

MANZEENE AVENUE, LARA

OFFSET MONITORING REPORT–

WARRAMBEEN OFFSET SITE

YEAR 3 – STAGE 1

YEAR 2 – STAGE 2

YEAR 1 – STAGE 3

Manzeene Avenue Development Project Trust



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April 2019

Report No. 11212 (9.0)

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1. INTRODUCTION

Manzeene Avenue Development Project Trust Pty Ltd engaged Brett Lane & Associates (BL&A) to conduct an annual offset monitoring survey of an offset site at Warrambeen Estate, Shelford. This area is used as an offset for the permitted native vegetation removal at Manzeene Village, Lara and is subject to an offset monitoring plan prepared by Brett Lane & Associates (BL&A 2015).

A baseline monitoring of the offset site was undertaken in December 2015 for a 30-hectare area used as an offset in three stages. This report focuses on all 3 stages of the offset area.

This investigation was commissioned to collect:

- year-three data of the monitoring program for Stage 1 of the offset site,
- year-two monitoring for Stage 2,
- and baseline data for Stage 3.

It includes the condition of native vegetation, extent of weed cover in the offset site and the adequacy of fencing, grazing and other biomass and weed control regimes. The data will be used in the monitoring and adaptive management of the offset site consistent with the Offset Management Plan (OMP) for this site (BL&A 2015).

Specifically, the scope of the investigation included:

- Estimation of overall weed cover and cover of each high threat [woody] weed species (refer to Table 11 of the OMP);
- Take photos at photo points;
- Assessment of integrity of offset zone fencing;
- Assessment of level of grazing pressure;
- Monitoring of compliance with land-use commitments and other management commitments; and
- Monitoring of quality of NTGVVP.

This report is divided into the following sections:

Section 2 provides an overview of the characteristics of the study area and describes the sources of information including the background to the project.

Section 3 describes the methods used for the field survey and monitoring.

Section 4 presents the investigation results, describing the flora and fauna of the study area.

Section 5 discusses the implications of the management plan implementation, analysis of results and recommendations to improve the management process.

This investigation was undertaken by a team from BL&A, comprising Chris Lee (Botanist), Chris Dunk (Botanist) and Inga Kulik (Senior Ecologist & Project Manager).

2. SITE DESCRIPTION AND BACKGROUND

2.1. Site Description

Stages 1 (4.9 ha), Stage 2 (11.6 ha) and Stage 3 (13.5 ha) of the offset site (Figure 1) are located in the northern part of a large property along the Rokewood-Shelford Road, in Shelford. They form a 30-hectare area set aside for current and future offsets, which is in turn part of an extensive 195-hectare paddock.

The offset property is known as Warrambeen Gumley Land Trust and is located approximately 50 kilometres northwest of Geelong. The offset property is bordered by Rokewood Shelford Road to the south, Lonies Road to the east and Gumley Mount Mercer Road to the west. The offset property incorporates livestock (sheep) grazing, and has done so for an extended period of time.

Large areas of native grassland exist in the area. The landowner of the offset property has indicated that there are over 500 hectares (including the offset sites) of native grassland within the Warrambeen Gumley Land Trust alone (Landowners, pers. comm. 2010).

The offset site lies within the Victorian Volcanic Plain bioregion and falls within the Corangamite catchment.

2.2. Background

This project was commissioned by Manzeene Avenue Development Project Trust Pty Ltd to provide annual data for the study area, which is being used for native vegetation offset credits. The native vegetation offset credits are a requirement for the construction of the Manzeene Village Development at Lara, under the Victorian *Biodiversity assessment guidelines* (DEPI 2013) and *Environment Protection and Biodiversity Conservation (EPBC) Act 1999*. The offset monitoring includes assessment against the requirements detailed by the offset management plan produced by Brett Lane & Associates (BL&A 2015).

The offset site within the Warrambeen property is secured as an offset by Manzeene Avenue Development Project Trust Pty Ltd under Section 173 of the *Planning and Environment Act 1987*. The requirement of the Offset Security Agreement between Manzeene Avenue Development Project Trust Pty Ltd, City of Greater Geelong and the Landowners, is to undertake monitoring at the offset site in years 1, 2, 5 and 10.

Offset Management Plan

The following assessments were undertaken by BL&A to gather monitoring data under the offset management plan:

- Flora surveys by a qualified Botanist, documenting the overall vegetation condition and percentage cover of weed species;
- Assessment of mapped vegetation against the criteria for the EPBC Act listed community *Natural Temperate Grasslands of the Victorian Volcanic Plain* (NTGVVP).

