Final Report

Caroline Springs Railway Station Offset Site, Victoria: Year 9 Annual Report:

PREPARED FOR

VicTrack

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Ecology and Heritage Partners acknowledge the Traditional Owners of the country we live and work on, and we pay our respect to Elders past, present and emerging.

GLOSSARY

Acronym	Description
AES	Aus Eco Solutions
CMP	Conservation Management Plan
DEECA	Victorian Department of Energy, Environment, and Climate Action
DCCEEW	Commonwealth Department of Climate Change, Energy, the Environment and Water
EHP	Ecology and Heritage Partners
EPBC Act	*Environment Protection and Biodiversity Conservation Act 1999* (Commonwealth)
NTGVVP	Natural Temperate Grassland of the Victorian Volcanic Plain
PG	Plains Grassland
OMP	Offset Management Plan
SLL	Striped Legless Lizard *Delma impar*
SRF	Spiny Rice-flower *Pimelea spinescens* subsp. *spinescens*
VQA	Vegetation Quality Assessment

CONTENTS

1 EXECUTIVE SUMMARY

Ecology and Heritage Partners Pty Ltd were commissioned by VicTrack to undertake ecological monitoring and oversee land management works for the Caroline Springs Railway Station Offset Site, located at Christies Road, Caroline Springs (Figure 1). The objective was to provide a framework for the continuation of the management, auditing and reporting required to be undertaken as part of the approved Conservation Management Plan (CMP) and Offset Management Plan (OMP) as per EPBC 2010/5463, to ensure the enhancement of the 2.04 hectare offset area, and other areas of retained grassland at the Caroline Springs Railway Station.

This report details the results of the Year 9 monitoring, including the status of the three matters of National Environmental Significance (MNES) within the site, Spiny Rice-flower *Pimelea spinescens* subsp. *spinescens* (SRF) (translocated and remnant plants), Striped Legless Lizard *Delma impar* (SLL) and quality and extent of the threatened ecological community, *Natural Temperate Grassland of the Victorian Volcanic Plain* (NTGVVP).

Native Vegetation

An assessment of the condition and extent of NTGVVP was undertaken to observe any changes in the native vegetation cover and weed extent within the grassland compared to previous years. Biomass across the offset site remains high, with vegetation condition ranging from low-moderate in areas of higher weed cover (particularly in inundation affected areas) to high due to the overall low cover of high threat weeds and mixture of native herbs and grasses present. Three habitat zones of differing quality were recorded in the offset site throughout Year 9 and have remained relatively consistent with conditions recorded during the Year 8 monitoring period (Ecology and Heritage Partners (EHP), 2022a) (Figure 2). All three habitat zones qualify as the EPBC Act listed ecological community, NTGVVP, due to the cover of non-grass weeds (<30% of total vegetation cover), and >50% perennial tussock cover of Kangaroo Grass, Wallaby-grass, and Spear-grass, as per the published listing advice for the community (Threatened Species Scientific Committee 2008). However, due to waterlogging, the area which experienced inundation during Years 8 and 9 did not qualify as NTG during Year 9, the impact of which was outlined in Ecology and Heritage Partners: Notification of temporary impact to Caroline Springs Railway Station Offset Sire and remediation works (EPBC 2010/5463) (EHP, 2022b). These areas are recovering post-burn and are likely to be dominated by native vegetation once more when weed cover is reduced and native species establish and spread. The land manager Aus Eco Solutions undertook an additional Ecological burn in July 2023. This burn comprised of several small patches to reduce exotic grass cover and manage biomass. Native vegetation reestablishment will also be encouraged through direct seeding. Aus Eco Solutions collected Kangaroo Grass seed in summer 2022/23 which was spread throughout the reserve in June 2023, especially into areas where weedy vegetation had previously been removed.

Spiny Rice-flower

The Spiny Rice-flower population included 58 translocated individuals established between 2014-2017, 22 individuals translocated in 2022, and a number of in-situ individuals located within the offset site. Of the initial 58 translocated individuals, four plants remain alive (5%), and of the twenty-two (22) translocated by AES on the 27 May 2022, none are still alive. This high decline in survivorship is attributed to continued higher than average rainfall throughout 2022 causing ongoing flooding of the translocation sites. As the current survival numbers are below the threshold which triggers a contingency response to occur, as per the contingency measures detailed in the CMP (EHP 2014a), seed will be collected by AES from SRF within the offset site following the 2023 flowering season. SRF seeds will be cleaned and given to VicUni in 2023 for germination.

Seedlings will then be planted into the offset site, as required. The translocation of SRF in the offset site is considered successful when 50% of translocated SRF have survived for a period of 5 consecutive years, as per the CMP. The 2014 cohort had reached this target, however only one survived the prolonged inundation.

Striped Legless Lizard

A total of 20 SLL individuals were recorded within the grid areas during the Year 9 targeted surveys, of which 11 were captured and measured. Eastern Blue-tongue *Tiliqua scincoides*, Tiger Snake *Notechis scutatus* and Little Whip Snake *Suta flagellum* were also recorded in the study area during tile grid checks along with Spotted Marsh Frog *Limnodynastes tasmaniensis*, and House Mouse *Mus musculus*. No other vertebrate fauna species of note were recorded during targeted surveys. The number of SLL recorded in Year 9 was far higher than that of Year 8 despite prolonged water inundation and reduced habitat suitability. This was potentially attributed to the reduced presence of a predator species (Tiger Snake). Monitoring indicated that the quality of SLL habitat in the offset site has increased throughout the Year 9 monitoring season compared to the past Year 8 and is now comparable to the higher Year 6 and 7 levels. SLL habitat monitoring highlighted the requirement for responses to below ideal levels of three features, including:

- Bare ground <5%;
- Exposed rock <5%; and,
- inter-tussock spacing <10%

Ecological burns undertaken in July 2023 addressed these issues within Grid 2.

Conclusion and Recommendations

Year 9 monitoring indicated that the overall quality of native vegetation (outside areas subject to water inundation) is improving, however the quality has reduced in areas of previous prolonged inundation. The works undertaken throughout Year 9 were as outlined by the CMP, the OMP and additional recommendations from the Year 8 Annual Report, in compliance with the EPBC Act approval conditions. As per the CMP and OMP, several trigger thresholds for corrective work were triggered, such as the SLL habitat condition and the low SRF survivorship. Management and monitoring is required to ensure that the offset site maintains optimal habitats for these species and to ensure that the low survivorship of transplanted SRF improves in future. To ensure that the native vegetation and habitat for significant species continues to improve, the following works should be incorporated into Year 10 land management and monitoring in addition to OMP management requirements (EHP 2014b: Table 12):

- Monitor the middle section of the offset site for the improved habitat suitability for SLL following the ecological burns, control weeds, and improve the quality and extent of native vegetation;
- Monitor the recovery of native vegetation in areas subject to water inundation (eastern side). Undertake additional weed control and planting/seed broadcasting of native grasses as required;
- Liaise with V/Line about drains and associated infrastructure monitoring to ensure blockages do not cause/exacerbate water pooling in Year 10;
- Collect and germinate SRF seed (2023), and plant seedlings growing from previous years seed collection into offset site 2023 (pending seedling growth and suitability for translocation);
- Continue to monitor and manage (i.e. water and hand weed) translocated and remnant SRF;

2 INTRODUCTION

2.1 Background

Ecology and Heritage Partners Pty Ltd were commissioned by VicTrack to undertake ecological monitoring and oversee land management works for the Caroline Springs Railway Station Offset Site, located at Christies Road, Caroline Springs (Figure 1). The offset site includes 2.04 hectares of native vegetation, comprising 1.92 hectares of Plains Grassland (PG) and *Natural Temperate Grassland of the Victorian Volcanic Plain* (NTGVVP), and 0.12 hectares of exotic vegetation, and approximately 80 Spiny Rice-flower (SRF) individuals and suitable habitat for a confirmed population of Striped Legless Lizard (SLL).

The management, monitoring and auditing works required to be undertaken at Caroline Springs are detailed in the CMP (EHP 2014a) and OMP (EHP 2014b) prepared for the site, and approved by the Commonwealth Department of Climate Change, Energy, the Environment and Water [DCCEEW] (formally the Department of Agriculture, Water and the Environment [DAWE]) under the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC 2010/5463), and the Victorian Department of Energy, Environment and Climate Action [DEECA] (formerly the Department of Environment, Land, Water and Planning [DELWP]).

Specifically, the land management works relate to the protection and ecological monitoring of the quality of the EPBC Act-listed community NTGVVP, weed and pest control works, biomass control methods such as prescribed ecological burns, and management and monitoring of the existing populations of the EPBC Act-listed SRF and SLL. Aus Eco Solutions were engaged directly by VicTrack to undertake land management works in Year 9.

The Year 9 annual monitoring report presented below outlines the management and monitoring actions undertaken within the offset site between 1 July 2022 and 30 June 2023 (Figure 2). The monitoring results for Year 1–Year 8 is detailed in EHP 2015; 2016; 2017; 2018a; 2018b; 2019a; 2020; 2021; 2022.

This report outlines the results of the Year 9 ecological monitoring and addresses the management, in accordance with the CMP (EHP 2014a) and OMP (EHP 2014b), as per the EPBC Approval (EPBC 2015/5463). Additionally, EHP review the results of the Year 9 monitoring to determine if the targets are being met/will be met by Year 10.

2.2 Objectives

The overall objective is to protect and improve the quality and extent of native vegetation and significant ecological values present within the offset site, and in accordance with EPBC 2010/5463 and associated CMP and OMP. This includes the populations of nationally significant species listed under the EPBC Act, SRF and SLL, as well as the threatened ecological community, NTGVVP.

The objectives of the CMP are to:

- *Clearly identify the matters of national environmental significance that will be impacted by the proposed railway station;*
- *Prescribe measures to manage retained matters of national environmental significance, which are not to be affected by the proposed railway station development;*

- *Prescribe salvage and translocation procedures for the Spiny Rice-flower that are located within the development footprint, and salvage and removal protocols for any Striped Legless Lizard that are salvaged during pre-construction and construction activities;*
- *Prescribe management measures for the recipient site to allow the long-term survival of the existing and relocated Spiny Rice-flower plants and a Striped Legless Lizard population;*
- *Provide a management program for 10 years to monitor and undertake activities designed to improve the condition of the recipient site, manage key threats to the Spiny Rice-flower and Striped Legless Lizard, and prescribe corrective and contingency measures should the condition of the recipient site deteriorate;*
- *Provide a Plan that meets regulatory approvals with the Department of Environment and Primary Industries (DEPI) and the Department of the Environment (DoE); and,*
- *Ensure that the appropriate arrangements are in place for the sites to be managed in perpetuity so that the management gains achieved over the 10-year management period are maintained at their Year 10 levels in perpetuity* (EHP 2014a).

The objectives of the OMP are to:

- *Comply with Condition 2 of the Environment Protection and Biodiversity Conservation Act 1998 Referral Approval (2010/5463);*
- *Clearly state the offset targets generated through the proposed vegetation removal associated with the construction of the railway station;*
- *Determine a suitable offset location;*
- *Prescribe recommendations to achieve the offset targets through the management of remnant vegetation over a 10-year period; and,*
- *Ensure that the appropriate arrangements are in place for the Offset site to be managed in perpetuity so that the management gains achieved over the 10-year management period are maintained in an ongoing manner* (EHP 2014b).

2.3 Offset Site Security

Condition 1 of the EPBC Act approval specifies that the land identified in Annexure 1 of approval 2010/5463 (i.e. the protected site), adjacent to the clearing site must be protected in perpetuity to compensate for impacts to the nationally significant ecological community NTGVVP, and EPBC Act listed species, SRF and SLL, in the form of a conservation covenant under the *Victorian Conservation Trust Act 1972*. A Trust for Nature (TfN) conservation covenant was entered by the Public Transport Development Authority and TfN and approved by the Minister on 27 June 2014.

2.4 Offset Site Events

2.4.1 *Continued Inundation*

Throughout the Year 9 monitoring period, the offset site experienced consistently high amounts of rainfall due to La Nina. This flooded much of the eastern portion of the offset site, including the areas previously inundated and extending to the eastern fence. This flooded all transplanted cohorts of Spiny Rice Flower throughout winter. The inundation was present from winter to December 2022 but had dried by January 2023.

2.4.2 *Ecological burn*

An ecological burn was planned to reduce the biomass in the western half of the offset site in Year 9. However, due to unfavourable weather conditions smaller targeted burns were completed on the 29th of June 2023 by Aus Eco Solutions using a butane torch. These smaller burns targeted areas of high exotic grass cover with the aim of reducing exotic grass cover and encouraging native grass growth.

