

MELBOURNE AIRPORT RAIL

MAR STATE LAND TERRESTRIAL ECOLOGY IMPACT ASSESSMENT

MAR-AJM-PWD-PWD-REP-XEV-NAP-0001710

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Table of Abbreviations

Abbreviation	Definition		
AJM-JV	Aurecon Jacobs Mott Macdonald Joint Venture		
ARTC	Australian Rail Track Corporation		
BLA	Brett Land and Associates		
CaLP Act	Catchment and Land Protection Act 1994		
CBD	Central Business District		
CEMP	Construction Environmental Management Plan		
COR	Corridor Section of the MAR State Land		
CSR	Combined Services Route		
DAWE	Commonwealth Department of Agriculture, Water and Environment		
DBH	Diameter at Breast Height		
DELWP	Victorian Department of Environment, Land, Water and Planning		
DTRS	Digital Train Radio System		
EE Act	Environment Effects Act 1978		
EES	Environment Effects Statement		
EMF	Environmental Management Framework		
EMR	Environmental Management Requirements		
EPA	Environment Protection Authority		
EP Act	Environment Protection Act 2017		
EPBC Act	Environment Protection and Biodiversity Conservation Act 1999		
EVC	Ecological Vegetation Class		
FFG Act	Flora and Fauna Guarantee Act 1988		
GPS	Global Positioning System		
GSM	Golden Sun Moth		
HV	High Voltage		
LHF	Large-headed Fireweed		
MAR	Melbourne Airport Rail		
MFL	Matted Flax-lily		
MNES	Matters of National Environmental Significance		
MTP	Metro Tunnel Project		
NCR	Nature Conservation Reserve		
NGZ	No-Go Zone		
NTGVVP	Natural Temperate Grassland of the Victorian Volcanic Plain, an EPBC listed threatened ecological community		
NVR	Native Vegetation Report		
OHLE	Overhead Line Equipment		
PMST	Protected Matters Search Tool		
P&E Act	Planning and Environment Act 1987		
RPV	Rail Projects Victoria		



Abbreviation	Definition	
SLL	Striped Legless Lizard	
SRF	Spiny Rice-flower	
SUN	Sunshine Section of the MAR State Land	
SUP	Shared User Path	
The Guidelines	Guidelines for the removal, destruction or lopping of native vegetation	
TPZ	Tree Protection Zone	
VBA	Victorian Biodiversity Atlas	
VQA	Vegetation Quality Assessment	
WBPG	Western (Basalt) Plains Grassland, an FFG listed threatened community	
Wildlife Act	Wildlife Act 1975	



1. Executive Summary

Aurecon Jacobs Mott Macdonald Joint Venture (AJM-JV) has been engaged by Rail Projects Victoria (RPV) to prepare the Melbourne Airport Rail (MAR) Project (the Project) State Land Terrestrial Ecology Impact Assessment (the Impact Assessment). The Impact Assessment identifies and evaluates ecological values relevant to the project, potential impacts to those ecological values, subsequent project constraints and opportunities, and the Commonwealth and State legislation and policy requirements and approvals pathways of the Project. This has been completed through a desktop assessment, site assessments, and an ecological impact assessment.

The Melbourne Airport Rail is a transformational public transport project connecting Melbourne Airport with a rail service for the first time. In 2018, the Victorian Government released the *Melbourne Airport Rail Link Sunshine Route Strategic Appraisal* (Transport for Victoria, 2018), which confirmed that the Sunshine route is the best solution for an airport rail link. This alignment is between a new railway station at Melbourne Airport and Melbourne Central Business District (CBD), via the Albion-Jacana rail corridor, Sunshine Station and connecting to the new tunnels provided via the Metro Tunnel Project (MTP). It is noted that only State Land along this alignment is addressed in this Impact Assessment as Commonwealth land is subject to a separate approvals process.

The methodology of the Impact Assessment includes three discrete components:

- Desktop assessment
- Site Assessments
- Ecological Impact Assessment

A summary of the ecological values, residual impacts to ecological values and next steps identified by the assessment are summarised in Table 1.1. It is to be noted that fish have not been considered as part of this terrestrial ecology impact assessment. Threatened fish species are considered in a separate aquatic ecology assessment which has been undertaken for the Project (AJM-JV 2021).

Table 1.1 Summary of ecological values present in and adja	acent to the State Project Land and residual impacts following avoidance and
mitigation measures	

Relevant Legislation	Ecological Values	Residual Impacts	
Commonwealth listed Environment Protection and Biodiversity Conservation Act 1999 (EPBC Act)	Natural Temperate Grassland of the Victorian Volcanic Plain (NTGVVP) Threatened Ecological Community • 5.960 ha within the State Project Land	 Significant Impact Direct removal of 0.221 ha of NTGVVP Exacerbation of fragmentation of NTGVVP at the M80 North Zone 	
	 Sunshine Diuris (Diuris fragrantissima) Known population adjacent to the State Project Land within the Sunshine Triangle Ecological Site 	• Following strict mitigation measures, Sunshine Diuris will not be impacted by the proposed works. This is not considered to be a significant impact under the EPBC Act	
	 Spiny Rice-flower (<i>Pimelea spinescens</i> subsp. spinescens) 77 individuals present across a number of locations within the State Project Land 	 Significant Impact Direct removal of 8 individuals in the rail corridor adjacent to the River Valley Estate, and at Munro Avenue in the South of Solomon Heights 	
	 Large-headed Fireweed (Senecio macrocarpus) Known population within the Matthews Hill Reserve (outside State Project Land) 	 Following strict mitigation measures, Large-headed Fireweed is not considered to a be impacted by the proposed works. This is not considered to be a significant impact under the EPBC Act 	
	 Striped Legless Lizard (Delma impar) 12.115 ha of Striped Legless Lizard habitat was recorded within the State Project Land. 	 Significant Impact Direct removal of 1.147 ha of Striped Legless Lizard habitat, and fragmentation resulting in the isolation of 0.46 ha Striped Legless Lizard habitat, amounting to a significant impact to this species. 	



Relevant Legislation	Ecological Values	Residual Impacts
		Exacerbation of fragmentation of Striped Legless Lizard Habitat at the M80 North Zone
		 Possible, localised reduction in habitat suitability due to noise and vibration associated with the construction of the M80 viaduct.
		 Injury or death of some Striped Legless Lizard individuals is expected during the habitat clearance within the M80 North Zone.
	Growling Grass Frog (Litoria	Significant Impact
	 raniformis) Known to utilise the Maribyrnong River, Steele Creek/Steele Creek North, and Moonee Ponds Creek to 	 Permanent removal of 0.268 ha and temporary removal (with revegetation) of 0.932 ha of terrestrial riparian overwintering habitat for the Growling Grass Frog.
	varying degrees	 Alteration of aquatic habitat corridors and temporary barriers to dispersal during Maribyrnong River Bridge construction for the estimated 3.5 year construction period.
		 Temporary isolation of a stormwater retention basin (the M80 retention basin, known to be utilised by the species for dispersal) from Steele Creek North for the estimated three-year duration of the M80 viaduct construction
		 Possible intermittent noise-induced changes to calling behaviour, localised to the Maribyrnong River in the vicinity of the Maribyrnong River bridge construction.
		• The combination of the above direct and indirect impacts are considered to amount to a significant impact under the EPBC Act.
	 Golden Sun Moth (Synemon plana) 1.405 ha of Golden Sun Moth (GSM) habitat was recorded within the State Project Land (at Solomon Heights and Luma Estate). GSM were also confirmed during targeted surveys within the Matthews Hill 	 Direct removal of 0.319 ha of Golden Sun Moth habitat along the Munro Avenue road reserve in the South of Solomon Heights, however, this is not considered to constitute a significant impact under the EPBC Act as it falls below the 0.5 ha significant impact threshold
State Listed	Reserve (outside State Project Land) Western (Basalt) Plains Grassland	Direct removal of 1.293 ha of WBPG across the State
Environment Effects Act 1978 (EE Act) Elora and Eauna	 (WBPG) Community Threatened Ecological Community 8.510 ha within the State Project Land 	Project Land
Guarantee Act 1988 (FFG Act)	FFG Act listed Threatened and Protected Flora	Direct removal of eight Spiny Rice-flower plants in the rail corridor adjacent to the River Valley Estate (as
Environment Act 1987 (P&E Act) Guidelines for the	 A moderate or higher likelihood of occurrence of ten threatened flora species listed under the FFG Act, including the above-mentioned flora species listed under the EPBC Act, as 	 Direct removal of 11 Fragrant Salt Bush plants at the Luma Estate, Brimbank Park and the M80 North Zone Direct removal of plants belonging to four EEG Act
removal, destruction or lopping of native vegetation (the Guidelines)	well as Arching Flax-lily, Studley Park Gum and Fragrant Saltbush (recorded), and Leafy Twig Sedge, Pale-flower Crane's-bill, Austral Tobacco and Rye Beetle-grass (moderate likelihood of occurrence).	protected taxa on public land.
	Presence of nine protected flora taxa (from the Acacia [wattle] genus or Asteraceae [daisy] family)	
	FFG Act listed Threatened Fauna	Impacts to Striped Legless Lizard (as detailed above)
	A moderate or higher likelihood of occurrence of six threatened fauna species listed under the FFG Act	Impacts to Growling Grass Frog (as detailed above)



Relevant Legislation	Ecological Values	Residual Impacts
	including the above-mentioned flora species listed under the EPBC Act, as well as Tussock Skink (recorded) and Brown Toadlet and Platypus (moderate likelihood of occurrence)	 Impacts to Golden Sun Moth habitat (as detailed above) Direct removal of 10.150 ha of Tussock Skink (<i>Pseudemoia pagenstecheri</i>) habitat across the State Project Land and exacerbation of fragmentation at the M80 North Zone.
	 Native Vegetation 33.266 ha of native vegetation comprising eight EVCs 64 large trees in patches 86 scattered trees (including 79 small and seven large) 	 Removal of 3.889 ha of native vegetation in patches from seven EVCs, including removal of six large trees in patches Removal of 37 scattered trees (including 35 small and two large).

The key implications of the ecological impact assessment are as follows:

- Two separate EPBC Act referrals have been prepared documenting the potential impacts to Matters of National Environmental Significance (MNES) from the Project Works on State Land. Separate referrals have been prepared for the Sunshine Section and Corridor Section of the State Project Land. The two sections of the Project Works on State Land present a different magnitude of potential impacts on MNES. Specifically:
 - > The Sunshine Section is unlikely to result in a significant impact on any MNES based on the scope and location of construction works.
 - > The Corridor Section has the potential to result in a significant impact on Striped Legless Lizard, Growling Grass Frog, Spiny Rice-flower and Natural Temperate Grassland of the Victorian Volcanic Plain (NTGVVP).
 - > Following the strict implementation of mitigation measures proposed in this impact assessment, it is considered unlikely that the Project will result in a significant impact to any other MNES present.
- A referral under the EE Act to determine whether an Environment Effects Statement (EES) is needed for the Project, is not required based on the ecological criteria specified in the *Ministerial guidelines for assessment of environmental effects under the Environment Effects Act 1978* (Department of Sustainability and Environment, 2006). The extent of removal of native vegetation proposed for the Project (3.889 ha and 37 scattered trees) falls well below the 10 ha referral threshold and limited impacts to FFG Act values such as State listed threatened species are predicted to occur based on implementation of proposed avoidance and mitigation measures.
- Native vegetation removal proposed for the Project will require planning approval under the P&E Act, pursuant to Clause 52.17 of the Hobsons Bay, Maribyrnong, Brimbank, Moonee Valley and Hume Planning Schemes. Native vegetation proposed for removal has been assessed in accordance with the Victorian *Guidelines for the removal, destruction or lopping of native vegetation* (Department of Environment, Land, Water and Planning, 2017) (The Guidelines). The following native vegetation is required for removal for the Project:
 - > 3.889 ha of native vegetation in patches (including six large trees in patches) and
 - > 37 scattered trees (35 small and 2 large)
- Under the Guidelines, all native vegetation removal, including scattered trees is converted into an equivalent area. This is done for scattered trees based on the area of a circle of 15 m radius for large trees, and 10 m radius for small trees. On this basis the total extent of native vegetation removal as per the Native Vegetation Report (NVR Report) equates to 4.711 ha. The offset required includes 0.811 general habitat units and 0.764 species units of habitat for Werribee Blue-box (as well as a total of 8 large trees) as detailed in Table 6.6 an Appendix M.
- A 'Permit to Take' under the FFG Act will be required for the removal of 1.293 ha of Western (Basalt) Plains Grassland Community, eight Spiny Rice-flower plants, 11 Fragrant Salt-bush plants, and a



number of plants belonging to four FFG Act protected taxa. This is applied for once planning approval for the Project is achieved.

The following next steps are recommended:

- Assessment of native vegetation and targeted survey for Golden Sun Moth at Border Drive Reserve is to be undertaken in summer 2021/2022 to determine the extent and quality of native vegetation, and the presence/absence of Golden Sun Moth in this location. While yet to be assessed in targeted surveys by AJM-JV, the central portion of Border Drive Reserve has conservatively been deemed a No-Go Zone (NGZ 23) to avoid any potential impacts to this area.
- EPBC Act offsets for impacts to MNES NTGVVP, Striped Legless Lizard, Spiny Rice-flower and Growling Grass Frog) are likely to be required if the Project is determined a controlled action under the EPBC Act following the referral. It is recommended that discussions with offset brokers are undertaken to understand the availability of potential EPBC Act offsets that may be required for the Project. It is recommended that offset availability is investigated as soon as possible as the establishment of new offset sites can be a lengthy process and offsets are required to be formalised and secured before construction can commence. Initial priority should be given to sourcing a potential offset site that meets the requirements of as many MNES as possible (i.e. a suitable grassland site that supports NTGVVP, Spiny Rice-flower and Striped Legless Lizard). The process involved for formalising any EPBC Act offset requirement is likely to include:
 - Engagement with offset providers to locate/source an appropriate site or number of sites to meet the specific offset requirements;
 - > Preparation of a memorandum of understanding (or similar) that outlines a commitment from both RPV and the offset provider, while the detail of the offset is prepared;
 - A likely requirement of surveying for relevant MNES at potential offset site/s to justify the presence of MNES (seasonal based on survey times for specific MNES);
 - Preparation of a detailed Offset Management Strategy and Offset Management Plan to outline how the offset will be achieved at the specified offset site/s;
 - > Submission of the proposed offset to Department of Agriculture, Water and the Environment (DAWE) as part of the likely required Commonwealth approval; and
 - > Negotiation and formal securing of the offset via a formal on-title agreement or similar.
- State native vegetation offsets are also required to compensate for the removal of native vegetation within the State Project Land. The offset required to compensate for the extent of native vegetation removal includes both general and specific offsets. The offset required includes 0.811 general habitat units and 0.764 species units of habitat for Werribee Blue-box (as well as a total of 8 large trees) as detailed in Table 6.6, and in Appendix M.
 - > The general offset amount required is readily available through offset brokers, however the species offsets required for Werribee Blue-Box are not readily available.
 - Solution of the Verribee Blue-Box is restricted to the Werribee River, and no actual impacts to this species are proposed from the Project, it is recommended that a proposal is lodged to the Department of Environment, Land, Water and Planning's (DELWP's) native vegetation team to have this species removed from the assessment process. Failing DELWP's acceptance of this proposal, offset availability should be investigated in detail through the assistance of native vegetation offset brokers to source/locate any available offset sites that would meet the requirements of this species. Further steps should also be considered to further avoid or minimise impacts around the Maribyrnong River to reduce offset requirements.
 - In the case that a species offset for Werribee Blue-box is not available following the above actions, an alternative offset can be proposed. The alternative offset must generate direct habitat improvements for the species, that provide equivalent compensation for the removal of its habitat. Alternative arrangements for species offsets are considered for approval on a case by case basis by DELWP and must be to the satisfaction of the Secretary to DELWP



- Priority should be given to sourcing state native vegetation offsets at a site that also meets the requirements for Commonwealth (MNES) offsets.
- Continue to avoid and minimise impacts to native vegetation including large and scattered trees and habitat for threatened species throughout the detailed design and construction process.
- Threatened Species Management Plans for both the Sunshine and Corridor Sections of the State Project Land have been prepared to support assessment of the Project under the EPBC Act. The implementation of management measures outlined in these plans is required to limit impacts to those accounted for in this assessment.



2. Introduction

Aurecon Jacobs Mott Macdonald Joint Venture (AJM-JV) has been engaged by Rail Projects Victoria (RPV) to prepare the Melbourne Airport Rail (MAR) Project (the Project) State Land Terrestrial Ecology Impact Assessment (the Impact Assessment).

2.1 Strategic Context

The Project is a once-in-a-generation transformation of Victoria's transport network, connecting Melbourne Airport's Integrated Terminal Precinct with a rail service for the first time.

Melbourne Airport handled more than 37 million passenger movements in 2018-19¹ and by 2038, this figure is projected to almost double to more than 67 million², which is an average growth of 3.2% per annum. Transport connectivity from Melbourne Airport to Melbourne's Central Business District (CBD) is currently limited to the Tullamarine Freeway, and therefore, the Victorian Government is committed to delivering an efficient, competitive alternative to cater for the ongoing increase in passenger numbers at Melbourne Airport.

In 2002, the Victorian Government considered possible corridor and alignment options for a Melbourne Airport Rail Link, ultimately selecting the Sunshine route as the preferred option. At this time, land was reserved between the Albion-Jacana rail corridor and extending through to Sharps Road, Tullamarine for the construction of a rail link.

In 2018, the Victorian Government released the Melbourne Airport Rail Link Sunshine Route Strategic Appraisal, which confirmed that the Sunshine route remains the best solution for an airport rail link. The Sunshine route would provide superior connections to regional Victoria, Melbourne's growth areas in the north and west and Melbourne's south eastern suburbs and could be delivered sooner and at a significantly lower cost than other route options.

2.2 Purpose

The purpose of the Impact Assessment is to determine ecological values that are likely to be impacted by the proposed works. This information will be used to inform the relevant approvals for the Project. The specific objectives of the Impact Assessment are to:

- Review of the scope of works and mapping presented in the 'MAR Project Description for Environmental Specialists' (MAR-AJM-PWD-PWD-MEM-XLP-NAP-0001505, Revision C) (the Project Description).
- Determine the nature and extent of ecological values present within the State Project Land.
- Provide an assessment of the likely impact of the Project on ecological values present to inform approval under relevant policy and legislation.
- Undertake review of requirements under State and Commonwealth policies and legislation in relation to ecological values present and likely impacts.
- Provide recommendations regarding opportunities to further avoid or minimise impacts on identified ecological values.

² https://www.melbourneairport.com.au/Corporate/Planning-projects/Master-plan



¹ https://www.bitre.gov.au/publications/ongoing/airport_traffic_data

2.3 State Project Land

The State Project Land defines the land within which the project components and construction activities will be contained. It sets out the full extent of land currently identified as potentially required for the delivery of the Project.

The State Project Land encompasses all State land areas that would be used for permanent structures and temporary construction areas. It provides the basis for and informs the Impact Assessment.

State Project Land relevant to State-based approvals includes:

- Land between Sharps Road and the Albion-Jacana rail corridor, including land crossing the M80 Freeway
- The existing Albion-Jacana rail corridor generally between Jacana and Albion Stations
- Land around Sunshine and Albion Stations, including the existing rail corridor
- Land required for the Project from Jacana Station in the north-east to Newport Station in the south-west and Middle Footscray Station in the east. This largely includes the Albion-Jacana rail corridor via Sunshine and Albion stations and land required for a new rail corridor between Sharps Road and the Albion-Jacana rail corridor.

The extent of the State Project Land is shown in Figure 2.1.

2.3.1 Key Assessment Areas and Main Waterways

Located variously within, and adjacent to the State Project Land are eleven key assessment areas and four main waterways. Key assessment areas and waterways are referred to regularly in this report in regards to the locations where ecological surveys have been undertaken and the presence of ecological values. The assessment areas are mapped in Figure 2.1 and are listed below:

- Sunshine Railway Line Linear Reserve
- Matthews Hill Reserve
- Sunshine Triangle Ecological Site
- Old Sunshine Tip Site
- St. Albans Road Biosites
- Solomon Heights
- Sunshine North Escarpment
- River Valley Estate
- Brimbank Park
- Border Drive Reserve
- M80 South Powerline Easement
- M80 North Zone

Main waterways that dissect the State Project Land are shown in Figure 2.1 and include:

- Maribyrnong River
- Moonee Ponds Creek
- Steele Creek
- Stony Creek







Figure 2.1 MAR State Project Land



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2.4 Main Works Scope

2.4.1 Project Sections

The main works for the Project comprise of three geographically distinct sections. The sections are summarised in Table 2.1 and the location of the sections are shown in Figure 2.1.

Table 2.1 Summary of Project section

Section	Summary
Airport section Not considered in State land approvals.	The Airport section generally includes all land relevant to the Project between Sharps Road, Tullamarine and Melbourne Airport and is located on Commonwealth owned land and is subject to a separate approvals process under the <i>Commonwealth Airports Act 1996</i>
Corridor section	The COR section generally includes the Albion-Jacana rail corridor between Jacana Station and south of Barwon Avenue, Sunshine North, as well as land between Sharps Road, Tullamarine and the Albion-Jacana rail corridor.
Sunshine section	The SUN section generally includes the existing rail corridor between Barwon Avenue, Sunshine North and Middle Footscray Station. The SUN Section also includes the Sunbury rail corridor to Ginifer Station and the Brooklyn freight corridor to Newport Station.

2.5 Corridor Section Summary

The COR section of the Project includes the following main works:

- Construction of the new MAR tracks, comprising an approximately 8 km dual track railway and associated overhead line equipment (OHLE), combined services route (CSR) and track drainage works, including:
 - > A 2.3 km long elevated twin track viaduct structure between Sharps Road, Tullamarine and the Albion-Jacana rail corridor, crossing Steele Creek and the Western Ring Road including emergency and maintenance access points.
 - > New at-grade MAR tracks within the existing Albion-Jacana rail corridor, located on the Western side of the existing Australian Rail Track Corporation (ARTC) tracks.
 - > An elevated twin track viaduct structure across the Maribyrnong River valley, adjacent to the Western side of the existing state significant heritage bridge.
 - > Slewing of ARTC tracks between Keilor Park Drive and the Calder Freeway.
- Signalling works along the Albion-Jacana rail corridor between Jacana Station and Barwon Avenue, Sunshine North and within the new MAR corridor North of the Western Ring Road.
- Construction of an intake supply substation at Terror Street or the Northeast area of Brimbank Park and two traction substations at Fullarton Road and within the McIntyre Sidings, Sunshine North.
- Construction of two new Digital Train Radio System (DTRS) facilities one North or South of Keilor Park Drive, Keilor East and a second at Airport Drive, Tullamarine.
- Diversion, relocation and replacement works associated with utilities and underground services, including the existing ARTC CSR, high voltage (HV) transmission lines and numerous miscellaneous assets
- Protection works associated with the Exxon Mobil jet fuel pipeline along the Albion-Jacana rail corridor.
- Modifications to existing structures, including structural modifications and strengthening works at Calder Freeway inbound and outbound bridges, Fullarton Road bridge, Western Ring Road on-ramp and offramp bridges, Keilor Park Drive and McIntyre Road bridges.



- Replacement of shared user path (SUP) connections at Calder Freeway / Fullarton Road, provision of a new SUP overpass at Cranbourne Avenue, and provision of a Strategic Cycling Corridor link between Western Ring Road and Airport Drive via Steele Creek.
- The provision of retention basins at several locations along the Albion-Jacana rail corridor
- Establishment of temporary construction laydown areas, site offices, worksites, storage, parking areas and access roads

2.6 Sunshine Section Summary

The SUN section of the Project includes the following main works:

- Construction of a new 1.8 km long MAR twin track viaduct structure, including associated OHLE and CSR between Sunshine Station and the Albion-Jacana corridor, crossing Anderson Road, Ballarat Road, the Sunbury rail corridor, St Albans Road and Stony Creek.
- Signalling works, including the installation of trackside equipment along the Sunbury line towards Ginifer Station, along the Brooklyn freight corridor towards Newport Station, and along the Western rail corridor to West Footscray Station.
- Modifications to the tracks, formation, drainage, CSR, OHLE and signalling equipment for the MAR, Sunbury and Bendigo tracks from Albion to the beginning of the Jacana freight corridor
- Modifications to the Western and Eastern Albion Station forecourts and car parks.
- Modifications to Sunshine Station, including modifications to platforms, the Sunshine Station western car park and the construction of a new concourse.
- Modifications to the existing Sunshine and Sunshine West substations
- Diversion, relocation and protection of existing utilities and underground services.
- Establishment of temporary construction laydown areas, site offices, worksites, storage, parking areas and access roads

2.7 Previous assessments

A number of previous assessments have been undertaken for various areas within and adjacent to the State Project Land. These studies have been referred to in determining the likely presence of ecological values within the State Project Land for the purpose of the Impact Assessment. The previous assessments utilised (in order of date published), include:

- MAR Ecology Existing Conditions Assessment Report (ARL-AJM-PWD-PWD-REP-XEV-NAP-0000041) (AJM-JV 2020b)
- SUN Ecology Existing Conditions Assessment Report (SUN-AJM-PWD-PWD-REP-XEV-NAP-0000246) (AJM-JV 2020a)
- Habitat Hectare Assessment and Spiny Rice-flower Survey: Solomon Heights, Sunshine North, Victoria (EHP 2020)
- Habitat Hectare Assessment and Spiny Rice-flower Survey: Solomon Heights, Sunshine North, Victoria (BLA 2018)
- Solomon Heights Biodiversity Project (Biosis 2016)
- Flora & Fauna report on Baldwin Avenue/Solomon Heights Grassland prepared for Brimbank City Council (Abzeco 2011)
- Targeted surveys undertaken for the Striped Legless Lizard *Delma impar* at Solomon Heights, Sunshine North, Victoria (ABZECO 2016)



- Targeted Surveys for Matted Flax-lily and Golden Sun Moth, Solomon Heights, Sunshine North, Victoria (EHP 2016a)
- Letter of Advice: Draft Masterplan for Border Drive Reserve, Keilor East (Abzeco 2021)

A summary of all previous studies reviewed is provided in Appendix A Summary of Previous Studies.

2.8 Legislation and Policy

A summary of legislation and policies referred to throughout the document has been prepared and is presented in Appendix B

Legislation Summary. That legislation and policy includes:

- Commonwealth
 - > Environment Protection and Biodiversity Conservation Act 1999 (EPBC Act)
- State
 - > Environment Effects Act 1978 (EE Act)
 - > Environment Protection Act 2017 (EP Act)
 - > Flora and Fauna Guarantee Act 1988 (FFG Act)
 - > Planning and Environment Act 1987 (P&E Act)
 - > Guidelines for the removal, destruction or lopping of native vegetation (Department of Environment, Land, Water and Planning, 2017) (the Guidelines)
 - > Catchment and Land Protection Act 1994 (CaLP Act)
 - > Wildlife Act 1975



3. Methods

The preparation of the Impact Assessment included three discrete components: a desktop assessment, site assessments, and an ecological impact assessment. The methods utilised in undertaking each of these components is outlined below.

3.1 Desktop assessment

3.1.1 Database Searches

A review of the following government databases and associated documents was undertaken to provide information on ecological values previously recorded or modelled to occur in the vicinity of the State Project Land and, therefore relevant to the Project. These databases provide information of biodiversity values that may trigger the need to respond to Commonwealth and/or State legislation. The following databases were utilised:

- Commonwealth Department of Agriculture, Water and the Environment (DAWE) database:
 - Protected Matters Search Tool (DAWE 2020a): The Protected Matters Search Tool (PMST) highlights Matters of National Environmental Significance (MNES) relevant to the Commonwealth EPBC Act that are likely to occur within a 5 km buffer of the State Project Land. The resulting PMST report can be viewed in Appendix C PMST Search.
- Victorian Department of Environment, Land, Water and Planning (DELWP) Biodiversity databases:
 - > **Nature Kit** (DELWP 2020a): comprises spatial data of native vegetation across Victoria; including modelled distributions of Ecological Vegetation Classes (EVC).
 - Victorian Biodiversity Atlas (DELWP 2020b): comprises historical spatial data records of flora and fauna species from across the state. Records are added opportunistically, as flora and fauna surveys are conducted within Victoria for a variety of purposes.

Available aerial imagery was also interpreted to inform the ecological assessment across the State Project Land.

A 5 km search buffer around the State Project Land was used to undertake these database searches. This was done in order to detect nearby areas of significant vegetation or threatened species records that may occur nearby, indicating a potential for presence within the State Project Land (e.g. mobile fauna species that have been recorded nearby that may move across the investigation area at times from known locations).

3.1.2 Review of Previous Studies

As indicated in Section 2.7, a number of previous assessments have been undertaken for various areas within and adjacent to the State Project Land. These studies have been referred to in determining the likely presence of ecological values within the State Project Land for the purpose of the Impact Assessment. The key findings of these assessments are summarised in Appendix A Summary of Previous Studies.

3.2 Site Assessment

3.2.1 Vegetation assessment and fauna habitat assessment

Assessment of native vegetation and fauna habitat was undertaken by two AJM-JV ecologists between 2018 and 2021. These assessments included preliminary field assessments to make high level determinations of the locations of high-quality native vegetation and potential threatened species habitat, followed by detailed field assessments. Tasks undertaken during the assessment included:



- Mapping of native vegetation including scattered trees and remnant patches in accordance with the Guidelines (DELWP 2017a)
- Undertaking a Habitat Hectare Assessment of any patches of native vegetation in accordance with the Vegetation Quality Assessment Manual v1.3 (DSE 2004)
- Assessing the presence or potential habitat for threatened flora and fauna that may occur in the State Project Land
- Assessing the presence of threatened communities in accordance with the listing advice for those communities.

Where access and program permitted, detailed field assessments aimed to map native vegetation (including VQAs) during the optimal spring survey window. Field assessment was undertaken on the following dates:

- Preliminary field assessments:
 - > 8 and 9 of November 2018 (areas between Stony Creek and Melbourne Airport)
 - > 30 April 2019 (areas in the vicinity of Sunshine)
- Detailed field assessments:
 - 5, 6, 8, and 18 February 2019, and 25 27 September 2019 (Public land between Steele Creek and Tullamarine)
 - > 23 September 2019 (Sunshine Scope)
 - > 7 July 2020 (Private Property within the M80 North Zone)
 - > 24 July 2020 to 28 July 2020 (Jacana rail corridor between M80 Powerline Easement and Jacana Station)
 - > 22 and 25 of September 2020 (River Valley Estate and Sunshine North Escarpment private land)
 - > 18 September and 6 October 2020 (State Project Land extent on the Sunbury line extending West of Albion Station)
 - > 11 June, and 2 July 2021 (Luma Estate and adjacent Stony Creek easement)

3.2.1.1 Native vegetation

Native vegetation was mapped in accordance with the Guidelines (DELWP 2017a) as either a patch, scattered tree or other native vegetation, described as follows:

- Patch:
 - > an area of vegetation where at least 25 per cent of the total perennial understorey plant cover is native, or any area with three or more native canopy trees where the drip line of each tree touches the drip line of at least one other tree, forming a continuous canopy, or
 - > any mapped wetland included in the current wetlands map, available in the DELWP systems and tools.
- Scattered tree:
 - > a native canopy tree that does not form part of a remnant patch. A native canopy tree is a mature tree (i.e. it is able to flower) that is greater than 3 m in height and is normally found in the upper layer of the relevant vegetation type.
- Other native vegetation:
 - > native vegetation that is not a remnant patch or scattered tree was incidentally identified such as scattered understorey trees.



Patches were further categorised into EVCs and then into Habitat Zones. These areas were Global Positioning System (GPS) mapped and assessed using the habitat hectare method described by DSE (2004) in the Vegetation Quality Assessment Manual – Guidelines for applying the habitat hectare scoring method – Version 1.3. Any Large Trees contained within patches were identified as Large Trees in patches, GPS mapped and their Diameter at Breast Height (DBH) recorded.

3.2.1.2 Planted Native Vegetation

Planted native vegetation was not mapped as part of this assessment unless the planting was deemed likely to have been planted with public funding for the purpose of land protection or enhancing biodiversity. In these cases, the vegetation was either assessed as a patch or a scattered tree.

Native plantings deemed to be planted for other purposes (such as amenity plantings) are exempt from permit requirement as outlined in Clause 52.17-7 of the Victoria Planning Provisions and were therefore not mapped or assessed.

In the absence of advice on the intended purpose of every planting within the State Project Land, the criteria provided in Table 3.1 below were used to determine whether a planting was likely to have been planted for the purpose of land protection or enhancing biodiversity, or for other purposes such as amenity.

Table 3.1	Criteria used to determine the purpose of planted native vegetation
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Factors indicating planting for the purpose of land protection or enhancing biodiversity		Factors indicating planting for other purposes such as amenity	
	 Planted scattered native trees, particularly within parklands, recreation reserves and along roadsides. In instances where scattered indigenous canopy trees occurred in largely modified landscapes (such as parklands) in a mosaic of planted native vegetation, but the trees were large enough to be considered potentially remnant or naturally occurring. Riparian plantings Plantings considered to be revegetation 	•	Isolated trees not large enough to be considered potentially remnant or naturally occurring. Evenly spaced rows of trees Plantings in the context of roadsides Parkland garden beds with some structural diversity (such as eucalypt species, over 1-2 shrub species, with a few robust groundcover species). Plantings incorporating non-indigenous species

3.2.2 Targeted surveys

3.2.2.1 Spring/Summer Targeted Flora Surveys

Targeted flora surveys were undertaken between September 2019 and February 2021 in patches of native vegetation that were considered potential habitat for listed threatened flora species. Areas of potential habitat were traversed on foot via transects approximately 5 m apart while recording threatened flora species observed. These surveys mainly targeted threatened flora species in higher-quality patches of Plains Grassland.

