*) and two P4 species (*Acacia*

speckii and *Dodonaea amplisemina*). **Table 11** provides regional and local (Survey Area) information on the distribution and status of the four species.

Table 11: Distribution and status of the Priority flora species located in the Survey Area

Current distribution status	Current distribution
Drummondita miniata (Priority 3) *D. minniata* has 24 records on FloraBase and NatureMap and they are all in the Murchison bioregion (DBCA, 2007-; WAH, 1998-). One of the NatureMap locations lies in IUCN protected land (4% of the locations). Fourteen *D. minniata* were found in the Survey Area. The plants were in the central and south-western sections of the Survey Area, but mostly in the south-western section.	
Sida picklesiana (Priority 3) *S. picklesiana* has 31 records on FloraBase and 32 on NatureMap and they are all in the Murchison and Gascoyne bioregions (DBCA, 2007-; WAH, 1998-). Three of the NatureMap locations appear to lie in IUCN protected land – two in the Gascoyne bioregion and one in the Murchison bioregion (9% of the locations). Seven *S. picklesiana* were recorded in the Survey Area. The plants were found in the central and south-western sections of the Survey Area, but most of them in the south-western section.	

Current distribution status	Current distribution
Acacia speckii (Priority 4) *A. speckii* has 37 records on FloraBase and 54 on NatureMap and they are in the Gascoyne, Murchison and Yalgoo bioregions (DBCA, 2007-; WAH, 1998-). Four of the NatureMap locations lie in IUCN protected land (7% of the records). Twenty-two *A. speckii* were found in the Survey Area and they were in the south-western and the north-western corners.	
Dodonaea amplisemina (Priority 4) *D. amplisemina* has 38 records on FloraBase and 55 on NatureMap and they are in the Gascoyne, Murchison and Yalgoo bioregions (DBCA, 2007-; WAH, 1998-). Five of the NatureMap locations lie in IUCN protected land (9% of the NatureMap records). Forty-five *D. amplisemina* were found in the Survey Area. The plants were all located in the south-western section of the Survey Area.	

Note: Images from NatureMap (DBCA, 2007-). Accessed on 11 July 2021. Bioregions and subregions as labelled, conservation tenure shown as pink polygons, plant records as blue dots.

7.2 Vegetation - Regional and Local Distribution

Regional significance of the vegetation of the Survey Area is discussed using land systems (LS) and Beard's vegetation system association (VSA) occurring in the Survey Area and their representation in the Eastern Murchison subregion. Local significance of the vegetation mapped in the Survey Area is discussed using the vegetation types mapped by Maia.

7.2.1 Land Systems

Three land systems are mapped in the Survey Area – Sherwood, Violet and Wiluna. The number of bioregions and subregions in which they are mapped, and the originally mapped area of each LS is listed in **Table 12**, along with the extent, distribution and protection in the Eastern Murchison subregion and in the local area (the Survey Area).

Each LS has more than 97% of its original mapped extent remaining in the subregion and each has a limited (Wiluna) or moderate (Sherwood and Violet) distribution, as they are mapped in two bioregions (three subregions) and three or four bioregions (and four or five subregions).

Approximately 100% (Sherwood), 90% (Wiluna) and 77% (Violet) of the original mapped extent of the three land systems remains in the local area (Survey Area).

7.2.2 Vegetation System Association

The number of bioregions and subregions in which vegetation system association 18 occurs is listed in **Table 12** along with its extent, distribution and protection in the Eastern Murchison subregion and the local area.

VSA 18 occurs in 10 bioregions (and 17 subregions) and more than 99% of it remains in the Eastern Murchison. Given the bioregional and subregional spread of this VSA and its remaining extent in the Eastern Murchison, it should not be regionally significant. However, Cowan (2001) lists vegetation association 18 as having moderate reservation priority for the Murchison bioregion; currently, only 1.05% of its pre-European extent is protected for conservation (IUCN I-IV).

Approximately 78% of the originally mapped extent of VSA 18 currently remains in the Survey Area (**Table 12**).

7.2.3 Maia Vegetation Types

Six vegetation types were mapped in the Survey Area, and four of them were mapped over less than 10% of it – *Aa***TSSL**, *A***TOSL**, *A***TSSL** (3) and M**LSSL**. These vegetation types would be more locally significant than the other two – *A***TSSL** (1) and *A***TSSL** (2), which were mapped over a larger proportion of the Survey Area (approximately 39% and 26% respectively).

The significant flora species were located in five of the six vegetation types:

- *Aa***TSSL** - *Acacia speckii* (six plants)
- *A***TSSL** (1) - *Acacia speckii* (three plants) and *Drummondita miniata* (one plant)
- *A***TSSL** (2) - *Sida picklesiana* (one plant)
- *A***TSSL** (3) - *Acacia speckii* (12 plants), *Dodonaea amplisemina* (45 plants) and Santalum spicatum (two trees)
- M**LSSL** - *Acacia speckii* (one plant), *Drummondita miniata* (13 plants) and *Sida picklesiana* (six plants).

No conservation significant flora species or other significant species were recorded in A**TOSL**.

Most of the Priority plants were located in A**TSSL** (1), A**TSSL** (3) and M**LSSL** in the south-western corner of the Survey Area. This area and those vegetation types are therefore more locally significant than the others.

Table 12: Regional and local pre-European or mapped extent, current extent and protection of the land systems and VSA of the Survey Area

Unit		Number of bioregions (subregions)	Regional - Eastern Murchison subregion				Local - Survey Area		
			Mapped (LS) or pre-European (VSA) extent (ha)	Current extent (ha)	Current extent remaining as a proportion of originally mapped or pre-European extent (%)	Current extent protected (IUCN I-IV) for conservation as a proportion of mapped or pre-European extent (%)	Mapped or pre-European extent (ha)	Current extent (ha)	Current extent remaining as a proportion of mapped or pre-European extent (%)
LS	**Sherwood**	4 (5)	1,105,985	1,104,767	99.89	0.85	60.90	60.90	100
	Violet	3 (4)	419,055	411,154	98.11	0	1,361.57	1,045.51	76.79
	Wiluna	2 (3)	151,312	147,882	97.73	0	18.44	16.66	90.37
VSA	**18**	10 (17)	4,307,946	4,256,038	99.59	1.05	1,440.90	1,123.07	77.94

Note: LS = land system, VSA = vegetation system association. Pre-European and current extent of VSA in the Murchison bioregion from GoWA, 2019. Bioregion areas (ha) have been rounded up or down to nearest whole number. The method used to determine originally mapped and current LS extents is described below. The VSA extent is area in Wiluna system.

Notes re methods used to determine mapped, pre-European and current extents in Table 12:

Murchison bioregion (regional), methods for determining originally mapped and current extent of land systems: The original mapped extent of the land systems was determined by intersecting land systems shapefiles (DPIRD, 2019a) with IBRA subregions (DotE, 2012); the current extent was determined by intersecting the resultant layer with Native Vegetation Extent (NVE) (DPIRD, 2020).

Survey Area (local), methods for determining mapped and current extent of land systems: The originally mapped extent of land systems was determined by intersecting the land systems shapefiles (DPIRD, 2019a) with Maia Vegetation Types (MVTs) mapped in the Survey Area – areas mapped as completely degraded and degraded were included in the calculations as well as native vegetation. To determine the current extent, the land systems shapefiles were intersected with MVTs and only native vegetation was included in the calculations (areas mapped as completely degraded and degraded were excluded).

Survey Area (local), methods used to determine pre-European and current extent of VSA: pre-European extent of VSA was calculated by intersecting pre-European vegetation shapefiles (DPIRD, 2019b) with MVTs mapped in the Survey Area (areas mapped as completely degraded and degraded were included in the calculations as well as with native vegetation). The current extent in the Survey Area was calculated by intersecting the pre-European vegetation shapefiles with MVTs, including only native vegetation in the calculations (completely degraded and degraded were not used).

7.3 Significant Vegetation

Significant vegetation is defined in EPA Technical Guidance - Flora and Vegetation Surveys for Environmental Impact Assessment (EPA, 2016) as vegetation:

- Being identified as threatened or priority ecological communities
- Restricted distribution
- Degree of historical impact from threatening processes
- A role as a refuge
- Providing an important function required to maintain ecological integrity of a significant ecosystem.

These dot points are discussed with respect to the vegetation of the Survey Area in the following sections.

7.3.1 Threatened and Priority Ecological Communities

The Survey Area is not close to any currently listed TEC, the closest is more than 60 km west north-west of the Tuckabianna Survey Area (Walga Rock; Australian Government, 2020).

The south-eastern corner of the Survey Area is approximately 2 km from the edge of a buffer around a section of the Lake Austin vegetation complexes (banded ironstone formation) P1 PEC.

7.3.2 Restricted Distribution, Historical Impact and Refugia

The land systems and vegetation system associations of the Survey Area are not restricted to the local area, as they occur in the wider East Murchison subregion in the Murchison bioregion and in neighbouring bioregions. The vegetation association and system association of the Survey Area have not been historically cleared / impacted, as their current remaining extent in the Murchison bioregion, East Murchison subregion and Shire of Cue is more than 99% (**Table 2**). Similarly, more than 97% of the land systems mapped in the Survey Area currently remains in the Eastern Murchison subregion (**Table 12**). Locally, 78% of VSA 18 and between 76% and 100% of the three land systems currently remains in the Survey Area (**Table 12**).

No refugia occur in the Survey Area (Cowan, 2001).

7.3.3 Groundwater Dependent and Sheet Flow Dependent Ecosystems

Two small areas of vegetation with low potential to be terrestrial GDE were identified by national assessment in the Survey Area. No large drainage lines or wetlands occur in the Survey Area, which could indicate the potential for a GDE. The watercourses are all non-permanent and ephemeral.

Areas of groved / banded mulga can be seen in the western and eastern sections of the Survey Area (aerial imagery). Five of the Survey Area acacias are mulga species: *Acacia aptaneura*, *A. caesaneura*, *A. craspedocarpa*, *A. incurvaneura* and *A. pteraneura* (Maslin and Reid, 2012; **Table 22, Appendix 6**). The level to gently undulating plains with mantles of abundant ironstone and quartz pebbles and cobbles and level to gently inclined lower plains with mantles of ironstone pebbles of the Violet LS can be subject to sheet flow (Payne *et al*., 1998). Alteration to sheet flow in these areas (e.g., by construction of tracks) could affect the health of the mulga, particularly down slope of structures altering the sheet flow (Payne *et al*., 1998).

8 Project Team, Licences and Limitations

8.1 Project Team and Licences

The survey was carried out and the report prepared by the ecologists listed in **Table 13**.

Table 13: Project team

Botanist	Flora licence number
Christina Cox (report)	Not applicable
Rochelle Haycock (report)	Not applicable
Scott Hitchcock (survey and report)	FB62000064-2
Eva Karikis (report)	Not applicable
Conrad Slee (plant taxonomy)	Not applicable

8.2 Survey Limitations

Technical Guidance, Flora and Vegetation Surveys for Environmental Impact Assessment (EPA, 2016) states that any survey-specific issues / limitations should be addressed in a limitations section and that the limitations should be addressed as standard, whether they were a limitation of survey or not. **Table 14** addresses any survey-specific issues / limitations.

Table 14: Survey limitations

Limitation	Comment
	No limitation
Availability of contextual information at a regional and local scale	A desktop study was carried out to gather contextual information in a regional and local context. The EPBC Act Protected Matters search tool, NatureMap and NationalMap were used to gather information along with the results of searches of the DBCA's threatened flora and ecological communities databases carried out in 2019. Relevant environmental GIS layers were downloaded and Beard's pre-European vegetation mapping, soil landscape mapping and the most recent vegetation statistics were used to provide context. Recent local information was also available from flora and vegetation surveys carried out by Maia in spring 2017, 2018 and 2019 and reports were available on other flora and vegetation surveys carried out within approximately 35 km of the Survey Area.
	No limitation
Competency /experience of the team carrying out the survey, including experience in the bioregion surveyed	Scott Hitchcock has approximately 15 years of experience of the flora of the Murchison bioregion. He carried out surveys along two 50 km long corridors in the local area in 2017 and 2018 and reconnaissance surveys in three different Westgold project areas around Cue in 2019. One or more specimens for each of the species encountered during the survey were collected for formal identification by a botanist / plant taxonomist. The specimens were identified by Conrad Slee, who has more than 17 years of experience in the taxonomy of the flora of the WA. Some of the specimens were confirmed / determined by Michael Hislop a scientist at the WA Herbarium.

Limitation	Comment
Proportion of flora recorded and/or collected, any identification issues	**No limitation**
	A species list of 97 taxa from 28 families and 47 genera was collated for the Survey Area: 13% of the species list were annual and 87% perennial. Approximately 41% of the species list taxa were identified from specimens with reproductive material (flowers / fruit). Three taxa could not be confirmed beyond genus level and three beyond family, either because no flowering or fruiting material was found or because the material collected was poor quality. It is unlikely that the five queried taxa would be conservation significant species. A survey carried out in January 2012 at Tuckabianna (Coffey, 2012a) recorded 44 species (from the 0.4 ha surveyed), while a survey carried out in September 2019 over the Tuckabianna West survey area (Maia, 2019b) recorded 110 taxa (from 47 ha assessed). The proportion of the flora collected and identified based on sampling effort, survey season and the habitats surveyed was appropriate.
Was the appropriate area fully surveyed (effort and extent)	**No limitation**
	A combined flora and vegetation reconnaissance survey and targeted flora survey was conducted over the Survey Area by one botanist over two days in March 2021. Approximately 4% (47 ha) of the 1,441 ha Survey Area was assessed by way of relevés and traverses. Given the relatively few habitats in the Survey Area, the current degree of disturbance (22% of the Survey Area) and the sparse to open shrublands or low open woodlands mapped in the Survey Area the coverage achieved was adequate for a reconnaissance survey.
Access restrictions within the survey area	**No limitation**
	There were no access problems. The Survey Area was accessed by walking from existing mine roads and tracks.
Survey timing, rainfall, season of survey	**No limitation**
	The survey was conducted in autumn (mid-March) 2021. Rainfall over the three full months before the survey was average. Therefore, the flora and vegetation could have been in average condition for the time of year. Approximately 13% of the species recorded were annuals and approximately 41% of the flora taxa recorded were fertile (flowering, fruiting or both flowering and fruiting) when the survey was carried out. In September 2019, a reconnaissance survey was carried out at the Tuckabianna West survey area and 27% of the species list were annuals and 76% of it was identified from fertile material. In November 2017, a survey was carried out over a haul road corridor option and in October 2018 over an alternative haul road option. In November 2017, 15% of the species list were annuals and 48% of the species list was identified from fertile material. In October 2018, 23% of the species list comprised annual species and 66% of the species list was identified from fertile material. Based on the above data, the season and survey timing was relatively good.
Disturbances (fire, flood, accidental human intervention etc.)	**No limitation**
	No disturbances were evident or noted by the botanist while carrying out the survey (apart from previously cleared areas and disturbance associated with ongoing mining activities). No floods, severe storms or fires had occurred in the weeks or months before the survey was carried out.

9 Summary - Main Results and Recommendations

9.1 Flora

- Ninety-seven taxa from 47 genera and 28 families were recorded in the Survey Area (87% perennial and 13% annual).
- No threatened flora species protected by the EPBC Act or BC Act were located in the Survey Area.
- Four Priority species were located in the Survey Area. Two Priority 3 flora and two Priority 4 flora species - *Drummondita miniata* (P3), *Sida picklesiana* (P3), *Acacia speckii* (P4) and *Dodonaea amplisemina* (P4).
- One species endemic to the Murchison bioregion was located (*Drummondita miniata*), while no new or unusual species were collected from the Survey Area.
- Ten range extension or gap filler species were collected from the Survey Area.
- Sandalwood (*Santalum spicatum*) was recorded at two locations in the Survey Area.
- No WoNS or declared plants were located in the Survey Area. One general weed species was located and (*Citrullus amarus*), and it is listed as having low ecological impact and rapid invasiveness by DBCA.

9.2 Vegetation

- Six vegetation types were mapped in the Survey Area – one *Acacia aptaneura* tall sparse shrubland, one *Acacia* tall open shrubland to low open woodland, three *Acacia* tall sparse shrublands, and one mixed low sparse shrubland.
- The condition of the vegetation at the Survey Area was mapped as Very Good (71%), Excellent (7%), and the remainder (22%) as Degraded to Completely Degraded.
- Four of the six vegetation types (*Aa***TSSL**, *A***TOSL**, *A***TSSL** (3) and M**LSSL**) were mapped over only 12.2% of the Survey Area collectively (1.66%, 3.49%, 6.83% and 0.22% respectively).
- The remaining extent of the three land systems and one vegetation association mapped in the Survey Area is more than 97% in the Eastern Murchison subregion. Between 77% and 100% of the originally mapped extent of the VSA and land systems currently remains in the Survey Area. Based on this information the VSA and land systems of the Survey are not regionally or locally significant.

9.3 Ecological Communities and Other Significant Areas

- None of the Survey Area lies in or over a TEC.
- None of the Survey Area lies in or over a PEC.
- The vegetation types mapped in the Survey Area are not similar to any of the currently listed TECs or PECs.
- The Survey Area does not lie in any DBCA Legislated Lands and Waters or DBCA Lands of Interest.
- The Survey Area is not in an ESA or a Schedule One area. No significant wetlands occur in the Survey Area. No perennial watercourses, lakes, waterholes, water points or springs cross or occur in or close to the Survey Area. The drainage lines in the Survey Area are non-permanent and ephemeral.
- Some of the Survey Area (small sections along the western and eastern boundaries) lies over an area mapped has having low potential to be a terrestrial GDE (based on national assessment).
- The level to gently undulating plains with mantles of abundant ironstone and quartz pebbles and cobbles and level to gently inclined lower plains with mantles of ironstone pebbles of the Violet LS can be subject to sheet flow. Alteration to sheet flow in these areas (e.g., by construction of tracks) could affect the health of the mulga, particularly down slope of structures altering the sheet flow.
- The most significant section of the Survey Area is the south-western section where most of the conservation significant flora species were located, and where three of the four least extensive vegetation types occur.