3 MONITORING METHODS

Baseline data to determine the condition and extent of Plains Grassland (PG) and NTGVVP, as well as the current population status of SLL and SRF within the offset site was undertaken by EHP in 2009 and 2010, respectively (EHP 2009; EHP 2010). The data collected during the biodiversity assessment and subsequent targeted surveys to inform the CMP/OMP (EHP 2014a, 2014b). Ecological monitoring is undertaken annually until the quality conditions outlined within the CMP/OMP are met.

Ecological monitoring in Year 9 was undertaken to monitor the quality and extent of PG and NTGVVP, as well as the population status of SLL and the retained and translocated SRF populations within the offset site. The following section outlines the methods used to undertake the monitoring in Year 9, in accordance with the CMP/OMP (EHP 2014a, 2014b). A summary of year 9 activities and dates is presented below.

Date	Activity
29/08/22	Site Assessment
20/09/22	SLL Monitoring
28/09/22	SLL Monitoring
04/10/22	SLL Monitoring
11/10/22	SLL Monitoring
19/10/22	SLL Monitoring
03/11/22	SLL Monitoring
10/11/22	SLL Monitoring
18/11/22	Site Assessment
22/11/22	SLL Monitoring
24/01/23	Site Assessment
09/02/23	Site Assessment

04/04/23	SRF Monitoring
07/06/23	SRF Monitoring

3.1 Native Vegetation Monitoring

The following methods have been undertaken in accordance with the CMP (EHP 2014a) and associated federal policy documents, *Nationally Threatened Ecological Communities of the Victorian Volcanic Plain: Natural Temperate Grassland & Grassy Eucalypt Woodland* (Commonwealth of Australia 2011a) and *Commonwealth Listing Advice on Natural Temperate Grassland of the Victorian Volcanic Plain* (Threatened Species Scientific Committee 2008):

- To assess changes in quality and extent of PG and NTGVVP, the following monitoring was undertaken:
    - The extent of PG and NTGVVP was mapped and a Habitat Hectare assessment (as per the *Vegetation Quality Assessment Manual: Guidelines for applying the habitat hectares scoring method* (DSE 2004) was undertaken to determine the overall quality (i.e. condition); and,
    - Photo point (Figure 5) monitoring was undertaken at photo points established in Year 1, which were placed in areas of native vegetation and predominantly weeds:
- An assessment of suitable habitat (i.e. extent, quality and structure) for SLL and SRF was undertaken to determine the effectiveness of management for the existing populations;
- Weed Monitoring to determine the effectiveness of management:
    - Broad weed mapping to record the overall cover, extent and composition (i.e. herbaceous, grassy, woody) of weeds within the offset site; and,
    - The cover and extent of all high threat weeds, as per the CMP/OMP, was mapped and recorded.

3.1.1 Supplementary Plantings

Approximately eight species of herbs (436 individuals) were planted in August 2017 to increase floristic diversity within the offset site. Additional herbs were planted in September 2018 and May 2022 (Table 1) (Figure 2). If plant survivorship drops below 80%, supplementary planting will be required.

Table 1. Native seedlings planted within the Offset Site (May 2022).

Scientific Name	Common Name	No. of Seedlings Planted
Dianella revoluta var. *revoluta* (syn *Dianella admixta*)	Black-anther flax lily	370
Senecio quadridentatus	Cottony Fireweed	60
Calocephalus citreus	Lemon Beauty-heads	220

3.2 Spiny Rice-flower Monitoring

The following methods have been undertaken in accordance with the CMP/OMP (EHP 2014a, 2014b), PSRT protocols (PSRT 2013) and the monitoring protocol outlined within Vallee *et al*. (2004):

- Undertake biannual monitoring (2022 and 2023) of translocated SRF plants during flowering period (May-August). The following attributes are collected as part of the translocation monitoring:
    - Growth, sex, virility (percentage of plant in flower), recruitment, health and survival rates (in accordance with Table 2).
- 25 existing in-situ plants (remnant plants) within the offset site were monitored concurrently to compare the growth, survival and recruitment of translocated SRF;
- To mitigate the threat of drought stress, particularly between January – April 2023, translocated SRF were watered monthly in accordance with the regime summarised in Table 3;
- Biomass surrounding translocated SRF plants was monitored to ensure appropriate inter-tussock space is maintained and does not prevent plant growth; and,
- Tags were checked and replaced by AES during 2022 planting events (numbers and plant locations provided by EHP).

Table 2. Health Rating Metric for Spiny Rice-flower.

Health Rating	Description	Health Indicator
1	Excellent	Less than 5% dieback
2	Good	Between 15 < 30% dieback
3	Moderate	Between 30 < 75% dieback
4	Poor	Between 75 < 99% dieback
5	Dead	No evidence of live biomass

Table 3. Watering requirements for translocated SRF plants.

Months after planting	Period between significant rainfall events that will trigger watering	Watering Required
0-3	1 week	Weekly
3-9	3-4 weeks	Fortnightly
9 - 21	1 – 2 Months	Monthly

3.3 Striped Legless Lizard Monitoring

The following methods have been undertaken in accordance with the CMP/OMP (EHP 2014 and 2014b) and the *Survey guidelines for Australia's threatened reptiles: Guidelines for detecting reptiles listed as threatened under the EPBC Act* (Commonwealth of Australia 2011b):

- 2 tile grids (10 x 5 tiles per grid) were established in August 2014 (Figure 3);
- Tiles were established in areas of suitable habitat (i.e. tussock grassland or grassy habitat) at least three months before the survey period to allow 'bedding-in';

- Tiles were checked a minimum of eight times between September and December under suitable conditions (early morning on warm, still days);
- Time of survey, weather conditions and the ambient temperature will be recorded for each grid;
- Morphological data including sex, body size and reproductive condition will be recorded for all individuals captured, as well as dorsal head shots for unique identification purposes; and,
- Habitat monitoring to determine the suitability/condition of SLL habitat (Table 4) and required management.

Striped Legless Lizard monitoring will be undertaken annually, as per the OMP (EHP 2014b).

Table 4. Striped Legless Lizard habitat monitoring criteria.

Habitat variable	Ideal level^	Trigger Threshold	Trigger Response
Native clumping grass cover	50%	<30%	Plant native clumping species
Introduced grass cover	<10%	>20%	Remove weeds
Bare ground	20%	<5%	Removal of vegetation
		>50%	Plant native clumping species
Exposed rock	10%	<5%	Removal of vegetation
Inter-tussock spacing	30 centimetres	<10 cm	Removal of vegetation
		>50 cm	Plant native clumping species

Note: ^The ideal level value is the average value for each tile grid.

4 MONITORING RESULTS

4.1 Native Vegetation Monitoring

Vegetation monitoring was undertaken by a suitably qualified Ecologist on the 8 August 2022, 18 November 2022 and 24 January 2023, 9 February 2023, 4 April 2023. The overall condition of the Offset Site was regularly monitored throughout Year 9 in each season (winter, spring, summer, autumn).

Biomass throughout Year 9 was high to very high within the offset site. The middle section remains dominated by Kangaroo Grass *Themeda triandra*, Wild Oats *Avena* sp., and Spear-grass *Austrostipa* spp. and generally has lower biomass than the far western corner of the site which is dominated by the exotic grasses Toowoomba Canary-grass *Phalaris aquatica* and Cocksfoot *Dactylis glomerata*. Biomass in the eastern section was dominated by exotic grasses and was very high throughout spring and summer; native grasses and herbs were establishing following the ecological burn in Year 8.

The vegetation condition remained similar to Year 8 and ranged from moderate to high due to the overall low cover of high threat weeds and mixture of native herbs and grasses present. Three habitat zones of differing quality were recorded in the offset site and have remained relatively consistent with conditions recorded during the Year 8 monitoring period (Figure 2). PG2, PG3 and much of PG1 qualify as the EPBC Act listed ecological community*, NTGVVP, due to the cover of non-grass weeds (<30% of total vegetation cover), and >50% perennial tussock cover of Kangaroo Grass, Wallaby-grass, and Spear-grass, as per the published listing advice for the community (Threatened Species Scientific Committee 2008) (Figure 2).

Areas of PG1 impacted by water inundation in Year 8 and subsequently Year 9 did not qualify as Plains Grassland/ Natural Temperate Grassland in Year 9. These areas are recovering post-burn and are likely to become native vegetation once weed cover is reduced and native species establish and spread. Native vegetation reestablishment will also be encouraged through direct seeding. Aus Eco Solutions collected Kangaroo Grass seed in summer 2022/23 to be spread throughout the reserve, particularly in areas of high weed cover, following the ecological burn in autumn 2023. The habitat zones are described below.

Plains Grassland 1 (PG1)

PG1 includes the eastern half of the offset site (Figure 2); the cover of native vegetation throughout this patch varies due to water inundation during Year 8. In water affected areas, native vegetation consists of swathes of Kangaroo Grass and Spear-grass *Austrostipa* spp., and scattered Hairy Panic *Panicum effusum*, Swamp Wallaby-grass *Amphibromus* spp. and native Rush *Juncus* spp. (Plate 1). Following the ecological burn in Autumn 2022, swathes of herbs emerged, including Narrow Plantain *Plantago gaudichaudii*, Cottony Fireweed *Senecio quadridentatus*, Common Bindweed *Convolvulus angustissimus*, Prickly Woodruff *Asperula scoparia* subsp. *scoparia*, and Hairy Sheep's Burr *Acaena agnipila*. Remnant Spiny Rice-flower were also observed re-shooting throughout the burn area (plate 2). Some SRF were protected during the burn by the high biomass cover and autumn burn conditions; these plants were observed actively growing and flowering in autumn 2022.

Annual weeds were prolific in Year 9 due to high rainfall and warm temperatures. The density and cover of introduced species was higher than previous monitoring years, and the overall size of many plants was observed as higher than average.

Weed cover throughout PG1 is low-moderate (<15%) but more prevalent towards the boundaries and the low-lying area on the north-eastern corner. The dominant weeds include Oats *Avena* spp., Ribwort *Plantago* spp., Couch *Cynodon dactylon* var. *dactylon*, Galenia *Aizoon pubescens,* Toowoomba Canary-grass *Phalaris aquatica,* and Paterson's Curse *Echium plantagineum*.

Plate 1. PG1 with coverage of Oats and Kangaroo Grass; looking south from the northern boundary (Ecology and Heritage Partners 09/02/2023).

Plate 2. Remnant Spiny Rice Flower amongst native grasses and environmental weeds (Ecology and Heritage Partners 09/02/2023).

Plains Grassland 2 (PG2)

PG2 includes the middle section of the offset site and incorporates most of the embedded rock within the offset site (Figure 2). This zone is generally dominated by Kangaroo Grass with Spear-grass, Weeping Grass, Wallaby-grass *Rytidosperma* spp., Red-leg grass *Bothriochloa macra,* and Windmill Grass *Chloris truncata* intermixed (Plate 3; Plate 4). Herbs are common throughout this area as embedded rock provides some refuge from the high cover of native grasses. Common herbs include those listed above in PG1, as well as Curved Rice-flower *Pimelea curviflora*, and Lemon Beauty-heads *Calocephalus citreus* (Plate 5; Plate 6). Weed cover is moderate within this zone (<25%), with higher cover along the boundaries. High threat grass and herbaceous weeds occur throughout and include Paterson's Curse, Ribwort, Galenia, Oats, Serrated Tussock *Nassella trichotoma*, Slender Pigeon-grass and Toowoomba Canary-grass.

Plate 3. PG2 dominated by Kangaroo Grass; looking north from central PG1 (Ecology and Heritage Partners 09/02/2023).

Plate 4. PG2 generally dominated by Kangaroo Grass but with high Toowoomba Canary grass cover along the boundary (Ecology and Heritage Partners 09/02/2023).

Plate 5. Berry Saltbush intermixed with exotic grasses (Ecology and Heritage Partners 09/02/2023).

Plate 6. Lemon Beauty-heads intermixed with native and exotic grasses (Ecology and Heritage Partners 09/02/2023).

Plains Grassland 3 (PG3)

PG3 includes the western corner of the offset site (Figure 2). PG3 is less diverse than PG1 and PG2 and is primarily dominated by Kangaroo Grass. The habitat zone adjoins a small patch previously listed as Plains Grassy Wetland (PGWe1 on Figure 2). Weed cover was high (50%) in PG3, and the dominant species included Toowoomba Canary-grass, Cocksfoot, Serrated Tussock, Oats, Slender Pigeon-grass, Panic Veldt-grass *Ehrharta erecta*, Ribwort, and Galenia. The far west corner and southern boundary were dominated by Toowoomba Canary-grass and Cocksfoot (Plate 7; Plate 8).

