AECOM GHD JOINT VENTURE

LEVEL CROSSING REMOVAL AUTHORITY

MERNDA RAIL EXTENSION PROJECT

00 - Multiple Sites

EPBC 2016/7674 Matted Flax-lily Translocation Plan

LXRA-MNDA-00-PA-RPT-0004

Revision: 9

June 2020

LEVEL CROSSING REMOVAL AUTHORITY

VICTORIA State Government

Document Control

Release

Revision	Date Released	Release Status	Comment
0	23/03/2016	**ISSUED FOR USE**	Final Report
1	12/06/2016	**ISSUED FOR USE**	Final Report
2	06/12/2016	**ISSUED FOR USE**	Final Report
3	02/05/2017	**ISSUED FOR USE**	Final Report
4	02/05/2017	**ISSUED FOR USE**	Final Report
5	08/05/2017	**ISSUED FOR USE**	Final Report
6	12/06/2018	**ISSUED FOR USE**	Final Report
7	03/08/2018	**ISSUED FOR USE**	Final Report
8	11/09/2018	**ISSUED FOR USE**	Final Report
9	18/06/2020	**ISSUE FOR USE**	Final Report

LXRA Distribution List

Name	Title	Email
Chris Papadopoulos	Project Director, Mernda Rail Extension Project	chris.papadopoulos@levelcrossings.vic.gov.au
James David	Senior Planning and Environment Specialist	James.david@levelcrossings.vic.gov.au
Joseph Sevillano	Planning and Environment Specialist	Joseph.sevillano@levelcrossings.vic.gov.au
Cathy Philo	Director Land Planning and Environment	cathy.philo@levelcrossings.vic.gov.au

AECOM-GHD JV Authorisation

Name	Originator	Checker	Verifier	Package Lead	Program Manager
Cameron Miller	☒	☐	☐	☐	☐
Skye Brown	☐	☒	☐	☐	☐
Dan Haysom	☐	☐	☒	☐	☐
David Leonard	☐	☐	☐	☒	☐
Rodd Mickelson	☐	☐	☐	☐	☒

Issue

Draft	☐	Final	☒

QA Sign Off

ON FILE	ON FILE
Package Lead	**Program Manager**

Table of Contents

Table Index

Figure Index

Appendices

Executive Summary

The following table provides a summary of this translocation plan.

Project Title	Level Crossing Removal Authority: Mernda Rail Extension Project
EPBC Act reference	2016/7674
Taxon to be translocated	Matted Flax-lily (*Dianella amoena)*
Number of plants to be translocated	129 plants will be subject to removal. However, it should be recognised that these plants actively respond to prevailing conditions and the final figure is likely to vary (+/-) depending on the prevailing conditions at the time of salvage.
Proposed dates of translocation	Project enabling works are likely to start in early 2017. The preference is for salvage to occur outside the flowering period of the species (October – April). Alteration to this program may be considered if suitable conditions are prevalent or if early human intervention is likely to lead to higher salvage success rates. Translocation is proposed to be undertaken within 1 year of salvage; subject to both the conditions of the plants at the time of salvage and the conditions of the recipient site(s).
Source location or propagation facility	The Project is a proposed new 8 km dual track railway line from the existing South Morang Station to Mernda. The railway infrastructure will be located within an existing rail reserve. In addition to the railway infrastructure, the project area includes: • A high voltage cable would be installed within the existing operational rail reserve from Epping Substation, through the existing South Morang Tie Station and up to Hawkstowe to provide extra traction power infrastructure • Additional land to provide for car parking at Mernda Station that is currently private freehold land • Temporary construction laydown areas, temporary construction access and for ancillary works associated with drainage improvements and road modifications, which are located on public land parcels (refer to Figure 1). Matted Flax-lily are distributed throughout the project area.
Recipient sites	• Plenty Gorge Parkland, managed by Parks Victoria • Quarry Hills Park, managed by City of Whittlesea.
Name of contact person	James David Senior Planning and Environment Specialist Level Crossing Removal Project james.david@levelcrossings.vic.gov.au
Name and Affiliation of Proponents	**Cameron Miller (M.Sc. B.Sc.)** *Associate Director – Ecology* AECOM Australia **Steve Mueck (M.Sc. B.Sc.Hons.)** *Senior Consultant Botanist* Biosis Research Pty Ltd
Summary of the Translocation	LXRA are proposing to salvage and translocate 129 individual plants. This Plan documents: • A protocol for salvage and translocation • Nomination and selection criteria to determine a recipient site • Pre-clearance surveys • Post translocation management • Monitoring and reporting • Contingency planning and adaptive management.

1. Introduction

1.1 Objectives

GHD Pty Ltd (GHD) and AECOM Australia Pty Ltd (AECOM) were engaged by the Level Crossing Removal Authority (LXRA) to prepare a Translocation Plan for those Matted Flax-lily *Dianella amoena* which are proposed for removal to enable the construction of the Mernda Rail Extension Project (Project).

The objectives of this Plan are to:

- provide background on the Project, the Matted Flax-lily, and the regulatory requirements for translocation
- identify Matted Flax-lily plants to be salvaged
- outline the criteria and process for the selection of suitable recipient site(s) for the translocated plants
- provide details on pre- and post-translocation management actions for both the salvage and recipient site
- establish clear and effective protocols for the salvage, translocation, propagation, management and monitoring of Matted Flax-lily plants that must be removed prior to Project construction
- identify roles and responsibilities for the parties involved in the translocation process
- establish benchmarks for translocation success
- outline future reporting requirements and provide guidelines for potential contingency and adaptive-management measures during the monitoring period
- provide a management plan for Matted Flax-lily recipient sites
- satisfy regulatory requirements under State and Commonwealth legislation.

1.2 Independent Review

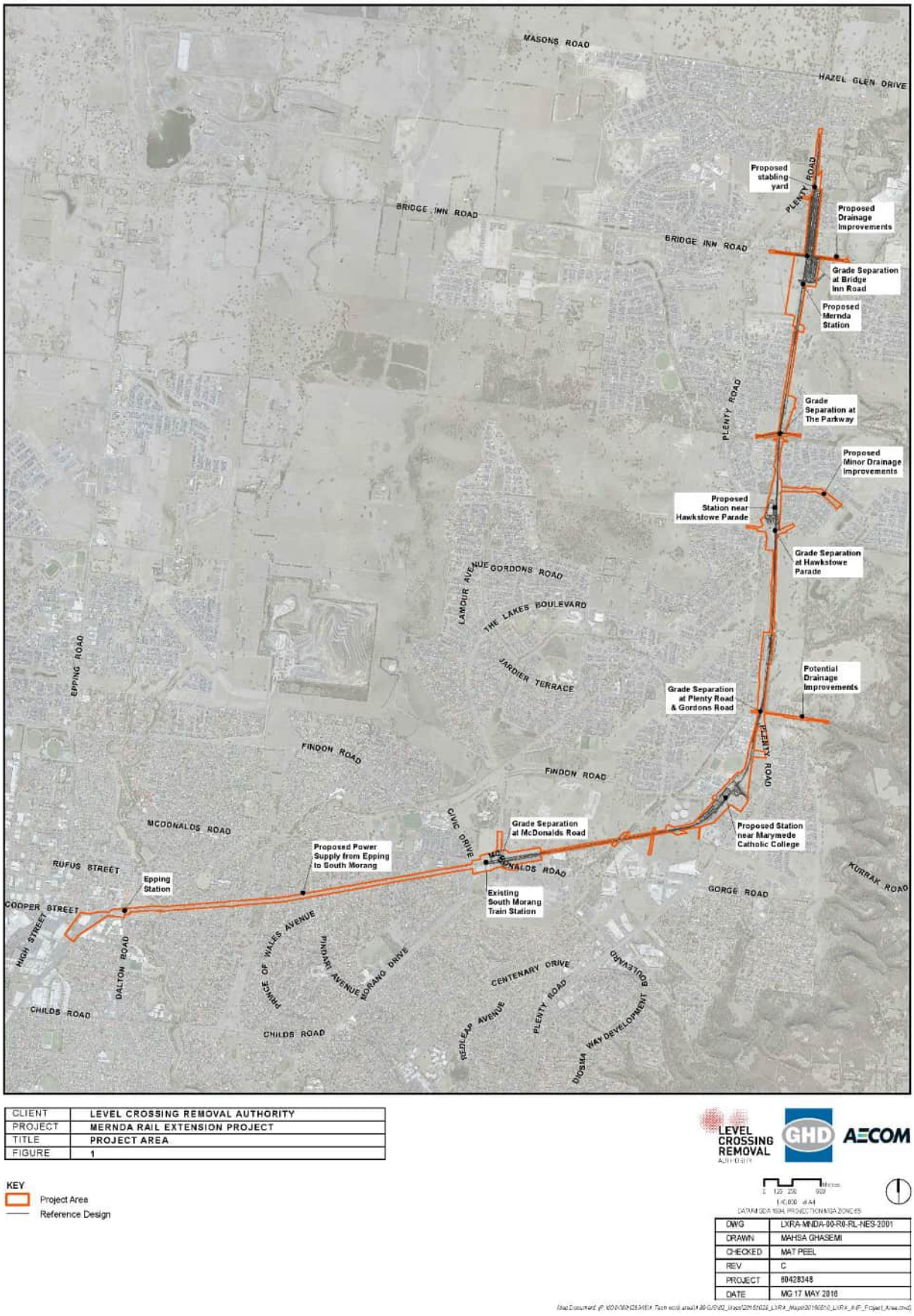
An independent review of an earlier draft of this Plan was completed by Steve Mueck of Biosis prior to submission for referral under the *Environmental Protection and Biodiversity Conservation Act 1999*. This review is presented in Appendix D.

1.3 Project description

The Project comprises a new 8 km dual track railway line from the existing South Morang Station to Mernda and is predominantly within an existing rail reserve. The alignment generally follows the route of the original Whittlesea railway line, which was decommissioned in 1959. New stations include a premium station at Mernda and two new stations near Marymede Catholic College and Hawkstowe Parade (named Middle Gorge Station and Hawkstowe Station respectively) (see Figure 1, overleaf). The Project also includes stabling facilities and a transport interchange at Mernda, car parking at each of the railway stations and the construction of grade separated road crossings at:

- McDonalds Road
- Plenty Road and Gordons Road
- Hawkstowe Parade
- The Parkway
- Bridge Inn Road.

In November 2016 a contract was awarded to John Holland to design and construct the works. Construction commenced in April 2017, with practical completion due at the end of 2018.



CLIENT	LEVEL CROSSING REMOVAL AUTHORITY
PROJECT	MERNDA RAIL EXTENSION PROJECT
TITLE	PROJECT AREA
FIGURE	1

KEY

Project Area

Reference Design

LEVEL CROSSING REMOVAL AUTHORITY GHD AECOM

1:6,000 at A4

DATUM GDA 1994 PROJECTION MGA ZONE 55

DWG	LXRA-MNDA-00-R0-RL-NES-2001
DRAWN	MAHSA GHASEMI
CHECKED	MAT PEEL
REV	C
PROJECT	60428348
DATE	MG 17 MAY 2016

Figure 1 Project area

1.4 Project area

Figure 1, above, shows the area referred to the Commonwealth Minister for the Environment under the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) in March 2016. Some minor revisions have since been made to the Project Area following refinement of the concept design, such as a reduction in the project footprint at the proposed Mernda railway station. The changes made to the Project Area have not changed the impacts of the Project on Matters of National Environmental Significance.

The habitat within the rail reserve remains substantially modified due to its past use as an active rail line. Evidence of the historic Whittlesea line is provided by sections of ballast that remains, cuttings through volcanic rock and a series of bridge culverts and other associated rail infrastructure. In addition to the existing rail reserve, the project area incorporates:

- a high voltage cable that will be installed within the existing operational rail reserve from Epping Substation, through the existing South Morang Tie-Station and up to Hawkstowe to provide extra traction power infrastructure
- additional land to provide for car parking at Mernda Station (currently private freehold land)
- temporary construction laydown areas, temporary construction access and for ancillary works associated with drainage improvements and road modifications (located on public land parcels).

The project area is adjoined by various land uses including agricultural land (primarily for grazing), commercial and utilities sites, and residential development. The rail corridor runs adjacent to Plenty Gorge Parkland in two areas - a 1.6 km segment between Gordon's Road and McArthurs Road, South Morang (located centrally within the project area), and a 500 metre segment located to the south of the proposed Mernda Station. At the southern end of the project area is South Morang Station, including commuter parking and the McDonalds Road Offset Site. The offset site is associated with the former South Morang Rail Extension Project (EPBC 2010/5313), and contains Plains Grassy Woodland Ecological Vegetation Class (EVC) and was a recipient site for translocated EPBC Act listed Matted Flax-lily (*Dianella amoena*).

The project area is located within the jurisdiction of the Port Phillip and Westernport Catchment Management Authority and the City of Whittlesea (CoW) and is mostly situated within the Victorian Volcanic Plains (VVP) Bioregion but abuts the border of the Highlands Southern Fall (HSF) Bioregion on Gordons Road at Plenty River.

1.5 Matted Flax-lily background

1.5.1 Conservation status

Matted Flax-lily is listed as Endangered under the EPBC Act and the Victoria Department of Environment, Land and Planning (DELWP) Advisory List, and as Threatened under the *Flora and Fauna Guarantee Act 1988* (FFG Act). In 2010, a National Recovery Plan was prepared for the species that outlines recovery objectives and actions necessary to ensure the species' long-term survival. The Recovery Plan identified the major current threats to the species as weed invasion and competition, habitat destruction and disturbance, and population fragmentation (Carter 2010).

1.5.2 Habitat and ecology

In Victoria, Matted Flax-lily typically occur in grassland and grassy woodland habitats with fertile, well-drained to seasonally-wet soils ranging from sandy loams to heavy cracking clays (Carr & Horsfall 1995; Gray & Knight 2001).

Matted Flax-lily is typically found in association with native grasses such as Common Wheat Grass (*Anthosachne scabra*), Common Tussock-grass (*Poa labillardierei*), Kangaroo Grass (*Themeda*

triandra), Grey Tussock-grass (*Poa sieberiana*), Wallaby Grass (*Austrodanthonia racemosa* var. *racemosa*), and Weeping Grass (*Microlaena stipoides* var. *stipoides*). In grassy woodland habitat, associated tree species include Blackwood (*Acacia melanoxylon*) and a variety of *Eucalyptus* species including River Red Gum (*Eucalyptus camaldulensis)*, Long-leaved Box (*E. goniocalyx)*, Red Stringy Bark (*E. macrorhyncha* subsp. *macrorhyncha)*, Yellow Box (E. *melliodora)*, Swamp Gum (*E. ovata)*, Snow Gum (*E. pauciflora* subsp. *pauciflora)*, and Red Box (*E. polyanthemos* subsp. *vestita*). Matted Flax-lily is also found in association with various introduced grasses and herbs (Carr & Horsfall 1995, Gray & Knight 2001, Carter 2010).

Flowers are buzz-pollinated by the native Blue-banded Bee (*Amegilla cingulata*). Fruits are readily formed but recruitment is often considered low or absent due to habitat disturbance and weed competition, and generally no seedlings are produced. Instead the species typically reproduces vegetatively through the production of rhizomes and ramets. The species can also be propagated by division (Carter 2010 and Ralph 2003). However, given the size of some of the observed plants and their isolation from other plants within the project area, there is the potential that some of these have been produced through sexual reproduction and seed dispersal.

1.5.3 Current population and distribution

Matted Flax-lily is currently known to occur in Victoria and Tasmania. Approximately 2,500 plants are estimated to remain in the wild in Victoria, found in approximately 120 sites (Carter 2010). Multiple populations are known from the northern suburbs of Melbourne, typically within remnant vegetation along roadsides and within rail corridors, conservation reserves, and in translocation sites (Carter 2010).

1.5.4 Population and distribution within Project area

During targeted surveys conducted in 2015, AECOM ecologists recorded 186 individual Matted Flax-lily plants in the project area, including 109 within the McDonalds Road Offset Site (AECOM-GHD Joint Venture). This is an increase from previous surveys undertaken by Ecology Partners (EP) (2007) and AECOM (2014), which identified 105 Matted Flax-lily plants. With the exception of those plants recorded between Gordons Road and Wilton Vale Road, and south of Vincent Drive, South Morang, the new Matted Flax-lily records were within close proximity (50 m) to the previous EP (2007) and AECOM (2014) records. A map showing the locations of Matted Flax-lily recorded during the most recent targeted assessment is provided in Appendix A. A photo of Matted Flax-lily habitat within the McDonalds Road Offset Site is provided in Figure 2.

Figure 2 Habitat within the McDonalds Road Offset Site containing a canopy of immature River Red Gums over a highly diverse understorey including Matted Flax-lily

Most Matted Flax-lily populations observed during AECOM-GHD Joint Venture's targeted survey were in a healthy condition. Plants within the exclusion area of the McDonalds Road offset site were mature and showed evidence of recent flowering (see Plate 2a). Weed and pest animal control in accordance with the South Morang Offset Management Plan is ongoing, and this may be assisting the plants' performance. Elsewhere, Matted Flax-lilies occur in a number of different habitats including at the base of River Red Gums, often co-existing with other *Dianella* species (see Plate 2b), on degraded rocky escarpments dominated by exotic grasses (see Plate 2c) or in shallow depressions (see Plate 2d). In these areas, plants were mostly immature and did not contain old flowering stems, suggesting they have sprouted from subterranean rhizomes in the past 12 months.

Based on the current indicative design footprint, 129 Matted Flax-lily plants have the potential to be directly affected by the Project and as such, require salvage and translocation prior to construction. This includes 52 plants within the McDonalds Road offset site. It should be recognised that there is a strong potential for there to be some variation in the final determination of numbers of impacted plants. A site assessment undertaken in March 2016 following a period of extended heat and little rainfall revealed that plants previously recorded and observed to be in a healthy condition had either senesced, or had become dormant and lost their above-ground vegetative structure. Additionally, some plants recorded had only a small number of ramets whilst others formed larger, mature clumps. This is evidence of the inherent dynamism of the species and suggests that prevailing weather conditions can have a significant and sudden impact on the viability of individuals and populations of the species, and highlights the difficulties of determining specific impacts based on a single survey within one season. As such a further pre-clearance survey is needed to determine final numbers (refer to Section 4.1).

(A) amongst Black-anther Flax-lily (D. revoluta) below River Red Gum

(B) amongst Wild Oat (*Avena fatua*) and Phalaris Grass (*Phalaris aquatica*) above an old rail cutting

(C) within a shallow depression alongside the old rail alignment (D)

(D) Old rail alignment

Figure 3 Matted Flax-lily locations within the Project area – large, healthy plants within the offset site

2. Regulatory Setting & Approvals

The following section of the Plan outlines the regulatory environment and permit requirements as they relate to the translocation of Matted Flax-lily.

2.1 Environment Protection and Biodiversity Conservation Act 1999

The Ecological Assessment prepared for the Project (AECOM-GHD Joint Venture) concluded that the Project would likely have a significant impact on Matted Flax-lily based on its potential to fragment an existing population and remove habitat to the extent that the species is likely to decline. The Project was referred to the Commonwealth Minister for the Environment for consideration under the EPBC Act (reference 2016/7674). The impact of the Project was assessed on preliminary documentation.

Part of the project area is also subject to the approval conditions associated with the South Morang Rail Extension Project (EPBC 2010/5313). As the Project will impact on these existing conditions, the conditions of approval for EPBC 2010/5313 will need to be amended to the satisfaction of the Department of the Environment and Energy (DoEE) before the Project can proceed.

When considered as part of a development proposal, translocation may be proposed as a mitigation measure, particularly for Matted Flax-lily. DoEE (2016) state '*The rhizomatous nature of Matted Flax-lilies allows plants to be translocated. Translocation has occurred at a number of sites*'. Translocation plans / strategies are factored into the approval decisions under Section 133 of the EPBC Act to address any residual impacts to Matters of National Environmental Significance (MNES) (DSEWPaC 2013). Given that translocation measures are recognised to reduce residual impacts, ultimately this can lead to a reduction in required offsets. All offsets for residual impacts to this MNES will be assessed under the EPBC Act offsets policy (DSEWPaC 2012).

2.1.1 Application of Commonwealth outcomes-based policy

The Australian Government has developed policy and guidance on outcomes-based conditions under the EPBC Act. Outcomes-based conditions specify the environmental outcome that must be achieved by an approval holder without prescribing how that outcome should be achieved. Outcomes-based conditions allow approval holders to be innovative and achieve the best environmental outcome at the lowest cost, while increasing the public transparency of the required environmental outcomes.

With this in mind, AECOM-GHD Joint Venture and LXRA have developed proposed environmental outcomes that specifically relate to Matted Flax-lily, as well as management and monitoring measures to achieve these outcomes. The proposed outcome, management measures, and monitoring objectives for Matted Flax-lily, which are detailed in this Translocation Plan, are summarised in Table 1.

Table 1 Proposed outcomes for Matted Flax-lily

Outcome	Management measures	Monitoring
No net loss to the extent and distribution of Matted Flax-lily as a result of the Project	Based on reference design, Matted Flax-lily plants would be directly impacted by the project (with 129 identified as requiring translocation in the most recent surveys by AECOM-GHD Joint Venture, including 52 within the existing McDonalds Road Offset Site)	Not applicable
	Matted Flax-lily to be impacted would be translocated to a suitable recipient site in accordance with a Matted Flax-lily Translocation Plan	Condition of translocated plants would be monitored prior to, during and immediately post translocation

Outcome	Management measures	Monitoring
		in accordance with a Matted Flax-lily Translocation Plan Recipient sites would be monitored in accordance with a Matted Flax-lily Translocation Plan
	Remaining Matted Flax-lilies would be managed during construction, including fencing of 'no go' areas, appropriate sediment controls and training of project personnel. Fencing of 'no go' areas would occur prior to construction commencing.	Condition of remnant plants would be monitored monthly throughout construction
	Ecological offsets that meet Commonwealth and State offset requirements would be secured.	Ecological offsets would be monitored in accordance with Commonwealth and State requirements

2.1.2 Commonwealth and State offsets

Offsets are required under the EPBC Act to compensate for any residual impacts to MNES (specifically Grassy Eucalypt Woodland) once avoidance and mitigation measures have been considered (DSEWPaC 2012). An offset must deliver an overall conservation outcome that improves or maintains the viability of the MNES and should be tailored specifically to the attribute of the MNES that is to be affected.

As all Matted Flax-lilies impacted by the project will be translocated and there are no residual impacts, DoEE has advised that no offsets for Matted Flax-lily are required. As such, no further information is provided within this plan regarding the offsetting of Matted Flax-lily.

2.2 Flora and Fauna Guarantee Act 1988

Under Section 48 of the FFG Act, a permit is required from the Secretary of DELWP for the translocation of flora listed under the Act. As part of the FFG Act permit application, a Translocation Plan is to be submitted describing the justification, nature of and likely success of translocation as described in Appendix 1 and 2 of the *Procedures Statement for Translocation of Threatened Native Flora in Victoria* (Department of Environment and Primary Industries [DEPI] 2013c). This document also addresses the principles and decision-making framework that are used by DELWP when assessing a Translocation Plan.

2.3 Permits and approvals

Before undertaking the proposed salvage and translocation of the Matted Flax-lily, the proponent will:

- seek approval from DoEE to salvage and translocate Matted Flax-lily
- obtain a permit from DELWP pursuant to Section 48 of the FFG Act for the translocation of listed flora.

3. Translocation management plan

3.1 Translocation activities

This section summarises the activities that will be undertaken to translocate the Matted Flax-lilies. Further detail is provided in Sections 4 to 7.

3.1.1 Salvage

Construction commenced in April 2017 and salvage occurred in April 2017. Salvaged material will be propagated in a nursery that has demonstrated suitable experience with native plants (and preferably with Matted Flax-lily), and translocated to the selected recipient sites provided that:

- plants have recovered from the disturbance of the salvage process, which is most readily identified by the new vegetative growth
- a sufficient number of clones have been propagated from the salvaged plants such that the required number of individuals are able to be planted to satisfy any required offset.

