M2G Offset – Williamsdale, NSW

Biodiversity Offset Monitoring Report

Final 01 – 2 April 2025
Prepared for Icon Water

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Acknowledgements

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- Portia Condell, Senior Land and Weeds Management Officer, Icon Water

We acknowledge the Traditional Custodians of the land on which we work. We pay our respects to Elders past and present.

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1 Introduction

Capital Ecology Pty Ltd (Capital Ecology) has been commissioned to complete the necessary biodiversity surveys and prepare this biennial Monitoring Report to assess the condition of the Murrumbidgee to Googong Water Transfer Project (M2G) offset site over time and inform ongoing management and rehabilitation works.

1.1 Background

The M2G was approved in 2010 under the joint jurisdiction of the Commonwealth Department of Climate Change, Energy, the Environment and Water (previously, Department of Sustainability, Environment, Water, Population and Communities), NSW Department of Planning, and the ACT Planning and Land Authority. As a condition of approval, Icon Water (formerly ACTEW Water) was required to establish an offset site to provide compensation for loss of habitat due to construction of the M2G pipeline.

1.2 Previous monitoring

As required under Condition 2.9b of the NSW Approval and Condition 3.1 of the Commonwealth Approval[1] for the M2G Project, the offset site must be managed and monitored according to the Offset Delivery Plan[2] (ODP).

Monitoring has been undertaken by Eco Logical Australia Pty Ltd (ELA) since the offset site was established, initially biannually from 2011 to 2015 (autumn and spring), and then biennially from 2016 to 2022 (spring) (ELA 2022[3]).

In 2024, Capital Ecology was commissioned to complete the biannual monitoring. Accordingly, Capital Ecology has undertaken the monitoring according to the methodology stipulated in the ODP and the previous monitoring by ELA. It is important to note that the raw data, mapping and photographs from ELA's previous monitoring sessions were not available for Capital Ecology's 2024 monitoring. We have therefore used what was available from previous reports to allow for comparison, however this has somewhat limited our ability to assess changes over time.

1.3 The Subject Land and Study Area

The subject land for this report is located just south of Williamsdale and north of the NSW border (Tuggeranong Block 1675), hereafter referred to as the Williamsdale property or 'the property' (see Figure 1 and Figure 2). The entire property is approximately 208 ha and is bordered by:

- the Monaro Highway to the east;
- the NSW border and private rural property to the south;
- Gigerline Nature Reserve and the Murrumbidgee River corridor to the west; and
- Angle Crossing Road and the Williamsdale Solar Farm to the north.

[1] EPBC 2009/5124

[2] https://www.iconwater.com.au/sites/default/files/2023-10/Murrumbidgee-Googong-Water-Transfer-Offset-Delivery-Plan-2021.pdf

[3] Eco Logical Australia 2022. M2G Offset Monitoring Report – Spring 2022. Prepared for Icon Water

The property is divided into several areas, as shown in Figure 2.

- The M2G offset – northern and southern offsets (the 'study area')
- Transgrid Substation.
- Transgrid Offset.
- ActewAGL Offset.

This monitoring report assesses only the M2G offset, which consists of the northern and southern offset areas (64.6 ha and 46.9 ha, respectively). The 'study area' for this report is therefore approximately 111.5 ha (see Figure 2).

1.4 Survey Overview

The following surveys were undertaken by Capital Ecology between 9 October 2024 and 10 December 2024.

- Vegetation monitoring plots.
- Flora surveys via random meander, surveys of rocky areas, and opportunistic observations.
- Bird surveys via area searches and opportunistic observations.
- Fauna habitat assessment.
- *Swainsona recta* translocation site monitoring.
- Weed monitoring.
- Erosion point monitoring.
- Revegetation survival monitoring.

1.4.1 Technical resources and qualifications

This report has been prepared by the following technical personnel.

- Robert Speirs – Director / Principal Ecologist

  BAppSc (Ecology), DipPM, MEIANZ, CEnvP-E, Accredited BAM Assessor (No: BAAS17089)
  Robert was project director for this assessment and closely supervised all field surveys, data entry, GIS mapping, and report preparation.

- Dr Catherine Ross – Consultant Ecologist

  BSc (Hons), PhD
  Catherine was project manager for this assessment and completed or closely supervised all field surveys, data entry, GIS mapping, and report preparation.

- Dr Sam Reid – Senior Ecologist

  BSc (Hons), PhD, Accredited BAM Assessor (No: BAAS20006)
  Sam undertook report review.

- Jarmin Thornberry – Consultant Ecologist

BEnvSc&Mgt, Accredited BAM Assessor (No: BAAS24044)
Jarmin undertook field surveys.

- Lucy Wenger – Consultant Ecologist

  PhB (Science) (Hons)
  Lucy undertook field surveys.

- Pia Cunningham – Field Ecologist

  BSc
  Pia undertook field surveys.

All surveys for this assessment were undertaken in accordance with the following.

- Capital Ecology's (Robert Speirs – Principal Investigator) Animal Research Authority (ARA) granted under the NSW *Animal Research Act 1985* by the Animal Care and Ethics Committee of the Secretary of the Department of Regional NSW (CSB 15/2046).
- Capital Ecology's NSW Scientific Licence issued by the NSW Department of Climate Change, Energy, the Environment, and Water under Part 2 of the NSW *Biodiversity Conservation Act 2016* (SL101623).

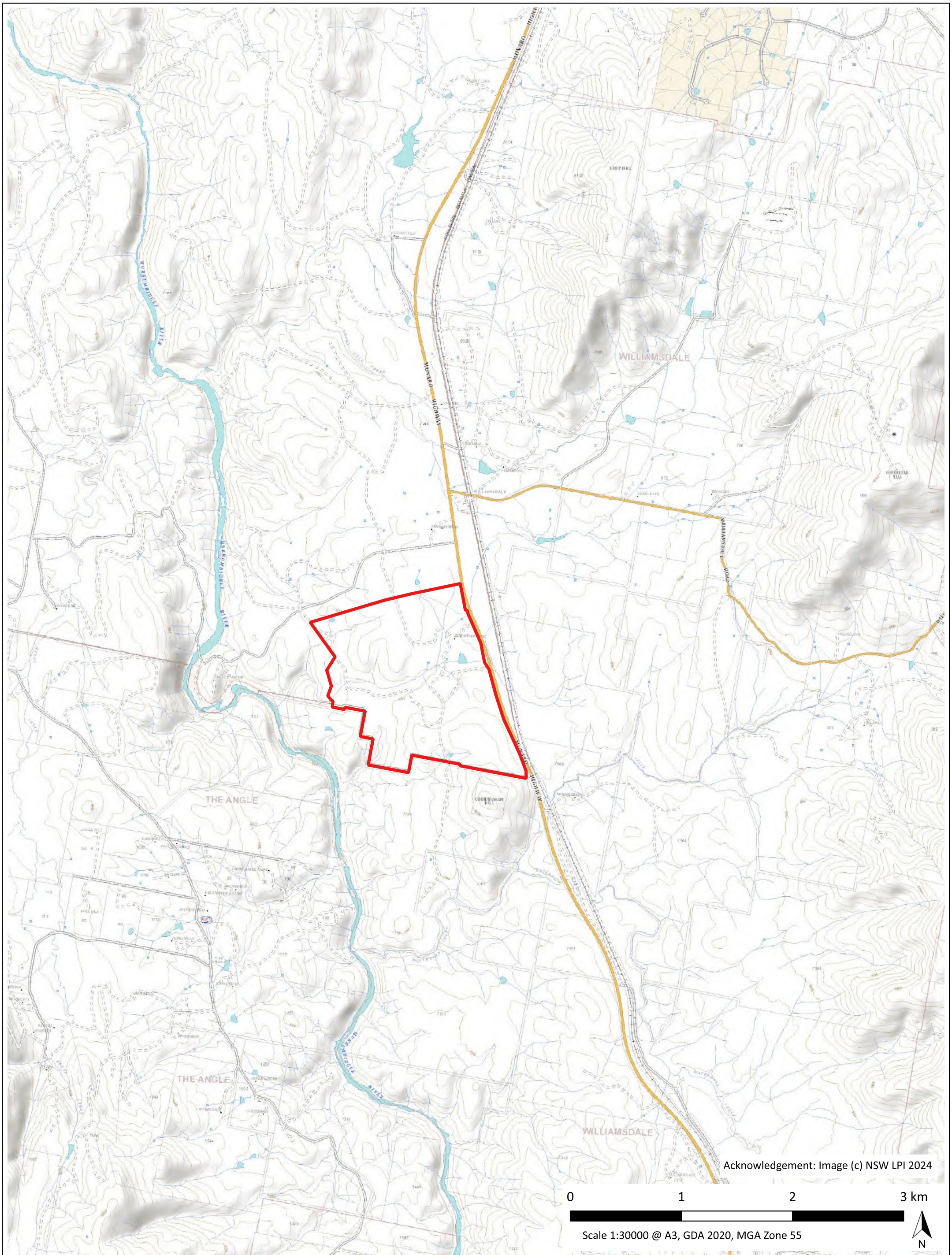

Figure 1. Locality Plan

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Drawn by: Dr Catherine Ross
Date: 17/03/2025

Legend

Subject Land

3306 Tuggeranong Block 1675

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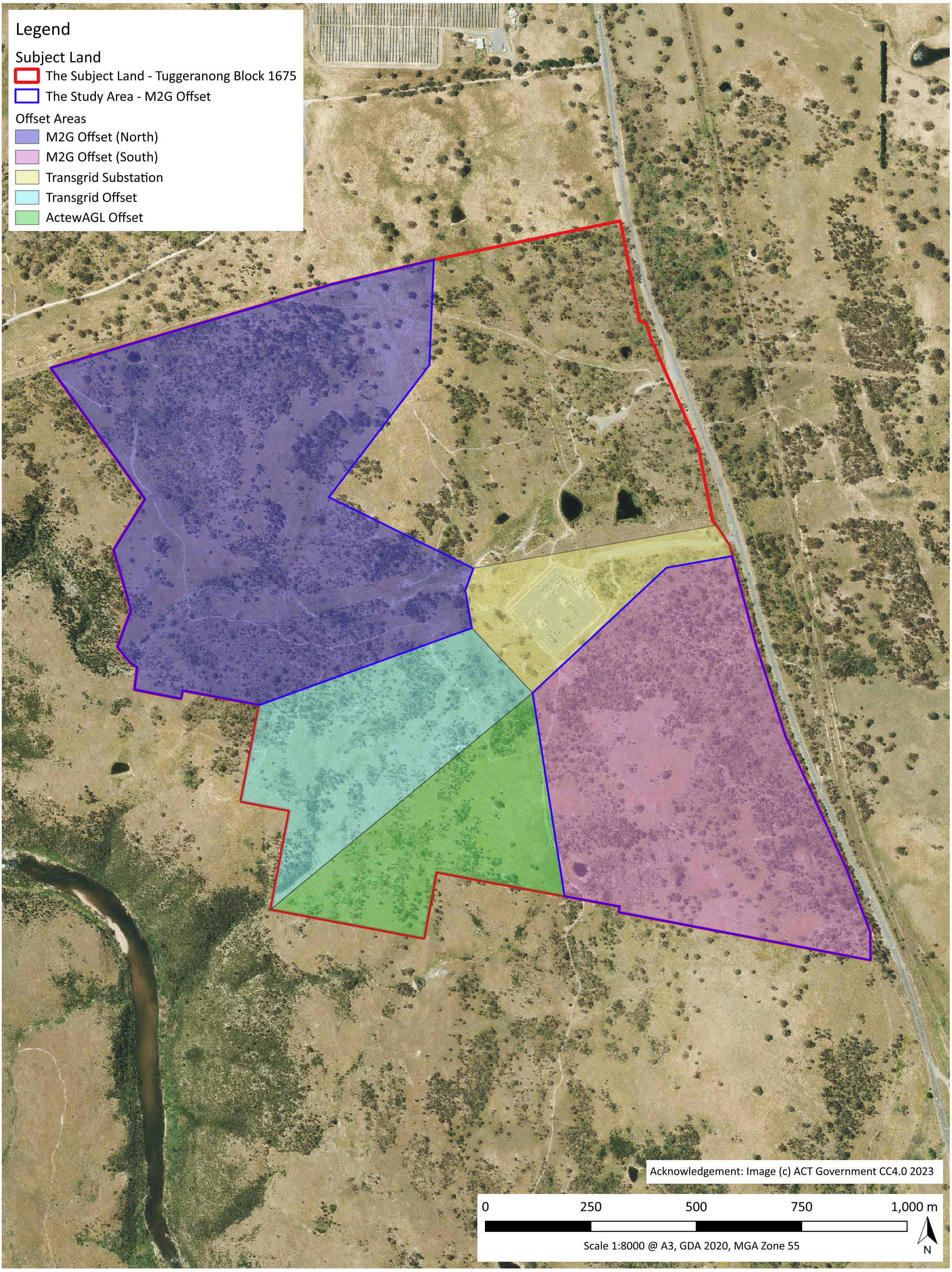

Figure 2. The Property (Subject Land) and M2G Offset Site (Study Area) on Aerial Imagery

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Drawn by: Dr Catherine Ross
Date: 24/03/2025

2 Methodology

The monitoring methodology, summarised below, is described in detail in the ODP and in previous monitoring reports by ELA (see Section 5 for reference list). The surveys undertaken during spring 2024 are summarised in Table 1, along with the survey date and survey effort. The results of the 2024 surveys are detailed in the following sections.