Plate 7. PG3 dominated by Kangaroo grass (left) and Toowoomba Canary grass (right) (Ecology and Heritage Partners 09/02/2023).

Plate 8. High biomass within PG3, looking east from the western corner (Ecology and Heritage Partners 09/02/2023).

Plains Grassy Wetland 1 (PGWe1)

A small patch of PGWe was previously recorded in the western corner of the offset site (Plate 9; Plate 10) (PGWe1 on Figure 2). This patch occupied a natural depression between the existing rock pile and PG3. Based on seasonal changes in moisture it was expected that this area may be considered Plains Grassland at various times of the year, especially summer when the area was dry. Vegetation surveys for Year 9 took place in summer and shortly after, and at the time of surveying the patch was dominated by native and exotic grasses and did not constitute PGWe. Previously recorded wetland species such as Common Spike-rush *Eleocharis acuta*, Brown-back Wallaby-grass *Rytidosperma duttonianum* and Common Blown-grass *Lachnagrostis filiformis* were not noted during this inspection, and the patch was considered PG.

Plate 9. Formerly present PGWe1 dominated by Common Spike-rush, Brown-back Wallaby-grass and Common Blown-grass (Ecology and Heritage Partners 07/12/2021).

Plate 10. Formerly present PGWe1 adjoining PG3 in the western section of the Offset Site (Ecology and Heritage Partners 07/12/2021).

4.1.1 Supplementary Plantings

Supplementary plantings from previous management years had varying success. Aus Eco Solutions undertook hand weeding and brush cutting to reduce the overall cover of biomass from around the 2017 and 2018 plantings (Plate 11). Additional seedlings were planted within the offset site in May 2022 (see Section 2.1.1. for species list) (Herb plantings on Figure 2). Aus Eco Solutions continued to hand weed and brush cut around these supplementary plantings to increase survivorship.

The area marked as the eastern herb planting was weedy and consisted largely of sow thistles and mustards intermixed with native and exotic grasses (Plate 11). Some young Paterson's Curse and slender bindweed were observed flowering in the planting area. There were also some scattered natives such as Nodding Saltbush *Einadia nutans* which was scattered throughout the planting area (Plate 12).

Few herbs persisted in the western supplementary planting. The area was smothered in a mixture of native and exotic grasses. Native grasses included Kangaroo Grass and some Weeping Grass and Wild Oats was the primary exotic grass.

Several herbs were present on the northern boundary of the offset site, on the border between PG1 and PG2. Whilst not within the marked supplementary planting areas this area contained several native herbs and plants including many Lemon Beauty Heads *Calocephalus citreus*, Black-anther flax lily *Dianella revoluta* var. *revoluta*, and Sheep's Bur *Acaena echinata*, suggesting survivorship from the May 2022 plantings (Plate 14 - Plate 16).

An additional supplementary herb planting took place on the 4th of July 2023. This planting was of 200 plants consisting of Sheep's Burr *Acaena echinate*, Chocolate Lily *Arthropodium strictum s.l*, Lobe-seed Daisy *Brachyscome dentata*, Common Everlasting *Chrysocephalum apiculatum*, Blue Devil *Eryngium ovinum*, and Running Postman *Kennedia prostrata*. These plantings were done along the northern edge of PG1 within areas that had undergone ecological burns the previous week (Figure 2).

Plate 11. Weedy patch in the eastern herb planting area containing sow thistle and mustards (Ecology and Heritage Partners 9/02/2023).

Plate 12. Nodding saltbush within the eastern herb planting area (Ecology and Heritage Partners 9/02/2023).

Plate 133. Western supplementary planting area smothered in native and exotic grasses (Ecology and Heritage Partners 9/02/2023).

Plate 144. Lemon Beauty-heads between PG1 and PG2 (Ecology and Heritage Partners 9/02/2023).

Plate 155. Black-anther Flax-lily on the border between PG1 and PG2 (Ecology and Heritage Partners 9/02/2023).

Plate 166. Sheep's Bur on the border between PG1 and PG2 (Ecology and Heritage Partners 9/02/2023).

4.1.2 Introduced Vegetation

Overall weed cover throughout the offset site is generally low-moderate (<20%). Woody weeds have been almost eliminated from the offset site with a single African Boxthorn growing from within a large Spiny Saltbush *Rhagodia spinescens*, although follow-up work is regularly undertaken to remove any germinants or re-sprouting mature plants. Weedy grasses and herbaceous weeds continue to persist within the site and remain the target for weed management in Year 9 and the subsequent year. The dominant weeds recorded within the offset site are Paterson's Curse *Echium plantagineum*, Galenia *Aizoon pubescens*, Ox-tongue *Helminthotheca echioides*, Ribwort *Plantago* spp., Oats, Toowoomba Canary-grass, Cocksfoot, Serrated Tussock, and Sow Thistle (Plate 17 – Plate 20). While Soursob *Oxalis pes-caprae* was not observed, other weedy Oxalis spp. were noted emerging, particularly in the inundation affected eastern side of the site. Serrated Tussock shared this distribution as it was generally present in low abundance throughout the site but displayed higher cover throughout previously inundated areas. Some dead Spear Thistle *Cirsium vulgare* individuals remain within the offset site, however no emerging seedlings were observed.

Plate 177. African Boxthorn emerging from a large Spiny Saltbush in PG2 (Ecology and Heritage Partners 9/02/2023).

Plate 188. Galenia intermixed with weedy grasses in PG2 (Ecology and Heritage Partners 9/02/2023).

Plate 199. Flowering Paterson's Curse intermixed with exotic and native grasses within the offset site (Ecology and Heritage Partners 9/02/2023).

Plate 2020. Cocksfoot and Toowoomba Canary-grass dominating the western corner (Ecology and Heritage Partners 9/02/2023).

In Year 9, raking and hand clearing of the biomass around the northern translocated SRF was carried out by AES to prevent complete coverage of the plants from the adjacent grasses. The results of this were observed during the 4 April 2023 site visit (Plate 17; Plate 18).

Plate 21. Translocated SRF site in the norther planting area, post biomass clearing (Ecology and Heritage Partners 04/04/2023).

Plate 22. Translocated SRF sites in the norther planting area, post biomass clearing (Ecology and Heritage Partners 04/04/2023).

Table 5. Weed cover for all weeds within the offset site.

Common Name	Scientific Name	Control Method	Timing for control	OMP target (%)	CaLP Act/WONS Status	High threat (Y/N)	Current cover %	Notes
WOODY WEEDS								
African Box-thorn	*Lycium ferocissimum*	Cut + Paint, remove debris from site	September - April	Eliminate (<1%)	W, N	Y	<1%	Continue to remove seedlings/ re-sprouting mature plants
Sweet Briar	*Rosa rubiginosa*	Spot Spray/Cut + Paint	September - April	Eliminate (<1%)	N	Y	0%	Continue to remove seedlings/ re-sprouting mature plants
HERBACEOUS WEEDS								
Galenia	*Aizoon pubescens*	Spot Spray	September - April	Eliminate (<1%)	N	Y	4%	Eliminate mature plants and new individuals as required.
Cape Weed	*Arctotheca calendula*	Spot Spray	Early Spring	Eliminate (<1%)	-	Y	<1%	Eliminate new individuals as required
Spear Thistle and other thistles	*Cirsium vulgare/ Helminthotheca echioides*	Spot Spray	All Year	Eliminate (<1%)	N	Y	2%	Only dead Spear Thistles remain within the offset site. Eliminate new individuals as required
Paterson's Curse	*Echium plantagineum*	Spot Spray	Early Spring	Eliminate (<1%)	N	Y	<1%	Scattered germinants recruiting after high rainfall

Common Name	Scientific Name	Control Method	Timing for control	OMP target (%)	CaLP Act/WONS Status	High threat (Y/N)	Current cover %	Notes
Flat Weeds and Mustards	*Hypochoeris* spp., *Plantago* spp., Brassica spp. etc	Spot Spray	All Year	Maintain low cover (<5%)	-	Y	4%	Primarily in the previously inundated areas. Targeted management required to reduce cover
Soursob and other invasive *Oxalis* spp.	*Oxalis pes-caprae*	Spot Spray/ hand removal (dig bulb out) if there are small numbers	Late Winter at bulb exhaustion/ prior to seed set	Eliminate (<1%)	N	N	5%	Soursob <1% cover, other Oxalis spp. observed in inundation affected areas. Eliminate new individuals as required
GRASSY WEEDS								
Chilean Needle-grass	*Nassella neesiana*	Spot Spray and remove/destroy inflorescence (where necessary)	Before seed set in late spring, remove seed heads if fertile	Eliminate (<1%)	W	Y	<1%	Eliminate new individuals as required
Serrated Tussock	*Nassella trichotoma*	Spot Spray	Before seed set in late spring	Eliminate (<1%)	W, N	Y	6%	Primarily emerging in inundation impacted areas. Eliminate new individuals as required
Brown-top Bent	*Agrostis capillaris*	Spot Spray/Burn	October – January	Maintain low cover (<5%)	-	Y	4%	Eliminate new individuals as required

Common Name	Scientific Name	Control Method	Timing for control	OMP target (%)	CaLP Act/WONS Status	High threat (Y/N)	Current cover %	Notes
Annual Grasses	*Vulpia* spp. and *Avena* spp.	Spot Spray/Burn	July - November	Maintain low cover (<5%)	-	Y	20%	Undertake Autumn burn and undertake follow up control
Cocksfoot	*Dactylis glomerata*	Spot Spray	October – January	Eliminate (<1%)	-	Y	7%	Primarily in the west. Undertake Autumn burn and undertake follow up control
Toowoomba Canary-grass	*Phalaris aquatica*	Spot Spray	October – January	Eliminate (<1%)	-	Y	5%	Primarily in the west. Undertake Autumn burn and undertake follow up control
Caterpillar Grass	*Paspalum dilatatum*	Spot Spray	October – January	Eliminate (<1%)	-	N	1%	Undertake Autumn burn and undertake follow up control
Couch Grass/Kikuyu	*Cynodon dactylon/ Pennisetum clandestinum*	Spot Spray	November-March	Eliminate (<1%)	-	Y	<1%	Undertake Autumn burn and undertake follow up control
Panic Veldt Grass + Sweet Vernal Grass	*Ehrharta erecta* + *Anthoxanthum odoratum*	Spot Spray	All Year	Eliminate (<1%)	-	Y	2%	Undertake Autumn burn and undertake follow up control

4.1.3 Temporary Disturbance

It was determined in late 2021 that a V/Line surface drain (trackside) on the southern boundary of the offset site was blocked from debris and sediment, causing water to pool within the offset site (Plate 21; Plate 22). While there was some debris around the drain when surveyed in February 2023, there was little to no debris to the west that is likely to flow into and block the drain (Plate 23; Plate 24) indicating that the measures implemented have been sufficient in preventing further flooding within the offset site due to drain blockages. While inundation was still observed due to high rainfall, the drain was not blocked during this time.

Plate 23. Water pooling within the offset site (Ecology and Heritage Partners 16/11/2021).

Plate 24. V/Line drain opposite the offset site fence line (southern boundary) blocked up with debris (Ecology and Heritage Partners 16/11/2021).

Plate 25. V/Line drain opposite the offset site fence line (southern boundary) relatively clear (Ecology and Heritage Partners 9/02/2023).

Plate 26. Area west of the drain showing little rubbish and debris likely to flow into and block the drain (Ecology and Heritage Partners 9/02/2023).

Following the temporary inundation disturbance, the re-growth in the impacted eastern portion of the offset site (Figure 2) has been monitored closely. This area generally had a high level of biomass, however much

consisted of exotic grass species dominated by Wild Oats which had died back and formed a dense mat covering the ground layer of vegetation (Plate 25) with scattered native grasses throughout.

Much of the new growth comprised of environmental weeds such as Bristly Ox-tongue *Helminthotheca echioides* and Sow Thistle *Sonchus oleraceus* (Plate 26). The northern boundary of the inundation impacted area had a large presence of Ribwort *Plantago* spp., intermingled with recovering native grasses such as Spear-grass (Plate 27). However, intermingled with the weeds were also many native grasses regrowing intermittently with Kangaroo Grass and Spear-grass. flowering sporadically throughout the impacted area and as larger patches towards the edges of the impacted area.