9.4 RECOMMENDATIONS

- Impact to the CSF species located in the Survey Area should be avoided or minimised.
- Impact to the vegetation of the Survey Area should be minimised. Impact to the vegetation in the south-western section of the Survey Area should be avoided or minimised because that was the area where most of the conservation significant flora species were located, and because some of the vegetation types were only mapped in that area.
- *Santalum spicatum* is a valuable resource and impact to this species should be avoided whenever possible. If the trees are to be cut down and passed on for processing relevant licences should be applied for.
- One weed species was located in the Survey Area and every effort should be made to prevent the spread of weeds from and between Westgold's different project areas and to prevent the introduction of new weed species into this relatively weed free Tuckabianna Survey Area.
- Drainage should be managed to minimise impact to any areas of groved / banded mulga in areas that will not be cleared for the project.
- Clearing of vegetation along watercourses should be avoided or minimised.

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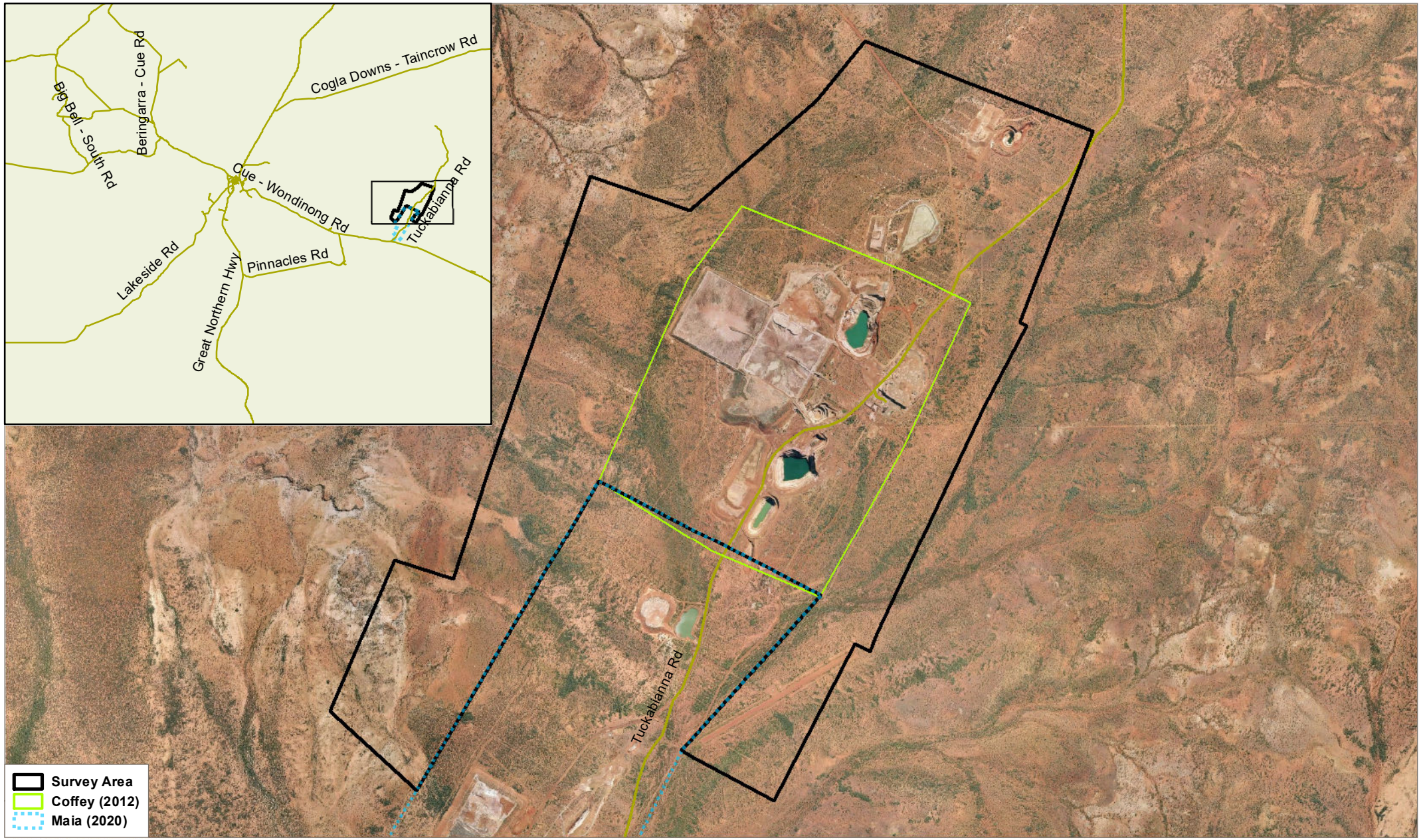
11 MAPS



Location Map

Localities (Geoscience Australia, 20020101)

Road Network (Main Roads, 20190516)

The Survey Area

maia

N

0 0.75

Kilometres

Datum: GDA 1994, MGA 50

Map: 1

Prepared for: Westgold

Drawn by: RH

Date: 9/06/2021

Version: 1 **Size:** A4

Location Map
Karratha
Newman
Wiluna
Geraldton
Kalgoorlie
Perth

Survey Area

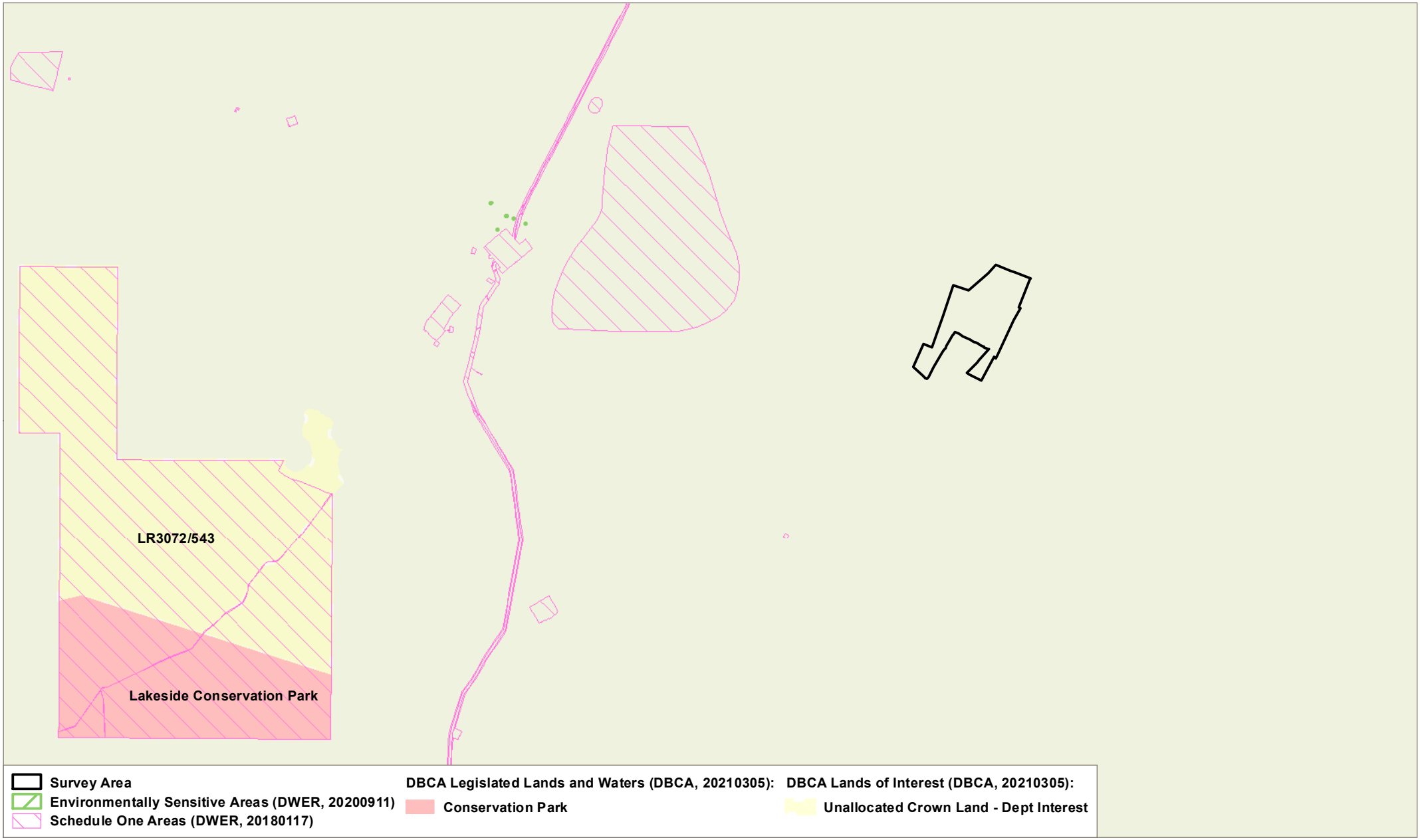
IBRA Bioregions and Subregions, Geology, Land Systems and Beard's Pre-European Vegetation (Vegetation System Associations)

maia

N

Datum: GDA 1994, MGA 50

Map: 2
Prepared for: Westgold
Drawn by: RH
Date: 9/06/2021
Version: 1 **Size:** A4



Protected and Significant Areas

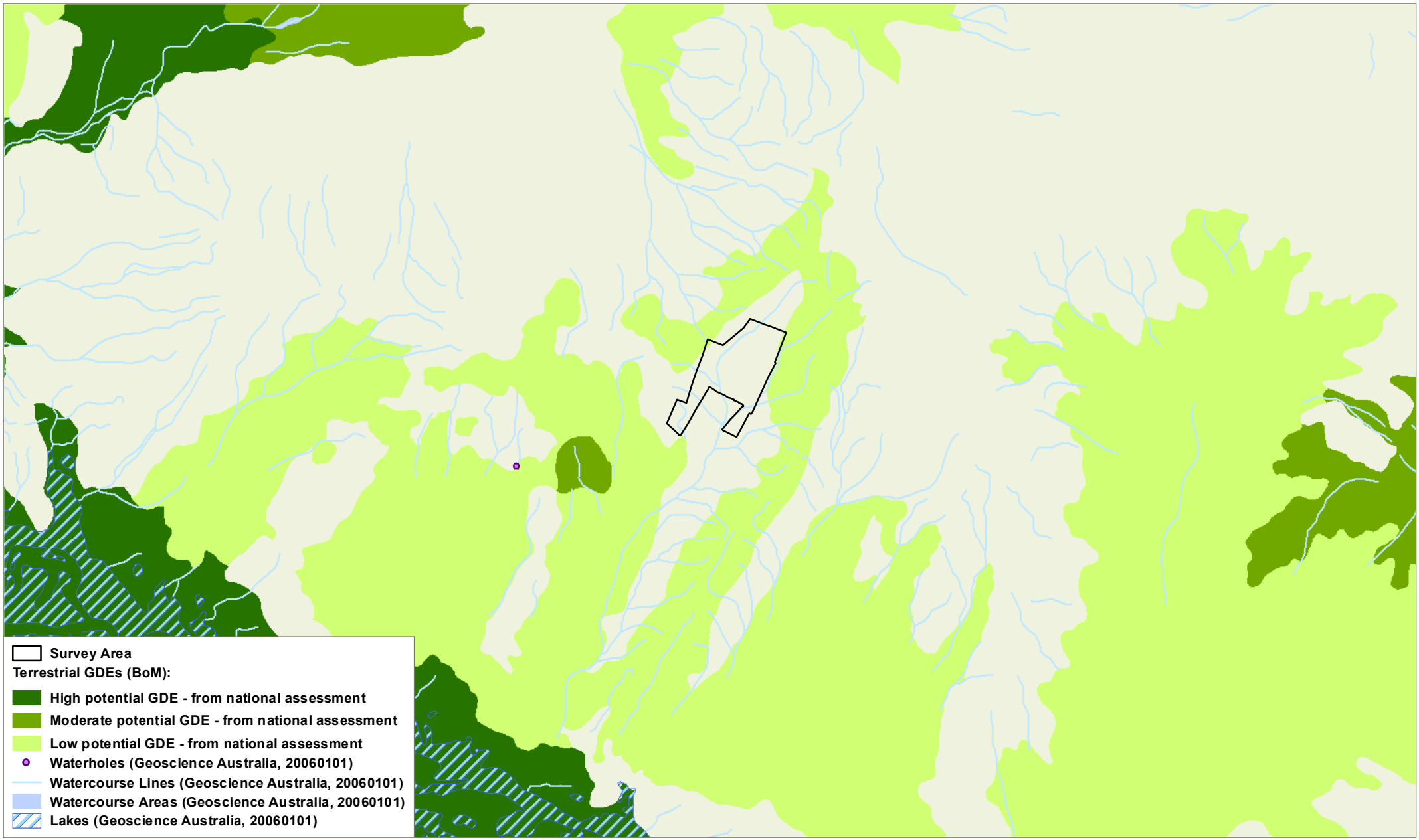
N

0 5

Kilometres

Datum: GDA 1994, MGA 50

Map: 3
Prepared for: Westgold
Drawn by: RH
Date: 9/06/2021
Version: 1 **Size:** A4



Watercourses, Wetlands and Terrestrial Groundwater Dependent Ecosystems

maia

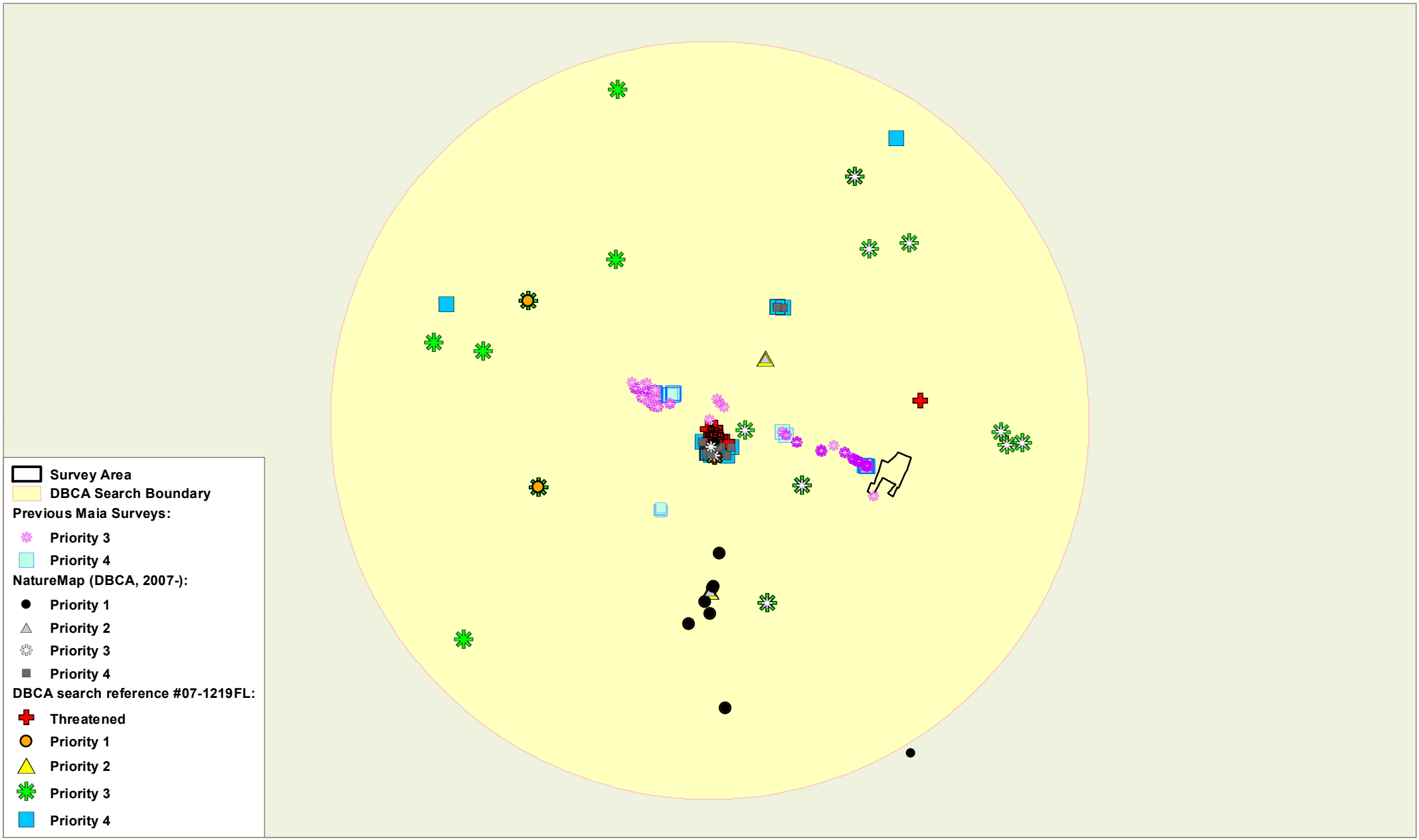
N

0 5

Kilometres

Datum: GDA 1994, MGA 50

Map: 4
Prepared for: Westgold
Drawn by: SH
Date: 9/06/2021
Version: 1 **Size:** A4



Conservation Significant Flora
(Previous Maia Surveys, NatureMap and DBCA Search Reference #07-1219FL)