In addition to the below surveys, opportunistic observations of fauna and flora species were taken during field surveys. An inventory of all species identified in the subject land are presented in Appendix C. Maintaining an inventory in this manner ensures that the maximum possible diversity of species is recorded.

Table 1. Survey dates

Task	Method	Date	Personnel	Survey effort
Vegetation Plots	20 x 20 m plot and 50 m transect	10/12/2024	2 people	16 hours
Targeted flora searches	Random meander through likely habitat	15/10/2024	4 people	24 hours
	Opportunistic observations[4]	-	1-4 people	-
Swainsona recta monitoring	Translocation site survey	09/10/2024 29/10/2024	1 person 1 person	1.5 hours 1.5 hours
Bird survey	Point surveys	29/10/2024	2 people	6 hours
	Opportunistic observations[2]	-	1-4 people	-
Fauna habitat assessment	Random meander[5]	15/10/2024	4 people	24 hours
Weed monitoring	Random meander[3]	15/10/2024	4 people	24 hours
Revegetation plantings monitoring	Random sample	29/10/2024	2 people	4 hours
Erosion point monitoring	Photo point comparison	29/10/2024	2 people	4 hours

2.1 Vegetation and Flora Monitoring

2.1.1 Vegetation Monitoring Plots

Eight permanent monitoring plots were established in 2011 and 2012. The locations of the plots are shown in Figure 3.

The monitoring methodology was adapted from the NSW Biobanking method. Each plot consists of a 20 x 20 m quadrat and a 50 m transect, described in detail below. The plots are permanently marked using a star picket at each corner of the quadrat, and an additional star picket marking the end of the transect.

[4] During all other surveys.
[5] Concurrently with flora surveys.

The purpose of the vegetation plots is to monitor the condition of the vegetation over time and the effect of management actions undertaken in the offset site. Two of the eight plots were designed to act as controls, to monitor changes in the vegetation over time due to natural variation in climate etc. These plots were located in high quality Box-Gum Woodland with no high threat weeds at the time of establishment. Where possible, management actions would be avoided in these plots (apart from site-level actions such as feral animal control and the removal of noxious weeds).

Floristic quadrats

The quadrats are intended to collect floristic data including:

- native and exotic species diversity;
- cover abundance of all species; and
- identify any rare or threatened flora.

Each quadrat is surveyed by an ecologist walking in parallel transects 2 m apart. Each flora species in the quadrat is recorded and assigned a score using the Braun-Blanquet scale (Table 2), which indicates the estimated cover and abundance of each species.

Table 2. Braun-Blanquet cover/abundance scores

Score	Description
1	< 5 % cover and solitary (< 4 individuals)
2	< 5 % cover and few (4-15 individuals)
3	< 5 % cover and numerous (> 15 individuals)
4	5 % - < 25 % cover
5	25 % - < 50% cover
6	50 % - < 75 % cover
7	75 % cover or greater

Point transects

A 50 m transect was established at each of the monitoring plots to compliment the floristic quadrat surveys and to determine the projective foliage cover of various structural components of the community. Each transect was referenced using a GPS device and three photos were taken from the start of the transect (left side, centre, and right side). The 50 m transect was surveyed as follows.

- At every 1 m along the 50 m tape, the understorey layer was assessed (50 survey points per transect). The understorey cover at each point was classified as one of the following.
    - Bare ground/Rock.
    - Litter.
    - Cryptogam.
    - Native grass.
    - Native other.
    - Exotic.

    For each category the number of points is then doubled to give a percentage cover for the whole plot.
- At every 5 m along the 50 m tape, the percentage foliage cover of native and exotic species in the overstorey and midstorey were recorded (10 survey points per transect). The cover values for each group are averaged to provide a percentage cover for the whole plot.

2.1.2 Flora Survey

Previous monitoring has identified a number of threatened or 'rare and uncommon' flora species across the offset site. However, a number of these species have not been recorded for several years.

Targeted flora surveys were therefore conducted across the study area. The survey involved four ecologists walking transects approximately 50-100 m apart, and searching areas where significant species had been recorded in previous years (totalling 24 hours of effective survey effort). When detected, significant species were recorded via a GPS waypoint, and where possible the following information was collected.

- Population numbers.
- Evidence of recruitment.
- Potential threats such as grazing and weed competition.

2.2 Fauna Monitoring

2.2.1 Bird Survey

A quantitative bird survey methodology was established in spring 2015 and has been undertaken during each reporting period since then. Bird species had been recorded opportunistically prior to this, and a full list of all species recorded in the offset is available in previous ELA reports.

The bird survey methodology is designed to provide information on both species richness and abundance. The survey is undertaken along two 500 m transects, one in each of the northern and southern offset sites. The transects are located in areas of suitable habitat and consist of five points located approximately 100 m apart (Figure 4).

At each point along the transect the abundance and species richness of bird species were surveyed in a circle with a 50 m radius over a 10-minute survey period (total of 50 minutes per transect, which covers an area of 0.07 ha). Any other species observed during the survey period either outside of 50 m circle, flying over the site, or between points was recorded as opportunistic.

2.2.2 Fauna habitat assessment

A number of fauna habitat features were recorded within each 20 m x 50 m vegetation monitoring plot, including the number of hollow-bearing trees, length of fallen logs (greater than 10 cm width), and other habitat features such as surface rock.

A qualitative assessment of fauna habitat features across the two offset sites was undertaken concurrently with the targeted flora survey. This assessment involved noting the presence and relative abundance of various habitat features (large, dead, or hollow-bearing trees, fallen timber, litter, surface or outcropping rocks, termite mounds, mistletoe, natural regeneration, and exotic or native shrub thickets). The following categories were used to indicate the relative abundance of each feature.

- Abundant = feature occurs in an almost continuous manner.
- Common = feature encountered commonly, i.e. without having to search for it.
- Occasional = feature occurs in more than a few cases, but not encountered frequently.
- Rare = feature observed very infrequently, one to a few cases at most.

2.3 *Swainsona recta* monitoring

A Small Purple-pea *Swainsona recta* propagation and translocation program was carried out in 2012 and 2013. The trial program was designed to test different propagation and translocation methods and measured survival of individuals from various source populations.

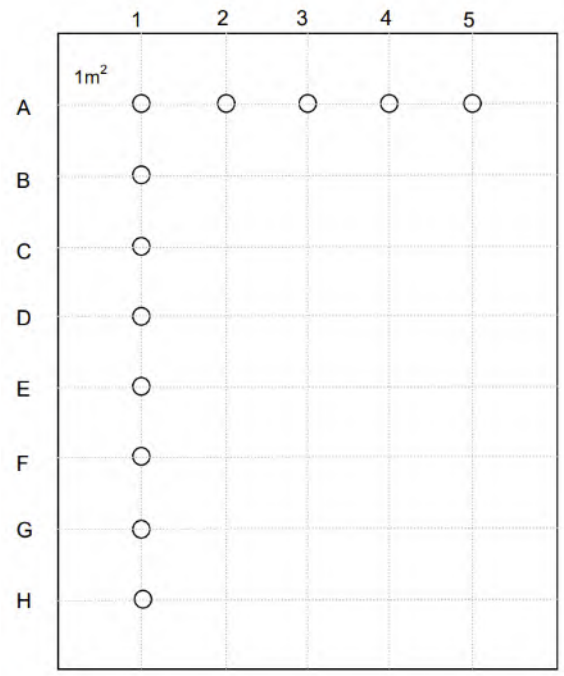
Three translocation plots were established in the southern offset, with locations shown in Figure 4. A total of 112 individuals were planted across the three plots, of which 66 were translocated in June 2012 and a further 46 translocated in September 2013.

Individuals were sourced from three population (Mt. Taylor, Williamsdale, and Burra) and propagated in containers filled with either standard nursery potting mix or a 1:1 mix of potting mix and local soil from the source population.

Each plot could accommodate up to 40 plants, with individuals planted at one metre spacing in a grid format (8 x 5 plants). The plots were fenced to exclude rabbits, kangaroos, and other grazing animals.

Each year, the translocation plots are surveyed during the peak flowering period (October / November) and each individual plant is assessed for survival and reproductive status (flowers and/or seeds). In addition, the plots are searched for any signs of recruitment.

Timing for the spring 2024 survey was determined by confirming flowering at a nearby reference population (i.e. the Williamsdale railway corridor). An additional survey was completed several weeks later as the first survey recorded very low numbers.



***Swainsona recta* translocation plot design.**

2.4 Weed monitoring

The management of weeds within the M2G offset is undertaken in accordance with the Weed Monitoring Sub-Plan. The Sub-Plan outlines the weed management activities to be undertaken to satisfy relevant approval conditions and commitments. As an action under the Sub-Plan, the monitoring of weeds within the offset is required on a biannual basis to incorporate the seasonal changes in weed abundance and weed control activities.

Weed monitoring in spring 2024 was undertaken concurrently with the targeted flora survey and fauna habitat assessment, as well as opportunistically during all other surveys.

2.5 Revegetation survival monitoring

Six revegetation sites within the subject land have been planted with a mix of native trees and shrubs to enhance habitat value and stabilise soil. The locations of these sites are shown in Figure 4, and Table 3 provides a summary.

Three of the plantings were assessed for survival in spring 2024 (Sites 1, 2, and 3). A sample of plants were randomly selected for assessment, recording the genus and condition (alive or dead). One hundred plants were assessed in Sites 1 and 2, and 50 plants in Site 3.

Table 3. Revegetation plantings

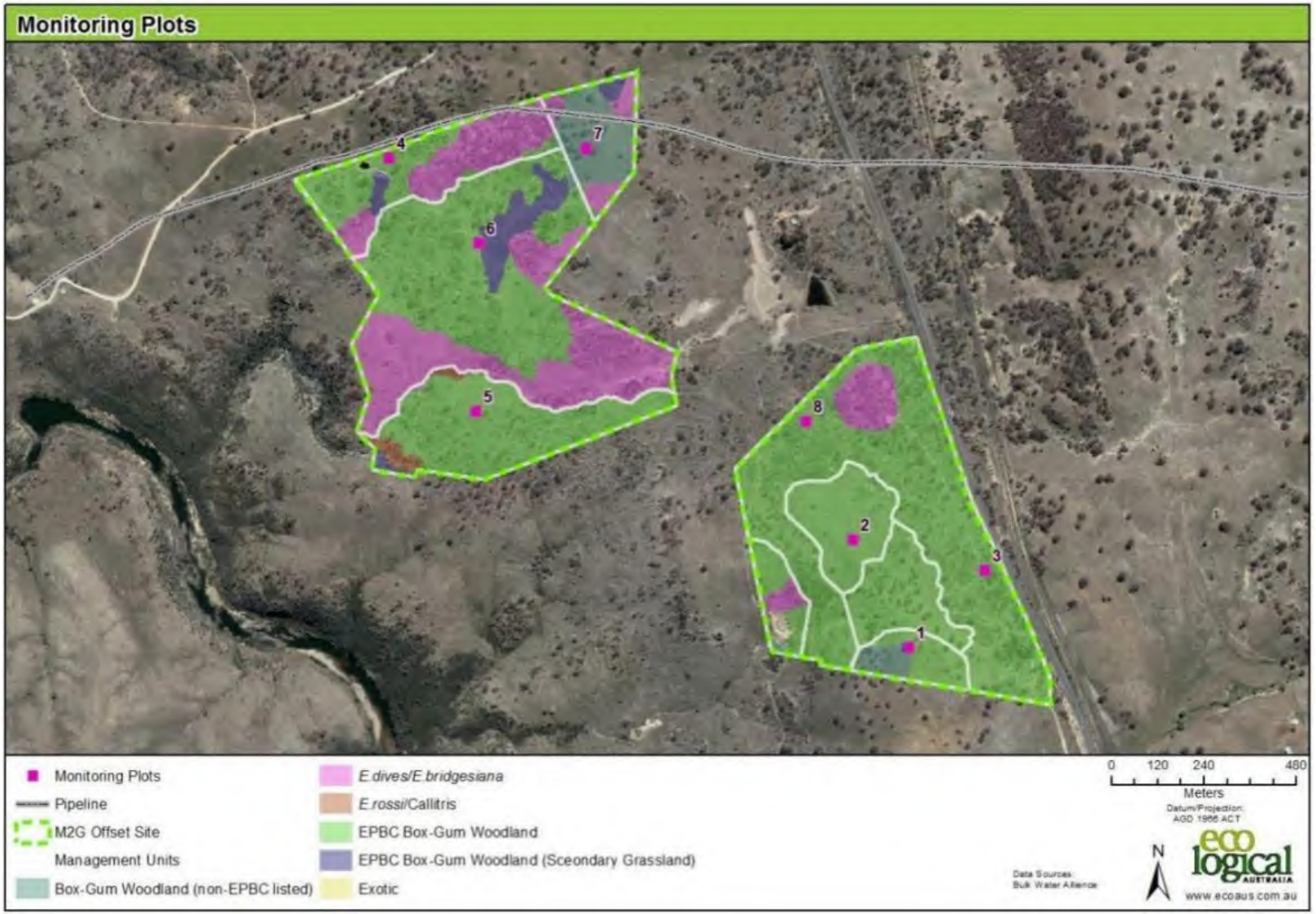
Site	Location	Date	Number of plants	Number of plants assessed
1	Gully in centre of northern offset	Winter 2016	600	100
2	Large gully near Transgrid substation	Winter 2016	1,400	100
3	Small gully under powerlines in northern offset	2023	160	50
4	North-east corner of northern offset (MU7)	2020	214	N/A
5	ActewAGL offset along ACT/NSW border	2020	200	N/A
6	Cunningham Hill in the south of the southern offset (MU1A)	2016 2020	200 30	N/A

2.6 Erosion point monitoring

A number of erosion monitoring points were established during the autumn 2012 monitoring surveys, along the main drainage lines in the offset site. At each point, photos were taken to provide a reference for changes over time, and notes made describing the site and any erosion activity. Over the years, a number of these points have been discontinued as they did not show any further signs of erosion. In 2022, there were six sites remaining which were recommended for continued monitoring. All six sites are located along ephemeral drainage lines in the northern offset (Figure 4).