Surveys were conducted in all areas of potential habitat for threatened flora species as identified during native vegetation assessments, literature review and analysis of Victorian Biodiversity Atlas (VBA) records. Threatened flora species subject to targeted surveys, as well as their conservation status, known flowering times, and the dates and locations surveyed are listed below:

- Matted Flax-lily (MFL) (*Dianella amoena*) (listed as Endangered under the EPBC Act and Critically Endangered under the FFG Act; flowers November to January), Button Wrinklewort (*Rutidosis leptorhynchoides*) (listed as Endangered under the EPBC Act and Endangered under the FFG Act; flowers November to January), Small Milkwort (*Comesperma polygaloides*) (listed as Critically endangered under the FFG Act; Flowers November to January) and Pale-flowered Cranesbill (Geranium species 3) (Listed as Endangered under the FFG Act; flowers September to January).
 - > Sunshine Linear Railway Reserve (19 December 2019)
 - > Matthews Hill Reserve (19 December 2019)
 - > St. Albans Road Biosites (4 December 2020)



- > Old Sunshine Tip Site (4 December 2020)
- > Munro Avenue road reserve south of Solomon Heights (27 January 2021)
- > Rail reserve Adjacent to Solomon Heights (11 December 2019)
- > River Valley Estate (15 December 2020)
- > Rail corridor adjacent to River Valley Estate (11 December 2019)
- > M80 North Zone (15 December 2020)
- Small Golden Moths (*Diuris basaltica*) (listed as Endangered under the EPBC Act and Critically Endangered under the FFG Act; flowers September to October) and Large-headed Fireweed (LHF) (*Senecio macrocarpus*) (listed as Vulnerable under the EPBC Act and Critically Endangered under the FFG Act; flowers August to October)
 - > Sunshine Linear Railway Reserve (23 September 2019)
 - > Matthews Hill Reserve (23 September 2019)
 - > St. Albans Road Biosites (18 September 2020)
 - > Old Sunshine Tip Site (18 September 2020)
 - > Munro Avenue road reserve south of Solomon Heights (24 September 2020)
 - > Rail reserve Adjacent to Solomon Heights (27 September 2019)
 - > River Valley Estate and adjacent rail corridor (24 September 2019)
 - > M80 North Zone (7 October 2020)
- Leafy Twig-sedge (*Cladium procerum*) (listed as Endangered under the FFG Act; flowers in Spring/Summer)
 - > Within the construction footprint at the Maribyrnong River and Steele Creek/Steele Creek North (7 May 2021). Although targeted surveying for this species took place outside of the flowering season, this species is considered to be readily observable when not in flower, and therefore the survey undertaken was considered appropriate to detect presence).
- Pale Everlasting (*Coronidium gunnianum*) (listed as Critically Endangered under the FFG Act; flowers February to April)
 - > Munro Avenue Road reserve south of Solomon Heights (3 February 2021)

3.2.2.2 Golden Sun Moth

Targeted surveys for Golden Sun Moth (*Synemon plana*), listed as Critically Endangered under the EPBC Act and Vulnerable under the FFG Act, were undertaken within all areas of suitable habitat identified within the State Project Land, except where specified below. Potential habitat for the species was identified during fauna habitat assessments, literature review, and analysis of VBA records. Surveys were conducted by two ecologists across two survey seasons, summer 2019-2020 and summer 2020-2021. The dates and locations of targeted surveys undertaken for Golden Sun Moth are outlined below:

- Sunshine Railway Linear Reserve
 - > 2019-2020 survey season (20 November 2019, 25 November 2019, 19 December 2019, and 9 January 2020)
- Matthews Hill Reserve
 - Reserve proper surveyed 2019-2020 survey season (20 November 2019, 25 November 2019, 19 December 2019, and 9 January 2020)
 - Rail corridor adjacent to reserve surveyed 2020-21 survey season (27 November 2020, 4 December 2020, 14 December 2020, and 8 January 2021)



- St. Albans Road Biosites
 - > 2020-21 survey season (27 November 2020, 4 December 2020, 14 December 2020, and 8 January 2021)
- The Old Sunshine Tip Site
 - 2020-21 survey season (27 November 2020, 4 December 2020, 14 December 2020, and 8 January 2021)
- Rail Corridor Adjacent to Solomon Heights
 - > 2019-2020 survey season (11 December 2019; 19 December 2019, 9 January 2020, and 17 January 2020)
- River Valley Estate and adjacent rail corridor
 - Adjacent rail corridor surveyed 2019-2020 survey season (11 December 2019; 19 December 2019, 9 January 2020, and 17 January 2020)
 - > River Valley Estate Proper surveyed 2020-21 survey season (19 November 2020, 25 November 2020, 15 December 2020, 11 January 2021)
- M80 South Powerline Easement
 - > 2019-20 Survey season: (20 November 2019, 25 November 2019, 19 December 2019, and 9 January 2020)
- M80 North Zone
 - > 2020-21 survey season (19 November 2020, 25 November 2020, 15 December 2020, 11 January 2021)

The State Project Land within Solomon Heights, including adjacent to the Jacana rail corridor, and within the Munro Avenue Road Reserve to the south were not subject to targeted survey for Golden Sun Moth as the species had recently been recorded within Solomon Heights (EHP 2016b). As such, areas of suitable habitat within Solomon Heights have been considered to support the species.

Targeted surveys for Golden Sun Moth were completed in accordance with the published survey guidelines for the species (DEWHA 2009a), and involved walking in transects no greater than 5 m apart with the intent of flushing Golden Sun Moth from the grass and observing them in flight. Transects and locations of Golden Sun Moth were recorded using a Trimble R1 GPS unit, and results of mapping provided in Appendix C PMST Search. The surveys were spaced at least one week apart to capture any variation in emergence patterns. This level of survey effort was considered sufficient to achieve the objective of confirming presence/absence of Golden Sun Moth within the site.

Nearby reference sites were monitored for activity prior to undertaking surveys in the State Project Land, with Craigieburn Grassland Nature Conservation Reserve (NCR), and Broadmeadows Valley Park utilised in Summer 2019-2020, and Broadmeadows Valley Park utilised in Summer 2020-2021. Both of these reference sites support known Golden Sun Moth populations.

Where possible, survey was undertaken while conditions were suitable for male flight in accordance with the published survey guidelines for the species (DEWHA 2009a). Surveys were conducted during the middle of the day, approximately between 10 am and 2 pm, when temperatures were above 20°C, cloud-cover and wind were minimal, and after at least 48 hours since last rainfall. Conditions during a number of surveys occurred in suboptimal conditions, however, the findings of these surveys are considered to be valid. These instances include:

- Surveys undertaken on the 25 November 2020. 2 mm of rainfall occurred the day prior to these surveys, however given Golden Sun Moth were observed flying at the Broadmeadows reference site, and all other weather conditions were suitable, surveys proceeded on this day.
- Survey undertaken in the Rail Corridor adjacent to Solomon Heights on the 20 November 2019 (one of the four surveys undertaken at this location) occurred with less than 12 hours having passed since rainfall. Further, no Golden Sun Moth were observed flying at reference sites that day. Although this



survey was undertaken during suboptimal conditions, a number of surveys in adjoining areas including Solomon Heights (EHP 2016a), and the River Valley Estate (BLA 2018) have been utilised in the discussion of this location to strengthen the findings at this location (see Section 4.5.1.13)

Weather details for all Golden Sun Moth targeted surveys undertaken are presented in Appendix D Targeted Fauna Survey Results and Mapping.

3.2.2.3 Growling Grass Frog

Targeted surveys for Growling Grass Frog (*Litoria raniformis*), listed as Vulnerable under the EPBC Act and FFG Act, were undertaken in all areas of suitable habitat identified within the State Project Land. Surveys were conducted by two ecologists across three survey seasons, including spring/summer 2018, 2019 and 2020. The dates and locations of targeted surveys undertaken for Growling Grass Frog are outlined below:

- Stony Creek East:
 - > 2019 survey season (20 November 2019 and 25 November 2019)
- Stony Creek West:
 - > 2018 survey season (5 December 2018 and 18 December 2018)
 - The Maribyrnong River (upper, middle and lower):
 - > 2018 survey season (5 December 2018 and 18 December 2018)
- Steele Creek:
 - > 2018 survey season: (5 December 2018 and 18 December 2018)
- Steele Creek North:
 - > 2019 survey season: (20 November 2019 and 25 November 2019)
- The M80 retention basin at the M80 North Zone:
 - > 2018 survey season: (8 December 2018 and 17 January 2019)
 - > 2020 survey season: (14 December 2020 and 16 December 2020)
- Moonee Ponds Creek:
 - > 2020 survey season: (14 December 2020 and 16 December 2020)

These surveys were undertaken in accordance with the published survey guidelines for the Growling Grass Frog (DEWHA 2009b), after sunset, during suitable weather conditions (being warm and with little wind). At the beginning of each survey, 10 minutes was spent listening for frog calls at the water's edge. Within the last five minutes of the listening period a pre-recorded Growling Grass Frog call was played. The perimeter of the wetlands were then systematically searched by two ecologists using spotlights. Survey results are provided in Appendix D

Targeted Fauna Survey Results and Mapping.

3.2.2.4 Spiny Rice-flower

Targeted surveys for Spiny Rice-flower (*Pimelea spinescens* subsp. *spinescens*), listed as Critically Endangered under the EPBC Act and FFG Act, were undertaken within all areas of suitable habitat identified in the State Project Land, except where specified below. Potential habitat for Spiny Rice-flower was identified through undertaking field vegetation assessments, literature review, and analysis of VBA records. Surveys were undertaken by three ecologists in the 2019 survey season, and two ecologists during the 2020 survey season. Surveys were undertaken within the known flowering time of the Spiny Rice-flower which is April to August. The dates and locations of targeted surveys undertaken for Spiny Rice-flower are outlined below:

- Sunshine Railway Linear Reserve
 - > 2019 survey season (3 and 4 June 2019)



- Matthews Hill Reserve and adjacent rail corridor
 - > 2019 survey season (3 and 4 June 2019)
 - St. Albans Road Biosites
 - > 26 July 2020
- Old Sunshine Tip Site
 - > 27 July 2020
- Rail corridor adjacent to Solomon Heights
 - > 3 and 4 June 2019
- Rail corridor adjacent to River Valley Estate
 - > 3 and 4 June 2019
- River Valley Estate
 - > 12 and 13 August 2020
- Road reserve of M80 North Zone
 - > 3 and 4 June 2019
- M80 North Zone proper
 - > 7 July 2020

Areas of the State Project Land within Solomon Heights, including adjacent to the Jacana rail corridor, and within the Munro Avenue Road Reserve to the South were not subject to targeted survey for Spiny Rice-flower as recent surveys for the species had been undertaken in previous assessments (Biosis 2016, EHP 2020). Mapped records of Spiny Rice-flower that intersected the State Project Land (i.e. those within the Munro Avenue road reserve in the South of Solomon Heights) were revisited as part of this assessment outside of the flowering season to confirm presence at these locations.

These surveys were undertaken in accordance with the published survey guidelines for the species (DEWHA 2009c). Areas of potential habitat identified within the State Project Land were surveyed by groups of either two or three ecologists walking parallel transects 5 m apart. Locations of Spiny Rice-flower were recorded, and the sex of individual plants was determined where possible.

3.2.2.5 Striped Legless Lizard

Targeted surveys for Striped Legless Lizard (*Delma impar*), listed as Vulnerable under the EPBC Act and Endangered under the FFG Act, were conducted in all areas of potential habitat identified for the species within the State Project Land. Suitable habitat was identified based on the fauna habitat assessment, literature review and analysis of VBA records. Targeted surveys were undertaken during the 2019-20, and 2020-21 survey seasons. The dates and locations of targeted surveys undertaken for Striped Legless Lizard are outlined below:

- 2019-20 survey season (September 2019 to February 2020):
 - > Matthews Hill Reserve
 - > Rail Corridor Adjacent to Solomon Heights and the River Valley Estate
 - > M80 South Powerline Reserve
- 2020-21 survey season (September 2020 to February 2021):
 - > St Albans Road Biosites
 - > Old Sunshine Tip Site
 - > River Valley Estate



- > Sunshine North Escarpment
- > Brimbank Park
- > M80 North Zone

The methods were conducted in accordance with the published survey guidelines (DSEWPaC 2011b) and included:

- Tile arrays were established prior to August 2019 for the Spring/Summer 2019-2020 survey season, and between 7 and 12 August 2020 for the Spring/Summer 2020-2021 surveys. Tile arrays surveyed at the St. Albans Road Biosites (in the Spring/Summer 2020-2021 survey season) were existing tile arrays that had been left in-situ by a third party from a previous survey season.
- Each grid or transect contained 50 artificial shelter sites (roofing tiles, 'French Terracotta' style with dimensions of 430 mm x 340 mm), used to provide temporary habitat for the species. Tiles were placed in 10 rows of fived tiles or a single row of 50 placed at intervals of 5 m apart, labelled and their GPS location recorded. The location of the grids, and dates surveyed are shown in Appendix D Targeted Fauna Survey Results and Mapping.
- Tile checks commenced from 9 September 2019 for the Spring/Summer 2019-2020 surveys, and 7 September 2020 for the Spring/Summer 2019-2020 surveys approximately one month after they were established.
- Tiles were checked at an approximately fortnightly frequency for the Spring/Summer 2019-2020 surveys, resulting in 11 checks between September 2019 and January 2020. For the Spring/Summer 2020-2021 surveys, tiles were checked weekly to fortnightly between September and December, and then fortnightly until February, resulting in a total of 16 checks for each grid between September and February.
- Tile checks were typically undertaken in early to late morning, sometimes extending into the afternoon, depending upon the prevailing conditions. Checks were conducted during appropriate seasonal and daily climate conditions, during the known activity period of the species (DSEWPaC 2011b). The species is most active during morning and early afternoon on days typically with temperatures below 28 degrees where possible. Weather data was only collected at the start of the survey for the Spring/Summer 2019-2020 surveys as checks typically lasted less than half an hour. For the Spring/Summer 2020-2021 surveys weather was collected at the start and end of the day's tile checks, as the checks typically lasted multiple hours. Further for the Spring/Summer 2019-2020 surveys, due to targeting specific ranges of temperature and weather conditions, tile grids could not all be checked on the same day, and were split across two to three days. Weather data for tile checks is presented in Appendix D Targeted Fauna Survey Results and Mapping.

3.2.2.6 Brown Toadlet

Targeted surveys for Brown Toadlet (*Pseudophryne bibronii*), listed as Endangered under the FFG Act were conducted in all areas of potential habitat identified for the species within the State Project Land. Potential habitat was identified for the species based on the fauna habitat assessment, literature review and analysis of VBA records. All surveys were undertaken during the 2021 survey season. The dates and locations of targeted surveys undertaken for Brown Toadlet are outlined below:

- Maribyrnong River Section 1
 - > 3 and 12 May 2021
- Maribyrnong River Section 2
 - > 3 and 12 May 2021
- Steele Creek Section 1
 - > 3 and 12 May 2021
- Steele Creek Section 2



> 3 and 12 May 2021

The methods were conducted in accordance with the published survey guidelines of similar toadlet species. The most effective way to detect Brown Toadlet is through recognition of call. The breeding season extends from March to May however calling activity can start in February and extend through to August.

Call playback was undertaken in May 2021. Surveys included active searching and call playback (broadcasting of Brown Toadlet calls). Call playback was utilised to encourage the commencement of calling by males. After a period of at least 5 minutes of call playback and active listening, the perimeter of the wetlands were then systematically searched by two ecologists using spotlights. Survey results are provided in Appendix D

Targeted Fauna Survey Results and Mapping.

3.2.3 Threatened Species Likelihood of Occurrence Assessment

The likelihood of each threatened species or community occurring within the State Project Land was assessed on the basis of the species' or community's history of occurrence and its habitat requirements. For each species or community, the presence of suitable habitat within the State Project Land was determined, along with the condition and approximate extent of suitable habitat within the State Project Land and the broader context of the surrounding landscape. This was coupled with how often and how recently each species or community had been recorded (if at all) in the vicinity of the State Project Land. Resources utilised to assist in determining likelihood of occurrences included VBA and PMST searches undertaken for the State Project Land, previous reports for the State Project Land, and all site assessments undertaken for the Impact Assessment to date including targeted surveys. The basis of the likelihood of occurrence of each threatened species or community is presented in Table 3.2.

Likelihood of Occurrence	Criteria		
Confirmed	Species recorded within the State Project Land by the present study.		
High	 Recent records of the species in the vicinity, and/or; The State Project Land contains areas of high-quality habitat for the species, and/or; The species has been recorded recently within or in the vicinity of the State Project Land by recent studies by a third party. 		
Moderate	 Limited or historic records of the species in the vicinity of the State Project Land, and/or; The State Project Land contains potential habitat for the species. 		
Low	 No previous records of the species in the vicinity, and/or; The State Project Land contains limited or no suitable habitat for the species, and/or; The species was not observed following appropriate survey effort, and/or, The State Project Land lies outside the known geographic range of the species. 		

Table 3.2 Threatened Species Likelihood of Occurrence Assessment Criteria

3.3 Ecological Impact Assessment

3.3.1 Native Vegetation Loss Calculation Methodology

The extent of vegetation loss was assessed in accordance with the Guidelines (DELWP 2017a) and the *Assessor's handbook: Applications to remove, destroy or lop native vegetation* (DELWP 2018). The following was assumed:

- Patches were considered to be impacted when the State Project Land intersected either a patch boundary, or the Tree Protection Zone (TPZ) of a mapped tree within a patch by more than 10%.
- Where a patch of wooded vegetation with canopy was determined to be impacted, the extent of impact to the patch was determined using the 'accurate mapping' method outlined in DELWP (2018). To undertake the 'accurate mapping' method, aerial imagery was overlaid with the State Project Land and native vegetation mapping. Aerial imagery was used to trace the canopy of any canopy trees considered



to be affected by the Project impact footprint, thus defining the portion of the patch that was considered lost.

- For native vegetation patches with no canopy, no additional loss buffer has been applied. It is assumed that only the extent of the EVC within the works area is impacted.
- Scattered trees are considered lost when greater than 10% of the TPZ is impacted. The radius of the TPZ is calculated as 12 x the DBH of the relevant tree.

3.3.2 Threatened Values Impact Assessment Methodology

Impacts to threatened flora, threatened fauna and threatened ecological communities were determined by considering values with a moderate or higher likelihood of presence against:

- The construction footprint to determine 'direct removal' impacts upon the values themselves or their habitat
- Additional 'indirect' modes of impact both during the construction and operation phase of the Project including:
 - > The spread of noxious weeds
 - > Potential barriers to dispersal
 - > Fragmentation of a population or habitat
 - > Erosion and sedimentation
 - > Changes to noise and vibration in the environment

3.4 Assumptions and Limitations

The following assumptions and limitations apply to the Impact Assessment:

- The Impact Assessment relates only to public and privately-owned State land and does not consider Commonwealth land or the 'Airport' design package, as Commonwealth land is not subject to Victoria's legislative framework. Impact assessments associated with Commonwealth land, specifically land at Melbourne Airport, will be subject to a separate assessment.
- The Impact Assessment is based on the scope of works detailed in the Project Description and State Project Land derived from MAR 'Project Land' Revision A.7 (MAR-AJM-PWD-PWD-MAP-XLP-MMN-0111172).
- This Impact Assessment addresses only terrestrial ecology. Impacts to aquatic ecology (including listed threatened fish species) are considered in the MAR State Land Aquatic Ecology and Geomorphology Impact Assessment (MAR-AJM-PWD-PWD-REP-XEV-NAP-0001711).
- Information from the desktop assessment is only as reliable as the data available and in the case of the VBA the number of surveys previously undertaken (i.e. an area where many surveys have been taken in the past, will, most likely, have a more extensive list of species than areas where very little survey work has been undertaken). The accuracy of past surveys is also variable and point locations can be out by up to 1 km.
- In addition to the number of previous surveys undertaken, there are other reasons why species, including threatened species, may not have previously been recorded. For example, at the time of historical site visits some plant species may not have been visible above the ground or flowering and therefore not identified as being present within the area surveyed. Also, the data collected is likely to consist of opportunistic observations only, and, therefore, listed fauna species moving in and out of the area may not have been observed or recorded. Similarly, many fauna species are cryptic, nocturnal and well-hidden such that their presence can only be detected through detailed targeted assessment methods. Hence species that can be readily identified at any time, and can be heard or have distinctive signs such as tracks, scats or diggings, are those most likely to be recorded.



- The field surveys undertaken only recorded flora species evident and identifiable at the time of assessment. While, the flora recorded provides a good general representation of the values present it should not be considered an exhaustive list. Aside from targeted surveys, fauna species were not recorded.
- The VQA and photographs used to inform approvals under the planning scheme are valid for three years, unless information is available that confirms conditions have changed within the State Project Land.
- Calculations and figures are based on design details available at the time of writing. Where design details change the outcomes of this document may require updating.
- Spatial data layers assessed were the most current available at the time of the assessment. Any changes to these layers may require the outcomes of this document to be updated.
- Assessment of impacts to ecological values undertaken within this report assumes that all mitigation measures detailed in Section 5.2 are implemented and enforced.
- The EPBC Act is undergoing a review that commenced in October 2019. Any changes to the applicable legislation and agreements may affect the outcomes of this report.
- There is no standard expiry date for data used to inform the EPBC Act assessment. EPBC Act implications provided in this report must be reviewed upon legislative change (review commenced October 2019) and the ecological information used to inform assessment under the EPBC Act is recommended to be reviewed after two-years and/or as any relevant new information becomes available, including changed conditions within the State Project Land due to other development or events.
 - > It is anticipated at least a desktop review will be necessary to assess legislative change that occurs within the life of the MAR Project.
- The FFG Act Amendment Bill 2019 passed through Victorian Parliament with amendments taking effect on 1 June 2020. To support the amendments, updates to the threatened species list were gazetted in May 2021. The recent updates to the FFG Act threatened list have been presented and considered in this assessment report. The protected flora list is currently being reviewed and has not yet been updated. When the new list comes into effect this will affect the details of the 'permit to take' required under the Act.



4. Results: Existing Conditions

This section presents the synthesised findings of the desktop assessment and site assessment, detailing the ecological values with a moderate or higher likelihood of presence within the State Project Land. These values are summarised in Table 4.1 below. These values are discussed in more detail in Sections 4.1.1 through 4.5.

Table 4.1	Summary of ecological values with a moderate or higher likelihood of occurrence within or adjacent to the State Project Land
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Ecological value	cological value Presence			
Matters of National Environmental Significance				
Threatened Ecological Communities listed under the EPBC Act	5.960 ha of NTGVVP in the State Project Land			
Threatened Species	Three threatened flora species			
listed under the EPBC Act	• Known presence of Sunshine Diuris (<i>Diuris fragrantissima</i>) outside the State Project Land within the Sunshine Triangle Ecological Site			
	• A population of Large-headed Fireweed (Senecio macrocarpus) occurs outside the State Project Land within the Matthews Hill Reserve			
	• 77 Spiny Rice-flower (Pimelea spinescens subsp. spinescens) individuals in the State Project Land			
	Three threatened fauna species			
	• 12.115 ha Striped Legless Lizard (Delma impar) habitat in the State Project Land			
	 Growling Grass Frog (<i>Litoria raniformis</i>) utilise the Maribyrnong River, Steele Creek/Steele Creek North, and Moonee Ponds Creek to varying degrees. 			
	 1.405 ha of Golden Sun Moth habitat within the State Project Land (at Solomon Heights and Luma Estate). Confirmed presence of Golden Sun Moth (<i>Synemon plana</i>) within the Matthews Hill Reserve (outside State Project Land). 			
Ramsar Wetlands listed under the EPBC Act				
Values of State Signific	cance			
Threatened species listed under the FFG	10 threatened flora species including the three threatened flora of national significance listed above, as well as:			
Act	Leafy Twig Sedge			
	Arching Flax-lily			
	Studley Park Gum			
	Pale-flower Crane's-bill			
	Austral Tobacco			
	Fragrant Saltbush			
	Rye Beetle-grass			
	Six threatened fauna species, including the three threatened fauna of national significance listed above, as well as:			
	Tussock Skink			
	Brown Toadlet			
	Platypus			
Protected taxa listed under the FFG Act	Four protected taxa listed under the FFG Act, namely Lemon Beauty-heads, Sifton Bush, Cotton Fireweed and Slender Fireweed			
Threatened ecological communities listed under the FFG Act	8.510 ha of Western (Basalt) Plains Grassland Community			



Ecological value	Presence		
Patches of Native Vegetation	33.266 ha of native vegetation across eight EVCs (55 Plains Grassy Woodland, 56 Floodplain Riparian Woodland, 125 Plains Grassy Wetland, 132_61 Heavier-soils Plains Grassland, 641 Riparian Woodland, 821 Tall Marsh, 851 Stream Bank Shrubland and 895 Escarpment Shrubland)		
Large trees in patches	• 64 large trees in patches, 36 of these with observable hollows		
Scattered trees	• 86 scattered trees (including 79 small and seven large), five with observable hollows		

4.1.1 Vegetation and Fauna Habitat

The State Project Land can be broadly characterised as a mostly linear extent comprising disturbed, urban areas that are devoid of native vegetation, albeit including a number of discrete areas of high-quality native vegetation and threatened species habitat at various points along its length.

4.1.2 Patches of Native Vegetation

The field assessment identified 188 patches of native vegetation, comprising a total of 33.266 ha.

A summary of EVCs mapped as vegetation patches is provided in Table 4.2. Following this is a brief description of each EVC within the State Project Land and discussion of fauna habitat values provided by that EVC within the State Project Land. Patches of native vegetation classified by EVC are shown on the maps in Appendix E

Impacted Vegetation Mapping. A list of all flora species recorded is provided in Appendix F Flora and Fauna Species Lists and results of the VQA for each patch is detailed in Appendix G Vegetation Quality Assessment (VQA) Results.

EVC	Conservation Status	Occurrence within State Project Land	Total Extent within State Project Land (ha)
55: Plains Grassy Woodland	Endangered	 Occurs in relatively small, degraded fragments across the State Project Land. Includes some areas of revegetation 	1.871
56: Floodplain Riparian Woodland	Endangered	Occurs within the Maribyrnong River Riparian Zone	10.661
125: Plains Grassy Wetland	Endangered	Restricted to linear depressions within the rail corridor	0.170
132_61: Plains Grassland	Endangered	 Large, high-quality stands of Plains Grassland occur within the Sunshine Railway Line Linear Reserve, at Solomon Heights and at River Valley Estate. More degraded and/or fragmented examples of 	8.510
		this EVC occur elsewhere across the State Project Land	
641: Riparian Woodland	Endangered	Restricted to the riparian zone of Moonee Ponds Creek	0.068
821: Tall Marsh	Endangered	Scattered occurrence across the State Project Land in association with depressions, and within Moonee Ponds Creek	0.444
851: Stream Bank Shrubland	Endangered	Occurs in association with Steele Creek and Steele Creek North	3.578
895: Escarpment Shrubland	Endangered	Occurs on the rocky escarpments either side of the Maribyrnong River, including Sunshine North Escarpment, River Valley Estate and Brimbank Park	7.964
Total extent of patches	of native vegetation		33.266

Table 4.2 Extent of patches of native vegetation within the State Project Land by EVC



EVC	Conservation Status	Occurrence within State Project Land	Total Extent within State Project Land (ha)
Total extent endangered	33.266		
Total extent of patches of total native vegetation re	10.685		

4.1.2.1 EVC 55: Plains Grassy Woodland

Plains Grassy Woodland occurred in small, mostly revegetated patches across the State Project Land including north of Sunshine Road, where the Jacana line crosses Moonee Ponds Creek (Figure 4.1), near Luma Estate and within Brimbank Park north of the M80 Ring Road. Along the Jacana line, these plantings comprise an immature canopy of Yellow Box (*Eucalyptus melliodora*) (to approx. 9 m high), over a medium shrub layer (1-5 m high) including Lightwood (*Acacia implexa*), Drooping Sheoak (*Allocasuarina verticillata*), and Hedge Wattle (*Acacia paradoxa*). Within Brimbank Park, the plantings included a canopy layer of River Red Gum and Yellow Box, and notably included planted Fragrant Saltbush (*Rhagodia parabolica*) in the understorey.

Elsewhere, patches of Plains Grassy Woodland were smaller in size and simpler in composition, e.g. mature River Red-gums (*Eucalyptus camaldulensis*) over tanbark mulch with little understorey, or shrubby regrowth of Lightwood over an understorey of introduced grasses.



Figure 4.1: EVC 55 Plains Grassy Woodland present as revegetation along Moonee Ponds Creek

³ As defined in Victoria's Native Vegetation Management Framework DSE (2002). *Victoria's Native Vegetation Management- A Framework for Action*. Department of Sustainability and Environment, Melbourne.



4.1.2.2 EVC 56: Floodplain Riparian Woodland

Floodplain Riparian Woodland was present along the alluvial terraces either side of the Maribyrnong River (Figure 4.2). Floodplain Riparian Woodland extends both to the north and south of the State Project Land along the Maribyrnong River. Only the area within the State Project Land has been assessed for this impact assessment.

This EVC was largely distinguished by a canopy of River Red-gum, many of which were classified as large trees (greater than 80 cm DBH). The shrub layer included Tree Violet (*Melicytus dentatus*), Sweet Bursaria (*Bursaria spinosa* ssp. *spinosa*) and Silver Wattle (*Acacia dealbata*). Along the banks and within the floodplain were River Club-sedge (*Schoenoplectus tabernaemontani*), Rush (*Juncus spp.*) and Scrub Nettle (*Urtica incisa*).

Weed invasion from the surrounding area was significant, with Toowoomba Canary-grass (*Phalaris aquatica*), Fennel (*Foeniculum vulgare*), African Box-thorn (*Lycium ferocissimum*), Blackberry (*Rubus fruticosus* spp. agg), Twiggy Turnip (*Brassica fruticulosa*) and Purple-top Verbena (*Verbena bonariensis*) commonly recorded.



Figure 4.2 Floodplain Riparian Woodland present along the Maribyrnong River beyond the River Valley Estate



4.1.2.3 EVC 125: Plains Grassy Wetland

Three patches of this EVC occur within the State Project Land, including two small patches in a disturbed drainage line along Gilmour Road, Albion within the rail corridor. These patches were dominated by Narrowleaf Cumbungi (*Typha domingensis*) and quickly gave way to disturbed weedy species. A higher quality example of this community occurs within the rail corridor adjacent to the Sunshine Triangle Ecological Site, fringing a patch of Tall Marsh (Figure 4.3). Here the patch was dominated by more grassy species including Common Swamp-wallaby Grass (*Amphibromus nervosus*), Common Blown Grass (*Lachnagrostis filiformis*) and Brown-back Wallaby Grass (*Rytidosperma duttonianum*).



Figure 4.3: Plains Grassy Wetland present within the rail corridor adjacent to the Sunshine Triangle Ecological Site





Several patches of Plains Grassland EVC were detected throughout the State Project Land, though the quality varied substantially. The low-quality patches comprised of high weed cover and a 25% cover of native species, while higher quality patches were dominated by native grasses.

High quality patches had greater species diversity, and were dominated by Kangaroo grass (*Themeda triandra*) and included a diverse range of herbs interspersed amongst the tussocks, such as Lemon Beautyheads (*Calocephalus citreus*) and Blushing Bindweed (*Convolvulus angustissimus* subsp. *angustissimus*). Other grasses present included Grey Tussock Grass (*Poa sieberiana*) and Windmill Grass (*Chloris truncata*).

Lower quality patches comprised of Berry Saltbush (*Atriplex semibaccata*), Blushing Bindweed, and spear and wallaby grasses (*Austrostipa* spp. and *Rytidosperma* spp.).

Dominant weed species recorded in and surrounding patches of Plains Grassland included grassy weeds such as Serrated Tussock (*Nassella trichotoma*), Chilean Needle-grass (*Nassella neesiana*), Cocksfoot (*Dactylis glomerata*), Rye grass (*Lolium* spp.) and Toowoomba Canary-grass, as well as Artichoke Thistle (*Cynara cardunculus*), Ribwort (*Plantago lanceolata*), Clovers (*Trifolium* spp.), and African Box-thorn. In lower-quality patches, the native herb layer was often displaced almost entirely by introduced species, and native grasses were commonly reduced to less than half of the grass layer.

Plains Grassland is also likely to occur at Border Drive Reserve in Keilor East as noted by ABZECO (2021) in an assessment undertaken in January 2021. Detailed assessment of the vegetation at Border Drive Reserve will be undertaken in summer 2021/2022 to determine the extent and quality of native vegetation in this location, as well as the presence/absence of Golden Sun Moth. While yet to be assessed in targeted surveys by AJM-JV, the central portion of Border Drive Reserve has conservatively been deemed a No-Go Zone (NGZ 23) to avoid any potential impacts to this area.



Figure 4.4: Plains Grassland present at River Valley Estate dominated by Kangaroo Grass, with introduced Serrated Tussock present and some surface basalt rocks providing fauna habitat



4.1.2.5 EVC 641: Riparian Woodland

Riparian Woodland within the State Project Land is restricted to the margins of Moonee Ponds Creek. This vegetation comprised a River Red-gum canopy over a mid-storey of Blackwood (*Acacia melanoxylon*), and a shrubby understorey of Sweet Bursaria and Swamp Paperbark (*Melaleuca ericifolia*). Ground layer vegetation was largely restricted to introduced grasses, namely Cocksfoot. In-stream areas were dominated by Common Reed (*Phragmites australis*).



Figure 4.5: EVC 641 Riparian Woodland present along Moonee Ponds Creek



4.1.2.6 EVC 821: Tall Marsh

Tall Marsh was recorded in small patches in the State Project Land including south of the M80 Ring Road and within the Moonee Ponds Creek. Tall Marsh was confined to damp depressions and largely characterised by a monoculture of Narrowleaf Cumbungi (*Typha domingensis*). Some patches included additional species at the fringes such as native rushes (*Juncus* spp.).



Figure 4.6: EVC 821 Tall Marsh present within the Old Sunshine Tip Site


4.1.2.7 EVC 851: Stream Bank Shrubland

Stream Bank Shrubland was present along Steele Creek North, and comprised River Red-gum as the dominant tree species, as well as a shrub layer of Tree Violet, Silver Wattle and Blackwood (Figure 4.7). The stream itself was dominated by Narrowleaf Cumbungi and Common Reed. Herb cover along the stream bank included Slender Knotweed (*Persicaria decipiens*) and Kidney-weed (*Dichondra repens*). The area had a high abundance of weeds from continual disturbance of illegal dumping along the creek line. Weeds present included Blackberry, Pepper Tree, Toowoomba Canary-grass, Chilean Needle Grass and Serrated Tussock.



Figure 4.7 EVC 851 Stream Bank Shrubland present along Steele Creek within the M80 North Zone



4.1.2.8 895: Escarpment Shrubland

Escarpment Shrubland was present on both sides of the Maribyrnong River escarpment (Figure 4.8). Vegetation present on the east side of the escarpment had largely been planted for conservation purposes and supported adequate species diversity and cover of native flora species to be classified and assessed as native vegetation. Patches on the west side of Maribyrnong River were comparatively degraded, supporting a sparse cover of woody species and high cover of both native and introduced grasses.

Escarpment Shrubland recorded comprised a sparse cover of River Red-gum and Yellow Box in the canopy layer, shrub layer dominated by Sweet Bursaria, Drooping She-oak, and native grass layer of Grey-Tussock Grass, Common Wallaby-grass and Kangaroo Grass. Native herbs such as Kidney Weed were common. Weed cover was high on both sides of the Maribyrnong River escarpment, and was largely attributable to Toowoomba Canary-grass on the eastern side and Serrated Tussock on the western side of the Maribyrnong River.



Figure 4.8: Patches of Escarpment Shrubland adjacent to the Maribyrnong River



4.1.3 Scattered Trees and Large Trees in patches

In accordance with the Guidelines, scattered trees and large trees within patches were mapped. These included:

- 86 Scattered Trees, comprising:
 - > 79 small trees, and
 - > 7 large trees (five of which were found to support observable hollows)
 - > 64 large trees in patches (36 of which were found to support observable hollows)

These trees are mapped in Appendix E Impacted Vegetation Mapping, and are listed in the tree register in Appendix H List of Scattered Trees and Large Trees in patches.

4.1.4 Other Vegetation

Outside patches of native vegetation, the State Project Land comprised of introduced vegetation, and plantings. Where relevant to this impact assessment (e.g. the provision of threatened fauna habitat), discussion of this vegetation is provided below.