The offset management plan outlined the following management actions which need to be undertaken:

- *Pest Plant Control:* Herbaceous weed control to be undertaken regularly throughout the year using spot spraying technique. Focusing on elimination of woody weeds and high threat herbaceous weeds;
- *Pest Animal Control:* Monitor for signs of pest animal activity, taking action where required;
- *Access:* Regularly check integrity of fencing throughout the life of the management plan;
- *Biomass Control:* Strategically graze the study area (in winter if dry), generally spelling in spring/summer to maintain and enhance a herb-rich open ground cover and significant species populations every year. Avoid grazing in any ephemerally wet areas.
- *Monitoring:* Regularly monitor composition and trends of vegetation to assess management effectiveness and guide future management actions. Monitoring will occur in years 1, 2, 5 and 10, with a brief report prepared for years 1 and 2, and a more detailed monitoring report at the end of year five and year 10. This report establishes year one data for the annual monitoring program for Stage 3, and provides year two data for Stage 2.

Methods employed to address the offset management plan requirements are presented in Table 2.

3. METHODS

3.1. Field methodology

Habitat hectare, weed-cover assessments and photo point monitoring was conducted on 8th February 2019. During this assessment, all stages of the offset area were inspected on foot.

Incidental records of threatened flora species were taken within all vegetation types and landforms whilst undertaking the habitat hectare and weed cover assessments. Specimens requiring identification using laboratory techniques were collected.

Photos were taken in pre-established photo points in Stage 1 and Stage 2, and preliminary photo points were established in Stage 3. Notes from photo points taken during the current survey are provided below in Table 1. Photos taken in these locations are provided in Appendix 1.

Table 1: Photo point notes

Stage 1		
Pole No.	Photo direction	Notes
145	S	
144	WNW	
143	S	
142	ESE	
146	SSE	(No pole)
Stage 2		
Pole No.	Photo direction	Notes
364	S	
365	E	
366	N	
363	SE	
362	SW	
367	W	
368	NW	
Stage 3		
Pole No.	Photo direction	Notes
369	S	(No pole)
370	W	(No pole)
371	S	(No pole)
372	N	(No pole)

3.2. Offset management actions

BL&A have reviewed the offset management plan to ensure that the proposed methods, discussed below, correspond to the requirements of the offset management plans.

The management actions include:

- Access control and fencing;

- Biomass reduction;
- Pest plant control;
- Pest animal control; and
- Protection of significant flora and fauna.

Table 2 details the methods used for the offset site monitoring.

Based on this the following surveys were undertaken, discussed in the sections below:

- Habitat hectare assessment (including documentation of the introduced flora species occurring in the offset site); and
- Photography at photo points.

Table 2: Monitoring methods

Monitoring actions	Relevant performance measures (as per OMP)	Monitoring method
Access control and fencing	Maintenance of existing fencing	Visual inspection to determine the condition of the fence
Biomass reduction	Appropriate stock grazing	Discussions with the landowner as to how stock was managed throughout the year (including when the grassland was rested from grazing)
	Maintenance of NTGVVP	Monitoring of vegetation to determined qualification as NTGVVP
Pest plant control	No increase in cover of any weed species	Visual inspection of site and through habitat hectare assessment
	No new weed species introduced	Visual inspection of site and through habitat hectare assessment
Pest animal control	Reduce the number of rabbits	Discussions with landowner as to how pest animals have been controlled
	Identify all rabbit warrens	Visual Inspection

3.2.1. *Habitat hectare and weed cover assessment*

In Victoria, native vegetation is assessed using the habitat hectare method, which is a DELWP approved vegetation quality assessment method. Native vegetation is currently defined in the Victoria Planning Provisions as 'plants that are indigenous to Victoria, including trees, shrubs, herbs and grasses'. The *Biodiversity assessment guidelines* define native vegetation as belonging to two categories (DEPI 2013):

- Patch; or
- Scattered tree.

The definitions of these categories are provided below, along with the prescribed DELWP methods to assess them.

In Victoria, native vegetation is assessed using the habitat hectare method, which is a vegetation quality assessment method prescribed by the Department of Environment, Land, Water and Planning (DELWP). Native vegetation in Victoria is defined as belonging to two categories (DELWP 2017):

- Patch; or
- Scattered tree.

A description of these is provided below.

Patch

A patch of native vegetation is either:

- An area of vegetation where at least 25 per cent of the total perennial understorey plant cover is native; or
- Any area with three or more native canopy trees¹ where the drip line² of each tree touches the drip line of at least one other tree, forming a continuous canopy; or
- Any mapped wetland included in the *Current wetlands map*, available in DELWP systems and tools.

Patch condition is assessed using the habitat hectare method (Parkes *et al.* 2003; DSE 2004) whereby components of the patch (e.g. tree canopy, understorey and ground cover) are assessed against an EVC benchmark. The score effectively measures the percentage resemblance of the vegetation to its original condition.

Scattered tree

A scattered tree is:

- A native canopy tree² that does not form part of a patch.

Scattered trees are counted and mapped, the species identified and their circumference at 1.3 m above the ground is recorded.