Monitoring involved relocating the sites using the photos from previous monitoring sessions and assessing any change by comparison with those photos.

Figure 3. Vegetation Mapping and Management Units by Eco Logical (extracted from ELA 2022)



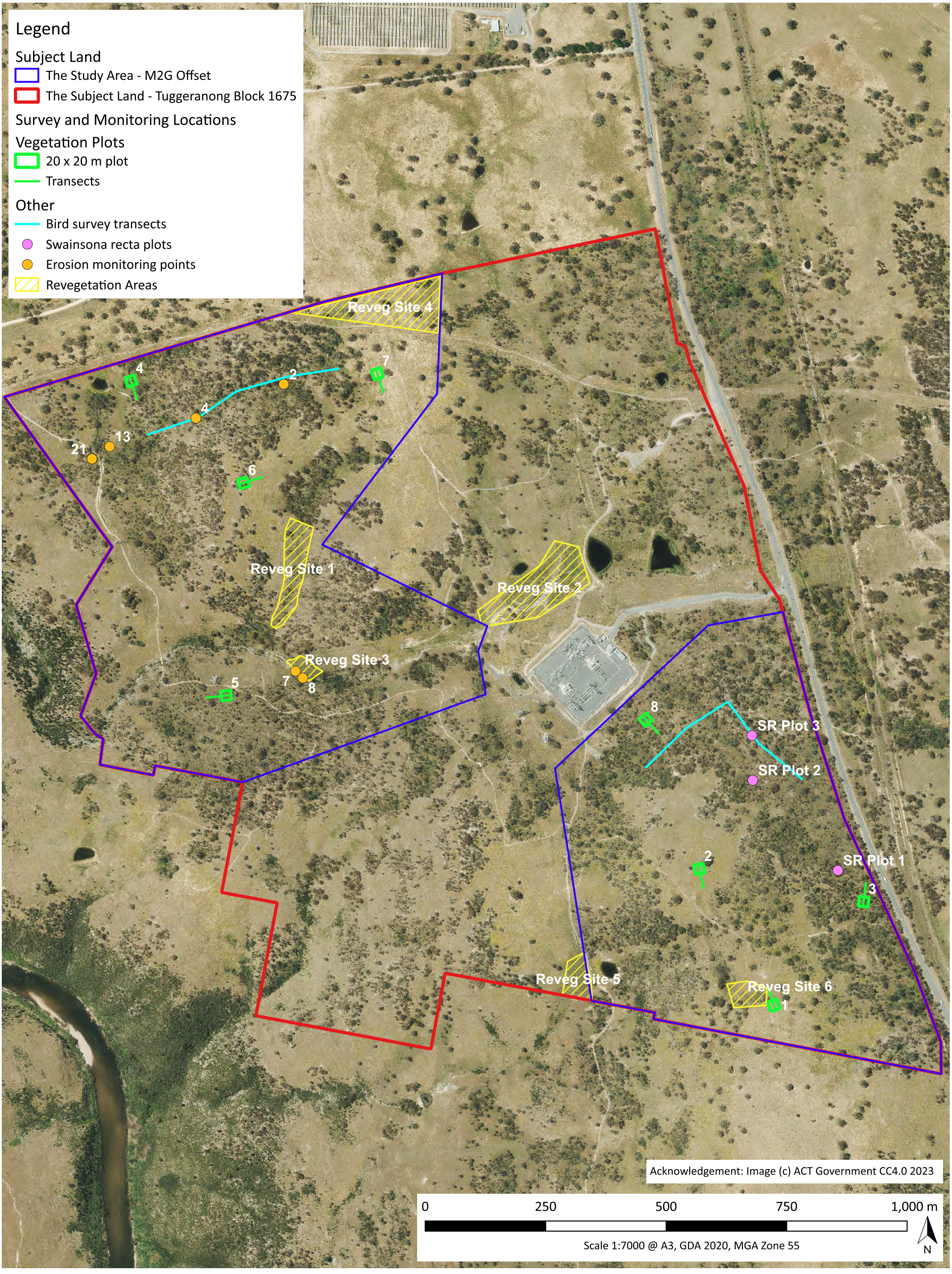


Figure 4. Survey and Monitoring Locations

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Date: 01/04/2025

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3 Results

3.1 Overview

Unlike the previous two monitoring sessions in spring 2020 and 2022, the spring of 2024 experienced much drier conditions. After three consecutive La Niña years, another La Niña event was predicted for spring 2024 but did not eventuate. Canberra Airport and Tuggeranong weather stations received less than half the average rainfall for the months of September-November (BOM 2024[6]). Mean maximum temperatures were also above average for the season.

The most notable differences in vegetation condition between spring 2024 and previous recent sessions, is a reduction in overall groundcover, exotic cover, and species richness. These changes can largely be explained by the seasonal conditions, with any changes due to management likely to be much less apparent.

The results of the spring 2024 monitoring session are presented below, and the raw data is presented in the Appendices.

3.2 Vegetation and Flora Monitoring

3.2.1 Vegetation Plots

Canopy cover was fairly consistent with the 2022 survey. This measure is not expected to change quickly, but most plots had numerous saplings present which will eventually lead to increased canopy cover.

The midstorey is sparse or entirely absent across all plots, and this has not changed since baseline levels. Plantings of native shrubs at several sites in the offset will contribute to restoration of the midstorey layer, but further plantings could be considered to enhance habitat value for woodland birds.

A total of 101 species were recorded across all plots, consisting of 68 native species and 33 exotic species. Native species richness has remained fairly stable over the years since the offset was established, and the 2024 surveys were consistent with baseline levels (see Figure 7, ELA 2022). Native species richness was lower across all vegetation plots than in 2022 and 2020. This is unsurprising given the much drier conditions, and was also observed consistently across the region.

Exotic species cover has varied widely between years (see Figure 8, ELA 2022). This is also likely due to seasonal conditions, as well as partly due to observed bias as noted in the 2022 report. Exotic cover was much lower in 2024 than the previous survey, as would also be expected during a drier season. However, St John's Wort *Hypericum perforatum* was recorded across all plots at relatively high densities. Blackberry *Rubus fruticosus* and Briar Rose *Rosa rubiginosa* were also widespread, but mostly as small plants regenerating from the seedbank.

The results for each monitoring plot are summarised in Table 4 to Table 11, and the raw data are presented in Appendix A and Appendix D.

[6] http://www.bom.gov.au/climate/current/season/act/archive/202411.summary.shtml

Table 4. Monitoring Plot 1 Summary

Plot 1 - MU1A (Southern Offset)			
Description Box-Gum Woodland derived grassland Native dominant – no canopy – no regen – low diversity Overall condition: Poor	This plot has a history of clearing and disturbance, with an absent canopy and midstorey, and no regeneration present. A low diversity understorey is dominated by Red-leg Grass *Bothriochloa macra*, Weeping Grass *Microlaena stipoides*, and Wallaby Grass *Rytidosperma spp.*, with a relatively high cover of exotic weeds including Paterson's Curse *Echium plantagineum*, St John's Wort *Hypericum perforatum*, Serrated Tussock *Nassella trichotoma*, Saffron Thistle *Carthamus lanatus*, and Spear Thistle *Cirsium vulgare*. The large tree in the left of the image had fallen since the previous survey.		
Habitat features			
Overstorey Species	-	Fallen Logs	0 m
Overstorey Regeneration	no	Litter Cover	2%
Hollow-bearing Trees	no	Other habitat features	Surface rock
Plot statistics	**Baseline**	**Spring 2022**	**Spring 2024**
Native overstorey cover (%)	0	0	0
Native midstorey cover (%)	0	0	0
Exotic midstorey cover (%)	0	0	0
Native grass (%)	40	12	60
Native other (%)	6	16	4
Exotic understorey cover (%)	58	78	24
Native species diversity	14	22	18
Exotic species diversity	-	39	21

Table 5. Monitoring Plot 2 Summary

Plot 2 – MU2B (Southern Offset)			
Description Box-Gum Woodland derived grassland Native dominant – no canopy – regen – high diversity Overall condition: Good	This plot is located on a rocky hilltop in the southern offset. The canopy has been largely cleared, with one large Blakely's Red Gum and scattered regeneration present. The midstorey is mostly absent with scattered Burgan *Kunzea ericoides*. The understorey is dominated by native grasses such as Spear Grasses *Austrostipa spp.*, Kangaroo Grass *Themeda triandra*, Wallaby Grass, Weeping Grass, and Purple Wiregrass *Aristida ramosa*. The plot supports a relatively high diversity of native forbs, although the number of native species has declined since 2022 from 34 to 31. Eighteen exotic species were recorded, including St John's Wort and Sheep's Sorrel *Rumex acetosella*.		
Habitat features			
Overstorey Species	*E. blakelyi*	Fallen Logs	0 m
Overstorey Regeneration	yes	Litter Cover	8%
Hollow-bearing Trees	no	Other habitat features	Surface rock
Plot statistics	**Baseline**	**Spring 2022**	**Spring 2024**
Native overstorey cover (%)	0	1	0
Native midstorey cover (%)	0	3.9	1
Exotic midstorey cover (%)	0	0	0
Native grass (%)	80	38	50
Native other (%)	4	28	16
Exotic understorey cover (%)	6	42	8
Native species diversity	30	34	31
Exotic species diversity	-	26	18

Table 6. Monitoring Plot 3 Summary

Plot 3 – MU3 (Southern Offset)			
Description Box-Gum Woodland Native dominant – canopy – regen – high diversity Overall condition: Good	Plot 3 is located in the southern offset near the Monaro Highway. The remnant canopy is intact, with a high number of Blakely's Red Gum saplings present. The sparse midstorey is dominated by *Cassinia* and Blackthorn *Bursaria spinosa*. The understorey is dominated by Kangaroo Grass, Wallaby Grass, Weeping Grass, and Red-leg Grass, with a high diversity of native forbs including Yellow Rush Lily *Tricoryne elatior*, Narrow Plantain *Plantago gaudichaudiana*, and Scaly Buttons *Leptorhynchos squamatus*. Exotic understorey cover was much lower than the previous survey, at 8% vs 48% in 2022, with only 8 exotic species recorded.		
Habitat features			
Overstorey Species	*E. blakelyi, E. bridgesiana*	Fallen Logs	10 m
Overstorey Regeneration	yes	Litter Cover	26%
Hollow-bearing Trees	no	Other habitat features	-
Plot statistics	**Baseline**	**Spring 2022**	**Spring 2024**
Native overstorey cover (%)	3.7	12.5	12.4
Native midstorey cover (%)	5.2	11	4.5
Exotic midstorey cover (%)	0.2	0.5	0
Native grass (%)	80	42	54
Native other (%)	16	36	8
Exotic understorey cover (%)	10	48	8
Native species diversity	27	36	34
Exotic species diversity	-	-	8

Table 7. Monitoring Plot 4 Summary

Plot 4 – MU4 (Northern Offset)			
Description Box-Gum Woodland Native dominant – canopy – regen – mod-high diversity Overall condition: Good	Plot 4 is located in the northern offset, near a small dam in the north-eastern corner. The canopy is dominated by Blakely's Red Gum, with some regeneration present. The native midstorey is absent. The dominant understorey species include Weeping Grass, Kangaroo Grass, Hairy Panic *Panicum effusum*, Snow Grass *Poa sieberiana*, and Wallaby Grass. The plot supports a moderate-high diversity of forbs, including Hairy Solenogyne *Solenogyne gunnii*, Common Bog-sedge *Shoenus apogon* and Variable Raspwort *Haloragis heterophylla.* While the overall exotic cover is low and only nine exotic species were recorded, this included African Lovegrass *Eragrostis curvula*, St John's Wort, and Briar Rose.		
Habitat features			
Overstorey Species	*E. blakelyi, E. melliodora*	Fallen Logs	12 m
Overstorey Regeneration	yes	Litter Cover	18%
Hollow-bearing Trees	no	Other habitat features	-
Plot statistics	**Baseline**	**Spring 2022**	**Spring 2024**
Native overstorey cover (%)	4.7	11	13.7
Native midstorey cover (%)	11.5	4.2	0
Exotic midstorey cover (%)	2	0	0
Native grass (%)	74	34	54
Native other (%)	18	52	18
Exotic understorey cover (%)	28	46	10
Native species diversity	24	25	24
Exotic species diversity	-	12	9