4.1.4.1 Amenity Plantings

Given the highly urbanised context, the State Project Land features many plantings across its extent. Commonly recorded planted tree species included Sugar Gums (*Eucalyptus cladocalyx*), Southern Mahogany (*Eucalyptus botryoides*) and Spotted Gum (*Corymbia maculata*). Some plantings featured native vegetation such as River Red-gums (see Section 3.2.1.2 which describes the method used to define the purpose of a planting). Other species included fruit trees and a variety of showy introduced species including daisies, and other flowering plants.

Flowering trees such as eucalypts provide foraging opportunities for nectivorous and insectivorous species. Fruit bearing trees offer potential foraging opportunities for frugivores such as the Grey-headed Flying Fox.

4.1.4.2 Introduced Tussock Grasslands

Introduced tussock grasslands, principally comprising Chilean Needle-grass and Serrated Tussock were identified at a number of locations in the State Project Land and form potential habitat for the threatened Striped Legless Lizard and Golden Sun Moth.



Figure 4.9 Introduced grassland at M80 North Zone dominated by Serrated Tussock, Chilean Needle-grass and Artichoke Thistle, all listed as noxious weeds but providing habitat for the Striped Legless Lizard



4.2 Wetlands and Waterways

4.2.1 Wetlands of International Significance

One wetland of international importance (Ramsar Wetland) was identified in the desktop phase as being potentially relevant to the Project: Port Phillip Bay (western shoreline) and Bellarine Peninsula (within 10 km of the State Project Land as modelled in the attached Appendix C

PMST Search. It is unlikely that there would be a significant impact on this wetland due to how remote it is from parts of the State Project Land where substantial earthworks are proposed to take place in the vicinity of larger waterways. The closest proximity of such works to the Ramsar wetland are those that will take place at the Maribyrnong River Bridge, which is approximately 21 km upstream from the Ramsar site, with the Point Cook Section of the Ramsar site being the closest point.

4.2.2 DELWP-Mapped Wetlands

DELWP-mapped wetlands (DELWP 2017b) are considered areas of native vegetation under the Guidelines. No DELWP-mapped wetlands occur within the State Project Land.

4.2.3 Waterways

A number of waterways intersect the State Project Land:

- Maribyrnong River
- Moonee Ponds Creek
- Steele Creek and Steele Creek North
- Stony Creek

Although this impact assessment focusses on terrestrial ecology, the presence of these waterways within the State Project Land have been considered when assessing impacts to some threatened species (e.g. the Growling Grass Frog).

4.3 Landscape Context

Although the ecological values within the State Project Land are relatively isolated from one another by the urban landscape, a number of landscape patterns exist that must be considered when assessing terrestrial ecological impacts. These include:

- Terrestrial dispersal corridors
- Aquatic dispersal corridors

The State Project Land and surrounds have been extensively modified for housing and industrial development within Melbourne's west and north. There remains few significant landscape features or vegetation corridors providing dispersal opportunities for terrestrial fauna, apart from the Maribyrnong River valley. The Maribyrnong River provides an important remnant corridor of native and introduced vegetation that extends from the agricultural land past Melbourne Airport to Melbourne's inner western suburbs. With regards to the State Project Land, the Maribyrnong River valley corridor connects Brimbank Park, which consists of a large reserve to the north and more suburban parks and reserves heading south. This vegetated corridor provides important dispersal opportunities for a range of mammals, birds and reptiles.

The riparian corridor along Maribyrnong River contains a continuous canopy of large remnant River Redgums and understorey *Acacia* spp. which provide important habitat for a variety of birds which utilise these resources for foraging and dispersal. The rocky escarpments, with native and introduced shrubs, provide different habitat resources that are utilised by other small birds for nesting and protection. The riparian corridors along Moonee Ponds Creek and Steele Creek additionally contain remnant River Red-gums and understorey shrubs that along with the planted eucalypts in the adjoining urban landscape, provide further habitat linkages.



The remnant native grasslands on the plateau above the western escarpment of the Maribyrnong River valley represent one of the larger remnants of this endangered community in greater Melbourne. A population of Eastern Grey Kangaroos (*Macropus giganteus*) were observed during site assessments in the River Valley Estate. It is likely the kangaroo population utilises the existing corridor underneath the M80 freeway and existing rail bridge to disperse between the River Valley Estate, Sunshine North Escarpment and Brimbank Park. Maintaining this corridor is vital for their, and other species' persistence at the site.

The main aquatic dispersal corridors through the State Project Land consist of the Maribyrnong River, Moonee Ponds Creek, Steele Creek and to a lesser extent Stony Creek. The latter exists as a concrete channel through sections which limit its habitat value for fauna. The values of the Maribyrnong River have been discussed above, but additionally as a major waterway, the Maribyrnong River provides vital aquatic dispersal opportunities between the ocean and upstream waterways. Migratory fish species such as the threatened Australian Grayling (*Prototroctes maraena*) rely on major waterways to migrate between marine and freshwater to breed.

Further discussion of aquatic values in the State Project Land are provided in MAR State Land Aquatic Ecology and Geomorphology Impact Assessment (MAR-AJM-PWD-PWD-REP-XEV-NAP-0001711).

4.4 Threatened Ecological Communities

Two threatened Ecological Communities were mapped within the State Project Land:

- Natural temperate grassland of the Victorian Volcanic Plain (NTGVVP) (listed as Critically endangered under the EPBC Act), and
- Western (Basalt) Plains Grassland (WBPG) (listed as threatened under the FFG Act).

These communities and their occurrence within the State Project Land are described in more detail below.

4.4.1 Natural Temperate Grassland of the Victorian Volcanic Plain

NTGVVP is listed as Critically Endangered under the EPBC Act. NTGVVP was identified when a patch of Plains Grassland was deemed to meet the following criteria as stipulated in the listing advice for the community (DEWHA 2011b):

- Native vegetation cover was more than 50% of the ground cover and is therefore dominant; and
- The patch was at least 0.05 ha in size; and
- The total perennial tussock cover represented by the above mentioned four native grass genera was at least 50%; or
- Non-grass weed cover was less than 30% of ground cover across the patch; or
- Native forbs comprised at least 50% of total vegetation cover during spring-summer.

A total of 5.960 ha of NTGVVP was recorded within the State Project Land in the following locations:

- Sunshine Railway Line Linear Reserve (1.235 ha)
- St Albans Road Biosites (0.369 ha)
- Old Sunshine Tip Site (0.540 ha)
- Solomon Heights and adjacent rail corridor (0.360 ha)
- River Valley Estate and adjacent rail corridor (2.401 ha)
- M80 South Powerline Easement (0.073 ha)
- M80 North Zone (0.290 ha)
- Border Drive Reserve (0.692 ha)



Occurrences of NTGVVP within the State Project Land recorded by AJM-JV are mapped in Appendix J Threatened Species Mapping. NTGVVP also occurs adjacent to (outside the State Project Land) at Matthews Hill Reserve and in the Sunshine Triangle Ecological Site.

Areas of NTGVVP recorded in the State Project Land were mostly associated with high quality patches of Plains Grassland (EVC 132) and were largely characterised by a dominant cover of Kangaroo Grass (*Themeda triandra*) (typically comprising 40-60% total cover, but always exceeding 50% of cover proportionately). The most intact examples of this community were found in the River Valley Estate which also included 10% cover of wallaby grasses (*Rytidosperma* spp.) and spear grasses (*Austrostipa* spp.), along with a variety of herbs including Lemon Beauty-heads (*Calocephalus citreus*), Sheep's Burr (*Acaena echinata*), Narrow-leaf Plantain (*Plantago gaudichaudii*) and Common Woodruff (*Asperula conferta*). Similarly, high-quality examples of this community were found at the St. Albans Road Biosites, the Old Sunshine Tip Site, within Solomon Heights (including examples of the community adjacent to the Jacana rail corridor, outside the rail corridor), and the M80 North Zone, where spear grass dominant examples of the community were also present.

Outside of these higher-quality examples of this community, occurrences elsewhere were comparatively more degraded. Adjacent to the Solomon Heights and the River Valley Estate, the margins of broader patches of NTGVVP occur in the adjacent rail corridor, and also into the Munro Avenue Road easement. These patches were observed to be notably more degraded. These areas maintain a dominant cover of Kangaroo Grass (>50% proportionally to other perennial species), however the total cover in these locations was observed to be less than the above-mentioned higher-quality examples (around 30% total cover). These more disturbed locations were subject to greater weed invasion typically by Toowoomba Canary Grass (*Phalaris aquatica*), Cocksfoot (*Dactylis glomeratus*), and Brome (*Bromus* sp.), and were characterised by a paucity of forb species.

Low-quality patches of NTGVVP also occur at Border Drive Reserve and the M80 South Powerline Easement. Although these patches meet the criteria for classification as NTGVVP on the basis of native grass cover, they are considered to be of limited ecological value. Extensive soil disturbance is evident at both patches as indicated by the even, flattened surfaces, a scarcity of embedded surface rock, and a negligible representation of native forbs (total cover <1%). The high cover of wallaby grass at the Border Drive Reserve site, along with the recreational use of this area, suggests that the grassland in this area is likely to have recolonised following previous disturbance.





Figure 4.10 NTGVVP recorded at the M80 North Zone with Steele's Creek in the background

4.4.2 Western (Basalt) Plains Grassland

A total of 8.510 ha of WBPG was mapped within the State Project Land.

The WBPG is an open grassland community found mainly on undisturbed, poorly-drained heavy clay soils on the basalt plains of western Victoria. These soils are usually waterlogged in winter and very hard, dry and cracking in summer. The vegetation is characteristically dominated by perennial native grasses, with very few eucalypts and shrubs.

This community occurred across the State Project Land, and for the purposes of this assessment, is considered to be synonymous with EVC 132 (i.e. all areas of EVC 132 Plains Grassland recorded in the State Project Land have been classified as WBPG). See Section 4.1.2.4 for the description of this EVC in the State Project Land.



4.4.3 Threatened Ecological Communities not present within the State Project Land

A number of threatened ecological communities were noted as having the potential to occur in the search region based on the desktop assessment, though have since been determined as absent in the State Project Land based on the result of detailed field assessments. These communities, and justification of their determination of absence in the State Project Land are summarised in Table 4.3 below.

Threatened Ecological community	Conservation Status		Discussion of Absence	
	EPBC Act	FFG Act		
Matters of National Environme	ental Sign	ificance		
Grassy Eucalypt Woodland of the Victorian Volcanic Plain	CR	n/a	Although this community was indicated in the PMST report as being known to occur within 5 km, the State Project Land supported limited woody vegetation, with no woodlands within the State Project Land found to meet the size or quality criteria to be considered for this community.	
			As such, this threatened ecological community does not occur within the State Project Land.	
Grey Box (<i>Eucalyptus</i> <i>microcarpa</i>) Grassy Woodlands and Derived	EN	n/a	Although this community was indicated in the attached PMST report as potentially occurring within 5 km, the State Project Land did not support any patches of Grey Box dominated woodland.	
Native Grasslands of South- eastern Australia			As such, this threatened ecological community does not occur within the State Project Land.	
Natural Damp Grassland of the Victorian Coastal Plains	CR	n/a	Although this community was indicated in the attached PMST as potentially occurring within 5 km, the State Project Land did not support any coastal grasslands. Patches of grassland within the State Project Land were found exclusively on the Victorian Volcanic Plain, making them ineligible for consideration as this community.	
			As such, this threatened ecological community does not occur within the State Project Land.	
Subtropical and Temperate Coastal Saltmarsh	VU	n/a	Although this community was indicated that the attached PMST report as potentially occurring within 5 km, the State Project Land occurred inland and as such, did not support any saltmarsh vegetation.	
			As such, this threatened ecological community does not occur within the State Project Land.	
White Box-Yellow Box- Blakely's Red Gum Grassy Woodland and Derived Native Grassland	CR	n/a	Only one of the three species that characterise this community, namely Yellow Box, was present within the State Project Land. However, where this species occurred, it was a component of plantings. None of these plantings met the intent, size or quality criteria to be classified as this community.	
			As such, this threatened ecological community does not occur within the State Project Land.	
Threatened Communities of State Significance				
Western Basalt Plains (River Red Gum) Grassy Woodland	n/a	L	Although the potential presence of this community within the State Project Land was indicated by the modelled occurrence of the Plains Grassy Woodland EVC within the State Project Land, in practice, areas supporting the characteristic canopy species of River Red-gum were either riparian in nature, or did not include the grassy understorey component of the community.	
			As such, this threatened community does not occur within the State Project Land.	

Table 4.3	Threatened communities absent from the State Project Land despite their consideration in the desktop assessment
10010 110	



4.5 Threatened, Protected and Migratory Species

4.5.1 Threatened Species

Thirty-six (36) threatened species (including 10 threatened flora and 26 threatened fauna, listed as threatened under the EPBC Act, and/or the FFG Act) are considered to have a moderate or higher likelihood of occurrence within the State Project Land. This includes threatened species which have been confirmed within and adjacent to the State Project Land. Full details of the likelihood of occurrence assessment of these species is presented in Appendix I

Threatened Species Likelihood of Occurence.

Of the 36 species considered to have a moderate or higher likelihood of occurrence, 20 of these (mostly birds, but also including the Grey-headed Flying-Fox and Yellow-bellied Sheathtail bat) are considered to have a negligible likelihood of impact as a result of the Project works. This is due to at least one of the following reasons:

- Utilisation of the State Project Land by these species is considered to be sporadic in nature; and/or
- The species has a high dispersal potential and habitat for this species is relatively well-represented in the surrounding landscape compared to the extent within the State Project Land.
- As such, these species are assessed in Appendix I Threatened Species Likelihood of Occurence, and not discussed further in the body of this assessment report.
- The remaining 16 threatened species (including ten threatened flora and six threatened fauna) with a moderate or higher likelihood of occurrence are discussed in Table 4.4 below.
- It is to be noted that fish have not been considered as part of this terrestrial ecology impact assessment. Threatened fish species are considered in a separate aquatic ecology assessment which has been undertaken for the Project (AJM-JV 2021).

Table 4.4	Summary of threatened species considered to have a moderate or higher likelihood of occurring within the State Project
	Land. Threatened species listed under the EPBC Act are listed first in bold .

Scientific Name	Common Name	Conservation Status		Presence within or
		EPBC Act	FFG Act	Adjacent to the State Project Land
Flora				
Diuris fragrantissima	Sunshine Diuris	Endangered	Critically Endangered	Known adjacent to the State Project Land (in the Sunshine Triangle Ecological Site). Does not occur in
				State Project Land
Pimelea spinescens subsp. spinescens	Spiny Rice-flower	Critically Endangered	Critically Endangered	Confirmed
Senecio macrocarpus	Large-headed Fireweed	Vulnerable	Critically Endangered	Confirmed adjacent to the State Project Land (in Matthews Hill Reserve). Unlikely to occur in
				State Project Land
Cladium procerum	Leafy Twig-sedge	-	Endangered	Moderate
Dianella longifolia var. grandis	Arching Flax-lily	-	Critically Endangered	Confirmed
Eucalyptus X studleyensis	Studley Park Gum	-	Critically Endangered	Confirmed
Geranium sp. 3	Pale-flower Crane's-bill		Endangered	Moderate



Scientific Name	Common Name	Conservation Status		Presence within or
		EPBC Act	FFG Act	Project Land
Nicotiana suaveolens	Austral Tobacco	-	Endangered	Confirmed
Rhagodia parabolica	Fragrant Saltbush	-	Vulnerable	Confirmed
Tripogonella loliiformis	Rye Beetle-grass	-	Endangered	Moderate
Fauna				
Delma impar	Striped Legless Lizard	Vulnerable	Endangered	Confirmed
Litoria raniformis	Growling Grass Frog	Vulnerable	Vulnerable	Confirmed
Synemon plana	Golden Sun Moth	Critically endangered	Vulnerable	High
Pseudemoia pagenstecheri	Tussock Skink	-	Endangered	Confirmed
Pseudophryne bibronii	Brown Toadlet	-	Endangered	Moderate
Ornithorhynchus anatinus	Platypus	-	Vulnerable	Moderate

4.5.1.1 Spiny Rice-flower

77 Spiny Rice-flower plants were mapped within the State Project Land.

Targeted surveys recorded the species within the State Project Land in the following locations:

- The rail corridor adjacent to the Sunshine Triangle Ecological Site (12 plants)
- St. Albans Road Biosites (8 plants)
- The Old Sunshine Tip site (1 plant)
- River Valley Estate and adjacent rail corridor (54 plants see Figure 4.11)
- Solomon Heights, Munro Avenue (2 plants)

Further, two plants were recorded within the Munro Avenue Road reserve during previous targeted survey. As Solomon Heights has been subject to recent targeted survey for Spiny Rice-flower (Biosis 2016, EHP 2020), targeted survey was not warranted at this location. However, records within or nearby to the Corridor Section Project Land were visited by this study to verify the presence of the species at these locations. These locations included immediately outside the Corridor Section Project Land on the western boundary of Solomon Heights, and within the Munro Avenue Road Reserve in the south of Solomon Heights.

In addition, Spiny Rice-flower is known to occur adjacent to the State Project Land at two locations:

- Within the land adjacent to Matthews Hill Reserve (17 plants recorded during targeted surveys undertaken as part of this assessment).
- Within Solomon Heights

Individuals recorded within the State Project Land are mapped in Appendix D Targeted Fauna Survey Results and Mapping.

These findings are consistent with the results of previous survey effort within the State Project Land. Targeted survey for the species was undertaken at the River Valley Estate, with Spiny Rice-flower being recorded by this assessment at locations identified in that previous reporting (BLA 2018).

Potentially suitable habitat identified elsewhere within the Project area was subject to targeted survey for the species with none recorded. It is considered unlikely that Spiny Rice-flower occurs elsewhere within the State Project Land.



4.5.1.2 Sunshine Diuris

Sunshine Diuris is known to occur adjacent to the Sunshine Section Project Land within the Sunshine Triangle Ecological Site. Although outside the Sunshine Section Project Land, the potential for indirect impacts to this species from the Project have been considered as part of this assessment.

4.5.1.3 Large-headed Fireweed

Having undertaken targeted surveys for this species within all areas of suitable habitat within the State Project Land, Large-headed Fireweed is considered unlikely to occur within the State Project Land. The species has been confirmed to occur during targeted surveys within Matthews Hill Reserve, outside the State Project Land. Matthews Hill Reserve does not form part of the State Project Land.

4.5.1.4 Leafy Twig-sedge

This species has a moderate likelihood of occurrence within the State Project Land within the Maribyrnong River and Moonee Ponds Creek. This species has been recorded once within 5 km of the State Project Land, within the Jacana Northern Wetland along Moonee Ponds Creek, less than 3 km upstream of where the Moonee ponds Creek intersects the State Project Land. Although extensive swampy habitat like that at Jacana Wetlands does not occur within the State Project Land, Moonee Ponds Creek and the Maribyrnong River support suitable stream-margin habitat for this species.

Targeted surveys for this species were conducted where the construction footprint intersects with Moonee Ponds Creek and the Maribyrnong River. Therefore, while the species has a moderate likelihood of occurring within the State Project Land, it is considered unlikely to occur within the construction footprint.

4.5.1.5 Arching Flax Lily

Targeted surveys within suitable habitat recorded 102 Individuals of this species within the State Project Land across a number of locations. Locations Include:

- Rail corridor adjacent to the Sunshine Diuris Ecological Site (10 plants)
- Sunshine North Escarpment (1 plants)
- St. Albans Road Biosites (3 plants)
- Old Sunshine Tip Site (63 plants)
- River Valley Estate (9 plants)
- M80 North Zone (16 plants)

These locations are consistent with previous studies and VBA records of the species. The species was located within the River Valley Estate as per the previous Brett Land and Associates (BLA) study in that location (BLA 2018), and recorded consistently with VBA records in Sunshine and St Albans. The species was also recorded in a location that had not yet been recorded on the VBA within the M80 North Zone.

Targeted survey within Solomon Heights was restricted to Munro Avenue in the South of the estate. The area of the estate that overlaps with the State Project Land adjacent to the Jacana Rail Line was not subject to targeted survey. However, the species is considered unlikely to occur in that location, with previous studies of Solomon Heights recording the species only in in areas of that estate that do not intersect the State Project Land. Further, the portion of Solomon heights that intersects the State Project Land along the Jacana rail line has been designated as a no-go zone, meaning impacts to the species in this location are unlikely.

4.5.1.6 Studley Park Gum

One Studley Park Gum (*Eucalyptus* x *studleyensis*) (listed as critically endangered under the FFG Act) was recorded within the State Project Land, in the riparian zone of the Maribyrnong River. Given the highly variable nature of Eucalypt hybrids, and the location of this individual outside of the expected range of this species, verification of the species of this tree was sought from the National Herbarium of Victoria, where the



species was identified as a likely Studley Park Gum (V. Stajsic 2021, personal communication (email), 25 May). The origin of this tree within the State Project Land is unknown, although the occurrence outside the species range, and the location next to a SUP suggests the individual may have been planted.

No other individuals of this species were observed within the State Project Land, and the occurrence of additional individuals within the State Project Land is considered unlikely.

4.5.1.7 Pale-flower Crane's-bill

This species has a moderate likelihood of occurrence within the high-quality grasslands within the River Valley Estate and Solomon Heights. This species was not recorded by targeted surveys in areas of suitable habitat. However, with the species having recently been previously recorded within the River Valley Estate, it is considered that there is a moderate likelihood of occurrence within the relatively intact patches of Plains Grassland (those classified as NTGVVP) within the River Valley Estate and Solomon Heights.

This species is unlikely to occur elsewhere within the State Project Land, including the degraded grassland fringes that extend into Munro Avenue and the Jacana rail corridor from Solomon Heights and the River Valley estate. These fringes are observably more degraded than the grasslands within either Solomon Heights or the River Valley Estate, with a high degree of weed invasion and poor representation of native forbs.

4.5.1.8 Austral Tobacco

One individual was recorded within the State Project Land within a higher-quality patch of Escarpment Shrubland within the Sunshine North Escarpment assessment area. The location of this species was recorded consistently with a previous investigation by Biosis (2016).

Neither the present study, or any of the previous survey effort within Solomon Heights, Sunshine North Escarpment and the River Valley Estate has located the species elsewhere within these locations. Given the extensive levels of survey that these areas have been subject to over the past decade, it is likely that this location is the only occurrence in that location. Elsewhere within the State Project Land, potentially suitable habitat is restricted to the rocky escarpment shrubland on the east side of the Maribyrnong River Valley. The species was not recorded in that location during vegetation survey. Further, the ground layer in that area was dominated by Toowoomba Canary-grass and other introduced perennial grasses. It is considered that the species is unlikely to occur in that location.

4.5.1.9 Fragrant Saltbush

30 individuals were recorded within the State Project Land including in the following locations:

- Luma Estate (4 plants)
- River Valley Estate (1 plant)
- Brimbank Park (24 plants), and
- M80 North Zone (1 plant).

Only the plants that occur at the River Valley Estate and the M80 North Zone are considered to represent members of existing wild populations of this species. Individuals within Brimbank Park consist of both planted individuals and recruits, while the individuals at the Luma Estate also occur in a garden bed, also indicating they are likely the offspring of planted individuals.

The species is considered unlikely to occur elsewhere within the State Project Land, having not been recorded during field assessments, this is consistent with VBA records in the vicinity of the State Project Land.

4.5.1.10 Rye Beetle Grass

Although not recorded within the State Project Land, this species is considered to have a moderate likelihood of occurrence in the higher-quality grasslands (i.e., those classified as NTGVVP) within the Solomon



Heights, the River Valley Estate, and the St. Albans Road Biosites, with the species having recently been previously recorded nearby to those locations.

The species is considered unlikely to occur elsewhere within the State Project Land, having not been recorded during field assessments, this is consistent with VBA records in the vicinity of the State Project Land.

4.5.1.11 Striped Legless Lizard

12.115 ha of Striped Legless Lizard (SLL) habitat was mapped within the State Project Land. This included 3.191 ha of native vegetation and 8.924 ha of non-native vegetation. Habitat considered likely to be utilised by the Striped Legless Lizard within the State Project Land (mapped in Appendix J Threatened Species Mapping) is considered to occur in the following locations:

- Sunshine Linear Railway Reserve (4.185 ha)
- Luma Estate (0.575 ha)
- St. Albans Road Biosites (0.770 ha)
- Old Sunshine Tip Site (0.897 ha)
- Solomon Heights (including Munro Avenue in the South and the adjacent rail corridor) (0.885 ha)
- M80 North Zone (presence confirmed through targeted survey) (4.803 ha)

Targeted surveys detected Striped Legless Lizard a total of 22 times at the St. Albans Road Biosites and 17 times at the M80 North Zone (see detection in Figure 4.12), thus confirming the presence of Striped Legless Lizard at these locations. Potentially suitable habitat (characterised by a good tussock structure) subject to targeted survey elsewhere within the State Project Land did not detect the species, and it is thus considered unlikely that the species occurs at these locations. This is consistent with VBA records in the landscape, with records of SLL nearby to the State Project Land being nearby to the St. Albans Road Biosites, and the M80 North Zone.

Although no targeted surveys were undertaken within Solomon Heights by this assessment, Striped Legless Lizard are considered highly likely to occur within Solomon Heights. AZBECO performed artificial shelter surveys within this estate in 2016 and recorded the species, concluding that the species was highly likely to utilise the high quality tussock grassland within Solomon Heights, including the eastern edge of the estate bounded by the Jacana railway line that is within the Corridor Section Project Land (ABZECO 2016). Additional areas within the State Project Land considered likely to support the species, without having undertaken targeted survey include the Old Sunshine Tip Site that supports a known population (O'Shea 2013), and Sunshine Linear Railway Reserve, where the species has been recorded recently.

Further, one area of potential habitat within the Luma Estate, was not subject to targeted survey as it was added to the State Project Land following the completion of artificial shelter surveys. As this location provides suitable habitat for the species and targeted survey has not been carried out, for the purposes of this assessment this location is considered to be Striped Legless Lizard habitat. This location has been designated a No-Go Zone to protect the values present.

Elsewhere within the State Project Land, the likelihood of occurrence is considered to be low. All additional areas of potentially suitable habitat, characterised by good tussock structure of native and/or introduced species for the species, were subject to targeted survey, with no individuals detected. Those additional areas include:

- Sunshine North Escarpment
- River Valley Estate
- Jacana rail corridor adjacent to the River Valley Estate and Solomon Heights.
- Brimbank Park
- M80 South Powerline Easement



Notably, two of these areas (The River Valley Estate, and the Jacana rail line adjacent to Solomon Heights and the River Valley Estate) are adjacent to Solomon Heights, an area supporting an existing population of the species. Despite the likely presence of this species within Solomon Heights, it is considered unlikely that the rail corridor adjacent to the estate also supports this species. Targeted survey was undertaken as part of this assessment within the rail corridor along the boundary of the Solomon Heights Estate during the 2019-2020 survey season and did not detect Striped Legless Lizard within the rail corridor at that location. The results of that survey are considered to be valid, having recorded SLL elsewhere in the rail network in the 2019-20 survey season. Further, the results of that survey are considered to reflect the poor habitat quality for the species at that location. Despite small incursions of grassland into the rail corridor from the Solomon Heights estate, the habitat available to the species within the rail corridor is marginal, with tussock structure notably poorer than the habitat across the boundary of the adjacent Solomon Heights estate. The grassland remnants in the rail corridor comprise a high level of bare ground, and invasion by non-tussock forming introduced grass species such as Cocksfoot grass at the time of the assessment.

Similarly, the River Valley Estate (where the species is unlikely to be present) shares a boundary with Solomon Heights. In practice however, the grassland habitat present at both of these estates have a high degree of isolation from one another, with a linear spoil pile separating the estates along much of their length. This separation between the two areas is consistent with the determination that SLL would occur at Solomon Heights, but not the River Valley Estate. Further, the findings are consistent with previous investigations by BLA who similarly did not record the species in their artificial shelter surveys within that location (BLA 2018).

4.5.1.12 Growling Grass Frog

Growling Grass Frog is considered to utilise habitat within the Maribyrnong River, Steele Creek and Steele Creek North, and Moonee Ponds Creek to varying degrees. These reaches and potential utilisation by the Growling Grass Frog within the Corridor Section Project Land are discussed below.

4.5.1.12.1 Maribyrnong River

The species was recorded within the Maribyrnong River during targeted surveys undertaken as part of this assessment in 2019. This is consistent with extensive VBA records within this reach, indicating that the Maribyrnong River reach is used extensively by the species.

Habitat values available to Growling Grass Frog within the Maribyrnong River reach are primarily concentrated to the waterbody itself, and the adjacent riparian woodland. The waterbody itself forms a key dispersal corridor for the species through the landscape, and slower-flowing, deeper sections provide potential breeding habitat. Despite heavy invasion from grassy weed species, the surrounding riparian woodland provides a structurally complex habitat at the ground layer incorporating rocks, logs and other coarse debris which form potential over-wintering opportunities for the species.

Beyond the relatively narrow band of riparian vegetation there is negligible habitat for the species. Within the State Project Land, the riparian woodland quickly gives way to steeper terrain that is drier, and characterised by a mosaic of areas dominated by introduced grasses, as well as fragmented patches of escarpment shrubland, with no waterbodies to provide potential breeding habitat. Although it cannot be ruled out that individuals may venture beyond the riparian zone seeking overwintering opportunities or potential breeding habitat, the habitat at this location is considered to be of negligible importance to the Growling Grass Frog metapopulation utilising the Maribyrnong River.

4.5.1.12.2 Steele Creek/Steele Creek North Reach

One Growling Grass Frog individual was heard calling during targeted surveys in 2018/19 of this reach within the Corridor Section Project Land, confirming that the species utilises the reach to some extent. This individual was heard calling from the M80 retention basin within the M80 North Zone (see Figure 4.11)

However, no other Growling Grass Frogs were heard or seen at the M80 retention basin or the adjacent Steele Creek during other surveys undertaken during the 2018/19 survey season. Subsequent targeted surveys along Steele Creek and Steele Creek North during the 2019/20 survey season, and in the M80 retention basin during the 2020/21 survey season did not identify any Growling Grass Frog activity at either of these locations in the two years following recording one individual. It is considered that the occurrence



within the M80 retention basin was that of a dispersing individual, and that it is unlikely the species currently breeds at that location or within the Steele Creek/Steele Creek North.

Across three years of survey, only the one individual was recorded calling in the M80 retention basin. Further, no tadpoles were observed in the basin or Steele Creek through torchlight visual observation of the water column, only an abundance of Mosquito Fish (*Gambusia holbrooki*), a contra-indicator for breeding populations of the species. These findings align with a scarcity of VBA records of the species within the Steele Creek/Steele Creek North overall, with the species only having been recorded once elsewhere in the reach in 1988, indicating that this reach is one that is less utilised by the species than the Maribyrnong River and Moonee Ponds Creek.

Limited utilisation of this reach by the species is supported by the habitat values present where the reach intersects the State Project Land. Although the waterbodies of Steele Creek and Steele Creek North are suitable for dispersal of the species through the landscape, the in-stream habitat presented by the waterbodies provides limited opportunity for breeding. The channel is deeply incised, and generally lacks deep pools with high quality fringing and emergent vegetation which is required by this species for breeding. Steele Creek is also prone to flash high peak flows that scour the channel making it unsuitable for the species, this area has been subject to significant invasion by introduced grasses, with logs, rocks and coarse woody debris present. In the vicinity of the M80 North private property, the tussock grasslands closer to the creek would also provide potential overwintering opportunities for the species.

4.5.1.12.3 Moonee Ponds Creek

Similarly to the Maribyrnong River, Moonee Ponds Creek is considered to be an important dispersal corridor for the species, that also features pockets of suitable in-stream habitat for breeding, with a thin band of riparian woodland vegetation that provides overwintering opportunities for the species. However, outside of the channel and immediate surrounds, the habitat value provided by the Corridor Section Project Land is considered to be negligible, being mostly dominated by introduced grasses associated with the parklands present. Further there are no wetlands along that reach that lie within the State Project Land, meaning that the lands adjacent to the Creek are unlikely to be used by the species for dispersal. Although it cannot be ruled out that individuals may venture beyond the riparian zone seeking overwintering opportunities or potential breeding habitat, the habitat beyond the riparian zone is considered to be of negligible importance to the species.

4.5.1.13 Golden Sun Moth

1.405 ha of GSM habitat was recorded within the State Project Land. This included 0.411 ha of native vegetation and 0.994 ha of non-native vegetation. GSM habitat was recorded in the following locations in the State Project Land:

 0.830 ha at Solomon Heights, including the Munro Avenue road reserve to the south. These areas of habitat are contiguous with the broader area of habitat present within Solomon Heights and are mapped in Appendix J

Threatened Species Mapping. Note that this area of habitat is contiguous with a broader area of habitat within Solomon Heights exceeding 10 ha.

• 0.575 ha at the Luma estate.

Targeted surveys for the species were not undertaken at either location. In the case of the Luma estate, this is because the area was added to the State Project Land following the conclusion of the Golden Sun Moth surveys undertaken as part of this assessments. Therefore, the species is considered to have a moderate likelihood of presence at that location. This habitat has been designated as a No-Go Zone to protect the habitat present.

In the case of Solomon Heights, as the species was recorded at this location through targeted survey recently (EHP 2016a), it was considered that targeted survey for the species was not necessary at this location. The previous targeted survey indicated that densities of the species were highest toward the centre of the Solomon Heights, where most individuals were recorded. Indeed, no GSM were recorded by that study where the State Project Land overlaps Solomon Heights, along the western edge that borders the



Jacana Line rail corridor and along the Munro Avenue Road Reserve to the South. Although these areas are considered to constitute habitat for the species, they do not form part of the core area of occupation for the species which is toward the centre of Solomon Heights.

Golden Sun Moth is also known to occur adjacent to the State Project Land within the Matthews Hill reserve. GSM was recorded at this location during the 2019-2020 survey season. This area does not form part of the State Project Land.

Elsewhere within the State Project Land, the likelihood of occurrence of Golden Sun Moth is considered to be low. All additional areas of potentially suitable habitat were subject to targeted survey, with no individuals detected. Those additional areas include:

- Sunshine Linear Railway Reserve
- St. Albans Road Biosites
- Old Sunshine Tip Site
- The Jacana rail corridor adjacent to Solomon Heights and the River Valley Estate
- The River Valley Estate
- M80 South Powerline Easement
- M80 North Zone
- The Jacana rail corridor adjacent to the River Valley Estate and Solomon Heights.

The rail corridor adjacent to Solomon Heights, although contiguous with the habitat present within Solomon Heights, is not considered to support habitat for GSM. Although patches of grassland encroach on the rail corridor from within Solomon Heights, the grassland within the rail corridor is noticeably more degraded than the grassland within Solomon Heights. Potential habitat within the rail corridor is marginal, with a lower cover of Golden Sun Moth food species (approx. 5%), incorporating more areas of bare ground, and invasion by non-tussock forming introduced grass species such as Cocksfoot grass. Targeted surveys of this area were undertaken as part of this assessment in the 2019-20 survey season, whereby the species was not detected. Although the fourth and final survey at this location was undertaken on a day when no GSM were observed flying at a reference site, the previous GSM survey undertaken within Solomon Heights found GSM densities were highest toward the centre of the Solomon Heights estate, and did not detect any GSM adjacent to the Jacana rail corridor where the State Project Land overlaps Solomon Heights (EHP 2016a). It is therefore considered unlikely that the degraded grassland margins within the rail corridor are utilised by the species.