¹ A native canopy tree is a mature tree (i.e. it is able to flower) that is greater than 3 metres in height and is normally found in the upper layer of the relevant vegetation type.

² The drip line is the outermost boundary of a tree canopy (leaves and/or branches) where the water drips on to the ground.

3.2.2. *Photography at photo points*

Photographs were taken at photo monitoring points (see Figure 1) to get a representation of the vegetation types and condition within the study area. Photo points that were established in Stage 1 in March 2016 were used here. Photos were taken at pre-established photo points in Stage 2. Preliminary photo points were taken for Stage 3 and permanent, representative locations need to be chosen and established with posts.

3.3. Limitations of field assessment

The temporally constrained nature of the field assessments can result in a failure to record all species and life-forms because of the seasonal absence of some species. During spring, for example, herb diversity is likely to be much higher and leaf litter much lower than in summer, which may affect habitat hectare scoring. However, this limitation was not considered to undermine the current investigation, which was designed to provide an indicative assessment of site condition, rather than an exhaustive inventory of species in the study area.

The survey was undertaken in summer, which is adequate to assess most of the features of this community. Spring flowering ephemeral species may still be noted by their mature seed pods, but may still be missed in this assessment.

4. ASSESSMENT RESULTS

4.1. Habitat hectare assessment

4.1.1. Habitat hectares

Evidence on site, including floristic composition and soil characteristics, suggested that *Heavier-soils Plains Grassland Heavier Soils* (EVC 132_61) was present within the study area (Figure 1).

Heavier-soils Plains Grassland (EVC 132_61) is described in the benchmark as “treeless vegetation mostly less than 1 m tall dominated by largely graminoid and herb life forms. Occupies fertile cracking basalt soils prone to seasonal waterlogging in areas receiving at least 500 mm annual rainfall” (see Appendix 3).

One remnant patch (referred to herein as Offset Zone Stages 1, 2 & 3 (see Figure 1) comprising the abovementioned EVC is pertinent to this report (Table 3).

Table 3: Description of offset zone

Offset Zone	Bioregion	EVC	Description
Stage 1	VVP	<i>Heavier-soils Plains Grassland</i> (EVC 132_61) NTGVVP	A continuous portion of a larger, high-quality native grassland that was dominated by a number of indigenous grasses and herbs. Tussock grasses, Wallaby grasses, Kangaroo grass and Spear grass species were co-dominant across the area, with native herbs such as Scaly Buttons, Blue Devil, and Poison Lobelia common and widespread throughout the entire site. One small shrub, Spiny Rice-flower, was also found onsite. Recruitment area was very low, with moderately high leaf litter presence. The area was gently undulating, with a number of basalt rocky rises. Introduced species were present, with Wild Oat, and Soft Brome providing the highest cover.
Stage 2	VVP	<i>Heavier-soils Plains Grassland</i> (EVC 132_61) NTGVVP	The site description and species composition were much the same as Stage 1, though, Spiny Rice-flower was not noted. Higher weed cover and high leaf litter was present at this site.
Stage 3	VVP	<i>Heavier-soils Plains Grassland</i> (EVC 132_61) NTGVVP	A continuous portion of a larger, high-quality native grassland that was dominated by indigenous grasses. Tussock grasses, Wallaby grasses, Kangaroo Grass and Spear grasses were co-dominant across the area, with native herbs such as Scaly Buttons, Blue Devil and Lemon Beauty Heads common across the site. Recruitment opportunities were relatively low, with high leaf litter presence. The area was gently undulating with a number of basalt rocky rises. Introduced species were more abundant here than the other stages, with Oat, Soft Brome, Spear Thistle and Quaking Grass providing the highest cover. Several Briar Rose plants were also noted in this area.

The habitat hectare assessment results for this habitat zone is provided in Table 4. More detailed habitat scoring results are presented in Appendix 2. The overall habitat score dropped from 61 to 48-50 since the last assessment. The decrease is likely attributed to a difference in assessment timing, which affected a number of factors:

- Leaf litter cover well over the EVC benchmark related to the ephemeral shedding of dead material from annual weed species such as Oats and Soft Brome.
- Higher leaf litter cover greatly reduced bare ground, lowering recruitment potential.
- Assessment timing and litter levels led to reduced visibility and detection of non-grass herbaceous plants.

Nonetheless, the site is still of very high quality and conservation value.