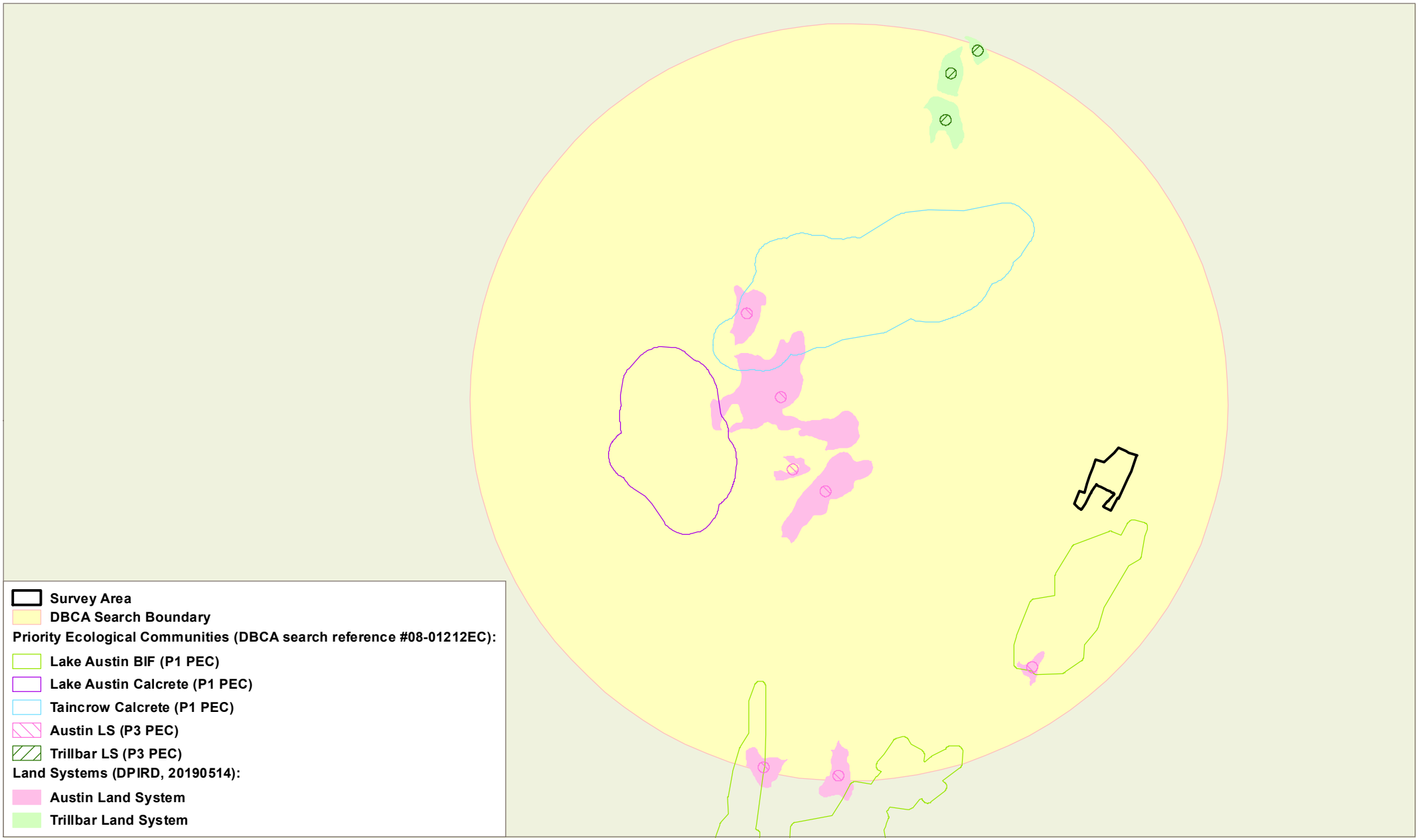
N

0 15

Kilometres

Datum: GDA 1994, MGA 50

Map: 5
Prepared for: Westgold
Drawn by: SH
Date: 9/06/2021
Version: 1 **Size:** A4



Location Map

Priority Ecological Communities (DBCA Search Reference #08-01212EC)

maia

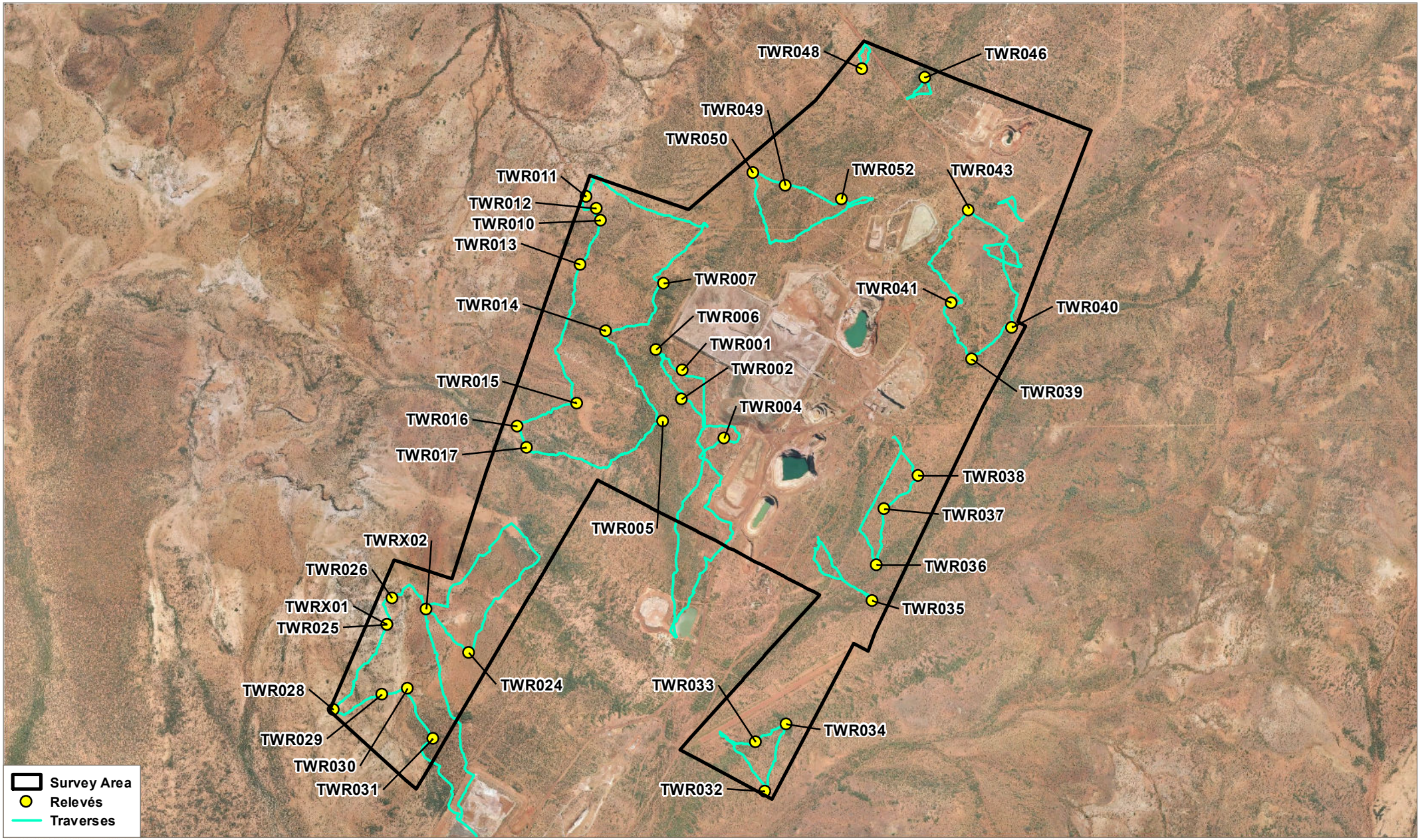
N

0 10

Kilometres

Datum: GDA 1994, MGA 50

Map: 6
Prepared for: Westgold
Drawn by: RH
Date: 9/06/2021
Version: 1 **Size:** A4



Location Map

Relevés and Traverses

maia

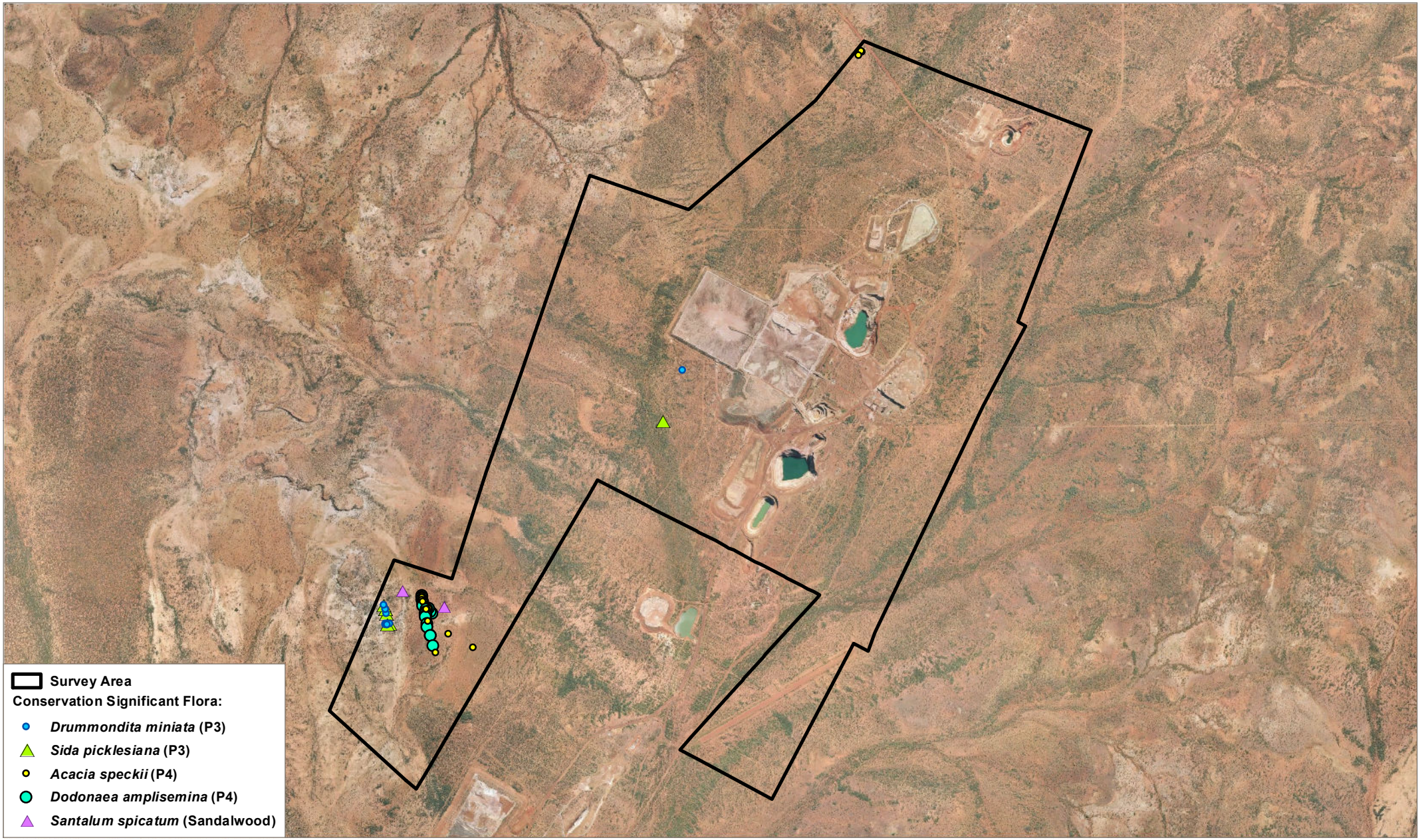
N

0 0.75

Kilometres

Datum: GDA 1994, MGA 50

Map: 7	
Prepared for: Westgold	
Drawn by: RH	
Date: 9/06/2021	
Version: 1	**Size:** A4



Conservation Significant Flora - Survey

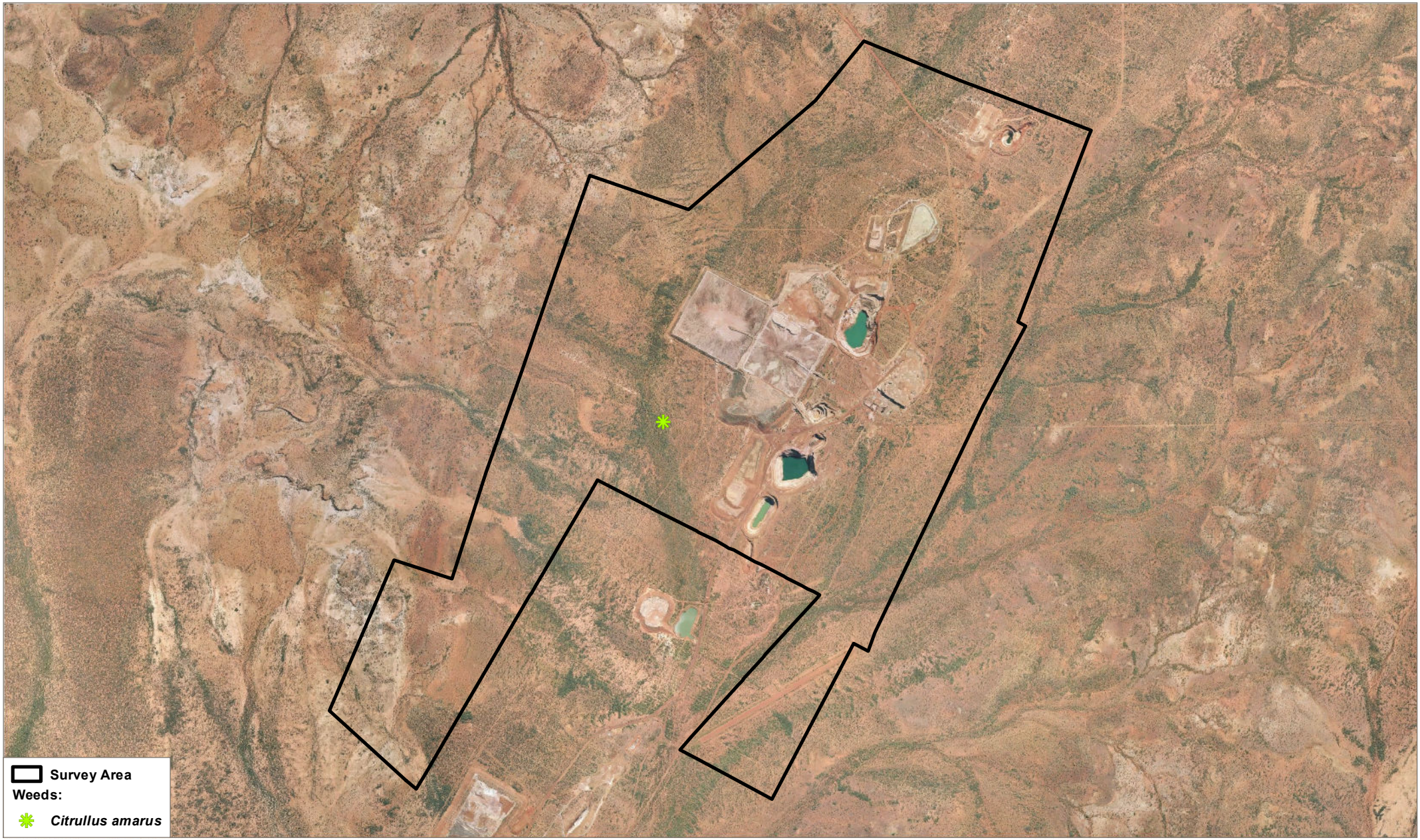
N

0 0.75

Kilometres

Datum: GDA 1994, MGA 50

Map: 8
Prepared for: Westgold
Drawn by: RH
Date: 9/06/2021
Version: 1 **Size:** A4



Location Map

Weeds

maia

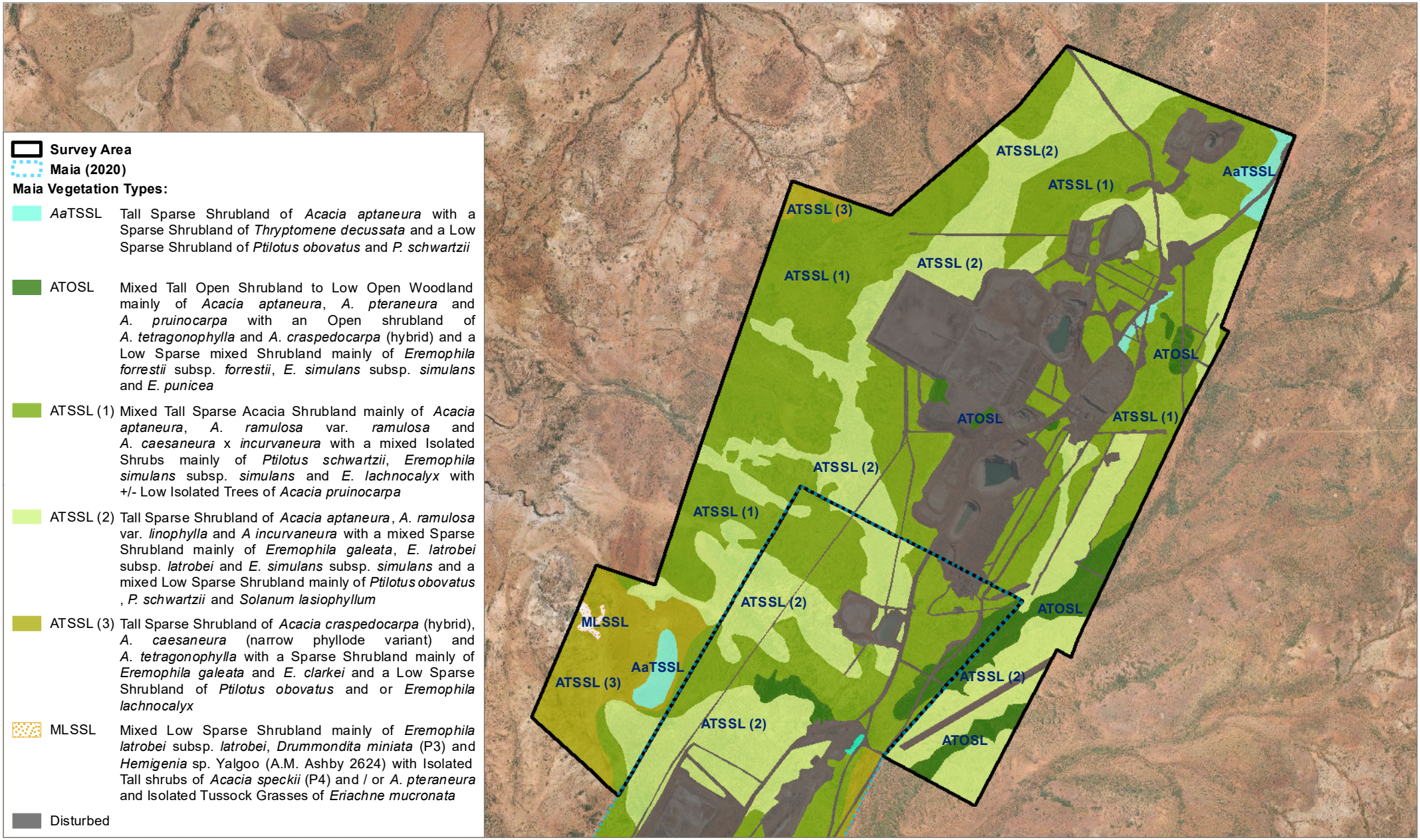
N

0 0.75

Kilometres

Datum: GDA 1994, MGA 50

Map: 9
Prepared for: Westgold
Drawn by: RH
Date: 9/06/2021
Version: 1 **Size:** A4