It is proposed that, where possible, whole plants (or sufficient material to produce the clones required) be salvaged at least six weeks prior to the commencement of works, allowing for the salvage of any additional material if required. If sufficient material is not present, more clones may need to be produced from a lesser number of individuals, as discussed in Section 4.3.

Translocation will be completed under the supervision of a suitably qualified botanist approved by DELWP and the botanist will follow the *Guidelines for the Translocation of Threatened Plants in Australia*, (Vallee et al. 2004), as applicable. The selection of a suitably qualified botanist to undertake salvage activities will the responsibility of the construction contractor (John Holland).

3.1.2 Nursery management

A suitable nursery will be selected and engaged by John Holland, through its contractual obligations to LXRA and subject to LXRA approval. The nursery will be engaged prior to commencement of salvage works.

Existing nurseries under consideration and with experience in Matted Flax-lily salvage and propagation include:

- Grey box and Grassland Nursery (GAGN)
- Victorian Indigenous Nursery Co-operative (VINC)
- Australian Ecosystems.

Additional nurseries to be considered could include:

- Merry Creek Management Committee (MCMC)
- Western Plains Flora (Ian Taylor)
- Buxton Nursery.

Alternatively, CoW or Parks Victoria may elect to manage any Matted Flax-lily plants within their own nursery facilities or enter into an arrangement with John Holland to lease space in the nursery.

3.1.3 Recipient site management

Recipient sites were identified and selected at the following two locations:

- Plenty Gorge Parkland, Crown Land managed by Parks Victoria
- Quarry Hills Park, owned and managed by CoW.

Appendix B provides detail on how the recipient sites were selected.

The ongoing active management of each site after translocation will be undertaken for a period of 10 years following initial translocation, or until long-term performance benchmarks are met (see Section 7.1).

The Quarry Hills recipient site will be secured by agreement with CoW under Section 69 of the *Conservation, Forests and Lands Act 1987*. Under this agreement, CoW will be responsible for preparation of the recipient site, planting of the Matted Flax-lilies and management of the site for a period of ten years. CoW will continue to be responsible for management of the site after ten years.

The Plenty Gorge site is within the Plenty Gorge Park, which is reserved under the Victorian *Crown Land (Reserves) Act 1978* for "conservation, recreation, leisure and tourism purposes". In this case, LXRA will engage the CoW to prepare and manage the recipient site. CoW will be responsible for preparation of the site, planting of the Matted Flax-lilies and management of the site, all in consultation with Parks Victoria, until expiry of the approval. Management of the site will then revert to Parks Victoria.

General management requirements are described in Section 5 and site-specific requirements are provided in Section 6.

These arrangements will ensure that maintenance and improvement outcomes achieved during site establishment will be protected in perpetuity.

3.2 Management responsibilities

Responsibilities of each party is summarised in Table 2 below.

Table 2 Translocation program responsibilities

Activity	Responsibility	Independent Monitoring and reporting to DoEE & DELWP
Plant salvage and nursery management		
Pre-clearance survey	John Holland	LXRA
Nursery selection	John Holland	LXRA
Plant salvage	John Holland	LXRA
Nursery management until translocation completed	John Holland	LXRA
Nursery management of "insurance" plants (after translocation)	John Holland until Practical Completion. LXRA from Practical Completion to Year 10.*	LXRA
Quarry Hills Recipient Site		
Site preparation	City of Whittlesea	LXRA
Planting	City of Whittlesea	LXRA
Management: Years 1 to 10	City of Whittlesea	LXRA
Management: Year 11+	City of Whittlesea	Not applicable

Activity	Responsibility	Independent Monitoring and reporting to DoEE & DELWP
Plenty Gorge Recipient Site		
Site preparation	City of Whittlesea	LXRA
Planting	City of Whittlesea	LXRA
Management: Years 1 to 10	City of Whittlesea	LXRA
Management: Year 11+	Parks Victoria	Not applicable

** LXRA will engage a suitably qualified contractor*

3.3 Timing and schedule

The proposed salvage of Matted Flax-lily material within the Project disturbance area will be undertaken prior to the start of construction and once the necessary approvals have been obtained. This is likely to be in early 2017.

The optimal time for salvage and translocation is when Matted Flax-lily is not flowering or fruiting, daily maximum temperatures are low, soil moisture is high and the corresponding increase in vegetative growth means the species can be easily identified in the field. Matted Flax-lily typically begins flowering in October and finishes setting seed by the end of April. Mean daily maximum temperatures in the Project area are lowest during winter (June-August), which is also the season of most consistent rainfall (i.e., highest mean number of days of rainfall per month). Conducting salvage and translocation between winter and early spring enhances the chance of success, primarily because the plants are more resilient to disturbance at this time, and because this timing allows for a longer period of beneficial growing conditions prior to the arrival of summer heat. Therefore, it is the preference that salvage occurs during the winter or early spring prior to start of construction, but provided that rainfall and other climatic conditions are suitable.

Salvage and translocation may occur outside of this time period if climatic conditions are conducive and/or if supplemental watering and monitoring are conducted to ensure the survival of the plants. Based on the current project timelines, salvage occurred in 2017.

The exact timing of salvage and other translocation actions is yet to be determined; however, Table 3 provides a summary timeline for translocation activities relative to the initial salvage event.

Table 3 Summary schedule of translocation program

Task	Action	Timeframe
1	Pre-clearance surveys of salvage site, including installation of protective fencing around plants to be salvaged	Prior to salvage
2	Identification of a suitable nursery	Within 3 months prior to salvage
3	Pre-translocation watering - undertake an appropriate watering schedule to maintain plant health and optimise translocation success	Assessment of plants to be translocated approximately 1 month prior to removal.
4	Salvage of plants to be translocated	Prior to start of construction in early 2017
5	Labelling of plants	During salvage and propagation at nursery

Task	Action	Timeframe
6	Propagation of clones (six per plant)	After transport of salvaged material to the nursery and then as needed during nursery management period
7	Nursery management	For up to 10 years following salvage, or until long-term performance criteria have been met
8	Preparation of a Management Plan for each of the recipient sites	Within 6 months prior to planting of salvaged material
9	Physical preparation of the recipient sites	During the 3 months prior to planting of salvaged material
10	Initial translocation to recipient sites to include 4 clones of each plant (where possible) and 2 retained as a safety net in the nursery	At end of Year 1 or 2 of nursery management period (subject to site conditions); optimal time is winter-early spring
11	Active recipient site management	For 10 years following initial translocation or until long-term performance criteria have been met
12	Monitoring period	Periodically for 10 years following salvage, or until long-term performance criteria have been met (monitoring schedule provided in Section 7)
13	Replacement plantings	As needed for 10 years following initial translocation; optimal time is winter-early spring
14	Reporting	Reports after salvage and initial translocation and then annually for 10 years or until long-term performance criteria have been met. Reports to be delivered to DoEE and DELWP
15	Adaptive management measures	As needed during 10 year monitoring period, or until long-term performance criteria are met
16	Evaluation of long-term performance criteria	At end of 5th year following initial translocation again at the end of the 10th year. If criteria not met, annually thereafter until criteria are met

4. Salvage and translocation

Survival rates for Matted Flax-lily that have been translocated for other developments in the local area have been high. The most relevant and recent examples are the South Morang Rail Extension Project and Melbourne Wholesale Markets. Provided certain safeguards are in place, the translocation procedure is generally considered low risk. This document incorporates protocols and procedures that have been informed by the translocation plans prepared for the South Morang Extension Project (EP, 2010 and KBR, 2014) and other translocation plans prepared for recent projects in Victoria, and have therefore been proven to be effective for the species in the local area. Measures to be implemented for the management and monitoring of the translocated plants are detailed in Sections 5 and 7, respectively.

4.1 Pre-clearance surveys

The detectability of Matted Flax-lily plants and/or populations is known to vary significantly within and between seasons and numbers of plants in a defined area can fluctuate markedly. This presents some difficulty both when defining a number of individuals to be impacted, but also provides uncertainty around the final number of Matted Flax-lily that are able to be salvaged and translocated. As such, it is proposed that a pre-clearance survey is implemented prior to the commencement of works (within a 3 month period prior to commencing construction). The aim of this survey is to confirm the total number of plants to be translocated and to identify any new individuals. In March 2016, AECOM-GHD Joint Venture undertook a further site assessment in consultation with Alan Webster of DELWP. It was noted during this assessment that there had been a decline in the number of detectable individuals as a result of prevailing dry conditions experienced in Victoria.

The pre-clearance survey will utilise the following methodology:

- All patches identified by previous surveys will be located by differential GPS, and any deviations from previously recorded locations and/or additional patches identified during the salvage will be recorded using the GPS unit.
- Each patch or plant will be marked with a red flag by a qualified botanist. The flag nominates that the individual is considered suitable for salvage.
- Appropriate protective fencing will be installed around each patch to protect the plants from damage prior to translocation.
- A qualified botanist will survey the area post-salvage to ensure all plants identified for translocated have been salvaged.
- A tally of plants will be recorded and mapped.
- The final removal number will be updated, and provided to DoEE and DELWP.

4.2 Proposed end-uses of salvaged plants

The Matted Flax-lilies salvaged from within the Project disturbance area will be divided, propagated and managed to reproduce vegetatively (i.e. clones) to establish a nursery population of a sufficient number of plants to allow for a variety of end-uses including as back-up material for each salvaged patch in case of losses within the recipient sites. Establishing a nursery population will also provide an appropriate amount of time to prepare the recipient site (i.e. weed control, fencing, vermin control, etc.) to maximise the probability of the clones' survival after replanting.

It is the intent that 6 clones are created from each plant, however this number may vary depending on the quality of the salvaged material. Where sufficient material cannot be obtained to generate 6 clones (e.g. small ramets / plants < 10 X 10 cm), a whole plant may be initially removed with the view to clone

this plant in the nursery at a later date. Alternatively, where more than six clones can be created, this will be undertaken to increase the number of clones available for translocation and insurance.

The proposed end-uses of the propagated material include:

- Four clones would be grown at the nursery until the following winter-spring planting season, or until they become sufficiently established in the nursery, at which point they would be translocated to the recipient sites (proving suitable climatic conditions prevail)
- Two clones would be retained at the nursery for a period of between two to ten years. This material would be used for insurance to provide replacement plants in the case of losses of plants at the recipient site. If, at the end of the ten-year period, not all of these plants have been used for replacement planting, they would be provided to Parks Victoria and/or other local agencies or organisations for revegetation projects in the region.

The goals of these proposed end-uses are:

- To ensure that the proposed performance benchmarks are met at the recipient site (see Section 7.1).
- Once those performance benchmarks have been met, to provide additional plants for other projects to expand the population and distribution of the Matted Flax-lily within Victoria.

4.3 Salvage protocol

A qualified botanist will oversee the salvage of all plants identified by the pre-clearance surveys as being suitable for translocation. All vegetative material of viable Matted Flax-lily plants within the proposed Project disturbance area will be removed and salvaged utilizing the following procedure:

- Plants will be watered the day before the removal, or for several days if conditions are dry, to loosen the soil and to ensure the plants are not water-stressed during salvage and transport.
- All patches previously marked with a red flag during the pre-clearance survey will be removed and recorded on the monitoring sheet (Appendix B). It is proposed that only enough material (attached ramets and rhizomes) is collected to generate the 6 clones. Any excess plant material can be left *in situ.*
- For each patch removed, the extent (length and width) will be measured, recorded and a photo taken along with an estimation of the height of ramets.
- Material will be dug from the ground by hand using suitable equipment that has been cleaned of dirt and debris prior to each day's removal work.
- Plants/divisions should be excavated as intact clumps, i.e. in such a manner that sufficient soil is maintained around the root system to keep roots from exposure and desiccating. This will be achieved by wrapping the clump of roots in a wet hessian or similar material until plants are potted-up at the nursery.
- Patches will be separated into divisions of a size that fits the transport container (polystyrene box or similar sealed container) to allow for ease of handling and transport. Care will be taken to ensure that sufficient root material is included with each division and that ramets are not separated from their attached rhizome/root base, to the extent practicable. Ideally, small plate sized material will be left intact (approximately 14 cm diameter pots). If smaller pieces of rhizomes or ramets accidentally become separated from the larger divisions, these may be gathered and taken to the nursery, as Matted Flax-lily can be propagated from relatively small pieces of vegetative material.
- Plant material other than Matted Flax-lily will be removed from the salvaged material prior to transport to the nursery.

- All vegetative material removed will be labelled by patch and division identifiers, using small aluminium ‘dog-tag’ labels attached with wire, and recorded on a tracking form according to the system described in Section 4.4 (below), in order to monitor the number of divisions created and to facilitate identification and tracking upon arrival at the nursery.
- Depending on soil moisture levels, the excavated divisions may need to be hand-watered to ensure that the soil is moist prior to transport.
- Once all plants are lifted from the ground and placed into transport containers, they will be promptly transported to the nursery.

4.4 Labelling

The correct labelling of all salvaged material needs to be undertaken to ensure plants can be identified and tracked throughout the entire removal, propagation, translocation and monitoring process.

Plants will be labelled with small metal labels at the salvage site during the removal and division process, using a numeric system that identifies both the patch and field division number. For example, the divisions from Patch 001 would be labelled 001-01, 001-02, 001-03 and so on.

At the nursery, the plants will be further divided to a size appropriate to the propagation containers – 14 to 24 cm diameter pots (6 to 10 inch pots) or other suitable propagation containers to be used. The metal dog-tag will be replaced with a staked metal nursery label, and the side of the pots will be also be labelled with a permanent marker. The nursery label will include the patch number and, in place of the two-digit field division number, will use a three-digit nursery clone number, e.g. 001-001, 001-002, etc., to simplify tallying of the total number of divisions taken from the parent plant.

4.5 Propagation and nursery management

All plants to be grown out at the nursery will be potted in a medium specifically designed for propagating native plants. Where achievable, six clones will be created to allow for four to be planted at the recipient site at the end of Year one and two to be retained in the nursery as potential replacement plants.

After the clones are potted, they must be managed correctly to ensure survival and good health within the nursery environment. Appropriate management will depend on conditions and the length of stay in the nursery. Watering, fertilisation, and disease and pest control will need to be undertaken to ensure survival and sufficient growth over the nursery management period. Disease and pest control in the nursery are also important to ensure no diseases or pests are introduced to the recipient site during delayed translocation. Correct hygiene procedures should be practiced at all times within the nursery. Any plants suspected of being diseased should be treated according to nursery guidelines or destroyed and disposed of appropriately to avoid spread of the disease. Plants suspected of carrying a disease or having pests will not be introduced to the recipient site. Weeding of pots will also be undertaken periodically and prior to translocation.

Generally, Matted Flax-lilies do well within a nursery environment and may spread to fill their container. If plants become pot-bound, further division and correct labelling will be undertaken.

Nursery populations will be monitored by a qualified botanist every 6 months in the first 2 years, and annually during Years 3 to 10. Results of the nursery monitoring will be included in the translocation program’s annual report (see Section 7.5).

Before planting into the recipient site, plants need to be ‘hardened-off’ (i.e. exposed to conditions similar to those occurring at the recipient site) gradually to ensure that they are not stressed by a sudden change in watering regime, sun and wind exposure, or temperature. Before the plants are translocated into the recipient sites, the health and readiness of the plants for translocation must be inspected and approved by the Project botanist.

4.6 Planting Procedure

The translocation to the recipient site will occur once plants have become established within the nursery and conditions at the site (e.g. climate, soil moisture, weed control) are favourable. The ideal time to conduct translocation is during winter or early spring, when temperatures are cool and rainfall is more consistent. Planting will be overseen by a qualified botanist approved by DELWP. Planting of the plants/clones at the recipient site will be accomplished by adopting the following practices:

- Holes will be pre-dug systematically and filled with water the day before translocation occurs; the holes will be dug roughly twice as wide as and slightly deeper than the pot in which the material is grown in. The holes should be laid out in a loose grid formation, no closer than one metres from one another, to assist in later monitoring of the plants. Where stony rises or embedded rock limit the ability to excavate the hole, the hole(s) can be skipped or the area removed from the plantible area. Where practicable, holes should be placed so as to avoid impacts to existing native vegetation at the site, to the extent practicable. Holes should also be placed so that they are not too close to any perimeter fence or to any large trees or other vegetation that would excessively shade the translocated plants or compete with them for water or nutrients. The spoils from the hole should be broken down into small clumps and mixed with a small amount of weed-free planting medium to serve as backfill during planting.
- The pre-dug planting holes will be re-filled with water just before the translocation to moisten and soften the surrounding soil and facilitate quick root growth. Any high-threat weeds that have not already been removed from the area immediately around the hole should also be hand-removed at this time.
- The potted plants will be well watered prior to translocation.
- After being transported from the nursery, the plants will be laid out systematically at pre-identified recipient holes. The plants will be arranged so that divisions planted next to each other are from different parent plants to facilitate cross-pollination and enhance genetic diversity within the recipient site.
- Care should be taken when removing the material from the pot to avoid damage to the plant and to keep the planting medium intact around the root system. If the plant is root-bound, the outer layer of roots may be loosened by hand or with pruning shears, taking care to not cause excessive damage to the roots.
- The translocated material should be placed in the centre of the planting hole at a sufficient depth so that the top of the root ball sits slightly lower than the surrounding soil surface, to create a slight basin to capture water.
- The backfill material will be placed around the root ball and tamped down slightly so that it is packed around the root ball and no large air pockets remain. Care should be taken to minimise disturbance of the root ball and avoid over-compacting the soil during backfilling. In order to avoid crown rot, the backfill soil also should not cover the crown of the plant.
- The area around the plant will be covered with a 7 to 10 cm layer of certified weed-free mulch consisting of organic material (e.g. wood chips or pea straw). Mulch should not cover the crowns of the plants. If considered appropriate and necessary, weed matting will also be considered to supress the establishment of weeds.
- The plant will be watered-in immediately after placement in the hole. Watering should continue until the soil in the planting depression is saturated, taking care not to displace the mulch when watering.
- The plant will be labelled according to the nursery number, using a small metal label attached to metal stake embedded in the ground, and the location of the plant will be recorded using a differential GPS.

- Immediately following translocation, the basal diameter and height of each clump and the number of ramets per clump will be measured in order to establish a baseline for monitoring the success of translocation. Reference photos will also be taken of the recipient site after the translocation episode is complete, to serve a visual baseline for subsequent monitoring, and the photo point location will be recorded using GPS.

Following the main translocation event at a recipient site additional translocations may take place annually or as otherwise appropriate if needed to replace losses at the recipient site. The timing of all replacement plantings will be recorded.

5. Recipient site management

Two sites have been chosen to receive salvaged Matted Flax-lilies: Quarry Hills Park and Plenty Gorge Parkland. These parks are managed by CoW and Parks Victoria respectively.

Prior to and following translocation, management and maintenance activities at the recipient site will be required to control threatening processes, and improve the health, growth and survivorship of the translocated plants. This section provides broad management activities that will be required across both recipient sites to achieve a successful translocation program. In order to ensure the longevity of recipient sites, the sites require a holistic management approach that aims to improve the ecological value of the entire site rather than focussing solely on the health of translocated plants. In some cases, this will involve enhancing and restoring parts of the recipient site not directly related to the translocated plants.

Management responsibilities and site security information is provided in Section 3.

Section 6 provides site-specific detail on existing site conditions, threats, management actions and schedule.

5.1 Watering

Watering of translocated plants at the recipient site will be undertaken to ensure that the plants establish quickly and survive through dry periods during the establishment phase (considered here to include the first summer endured by the planted material). Supplementary watering can be critical to the plants' survival during the first year, and particularly the first summer after translocation, when the plants are still establishing their root systems and are therefore more prone to drought-stress. The frequency and volume of watering required during this period is dependent on a number of factors, including the time of year that translocation occurs, rainfall, temperature, soil type and topography. After the plants have lived through the first summer, supplemental watering is unlikely to be required unless the plants show signs of water-stress.

A suggested watering schedule is outlined in Table 4. The schedule may be modified based on the time of planting as well as monitoring of weather conditions, soil moisture, and the condition of the translocated plants at the recipient site. The quantity of water used for each watering episode will be sufficient to promote survival of the translocated plants, as informed by monitoring of soil moisture and the condition of the plants at the recipient site.

Table 4 Watering requirements for translocated plants

Months after planting	Period between significant rainfall events[1] that will trigger watering	Watering schedule
0-3	1 week	Weekly[2]
3-9	2 weeks	Weekly
9-21	1-2 months	Monthly
21-36	1-2 months	Only if plants display signs of stress

[1]A "significant rainfall event" will be defined as ≥20 mm of rainfall within a 24-hour period; rainfall and watering records will be included the Project monitoring reports.
[2]More frequent monitoring may be required in the first months if planting occurs outside of the preferred winter to early-spring season.
Source: Adapted from EP (2010)

5.2 Weed control

Control of high-threat weeds within and adjacent to the location(s) of transplanted Matted Flax-lilies will be will be undertaken prior to translocation. This includes woody, grassy and herbaceous weeds present at both recipient sites. At Quarry Hills Park an emphasis will be placed on targeting Chilean Needle-grass *Nassella neesiana,* Pattersons Curse *Echium plantagineum*, Serrated Tussock *Nassella trichotoma*, Brown-top Bent Grass *Agrostis capillaris* and Toowoomba Canary-grass *Phalaris aquatic.*

The Plenty Gorge Parkland recipient site will require significant initial and follow-up weed control efforts due to the high cover of high-threat weeds. High-threat weeds that will be targeted include Chilean Needle-grass, Pattersons Curse, Artichoke Thistle *Cynara cardunculus,* Sweet Briar *Rosa rubiginosa,* Blackberry *Rubus fruiticosus* and Hawthorn *Crataegus monogyna*. Several invasive annual grassy and herbaceous weeds occur at the site including Great Broom *Bromus spp.,* Panic Veldt Grass *Ehrharta erecta,* and Cape Weed *Arctotheca calendula*.

After an initial weed control effort in 2018, an ongoing weed control program will occur biannually at times of the year when weeds are germinating and actively growing (autumn and spring). Spring weed control timing is critical so that high-threat weeds can be targeted before setting seed. The weed control methods will include undertaking spot-spraying using both broad-leaf and grass selective herbicide. Woody weeds will be removed using the cut-paint method and germinates will be treated with a broad-leaf selective herbicide. The alternate use of selective herbicides reduces the likelihood of off-target damage, increases the ability of applicators to target broad-leaf weeds amongst indigenous grasses, and assists exotic grass control amongst indigenous herbs.

Noxious weeds will be maintained at <1% cover within 5 m of any planted material within the first five years of management. To achieve this, carefully targeted spot-spraying with selective herbicides must only be undertaken at distances greater than 50 cm away from translocated plants. Mulching and hand weeding will be required to remove weeds within 50cm of translocated plants.

Herbicide application must only be undertaken during conditions considered suitable by an experienced operator, and all operators must be familiar with the range of exotic and indigenous species present on site. Prior to application, the contractor would be informed of the locations of the translocated plants, and instructed in the identification of Matted Flax-lily and other sensitive native species occurring at the recipient site. This will ensure that the plants are not affected by off-target application or overspray.

Nursery stock will be inspected prior to planting to avoid introducing weeds to the recipient site, and additional weed control will be undertaken at the recipient site before and after the replanting of the salvaged material. Monitoring of weed levels at the recipient site will be performed according to the monitoring schedule outlined in Section 7.3, and weed control actions will take place as needed according to the monitoring results and associated observations of environmental conditions.

5.3 Pest animal control

If rabbits and/or hares are present within fenced recipient areas, or pose a threat to isolated plants, a combination of harbour removal, warren destruction and baiting will need to be undertaken.