Plate 27. Died back exotic grass within the recovering inundated area (Ecology and Heritage Partners 9/02/2023).

Plate 28. Impacted area showing weedy regrowth (Ecology and Heritage Partners 9/02/2023).

Plate 29. The northern boundary of the inundation impacted area with prevalent ribwort plantain (Ecology and Heritage Partners 9/02/2023).

Plate 30. Native kangaroo grasses flowering in the recovering inundated area (Ecology and Heritage Partners 9/02/2023).

4.1.4 *Ecological Burns*

In Year 8 Aus Eco Solutions undertook an ecological burn on the 10 May 2022 (Figure 2). The Ecological Burn reduced the overall cover of biomass within the eastern section of the reserve and was also intended to promote regrowth of native grasses and the SRF plants which were negatively impacted by water pooling (Plate 29 – Plate 32). Following this burn, this area was subjected to further inundation due to high rainfall, which accelerated the invasion and growth of environmental weeds into this area. As a result, more grassy weeds were recorded than in previous years. A large ecological burn was planned for Year 9 in the western section of the offset site to reduce the biomass there, however it was unable to occur due to unfavourable weather conditions. Instead, on the 29th of June 2023 AES completed several small patch burns in the middle and east of the site using a butane torch, targeting areas of exotic grasses to reduce the cover of the grassy weeds and promote recolonisation by native grasses. The below table summarises the ecological burns undertaken within the offset site to date.

Management Year	Completed By	Timing	Location	Notes
1	Western Land Services	April 2015	Eastern half	Biomass reduction
2	Planned for Spring 2016, did not take place due to unfavourable weather			
3	Western Land Services	June 2017	Northern edge, north-eastern corner, western corner	Biomass reduction
4	Western Land Services	June 2018	Western half	Biomass reduction
5	Western Land Services	June 2019	Eastern half	Biomass reduction
6	No burn took place			
7	No burn took place			
8	Aus Eco Solutions	May 2022	Eastern half	Intended to promote native regrowth in inundation impacted areas
9	Aus Eco Solutions	June 2023	Middle portion and north-eastern corner	Small scale targeted burns due to unfavourable weather conditions. Targeted areas of exotic grasses.

Plate 31. Post Year 8 ecological burn; looking south towards the western boundary of burn area (Ecology and Heritage Partners 19/05/2022).

Plate 32. Native vegetation re-sprouting following the Year 8 ecological burn; looking south (Ecology and Heritage Partners 19/05/2022).

Plate 33. Post Year 8 ecological burn; looking west from the offset site gate (Ecology and Heritage Partners 19/05/2022).

Plate 34. SLL tile grid in Year 8 ecological burn area; looking north-west towards the industrial estate (Ecology and Heritage Partners 19/05/2022).

4.2 Spiny Rice-flower Monitoring

Spiny Rice-flower monitoring was undertaken by a suitably qualified Ecologist on the 29th of August 2022, 9th of February 2023, and on the 4th of April 2023. This SRF monitoring occurred late in the season and occurred immediately after and before the flowering period (April to August). Monitoring occurred at this time due to there being no other suitable time despite multiple attempts throughout the year. The surveys were initially delayed to allow time for regrowth post an ecological burn which occurred on the 10th of May 2022. Surveys were again delayed because of the high rain experienced throughout winter, but they were then attempted again in November 2022. They were further delayed due to the site being completely inundated. It was attempted again in December, however the site remained flooded and the combination of being post burn, high rainfall, and warm temperatures caused very high biomass throughout the site, further hindering efforts to locate and monitor the SRF.

The SRF monitoring in Year 9 determined that the majority of translocated SRF have either perished or are in a dormant state (i.e. below ground taproot is alive). Fifty-five plants have been translocated into the offset site since 2014, but most could only be located by dead above ground tissue or a remaining stake. As of the 4 April 2023 survey, four plants remain alive (5%). This includes one plant from the 2014 cohort, three plants from the 2015 cohort, zero plants from the 2017 cohort. No plants from the 2022 cohort caged in the southeast corner remained and the empty cages were removed by the 4th of April survey. The 5 living translocated plants are in moderate health. No plants were flowering during the surveys, and no germinants were recorded during the monitoring period, however, those that were still alive had moderate to good foliage cover; (Appendix 2; Appendix 3).

Table 6. Survival rate of translocated SRF for each planting cohort.

Monitoring Year (1 – 9)	Survival Rate (Alive/No. translocated)			
Cohort (Year)	**2014 (#/23)**	**2015 (#/32)**	**2017 (#/3)**	**2022 (#/22)**
1	17	NA	NA	NA
2	17	32	NA	NA
3	17	20	3	NA
4	15	18	3	NA
Mid-5	-	15	1	NA
5	15	13	1	NA
Mid-6	15	13	1	NA
6	14	12	1	NA
7	8	11	1	NA
8	5	9	0	22
9	1	3	0	0

The Year 6 and Year 7 annual reports identified that the number of SRF plants had fallen below the 50% survivorship threshold, triggering a contingency response during Year 8. Throughout Year 8, the site was subject to large amounts of rainfall, resulting in a large portion of the eastern half of the site being inundated for extended periods of time. While the initial water pooling was not believed to be the primary cause of the declining health and survivorship of the transplanted SRF, with stresses listed including biomass, weeds, translocation, and drought, the extended period of inundation would have also been detrimental to the health of the SRF.

To mitigate this threat, the 2022 cohort was translocated into the south-eastern corner as this was higher elevation than previous SRF recipient sites, and outside the previous year's flooding events. This location was also within the area of the 10th of May 2022 ecological burn making it a suitable recipient site. Twenty-two (22) SRF seedlings grown from previously collected seed from specimens within the offset site were collected

from VicUni and planted within the offset site by AES on the 27 May 2022. All seedlings were planted, lightly mulched, guarded and tagged (Plate 33).

However, the La Niña period caused even higher levels of rain, resulting in prolonged flooding of a larger area than the previous year's floods. Despite being transplanted cautiously, the entire 2022 cohort was flooded for extended periods of the year, and when checked on the 9 February 2023, no plants remained (Plates 34 – 36).

Plate 35. Translocated SRF recipient site (2022) and planted SRF seedlings (Aus Eco Solutions 27/05/2022).

Plate 36. Level of flooding experienced throughout the site through the Year 8 period, including the 2022 SRF recipient site (Ecology and Heritage Partners 18/11/2022).

Plate 37. The flooding of the 2022 SRF cohort (Ecology and Heritage Partners 18/11/2022).

Plate 38. A 2022 SRF cohort location, where the SRF has died and is no longer present (Ecology and Heritage Partners 09/02/2023).

Remnant in situ SRF within the offset site were observed in good condition throughout Year 9 (Plate 37 - 39). Remnants were generally highly covered with grassy biomass restricting survey ability but were healthy with good foliage cover (Plate 38; Plate 39). Remnant SRF from within the flooding impact area were lightly affected, with some presenting lower foliage cover, (Plate 40; Plate 41). However, remnant plants were generally in good condition and will continue to be monitored to ensure ongoing survivorship.

Plate 39. Healthy remnant SRF with good foliage cover (Ecology and Heritage Partners 09/02/2023).

Plate 3840. Healthy remnant SRF with good foliage cover growing in amongst high grassy biomass (Ecology and Heritage Partners 09/02/2023).

Plate 39. Healthy remnant SRF with good foliage cover growing in amongst high grassy biomass (Ecology and Heritage Partners 09/02/2023).

Plate 4041. Healthy remnant SRF with moderate-good foliage cover from within flooding area (Ecology and Heritage Partners 09/02/2023).

Plate 41. Healthy remnant SRF with moderate-good foliage cover from within flooding area (Ecology and Heritage Partners 09/02/2023).

4.2.1 *Required Management Actions*

High threat weeds such as Paterson's Curse, Toowoomba Canary-grass, Slender Pigeon-grass, and native grasses including Kangaroo Grass have the potential to out-compete or smother translocated SRF plants and prevent recruitment. However, ongoing weed control, including hand weeding, and biomass are anticipated to continue to mitigate these threats. Where required, subsequent ecological burns can be used to reduce biomass. Several small patch ecological burns were recently completed in the middle of the site (PG2 and a small section of PG1 on Figure 2).

As per the contingency measures detailed in the CMP (EHP 2014a), seed will be collected by AES from SRF within the offset site following the 2023 flowering season. SRF seeds will be cleaned and given to VicUni in 2023 for germination. Seedlings will then be planted into the offset site, as required. VicUni continues to germinate and grow SRF seedlings from the 2022 seed collected which will be transplanted into the reserve when ready. Following the inundation of all translocated cohorts, a meeting with the *Pimelea spinescences* Recovery Team is recommended to identify if any more suitable recipient locations exist within the offset site for subsequent SRF translocations. This meeting is recommended between Ecology and Heritage Partners, Aus Eco Solutions, the *Pimelea spinescences* Recovery Team, and Trust for Nature to discuss ongoing SRF translocation and management within the site, and should take place prior to additional SRF plantings.

The translocation of SRF in the offset site is considered successful when 50% of translocated SRF have survived for a period of 5 consecutive years, as per the CMP. The 2014 cohort had previously reached this target but following the successive flooding events almost all plants have died.

4.3 Striped Legless Lizard Monitoring

Striped Legless Lizard monitoring was undertaken on the 20 and 28 September, the 4, 11, and 19 of October, and the 3, 10, and 22 of November 2022 by qualified Ecologists. A total of 20 SLL individuals were recorded within the surveys grids, and another one was observed outside of the grid areas during the Year 9 targeted surveys (Table 7). Many of these individuals were captured, measured and weighed. Eastern Blue-tongue *Tiliqua scincoides,* Tiger Snake *Notechis scutatus*, Little Whip Snake *Suta flagellum*, Spotted Marsh Frog *Limnodynastes tasmaniensis*, and House Mouse *Mus musculus* were also recorded in the study area during tile grid checks. No other vertebrate fauna species of note were recorded during targeted surveys.

This result contrasts with the Year 8 monitoring survey results, in which only two individuals were recorded. However, the Year 9 result better aligns with Year 7 (12 SLL individuals), Years 5 and 6 (19 individuals), Year 4 (18 individuals), and Year 3 (14 individuals). It is possible that some of the individuals recorded were recaptures. The relatively low number observed in Year 8 indicated that the presence of the Tiger Snake, a potential predator species, may have discouraged SLL from seeking shelter under nearby tiles. Fewer Tiger Snakes were observed this year and were found once in Grid 2 and never in Grid 1 compared to being found 3 times in Grid 1 during Year 8. The higher number of SLL observations this year, suggests a more stable population within the study area.

One additional SLL was found dead atop an embedded rock within the study area on the 18th of November 2022. This individual was measured and weighed, but no obvious cause of death was evident (Plate 42).

Plate 42. Dead Stiped Legless Lizard found within the study area (Ecology and Heritage Partners 18/11/2022).

Table 7. Summary of Year 9 Striped Legless Lizard surveys.

Date	Observer	Time	Air Temp	Cloud Cover (%)	Wind Direction and Speed	Above Tile Temp	Under Tile Temp	Grid 1 (east)	Grid 2 (west)
20/09/22	CM, SP, DH	9:53	14.9	40	NNE (24.1km)	19.7	12	2x SLL, 5x SMF	4x LWS, 1x EBT
28/09/22	CM, SP	12:56	15.4	60	SSW (31.5km)	26.9	16.4	3x SLL, 1x SMF	2x SLL, 4x TS, 1x LWS, 1x EBT 1x S
04/10/22	CM, SP	12:33	13.9	10	SE (16.7 km)	25	19.1	3x SLL 2x SMF	2x LWS 4x SLL 1x EBT
11/10/22	CM	11:50	18.1	60	S (29.6 km)	40.2	17.9	2x SLL	2x SLL 2x LWS
19/10/22	CM, MB	11:40	19.3	0	SE (16.7 km)	45.6	22.6	2x SMF	1x LWS 1x EBT
03/11/22	CM, SH	10:25	13.3	90	SW (25.9km)	27.2	14.6	1x SLL	1x LWS
10/11/22	RM	11:30	23	50	W (11km)	40.0	25.3	-	1x HM
22/11/22	CM, RM	10:36	14.6	95	W (15km)	25*	15*	1x SLL	-

Note: SLL = Striped Legless Lizard; EBT = Eastern Blue-tongue, LWS = Little Whip Snake, TS = Tiger Snake, SMF = Spotted Marsh Frog, S = Skink sp. (unidentified), HM = House Mouse. *Approximate readings only, as a result of equipment malfunction.