The River Valley Estate is also not considered to support GSM habitat. Targeted surveys undertaken in the 2020-2021 survey season did not detect the species at this location. These findings are consistent with previous investigation by BLA who similarly did not record the species in recent targeted survey at this location (BLA 2018).

Grassy habitat at Border Drive Reserve in Keilor East was noted by ABZECO (2021) as having the potential to support Golden Sun Moth. While this area is disturbed and currently used for recreation, a targeted survey for Golden Sun Moth in grassy habitats at Border Drive Reserve will be undertaken in summer 2021/2022 to determine the presence/absence of Golden Sun Moth in this area. While yet to be assessed in targeted surveys by AJM-JV, the central portion of Border Drive Reserve has conservatively been deemed a No-Go Zone (NGZ 23) to avoid any potential impacts to this area.

4.5.1.14 Tussock Skink

36.707 ha of Tussock Skink habitat was mapped within the State Project Land. This includes 9.664 ha (26%) in areas of native grassy vegetation and 27.043 ha (74%) is areas of non-native vegetation (i.e. in areas of introduced grasses).

Tussock Skink habitat within the State Project Land (mapped in Appendix J Threatened Species Mapping) is considered to occur in the following locations:

• St. Albans Road Biosites (0.769 ha, confirmed presence)



- Old Sunshine Tip Site (0.897 ha, high likelihood of presence)
- The Luma Estate (0.575 ha, moderate likelihood of presence)
- Solomon Heights including adjacent Jacana rail corridor and Munro Avenue (0.907 ha, confirmed presence)
- The River Valley Estate including adjacent rail corridor (7.669 ha, confirmed presence)
- Brimbank Park (7.121 ha, confirmed presence)
- M80 South Powerline Easement (7.559 ha, confirmed presence)
- M80 North Zone (4.803 ha, confirmed presence)
- Sunshine Railway Linear Reserve (4.185 ha, moderate likelihood of presence)
- Sunshine North Escarpment (2.222 ha, confirmed presence)

Confirmation of presence of this species in the above-mentioned locations has been determined through recording the species during targeted survey, with the species being recorded a total of 83 times across six sites, and most of the records coming from two sites, namely St Albans Road Biosites (33 records) and the M80 North Zone (35 records).

This includes 33 at the St. Albans Road Biosites, 3 at the River Valley Estate, 3 in the Jacana Rail corridor adjoining the River Valley Estate and Solomon Heights, 1 at Brimbank Park, 8 at the M80 South Powerline Easement and 35 at the M80 North Zone (full results are presented in Appendix D

Targeted Fauna Survey Results and Mapping). It should be noted that a on a number of occasions, skinks were unable to be captured and successfully identified to species level (shown as 'unidentified skink' in the results table in Appendix D

Targeted Fauna Survey Results and Mapping). In each of these cases, Tussock Skink was able to be ruled out without capture based on visual observation of the lizard.

Determinations of high and moderate likelihood of presence have been made where targeted survey was not completed as part of this assessment. With recent VBA records of the species at the Old Sunshine Tip Site, it is considered likely that a population of the species is present at that location. Potentially suitable, albeit marginal habitat for the species was mapped at The Luma Estate. Although there are no records of the species at this location, presence of the species cannot be ruled out without targeted survey.

Limited suitable habitat for the species occurs elsewhere within the State Project Land. Tussock Skink is considered unlikely to occur within the State Project Land outside the above-mentioned locations.

4.5.1.15 Brown Toadlet

Brown Toadlet is considered to have a moderate likelihood of occurrence within suitable seasonally inundated areas of the Riparian Woodlands associated with the Maribyrnong River and Moonee Ponds Creek. With recent records associated with tributaries of these waterbodies in the vicinity of the State Project Land it is considered likely that this species utilises habitat in these locations.

Targeted surveys within the construction footprint at the Maribyrnong River, and at Steele Creek did not detect the species, and it is therefore considered unlikely that the species utilises these areas. On this basis, the species is considered unlikely to utilise habitat within the construction footprint.

4.5.1.16 Platypus

Platypus is considered to have a moderate likelihood of occurrence within the Maribyrnong River where it intersects with the State Project Land.

While historical records of Platypus (records from the 1930's and 1940's) exist from the downstream sections of the Maribyrnong River, recent records (most recently from the late 1990's) are limited to further upstream. Particularly, recent records of Platypus occur >10 km upstream of the Maribyrnong River as to where it intersects with the State Project Land.



Platypus is a cryptic species, and no targeted surveys were conducted for this species for this assessment. Given the lack of recent records in the downstream sections of the Maribyrnong River, it is considered unlikely that the species is resident in the section of the river that intersects the State Project Land. Any occurrence of Platypus through this portion of the river is likely to be limited to vagrants or dispersing individuals.



Figure 4.11 Spiny Rice-flower recorded during targeted surveys in winter 2020 within the River Valley Estate





Figure 4.12 M80 North Zone retention basin considered to be sporadically used habitat for Growling Grass Frog



Figure 4.13 Striped Legless Lizard (left) and Tussock Skink (right) detected during targeted surveys (artificial tiles) in the M80 North Zone in 2020/21.

4.5.2 Migratory Species

Two migratory species, White-throated Needletail and Latham's Snipe are considered to have a moderate or higher likelihood of occurrence in the State Project Land. However, the aquatic habitats in the Project are not considered important habitat for these species and are unlikely to support an ecologically significant proportion of populations of these species (as defined in the *Matters of National Environmental Significance significant impact guidelines 1.1 Environment Protection and Biodiversity Conservation Act 1999* (Australian Government Department of Environment, 2013)).). As such it is unlikely that these species would be significantly impacted by the Project Works and they are not considered further in this report. This utilisation is summarised by species functional group in Table 4.5 below.



Table 4.5 Likely utilisation of the State Project Land by migratory species

Migratory species functional group	No. Species modelled as relevant to the State Project Land	Likelihood of Utilisation of habitat within the investigation area	Important Habitat⁴ within State Project Land
Migratory Marine Birds	18	Low: These species are almost exclusively marine, and the State Project Land does not impact on marine habitats.	No: Species unlikely to be present
Migratory Marine Species (incl whales, sharks, dolphins and turtles)	9	Low : The species are generally exclusively marine and the State Project Land does not impact on marine habitats.	No: Species unlikely to be present
Migratory Terrestrial Species	5	White-throated Needletail Moderate: Varied and disjunct habitat exists in the Corridor Section Project Land that may provide aerial and occasional foraging habitat for the White-throated Needletail. This species is already considered/discussed in Section 4.5.1. Black-faced Monarch, Yellow Wagtail, Satin Flycatcher, Rufous Fantail Low: No preferred habitats for these terrestrial migratory birds occur in the State Project Land.	No: Although utilised by terrestrial birds, the terrestrial areas within the rail line are not considered to be important habitat for migratory terrestrial birds due to their generally low quality, isolated and small size, and consequently small proportions of species they have the potential to support.
Migratory Wetland Species	26	Latham's Snipe High: Corridor Section Project Land supports some limited areas of moderate to low quality aquatic habitat that may occasionally be visited by Latham's Snipe. Sunshine Section Project Land also supports limited area of low-quality aquatic habitat in and adjacent to Stony Creek that may occasionally be visited by Latham's Snipe	No: The wetlands within the State Project Land are likely to see transient use. However, the relatively small water bodies and rail side portions within the State Project Land are not likely to be considered important habitat.
		All other EPBC Act listed Migratory Wetland species Low: All other migratory wetland species are migratory shorebirds and are mainly utilise coastal and intertidal environs.	

4.5.3 Protected Species

Nine taxa listed as protected under the FFG Act were recorded within the State Project Land, limited to the Acacia genus (wattles) or Asteraceae family (daisies). A complete list of species is provided in Appendix F Flora and Fauna Species Lists. Although these species are not threatened species, their removal requires a permit to take under the FFG Act where located on public land.

4.5.4 Noxious Weeds and Pest Animals

A number of CaLP Act listed noxious weeds were recorded or have been previously recorded in the State Project Land and have been listed in Appendix F Flora and Fauna Species Lists.

Rabbits and European Hares were observed and evidence of their burrows, diggings and scats were recorded along the Maribyrnong River escarpments and at the M80 North Zone. Many house mice were recorded during artificial shelter tile surveys and along with black rats are expected to be ever-present

⁴ Important habitat for migratory species assessed as per the Significant Impact Guidelines DoE (2013). *Matters of National Environmental Significance. Significant Impact Guidelines 1.1. Environmental Protection and Biodiversity Conservation Act 1999.* Department of the Environment, Government of Australia, Canberra.





across the entire State Project Land. Invasive feral predators including feral cats and foxes are also expected to occur across the entire State Project Land.



5. Ecological Impact Assessment

This section of the report outlines potential impacts to ecological values from the Project, as well as outlining the relevant mitigation measures, and subsequent residual impacts. An 'avoid and minimise' statement in accordance with the Guidelines (DELWP 2017a) is also provided to demonstrate the efforts of the Project to avoid and minimise impacts on biodiversity.

Some values identified in Section 4 have been identified as having a negligible potential for impact, as their utilisation of the State Project Land is restricted to foraging and dispersal over a relatively small proportion of their range (see section 4.1.1). Due to the low potential for any impact to these species, they are not addressed in this section of the report.

Residual impacts of the Project are summarised in Table 5.1

Ecological value	Summary of Residual Impacts	
Matters of National Environmental Significance		
Threatened Ecological Communities	 NTGVVP: Removal of 0.221 ha, which is considered to amount to a significant impact to this threatened ecological community under the EPBC Act 	
Threatened flora	• Spiny Rice-flower : Removal of eight plants, which amounts to a significant impact to this species under the EPBC Act	
Threatened fauna	Striped Legless Lizard:	
	 Direct removal of 1.147 ha of Striped Legless Lizard habitat, and fragmentation resulting in the isolation of 0.46 ha Striped Legless Lizard habitat, amounting to a significant impact to this species under the EPBC Act 	
	 Exacerbation of fragmentation of Striped Legless Lizard Habitat at the M80 North Zone 	
	 Possible, localised reduction in habitat suitability due to noise and vibration associated with the construction of the M80 viaduct. 	
	 Injury or death of some Striped Legless Lizard individuals is expected during the habitat clearance within the M80 North Zone. 	
	Growling Grass Frog:	
	 Permanent removal of 0.268 ha and temporary removal (with revegetation) of 0.932 ha of terrestrial riparian overwintering habitat for the Growling Grass Frog. 	
	 Alteration of aquatic habitat corridors and temporary barriers to dispersal during Maribyrnong River Bridge construction for the estimated 3.5 year construction period. 	
	 Temporary isolation of a stormwater retention basin (the M80 retention basin, known to be utilised by the species for dispersal) from Steele Creek North for the estimated three year duration of the M80 viaduct construction 	
	 Possible intermittent noise-induced changes to calling behaviour, localised to the Maribyrnong River in the vicinity of the Maribyrnong River bridge construction for the estimated three-and-a-half year duration of the Maribyrnong River bridge construction. 	
	 The combination of the above direct and indirect impacts are considered to amount to a significant impact under the EPBC Act. 	
	 Golden Sun Moth (Note – the following impacts to Golden Sun Moth do not amount to a significant impact under the EPBC Act): 	
	 Direct removal of 0.319 ha Golden Sun Moth habitat, which is below the 0.5 ha significant impact threshold for areas of habitat >10 ha. 	
	 Area of GSM habitat in Matthews Hill Reserve is outside State Project Land and mitigation measures to be undertaken to manage potential indirect impacts 	

Table 5.1 Summary of residual impacts to ecological values within the State Project Land

Values of State Significance



Ecological value	Summary of Residual Impacts
Threatened Ecological Communities	• Western (Basalt) Plains Grassland Community: Direct Removal of 1.293 ha.
Threatened flora	 Direct removal of Spiny Rice-flower as per the above MNES section, in addition to: Fragrant Salt Bush: Direct Removal of 11 plants
Threatened fauna	 Impacts to: Striped Legless Lizard, Growling Grass Frog, and Golden Sun Moth, as per the above MNES section, in addition to: Tussock Skink: Direct Removal of 10.150 ha habitat and exacerbation of habitat fragmentation at the M80 North Zone.
Native Vegetation	 Removal of 3.889 ha of native vegetation in patches from seven EVCs, including removal of six large trees in patches Removal of 37 scattered trees (including 35 small and two large).

The above residual impacts are the result of collaborative refinement of the Project works between planning and environmental specialists and design engineers to avoid and minimise impacts to biodiversity, with particular emphasis on MNES. Locations where the above impacts are proposed to occur are considered unavoidable given the scope of works, with works in those locations being critical to the Project. These locations include:

- Solomon Heights (including Munro Avenue to the south), and the rail corridor adjacent to Solomon Heights and the River Valley Estate, where Spiny Rice-flower, NTGVVP, as well as habitat for Golden Sun Moth and Striped Legless Lizard will be removed. These areas are required for construction as they form a critical access routes for the Maribyrnong River Bridge construction. Utilisation of these more degraded areas has allowed the avoidance of Solomon Heights proper and the River Valley Estate (where larger, more intact stands NTGVVP and habitat for the above-mentioned threatened species occurs), minimising impacts to these values and eliminating any fragmentation that might have occurred as a result of the proposed works.
- The Maribyrnong River, where riparian habitat that may be utilised by the Growling Grass Frog will be removed (including some temporary and some permanent removal), and noise and vibration from construction will affect the reach and habitat for Growling Grass Frog and the Australian Grayling in the vicinity of construction. Given the construction of a bridge spanning the Maribyrnong River, impacts in this location are unavoidable. The works footprint has been refined in this location to minimise impacts (including the use of an existing access track), and the works that are expected to cause the greatest-intensity noise and vibration in the Maribyrnong River have been restricted to December to March and July to August (outside the critical migration period of the Australian Grayling which is April June and September November).
- The M80 North Zone, where NTGVVP and habitat for Striped Legless Lizard will be removed, resulting in fragmentation, and loss of dispersal habitat, including the temporary isolation of one wetland. Construction and these associated impacts are required within the M80 North Zone and are unavoidable due to the rail alignment. It would not be possible to design and construct the Project without these impacts. Impacts in this location have been confined to a footprint that minimises impacts to these values.



5.1 Proposed Works and Potential Impacts

The proposed works that form the Corridor Section, the Sunshine Section, and the Rail System Package have been considered for the potential impacts they may have upon ecological values within the State Project Land and outside the State Project Land where there is potential for impact.

These considerations include both impacts during the construction phase and operation phase as follows.

- Construction Phase Impacts:
 - > Direct removal and/or destruction of ecological values (including native vegetation and habitat) associated with construction activities.
 - > Facilitating the spread of noxious weeds, pest animals and pathogens through the transport of propagules, and increasing the suitability of the State Project Land for these species through ground disturbance.
 - > Temporary barriers to dispersal of indigenous fauna species, including listed species, created by construction activities such as fences. This is considered to be most relevant at the Maribyrnong River bridge, where substantial construction works will need to occur across both important terrestrial and aquatic habitats.
 - > Works near waterways causing sedimentation of those waterways through the exacerbation of erosion or through surface runoff. This is particularly relevant at the Maribyrnong River, Steele Creek and Steele Creek North, where rail viaducts will be constructed over these waterways.
 - > Reduction in water quality in waterways due to the release of construction runoff. This is particularly relevant at the Maribyrnong River, Steele Creek and Steele Creek North, where rail viaducts will be constructed over these waterways.
 - > Increased noise and vibration reducing habitat suitability for fauna
- Operation Phase Impacts:
 - > Permanent barriers to dispersal of indigenous fauna species, including listed species, associated with new infrastructure or clearance of vegetation that constituted a fauna dispersal corridor.
 - > Ongoing absence of permanently removed vegetation causing a net reduction in available habitat, and dispersal potential.



5.2 Assessment Approach and Management Framework for Victorian Rail Infrastructure Program projects

The RPV Environmental Management Governance Workflow (provided at Figure 5.1 below), together with approval requirements under Commonwealth and State legislation, enable Victorian Rail Infrastructure projects, such as the MAR to avoid and minimise impacts to biodiversity and other environmental values, where possible. This assessment has been completed in accordance with this framework.

The RPV Environmental Management Governance Workflow includes a method of how environmental values, including biodiversity, are to be assessed and considered through the design, planning approvals and environmental processes, and construction processes for projects. The framework allows for the implementation of the following steps:

- Avoid and minimise impacts first.
- Mitigate impacts where avoidance is not possible.
- Offset where residual impacts cannot be avoided.

The process outlined in Figure 5.2 is used to determine the likely impacts and offset requirements for Victorian Rail Infrastructure Program projects, such as the Project.

As the detailed design is not completed until the Delivery Partner is engaged, the precise location and extent of works and the precise construction method and timing is not known at the time of gaining environmental approvals for the proposed works. A brief description of the proposed works is provided in Section 2.4.

To enable the most accurate preliminary determination of the impact to ecological values, workshops are held with Designers, Planners and Ecologists to agree a State Project Land that enables flexibility for the Delivery Partner to deliver the required Project. Where significant ecological values have been identified within the State Project Land, strategies are agreed to avoid and minimise the impact to these values. For example:

- The use of no-go zones in protecting significant ecological values (i.e. threatened species)
- Implementing specific construction timing or methodologies to minimise noise and vibration, or dust impacts to potentially sensitive receptors.
- Utilisation of additional measures such as fencing and weed hygiene measures.

Details on how these strategies have been used for the Project are provided in the avoid and minimise statement in Section 5.3.

Section 5.4 outlines the mitigation measures that have been agreed upon with RPV to avoid and minimise impacts to identified ecological values within the State Project Land.

Once the Delivery Partner is engaged, the impact assessment will be refined to reflect any changes to the refined proposed scope of works.





Figure 5.1 Environmental Management Governance workflow



- Ecology Assessment Completed
- Maps prepared highlighting areas of ecological significance
 - Threatened fauna habitat
 - Threatened flora
 - Threatened ecological communities
 - High quality native vegetation and significant trees

Constraint workshop held with Designers, Planners and Ecologists to agree

- No Go Zones
- Project Area extent inclusive of Secondary Construction Areas
- Activities to be carried out within the Project Area and the associated level of clearing and disturbance likely to take place
- Mitigation measures to be adhered to by the Delivery Partner where considered necessary to avoid significantly impacting on an ecological matter. This may include stipulating the construction method or timing of construction.

Use outcomes of constraint workshop to complete baseline impact assessment. The following to be assumed

- No impact to ecological values within No Go Zones
- No impact to ecological values outside of the Project Area
- Mitigation measures agreed to, to avoid significantly impacting on an ecological matter, will be enforced by the Principal.
- Residual impact to ecological values within the Project Area determined
- Required offsets calculated in line with State and Federal policies.

Figure 5.2 Process used to determine likely impacts and offset requirements



5.3 Avoid and Minimise Statement

In accordance with the requirements under the Guidelines, any application to remove native vegetation requires the preparation of an 'avoid and minimise statement'. This statement is required to clearly identify the actions undertaken and efforts made throughout the planning process to avoid the removal of, and minimise impacts on, the biodiversity and other values of native vegetation. Importantly, the Guidelines require that these efforts must focus on areas of native vegetation that have the most value.

As detailed above in Section 5.2, the planning process for the Project has followed the RPV Environmental Management Governance Workflow framework which has adopted the principles of avoidance and minimisation of impacts on native vegetation, particularly those of higher value which have been identified to support MNES.

At a strategic level, the need for, and location of, a rail link to Melbourne Airport has been subject to considerable investigation by Victorian Governments with various planning studies and panel reports undertaken to inform possible corridors for the rail link. In 2001, the Department of Infrastructure released a Business Case for the proposed Melbourne Airport Rail Link, finding the Sunshine/Albion East Link to be the preferred long-term option. The current Project follows a similar alignment, and was ultimately chosen as the best route to meet the objectives for the Project. At a strategic level, the Project shows adherence to the 'avoid and minimise' principles as a significant proportion of the State Project Land falls within or immediately adjacent to the existing rail corridor and urban road network. A large proportion of these areas are heavily disturbed and void of ecological value due to previous and existing use. By following the existing rail corridor (at least in part), the Project avoids potential impacts to other less disturbed land in the region.

Detailed efforts to avoid and minimise impacts to native vegetation and other ecological values have been undertaken during the site level planning process. Following identification of the route alignment, extensive desktop and field based ecological assessment has been undertaken by AJM-JV to identify native vegetation and ecological values within and adjacent to the State Project Land. Detailed ecological assessment (including native vegetation and habitat assessments, as well as various targeted surveys for threatened species) has been conducted throughout the State Project Land between 2018 and 2021. This assessment resulted in the identification of various significant ecological values, including high quality native vegetation and the presence of state and Commonwealth listed threatened species and ecological communities. The identification of significant ecological values prompted the initial exclusion of particular key sites from the State Project Land (i.e. Matthews Hill Reserve and the Sunshine Triangle Ecological Site) as well as the early recommendation for establishment of No-Go Zones within the State Project Land. The recommendations for no-go zones has since been discussed in project workshops with designers, planners and ecologists, to allow incorporation of these No-Go Zones into the project design.

No-Go Zones have now been incorporated into the design in both the Sunshine and Corridor Section of the State Project Land, and are summarised in Appendix K

List of No-Go Zones. The implementation of No-Go Zones has prioritised the avoidance of impacts to native vegetation and/or habitat which has been identified to support threatened species or communities, particularly MNES listed under the Commonwealth EPBC Act. No-Go Zones are depicted in the Native Vegetation mapping in Appendix E

Impacted Vegetation Mapping and Threatened species mapping is in Appendix J Threatened Species Mapping.

5.3.1 Sunshine Section

In the Sunshine Section, the changes to the State Project Land and implementation of No-Go Zones has resulted in the avoidance of all MNES as well as the avoidance of a significant proportion of the native vegetation identified. Changes to the State Project Land and implementation of No-Go Zones in the Sunshine Section have resulted in the avoidance of the following ecological values:

- Sunshine Railway Linear Reserve (No-Go Zone 1):
 - > <u>MNES:</u> The implementation of No-Go Zone 1 results in the avoidance of two large patches of NTGVVP, as well as avoidance of extensive area of potential habitat for Striped Legless Lizard.



- State listed ecological values: The implementation of No-Go Zone 1 results in the avoidance of numerous patches of native vegetation (Plains Grassland – EVC 132), as well as extensive area of potential habitat for Tussock Skink.
- Matthews Hill Reserve and adjoining land (excluded from State Project Land):
 - MNES: Excluding this area from the State Project Land results in the avoidance of impacts to Spiny Rice-flower in the rail corridor. It also provides an additional buffer from Matthews Hill Reserve which supports a population of Golden Sun Moth and Large-headed Fireweed, as well as NTGVVP and potential habitat for Striped Legless Lizard.
 - State listed ecological values: Excluding this area from the State Project Land results in the avoidance of numerous small patches of native vegetation (Plains Grassland EVC 132), as well as the avoidance of numerous individuals of Arching Flax-lily which were recorded in this area.
- Land south west of the Sunshine Triangle Ecological site (No-Go Zone 2):
 - MNES: The implementation of No-Go Zone 2 results in the avoidance of impacts to eight Spiny Rice-flower plants which occur in the rail corridor in this location. It also provides an additional buffer from the Sunshine Triangle Ecological Site which supports an important population of Sunshine Diuris and other ecological values including habitat for threatened fauna and NTGVVP.
 - State listed ecological values: The implementation of No-Go Zone 2 results in the avoidance of numerous small patches of native vegetation (Plains Grassland, Tall Marsh and Plains Grassy Wetland).
- Old Sunshine tip site (west of rail line) (No-Go Zone 3):
 - > <u>MNES</u>: The implementation of No-Go Zone 3 results in the avoidance of impacts to an extensive area of confirmed Striped Legless Lizard habitat and NTGVPP, as well as one Spiny Rice-flower.
 - State listed ecological values: The implementation of No-Go Zone 3 results in the avoidance of high quality native vegetation (Plains Grassland and Tall Marsh), as well as the avoidance of habitat for Tussock Skink and numerous Arching Flax-lily which were recorded here.
- St Albans Biosites (east of rail line) (No-Go Zones 4, 5 and 6):
 - MNES: The implementation of No-Go Zones 4, 5 and 6 result in the avoidance of impacts to an extensive area of confirmed Striped Legless Lizard habitat and NTGVPP, as well as eight Spiny Rice-flower plants.
 - State listed ecological values: The implementation of no-go zones 4, 5 and 6 result in the avoidance of high-quality native vegetation (Plains Grassland), as well as the avoidance of habitat for Tussock Skink and numerous Arching Flax-lily which were recorded here.

5.3.2 Corridor Section

In the Corridor Section, the implementation of No-Go Zones has resulted in the avoidance of a significant proportion of both the MNES and state protected ecological values identified. The implementation of No-Go Zones in the Corridor Section have resulted in the avoidance of the following ecological values:

- Solomon Heights (north side of Munro Avenue) (No-Go Zones 7-8):
 - MNES: The implementation of No-Go Zones 7-8 result in the avoidance of impacts to an area of NTGVPP that supports habitat for Striped Legless Lizard and Golden Sun Moth.
 - State listed ecological values: The implementation of No-Go Zones 7-8 result in the avoidance of high-quality native vegetation (Plains Grassland) on the north side of Munro Avenue. Some vegetation removal will be required on the south side of Munro Avenue for construction access in this area. The retention of vegetation on the north side of Munro Avenue has been prioritised here to minimise fragmentation to the large area of native vegetation at Solomon Heights.
- Solomon Heights (adjacent to rail corridor) (No-Go Zone 9):



- MNES: The implementation of No-Go Zone 9 results in the avoidance of impacts to the western edge of a large area of NTGVPP at Solomon Heights that also supports habitat for Striped Legless Lizard and Golden Sun Moth. Some NTGVVP of lower quality (which does not support habitat for threatened fauna) will be required for removal in the rail corridor. The retention of vegetation in Solomon Heights been prioritised here to minimise impacts to the higher quality vegetation and habitat for MNES.
- > <u>State listed ecological values:</u> The implementation of No-Go Zone 9 results in the avoidance of high-quality native vegetation (Plains Grassland) along the western edge of Solomon Heights.
- River Valley Estate (No-Go Zone 10 and 11):
 - MNES: The implementation of No-Go Zones 10 and 11 results in the avoidance of impacts to an extensive area of NTGVVP and large population of Spiny Rice-flower within River Valley Estate. A narrow area of NTGVVP and six Spiny Rice-flower in the adjacent rail corridor cannot be avoided.
 - State listed ecological values: The implementation of No-Go Zones 10 and 11 results in the avoidance of high-quality native vegetation within River Valley Estate. This area also supports Tussock Skink and Arching Flax-lily.
- Sunshine North Escarpment (No-Go Zone 12):
 - State listed ecological values: The implementation of No-Go Zone 12 results in the avoidance of an area of Stream Bank Shrubland (EVC 851) which was identified as supporting Austral Tobacco. Construction access path through this area has been selected based on existing track with ground disturbance evident. This avoids the majority of the significant area of Tussock Skink habitat at this location.
- Maribyrnong River (No-Go Zones 13, 14 and 15):
 - MNES: Access to the Maribyrnong River is required to bring construction materials for the new bridge crossing. Impacts to this area have been minimised by the decision to utilise the existing SUP on the north side of the river. Some vegetation that forms habitat for Growling Grass Frog adjoining the Maribyrnong River will be temporarily impacted during construction to allow for the required widening of the existing SUP to allow for construction vehicles to utilise this access route. The implementation of No-Go Zones 13 to 15 either side of the Maribyrnong River have been incorporated to avoid any further impacts to Growling Grass Frog, and also to avoid impacts to the Australian Grayling that disperses through this waterway. Some tree canopy impacts as assessed under the Guidelines exist at this location underneath the Maribyrnong River bridge which overlap with No-Go Zones 13 and 15. The location and implementation of these No-Go Zones are to protect the aquatic habitat values at the ground layer and within the waterway.
 - State listed ecological values: The implementation of No-Go Zones 13 to 15 will result in the avoidance of an important band of Floodplain Riparian Woodland (EVC 56) that supports several large trees along the Maribyrnong River.
- Brimbank Park (No-Go Zone 16):
 - State listed ecological values: A large area of Tussock Skink habitat occurs at Brimbank Park. A portion of this area in the north will be required to be removed for laydown for the construction of the Project. The southern section of Tussock Skink has been prioritised for retention due to connectivity to similar habitats to the south and west. This area will be avoided through the implementation of No-Go Zone 16.
- Steele Creek and M80 North Zone (No-Go Zone s17 to 19):
 - MNES: The M80 North Zone supports a large area of habitat for the Striped Legless Lizard, small disjunct patches of NTGVVP and a low value reach for Growling Grass Frog along Steeles Creek. This area presents one of the most challenging locations for the Project in regards to potential for impacts on ecological values including MNES, namely due to the amount of significant works required in a currently undeveloped area. Extensive workshops, project meetings and other communications have been undertaken with the design and ecology teams relevant to this area with the aim to avoid and minimise impacts to ecological values, while still meeting the objectives of



the Project. The outcome for this area has been to constrain the works corridor through this area to the minimum required for construction (55m) and to route this in a way that avoids fragmentation of the larger areas of Striped Legless Lizard habitat. While some habitat for Striped Legless Lizard will be required to be removed for this construction corridor, a large proportion of this habitat will be avoided in No-Go Zones either side. Further to this a new SUP is required as part of the Project delivery in this area. Three options were considered for this SUP, and the southern option that has the least impact on Striped Legless Lizard habitat area. No-Go Zones will also be implemented along a large proportion of Steeles Creek which provides a low value reach for the Growling Grass Frog. Some tree canopy impacts as assessed under the Guidelines exist at this location underneath the proposed viaduct which overlap with No-Go Zone 17. The location and implementation of these No-Go Zones are to protect the aquatic habitat values at the ground layer and within the waterway.

- State listed ecological values: The measures described above will also result in the avoidance of habitat for the Tussock Skink and a dense cluster of Arching Flax-lily.
- M80 South Powerline easement (No-Go Zone 20):
 - > <u>MNES</u>: The implementation of No-Go Zone 20 results in the avoidance of a small area of NTGVVP.
 - State listed ecological values: The broad M80 South powerline easement area was identified as supporting habitat for Tussock Skink, while disjunct patches of native vegetation were also recorded. While some of this area will be required to be removed for construction, the implementation of No-Go Zone 20 will result in the avoidance of a significant proportion of this habitat and vegetation.
- Moonee Ponds Creek (No-Go Zone 21):
 - > <u>MNES</u>: The implementation of No-Go Zone 21 will result in the avoidance of potential impacts to an area that been identified as a high value reach Growling Grass Frog in Moonee Ponds Creek.
- Luma Estate (No-Go Zone 22):
 - MNES: The implementation of No-Go Zone 22 will result in the avoidance of any impacts on grassy habitat that has been identified as potential habitat for Striped Legless Lizard and Golden Sun Moth.
- Border Drive Reserve (No-Go Zone 23):
 - MNES: An area of NTGVVP is considered to occur within the central portion of the Border Drive Reserve in Keilor East as noted by ABZECO (2021) in an assessment undertaken in January 2021. This area, while notably disturbed, and utilised for recreation (football field) has conservatively been deemed a No-Go Zone (NGZ 23) to avoid any potential impacts to NTGVVP in this area.

The above detail provided within Section 5.3 highlights how the Project been designed to avoid and minimise impacts on native vegetation with the highest ecological value, often prioritising habitat for MNES. Where vegetation is proposed for removal, no feasible opportunities exist to further avoid and minimise impacts on native vegetation without undermining the key objectives of the proposal.

5.4 Mitigation Measures

Mitigation measures for the Project are detailed in this section. The implementation of these mitigation measures have been considered as forming part of the action in the assessment of impacts.

Mitigation measures will be applied through the MAR Environmental Management Framework (EMF), that details specific Environmental Management Requirements (EMR) that must be implemented by the Delivery Partners and will include requirements such as a Construction Environmental Management Plan. The EMRs are a suite of performance-based environmental standards/outcomes. Compliance with the EMRs will be enforced by the Project Owner through the contractual arrangements for design and construction of the Project and monitored by way of inspections, reports and audits, with penalties applied for non-conformance.



Table 5.2 Mitigation measures targeted toward reducing impacts to ecological values

Mitigation Measure	Description
General Construction Meas	ures
No-go zones	 No-Go Zones have been identified for the project in areas that support MNES and other sensitive matters. Potential impacts upon MNES would necessitate a referral under the EPBC Act.
	 The No-Go Zones identified in this report (listed in Appendix K List of No-Go Zones and mapped in Appendix E Impacted Vegetation Mapping) are to be avoided by construction works, with no admittance to the areas. The value to be protected by the No-Go Zone must not be impacted.
	 All No-Go Zones are to be included on all site maps, including all Environmental Management Plans and related documentation (including the Construction Environmental Management Plan (CEMP)).
	 All No-Go Zones must be fenced with high-visibility safety bunting or temporary construction fencing (including erosion fencing if necessary). The area is to be signed as a 'No-Go Zone'. Fencing should be erected in a way that still enables fauna to move through areas of habitat.
	 Where a No-Go Zone is to be established to protect EPBC Act listed NTGVVP, additional solid construction fencing (e.g. geofabric, shade cloth or similar solid fabric) is required to be erected to prevent dust impacts.
	 The erection of the fencing surrounding No-Go Zones (threatened ecological communities, mapped threatened species habitat and threatened flora species) must be supervised or reviewed by a qualified and experienced ecologist to ensure that the values supported within that No-Go Zone are not impacted. The fencing is to be maintained for the duration of the works.
	 The induction of all staff to the site must include a discussion of the importance of No-Go Zone, and must clearly outline activities which are prohibited from these areas.
	 No construction vehicles, machinery or equipment, lay down of materials or unauthorised personnel are allowed within No-Go Zones.
	• Foot access of personnel to No-Go Zones for the purpose of guiding bores must be accompanied by a qualified ecologist. This impact assessment assumes that these areas will not be impacted by the proposed works.
Adherence to AS4970- 2009 (Protection of Trees	 Trees near the proposed works site are to be determined to be either retained or lost as determined by AS4970-2009.
on Development Sites)	• Trees that will be removed and protected must comply with any regulatory approval conditions.
	 Where scattered trees are to be retained in close proximity to proposed work sites, tree protection plans are to be prepared by a qualified arborist that will ensure that trees proposed to be retained are adequately protected from the impact of construction or related activities, prior to those works being undertaken. Tree protection plans are to be developed in accordance with AS4970-2009 Protection of Trees on Development Sites.
	• Should the arborist determine that the works cannot proceed without impacting on the survivability of an indigenous tree, the tree will be required to be offset in accordance with the Guidelines.
Adherence to construction footprint	• The construction footprint as outlined in this document is to be adhered to through the construction process wherever possible. Deviations outside the construction footprint are subject to re-evaluation by a suitably qualified ecologist to ensure the findings of the impact assessment remain valid following the change.
Construction Hygiene Measures	The spread of noxious weeds and pest animals must be controlled in accordance with the CaLP Act.
	 Where possible, all vehicles, machinery and equipment will move along formed/designated access tracks to prevent the spread and establishment of weeds and diseases. Vehicles and machinery will access the State Project Land through defined entry and exit points. Additional measures to prevent the spread and establishment of weeds and disease must be provided within the CEMP.
	 Construction stockpiles, machinery, roads, and other infrastructure should be placed away from areas supporting native vegetation and waterways; and placed in previously cleared or hardstand areas.
Erosion and Sedimentation Controls	• Environmental management for erosion and sediment control, in accordance with Environment Protection Authority (EPA) Victoria construction guidelines (Publications 1834 and 1896) will be implemented for works in the vicinity of waterways and wetlands such that water quality of wetlands within and adjacent to the State Project Land and watercourses that intersect the State Project Land is to be maintained at pre-construction levels.



