NORTH EAST LINK PROJECT

EPBC Referral Attachment D - Ecology Report

Revision 0

12 January 2018

Document prepared by:

Abbreviations

Abbreviation	Definition
BCS	Bioregional conservation status
BIOR	Biodiversity Impact and Offset Report
CaLP Act	*Catchment and Land Protection Act 1994*
CAMBA	China-Australia Migratory Bird Agreement
DBH	Diameter at breast height
DoEE	Department of Environment and Energy
DELWP	Department of Environment, Land, Water and Planning
DEDJTR	Department of Economic Development, Jobs, Transport and Resources
DEPI	Department of Environment and Primary Industries (now DELWP)
EPBC Act	*Environment Protection and Biodiversity Conservation Act 1999*
EVC	Ecological Vegetation Class
FFG Act	*Flora and Fauna Guarantee Act 1988*
FIS	Flora Information System
Hha	Habitat hectares
HZ	Habitat zone
JAMBA	Japan-Australia Migratory Bird Agreement
NELA	North East Link Authority
NES	National Environmental Significance
NVIM	Native Vegetation Information Management
PMST	Protected Matters Search Tool
VROTS	Victorian rare or threatened species
VBA	Victorian Biodiversity Atlas
WONS	Weeds of national significance

Glossary

Term	Definition
Amenity plantings	Amenity plantings include street trees, shrubs and understorey species planted in urban landscapes. This may include both native and exotic species.
Biodiversity	The variety of all life forms, the different plants, animals and micro-organisms, the genes they contain, and the ecosystems of which they form a part.
Bioregion	A landscape based approach to classifying the land surface using a range of environmental attributes such as climate, geomorphology, lithology and vegetation.
Bioregional conservation status	An assessment of the conservation status of the native vegetation type (EVC) in the context of a particular bioregion, taking account of how commonly it originally occurred, the current level of depletion and the level of degradation of condition typical of remaining stands.
Ecological vegetation class	A type of indigenous vegetation classification that is described through a combination of floristics, lifeforms and ecological characteristics and through an inferred fidelity to particular environmental attributes. Each EVC includes a collection of floristic communities that occurs across a biogeographic range, and although differing in species, have similar habitat and ecological processes operating.
Exotic fauna	Any fauna that is not native to Australia or its states and territories.
Exotic vegetation	Any vegetation that is not native to Australia or its states and territories.
Habitat hectare	A site-based measure of quality and quantity of native vegetation that is assessed in the context of the relevant native vegetation type.
Habitat zone	A discrete area of native vegetation consisting of a single vegetation type (EVC) with an assumed similar averaged quality. This is the base spatial unit for conducting a habitat hectare assessment.
Indigenous vegetation	Indigenous vegetation includes vegetation that is native to Australia as well as being native to a specific geographic region.
Native vegetation	Native vegetation includes all vegetation that is native to Australia, and its states and territories. *Note: Under the Victorian Planning Provisions native vegetation is defined as 'plants that are indigenous to Victoria including trees, shrubs, herbs and grasses* (DEPI, 2013).
Remnant patch	A remnant patch of native vegetation is either a) an area of vegetation[1] indigenous to Victoria, with or without trees, where at least 25% of the total perennial understorey plant cover is native plants, or b) an area with three or more indigenous canopy trees where the tree canopy cover is at least 20% (DEPI, 2013). This excludes regrowth that has regenerated and is < 10 years old.
Scattered tree	Scattered trees are indigenous canopy trees within an area where at least 75% of the total understorey plant cover is weeds or non-native plants and the overall canopy cover for a group of trees (three or more) is less than 20%. This can include dead vegetation with a DBH > 40 cm (DEPI, 2013).
Threatened species	For the purposes of this report, threatened species refers to species considered threatened in Victoria or Australia. This includes species that are vulnerable or endangered in Victoria as defined by DEPI (2014) or DSE (2014), listed under the FFG Act or vulnerable, endangered or critically endangered under the EPBC Act.

[1] Continuous and unbroken native vegetation. A break in remnant patch will occur where the definition of remnant patch has not been met for a continuous width of at least 10 m (DEPI 2013a).

Term	Definition
	VROT rare, near-threatened, poorly known or data deficient species are not considered threatened.
Victorian Biodiversity Atlas	The Victorian Biodiversity Atlas (VBA) is administered by the Victorian Department of Environment, Land, Water and Planning and replaces several legacy systems, including the Flora Information System, the Atlas of Victorian Wildlife, and the Aquatic ecology Database. The VBA encompasses vertebrate and invertebrate animals, fungi, vascular and non-vascular plants from terrestrial and aquatic environments, including marine waters to the three nautical mile statutory limit. It includes both native and naturalised exotic species (including weeds and pests) but is not intended to hold data on cultivated or domesticated species.

Executive Summary

North East Link ('the project') is a proposed new freeway standard road connection that would complete the missing link in Melbourne's metropolitan ring road, giving the city a fully completed orbital connection for the first time. North East Link would connect the Western Ring Road (M80) to the Eastern Freeway, and include works along the Eastern Freeway. This assessment of the potential impacts of the project on Matters of National Environmental Significance (NES) has been prepared for the North East Link Authority (NELA) in accordance with the requirements of the *Environment Projection and Biodiversity Conservation Act 1999* (EPBC Act). The purpose of this report is to support the EPBC Act referral for the project as a technical ecological appendix. Specific objectives of the report are to:

- Determine the occurrence, or likelihood of occurrence, of matters of NES within the project area
- Determine the potential impacts of the project on matters of NES and whether these would be considered as significant under the Significant Impact Guidelines 1.1 – Matters of National Environmental Significance (DoE, 2013)
- Based on this assessment of significant impacts, determine whether the development of specific management measures is required to protect matters of NES.

The following matters of NES were identified as being present or likely to occur within the project area:

- One endangered flora species; Matted Flax-lily
- One vulnerable flora species; Clover Glycine
- One critically endangered fauna species; Swift Parrot
- Two vulnerable fauna species; Grey-headed Flying-fox, Growling Grass frog
- One endangered aquatic fauna species; Macquarie Perch
- One vulnerable aquatic fauna species; Australian Grayling
- One Migratory fauna species: Latham's Snipe.