Table 8. Monitoring Plot 5 Summary

Plot 5 – MU5 (Northern Offset)			
Description Box-Gum Woodland Native dominant – canopy – regen – mod-high diversity Overall condition: Good	Plot 5 is located just south of the powerlines in the south of the northern offset. The canopy is dominated by Blakely's Red Gum, with some regeneration present. The plot contains a sparse midstorey of Bursaria and Cassinia, and several subshrubs including Bitter Cryptandra *Cryptandra amara* and Urn Heath *Melichrus urceolata.* The understorey is dominated by Weeping Grass, Kangaroo Grass, Snow Grass, and Wallaby Grass, with a moderate-high diversity of native forbs. The exotic cover remains low; however, St John's Wort is present at >5% cover, along with low cover of Briar Rose and Blackberry.		
Habitat features			
Overstorey Species	*E. blakelyi*	Fallen Logs	8 m
Overstorey Regeneration	yes	Litter Cover	14%
Hollow-bearing Trees	no	Other habitat features	-
Plot statistics	**Baseline**	**Spring 2022**	**Spring 2024**
Native overstorey cover (%)	0	11	10.5
Native midstorey cover (%)	11	14.5	7
Exotic midstorey cover (%)	0	0	0
Native grass (%)	76	54	60
Native other (%)	14	18	18
Exotic understorey cover (%)	4	0	6
Native species diversity	29	35	27
Exotic species diversity	-	15	11

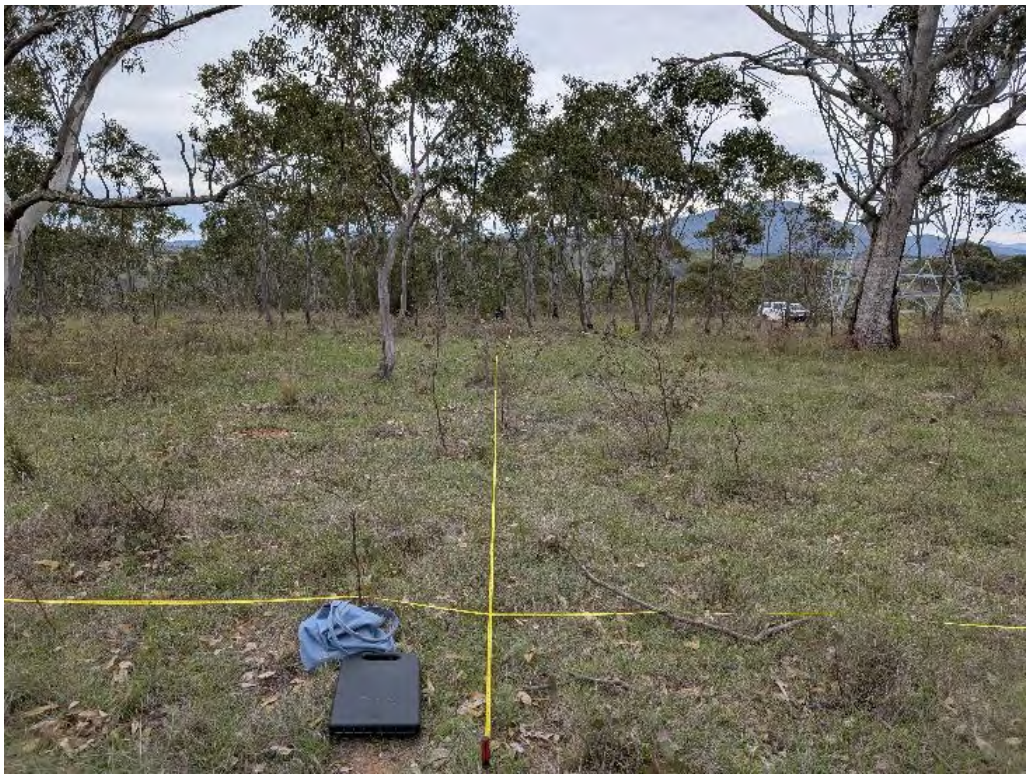

Table 9. Monitoring Plot 6 Summary

Plot 6 – MU6 (Northern Offset)			
Description Box-Gum Woodland/Derived Grassland Native dominant – canopy – regen – mod-high diversity Overall condition: Moderate	Plot 6 is one of the two control plots, and is located in MU6 on the boundary between Box-Gum Woodland and derived grassland. The canopy consists of Blakely's Red Gum with scattered regeneration present. The midstorey is absent. The understorey is dominated by Spear Grasses *Austrostipa scabra* and *Austrostipa bigeniculata,* with Wallaby Grasses and Hairy Panic. Cover and diversity of exotic species is relatively high in this plot, with a high cover of St John's Wort.		
Habitat features			
Overstorey Species	*E. blakelyi*	Fallen Logs	0 m
Overstorey Regeneration	yes	Litter Cover	8%
Hollow-bearing Trees	no	Other habitat features	-
Plot statistics	**Baseline**	**Spring 2022**	**Spring 2024**
Native overstorey cover (%)	5.3	5	3.2
Native midstorey cover (%)	0	1.3	0
Exotic midstorey cover (%)	0	0	0
Native grass (%)	80	28	54
Native other (%)	10	28	12
Exotic understorey cover (%)	8	66	22
Native species diversity	28	30	29
Exotic species diversity	-	-	18

Table 10. Monitoring Plot 7 Summary

Plot 7 – MU7 (Northern Offset)			
Description Box-Gum Woodland Native dominant – canopy – regen – low diversity Overall condition: Poor	This plot consists of degraded Box-Gum Woodland. The canopy has been partly cleared and there is no regeneration. The midstorey has also been cleared. This plot has the lowest native species diversity of any plot with 14 species, all of which are disturbance tolerant species such as Austral Rush *Juncus australis,* Common Lovegrass *Eragrostis brownii,* and Weeping Grass. Twenty-two exotic species were recorded, with the dominant species being Brome Grass *Bromus sp*. and Clover *Trifolium sp.*		
Habitat features			
Overstorey Species	*E. melliodora*	Fallen Logs	0 m
Overstorey Regeneration	no	Litter Cover	4%
Hollow-bearing Trees	no	Other habitat features	-
Plot statistics	**Baseline**	**Spring 2022**	**Spring 2024**
Native overstorey cover (%)	0	1	0.5
Native midstorey cover (%)	0	0	0
Exotic midstorey cover (%)	0	0	0
Native grass (%)	74	24	56
Native other (%)	0	16	18
Exotic understorey cover (%)	0	86	10
Native species diversity	13	16	14
Exotic species diversity	-	-	22

Table 11. Monitoring Plot 8 Summary

Plot 8 – MU8 (Southern Offset)			
Description Box-Gum Woodland Native dominant – canopy – regen – moderate diversity Overall condition: Good	Plot 8 is a control plot located in the southern offset near the Transgrid substation. The canopy is dominated by Blakely's Red Gum with numerous saplings present, however the midstorey is absent. The native understorey is dominated by Kangaroo Grass, Purple Wiregrass and Red-leg Grass. Common Raspwort *Gonocarpus tetragynus* and Variable Raspwort are common in the understorey. The endangered Hoary Sunray *Leucochrysum albicans* was also recorded in this plot, and is common in the surrounding area. Exotic cover and diversity have declined significantly since the previous survey, with only seven species recorded. A small amount of African Lovegrass and Briar Rose were recorded in this plot.		
Habitat features			
Overstorey Species	*E. blakelyi*	Fallen Logs	15 m
Overstorey Regeneration	yes	Litter Cover	38%
Hollow-bearing Trees	no	Other habitat features	-
Plot statistics	**Baseline**	**Spring 2022**	**Spring 2024**
Native overstorey cover (%)	0	9	10
Native midstorey cover (%)	8.5	5.3	0
Exotic midstorey cover (%)	0	0	0
Native grass (%)	80	40	56
Native other (%)	14	38	6
Exotic understorey cover (%)	4	44	0
Native species diversity	26	38	26
Exotic species diversity	-	20	7

3.2.2 Flora Survey

A total of 117 flora species (82 native and 35 exotic) were recorded across the study area, during the flora survey, vegetation, and opportunistic records.

Previously, four threatened flora species and 12 'rare and uncommon' species had been identified within the offset area. These species are listed in Table 12, along with the year they were last recorded (if known). The 2024 survey located all threatened species and five of the twelve rare species. Since the previous report, the ACT 'rare and uncommon' list has been updated and replaced by the 'Protected native species list'[7]. As such, the status of some species has changes, and we have added several species which are either listed as protected or are relatively rare in the region and, to the best of our knowledge, had not been recorded previously. The survey tracks and locations of significant plants are shown in Figure 5.

Hoary Sunray *Leucochrysum albicans* and Silky Swainson-pea *Swainsona sericea* were recorded in large numbers across the offset site, with population clusters of up to 500 plants. The populations of Australian Anchor Plant *Discaria pubescens*, Pale Pomaderris *Pomaderris pallida*, and *Dillwynia sp. Yetholme,* which were not recorded in the 2022 survey, were relocated and appear to be increasing in number with evidence of recruitment. A new location for Zornia *Zornia dyctiocarpa* was recorded, with a population of around 20 plants.

Small Purple-pea has not been recorded outside the translocation plots for several years, and only one of the translocated plants was recorded this year. Notched Swainson-pea *Swainsona monticola* has also not been recorded since 2020.

Three small wetland plants, Small Mud-mat *Glossostigma elatinoides,* Austral Mudwort *Limosella australis,* and Dwarf Triggerplant *Stylidium despectum,* have not been recorded since they were discovered in 2014, and Austral Toad-flax *Thesium australe* has also not been recorded since the original record in 2015.

Table 12. Threatened, protected and rare flora species

Species Name	Status	Last recorded	2024 Survey
Austrostipa setacea **Corkscrew Grass**	-	2022	Not recorded in 2024
Bossiaea prostrata **Creeping Bossiaea**	-	2020	Recorded near creek crossing in northern offset.
Oxytes brachypoda **Large Tick-trefoil**	-	?	Not recorded in 2024
Dillwynia sp. Yetholme	-	?	Recorded near Plot 8 in the southern offset, population of around 10 plants including recruitment.
Discaria pubescens **Australian Anchor Plant**	ACT Protected species	2020	Population of around 30-40 plants with multiple seedlings.
Eryngium ovinum **Blue Devil**	ACT Protected species	-	Recorded on the eastern side of the southern offset.
Glossostigma elatinoides **Small Mud-mat**	ACT Protected species	2014	Not recorded in 2024

[7] Nature Conservation Protected Native Species List 2023. https://www.legislation.act.gov.au/View/ni/2023-778/current/html/2023-778.html

Species Name	Status	Last recorded	2024 Survey
Leucochrysum albicans var. tricolor **Hoary Sunray**	EPBC Act Endangered NC Act Endangered BC Act Endangered	2022	Recorded in Plot 8 and in dense patches (up to 500 individuals) across the offset site, more common in the southern offset.
Limosella australis **Australian Mudwort**	-	2014	Not recorded in 2024
Microseris lanceolata **Yam Daisy**	-	2022	Low numbers recorded in the western part of the northern offset. Also recorded in *Swainsona recta* translocation Plot 3 and surrounding area.
Ophioglossum lusitanicum **Adder's Tongue**	-	-	Recorded in *Swainsona recta* translocation Plot 2.
Plantago gaudichaudii **Narrow Plantain**	-	2022	Recorded in Plot 3
Pomaderris pallida **Pale Pomaderris**	EPBC Act Vulnerable NC Act Vulnerable BC Act Vulnerable	2020	Population of around 20 individuals including many seedlings.
Solenogyne gunnii **Hairy Solenogyne**	-	-	Recorded in Plot 4
Stylidium despectum **Dwarf Triggerplant**	-	2014	Not recorded in 2024
Swainsona monticola **Notched Swainson-pea**	ACT Protected species	2020	Not recorded in 2024
Swainsona recta **Small Purple Pea**	EPBC Act Endangered NC Act Endangered BC Act Endangered	2020	A single flowering plant was recorded in translocation Plot 3 in 2024.
Swainsona sericea **Silky Swainson-pea**	BC Act Vulnerable ACT Protected species	2022	Large numbers recorded across the offset site, more commonly in the northern offset particularly along the western boundary.
Thesium australe **Austral Toad-flax**	EPBC Act Vulnerable NC Act Vulnerable BC Act Vulnerable	2015	Not recorded in 2024
Zornia dyctiocarpa **Zornia**	ACT Protected species	?	Recorded in two locations, one on the fence at the north-eastern end of the southern offset (previously known location), and a new location along the road under the powerlines near Plot 5, with around 20 plants.