Mitigation Measure	Description		
Fauna salvage and relocation	 Where woody habitat is identified for removal, including singular trees, hollow-bearing trees and logs, engage an ecologist / wildlife handler to check for fauna occupancy. Where fauna are identified, fauna are to be safely relocated prior to the removal of habitat. 		
	 Where non-woody habitat is identified for removal, including grasslands, introduced tussock grasslands or any vegetation in the riparian zone, a wildlife handler must supervise habitat clearance. Any fauna disturbed in the process must be safely relocated to adjacent habitat outside the construction footprint. 		
	• Where a threatened species listed under the FFG Act has been identified to utilise a tree hollow through pre-clearance survey, that hollow should be replaced.		
	• Any interaction with wildlife through habitat clearing activities must be undertaken by a person holding a Section 28A <i>Wildlife Act 1975</i> authorisation.		
Strategic Revegetation	 Revegetation of areas of ground disturbance is required in a number of areas to minimise the impacts of the Project to ecological values. These locations are discussed below. 		
	• The Maribyrnong River Riparian Zone: All areas of the construction footprint within the riparian zone of the Maribyrnong River, including the construction footprint of associated access tracks and maintenance paths, are to be revegetated with site-indigenous species such that the area supports EVC 56: Floodplain Riparian Woodland.		
	• The M80 North Zone: All areas of the construction footprint within the M80 North Zone should be revegetated with site indigenous species such that the area supports the Plains Grassland EVC. The viaduct construction footprint is expected to result in an increase in shade below the structure, as such, only more shade-tolerant C3 grasses (such as Wallaby Grasses and Spear Grasses) should be used in the revegetation process rather than Kangaroo Grass, the lone site-indigenous C4 grass species. Further, monitoring will be required to beneath the viaduct to determine the success of grassland revegetation. With the increase in shade (some areas receiving 3 additional hours of shade per day – mostly at the centre of the viaduct footprint) meaning that grassland vegetation may not take in some locations. Should grassland revegetation not take in those shadier locations, then more shade tolerant plantings should be utilised.		
	• Steele Creek and Steele Creek North: All areas of the construction footprint within the riparian zone of the Steele Creek and Steele Creek North, including the area surrounding the M80 retention basin, are to be revegetated with site-indigenous species such that the area supports EVC 851_61: Treed Stream Bank Shrubland.		
Specific Measures: Australia	an Grayling		
Noise and vibration controls	 Piling activities associated with pier 8 and associated safe work platform, adjacent to the Maribyrnong River, will be restricted to December to March and July to August (outside the critical migration period of the Australian Grayling which is April - June and September – November) to ensure that the noise and vibration associated with piling does not interfere with the migration of the species. All piling associated with the Maribyrpong River Bridge construction is to be bored rather than 		
	driven to minimise noise and vibration to the Maribyrnong River.		
Maintenance of dispersal capability	• The dispersal capability of the Australian Grayling will be maintained throughout the project works through ensuring that all permanent infrastructure and construction activities (including fences and the removable footbridge over the Maribyrnong River) remain clear of the low flow channel.		
Specific Measures: Golden	Sun Moth		
Exclusion Fencing	• At Solomon Heights, where Golden Sun Moth habitat occurs adjacent to the Project footprint, shade cloth fencing to a height of 1.8 m will be used to prevent Golden Sun Moth from entering the construction footprint for the duration of the flying season (late October – early January).		
Specific Measures: Growling Grass Frog			
Chytrid Fungus hygiene measures	• Chytrid Fungus standard hygiene controls for frog handling, footwear and vehicles will be included in the CEMP (DSEWPaC 2011a).		
Growling Grass Frog salvage and relocation	 Before construction, a protocol is to be developed for frog salvage and re-location and included in the contractor CEMP and/or Growling Grass Frog Management Plan if required. 		
	• Only a qualified wildlife handler/ Ecologists with the appropriate ethics approval and DELWP scientific permit can undertake the surveys and salvage protocol. A permit under the <i>Wildlife Act 1975</i> is required to handle native fauna. The permit will also specify salvage and re-location controls that will need to be followed and included in the Growling Grass Frog Management Plan.		
Pre-construction Growling Grass Frog relocation	 Immediately prior to construction being undertaken at the M80 North Zone, Growling Grass Frog survey must be undertaken at the M80 retention basin with the purpose of capturing and relocating any dispersing Growling Grass Frog Individuals to outside the construction footprint, and the 		



Mitigation Measure	Description		
	already set-up exclusion fencing that will prevent relocated Growling Grass Frog from re-entering the construction footprint. Surveys should be undertaken in accordance with the survey guidelines for the species (DEWHA 2009b). This measure is in addition to the above Growling Grass Frog salvage and relocation measure which is to be enacted for the duration of the construction.		
Growling Grass Frog- secure worksite	 Fencing suitable for the exclusion of Growling Grass Frog must be erected to exclude waterways from construction areas and access tracks within 200 m. During construction, daily checks of fencing will occur by a suitably qualified environmental representative. 		
	 As part of the Growling Grass Frog Management Plan, a Growling Grass Frog induction to all site personnel is required. This induction must be a part of the site induction process, and staff should not be on site without having undertaken this induction. 		
	 Open trenches are to be closed at the close of each workday to prevent fauna from becoming stuck in the trenches. Where trenches are unable to be 'closed' for the night, open trenches are to include egress structures to allow frogs to exit, and be checked each morning for fauna presence. If animals are within the trench, an ecologist/ wildlife handler must be called to remove the animal. If it is a snake, a snake catcher must be called. 		
Maintenance of dispersal capability	• Construction activities, including Growling Grass Frog exclusion fencing, the removable footbridge over the Maribyrnong River must not encroach upon the low flow channel of any waterway, and further, must leave sufficient terrestrial space within the riparian zone so as to ensure that the Growling Grass Frog has the capacity to disperse overland along the riparian corridor.		
Noise and vibration controls	 All piling associated with the Maribyrnong River Bridge construction is to be bored rather than driven to minimise noise and vibration to the Maribyrnong River. 		
Specific Measures: NTGVVI	P, Spiny Rice-flower, and Large-headed Fireweed		
Dust Mitigation	• Where dust has the potential to impact areas immediately adjacent to the construction footprint that support NTGVVP and Spiny Rice-flower, management of dust will be undertaken through installation and maintenance of temporary construction fencing (e.g. geofabric, shadecloth or similar solid fabric) that will create a dust barrier between the construction footprint and areas of concern.		
	• Dust monitoring will be implemented to determine if additional protocols need to be enacted.		
Specific Measures: Striped I	Legless Lizard		
Construction Timing:	 Within the M80 North Zone, where noise and vibration-intensive piling activities are to take place adjacent to areas of Striped Legless Lizard habitat to be retained, piling activities are to be restricted to one active period of Spring to Early Autumn (i.e. September to March). This restriction only applies to the more noise and vibration intensive precast, driven piles. And does not need to be adhered to should a less noise and vibration intensive method such as bored piling be utilised. 		
Pre-construction striped Legless Lizard Relocation	 Prior to the clearance of Striped Legless Lizard Habitat at the M80 North Zone and Munro Avenue in the South of Solomon Heights, artificial shelter survey must be used to capture and relocate Striped Legless Lizard within the construction footprint to outside the construction footprint, and the already set-up exclusion fencing that will prevent relocated Striped Legless Lizard from re- entering the construction footprint. The artificial shelter survey technique should be employed as per the survey guidelines of the species (DEWHA 2011a), and include weekly checks for at least three months within the peak activity season for the species, during the active season prior to construction. This measure is in addition to the Fauna Salvage and relocation measure which is to be enacted at the time of habitat clearance. 		
Specific Measures: Sunshine Diuris			
Sunshine Triangle mitigation measures	The following specific mitigation measures will be put in place to manage potential impacts on the Sunshine Diuris for works adjacent to the Sunshine Triangle Ecological Site in addition to the protection and management measures already in place for the site.		
	 No-Go Zones will be clearly delineated on site using temporary construction fencing as required and signage (see above for further details under No-Go Zones). 		
	 Management of dust will be undertaken through installation and maintenance of temporary construction fencing (e.g. geofabric, shadecloth or similar solid fabric) before undertaking any works adjacent to this area 		
	 Further dust management will be undertaken by limiting construction activities adjacent to the Sunshine Triangle Ecological Site to outside the flowering period of the Sunshine Diuris (1 October – 31 December). Dust monitoring will be implemented to determine if additional protocols need to be enacted. Prior consultation with DELWP and DAWE is required prior to commencement if any major works are to occur within the flowering period. 		
	 Prior to construction, an ecologist will assess the distribution of current weed species within the construction footprint adjacent to the No-Go Zone before construction commences to enable a 		



Mitigation Measure	Description
	post-construction weed assessment and comparison (within the construction area). Notify DELWP on any planned weed control measures adjacent to the site.
	 Drainage will be kept intact around the Sunshine Triangle Ecological Site. If works require any alterations to drainage then additional drainage advice must be sought.
	 Appropriate waste disposal measures will be put in place during construction to avoid any increase in the number of pest animals (particularly House Mouse) within and adjacent to the Sunshine Triangle Ecological Site

5.5 Assessment of Residual Impacts

The potential impacts of the proposed works highlighted in 5.1 have been considered against required mitigation measures in Section 5.4 to derive the residual impact of the Project to ecological values. The implementation of mitigation measures outlined in this report have been considered as forming part of the action in the assessment of impacts. Residual impacts are discussed below.

It is important to note that the figures and conclusions of impacts presented in this section are based on the current Project scope and are likely to change slightly as the scope of works is refined in the detailed design phase.

5.5.1 Native Vegetation Removal

A total of 3.889 ha of native vegetation (including six large trees in patches), and 37 scattered trees (35 small and 2 large) will be removed across the State Project Land which will require approval and offsetting under the Guidelines. The extent of native vegetation removal is broken down by EVC in Table 5.3.

EVC	Bioregional Conservation Status	Extent of Removal (ha)
55: Plains Grassy Woodland	Endangered	0.581
56 Floodplain Riparian Woodland	Endangered	0.840
125 Plains Grassy Wetland	Endangered	0.111
132_61 Heavier-soils Plains Grassland	Endangered	1.293
821 Tall Marsh	Endangered	<0.001
851 Stream Bank Shrubland	Endangered	0.646
895 Escarpment Shrubland	Endangered	0.418
Vegetation of Very High Conservation Significance (subset/part of the total native vegetation recorded)		0.918
Vegetation that is of an Endangered EVC		3.889
Total		3.889

 Table 5.3
 Native vegetation removal within the State Project Land

A list of impacted trees required for removal is provided in Appendix H List of Scattered Trees and Large Trees in patches.

5.5.2 Residual Impacts to Wetlands and Waterways

Ramsar wetlands

The only Ramsar wetland in close proximity to the State Project Land, Port Philip Bay (Western Shoreline) and Bellarine Peninsula is unlikely to be significantly impacted by the Project. It is unlikely that there would be a significant impact on this wetland due to how remote it is from parts of the State Project Land where substantial earthworks are proposed to take place in the vicinity of larger waterways. The closest proximity of such works to the Ramsar wetland are those that will take place at the Maribyrnong River Bridge, which is approximately 21 km upstream from the Ramsar site, with the Point Cook Section of the Ramsar site being the closest point. Given the distance of the wetland from the State Project Land, construction and operation



of the Project is unlikely to result in a significant impact on the ecological character of this or any other wetlands of international importance. All Project works in the vicinity of waterways will be required to adhere to the 'erosion and sedimentation controls' mitigation measures, further reducing any potential impacts. Given the lack of potential for a significant impact, Ramsar wetlands are not considered further.

Waterways

Potential impacts to water quality will be discussed in more detail in the MAR State Land Aquatic Ecology and Geomorphology Impact Assessment (AJM-JV 2021), however, impacts to waterways – specifically impacts to water quality must be considered as part of this impact assessment because of the potential of such impacts for species such as the Growling Grass Frog. Although minor fluctuations in water quality are expected as part of the proposed works, adherence to impacts to water quality will be mitigated through the implementation of the 'Erosion and Sedimentation controls' mitigation measures, including adherence to best practice guidelines, EPA approvals and an approved construction environment management plan. As such, impacts to water quality within waterways within the State Project Land are expected to be negligible.


5.5.3 Residual Impacts to Threatened Ecological Communities

Residual impacts to threatened ecological communities are assessed in Table 5.4 and Table 5.5 below. Residual impacts to NTGVVP (listed under the EPBC Act) are assessed against the relevant significant impact guidelines in Appendix L Self Assessment of EPBC Act Referral Criteria.

Likelihood of Significant Impact **Potential Impacts** Mitigation Measures **Residual Impacts** under the Significant Impact Guidelines 1.1 (DoE 2013) **Direct removal** Direct removal of 0.221 ha Likely: This quantum of removal • Adherence to Project footprint: Areas of this community have been identified and constitutes a reduction in the extent of A total of 5.960 ha of NTGVVP occurs 0.221 ha of this threatened community is to be removed across avoided as much as practicable in the this threatened ecological community, within the State Project Land (including the State Project Land (all from within the Corridor Section). This which constitutes a significant impact planning and design phase, therefore, by 3.816 ha in the Corridor Section and includes removal at: adhering to the construction footprint, under the significant impact guidelines. 2.144 ha in the Sunshine Section). In Solomon Heights (0.131 ha). This removal is the outer edge direct impacts to the community are the absence of mitigation there is of the broader complex of NTGVVP at Solomon Heights minimised. potential for the unintentional removal of • The M80 North Zone to be removed (0.050 ha). This this community to occur. No-Go Zones: Areas of this community • removal is from one patch that is intersected by the Project that are to be avoided are to be footprint. designated No-Go Zones and fenced to ensure there is no unintentional egress • River Valley Estate and adjacent rail corridor (0.040 ha) into or damage to the threatened • No NTGVVP will be removed as part of the proposed works ecological community. for the Sunshine Section. All remaining areas of NTGVVP are to be protected through • the implementation of No-Go Zones and other mitigation measures. Fragmentation Increased fragmentation at the M80 North Zone and Munro Likely: Fragmentation of NTGVVP will Adherence to Project footprint: Areas of this community have been identified and Avenue in the South of Solomon Heights. be exacerbated for the duration of In the absence of mitigation there is fragmentation avoided as much as construction where the construction Two areas of NTGVVP will see an increase in fragmentation as potential for unintentional removal to footprint intersects an area supporting practicable in the planning and design cause fragmentation of the community a result of the proposed works including: phase, therefore, by adhering to the NTGVVP patches. Despite by, for example, bisecting patches. The M80 North Zone: Although the existing patches in this • revegetation, this fragmentation is construction footprint, direct impacts to the location are already fragmented, some level of connectivity community are minimised. considered to persist following through the introduced tussock grasslands that interconnect construction, due to a sealed access • No-Go Zones: Areas of this community them. track separating the patches. that are to be avoided are to be For the total duration of construction of the Steele Creek designated No-Go Zones and fenced to Viaduct (three-and-a-half years) these patches will be ensure there is no unintentional egress effectively isolated from one another by the construction

Table 5.4 Summary of impacts and impact mitigation for the NTGVVP threatened ecological community (Critically Endangered under the EPBC Act)



Potential Impacts	Mitigation Measures	Residual Impacts	Likelihood of Significant Impact under the Significant Impact Guidelines 1.1 (DoE 2013)
	 into or damage to the threatened ecological community. Strategic revegetation: Areas where fragmentation of this community occurs at the M80 North Zone will be the target of supplementary revegetation. 	 footprint, which is aligned between the two patches. Following construction, the connectivity of the patches will increase through the revegetation of the works area but will remain separated by a sealed maintenance track. It is considered that these factors constitute a net increase in the fragmentation between those two patches Munro Avenue in the South of Solomon Heights: with the clearance of the area of 0.131 ha of NTGVVP on the South side of Munro Avenue, a small 0.03 ha area of adjoining grassland in the private property to the south will remain, which is considered to constitute a net increase to fragmentation of NTGVVP in that location. 	
Habitat degradation through the spread of weed propagules and dust	 Construction Hygiene Measures, to be outlined in the CEMP must be adhered to for the duration of the works. These measures encompass a range of hygiene measures aimed at reducing the effect of weeds. Dust Mitigation: Shade cloth will be utilised to protect the species from dust impacts where required. Dust monitoring will be implemented to determine whether additional measures are required to suitable protect the species from dust. Adherence to Project footprint: Areas of this community have been identified and avoided as much as practicable in the planning and design phase, therefore, reducing the risk of weed spread to these areas. No-Go Zones: Areas of this community that are to be avoided are to be designated No-Go Zones and fenced to ensure there is no unintentional egress of personnel, machinery and equipment onto these areas, therefore reducing the risk of weed invasion. 	Residual impacts unlikely Through the avoidance of areas of this threatened ecological community to be retained, the adherence to strict hygiene controls, and revegetation where fragmentation is expected to be exacerbated, the risk of facilitating the establishment of these species within the community is low.	Unlikely: The threshold of impact to this community as it relates to weed species is the proposed action 'assisting invasive species, that are harmful to the listed ecological community, to become established'. It is unlikely that the MAR Corridor Section will assist invasive species becoming established within the threatened Ecological Community



Potential Impacts	Mitigation Measures	Residual Impacts	Likelihood of Significant Impact under the Significant Impact Guidelines 1.1 (DoE 2013)
	• Strategic revegetation: Areas where fragmentation of this community occurs at the M80 North Zone have been identified as a potential location for invasion of weeds into this community. Areas subject to disturbance at this location will be revegetated with native grassland to reduce the risk of these areas being colonised by weeds.		

Summary of impacts and mitigation for the Western (Basalt) Plains Grassland threatened ecological community (listed as threatened under the FFG Act) Table 5.5

Potential Impacts	Mitigation Measures	Residual Impacts
 Direct removal Fragmentation Habitat degradation through the spread of weeds 	 Adherence to Project footprint or ensure that areas of this community considered to be avoided are not impacted No-Go Zones to ensure that higher quality examples of this community (i.e. those that are also considered to be NTGVVP protected under the EPBC Act) are appropriately protected with measures such as fencing. Construction Hygiene measures to ensure that are areas of this community to be retained are not 	 Direct Removal 293 ha of this threatened community to be removed at various locations across the State Project Land as part of the proposed works Fragmentation As per the impact assessment for NTGVVP in Table 5.4, fragmentation will increase in two locations supporting higher quality examples of this threatened ecological community, at Munro Avenue in the South of Solomon Heights, and at the M80 North Zone.
	further degraded through the spread of weed and pest species.	Additional residual impacts to this community are unlikely



5.5.4 Residual Impacts to Threatened Species of National Significance

Residual impacts to threatened species of National Significance are assessed in to Table 5.6 to Table 5.11 below. Residual impacts to threatened species listed under the EPBC Act are assessed against the relevant significant impact guidelines in Appendix L Self Assessment of EPBC Act Referral Criteria.

Table 5.6 Summary of impacts and impact mitigation for the Sunshine Diuris (Listed as Endangered under the EPBC Act, and Critically Endangered under the FFG Act)

Potential Impacts	Mitigation Measures	Residual Impacts	Likelihood of Significant Impact under the Significant Impact Guidelines 1.1 (DoE 2013)
Habitat degradation through the spread of weed propagules and the spread of construction airborne particulate matter (dust) into the species' habitat Although the Sunshine Diuris is outside the construction footprint within Sunshine Triangle Ecological Site, the minor trackwork taking place nearby gives rise to the potential for indirect impacts to this area through the spread of weed propagules and dust into the species' habitat outside of the State Project Land.	 Construction Hygiene Measures, to be outlined in the CEMP will be adhered to for the duration of the works. These measures encompass a range of hygiene measures aimed at reducing the effect of weeds. Adherence to Project footprint: Adherence to construction footprint will minimise any impacts to the Sunshine Triangle Ecological Site. Sunshine Triangle-specific mitigation measures: Additional management measures specific to the Sunshine Triangle Ecological Site including weed monitoring, dust management, appropriate fencing and maintenance of current drainage regimes will avoid any indirect impacts on the Sunshine Diuris or its habitat. 	Residual impacts unlikely With the avoidance of the Sunshine Diuris Ecological Site (which is located outside the Corridor Package Project Land), and the adherence to the stipulated management measures, the risk of degradation of the habitat present at within the Sunshine Triangle Ecological Site is considered to be Low.	Unlikely : The Sunshine Diuris is unlikely to be impacted by direct or indirect means. In consideration of the significant impact guidelines for this species (DoE 2013), there will be no significant impact to the species.



Table 5.7	Summary of impacts and impact mitigation for the Spiny F	Rice Flower (Listed as Critically Endangered under	the EPBC Act, and Critically Endangered under the FFG Act)

Potential Impacts	Mitigation Measures	Residual Impacts	Likelihood of Significant Impact under the 'Significant Impact Guidelines for the Critically Endangered Spiny Rice- flower'(DEWHA 2009c)
 Direct removal Seventy-seven (77) Spiny Rice-flower plants occur within the Project footprint. In the absence of mitigation, the potential for accidental removal of Spiny Rice-flower Plants is high. Locations of presence include: Solomon Heights (including the Munro Avenue Road Reserve in the south of the estate. The River Valley Estate including the adjacent rail corridor No Spiny Rice-flower individuals will be removed in association with the works for the Sunshine Section. Spiny Rice-flower plants and adjacent habitat are to be protected through the implementation of No-Go Zones and other mitigation measures to ensure the plants and their habitat are not impacted 	 Adherence to Project footprint: Areas supporting Spiny Rice-flower have been identified and avoided as much as practicable in the planning and design phase, with the aim of reducing the removal of Spiny Rice-flower, and the removal or fragmentation of Spiny Rice-flower habitat therefore, by adhering to the construction footprint, direct removal of Spiny Rice-flower is minimised, and the potential for fragmentation eliminated. No-Go Zones: Areas supporting Spiny Rice-flower that are to be avoided are to be designated No-Go Zones and fenced to ensure there is no unintentional egress into or damage to any individuals or their habitat. 	 Direct removal of eight Spiny Rice-flower plants Eight Spiny Rice-flower plants will be removed as a result of the proposed works (all within the Corridor Section), including: Two within the Munro Avenue Road Reserve in the South of Solomon Heights. Six within the rail reserve adjacent to the River Valley Estate 	Confirmed : The extent of removal of species across the State Project Land exceeds the significant impact threshold of five plants which constitutes a significant impact. This removal of Spiny Rice-flower also occurs in urban Melbourne, which is considered to be on the eastern edge of the species' range. This removal on the edge of the species' range also constitutes a significant impact.
 Fragmentation Seventy-seven (77) Spiny Rice-flower plants occur within the Project footprint. In the absence of mitigation, the potential to clear vegetation in such a way that would create isolated smaller patches in the Corridor Section Project Land is high. No Spiny Rice-flower individuals will be removed in association with the works for the Sunshine Section. Spiny Rice-flower plants and adjacent habitat are to be protected through the implementation of No-Go Zones and other mitigation measures to ensure the plants and their habitat are not impacted 		Residual impacts unlikely Locations of Spiny Rice-flower plant and habitat removal (listed above) are considered to form the 'outer edge' of the broader population that occurs across the Solomon Heights, and River Valley Estate. With direct removal and ground disturbance restricted to the outer edge of this population, there will be no residual impact on the contiguity of the population and habitat present, and therefore no fragmentation.	Unlikely: No fragmentation will occur as a result of the Project Works.



Potential Impacts	Mitigation Measures	Residual Impacts	Likelihood of Significant Impact under the 'Significant Impact Guidelines for the Critically Endangered Spiny Rice- flower'(DEWHA 2009c)
Habitat degradation through the spread of weed propagules and dust into the species' habitat	 Construction Hygiene Measures, to be outlined in the CEMP will be adhered to for the duration of the works. These measures encompass a range of hygiene measures aimed at reducing the effect of weeds. Dust Mitigation: Shade cloth will be utilised to protect the species from dust impacts where required. Dust monitoring will be implemented to determine whether additional measures are required to suitable protect the species from dust. Adherence to Project footprint: Areas supporting Spiny Rice-flower have been identified and avoided as much as practicable in the planning and design phase, therefore, reducing the risk of weed spread to these areas. No-Go Zones: Areas supporting Spiny Rice-flower that are to be avoided are to be designated No-Go Zones and fenced to ensure there is no unintentional egress of personnel, machinery and equipment onto these areas, therefore reducing the risk of weed invasion. 	Residual impacts unlikely Through the avoidance of areas supporting Spiny Rice-flower plants that are to be retained, the adherence to strict hygiene controls, the risk of the Project facilitating the establishment of weed species that might compete with Spiny Rice-flower is low.	None: Habitat degradation as a result of weed infestation is unlikely to be exacerbated by the Project. Habitat degradation of this nature is also not captured in the significant impact guidelines for this species.



Summary of impacts and impact mitigation for the Large-headed Fireweed (Listed as Vulnerable under the EPBC Act, and Critically Endangered under the FFG Act). Table 5.8

Potential Impacts	Mitigation Measures	Residual Impacts	Likelihood of Significant Impact under the Significant Impact Guidelines 1.1 (DoE 2013)
Habitat degradation through the spread of weed propagules and dust into the species' habitat Although the Large-headed Fireweed is outside the construction footprint within the Matthews Hill Reserve, there is potential for indirect impacts to this area through the spread of weed propagules outside of the State Project Land	 Construction Hygiene Measures, to be outlined in the CEMP will be adhered to for the duration of the works. These measures encompass a range of hygiene measures aimed at reducing the effect of weeds. Dust Mitigation: Shade cloth will be utilised to protect the species from dust impacts where required. Dust monitoring will be implemented to determine whether additional measures are required to suitable protect the species from dust. Adherence to Project footprint: Areas supporting Large-headed Fireweed are outside the Construction Footprint. By adhering to the construction footprint, works will be contained within the State Project Land, and any direct impacts or spread of weeds to Matthews Hill through disturbance to the area will be avoided. 	Residual impacts unlikely With the avoidance of Matthews Hill (which is located outside the Corridor Package Project Land), and the adherence to strict hygiene controls, the risk of degradation of the habitat present at Matthews Hill is considered to be Low.	None: Habitat degradation as a result of weed infestation is unlikely to be exacerbated by the Project. Habitat degradation of this nature is also not captured in the significant impact guidelines for this species.



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Lable 5.9	Summary of impacts and impact mitidation for Striped Lediess-lizard	() Isted as vulnerable under the EPBC Act, and Endandered under the EEG Act)
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Potential Impact	Mitigation Measures	Residual Impact	Likelihood of Significant Impact under the Significant Impact Guidelines 1.1 (DoE 2013)
 Direct Removal 12.115 ha of Striped Legless Lizard habitat occurs at six locations within the State Project Land. Sunshine Linear Railway Reserve St. Albans Road Biosites Old Sunshine Tip Site The Luma Estate Solomon Heights M80 North Zone In the absence of mitigation the potential for accidental removal of Striped Legless Lizard habitat is high. Due to the size of the areas of habitat present at these locations (> 0.5 ha), these populations are considered to be 'important populations' as per the referral guidelines for the species (DSEWPaC 2011b). 	 Adherence to Project Footprint: Areas of habitat for this species have been identified in the planning and design phase, with habitat removal and fragmentation minimised as much as practicable therefore, by adhering to the construction footprint, direct impacts to these areas are minimised. No-Go Zones: Areas habitat for this species that are to be avoided are to be designated No-Go Zones and fenced to ensure there is no unintentional egress into or damage to these areas or removal that may cause additional fragmentation. Strategic revegetation: Where both habitat removal and fragmentation is to occur within the M80 North Zone, strategic revegetation will be used to create supplementary contiguous habitat to compensate for the loss and fragmentation of habitat in that location 	Direct removal of habitat While the majority of Striped Legless Lizard habitat within the State Project Land has been avoided, 1.147 ha of Striped Legless Lizard habitat is to be removed, including 0.772 ha of habitat within the M80 North Zone as a result of the construction of the viaduct that crosses Steele Creek and Steele Creek North, and 0.375 ha of habitat at the proposed access route at Munro Avenue in the South of Solomon Heights.	Likely: Removal of 1.147 ha of Striped Legless Lizard habitat will result in the area of occupancy of an important population to be reduced, constituting a significant impact.
 Habitat Fragmentation In the absence of mitigation the potential for habitat to become fragmented in the course of that clearance is high. No Striped Legless Lizard or associated habitat areas will be removed in association with the works for the Sunshine Section. Striped Legless Lizard and associated habitat is to be protected through the implementation of no-go zones and other mitigation measures to ensure the species is not impacted. 		Increased fragmentation of habitat Fragmentation of available habitat to this species is expected to increase in two locations: The M80 North Zone: The above-mentioned viaduct construction, associated vegetation removal and establishment of a permanent access track that will be completed at the M80 North Zone is considered to effectively isolate one portion of the remaining habitat from the other, situated on the east and west sides of the viaduct. This isolation is considered to have a net reduction in the viability of the Striped Legless Lizard population. This is considered to be of negligible impact on the eastern side of the bridge where the large habitat size of 3.55 ha is expected to continue to support a population of Striped Legless Lizard. The smaller habitat fragment of 0.46 ha on the western side of the viaduct is	Likely: By fragmenting habitat within the M80 North Zone, the important population of Striped Legless Lizard will be fragmented, constituting a significant impact.



Potential Impact	Mitigation Measures	Residual Impact	Likelihood of Significant Impact under the Significant Impact Guidelines 1.1 (DoE 2013)
		expected to have an increased likelihood of local extinction at the patch level.	
Degradation of retained habitat through shading The Steele Creek/Steele Creek North Viaduct, aligned through the M80 North Zone, and the important population of Striped Legless Lizard there has the potential to cause habitat degradation by shading the grassland habitat this population inhabits, reducing its suitability for the species.	N/A: Shade modelling provided in Appendix N Shade Modelling indicates that the majority of the shading caused by the bridge, is contained within the construction footprint of the bridge; i.e. within areas habitat that is to be removed.	None	Unlikely : Shading impacts to areas outside of the area of vegetation clearance are expected to be negligible.
Intermittent reduction in habitat suitability due to noise and vibration over the estimated 3 year construction period Potential for noise and vibration impacts to Striped Legless Lizard habitat have been considered at the M80 North Zone, where the Steele Creek/Steele Creek North Viaduct construction footprint intersects Stiped Legless Lizard habitat. At this location, noise and vibration-intensive piling will occur immediately adjacent to areas of Striped Legless Lizard habitat that are to be retained. Although little is known about the effects of anthropogenic noise and vibration on reptiles (particularly concerning specific taxa) (Simmons and Narins 2018), simulated machinery noise (specifically, noise from mining machinery) has been shown to elicit freezing and retreat responses in Blue-tongue lizard, which is thought to be a stress response (Mancera et al. 2017). It has therefore been inferred that the construction noise associated with the Steele Creek/Steele Creek North viaduct construction may have the potential to illicit such a response in Striped Legless Lizard, and therefore impact the habitat suitability in the vicinity of the construction footprint.	Construction Timing: To minimise risk of noise and vibration impacts to Striped Legless Lizard, piling works within the M80 North Zone should be restricted to occurring within only one Striped Legless Lizard Active season (considered to be Spring to early Autumn, i.e. September to March) to minimise any potential impacts to Striped Legless Lizard at this location. This timing restriction does not need to be adhered to should a less noise and vibration intensive method such as bored piling be utilised rather than driven piles.	 Possible, localised reduction in habitat suitability due to noise and vibration Although timing restrictions around piling activities have reduced the potential reduction in habitat suitability, there is still expected to be localised, intermittent reductions in habitat suitability in the vicinity of the M80/Steele Creek Viaduct associated with noise and vibration generated by construction. Given the noise and vibration impacts will be reduced as much as feasible, this reduction however is not expected to have lasting impact on the population of SLL present. SLL have been shown to persist in urban habitat fragments in close proximity to areas where major civil construction has taken place, including: The Striped Legless Lizard population present within the M80 North Zone where individuals have been recorded as part of this assessment, which have persisted despite the construction of the nearby M80 bridge over Steele Creek. The Striped Legless Lizard population present at the Denton Avenue Grassland in St. Albans (O'Shea 2013), which has persisted through the construction of the nearby M80 bridge over St. Albans Road. Given these populations of Striped Legless Lizard were able to persist in the vicinity of construction of a similar scale. it is considered unlikely that construction and 	Unlikely: Any temporary reduction in habitat suitability is considered unlikely to result in lasting impact to the Striped Legless Lizard population present at the M80 North Zone.



Potential Impact	Mitigation Measures	Residual Impact	Likelihood of Significant Impact under the Significant Impact Guidelines 1.1 (DoE 2013)
		noise vibration would have a permanent effect on the population of SLL at the M80 North Zone	
Injury or death to Striped Legless Lizard Individuals: Habitat clearance at the M80 North Zone may result in injury or death to Striped Legless Lizard.	 Pre-emptive Striped Legless Lizard Relocation: Tile survey is to be used to pre- emptively relocate Striped Legless Lizard to adjacent habitat outside the construction footprint and exclusion fencing. This is expected to reduce the presence of Striped Legless Lizard within the Construction footprint prior to clearance. Fauna Salvage and relocation: Clearance of vegetation in areas where Striped Legless Lizard habitat is to be cleared, or non-habitat areas that are to be cleared adjacent to bebits (to account for appendix diagent) 	Injury or death to Striped Legless Lizard Individuals: Although the applied mitigation measures have reduced the risk of injury or death to Stiped Legless Lizard Across the Corridor Sec Project Land, the risk of injury or death to a number of Striped Legless Lizards during the clearance of habitat within the M80 North Zone is certain.	N/A: This residual impact is not accounted for in the significant impact criteria.
	habitat (to account for sporadic dispersal outside of habitat areas), must be accompanied by a person holding a Section 28A <i>Wildlife Act 1975</i> authorisation, so that any individuals disturbed by the works can be relocated to habitat outside the construction footprint.		
	• Exclusion fencing : Species appropriate exclusion fencing must separate the construction footprint from areas of Striped Legless Lizard habitat to be retained to prevent Striped Legless Lizard from entering the construction footprint from adjacent habitat.		