Through extensive field investigations, it was found that the project area has undergone significant urbanisation, but areas of high ecological value still remain in some sections, particularly near the Yarra River and its associated floodplain, and at Simpson Barracks. These investigations covered a wide area with a focus on areas of high ecological value. The field work undertaken has been determined to be sufficient to uncover any potential impacts on matters of NES, with some remaining flora surveys (to be undertaken in 2018) anticipated to be of low ecological value or contain predominantly amenity plantings.

Targeted surveys were undertaken to assess the presence of and suitable habitat for the above-listed species. It was determined that the project has the potential to significantly impact the Matted Flax-lily which has been found at three locations across the project area. A translocation plan has been developed (refer to Attachment F – Draft translocation plan) to minimise impacts to this species. This will be further refined in consultation with DoEE and DELWP. While suitable habitat for Clover Glycine exists within the project area, it was not found during extensive field investigations or targeted surveys.

There is potential that tunnelling activities under the Yarra River may cause groundwater dewatering, however this is not anticipated to have a measurable impact on flows in the Yarra River or have subsequent impacts to the Australian Grayling and Macquarie Perch.

Other EPBC Act-listed species and communities (Swift Parrot, Grey-headed Flying-fox, Growling Grass frog and Latham's Snipe) were determined unlikely to be significantly impacted by the project.

The project is unlikely to impact any Wetlands of international significance due to geographic separation from the project area.

Table of Contents

Table Index

Figure Index

Appendices

1. Introduction

1.1 Purpose of this report

North East Link ('the project') is a proposed new freeway standard road connection that would complete the missing link in Melbourne's metropolitan ring road, giving the city a fully completed orbital connection for the first time. North East Link would connect the Western Ring Road (M80) to the Eastern Freeway, and include works along the Eastern Freeway.

This assessment of the potential impacts of the project on Matters of National Environmental Significance (NES) has been prepared for the North East Link Authority (NELA) in accordance with the requirements of the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act). Under the EPBC Act, a person must not take an action that has, will have, or is likely to have a significant impact on any matter of NES without approval. To obtain approval, the action is required to be referred to the Australian Government Environment Minister.

The purpose of this report is to support the EPBC Act referral to the Environment Minister for the project by identifying whether any of the following matters of NES would be impacted by the project:

- Nationally threatened species and ecological communities
- Migratory species
- Wetlands of international importance (often called Ramsar wetlands).

1.2 Scope of this report

Specific objectives of this report are to:

- Determine the occurrence, or likelihood of occurrence, of matters of NES within the project area
- Determine the potential impacts of the project on matters of NES and whether these would be considered as significant under the Significant Impact Guidelines 1.1 – Matters of National Environmental Significance (DoE, 2013)
- Based on this assessment of significant impacts, determine whether the development of specific management measures is required to protect matters of NES.

The project intersects with Commonwealth Land at Simpson Barracks and a small publically accessible area immediately south west of the Simpson Barracks fence line (for the purpose of this assessment these two areas have been assessed together as 'Simpson Barracks'). The potential impacts of the project on matters of NES with respect to Significant Impact Guidelines 1.2 are assessed in Attachment E of the referral. Impacts associated with EPBC Act-listed flora and fauna within Simpson Barracks are addressed in this document.

1.2.1 Exclusions, limitations and assumptions

Limitations and remaining data gaps of this assessment are outlined below. Generally, the level of risk posed by these limitations and data gaps is considered to be low to moderate since the ecological features of the Melbourne area (including the assessment area) have a long history of disturbance, degradation and urbanisation typical of a large city. The likelihood of this assessment missing species or communities of high ecological value in the project area is

considered to be very low, since the ecological features of the Melbourne area tend to be relatively well studied and well understood.

Remaining limitations and data gaps include:

- Since a detailed design for the project is yet to be established, for the purpose of this referral, it has been assumed that any area within the project area may be subject to land clearing. The exception to this is the area of proposed tunnel that would be constructed by tunnel boring machine (TBM) which will not result in surface disturbance, and other locations where indicated (i.e. the conditional no-go zone area of the Banyule Flats and the Yarra River floodplain). It should be noted that the actual impacts realised by the project would be expected to affect a significantly smaller footprint within the referred area.
- It is possible that areas containing large amenity plantings such as public parks and reserves may contain some remnant scattered trees. These areas were not assessed in detail and should be the subject of a detailed botanical assessment to determine if remnant trees are present.
- Mapping was conducted using hand-held GPS enabled tablets and aerial photo interpretation. The accuracy of the mapping is subject to the accuracy of the unit and access to satellite information (generally ±5 metres).
- Extensive surveying has been undertaken in areas with the highest potential for ecological values, leaving some outstanding flora surveys to be undertaken in 2018 (refer to Figure 6). Fauna and aquatic surveys have been completed for matters of NES, with 2018 surveys to focus on state-listed species. It is considered unlikely to low that these areas contain EPBC Act-listed ecological communities based on results of the desktop assessment (refer to Section 4.1) and unlikely to affect the conclusions of this referral.
- Fauna habitat assessments were limited to locations that were considered to represent habitats most likely to support threatened species within the project area. In some cases, these locations were not within the project area, but were considered representative of what could be located within less accessible sections of the project area.
- Site visit locations for fauna were selected partly on the basis of threatened/migratory species records, because the presence of those species often reflects high quality habitat for all species, including non-threatened species. However, this is not always true; some species have specific habitat requirements that do not represent the requirements of other species.
- It is acknowledged that some fauna are highly mobile and locations of historical records (used as one of the bases to select key locations to visit) may not represent preferred habitat (i.e., species may be observed in sub-optimal habitat as they move through an area).

Surveys were not undertaken on a small number of sites within this project area due to access restrictions. This created a number of gaps in the data. Based on mapping information and previous assessments, the implications of these gaps are explained below.