Plate 1. Threatened and rare flora species recorded during surveys. Clockwise from top left: Hairy Anchor Plant *Discaria pubescens*, Yam Daisy *Microseris lanceolata*, Zornia *Zornia dyctiocarpa*, Hoary Sunray *Leucochrysum albicans*, Silky Swainson-pea *Swainsona sericea*, *Dillwynia sp. Yetholme.*

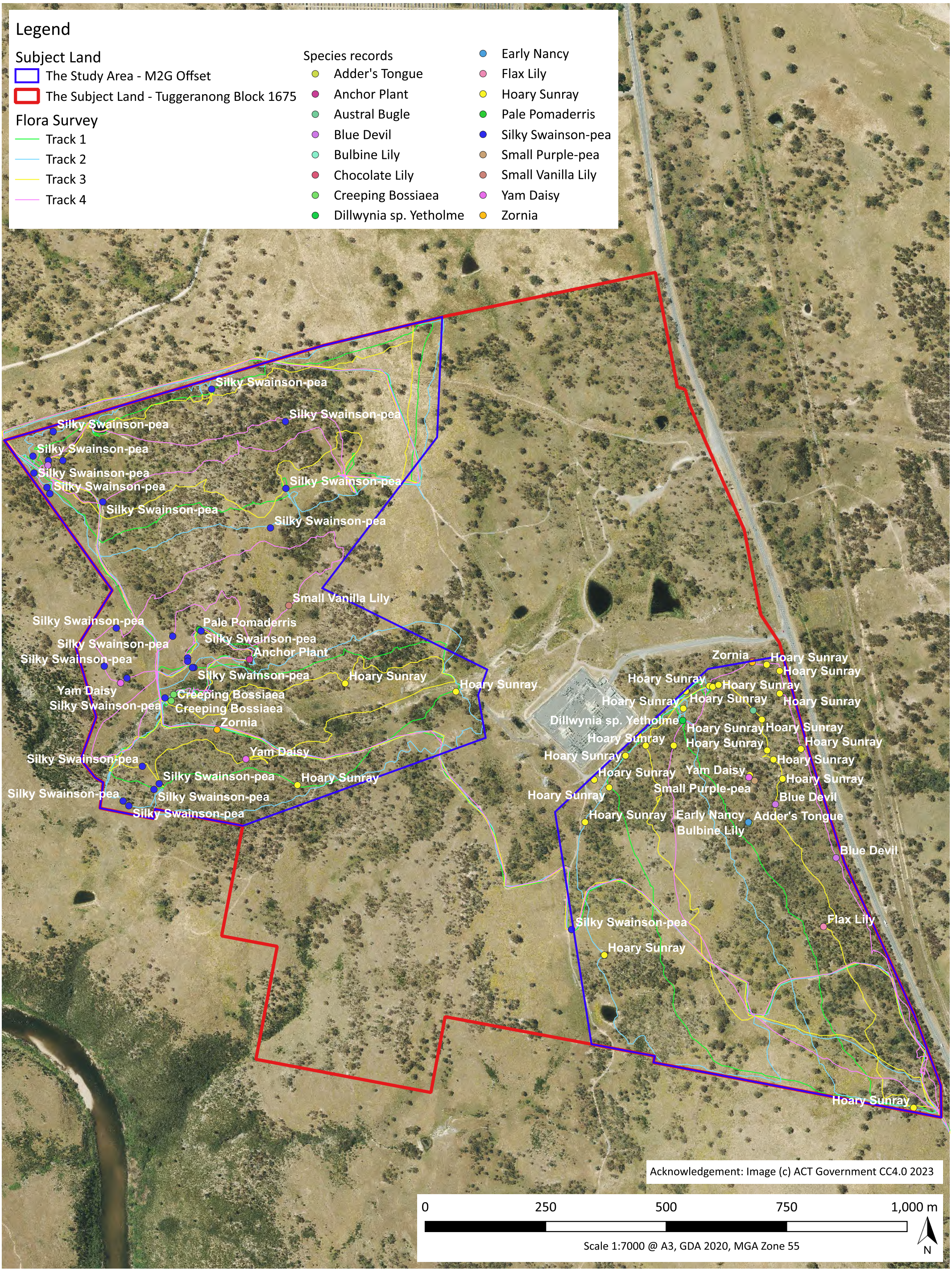

Figure 5. Flora Survey and Records

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Date: 24/03/2025

3.3 Fauna Monitoring

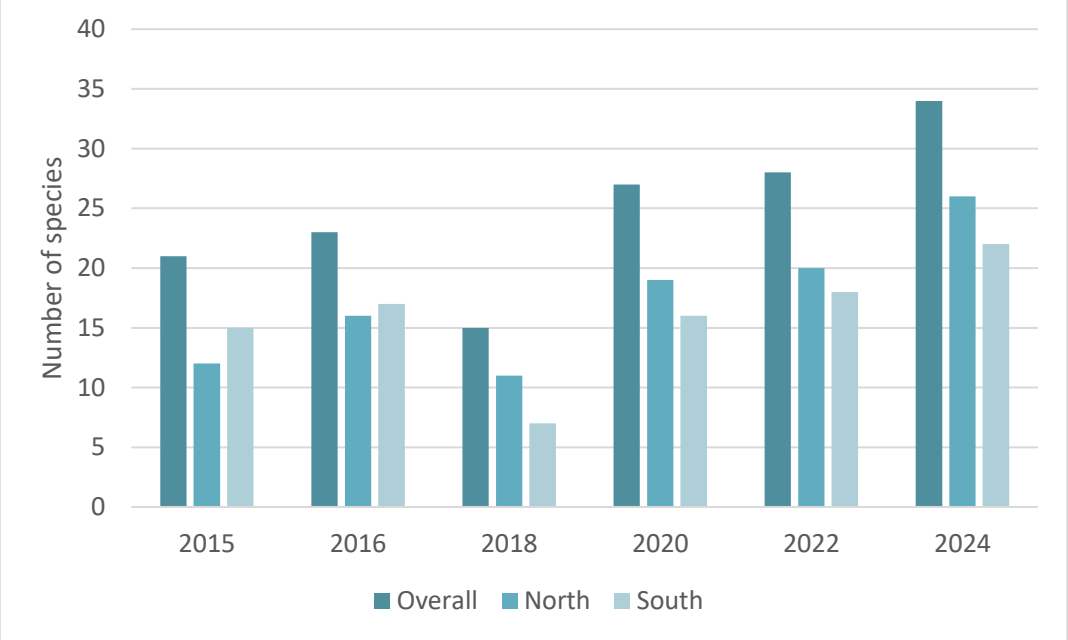
3.3.1 Bird Survey

Across all 10 survey sites, a total of 34 bird species were recorded during the surveys (see Appendix B). Of these, eight were only recorded as fly-overs or outside the 50 m radius. This is the highest number of species recorded in any year since surveys began in 2015, which follows a trend of apparent increase in bird species richness (Figure 6).

The most abundant species recorded was Rufous Whistler, followed by Striated Pardalote, Grey Fantail, and Yellow-faced Honeyeater. Noisy Miner was also relatively abundant, but was much more commonly found in the northern transect than the southern transect.

Two threatened species were recorded during the targeted surveys, Dusky Woodswallow *Artamus cyanopterus cyanopterus* and Scarlet Robin *Petroica boodang*. A number of other threatened species were recorded opportunistically during other surveys, including Speckled Warbler *Chthonicola sagittata*, Varied Sittella *Daphnoenositta chrysoptera*, and Brown Treecreeper *Climacteris picumnus victoria*e (Figure 7). These are the first records of Varied Sittella and Brown Treecreeper (ELA 2022).

Figure 6. Bird species richness over time (data extracted from ELA 2022)



3.3.2 Fauna habitat assessment

No changes were recorded in the frequency of habitat features present in the northern and southern offsets Table 13. As this is a qualitative assessment, it is difficult to compare with previous assessments carried out by other observers. However, as noted in the 2022 report, these features are unlikely to change in the short to medium term (except in the case of an extreme event such as bushfire, storm etc). There were also no observed differences in frequency of habitat features between the northern and southern offsets.

Table 13. Habitat Features Relative Frequency

Habitat Feature	Northern Offset	Southern Offset
Tree hollows	Occasional	Occasional
Large trees (> 60cm DBH)	Occasional	Occasional
Dead standing trees	Occasional	Occasional
Stumps (<2m)	Rare	Rare
Mistletoes	Occasional	Occasional
Regenerating tree thickets	Abundant	Abundant
Native shrub thickets	Occasional	Occasional
Exotic shrub thickets	Rare	Rare
Logs (fallen)	Common	Common
Timber (fallen)	Common	Common
Litter (leaf, twig, bark)	Common	Common
Loose rocks	Common	Common
Outcropping rocks	Common	Common
Termite mounds	Rare	Rare
Meat ant nests	Occasional	Occasional
Deep gully walls	Rare	Rare

3.3.3 Opportunistic observations

As mentioned in Section 3.2.1, a number of bird species were recorded opportunistically in addition to those recorded during the survey.

A Pink-tailed Legless Lizard was recorded in the central part of the northern offset (Figure 7, Plate 2). This species has been recorded once within the subject land, in 2018 (ELA 2018) and is considered likely to occur across all suitable rocky areas.

See Appendix C for a full list of recorded fauna.

Plate 2. Pink-tailed Legless Lizard recorded opportunistically in the northern offset.

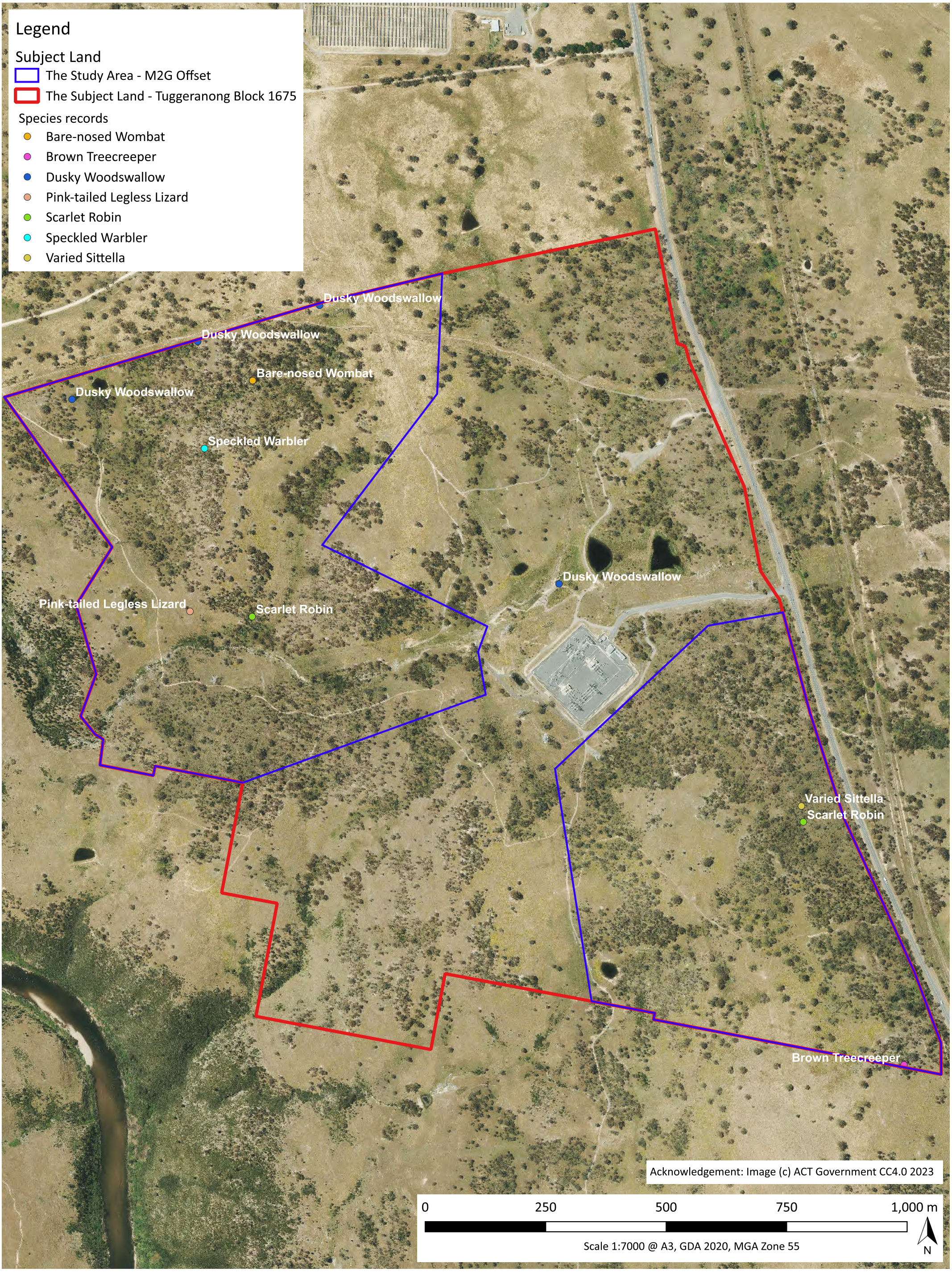


FIgure 7. Fauna Records

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Date: 24/03/2025

3.4 *Swainsona recta* monitoring

The 2024 survey was undertaken to coincide with the peak flowering period for the species, as confirmed by visiting the nearby Williamsdale population.

Only one *Swainsona recta* individual was recorded during the 2024 surveys, in Plot 3 (Plate 3). The plant was in flower at the time of the survey on 9 October 2024 and was located at the H4 position (refer to diagram in section 2.3) in the plot.

A second survey was undertaken on 29 October 2024 to ensure that no plants were missed, but no plants were observed during this survey.

Plot 3 was dominated by dense Kangaroo Grass (Plate 4). The grass cover and height were slightly higher inside the plot than the surrounding area, indicating a moderate level of grazing pressure outside the plot. The density of the grass cover in all plots may be a contributing factor to the low survival rate and lack of recruitment.

Plate 3. Above: *Swainsona recta* individual in plot 3.

A number of other native forbs were observed in the plots during the survey, including Hoary Sunray *Leucochrysum albicans,* Yam Daisy *Microseris lanceolata,* Bulbine Lily *Bulbine bulbosa*, Early Nancy *Wurmbea dioica,* and Common Everlasting *Chrysocephalum apiculatum.* The protection from kangaroo grazing appeared to also be beneficial for these species.