Summary of impacts and impact mitigation for Growling Grass Frog (Listed as Vulnerable under the EPBC Act, and Vulnerable under the FFG Act) Table 5.10

Potential Impacts in the Absence of Mitigation	Mitigation Measures	Residual Impact	Likelihood of Significant Impact under the Significant Impact Guidelines for the Vulnerable Growling Grass Frog (DEWHA 2009b)
 Direct removal of habitat The Corridor Section Project Land intersects with a number of reaches known to be utilised to some degree by the Growling Grass Frog, including: The Maribyrnong River – considered to form an important dispersal corridor for important populations that occur along its length Steele Creek/Steele Creek North – within the State Project Land, utilisation of this reach and associated habitat is considered to be restricted to sporadic dispersal only. Moonee Ponds Creek - considered to form an important dispersal corridor for important populations that occur along its length Given the Project involves the construction of a bridge over the Maribyrnong River and a viaduct over Steele Creek/Steele Creek North, the potential for the direct removal of habitat in these locations as a result of the works is high. 	 Adherence to Project Footprint: Areas of habitat for this species have been identified in the planning and design phase, with habitat removal and fragmentation minimised as much as practicable therefore, by adhering to the construction footprint, direct impacts to these areas are minimised. No-Go Zones: Areas of habitat for this species that are to be avoided are to be designated No-Go Zones and fenced to ensure there is no unintentional egress into or damage to these areas or removal that may cause additional fragmentation. Strategic revegetation: Where both habitat removal and fragmentation is to occur within the M80 North Zone, strategic revegetation will be used to create supplementary contiguous habitat to compensate for the loss and fragmentation of habitat in that location. 	 Permanent direct removal of 0.268 ha riparian overwintering habitat along two reaches Riparian vegetation along the Maribyrnong River and Steele Creek North will be permanently removed as a result of the permanent infrastructure being built within areas that currently support native riparian vegetation. Extent of permanent removal includes: 0.256 ha of Floodplain Riparian Woodland at the Maribyrnong River associated with bridge pier footprints and SUP widening. 0.012 ha Stream Bank Shrubland at Steele Creek North associated with the M80/Steele Creek viaduct pier bases, and a permanent access track beneath the viaduct. Temporary direct removal of 0.932 ha riparian overwintering habitat along two reaches This removal associated with the broader construction footprint at both the Maribyrnong River and Steele Creek (minus the above permanent removal). This includes: 0.388 ha at the Maribyrnong River 0.544 ha at Steele Creek/Steele Creek North This removal is considered to be temporary as areas of construction footprint within riparian zones will be revegetated following the completion of the Maribyrnong River Bridge Works (currently expected to last approximately 3.5 years). It is noted that there are still some uncertainties surrounding the construction footprint associated with the Maribyrnong River bridge pier footprint, with additionally, the ability to revegetate some of the 	Likely: The proposed works will result in permanent removal of 0.268 ha and temporary removal (with revegetation) of 0.932 ha of riparian overwintering habitat vegetation within 200 m of waterbodies known to support the species in some capacity. The quantum of habitat permanently lost has the potential to reduce the area of occupancy of an important population.



Potential Impacts in the Absence of Mitigation	Mitigation Measures	Residual Impact	Likelihood of Significant Impact under the Significant Impact Guidelines for the Vulnerable Growling Grass Frog (DEWHA 2009b)
		steeper slopes may be limited. As such the above permanent and temporary removal extents are subject to change as the detailed design progresses. Any changes to the footprint are unlikely to be significant, and are unlikely to result in any significant change in the overall impact assessment for this species	
Fragmentation and isolation of populations The works area intersects with a number of waterways that are utilised by the species for dispersal. Works in the vicinity of these waterways have the potential create physical barriers that may isolate populations that are connected by those waterways. The construction of a bridge over the Maribyrnong River and a viaduct over Steele Creek/Steele Creek North, and direct removal of habitat as discussed above has the potential to cause alteration of these waterways or aquatic habitat corridors.	 No-Go Zones: Waterways and riparian areas identified as being utilised for dispersal by this species have been designated No-Go Zones outside of areas where construction in the riparian zone is required. These areas are to be fenced to reduce the risk of disturbance of these corridors Maintenance of dispersal capability: Where the construction footprint intersects any riparian corridor, there must be no encroachment of any structures or works (including fencing and the footbridge at the Maribyrnong River) upon the low-flow channel, and must allow ample terrestrial space for frogs to disperse. 	 Temporary isolation and fragmentation of Maribyrnong River population The construction of a bridge over the Maribyrnong River will create temporary barriers to dispersal where construction works will need to occur across both terrestrial and aquatic habitats. Significant efforts have reduced the impact footprint at this location and the implementation of mitigation measures to maintain dispersal capability reduced likely impacts, however piling activities associated with the construction of Pier 8 within the riparian zone will cause a net reduction in the dispersal capabilities of the species along this reach. Permanent and temporary alteration of waterways Piling activities associated with the construction of Pier 8 within the riparian zone of the Maribyrnong River will lead to the temporary alteration of the aquatic habitat corridor (currently expected to last approximately 3.5 years), and possibly permanent alteration of the waterway Temporary isolation of the M80 retention basin from the Steele Creek North reach The M80 retention basin will be inaccessible to Growling Grass Frog for the estimated three year duration of the viaduct construction at that location. The loss of this dispersal habitat however 	Likely: Growling Grass Frog dispersal along the Maribyrnong River reach is likely to be affected by the proposed works due to the temporary barriers created by the instream works associated with the Pier 8 construction. Isolation. The permanent and temporary direct habitat removal discussed above will result in the alteration of the aquatic habitat corridor. This has the potential to result in the fragmentation and isolation of populations.



Potential Impacts in the Absence of Mitigation	Mitigation Measures	Residual Impact	Likelihood of Significant Impact under the Significant Impact Guidelines for the Vulnerable Growling Grass Frog (DEWHA 2009b)
		Frog along the Steele Creek/Steele Creek corridor.	
Facilitating the spread of Chytrid Fungus As the Project includes works in close proximity to waterways utilised by the Growling Grass Frog, the Project has the potential to spread Chytrid fungus to waterways that support Growling Grass Frog.	• Growling Grass Frog Measures – Chytrid Fungus Controls: Chytrid Fungus standard hygiene controls for frog handling, footwear and vehicles will be included in the CEMP (DSEWPaC 2011a).	None: With appropriate Chytrid fungus controls in place it is unlikely that the Project will result in the spread of Chytrid fungus.	Unlikely : As Chytrid fungus is unlikely to spread as a result of the proposed works, habitat degradation as a result of disease agent spread is also unlikely.
Noise-induced changes to calling behaviour Potential for noise and vibration impacts to Growling Grass Frog have been considered at the Maribyrnong River Bridge and the Steele Creek/Steele Creek North Viaduct. (works at Moonee Ponds Creek are limited to signalling works on an existing bridge and are considered to be low- risk from a noise and vibration perspective). Noise and Vibration at the Maribyrnong and Steele Creek/Steele Creek North are expected to be elevated (albeit intermittently) over the duration of the constructions in those locations, particularly during piling works. Those works are currently expected to take place over a period of four-and-a- half years for the Maribyrnong River Bridge, and four years for the Steele Creek/Steele Creek North Viaduct. While the impacts of vibration on frogs generally are unclear, there is a body of literature to suggest changes in advertisement (breeding) calls in response to anthropogenic noise. This response varies between species however, and variously includes increases and decreases in total calling, as well as changes to duration amplitude and frequency, with some species pausing calling behaviour altogether. These changes are thought to have the potential to be detrimental to the reproductive success of affected species (Simmons	 Noise and Vibration controls - utilising the Bored Piling Methodology: Construction of the Steele Creek/Steele Creek North Viaduct will be completed utilising bored piling. This piling method produces considerably less noise and vibration than percussive methods such as driven piling. 	 Possible, localised, intermittent noise-induced changes to calling behaviour: Given the species specific response of Growling Grass Frog to elevated noise levels is not known, it is possible that elevated construction noise, albeit intermittently, across the estimated 3.5 year construction period may alter the calling behaviour of the Growling Grass Frog and therefore result in a potential localised reduction in breeding success in the vicinity of the Maribymong River Bridge. As Steele Creek and Steele Creek North are considered to be only utilised by the species for sporadic dispersal, impacts at this location are unlikely to occur within the Corridor Section Project Land. These changes however are not considered likely to have a lasting effect on the population of Growling Grass Frog that utilises the Maribymong River. Localised occurrences of Growling Grass Frog in urban Melbourne illustrate the capability of the species to persist in locations following elevated noise from construction activity. For example, Growling Grass Frog have continued to persist in, and utilise the Maribymong River in the vicinity of the M80 Ring Road, following the construction project of similar scale. 	Unlikely: Although increased noise from construction may alter the calling behaviour of the Growling Grass Frog in the vicinity of the proposed works, given the illustrated capability of Growling Grass Frog to persist following constructions of similar scale, it is unlikely that construction noise constitutes habitat degradation to the extent that it alters the recruitment, survival or dispersal rates of the important population resent within the Maribyrnong River.



Potential Impacts in the Absence of Mitigation	Mitigation Measures	Residual Impact	Likelihood of Significant Impact under the Significant Impact Guidelines for the Vulnerable Growling Grass Frog (DEWHA 2009b)
and Narins 2018). Although no specific data for growling grass frog exists on how its calling behaviour might change, it is possible that the increased noise from construction might alter Growling Grass Frog calling behaviour and alter breeding success.			
Water quality impacts Impacts to the waterbodies and waterways and waterbodies within the construction area have the potential to reduce their suitability for Growling Grass Frog.	• Erosion and Sediment Controls : Best practice erosion and sedimentation controls are to be enacted such that water quality is maintained at pre-construction levels.	None: With appropriate erosion and sediment controls in place it is unlikely that the Project will result in reduced water quality.	Unlikely : The reduction in habitat suitability as a result of water quality impacts is unlikely.
Frog injury or death as a result of Growling Grass Frog entering the construction footprint Where works occur within 200 m of a waterway, there is potential for Growling Grass Frog to enter the construction footprint	• Exclusion fencing : Wherever the construction footprint comes within 200 m of a waterway, exclusion fencing must be set up between the construction footprint and that waterway such that frogs are excluded from the construction footprint.	None: The risk of injury or death to Growling Grass Frog is considered to be low.	N/A: This residual impact is not accounted for in the significant impact criteria.
	• Growling Grass Frog Specific Measures : Including covering pits overnight, and mandating a Growling Grass Frog site induction detailing all measures within the CEMP to ensure that Growling Gras Frogs that do enter site are dispatched without harm to the animal.		
	• Pre-construction Growling Grass Frog relocation : Any dispersing Growling Grass Frog individuals within the M80 retention basin will be relocated prior to construction.		



Potential Impact	Mitigation Measures	Residual Impact	Likelihood of Significant Impact under the Significant Impact Guidelines for the Critically Endangered Golden Sun Moth (DoE 2013)
Direct Removal Golden Sun Moth habitat within the Corridor Section Project land is restricted to Solomon Heights. Of the broader area of habitat present at Solomon Heights, 1.405 ha occurs within the State Project Land, restricted to the southern portion (Munro Avenue), Western portion (adjacent to the Jacana Line rail corridor) of Solomon Heights and Luma Estate. In the absence of mitigation the potential for accidental removal of Golden Sun Moth habitat in these locations is high. No Golden Sun Moth or associated habitat areas will be removed in association with the works for the Sunshine Section. Best practice weed hygiene measures adjacent to the Matthews Hill Reserve will be enacted, with weed management to be conducted in consultation with DELWP as required.	 Adherence to Project Footprint: Areas of habitat for this species have been identified in the planning and design phase, with habitat removal and fragmentation minimised as much as practicable therefore, by adhering to the construction footprint, direct impacts to these areas are minimised. No-go zones: Areas of habitat for this species that are to be avoided are to be designated no-go zones and fenced to ensure there is no unintentional egress into or damage to these areas or removal that may cause additional fragmentation. 	Removal of 0.319 ha of Golden Sun moth habitat within the Munro Avenue Road Reserve in the south of Solomon Heights.	Unlikely: The removal of 0.319 ha of Golden Sun Moth habitat is below the 0.5 ha threshold for significant impact specified in the significant impact guidelines. Due to the connectivity with the broader areas of habitat present, the population at Solomon Heights is considered to be an important populations as per the referral guidelines for the species (DSEWPaC 2011b).
Habitat Fragmentation Golden Sun Moth habitat occurs at Solomon Heights. In the absence of mitigation the potential for habitat to become fragmented is high.		None: Golden Sun Moth habitat loss is restricted to the southern boundary of the Solomon Heights estate, such that it does not cause fragmentation. No barriers to dispersal will be introduced during construction at the southern boundary of Solomon Heights.	Unlikely: The removal of 0.319 ha of Golden Sun Moth habitat in the south of Solomon Heights is at the edge of the broader habitat at this location and is unlikely to result in habitat fragmentation. Construction will also not introduce any barriers to dispersal.
Moth injury or death as a result of entry into the construction footprint	 Exclusion fencing: Exclusion fencing suitable for Golden Sun Moth must separate the construction footprint at Solomon Heights. 	None: The use of exclusion fencing means it is unlikely that Golden Sun Moth will enter the construction footprint.	N/A: This residual impact is not accounted for in the significant impact criteria



5.5.5 Residual Impacts to Threatened Species of State Significance

Residual impacts to threatened species are assessed in Table 5.12 below. Note that threatened species of National significance that are listed under both the EPBC Act and FFG Act are assessed in Table 5.6 to Table 5.11 above, and are not re-assessed below.

Table 5.12	Summary of Resid	dual Impacts to thre	atened species lis	sted only under the FFG Act
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Species	Potential impacts and Proposed Mitigation Measures	Residual Impacts
Threatened flora of Sta	te significance	
Leafy Twig-sedge (Listed as Endangered under the FFG Act)	 Potential Impacts Direct removal of this species due to construction activities where the construction footprint intersects the Maribyrnong River or Habitat degradation through to construction activities in or near waterbodies Proposed Mitigation Measures No-Go Zones Erosion and sedimentation control Adherence to construction footprint 	 None Targeted surveys have confirmed that this species is not present within the construction footprint. Further, additional areas of identified habitat for the Leafy Twigsedge, including the riparian zones of the Maribyrnong River and Moonee Ponds Creek have been set aside as no-go zones. In addition, properly implemented erosion and sedimentation controls mean that habitat degradation of this species habitat through such means is unlikely.
Studley Park Gum (Listed as Critically Endangered under the FFG Act)	 Potential Impacts Direct removal of this species due to construction activities Indirect impacts to this species from construction (i.e. excavation works within >10% of the TPZ, that result in the tree dying over time) Proposed Mitigation Measures No-Go Zones Adherence to construction footprint 	 None Only one individual of this species has been recorded in the State Project Land. This tree falls outside the construction footprint and will be avoided by works. While a small proportion (<10%) TPZ of this tree does intersect with the footprint for access, the area of incursion into the TPZ falls within an existing access track and excavation is not required in this area. Guidance from the Project arborist will be provided to ensure effective protection of this tree during works.



Species	Potential impacts and Proposed Mitigation Measures	Residual Impacts
Arching Flax-lily (Listed as Critically endangered under the FFG Act)	 Potential Impacts Direct removal of plants of this species through construction activities within areas of potential habitat at Solomon Heights Habitat degradation through the spread of weeds propagules into the species' habitat at Solomon Heights Proposed Mitigation Measures Avoidance of values No-Go Zones Adherence to construction footprint 	 None Targeted surveys for this species have mapped populations of this species in several locations within the State Project Land. This species is also highly likely to occur within grasslands within the broader Solomon Heights estate where targeted survey has not been undertaken. Areas where this species occurs, and areas of suitable habitat within the Solomon Heights estate are to be avoided as no-go zones. It is therefore unlikely that any individuals of this species will be removed. Further, best practice weed hygiene measures will be implemented such that the risk of further weed invasion in areas of habitat for this species are considered to be low.
Pale-flower Crane's- bill (Listed as Endangered under the FFG Act	 Potential Impacts Direct removal of plants of this species through construction activities within areas of potential habitat at Solomon Heights Habitat degradation through the spread of weeds propagules into the species' habitat at Solomon Heights Proposed Mitigation Measures Avoidance of values No-Go Zones 	 None This species has the potential to occur in high quality grasslands in Solomon Heights and River Valley Estate, and a low likelihood of occurrence elsewhere. Areas of suitable habitat within Solomon Heights and the River Valley Estate will be avoided as no-go zones. It is therefore unlikely that any individuals of this species will be removed. Further, best practice weed hygiene measures will be implemented such that the risk of further weed invasion in areas of habitat for this species are considered to be low.
Austral Tobacco (Listed as Endangered under the FFG Act)	 Potential Impacts Direct removal of plants of this species through construction activities within areas of potential habitat at the Sunshine North Escarpment Habitat degradation through the spread of weeds propagules into the species' habitat at the Sunshine North Escarpment Proposed Mitigation Measures Avoidance of values No-Go Zones 	 None One individual of this species has been mapped in the Sunshine North Escarpment. The species is considered unlikely to occur elsewhere within the State Project Land. The one area of occurrence of this species at the Sunshine North Escarpment will be avoided as a No-Go Zone. It is therefore unlikely that any individuals of this species will be removed. Further, best practice weed hygiene measures will be implemented such that the risk of further weed invasion in areas of habitat for this species are considered to be low.



Species	Potential impacts and Proposed Mitigation Measures	Residual Impacts	
Fragrant Saltbush	Potential Impacts	Direct removal of 11 individuals	
(Listed as Vulnerable under the FFG Act)	Direct removal of plants of this species through construction activities within areas of potential habitat at the River Valley Estate.	• Removal to occur at the Luma Estate (4 plants), Brimbank Park (6 plants), and the M80 North Zone (1 plant).	
	Habitat degradation through the spread of weeds propagules into the species' habitat at the River Valley Estate	• The occurrence of this species at the River Valley Estate will be avoided as a No-Go Zone. It is therefore unlikely that any	
	Proposed Mitigation Measures	individuals of this species will be removed.	
	Adherence to construction footprint	Further, best practice weed hygiene measures will be implemented such that the risk of further weed invasion in areas	
	No-Go Zones	of habitat for this species are considered to be low.	
Rye Beetle-grass	Potential Impacts	None	
(Listed as Vulnerable under the FFG Act)	Direct removal of plants of this species through construction activities within areas of potential habitat at Solomon Heights and the River Valley Estate	This species has the potential to occur in high quality grasslands in Solomon Heights and River Valley Estate, and a	
	Habitat degradation through the spread of weeds propagules into the species' habitat at Solomon	low likelihood of occurrence elsewhere.	
	Heights and the River Valley Estate	Areas of suitable habitat within Solomon Heights and the River	
	Mitigation Measures	unlikely that any individuals of this species will be removed.	
	Adherence to construction footprint	Eurther best practice weed bygiene measures will be	
	No-Go Zones	implemented such that the risk of further weed invasion in areas of habitat for this species are considered to be low.	
Threatened fauna of State Significance			



Species	Potential impacts and Proposed Mitigation Measures	Residual Impacts
Tussock Skink (Listed as Endangered under the FFG Act)	Potential Impacts Direct removal of habitat through construction activities across the State Project Land Habitat fragmentation through construction activities Shading of habitat with the viaduct constructed at Steele Creek North Proposed Mitigation Measures No-Go Zones Fauna salvage 	 Direct Removal of Habitat While the majority of Tussock Skink habitat within the State Project Land (36.707 ha) has been avoided, 10.150 ha of Tussock Skink habitat is expected to be removed as a result of construction. Habitat for this species as identified in this assessment comprised both areas of native and non-native vegetation, with 74% of the habitat mapped comprising non-native areas. This included heavily disturbed sites that were dominated by introduced grass/high threat weeds such as Serrated Tussock. This suggests that the species is adaptable and can survive in a range of habitats, including disturbed areas which are prevalent in and around greater Melbourne. Though the majority (72%) of the Tussock Skink habitat recorded in the Corridor Section Project Land will be avoided through the implementation of No-go Zones, 10.150 ha (26%) will be removed. The 10.150 ha loss of grassy habitat in the Melbourne region, considering that a large proportion comprised introduced vegetation, is not considered to be significant. Fragmentation of Habitat As per the fragmentation effects upon Striped Legless Lizard, it is considered that the vegetation removal as well as the viaduct and associated access track form a barrier to dispersal of this species from the habitat on the east and west side of the viaduct in the M80 North Zone. This is considered to result in increased likelihood of local extinction at the patch level within the remaining habitat on the western side of the viaduct where only 0.46 ha remains. Additionally the construction access path in the Sunshine North Escarpment is also expected to lead to the fragmentation of habitat Limited potential for further impacts Elsewhere within the State Project Land, Tussock Skink habitat has been avoided. Shading caused by the viaduct that constitutes 30 minutes or greater shade on a given day is contained within the footprint of habitat removal.



Species	Potential impacts and Proposed Mitigation Measures	Residual Impacts
Brown Toadlet (Listed as Endangered under the FFG Act)	 Potential Impacts Direct removal of riparian woodland habitat for this species at the Maribyrnong River, Steele Creek North and Moonee Ponds Creek Proposed Mitigation Measures No-Go Zones Fauna salvage 	None Although suitable pockets of seasonally inundated riparian woodland occur within the State Project Land, the species is considered unlikely to occur within the construction footprint following having undertaken targeted survey in areas of suitable habitat that intersect the construction footprint at the Maribyrnong River and Steele Creek North.
Platypus (Listed as Vulnerable under the FFG Act)	 Potential Impacts Removal of riparian habitat where the Project intersects with the Maribyrnong River Disruption to flows for dispersing individuals Proposed Mitigation Measures No-Go Zones 	None Although records of Platypus exist in the Maribyrnong River, recent records are limited to >10 km upstream of where the river intersects with the State Project Land. As such, it is considered unlikely that the species is resident in the section of the river that intersects the State Project Land. Any occurrence of Platypus through this portion of the river is likely to be limited to vagrants or dispersing individuals. While a small area of riparian habitat at the Maribyrnong River will be subject to permanent and temporary removal (see assessment for Growling Grass Frog), this is considered to result in a negligible impact on Platypus. No-Go Zones are in place to avoid impacts to most of the riparian habitat adjacent to the river. Flows in the Maribyrnong River will not be disrupted during construction or operation.



Legislative and Policy Obligations 6.

A summary of the likely legislative requirements identified in preparing this document is provided below in Table 6.1. Note, this summary is provided with the assumption that mitigation actions are implemented. Where additional works are proposed to be undertaken within the State Project Land, or where design and construction details are refined, further assessments and approvals may be required to adhere to the legislation and policies described.

Policy/Legislation	Relevant Matters and Impacts	Actions Required
Commonwealth		
EPBC Act	 Ramsar Wetlands The Port Philip Bay and Westernport Bay Ramsar Site is unlikely to be significantly impacted 	No further actions required
	 Threatened Ecological Community NTGVVP will be significantly impacted with the removal of 0.221 ha of the threatened ecological community Threatened Flora Species Sunshine Diuris is unlikely to be significantly impacted Spiny Rice-flower will be significantly impacted with the removal of 8 plants Large-headed Fireweed is unlikely to be significantly impacted Threatened Fauna Species Striped Legless Lizard is likely to be significantly impacted with the removal of 1.147 ha of habitat from an important population, and associated fragmentation. Growling Grass Frog is likely to be significantly impacted with the permanent removal of 0.268 ha and temporary removal (with revegetation) of 0.932 ha of habitat from an important population and construction within the riparian zone leading to alteration of waterways and possible isolation and fragmentation of populations. Direct removal of 0.319 ha of Golden Sun Moth habitat along the Munro Avenue road reserve in the South of Solomon Heights, however, this is not considered to constitute a significant impact under the EPBC Act as it falls below the 0.5 ha and experimentation. 	 The potential for significant impacts to NTGVVP necessitate the referral of the Project to DAWE under the EPBC Act. Management plans required for this MNES will be integrated into the CEMP The potential for significant impacts to Spiny Rice-flower necessitate the referral of the Project to DAWE under the EPBC Act. Management plans required for this species to be integrated into the CEMP The potential for significant impacts to Striped Legless Lizard and Growling Grass Frog necessitate the referral of the Project to DAWE under the EPBC Act. Management plans required for these species to be integrated into the CEMP
	 Migratory Species Migratory Terrestrial Species are unlikely to be significantly impacted Migratory Marine Species are unlikely to 	No further actions required
01-1-	be significantly impacted	

Table 6.1 Policy and Legislation obligations and actions required



Policy/Legislation	Relevant Matters and Impacts	Actions Required
EE Act	A referral under the EE Act to determine	- No further estima required
EE ACI	A referral under the EE Act to determine whether an Environment Effects Statement (EES) is needed for the Project, is not required based on the ecological criteria specified in the 'Ministerial guidelines for assessment of environmental effects under the <i>Environment</i> <i>Effects Act 1978</i> '.	No further actions required
	The extent of removal of native vegetation proposed for the Project (3.889 ha and 37 scattered trees) falls well below the 10 ha referral threshold and limited impacts to FFG Act values or other State listed threatened species are predicted to occur based on implementation of proposed avoidance and mitigation measures.	
	Assessment of the Project's impacts against these triggers is detailed in Section 6.1 below.	
P&E Act and Guidelines for the removal, destruction or lopping of native vegetation	 Removal of Native Vegetation Removal of 3.889 ha of native vegetation in patches from seven EVCs, including removal of six large trees in patches 	 Removal of native vegetation invokes relevant municipal planning and approval requirements under the P&E Act. All native vegetation to be removed requires approval under the P&E Act.
(DELWP 2017) – the Guidelines.	 Removal of 37 scattered trees (including 35 small and 2 large). 	 Native Vegetation removed is required to be offset in accordance with the guidelines. Assessment of the native vegetation removal required for the against the Guidelines is available in Section 6.2 below.
		 Efforts to avoid and minimise impacts to biodiversity should continue throughout the life of the project including construction phase. Efforts to avoid and minimise up to the time of issue of this document are captured in the avoid and minimise statement available in Section 5.4.
Flora and Fauna Guarantee Act 1988	 Threatened Ecological Communities 1.293 ha of Western (Basalt) Plains Grassland Community to be removed 	• A permit to take under the FFG Act must be obtained prior to the removal of this threatened ecological community.
	 Threatened Flora Impacts to Spiny Rice-flower (as detailed above) Direct Removal of 11 Fragrant Salt-bush plants No further threatened flora likely to be removed 	 A permit to take under the FFG Act must be obtained for the removal of 8 Spiny Rice-flower plants, and 11 Fragrant Salt-bush plants.
	Threatened Fauna	Further minimise impacts to extent of Tussock
	Impacts to Striped Legless Lizard (as detailed above)	Skink habitat in detailed design
	Impacts to Growling Grass Frog (as detailed above)	
	Impacts to Golden Sun Moth habitat as detailed above	
	Removal of 10.150 ha of Tussock Skink habitat, as well as associated habitat fragmentation	



Policy/Legislation	Relevant Matters and Impacts	Actions Required
	 Protected Flora Four flora taxa listed as protected under the FFG Act require removal on public land, including Lemon Beauty-heads, Sifton Bush, Common Fireweed and Slender Fireweed. Estimated number of individuals to be removed is provided in Appendix F Flora and Fauna Species Lists 	 A permit to take under the FFG Act must be obtained for the removal of protected flora prior to their removal. <i>N.B</i> The FFG Act Amendment Bill 2019 passed through Victorian Parliament with amendments taking effect on 1 June 2020. To support the amendments, updates to the threatened species list were gazetted in May 2021. The protected flora list is currently being reviewed and has not yet been updated. When the new list comes into effect this will affect the details of the 'permit to take' required under the Act.
Wildlife Act 1975	Native Wildlife occur within the State Project Land. All native wildlife is protected in Victoria. It is an offence to kill, take, control or harm wildlife under the <i>Wildlife Act 1975</i> , unless an appropriate authorisation under Section 28A is obtained.	 Avoid, minimise and mitigate impacts to wildlife habitat such as wetlands, patches of native vegetation and scattered trees during the design process. Salvage and ethical treatment of wildlife should be incorporated into measures within a CEMP. Projects approved under the Planning Scheme are generally exempt from requiring a permit under the Wildlife Act.
Catchment and Land Protection Act 1994	The proposed works require the disturbance of soil and the movement of a variety of vehicles and machinery. These activities encourage the spread and establishment of weed species. Some weed species are declared noxious under the CaLP Act and, as such, the responsible party is legally required to prevent the spread and establishment of these species. A full list of species listed under the CaLP Act recorded within the State Project Land is available in Appendix F Flora and Fauna Species Lists.	 CEMP should be developed that clearly identifies measures to be undertaken which will prevent the growth, spread and establishment of noxious weed species.

6.1 Self-Assessment under the *Environment Effects Act 1978*

The trigger for a referral under the EE Act is determined by criteria detailed in the *Ministerial Guidelines for Assessment of Environmental Effects* (DSE 2006). These criteria fall into one of two categories:

- Individual criteria (meeting one of these criteria triggers the requirement for a referral)
- Combination criteria (meeting two or more of these criteria triggers the requirement for a referral)

In this assessment the proposed works are assessed against the criteria which are relevant to impacts on ecological values as per the scope of this ecological impact assessment⁵. Individual criteria are assessed in Table 6.2 and combination criteria are assessed in Table 6.3.

Based on this assessment, a referral under the EE Act is not triggered based on the criteria addressed below. This assessment has identified that the Project is unlikely to have any extensive ecological impacts and would not meet the thresholds identified in the relevant criteria. The extent of removal of native vegetation proposed for the Project (3.38 ha and 11 scattered trees) falls well below the 10 ha referral threshold and limited impacts to FFG Act values or other State listed threatened species are predicted to occur based on implementation of proposed avoidance and mitigation measures.

⁵ Assessment assumes that all mitigation measures called for within Section 5.2 of this report are implemented.



Table 6.2: Assessment of Project impacts against individual criteria

Criterion	Details of the Proposed Works Outcome	
Potential clearing of 10 ha or more of native vegetation from an area that: is of an EVC identified as endangered by the Department of Sustainability and Environment (in accordance with Appendix 2 of Victoria's Native Vegetation Management Framework); or is, or is likely to be, of very high conservation significance (as defined in accordance with Appendix 3 of Victoria's Native Vegetation Management Framework); and is not authorised under an approved Forest Management Plan or Fire Protection Plan	 To facilitate the proposed works the following extents of native vegetation clearing are required: 3.889 ha of native vegetation to be removed, all of which is from endangered EVCs 0.918 ha native vegetation that is of 'very high conservation significance' (this is a subset/part of the total native vegetation recorded) It is assumed that none of the above extents are authorised under an approved Forest Management Plan or Fire Protection Plan. 	Criterion not met
Potential long-term loss of a significant proportion (e.g. 1 to 5 percent depending on the conservation status of the species) of known remaining habitat or population of a threatened species within Victoria	Percentage habitat lost as a result of the proposed works is presented within the attached Native Vegetation Report (NVR) for each relevant threatened species. The highest percentage loss of habitat is that of Werribee Blue Box at 0.0082%.	Criterion not met
Potential long-term change to the ecological character of a wetland listed under the Ramsar Convention or in 'A Directory of Important Wetlands in Australia	 The Port Philip and Westernport Bay Ramsar Wetland will not be impacted by the works. No wetlands that appear in 'A Directory of Important Wetlands in Australia' occur in the vicinity of the State Project Land and therefore none are expected to be impacted by the proposed works. 	Criterion not met
Potential extensive or major effects on the health or biodiversity of aquatic, estuarine or marine ecosystems, over the long term	 Given the 'waterways and wetlands measures', and 'general construction measures' mitigation measures to be implemented, is unlikely that the proposed works will result in extensive or major effects on aquatic systems. 	Criterion not met

Table 6.3: Assessment of Project impacts against combination criteria

Criterion	Details of the Proposed Works	Outcome
Potential clearing of 10 ha or more of native vegetation, unless authorised under an approved Forest Management Plan or Fire Protection Plan	 To facilitate the proposed works the following extent of native vegetation clearing is required: 3.889 ha of native vegetation It is assumed that this extent is not authorised under an approved Forest Management Plan or Fire Protection Plan. 	Criterion not met
 Matters listed under the Flora and Fauna Guarantee Act 1988: potential loss of a significant area of a listed ecological community; or potential loss of a genetically important population of an endangered or threatened 	 1.293 ha of the Western (Basalt) Plains Grassland Community will be cleared to facilitate the proposed works. Given the limited extent of clearance, and that most of this extent comprises of small, low-quality fragments of Plains Grassland, it is not considered that this area is 'significant'. 	Criterion not met
 species (listed or nominated for listing), including as a result of loss or fragmentation of habitats; or potential loss of critical habitat; or potential significant effects on habitat values of a wetland supporting migratory bird species 	 No populations of threatened species are expected to be lost as a result of the proposed works. No critical habitat for threatened species has been defined under the EEG Act 	
	 Wetlands within the State Project Land are small and degraded and are not considered to constitute important habitat for wetland birds. 	



6.2 Planning and Environment Act 1987

6.2.1 Planning Approval for Native Vegetation Removal Under the Victoria Planning Provisions

There are a variety of pathways via which planning approval may be obtained for rail projects. The planning approval pathway for the Project will be confirmed through further consultation with DELWP. Regardless of the approval pathway, the removal of native vegetation must comply with the Guidelines which are addressed below.

6.2.1.1 Application Requirements from the Guidelines

In accordance with the Clause, application requirements 1, 5, 9, 10, and 11 of the Guidelines must be prepared to the satisfaction of the Secretary to DELWP prior to the removal, destruction or lopping of native vegetation. These application requirements are considered to be appropriately addressed by this ecological impact assessment. Details of where these application requirements are addressed within this report are addressed in Table 6.4.

Application requirement	Comment on how requirement is addressed by this report
1: Information about the native vegetation to be removed including:	• The assessment pathway and reason for assessment pathway (including location category) can be found in Table 6.6 below.
The assessment pathway	• The native vegetation to be removed is described throughout this report, including:
A description of the native vegetation to be removed	 The determination of patch or scattered tree, extent of removal with the type of native vegetation to be removed being specified in Section 5.5.1 The number and circumference of any large trees to be removed in a patch and scattered trees to
Maps showing the native vegetation	be removed, which can be found in Appendix H List of Scattered Trees and Large Trees in patches
I he offset requirement	 The number and circumference of any large trees to be removed in a patch and scattered trees to be removed, which can be found in Appendix H List of Scattered Trees and Large Trees in patches
	 The strategic biodiversity value score, which can be found in Table 6.6 below.
	 The condition score, which can be found in Appendix G Vegetation Quality Assessment (VQA) Results
	 Whether the removal includes any endangered EVCs, which can be found in Section 5.5.1
	 Whether the removal includes sensitive wetland or coastal areas. As stated in Section 5.5.2, it does not.
	 Maps showing vegetation removal can be found in Appendix E Impacted Vegetation Mapping
	 The offset requirement can be found in Table 6.6 below, as well as in the attached scenario test NVR report (Appendix M NVR Report and Offset Credit Register Search).
5: An avoid and minimise statement	The avoid and minimise statement can be found in Section 5.3
9: An offset Statement	 The offset required includes 0.811 general habitat units (with 6 large trees) and 0.764 species units of habitat for Werribee Blue-box (with 2 large trees), as detailed in Table 6.6, and in Appendix M NVR Report and Offset Credit Register Search. The general offset amount required is readily available through offset brokers, however the species offsets required for Werribee Blue-Box are not readily available.
	 Given that the actual distribution of the Werribee Blue-Box is restricted to the Werribee River, and no actual impacts to this species are proposed from the Project, it is recommended that a proposal is lodged to DELWP's native vegetation team to have this species removed from the assessment process. Failing DELWP's acceptance of this proposal, offset availability should be investigated in detail through the assistance of native vegetation offset brokers to source/locate any available offset sites that would meet the requirements of this species. Further steps should also be considered to further avoid or minimise impacts around the Maribyrnong River to reduce offset requirements.