Table 1 Sites not surveyed

Site	Reason behind exclusion	Implication
Freeway Golf Club	Access not granted	As the golf club is expected to contain largely

Site	Reason behind exclusion	Implication
		planted exotic and non-indigenous native vegetation, it is not anticipated to contain EPBC Act-listed flora species. It is possible that this vegetation is utilised by EPBC Act-listed fauna species for foraging and roosting, but it is unlikely to constitute critical habitat for threatened species.
Marcellin College	Access not granted	It is anticipated that vegetation within Marcellin College is largely planted. It not expected that EPBC Act-listed vegetation is present in the project area within the college. It is possible that the vegetation is utilised by EPBC Act-listed fauna species for foraging and roosting, but it is unlikely to constitute critical habitat for threatened species.

1.3 Structure of this report

The report is structured as follows:

- The proposed project area and action are outlined in section 2
- The methods for ecological assessment are described in section 3
- The results of studies and assessment of the potential impacts to nationally threatened species and ecological communities and migratory species is provided in section 4
- The potential for the project to impact Wetlands of international importance is summarised in section 5
- Assessment against significant impact criteria are provided in section 6
- The proposed mitigation measures to protect matters of NES are outlined in section 7
- Conclusions are provided in section 8.

2. Description of project area and proposed action

2.1 Referred project area

The project comprises a new road connecting M80 Ring Road to the Eastern Freeway, and widening of some sections of the Eastern Freeway.

The road would traverse Melbourne's north-eastern suburbs of Greensborough, Watsonia, Macleod, Rosanna and Bulleen. The project also includes widening of the Eastern Freeway largely within the road reserve except through Bulleen, Balwyn North, Doncaster, Mont Albert North and Box Hill North. This region is highly urbanised and incorporates a range of residential, commercial and recreational land uses. Areas that will be affected by above ground works are mainly located within or abutting highly disturbed major transport corridors, including:

- Greensborough Road, beginning at the M80 Ring Road and ending at Lower Plenty Road
- Bulleen Road, beginning at Manningham Road and ending at the Eastern Freeway
- Eastern Freeway, with widening works approximately between Hoddle Street and Springvale Road.

The EPBC referred project area ('project area') is shown in Figure 1 (Appendix A - Figures). The referred project area is wider than the actual footprint of the concept design, allowing for potential variations to the project as the design progresses. Accordingly, the referred project area has assumed the worst case scenario in terms of potential surface impacts. Impacts at a number of sensitive areas near to the project have been avoided through the designation of no-go zones where surface works are not permitted as part of the project. No-go zones have been designated for the following sensitive areas (see Figure 2):

- A vegetated patch near the intersection of M80 and Plenty Road. This was observed to contain a community of Grassy Eucalypt Woodland of the Victorian Volcanic Plain (EPBC Act-listed as critically endangered), which may have originated as a Plains Grassy Woodland (EVC 55) offset site
- Bolin Bolin Billabong, located between Bulleen Road and the Yarra River. This is a known site of cultural significance and ecological value (non EPBC related)
- A portion of Yarra Bend Park, south of the Eastern Freeway. This area supports a large population of the Grey-headed Flying-fox (EPBC Act-listed as vulnerable) and is protected under the Flying-Fox Campsite Management Plan (DSE, 2005).

A tunnel has been proposed beneath the Banyule Flats, Warringal Parklands and the Yarra River and its associated floodplain, as well as the Heide Museum of Modern Art and sculpture park, to avoid surface impacts at these locations. This area has been included within a designated 'conditional no-go area' where surface works would not be permitted as part of the project with the possible exception of activities relating to site investigations, relocation of minor utilities and ground improvement.

2.2 Overview of proposed action

The following section describes the North East Link alignment and the key elements, noting that development of the concept design is ongoing:

- **Western Ring Road to Lower Plenty Road** – from the M80 and Greensborough Bypass to the northern tunnel portal, this section would include a mixture of above, below and at surface road sections, with new road interchanges at M80, Grimshaw Street and Lower Plenty Road.
- **Tunnels** – from the northern tunnel portal located just north of Lower Plenty Road to south of Manningham Road, twin tunnels would travel under residential areas, Banyule Flats and the Yarra River. Near each tunnel portal, supporting tunnel infrastructure would be required, including ventilation structures, substations and associated infrastructure. This section would include a new interchange at Manningham Road.
- **Bridge Street to Eastern Freeway** – this section would include open cut and bored or mined tunnel with the southern tunnel portal located south of the Veneto Club. Further south, surface road and viaduct structures would connect to the Eastern Freeway via a new interchange.
- **Eastern Freeway upgrades** – from around Hoddle Street in the west through to Springvale Road in the east, modifications to the Eastern Freeway would include widening to accommodate future traffic volumes, provision of new dedicated bus lanes for rapid bus services (Doncaster Busway) and associated works.

For a more detailed description of the project, see the covering referral document.

2.2.1 Construction

Construction activities that have the greatest potential to impact flora and fauna include:

- Clearing or direct damage to vegetation / habitat
- Changes to groundwater conditions due to tunnelling
- Generation of noise and air pollution from construction machinery
- Lighting of construction worksites
- Vibration caused by tunnelling activities.

2.2.2 Operation and maintenance

Operation and maintenance activities that have the greatest potential to impact flora and fauna include:

- Increased traffic volumes due to the project, resulting in increased collisions with fauna species
- Noise and air quality changes generated by operation of the tunnel ventilation systems
- Increased lighting of roadways.

3. Methods

To assess whether EPBC Act-listed species or communities or other matters of NES were likely to occur within the project area, a staged approach was adopted. This included:

- A desktop assessment to determine the likelihood of occurrence of flora, fauna and communities
- A general field assessment to collect information on vegetation and habitat characteristics to inform the need for targeted surveys
- Targeted surveys at specific locations that were considered likely to support threatened species or communities.

The methods for these steps are described below, as they relate to flora, terrestrial fauna and aquatic fauna.

3.1 Desktop assessment

3.1.1 Ecological database review

The ecology desktop review primarily included undertaking an assessment of the occurrence of threatened and migratory species and threatened ecological communities within the project area. This involved reviewing species record data and considering the presence of suitable habitat occurring within the project area based on preliminary field surveys, aerial imagery and modelled information. The following databases were reviewed in order to generate community and species information relevant to the project area:

- Department of Environment and Energy (DoEE) – Protected Matters Search Tool (PMST) for EPBC Act-listed items, incorporating a five kilometre buffer of the project area.
- Victorian Biodiversity Atlas (VBA) – Flora and terrestrial fauna data extracts were based on a five kilometre buffer of the project area. Aquatic ecology data extracts where based on a 500 metre buffer of the entire water catchment of waterways traversed by the project area.