Table 4: Summary of habitat hectare assessment results

Offset Zone	EVC	Area (ha)	Habitat Score (out of 100)
Stage 1	<i>Heavier-soils Plains Grassland</i> (EVC 132_61)	4.9	50
Stage 2	<i>Heavier-soils Plains Grassland</i> (EVC 132_61)	11.6	48
Stage 3	<i>Heavier-soils Plains Grassland</i> (EVC 132_61)	13.5	48

4.1.2. Threatened species

Targeted surveys for threatened species were not included in this monitoring plan. Nonetheless, two state-listed threatened flora species were incidentally encountered and recorded during the offset site monitoring; Small Milkwort and Small Scurf-pea (Photo 1). One Small Milkwort was recorded in Stage 1, and numerous Small Scurf-peas were recorded throughout Stage 1, 2 & 3, where they frequently formed large mats in rockier outcrops. Small Milkwort is listed as threatened under the FFG Act and as vulnerable on the DELWP Advisory list. Small Scurf-pea is listed as threatened under the FFG Act and as endangered on the DELWP Advisory list.

One federally-listed, critically endangered flora species was recorded during the offset site monitoring; Spiny Rice-flower (Photo 2). Several plants were spotted in Stage 1 and recorded with GPS points.

The analysis within the OMP (BL&A 2015) indicated that the additional listed flora species are likely to occur or have the potential to occur:

- Clover Glycine (Vulnerable – EPBC Act).

This species was not recorded in the vegetation assessment.



Photo 1: Small Scurf-pea (*Cullen parvum*) at the offset site



Photo 2: Spiny Rice-flower (*Pimelea spinescens* subsp. *spinescens*)

4.1.3. Access control and fencing

The fencing was found to be of good quality, and is required to be maintained over the years to retain this standard. A temporary fence stands at the southern extent of the offset site, and a more robust permanent fence is planned for construction (Landholder pers. com. Feb 2019). A fence surrounds the 195-hectare paddock, of which the offset site forms a portion, and no additional fence between different offset parties is required (as per BL&A 2015).

There appeared to be very little impact from vehicle access through the offset site, and people are discouraged from accessing the area unless it is absolutely necessary (Landholder pers. com., Dec 2016).

4.1.4. Biomass reduction

Discussions with the landholder found that the following biomass reduction efforts were undertaken during year 2 management within a portion of Stage 2:

- 2075 year 1 wethers grazed the site from 3rd May 2017 until 6th June 2017; and
- 497 ewes grazed the site from 12th June 2017 until 28th August 2017

Assessment of the site found that the current grazing pressure at the time of the survey was low, but effective at biomass reduction (photo 3).



Photo 3: Ungrazed (left) vs grazed (right) grassland in Stage 2

4.1.5. Pest animal monitoring

No evidence of the presence of European Rabbit was detected at the offset site, however Rabbits have been recorded on the broader property.

4.1.6. Pest plant monitoring

Weed species currently contribute to approximately 18% of the vegetative cover in the offset site. Under the offset plan (BL&A 2015), to achieve site gain all weeds are required

to be controlled such that their cover does not increase beyond original levels. In addition to this, there are obligations for land managers under the *Catchment and Land Protection Act 1994* with respect to eradicating regionally prohibited weeds and preventing the growth and spread of regionally controlled weeds. The pest plant species recorded on-site and their percentage cover at the time of the current survey are included in Table 5.

Five additional weed species were recorded in the offset site that were not previously recorded in Year 1. This included Briar Rose (Photo 4), Brown-top Bent, Lesser Hawkbit, and Prickly Lettuce. The locations of encountered Briar Rose are shown in Figure 1.



Photo 4: Briar Rose (*Rosa rubiginosa*)

Weed cover levels of some weed species previously recorded were noted as having increased, including Large Quaking Grass, and Spear Thistle. There was evidence of successful spot spraying of Spear Thistle (Photo 5) and less successful spraying of Flatweed (Photo 6). Repeated applications of herbicide may help with taprooted perennial species such as Flatweed.

The cover of Oat has decreased since Year 2, but still remains higher than levels found in Year 1. Overall, the cover and diversity of native grassland species at the offset site is still at a healthy level, and the weed cover at Stage 1 seems to have decreased since the Year 2 monitoring. Weed control methods must be continued in the coming year to target particular species, namely Briar Rose, Oat and Spear Thistle.



Photo 5: Spear Thistle successful herbicide treatment



Photo 6: Flatweed unsuccessful herbicide treatment

4.1.7. *Controlled burns*

There was evidence for spot burning to target high-threat grass weeds (Photo 7) in Stage 2. Targeted burning was effective in controlling many plants, but longer, more intensive burning would help prevent regrowth from the surviving underground mass.