Table 6.4 Application requirements under the Guidelines



Application requirement	Comment on how requirement is addressed by this report
	 In the case that a species offset for Werribee Blue-box is not available following the above actions, an alternative offset can be proposed. The alternative offset must generate direct habitat improvements for the species, that provide equivalent compensation for the removal of its habitat. Alternative arrangements for species offsets are considered for approval on a case by case basis by DELWP and must be to the satisfaction of the Secretary to DELWP.
 10: A site assessment report of the native vegetation to be removed including: A habitat hectare assessment for any patches The location and circumference of any large trees within patches The location and circumference of any scattered trees 	 This ecological impact assessment report forms the required site assessment report, including: A habitat hectare assessment, with condition scores presented in Appendix G Vegetation Quality Assessment (VQA) Results, extent of removal, EVC and bioregional conservations status detailed in Section 5.5.1, The number and circumference of any large trees to be removed in a patch and scattered trees (including size) to be removed, which can be found in Appendix H List of Scattered Trees and Large Trees in patches
 11: Information about impacts on rare or threatened species habitat including: The relevant section of the Habitat importance map for each species requiring species offset For each rare or threatened species that the native vegetation to be removed is habitat for, according to the Habitat importance maps: The species' conservation status The proportional impact of the removal of native vegetation on the total habitat for that species Whether their habitats are highly localised habitats, or important areas of habitat within a dispersed species 	 This information is addressed in the attached NVR report (Appendix M NVR Report and Offset Credit Register Search)

6.2.2 The Guidelines for the Removal, Destruction and Lopping of Native Vegetation

Areas of native vegetation that are to be removed or impacted due to the Project require approval and offsetting under The Guidelines, pursuant to Clause 52.17 of the Hobsons Bay, Hume, Moreland, Maribyrnong, Brimbank and Moonee Valley Planning Schemes.

The Guidelines provide a risk-based level of assessment for approval to remove native vegetation. Based on the potential for biodiversity loss, the risk-based level of assessment identifies the level of risk posed by the Project to Victoria's biodiversity and requires an appropriately detailed level of assessment to be conducted to inform determining authorities in making approval decisions.

The application requirements are outlined in the Guidelines. They have been addressed in this report, including the avoid and minimise statement in Section 5.5.

The risk-based level of assessment (basic, intermediate or detailed) is determined by considering the Location Category, Extent and number of Large Trees within the proposed native vegetation clearing. The Guidelines specify the resulting assessment pathway.



Where a site occupies a broad area, multiple Location Categories may occur. In this case the highest category is applied to the entire application. Extent includes the area of impact to native vegetation; both patches and scattered trees.

Table 6.5: Determining the assessment pathways

Extent of native vegetation	Location Category		
	Location 1	Location 2	Location 3
Less than 0.5 ha and not including any large trees	Basic	Intermediate	Detailed
Less than 0.5 ha and including one or more large trees	Intermediate	Intermediate	Detailed
0.5 ha or more	Detailed	Detailed	Detailed

6.2.2.1 Extent of vegetation loss

The following native vegetation is required for removal for the Project:

- 3.889 ha of native vegetation in patches (including six large trees in patches) and
- 37 scattered trees (35 small and 2 large)

Under the Guidelines, all native vegetation removal, including scattered trees is converted into an equivalent area. This is done for scattered trees based on the area of a circle of 15 m radius for large trees, and 10 m radius for small trees. On this basis the total extent of native vegetation removal as per the NVR Report equates to 4.711 ha (See Table 6.6).

6.2.2.2 Assessment Pathway

As the quantity of native vegetation lost exceeds 0.5 ha, and includes large trees, the **Detailed Assessment Pathway** applies.

6.2.2.3 Native Vegetation Offsets

The NVR report outlines the offset requirements for the Project, including both general and species offsets. A summary of the offset requirements for the Project is provided in Table 6.6 below with the full report provided in Appendix M

NVR Report and Offset Credit Register Search. Note that both the general and species offsets are required to be achieved to meet the offset requirements of the Guidelines.

Table 6.6: Native vegetation removal and offsets summary

Summary of native vegetation removal		
Extent of proposed vegetation removal	4.711 ha	
Extent of past removal	0.000 ha	
Number of Large Trees to be removed	8	
Location Category	Location 3 The native vegetation is in an area mapped as an endangered EVC, sensitive wetland or coastal area. Removal of less than 0.5 hectares of vegetation could have a significant impact on any habitat for rare or threatened species.	



Offset requirements		
	General offset amount	0.811 general habitat units
General offset	Vicinity	Port Phillip and Westernport Catchment Management Authority (CMA) or Brimbank City, Maribyrnong City, Moonee Valley City, Moreland City Council
	Minimum strategic biodiversity value score	0.239
	Large trees*	6 large trees
Species offset	Species offset amount	0.764 species units of habitat for Werribee Blue-box, Eucalyptus baueriana subsp. thalassina
	Large trees*	2 trees

*Note: A total of 8 large trees are to be protected in either the general, species or combination across all habitat units protected

6.2.2.4 Obtaining Native Vegetation Offsets

The offset required includes 0.811 general habitat units (with 6 large trees) and 0.764 species units of habitat for Werribee Blue-box (with 2 large trees) as detailed in Table 6.6, and in Appendix M. The general offset amount required is readily available through offset brokers, however the species offsets required for Werribee Blue-Box are not readily available.

Given that the actual distribution of the Werribee Blue-Box is restricted to the Werribee River, and no actual impacts to this species are proposed from the Project, it is recommended that a proposal is lodged to DELWP's native vegetation team to have this species removed from the assessment process. Failing DELWP's acceptance of this proposal, offset availability should be investigated in detail through the assistance of native vegetation offset brokers to source/locate any available offset sites that would meet the requirements of this species. Further steps should also be considered to further avoid or minimise impacts around the Maribyrnong River to reduce offset requirements.

In the case that a species offset for Werribee Blue-box is not available following the above actions, an alternative offset can be proposed. The alternative offset must generate direct habitat improvements for the species, that provide equivalent compensation for the removal of its habitat. Alternative arrangements for species offsets are considered for approval on a case by case basis by DELWP and must be to the satisfaction of the Secretary to DELWP.



7. Conclusion and Next Steps

The terrestrial ecology impact assessment of the MAR State Project Land has been prepared based on extensive ecological surveys across multiple seasons. Detailed ecological assessment (including native vegetation and habitat assessments, as well as various targeted surveys for threatened species) has been conducted throughout the MAR State Project Land between 2018 and 2021.

This assessment resulted in the identification of various significant ecological values, including high quality native vegetation and the presence of state and Commonwealth listed threatened species and ecological communities. The identification of significant ecological values prompted the initial exclusion of particular key sites from the State Project Land (i.e. Matthews Hill Reserve and the Sunshine Triangle Ecological Site) as well as the early recommendation for establishment of numerous No-Go Zones within the State Project Land, which have since been incorporated into the Project.

No-Go Zones, and various other mitigation measures (many which are species specific) will be applied through the MAR EMF, that details specific EMRs that must be implemented by the Delivery Partners and will include requirements such as a CEMP. Compliance with the EMRs will be enforced by the Project Owner through the contractual arrangements for design and construction of the Project and monitored by way of inspections, reports and audits, with penalties applied for non-conformance.

Further avoidance and minimisation of impacts to ecological values is to be achieved at the detailed design phase of the Project.

7.1 Ecological Values within the State Project Land

A summary of the ecological values within the State Project Land, and impacts to those values is presented in Table 7.1.

Relevant Legislation	Ecological Values	Residual Impacts
Commonwealth listed Environment Protection and Biodiversity Conservation Act 1999 (EPBC Act)	Natural Temperate Grassland of the Victorian Volcanic Plain (NTGVVP) Threatened Ecological Community • 5.960 ha within the State Project Land	 Significant Impact Direct removal of 0.221 ha of NTGVVP Exacerbation of fragmentation of NTGVVP at the M80 North Zone
	 Sunshine Diuris (Diuris fragrantissima) Known population adjacent to the State Project Land within the Sunshine Triangle Ecological Site 	 Following strict mitigation measures, Sunshine Diuris is not considered to a be impacted by the proposed works. This is not considered to be a significant impact under the EPBC Act
	 Spiny Rice-flower (Pimelea spinescens subsp. spinescens) 77 individuals present across a number of locations within the State Project Land 	 Significant Impact Direct removal of 8 individuals in the rail corridor adjacent to the River Valley Estate, and at Munro Avenue in the South of Solomon Heights
	 Large-headed Fireweed (Senecio macrocarpus) Known population adjacent to the State Project Land within the Matthews Hill Reserve 	 Following strict mitigation measures, Large-headed Fireweed is not considered to a be impacted by the proposed works. This is not considered to be a significant impact under the EPBC Act
	 Striped Legless Lizard (Delma impar) 12.115 ha of Striped Legless Lizard habitat was recorded within the State Project Land. 	 Significant Impact Direct removal of 1.147 ha of Striped Legless Lizard habitat, and fragmentation resulting in the isolation of 0.46 ha Striped Legless Lizard habitat, amounting to a significant impact to this species.

Table 7.1 Summary of ecological values present in and adjacent to the State Project Land and residual impacts following avoidance and mitigation measures



Relevant Legislation	Ecological Values	Residual Impacts
		 Exacerbation of fragmentation of Striped Legless Lizard Habitat at the M80 North Zone
		 Possible, localised reduction in habitat suitability due to noise and vibration associated with the construction of the M80 viaduct.
		 Injury or death of some Striped Legless Lizard individuals is expected during the habitat clearance within the M80 North Zone.
	Growling Grass Frog (Litoria	Significant Impact
	 raniformis) Known to utilise the Maribyrnong River, Steele Creek/Steele Creek North, and Moonee Ponds Creek to varying degrees 	 Permanent removal of 0.268 ha and temporary removal (with revegetation) of 0.932 ha of terrestrial riparian overwintering habitat for the Growling Grass Frog.
		 Alteration of aquatic habitat corridors and temporary barriers to dispersal during Maribyrnong River Bridge construction for the estimated 3.5 year construction period.
		 Temporary isolation of a stormwater retention basin (the M80 retention basin, known to be utilised by the species for dispersal) from Steele Creek North for the estimated three year duration of the M80 viaduct construction
		 Possible intermittent noise-induced changes to calling behaviour, localised to the Maribymong River in the Vicinity of the Maribymong River bridge construction.
		• The combination of the above direct and indirect impacts are considered to amount to a significant impact under the EPBC Act.
	Golden Sun Moth (Synemon plana)	Direct removal of 0.319 ha of Golden Sun Moth Habitat
	 1.405 ha of GSM habitat was recorded within the State Project Land (at Solomon Heights and Luma Estate). 	along the Munro Avenue road reserve in the South of Solomon Heights, however, this is not considered to constitute a significant impact under the EPBC Act as it falls below the 0.5 ha significant impact threshold
	 GSM were also confirmed during targeted surveys within the Matthews Hill Reserve (outside State Project Land) 	
State Listed Environment Effects Act 1978 (EE Act)	Western (Basalt) Plains Grassland (WBPG) Community Threatened Community	 Direct removal of 1.293 ha of WBPG across the State Project Land
Flora and Fauna Guarantee Act 1988	 8.510 ha within the State Project Land 	
(FFG Act) Planning and	FFG listed Threatened and Protected Flora	 Direct removal of 8 Spiny Rice-flower plants in the rail corridor adjacent to the River Valley Estate (as above)
Environment Act 1987 (P&E Act)	A moderate or higher likelihood of	and from the Murro Avenue Road Reserve in the South of
	occurrence of ten threatened flora species listed under the FFG Act,	 Direct removal of 11 Fragrant Salt Bush Plants at the
Guidelines for the removal, destruction or lopping of native vegetation (the Guidelines)	including the above-mentioned flora species listed under the EPBC Act,	Luma Estate, Brimbank Park and the M80 North Zone
	as well as Arching Flax-lily, Studley Park Gum and Fragrant Saltbush (recorded), and Leafy Twig Sedge, Pale-flower Crane's-bill, Austral Tobacco and Rye Beetle-grass (moderate likelihood of occurrence).	 Direct removal of plants belonging to four FFG Act protected taxa on public land.
	 Presence of 9 protected flora taxa (from the Acacia [wattle] genus or Asteraceae [daisy] family) 	
	FFG listed Threatened Fauna	Impacts to Striped Legless Lizard (as detailed above)
	 A moderate or higher likelihood of occurrence of six threatened fauna species listed under the FFG Act 	 Impacts to Growling Grass Frog (as detailed above) Impacts to Golden Sun Moth habitat (as detailed above)



Relevant Legislation	Ecological Values	Residual Impacts
	including the above-mentioned flora species listed under the EPBC Act, as well as Tussock Skink (recorded) and Brown Toadlet and Platypus (moderate likelihood of occurrence)	 Direct removal of 10.150 ha of Tussock Skink (<i>Pseudemoia pagenstecheri</i>) habitat across the State Project Land and exacerbation of fragmentation at the M80 North Zone.
	Native Vegetation	• Removal of 3.889 ha of native vegetation in patches from
	 33.266 ha of native vegetation comprising eight EVCs 	seven EVCs, including removal of six large trees in patches
	64 large trees in patches	Removal of 37 scattered trees (including 35 small and 2 large)
	 86 scattered trees (including 79 small and 7 large) 	laige).

7.2 Next Steps

Based on the findings of this ecological impact assessment, it is recommended that the following assessments and next steps be completed as per Table 7.2.

Table 7.2: Summarv	of Actions	Required in	accordance with	relevant policy	and legislation
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Policy/Legislation	Actions required			
Commonwealth				
EPBC Act	Project is required to be referred under the EPBC Act due to the likely significant impacts to NTGVVP, Spiny Rice-flower, Striped Legless Lizard and Growling Grass Frog.			
	 EPBC Act offsets for impacts to the above listed species are likely to be required if the Project is determined a controlled action under the EPBC Act following the referral. It is recommended that discussions with offset brokers are undertaken to understand the availability of potential EPBC Act offsets that may be required for the Project. It is recommended that offset availability is investigated as soon as possible as the establishment of new offset sites can be a lengthy process and offsets are required to be formalised and secured before construction can commence. Initial priority should be given to sourcing a potential offset site that meets the requirements of as many MNES as possible (i.e. a suitable grassland site that supports NTGVVP, Spiny Rice-flower and Striped Legless Lizard). The process involved for formalising any EPBC Act offset requirement is likely to include: 			
	 Engagement with offset providers to locate/source an appropriate site or number of sites to meet the specific offset requirements; 			
	 Preparation of a memorandum of understanding (or similar) that outlines a commitment from both RPV and the offset provider, while the detail of the offset is prepared; 			
	 A likely requirement of surveying for relevant MNES at potential offset site/s to justify the presence of MNES (seasonal based on survey times for specific MNES); 			
	 Preparation of a detailed Offset Management Strategy and Offset Management Plan to outline how the offset will be achieved at the specified offset site/s; 			
	 Submission of the proposed offset to DAWE as part of the likely required Commonwealth approval; and 			
	• Negotiation and formal securing of the offset via a formal on-title agreement or similar.			
	 Threatened Species Management Plans for both the Sunshine and Corridor Sections of the State Project Land have been prepared to support assessment of the Project under the EPBC Act. The implementation of management measures outlined in these plans is required to ensure no further impacts beyond those accounted for in this assessment. 			
EE Act	No further ecology actions expected under this Act.			
P&E Act	 Planning approval required for the total extent loss of 4.711 ha of native vegetation including 8 large trees 			
	 The offset required to compensate for the extent of native vegetation removal includes both general and specific offsets. The offset required includes 0.811 general habitat units (with 6 large trees) and 0.764 species units of habitat for Werribee Blue-box (with 2 large trees). The general offset amount required is readily available through offset brokers, however the species offsets required for Werribee Blue-Box are not readily available. 			
	 Given that the actual distribution of the Werribee Blue-Box is restricted to the Werribee River, and no actual impacts to this species are proposed from the Project, it is recommended that a 			



Policy/Legislation	Actions required		
	proposal is lodged to DELWP's native vegetation team to have this species removed from the assessment process. Failing DELWP's acceptance of this proposal, offset availability should be investigated in detail through the assistance of native vegetation offset brokers to source/locate any available offset sites that would meet the requirements of this species. Further steps should also be considered to further avoid or minimise impacts around the Maribyrnong River to reduce offset requirements.		
	 In the case that a species offset for Werribee Blue-box is not available following the above actions, an alternative offset can be proposed. The alternative offset must generate direct habitat improvements for the species, that provide equivalent compensation for the removal of its habitat. Alternative arrangements for species offsets are considered for approval on a case by case basis by DELWP and must be to the satisfaction of the Secretary to DELWP 		
	• Priority should be given to sourcing state native vegetation offsets at a site that also meets the requirements for Commonwealth (MNES) offsets.		
	• Efforts to avoid and minimise impacts to biodiversity must continue through the design phase, and into the construction phase.		
FFG Act	• 'Permit to take' under the FFG Act required for the removal of eight Spiny Rice-flower, 11 Fragrant Salt bush, and a number of plants from four protected taxa that occur on public land.		
Wildlife Act	 Avoid and minimise impacts to wildlife habitat and ensure salvage and ethical treatment of wildlife. 		
	 'Fauna Salvage and Relocation' mitigation measures from Section 5.2 must be incorporated into the CEMP. 		
CaLP Act	Undertake measures to prevent the spread of weeds within and away from the State Project Land. These measures must be implemented into the CEMP.		



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APPENDIX A SUMMARY OF PREVIOUS STUDIES




Source	State Project Land	Date	Methods	Findings	Relevance for MAR
Abzeco (2011) Flora & Fauna report on Baldwin Avenue / Solomon Heights Grassland Prepared for Brimbank City Council	Solomon Heights and the River Valley Estate	May 2011	Habitat Assessments Targeted SRF surveys Targeted SLL surveys (in 2009)	309 Spiny Rice-flower recorded ~16 ha of Plains Grassland No MFL recorded SLL surveys in 2009 were completed in peak season with no detection, two SLL sloughs were recorded during opportunistic check in March	Low records/density of SLL detections across entire Solomon Heights Grassland
ABZECO (2021) Letter of Advice: Draft Masterplan for Border Drive Reserve, Keilor East	Border Drive Reserve	Jan 2021	Overview assessment to determine presence of native vegetation and ecological values	Central area of Border Drive Reserve found to support NTGVVP. Additional areas found to support Plains Grassland. Potential suitable habitat considered to be present for threatened species namely SRF, LHF, GSM and SLL.	The classification by ABZECO of the central portion of the Border Drive Reserve as NTGVVP has been considered in this assessment, and this area has therefore been made a No-Go Zone (NGZ 23). The consideration by ABZECO that SRF, LHF and SLL may occur in this area is not supported by AJM. The area is considered to be too disturbed to support these species. Given the high cover of wallaby grass recorded by ABZECO at the time of surveying, there is potential that GSM may utilise this area. Detailed assessment of native vegetation as well as a targeted survey for GSM in the grassland habitats at Border Drive Reserve has been scheduled for summer 2021- 2022.
Ecology and Heritage Partners (2016) Ecological Assessment, Solomon Heights (Munro Avenue to Whitehill Avenue), Sunshine North, Victoria. Report for Glen Ora Estate	Solomon Heights (south only)	Jan 2016	Habitat Hectare assessment No targeted surveys completed	Habitat assessments completed for Flora (SRF, MFL) and Fauna (GSM and SLL)	Habitat assessment completed for Solomon Heights



Source	State Project Land	Date	Methods	Findings	Relevance for MAR
Locations of Spiny Rice-flower recorded during targeted surveys (2016)	Solomon Heights (south only)	Jan 2016	Targeted surveys completed for Spiny Rice-flower (between Munro Av and Whitehill Av)	24 Spiny Rice-flower individuals	Recent SRF records at Solomon Heights (south only)
Ecology and Heritage Partners (2016) Targeted Surveys for Matted Flax-lily and Golden Sun Moth, Solomon Heights, Sunshine North, Victoria. Prepared for Glen Ora Estate	Solomon Heights (south only)	March 2016	Targeted GSM surveys Targeted MFL surveys	No MFL recorded at Solomon Heights GSM recorded in Solomon Heights (central area)	GSM habitat across Solomon Heights – does not include rail corridor
Abzeco (2016) Targeted surveys undertaken for the Striped Legless Lizard Delma impar at Solomon Heights, Sunshine North, Victoria. Report for Brimbank Council	Solomon Heights	March 2016	Targeted SLL surveys	Seven SLL and two sloughs recorded Distribution of detections primarily across southern and central part of Solomon Heights	SLL habitat across Solomon Heights – does not include rail corridor
Blue Devil Consulting (2016) Survey of Spiny Rice-flower (<i>Pimelea</i> <i>spinescens subsp. spinescens</i>) on Southern Section	Solomon Heights (south only)	June 2016	Targeted SRF surveys	91 Spiny Rice-flower individuals	Recent SRF records at Solomon Heights (south only)
Biosis (2016) Solomon Heights Biodiversity Project. Report prepared for Brimbank City Council	Solomon Heights, Sunshine North Escarpment and the River Valley Estate	Dec 2016	Habitat Hectare Assessment Targeted flora surveys	400 Spiny Rice-flower individuals 4 mats of Matted Flax-lily Other threatened species: Arching Flax- lily, Austral Tobacco, Fragrant Saltbush	SRF records across River Valley Estate (east) differs slightly to Brett Lane records Matted Flax-lily records at River Valley Estate
Brett Lane and Associates (2018) River Valley Estate Matters of National Environmental Significance. Consultant Report prepared for Atlantic Link	River Valley Estate	May 2018	Targeted SRF surveys Targeted SLL surveys Targeted GSM surveys	73 Spiny Rice-flower individuals recorded No MFL recorded on Atlantic Link No SLL recorded during surveys No GSM recorded during surveys	Matted Flax-lily not recorded at River Valley Estate
Ecology and Heritage Partners (2020) Habitat Hectare Assessment and Spiny Rice-flower Survey: Solomon Heights, Sunshine North, Victoria	Solomon Heights	August 2020	Habitat Hectare Assessment Targeted SRF surveys (of existing 130 plants)	117 Spiny Rice-flower individuals	Recent SRF records in Solomon Heights (south only)



APPENDIX B LEGISLATION SUMMARY



Table B.1 Legislation Summary

Legislation/policy	Description	Project relevance
Commonwealth		
Environment Protection and Biodiversity Conservation Act 1999 (EPBC Act)	The EPBC Act provides for the listing of nationally threatened species, threatened ecological communities and key threatening processes; and provides the legal framework to protect and manage nine matters of national environmental significance (MNES): world heritage properties; national heritage places; wetlands of international importance (Ramsar); listed threatened species and communities; listed migratory species; Commonwealth marine areas; the Great Barrier Reef Marine Park; nuclear actions; and water resources, in relation to coal seam gas and large coal mining development. Any project, not covered by an approved strategic assessment, that is likely to have a significant impact on MNES, is required to be referred to the Commonwealth Minister for Environment via DAWE for a decision on whether the project is a 'controlled action' requiring assessment and approval under the EPBC Act.	Determine whether any MNES are likely to be 'significantly' impacted by the proposed works. Recommend further assessment where required, such as targeted surveys. Where MNES may be impacted, recommend mitigation measures to avoid and reduce impact. If a significant impact cannot be avoided, the Project will need to be referred to DAWE.
State		
Environment Effects Act 1978 (EE Act)	The EE Act provides for the assessment of actions that are capable of having a significant effect on the environment. A project is required to be referred to the Victorian Minister for Planning for a decision on whether an EES is required, if the Project triggers one individual or at least two combination referral criteria specified in the ' <i>Ministerial guidelines for assessment of environmental effects under the Environment Effects Act 1978</i> ' (DSE, 2006) (Ministerial Guidelines). Biodiversity referral criteria include potential clearing of 10 ha or more of native vegetation (particularly endangered EVCs), potentially significant impacts on species or ecological communities threatened in Victoria, and potentially significant impacts on the ecological character of internationally or nationally important wetlands. The EE Act also allows an applicant to write to the Secretary of the DELWP to confirm no EES is required. The assessment process under this Act is not an approval process itself, rather it enables statutory decision-makers to make decisions about whether a project with potentially significant environmental effects should proceed. If an EES is required, statutory approval decisions (e.g. planning permit, FFG Act permit) are put on hold until the EES process is complete.	Determine whether the extent of removal of native vegetation and habitat for threatened species of state significance will trigger the need for a referral based on relevant biodiversity referral criteria in the Ministerial Guidelines. Recommend further assessment where required, such as targeted surveys. If a trigger for referral under the EE Act is met, recommend mitigation measures to avoid and reduce impact. If impact cannot be avoided or reduced below the referral thresholds, an EE Act referral will need to be submitted.
Flora and Fauna Guarantee Act 1988 (FFG Act)	The FFG Act provides a framework for biodiversity conservation in Victoria, including providing for the listing of threatened species and communities of flora and fauna, as well as threatening processes. A number of non-threatened flora species are also listed as protected under the FFG Act. A permit to take is required to remove protected flora, including listed threatened and non-threatened flora, from public land. The FFG Act Amendment Act 2019 came into effect on 1 June 2020. As part of the amendments, all taxa of flora and fauna listed under the FFG Act, along with taxa previously listed as threatened on the DELWP Advisory lists and any taxa nominated by public submissions, were assessed in accordance with the common assessment method by a Scientific Advisory Committee overseen by DELWP. This process was completed with the gazetting of a new FFG Act threatened list in May 2021 and the DELWP Advisory lists	Determine if any FFG Act listed flora or fauna species are likely to be affected or threatening processes occur by the proposed works. Public authority proponent is obliged to avoid and reduce impacts to FFG Act values in accordance with the objectives of the Act. Recommend further assessment where required, such as targeted surveys. Where listed flora and fauna species are identified or threatening processes likely, recommend mitigation measures to avoid and reduce impact. If protected flora are to be removed from public land, a permit to take will need to be obtained. The amended threatened species list and protected flora list are not yet available



Legislation/policy	Description	Project relevance	
	The FFG Act Amendment Act 2019 also introduces changes to the categories of protected flora and the way they are regulated, including introducing two categories: 'restricted use protected flora' and 'generally protected flora'. Restricted use protected flora are exclusively threatened by take for commercial/personal use, and the taking of these species incidental to clearing for development works, will not require a permit to take. Generally protected flora are threatened by take for reasons other than or additional to commercial/personal use (e.g. development clearing) and will require a permit to take for any purpose. The protected flora list is currently being reviewed, but for now, all protected flora are classified as generally protected flora. Under the FFG Act, public authorities have a duty of care to consider potential biodiversity impacts when exercising their functions, including giving proper attention to the objectives of the FFG Act.	requirements contained in this report if the new lists come into effect before the development proceeds.	
Planning and Environment Act 1987 (P&E Act)	 The P&E Act regulates the use and development (including works involving vegetation removal) of land in Victoria, and provides the framework and procedures for preparing and amending planning schemes, obtaining planning permits and enforcing compliance with planning schemes. The State Project Land is subject to the Hobsons Bay, Maribyrnong, Brimbank and Moonee Valley Planning Schemes. These Planning Schemes, through the Victoria Planning Provisions, identifies where a planning permit is required for the removal of vegetation: Planning approval is required to remove, destroy, or lop native vegetation pursuant to Clause 52.17 Native Vegetation; unless specific exemptions apply 	Identify where native vegetation is present and may be impacted. Where native vegetation is present, recommend mitigation measures to avoid and minimise the impact (removal, destruction, or lopping) to native vegetation. If native vegetation impacts cannot be avoided, a permit will be required under Clause 52.17 from the responsible authority (Council) and the appropriate offset requirements identified and obtained prior to works commencing. Native vegetation offsets will need to be calculated in accordance with the Guidelines (DELWP 2017a) once the extent of impacts is confirmed. Identify vegetation that may require a permit to remove under relevant planning scheme overlays and provisions.	
Guidelines for the removal, destruction or lopping of native vegetation (the Guidelines) (DELWP 2017)	The planning permit assessment process and offset requirements for impacts to native vegetation associated with Clause 52.17 of the planning scheme are undertaken in accordance with the Guidelines (DELWP 2017a). The Guidelines guide how impacts on biodiversity should be considered, including whether a permit should be granted when assessing a planning permit application. The primary objective of the Guidelines is to achieve no net loss of native vegetation, through a three-step approach of avoid and minimise impacts, and offset unavoidable losses through the protection and ongoing management of an area proportional to their importance in Victoria's biodiversity. Depending on the location and scale of native vegetation removal, the planning permit application may require statutory referral to DELWP.		
Catchment and Land Protection Act 1994 (CaLP Act)	 The CaLP Act defines requirements to: Avoid land degradation; Conserve soil; Protect water resources; and Eradicate and prevent the spread and establishment of noxious weed and pest animal species. The CaLP Act defines four categories of noxious weeds: State Prohibited Weeds, Regionally Prohibited Weeds, Regionally Controlled Weeds and Restricted Weeds. Noxious weed species and the category they are placed in is specific to individual CMA regions. 	Determine whether any pest plant or animal species are present within the State Project Land. Recommend mitigation measures to control pest plant and animal species and to prevent an increase in the population of the species as a result of proposed works.	
Wildlife Act 1975 (Wildlife Act)	The Wildlife Act establishes procedures to protect and conserve Victoria's wildlife. It is an offence under the Wildlife Act to kill, take, control or harm wildlife or to damage, disturb	To facilitate construction of the Project, it may be necessary to relocate wildlife to a suitable habitat outside of the construction area. Any persons engaged	



Legislation/policy	Description	Project relevance
	or destroy wildlife habitat unless authorised to do so under the Act or associated Wildlife Regulations 2013.	by the Project to relocate or otherwise handle wildlife will need to hold the
	Approval to damage, disturb or destroy wildlife habitat is not required under this Act where authorised under another Act (e.g. permit to remove native vegetation under the P&E Act). Section 28A of the Act empowers the Secretary of DELWP (or delegate) to provide an individual written authorisation to take wildlife for a range of purposes, including for protection and enabling the care of sick, injured or orphaned wildlife. Such authorisation generally comes with strict terms and conditions which the individual must comply with.	appropriate authorisation under the Wildlife Act. This requirement will need to be addressed by the relevant construction contractor and should be included in the project environmental management plan.



APPENDIX C PMST SEARCH



Australian Government



Department of the Environment and Energy

EPBC Act Protected Matters Report

This report provides general guidance on matters of national environmental significance and other matters protected by the EPBC Act in the area you have selected.

Information on the coverage of this report and qualifications on data supporting this report are contained in the caveat at the end of the report.

Information is available about <u>Environment Assessments</u> and the EPBC Act including significance guidelines, forms and application process details.

Report created: 03/09/20 14:08:41

Summary Details Matters of NES Other Matters Protected by the EPBC Act Extra Information Caveat Acknowledgements



This map may contain data which are ©Commonwealth of Australia (Geoscience Australia), ©PSMA 2010

Coordinates Buffer: 5.0Km



Summary

Matters of National Environmental Significance

This part of the report summarises the matters of national environmental significance that may occur in, or may relate to, the area you nominated. Further information is available in the detail part of the report, which can be accessed by scrolling or following the links below. If you are proposing to undertake an activity that may have a significant impact on one or more matters of national environmental significance then you should consider the <u>Administrative Guidelines on Significance</u>.

World Heritage Properties:	None
National Heritage Places:	1
Wetlands of International Importance:	1
Great Barrier Reef Marine Park:	None
Commonwealth Marine Area:	None
Listed Threatened Ecological Communities:	6
Listed Threatened Species:	66
Listed Migratory Species:	58

Other Matters Protected by the EPBC Act

This part of the report summarises other matters protected under the Act that may relate to the area you nominated. Approval may be required for a proposed activity that significantly affects the environment on Commonwealth land, when the action is outside the Commonwealth land, or the environment anywhere when the action is taken on Commonwealth land. Approval may also be required for the Commonwealth or Commonwealth agencies proposing to take an action that is likely to have a significant impact on the environment anywhere.

The EPBC Act protects the environment on Commonwealth land, the environment from the actions taken on Commonwealth land, and the environment from actions taken by Commonwealth agencies. As heritage values of a place are part of the 'environment', these aspects of the EPBC Act protect the Commonwealth Heritage values of a Commonwealth Heritage place. Information on the new heritage laws can be found at http://www.environment.gov.au/heritage

A <u>permit</u> may be required for activities in or on a Commonwealth area that may affect a member of a listed threatened species or ecological community, a member of a listed migratory species, whales and other cetaceans, or a member of a listed marine species.

Commonwealth Land:	8
Commonwealth Heritage Places:	3
Listed Marine Species:	68
Whales and Other Cetaceans:	7
Critical Habitats:	None
Commonwealth Reserves Terrestrial:	None
Australian Marine Parks:	None

Extra Information

This part of the report provides information that may also be relevant to the area you have nominated.

State and Territory Reserves:	3
Regional Forest Agreements:	1
Invasive Species:	47
Nationally Important Wetlands:	None
Key Ecological Features (Marine)	None

Details

Matters of National Environmental Significance

National Heritage Properties		[Resource Information]
Name	State	Status
Historic		
Flemington Racecourse	VIC	Listed place
Wetlands of International Importance (Ramsar)		[Resource Information]
Name		Proximity
Port phillip bay (western shoreline) and bellarine peninsula		Within 10km of Ramsar

Listed Threatened Ecological Communities

For threatened ecological communities where the distribution is well known, maps are derived from recovery plans, State vegetation maps, remote sensing imagery and other sources. Where threatened ecological community distributions are less well known, existing vegetation maps and point location data are used to produce indicative distribution maps.