For the flora and terrestrial fauna assessments, a search area of five kilometres around the project was utilised for the VBA extract and PMST search tool to compensate for a potential lack of historical survey data within the project area and its immediate surrounds. This approach also allows for the identification of mobile species such as birds which may use the project area intermittently and opportunistically.

A 500 metre buffer was used in the database search for aquatic ecology to compensate for inaccurate spatial records that may place aquatic ecology records outside the designated waterways. The entire catchment of waterways intersected by the project area were also included to check for migratory aquatic species that may be found in the catchment and need passage through the project area, but are not resident in the area and have not been collected in the vicinity of the project area.

Interpretation of these data have taken into consideration the ecological value and attributes of the project area when compared to the broader landscape. Review of flora and fauna extracts have been limited to records from the past 30 years and species identified within the PMST.

3.1.2 Likelihood of threatened/migratory species and threatened communities

A likelihood of species (and ecological communities) occurrence assessment was completed for each threatened or migratory species identified in the desktop study as either occurring, or having the potential to occur, within five kilometres of the project area. For the purposes of this report 'threatened species' refers to those species that are considered 'threatened', and 'Migratory species' refers to species listed as Migratory, under the EPBC Act. This includes species and communities that are:

- Vulnerable, endangered, or critically endangered under the EPBC Act
- Migratory under the EPBC Act.

The Marine status of fauna species (as defined under the EPBC Act) was not considered, because the project area is not within or near a Commonwealth Marine Area, and impacts on a Commonwealth Marine Area are highly unlikely.

The likelihood assessment is used to determine the likelihood of species' presence within five kilometres of the project area based on the results of the habitat assessment and the dates and number of previous records of each species. The complete likelihood assessment for each species is presented in Appendix B. The following likelihood categories were used to rate each species' likelihood of occurrence:

- **Unlikely**: no preferred habitat in the desktop study area or the project is beyond the species' current range and distribution.

  Species unlikely to be present in the desktop study area at any time or season.

- **Low**: some of the preferred habitat is present within the desktop study area. Species may infrequently visit the site en route to foraging resources or suitable habitat, but would not depend on habitats in the desktop study area for their survival. Migratory and aerial foraging birds may fly over the desktop study area and migratory fish may pass through waterways.

  Isolated individuals may occur, but limited records exist in the region and the age of records is old.

- **High**: desktop study area contains the preferred habitat which is likely to support a population of the species, including roosting sites. Migratory fish likely to pass through waterways in the desktop study area.

  Numerous records occur within the region of varying age.

- **Present**: Species directly observed in the desktop study area or recently recorded in the desktop study area. Preferred habitat is present in the desktop study area. Migratory fish known to pass through waterways in the desktop study area.

  The species is likely to be present at appropriate times of the year.

This process was used to short-list species that have potential to be impacted by the proposed works, and determine the focus of field surveys.

The assessment was updated following the field assessment and targeted surveys.

3.2 Field assessment

Extensive field assessments of the broad project area were undertaken by a team of ecologists and zoologists to collect further information on the habitats and flora and fauna potentially present. Surveys were focussed on ecologically sensitive areas within the project area.

Separate field surveys were undertaken for flora and vegetation, terrestrial fauna and aquatic fauna as described in the following sections.

3.2.1 Flora and vegetation

The purpose of the field assessment was to collect information on vegetation characteristics of sites located within the project area. In the planning phase of the field assessments approximately 45 sites were identified across the proposed project area for assessment. Additional sites were located whilst in the field and existing sites were further split-up in the field and during post data processing to end up with approximately 200 assessment sites consisting of remnant patches and amenity plantings (approximately 90 remnant patches and 110 amenity plantings). Field assessments were conducted between 28 June – 14 July 2017 and 23 October – 19 December 2017. The aim of the vegetation assessment was to map and provide a detailed assessment of the floristic composition within the project area.

Three distinct categories of vegetation were mapped during vegetation assessments: remnant vegetation, scattered trees and amenity plantings. Vegetation quality assessments were undertaken using the habitat hectare method for those patches determined to be remnant vegetation, in order to provide an indication of the quality of vegetation and potential requirements for offsets under Victorian Planning Provisions. Amenity plantings include all vegetation that is not considered remnant or threatened. This could include Australian native and exotic flora as well as indigenous vegetation that has been planted.

Remnant vegetation within the project area was categorised according to the prescriptions of Victoria's *Permitted clearing of native vegetation- Biodiversity assessment guidelines* (DEPI, 2013). Under the Guidelines, remnant vegetation is considered to be either a remnant patch or scattered tree, where:

A remnant patch is defined as:

> "an area of vegetation where at least 25 per cent of the total perennial understorey plant cover is native", or "an area with three or more native canopy trees where the canopy foliage cover is at least 20 per cent of the area" (DEPI, 2013).

And a scattered tree is defined as:

> "a native canopy tree that does not form part of a remnant patch", where a canopy tree is defined as "a mature tree that is greater than 3 metres in height and is normally found in the upper layer of the relevant vegetation type" (DEPI, 2013).

The location of remnant patches and scattered trees was mapped using a Samsung tablet which has a spatial accuracy of approximately ± 5 metres depending on access to satellites.

A Vegetation Quality Assessment (VQA) was undertaken for all patches of remnant vegetation using the Habitat Hectares method as described by DEPI (2013). Locations of amenity plantings were recorded as part of the assessment due to their values to the environment and community. However, these were not assessed as they are not relevant to the DEPI guidelines.

It is noted that the *Guidelines for the removal, destruction or lopping of native vegetation* (DELWP 2017) have recently replaced the *Permitted clearing of native vegetation- Biodiversity*

Assessment Guidelines (DEPI 2013). The revised guidelines include new requirements for the calculation of the biodiversity of native vegetation. Further field work may be required in 2018 to align the vegetation assessment to the revised guidelines.