Photo 7: Spot burning of invasive grasses in Stage 2

Table 5: Pest plant data year three

Common Name	Scientific name	Weed Category	Control under offset plan - Ensure cover does not increase beyond current level	% Cover		
				Year 1 (30 Nov 2016)	Year 2 (30 Nov 2017)	Year 3 (08 Feb 2019)
Barley Grass	<i>Hordeum vulgare</i>	Low-threat	X	-	<1%	<1%
Briar Rose	<i>Rosa rubiginosa</i>	High-threat woody	X	-	-	1%
Brown-Top Bent	<i>Agrostis capillaris</i>	Other weed	X	-	-	<1%
Buck's-horn Plantain	<i>Plantago coronopus</i>	Other weed	X	<1%	<1%	<1%
Capeweed	<i>Arctotheca calendula</i>	Other weed	X	<1%	<1%	<1%
Clover	<i>Trifolium</i> spp.	High-threat	X	15%	2%	2%
Flatweed	<i>Hypochaeris radicata</i>	Moderate-threat	X	1%	1%	1%
Hair Grass	<i>Aira</i> sp.	Other weed	X	1%	<1%	<1%
Large Quaking-grass	<i>Briza maxima</i>	Other weed	X	-	<1%	1%
Lesser Hawkbit	<i>Leontodon saxatilis</i>	Other weed	X	-	-	<1%
Narrow-leaved Clover	<i>Trifolium angustifolium</i> var. <i>angustifolium</i>	Other weed	X	<1%	<1%	<1%
Oat	<i>Avena</i> spp.	High-threat	X	4%	20%	10%
Onion Grass	<i>Romulea rosea</i>	Other weed	X	-	<1%	<1%
Prickly Lettuce	<i>Lactuca serriola</i>	Other weed	X	-	-	<1%
Rough Dog's-tail	<i>Cynosurus echinatus</i>	Other weed	X	<1%	<1%	<1%
Rough Sow-thistle	<i>Sonchus asper</i> s.l.	Other weed	X	<1%	<1%	<1%
Saffron Thistle	<i>Carthamus lanatus</i>	Other weed	X	<1%	<1%	<1%
Soft Brome	<i>Bromus hordeaceus</i>	Other weed	X	3%	<1%	<1%
Spear Thistle	<i>Cirsium vulgare</i>	High-threat weed	X	<1%	<1%	1%
Squirrel-tail Fescue	<i>Vulpia bromoides</i>	Other weed	X	<1%	5%	5%

Common Name	Scientific name	Weed Category	Control under offset plan - Ensure cover does not increase beyond current level	% Cover		
				Year 1 (30 Nov 2016)	Year 2 (30 Nov 2017)	Year 3 (08 Feb 2019)
Sweet Vernal Grass	<i>Anthoxanthum odoratum</i>	Other weed	X	-	<1%	<1%
Toowoomba Canary-grass	<i>Phalaris aquatica</i>	High-threat	X	-	<1%	<1%
Wimmera Rye-grass	<i>Lolium rigidum</i>	Other weed	X	1%	1%	1%
Wood-sorrel	<i>Oxalis</i> sp.	Other weed	X	<1%	<1%	<1%
Yorkshire Fog	<i>Holcus lanatus</i>	High-threat	X	1%	5%	5%

Grey shaded weed species were not previously recorded in the offset site. **Bold % cover** is where the cover of weed species had increased since Year 2.

4.1.8. Qualification as NTGVVP

The entirety of the offset site qualified as *Natural Temperate Grasslands of the Victorian Volcanic Plain* (NTGVVP) at the time of year three survey as it met all the diagnostic features and two of the three condition thresholds from the listing advice (TSSC 2008), as detailed in Table 6.

Table 6: Qualification of offset site at NTGVVP

NTGVVP key diagnostic features (must meet all)	
Quaternary basalt soils within the Victorian Volcanic Plain bioregion.	Yes
At least one of the following grass genera is the dominant native species in the ground layer: Kangaroo-grass, Wallaby-grass, Spear-grass and/or Tussock-grass.	Yes
For a native vegetation remnant >1 hectare in size, the minimum contiguous size of a grassland patch is 0.5 hectare and the density of mature trees within the grassland patch should not exceed 2 trees per hectare.	Yes
NTGVVP condition thresholds (must meet at least one)	
The total perennial tussock cover represented by the native grass genera Kangaroo-grass, Wallaby-grass, Spear-grass and/or Tussock-grass is at least 50%.	Yes
The ground cover of native forbs (wildflowers) is at least 50% of total vegetation cover during spring-summer (September to February).	No
The cover of non-grass weeds is less than 30% of total vegetation cover at any time of the year.	Yes

4.2. Photo points

A comparison of the yearly images from the photo points are shown in Appendix 1. Photo monitoring points were taken in the area of Stage 1, 2 and 3.

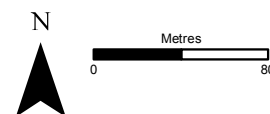


Figure 1: Offset Site

Project: Warrambeen Offset Site **Client:** Manzeene Avenue Development Project Trust **Date:** 26/04/2019

Threatened Flora Species

- | | |
|---------------------|------------------|
| ★ Spiny Rice Flower | ● Photo Points |
| ▲ Small Scurf Pea | □ Offset Staging |
| ▲ Small Milkwort | □ Offset Site |
| ★ Briar Rose | |



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5. REFERENCES

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- Parkes D, Newell G, & Cheal D 2003, 'Assessing the Quality of Native Vegetation: The 'habitat hectares' approach'. *Ecological Management and Restoration*, 4:29-38
- Threatened Species Scientific Committee (TSSC) 2008, *Commonwealth Listing Advice on Natural Temperate Grassland of the Victorian Volcanic Plain*, Department of the Environment, Canberra.