Name	Status	Type of Presence
Grassy Eucalypt Woodland of the Victorian Volcanic	Critically Endangered	Community known to occur
<u>Plain</u>		within area
<u>Grey Box (Eucalyptus microcarpa) Grassy Woodlands</u>	Endangered	Community may occur
Australia		within area
Natural Damp Grassland of the Victorian Coastal	Critically Endangered	Community may occur
Plains		within area
Natural Temperate Grassland of the Victorian Volcanic	Critically Endangered	Community likely to occur
<u>Plain</u>		within area
Subtropical and Temperate Coastal Saltmarsh	Vulnerable	Community likely to occur
White Box-Vellow Box-Blakely's Red Gum Grassy	Critically Endangered	Community likely to occur
Woodland and Derived Native Grassland	Onlically Endangered	within area
Listed Threatened Species		[Resource Information]
Name	Status	Type of Presence
Birds		
Anthochaera phrygia		
Regent Honeyeater [82338]	Critically Endangered	Foraging, feeding or related
		within area
Botaurus poiciloptilus		
Australasian Bittern [1001]	Endangered	Species or species habitat
		known to occur within area
Calidris caputus		
Red Knot Knot [855]	Endangered	Species or species habitat
	Lindangered	known to occur within area
Calidris ferruginea		
Curlew Sandpiper [856]	Critically Endangered	Species or species habitat
		known to occur within area
Calidris tenuirostris		
Great Knot [862]	Critically Endangered	Roosting known to occur
		within area
Diomedea antipodensis		
Antipodean Albatross [64458]	Vulnerable	Foraging, feeding or related
		behaviour likely to occur
Diomedea enomonhora		within area
Southern Royal Albatross [89221]	Vulnerable	Foraging feeding or related
		behaviour likely

[Resource Information]

Name	Status	Type of Presence
		to occur within area
Diomedea exulans Wandering Albatross [89223]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Diomedea sanfordi		
Northern Royal Albatross [64456]	Endangered	Foraging, feeding or related behaviour likely to occur within area
Falco hypoleucos		
Grey Falcon [929]	Vulnerable	Species or species habitat likely to occur within area
Grantiella picta		
Painted Honeyeater [470]	Vulnerable	Species or species habitat likely to occur within area
Hirundapus caudacutus		
White-throated Needletail [682]	Vulnerable	Species or species habitat known to occur within area
Lathamus discolor		
Swift Parrot [744]	Critically Endangered	Species or species habitat known to occur within area
Limosa lapponica baueri		
Bar-tailed Godwit (baueri), Western Alaskan Bar-tailed Godwit [86380]	Vulnerable	Species or species habitat known to occur within area
Limosa lapponica, menzhieri		
Northern Siberian Bar-tailed Godwit, Bar-tailed Godwit (menzbieri) [86432]	Critically Endangered	Species or species habitat may occur within area
Macronectes diganteus		
Southern Giant-Petrel, Southern Giant Petrel [1060]	Endangered	Species or species habitat may occur within area
Macronectes halli		
Northern Giant Petrel [1061]	Vulnerable	Species or species habitat may occur within area
Neophema chrysodaster		
Orange-bellied Parrot [747]	Critically Endangered	Migration route likely to occur within area
Numenius madagascariensis		
Eastern Curlow, Ear Eastern Curlow [847]	Critically Endangered	Spaciae or enaciae habitat

Eastern Curlew, Far Eastern Curlew [847]	Critically Endangered	known to occur within area
Pachyptila turtur subantarctica Fairy Prion (southern) [64445]	Vulnerable	Species or species habitat known to occur within area
Pedionomus torquatus Plains-wanderer [906]	Critically Endangered	Species or species habitat likely to occur within area
Phoebetria fusca Sooty Albatross [1075]	Vulnerable	Species or species habitat likely to occur within area
Pterodroma leucoptera leucoptera Gould's Petrel, Australian Gould's Petrel [26033]	Endangered	Species or species habitat may occur within area
Rostratula australis Australian Painted Snipe [77037]	Endangered	Species or species habitat known to occur within area
<u>Sternula nereis</u> Australian Fairy Tern [82950]	Vulnerable	Species or species habitat known to occur within area

Nomo	Statua	Turne of Dreasance
	Status	Type of Presence
Buller's Albatross, Pacific Albatross [64460]	Vulnerable	Species or species habitat may occur within area
Thalassarche bulleri, platei		
Northern Buller's Albatross, Pacific Albatross [82273]	Vulnerable	Species or species habitat may occur within area
Thalassarche cauta		
Shy Albatross [89224]	Endangered	Foraging, feeding or related behaviour likely to occur within area
<u>Thalassarche impavida</u> Campbell Albatross, Campbell Black-browed Albatross [64459]	Vulnerable	Species or species habitat may occur within area
Thalassarche melanophris		
Black-browed Albatross [66472]	Vulnerable	Species or species habitat may occur within area
Thalassarche salvini		
Salvin's Albatross [64463]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Thalassarche steadi		
White-capped Albatross [64462]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
<u>I ninornis cuculiatus</u>	× <i>r</i> · · · ·	
Hooded Plover (eastern), Eastern Hooded Plover [90381]	Vulnerable	Species or species habitat likely to occur within area
Fish		
Galaxiella pusilla		
Eastern Dwarf Galaxias, Dwarf Galaxias [56790]	Vulnerable	Species or species habitat likely to occur within area
Maccullochella peelii		
Murray Cod [66633]	Vulnerable	Species or species habitat known to occur within area
Nannoperca obscura		
Yarra Pygmy Perch [26177]	Vulnerable	Species or species habitat likely to occur within area

Vulnerable

Species or species habitat known to occur within area

Frogs		
Litoria raniformis		
Growling Grass Frog, Southern Bell Frog, Green and Golden Frog, Warty Swamp Frog, Golden Bell Frog [1828]	Vulnerable	Species or species habitat known to occur within area
Insects		
Synemon plana		
Golden Sun Moth [25234]	Critically Endangered	Species or species habitat known to occur within area
Mammals		
Antechinus minimus maritimus		
Swamp Antechinus (mainland) [83086]	Vulnerable	Species or species habitat may occur within area
Dasyurus maculatus maculatus (SE mainland populatio	<u>on)</u>	
Spot-tailed Quoll, Spotted-tail Quoll, Tiger Quoll (southeastern mainland population) [75184]	Endangered	Species or species habitat may occur within area
Eubalaena australis		
Southern Right Whale [40]	Endangered	Species or species habitat known to occur within area

Name	Status	Type of Presence
Megaptera novaeangliae Humpback Whale [38]	Vulnerable	Species or species habitat may occur within area
Perameles gunnii Victorian subspecies Eastern Barred Bandicoot (Mainland) [88020]	Endangered	Translocated population known to occur within area
Pteropus poliocephalus Grey-headed Flying-fox [186]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Plants		
<u>Amphibromus fluitans</u> River Swamp Wallaby-grass, Floating Swamp Wallaby-grass [19215]	Vulnerable	Species or species habitat likely to occur within area
Dianella amoena Matted Flax-lily [64886]	Endangered	Species or species habitat known to occur within area
Diuris basaltica Small Golden Moths Orchid, Early Golden Moths [64654]	Endangered	Species or species habitat likely to occur within area
Diuris fragrantissima Sunshine Diuris, Fragrant Doubletail, White Diuris [21243]	Endangered	Species or species habitat likely to occur within area
Dodonaea procumbens Trailing Hop-bush [12149]	Vulnerable	Species or species habitat may occur within area
Glycine latrobeana Clover Glycine, Purple Clover [13910]	Vulnerable	Species or species habitat likely to occur within area
<u>Lachnagrostis adamsonii</u> Adamson's Blown-grass, Adamson's Blowngrass [76211]	Endangered	Species or species habitat likely to occur within area
Leucochrysum albicans subsp. tricolor Hoary Sunray, Grassland Paper-daisy [89104]	Endangered	Species or species habitat likely to occur within area
Pimelea spinescens subsp. spinescens Plains Rice-flower, Spiny Rice-flower, Prickly Pimelea [21980]	Critically Endangered	Species or species habitat known to occur within area
Prasophyllum frenchii Maroon Leek-orchid, Slaty Leek-orchid, Stout Leek- orchid, French's Leek-orchid, Swamp Leek-orchid [9704]	Endangered	Species or species habitat likely to occur within area
Leafy Greenhood [15459]	Vulnerable	Species or species habitat may occur within area
Rutidosis leptorhynchoides Button Wrinklewort [67251]	Endangered	Species or species habitat known to occur within area
Senecio macrocarpus Large-fruit Fireweed, Large-fruit Groundsel [16333]	Vulnerable	Species or species habitat likely to occur within area
Senecio psilocarpus Swamp Fireweed, Smooth-fruited Groundsel [64976]	Vulnerable	Species or species habitat likely to occur within area
Xerochrysum palustre Swamp Everlasting, Swamp Paper Daisy [76215]	Vulnerable	Species or species habitat likely to occur within area

Name	Status	Type of Presence
Reptiles		
Caretta caretta		
Loggerhead Turtle [1763]	Endangered	Species or species habitat known to occur within area
<u>Chelonia mydas</u>		
Green Turtle [1765]	Vulnerable	Foraging, feeding or related behaviour known to occur within area
Delma impar Striped Legless Lizard, Striped Snake-lizard [1649]	Vulnerable	Species or species habitat
Dermochelys coriacea		
Leatherback Turtle, Leathery Turtle, Luth [1768]	Endangered	Species or species habitat known to occur within area
Tympanocryptis pinguicolla		
Grassland Earless Dragon [66727]	Endangered	Species or species habitat known to occur within area
Sharks		
Carcharodon carcharias		
White Shark, Great White Shark [64470]	Vulnerable	Species or species habitat known to occur within area
Listed Migratory Species		[Resource Information]
* Species is listed under a different scientific name on t	the EPBC Act - Threatened	Species list.
Name	Threatened	Type of Presence
Migratory Marine Birds		
Anous stolidus		
Common Noddy [825]		Species or species habitat likely to occur within area
Apus pacificus		
Fork-tailed Swift [678]		Species or species habitat likely to occur within area
Ardenna carneipes		
Flesh-footed Shearwater, Fleshy-footed Shearwater [82404]		Foraging, feeding or related behaviour likely to occur within area
Aruenna grisea Sooty Shoorwatar [82651]		Spacios or oppoios habitat
Sourd Shearwarer [02031]		Species of species nabilat

Diomedea antipodensis		
Antipodean Albatross [64458]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Diomedea epomophora		
Southern Royal Albatross [89221]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Diomedea exulans		
Wandering Albatross [89223]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Diomedea sanfordi		
Northern Royal Albatross [64456]	Endangered	Foraging, feeding or related behaviour likely to occur within area
Macronectes giganteus		
Southern Giant-Petrel, Southern Giant Petrel [1060]	Endangered	Species or species habitat may occur within area
Macronectes halli		
Northern Giant Petrel [1061]	Vulnerable	Species or species habitat may occur within area

Name	Threatened	Type of Presence
Phoebetria fusca Sooty Albatross [1075]	Vulnerable	Species or species habitat likely to occur within area
Sternula albifrons Little Tern [82849]		Species or species habitat may occur within area
<u>Thalassarche bulleri</u> Buller's Albatross, Pacific Albatross [64460]	Vulnerable	Species or species habitat may occur within area
<u>Thalassarche cauta</u> Shy Albatross [89224]	Endangered	Foraging, feeding or related behaviour likely to occur within area
<u>Thalassarche impavida</u> Campbell Albatross, Campbell Black-browed Albatross [64459]	Vulnerable	Species or species habitat may occur within area
Thalassarche melanophris Black-browed Albatross [66472]	Vulnerable	Species or species habitat may occur within area
<u>Thalassarche salvini</u> Salvin's Albatross [64463]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Thalassarche steadi White-capped Albatross [64462]	Vulnerable	Foraging, feeding or related behaviour likely to occur within area
Migratory Marine Species		
Balaena glacialis australis Southern Right Whale [75529]	Endangered*	Species or species habitat known to occur within area
Caperea marginata Pygmy Right Whale [39]		Species or species habitat may occur within area
Carcharodon carcharias White Shark, Great White Shark [64470]	Vulnerable	Species or species habitat known to occur within area
Caretta caretta Loggerhead Turtle [1763]	Endangered	Species or species habitat known to occur within area
<u>Chelonia mydas</u> Green Turtle [1765]	Vulnerable	Foraging, feeding or related behaviour known to occur within area
Dermochelys coriacea Leatherback Turtle, Leathery Turtle, Luth [1768]	Endangered	Species or species habitat known to occur within area
Lagenorhynchus obscurus Dusky Dolphin [43]		Species or species habitat may occur within area
<u>Lamna nasus</u> Porbeagle, Mackerel Shark [83288]		Species or species habitat likely to occur within area
Megaptera novaeangliae Humpback Whale [38]	Vulnerable	Species or species habitat may occur within area
Migratory Terrestrial Species		
Hirundapus caudacutus White-throated Needletail [682]	Vulnerable	Species or species habitat known to occur

Name	Threatened	Type of Presence
Monarcha melanopsis		within area
Black-faced Monarch [609]		Species or species habitat known to occur within area
Motacilla flava		
Yellow Wagtail [644]		Species or species habitat likely to occur within area
Myiagra cyanoleuca		
Satin Flycatcher [612]		Species or species habitat known to occur within area
Rhipidura rufifrons		
Rufous Fantail [592]		Species or species habitat known to occur within area
Migratory Wetlands Species		
Actitis hypoleucos		
Common Sandpiper [59309]		Species or species habitat known to occur within area
Arenaria interpres		
Ruddy Turnstone [872]		Roosting known to occur within area
Calidris acuminata		
Sharp-tailed Sandpiper [874]		Roosting known to occur within area
Calidris canutus		
Red Knot, Knot [855]	Endangered	Species or species habitat known to occur within area
Calidris ferruginea		
Curlew Sandpiper [856]	Critically Endangered	Species or species habitat known to occur within area
Calidris melanotos		
Pectoral Sandpiper [858]		Species or species habitat known to occur within area
Calidris ruficollis		
Red-necked Stint [860]		Roosting known to occur within area
Calidris subminuta		
Long-toed Stint [861]		Roosting known to occur

Calidris tenuirostris Great Knot [862]

<u>Charadrius bicinctus</u> Double-banded Plover [895]

Gallinago hardwickii Latham's Snipe, Japanese Snipe [863]

Gallinago megala Swinhoe's Snipe [864]

Gallinago stenura Pin-tailed Snipe [841]

Limicola falcinellus Broad-billed Sandpiper [842]

Limosa lapponica Bar-tailed Godwit [844]

Limosa limosa Black-tailed Godwit [845] within area

Critically Endangered

Roosting known to occur within area

Roosting known to occur within area

Roosting known to occur within area

Roosting likely to occur within area

Roosting likely to occur within area

Roosting known to occur within area

Species or species habitat known to occur within area

Roosting known to occur within area

Name	Threatened	Type of Presence
Numenius madagascariensis		
Eastern Curlew, Far Eastern Curlew [847]	Critically Endangered	Species or species habitat known to occur within area
Numenius minutus		
Little Curlew, Little Whimbrel [848]		Roosting likely to occur within area
Numenius phaeopus		
Whimbrel [849]		Roosting known to occur within area
Pandion haliaetus		
Osprey [952]		Species or species habitat likely to occur within area
Philomachus pugnax		
Ruff (Reeve) [850]		Roosting known to occur within area
Pluvialis fulva		
Pacific Golden Plover [25545]		Roosting known to occur within area
Tringa brevipes		
Grey-tailed Tattler [851]		Roosting known to occur within area
Tringa glareola		
Wood Sandpiper [829]		Roosting known to occur within area
<u>Tringa nebularia</u>		
Common Greenshank, Greenshank [832]		Species or species habitat known to occur within area
Tringa stagnatilis		

Marsh Sandpiper, Little Greenshank [833]

Roosting known to occur within area

[Resource Information]

Other Matters Protected by the EPBC Act

Commonwealth Land

The Commonwealth area listed below may indicate the presence of Commonwealth land in this vicinity. Due to the unreliability of the data source, all proposals should be checked as to whether it impacts on a Commonwealth area, before making a definitive decision. Contact the State or Territory government land department for further information.

Name

Commonwealth Land -Defence - AIRTC FOOTSCRAY

Defence - DSTO FISHERMANS BEND Defence - DSTO MARIBYRNONG Defence - FORT GELLIBRAND Defence - MARIBYRNONG COMPLEX Defence - RAAF TOTTENHAM 1SD Defence - SUNSHINE TRAINING DEPOT

Commonwealth Heritage Places		[Resource Information]
Name	State	Status
Historic		
Defence Explosive Factory Maribyrnong	VIC	Listed place
Essendon Airport Air Traffic Control Tower	VIC	Listed place
Fort Gellibrand Commonwealth Area	VIC	Listed place
Listed Marine Species		[Resource Information]
* Species is listed under a different scientific name on	the EPBC Act - Threatened	Species list.
Name	Threatened	Type of Presence
Birds		
Actitis hypoleucos		
Common Sandpiper [59309]		Species or species habitat known to occur within area
Anous stolidus		

Common Noddy [825]

Species or species habitat likely to occur within area

Name	Threatened	Type of Presence
Apus pacificus Fork-tailed Swift [678]		Species or species habitat likely to occur within area
<u>Ardea alba</u> Great Egret, White Egret [59541]		Species or species habitat known to occur within area
Ardea ibis Cattle Egret [59542]		Species or species habitat may occur within area
Arenaria interpres Ruddy Turnstone [872]		Roosting known to occur within area
Calidris acuminata Sharp-tailed Sandpiper [874]		Roosting known to occur within area
Red Knot, Knot [855]	Endangered	Species or species habitat known to occur within area
<u>Calidris ferruginea</u> Curlew Sandpiper [856]	Critically Endangered	Species or species habitat known to occur within area
<u>Calidris melanotos</u> Pectoral Sandpiper [858]		Species or species habitat known to occur within area
<u>Calidris ruficollis</u> Red-necked Stint [860]		Roosting known to occur within area
Calidris subminuta Long-toed Stint [861]		Roosting known to occur within area
Calidris tenuirostris Great Knot [862]	Critically Endangered	Roosting known to occur within area
<u>Charadrius bicinctus</u> Double-banded Plover [895]		Roosting known to occur within area
<u>Charadrius ruficapillus</u> Red-capped Plover [881]		Roosting known to occur within area

<u>Chrysococcyx osculans</u> Black-eared Cuckoo [705]

Diomedea antipodensis Antipodean Albatross [64458]

Diomedea epomophora Southern Royal Albatross [89221]

Diomedea exulans Wandering Albatross [89223]

Diomedea sanfordi Northern Royal Albatross [64456]

Gallinago hardwickii Latham's Snipe, Japanese Snipe [863]

Gallinago megala Swinhoe's Snipe [864] Species or species habitat known to occur within area

Vulnerable Foraging, feeding or related behaviour likely to occur within area Vulnerable Foraging, feeding or related behaviour likely to occur within area Vulnerable Foraging, feeding or related behaviour likely to occur within area Endangered Foraging, feeding or related behaviour likely to occur within area Roosting known to occur within area Roosting likely to occur within area

Name	Threatened	Type of Presence
Gallinago stenura		
Pin-tailed Snipe [841]		Roosting likely to occur within area
Haliaeetus leucogaster		
White-bellied Sea-Eagle [943]		Species or species habitat known to occur within area
Heteroscelus brevipes		
Grey-tailed Tattler [59311]		Roosting known to occur within area
Himantopus himantopus		
Pied Stilt, Black-winged Stilt [870]		Roosting known to occur within area
<u>Minundapus caudaculus</u>		Cracico er erecios hebitet
white-throated Needletall [682]	vuinerable	known to occur within area
Lathamus discolor		
Swift Parrot [744]	Critically Endangered	Species or species habitat known to occur within area
Limicola falcinellus		
Broad-billed Sandpiper [842]		Roosting known to occur within area
Limosa lapponica		
Bar-tailed Godwit [844]		Species or species habitat known to occur within area
Limosa limosa		
Black-tailed Godwit [845]		Roosting known to occur
		within area
Macronectes giganteus		
Southern Giant-Petrel, Southern Giant Petrel [1060]	Endangered	Species or species habitat may occur within area
Macronectes halli		
Northern Giant Petrel [1061]	Vulnerable	Species or species habitat
		may occur within area
<u>Merops ornatus</u>		
Rainbow Bee-eater [670]		Species or species habitat may occur within area
		-
Monarcha melanopsis		
Black-faced Monarch [609]		Species or species habitat

known to occur within area

Motacilla flava Yellow Wagtail [644]

Myiagra cyanoleuca Satin Flycatcher [612]

Neophema chrysogaster Orange-bellied Parrot [747]

Numenius madagascariensis Eastern Curlew, Far Eastern Curlew [847]

Numenius minutus Little Curlew, Little Whimbrel [848]

Numenius phaeopus Whimbrel [849]

Pachyptila turtur Fairy Prion [1066] Species or species habitat likely to occur within area

Species or species habitat known to occur within area

Migration route likely to occur within area

Critically Endangered Specie

Critically Endangered

Species or species habitat known to occur within area

Roosting likely to occur within area

Roosting known to occur within area

Species or species habitat known to occur within area

Name	Threatened	Type of Presence
Pandion haliaetus		
Osprey [952]		Species or species habitat
		likely to occur within area
Philomachus pugnax		
Ruff (Reeve) [850]		Roosting known to occur
		within area
Phoebetria fusca		
Sooty Albatross [1075]	Vulnerable	Species or species habitat
		likely to occur within area
Durvielie fulve		
Pluvialis luiva Desifie Colder Discor [25545]		Depating lyngywr ta agawr
Pacific Golden Plover [25545]		Roosting known to occur
Puffinus carneines		within area
Floch footod Shoarwater, Flochy footod Shoarwater		Ecroging fooding or related
		behaviour likely to occur
[1043]		within area
Puffinus ariseus		Within area
Sooty Shearwater [1024]		Species or species habitat
		may occur within area
Recurvirostra novaehollandiae		
Red-necked Avocet [871]		Roosting known to occur
		within area
Rhipidura rufifrons		
Rufous Fantail [592]		Species or species habitat
		known to occur within area
<u>Rostratula benghalensis (sensu lato)</u>		
Painted Snipe [889]	Endangered*	Species or species habitat
		known to occur within area
<u>Sterna albitrons</u>		
Little Tern [813]		Species or species habitat
		may occur within area
Thalassarcho bullori		
Buller's Albetross, Pacific Albetross [64460]	Vulporable	Spacios or spacios babitat
Buller's Albatioss, Facilic Albatioss [04400]	vullelable	may occur within area
		may occur within area
Thalassarche cauta		
Shy Albatross [89224]	Endangered	Foraging, feeding or related
	Lindaligered	behaviour likely to occur
		within area
Thalassarche impavida		
Campbell Albatross, Campbell Black-browed Albatross	Vulnerable	Species or species habitat
[64459]		may occur within area
		-
Thalassarche melanophris		
Black-browed Albatross [66472]	Vulnerable	Species or species habitat
		may occur within area
I nalassarche salvini		– – – – – – – – – –
Salvin's Albatross [64463]	Vulnerable	Foraging, feeding or related
		benaviour likely to occur
Thalassarche sp. nov		
Desific Albetross [66511]	Vulparabla*	Species or openies habitat
1 auno Aibanos [00011]	ง นเมษา อมเษ	may occur within area
		may occur within alea
Thalassarche steadi		
White-capped Albatross [64462]	Vulnerable	Foraging, feeding or related
		behaviour likely to occur
		within area
Thinornis rubricollis rubricollis		
Hooded Plover (eastern) [66726]	Vulnerable*	Species or species habitat
· · ·		likely to occur within area
Tringa glareola		
Wood Sandpiper [829]		Roosting known to occur
		within area

Name	Threatened	Type of Presence
Tringa nebularia		
Common Greenshank, Greenshank [832]		Species or species habitat known to occur within area
Tringa stagnatilis		
Marsh Sandpiper, Little Greenshank [833]		Roosting known to occur within area
Mammals		
Arctocephalus forsteri		
Long-nosed Fur-seal, New Zealand Fur-seal [20]		Species or species habitat may occur within area
Arctocephalus pusillus		
Australian Fur-seal, Australo-African Fur-seal [21]		Species or species habitat may occur within area
Reptiles		
Caretta caretta		
Loggerhead Turtle [1763]	Endangered	Species or species habitat known to occur within area
<u>Chelonia mydas</u>		
Green Turtle [1765]	Vulnerable	Foraging, feeding or related behaviour known to occur within area
Dermochelys coriacea		
Leatherback Turtle, Leathery Turtle, Luth [1768]	Endangered	Species or species habitat known to occur within area
Whales and other Cetaceans		[Resource Information]
Name	Status	Type of Presence
Mammals		
Caperea marginata		
Pygmy Right Whale [39]		Species or species habitat may occur within area
Delphinus delphis		
Common Dophin, Short-beaked Common Dolphin [60]		Species or species habitat may occur within area
Eubalaena australis		
Southern Right Whale [40]	Endangered	Species or species habitat known to occur within area

Lagenorhynchus obscurus Dusky Dolphin [43]

Megaptera novaeangliae Humpback Whale [38]

Vulnerable

Species or species habitat may occur within area

Species or species habitat

likely to occur within area

Tursiops aduncus Indian Ocean Bottlenose Dolphin, Spotted Bottlenose Dolphin [68418]

<u>Tursiops truncatus s. str.</u> Bottlenose Dolphin [68417] Spacios or spacios babitat

Species or species habitat may occur within area

Species or species habitat may occur within area

Extra Information

State and Territory Reserves		[Resource Information]
Name		State
Cairnlea Estate N.C.R.		VIC
Derrimut Grassland N.C.R.		VIC
Jawbone F.F.R.		VIC
Regional Forest Agreements		[Resource Information]
Note that all areas with completed RFAs ha	ve been included.	
Name		State
West Victoria RFA		Victoria
Invasive Species		[Resource Information]
Weeds reported here are the 20 species of that are considered by the States and Territ following feral animals are reported: Goat, F Landscape Health Project, National Land ar	national significance (WoNS), ories to pose a particularly sig Red Fox, Cat, Rabbit, Pig, Wat nd Water Resouces Audit, 200	along with other introduced plants nificant threat to biodiversity. The ter Buffalo and Cane Toad. Maps from 01.
Name	Status	Type of Presence
Birds		
Acridotheres tristis		
Common Myna, Indian Myna [387]		Species or species habitat likely to occur within area
Alauda arvensis		
Skylark [656]		Species or species habitat likely to occur within area
Anas platyrhynchos		
Mallard [974]		Species or species habitat likely to occur within area
Carduelis carduelis		
European Goldfinch [403]		Species or species habitat likely to occur within area
Carduelis chloris		
European Greenfinch [404]		Species or species habitat likely to occur within area
Columba livia		
Rock Pigeon, Rock Dove, Domestic Pigeon	[803]	Species or species habitat likely to occur within area

Passer domesticus House Sparrow [405]

Passer montanus Eurasian Tree Sparrow [406]

Pycnonotus jocosus Red-whiskered Bulbul [631]

Streptopelia chinensis Spotted Turtle-Dove [780]

Sturnus vulgaris Common Starling [389]

Turdus merula Common Blackbird, Eurasian Blackbird [596]

Turdus philomelos Song Thrush [597] Species or species habitat likely to occur within area

Species or species habitat likely to occur within area

Species or species habitat likely to occur within area

Species or species habitat likely to occur within area

Species or species habitat likely to occur within area

Species or species habitat likely to occur within area

Species or species

Name	Status	Type of Presence
		habitat likely to occur within area
Mammals		
Bos taurus		
Domestic Cattle [16]		Species or species habitat likely to occur within area
Canis lupus familiaris		
Domestic Dog [82654]		Species or species habitat likely to occur within area
Capra hircus		
Goat [2]		Species or species habitat likely to occur within area
Felis catus		
Cat, House Cat, Domestic Cat [19]		Species or species habitat likely to occur within area
Lepus capensis		
Brown Hare [127]		Species or species habitat likely to occur within area
Mus musculus		
House Mouse [120]		Species or species habitat likely to occur within area
Oryctolagus cuniculus		
Rabbit, European Rabbit [128]		Species or species habitat likely to occur within area
Rattus norvegicus		
Brown Rat, Norway Rat [83]		Species or species habitat likely to occur within area
Rattus rattus		
Black Rat, Ship Rat [84]		Species or species habitat likely to occur within area
Vulpes vulpes		
Red Fox, Fox [18]		Species or species habitat likely to occur within area

Plants

Alternanthera philoxeroides

Alligator Weed [11620]

Anredera cordifolia

Madeira Vine, Jalap, Lamb's-tail, Mignonette Vine, Anredera, Gulf Madeiravine, Heartleaf Madeiravine, Potato Vine [2643] Asparagus asparagoides Bridal Creeper, Bridal Veil Creeper, Smilax, Florist's Smilax, Smilax Asparagus [22473]

Carrichtera annua Ward's Weed [9511]

Cenchrus ciliaris Buffel-grass, Black Buffel-grass [20213]

Chrysanthemoides monilifera Bitou Bush, Boneseed [18983]

Chrysanthemoides monilifera subsp. monilifera Boneseed [16905]

Species or species habitat likely to occur within area

Species or species habitat likely to occur within area

Species or species habitat likely to occur within area

Species or species habitat may occur within area

Species or species habitat may occur within area

Species or species habitat may occur within area

Species or species habitat likely to occur within area

Name	Status	Type of Presence
Cytisus scoparius		
Broom, English Broom, Scotch Broom, Common Broom, Scottish Broom, Spanish Broom [5934]		Species or species habitat likely to occur within area
Dolichandra unquis-cati		
Cat's Claw Vine, Yellow Trumpet Vine, Cat's Claw		Species or species habitat
Creeper, Funnel Creeper [85119]		likely to occur within area
Eichhornia crassipes		
Water Hyacinth, Water Orchid, Nile Lily [13466]		Species or species habitat
		likely to occur within area
Genista linifolia		
Flax-leaved Broom, Mediterranean Broom, Flax Broom		Species or species habitat
[2800]		likely to occur within area
Genista monspessulana		
Montpellier Broom, Cape Broom, Canary Broom,		Species or species habitat
		incerv to occur within area
Genista sp. X Genista monspessulana		• • • • • • •
Broom [67538]		Species or species habitat
Lycium ferocissimum		On a size on an asian habitat
African Boxtnorn, Boxtnorn [19235]		Species or species habitat likely to occur within area
		, , , , , , , , , , , , , , , , , , ,
Nassella neesiana Chilean Needle grass [67699]		Species or species habitat
Crillean Needle grass [0/ 099]		likely to occur within area
Nassella tricnotoma Serrated Tussock, Yass River Tussock, Yass Tussock		Species or species habitat
Nassella Tussock (NZ) [18884]		likely to occur within area
Olive, Common Olive [9160]		Species or species habitat
		may occur within area
Opuntia spp.		
Prickly Pears [82753]		Species or species habitat
		likely to occur within area

Rubus fruticosus aggregate Blackberry, European Blackberry [68406]

Species or species habitat likely to occur within area

Sagittaria platyphylla Delta Arrowhead, Arrowhead, Slender Arrowhead [68483]

Salix spp. except S.babylonica, S.x calodendron & S.x reichardtii Willows except Weeping Willow, Pussy Willow and Sterile Pussy Willow [68497]

Senecio madagascariensis Fireweed, Madagascar Ragwort, Madagascar Groundsel [2624]

Solanum elaeagnifolium

Silver Nightshade, Silver-leaved Nightshade, White Horse Nettle, Silver-leaf Nightshade, Tomato Weed, White Nightshade, Bull-nettle, Prairie-berry, Satansbos, Silver-leaf Bitter-apple, Silverleaf-nettle, Trompillo [12323] Ulex europaeus Gorse, Furze [7693]

Species or species habitat likely to occur within area

Species or species habitat likely to occur within area

Species or species habitat likely to occur within area

Species or species habitat likely to occur within area

Species or species habitat likely to occur within area

Caveat

The information presented in this report has been provided by a range of data sources as acknowledged at the end of the report.

This report is designed to assist in identifying the locations of places which may be relevant in determining obligations under the Environment Protection and Biodiversity Conservation Act 1999. It holds mapped locations of World and National Heritage properties, Wetlands of International and National Importance, Commonwealth and State/Territory reserves, listed threatened, migratory and marine species and listed threatened ecological communities. Mapping of Commonwealth land is not complete at this stage. Maps have been collated from a range of sources at various resolutions.

Not all species listed under the EPBC Act have been mapped (see below) and therefore a report is a general guide only. Where available data supports mapping, the type of presence that can be determined from the data is indicated in general terms. People using this information in making a referral may need to consider the qualifications below and may need to seek and consider other information sources.

For threatened ecological communities where the distribution is well known, maps are derived from recovery plans, State vegetation maps, remote sensing imagery and other sources. Where threatened ecological community distributions are less well known, existing vegetation maps and point location data are used to produce indicative distribution maps.

Threatened, migratory and marine species distributions have been derived through a variety of methods. Where distributions are well known and if time permits, maps are derived using either thematic spatial data (i.e. vegetation, soils, geology, elevation, aspect, terrain, etc) together with point locations and described habitat; or environmental modelling (MAXENT or BIOCLIM habitat modelling) using point locations and environmental data layers.

Where very little information is available for species or large number of maps are required in a short time-frame, maps are derived either from 0.04 or 0.02 decimal degree cells; by an automated process using polygon capture techniques (static two kilometre grid cells, alpha-hull and convex hull); or captured manually or by using topographic features (national park boundaries, islands, etc). In the early stages of the distribution mapping process (1999-early 2000s) distributions were defined by degree blocks, 100K or 250K map sheets to rapidly create distribution maps. More reliable distribution mapping methods are used to update these distributions as time permits.

Only selected species covered by the following provisions of the EPBC Act have been mapped:

- migratory and
- marine

The following species and ecological communities have not been mapped and do not appear in reports produced from this database:

- threatened species listed as extinct or considered as vagrants
- some species and ecological communities that have only recently been listed
- some terrestrial species that overfly the Commonwealth marine area
- migratory species that are very widespread, vagrant, or only occur in small numbers

The following groups have been mapped, but may not cover the complete distribution of the species:

- non-threatened seabirds which have only been mapped for recorded breeding sites
- seals which have only been mapped for breeding sites near the Australian continent

Such breeding sites may be important for the protection of the Commonwealth Marine environment.

Coordinates

-37.843774 144.883678,-37.835165 144.882047,-37.809537 144.849431,-37.801874 144.84368,-37.798347 144.846513,-37.799704 144.863679,-37.795363 144.838616,-37.760019 144.810807,-37.772842 144.82248,-37.753843 144.840333,-37.727305 144.864709,-37.719429 144.873292,-37.713251 144.871661,-37.70809 144.874923,-37.70809 144.874923

Acknowledgements

This database has been compiled from a range of data sources. The department acknowledges the following custodians who have contributed valuable data and advice:

-Office of Environment and Heritage, New South Wales -Department of Environment and Primary Industries, Victoria -Department of Primary Industries, Parks, Water and Environment, Tasmania -Department of Environment, Water and Natural Resources, South Australia -Department of Land and Resource Management, Northern Territory -Department of Environmental and Heritage Protection, Queensland -Department of Parks and Wildlife, Western Australia -Environment and Planning Directorate, ACT -Birdlife Australia -Australian Bird and Bat Banding Scheme -Australian National Wildlife Collection -Natural history museums of Australia -Museum Victoria -Australian Museum -South Australian Museum -Queensland Museum -Online Zoological Collections of Australian Museums -Queensland Herbarium -National Herbarium of NSW -Royal Botanic Gardens and National Herbarium of Victoria -Tasmanian Herbarium -State Herbarium of South Australia -Northern Territory Herbarium -Western Australian Herbarium -Australian National Herbarium, Canberra -University of New England -Ocean Biogeographic Information System -Australian Government, Department of Defence Forestry Corporation, NSW -Geoscience Australia -CSIRO -Australian Tropical Herbarium, Cairns -eBird Australia -Australian Government – Australian Antarctic Data Centre -Museum and Art Gallery of the Northern Territory -Australian Government National Environmental Science Program

-Australian Institute of Marine Science

-Reef Life Survey Australia

-American Museum of Natural History

-Queen Victoria Museum and Art Gallery, Inveresk, Tasmania

-Tasmanian Museum and Art Gallery, Hobart, Tasmania

-Other groups and individuals

The Department is extremely grateful to the many organisations and individuals who provided expert advice and information on numerous draft distributions.

Please feel free to provide feedback via the Contact Us page.

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