3.2.2 Terrestrial fauna

The site assessment for fauna (excluding targeted surveys) was conducted by two zoologists between July and December 2017. The project area was visited and assessed at 16 discrete locations – additional sites were visited for targeted surveys, as described in Section 3.3.2. Prior to the site visits, higher priority locations to visit had been identified from aerial imagery and locations of historical threatened fauna records (VBA), relative to the specific locations along the project area. The site assessments were conducted during daylight hours only.

At most locations, assessments were undertaken on foot by walking into the area perceived to contain the highest-quality habitat (based on aerial imagery and prior field experience). Photographs were taken at most locations, as a record of the habitats encountered. Observations of species were recorded for sites, more to provide an indication of habitat value and condition rather than as an attempt to document all species present.

The fauna assessment was undertaken as though the proposed project area will be constructed at surface level for the entire corridor indicated (i.e., irrespective of tunnels, tunnel portals, structure, cut). This includes the conditional no-go area at Banyule Flats and the Yarra River floodplain. This provides a conservative assessment of potential impacts on fauna, and was done to ensure that all ecological values are captured despite any design changes.

3.2.3 Aquatic ecology

Aquatic ecologists completed a site inspection of all mapped waterways, wetlands and drainage lines that intersected the project area. Prior to site visits, aerial photography, topographic maps and drainage lines were examined for each location that were known or possible waterway sites.

The visual assessment of each location was conducted to provide a qualitative assessment of the condition and threats to aquatic habitat quality, and the likelihood of significant aquatic ecosystem values to occur. The sites were visited by two aquatic ecologists on 10 July 2017. Representative photographs were taken at each waterway site.

Waterway conditions and threats were assessed using features that are known predictors of aquatic ecosystem quality, that are spatially variable between sites on the same waterway, but that are not highly variable on an annual or seasonal basis:

- Condition - bed and bank form and composition, riparian vegetation, instream habitat diversity
- Threats – pollution and stormwater inputs, barriers to connectivity.

The site inspections did not include any surveys or sampling for aquatic fauna. This assessment of water ecosystem values, including but not limited to the potential for individual significant species to be present, is based on these site inspections and known ecological preferences and requirements for these species.

3.3 Targeted surveys

Following the general field assessment, targeted surveys were undertaken at areas most likely to contain threatened species or communities.

3.3.1 Flora and vegetation

Targeted surveys were conducted for two flora species and one ecological community. See sections below for survey rationale for other EPBC Act-listed species. For locations of targeted surveys and results refer to Appendix D.

Matted Flax-lily *Dianella amoena* and Clover Glycine *Glycine latrobeana*

Flora surveys for Matted Flax-lily and Clover Glycine followed the following protocol:

- Surveys were undertaken when plants were in flower where possible.
- Surveys commenced at Simpson Barracks on 26 October 2017 when Matted Flax-lily was initially identified. A follow-up survey was undertaken on 2 November 2017 at the tail end of the Clover Glycine flowering season and while Matted Flax-lily was in bud (prior to flowering) and a final survey was undertaken on 21 November 2017 after Matted Flax-lily had commenced flowering and was consequently more visible. Surveys were undertaken at the Hurstbridge Rail Line and the M80 Interchange on 24 October 2017 and 6 December 2017.
- Where plants were positively identified, sites were visited twice (Simpson Barracks, Hurstbridge Rail Line and M80 Interchange).
- Surveys for Matted Flax-lily were undertaken in accordance with the timing outlined in the DoEE Species Profile and Threats (SPRAT) Database, i.e. November to February[2]. Surveys for Clover Glycine were undertaken in accordance with the flowering time of the species provided in VicFlora[3].
- Targeted survey effort was directed at potential native grassland and grassy woodland habitat, particularly better quality patches with low to moderate weed cover.
- Survey teams were led by botanists/ecologists familiar with the target species.
- Teams of a minimum two ecologists slowly walked transects at 5 m intervals (as stipulated for Matted Flax-lily in the Melbourne Strategic Assessment, (DSE, 2010)) in all potential habitat. Reliable line of sight was approximately 2.5 m either side of each ecologist.
- Where individuals were observed, the species was recorded, along with number of individuals and/or patch size, and the location of the plant/patch was mapped. Additional searching effort then occurred in concentric circles out from the initially identified individual until no further individuals were observed within a 10-metre radius from the initially identified plant.
- It should be noted that it is almost impossible (except with molecular techniques) to accurately determine population size for Matted Flax-lily, owing to its mat-forming habit, which can comprise anything from dense patches to sparsely distributed tufts of leaves. Therefore, this report describes the occurrence of this species as discrete individual plants or patches separated by a gap of at least 1 m between visible tufts of leaves. The use of this criterion implies that each plant/patch contains at least one plant but possibly more, and that where tufts are at least 1 m apart, they are regarded as separate plants.

[2] http://www.environment.gov.au/cgi-bin/sprat/public/publicspecies.pl?taxon_id=64886

[3] https://vicflora.rbg.vic.gov.au/flora/search?q=Glycine latrobeana

Seasonal Herbaceous Wetlands of the Temperate Lowland Plains

Surveys for Seasonal Herbaceous Wetlands were undertaken in accordance with *Approved Conservation Advice for the Seasonal Herbaceous Wetlands (Freshwater) of the Temperate Lowland Plains* (TSSC, 2012), which generally followed the following protocol:

- Surveys were undertaken within the recommended period of spring to early summer, with one day completed on 19 December 2017 by two ecologists (one aquatic and one terrestrial).
- Vegetation assessed was an area within Banyule Flats and Warringal Parklands, but was not an extensive assessment of all vegetation in this area.
- Surveys followed the key diagnostic criteria and description according to TSSC (2012).
- An overall assessment was undertaken of the wetland areas and surrounding landscape.
- Where a patch was considered as having the potential to contain Seasonal Herbaceous Wetlands a detailed assessment was undertaken including identification of native vegetation.

3.3.2 Terrestrial fauna

Targeted surveys were conducted for one fauna species only (the Growling Grass Frog). See sections below for survey rationale for other EPBC Act-listed species. For locations of targeted surveys and results refer to Appendix D.