An additional two adult Tiger Snakes, one SLL, and one Eastern Blue-tongue were incidentally seen during the SLL targeted surveys outside of the grid areas. No other vertebrate fauna species of note were recorded during the surveys.

4.3.1 Habitat monitoring results

The CMP details the requirements for SLL habitat rehabilitation and management. For each habitat variable, the recorded value must be compared to the trigger value to determine if a management response is triggered, and the nature of the response required. Section 3.3 (Table 4) summarises the monitoring categories and trigger thresholds for SLL monitoring, while Table 8 summarises the results of Year 9 habitat monitoring. Three trigger values were exceeded, the amount of bare ground, the amount of exposed rock, and inter-tussock spacing (Plate 43 – 50).

Plate 43. Grid 1; looking south-east from the north-western corner (Ecology and Heritage Partners 9/02/2023).

Plate 44. Grid 1; looking north-east from the south-western corner (Ecology and Heritage Partners 9/02/2023).

Plate 45. Grid 1; looking north-west from the south-eastern corner (Ecology and Heritage Partners 9/02/2023).

Plate 46. Grid 1; looking south-west from the north-eastern corner (Ecology and Heritage Partners 9/02/2023).

Plate 47. Grid 2; looking south from the north-eastern corner (Ecology and Heritage Partners 9/02/2023).

Plate 48. Grid 2; looking south-east from the north-western corner (Ecology and Heritage Partners 9/02/2023).

Plate 49. Grid 2; looking north-east from the south-western corners (Ecology and Heritage Partners 9/02/2023).

Plate 50. Grid 2; looking north from the south-eastern corner (Ecology and Heritage Partners 9/02/2023).

Table 8. Striped Legless Lizard habitat monitoring results.

Habitat Variable	Grid 1 (East)					Grid 2 (West)					Response Triggered
	Y8. MP1 (Q1)	Y8. MP2 (Q2)	Y9. MP1 (Q3)	Y9. MP2 (Q4)	Average (%)	Y8. MP1 (Q1)	Y8. MP2 (Q2)	Y9. MP3 (Q3)	Y9. MP4 (Q4)	Average (%)	
Native clumping grass (%)	85	55	60	60	**65**	70	50	60	60	**60**	No
Introduced grass (%)	10	20	25	20	**18.75**	10	20	20	20	**17.5**	**No**
Bare ground (%)	5	5	3	2	**3.75**	5	5	3	2	**3.75**	Yes
Exposed rock (%)	1	1	1	1	**1**	1	3	2	3	**2.25**	**Yes**
Inter-tussock spacing (cm)	5	3	2	3	**3.25**	3	3	2	1	**2.25**	**Yes**

Note: Q1 and Q2 results are from Year 8 monitoring report (July – December) (Ecology and Heritage Partners 2021). Q3 and Q4 are from the current, Year 9, monitoring period.

4.3.2 Required Management Actions

A population of SLL is still present in the offset site, with the species being recorded during six of the eight tile grid checks.

Monitoring indicated that the quality of SLL habitat in the offset site has declined slightly during the Year 9 monitoring season compared to the past Year 8 levels, triggering responses for three management actions. Despite this slight decrease in SLL habitat quality, the number of SLL observed were the highest within the site to date. This suggests that the habitat within the offset site has been suitable despite the recorded decline in condition.

Under the listed habitat requirements, both grids require management actions for lower than ideal levels of bare ground (<5%), lower than ideal levels of exposed rock (<5%) and lower than ideal inter-tussock spacing (<10cm), the management action for all of which is the removal of some vegetation.

As discussed in Section 3.1.4, an ecological burn was undertaken in July 2023 consisting of several small areas. This burn addressed the required management action within the Western Grid (Grid 2 on Figure 3) and would have removed swathes of the exotic grasses and provided greater bare ground, exposed rock, and inter-tussock spacing. The effect of this burn on the suitability of the SLL habitat within Grid 2 will continue to be monitored throughout Year 10.

Further management is required for the Eastern Grid (Grid 1 on Figure 3) which has high biomass following the 2020 ecological burn.

4.4 OMP Management Actions

The following section relates to the management actions and targets summarised in Table 12 of the OMP prepared for the offset site (EHP 2014b).

Table 9. Assessment of actions completed in Year 9 and required actions in Year 10.

Year	Action No.	Land use and management actions to be completed	Resource/personnel required	Timing of action	Key performance target	Action completed (Y/N)	Action required in Year 10
9	**Year 9**						
9	*9.1*	Undertake control of woody weeds (Table 9).	Bushland Mgt Contractor/PTV.	Before seed heads mature in spring/summer.	Ensure cover of woody weeds is <1%	Y	Continue to remove germinating woody weeds and cut & paint re-sprouting plants. Cut and Paint the single mature African Boxthorn as low as possible without damaging the Rhagodia.
9	*9.2*	Undertake control of exotic grasses and herbaceous broadleaves (See Table 9). Three visits per year	Bushland Mgt Contractor/PTV.	Before seed heads mature in spring/summer	Reduce perennial grass cover to <40% and annual grasses/broadleaves to <5%	Y	Perennial grass cover has been reduced to <40%, however annual grasses continue to persist above 5%. Undertake ecological burn in Year 10 to reduce annual weeds. Continue to brush cut and spot spray annual weeds.
9	*9.3*	Conduct rabbit control if required.	Pest Mgt Contractor/PTV	After peak breeding season - late summer/early autumn.	Significant reduction in number/signs of rabbits.	Y	Continue to monitor for evidence of pest animals and undertake pest animal control, if required.
9	*9.4*	Maintain Perimeter Fence	PTV	Ongoing	Fence is maintained and fixed if broken	Y	The perimeter fence remains in good condition. Continue to monitor and

Year	Action No.	Land use and management actions to be completed	Resource/personnel required	Timing of action	Key performance target	Action completed (Y/N)	Action required in Year 10
							undertake repairs, if required.
9	*9.5*	Undertake biomass reduction either weeding/mosaic burns in selected areas	Bushland Mgt Contractor/PTV.	Autumn	Areas of intertussock space opened up to allow recruitment	Y	The large western burn could not take place, however smaller targeted burns were undertaken in the middle section of the offset site.
9	*9.6*	Monitor status of vegetation condition, and the status of Spiny Rice-flower and Striped Legless Lizard populations and the condition of their habitat within the offset site and provide annual report to DEECA/DCCEEW.	PTV/ Qualified Ecologist	Early Summer	Progress report to satisfaction of DEECA/DCCEEW	Y	Continue to monitor the quality of vegetation and suitability of habitat for SLL, particularly in areas subject to prolonged water inundation. Organise a meeting with the *Pimelea spinescences* Recovery Team to discuss SRF translocation and management within the offset site. Continue to transplant SRF into the site as required.
9	*9.7*	Removal of all existing rubbish from site and rubbish removed immediately if further dumping occurs.	PT3V/Contractor	At least every 2 months	All rubbished removed, and removed immediately if dumping occurs.	Y	Rubbish is typically windblown rubbish that enters the offset site from the adjacent train station platform and surrounding industrial development. AES regularly remove rubbish from the offset site and will continue to remove rubbish in Year 10.

4.4.1 *Recommended Actions From Year 8*

Several additional actions were outlined in the Year 8 report to be completed in Year 9. All of these recommended actions were completed throughout Year 9. They included:

- Undertaking an ecological burn in the middle section (PG2) of the offset site to improve habitat suitability for SLL, control weeds, and improve the quality and extent of native vegetation;
- Monitoring of the recovery of native vegetation in the western section of the offset site (i.e. in areas subject to water inundation). Additional herb and native grass seed plantings were undertaken by AES as required;
- Monitoring of V/Line drains and associated infrastructure to ensure this does not contribute to inundation in Year 9;
- Monitoring and Management (i.e. water and hand weed) translocated and remnant SRF;
- Undertake targeted weed control to meet the targets outlined in the OMP (see Table 5);
- Monitoring of rabbit proof fence, including fence maintenance and rabbit control, although none was required.

One item has yet to be completed. The germination of 2022 SRF seed remains ongoing with VicUni and seedlings will be planted in 2023 when ready. Further SRF seed will also be collected in 2023 for subsequent propagation.

5 CONCLUSION AND RECOMENDATIONS

Year 9 monitoring was undertaken as outlined in the CMP, the OMP, and recommendations from the Year 8 Annual Report to ensure compliance with the EPBC Act approval conditions. The overall quality of native vegetation (outside areas subject to water inundation) is improving, however ongoing management and monitoring is required to ensure that the offset site maintains optimal habitats for significant species, such as SRF and SLL.

Biomass from native (Kangaroo Grass) and introduced vegetation is high and ongoing works are required to reduce this. An ecological burn is planned for PG2 and some of PG1. This will reduce biomass, open up inter-tussock space and assist in controlling weeds, particularly grassy weeds which are prevalent throughout the flood impacted areas.

Year 9 monitoring indicated an increase in the number of SLL within the offset site compared to the Year 8 results. As discussed in Section 3.3, Year 8 had a higher occurrence of Tiger Snakes, particularly within Grid 1. This in combination with the high biomass and water inundation may have resulted in low captures in Year 8. Comparatively few Tiger Snake observations were recorded in Year 9, potentially making the tile grids more suitable habitat for SLL. The Year 9 results were the highest number of records of SLL within the site to date and suggests that a larger, more stable, population uses the study area.

A number of small patch ecological burns were undertaken in the middle section of the offset site in Winter 2023. These will aid in reducing biomass (particularly of grassy weeds) and improve the overall quality and

suitability of habitat for SLL. The population of SLL are still present within the offset site, and works should continue to maintain and improve the quality of SLL habitat within the site.

As highlighted in previous monitoring reports, survivorship of translocated SRF continued to decline. To remediate this, twenty-two SRF seedlings were planted into the offset site in May 2022, with the seedlings placed outside of the area affected by the water pooling caused by the stormwater drain overflow (EHP 2022b). Despite attending to the stormwater drain blockage, the impact of successive prolonged flooding events due to heavy rains caused most of the persisting translocated SRF to die, including the entire 2022 cohort. The low survivorship of the transplanted SRF requires addressing.

As per the contingency measures, additional seed was collected by AES and germinated by VicUni in 2022, with seedlings to be planted into the offset site in 2023 when they reach suitable planting size. A meeting to discuss alternative translocation locations and ongoing management of the SRF within the site is recommended prior to further SRF translocation into the site. Monitoring has indicated that remnant SRF were generally unaffected by the water pooling. Further SRF seed will be collected during 2023 for germination by VicUni to increase the seed bank for additional SRF seedlings to translocate required.

Weed control throughout Year 9 has been effective at reducing the overall cover of weeds throughout the offset site, however, works should continue to reduce the overall cover of high threat weeds and annual grasses to below the accepted thresholds (see Section 3.1.2). Additionally, works should focus on preventing high threat weeds from setting seed and remove new recruits where possible, such as Paterson's Curse and African Boxthorn both of which were identified within the site. However, it is acknowledged that pressure from windblown seed is a factor in reducing the overall cover of weeds within the offset site. The ecological burn in Year 9, contributed to a reduction in the overall weed cover, particularly of exotic grasses. The combination of available space, high levels of rain, and warm temperatures, caused prolific recruitment of weedy grasses into the affected area resulting in very high biomass.

Approximately 18 kilograms of native grass seed, primarily Kangaroo Grass, was collected by AES during January 2023. This seed was spread throughout burnt areas to increase the native grass recruitment and assist in suppressing weed cover in these areas.