Survey Area

Maia (2020)

Maia Vegetation Types:

*Aa*TSSL	Tall Sparse Shrubland of *Acacia aptaneura* with a Sparse Shrubland of *Thryptomene decussata* and a Low Sparse Shrubland of *Ptilotus obovatus* and *P. schwartzii*
ATOSL	Mixed Tall Open Shrubland to Low Open Woodland mainly of *Acacia aptaneura*, *A. pteraneura* and *A. pruinocarpa* with an Open shrubland of *A. tetragonophylla* and *A. craspedocarpa* (hybrid) and a Low Sparse mixed Shrubland mainly of *Eremophila forrestii* subsp. *forrestii*, *E. simulans* subsp. *simulans* and *E. punicea*
ATSSL (1)	Mixed Tall Sparse Acacia Shrubland mainly of *Acacia aptaneura*, *A. ramulosa* var. *ramulosa* and *A. caesaneura* x *incurvaneura* with a mixed Isolated Shrubs mainly of *Ptilotus schwartzii*, *Eremophila simulans* subsp. *simulans* and *E. lachnocalyx* with +/- Low Isolated Trees of *Acacia pruinocarpa*
ATSSL (2)	Tall Sparse Shrubland of *Acacia aptaneura*, *A. ramulosa* var. *linophylla* and *A incurvaneura* with a mixed Sparse Shrubland mainly of *Eremophila galeata*, *E. latrobei* subsp. *latrobei* and *E. simulans* subsp. *simulans* and a mixed Low Sparse Shrubland mainly of *Ptilotus obovatus* , *P. schwartzii* and *Solanum lasiophyllum*
ATSSL (3)	Tall Sparse Shrubland of *Acacia craspedocarpa* (hybrid), *A. caesaneura* (narrow phyllode variant) and *A. tetragonophylla* with a Sparse Shrubland mainly of *Eremophila galeata* and *E. clarkei* and a Low Sparse Shrubland of *Ptilotus obovatus* and or *Eremophila lachnocalyx*
MLSSL	Mixed Low Sparse Shrubland mainly of *Eremophila latrobei* subsp. *latrobei*, *Drummondita miniata* (P3) and *Hemigenia* sp. Yalgoo (A.M. Ashby 2624) with Isolated Tall shrubs of *Acacia speckii* (P4) and / or *A. pteraneura* and Isolated Tussock Grasses of *Eriachne mucronata*
Disturbed	

Maia Vegetation Types

N

0 0.75

Kilometres

Datum: GDA 1994, MGA 50

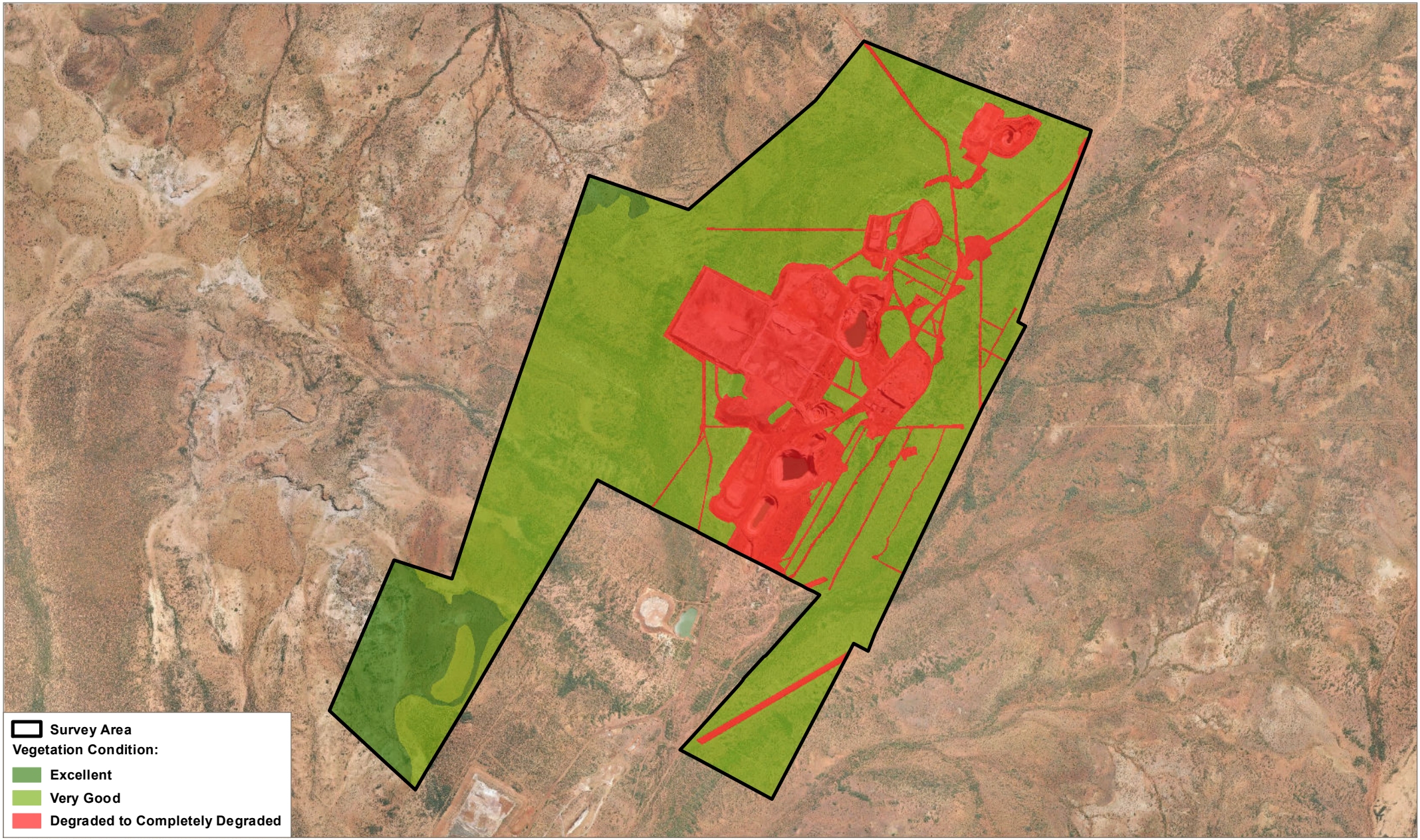
Map: 10

Prepared for: Westgold

Drawn by: RH

Date: 9/06/2021

Version: 1 **Size:** A4



Location Map

Vegetation Condition

maia

N

0 0.75

Kilometres

Datum: GDA 1994, MGA 50

Map: 11
Prepared for: Westgold
Drawn by: RH
Date: 9/06/2021
Version: 1 **Size:** A4

APPENDIX 1: CONSERVATION SIGNIFICANCE (FLORA AND ECOLOGICAL COMMUNITIES)

Threatened Flora

Some flora species can be protected by Australian Government legislation (*Environment Protection and Biodiversity Conservation Act 1999*, EPBC Act) or by WA legislation (*Biodiversity Conservation Act 2016*, BC Act) (DAWE, 2021d; GoWA, 2016). Species specially protected by these acts are referred to as threatened species and can be listed as critically endangered, endangered or vulnerable.

On 1 January 2019, the BC Act and *Biodiversity Conservation Regulations 2018* replaced both the *Wildlife Conservation Act 1950* and the *Sandalwood Act 1929* and their associated regulations (DBCA, 2019a; GoWA, 2016 and 2018a and b). The new BC Act and regulations provide greater protection for threatened species and ecological communities.

Priority Flora

Possible threatened species that do not meet survey criteria, or are otherwise data deficient, are added to the Priority Flora List under Priorities (P) 1, 2, 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 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 list for other than taxonomic reasons, are placed in Priority 4 and require regular monitoring (DBCA, 2019b). The most recent priority flora list was issued in December 2018 (DBCA, 2018b).

Threatened Ecological Communities

Some ecological communities are protected by Australian Government legislation (the EPBC Act) based on the perceived levels of threat to the community or species population at a national level. They are listed as threatened ecological communities – TECs – and can be listed as critically endangered, endangered or vulnerable: the communities are listed by state on the DAWE website (DAWE, 2021b).

In WA, the BC Act provides for the statutory listing of TECs by the Minister. The new legislation also describes statutory processes for preparing recovery plans for TECs, the registration of their critical habitat, and penalties for unauthorised modification of TECs. These TECs are listed as presumed totally destroyed, critically endangered, endangered or vulnerable (DBCA, 2018a; Department of Environment and Conservation (DEC), 2013).

Priority Ecological Communities

Ecological communities with insufficient information available to be considered a TEC, or which are rare but not currently threatened are placed on a priority list and are referred to as priority ecological communities (PECs). The most recent list was released in March 2021 (DBCA, 2021f). Definitions, categories and criteria for threatened and priority ecological communities can be found on the DBCA's website (DEC, 2013).

APPENDIX 2: WEEDS

Weeds of National Interest

A number of lists of weeds of national interest are currently recognised. A number of lists and strategies have been created that identify plants of particular concern or plants that have been through an assessment process (weedsAustralia, 2021). Weeds lists include: Weeds of National Significance (WoNS); Candidate weeds for biological control; Species permitted entry into Australia; National Priority List of Exotic Environmental Pests, Weeds and Diseases; National Environmental Alert List; Agricultural sleeper weeds; Species targeted for eradication; and, State and territory noxious weed lists (weedsAustralia, 2021).

Declared Pests

To protect WA agriculture DPIRD regulates harmful plants under the *Biosecurity and Agriculture Management Act 2007* (BAM Act). The Western Australian Organism List (WAOL) provides the status of organisms which have been categorised under the BAM Act (DPIRD, 2021). Under the Biosecurity and Agriculture Management Regulations 2013, declared pests can be assigned to one of three control categories and these are explained in **Table 15**.

Table 15: Control categories for declared pests (DPIRD, 2021)

Category (C)	Definition
C1 (Exclusion)	Organisms which should be excluded from part or all of Western Australia.
C2 (Eradication)	Organisms which should be eradicated from part or all of Western Australia.
C3 (Management)	Organisms that should have some form of management applied that will alleviate the harmful impact of the organism, reduce the numbers or distribution of the organism or prevent or contain the spread of the organism.
Unassigned	Unassigned: Declared pests that are recognised as having a harmful impact under certain circumstances, where their subsequent control requirements are determined by a Plan or other legislative arrangements under the Act.

DBCA Weed Prioritisation Process

The DBCA prioritises weeds in each region based on their invasiveness, ecological impact, potential and current distribution and feasibility of control. The resulting priorities focus on weeds considered to be high impact, rapidly invasive and still at a population size that can feasibly be eradicated or contained to a manageable size (DBCA, 2021g).

Summaries of the species' ecological impact and invasiveness rankings are provided to help landholders, community groups and private enterprises manage weeds that might impact on the natural environment (DBCA, 2021g). Most recent species-led ecological impact and invasiveness ranking summary results are available for the different government regions in WA.

APPENDIX 3: DATABASE AND LITERATURE SEARCH RESULTS

Table 16: Conservation significant flora listed in the database search results and literature

Species	EPBC Act listing	WA listing	Searches
Eremophila rostrata subsp. *rostrata*	Critically Endangered (CE)	T (CE)	TPFL, WAHerb, NM
Minuria tridens	Vulnerable	P1	TPFL, WAHerb, NM
Angianthus uniflorus		P1	TPFL, WAHerb, NM
Dicrastylis sp. Cue (A.A. Mitchell 764)		P1	WAHerb, NM
Drosera eremaea		P1	WAHerb, NM
Eremophila glabra subsp. Lake Austin (P.J. Curry & P. Hennig 367)		P1	WAHerb
Jacksonia lanicarpa		P1	WAHerb, NM
Millotia depauperata		P1	WAHerb
Angianthus microcephalus		P2	WAHerb, NM
Bergia auriculata		P2	WAHerb, NM
Acacia burrowsiana		P3	WAHerb
Atriplex lindleyi subsp. *conduplicata*		P3	WAHerb
Calotis sp. Perrinvale Station (R.J. Cranfield 7096)		P3	WAHerb, NM, Maia 2020a
Calytrix verruculosa		P3	WAHerb, NM
Drummondita miniata		P3	WAHerb, Maia 2019, NM
Hemigenia tysonii		P3	WAHerb
Hibiscus krichauffianus		P3	WAHerb, Coffey 2013a, Maia 2018
Maireana prosthecochaeta		P3	WAHerb, NM
Micromyrtus placoides		P3	WAHerb, NM
Petrophile pauciflora		P3	WAHerb
Prostanthera ferricola		P3	Maia 2018 and 2019
Prostanthera petrophila		P3	WAHerb, NM
Ptilotus beardii		P3	WAHerb, MWH 2015, Maia 2018, 2019 and 2020c, NM
Ptilotus luteolus		P3	Maia 2018, 2019 and 2020c
Rhodanthe collina		P3	Coffey 2013a
Sauropus sp. Woolgorong (M. Officer s.n. 10/8/94)		P3	Maia 2018
Sida picklesiana		P3	WAHerb, Maia 2019, NM
Tecticornia fimbriata		P3	WAHerb, Coffey 2013b, Maia 2020c, NM
Acacia speckii		P4	WAHerb, Coffey 2012b, Coffey 2012c, Maia 2018 and 2019, NM
Dodonaea amplisemina		P4	TPFL, WAHerb, Coffey 2012c, Maia 2018, 2019, 2020b & 2020c, NM
Goodenia berringbinensis		P4	TPFL, WAHerb, NM
Grevillea inconspicua		P4	TPFL, WAHerb, Coffey 2013a, Maia 2018, 2019 and 2020c, NM

Note: P1 – P4 = Priority 1 to Priority 4 species, T = Threatened, CE = Critically Endangered; PMST = EPBC Act Protected Matters Search Tool (DAWE, 2021a); WAHERB = DBCA's Western Australian Herbarium database (DBCA, 2019c; search reference 07-1219FL); TPFL = DBCA's Threatened and Priority Flora List (DBCA, 2019c; search reference 07-1219FL. Rows highlighted green indicate the 11 species located at other Westgold survey areas within 50 km of the Tuckabianna Survey Area (Maia, 2018, 2019, and 2020a, b and c).

Table 17: Weeds listed in the database search results and literature referenced

Species	Impact rating (DPaW, 2014)	Invasiveness rating (DPaW, 2014)	Source
Opuntia stricta (**WoNS, DPP** - C3 Restricted, whole of state (DPIRD, 2021))	Not rated	Not rated	NM, Maia (2018 and 2019)
Tamarix aphylla (**WoNS, DPP** – Unassigned, Exempt (DPIRD, 2021))	Not rated	Not rated	Maia (2018)
Brassica tournefortii	High	Rapid	Maia (2020b)
Callitriche stagnalis	Not rated	Not rated	NM
Carrichtera annua	Not rated	Not rated	PMST
Cenchrus ciliaris	High	Rapid	PMST, Maia (2018, 2019 and 2020b&c)
Cenchrus setiger	High	Rapid	Maia (2020b)
Centaurea melitensis	High	Rapid	NM, Maia (2020b)
Centaurium tenuiflorum	Low	Slow	Maia (2020c)
Chenopodium murale	Not rated	Not rated	NM
Citrullus amarus	Low (listed as *C. lanatus*)	Rapid (listed as *C. lanatus*)	NM, Maia (2019)
Citrullus lanatus	Low	Rapid	Maia (2018)
Cuscuta planiflora	Unknown	Rapid	NM, Maia (2019 and 2020a,b&c)
Cynodon dactylon	High	Rapid	Maia (2020b)
Diplotaxis muralis	Not rated	Not rated	NM
Eragrostis curvula	High	Rapid	NM
Hypochaeris glabra	Low	Rapid	NM
Lysimachia arvensis	Low	Rapid	NM, Maia (2019 and 2020a&b)
Malvastrum americanum	High	Rapid	Maia (2020b)
Medicago polymorpha	Unknown	Rapid	Maia (2020b)
Pentameris airoides	Unkown	Rapid	NM
Pentameris airoides subsp. *airoides*	Unknown	Rapid	NM
Rostraria pumila	Unknown	Unknown	NM, Maia (2019 and 2020b)
Rumex hypogaeus	Low	Rapid	NM
Rumex vesicarius	High	Rapid	NM, Maia (2019 and 2020a&b),
Schinus molle	Not listed	Not listed	Maia (2020b)
Sisymbrium erysimoides	Unknown	Unknown	NM, Maia (2020b)
Solanum nigrum	Unknown	Rapid	NM
Sonchus oleraceus	Unknown	Rapid	Maia (2018) Maia (2020b&c)
Vachellia farnesiana	High	Moderate	NM

Notes: DPP = Declared Pest Plant, WoNS = Weed of National Significance; PMST = EPBC Act Protected Matters Search Tool (DAWE, 2021a); NM = NatureMap (DBCA, 2007-). Rows coloured green indicate species that have been located during Westgold transport corridor surveys (Maia, 2018 and 2019) and in other Westgold survey areas within 50 km of the Tuckabianna Survey Area (Maia, 2020a, b and c).