Baiting will ideally be undertaken in late summer to mid-autumn when populations are naturally low and repeated on a yearly basis as required. Baiting can also be undertaken during winter and spring, although this may not be as effective if there is high availability of natural feed (potentially reducing the desirability of baits). Given translocation areas at both reserves are within close proximity to neighbouring properties, roadsides and pedestrian paths, appropriate warning signage must be erected at access points and along fence lines prior to laying baits. Sites will need to be revisited four days after baiting to remove uneaten baits and again 12 days after laying baits to remove any dead carcasses. Uneaten baits and carcasses are to be buried to a depth of at least 500 mm in cleared areas outside of recipient sites.

Surveys for rabbits and active warrens at recipient sites will be undertaken at least twice yearly, and any warrens located are to be fumigated and destroyed. Following each warren treatment, affected areas are to be re-sown with indigenous grasses and follow-up weed control undertaken as required.

5.4 Biomass control

An integrated biomass control program will be implemented with the aim of reducing competition for light, nutrients and moisture from grassy weeds. In the later stages of the management plan, biomass control will be used to reduce competition (thatching) from native grasses and to promote understory species diversity. A mixture of low impact techniques will be used to reduce biomass and may include low intensity burning, slashing, spraying and hand removal. Techniques will vary between receptor sites due to management protocols required by the respective site managers.

Low intensity fire regime may be incorporated into biomass control at Quarry Hills Park, however, this will be driven by the prevailing climatic conditions and biomass and the time since last burn.

Any proposed burns would be carried out during autumn (cool burn) with the aim of reducing competition from annual grassy weeds and to encourage germination of native understorey herbs and graminoids. An ongoing burn program has been tentatively scheduled into the Quarry Hill Park site management plan on a 3-4 year cycle (Section 6) should burning be implemented.

A combination of other low impact biomass control methods including slashing, grass selective herbicide application and hand weeding will be used in between burning events at Quarry Hills Park and as the sole control method at the Plenty Gorge Parkland receptor site. Biomass control will occur biannually at each site to coincide with periods of active growth (spring and summer/autumn) to prevent translocated plants being out competed during optimal conditions.

Cut grass will be removed from receptor plots where this has the potential to smother translocated plants (a hand mower with a catcher may be used if appropriate for parts of each site). Where lower quantities of biomass are concerned, a brush cutter will be used as this is likely to disperse grass in the process of slashing.

It must be ensured that translocated Matted Flax-lilies and other newly established plants are not damaged or destroyed during slashing. Before a plot is slashed, each Matted Flax-lily must have a fluorescent flag placed near its base or several flags placed around the edge of the colony for plants consisting of numerous ramets. If a high quantity of biomass is growing within translocated plants, this must be removed by hand, being careful not to damage or cause significant disturbance to the Matted Flax-lilies.

Spring slashing should occur prior to exotic grasses and herbs setting seed to prevent seed spread.

5.5 Fencing

The design and construction of the fencing will ensure the exclusion of herbivores known to occur in the vicinity and which pose a potential threat to the translocated plants at each receptor site. At the Quarry Hills Park site this will include rabbits and hares whilst at the Plenty Gorge Parkland site this includes kangaroos, wallabies, rabbits and hares. The Quarry Hills Park site has high landscape amenity value, thus a fence design that can be removed following the 10-year management period will be used. A chain wire mesh fence is located around an existing Matted Flax-lily translocation site at the Plenty Gorge Parkland site and therefore it is proposed that the same style of fencing will be used for the adjoining new site.

To exclude rabbits and hares, both fencing styles will contain a horizontal skirt at the base of the fence. The skirt will be 300 mm wide with its base secured to the ground with steel jute pins. The mesh is to be attached to two or more strands of wire tensioned between posts at 5 m intervals.

The fence will include gates designed to allow access for management and monitoring while also excluding pest animals. Adequate signage will be installed on the fencing and gates to deter unauthorised access and minimise human disturbance of the site.

The fence will be inspected on a regular basis after translocation, including during the Project monitoring events conducted as per the schedule outlined in Section 7, and maintained as necessary. The translocated plants will also be monitored for evidence of grazing, and additional measures, such as use of cages or tree guards for individual plants, may be implemented as necessary. Additional pest fauna controls, such as bait traps for snails or similar pests, would also be implemented if the need is indicated by monitoring.

On occasion, herbivore control will be too difficult to achieve and individual plants may be caged. This will be considered as an option if other herbivore control is not effective.

5.6 Enhancement Planting

Receptor sites will be selectively revegetated with locally indigenous plants particular to the relevant EVC. Plants chosen will predominately be from understorey lifeforms and consist of herbs, groundcovers, daisies, lilies and graminoids to assist with weed suppression and potentially attracting pollinators. Areas that have been removed of woody, herbaceous and grassy weeds will require revegetation with indigenous grasses to provide competition against colonising weeds. Areas containing existing understory grasses will require supplementing with herbs, groundcovers, daisies, lilies to improve species diversity. Enhancement planting is scheduled to take place in year two and beyond to allow targeted weed control and to provide optimum opportunity for translocated Matted Flax-lilies.

It is anticipated that overstorey trees and shrubs will naturally recolonise the site once herbivores are removed. Existing percentage cover of understorey species at both receptor sites vary and as such, planting densities will be required to be adjusted within and between receptor sites.

On-going maintenance of enhancement plantings including watering, weeding, and biomass management is scheduled in Section 6 and is expected to be undertaken concurrently with actions required to maintain the translocated Matted Flax-lilies.

Table 5 Understory species suitable for enhancement planting

Common name	Scientific name
Shrubs	
Sweet Bursaria	*Bursaria spinosa*
Hedge Wattle	*Acacia paradoxa*
Groundcovers	
Berry Saltbush	*Atriplex semibaccata*
Kidney Weed	*Dichondra repens*
Purple Coral-pea	*Hardenbergia violacea*
Running Postman	*Kennedia prostrata*
Berry Saltbush	*Atriplex semibaccata*
Daisies	
Clustered Everlasting	*Chrysocephalum semipapposum*

Common name	Scientific name
Wiry Buttons	*Leptorhynchos tenuifolius*
Lilies	
Chocolate Lily	*Arthropodium strictum*
Grasses	
Common Wallaby-grass	*Austrodanthonia caespitosa*
Brown-back Wallaby Grass	*Austrodanthonia duttoniana*
Clustered Wallaby-grass	*Austrodanthonia racemosa*
Australian Wheat Grass	*Anthosachne scabra*
Wattle Mat-rush	*Lomandra filiformis*
Spiny-headed Mat-rush	*Lomandra longifolia*
Weeping Grass	*Microlaena stipoides*
Velvet Tussock-grass	*Poa morrisii*
Large Tussock-grass (volcanic plains form)	*Poa labillardieri*

6. Recipient Site Management Plan

6.1 Quarry Hills Park

Quarry Hills Park (Quarry Hills) is approximately 220 ha of land managed by CoW and includes Quarry Hills Bushland Park, Foothills Park and Granite Hills Reserve. The park spans from low relief plains across its southern end, rising to a low hill in the south west. The site crosses two bioregions- the Victorian Volcanic plain (south) and the Central Victorian Uplands (north).

The site supports extensive remnant patches in the form of open woodlands, grassy forests and open spaces with scattered trees and exotic pastures.

The recipient site has been assessed as supporting EVC 55_61: Plains Grassy Woodland and is contained within a wider habitat zone of EVC 55_61 spanning approximately 5 hectares. The recipient site is located on a low-lying plain of basalt-derived heavy clay soils and contains some areas of revegetation using woody native species. Several indigenous understorey species occur within the site including, Common Tussock grass *Poa labillardieri*, Velvet Tussock grass *Poa morrisii*, Weeping grass *Microlaena stipoides*, Kangaroo grass *Themeda triandra* and some indigenous herbs and sedges such as Chocolate Lily *Arthropodium strictum*, Kidney weed *Dichondra repens* and Australian Sheep's burr *Acaena ovina*. Remnant Matted Flax-lily also occur in some parts of the recipient site.

A mixture of grassy and herbaceous weeds exists at the site including the high threat Chilean Needle-grass and Patterson's Curse.

6.1.1 Existing management threats

- high threat weeds including Chilean Needle-grass and Patterson's Curse
- Eastern Grey Kangaroo grazing
- rabbit grazing
- public access to sensitive areas.

6.1.2 Planting configuration

Plants will be evenly placed in a large grid formation to assist with follow-up monitoring and maintenance. It is proposed that 258 plants will be translocated at this site which will require 0.41 hectares (4,100 m²). The recipient site will be extended by 0.5 hectares to allow for additional Matted Flax-lily plants that may be salvaged in addition to those already counted. Individual plants will be placed at four metre intervals which is close enough to encourage cross-pollination and allows sufficient inter plant space so plants are not competing in the early stages of establishment. Clumps commonly form up to 5 metres wide when established, resulting in reduced inter-plant space encouraging cross-pollination. Cross pollination by buzz pollinators is known to be important for successful Matted Flax-lily reproduction.

Actual placement of plants at each four metre interval will consider site specific conditions including rocks, depressions likely to encourage inundation and suitable planting locations. Actual planting locations will seek to avoid an 'unnatural' looking grid whilst also assisting with plant monitoring.

Figure 4 Quarry Hills Park recipient site

6.1.3 Proposed management program

Based on the requirements in Sections 4 and 5, the proposed management program is provided in Tables 6 to 11.

Table 6 Management Program Year 1 (2018/19)

Management Action	Activity
Winter - Spring 2018	
Survey site	• Establish baseline condition and survey site for any existing Matted Flax-lily
Weed control	• Targeted spraying of woody, herbaceous and grassy weed germinates, as per Section 5.2
Pest control	• Rabbit and hare baiting, as per Section 5.3
Biomass control	• Pre-translocation biomass control as per Section 5.4
Fencing	• Install herbivore fencing, as per Section 5.5
Spring 2018	
Weed control	• Targeted spraying of woody, herbaceous and grassy weed germinates, as per Section 5.2
Pest control	• Survey for rabbits / active warrens, as per Section 5.3
Biomass control	• As per Section 5.4
Herbivore fencing	• Inspect and repair as required and as per Section 5.5
Summer 2018/19	
Pest control	• Late Summer to mid-Autumn, rabbit and hare baiting as required and as per Section 5.3
Biomass control	• Late Summer to early Autumn, as per Section 5.4
Monitoring	• Nursery auditing as required.

Table 7 Management Program Year 2 (2019/20)

Management Action	Activity
Autumn 2019	
Weed control	• Targeted spraying of woody, herbaceous and grassy weed germinates, as per Section 5.2
Pest control	• Rabbit and hare baiting, as per Section 5.3
Biomass control	• Pre-translocation biomass control, as per Section 5.4
Fencing	• Inspect and repair as required and as per Section 5.5
Monitoring	• Yearly nursery audit
Winter 2019	
Translocation of Matted Flax-lily	• Late Winter to early Spring, planting as per procedure in Section 4.6
Watering	• Commence watering, as per Section 5.1
Monitoring and reporting	• LXRA to report on translocation and nursery audit in accordance with Section 7.
Spring 2019	
Watering	• As per schedule in Section 5.1
Weed control	• Targeted spraying of woody, herbaceous and grassy weed germinates, as per Section 5.2
Pest control	• Survey for rabbits / active warrens, as per Section 5.3
Biomass control	• As per Section 5.4
Fencing	• Inspect and repair as required and as per Section 5.5
Monitoring	• Monthly independent monitoring of translocated plants by LXRA in accordance with Section 7.
Summer 2019/20	
Watering	• As per schedule in Section 5.1
Pest control	• Late Summer to mid-Autumn, rabbit and hare baiting as required and as per Section 5.3
Biomass control	• Late Summer to early Autumn, as per Section 5.4
Monitoring	• Monthly independent monitoring of translocated plants by LXRA in accordance with Section 7.

Table 8 Management Program Year 3 (2020/1)

Management Action	Activity
Autumn 2020	
Watering	• As per schedule in Section 5.1
Weed control	• Targeted spraying of woody, herbaceous and grassy weed germinates, as per Section 5.2
Fencing	• Inspect and repair as required and as per Section 5.5
Monitoring	• Monthly independent monitoring of translocated plants by LXRA in accordance with Section 7 • Yearly nursery audit
Winter 2020 – One year post translocation	
Follow-up translocation of MFL	• Re-planting as per planting procedure in Section 4.6
Watering	• As per schedule in Section 5.1
Enhancement planting	• Planting of grassy woodland species as per Section 5.6
Monitoring and annual reporting	• Monthly independent monitoring of translocated plants continues until July 2020 which is one year post translocation • Annual report published by 4th July in line with EPBC requirements (covering monitoring over the period 4 April 2019 – 3 April 2020). Annual report to cover nursery auditing and translocated plants monitoring, see Section 7.5
Spring 2020	
Watering	• As per schedule in Section 5.1
Weed control	• Targeted spraying of woody, herbaceous and grassy weed germinates, as per Section 5.2
Pest control	• Survey for rabbits / active warrens, as per Section 5.3
Biomass control	• As per Section 5.4
Fencing	• Inspect and repair as required and as per Section 5.5
Monitoring	• Quarterly independent monitoring by LXRA in accordance with Section 7
Summer 2020/21	
Watering	• As per schedule in Section 5.1
Pest control	• Late Summer to mid-Autumn, rabbit and hare baiting as required and as per Section 5.3
Biomass control	• Late Summer to early Autumn, as per Section 5.4
Monitoring	• Quarterly independent monitoring of translocated plants by LXRA in accordance with Section 7

Table 9 Management Program Year 4 (2021/2)

Management Action	Activity
Autumn 2021	
Watering	• As per schedule in Section 5.1
Weed control	• Targeted spraying of woody, herbaceous and grassy weed germinates, as per Section 5.2
Fencing	• Inspect and repair as required and as per Section 5.5
Monitoring	• Quarterly independent monitoring by LXRA in accordance with Section 7 • Yearly nursery audit
Winter 2021 – Two years post translocation	
Follow-up translocation of MFL	• Re-planting as per planting procedure in Section 4.6
Watering	• As per schedule in Section 5.1
Enhancement planting	• Planting of grassy woodland species as per Section 5.6
Monitoring and annual reporting	• Quarterly independent monitoring of translocated plants (last one – moving to six-monthly hereafter) • Annual report published by 4th July in line with EPBC requirements (period 4 April 2021 – 3 April 2022). Annual report to cover nursery auditing and translocated plants monitoring, see Section 7.5
Spring 2021	
Watering	• As per schedule in Section 5.1
Weed control	• Targeted spraying of woody, herbaceous and grassy weed germinates, as per Section 5.2
Pest control	• Survey for rabbits / active warrens, as per Section 5.3
Biomass control	• As per Section 5.4
Fencing	• Inspect and repair as required and as per Section 5.5
Summer 2021/22	
Watering	• As per schedule in Section 5.1
Pest control	• Late Summer to mid-Autumn, rabbit and hare baiting as required and as per Section 5.3
Biomass control	• Late Summer to early Autumn, as per Section 5.4
Monitoring	• Six monthly independent monitoring of translocated plants in accordance with Section 7

Table 10 Management Program Year 5 – 6 (2022/23 – 2023/24)

Management Action	Activity
Autumn 2022 & 2023	
Watering	• If required, as per schedule in Section 5.1
Weed control	• Targeted spraying of herbaceous and grassy weed germinates, as per Section 5.2
Fencing	• Inspect and repair as required and as per Section 5.5
Monitoring	• Yearly nursery audit
Winter 2022 & 2023 – Three and four years post translocation	
Follow-up translocation of MFL	• Re-planting as per planting procedure in Section 4.6
Watering	• If required, as per schedule in Section 5.1
Enhancement planting	• Planting of grassy woodland species as per Section 5.6
Monitoring and annual reporting	• Six monthly independent monitoring of translocated plants by LXRA in accordance with Section 7 • Annual report published by 4th July in line with EPBC requirements (period 4 April – 3 April). Annual report to cover nursery auditing and translocated plants monitoring, see Section 7.5
Spring 2022 & 2023	
Watering	• If required, as per schedule in Section 5.1
Weed control	• Targeted spraying of herbaceous and grassy weed germinates, as per Section 5.2
Pest control	• Survey for rabbits / active warrens, as per Section 5.3
Biomass control	• As per Section 5.4
Fencing	• Inspect and repair as required and as per Section 5.5
Summer 2022/3-2023/4	
Watering	• If required, as per schedule in Section 5.1
Pest control	• Late Summer to mid-Autumn, rabbit and hare baiting as required and as per Section 5.3
Biomass control	• Late Summer to early Autumn, as per Section 5.4
Monitoring	• Six monthly independent monitoring of translocated plants by LXRA in accordance with Section 7.

Table 11 Management Program Year 7 – 12 (2024/25 – 2028/29), (if required beyond five years post translocation)

Management Action	Activity
Autumn 2024-2029	
Watering	• If required, as required and as per schedule in Section 5.1
Weed control	• Targeted spraying of herbaceous and grassy weed germinates, as per Section 5.2
Fencing	• Inspect and repair as required and as per Section 5.5
Monitoring	• Yearly nursery audit
Winter 2024-2029 – Five to ten years post translocation	
Watering	• If required, as required and as per schedule in Section 5.1
Monitoring and annual reporting	• Yearly independent monitoring of translocated plants in accordance with Section 7 • Annual report published by 4th July in line with EPBC requirements (period 4 April – 3 April) Note: Winter 2024 is five years post translocation – monitoring report is to include analysis of the success of the translocation program, see Section 7.5. If long-term performance criteria are met, translocation plan is declared a success. The need to continue monitoring should be assessed on a yearly basis from this point forward. Winter 2029 is ten years post translocation – in accordance with Section 7.3 final site assessment required unless long term performance benchmarks have been met earlier and this assessment has been conducted at that time
Spring 2024-2028	
Watering	• If required, as required and as per schedule in Section 5.1
Weed control	• Targeted spraying of herbaceous and grassy weed germinates, as per Section 5.2
Pest control	• Survey for rabbits / active warrens, as per Section 5.3
Biomass control	• As per Section 5.4
Fencing	• Inspect and repair as required and as per Section 5.5
Summer 2023/4-2028/9	
Watering	• If required, as per schedule in Section 5.1
Biomass control	• Late Summer to early Autumn, as per Section 5.4

6.2 Plenty Gorge Parkland

The Plenty Gorge recipient site is located within the Plenty Gorge Parkland, managed by Parks Victoria. The park has been reserved for its natural and historic values and it borders the Plenty River that includes Plenty Gorge. The park contains several geological features characteristic of the area including stony rises/knolls, escarpments and flat volcanic plains. The Plenty Gorge recipient site adjoins an existing Matted Flax-lily translocation site. The existing translocation site was in a degraded condition, however after careful management, the Matted Flax-lily population has recovered and plants have vigorous growth.

Preparation of the site, planting and maintenance will be undertaken by a contractor engaged by LXRA and all works must be undertaken in consultation with Parks Victoria. Vehicle access to the site will be provided in consultation with Parks Victoria.

The recipient site is in a state of degradation as it contains a high cover of grassy, herbaceous and woody weeds including a high cover of Chilean Needle-grass. Other high threat weeds present include, Montpellier Broom, *Genista monspessulana*, Hawthorn *Crataegus monogyna,* Sweet Briar, Patterson's Curse and Artichoke thistle *Cynara cardunculus*.

Some small patches of indigenous grasses exist including Spear Grass and Kangaroo Grass along with several large River Red Gums.

6.2.1 Existing management threats

- high threat weeds
- Eastern Grey Kangaroo grazing
- rabbit and hare grazing
- public access to sensitive areas.

6.2.2 Planting configuration

Plants will be broadly placed at one metre intervals in a large grid formation to assist with follow-up monitoring and maintenance. It is proposed that 258 plants will be translocated at this site which will require 0.41 hectares (4,100 m^2). The recipient site will be extended to 0.5 hectares to allow for additional Matted Flax-lily plants that may be salvaged in addition to those already counted. Individual plants will be placed at one metre intervals which is close enough to encourage cross-pollination and allows sufficient inter plant space so plants are not competing in the early stages of establishment. Clumps commonly form up to 5 metres wide when established resulting in reduced inter-plant space encouraging cross-pollination. Cross pollination by buzz pollinators is known to be an important for successful Matted Flax-lily reproduction.

Actual placement of plants at each interval will consider site specific conditions including rocks, depressions likely to encourage inundation and suitable planting locations. Actual planting locations will seek to avoid an 'unnatural' looking grid whilst also assisting with plant monitoring.

Figure 5 Plenty Gorge recipient site

6.2.3 Proposed management program

Based on the requirements in Sections 4 and 5, the proposed management program is provided in Tables 12 to 17.