To ensure that the native vegetation and habitat for significant species continues to improve, the following works should be incorporated into Year 10 land management and monitoring in addition to OMP management requirements (EHP 2014b: Table 12):

- Monitor the middle section of the offset site for the improved habitat suitability for SLL following the ecological burns, control weeds, and improve the quality and extent of native vegetation;
- Monitor the recovery of native vegetation in areas subject to water inundation (eastern side). Undertake additional weed control and planting/seed broadcasting of native grasses as required;
- Liaise with V/Line about drains and associated infrastructure monitoring to ensure blockages do not cause/exacerbate water pooling in Year 10;
- Collect and germinate SRF seed (2023), and plant seedlings growing from previous years seed collection into offset site 2023 (pending seedling growth and suitability for translocation);
- Continue to monitor and manage (i.e. water and hand weed) translocated and remnant SRF;

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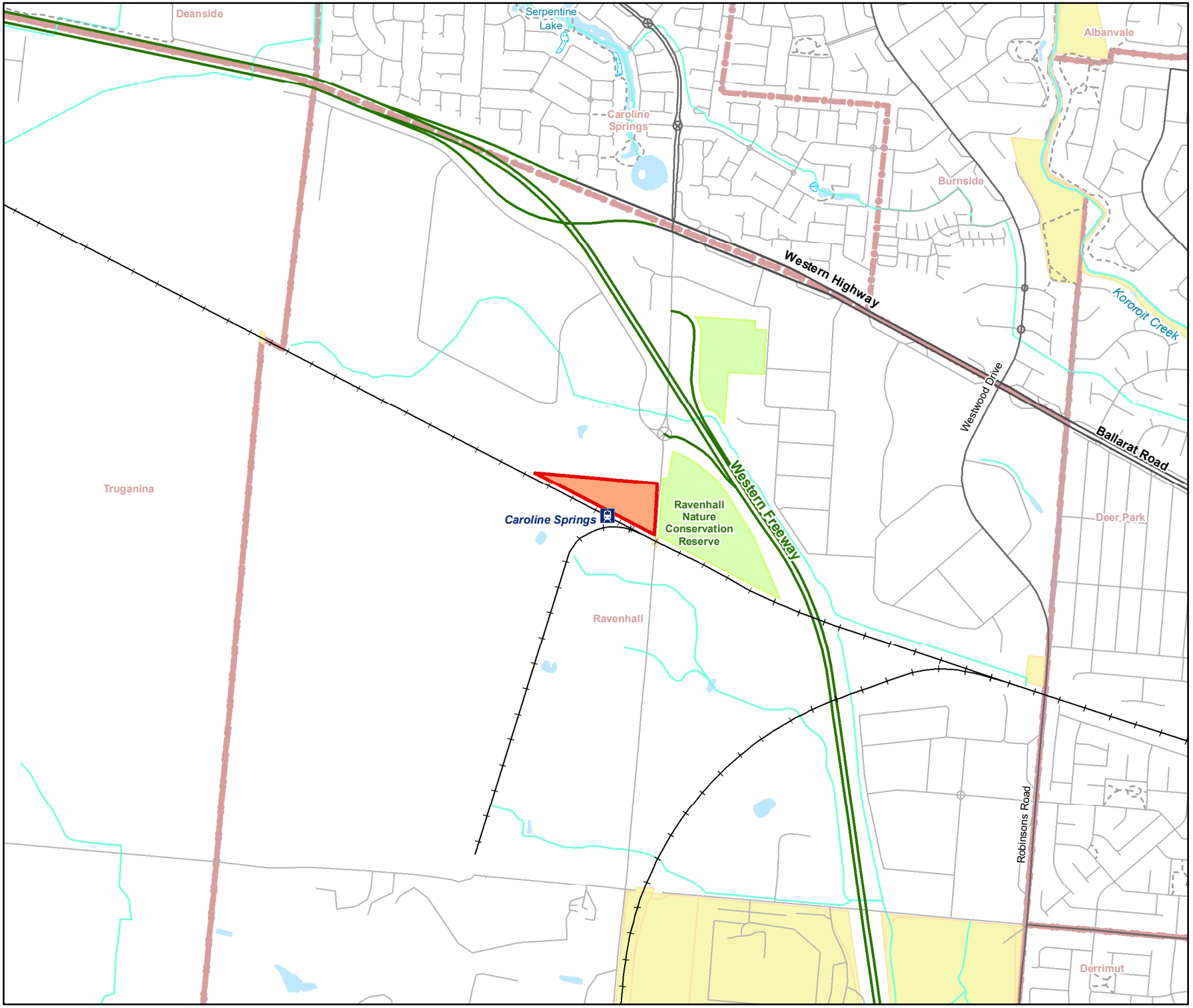
FIGURES



Legend

- Study Area
- Railway
- Freeway
- Major Road
- Collector Road
- Minor Road
- Proposed Road
- Minor Watercourse
- Permanent Waterbody
- Wetland/Swamp
- Parks and Reserves
- Crown Land
- Localities

Figure 1

Location of the study area

Caroline Springs

Year 9 Annual Report

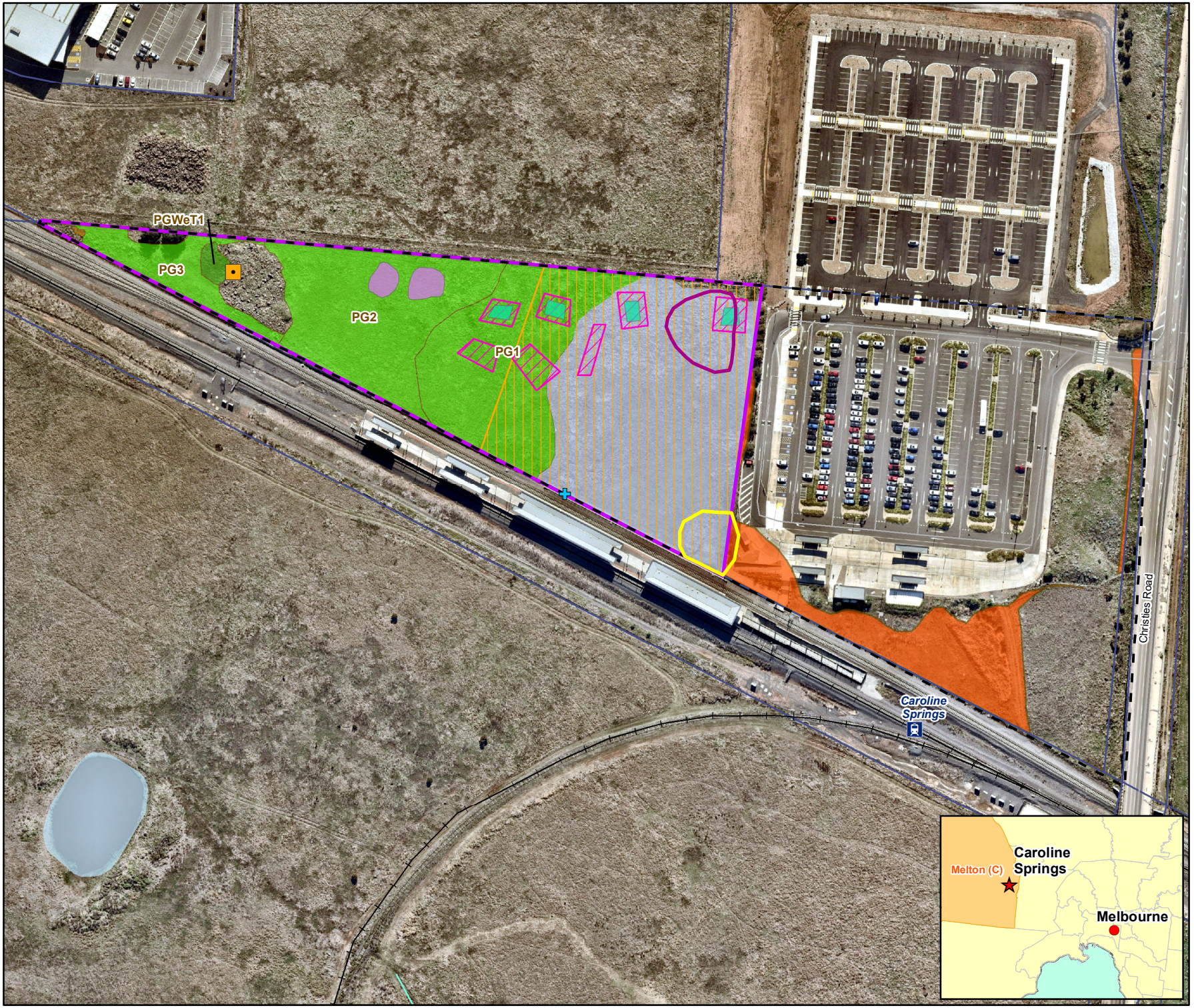
N

0 250 500

Metres

ecology & heritage partners

16510_Fig01_StudyArea_fr14160 28/07/2023 psorensen



Legend

- Site boundary
- Caroline Springs Lot 1
- 2022 Spiny Rice-flower recipient site
- 2014 Spiny Rice-flower recipient site
- Herb plantings 2023
- Herb plantings
- Rubbish pile
- Plains Grassland / Retained areas of NTGVVP
- Plains Grassy Wetland
- PG1/NTGVVP impacted by water inundation
- Plains Grassland / Removed areas of NTGVVP and Striped Legless Lizard habitat
- Ecological burn 2023
- Ecological burn 2022
- Rockpile
- Drain

Figure 2

Ecological features and extent of NTGVVP and Striped Legless Lizard habitat

Caroline Springs Year 9 Annual Report

N

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Metres

ecology & heritage partners

16510_Fig02_EcoFeat_NTGVVP_SLL 28/07/2023 psorensen

Aerial source: Nearmap 2023

Legend

- Study Area
- Tile grids

Figure 3

Striped Legless Lizard grid locations and records

Caroline Springs

Year 9 Annual Report

N

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Metres

ecology & heritage partners

16510_Fig03_SLL_GridLoc 28/07/2023 psorensen

Aerial source: Nearmap 2023

Legend

- Spiny Rice-flower recipient site (2022)
- Spiny Rice-flower recipient site (previous)
- Translocated Spiny Rice-flower (2022)
- Monitored *In-situ* Spiny Rice-flower
- Translocated Spiny Rice-flower (2017)
- Translocated Spiny Rice-flower (2015)
- *In-situ* Spiny Rice-flower population (August 2014)
- *In-situ* Spiny Rice-flower population (August 2015)
- Translocated Spiny Rice-flower (2014)
- Caroline Springs Lot 1
- Site boundary
- Retained areas of Grassland
- Retained areas of Grassland impacted by water inundation
- Ecological burn 2023
- Ecological burn 2022

Figure 4a

Spiny Rice-flower recipient site, and monitored and translocated Spiny Rice-flowers

Caroline Springs
Year 9 Annual Report

N

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Metres

ecology & heritage partners

16510_Fig04a_SRF_RecipientSite 28/07/2023 psorensen

Aerial source: Nearmap 2023

Legend

- Spiny Rice-flower recipient site (previous)
- Monitored *In-situ* Spiny Rice-flower
- Translocated Spiny Rice-flower (2017)
- Translocated Spiny Rice-flower (2015)
- Translocated Spiny Rice-flower (2014)
- Caroline Springs Lot 1

Figure 4b

Spiny Rice-flower recipient site, and monitored and translocated Spiny Rice-flowers

Caroline Springs
Year 9 Annual Report

N

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Metres

ecology & heritage partners

16510_Fig04_SRF_RecipientSite_MB 28/07/2023 psorensen

Aerial source: Nearmap 2023

Legend

- Spiny Rice-flower recipient site (2022)
- Translocated Spiny Rice-flower (2022)
- Caroline Springs Lot 1

Figure 4c

Spiny Rice-flower recipient site, and monitored and translocated Spiny Rice-flowers

Caroline Springs
Year 9 Annual Report

N

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Metres

ecology & heritage partners

16510_Fig04_SRF_RecipientSite_MB 28/07/2023 psorensen

Aerial source: Nearmap 2023

Legend

- Photo points
- Ecological burn 2023
- Ecological burn 2022
- Ecological burn 2019
- Ecological burn 2018
- Caroline Springs Lot 1
- Spiny Rice-flower recipient site (2022)
- Spiny Rice-flower recipient site (previous)
- Herb plantings 2023
- Herb plantings

Figure 5

Location of photo points and ecological burn

Caroline Springs

Year 9 Annual Report

N

0 15 30

Metres

ecology & heritage partners

16510_Fig05_Photopoints_Ecoburn 28/07/2023 psorensen

Aerial source: Nearmap 2023

APPENDICES

Appendix 1. Spiny Rice-flower Monitoring Data

5.1.1 A1.1. 2014/2015 Transplant Cohort

Table A1.1. Sex and status of translocated Spiny Rice-flower.