Appendix 1: Photo-point monitoring photographs

Photo No.	Photograph		Photo direction and date	WP #	Notes
142			East South-east March 2016		EVC: <i>Heavier Soils</i> Plains Grassland (132_61)
			East South-east 30/11/2016	37° 54' 09" S, 143° 52' 02" E	EVC: <i>Heavier Soils</i> Plains Grassland (132_61)
			ESE 30/11/2017	37° 54' 09" S, 143° 51' 56" E (NOTE – This is the actual location of pole 142)	EVC: <i>Heavier Soils</i> Plains Grassland (132_61) Spear Thistle and high cover of Wild Oat present

Photo No.	Photograph		Photo direction and date	WP #	Notes
142			ESE 08/02/2019	37° 54' 09" S, 143° 51' 56" E	EVC: <i>Heavier Soils</i> Plains Grassland (132_61)
143			South March 2016	37° 54' 09" S, 143° 52' 02" E	EVC: <i>Heavier Soils</i> Plains Grassland (132_61)
			South 30/11/2016		EVC: <i>Heavier Soils</i> Plains Grassland (132_61)

Photo No.	Photograph		Photo direction and date	WP #	Notes
143			S 30/11/2017		EVC: <i>Heavier Soils Plains Grassland</i> (132_61)
			S 08/02/2019	37° 54' 09" S, 143° 52' 02" E	EVC: <i>Heavier Soils Plains Grassland</i> (132_61)
144			West North-west March 2016	37° 54' 09" S, 143° 52' 06" E	EVC: <i>Heavier Soils Plains Grassland</i> (132_61)

Photo No.	Photograph		Photo direction and date	WP #	Notes
144			WNW 30/11/2016	37° 54' 09" S, 143° 52' 06" E	EVC: <i>Heavier Soils Plains Grassland</i> (132_61)
			WNW 30/11/2017		EVC: <i>Heavier Soils Plains Grassland</i> (132_61)
			WNW 08/02/2019		EVC: <i>Heavier Soils Plains Grassland</i> (132_61)

Photo No.	Photograph		Photo direction and date	WP #	Notes
145			South March 2016	37° 54' 10" S, 143° 52' 11" E	EVC: <i>Heavier Soils</i> Plains Grassland (132_61)
			South 30/11/2016		EVC: <i>Heavier Soils</i> Plains Grassland (132_61)
			S 30/11/2017		EVC: <i>Heavier Soils</i> Plains Grassland (132_61)

Photo No.	Photograph		Photo direction and date	WP #	Notes
145				S 08/02/2019	37° 54' 10" S, 143° 52' 11" E EVC: <i>Heavier Soils Plains Grassland</i> (132_61)
146				South South-east 30/11/2016	37° 54' 14" S 143° 51' 89" E EVC: <i>Heavier Soils Plains Grassland</i> (132_61)
				SSE 30/11/2017 (Note – No pole exists at this location at 30/11/2017)	37° 54' 14" S 143° 51' 52" E EVC: <i>Heavier Soils Plains Grassland</i> (132_61) Spear Thistle and Wild Oat present

Photo No.	Photograph		Photo direction and date	WP #	Notes
146				SSE 08/02/2019 (Note – No pole exists at this location at 30/11/2017)	37° 54' 14" S 143° 51' 52" E EVC: Heavier Soils Plains Grassland (132_61)
Stage 2					
362				SW 30/11/2017	37° 54' 13" S 143° 52' 06" E EVC: Heavier Soils Plains Grassland (132_61)
				SW 08/02/2019	EVC: Heavier Soils Plains Grassland (132_61)

Photo No.	Photograph		Photo direction and date	WP #	Notes
363			SE 30/11/2017	37° 54' 12" S 143° 52' 01" E	EVC: <i>Heavier Soils</i> Plains Grassland (132_61)
			SE 08/02/2019		EVC: <i>Heavier Soils</i> Plains Grassland (132_61)
364			S 30/11/2017	37° 54' 11" S 143° 51' 56" E	EVC: <i>Heavier Soils</i> Plains Grassland (132_61) High cover of Wild Oat present

Photo No.	Photograph		Photo direction and date	WP #	Notes
364			S 08/02/2019	37° 54' 11" S 143° 51' 56" E	EVC: <i>Heavier Soils</i> Plains Grassland (132_61)
365			E 30/11/2017	37° 54' 14" S 143° 51' 57" E	EVC: <i>Heavier Soils</i> Plains Grassland (132_61) High cover of Wild Oat present
			E 08/02/2019		EVC: <i>Heavier Soils</i> Plains Grassland (132_61)