Table 12 Management Program Year 1 (2018/19)

Management Action	Activity
Winter-Spring 2018	
Survey site	• Establish baseline condition and survey site for any existing Matted Flax-lily
Weed control	• Targeted spraying of woody, herbaceous and grassy weed germinates, as per Section 5.2
Pest control	• Rabbit and hare baiting, as per Section 5.3
Biomass control	• Pre-translocation biomass control as per Section 5.4
Fencing	• Install herbivore fencing, as per Section 5.5
Spring 2018	
Weed control	• Targeted spraying of woody, herbaceous and grassy weed germinates, as per Section 5.2
Pest control	• Survey for rabbits / active warrens, as per Section 5.3
Biomass control	• As per Section 5.4
Herbivore fencing	• Inspect and repair as required and as per Section 5.5
Summer 2018/19	
Pest control	• Late Summer to mid-Autumn, rabbit and hare baiting as required and as per Section 5.3
Biomass control	• Late Summer to early Autumn, as per Section 5.4
Monitoring and reporting	• Nursery auditing as required

Table 13 Management Program Year 2 (2019/20)

Management Action	Activity
Autumn 2019	
Weed control	• Targeted spraying of woody, herbaceous and grassy weed germinates, as per Section 5.2
Pest control	• Rabbit and hare baiting, as per Section 5.3
Biomass control	• Pre-translocation biomass control, as per Section 5.4
Fencing	• Inspect and repair as required and as per Section 5.5
Monitoring	• Yearly nursery audit
Winter 2019	
Translocation of Matted Flax-lily	• Late Winter to early Spring, planting as per procedure in Section 4.6
Watering	• Commence watering, as per Section 5.1
Monitoring and reporting	• LXRA to report on translocation and nursery audit in accordance with Section 7.
Spring 2019	
Watering	• As per schedule in Section 5.1
Weed control	• Targeted spraying of woody, herbaceous and grassy weed germinates, as per Section 5.2
Pest control	• Survey for rabbits / active warrens, as per Section 5.3
Biomass control	• As per Section 5.4
Fencing	• Inspect and repair as required and as per Section 5.5
Monitoring	• Monthly independent monitoring of translocated plants by LXRA in accordance with Section 7
Summer 2019/20	
Watering	• As per schedule in Section 5.1
Pest control	• Late Summer to mid-Autumn, rabbit and hare baiting as required and as per Section 5.3
Biomass control	• Late Summer to early Autumn, as per Section 5.4
Monitoring	• Monthly independent monitoring of translocated plants by LXRA in accordance with Section 7

Table 14 Management Program Year 3 (2020/21)

Management Action	Activity
Autumn 2020	
Watering	• As per schedule in Section 5.1
Weed control	• Targeted spraying of woody, herbaceous and grassy weed germinates, as per Section 5.2
Fencing	• Inspect and repair as required and as per Section 5.5
Monitoring	• Monthly independent monitoring of translocated plants by LXRA in accordance with Section 7 • Yearly nursery audit
Winter 2020 – One year post translocation	
Follow-up translocation of MFL	• Re-planting as per planting procedure in Section 4.6
Watering	• As per schedule in Section 5.1
Enhancement planting	• Planting of grassy woodland species as per Section 5.6
Monitoring and annual reporting	• Monthly independent monitoring of translocated plants continues until July 2020 which is one year post translocation • Annual report published by 4th July in line with EPBC requirements (covering monitoring over the period 4 April 2019 – 3 April 2020). Annual report to cover nursery auditing and translocated plants monitoring, see Section 7.5
Spring 2020	
Watering	• As per schedule in Section 5.1
Weed control	• Targeted spraying of woody, herbaceous and grassy weed germinates, as per Section 5.2
Pest control	• Survey for rabbits / active warrens, as per Section 5.3
Biomass control	• As per Section 5.4
Fencing	• Inspect and repair as required and as per Section 5.5
Monitoring	• Quarterly independent monitoring by LXRA in accordance with Section 7
Summer 2020/21	
Watering	• As per schedule in Section 5.1
Pest control	• Late Summer to mid-Autumn, rabbit and hare baiting as required and as per Section 5.3
Biomass control	• Late Summer to early Autumn, as per Section 5.4
Monitoring	• Quarterly independent monitoring of translocated plants by LXRA in accordance with Section 7

Table 15 Management Program Year 4 (2021/22)

Management Action	Activity
Autumn 2021	
Watering	• As per schedule in Section 5.1
Weed control	• Targeted spraying of woody, herbaceous and grassy weed germinates, as per Section 5.2
Fencing	• Inspect and repair as required and as per Section 5.5
Monitoring	• Quarterly independent monitoring by LXRA in accordance with Section 7 • Yearly nursery audit
Winter 2021 – Two years post translocation	
Follow-up translocation of MFL	• Re-planting as per planting procedure in Section 4.6
Watering	• As per schedule in Section 5.1
Enhancement planting	• Planting of grassy woodland species as per Section 5.6
Monitoring and annual reporting	• Quarterly independent monitoring of translocated plants (last one – moving to six-monthly hereafter) • Annual report published by 4th July in line with EPBC requirements (period 4 April 2021- 3 April 2022). Annual report to cover nursery auditing and translocated plants monitoring
Spring 2021	
Watering	• As per schedule in Section 5.1
Weed control	• Targeted spraying of woody, herbaceous and grassy weed germinates, as per Section 5.2
Pest control	• Survey for rabbits / active warrens, as per Section 5.3
Biomass control	• As per Section 5.4
Fencing	• Inspect and repair as required and as per Section 5.5
Summer 2021/22	
Watering	• As per schedule in Section 5.1
Pest control	• Late Summer to mid-Autumn, rabbit and hare baiting as required and as per Section 5.3
Biomass control	• Late Summer to early Autumn, as per Section 5.4
Monitoring	• Six monthly independent monitoring of translocated plants by LXRA in accordance with Section 7

Table 16 Management Program Year 5 – 6 (2022/23 – 2023/24)

Management Action	Activity
Autumn 2022 & 2023	
Watering	• If required, as per schedule in Section 5.1
Weed control	• Targeted spraying of herbaceous and grassy weed germinates, as per Section 5.2
Fencing	• Inspect and repair as required and as per Section 5.5
Monitoring	• Yearly nursery audit
Winter 2022 & 2023 – Three and four years post translocation	
Follow-up translocation of MFL	• Re-planting as per planting procedure in Section 4.6
Watering	• If required, as per schedule in Section 5.1
Enhancement planting	• Planting of grassy woodland species as per Section 5.6
Monitoring and annual reporting	• Six monthly independent monitoring by LXRA in accordance with Section 7 • Annual report published by 4th July in line with EPBC requirements (period 4 April – 3 April). Annual report to cover nursery auditing and translocated plants monitoring, see Section 7.5
Spring 2022 & 2023	
Watering	• If required, as per schedule in Section 5.1
Weed control	• Targeted spraying of herbaceous and grassy weed germinates, as per Section 5.2
Pest control	• Survey for rabbits / active warrens, as per Section 5.3
Biomass control	• As per Section 5.4
Fencing	• Inspect and repair as required and as per Section 5.5
Summer 2022/3-2023/4	
Watering	• If required, as per schedule in Section 5.1
Pest control	• Late Summer to mid-Autumn, rabbit and hare baiting as required and as per Section 5.3
Biomass control	• Late Summer to early Autumn, as per Section 5.4
Monitoring	• Six monthly independent monitoring of translocated plants by LXRA in accordance with Section 7

Table 17 Management Program Year 7 – 12 (2024/25 – 2028/29), (if required beyond five years post translocation)

Management Action	Activity
Autumn 2024-2029	
Watering	• If required, as required and as per schedule in Section 5.1
Weed control	• Targeted spraying of herbaceous and grassy weed germinates, as per Section 5.2
Fencing	• Inspect and repair as required and as per Section 5.5
Monitoring	• Yearly nursery audit
Winter 2024-2029 – Five to ten years post translocation	
Watering	• If required, as required and as per schedule in Section 5.1
Monitoring and annual reporting	• Yearly independent monitoring of translocated plants by LXRP in accordance with Section 7. Note: Winter 2024 is five years post translocation – monitoring report is to include analysis of the success of the translocation program, see Section 7.5. If long-term performance criteria are met, translocation plan is declared a success. The need to continue monitoring should be assessed on a yearly basis from this point forward. Winter 2029 is ten years post translocation – in accordance with Section 7.3 final site assessment required unless long term performance benchmarks have been met earlier and this assessment has been conducted at that time • Annual report published by 4th July in line with EPBC requirements (period 4 April – 3 April)
Spring 2024-2028	
Watering	• If required, as required and as per schedule in Section 5.1
Weed control	• Targeted spraying of herbaceous and grassy weed germinates, as per Section 5.2
Pest control	• Survey for rabbits / active warrens, as per Section 5.3
Biomass control	• As per Section 5.4
Fencing	• Inspect and repair as required and as per Section 5.5
Summer 2023/4-2028/9	
Watering	• If required, as per schedule in Section 5.1
Biomass control	• Late Summer to early Autumn, as per Section 5.4

7. Monitoring and reporting

Monitoring of the translocated plants as well as the conditions at each recipient site will be required to identify key threatening processes, determine whether additional management actions are necessary, track the health, growth and survivorship of the translocated plants and demonstrate whether performance benchmarks and regulatory requirements are being met. Monitoring will be performed by LXRA who will engage a suitably qualified botanist familiar with Matted Flax-lily biology and ecology and the sites. As detailed in Section 7.4, monitoring at the recipient sites will include the documentation of threatening processes, such as water stress, pest animals and signs of grazing, weed infestation and other site disturbances, as well as the condition, growth rates, reproduction, and survivorship of the translocated material.

7.1 Performance benchmarks

The translocation process does stress salvaged plants and without active management, most plants would be unlikely to survive. Successful translocation of Matted Flax-lily has occurred within Victoria, with the first two years following re-planting seen as the most critical period for plant establishment. Once planted material has survived for a period of five years it is considered established at that location and is otherwise part of the broader ecosystem in which it has been planted. However, each salvage and translocation operation needs to be carefully planned, managed, and monitored to ensure that plants successfully become established at the recipient site within the agreed-upon timeframe.

The overall goals of the proposed Matted Flax-lily translocation program are to ensure that genetic diversity of the species is conserved and that the population affected by the Project is re-established into suitable habitat and managed for the survival and reproduction of this species. Individual performance criteria have been created to assess the translocation program's progress towards meeting those goals. The following performance criteria are derived from Vallee *et al.* (2004) with adaptation to suit the circumstances of the current Project and species to be translocated. The criteria are divided according to the phase of the proposed translocation program:

7.1.1 Propagation and nursery management:

- The required number of transplants was available for the proposed translocation.
- Correct labelling and documentation was maintained throughout the propagation and nursery management period.
- Techniques for successful propagation of Matted Flax-lily developed through past translocation projects in Victoria were tested and/or advanced.
- A genetically representative collection was maintained.

7.1.2 Habitat and threat management:

- Good-quality habitat was restored or maintained within the recipient site.
- Management and maintenance activities were carried out at suitable intervals and to the required standard.
- Threatening processes, including weed invasion, were eliminated or effectively controlled.

7.1.3 Short- to mid-term translocation criteria (1 to 5 years):

The translocation of each species:

- At least 85% of transplanted clones survive, including representatives from the range of genetic individuals salvaged.

- The translocated populations display similar growth, development and vigour as naturally occurring populations.
- Transplants survive to a reproductive stage (producing flowers and fruit).
- If plants don't survive to reproductive stage, then the plants will be replaced.
- Regeneration occurs in the translocated individuals (since the recruitment of Matted Flax-lily through seed is thought to be rare, the production of ramets at a rate similar to naturally occurring populations is considered sufficient to meet this criterion).

7.1.4 Long-term criteria (after 5 years)

- The number of individuals within the population is stable, or has increased by natural (including vegetative) recruitment.
- Adequate levels of genetic diversity are maintained.

The number of surviving plants at the end of the 10 year monitoring program that are needed to meet the long-term success criteria will depend on the number of clones propagated and planted out. Assuming that at least four plants/clones are planted from each of the 129 distinct Matted Flax-lily plants proposed to be salvaged and translocated, the goal of having at least 85% survival of the transplants would mean that at least 439[1] clones should be present and in good condition across the recipient sites at the end of the 5 years. Condition and success of the clones will continue to be monitored between years 5-10 with the aim of achieving 85% survival of clones. Should 85% survival not be achieved at the end of 5 years, contingency planning shall be initiated (refer Section 7.2).

7.2 Contingency and adaptive management

A sufficient number of clones will be propagated and retained in the nursery to replace any losses of the translocated plants at the recipient sites to ensure 100% genetic survivorship of salvaged material. This is critical to the success of the approach. Based on previous translocation programs, Matted Flax-lily can be successfully propagated in a nursery setting and a large number of clones can often be produced from a single parent plant.

The primary criteria for triggering replanting will be plant mortality at the recipient sites, based on the judgement of the project botanist. Plants in poor health and/or which are not sufficiently growing either in width or number of ramets should first be watered before being considered for replacement.

The health and survivorship of the translocated plants will be monitored according to the protocol described in Section 5.3, and if the translocated population appears to be declining and/or performance benchmarks are not being met, the root cause of the decline will be assessed, and further adaptive management measures will be developed in consultation with DELWP. If the root cause is determined to be an aspect of the management of the recipient sites (e.g. insufficient watering or weed control), then modifications to site management will evaluated and implemented as needed. In addition, if survivorship criteria are not being met, the number of clones in the nursery can be increased by creating further divisions of established nursery stock to ensure that sufficient clones are available to replace losses. If the long-term success criteria have not been met at the end of the 10-year monitoring period, then the monitoring period may be extended until it is determined that survival of additional replacement plantings have met the criteria. Performance measures and contingency measures are presented in Table 18.

[1] This is indicative and assumes 4 clones produced from 129 plants. Ultimately the number of plants salvaged and the number of clones produced from each plant is likely to vary.

Table 18 Performance Management and Contingency Planning

Year for completion of Activity	Standard to be achieved	Contingency
Pre-planting	• 100% salvage of pre-clearance plants (121 plants) • Where achievable 6 clones to be created to replace salvaged plants. 726 plants to be established in total.	• If the six clones cannot initially be established, additional clones to be produced • Two clones maintained in nursery conditions
End of first year	• >85% survivorship of 4 clones (minimum 412[2]plants)	• Do nothing and continue to monitor
	• <85% survivorship of 4 clones (<412 plants)	• Replant up to 85% (412plants) survivorship of 4 clones
End of second year	• >85% survivorship of 4 clones (minimum 412plants)	• Do nothing and continue to monitor
	• <85% survivorship of 4 clones (<412plants)	• Replant up to 85% (412plants) survivorship of 4 clones
End of third year	• >85% survivorship of 4 clones (minimum 412plants)	• Do nothing and continue to monitor
	• <85% survivorship of 4 clones (<412plants)	• Replant up to 85% (412plants) survivorship of 4 clones
End of fourth year	• >85% survivorship of 4 clones (minimum 412plants)	• Do nothing and continue to monitor
	• <85% survivorship of 4 clones (<412plants)	• Replant up to 85% (412plants) survivorship of 4 clones
End of fifth year	• Achieved a performance target of at least 85% of clones surviving? • If this is the case the translocation plan is declared a success.	• No contingency required • Continue to manage the offset site for the remaining 5 years
	• If the performance target has not been met at the end of a 5-year period continue with replanting strategy.	• Review the existing strategy and explore options to improve success rates • Replant with 'insurance clones' as required to achieve performance target and monitor until performance target achieved
End of year 6 to 10	• Achieve a performance target of at least 4 clones surviving for a minimum of five years (85% of plants translocated) • If this is the case the translocation plan is declared a success.	• No further contingency required
	• If the performance target has not been met at the end of a 5 year period (85% of plants translocated) continue with replanting strategy.	• Review the existing strategy and explore options to improve success rates. • Replant all to be represented by 4 clones

Note: This table has been updated to reflect the salvage of 121 plants.

[2] Determined by 121 X 4 X 0.85 = 412

7.3 Monitoring schedule

Generally, monitoring needs to be conducted more frequently immediately following replanting to confirm that the new transplants are establishing themselves at each site. Monitoring can be undertaken less frequently once the plants become established. Monitoring will be conducted monthly for the first year after planting and then quarterly for the second year after planting. Thereafter, monitoring will be conducted on a 6 monthly basis for up to five years or until long-term performance criteria are met.

It is proposed that the monitoring be scheduled to be coordinated across the two recipient sites and with the annual reporting requirements, taking into account seasonal considerations. This schedule may be revised, with approval of DoEE and DELWP, depending on establishment rates and achievement of performance benchmarks. A final site assessment would be conducted at the end of the tenth year after the initial translocation event to confirm that performance benchmarks have been met unless long term performance benchmarks have been met earlier and this report has been produced at that time. The reporting schedule for providing the results of the monitoring to DoEE and DELWP is discussed below in Section 7.5.

7.4 Monitoring protocol

Monitoring at the recipient sites will be undertaken or overseen by a qualified botanist approved by DELWP. Monitoring will include the following components:

- A population count of all translocated Matted Flax-lilies at the site.
- An assessment of the growth and condition of the plants will be conducted for four 25 m^2 quadrats set up in established locations that are easily locatable and repeatable. Quadrat monitoring will be conducted on an annual basis during the summer, when the plants are most actively growing. Information to be collected will focus on plant health and cover, but will also look at other information such as plant reproduction, weed abundance and diversity, grazing impacts and other issues.
- Photo point monitoring would be conducted at established locations showing representative views of the translocated population. Photos will be taken on a quarterly basis.
- A general site assessment and threats analysis for the entire recipient site.

A monitoring form will be completed for each monitoring event (see Appendix C) to record the results of the monitoring, including:

- location and population of individual plants
- plant cover and growth (basal diameter and height of each patch, number of ramets per patch)
- presence of flowers and/or fruits and height of inflorescence or infructescence
- evidence of herbivory or pathogens
- presence and cover of weed species
- other potential or occurring threats or management issues
- maintenance or corrective actions completed or recommended.

7.5 Reporting

LXRA will submit the following to DoEE and DELWP:

- an initial report summarising the results of the salvage and nursery propagation
- a report after the initial translocation
- a progress report after the first six months of monitoring
- an annual summary report annually for a period of 10 years, or until long-term performance criteria have been met.

The annual summary report will be coordinated with annual compliance report to be provided under the approval. The annual compliance report is for the period 4 April – 3 April and must be published by 4 July in the relevant year.

The annual summary reports will include:

- information on conditions at both the recipient site and the nursery
- discussion of the survivorship and growth of the plants
- an assessment of the status of the translocation program relative to the established performance benchmarks
- discussion of occurring or potential threats or management issues and any maintenance or corrective actions taken or proposed
- rainfall and watering data
- monitoring forms for each monitoring event
- quarterly/biannual or yearly photos taken from each established photo point.

Thefinal summary report will include:

- a summary of the translocation program to date
- analysis of the success of the translocation program in achieving long-term performance benchmarks and consideration of the need for ongoing management and monitoring
- lessons learned and recommendations for future translocation programs.

8. References

AECOM. 2014. Mernda and Yan Yean – Flora and Fauna Assessment. Prepared for VicTrack by AECOM, January 2014.

Carr, G.W. and Horsfall, P.F. 1995. Studies in the Phormiaceae (liliaceae) 1: New Species and combinations in *Dianella* Lam. Ex. Juss.; In Muelleria 8; (3):365-378.

Carter, O. 2010. National Recovery Plan for the Matted Flax-lily *Dianella amoena*. Department of Sustainability and Environment, Victoria.

DEPI. 2013a. Biodiversity Conservation Strategy for Melbourne's Growth Corridors. Victorian Government Department of Environment and Primary Industries, Melbourne, May 2013. Available at: http://www.depi.vic.gov.au/environment-and-wildlife/biodiversity/melbourne-strategic-assessment/conservation-strategies#A2.2a

DEPI. 2013b. Permitted clearing of native vegetation – biodiversity assessment guidelines. Victorian Government Department of Environment and Primary Industries, Melbourne, September 2013.

DEPI. 2013c. Procedures Statement for Translocation of Threatened Native Flora in Victoria. Victorian Government Department of Environment and Primary Industries, Melbourne, June 2013.

DoEE, 2016. *Dianella amoena* — Matted Flax-lily. Website accessed 2016 at: http://www.environment.gov.au/cgi-bin/sprat/public/publicspecies.pl?taxon_id=64886.

DoE. 2012. Offsets Assessment Guide spreadsheet. Australian Government Department of the Environment, October 2012. Available at: http://www.environment.gov.au/epbc/publications/ epbc-act-environmental-offsets-policy

DSEWPaC. 2013. Environment Protection and Biodiversity Conservation Act 1999 (Cth) Policy Statement: Translocation of Listed Threatened Species – Assessment under Chapter 4 of the EPBC Act. Available at: https://www.environment.gov.au/resource/epbc-act-policy-statement-translocation-listed-threatened-species-assessment-under-chapter

DSEWPaC. 2012. Environment Protection and Biodiversity Act 1999 Environmental Offsets Policy. October 2012. Available at: http://www.environment.gov.au/system/files/resources/ 12630bb4-2c10-4c8e-815f-2d7862bf87e7/files/offsets-policy_2.pdf

EP. 2007. Epping to Mernda, Ecology Partners, March 2007 Targeted Matted Flax-Lily *Dianella amoena* and Growling Grass Frog *Litoria raniformis*

EP. 2010. Translocation and Management Plan for Matted Flax-lily Dianella amoena, South Morang Rail Extension, South Morang, Victoria. Prepared for Department of Transportation, February 2010.

AECOM-GHD Joint Venture. 2016. Mernda Rail Extension Project – Ecological Assessment. Prepared for LXRA, January 2016.

Gray, M. and Knight, J. (eds.). 2001. Flora of Melbourne: A Guide to the Indigenous Plants of the Greater Melbourne Area, Hyland House Publishing, Melbourne.

KBR. 2014. South Morang Rail Extension Project – Translocation Plan for Matted Flax-lily. Document No. SMREP-REP-PW-ENV-002, Revision 3, May 2014.

Ralph, M. 2003. Growing Australian Native Plants from Seed. Second Edition. Bushland Horticulture. Fitzroy.

SMREP, 2012. South Morang Rail Extension Project – South Morang Grassy Eucalypt Woodland Management Plan.

SMREP, 2014. South Morang Rail Extension Project. – Translocation Plan for Matted Flax-lily.

Tasmanian Department of Primary Industries and Water. 2008. Threatened Flora of Tasmania: *Dianella amoena*. [Online]. Available at: http://www.dpiw.tas.gov.au/inter.nsf/Attachments/LJEM-74ZUT6/$FILE/Dianella%20amoena.pdf

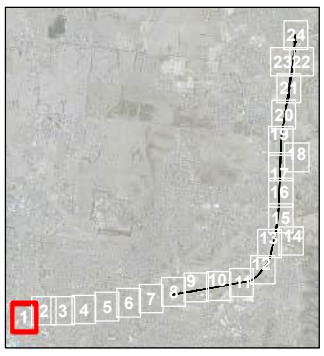
Vallee, L. Hogbin, T., Monks, L., Makinson, B., Matthes, M. and Rossetto, M. 2004. Guidelines for the translocation of threatened plants in Australia. Second edition. Australian Network for Plant Conservation, Canberra.

Appendices

Appendix A – Survey Figures

HIGH STREET
WEDGE STREET
HOWARD STREET
COULSTOCK STREET
DAVISSON STREET
COOPER STREET
TERESA COURT
PETRA COURT
MONICA COURT
GRAND PARADE

CLIENT	**LEVEL CROSSING REMOVAL AUTHORITY**
PROJECT	**MERNDA RAIL EXTENSION PROJECT**
TITLE	**ECOLOGY RESULTS**
SHEET	**1 of 24**



KEY

Project Area

Cadastre

0 25 50 100 Metres

1:2,000 at A3

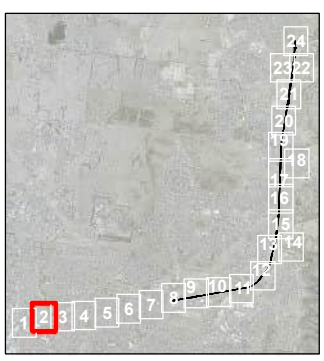
DATUM GDA 1994, PROJECTION MGA ZONE 55

DWG	LXRA-MNDA-00-R0-SP-SKT-0011
DRAWN	DUSTIN EDGE
CHECKED	CAMERON MILLER
REV	C
PROJECT	60428348
DATE	22 MAR 2016

Map Document: (P:\604X\60428348\4. Tech work area\4.99 GIS\02_Maps\20151029_LXRA_Maps\201603010_LXRA_A3P_Ecology_MapBooks_2K.mxd)

RUFUS STREET
GREENBROOK DRIVE
DAREBIN CREEK
LETCHWORTH PLACE
PEPPERCORN PARADE
SUNBIRD GARDENS
DAVISSON STREET
WINTERTON CLOSE
COULSTOCK STREET
WEDGE STREET
HENRY COURT
CAMPBELL STREET
COOPER STREET
COOPER STREET
HENDERSONS ROAD
DALTON ROAD
GUILA COURT
NARINA WAY
KANTIKI DRIVE

CLIENT	**LEVEL CROSSING REMOVAL AUTHORITY**
PROJECT	**MERNDA RAIL EXTENSION PROJECT**
TITLE	**ECOLOGY RESULTS**
SHEET	**2 of 24**



KEY

Project Area

Cadastre

0 25 50 100 Metres

1:2,000 at A3

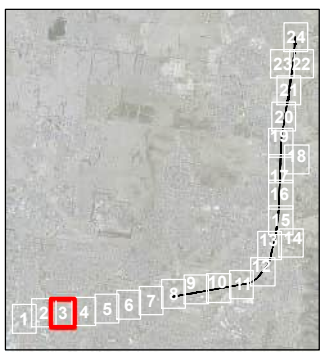
DATUM GDA 1994, PROJECTION MGA ZONE 55

DWG	LXRA-MNDA-00-R0-SP-SKT-0011
DRAWN	DUSTIN EDGE
CHECKED	CAMERON MILLER
REV	C
PROJECT	60428348
DATE	22 MAR 2016

Map Document: (P:\604X\60428348\4. Tech work area\4.99 GIS\02_Maps\20151029_LXRA_Maps\201603010_LXRA_A3P_Ecology_MapBooks_2K.mxd)

TOUHEY AVENUE
CLEELAND CLOSE
LETCHWORTH PLACE
WINTERTON CLOSE
SAVANNAH CRESCENT
ZIMMER COURT
LOWALDE DRIVE
EVA PLACE
PEPPERCORN PARADE
HENRY COURT
DAREBIN CREEK
BISHOP PLACE
MAYWOOD DRIVE
SUNRISE COURT
PECAN COURT
DELMONT CLOSE
CORINE COURT
HENDERSONS ROAD
WOOLNOUGH DRIVE
NARINA WAY
MIRRAM COURT
KARRI GROVE
KANTIKI DRIVE

CLIENT	**LEVEL CROSSING REMOVAL AUTHORITY**
PROJECT	**MERNDA RAIL EXTENSION PROJECT**
TITLE	**ECOLOGY RESULTS**
SHEET	**3 of 24**