Plant #	Sex	Plant Status	Flowering & per cent in flower	% Foliage	Heath score (1-5)	Germinants
#1	Female	Dead	-	-	-	-
#2	Male	Dead	-	-	-	-
#3	Female	Dead	-	-	-	-
#4	Female	Dead	-	-	-	-
#5	Female	Dead	-	-	-	-
#6	Female	Dead	-	-	-	-
#7	Female	Dead	-	-	-	-
#8	Female	Dead	-	-	-	-
#9	Female	Dead	-	-	-	-
#10	Male	Dead	-	-	-	-
#11	Male	Dead	-	-	-	-
#12	Male	Dead	-	-	-	-
#13	Female	Dead	-	-	-	-
#14	Female	Dead	-	-	-	-
#15	Male	Dead	-	-	-	-
#16	Male	Dead	-	-	-	-
#17	Male	Dead	-	-	-	-
#18	Female	Dead	-	-	-	-
#19	Male	Dead	-	-	-	-
#20	Male	Dead	-	-	-	-
#21	Female	Dead	-	-	-	-
#22	Female	Dead	-	-	-	-
#23	Male	Dead	-	-	-	-

5.1.2 *A1.2. 2015/2016 Transplant Cohort*

Table A1.2. Sex and status of translocated Spiny Rice-flower.

Plant #	Sex	Plant Status	% flowering	% Foliage	Heath score (1-5)	Germinants
#24	Male	Dead	-	-	-	-
#25	Male	Alive	0	40	3	0
#26	Female	Dead	-	-	-	-
#27	Female	Alive	0	65	2	0
#28	Male	Dead	-	-	-	-
#29	Female	Dead	-	-	-	-
#30	Male	Dead	-	-	-	-
#31	Male	Dead	-	-	-	-
#32	Female	Dead	-	-	-	-
#33	Male	Dead	-	-	-	-
#34	Male	Dead	-	-	-	-
#35	Female	Dead	-	-	-	-
#36	Male	Dead	-	-	-	-
#37	Female	Dead	-	-	-	-
#38	Male	Dead	-	-	-	-
#39	Female	Dead	-	-	-	-
#40	Male	Dead	-	-	-	-
#41	Male	Dead	-	-	-	-
#42	Female	Dead	-	-	-	-
#43	Male	Dead	-	-	-	-
#44	Female	Dead	-	-	-	-
#45	Male	Dead	-	-	-	-
#46	Female	Dead	-	-	-	-
#47	Female	Alive	0	40	3	0
#48	Male	Dead	-	-	-	-
#49	Male	Alive	0	65	2	0
#50	Male	Dead	-	-	-	-
#51	Male	Dead	-	-	-	-
#52	Female	Dead	-	-	-	-
#53	Female	Dead	-	-	-	-
#54	Female	Dead	-	-	-	-
#55	Female	Dead	-	-	-	-

Appendix 2. Habitat Hectare Assessment

Table A2.1. Habitat hectare assessment.

Vegetation Zone		PG1	PG2	PG3*
Bioregion		Victorian Volcanic Plain		
EVC / Tree		Plains Grassland (Heavier Soils)		
EVC Number		132_61		
EVC Conservation Status		Endangered		
Patch Condition	Large Old Trees /10	Na		
	Canopy Cover /5	Na		
	Under storey /25	15	20	10
	Lack of Weeds /15	4	7	4
	Recruitment /10	0	0	0
	Organic Matter /5	3	3	4
	Logs /5	Na		
	Treeless EVC Multiplier	1.36		
	Subtotal =	29.92	40.8	24.48
Landscape Value /25		16		
Habitat Points /100		45.92	56.8	40.48
Habitat Score		0.46	0.57	0.40

Note* This score also applies for the area mapped as PGWe1. Given the surveys took place in summer, the area labelled PGWe1 was mapped as Plains Grassland and considered homogenous with patch PG3 during the Year 9 monitoring.

Appendix 3. Translocated Spiny Rice-Flower photos

Plate A4.1. Transplant 1 (Dead) (April 2023)

Plate A4.2. Transplant 2 (Dead) (April 2023)

Plate A4.3. Transplant 3 (Dead) (April 2023)

Plate A4.4. Transplant 4 (Dead) (April 2023)

Plate A4.5. Transplant 5 (Dead) (April 2023)

Plate A4.6. Transplant 6 (Dead) (April 2023)

Plate A4.7. Transplant 7 (Dead) (April 2023)

Plate A4.8. Transplant 8 (Dead) (April 2023)

Plate A4.9. Transplant 9 (Dead) (April 2023)

Plate A4.10. Transplant 10 (Dead) (April 2023)

Plate A4.11. Transplant 11 (Dead) (April 2023)

Plate A4.12. Transplant 12 (Dead) (April 2023)

Plate A4.13. Transplant 13 (Dead) (April 2023)

Plate A4.14. Transplant 14 (Dead) (April 2023)

Plate A4.15. Transplant 15 (Dead) (April 2023)

Plate A4.16. Transplant 16 (Dead) (April 2023)

Plate A4.17. Transplant 17 (Dead) (April 2023)

Plate A4.18. Transplant 18 (Dead) (April 2023)

Plate A4.19. Transplant 19 (Dead) (April 2023)

Plate A4.20. Transplant 20 (Dead) (April 2023)

Plate A4.21. Transplant 21 (Dead) (April 2023)

Plate A4.22. Transplant 22 (Dead) (April 2023)

Plate A4.23. Transplant 23 (Dead) (April 2023)

Plate A4.24. Transplant 24 (Dead) (April 2023)

Plate A4.25. Transplant 25 (Alive) (April 2023)

Plate A4.26. Transplant 26 (Dead) (April 2023)

Plate A4.27. Transplant 27 (Alive) (April 2023)

Plate A4.28. Transplant 28 (Dead) (April 2023)

Plate A4.29. Transplant 29 (Dead) (April 2023)

Plate A4.30. Transplant 30 (Dead) (April 2023)

Plate A4.31. Transplant 31 (Dead) (April 2023)

Plate A4.32. Transplant 32 (Dead) (April 2023)

Plate A4.33. Transplant 33 (Dead) (April 2023)

Plate A4.34. Transplant 34 (Dead) (April 2023)

Plate A4.35. Transplant 35 (Dead) (April 2023)

Plate A4.36. Transplant 36 (Dead) (April 2023)

Plate A4.37. Transplant 37 (Dead) (April 2023)

Plate A4.38. Transplant 38 (Dead) (April 2023)

Plate A4.39. Transplant 39 (Dead) (April 2023)

Plate A4.40. Transplant 40 (Dead) (April 2023)

Plate A4.41. Transplant 41 (Dead) (April 2023)

Plate A4.42. Transplant 42 (Dead) (April 2023)

Plate A4.43. Transplant 43 (Dead) (April 2023)

Plate A4.44. Transplant 44 (Dead) (April 2023)

Plate A4.45. Transplant 45 (Dead) (April 2023)

Plate A4.46. Transplant 46 (Dead) (April 2023)

Plate A4.47. Transplant 47 (Alive) (April 2023)

Plate A4.48. Transplant 48 (Dead) (April 2023)

Plate A4.49. Transplant 49 (Alive) (April 2023)

Plate A4.50. Transplant 50 (Dead) (April 2023)

Plate A4.51. Transplant 51 (Dead) (April 2023)

Plate A4.52. Transplant 52 (Dead) (April 2023)

Plate A4.53. Transplant 53 (Dead) (April 2023)

Plate A4.54. Transplant 54 (Dead) (April 2023)

Plate A4.55. Transplant 55 (Dead) (April 2023)

Appendix 4. Photo points

Plate A2.1. Photo point 1 (February 2023)

Plate A2.2. Photo point 2 (February 2023)

Plate A2.3. Photo point 3 (February 2023)

PlateA2.4. Photo point 4 (February 2023)

Plate A2.5. Photo point 5 (February 2023)

PlateA2.6. Photo point 6 (February 2023)

PlateA2.7. Photo point 7 (February 2023)

Plate A2.8. Photo point 8 (February 2023)

Plate A2.9. Photo point 9 (February 2023)

Plate A2.10. Photo point 10 (February 2023)

Appendix 5. A2256 – VicTrack – Caroline Springs Grassland – 2022-Management Report (AES 2022/2023)

A2256 - Vic Track- Caroline Springs Grassland - 2022/2023 - Management Report V2

Report for VicTrack

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Contents

1. Introduction:

Aus Eco solutions were engaged by Renata Pangemanan of VicTrack to undertake the vegetation and land management works of the Caroline Springs Grassland Reserve spanning the 2022-2023 financial year.

1.2 Project Background:

SITE DESCRIPTION:

The Caroline springs Grassland reserve is located to the west of the Caroline Springs Train Station off Christies road. The reserve harbours two protected species the critically endangered Spiny Rice-flower and the threatened Striped Legless Lizard. The reserve is classified as a Natural Temperate Grassland of the Victorian Volcanic Plains and as such, the Ecological Vegetation Class (EVC) is also deemed a critically endangered community under the EPBC Act.

Approval conditions (EPBC 2010/5463) include the protection and management of the Site in accordance with a Conservation Management Plan (CMP) and an Offset Management Plan (OMP) approved by the Commonwealth and developed by Ecology & Heritage partners. The reserve is also required to be managed under Trust for Nature's guidance.

AUS ECO SOLUTIONS

Aus Eco Solutions has depots in Ballan west of Melbourne in Victoria and Wingham on the mid-north coast of New South Wales. Our family based business combines the technical knowledge of 25+ years of our founder, Kristian Guppy, with the 30+ year's experience in business systems and project management skills of his wife, Kerrie Guppy. Our business attracts a dedicated, qualified and experienced team who work with integrity and take great pride in the legacy of our work to restore native ecosystems.

Kristian holds a DELWP VIC Commercial Operators License. The Aus Eco Solutions team includes a mix of people with financial, managerial, administrative and conservation and land management qualifications and experience. Relevant qualifications include; Bachelors and Masters in Applied Science, Zoology and Environmental Management, Diplomas and Certificates II, III & IV in Conservation and Land Management, DELWP VIC Agricultural Chemical User Permits (ACUP), Chemcert, chainsaw (fallers and crosscut), pest animal management, all-terrain vehicle training, OHS training, vehicle hygiene and first aid (level 2). Our employees also have significant experience in plant identification, particularly weeds and natives to ensure off-target damage is minimised.

Aus Eco Solutions has an integrated management system framework in place that covers quality, environmental and occupational health and safety. This framework is certified to AS/ISO 9001 Quality Management Systems, AS/ISO 14001 Environmental Management Systems, AS/ISO 45000 Occupational Health and Safety Management Systems. Aus Eco Solutions is also a member of VECCI to ensure industrial relations and OHS requirements are met.

Legend:

VicTrack Owned Land

The land owned by VicTrack is the area bounded by a blue dashed line

Site

The site is defined by any area bound by the black line

Retained grassland (approximate area)

Leased Site:

Leased Site includes any land highlighted light pink

V/Line Site:

V/Line Leased Site includes any land highlighted light yellow

VicTrack Controlled land:

VicTrack controlled Land includes any land highlighted green, brown or red

2 . Project Objective

The objective is to monitor and manage the biodiversity within the Caroline Springs Grassland Reserve in accordance with EPBC 2010/5463 and the Commonwealth approved CMP and OMP (Year 9), between July 2022 and June 2023.

Aus Eco Solutions is an experienced and qualified team of Project Managers & Field Technicians qualified to undertake the management actions outlined in the CMP & OMP. Our team is familiar with working within Rail Reserves and native grasslands in particular. We hold the relevant qualifications in environmental management and ecological burning to deliver the technical aspects of management.

Image of healthy spiny rice flower taken in January of 2023

image of a blue tongue lizard found onsite

3. Management Actions

The following management actions have been undertaken from

September 2022 to July 2023 timeframe to assist in achieving the overall project objectives for this site.

Note:

Due to ongoing issues with the weather and wind directions we were unable to get the optimal conditions for a full scale ecological burn, instead we undertook smaller patch burning, further details of this technique have been provided in section 3.8

3.1 LITTER AND RUBBISH REMOVAL

Rubbish collection and removal was undertaken on a "as required" basis on each visit. As the crew undertook other management actions for the site they would collect and remove any rubbish found. The majority of the rubbish was collected from the fence line adjacent to the train station.

3.2 HERBACEOUS/ GRASSY WEED CONTROL

The Herbaceous/ Grassy weed control was performed on 6 days from September to July 2022/2023, the final weed control works have been pushed into the start of July as they were meant to be post burn works but the large scale burn was not able to go ahead. The weed control works were performed across the site in accordance with the OMP to work towards achieving the target goals for this site. The herbaceous weeds that were treated across the site include Cape weed, Spear Thistle, Patterson's Curse, Flat weeds and Mustard weeds, Artichoke thistle seedlings were also found on-site and controlled at the same time as the other herbaceous weeds. The Grassy high threat weeds of this site was the main focus of the grassy weed control to work towards the OMP targets of eliminating all high threat weeds on site including Chilean Needle grass (*Nassella Neesiana*) and Serrated Tussock (*Nassella Trichotoma*). Grassy weed control was also performed on the following additional grassy weeds including Sweet vernal and pigeon grass (Setaria pumila) which was also identified as being on site. The crews used several techniques to perform the weed control including Knapsacks with selective herbicides and hand weeding around the Spiny Rice flowers.