APPENDIX 4: NATIONAL VEGETATION INFORMATION SYSTEM VEGETATION CLASSIFICATION

Table 18: NVIS growth forms and descriptions

Growth form	Description
Tree	Woody plants, more than 2m tall with a single stem or branches well above the base.
Tree Mallee	Woody perennial plant usually of the genus *Eucalyptus*. Multi-stemmed with fewer than 5 trunks of which at least 3 exceed 100 mm at breast height (1.3 m). Usually 8 m or more in height.
Shrub	Woody plants multi-stemmed at the base (or within 200 mm from ground level) or if single stemmed, less than 2 m in height.
Mallee Shrub	Commonly less than 8 m tall, usually with 5 or more trunks, of which at least 3 of the largest do not exceed 100 mm at breast height (1.3 m).
Heath Shrub	Shrub usually less than 2 m, with sclerophyllous leaves having high fibre: protein ratios and with an area of nanophyll or smaller (less than 225 sq. m.). Often a member of the following families: Epacridaceae, Myrtaceae, Fabaceae and Proteaceae. Commonly occur in nutrient-poor substrates.
Chenopod Shrub	Single or multi-stemmed, semi-succulent shrub of the family Chenopodiaceae exhibiting drought and salt tolerance.
Samphire Shrub	Genera (of Tribe Salicornioideae, viz: *Halosarcia*, *Pachycornia, Sarcocornia*, *Sclerostegia*, *Tecticornia* and *Tegicornia*) with articulate branches, fleshy stems and reduced flowers within the Chenopodiaceae family, succulent chenopods. Also genus *Suaeda*.
Tussock Grass	Forms discrete but open tussocks usually with distinct individual shoots, or if not, then forming a hummock. These are common agricultural grasses.
Hummock Grass	Coarse xeromorphic grass with a mound-like form often dead in the middle; genera are *Triodia* and *Plectrachne*.
Sedge	Herbaceous, usually perennial erect plant generally with a tufted habit and of the families Cyperaceae (true sedges) or Restionaceae (node sedges).
Rush	Herbaceous, usually perennial erect monocot that is neither a grass nor sedge. For the purposes of NVIS, rushes include the monocotyledon families Juncaceae, Typhaceae, Liliaceae, Iridaceae, Xyridaceae and the genus *Lomandra* (i.e. "graminoid" or grass-like genera).
Forb	Herbaceous or slightly woody, annual or sometimes perennial plant (usually a dicotyledon).
Grass-tree	Australian grass trees. Members of the family Xanthorrhoeaceae.
Cycad	Members of the families Cycadaceae and Zamiaceae.

Table 19: Height classes defined for the NVIS

Height classes	Height range (m)	Tree	Shrub, heath shrub, chenopod shrub, samphire shrub, cycad, grass-tree	Tree mallee, mallee shrub	Tussock grasses, sedges, rushes and forbs
8	**>30**	tall			
7	**10-30**	mid		tall	

Height classes	Height range (m)	Tree	Shrub, heath shrub, chenopod shrub, samphire shrub, cycad, grass-tree	Tree mallee, mallee shrub	Tussock grasses, sedges, rushes and forbs
6	**<10**	low		mid	
5	**<3**			low	
4	**>2**		tall		tall
3	**1-2**		mid		tall
2	**0.5-1**		low		mid
1	**<0.5**		low		low

Table 20: NVIS structural formation terminology

Growth Form	Height (m)	Foliage Cover (%)					
		>70	**30-70**	**10-30**	**2-10**	**<2 (isolated)**	**<2 (isolated clump)**
Tree	**<10,10-30, >30**	Closed Forest	Open Forest	Woodland	Open Woodland	Isolated Trees	Isolated Clumps Of Trees
Tree Mallee	**<3, <10, 10-30**	Closed Mallee Forest	Open Mallee Forest	Mallee Woodland	Open Mallee Woodland	Isolated Mallee Trees	Isolated Clumps Of Mallee Trees
Shrub	**<1,1-2,>2**	Closed Shrubland	Shrubland	Open Shrubland	Sparse Shrubland	Isolated Shrubs	Isolated Clumps Of Shrubs
Mallee Shrub	**<3, <10, 10-30**	Closed Mallee Shrubland	Mallee Shrubland	Open Mallee Shrubland	Sparse Mallee Shrubland	Isolated Mallee Shrubs	Isolated Clumps Of Mallee Shrubs
Heath Shrub	**<1,1-2,>2**	Closed Heathland	Heathland	Open Heathland	Sparse Heathland	Isolated Heath Shrubs	Isolated Clumps Of Heath Shrubs
Chenopod Shrub	**<1,1-2,>2**	Closed Chenopod Shrubland	Chenopod Shrubland	Open Chenopod Shrubland	Sparse Chenopod Shrubland	Isolated Chenopod Shrubs	Isolated Clumps Of Chenopod Shrubs
Samphire Shrub	**<0.5,>0.5**	Closed Samphire Shrubland	Samphire Shrubland	Open Samphire Shrubland	Sparse Samphire Shrubland	Isolated Samphire Shrubs	Isolated Clumps Of Samphire Shrubs
Hummock Grass	**<2,>2**	Closed Hummock Grassland	Hummock Grassland	Open Hummock Grassland	Sparse Hummock Grassland	Isolated Hummock Grasses	Isolated Clumps Of Hummock Grasses
Tussock Grass	**<0.5,>0.5**	Closed Tussock Grassland	Tussock Grassland	Open Tussock Grassland	Sparse Tussock Grassland	Isolated Tussock Grasses	Isolated Clumps Of Tussock Grasses
Sedge	**<0.5,>0.5**	Closed Sedgeland	Sedgeland	Open Sedgeland	Sparse Sedgeland	Isolated Sedges	Isolated Clumps Of Sedges
Rush	**<0.5,>0.5**	Closed Rushland	Rushland	Open Rushland	Sparse Rushland	Isolated Rushes	Isolated Clumps Of Rushes
Forb	**<0.5,>0.5**	Closed Forbland	Forbland	Open Forbland	Sparse Forbland	Isolated Forbs	Isolated Clumps Of Forbs

Source: Information in Tables 18 to 20 from ESCAVI (2003)

APPENDIX 5: RELEVÉ SITE INFORMATION

Table 21: Information collected at relevé sites

Relevé	TWR001	Botanist: Scott Hitchcock			Date:	15/03/2021	Photo:
Location:		GDA94	611740	mE	6963175	mN	
Habitat:		Hardpan plain					
Soil:		Red-orange sandy-loam surface crust (60%)					
Rocks:		Ironstone gravel (2%)					
Mapped as:		ATSSL (1)					
Vegetation type:		Sparse Tall Shrubland of *Acacia incurvaneura*, *A. aptaneura* and *A. ramulosa* var. *ramulosa*					
Vegetation condition:		Very Good					
Disturbances:		Grazing, exploration activities, animal tracks - trampled vegetation					
Fire age:		Old (> 5yrs)					
Species:		*Acacia aptaneura, Acacia craspedocarpa* (hybrid), *Acacia incurvaneura*, *Acacia ramulosa* var. *ramulosa*, ***Drummondita miniata* (P3),** *Eremophila simulans* subsp. *simulans*, *Erodium cygnorum, Hemigenia* sp. Yalgoo (A.M. Ashby 2624), *Psydrax rigidula, Ptilotus obovatus, Ptilotus schwartzii, Sida* sp. dark green fruits (S. van Leeuwen 2260)					
Relevé	**TWR002**	**Botanist: Scott Hitchcock**			**Date:**	**29/03/2021**	**Photo:**
Location:		GDA94	611735	mE	6962955	mN	
Habitat:		Low hill (very gentle midslope)					
Soil:		Red-brown sandy-clay surface crust (20%)					
Rocks:		Ironstone stones (20%), quartz stones (20%)					
Mapped as:		ATSSL (1)					
Vegetation type:		Sparse Tall Shrubland of *Acacia ramulosa* var. *ramulosa* and *A. caesaneura* x *incurvaneura* with Isolated Low Shrubs of *Eremophila lachnocalyx*					
Vegetation condition:		Very Good					
Disturbances:		Animal tracks - trampled vegetation					
Fire age:		None evident					
Species:		*Acacia aptaneura, Acacia caesaneura* x *incurvaneura*, *Acacia craspedocarpa* (hybrid), *Acacia incurvaneura, Acacia ramulosa* var. *ramulosa*, *Eremophila lachnocalyx, Eremophila simulans* subsp. *simulans*, *Erodium cygnorum, Ptilotus schwartzii*					

Relevé	TWR004	Botanist: Scott Hitchcock			Date:	29/03/2021	Photo:
Location:		GDA94	612062	mE	6962656	mN	
Habitat:		Stony plain					
Soil:		Red-brown sandy-clay surface crust (20%)					
Rocks:		Ironstone stones (20%), quartz stones (20%)					
Mapped as:		ATSSL (1)					
Vegetation type:		Sparse Tall Shrubland of *Acacia aptaneura* and *A. incurvaneura* with Isolated Mid Shrubs of *A. ramulosa* var. *ramulosa* and Isolated Low Shrubs of *Eremophila lachnocalyx* and *Ptilotus obovatus*					
Veg. condition:		Good					
Disturbances:		Animal tracks - trampled vegetation, grazing, mining activities					
Fire age:		None evident					
Species:		*Acacia aptaneura, Acacia caesaneura* x *incurvaneura*, *Acacia craspedocarpa, Acacia craspedocarpa* (hybrid), *Acacia incurvaneura*, *Acacia ramulosa* var. *ramulosa*, ***Enchylaena tomentosa*** **(RE),** *Eremophila forrestii* subsp. *forrestii*, *Eremophila lachnocalyx, Eremophila simulans* subsp. *simulans*, *Ptilotus obovatus, Ptilotus schwartzii*					

Relevé	TWR005	Botanist: Scott Hitchcock			Date:	16/03/2021	Photo:
Location:		GDA94	611594	mE	6962791	mN	
Habitat:		Grove very gentle					
Soil:		Red-orange clay-loam surface crust (40%)					
Rocks:		Ironstone gravel (20%), quartz stones (10%)					
Mapped as:		ATSSL (2)					
Vegetation type:		Open Low Forest of *Acacia caesaneura* (narrow phyllode variant) and *A. aptaneura* with an Open Tall Shrubland of *A. caesaneura* (narrow phyllode variant) and *A. aptaneura* and an Open Low Shrubland of *Eremophila simulans* subsp. *simulans* and *E.*					
Veg. condition:		Excellent					
Disturbances:		Animal tracks - trampled vegetation					
Fire age:		None evident					
Species:		*Acacia aptaneura, Acacia caesaneura* (narrow phyllode variant), *Acacia tetragonophylla, Calandrinia* sp. indet., ***Centipeda minima*** **(RE),** *Cheilanthes sieberi* subsp. *sieberi*, ***Citrullus amarus*,*** *Eremophila forrestii* subsp. *forrestii*, *Eremophila lachnocalyx, Eremophila simulans* subsp. *simulans*, *Erodium cygnorum, Euphorbia drummondii, Goodenia rosea, Leichhardtia australis,* ***Nicotiana rotundifolia*** **(RE),** *Paspalidium basicladum,* ***Phyllanthus maderaspatensis*** **(RE),** *Psydrax latifolia, Psydrax rigidula, Ptilotus obovatus, Rhagodia eremaea, Schoenus variicellae, Sida* ?sp. Excedentifolia (J.L. Egan 1925), ***Sida picklesiana*** **(P3),** *Sida* sp. dark green fruits (S. van Leeuwen 2260), *Teucrium teucriiflorum, Tripogonella loliiformis, Vincetoxicum lineare*					

Relevé	TWR006	Botanist: Scott Hitchcock			Date:	15/03/2021	Photo:
Location:		GDA94	611540	mE	6963332	mN	
Habitat:		Hardpan plain					
Soil:		Orange-white clay-loam surface crust (80%)					
Rocks:		Ironstone stones (2%)					
Mapped as:		ATSSL (2)					
Vegetation type:		Open Tall Shrubland of *Acacia craspedocarpa* (hybrid) and *A. tetragonophylla* with a Sparse Low Shrubland of *Eremophila punicea*					
Veg. condition:		Excellent					
Disturbances:		Animal tracks - trampled vegetation					
Fire age:		Old (> 5yrs)					
Species:		*Abutilon cryptopetalum, Acacia craspedocarpa* (hybrid), *Acacia incurvaneura, Acacia pruinocarpa, Acacia tetragonophylla, Centipeda thespidioides, Cheilanthes sieberi* subsp. *sieberi*, *Eremophila punicea, Eremophila simulans* subsp. *simulans*, *Erodium cygnorum, Euphorbia drummondii, Goodenia rosea, Leichhardtia australis, Monachather paradoxus, Paspalidium basicladum, Ptilotus obovatus, Rhagodia eremaea, Sida* ?sp. Excedentifolia (J.L. Egan 1925), *Vincetoxicum lineare*					

Relevé	TWR007	Botanist: Scott Hitchcock			Date:	16/03/2021	Photo:
Location:		GDA94	611597	mE	6963839	mN	
Habitat:		Grove very gentle					
Soil:		Red-orange clay-loam surface crust (40%)					
Rocks:		Ironstone gravel (20%), quartz stones (10%)					
Mapped as:		ATSSL (2)					
Vegetation type:		Open Low Forest of *Acacia caesaneura* (narrow phyllode variant) and *A. aptaneura* with an Open Tall Shrubland of *A. caesaneura* (narrow phyllode variant) and *A. aptaneura*, Open Low Shrubland of *Eremophila simulans* subsp. *simulans* and *E. forrestii* subsp. *forrestii* and an Open Forbland of *Cheilanthes sieberi* subsp. *sieberi*					
Veg. condition:		Very Good					
Disturbances:		Grazing, animal tracks - trampled vegetation					
Fire age:		Old (> 5yrs)					
Species:		*Acacia aptaneura, Acacia caesaneura* (narrow phyllode variant), *Cheilanthes sieberi* subsp. *sieberi*, *Eremophila forrestii* subsp. *forrestii*, *Eremophila lachnocalyx, Eremophila punicea, Eremophila simulans* subsp. *simulans*, *Erodium cygnorum, Euphorbia drummondii, Goodenia rosea, Leichhardtia australis, Paspalidium basicladum, Psydrax latifolia, Psydrax rigidula, Ptilotus obovatus, Ptilotus schwartzii, Rhagodia eremaea, Schoenus variicellae, Sida* ?sp. Excedentifolia (J.L. Egan 1925), *Sida* sp. dark green fruits (S. van Leeuwen 2260), *Tripogonella loliiformis, Vincetoxicum lineare*					

Relevé	TWR010	Botanist: Scott Hitchcock			Date:	29/03/2021	Photo:
Location:		GDA94	611122	mE	6964321	mN	
Habitat:		Low hill (very gentle upperslope)					
Soil:		Red-orange clay-loam surface crust (10%)					
Rocks:		Ironstone stones (50%), quartz stones (10%)					
Mapped as:		ATSSL (1)					
Vegetation type:		Sparse Tall Shrubland of *Acacia ramulosa* var. *ramulosa* and *A. caesaneura* x *incurvaneura* with Isolated Low Shrubs of *Eremophila latrobei*					
Veg. condition:		Excellent					
Disturbances:		Grazing					
Fire age:		None evident					
Species:		*Acacia aptaneura, Acacia caesaneura* x *incurvaneura*, *Acacia craspedocarpa* (hybrid), *Acacia incurvaneura, Acacia ramulosa* var. *ramulosa*, *Eremophila latrobei, Erodium cygnorum, Grevillea berryana, Leichhardtia australis, Ptilotus schwartzii, Sida* sp. Golden calyces glabrous (H.N. Foote 32)					

Relevé	TWR011	Botanist: Scott Hitchcock			Date:	16/03/2021	Photo:
Location:		GDA94	611006	mE	6964499	mN	
Habitat:		Low hill (very gentle west facing upperslope)					
Soil:		Red-orange clay-loam surface crust (10%)					
Rocks:		Quartz stones (40%), ironstone stones (20%)					
Mapped as:		ATSSL (3)					
Vegetation type:		Isolated Low Trees of *Acacia pteraneura* with Isolated Tall Shrubs of *A. pteraneura* and *A. grasbyi*					
Veg. condition:		Very Good					
Disturbances:		Exploration activities, grazing					
Fire age:		None evident					
Species:		*Acacia aptaneura, Acacia grasbyi, Acacia pteraneura, Maireana georgei, Maireana villosa, Ptilotus obovatus, Scaevola spinescens*					

Relevé	TWR012	Botanist: Scott Hitchcock			Date:	29/03/2021	Photo:
Location:		GDA94	611084	mE	6964412	mN	
Habitat:		Low hill (very gentle hilltop)					
Soil:		Red-orange clay-loam surface crust (10%)					
Rocks:		Quartz boulders (25%), granitic rocks boulders (25%)					
Mapped as:		ATSSL (1)					
Vegetation type:		Sparse Tall Shrubland of *Acacia ramulosa* var. *ramulosa* and *A. caesaneura* x *incurvaneura* with a Sparse Mid Shrubland of *Thryptomene decussata* and Isolated Low Shrubs of *Eremophila latrobei*					
Veg. condition:		Excellent					
Disturbances:		Grazing					
Fire age:		None evident					
Species:		*Acacia aptaneura, Acacia caesaneura* x *incurvaneura*, *Acacia craspedocarpa* (hybrid), *Acacia incurvaneura, Acacia ramulosa* var. *ramulosa*, *Eremophila latrobei, Erodium cygnorum, Euphorbia drummondii, Grevillea berryana, Leichhardtia australis, Monachather paradoxus,* ***Philotheca brucei*** **(RE),** *Ptilotus schwartzii, Sida* sp. Golden calyces glabrous (H.N. Foote 32), *Thryptomene decussata*					