KEY

Project Area
Cadastre
Scattered Trees

0 25 50 100 Metres

1:2,000 at A3
DATUM GDA 1994, PROJECTION MGA ZONE 55

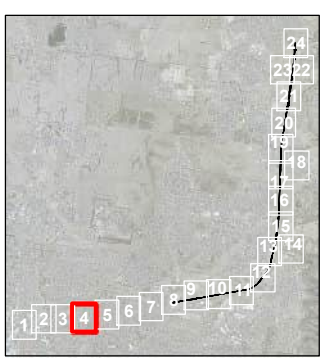
DWG	LXRA-MNDA-00-R0-SP-SKT-0011
DRAWN	DUSTIN EDGE
CHECKED	CAMERON MILLER
REV	C
PROJECT	60428348
DATE	22 MAR 2016

Map Document: (P:\604X\60428348\4. Tech work area\4.99 GIS\02_Maps\20151029_LXRA_Maps\201603010_LXRA_A3P_Ecology_MapBooks_2K.mxd)

BROWNLOW CRESCENT
LOWALDE DRIVE
THREDBO COURT
HOWQUA COURT
JAMIESON COURT
AVON PLACE
GRIMWADE COURT
PLOWMAN COURT
PEPPERCORN PARADE
HERITAGE DRIVE
BISHOP PLACE
MAYWOOD DRIVE
TERALBA CLOSE
DORRINGTON COURT
WESTLEIGH COURT
ESSEX COURT
WOOLNOUGH DRIVE
ESTER DRIVE
HONE COURT
HOBSON CRESCENT
PRINCE OF WALES AVENUE

CLIENT	**LEVEL CROSSING REMOVAL AUTHORITY**
PROJECT	**MERNDA RAIL EXTENSION PROJECT**
TITLE	**ECOLOGY RESULTS**
SHEET	**4 of 24**

GHD AECOM



KEY

Project Area
Cadastre
Scattered Trees

0 25 50 100 Metres

1:2,000 at A3

DATUM GDA 1994, PROJECTION MGA ZONE 55

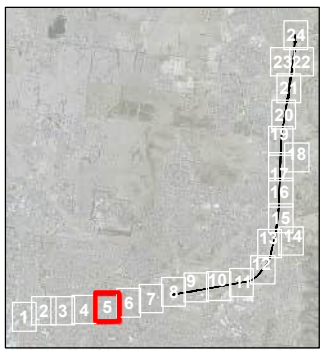
DWG	LXRA-MNDA-00-R0-SP-SKT-0011
DRAWN	DUSTIN EDGE
CHECKED	CAMERON MILLER
REV	C
PROJECT	60428348
DATE	22 MAR 2016

Map Document: (P:\604X\60428348\4. Tech work area\4.99 GIS\02_Maps\20151029_LXRA_Maps\201603010_LXRA_A3P_Ecology_MapBooks_2K.mxd)

MENTOR COURT
GLENCOE COURT
TARCOOLA CLOSE
WYNNETTE COURT
STOW CLOSE
ZURZOLO TERRACE
WOTAN DRIVE
REBEL CLOSE
RAINBIRD COURT
BAYSTONE ROAD
BANKER COURT
ARSENAL COURT
KALMAN ROAD
GRIMWADE COURT
FOXZAMI CRESCENT
ROMANO AVENUE
BERALA PLACE
HERITAGE DRIVE
PINDARI AVENUE
BRONSDON COURT
BENDALE COURT
CORBIN PLACE
PRINCE OF WALES AVENUE
ESSUE COURT
ROMANO AVENUE
ALLAWAH COURT
DENHAM PLACE
LAMINA AVENUE
RANDELL COURT

CLIENT	**LEVEL CROSSING REMOVAL AUTHORITY**
PROJECT	**MERNDA RAIL EXTENSION PROJECT**
TITLE	**ECOLOGY RESULTS**
SHEET	**5 of 24**

GHD AECOM



KEY

Project Area

Cadastre

0 25 50 100 Metres

1:2,000 at A3

DATUM GDA 1994, PROJECTION MGA ZONE 55

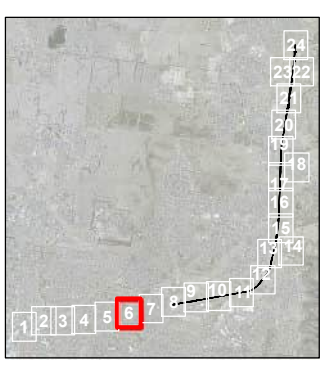
DWG	LXRA-MNDA-00-R0-SP-SKT-0011
DRAWN	DUSTIN EDGE
CHECKED	CAMERON MILLER
REV	C
PROJECT	60428348
DATE	22 MAR 2016

Map Document: (P:\604X\60428348\4. Tech work area\4.99 GIS\02_Maps\20151029_LXRA_Maps\201603010_LXRA_A3P_Ecology_MapBooks_2K.mxd)

MCDONALDS ROAD
NARIN COURT
DORA WAY
ZURZOLO TERRACE
WOTAN DRIVE
KAYLA COURT
BECCIA AVENUE
PRIMROSE PLACE
LARKSPUR CLOSE
BLUEBELL DRIVE
COLUMBINE COURT
CALENDULA CIRCUIT
KALMAN ROAD
BORDER DRIVE
CAWLEY COURT
STURROCK COURT
VARGA CLOSE
CALLAN COURT
MANNING CLARK ROAD
ROE WAY
BRONSDON COURT
MARSDEN COURT
DUNLOP CRESCENT
ROMANO AVENUE

CLIENT	**LEVEL CROSSING REMOVAL AUTHORITY**
PROJECT	**MERNDA RAIL EXTENSION PROJECT**
TITLE	**ECOLOGY RESULTS**
SHEET	**6 of 24**

GHD AECOM



KEY

Project Area
Cadastre
Scattered Trees

0 25 50 100 Metres

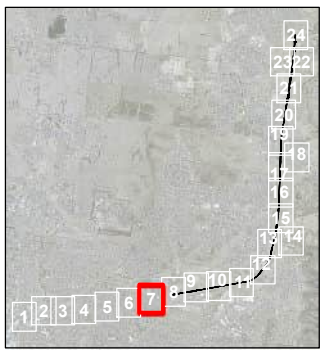
1:2,000 at A3

DATUM GDA 1994, PROJECTION MGA ZONE 55

DWG	LXRA-MNDA-00-R0-SP-SKT-0011
DRAWN	DUSTIN EDGE
CHECKED	CAMERON MILLER
REV	C
PROJECT	60428348
DATE	22 MAR 2016

Map Document: (P:\604X\60428348\4. Tech work area\4.99 GIS\02_Maps\20151029_LXRA_Maps\201603010_LXRA_A3P_Ecology_MapBooks_2K.mxd)

CLIENT	**LEVEL CROSSING REMOVAL AUTHORITY**
PROJECT	**MERNDA RAIL EXTENSION PROJECT**
TITLE	**ECOLOGY RESULTS**
SHEET	**7 of 24**



KEY

Project Area

Cadastre

Scattered Trees

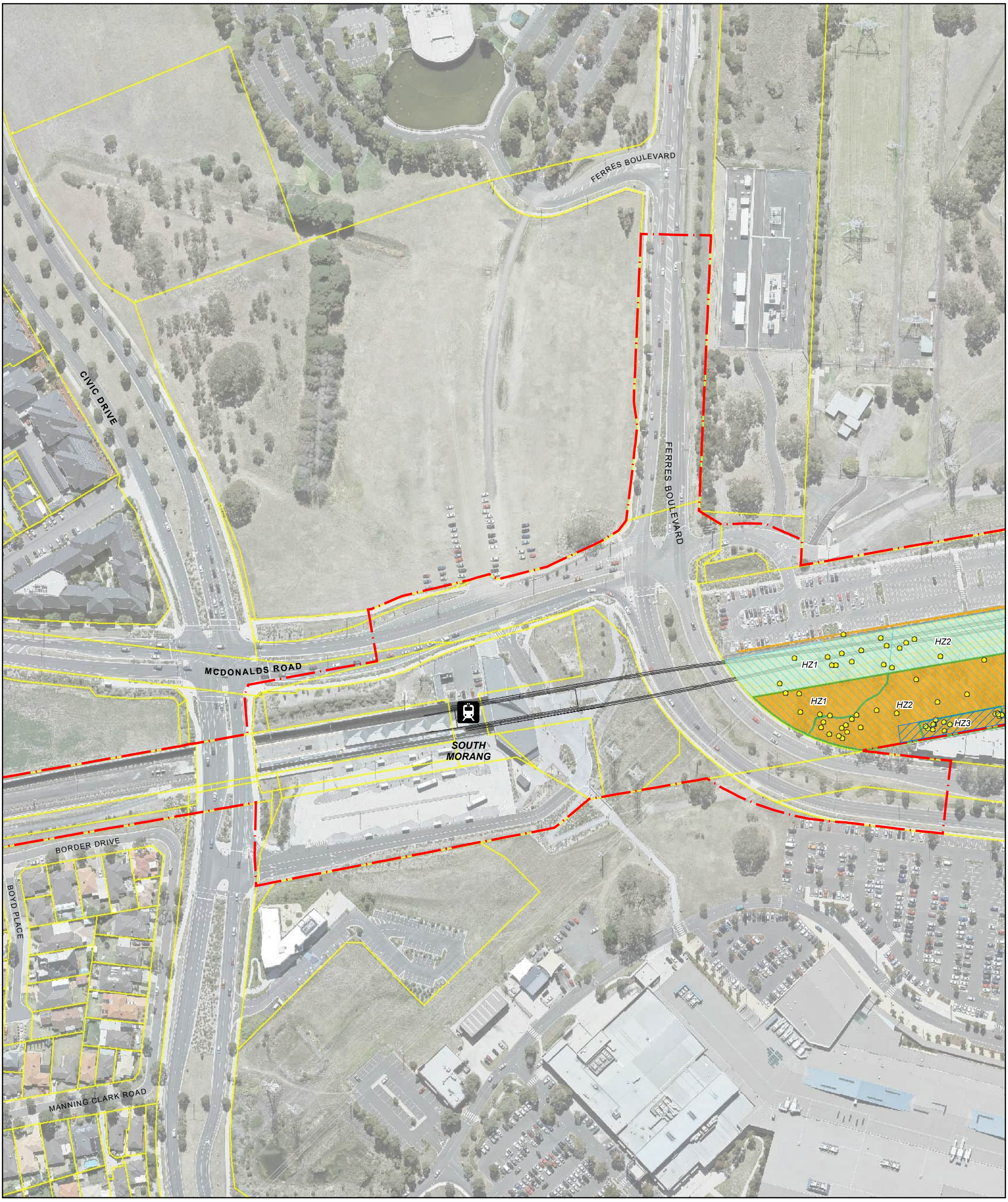
0 25 50 100 Metres

1:2,000 at A3

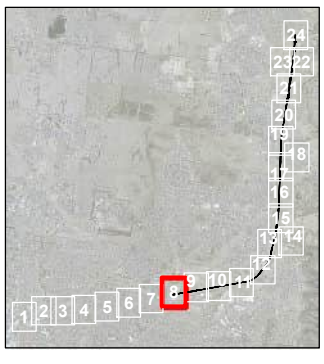
DATUM GDA 1994, PROJECTION MGA ZONE 55

DWG	LXRA-MNDA-00-R0-SP-SKT-0011
DRAWN	DUSTIN EDGE
CHECKED	CAMERON MILLER
REV	C
PROJECT	60428348
DATE	22 MAR 2016

Map Document: (P:\604X\60428348\4. Tech work area\4.99 GIS\02_Maps\20151029_LXRA_Maps\201603010_LXRA_A3P_Ecology_MapBooks_2K.mxd)



CLIENT	**LEVEL CROSSING REMOVAL AUTHORITY**
PROJECT	**MERNDA RAIL EXTENSION PROJECT**
TITLE	**ECOLOGY RESULTS**
SHEET	**8 of 24**



KEY

- Project Area
- Rail Line
- Earthworks
- Cadastre
- South Morang Extension Project (Receptor Site 4)
- Matted Flax-lily
- Grassy Eucalypt Woodland of the Victorian Volcanic Plain
- EVC 55, Plains Grassy Woodland
- Ecological No-Go Zones

0 25 50 100 Metres

1:2,000 at A3

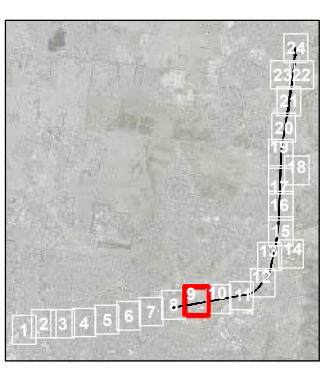
DATUM GDA 1994, PROJECTION MGA ZONE 55

DWG	LXRA-MNDA-00-R0-SP-SKT-0011
DRAWN	DUSTIN EDGE
CHECKED	CAMERON MILLER
REV	C
PROJECT	60428348
DATE	22 MAR 2016

Map Document: (P:\604X\60428348\4. Tech work area\4.99 GIS\02_Maps\20151029_LXRA_Maps\201603010_LXRA_A3P_Ecology_MapBooks_2K.mxd)

HZ2
HZ2
HZ3
HZ4
HZ5
HZ6
MCDONALDS ROAD

CLIENT	**LEVEL CROSSING REMOVAL AUTHORITY**
PROJECT	**MERNDA RAIL EXTENSION PROJECT**
TITLE	**ECOLOGY RESULTS**
SHEET	**9 of 24**



KEY

- Project Area
- Rail Line
- Earthworks
- Cadastre
- South Morang Extension Project (Receptor Site 4)
- Scattered Trees
- Matted Flax-lily
- Grassy Eucalypt Woodland of the Victorian Volcanic Plain
- EVC 55, Plains Grassy Woodland
- Ecological No-Go Zones

0 25 50 100 Metres

1:2,000 at A3

DATUM GDA 1994, PROJECTION MGA ZONE 55

DWG	LXRA-MNDA-00-R0-SP-SKT-0011
DRAWN	DUSTIN EDGE
CHECKED	CAMERON MILLER
REV	C
PROJECT	60428348
DATE	22 MAR 2016

Map Document: (P:\604X\60428348\4. Tech work area\4.99 GIS\02_Maps\20151029_LXRA_Maps\201603010_LXRA_A3P_Ecology_MapBooks_2K.mxd)

HZ6

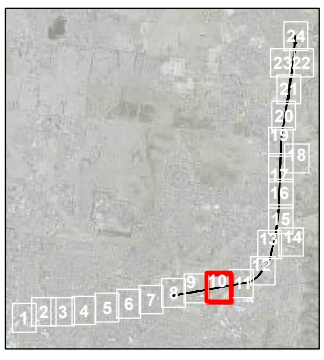
HZ7

TIM CLOSE

DANAHER DRIVE

MCDONALDS ROAD

CLIENT	**LEVEL CROSSING REMOVAL AUTHORITY**
PROJECT	**MERNDA RAIL EXTENSION PROJECT**
TITLE	**ECOLOGY RESULTS**
SHEET	**10 of 24**



KEY

- Project Area
- Rail Line
- Earthworks
- Cadastre
- Scattered Trees
- Matted Flax-lily
- EVC 55, Plains Grassy Woodland

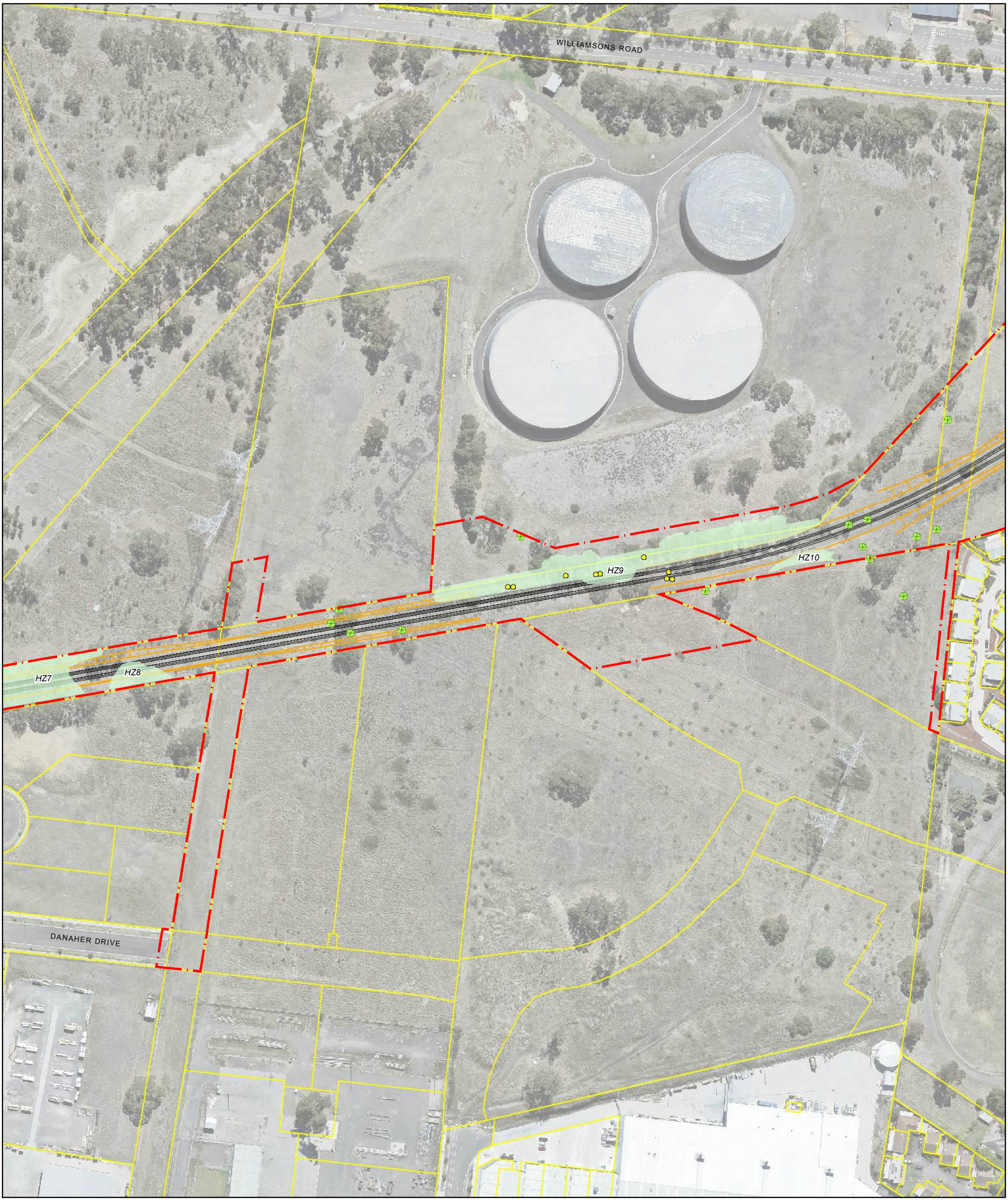
0 25 50 100 Metres

1:2,000 at A3

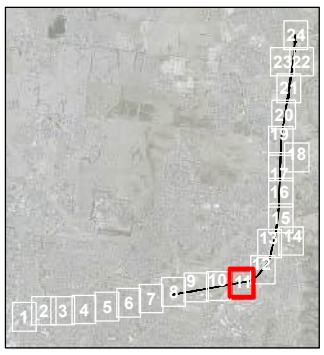
DATUM GDA 1994, PROJECTION MGA ZONE 55

DWG	LXRA-MNDA-00-R0-SP-SKT-0011
DRAWN	DUSTIN EDGE
CHECKED	CAMERON MILLER
REV	C
PROJECT	60428348
DATE	22 MAR 2016

Map Document: (P:\604X\60428348\4. Tech work area\4.99 GIS\02_Maps\20151029_LXRA_Maps\201603010_LXRA_A3P_Ecology_MapBooks_2K.mxd)



CLIENT	**LEVEL CROSSING REMOVAL AUTHORITY**
PROJECT	**MERNDA RAIL EXTENSION PROJECT**
TITLE	**ECOLOGY RESULTS**
SHEET	**11 of 24**



KEY

- Project Area
- Rail Line
- Earthworks
- Cadastre
- Scattered Trees
- Matted Flax-lily
- EVC 55, Plains Grassy Woodland

0 25 50 100 Metres

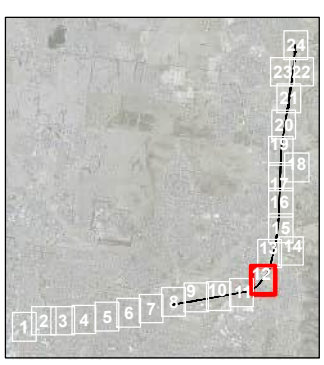
1:2,000 at A3

DATUM GDA 1994, PROJECTION MGA ZONE 55

DWG	LXRA-MNDA-00-R0-SP-SKT-0011
DRAWN	DUSTIN EDGE
CHECKED	CAMERON MILLER
REV	C
PROJECT	60428348
DATE	22 MAR 2016

Map Document: (P:\604X\60428348\4. Tech work area\4.99 GIS\02_Maps\20151029_LXRA_Maps\201603010_LXRA_A3P_Ecology_MapBooks_2K.mxd)

CLIENT	**LEVEL CROSSING REMOVAL AUTHORITY**
PROJECT	**MERNDA RAIL EXTENSION PROJECT**
TITLE	**ECOLOGY RESULTS**
SHEET	**12 of 24**



KEY

- Project Area
- Rail Line
- Earthworks
- Cadastre
- Scattered Trees
- Matted Flax-lily
- EVC 55, Plains Grassy Woodland

0 25 50 100 Metres

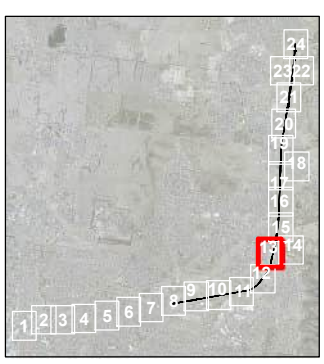
1:2,000 at A3

DATUM GDA 1994, PROJECTION MGA ZONE 55

DWG	LXRA-MNDA-00-R0-SP-SKT-0011
DRAWN	DUSTIN EDGE
CHECKED	CAMERON MILLER
REV	C
PROJECT	60428348
DATE	22 MAR 2016

Map Document: (P:\604X\60428348\4. Tech work area\4.99 GIS\02_Maps\20151029_LXRA_Maps\201603010_LXRA_A3P_Ecology_MapBooks_2K.mxd)

CLIENT	**LEVEL CROSSING REMOVAL AUTHORITY**
PROJECT	**MERNDA RAIL EXTENSION PROJECT**
TITLE	**ECOLOGY RESULTS**
SHEET	**13 of 24**



KEY

- Project Area
- Rail Line
- Earthworks
- Cadastre
- Scattered Trees
- Matted Flax-lily
- EVC 47, Valley Grassy Forest
- EVC 55, Plains Grassy Woodland