Works were also done to rake up all the dead weedy biomass that was laying over the Native vegetation after the larger rainfalls of Spring 2022 created a larger weedy biomass onsite. The dead vegetation was moved into the dead weed spots in the 2023 burn area.

3.3 WOODY WEED CONTROL AND REMOVAL

The Woody weed herbicide treatment and removal for this site was performed on 2 days from September 2022 to April 2023, across the site in accordance with the OMP to work towards achieving the target goals for this site, additional ongoing monitoring for emerging woody weeds occurred across the project. The woody weeds that were controlled on the site included African boxthorn and Sweet Briar as identified in the OMP.

The weed control methods were used in accordance with the below table to assist Vic Track in achieving below OMP target goals. Woody weeds were controlled using cutting and painting and Herbaceous/Grassy weeds were controlled using spot spraying, except around the Spiny Rice Flowers were hand weeding was used.

Table 1. OMP Weed Control Methods, Timing and Goals

Common Name	Control Method	Timing	Goal
Woody Weeds			
African Boxthorn	Cut and paint, remove debris from site	September – April	Eliminate (<1%)
Sweet Briar	Spot Spray/Cut and paint	September – April	Eliminate (<1%)
Herbaceous Weeds			
Cape Weed	Spot Spray	Early Spring	Eliminate (<1%)
Spear Thistle and other thistles	Spot Spray	All Year	Eliminate (<1%)
Patterson's Curse	Spot Spray	Early Spring	Eliminate (<1%)
Flat Weeds and Mustards	Spot Spray	All Year	Maintain low cover (<5%)
Soursob and other Oxalis *spp.*	Spot Spray	Later Winter at bulb exhaustion	Eliminate (<1%)
Grassy Weeds			
Chilean Needle Grass	Spot Spray	Before seed set in late spring, remove seed heads if fertile	Eliminate (<1%)
Serrated Tussock	Spot Spray	Before seed set in late spring	Eliminate (<1%)
Brown-top Bent	Spot Spray/Burn	October - January	Maintain low cover (<5%)
Annual Grasses - Various Spp.	Spot Spray/Burn	July – November	Maintain low cover (<5%)
Cocksfoot	Spot Spray	October - January	Eliminate (<1%)
Toowoomba Canary Grass	Spot Spray	October - January	Eliminate (<1%)
Caterpillar Grass	Spot Spray	October - January	Eliminate (<1%)
Couch Grass/Kikuyu	Spot Spray	November – March	Eliminate (<1%)
Panic Veldt Grass and Sweet Vernal Grass	Spot Spray	All Year	Eliminate (<1%)

Table of OMP goals for weed control

3.4 PEST ANIMAL CONTROL

Pest animal activity was monitored as a part of every site visit including an inspection of the rabbit-proof fencing to ensure that the rabbit-proof fencing is maintained. No pest animal activity was observed during the management period. Pest animals such as the European Rabbit and Foxes are present and have been observed in adjacent grassland reserves. Observation of any increase in pest animal activity will be reported and actioned immediately to ensure the revegetation efforts such as tube stock planting/seeding are not impacted by grazing.

It's also worth noting that a large mob of Eastern Grey Kangaroos are also present in the surrounding area and revegetation efforts will be monitored for impacts. No Grazing on the Native vegetation in the reserve was observed.

3.5 RESERVE FENCE AND SIGNAGE

The small size of the reserve allows for regular perimeter inspections for damage or pest animal access points. No major damage has been reported regarding the fence to date. Signage for the site had fallen off the gate but was reattached by Crew when on site on the 29/06/2023.

3.6 NATIVE GRASS SEED HARVEST

The native grass seed harvest for site occurred during January 2023. The main native grass that was collected from site was Kangaroo grass. The seed collection was completed under the seed collecting protocols with 10/20 percent collected from the denser patches leaving the remaining seed to drop naturally. The seed was transported back to our Ballan Depot dried out and placed in clean cloth seed bags. The seed was then weighed and there was about 18kg of seed collected.

3.7 NATIVE GRASS SEED DISPERSAL

The Native grass seed that was collected in January 2023 was then direct seeded into the areas where the weedy vegetation had been cleared out to assist with meeting the OMP goals and increase the distribution of the native seed bank across the site, the seed was spread at the end of June 2023 . See map below section 3.10 of areas where seed was spread. Below are images of areas that have been direct seeded and had tube stock plantings.

Above images of areas that have been direct seeded and planted 2023

3.8 BIOMASS REDUCTION (ECOLOGICAL BURN)

Due to the issues mentioned above we were unable to get a large scale ecological burn complete, instead we completed smaller burns using a butane torch to burn out some of the dead weedy patches and the annual weeds that were growing around the native vegetation. The smaller lower intensity of this approach meant there was less smoke and the smoke that was produced disappeared or lifted before it got to the adjacent areas including the Train station and parking lot.

The Butane torch was also able to be used on the green annual grasses that were growing near the Native grassland areas, The Butane torch kills the green actively growing grasses by heating the cells and causing them to burst which means the plants are unable to get the nutrients they need to survive. By using the this method of burning we were able to remove weedy biomass from the site while leaving the Native biomass intact.

Due to the fact the works were done with Butane torch that had a flame and produced a small amount of smoke. notifications were still made to the CFA (via the notifications fire permits website)and station master to advise them of the burn. A crew member was also on the station floor to assist the general public if they had in queries. Fresh water was also onsite in our rigs for the works.

Image of Dead weedy bio bass being burnt out with Butane torch

Image of annual grass being treated with butane torch

3.9 HERBACEOUS SEEDLING PURCHASE AND PLANTING PREPARATION

The Herbaceous seedling planting occurred on June 30th/2023. There was 500 tube stock sourced for this project that included *Acaena echinate* (Sheep's Burr), *Arthropodium strictum s.l* (Chocolate Lily) *Brachyscome dentata* (Lobe-seed Daisy), *Chrysocephalum apiculatum* (Common Everlasting), *Eryngium ovinum* (Blue Devil), *Kennedia prostrata* (Running Postman) the seedlings were sourced from the Newport Nursery . The species selected are based off the management plan for the site. The tube stock was planted in the areas that been previously prepared using the butane torch/ had weed control done, see below map of areas.

3.10 SUPPLEMENTARY PLANTING PREPARATION

A supplementary planting occurred on the 4th/2023 of July and included an additional 200 plants made up of the follow species (Same as above planting spcies)*Acaena echinate* (Sheep's Burr), *Arthropodium strictum s.l* (Chocolate Lily) *Brachyscome dentata* (Lobe-seed Daisy), *Chrysocephalum apiculatum* (Common Everlasting), *Eryngium ovinum* (Blue Devil), *Kennedia prostrata* (Running Postman) these were also sourced from the Newport Nursery . this Tube stock was planted in areas were dead bio mass had been burnt out using the butane torch,. The supplementary planting was done to help achieve the 80% bench mark for the Native plantings as some of the tube stock planted in the previously years had died . See below map for additional information.

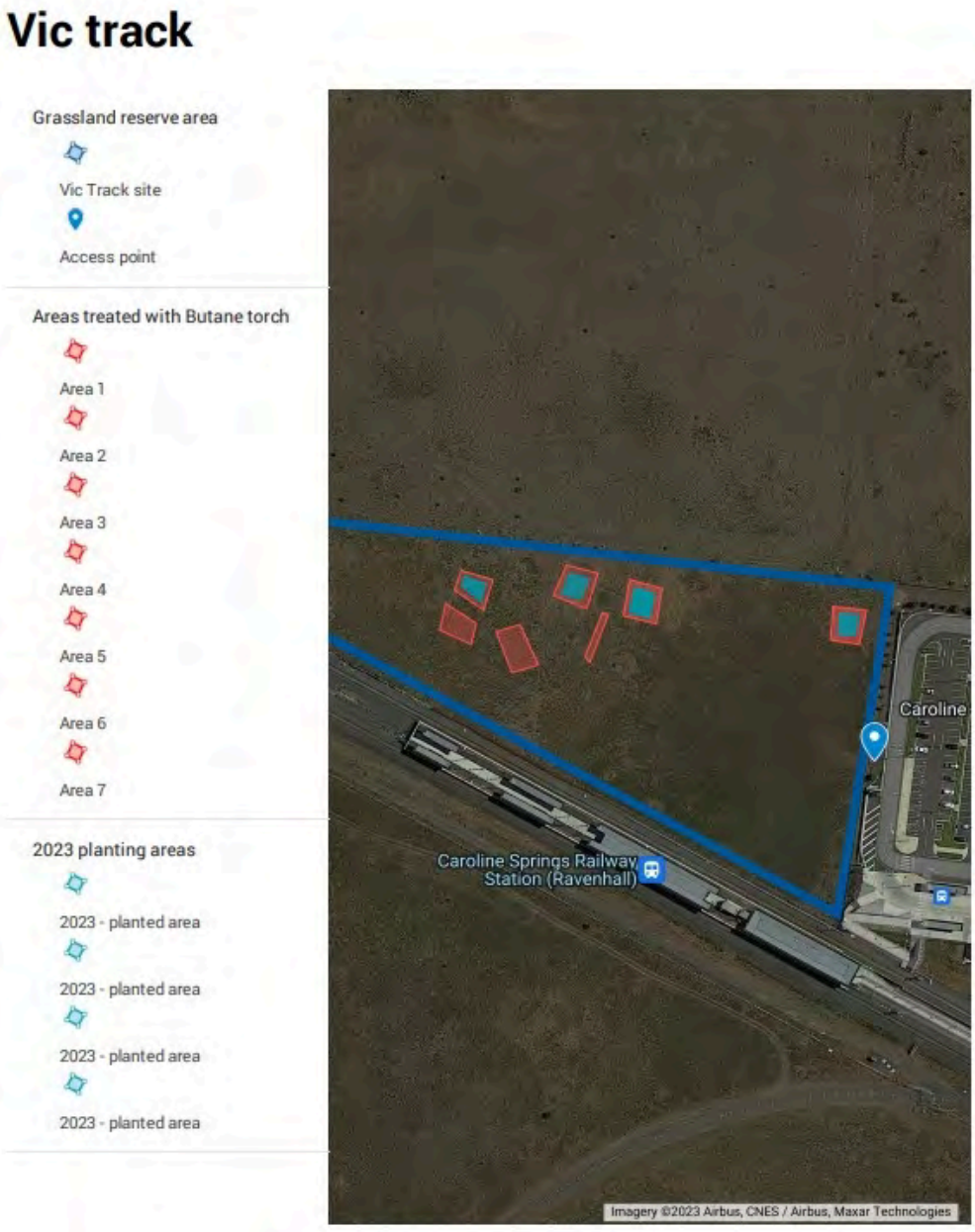

Image of Herbaceous planting planting areas in blue and areas that were treated with Butane torch in red

4 . Recommended Future Actions

4.1 ONGOING HERBACEOUS AND GRASSY WEED CONTROL

In line with the OMP ongoing Herbaceous and grassy weed control will need to be performed to continue to reduce the overall weed bio mass of the site and weed seed bank. As well as to eliminate all high threat weeds including chilean Needle grass (*Nassella Neesiana*) and Serrated Tussock (*Nassella Trichotoma*). It would be optimal to start the weed control works late winter early spring to assist in the control of weeds actively grow at those times and that can be dormant across Autumn/ Winter.

4.2 LITTER AND RUBBISH REMOVAL

Ongoing monitoring and removal of litter will also need to be performed ongoing as the site is prone to rubbish being blown in from adjacent land.

4.3 FOLLOW UP WOODY WEED CONTROL

Ongoing monitoring and control will need to be performed for any new woody weeds that will emerging from the existing seed bank to help in the elimination of the Woody weeds seed bank on this site.

4.4 BIOMASS REDUCTION (ECOLOGICAL BURN)

The ecological burn of Middle area of the reserve that was meant to occur during 2023 would be beneficial in helping reduce the overall weed bio mass of the site and help promote native seed germination. Alternatively additional works could be done using the Butane torch to burn out the individual patches of weedy bio mass.

REFERENCES:

- Ecology and Heritage Partners - Offset Management Plan for the Proposed Caroline Springs Railway Station , Victoria - May 2014
- Aus Eo Solutions proposal for works - A2256 - Vic Track-Caroline Springs Grassland 2022/2023