Plate 4. Right: *Swainsona recta* translocation plot 3. Below Left: Plot 1. Below Right: Plot 2.

3.5 Weed monitoring

A number of high threat weeds were recorded across the offset sites. These species are listed in Table 14 below, and locations recorded during the flora survey are shown in Figure 8. We note that these records are by no means comprehensive, particularly for very widespread species such as St John's Wort. Table 13 also provides information on the occurrence of each species, as well as any control actions recommended and their priority.

Table 14. High Threat Weeds

Name	Description of Occurrence	Action Required and Priority
Echium plantagineum **Paterson's Curse**	Paterson's Curse is present at low levels, with higher densities in disturbed areas such as MU 1 and 7. MUs present: MU1,2,4,5,7	**Priority: Low** **Recommendation:** Continue current control measures i.e. spot spraying individuals.
Eragrostis curvula **African Lovegrass**	African Lovegrass currently occurs in small patches but is widespread across the offset. It was recorded in Plots 4,7 and 8, and was recorded several times during the survey. MUs present: All	**Priority: High** African Lovegrass is considered a very high threat to biodiversity in the region and is difficult to control once established. While it is at relatively low densities, it should be a high priority for control to prevent further spread. **Recommendation:** Spot spraying with flupropanate where appropriate. Maintain good vehicle hygiene on site to prevent spread.
Hypericum perforatum **St. John's Wort**	St John's Wort is widespread across the offset site, particularly in open areas. It was recorded in all plots. MUs present: All, high densities	**Priority: High** **Recommendation:** Continue current control measures.
Nassella trichotoma **Serrated Tussock**	Serrated Tussock is currently present in small, isolated patches within the offset. MUs present: MU1,3,6	**Priority: High** While the species is present at low densities, it should be a high priority for eradication to prevent further spread. **Recommendation:** Spot spray individuals.
Rosa rubiginosa **Briar Rose**	Briar Rose was recorded in all monitoring plots except Plot 1, usually present as small seedlings germinating from the seed bank. Very few large plants. MUs present: All	Priority: Moderate Control of this species appears to be working as large plants are rare'; however, there are many seedlings emerging so ongoing management is required. **Recommendation:** Continue current control measures and follow-up to control seedlings.
Rubus fruticosus **Blackberry complex**	Blackberry was present in all monitoring plots except Plot 8. Many small seedlings present but few large plants. MUs present: All	Priority: Moderate Control of this species appears to be working as large plants are rare, however there are many seedlings emerging so ongoing management is required. **Recommendation:** Continue current control measures and follow-up to control seedlings.

Name	Description of Occurrence	Action Required and Priority
Thistles (*Carthamus lanatus, Carduus spp. Cirsium vulgare, Onopordum spp.)*	Widespread across the site, particularly Saffron Thistle and Spear Thistle, with localised areas of dominance particularly in disturbed areas such as MU1 and MU7. Saffron Thistle: MU1 Spear Thistle: MU1,2,3,5,6,7	**Priority: Moderate** **Recommendation:** Continue current control measures.
Woody Weeds (Crataegus, Prunus, Pyracantha, Cotoneaster)	Woody weeds occur as scattered individuals at low density.	**Priority: Low** **Recommendation:** Continue monitoring.

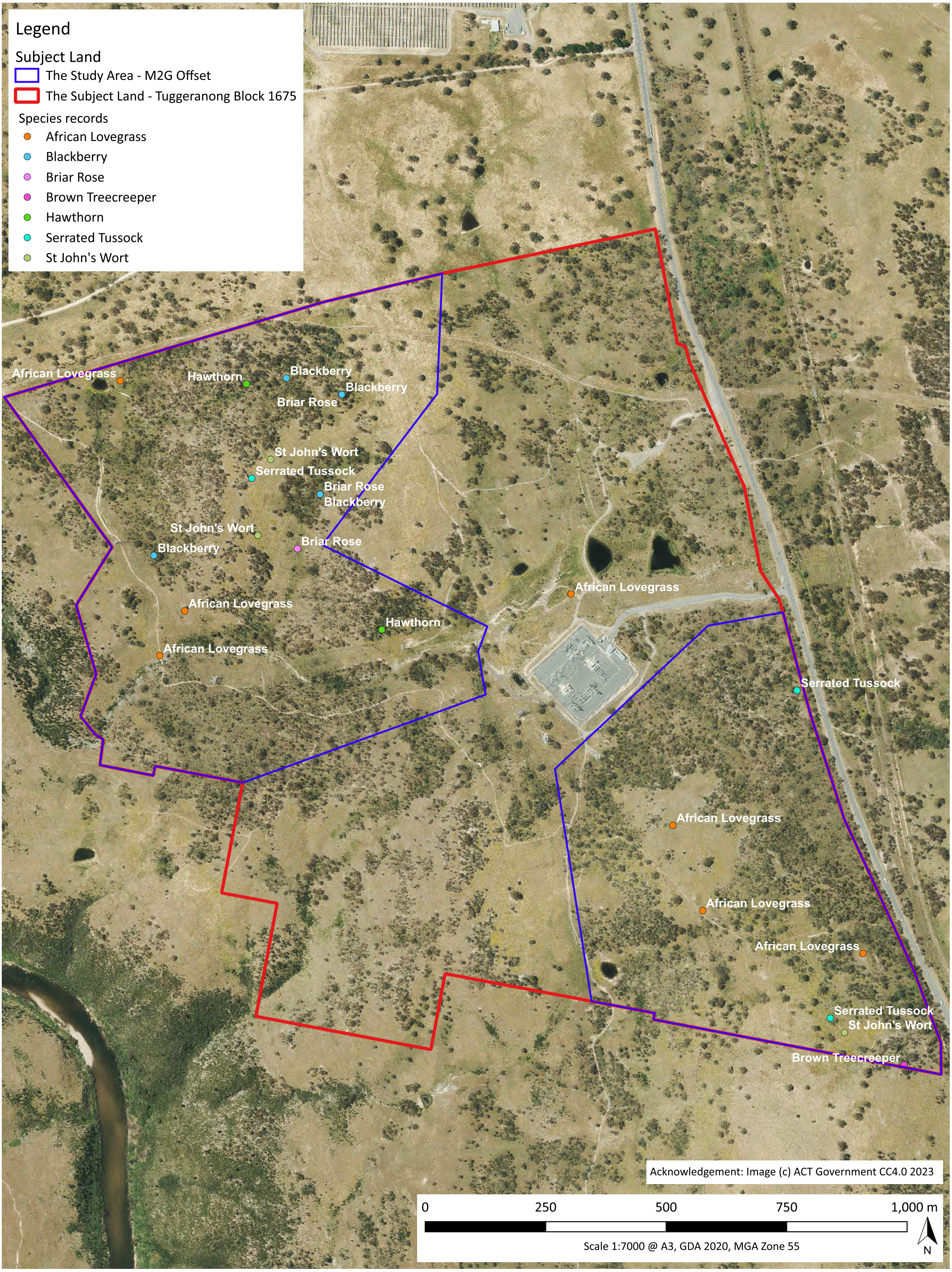

Figure 8. High Threat Weeds

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Date: 24/03/2025

3.6 Revegetation survival monitoring

Table 15 shows the results of the revegetation survival monitoring at the three planting sites (Plate 5).

Overall, survival is considered to be relatively high, with the average survival rate across all sites being 80%. The lowest survival was in Site 3, which is also the most recent planting. However, at 76% the survival rate is still good.

The older plantings at Sites 1 and 2 are becoming well established, with many plants reaching 1-2 m high. Particularly in the Transgrid planting (Site 2) which is fenced from kangaroos, the tree guards should be removed to allow the plants go grow freely.

Table 15. Revegetation Plantings Monitoring

Site	Genus	Condition		Total (% Survival)
		Alive	Dead	
1 - North	*Acacia*	37	2	39 (95%)
	Bursaria	4	0	4 (100%)
	Cassinia	1	0	1 (100%)
	Dodonaea	0	1	1 (0%)
	Eucalyptus	19	0	19 (100%)
	Kunzea	2	0	2 (100%)
	Leptospermum	2	0	2 (100%)
	Lomandra	10	0	10 (100%)
	Melaleuca	11	1	12 (92%)
	Plant dead or missing	0	10	10 (0%)
Site 1 Total		**86**	**14**	**100 (84%)**
2 - Transgrid	*Acacia*	15	2	17 (88%)
	Bursaria	16	1	17 (94%)
	Cassinia	2	1	3 (67%)
	Dodonaea	0	2	2 (0%)
	Eucalyptus	16	1	17 (94%)
	Leptospermum	7	0	7 (100%)
	Lomandra	8	0	8 (100%)
	Melaleuca	13	1	14 (93%)
	Plant dead or missing	0	15	15 (0%)
Site 2 Total		**77**	**23**	**100 (77%)**
3 - South	*Kunzea*	11	2	13 (85%)
	Leptospermum	8	4	12 (67%)
	Melaleuca	19	0	19 (100%)
	Plant dead or missing	0	6	6 (0%)
Site 3 Total		**38**	**12**	**50 (76%)**
Grand Total		**201**	**49**	**250 (80%)**

Plate 5. Revegetation plantings. Site 1 (top left), Site 2 (top right), Site 3 (bottom left and right).

3.7 Erosion point monitoring

There appears to be little change across the six remaining erosion points (see Table 16 to Table 21). It is clear from comparison with the 2022 photos that the wet condition over the last few years led to an increase in vegetation which has helped to stabilise the banks and channels. Despite prolonged wet periods and heavy rainfall, this has not led to significant erosion.

At the time of the survey in 2024, there was no water in the ephemeral streams and all pools had dried out. While the drier conditions resulted in lower vegetation cover, the erosion sites still appeared relatively stable. Only Erosion Point 2 had evidence of recent activity (see Table 16).

Since the 2022 survey, native shrubs have been planted on the northern bank near Erosion Points 7 and 8 (Section 3.5, Plate 4). These plantings will hopefully contribute to stabilising the bank.

Table 16. Erosion Point 2

Erosion Point 2	
Description	Within an ephemeral drainage line in MU4, northern offset
Change	Less vegetation present than in 2022 due to drier conditions. Evidence of further slumping and tunnelling (see bottom right image of tunnel forming)
Action required	Remediation measures to slow surface water flow and stop progression of head cut and tunnelling could be considered. Continue to monitor

Reference photos taken in 2022 (left) and 2024 (below)

Table 17. Erosion Point 4

Erosion Point 4	
Description	Within an ephemeral drainage line in MU4, northern offset
Change	Pool dry, exposed bedrock at base. Stable
Action required	None. Continue to monitor.

Reference photos taken in 2022 (left) and 2024 (below)

Table 18. Erosion Point 7

Erosion Point 7	
Description	Located along the main creek line in northern offset.
Change	Little change from 2022. New plantings on the north bank will hopefully provide stabilisation.
Action required	None. Continue to monitor

Reference photos taken in 2022 (left) and 2024 (below)

Table 19. Erosion Point 8

Erosion Point 8	
Description	Located along the main creek line in northern offset, upstream from erosion Point 7.
Change	Little change from 2022. New plantings on the north bank will hopefully provide stabilisation.
Action required	None. Continue to monitor.

Reference photos taken in 2022 (left) and 2024 (below)

Table 20. Erosion Point 13

Erosion Point 13	
Description	Located east of the access track running down the western boundary of the northern offset.
Change	Pool dry. Vegetation in channel reduced due to drier conditions but still providing stabilisation. Evidence of minor fresh slumping on northern side (see right side of photo).
Action required	None. Continue to monitor.

Reference photos taken in 2022 (left) and 2024 (below)

Table 21. Erosion Point 21

Erosion Point 21	
Description	Located west (just downstream) from the access track running along the western boundary in the northern offset.
Change	Pool dry, bedrock exposed. Appears stable with vegetation on banks and in channel.
Action required	None. Continue to monitor

Reference photos taken in 2022 (left) and 2024 (below)

4 Summary and management recommendations

4.1 Summary of survey results

Vegetation

The condition of the vegetation across the offset sites is generally good, with native species richness lower than recent years but remaining consistent with baseline levels, and exotic cover relatively low compared to recent years. These changes can largely be explained by the much drier and warmer conditions experienced in spring 2024, with any changes due to management likely to be much less apparent.

Threatened and Rare Flora

Of the four threatened flora species previously recorded in the offset, all were able to be relocated. The offset supports large and widespread populations of Hoary Sunray and Silky Swainson-pea. The population of Pale Pomaderris appears to be increasing, with evidence of recruitment. However, only one Small Purple-pea individual was recorded in the translocation plots, and the species has not been recorded outside the plots. Of the twelve 'rare and uncommon' species, five were able to be relocated and their populations appeared to be increasing.

Staff and contractors should be made aware of these species and their locations on site (i.e. provided with maps and photographs) to minimise inadvertent damage to populations. This is particularly important for personnel involved in spraying herbicides.

Fauna

Bird diversity appears to be increasing, with at least 10 threatened woodland bird species now known to occur in the offset area (ELA 2022), and several others of conservation concern.

Pink-tailed Worm-lizard was recorded opportunistically during the survey, and is considered likely to occur across all suitable rocky areas.

There has been little to no change in fauna habitat features, but these are unlikely to change in the short term. Further plantings of native shrubs could be considered to enhance the habitat value for woodland birds and reduce the dominance of Noisy Miners.

Swainsona recta translocation

Only one flowering individual was recorded in translocation plot 3, and there has never been any sign of recruitment.