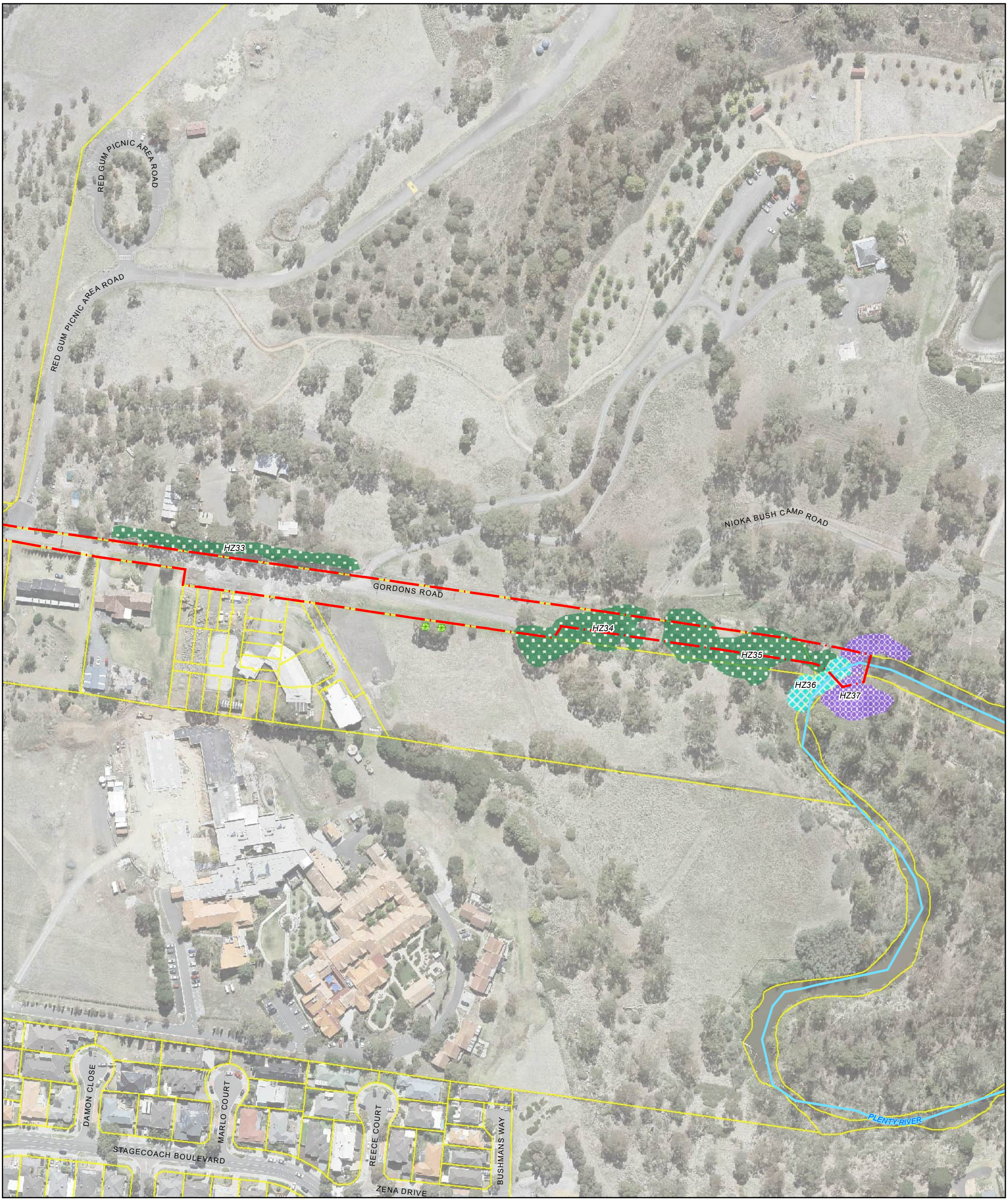
0 25 50 100 Metres

1:2,000 at A3

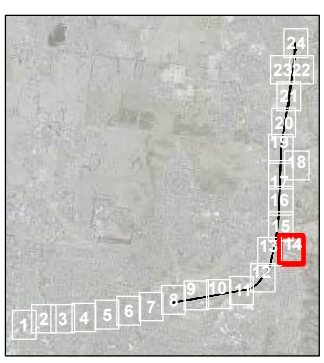
DATUM GDA 1994, PROJECTION MGA ZONE 55

DWG	LXRA-MNDA-00-R0-SP-SKT-0011
DRAWN	DUSTIN EDGE
CHECKED	CAMERON MILLER
REV	C
PROJECT	60428348
DATE	22 MAR 2016

Map Document: (P:\604X\60428348\4. Tech work area\4.99 GIS\02_Maps\20151029_LXRA_Maps\201603010_LXRA_A3P_Ecology_MapBooks_2K.mxd)



CLIENT	**LEVEL CROSSING REMOVAL AUTHORITY**
PROJECT	**MERNDA RAIL EXTENSION PROJECT**
TITLE	**ECOLOGY RESULTS**
SHEET	**14 of 24**



KEY

- Project Area
- Cadastre
- Scattered Trees
- EVC 47, Valley Grassy Forest
- EVC 53, Swamp Scrub
- EVC 641, Riparian Woodland

0 25 50 100 Metres

1:2,000 at A3

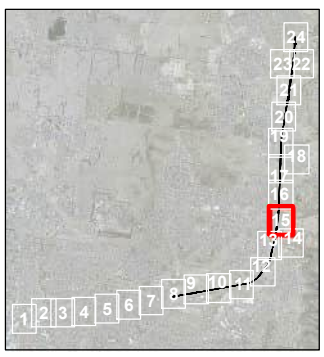
DATUM GDA 1994, PROJECTION MGA ZONE 55

DWG	LXRA-MNDA-00-R0-SP-SKT-0011
DRAWN	DUSTIN EDGE
CHECKED	CAMERON MILLER
REV	C
PROJECT	60428348
DATE	22 MAR 2016

Map Document: (P:\604X\60428348\4. Tech work area\4.99 GIS\02_Maps\20151029_LXRA_Maps\201603010_LXRA_A3P_Ecology_MapBooks_2K.mxd)

HZ20
HZ18
HZ19
HZ17
HZ16
HZ15
YELLOWBOX AVENUE
RED OAKS WAY
THE LAKES BOULEVARD
SANDPIPER WAY
WINGSPAN AVENUE
PLENTY ROAD
PLENTY ROAD
RED GUM PICNIC AREA ROAD

CLIENT	**LEVEL CROSSING REMOVAL AUTHORITY**
PROJECT	**MERNDA RAIL EXTENSION PROJECT**
TITLE	**ECOLOGY RESULTS**
SHEET	**15 of 24**



KEY

- Project Area
- Rail Line
- Earthworks
- Cadastre
- Scattered Trees
- Matted Flax-lily
- EVC 55, Plains Grassy Woodland
- 647, Plains Sedgy Wetland

0 25 50 100 Metres

1:2,000 at A3

DATUM GDA 1994, PROJECTION MGA ZONE 55

DWG	LXRA-MNDA-00-R0-SP-SKT-0011
DRAWN	DUSTIN EDGE
CHECKED	CAMERON MILLER
REV	C
PROJECT	60428348
DATE	22 MAR 2016

Map Document: (P:\604X\60428348\4. Tech work area\4.99 GIS\02_Maps\20151029_LXRA_Maps\201603010_LXRA_A3P_Ecology_MapBooks_2K.mxd)

BUTTRESS CRESCENT

HZ21

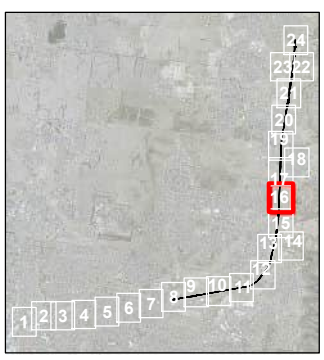
HZ20

PLENTY ROAD

YELLOWBOX AVENUE

HZ19

CLIENT	**LEVEL CROSSING REMOVAL AUTHORITY**
PROJECT	**MERNDA RAIL EXTENSION PROJECT**
TITLE	**ECOLOGY RESULTS**
SHEET	**16 of 24**



KEY

- Project Area
- Rail Line
- Earthworks
- Cadastre
- Scattered Trees
- Matted Flax-lily
- EVC 55, Plains Grassy Woodland
- 647, Plains Sedgy Wetland

0 25 50 100 Metres

1:2,000 at A3

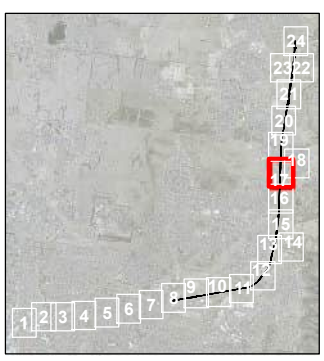
DATUM GDA 1994, PROJECTION MGA ZONE 55

DWG	LXRA-MNDA-00-R0-SP-SKT-0011
DRAWN	DUSTIN EDGE
CHECKED	CAMERON MILLER
REV	C
PROJECT	60428348
DATE	22 MAR 2016

Map Document: (P:\604X\60428348\4. Tech work area\4.99 GIS\02_Maps\20151029_LXRA_Maps\201603010_LXRA_A3P_Ecology_MapBooks_2K.mxd)

FERNCROFT DRIVE
TORBRECK AVENUE
MOUNT ECCLES WAY
HZ23
PLENTY ROAD
WILDERNESS PLACE
HEPBURN STREET
EILDON CIRCUIT
GRAMPIANS DRIVE
MCARTHURS ROAD
HAWKSTOWE PARADE
WILTON VALE ROAD
HZ22
ARROWGRASS STREET
NARDOO STREET
BUTTRESS CRESCENT
HZ21

CLIENT	**LEVEL CROSSING REMOVAL AUTHORITY**
PROJECT	**MERNDA RAIL EXTENSION PROJECT**
TITLE	**ECOLOGY RESULTS**
SHEET	**17 of 24**



KEY

- Project Area
- Rail Line
- Earthworks
- Cadastre
- Scattered Trees
- EVC 55, Plains Grassy Woodland
- 647, Plains Sedgy Wetland

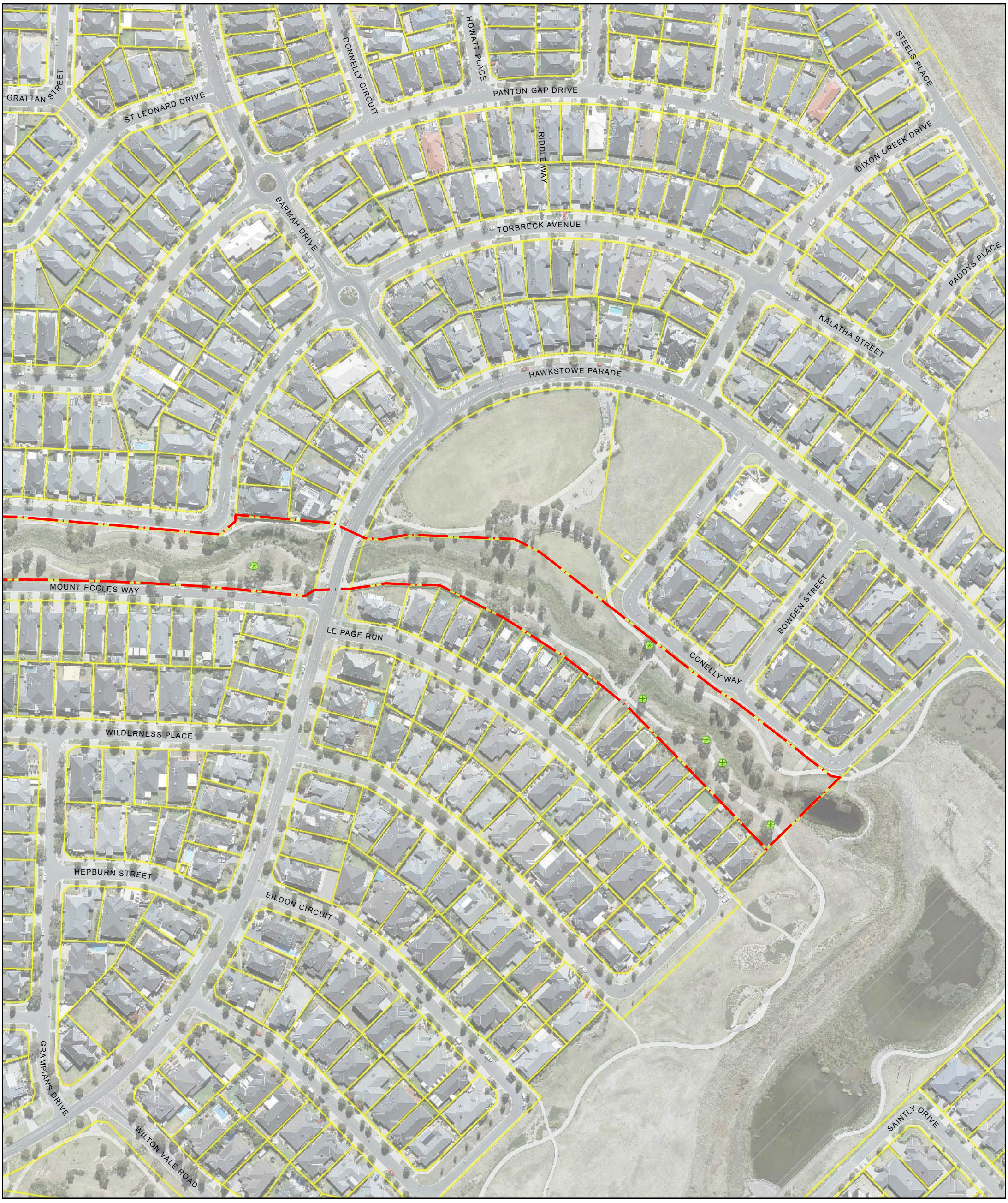
0 25 50 100 Metres

1:2,000 at A3

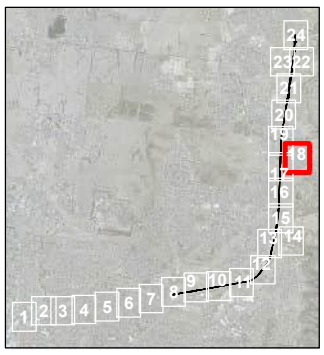
DATUM GDA 1994, PROJECTION MGA ZONE 55

DWG	LXRA-MNDA-00-R0-SP-SKT-0011
DRAWN	DUSTIN EDGE
CHECKED	CAMERON MILLER
REV	C
PROJECT	60428348
DATE	22 MAR 2016

Map Document: (P:\604X\60428348\4. Tech work area\4.99 GIS\02_Maps\20151029_LXRA_Maps\201603010_LXRA_A3P_Ecology_MapBooks_2K.mxd)



CLIENT	**LEVEL CROSSING REMOVAL AUTHORITY**
PROJECT	**MERNDA RAIL EXTENSION PROJECT**
TITLE	**ECOLOGY RESULTS**
SHEET	**18 of 24**



KEY

Project Area

Cadastre

Scattered Trees

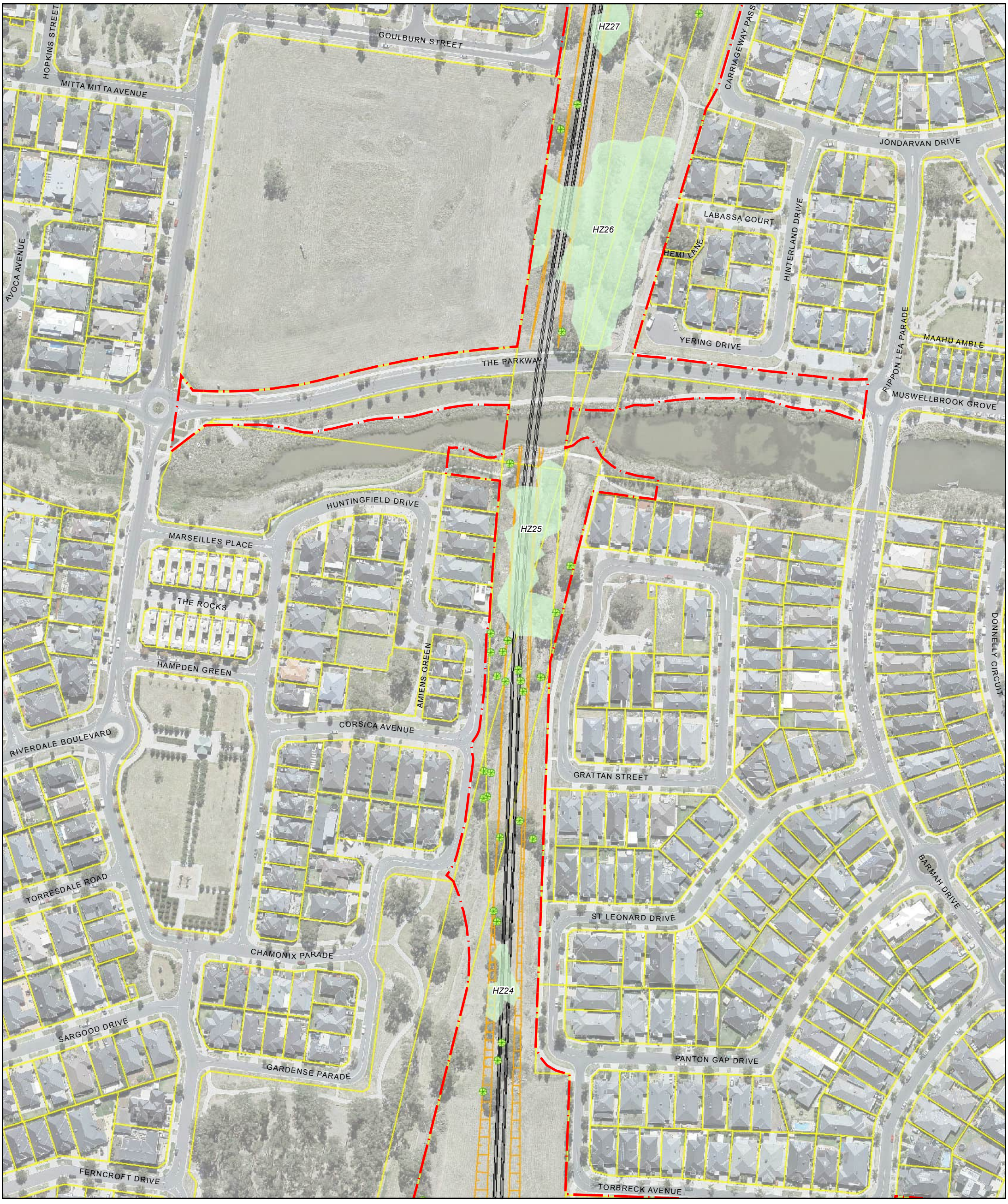
0 25 50 100 Metres

1:2,000 at A3

DATUM GDA 1994, PROJECTION MGA ZONE 55

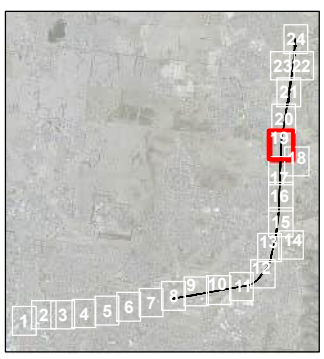
DWG	LXRA-MNDA-00-R0-SP-SKT-0011
DRAWN	DUSTIN EDGE
CHECKED	CAMERON MILLER
REV	C
PROJECT	60428348
DATE	22 MAR 2016

Map Document: (P:\604X\60428348\4. Tech work area\4.99 GIS\02_Maps\20151029_LXRA_Maps\201603010_LXRA_A3P_Ecology_MapBooks_2K.mxd)



CLIENT	**LEVEL CROSSING REMOVAL AUTHORITY**
PROJECT	**MERNDA RAIL EXTENSION PROJECT**
TITLE	**ECOLOGY RESULTS**
SHEET	**19 of 24**

GHD AECOM



KEY

- Project Area
- Rail Line
- Earthworks
- Cadastre
- Scattered Trees
- EVC 55, Plains Grassy Woodland

0 25 50 100 Metres

1:2,000 at A3

DATUM GDA 1994, PROJECTION MGA ZONE 55

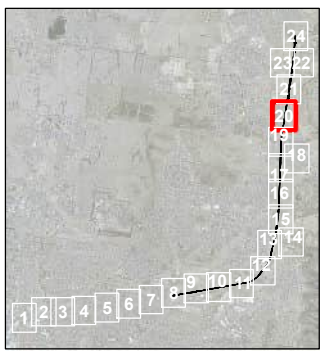
DWG	LXRA-MNDA-00-R0-SP-SKT-0011
DRAWN	DUSTIN EDGE
CHECKED	CAMERON MILLER
REV	C
PROJECT	60428348
DATE	22 MAR 2016

Map Document: (P:\604X\60428348\4. Tech work area\4.99 GIS\02_Maps\20151029_LXRA_Maps\201603010_LXRA_A3P_Ecology_MapBooks_2K.mxd)

MINTBUSH GRANGE
MANGO CRESCENT
TANGELO GROVE
GOULBURN STREET
RIVERDALE BOULEVARD
RIBERRY CRESCENT
APRICOT AVENUE
TYERS WAY
POWLETT STREET
LERDERDERG WALK
MACALISTER STREET
MORWELL WAY
CHATSWORTH AVENUE
COLIBAN DRIVE
BUNYIP WAY
LEIGH WAY
VILLEROY STREET
LANG LANG WAY
HZ29
CARRIAGEWAY PASS GINNINDERRY GRANGE
HATHFELDE BOULEVARD
MOE WAY
HZ28
BRINDABELLA GREEN
HZ27
MITTA MITTA AVENUE

CLIENT	**LEVEL CROSSING REMOVAL AUTHORITY**
PROJECT	**MERNDA RAIL EXTENSION PROJECT**
TITLE	**ECOLOGY RESULTS**
SHEET	**20 of 24**

GHD AECOM



KEY

- Project Area
- Rail Line
- Earthworks
- Cadastre
- Scattered Trees
- EVC 55, Plains Grassy Woodland

0 25 50 100 Metres

1:2,000 at A3

DATUM GDA 1994, PROJECTION MGA ZONE 55

DWG	LXRA-MNDA-00-R0-SP-SKT-0011
DRAWN	DUSTIN EDGE
CHECKED	CAMERON MILLER
REV	C
PROJECT	60428348
DATE	22 MAR 2016

Map Document: (P:\604X\60428348\4. Tech work area\4.99 GIS\02_Maps\20151029_LXRA_Maps\201603010_LXRA_A3P_Ecology_MapBooks_2K.mxd)

HZ30

PASSIONFRUIT CRESCENT

VILLAGE WALK

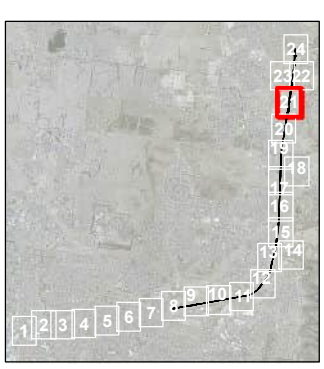
POMEGRANATE GROVE

RIVERDALE BOULEVARD

MANGO CRESCENT

PLENTY RIVER

CLIENT	**LEVEL CROSSING REMOVAL AUTHORITY**
PROJECT	**MERNDA RAIL EXTENSION PROJECT**
TITLE	**ECOLOGY RESULTS**
SHEET	**21 of 24**



KEY

- Project Area
- Rail Line
- Earthworks
- Cadastre
- Scattered Trees
- EVC 55, Plains Grassy Woodland

0 25 50 100 Metres

1:2,000 at A3

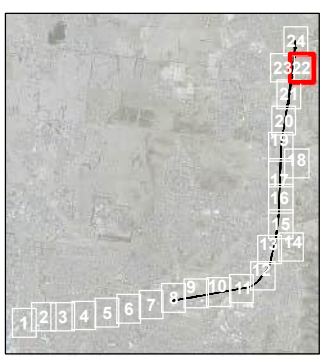
DATUM GDA 1994, PROJECTION MGA ZONE 55

DWG	LXRA-MNDA-00-R0-SP-SKT-0011
DRAWN	DUSTIN EDGE
CHECKED	CAMERON MILLER
REV	C
PROJECT	60428348
DATE	22 MAR 2016

Map Document: (P:\604X\60428348\4. Tech work area\4.99 GIS\02_Maps\20151029_LXRA_Maps\201603010_LXRA_A3P_Ecology_MapBooks_2K.mxd)

CLIENT	**LEVEL CROSSING REMOVAL AUTHORITY**
PROJECT	**MERNDA RAIL EXTENSION PROJECT**
TITLE	**ECOLOGY RESULTS**
SHEET	**22 of 24**