Growling Grass Frog *Litoria raniformis*

Growling Grass Frog habitat assessments were conducted in the field at locations determined through review of threatened species' record data (VBA) and considering the presence of potentially suitable habitat occurring within the project area, based on preliminary field surveys, aerial imagery and modelled information.

Each location was visited during daylight hours to determine the habitat suitability of the waterway or waterbody for the Growling Grass Frog. The assessment took into account the following attributes:

- Presence of surface water
- Presence of emergent and fringing vegetation
- Shading
- The known or likely presence of fish
- Water quality
- Bank suitability (e.g. steep, shallow)
- Potential for high flows
- Level of degradation
- Landscape context of waterbody (i.e., isolation/connection to other waterways/waterbodies).

Two zoologists completed between one and three rounds of targeted frog surveys at each site where habitat was deemed suitable between the 31 October and 15 November 2017. The survey timing was chosen to target the peak activity period of the Growling Grass Frog

(November-December). While all habitat assessments were conducted during daylight hours, all monitoring for the frogs themselves was conducted at night, because frog activity is most likely to be detected at night (refer to Appendix D for survey conditions including weather and timing).

Nocturnal frog surveys targeting suitable weather conditions were undertaken at 16 sites with the following protocol:

- An initial quiet listening session (up to 5 mins) was undertaken from the edge of the waterway/waterbody to detect calling of frogs
- Playback of pre-recorded advertisement calls of Growling Grass Frog was undertaken for 2 to 3 minutes at each site, in an attempt to elicit responses from frogs that may be present but not calling spontaneously
- The number of frogs calling for each species was estimated for each site using the following abundance categories 0, 1-5, 11-20, 21-50, 51+
- A visual inspection of a portion of each site (generally the most suitable habitat) was undertaken following playback, using strong head torches to scan the water's surface, aquatic and bank-side vegetation for resting/perching frogs. Searches at each site lasted for up to 40 minutes; duration was based on the size of the waterbody, frog activity at the site, and habitat suitability for Growling Grass Frog.

Frog surveys are best undertaken during warm, humid and windless conditions, and surveys were timed to encounter appropriate conditions as much as possible. At each site, weather conditions were recorded, including cloud cover (estimated %), wind speed and direction, rain at the time of survey, presence of moonlight, air temperature (°C) and relative humidity (%). Temperature, relative humidity, wind speed and direction were taken from nearest weather station to each site and accessed via Eldersweather.com.au (refer to Appendix D for survey details).

Grey-headed Flying-fox *Pteropus poliocephalus*

Targeted surveys were not conducted for this species. This species is well-known to have a large roosting and breeding colony at Yarra Bend Park along the Yarra River, downstream of the Eastern Freeway, and to disperse widely from the colony to forage in flowering and fruiting trees and shrubs (planted and remnant) throughout the majority of Melbourne's suburbs. Presence of this species throughout the project area is therefore presumed.

On 16 November 2017, the Yarra Bend colony was visited by zoologists (accessed from Fairlea Reserve, Fairfield) to determine proximity of the project area to current roosting areas used by flying-foxes.

Swift Parrot *Lathamus discolor*

Targeted surveys were not conducted for this species. This species is migratory (as well as threatened), and breeds in Tasmania only. Typically, small numbers of birds fly through the Melbourne area on their northerly and southerly migrations. Birds are reported sporadically in small numbers in Melbourne's northern and north-western suburbs in most years, where suitable eucalypts occur and flower at appropriate times of the year. Given that the field assessments for this project occurred outside the peak migratory season for the Swift Parrot (i.e., after August), the chance of detecting the species through targeted survey was considered low, yet drawing a subsequent conclusion of absence from non-detection would be misleading. Therefore, assessment for this species was restricted to habitat assessment, with occasional presence presumed in appropriate habitat.

Latham's Snipe *Gallinago hardwickii*

Targeted surveys were not conducted for this species. This species is migratory, and is present in southern Australia only during the warmer months (August to March). According to the VBA records, the most suitable habitat for this species is associated with the Yarra River and its associated floodplain in the Banyule/Bulleen area. These areas are currently proposed to be tunnelled, so will not be impacted. The location where the Yarra River is crossed by the Eastern Freeway does not support habitats suitable for Latham's Snipe. Other locations where this species may occur are typically degraded, disturbed (particularly by people walking dogs) and within urbanised areas. That, in association with the few VBA records, suggests that those areas are very unlikely to support large enough numbers of birds (18 or more) to be considered important habitat. Assessment for this species was restricted to habitat assessment and opportunistic observations.

3.3.3 Aquatic ecology

Habitat suitability assessment was conducted in the field to confirm locations for targeted surveys for Australian Grayling, Macquarie Perch and Dwarf Galaxias. Murray Cod are known from the Yarra catchment, however this population is outside the natural distribution, and therefore are not considered as a protected population under the EPBC Act (Department of the Environment, 2017). The only site where Dwarf Galaxias is considered to possibly occur is Banyule Creek in Simpson Barracks, which is relatively near to a known translocated population of this species that occurs in wetlands in and around La Trobe University.

Survey methods were selected based on the habitat present and safe working conditions.

Small channels were surveyed using dip nets, through the aquatic vegetation in the channel. In larger waterbodies, such as streams, dams or wetlands, dip netting through aquatic habitat was supplemented with backpack electrofishing. The survey effort was proportional to the area of aquatic habitat present, with typically at least 1200 seconds of pulse time for electrofishing in streams and rivers.

Fyke nets were deployed overnight, with a minimum soak time of 12 hours. The maximum water depth for fyke nets was 1.2 m, and these were located in areas with minimal public access to avoid vandalism. In rivers and streams, two fyke nets were deployed; one net facing downstream, one net facing upstream.

All fish collected or observed were identified. Native fish were released at point of capture. Exotic fish were euthanised and removed from the waterway.

3.3.4 Permits

Flora and fauna surveys for the project have been undertaken in accordance with the permits in Table 2 granted by the Department of Environment, Land, Water and Planning (DELWP) under the *Wildlife Act* 1975, *Prevention of Cruelty to Animals Act* 1986 and *Flora and Fauna Guarantee Act* 1988, and by the Department of Economic Development, Jobs, Transport and Resources (DEDJTR) (*Fisheries Act* 1995).