Relevé	TWR013	Botanist: Scott Hitchcock			Date:	29/03/2021	Photo:
Location:		GDA94	610966	mE	6963983	mN	
Habitat:		Low hill (very gentle midslope)					
Soil:		Red-brown sandy-clay surface crust (20%)					
Rocks:		Ironstone stones (20%), quartz stones (30%)					
Mapped as:		ATSSL (1)					
Vegetation type:		Sparse Tall Shrubland of *Acacia ramulosa* var. *ramulosa* and *A. caesaneura* x *incurvaneura* with Isolated Low Shrubs of *Eremophila latrobei*					
Veg. condition:		Very Good					
Disturbances:		Animal tracks - trampled vegetation					
Fire age:		None evident					
Species:		*Acacia aptaneura, Acacia caesaneura* x *incurvaneura*, *Acacia craspedocarpa* (hybrid), *Acacia incurvaneura, Acacia pteraneura, Acacia ramulosa* var. *ramulosa*, *Eremophila lachnocalyx, Eremophila latrobei, Eremophila simulans* subsp. *simulans*, *Erodium cygnorum, Psydrax suaveolens, Ptilotus schwartzii*					

Relevé	TWR014	Botanist: Scott Hitchcock			Date:	16/03/2021	Photo:
Location:		GDA94	611158	mE	6963479	mN	
Habitat:		Low hill (very gentle north-east facing slope hillslope)					
Soil:		Red-orange clay-loam surface crust (30%)					
Rocks:		Ironstone stones (20%), quartz stones (20%)					
Mapped as:		ATSSL (1)					
Vegetation type:		Sparse Tall Shrubland of *Acacia caesaneura* x *incurvaneura* with a Sparse Low Shrubland of *Eremophila simulans* subsp. *simulans* and *Sida ectogama* and Isolated Low Trees of *A. pruinocarpa*					
Veg. condition:		Excellent					
Disturbances:		Animal tracks - trampled vegetation					
Fire age:		None evident					
Species:		*Acacia aptaneura, Acacia caesaneura* (narrow phyllode variant), *Acacia caesaneura* x *incurvaneura*, *Acacia pruinocarpa, Acacia quadrimarginea, Acacia ramulosa* var. *ramulosa*, ***Enchylaena tomentosa*** **(RE),** *Eremophila forrestii* subsp. *forrestii*, *Eremophila lachnocalyx, Eremophila latrobei, Eremophila simulans* subsp. *simulans*, *Erodium cygnorum, Goodenia rosea, Psydrax rigidula, Sida ectogama*					

Relevé	TWR015	Botanist: Scott Hitchcock			Date:	16/03/2021	Photo:
Location:		GDA94	610938	mE	6962928	mN	
Habitat:		Drainage lines					
Soil:		Red-orange sandy-loam surface crust (60%)					
Rocks:		Ironstone gravel (2%)					
Mapped as:		ATSSL (1)					
Vegetation type:		Sparse Tall Shrubland of *Acacia craspedocarpa* (hybrid), *A. craspedocarpa* and *A. caesaneura* (narrow phyllode variant) with a Sparse Mid Shrubland of *A. craspedocarpa*					
Veg. condition:		Very Good					
Disturbances:		Grazing, animal tracks - trampled vegetation					
Fire age:		Old (> 5yrs)					
Species:		*Acacia aptaneura, Acacia caesaneura* (narrow phyllode variant), *Acacia craspedocarpa, Acacia craspedocarpa* (hybrid), *Acacia incurvaneura, Acacia tetragonophylla, Cheilanthes sieberi* subsp. *sieberi*, ***Enchylaena tomentosa*** **(RE),** *Eremophila galeata, Erodium cygnorum, Ptilotus obovatus, Ptilotus schwartzii, Teucrium teucriiflorum*					

Relevé	TWR016	Botanist: Scott Hitchcock			Date:	16/03/2021	Photo:
Location:		GDA94	610485	mE	6962752	mN	
Habitat:		Low hill (gentle hillslope)					
Soil:		Red-orange clay-loam surface crust (10%)					
Rocks:		Ironstone gravel (60%)					
Mapped as:		ATSSL (1)					
Vegetation type:		Isolated Low Trees of *Acacia aptaneura* and *A. incurvaneura* with Isolated Tall Shrubs of *Thryptomene decussata*, Isolated Mid Shrubs of *T. decussata* and Isolated Low Shrubs of *Ptilotus schwartzii*					
Veg. condition:		Excellent					
Disturbances:		Animal tracks - trampled vegetation					
Fire age:		Old (> 5yrs)					
Species:		*Acacia aptaneura, Acacia pteraneura, Acacia quadrimarginea, Acacia tetragonophylla, Cheilanthes sieberi* subsp. *sieberi*, *Eremophila latrobei* subsp. *latrobei, Eremophila jucunda* subsp. *jucunda*, *Erodium cygnorum, Leichhardtia australis, Ptilotus obovatus, Ptilotus schwartzii, Rhagodia eremaea, Thryptomene decussata, Vincetoxicum lineare*					

Relevé	TWR017	Botanist: Scott Hitchcock			Date:	29/03/2021	Photo:
Location:		GDA94	610552	mE	6962586	mN	
Habitat:		Stony plain					
Soil:		Orange-white sandy-clay surface crust (20%)					
Rocks:		Ironstone stones (20%), quartz stones (20%)					
Mapped as:		ATSSL (1)					
Vegetation type:		Sparse Tall Shrubland of *Acacia craspedocarpa* (hybrid) with Isolated Low Shrubs of *Eremophila simulans* subsp. *simulans* and *E. lachnocalyx*					
Veg. condition:		Very Good					
Disturbances:		Animal tracks - trampled vegetation					
Fire age:		None evident					
Species:		*Acacia aptaneura, Acacia caesaneura* x *incurvaneura*, *Acacia craspedocarpa, Acacia craspedocarpa* (hybrid), *Acacia ramulosa* var. *ramulosa*, ***Enchylaena tomentosa*** **(RE),** *Eremophila galeata, Eremophila lachnocalyx, Eremophila simulans* subsp. *simulans*, *Erodium cygnorum, Psydrax rigidula, Ptilotus schwartzii*					

Relevé	TWR024	Botanist: Scott Hitchcock			Date:	17/03/2021	Photo:
Location:		GDA94	610114	mE	6961025	mN	
Habitat:		Hill (very gentle hilltop)					
Soil:		Red-orange sandy-clay surface crust (30%)					
Rocks:		Ironstone gravel (50%)					
Mapped as:		AaTSSL					
Vegetation type:		Isolated Tall Shrubs of *Acacia aptaneura* with Isolated Mid Shrubs of *A. quadrimarginea* and Isolated Low Shrubs of *Thryptomene decussata*					
Veg. condition:		Excellent					
Disturbances:		No disturbances					
Fire age:		None evident					
Species:		*Acacia aptaneura, Acacia incurvaneura, Acacia quadrimarginea, Eremophila forrestii* subsp. *forrestii, Eremophila galeata, Eremophila glutinosa, Eremophila latrobei, Eriachne mucronata, Ptilotus aervoides, Ptilotus schwartzii, Senna glaucifolia, Thryptomene decussata*					

Relevé	TWR025	Botanist: Scott Hitchcock			Date:	17/03/2021	Photo:
Location:		GDA94	609493	mE	6961242	mN	
Habitat:		Breakaway (very gentle hilltop)					
Soil:		Orange-white sand loose soil (40%)					
Rocks:		Granitic rocks boulders (40%)					
Mapped as:		MLSSL					
Vegetation type:		Sparse Low Shrubland of ***Sida picklesiana* (P3)** and *Calytrix amethystina* with Isolated Mid Shrubs of *Acacia aulacophylla* and *A. pteraneura* and Isolated Tussock Grasses of *Eriachne mucronata*					
Veg. condition:		Excellent					
Disturbances:		No disturbances					
Fire age:		None evident					
Species:		*Acacia aulacophylla, Acacia aptaneura, Acacia craspedocarpa, Acacia pteraneura, Acacia quadrimarginea, Acacia ramulosa* var. *ramulosa***,** *Calytrix amethystina, Eremophila exilifolia, Eremophila latrobei* subsp. *latrobei, Eriachne mucronata, Hemigenia* sp. Yalgoo (A.M. Ashby 2624), *Maireana villosa, Ptilotus obovatus,* ***Sida picklesiana* (P3),** *Stylidium longibracteatum, Thryptomene decussata, Tripogonella loliiformis*					

Relevé	TWR026	Botanist: Scott Hitchcock			Date:	17/03/2021	Photo:
Location:		GDA94	609527	mE	6961443	mN	
Habitat:		Low hill (very gentle hillslope)					
Soil:		Orange-white sandy-clay loose soil (40%), surface crust (20%)					
Rocks:		Granitic rocks stones (10%)					
Mapped as:		ATSSL (3)					
Vegetation type:		Sparse Tall Shrubland of *Acacia caesaneura* x *incurvaneura* and *A. aptaneura* with a Sparse Low Shrubland of *Eremophila punicea* and *E. latrobei* subsp. *latrobei*					
Veg. condition:		Excellent					
Disturbances:		No disturbances					
Fire age:		None evident					
Species:		*Acacia aptaneura, Acacia caesaneura* (narrow phyllode variant), *Acacia caesaneura* x *incurvaneura, Acacia grasbyi, Cheilanthes sieberi* subsp. *sieberi,* ***Eremophila compacta* (RE),** *Eremophila latrobei* subsp. *latrobei, Eremophila punicea, Erodium cygnorum, Monachather paradoxus, Paspalidium basicladum, Sida ectogama, Solanum lasiophyllum, Tripogonella loliiformis*					

Relevé	TWR028	Botanist: Scott Hitchcock			Date:	17/03/2021	Photo:
Location:		GDA94	609084	mE	6960592	mN	
Habitat:		Hill (very gentle midslope)					
Soil:		Orange sandy-loam loose soil (20%), surface crust (10%)					
Rocks:		Granitic rocks stones (20%), quartz stones (20%)					
Mapped as:		ATSSL (3)					
Vegetation type:		Sparse Mid Shrubland of *Eremophila compacta* with Isolated Low Trees of *Acacia pteraneura*, Isolated Low Shrubs of *E. compacta* and Isolated Chenopod Shrubs of *Maireana triptera*					
Veg. condition:		Excellent					
Disturbances:		No disturbances					
Fire age:		None evident					
Species:		*Acacia craspedocarpa, Acacia grasbyi, Acacia pteraneura, Acacia tetragonophylla,* ***Enchylaena tomentosa*** **(RE),** ***Eremophila compacta*** **(RE),** *Eremophila oppositifolia* subsp. *angustifolia*, *Eremophila punicea, Erodium cygnorum, Exocarpos aphyllus, Maireana georgei, Maireana triptera, Maireana villosa, Ptilotus exaltatus, Ptilotus obovatus, Rhagodia eremaea, Scaevola spinescens, Sida ectogama, Solanum lasiophyllum*					

Relevé	TWR029	Botanist: Scott Hitchcock			Date:	17/03/2021	Photo:
Location:		GDA94	609453	mE	6960704	mN	
Habitat:		Low hill (very gentle footslope)					
Soil:		Orange-white sandy-loam surface crust (60%)					
Rocks:		Quartz stones (20%)					
Mapped as:		ATSSL (3)					
Vegetation type:		Open Tall Shrubland of *Acacia craspedocarpa* with a Sparse Low Shrubland of *Eremophila compacta* and Isolated Chenopod Shrubs of *Maireana georgei*, *M. triptera* and *Enchylaena tomentosa*					
Veg. condition:		Excellent.					
Disturbances:		No disturbances					
Fire age:		None evident					
Species:		*Acacia craspedocarpa, Acacia grasbyi, Acacia pteraneura, Acacia tetragonophylla, Cheilanthes sieberi* subsp. *sieberi*, ***Enchylaena tomentosa*** **(RE),** ***Eremophila compacta*** **(RE),** *Eremophila punicea, Eremophila simulans* subsp. *simulans*, *Erodium cygnorum, Maireana georgei, Maireana triptera, Monachather paradoxus, Paspalidium basicladum, Ptilotus exaltatus, Rhagodia eremaea, Scaevola spinescens,* ***Sclerolaena ?cornishiana*** **(RE),** *Solanum lasiophyllum, Teucrium teucriiflorum, Tripogonella loliiformis*					

Relevé	TWR030	Botanist: Scott Hitchcock			Date:	17/03/2021	Photo:
Location:		GDA94	609649	mE	6960753	mN	
Habitat:		Depression (very gentle slope)					
Soil:		Orange sandy-loam loose soil (60%)					
Rocks:		Quartz stones (20%)					
Mapped as:		ATSSL (3)					
Vegetation type:		Sparse Tall Shrubland of *Hakea preissii* with a Sparse Low Shrubland of *Eremophila compacta* and Isolated Chenopod Shrubs of *Maireana georgei*, *M. triptera* and *Enchylaena tomentosa*					
Veg. condition:		Excellent					
Disturbances:		No disturbances					
Fire age:		None evident					
Species:		*Acacia craspedocarpa, Acacia grasbyi, Acacia pteraneura, Acacia tetragonophylla,* ***Enchylaena tomentosa*** **(RE),** ***Eremophila compacta*** **(RE),** *Eremophila galeata, Eremophila oppositifolia* subsp. *angustifolia*, *Eremophila simulans* subsp. *simulans*, *Hakea preissii, Maireana georgei, Maireana triptera, Monachather paradoxus, Ptilotus exaltatus, Scaevola spinescens,* ***Sclerolaena ?cornishiana*** **(RE),** *Sida ectogama, Solanum lasiophyllum*					

Relevé	TWR031	Botanist: Scott Hitchcock			Date:	17/03/2021	Photo:
Location:		GDA94	609839	mE	6960370	mN	
Habitat:		Sandy plain (very gentle slope)					
Soil:		Red-orange sandy-clay loose soil (40%), surface crust (30%)					
Rocks:		No rocks					
Mapped as:		ATSSL (2)					
Vegetation type:		Low Woodland of *Acacia caesaneura* x *incurvaneura* and *A. caesaneura* (narrow phyllode variant) with a Sparse Tall Shrubland of *A. caesaneura* x *incurvaneura* and *A. caesaneura* (narrow phyllode variant) and a Sparse Low Shrubland of *Eremophila forrestii* subsp. *forrestii*					
Veg. condition:		Very Good					
Disturbances:		Erosion, grazing					
Fire age:		None evident					
Species:		*Abutilon otocarpum, Acacia aptaneura, Acacia caesaneura* (narrow phyllode variant), *Acacia caesaneura* x *incurvaneura*, *Acacia ramulosa, Eremophila exilifolia, Eremophila forrestii* subsp. *forrestii*, *Eremophila latrobei* subsp. *latrobei*, *Eremophila simulans* subsp. *simulans*, *Erodium cygnorum, Maireana villosa, Monachather paradoxus, Psydrax latifolia, Psydrax rigidula, Psydrax suaveolens, Sida* sp. dark green fruits (S. van Leeuwen 2260), *Teucrium teucriiflorum*					

Relevé	TWR032	Botanist: Scott Hitchcock			Date:	17/03/2021	Photo:
Location:		GDA94	612373	mE	6959965	mN	
Habitat:		Hill (very gentle footslope)					
Soil:		Orange sandy-clay surface crust (20%)					
Rocks:		Ironstone gravel (40%), quartz stones (10%)					
Mapped as:		ATSSL (2)					
Vegetation type:		Sparse Tall Shrubland of *Acacia aptaneura* and *A. incurvaneura* with Isolated Mid Shrubs of *A. ramulosa* var. *linophylla*					
Veg. condition:		Very Good					
Disturbances:		Exploration activities					
Fire age:		None evident					
Species:		*Acacia aptaneura, Acacia caesaneura* (narrow phyllode variant), *Acacia incurvaneura*, *Acacia pteraneura, Acacia ramulosa* var. *linophylla*, *Eremophila galeata, Maireana villosa, Psydrax rigidula, Ptilotus schwartzii, Teucrium teucriiflorum, Vincetoxicum lineare*					

Relevé	TWR033	Botanist: Scott Hitchcock			Date:	17/03/2021	Photo:
Location:		GDA94	612301	mE	6960343	mN	
Habitat:		Hill (very gentle hillslope)					
Soil:		Red-orange sandy-loam surface crust (20%)					
Rocks:		Ironstone gravel (40%)					
Mapped as:		ATOSL					
Vegetation type:		Sparse Tall Shrubland of *Acacia craspedocarpa* (hybrid), *A. tetragonophylla* and *A. ramulosa* var. *ramulosa* with a Sparse Low Shrubland of *Eremophila forrestii* subsp. *forrestii* and *E. punicea* and Isolated Low Trees of *A. caesaneura* and *A. craspedocarpa* (hybrid)					
Veg. condition:		Very Good					
Disturbances:		Animal tracks - trampled vegetation, animal tracks - trampled vegetation					
Fire age:		None evident					
Species:		*Acacia caesaneura, Acacia craspedocarpa* (hybrid), *Acacia ramulosa* var. *ramulosa*, *Acacia tetragonophylla,* ***Enchylaena tomentosa*** **(RE),** *Eremophila forrestii* subsp. *forrestii*, *Eremophila galeata, Eremophila punicea, Eremophila simulans* subsp. *simulans*, *Erodium cygnorum,* ***Hibiscus burtonii*** **(RE),** *Maireana villosa, Paspalidium basicladum, Ptilotus obovatus, Sida* ?sp. Excedentifolia (J.L. Egan 1925), *Tribulus astrocarpus*					