Weeds

A number of high threat weeds are present across the offset. The species identified as highest priority for control were St John's Wort, African Lovegrass, and Serrated Tussock. St John's Wort remains widespread a high densities across the offset. While African Lovegrass and Serrated Tussock are currently present at low densities, they are at high risk of spread and are extremely difficult to control once established.

While control measures have been effective for Blackberry and Briar Rose, follow-up control is required to prevent re-sprouting. Current monitoring and control activities should continue for other high threat weeds.

Revegetation

Survival of the revegetation plantings was relatively high, ranging from 76% to 84%. Where plants have become large enough to withstand rabbit and kangaroo grazing, the tree guards should be removed.

Further plantings of native shrubs could be considered to enhance the habitat value for woodland birds and reduce the dominance of Noisy Miners.

Erosion

Following recommendations from previous reports, a number of erosion points are no longer being monitored. Six erosion points remain, these have been largely stabilised by vegetation in the channel and on the banks, but it is recommended monitoring of these remain points are continued. Erosion Point 2 has some evidence of further slumping and tunnelling, and remediation works could be considered to prevent further movement.

Fencing

Fence monitoring was not undertaken during the current survey as maintenance had recently been carried out on all fencing in the property.

Grazing

Formal measurement of grazing pressure was not carried out during this monitoring session, however casual observations were made at the *Swainsona recta* plots and some of the grazing exclusion areas. Higher levels of grass cover and taller grass height in these fenced areas suggests that grazing pressure is moderate. Under current conditions this grazing pressure is likely to be sustainable, but if conditions become drier over 2025-26, kangaroo population management may be required.

4.2 Management Recommendations

A summary of the recommended adaptive management actions relating to the offset site is provided in Table 22 below. The actions relate to the appropriate ODP Sub-Plan and are based on the results presented in the above sections.

Table 22. Management Recommendations

ODP Sub-plan	Management Recommendations
Weeds	• Target priority species including St John's Wort, African Lovegrass, and Serrated Tussock. • MU1 and MU7 contain highly disturbed areas that could be targeted for more intensive or experimental control measures, such as scalping and re-seeding with native grasses and forbs. • Continue to undertake follow up weed control as required on persistent species such as St John's Wort, Thistle species, Briar Rose, and Blackberry after priority control. • Maintain vehicle hygiene to prevent introduction and spread of propagules.
Rehabilitation	Consider further plantings of native shrubs to enhance habitat for woodland birds and reduce dominance of noisy miners.
Erosion	The majority of sites within the offset are considered to be stable and no immediate action is required. Where remaining sites are remediated in the future, monitoring of these sites will also cease. • Ongoing monitoring of sites 2, 4, 7, 8, 13 and 21. • Consider remediation works at Site 2 to slow water flow and prevent further head-cutting and tunnelling.
Bushfire	No action currently required. As per previous recommendations: • consider developing and implementing an improved bushfire management plan which specifically manages the site for conservation (in consultation with NSW and ACT Rural Fire Services). The plan should include consideration of fire as a tool to manage invasive species, increase native species diversity, maintain an open structure to the woodland and enable a mosaic of fire classes to be established across the site.
Pest and Feral Management	Continue current monitoring and control measures.
Grazing	No action currently required, but kangaroo population management may be required if dry conditions worsen.
Fencing	Continue current monitoring and maintenance measures.

5 References

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Previous Monitoring Reports by ELA – available at: https://www.iconwater.com.au/Water-education/Sustainability-and-Environment/Environmental-management/Murrumbidgee-River-compliance-reports#biodiversity-offsets-monitoring-reports

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6 Appendices

Appendix A. Vegetation Plot Data

Flora Species Recorded by Plot and Braun-Blanquet Score

Score	Description
1	< 5 % cover and solitary (< 4 individuals)
2	< 5 % cover and few (4-15 individuals)
3	< 5 % cover and numerous (> 15 individuals)
4	5 % - < 25 % cover
5	25 % - < 50% cover
6	50 % - < 75 % cover
7	75 % cover or greater

Species Name	Common Name	3306_1	3306_2	3306_3	3306_4	3306_5	3306_6	3306_7	3306_8
Exotic									
Aira spp.	Hair-grass	1							
Bromus spp.	Brome Grass	2					3	3	
Carthamus lanatus	Saffron Thistle	3							
Centaurium spp.	Common Centaury		3	3	2	2	3		3
Cirsium vulgare	Spear Thistle	3	1	2		2	2	2	
Conyza spp.	Fleabane	3	1	1		1	2		1
Cyperus eragrostis	Tall Flat-sedge	2						3	
Echium vulgare	Paterson's Curse	4	1		1	1		3	
Eragrostis curvula	African Lovegrass				3			2	1
Erodium cicutarium	Storksbill							3	
Hordeum spp.	Barley Grass							3	
Hypericum perforatum	St John's Wort	4	3	3	2	4	4	3	3
Hypochaeris glabra	Smooth Cats-ear							3	
Hypochaeris radicata	Flatweed	3	3	3	3	2	3	3	2
Lactuca serriola	Prickly Lettuce	1							
Lysimachia arvensis	Scarlet Pimpernel	1							
Malva spp.	Mallow/Marshmallow Weed	1						2	
Marrubium vulgare	White Horehound							2	

Species Name	Common Name	3306_1	3306_2	3306_3	3306_4	3306_5	3306_6	3306_7	3306_8
Modiola caroliniana	Red-flowered Mallow				1			2	
Nassella trichotoma	Serrated Tussock	3					1		
Paronychia brasiliana	Brazilian Whitlow	3	2				3	3	
Petrorhagia nanteuilii	Proliferous Pink		2				2		
Plantago lanceolata	Plantain/Lamb's Tongue	2	3	3	3	3	3	3	3
Rosa rubiginosa	Briar Rose		2	1	2	1	2	2	1
Rubus fruticosus	Blackberry	1	1	1	1	1	1	1	
Rumex acetosella	Sheep's Sorrel		3			2	3	3	
Solanum chenopodioides	Whitetip Nightshade		1				1	1	
Sonchus spp.	Sowthistle	1	1				1		
Tolpis barbata	Yellow Hawkweed	2	2				2		
Trifolium spp.	Clover		2			3	3	3	
Verbascum thapsus	Common Mullein	2	2				2		
Verbena incompta	Purpletop	1						3	
Vulpia spp.	Rat's Tail Fescue	3	3					3	
Native									
Acaena ovina	Sheep's Burr	1	2	2	2	2	2	1	2
Alternanthera spp.	Joyweed	2						3	
Anthosachne scabra	Common Wheat Grass		3		3		3		
Aristida ramosa	Purple Wiregrass		4						4
Arthropodium fimbriatum	Chocolate Lily			1					
Asperula conferta	Common Woodruff			3	3	3			2
Austrostipa bigeniculata	Tall Speargrass				3		4		
Austrostipa scabra	Rough Speargrass		4				4		3
Bothriochloa macra	Red-leg Grass	4		4	3	2			4
Bursaria lasiophylla	Native Blackthorn			1		1			
Calocephalus citreus	Lemon Beautyheads			2					
Carex appressa	Tall Sedge							2	
Carex inversa	Knob Sedge	3	3	2		3		4	

Species Name	Common Name	3306_1	3306_2	3306_3	3306_4	3306_5	3306_6	3306_7	3306_8
Cassinia aculeata	Common Cassinia					1			
Cassinia longifolia	Long-leaf Cassinia		1	1					
Cheilanthes sieberi	Rock Fern	2	3	2			2		2
Chloris truncata	Windmill Grass	3							
Chrysocephalum apiculatum	Common Everlasting		3	3		3	3		2
Chrysocephalum semipapposum	Clustered Everlasting		2				3		
Clematis leptophylla	Old Man's Beard			1	1		1		
Convolvulus erubescens	Australian Bindweed		1			1	1		
Cryptandra amara	Bitter Cryptandra					3	1		
Cymbonotus lawsonianus	Bear's Ears		2		1	2	2		
Cynoglossum australe	Australian Hound's-tongue						2		
Desmodium varians	Slender Tick-trefoil	1	3	2		3	2		2
Dichelachne crinita	Long-hair Plume Grass					3			
Dichondra repens	Kidney Weed		3	2			3		
Einadia nutans	Climbing Saltbush		2				2		
Eragrostis brownii	Common Love Grass				3			3	
Erodium crinitum	Native Crowfoot	2						3	
Eucalyptus blakelyi	Blakely's Red Gum	1	4	5	4	4	4		4
Eucalyptus bridgesiana	Apple Box			2					
Eucalyptus melliodora	Yellow Box	1			1			4	
Euchiton spp.	Cudweed	1	3	2			3		2
Euphorbia drummondii	Caustic Spurge	2					2		
Geranium solanderi	Native Geranium	2	2				2	2	
Glycine clandestina	Twining Glycine						3		
Gonocarpus tetragynus	Common Raspwort			3		3			3
Haloragis heterophylla	Variable Raspwort				3				3
Hovea heterophylla	Common Hovea					2			
Hydrocotyle laxiflora	Stinking Pennywort		2	2					
Hypericum gramineum	Native St John's Wort				3	3			3

Species Name	Common Name	3306_1	3306_2	3306_3	3306_4	3306_5	3306_6	3306_7	3306_8
Juncus australis	Austral Rush							4	
Juncus filicaulis	Pinrush	3		3	2			3	
Kunzea ericoides	Burgan		1						
Leptorhynchos squamatus	Scaly Buttons			3	1	3			2
Leucochrysum albicans	Hoary Sunray								1
Lomandra filiformis subsp. coriacea	Wattle Mat-rush			2	2	2	2		1
Melichrus urceolatus	Urn Heath					2			1
Microlaena stipoides	Weeping Grass	4	4	4	5	4		5	
Oxalis perennans	Woody-Root Oxalis	3	3	3	2		2	3	
Panicum effusum	Hairy Panic		4	3	4		4		3
Plantago gaudichaudii	Narrow Plantain			1					
Plantago varia	Variable Plantain			3					
Poa labillardierei	River Tussock Grass			2					
Poa sieberiana	Snowgrass		3	3	4	4	3		3
Rumex brownii	Swamp Dock	1	1					3	
Rytidosperma spp.	Wallaby Grass	4	4	4	4	4	4		3
Schoenus apogon	Common Bog-sedge		3	3	3		3		3
Senecio quadridentatus	Cotton Fireweed		1	1				1	
Solenogyne dominii	Smooth Solenogyne				3				2
Solenogyne gunnii	Hairy Solenogyne				1				
Stackhousia monogyna	Creamy Candles					3			
Themeda triandra	Kangaroo Grass		4	4	5	5			5
Tricoryne elatior	Yellow Rush Lily		1	3		1			2
Vittadinia muelleri	New Holland Daisy		3			2	3		1
Wahlenbergia communis	Native Bluebell		1	1		1	2		1
Xerochrysum viscosum	Sticky Everlasting						1		
	Number of Species	39	49	42	33	38	47	36	33
	Number of Native Species	18	31	34	24	27	29	14	26
	Number of Exotic Species	21	18	8	9	11	18	22	7

50m Transect – Understorey % cover

Plot	Bare earth/ rock	Litter/dead vegetation	Exotic	Native grass	Other native
1	10	2	24	60	4
2	8	8	16	50	16
3	4	26	8	54	8
4	0	18	10	54	18
5	2	14	6	60	18
6	4	8	22	54	12
7	2	4	20	56	18
8	0	38	0	56	6

50m Transect - Canopy and Midstorey % cover

Plot	Midstorey (1-2m)	Canopy (>2m)
1	0	0
2	0	1
3	4.5	12.4
4	0	13.7
5	7	10.5
6	0	3.2
7	0	0.5
8	0	10

50 x 50m Plot - Habitat Features

Plot	Tree hollows	Logs (m)
1	0	0
2	0	0
3	0	10
4	0	12
5	0	8
6	0	0
7	0	0
8	0	15

Appendix B. Bird Survey Results – Ordered by number of sites and total abundance

Species Name	Common Name	N1	N2	N3	N4	N5	N Opportunistic	S1	S2	S3	S4	S5	S Opportunistic	No of sites	Total abundance
Pachycephala rufiventris	Rufous Whistler	1	2	2	1	3		1	2	1	2	1		10	16
Smicrornis brevirostris	Weebill		1	1	4	2			1		1	1		7	11
Gerygone albogularis	White-throated Gerygone				1	1	2	2	1	1	1	1		7	10
Pardalotus striatus	Striated Pardalote	2	2	1			1		3		2	4	1	6	16
Rhipidura albiscapa	Grey Fantail					3	2	2	1	3	2	1	1	6	15
Manorina melanocephala	Noisy Miner	7	2		1		1	1						4	12
Platycercus elegans	Crimson rosella	1	3	1	1								5	4	11
Philemon corniculatus	Noisy Friarbird		1	1			2		2			1	1	4	8
Anthochaera carunculata	Red Wattlebird						1	1		1	1	1	2	4	7
Pardalotus punctatus	Spotted Pardalote		1	2	2		1			1				4	7
Acanthiza reguloides	Buff-rumped Thornbill			1	1				3			1		4	6
Lichenostomus chrysops	Yellow-faced Honeyeater					1	2	1			3		7	3	14
Acanthiza chrysorrhoa	Yellow-rumped Thornbill							5	2	1				3	8
Myiagra rubecula	Leaden Flycatcher				1					2		1	1	3	5
Cormobates leucophaea	White-throated Treecreeper							1	1				2	2	4
Rhipidura leucophrys	Willy Wagtail	1		1									1	2	3
Corcorax melanorhamphos	White-winged Chough		3				3							1	6
Coracina novaehollandiae	Black-faced Cuckoo-shrike							1					2	1	3
Gerygone fusca	Western Gerygone		1				2							1	3
Platycercus eximius	Eastern Rosella			3										1	3
Phaps chalcoptera	Common Bronzewing			2										1	2
Malurus cyaneus	Superb Fairy-wren			2										1	2
Petroica boodang	Scarlet Robin								1					1	1
Nesoptilotis leucotis	White-eared Honeyeater			1										1	1
Gymnorhina tibicen	Australian Magpie						5						6	0	11
Corvus coronoides	Australian Raven						2						2	0	4