Table 2 Flora and fauna permits

Discipline	Permit number	Expiry
Aquatic ecology – Research permit and permit to take protected fish (*Flora and Fauna*	10007730 (GHD)	30 September 2018

Discipline	Permit number	Expiry
Guarantee Act 1988)		
Aquatic ecology – General research permit (*Fisheries Act 1995*)	RP1096 (GHD)	28 September 2018
Fauna – Research permit and management authorisation (*Wildlife Act 1975*)	10008401 (GHD)	31 July 2020
Fauna – Scientific procedures fieldwork licence (*Prevention of Cruelty to Animals Act 1986*)	SPFL20067 (GHD)	20 June 2021
Flora – Permit to take protected flora (*Flora and Fauna Guarantee Act 1988*)	10008049 (AECOM)	20 July 2019

4. Results

4.1 Desktop assessment

This section provides a summary of the results of the PMST search and VBA extract. Section 4.1.2 includes EPBC Act-listed species and communities that are considered to have a high likelihood of occurring, or are known to be present, within the project area. A full assessment of the likelihood of occurrence of all EPBC Act-listed species and threatened ecological communities is provided in Appendix B.

4.1.1 PMST results

Ecological matters of NES that have potential to occur within five kilometres from the project area according to the PMST search include:

- Listed Threatened Ecological Communities
  - 5 communities
- Listed Threatened Species
  - 15 flora species
  - 25 fauna species
- Listed Migratory Species
  - 15 species.

No Wetlands of International Importance or Commonwealth Marine Areas are within 5 kilometres of the project area and it is not in proximity to the Great Barrier Reef Marine Park. The full PMST results are provided in Appendix C.

4.1.2 Likelihood of occurrence

The following tables (Table 3 to Table 8) present results from the desktop assessment for ecological communities, flora and fauna.

Table 3 Classifications

Code	Category
EPBC Act	
CR	Critically Endangered
EN	Endangered
VU	Vulnerable
Ma	Marine
Mi	Migratory species
FFG Act	
L	Listed
N	Nominated for listing

Code	Category
I	Invalid or ineligible
Advisory List of Rare or Threatened Species (DELWP) - flora	
e	Endangered
v	Vulnerable
r	Rare
Advisory List of Rare or Threatened Species (DELWP) - fauna	
cr	Critically endangered
en	Endangered
vu	Vulnerable

Five EPBC Act-listed ecological communities have been identified by the PMST as having the potential to occur within five kilometres of the project area. The likelihood of occurrence for these communities is presented in Table 4. At the desktop assessment phase, one of these communities, *Seasonal Herbaceous Wetlands (Freshwater) of the Temperate Lowland Plains*, was identified as having a high likelihood of occurrence within the project area, however targeted surveys found that the wetlands and habitats were not suitable to support this community.

Table 4 Threatened ecological communities

Ecological community	Associated EVC	EPBC Act	Likelihood of occurrence
Grassy Eucalypt Woodland of the Victorian Volcanic Plain	EVC 55_61 Plains Grassy Woodland EVC 649 Stony Knoll Shrubland EVC 651 Plains Swampy Woodland EVC 897 Plains Grassland/Plains Grassy Woodland Mosaic	CE	Low – majority of the Project is outside of the Victorian Volcanic Plain (VVP) and sits within the Gippsland Plain or Highlands-Southern Fall bioregions. Small pockets of VVP occur within the project area, however these areas have a low likelihood of supporting the community due to the modified nature of these areas and vegetation not meeting composition and quality criteria. Refer to Figure 3 for geology of the project area.
Natural Damp Grassland of the Victorian Coastal Plains	EVC 132 Plains Grassland	CE	Unlikely – the project is outside of the Victorian Coastal Plains

Ecological community	Associated EVC	EPBC Act	Likelihood of occurrence
Natural Temperate Grassland of the Victorian Volcanic Plain	EVC 132 Plains Grassland EVC 654 Creekline Tussock Grassland EVC 897 Plains Grassland/Plains Grassy Woodland Mosaic	CE	Unlikely – majority of the project is outside of the Victorian Volcanic Plain and sits within the Gippsland Plain or Highlands-Southern Fall bioregions. Very limited areas of grassland EVCs have been observed to occur within the project area. Field investigations found that areas of vegetation did not meet the composition and quality criteria.
Seasonal Herbaceous Wetlands (Freshwater) of the Temperate Lowland Plains	EVC 125 Plains Grassy Wetland EVC 306 Aquatic Grassy Wetland EVC 647 Plains Sedgy Wetland EVC 678 Ephemeral Drainage-line Grassy Wetland EVC 778 Gilgai Wetland EVC 920 Sweet Grass Wetland EVC 956 Herb-rich Gilgai Wetland	CE	Low – at the desktop phase, the potential for small patches of Seasonal Herbaceous Wetlands (Freshwater) of the Temperate Lowland Plains was identified (high likelihood) on the floodplain of the Yarra River. However, subsequent field investigations indicated that the community has a low likelihood of occurrence, as the wetlands are connected to a riverine system and the dominant water source is from overbank flooding (characteristics that are not allowable in the Listing Advice for the community[4]).
White Box-Yellow Box-Blakely's Red Gum Grassy Woodland and Derived Native Grassland	EVC 175 Grassy Woodland EVC 55 Plains Grassy Woodland	CE	Unlikely - Whilst some areas of Plains Grassy Woodland and Grassy Woodland occur within the Project, it is unlikely that where they occur they contain the associated species composition and condition.

[4] http://www.environment.gov.au/biodiversity/threatened/communities/pubs/97-listing-advice.pdf

A total of 16 EPBC Act-listed flora species were identified through the PMST and VBA searches as occurring or having the potential to occur within five kilometres of the project area Appendix B. Of these, Table 5 includes three species of listed flora that are considered to have a high likelihood of occurring, or are known to be present within the project area. Figure 4 shows the recorded locations of national and state listed threatened species from the VBA extract.