GHD AECOM



KEY

- Project Area
- Rail Line
- Earthworks
- Cadastre
- Scattered Trees
- EVC 83, Swampy Riparian Woodland
- EVC 191, Riparian Scrub

0 25 50 100 Metres

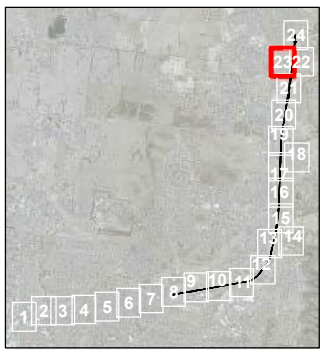
1:2,000 at A3

DATUM GDA 1994, PROJECTION MGA ZONE 55

DWG	LXRA-MNDA-00-R0-SP-SKT-0011
DRAWN	DUSTIN EDGE
CHECKED	CAMERON MILLER
REV	C
PROJECT	60428348
DATE	22 MAR 2016

Map Document: (P:\604X\60428348\4. Tech work area\4.99 GIS\02_Maps\20151029_LXRA_Maps\201603010_LXRA_A3P_Ecology_MapBooks_2K.mxd)

CLIENT	**LEVEL CROSSING REMOVAL AUTHORITY**
PROJECT	**MERNDA RAIL EXTENSION PROJECT**
TITLE	**ECOLOGY RESULTS**
SHEET	**23 of 24**



KEY

- Project Area
- Rail Line
- Earthworks
- Cadastre
- Scattered Trees

0 25 50 100 Metres

1:2,000 at A3

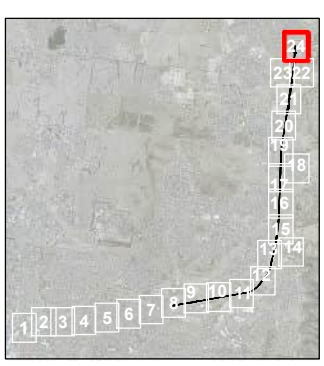
DATUM GDA 1994, PROJECTION MGA ZONE 55

DWG	LXRA-MNDA-00-R0-SP-SKT-0011
DRAWN	DUSTIN EDGE
CHECKED	CAMERON MILLER
REV	C
PROJECT	60428348
DATE	22 MAR 2016

Map Document: (P:\604X\60428348\4. Tech work area\4.99 GIS\02_Maps\20151029_LXRA_Maps\201603010_LXRA_A3P_Ecology_MapBooks_2K.mxd)

GREIG DRIVE
BEALE STREET
PERRY STREET
JOHNSONS ROAD
MERNDA VILLAGE DRIVE
SCHOTTERS ROAD
HAYES ROAD
JANE COURT
STATION ROAD
PLENTY ROAD

CLIENT	**LEVEL CROSSING REMOVAL AUTHORITY**
PROJECT	**MERNDA RAIL EXTENSION PROJECT**
TITLE	**ECOLOGY RESULTS**
SHEET	**24 of 24**



KEY

- Project Area
- Rail Line
- Earthworks
- Cadastre

0 25 50 100 Metres

1:2,000 at A3

DATUM GDA 1994, PROJECTION MGA ZONE 55

DWG	LXRA-MNDA-00-R0-SP-SKT-0011
DRAWN	DUSTIN EDGE
CHECKED	CAMERON MILLER
REV	C
PROJECT	60428348
DATE	22 MAR 2016

Map Document: (P:\604X\60428348\4. Tech work area\4.99 GIS\02_Maps\20151029_LXRA_Maps\201603010_LXRA_A3P_Ecology_MapBooks_2K.mxd)

Appendix B – Recipient Site Selection

Prior to translocation, DELWP must approve the selected recipient sites and this translocation plan. The following section provides detail on how the chosen recipient sites were selected including the assessment criteria provided in Table B1.

Selection of a recipient site

Information required to guide the selection of an appropriate recipient site includes an understanding of the presence, historical or otherwise, of Matted Flax-lily at that site. A site that has remained undisturbed following recent extinction of the species or where the species is present in low numbers in otherwise suitable habitat and that is not currently protected through relevant planning controls is considered to be the best option. Securing such an area for active ecological management in perpetuity would provide a strong ecological benefit for the species. Whilst the presence of an existing, large and self-sustaining population at a potential recipient site may indicate that the habitat would be suitable for translocated plants, there is a risk that the addition of more plants to the site may adversely affect the current population and this is to be avoided. However, translocation into sites with existing self-sustaining populations and/or which are already under active conservation management can be undertaken in circumstances that would provide a benefit to both the species and the community or ecosystem at the site. This can only occur if no other preferential sites are available.

Identification of potential recipient sites

Multiple criteria must be considered when identifying potential recipient sites for the Matted Flax-lilies to be translocated in to for the Project. Selection factors for consideration are documented in Figure B1, overleaf.

Potential recipient sites

Consultation with the regulators was undertaken by AECOM in order to understand the extent and condition of the Matted Flax-lilies at the clearance site as well as to propose potential translocation receptor sites. This involved undertaking a site inspection with Alan Webster – Program Manager, Biodiversity – Land Use Planning at DELWP and Ian Clarke – Senior Planning Engineer at LXRA on 8 March 2016.

Following consultation with regulators and various land managers including Parks Victoria and the CoW, the list of sites identified below were proposed as potential recipient sites. Some of the listed sites are currently protected or are proposed for protection and several of them have existing populations of native or translocated Matted Flax-lilies. As such consultation sought the agreement of respective land managers for each site to be used as receptor sites.

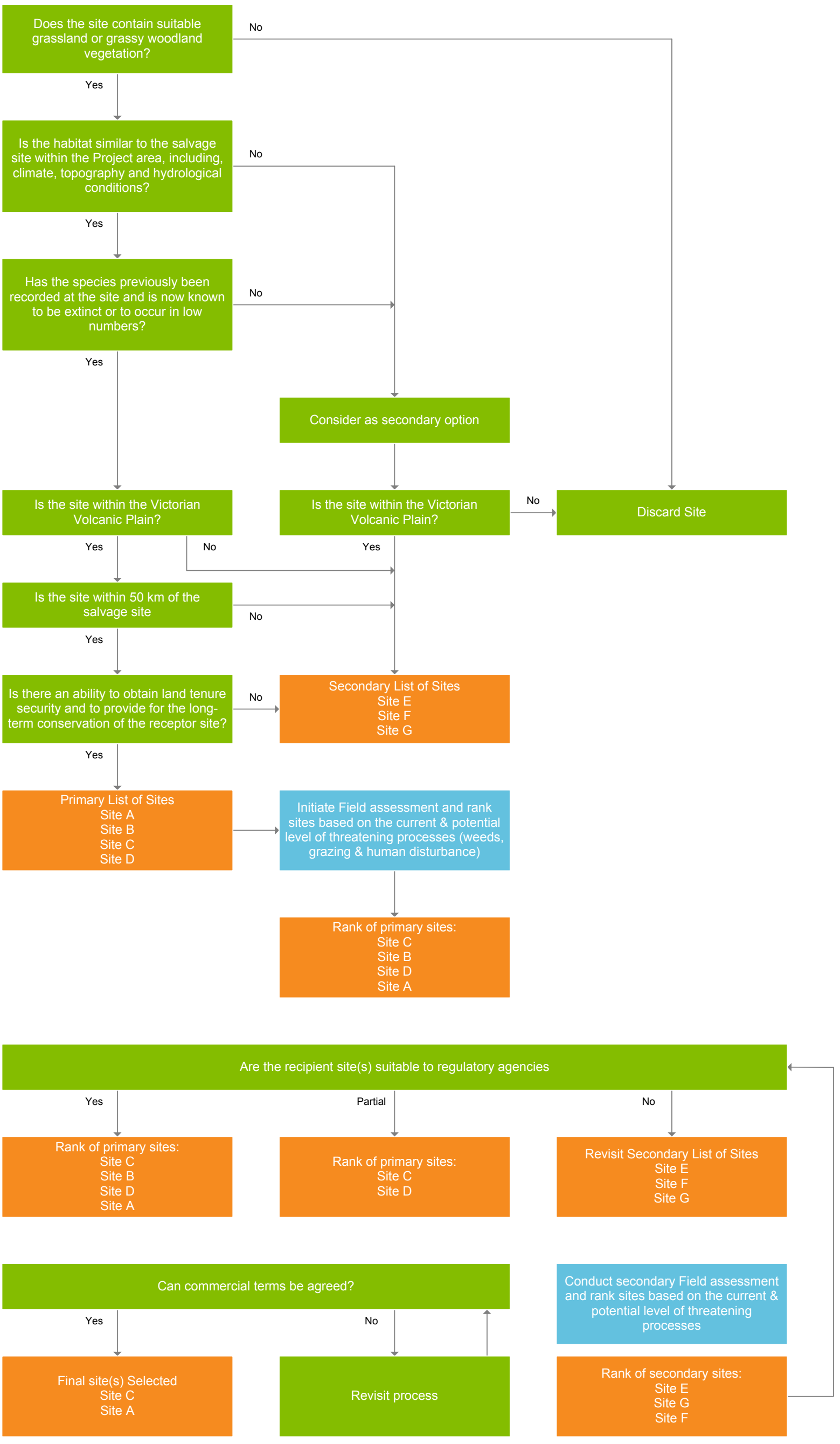


Figure B1 Decision tree to select a recipient site

Potential recipient sites identified include:

- **Quarry Hills Park (Quarry Hills),** including Quarry Hills Bushland Park, Foothills Park and Granite Hills Reserve
- **Mernda Villages Conservation Reserve**
- **185 Bridge Inn Road, Mernda**
- **McDonalds Road Offset Site**, South Morang (used previously as a Matted Flax-lily recipient and offset site for the South Morang Rail Extension Project)[3]
- **Plenty Gorge Parklands, Mernda**
- **1775 Donnybrook Road, Woodstock.**

Following stakeholder consultation, each site was assessed against selection criteria listed in to objectively assess suitable recipient sites. Specific details on each of the potential recipient sites are provided below.

Recipient site ranking and selection

An initial site ranking of the proposed recipient sites was completed, based on the decision tree presented in Figure B1. The outcome of this assessment is presented in Table B1 and is summarised as:

- **Rank A** – Plenty Gorge Parkland – Site 3
- **Rank A** – Quarry Hills Park
- **Rank B** – Mernda Villages and 1775 Donnybrook Road, Woodstock
- **Rank C** – McDonalds Road Offset Site
- **Rank D** – 185 Bridge Inn Road.

Based on this ranking LXRA have selected Plenty Gorge Parkland (Site 3) and Quarry Hills Park as preferred Matted Flax-lily translocation recipient sites.

[3] Subject to availability of sufficient additional capacity - 57 plants currently in potential receptor area. Over-crowding has the potential to negatively impact existing plants.

Table B1 Recipient site ranking

Question / Assessment	Flow Chart Question	Site assessment					
		Quarry Hills Zone 3	Mernda Villages CR	185 Bridge Inn Rd	Plenty Gorge Park – Site 3	McDonalds Road (existing Offset Site)	1775 Donnybrook Road, Woodstock
1	Does the site contain suitable grassland or grassy Eucalypt woodland?	Yes	Yes	Yes	Yes	Yes	Yes
2	Is the habitat similar to the salvage site including climate, topography and hydrology?	Yes	Yes	Yes	Yes	Yes	Yes
3	Has the species previously been recorded at the site and is it now known to be extinct or to occur in low numbers?	Yes (natural & translocated)	Yes (translocated)	No	Yes (translocated)	Yes (natural & translocated)	Yes (natural)
Hold-point		continue	continue	consider as secondary option	continue	continue	continue
4	Is the site within the Victorian Volcanic Plain?	Yes	Yes	Yes	Yes	Yes	Yes
5	Is the site within 50 km of the salvage site	Yes	Yes	Yes	Yes	Yes	Yes
Hold-point		consider as primary option	consider as primary option	consider as secondary option	consider as primary option	consider as primary option	consider as primary option
Field Assessment 1	Initial Ranks of Sites	Rank A	Rank B	Rank D	Rank A	Rank C	Rank B
6	Are the recipient site(s) acceptable to regulatory agencies?	Yes	to be determined	to be determined	Yes	Potential – Consider as secondary option	to be determined
7	Can commercial terms be agreed?	Yes	to be determined	to be determined	Yes	to be determined	to be determined
Field Assessment 2	Assess local conditions and ability to achieve desired management outcomes	complete	-	-	complete	-	-
Final site ranking		**Rank A**	**Rank B**	**Rank D**	**Rank A**	**Rank C**	**Rank B**

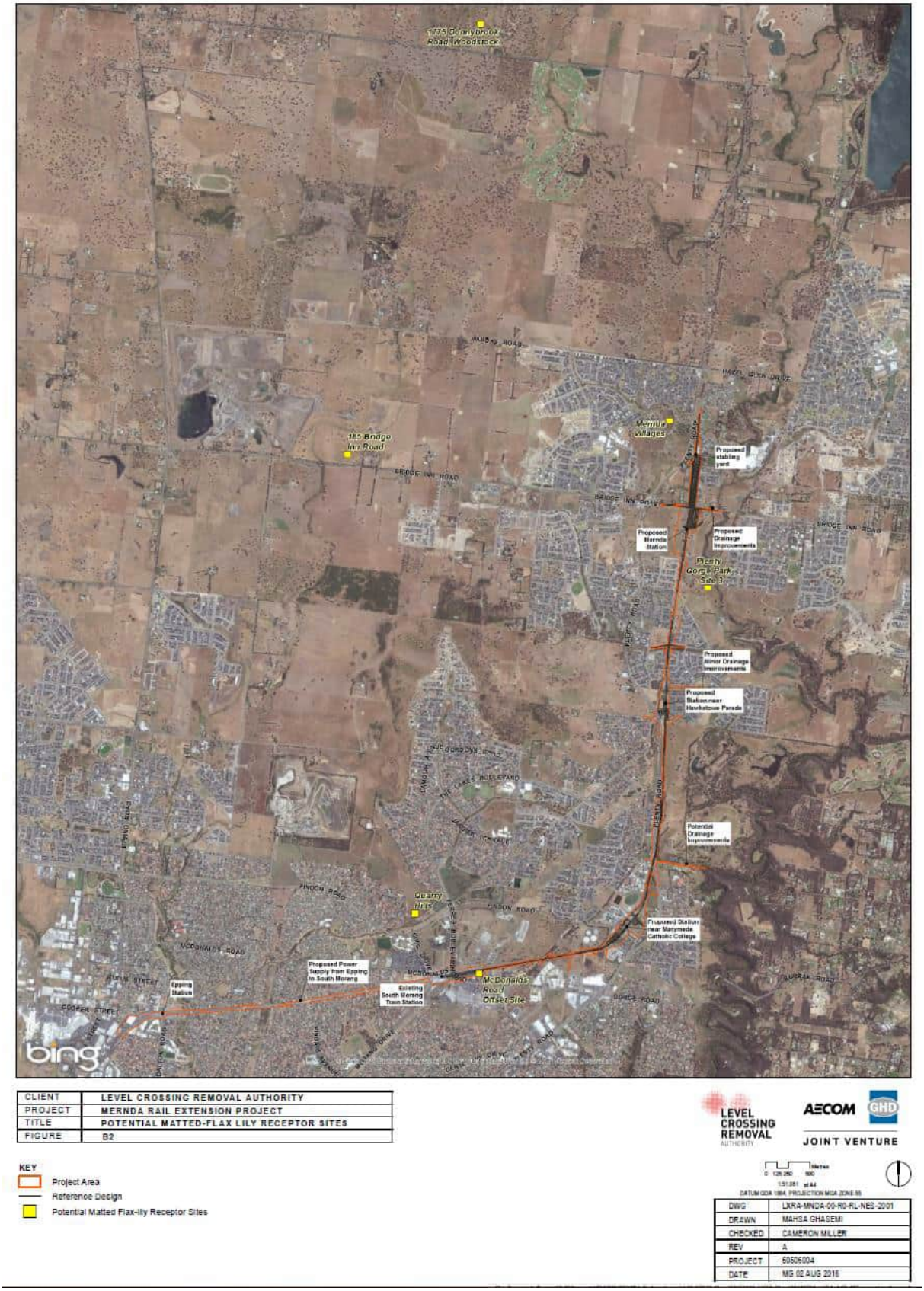


Figure B2. Potential Matted Flax-lily recipient sites

Quarry Hills Park

Site background

Quarry Hills Park (Quarry Hills) is approximately 220 ha of council owner land that includes Quarry Hills Bushland Park, Foothills Park and Granite Hills Reserve. The site spans from low relief plains across the southern end, rising to a low hill in the south west. The site crosses two bioregions, including the Victorian Volcanic plain (south) and the Central Victorian Uplands (north).

The site supports extensive remnant patches in the form of open woodlands, grassy forests and open spaces with scattered trees and exotic pastures. The whole site is depicted in Figure B3.

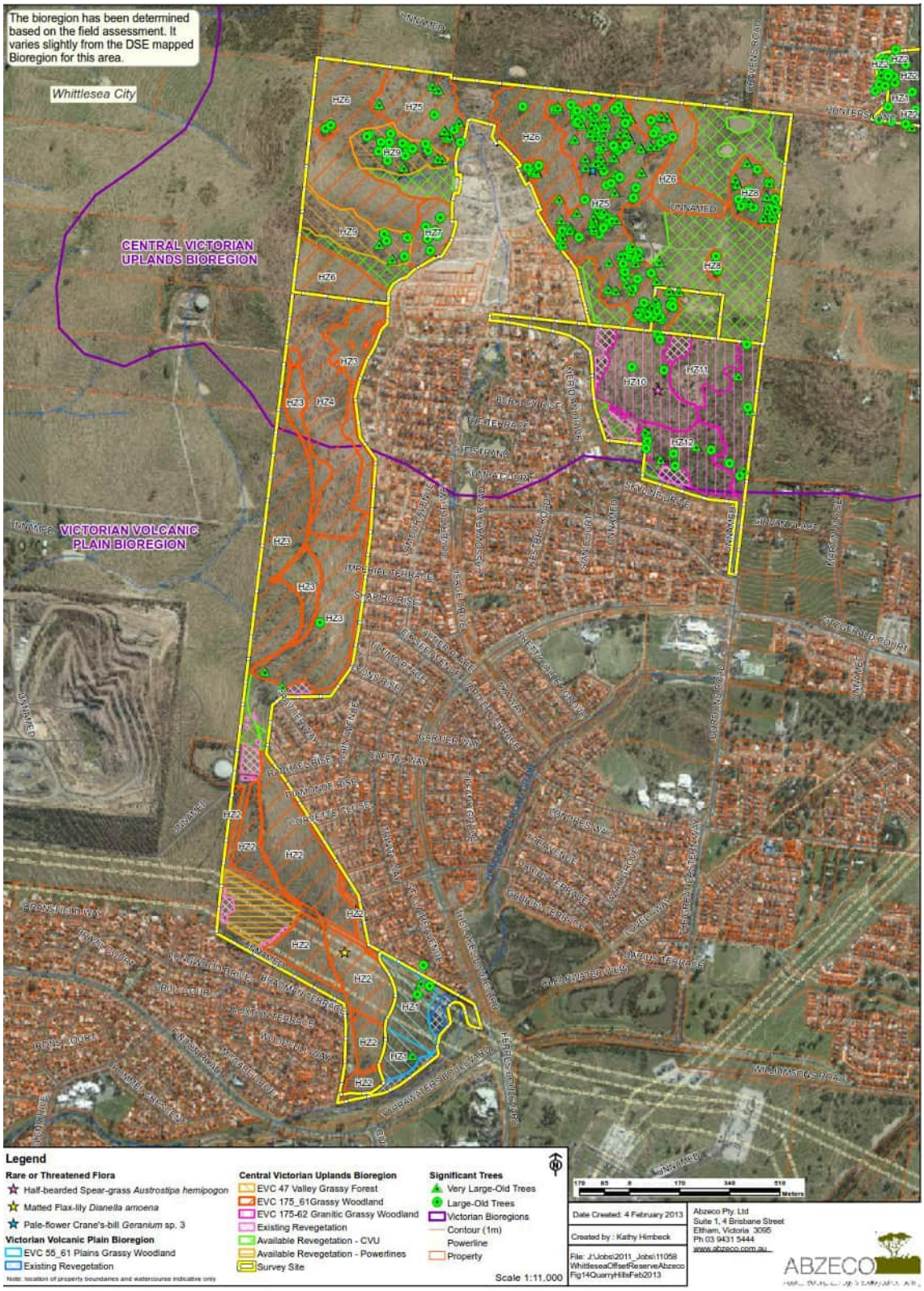


Figure B3 Quarry Hills Park Vegetation Communities *(Source ABZECO – supplied by City of Whittlesea)*

Within Quarry Hills, a potential Matted Flax-lily recipient site exists at the southern end of the park. This site occurs north of the Lakes Boulevard and contains habitat zones HZ1 and HZ2 as depicted in Figure B3.

Further information on this area within the Park is provided in Figure B4.

Figure B4 Quarry Hill Matted Flax-lily recipient site

Red dots to the north of the image represent a translocated population whilst the single red dot in the lower middle is a naturally occurring specimen)

Vegetation Description

HZ1 is representative of EVC 55_61: Plains Grassy Woodland and spans approximately 5 hectares (refer Figure B3). It occurs on basalt-derived heavy clay soils and contains some areas of revegetation using woody native species. Whilst many exotic species occur in the understory, several indigenous species also occur including, common tussock grass, Velvet Tussock grass (*Poa morrisii)*, Weeping grass, Kangaroo grass and some indigenous herbs and sedges such as Chocolate Lily, Kidney weed and Australian Sheep's burr. Whilst it has some degradation, a study commissioned by the City of Whittlesea determined the habitat quality to be 41 (out of 100) using the habitat hectares assessment methods.

HZ2 is representative of Grassy Woodland, characterised by Manna Gum (*E. viminalis),* Yellow Box (*E. melliodora*), Drooping Sheoak (*Allocasuarina stricta)* and Lightwood (*Acacia implexa).* Scattered Blackwood (*A. mearnsii*) and Cherry Ballart (*Exocarpus cupressiformis*) are other understorey trees/large shrubs characterising the zone. HZ2 received a habitat quality score of 52 (out of 100) using the habitat hectares' assessment methods.

Remnant Matted Flax-lily was observed from several plants within this zone (refer to red dots in Figure B4). In addition, a portion of the site has been used as a Matted Flax-lily translocation site.

Figure B5 Remnant vegetation within the Quarry Hills recipient site

Figure B6 Image of a naturally occurring Matted Flax-lily within Quarry Hills

Goals and objectives of the existing Offset Management Plan

To maintain existing attributes

- Retain all large tress (dead or alive)
- Retain all (non-large) canopy trees (dead or alive)
- Exclude stock and ensure that weed cover does not increase beyond current levels
- Retain fallen branches and litter
- Retain all logs

To achieve improvement

- Retain all (non-large) canopy trees (dead or alive)
- Control high threats (rabbit, other pest herbivores high threat weeds, inappropriate fire regime, inappropriate flooding and other threats such as inappropriate slashing
- Eliminate high threat woody environmental weeds (<1% cover) and ensure that the cover of other high threat weeds does not increase beyond current levels
- Control all on site grazing threats (stock, rabbits)
- Supplementary planting or encourage recruitment of canopy trees.

Mernda Villages Conservation Reserve

Site background

Mernda Villages is a 4.5 ha Conservation Reserve, managed to contribute to the Net Gain offsets required for the Mernda Villages development. Handover to Whittlesea Council was on 31st May 2011. The site is shown in Figure B7.

Vegetation Description

Mernda Villages supports scattered mature River Red Gum over a predominantly introduced understorey. The high density of the 24 large and very large River Red Gums is the key feature of the conservation reserve. The understorey is mainly exotic, but there are some scattered native grasses along its eastern edge, amongst the embedded rock adjacent to the existing creek. Species include Kangaroo Grass, Wallaby Grass (*Rytidosperma* spp.) and Weeping Grass. It is possible that additional indigenous species may have dormant seed which may germinate under the new management plan.