Relevé	TWR034	Botanist: Scott Hitchcock			Date:	17/03/2021	Photo:
Location:		GDA94	612530	mE	6960478	mN	
Habitat:		Depression					
Soil:		Orange clay-loam surface crust (60%)					
Rocks:		Ironstone gravel (10%)					
Mapped as:		ATOSL					
Vegetation type:		Open Low Forest of *Acacia pruinocarpa*, *A. aptaneura* and *A. caesaneura* (narrow phyllode variant) with an Open Low Shrubland of *Ptilotus obovatus*, Sparse Mid Shrubland of *Eremophila lachnocalyx* and *E. simulans* subsp. *simulans* and a Sparse Tussock Grassland of *Paspalidium basicladum*					
Veg. condition:		Very Good					
Disturbances:		Animal tracks - trampled vegetation, exploration activities					
Fire age:		None evident					
Species:		*Acacia aptaneura, Acacia caesaneura* (narrow phyllode variant), *Acacia pruinocarpa, Acacia pteraneura, Acacia tetragonophylla, Calandrinia eremaea, Eremophila forrestii* subsp. *forrestii*, *Eremophila lachnocalyx, Eremophila simulans* subsp. *simulans*, *Erodium cygnorum, Glycine canescens,* ***Hibiscus burtonii*** **(RE),** *Maireana villosa,* ***Nicotiana rotundifolia*** **(RE),** *Paspalidium basicladum,* ***Phyllanthus maderaspatensis*** **(RE),** *Portulaca oleracea, Ptilotus exaltatus, Ptilotus obovatus, Rhagodia eremaea,* ***Salicornia quinqueflora*** **(RE),** *Solanum lasiophyllum, Tribulus astrocarpus, Vincetoxicum lineare*					

Relevé	TWR035	Botanist: Scott Hitchcock			Date:	17/03/2021	Photo:
Location:		GDA94	613191	mE	6961421	mN	
Habitat:		Major channel					
Soil:		Orange sandy-loam loose soil (20%), surface crust (20%)					
Rocks:		Ironstone gravel (20%)					
Mapped as:		AxAsSL					
Vegetation type:		Open Tall Shrubland of *Acacia craspedocarpa* (hybrid) and *A. aptaneura* with a Sparse Low Shrubland of *Eremophila punicea* and *Ptilotus obovatus*					
Veg. condition:		Very Good					
Disturbances:		Grazing, animal tracks - trampled vegetation					
Fire age:		None evident					
Species:		*Abutilon cryptopetalum, Acacia aptaneura, Acacia craspedocarpa* (hybrid), *Acacia pteraneura, Acacia ramulosa, Acacia ramulosa* var. *ramulosa*, *Acacia tetragonophylla,* ***Centipeda minima*** **(RE),** *Cheilanthes sieberi* subsp. *sieberi*, *Eremophila exilifolia, Eremophila punicea, Eremophila simulans* subsp. *simulans*, *Hibiscus* sp. Gardneri (A.L. Payne PRP 1435), *Monachather paradoxus,* ***Nicotiana rotundifolia*** **(RE),** *Paspalidium basicladum,* ***Phyllanthus maderaspatensis*** **(RE),** *Ptilotus obovatus, Sida ectogama, Teucrium teucriiflorum, Tripogonella loliiformis, Vincetoxicum lineare, Wurmbea densiflora*					

Relevé	TWR036	Botanist: Scott Hitchcock			Date:	18/03/2021	Photo:
Location:		GDA94	613223	mE	6961693	mN	
Habitat:		Depression					
Soil:		Red-orange sandy-clay surface crust (10%), loose soil (20%)					
Rocks:		Ironstone stones (20%)					
Mapped as:		ATOSL					
Vegetation type:		Tall Shrubland of *Acacia caesaneura* (narrow phyllode variant), *A. incurvaneura* and *A. aptaneura* with an Open Mid Shrubland of *A. ramulosa* var. *linophylla*, Sparse Low Shrubland of *Eremophila punicea* and Isolated Low Trees of *A. pruinocarpa*					
Veg. condition:		Very Good					
Disturbances:		Gazing, animal tracks - trampled vegetation					
Fire age:		None evident					
Species:		*Acacia aptaneura, Acacia caesaneura* (narrow phyllode variant), *Acacia incurvaneura, Acacia pruinocarpa, Acacia ramulosa* var. *linophylla*, ***Centipeda minima*** **(RE),** *Cheilanthes sieberi* subsp. *sieberi*, *Eremophila foliosissima, Eremophila forrestii* subsp. *forrestii*, *Eremophila punicea, Eriachne* aff. *helmsii, Erodium cygnorum,* ***Hibiscus burtonii*** **(RE),** ***Nicotiana rotundifolia*** **(RE),** *Paspalidium basicladum,* ***Phyllanthus maderaspatensis*** **(RE),** *Psydrax rigidula, Psydrax suaveolens, Ptilotus obovatus, Ptilotus schwartzii,* ***Sida*** **sp. L (A.M. Ashby 4202) (RE),** *Solanum lasiophyllum, Teucrium teucriiflorum, Tripogonella loliiformis, Vincetoxicum lineare*					

Relevé	TWR037	Botanist: Scott Hitchcock			Date:	18/03/2021	Photo:
Location:		GDA94	613277	mE	6962118	mN	
Habitat:		Hill (very gentle hilltop)					
Soil:		Red-orange sandy-clay surface crust (20%)					
Rocks:		Ironstone gravel (50%)					
Mapped as:		ATSSL (2)					
Vegetation type:		Sparse Tall Shrubland of *Acacia caesaneura* x *incurvaneura* and *A. aptaneura* with Isolated Mallee Trees of *A. pruinocarpa*, Isolated Mid Shrubs of *A. ramulosa* var. *linophylla* and Isolated Low Shrubs of *Eremophila foliosissima*					
Veg. condition:		Very Good					
Disturbances:		Exploration activities, animal tracks - trampled vegetation					
Fire age:		None evident					
Species:		*Acacia aptaneura, Acacia caesaneura, Acacia caesaneura* x *incurvaneura*, *Acacia incurvaneura, Acacia pruinocarpa, Acacia ramulosa* var. *linophylla*, ***Enchylaena tomentosa*** **(RE),** *Eremophila foliosissima, Eremophila forrestii* subsp. *forrestii*, *Eremophila simulans* subsp. *simulans*, *Erodium cygnorum, Psydrax suaveolens, Ptilotus obovatus, Ptilotus schwartzii, Vincetoxicum lineare*					

Relevé	TWR038	Botanist: Scott Hitchcock			Date:	18/03/2021	Photo:
Location:		GDA94	613541	mE	6962373	mN	
Habitat:		Hill (very gentle hilltop)					
Soil:		Red-orange sandy-clay surface crust (20%)					
Rocks:		Ironstone gravel (50%)					
Mapped as:		AxAsSL					
Vegetation type:		Sparse Tall Shrubland of *Acacia caesaneura*, *A. incurvaneura* and *A. aptaneura* with Isolated Mid Shrubs of *A. ramulosa* var. *linophylla* and Isolated Low Shrubs of *Eremophila foliosissima*					
Veg. condition:		Good					
Disturbances:		Exploration activities, animal tracks - trampled vegetation, mining activities					
Fire age:		None evident					
Species:		*Acacia aptaneura, Acacia caesaneura, Acacia incurvaneura, Acacia ramulosa* var. *linophylla*, ***Enchylaena tomentosa*** **(RE),** *Eremophila foliosissima, Ptilotus obovatus, Ptilotus schwartzii, Vincetoxicum lineare*					

Relevé	TWR039	Botanist: Scott Hitchcock			Date:	18/03/2021	Photo:
Location:		GDA94	613944	mE	6963263	mN	
Habitat:		Depression					
Soil:		Red-orange sandy-clay surface crust (10%), loose soil (20%)					
Rocks:		Ironstone stones (10%)					
Mapped as:		ATOSL					
Vegetation type:		Tall Shrubland of *Acacia caesaneura* (narrow phyllode variant), *A. incurvaneura* and *A. aptaneura* with an Open Low Woodland of *A. pruinocarpa* and Sparse Low Shrubland of *Eremophila simulans* subsp. *simulans*					
Veg. condition:		Very Good					
Disturbances:		Grazing, animal tracks - trampled vegetation					
Fire age:		None evident					
Species:		*Acacia aptaneura, Acacia caesaneura* (narrow phyllode variant), *Acacia incurvaneura*, *Acacia pruinocarpa,* ***Centipeda minima*** **(RE),** *Cheilanthes sieberi* subsp. *sieberi*, *Eremophila forrestii* subsp. *forrestii*, *Eremophila latrobei* subsp. *latrobei*, *Eremophila punicea, Eremophila simulans* subsp. *simulans*, *Eriachne* aff. *helmsii*, *Erodium cygnorum, Euphorbia drummondii,* ***Hibiscus burtonii*** **(RE),** ***Nicotiana rotundifolia*** **(RE),** *Paspalidium basicladum,* ***Phyllanthus maderaspatensis*** **(RE),** *Psydrax rigidula, Psydrax suaveolens, Ptilotus obovatus, Ptilotus schwartzii,* ***Sclerolaena ?cornishiana*** **(RE),** *Sida* ?sp. Excedentifolia (J.L. Egan 1925), *Solanum lasiophyllum, Teucrium teucriiflorum, Tripogonella loliiformis, Vincetoxicum lineare*					

Relevé	TWR040	Botanist: Scott Hitchcock		Date:	18/03/2021	Photo:
Location:	GDA94	614252	mE	6963503	mN	
Habitat:	Hill (very gentle hilltop)					
Soil:	Red-orange sandy-clay surface crust (20%)					
Rocks:	Ironstone gravel (50%)					
Mapped as:	ATSSL (2)					
Vegetation type:	Sparse Tall Shrubland of *Acacia caesaneura* x *incurvaneura*, *A. aptaneura*, *A. caesaneura* (narrow phyllode variant) with a Sparse Mid Shrubland of *A. ramulosa var. linophylla*, Isolated Mallee Trees of *A. pruinocarpa* and Isolated Low Shrubs *Eremophila forrestii* subsp. *forrestii* and *E. simulans* subsp. *simulans*					
Veg. condition:	Excellent					
Disturbances:	Animal tracks - trampled vegetation					
Fire age:	None evident					
Species:	*Acacia aptaneura, Acacia caesaneura* (narrow phyllode variant), *Acacia caesaneura* x *incurvaneura*, *Acacia incurvaneura, Acacia pruinocarpa, Acacia ramulosa* var. *linophylla*, ***Enchylaena tomentosa*** **(RE),** *Eremophila forrestii* subsp. *forrestii*, *Eremophila simulans* subsp. *simulans*, *Erodium cygnorum, Paspalidium basicladum, Psydrax suaveolens, Ptilotus obovatus, Ptilotus schwartzii, Vincetoxicum lineare*					

Relevé	TWR041	Botanist: Scott Hitchcock		Date:	18/03/2021	Photo:
Location:	GDA94	613790	mE	6963693	mN	
Habitat:	Hill (very gentle hilltop)					
Soil:	Red-orange sandy-loam surface crust (5%)					
Rocks:	Ironstone stones (60%)					
Mapped as:	AWL (1)					
Vegetation type:	Sparse Tall Shrubland of *Acacia incurvaneura* with Isolated Mid Shrubs of *Thryptomene decussata* and *A. aptaneura*					
Veg. condition:	Very Good					
Disturbances:	Exploration activities, animal tracks - trampled vegetation					
Fire age:	None evident					
Species:	*Acacia aptaneura, Acacia caesaneura* (narrow phyllode variant), *Acacia incurvaneura*, *Acacia ramulosa* var. *linophylla*, *Eremophila forrestii* subsp. *forrestii*, *Eremophila glutinosa, Eremophila latrobei* subsp. *latrobei*, *Eremophila punicea, Thryptomene decussata*					

Relevé	TWR043	Botanist: Scott Hitchcock		Date:	18/03/2021	Photo:
Location:	GDA94	613919	mE	6964395	mN	
Habitat:	Hill (very gentle hilltop)					
Soil:	Red-orange sandy-clay surface crust (20%)					
Rocks:	Ironstone gravel (50%)					
Mapped as:	ATSSL (2)					
Vegetation type:	Sparse Tall Shrubland of *Acacia incurvaneura* with Isolated Mallee Trees of *A. pruinocarpa*, Isolated Mid Shrubs of *A. ramulosa* var. *linophylla* and Isolated Low Shrubs of *Eremophila forrestii* subsp. *forrestii*					
Veg. condition:	Very Good					
Disturbances:	Exploration activities, animal tracks - trampled					
Fire age:	None evident					
Species:	*Acacia aptaneura, Acacia craspedocarpa* (hybrid), *Acacia incurvaneura*, *Acacia pruinocarpa, Acacia ramulosa* var. *linophylla*, ***Enchylaena tomentosa*** **(RE),** *Eremophila forrestii* subsp. *forrestii*, *Eremophila latrobei* subsp. *latrobei*, *Erodium cygnorum, Ptilotus obovatus, Ptilotus schwartzii, Thryptomene decussata, Vincetoxicum lineare*					

Relevé	TWR046	Botanist: Scott Hitchcock			Date:	16/03/2021	Photo:
Location:		GDA94	613587	mE	6965409	mN	
Habitat:		Hardpan plain					
Soil:		Orange clay-loam surface crust (50%)					
Rocks:		Ironstone stones (10%)					
Mapped as:		ATSSL (2)					
Vegetation type:		Open Tall Shrubland of *Acacia caesaneura* (narrow phyllode variant), *A. aptaneura* and *A. tetragonophylla* with an Open Low Shrubland of *Eremophila lachnocalyx* and *E. forrestii* subsp. *forrestii*					
Veg. condition:		Excellent					
Disturbances:		Animal tracks - trampled vegetation					
Fire age:		Old (> 5yrs)					
Species:		*Acacia aptaneura, Acacia caesaneura, Acacia caesaneura* (narrow phyllode variant), *Acacia incurvaneura, Acacia pruinocarpa, Acacia tetragonophylla, Calandrinia* sp. indet., *Centipeda thespidioides, Cheilanthes sieberi* subsp. *sieberi*, *Eremophila forrestii* subsp. *forrestii*, *Eremophila lachnocalyx, Eremophila simulans* subsp. *simulans*, *Erodium cygnorum, Euphorbia drummondii, Goodenia rosea, Leichhardtia australis, Monachather paradoxus,* ***Nicotiana rotundifolia*** **(RE),** *Paspalidium basicladum, Ptilotus obovatus, Rhagodia eremaea, Sida* ?sp. Excedentifolia (J.L. Egan 1925), *Solanum lasiophyllum, Vincetoxicum lineare*					

Relevé	TWR048	Botanist: Scott Hitchcock			Date:	16/03/2021	Photo:
Location:		GDA94	613107	mE	6965472	mN	
Habitat:		Low hill (very gentle north-east facing hillslope)					
Soil:		Red-orange clay-loam surface crust (30%)					
Rocks:		Ironstone stones (20%), quartz stones (30%)					
Mapped as:		ATSSL (1)					
Vegetation type:		Sparse Tall Shrubland of *Acacia caesaneura* x *incurvaneura*, *A. ramulosa* var. *ramulosa* and *A. caesaneura* (narrow phyllode variant) with Isolated Low Trees of *A. pruinocarpa* and Isolated Low Shrubs of *Eremophila latrobei*					
Veg. condition:		Excellent					
Disturbances:		Animal tracks - trampled vegetation					
Fire age:		None evident					
Species:		*Acacia aptaneura, Acacia caesaneura* (narrow phyllode variant), *Acacia caesaneura* x *incurvaneura*, *Acacia pruinocarpa, Acacia ramulosa* var. *ramulosa*, *Acacia tetragonophylla, Eremophila latrobei, Erodium cygnorum, Psydrax suaveolens*					

Relevé	TWR049	Botanist: Scott Hitchcock			Date:	16/03/2021	Photo:
Location:		GDA94	612529	mE	6964585	mN	
Habitat:		Stony plain (very gentle slope)					
Soil:		Red-orange clay-loam surface crust (40%)					
Rocks:		Ironstone gravel (30%), quartz stones (10%)					
Mapped as:		ATSSL (2)					
Vegetation type:		Low Woodland of *Acacia caesaneura* (narrow phyllode variant) and *A. aptaneura* with an Open Tall Shrubland of *A. caesaneura* (narrow phyllode variant) and *A. aptaneura* and an Open Low Shrubland of *Eremophila simulans* subsp. *simulans* and *E. punicea*					
Veg. condition:		Very Good					
Disturbances:		Grazing, animal tracks - trampled vegetation					
Fire age:		Old (> 5yrs)					
Species:		*Acacia aptaneura, Acacia caesaneura* (narrow phyllode variant), *Acacia tetragonophylla, Calandrinia* sp. indet., *Cheilanthes sieberi* subsp. *sieberi*, *Eremophila lachnocalyx, Eremophila punicea, Eremophila simulans* subsp. *simulans*, *Erodium cygnorum, Goodenia rosea, Leichhardtia australis, Paspalidium basicladum, Psydrax latifolia, Psydrax rigidula, Ptilotus obovatus, Ptilotus schwartzii, Rhagodia eremaea, Schoenus variicellae, Sida* ?sp. Excedentifolia (J.L. Egan 1925), *Sida* sp. dark green fruits (S. van Leeuwen 2260), *Tripogonella loliiformis, Vincetoxicum lineare*					

Relevé	TWR050	Botanist: Scott Hitchcock			Date:	16/03/2021	Photo:
Location:		GDA94	612280	mE	6964682	mN	
Habitat:		Low hill (gentle hillslope)					
Soil:		Red-orange clay-loam surface crust (10%)					
Rocks:		Ironstone gravel (40%), quartz stones (30%)					
Mapped as:		ATSSL (1)					
Vegetation type:		Isolated Low Trees of *Acacia aptaneura* and *A. incurvaneura* with Isolated Tall Shrubs of *A. ramulosa* var. *ramulosa*, Isolated Mid Shrubs of *Thryptomene decussata* and Isolated Low Shrubs of *Ptilotus schwartzii* and *Eremophila simulans* subsp. *simulans*					
Veg. condition:		Excellent					
Disturbances:		Animal tracks - trampled vegetation					
Fire age:		Old (> 5yrs)					
Species:		*Acacia aptaneura, Acacia incurvaneura, Acacia ramulosa* var. *ramulosa*, *Acacia tetragonophylla, Eremophila punicea, Eremophila simulans* subsp. *simulans*, *Erodium cygnorum, Leichhardtia australis, Psydrax suaveolens, Ptilotus obovatus, Ptilotus schwartzii, Scaevola spinescens, Teucrium teucriiflorum, Thryptomene decussata*					