Photo No.	Photograph		Photo direction and date	WP #	Notes
366			N 30/11/2017	37° 54' 15" S 143° 52' 01" E	EVC: <i>Heavier Soils</i> Plains Grassland (132_61)
			N 08/02/2019		EVC: <i>Heavier Soils</i> Plains Grassland (132_61)
367			W 30/11/2017	37° 54' 16" S 143° 52' 05" E	EVC: <i>Heavier Soils</i> Plains Grassland (132_61) High cover of Wild Oat present

Photo No.	Photograph		Photo direction and date	WP #	Notes
367			W 08/02/2019	37° 54' 16" S 143° 52' 05" E	EVC: <i>Heavier Soils</i> Plains Grassland (132_61)
368			NW 30/11/2017	37° 54' 17" S 143° 52' 09" E	EVC: <i>Heavier Soils</i> Plains Grassland (132_61)
			NW 08/02/2019		EVC: <i>Heavier Soils</i> Plains Grassland (132_61)

Photo No.	Photograph			Photo direction and date	WP #	Notes
Stage 3						
369				S	37 ° 54' 22" S 143 ° 52' 08" E	EVC: <i>Heavier Soils</i> Plains Grassland (132_61)
370				W	37 ° 54' 27" S 143 ° 52' 09" E	EVC: <i>Heavier Soils</i> Plains Grassland (132_61)
371				S	37 ° 54' 20" S 143 ° 52' 03" E	EVC: <i>Heavier Soils</i> Plains Grassland (132_61)

Photo No.	Photograph			Photo direction and date	WP #	Notes
372				N	37° 54' 24" S 143° 52' 01" E	EVC: <i>Heavier Soils</i> Plains Grassland (132_61)

Appendix 2: Detailed habitat hectare assessment results

Habitat Zone			Stage 1	Stage 2	Stage 3
Bioregion			VVP	VVP	VVP
EVC Number			132_61	132_61	132_61
Site Condition	Large Old Trees	/10	0	0	0
	Tree Canopy Cover	/5	0	0	0
	Lack of Weeds	/15	9	9	9
	Understorey	/25	15	15	15
	Recruitment	/10	0	0	0
	Organic Matter	/5	3	2	2
	Logs	/5	0	0	0
	Site condition standardising multiplier		1.36	1.36	1.36
	Site Condition subtotal		37	35	35
Landscape Context	Patch Size	/10	8	8	8
	Neighbourhood	/10	1	1	1
	Distance to Core	/5	4	4	4
Total Habitat Score		/100	50	48	48
Habitat score out of 1			0.50	0.48	0.48
EPBC Community			NTGVVP	NTGVVP	NTGVVP

Appendix 3: Native flora recorded in the study area

Conservation Status	Common Name	Scientific Name
Native	Australian Bindweed	<i>Convolvulus angustissimus</i>
Native	Blue Devil	<i>Eryngium ovium</i>
Native	Common tussock-grass	<i>Poa labillardierei</i>
Native	Common Wallaby-grass	<i>Rytidosperma caespitosum</i>
Native	Common Wheat-grass	<i>Anthosachne scabra</i>
Native	Dock	<i>Rumex</i> sp
Native	Dodder	<i>Cuscuta</i> sp.
Native	Double-jointed Speargrass	<i>Austrostipa bigeniculata</i>
Native	Everlasting	
Native	Grassland Wood-sorrel	<i>Oxalis perennans</i>
Native	Grey Tussock-grass	<i>Poa sieberiana</i>
Native	Kangaroo Grass	<i>Themeda triandra</i>
Native	Lemon Beauty-heads	<i>Calocephalus citreus</i>
Native	Long-hair Plume-grass	<i>Dichelachne crinita</i>
Native	Prickfoot	<i>Eryngium vesiculosum</i>
Native	Rush	<i>Juncus flavidus</i>
Native	Sheep's Burr	<i>Acaena ovina</i>
Native	Sheep's Burr	<i>Acaena echinata</i>
Native	Short Wallaby-grass	<i>Rytidosperma carphoides</i>
FFG	Small Milkwort	<i>Comesperma polygaloides</i>
FFG	Small Scurf-pea	<i>Cullen parvum</i>
Native	Small-leaved Mallee-pea	<i>Eutaxia microphylla</i>
Native	Solenogyne	<i>Solenogyne</i>
FFG, EPBC	Spiny Rice-Flower	<i>Pimelea spinescens</i>
Native	Sprawling Bluebell	<i>Wahlenbergia gracilis</i>
Native	Sweet Hound's-tongue	<i>Cynoglossum suaveolens</i>
Native	Wallaby Grass	<i>Rytidosperma erianthum</i>
Native	Wiry Dock	<i>Rumex dumosus</i>
Native	Woodruff	<i>Asperula</i> sp.