Species Name	Common Name	N1	N2	N3	N4	N5	N Opportunistic	S1	S2	S3	S4	S5	S Opportunistic	No of sites	Total abundance
Falco cenchroides	Nankeen Kestrel						3						1	0	4
Strepera graculina	Pied Currawong												4	0	4
Aquila audax	Wedge-tail Eagle						3							0	3
Artamus cyanopterus cyanopterus	Dusky Woodswallow						1							0	1
Pachycephala pectoralis	Golden Whistler						1							0	1
Cracticus torquatus	Grey Butcherbird						1							0	1
Dacelo novaeguineae	Laughing Kookaburra												1	0	1
Grallina cyanoleuca	Magpie-lark						1							0	1
	Site species richness	5	9	12	8	5		18	10	7	7	9	15		

Appendix C. Flora and Fauna Species Inventory

Flora Species Inventory

Scientific Name	Common Name	Status
Exotic		
Aira sp.	Hair-grass	-
Bromus sp.	Brome Grass	-
Carthamus lanatus	Saffron Thistle	HTW
Centaurium sp.	Common Centaury	-
Cirsium vulgare	Spear Thistle	-
Conyza sp.	Fleabane	-
Crataegus monogyna	Common Hawthorn	HTW
Cyperus eragrostis	Tall Flat-sedge	HTW
Echium plantagineum	Paterson's Curse	-
Eragrostis curvula	African Lovegrass	AP
Erodium sp.	Stork's-bill	-
Gamochaeta sp.	Cudweed	-
Hordeum sp.	Barley Grass	-
Hypericum perforatum	St John's Wort	LM
Hypochaeris glabra	Smooth Cats-ear	-
Hypochaeris radicata	Flatweed	-
Lactuca serriola	Prickly Lettuce	-
Lysimachia arvensis	Scarlet Pimpernel	-
Marrubium vulgare	White Horehound	-
Modiola caroliniana	Red-flowered Mallow	-
Modiola caroliniana	Red-flowered Mallow	-
Nassella trichotoma	Serrated Tussock	WoNS, C
Paronychia brasiliana	Brazilian Whitlow	-
Petrorhagia nanteuilii	Proliferous Pink	-
Plantago lanceolata	Plantain / Lamb's Tongue	-
Rosa rubiginosa	Briar Rose	HTW
Rubus fruticosus	Blackberry	WoNS, LM
Rumex acetosella	Sheep's Sorrel	-
Solanum chenopodioides	Whitetip Nightshade	-
Sonchus sp.	Milk/Sow Thistle	-
Tolpis barbata	Yellow Hawkweed	-
Trifolium sp.	Clover	-
Verbascum thapsus	Common Mullein	-
Verbena incompta	Purpletop	-
Vulpia sp.	Rat's Tail Fescue	-
Native		
Acaena ovina	Sheep's Burr	-
Ajuga australis	Austral Bugle	-
Alternanthera sp.	Joyweed	-
Anthosachne scabra	Common Wheat Grass	-
Aristida ramosa	Purple Wiregrass	-
Arthropodium fimbriatum	Chocolate Lily	-
Arthropodium minus	Small Vanilla Lily	-
Asperula conferta	Common Woodruff	-
Austrostipa bigeniculata	Tall Speargrass	-
Austrostipa scabra	Rough Spear-grass	-
Bossiaea prostrata	Creeping Bossiaea	-
Bothriochloa macra	Red-leg Grass	-

Scientific Name	Common Name	Status
Bracteantha viscosa	Sticky Everlasting	-
Bulbine bulbosa	Bulbine Lily	-
Bursaria spinosa subsp. lasiophylla	Native Blackthorn	-
Calocephalus citreus	Lemon Beauty-heads	-
Carex appressa	Tall Sedge	-
Carex inversa	Knob Sedge	-
Cassinia aculeata	Common Cassinia	-
Cassinia longifolia	Long-leaf Cassinia	-
Chamaesyce drummondii	Caustic Spurge	-
Cheilanthes sieberi	Rock Fern	-
Chloris truncata	Windmill Grass	-
Chrysocephalum apiculatum	Common Everlasting	-
Chrysocephalum semipapposum	Clustered Everlasting	-
Clematis microphylla	Small-leaved Clematis	-
Convolvulus erubescens	Australian Bindweed	-
Cryptandra amara	Bitter Cryptandra	-
Cymbonotus lawsonianus	Bear's Ears	-
Cynoglossum australe	Australian Hound's-tongue	-
Desmodium varians	Slender Tick-trefoil	-
Dichelachne crinita	Long-hair Plume Grass	-
Dichondra repens	Kidney Weed	-
Dillwynia sp. Yetholme	Dillwynia sp. Yetholme	-
Discaria pubescens	Australian Anchor Plant	-
Einadia nutans	Climbing Saltbush	-
Eragrostis brownii	Brown's Love-grass	-
Erodium crinitum	Native Crowfoot	-
Eryngium ovinum	Blue Devil	-
Eucalyptus blakelyi	Blakely's Red Gum	-
Eucalyptus bridgesiana	Apple Box	-
Eucalyptus dives	Broad-leaved Peppermint	-
Eucalyptus melliodora	Yellow Box	-
Geranium solanderi	Native Geranium	-
Glycine clandestina	Twining Glycine	-
Gonocarpus tetragynus	Common Raspwort	-
Haloragis heterophylla	Variable Raspwort	-
Hovea heterophylla	Common Hovea	-
Hydrocotyle laxiflora	Stinking Pennywort	-
Hypericum gramineum	Native St John's Wort	-
Juncus australis	Austral Rush	-
Juncus filicaulis	Pinrush	-
Kunzea ericoides	Burgan	-
Leptorhynchos squamatus	Scaly Buttons	-
Leucochrysum albicans var. tricolor	**Hoary Sunray**	**EPBC, BC, NC Act Endangered**
Lomandra filiformis	Wattle Mat-rush	-
Melichrus urceolatus	Urn Heath	-
Microlaena stipoides	Weeping Grass	-
Microseris lanceolata	Yam Daisy	-
Ophioglossum lusitanicum	Adder's Tongue	-
Oxalis perennans	Woody-Root Oxalis	-
Panicum effusum	Hairy Panic	-
Plantago gaudichaudiana	Narrow Plantain	-
Plantago varia	Variable Plantain	-
Poa labillardieri	River Tussock-grass	-

Scientific Name	Common Name	Status
Poa sieberiana	Snowgrass	-
Pomaderris pallida	**Pale Pomaderris**	**EPBC, BC, NC Act Vulnerable**
Rumex brownii	Swamp Dock	-
Rytidosperma sp.	Wallaby Grass	-
Schoenus apogon	Common Bog-sedge	-
Senecio quadridentatus	Cotton Fireweed	-
Solenogyne dominii	Smooth Solenogyne	-
Solenogyne gunnii	Hairy Solenogyne	-
Stackhousia monogyna	Creamy Candles	-
Swainsona recta	**Small Purple Pea**	**EPBC, BC, NC Act Endangered**
Swainsona sericea	**Silky Swainson-pea**	**BC Act Vulnerable**
Themeda triandra	Kangaroo Grass	-
Tricoryne elatior	Yellow Rush-Lily	-
Vittadinia gracilis	New Holland Daisy	-
Wahlenbergia communis	Native Bluebell	-
Wurmbea dioica	Early Nancy	-
Zornia dyctiocarpa	Zornia	-

Fauna Species Inventory

Class	*Scientific Name*	Common Name	Native/ Exotic	Status
Amphibia	*Crinia parinsignifera*	Eastern Sign-bearing Froglet	Native	Protected
Amphibia	*Crinia signifera*	Common eastern froglet	Native	Protected
Aves	*Acanthiza chrysorrhoa*	Yellow-rumped Thornbill	Native	Protected
Aves	*Acanthiza reguloides*	Buff-rumped Thornbill	Native	Protected
Aves	*Anas gracilis*	Grey Teal	Native	Protected
Aves	*Anthochaera carunculata*	Red Wattlebird	Native	Protected
Aves	*Aquila audax*	Wedge-tail Eagle	Native	Protected
Aves	*Ardea pacifica*	White-necked Heron	Native	Protected
Aves	***Artamus cyanopterus cyanopterus***	**Dusky Woodswallow**	**Native**	**BC Act Vulnerable**
Aves	*Aythya australis*	Hardhead Duck	Native	Protected
Aves	*Cacatua galerita*	Sulphur-crested Cockatoo	Native	Protected
Aves	*Cacomantis flabelliformis*	Fan-tailed Cuckoo	Native	Protected
Aves	*Chenonetta jubata*	Australian Wood Duck	Native	Protected
Aves	***Chthonicola sagittata***	**Speckled Warbler**	**Native**	**BC Act Vulnerable**
Aves	***Climacteris picumnus victoriae***	**Brown Treecreeper**	**Native**	**EPBC, BC, NC Act Vulnerable**
Aves	*Coracina novaehollandiae*	Black-faced Cuckoo-shrike	Native	Protected
Aves	*Corcorax melanorhamphos*	White-winged Chough	Native	Protected
Aves	*Cormobates leucophaea*	White-throated Treecreeper	Native	Protected
Aves	*Corvus coronoides*	Australian Raven	Native	Protected
Aves	*Cracticus torquatus*	Grey Butcherbird	Native	Protected
Aves	*Dacelo novaeguineae*	Laughing Kookaburra	Native	Protected
Aves	***Daphoenositta chrysoptera***	**Varied Sittella**	**Native**	**BC, NC Act Vulnerable**
Aves	*Eolophus roseicapilla*	Galah	Native	Protected
Aves	*Falco cenchroides*	Nankeen Kestrel	Native	Protected
Aves	*Fulica atra*	Eurasian Coot	Native	Protected
Aves	*Gallinula tenebrosa*	Dusky Moorhen	Native	Protected
Aves	*Gerygone albogularis*	White-throated Gerygone	Native	Protected
Aves	*Gerygone fusca*	Western Gerygone	Native	Protected
Aves	*Grallina cyanoleuca*	Magpie-lark	Native	Protected
Aves	*Gymnorhina tibicen*	Australian Magpie	Native	Protected
Aves	*Hirundo neoxena*	Welcome Swallow	Native	Protected
Aves	*Lichenostomus chrysops*	Yellow-faced Honeyeater	Native	Protected
Aves	*Malurus cyaneus*	Superb Fairy-wren	Native	Protected
Aves	*Manorina melanocephala*	Noisy Miner	Native	Protected
Aves	*Myiagra rubecula*	Leaden Flycatcher	Native	Protected
Aves	*Nesoptilotis leucotis*	White-eared Honeyeater	Native	Protected
Aves	*Pachycephala pectoralis*	Golden Whistler	Native	Protected
Aves	*Pachycephala rufiventris*	Rufous Whistler	Native	Protected
Aves	*Pardalotus punctatus*	Spotted Pardalote	Native	Protected
Aves	*Pardalotus striatus*	Striated Pardalote	Native	Protected

Aves	***Petroica boodang***	**Scarlet Robin**	**Native**	**BC, NC Act Vulnerable**
Aves	*Phaps chalcoptera*	Common Bronzewing	Native	Protected
Aves	*Philemon corniculatus*	Noisy Friarbird	Native	Protected
Aves	*Platycercus elegans*	Crimson Rosella	Native	Protected
Aves	*Platycercus eximius*	Eastern Rosella	Native	Protected
Aves	*Rhipidura albiscapa*	Grey Fantail	Native	Protected
Aves	*Rhipidura leucophrys*	Willy Wagtail	Native	Protected
Aves	*Smicrornis brevirostris*	Weebill	Native	Protected
Aves	*Strepera graculina*	Pied Currawong	Native	Protected
Aves	*Sturnus vulgaris*	Common Starling	Exotic	-
Aves	*Tachybaptus novaehollandiae*	Australasian Grebe	Native	Protected
Aves	*Vanellus miles*	Masked Lapwing	Native	Protected
Mammalia	*Macropus giganteus*	Eastern Grey Kangaroo	Native	Protected
Mammalia	*Macropus rufogriseus*	Red-necked Wallaby	Native	Protected
Mammalia	*Oryctolagus cuniculus*	European Rabbit	Exotic	-
Mammalia	*Tachyglossus aculeatus*	Short-beaked Echidna	Native	Protected
Mammalia	*Vombatus ursinus*	Common Wombat	Native	Protected
Reptilia	***Aprasia parapulchella***	**Pink-tailed Worm-lizard**	**Native**	**EPBC, BC, NC Act Vulnerable**

Appendix D. Raw Data (Spreadsheet, shapefiles, and photos in separate .zip folder)