Relevé	TWR052	Botanist: Scott Hitchcock			Date:	16/03/2021	Photo:
Location:		GDA94	612957	mE	6964480	mN	
Habitat:		Low hill (very gentle north-east facing hillslope)					
Soil:		Red-orange clay-loam surface crust (10%)					
Rocks:		Ironstone gravel (40%), quartz stones (10%)					
Mapped as:		ATSSL (1)					
Vegetation type:		Sparse Tall Shrubland of *Acacia caesaneura* x *incurvaneura* and *A. aptaneura*					
Veg. condition:		Very Good					
Disturbances:		Animal tracks - trampled vegetation					
Fire age:		None evident					
Species:		*Acacia aptaneura, Acacia caesaneura* (narrow phyllode variant), *Acacia caesaneura* x *incurvaneura*, *Acacia ramulosa* var. *ramulosa*, *Eremophila simulans* subsp. *simulans*, *Erodium cygnorum, Goodenia rosea, Psydrax rigidula, Teucrium teucriiflorum*					

Relevé	TWRX01	Botanist: Scott Hitchcock			Date:	17/03/2021	Photo:
Location:		GDA94	609493	mE	6961242	mN	
Habitat:		Hill (very gentle hilltop)					
Soil:		Orange-white sand loose soil (5%)					
Rocks:		Granitic rocks boulders (70%)					
Mapped as:		MLSSL					
Vegetation type:		Sparse Low Shrubland of *Eremophila latrobei* subsp. *latrobei*, ***Drummondita miniata*** **(P3)** and *Hemigenia* sp. Yalgoo (A.M. Ashby 2624) with Isolated Mid Shrubs of *Acacia aulacophylla* and Isolated Tussock Grasses of *Eriachne mucronata*					
Veg. condition:		Excellent					
Disturbances:		No disturbances					
Fire age:		None evident					
Species:		*Acacia aptaneura, Acacia aulacophylla, Acacia quadrimarginea, Acacia ramulosa* var. *ramulosa*, ***Drummondita miniata*** **(P3),** *Eremophila exilifolia, Eremophila latrobei* subsp. *latrobei*, *Eriachne mucronata, Hemigenia* sp. Yalgoo (A.M. Ashby 2624), *Ptilotus exaltatus, Stylidium longibracteatum, Tripogonella loliiformis*					

Relevé	TWRX02	Botanist: Scott Hitchcock			Date:	17/03/2021	Photo:
Location:		GDA94	609787	mE	6961358	mN	
Habitat:		Hill (very gentle hilltop)					
Soil:		Red-brown sandy-loam loose soil (5%)					
Rocks:		Shale outcrop (20%)					
Mapped as:		ATSSL (3)					
Vegetation type:		Sparse Tall Shrubland of *Acacia ramulosa* var. *linophylla* with a Sparse Mid Shrubland of *Eremophila maculata* subsp. *brevifolia* and *Senna glaucifolia* and a Sparse Low Shrubland of *Ptilotus obovatus* and *Dodonaea amplisemina* (P4)					
Veg. condition:		Excellent					
Disturbances:		No disturbances					
Fire age:		None evident					
Species:		*Acacia craspedocarpa, Acacia grasbyi, Acacia pteraneura, Acacia ramulosa* var. *linophylla*, ***Acacia speckii* (P4),** *Acacia tetragonophylla, Cheilanthes sieberi* subsp. *sieberi*, ***Dodonaea amplisemina* (P4), *Enchylaena tomentosa* (RE), *Eremophila compacta* (RE),** *Eremophila exilifolia, Eremophila forrestii* subsp. *forrestii*, *Eremophila galeata, Eremophila lachnocalyx, Eremophila latrobei* subsp. *latrobei*, *Eremophila maculata* subsp. *brevifolia*, *Eremophila oppositifolia* subsp. *angustifolia*, *Erodium cygnorum, Hakea preissii, Maireana georgei, Maireana triptera, Maireana villosa, Monachather paradoxus, Paspalidium basicladum, Ptilotus exaltatus, Ptilotus obovatus, Rhagodia eremaea, Scaevola spinescens,* ***Sclerolaena ?cornishiana* (RE),** *Senna artemisioides* subsp. *helmsii*, *Senna glaucifolia*, *Sida ectogama, Sida* sp. dark green fruits (S. van Leeuwen 2260), *Solanum lasiophyllum, Teucrium teucriiflorum, Tripogonella loliiformis*					

Note: P3 – P4 = Priority Three and Priority Four species, * after a species indicates a weed species, RE = range extension, subsp. = subspecies, var. = variety, sp. = species. ? = query species, indet. = indeterminate.

APPENDIX 6: VASCULAR FLORA LIST

Table 22: Vascular flora list

Family	Taxa	FlFr	Relevé	OppColl
Amaranthaceae	*Ptilotus aervoides*		•	
Amaranthaceae	*Ptilotus exaltatus*		•	
Amaranthaceae	*Ptilotus obovatus*		•	
Amaranthaceae	*Ptilotus schwartzii*	Fl	•	
Apocynaceae	*Leichhardtia australis*		•	
Apocynaceae	*Vincetoxicum lineare*		•	
Asteraceae	***Centipeda minima* (RE)**		•	
Asteraceae	*Centipeda thespidioides*	Fr	•	
Chenopodiaceae	***Enchylaena tomentosa* (RE)**		•	
Chenopodiaceae	*Maireana georgei*		•	
Chenopodiaceae	*Maireana triptera*		•	
Chenopodiaceae	*Maireana villosa*		•	
Chenopodiaceae	*Rhagodia eremaea*		•	
Chenopodiaceae	***Salicornia quinqueflora* (RE)**		•	
Chenopodiaceae	***Sclerolaena ?cornishiana* (RE)**		•	
Colchicaceae	*Wurmbea densiflora*	Fl	•	
Cucurbitaceae	***Citrullus amarus****		•	
Cyperaceae	*Schoenus variicellae*	FlFr	•	
Euphorbiaceae	*Euphorbia drummondii*	Fr	•	
Fabaceae	*Acacia aptaneura*	Fl	•	
Fabaceae	*Acacia aulacophylla*	Fl	•	
Fabaceae	*Acacia caesaneura*		•	
Fabaceae	*Acacia caesaneura* (narrow phyllode variant)	Fl	•	
Fabaceae	*Acacia caesaneura* x *incurvaneura*	Fl	•	•
Fabaceae	*Acacia craspedocarpa*	Fl	•	•
Fabaceae	*Acacia craspedocarpa* (hybrid)	Fl	•	
Fabaceae	*Acacia grasbyi*		•	
Fabaceae	*Acacia incurvaneura*	Fl	•	
Fabaceae	*Acacia pruinocarpa*	Fr	•	
Fabaceae	*Acacia pteraneura*		•	
Fabaceae	*Acacia quadrimarginea*		•	
Fabaceae	*Acacia ramulosa*		•	
Fabaceae	*Acacia ramulosa* var. *linophylla*	Fl	•	•
Fabaceae	*Acacia ramulosa* var. *ramulosa*	Fl	•	•
Fabaceae	***Acacia speckii* (P4)**	Fl	•	•
Fabaceae	*Acacia tetragonophylla*		•	
Fabaceae	*Glycine canescens*		•	
Fabaceae	*Senna artemisioides* subsp. *helmsii*		•	
Fabaceae	*Senna glaucifolia*		•	
Geraniaceae	*Erodium cygnorum*	FlFr	•	
Goodeniaceae	*Goodenia rosea*	Fl	•	
Goodeniaceae	*Scaevola spinescens*		•	•
Lamiaceae	*Hemigenia* sp. Yalgoo (A.M. Ashby 2624)	Fl	•	
Lamiaceae	*Teucrium teucriiflorum*		•	
Malvaceae	*Abutilon cryptopetalum*		•	

Family	Taxa	FlFr	Relevé	OppColl
Malvaceae	*Abutilon otocarpum*		•	
Malvaceae	***Hibiscus burtonii* (RE)**		•	
Malvaceae	*Hibiscus* sp. Gardneri (A.L. Payne PRP 1435)		•	
Malvaceae	*Sida* ?sp. Excedentifolia (J.L. Egan 1925)		•	
Malvaceae	*Sida ectogama*	FlFr	•	
Malvaceae	***Sida picklesiana* (P3)**	Fl	•	
Malvaceae	*Sida* sp. dark green fruits (S. van Leeuwen 2260)	Fl	•	
Malvaceae	*Sida* sp. Golden calyces glabrous (H.N. Foote 32)	Fl	•	
Malvaceae	***Sida* sp. L (A.M. Ashby 4202) (RE)**	FlFr	•	
Myrtaceae	*Calytrix amethystina*		•	
Myrtaceae	*Calytrix erosipetala*			•
Myrtaceae	*Thryptomene decussata*		•	•
Phrymaceae	*Peplidium* sp. C Evol. Fl. Fauna Arid Aust. (N.T. Burbidge & A. Kanis 8158)	Fl		•
Phyllanthaceae	***Phyllanthus maderaspatensis* (RE)**	Fr	•	
Poaceae	*Eriachne* aff. *helmsii*		•	
Poaceae	*Eriachne mucronata*		•	
Poaceae	*Monachather paradoxus*		•	
Poaceae	*Paspalidium basicladum*	FlFr	•	
Poaceae	*Tripogonella loliiformis*	FlFr	•	
Portulacaceae	*Calandrinia eremaea*		•	
Portulacaceae	*Calandrinia* sp. indet.	Fl	•	
Portulacaceae	*Portulaca oleracea*		•	
Proteaceae	*Grevillea berryana*	Fr	•	
Proteaceae	*Hakea preissii*		•	
Pteridaceae	*Cheilanthes sieberi* subsp. *sieberi*		•	
Rubiaceae	*Psydrax latifolia*		•	
Rubiaceae	*Psydrax rigidula*		•	
Rubiaceae	*Psydrax suaveolens*	Fl	•	•
Rutaceae	***Drummondita miniata* (P3)**		•	
Rutaceae	***Philotheca brucei* (RE)**		•	
Santalaceae	*Exocarpos aphyllus*		•	
Sapindaceae	***Dodonaea amplisemina* (P4)**		•	•
Scrophulariaceae	***Eremophila compacta* (RE)**		•	
Scrophulariaceae	*Eremophila exilifolia*	Fl	•	•
Scrophulariaceae	*Eremophila foliosissima*	Fl	•	•
Scrophulariaceae	*Eremophila forrestii* subsp. *forrestii*	Fl	•	•
Scrophulariaceae	*Eremophila galeata*		•	
Scrophulariaceae	*Eremophila glabra* subsp. *glabra*			•
Scrophulariaceae	*Eremophila glutinosa*	Fl	•	
Scrophulariaceae	*Eremophila jucunda* subsp. *jucunda*	Fl	•	
Scrophulariaceae	*Eremophila lachnocalyx*		•	
Scrophulariaceae	*Eremophila latrobei*		•	
Scrophulariaceae	*Eremophila latrobei* subsp. *latrobei*		•	
Scrophulariaceae	*Eremophila maculata* subsp. *brevifolia*		•	
Scrophulariaceae	*Eremophila oldfieldii* subsp. *angustifolia*			•
Scrophulariaceae	*Eremophila oppositifolia* subsp. *angustifolia*		•	
Scrophulariaceae	*Eremophila platycalyx* subsp. Granites (D.J. Edinger & G. Marsh DJE 4782)	Fr		•
Scrophulariaceae	*Eremophila punicea*	Fl	•	•

Family	Taxa	FlFr	Relevé	OppColl
Scrophulariaceae	*Eremophila simulans* subsp. *simulans*	Fl	•	
Solanaceae	***Nicotiana rotundifolia* (RE)**	Fl	•	
Solanaceae	*Solanum ferocissimum*	Fl		•
Solanaceae	*Solanum lasiophyllum*		•	
Stylidiaceae	*Stylidium longibracteatum*		•	
Zygophyllaceae	*Tribulus astrocarpus*	Fl	•	•

Note: OppColl = opportunistic collection, Fl = flowering material, Fr = fruiting material, P3 – P4 = Priority Three and Priority Four species, * after a species indicates a weed species, RE = range extension, subsp. = subspecies, var. = variety, sp. = species. ? = query species, indet. = indeterminate. Nomenclature based on current WA Herbarium terminology and confirmed on FloraBase (WAH, 1998-).

APPENDIX 7: CONSERVATION SIGNIFICANT FLORA PHOTOGRAPHS

Table 23: Photographs of conservation significant flora

***Drummondita miniata* (P3)**	
	
***Sida picklesiana* (P3)**	
	
***Acacia speckii* (P4)**	
	

Dodonaea amplisemina (P4)	
	

Note: P3 – P4 = Priority 3 and Priority 4 species. Photographs taken by Maia ©.

APPENDIX 8: SPECIES BY VEGETATION TYPE MATRIX

Table 24: Species and vegetation type matrix

Taxa	AaTSSL	ATOSL	ATSSL (1)	ATSSL (2)	ATSSL (3)	MLSSL
Abutilon cryptopetalum			■		■	
Abutilon otocarpum			■		■	
Acacia aptaneura	■	■	■	■	■	■
Acacia aulacophylla					■	■
Acacia caesaneura			■	■	■	
Acacia caesaneura (narrow phyllode variant)		■	■	■	■	■
Acacia caesaneura x *incurvaneura*	■	■	■	■	■	■
Acacia craspedocarpa		■	■	■	■	■
Acacia craspedocarpa (hybrid)	■	■	■	■	■	
Acacia grasbyi				■		■
Acacia incurvaneura	■	■	■	■	■	
Acacia pruinocarpa		■	■	■	■	
Acacia pteraneura		■	■	■	■	■
Acacia quadrimarginea		■	■	■	■	■
Acacia ramulosa			■		■	
Acacia ramulosa var. *linophylla*			■	■	■	■
Acacia ramulosa var. *ramulosa*	■	■	■	■	■	■
***Acacia speckii* (P4)**				■		■
Acacia tetragonophylla			■	■	■	■
Calandrinia eremaea					■	
Calandrinia sp. indet.			■	■	■	
Calytrix amethystina				■		■
***Centipeda minima* (RE)**			■		■	
Centipeda thespidioides			■	■	■	
Cheilanthes sieberi subsp. *sieberi*			■	■	■	■
Citrullus amarus*			■		■	
***Dodonaea amplisemina* (P4)**				■		■
***Drummondita miniata* (P3)**	■				■	■
***Enchylaena tomentosa* (RE)**		■	■	■	■	■
***Eremophila compacta* (RE)**				■		■
Eremophila exilifolia			■	■	■	■
Eremophila foliosissima			■		■	
Eremophila forrestii subsp. *forrestii*		■	■	■	■	■
Eremophila galeata			■	■	■	■
Eremophila glutinosa					■	
Eremophila jucunda subsp. *jucunda*			■		■	
Eremophila lachnocalyx	■	■	■	■	■	■
Eremophila latrobei		■	■		■	
Eremophila latrobei subsp. *latrobei*			■	■	■	■
Eremophila maculata subsp. *brevifolia*				■		■
Eremophila oppositifolia subsp. *angustifolia*				■		■
Eremophila punicea			■	■	■	■
Eremophila simulans subsp. *simulans*	■	■	■	■	■	■
Eriachne aff. *helmsii*					■	
Eriachne mucronata				■	■	■
Erodium cygnorum	■	■	■	■	■	■
Euphorbia drummondii		■	■	■	■	

Taxa	AaTSSL	ATOSL	ATSSL (1)	ATSSL (2)	ATSSL (3)	MLSSL
Exocarpos aphyllus						
Glycine canescens						
Goodenia rosea						
Grevillea berryana						
Hakea preissii						
Hemigenia sp. Yalgoo (A.M. Ashby 2624)						
***Hibiscus burtonii* (RE)**						
Hibiscus sp. Gardneri (A.L. Payne PRP 1435)						
Leichhardtia australis						
Maireana georgei						
Maireana triptera						
Maireana villosa						
Monachather paradoxus						
***Nicotiana rotundifolia* (RE)**						
Paspalidium basicladum						
***Philotheca brucei* (RE)**						
***Phyllanthus maderaspatensis* (RE)**						
Portulaca oleracea						
Psydrax latifolia						
Psydrax rigidula						
Psydrax suaveolens						
Ptilotus aervoides						
Ptilotus exaltatus						
Ptilotus obovatus						
Ptilotus schwartzii						
Rhagodia eremaea						
***Salicornia quinqueflora* (RE)**						
Scaevola spinescens						
Schoenus variicellae						
***Sclerolaena ?cornishiana* (RE)**						
Senna artemisioides subsp. *helmsii*						
Senna glaucifolia						
Sida ?sp. Excedentifolia (J.L. Egan 1925)						
Sida ectogama						
***Sida picklesiana* (P3)**						
Sida sp. dark green fruits (S. van Leeuwen 2260)						
Sida sp. Golden calyces glabrous (H.N. Foote 32)						
***Sida* sp. L (A.M. Ashby 4202) (RE)**						
Solanum lasiophyllum						
Stylidium longibracteatum						
Teucrium teucriiflorum						
Thryptomene decussata						
Tribulus astrocarpus						
Tripogonella loliiformis						
Vincetoxicum lineare						
Wurmbea densiflora						

Note: P3 – P4 = Priority Three and Priority Four species, * after a species indicates a weed species, RE = range extension, subsp. = subspecies, var. = variety, sp. = species. ? = query species, indet. = indeterminate. Nomenclature based on current WA Herbarium terminology and confirmed on FloraBase (WAH, 1998-). Species listed are those recorded in quadrats; the list does not include opportunistic collections.