Notes: FFG = listed under the Flora and Fauna Guarantee (FFG) Act 1988; EPBC = listed under the *Environment Protection and Biodiversity Conservation (EPBC) Act* 1999

Appendix 4: EVC Benchmarks

- EVC 132_61 (*Heavier Soils Plains Grassland*) – **VVP**

EVC/Bioregion Benchmark for Vegetation Quality Assessment

Victorian Volcanic Plain bioregion

EVC 132_61: *Heavier-soils* Plains Grassland

Description:

Treeless vegetation mostly less than 1 m tall dominated by largely graminoid and herb life forms. Occupies fertile cracking basalt soils prone to seasonal waterlogging in areas receiving at least 500 mm annual rainfall.

Life Forms:

Life form	# Spp	% Cover	LF code
Large Herb	2	5%	LH
Medium Herb	12	20%	MH
Small or Prostrate Herb	4	5%	SH
Large Tufted Graminoid	1	5%	LTG
Medium to Small Tufted Graminoid	13	40%	MTG
Medium to Tiny Non-tufted Graminoid	4	5%	MNG
Bryophytes/Lichens and Soil Crust*	na	20%	BL

* Note: treat as one life form in this EVC

LF Code	Species typical of at least part of EVC range	Common Name
SS	<i>Pimelea humilis</i>	Common Rice-flower
LH	<i>Rumex dumosus</i>	Wiry Dock
MH	<i>Calocephalus citreus</i>	Lemon Beauty-heads
MH	<i>Acaena echinata</i>	Sheep's Burr
MH	<i>Leptorhynchus squamatus</i>	Scaly Buttons
MH	<i>Eryngium ovium</i>	Blue Devil
SH	<i>Solenogyne dominii</i>	Smooth Solenogyne
SH	<i>Lobelia pratioides</i>	Poison Lobelia
LTG	<i>Austrostipa bigeniculata</i>	Kneed Spear-grass
LTG	<i>Dichelachne crinita</i>	Long-hair Plume-grass
MTG	<i>Themeda triandra</i>	Kangaroo Grass
MTG	<i>Austrodanthonia caespitosa</i>	Common Wallaby-grass
MTG	<i>Elymus scaber</i> var. <i>scaber</i>	Common Wheat-grass
MTG	<i>Schoenus apogon</i>	Common Bog-sedge
MNG	<i>Microlaena stipoides</i> var. <i>stipoides</i>	Weeping Grass
MNG	<i>Thelymitra pauciflora</i> s.l.	Slender Sun-orchid
MNG	<i>Microtis unifolia</i>	Common Onion-orchid
SC	<i>Convolvulus erubescens</i>	Pink Bindweed

Recruitment:

Episodic/Fire or Grazing. Desirable period between disturbances is 5 years.

Organic Litter:

10% cover

EVC 132_61: *Heavier-soils* Plains Grassland - Victorian Volcanic Plain bioregion

Weediness:

LF Code	Typical Weed Species	Common Name	Invasive	Impact
LH	<i>Plantago lanceolata</i>	Ribwort	high	low
LH	<i>Cirsium vulgare</i>	Spear Thistle	high	high
LH	<i>Sonchus oleraceus</i>	Common Sow-thistle	high	low
MH	<i>Hypochoeris radicata</i>	Cat's Ear	high	low
MH	<i>Leontodon taraxacoides</i> ssp. <i>taraxacoides</i>	Hairy Hawkbit	high	low
MH	<i>Trifolium subterraneum</i>	Subterranean Clover	high	low
MH	<i>Plantago coronopus</i>	Buck's-horn Plantain	high	low
MH	<i>Trifolium striatum</i>	Knotted Clover	high	low
MH	<i>Trifolium dubium</i>	Suckling Clover	high	low
LTG	<i>Phalaris aquatica</i>	Toowoomba Canary-grass	high	high
LNG	<i>Holcus lanatus</i>	Yorkshire Fog	high	high
MTG	<i>Romulea rosea</i>	Onion Grass	high	low
MTG	<i>Vulpia bromoides</i>	Squirrel-tail Fescue	high	low
MTG	<i>Briza minor</i>	Lesser Quaking-grass	high	low
MTG	<i>Bromus hordeaceus</i> ssp. <i>hordeaceus</i>	Soft Brome	high	low
MTG	<i>Briza maxima</i>	Large Quaking-grass	high	low
MTG	<i>Lolium rigidum</i>	Wimmera Rye-grass	high	low
MTG	<i>Lolium perenne</i>	Perennial Rye-grass	high	low
MTG	<i>Nassella neesiana</i>	Chilean Needle-grass	high	high
MNG	<i>Cynosurus echinatus</i>	Rough Dog's-tail	high	low
MNG	<i>Juncus capitatus</i>	Capitate Rush	high	low

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