Goals and objectives of the existing Offset Management Plan

The Reserve is currently being to be managed to:

- Maintain health of existing trees and facilitate recruitment of new trees
- Retain and re-establish indigenous grass cover along the Eastern boundary
- Improve the quality of the understory.

The key management issues to improve the condition of indigenous vegetation within the reserves are:

- Fencing
- Tree protection
- Retention of logs and organic litter
- Recruitment and enrichment planting
- Rehabilitation of temporary access tracks
- Herbaceous and grassy weed control
- Woody weed removal
- Biomass control
- Pest control
- Access
- Signage
- Fire safety management
- Long term protection.

Figure B7 Mernda Villages Conservation Reserve (source City of Whittlesea)

Translocation and supplementary Planting

Matted Flax-lily is present on site and found in three zones. Zone 2 (MV02) and Zone 4 (MV04) have one plant in each. Zone 5 (MV05) has three recorded plants that have been planted there by the City of Whittlesea Bushland Team.

The Bushland Team has undertaken revegetation within the broader indigenous grassy regeneration zone including plantings near the creek and revegetation undertaken within the reserve including community planting days. There has also been substantial wildflower and grass planting throughout the reserve. Figure B8 shows one of the many old River Red Gums within the reserve and the abundance of rock present which provides habitat for a range of fauna. Figure B9 is an image of one patch of translocated Matted Flax-lily within the reserve.

Figure B8 General woodland habitat within the Mernda Villages Site.

Figure B9 Translocated Matted Flax-lily within the Mernda Villages Site.

185 Bridge Inn Road, Mernda

Site background

185 Bridge Inn Road, Mernda is approximately 21 ha of council owned land (City of Whittlesea). The site can be characterised as containing open pasture and weeds and some limited, degraded remnant vegetation including large scattered trees.

Vegetation Description

Bridge Inn Road falls on the boundary of two bioregions, the Victorian Volcanic Plain and the Central Victorian Uplands. The west of the site is degraded and supports one River Red Gum and one Yellow Box. The understorey is characterised by a mixture of exotic pasture grasses including Sweet Vernal Grass, Toowoomba Canary grass, Cocksfoot and Chilean Needle Grass. The original vegetation of this area is considered to be EVC 175_61: Grassy Woodland. Vegetation attributes to the east of the Site are in a better condition and consists of large old River Red Gums and regeneration. Remnant vegetation is mapped as EVC 55_61: Plains Grassy Woodland (refer to Figure B10). The habitat quality was assessed by ABZECO as 22 (out of 100), largely driven by the presence of very large and large old trees which are actively recruiting (refer to Figure B11 and Figure B12).

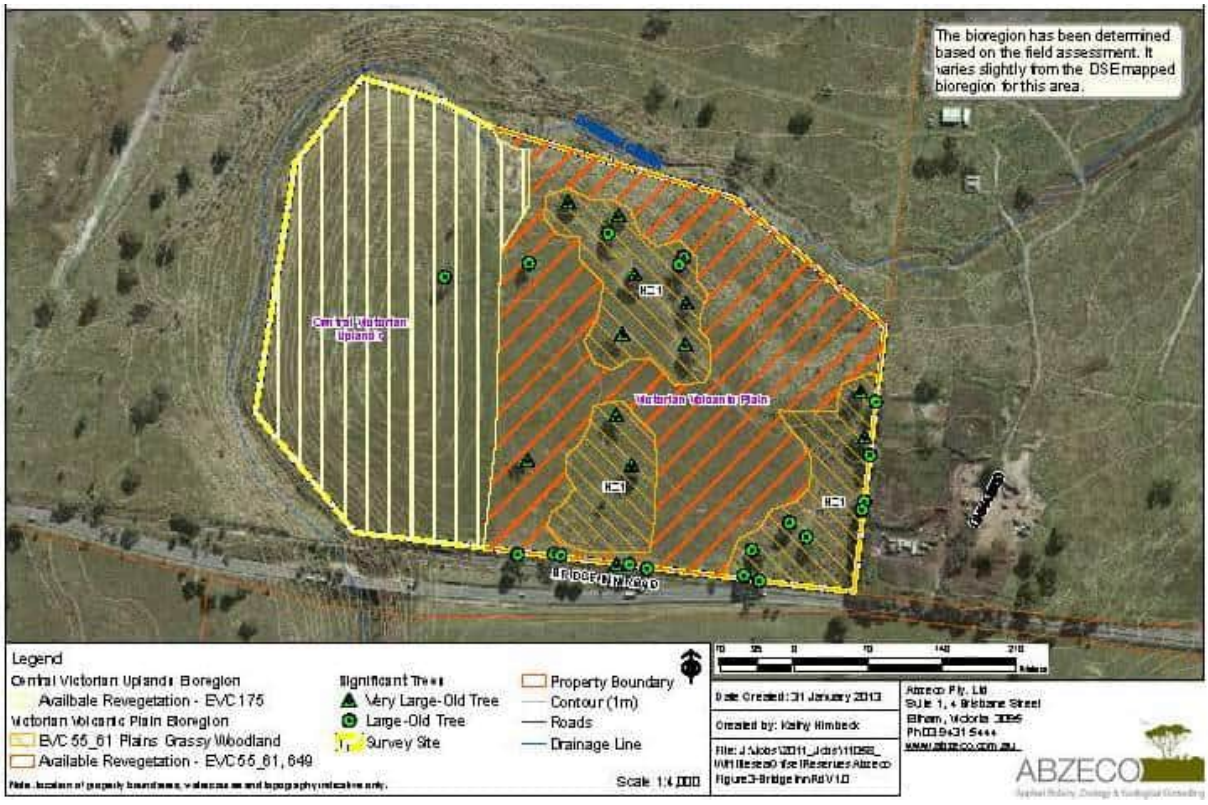


Figure B10 Detailed site analysis, 185 Bridge Inn Road, Mernda *(Source: City of Whittlesea)*

The site has been recognised as a potential offset and/or translocation site but would require management to improve the site condition.

Figure B11 General woodland habitat within the 185 Bridge Inn Road

Figure B12 Woodland regeneration within 185 Bridge Inn Road

Goals and objectives of the potential Offset Management Plan

To maintain existing attributes

- Retain all (non-large) canopy trees (dead or alive)
- Exclude stock and ensure that weed cover does not increase beyond current levels
- Retain fallen branches and litter
- Retain all logs.

To achieve improvement

- Retain all (non-large) canopy trees (dead or alive)
- Control high threats (rabbit, other pest herbivores high threat weeds, inappropriate fire regime, inappropriate flooding and other threats such as inappropriate slashing
- Eliminate high threat woody environmental weeds (<1% cover) and ensure that the cover of other high threat weeds does not increase beyond current levels
- Control all on site grazing threats (stock, rabbits)
- Supplementary planting or encourage recruitment of canopy trees.

McDonalds Road Offset Site

Both the baseline ecology report produced by AECOM/ GHD (AECOM 2016a) and this translocation plan provide details around the size, attributes and quality of vegetation within the McDonalds Road Offset site. Further information in relation to the management of the McDonalds Road Offset site is provided below.

The Site is currently managed for two Commonwealth MNES; Grassy Eucalypt Woodland of the Victorian Volcanic Plain (GEWVVP) and Matted Flax-Lily as detailed in the current management plan – South Morang Grassy Eucalypt Woodland Management Plan (SMREP, 2012). This plan has the dual purposes of:

- Specific management actions for translocated Matted Flax-lily within the designated recipient area (receptor site 4). These actions are detailed in a separate translocation plan for the South Morang Rail Extension Project (SMREP).
- Overall management actions for the conservation of GEWVVP and existing Matted Flax-lily within the site.

Specific management actions include:

1. Fencing to exclude the public, grazing and pest animals
2. Litter removal
3. Herbaceous and grassy weed control
4. Woody weed control
5. Biomass control including fuel reduction burning and weed control
6. Pest animal control
7. Supplementary planting.

The plan also identifies the management arrangements and monitoring and reporting requirements.

Plenty Gorge Parklands

The Translocation Plan for Matted Flax-lily developed by SMREP identified four sites for translocation (SMREP 2014). These included:

- **Receptor Site 1** – Plenty Gorge Park, Mill Park
- **Receptor Site 2** – Plenty Gorge Park, Doreen
- **Receptor Site 3** – Plenty Gorge Park, Mernda
- **Receptor Site 4** – McDonalds Road Offset Site

Site background

Receptor Site 3 is being considered as an additional recipient site for the current translocation as the site has capacity to take additional plants and has an existing management regime identified to ensure the persistence of Matted Flax-lily within the site.

Receptor Site 3 is located on the west side of the Plenty River. The site is accessed through a residential development from Plenty Road. The northern extent of the site is parallel to a drainage line and a dam. The site extends south along the Plenty River, rising up an escarpment to a flat area above the river. The south end of the site runs from the escarpment heading west through a flat grassy area, around a stony rise, then heads north through a stand of River Red Gums.

Although the site condition was considered degraded, the site was chosen as a recipient site due to its values of containing some native grassland and grassy woodland, ease of access to the site and location within a secure land tenure managed by Parks Victoria. The use of this site was considered suitable provided that sufficient site preparation was undertaken. The translocation into this site is considered to be a re-introduction or compensatory introduction (Vallee *et al.* 2004) as the species is likely to have once been present at the site**.**

Vegetation description

Prior to translocation the vegetation at the site was present as degraded grassland and degraded grassy woodland, which contained a predominantly exotic understorey, with patches of Kangaroo grass throughout. Surrounding this area, the vegetation was dominated by Chilean Needle-grass (*Nassella neesiana)*. Based on remnant vegetation this area is likely to have been previously suitable habitat for the species and is likely to have been present, as nearby records are present within the park.

The existing translocation site is now fenced (refer Figure B15) and contains very high quality grassland and grassy woodland (Figure B13). The existing population is doing very well and plants have vigorous growth (refer Figure B14). Whilst weeds remain an issue within sections of the site, the site is dominated by indigenous species including kangaroo grass, tussock grass, Matted Flax-lily, other lilies and indigenous herbs such as pelargoniums. If selected, it is likely that the translocation site would be extended to the west of the existing fence as shown in Figure B16.

Figure B13 General woodland habitat with health understory in Plenty Gorge Park – Site 3

Figure B14 Healthy Matted Flax-lily in Plenty Gorge Park – Site 3

Figure B15 Existing exclusion fencing around Plenty Gorge Park – Site 3

Figure B16 Potential extension area of Plenty Gorge Park – Site 3

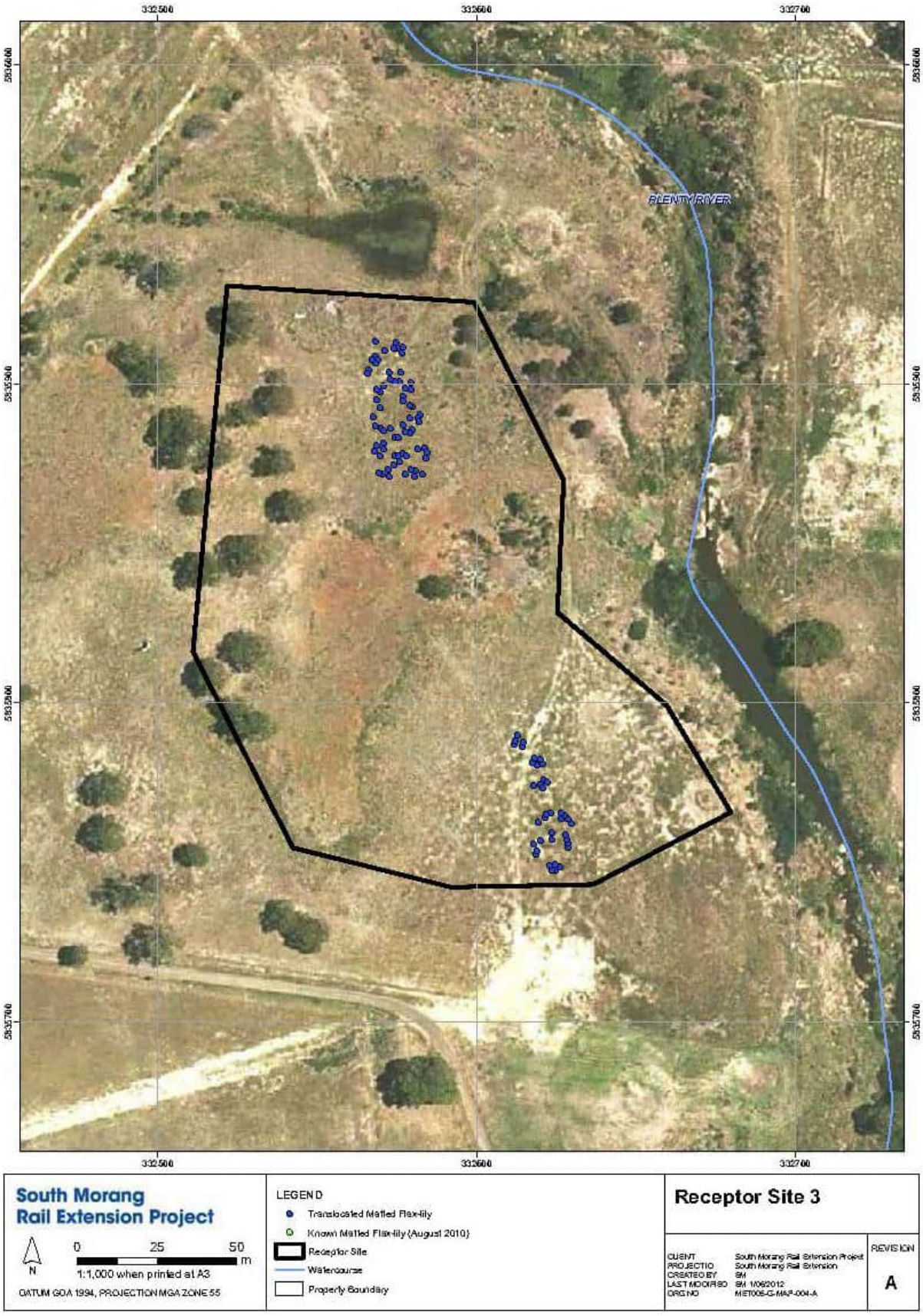


Figure B17 Plenty Gorge Parklands – Site 3

Management actions identified in the Translocation Management Plan for Plenty Gorge Parklands – Site 3

Prior to translocation

- Removing the biomass of Chilean needle-grass and other species, through a controlled burn
- Post-burn weed spraying
- Collection of Themeda seed medium, either hay, thatch or seed chaff (florets only) in summer
- Follow-up controlled burn to reduce weed biomass just prior to seed spread
- Post-burn weed spraying
- Scarifying of topsoil to create suitable seedbed, which is critical for Themeda seed germination
- Spreading of Themeda seed medium in May or June, immediately after soil scarification
- Removal of Themeda thatch using a controlled burn
- Planting out gaps with Spear-grasses (*Austrostipa* spp.) in high densities
- Follow-up targeted weed control in following season.

Post Translocation – ongoing maintenance

- Burn undertaken in March 2012
- Weeds within the site sprayed
- Site perimeter fence erected in May 2012 and maintained
- Rabbit control program began in May 2012
- Spreading Kangaroo grass and Red-leg grass (*Bothriochloa macra)* seed
- Revegetation using Spear-grass and Common Tussock-grass tubestock in May 2013.

1775 Donnybrook Road, Woodstock

Site background

The Donnybrook Road, Woodstock site is located within the Victorian Volcanic Plain bioregion and is made up of Newer Volcanic stony rise outcrops interspersed with low lying areas and swamps. Figure B20 provides an overview of this site and the extent of habitat zones are presented in Figure B21.

The site is currently managed by the City of Whittlesea whom is actively working to reduce high threat woody and herbaceous weeds including Serrated Tussock (*N.trichotoma*). Other management activities that have occurred include burning to encourage grassy woodland regeneration and kangaroo exclusion fencing which has demonstrated positive results.

Vegetation description

The Donnybrook Road site contains a mosaic of grassland, woodland and wetland Ecological Vegetation Classes (EVC's) characteristic of a volcanic stony rise landform. These include Plains Grassland (EVC 132), Creekline Tussock Grassland (EVC 654), Plains Grassy Woodland (EVC 55), Plains Swampy Woodland (EVC 651) and Stony Knoll Shrubland (EVC 649).

The Woodland EVC's are dominated by River Red Gum along with sporadic occurrences of Yarra Gum (*Eucalyptus yarraensis*) listed on the Victorian *FFG Act 1988* Advisory List of rare or threatened plants in Victoria. It is estimated that ~4-5 large trees (>70cm dbh) per hectare are present and recruitment of River Red Gum was observed.

Areas of grassy woodland that have been excluded from kangaroo browsing predominately contain an understory of grasses and herbs with a cover of ~50-60%. Species identified within the groundlayer include, Geranium (*Geranium spp.*), Chocolate Lilly, Woodruff (*Asperula conferta*), Tussock Grass (*Poa spp.*), Kangaroo Grass and *EPBC Act 1999* and *FFG Act 1988* listed Matted Flax Lilly.

Goals and objectives of the potential Offset Management Plan

Prior to translocation

- Continue to manage woody and herbaceous weeds including Serrated Tussock
- Exclude stock
- Targeted follow-up weed control following recent ecological burn
- Retain all logs.

Post translocation – ongoing maintenance

- Maintain and extend kangaroo exclusion fencing around Matted Flax-lily recipient area
- Rabbit control
- Revegetation using a mixture of tubestock and direct seeding
- Targeted weed control, particularly for herbaceous and grassy weeds.

Figure B18 Large River Red Gum (background) and kangaroo exclusion (foreground)

Figure B19 Matter Flax-lily (Dianella amoena)

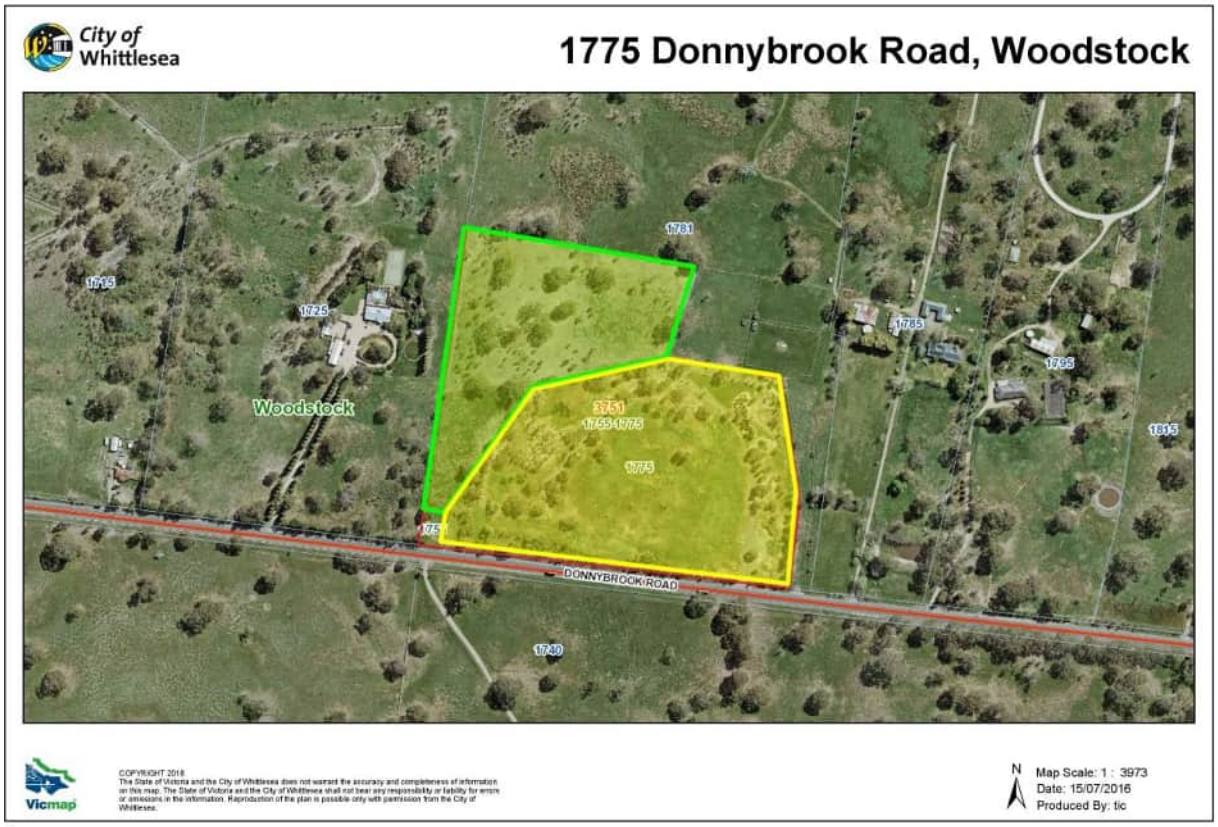


Figure B20 775 Donnybrook Road, Woodstock. Green polygon represents the potential translocation area

Figure B21 1775 Donnybrook Road, Woodstock. Habitat zones marked in 2013 by ABZECO (source, City of Whittlesea)

Appendix C – Monitoring Form

Matted Flax-lily *Dianella amoena* Translocation: Monitoring

Site Name:	
Date:	

Plant / Clump ID	Coordinates (GDA94)			
	Easting	Northing	Live / Dead	**Source of plant (translocated [T] or new plant [NP])**
1				
2				
3				
4				
5				
6				
7				
8				
9				
10				
11				
12				

Matted Flax-lily *Dianella amoena* Translocation: Monitoring

Date of Survey: Surveyors:

AECOM

Plant / Clump ID	Cover - abundance	Plant basal diam. (cm)	No. shoots	Max. leaf length (cm) - height	No. leaves /shoot (range)	Is there flowering? (Y/N)	Inflorescence/infructescence				Evidence of…….			Other Comments
							Height (cm)	Buds	Flowering (1 - 3)	Fruiting (1 - 3)	Herbivory (Y/N)	Water Stress (Y/N)	Weed encroachment / competition (Y/N)	
1														
2														
3														
4														
5														
6														
7														
8														
9														
10														
11														
12														

Appendix D – Independent Review

An independent peer review of an earlier version of this Plan was completed by Steve Mueck of Biosis to review the proposed strategy prior to submission for referral under the *Environmental Protection and Biodiversity Conservation Act 1999*.

Steve's final review is presented below.

18 February 2016

Brad George
Principal - Planning and Approvals
GHD
Level 8, 180 Lonsdale Street
Melbourne, Vic 3000
Email: brad.george@ghd.com

Dear Brad,

Review of the Mernda Rail Extension Project Matted Flax-lily Translocation Plan

Project no. 21702

To date my participation in the Mernda Rail Extension Project has included a peer review of the Matted Flax-lily Translocation, Management and Monitoring Plan prepared by GHD & AECOM. I have now reviewed this document on three occasions and provided comments to Cameron Miller, Impact Assessment & Permitting Team Leader at AECOM.

I am satisfied that the authors of this document have considered my comments and reviewed the document in response to those comments. While both the federal Department of the Environment (DoE) and the Victorian Department of Environment, Land, Water and Planning (DELWP) may suggest refinements to this plan, I consider the plan to provide a reasonable description of the proposed translocation process that is within parameters which have been previously approved by these departments and prescribe a reasonable protocol for the approval of this project.

Please call to discuss if you have any concerns relating to the plan and the obligations it outlines.

Regards

Steve Mueck
Senior Consultant Botanist

Biosis Pty Ltd
Melbourne Resource Group

38 Bertie Street
Port Melbourne VIC 3207

Phone: 03 9646 9499
Fax: 03 9646 9242

ACN 006 175 097
ABN 65 006 175 097

Email: melbourne@biosis.com.au

biosis.com.au