Table 5 Threatened flora likely to occur within the project area

Scientific Name	Common Name	EPBC Act	FFG Act	DELWP	Most recent record	Records
Glycine latrobeana	Clover Glycine	VU	L	v	2011/ PMST	18
Dianella amoena	Matted Flax-lily	EN	L	e	2014/ PMST	67
Amphibromus fluitans	River Swamp Wallaby-grass	VU			2011/ PMST	9

A total of 25 threatened terrestrial fauna species were identified as occurring within five kilometres of the project area through the PMST search. For a full list of threatened species identified, refer to Appendix B. Of the 25 species, Table 6 includes three fauna species that are considered to have a high likelihood of occurring, or are known to be present, within the project area.

Table 6 Threatened terrestrial fauna likely to occur within the project area

Common Name	Scientific Name	EPBC Act	FFG Act	DELWP	Most recent record	Records
Swift Parrot	*Lathamus discolor*	CE	L	e	2009/ PMST	57
Grey-headed Flying-fox	*Pteropus poliocephalus*	VU	L	v	2013/ PMST	420
Growling Grass Frog	*Litoria raniformis*	VU	L	e	2014/ PMST	47

A total of 15 Migratory fauna species were identified as occurring within five kilometres of the project area through the PMST search, and there are VBA records of another four Migratory species that were not identified by the PMST. For a full list of Migratory species identified, refer to Appendix B. Of the 15 species, Table 7 includes one species that is considered likely to occur, or is known to be present, within the project area.

Table 7 Migratory fauna likely to occur within the project area

Common Name	Scientific Name	EPBC Act	FFG Act	DELWP	Most recent record	Records
Latham's Snipe	*Gallinago hardwickii*	Mi		nt	2013/ PMST	49

Four threatened aquatic fauna species were identified as occurring within five kilometres of the project area through the PMST search. For a full list of threatened species identified refer to Appendix B. Of these, Table 8 includes listed aquatic fauna that are considered to be a high likelihood of occurring, or are known to be present within the project area.

Table 8 Threatened aquatic fauna extract

Common Name	Scientific Name	EPBC Act	FFG Act	DELWP	Most recent record	Records
Dwarf Galaxias	*Galaxiella pusilla*	VU	L	e	2010/ PMST	5
Murray Cod*	*Maccullochella peelii*	VU	L	v	2015/ PMST	11
Macquarie Perch	*Macquaria australasica*	EN	L	e	2015	61
Australian Grayling	*Prototroctes maraena*	VU	L	v	2014/ PMST	98

* Murray Cod population in Yarra catchment not protected under EPBC Act as outside natural distribution.

4.2 Field assessment

4.2.1 Flora and vegetation

Threatened ecological communities

Of the five EPBC Act-listed communities listed as potentially occurring within the project area, three were considered unlikely to occur within the project area following site assessments. None of the EVCs associated with these EPBC Act-listed communities were recorded during field assessments of the project area and/or the project area did not support the biogeographical characteristics of these communities. Consequently, these communities were not considered further.

In the vicinity of the project, two areas of Yarra River floodplain wetlands (Bolin Bolin Billabong and Banyule Swamp/Warringal Parklands) occur in landscapes potentially associated with Seasonal Herbaceous Wetlands (Freshwater) of the Temperate Lowland Plains. The community occurs on seasonally-filled drainage lines or depressions, sometimes poorly defined, that are variously categorised as isolated, closed or endorheic systems. Their inundation is typically seasonal. Inundation is not dependent on connections to riverine systems but is fed by local rainfall. There may be some groundwater influence that contributes to retention of the water in wetlands and persistence of wetland flora when climatic conditions are dry (TSSC, 2012).

Field surveys did not identify Seasonal Herbaceous Wetlands at either of the locations identified above (refer to section 4.3.1 for further details of targeted survey). The primary reason for the listed community being regarded as not present at Banyule Flats and Warringal Parklands is that the wetlands are connected to a riverine system and the dominant water source is from overbank flooding (characteristics that are not allowable according to the Listing Advice for the community)[5]. Habitat hectare assessments revealed that the vegetation at Bolin Bolin Billabong

[5] http://www.environment.gov.au/biodiversity/threatened/communities/pubs/97-listing-advice.pdf

is primarily Floodplain Riparian Woodland of the Gippsland Plain that does not meet the Seasonal Herbaceous Wetlands criteria set out by TSSC (2012).

A second community; Grassy Eucalypt Woodland of the Victorian Volcanic Plain (VVP) was identified to have some potential to occur in the project area. Although unlikely to occur within much of the project area, a patch of Grassy Eucalypt Woodland of the Victorian Volcanic Plain has been found along the Metropolitan Ring Road in a small (approximately 1.5 ha) patch that occurs between Enterprise Drive and the M80. There is potential that this is an offset site of Plains Grassy Woodland (EVC 55) that has evolved over time. This patch has been designated as a no-go zone by the Project, to avoid potential impacts on this community.

The Plains Grassy Woodland (EVC 55) that exists within Simpson Barracks was investigated for its potential to be considered Grassy Eucalypt Woodland of the Victorian Volcanic Plain. Whilst the flora present on site contained open woodland with a grassy understory which resembles some of the vegetation characteristics of Grassy Eucalypt Woodland, the geological terrain was identified to be dominated by sandstone, as shown in Figure 3. Therefore, since Grassy Eucalypt Woodland is 'specifically limited to the extensive Quaternary basalt plain of south-western Victoria' (as per the listing advice) it was concluded that the woodland within Simpson Barracks is not Grassy Eucalypt Woodland.

Vegetation Quality Assessment (Habitat Hectare)

Vegetation assessments were undertaken beyond the project area extending to approximately 90 hectares of vegetation. Vegetation within the project area (refer to Table 9) was found to predominantly consist of riparian and floodplain vegetation and Plains Grassy Woodland of varying qualities within the Gippsland Plain bioregion. In the northern part of the project area, some areas of Grassy Dry Forest and Valley Grassy Forest will be impacted within the Highlands Southern Fall bioregion. The outcomes of the assessment undertaken to date within the project area are summarised in Table 9 and mapped in Appendix E.

Modelled EVC data (VicMap, 2002) have been used for areas of EVCs where vegetation assessments haven't yet been undertaken, which was found to be predominantly Floodplain Riparian Woodland of the Gippsland Plain (refer to Table 10 below). This data has been employed only to give an indication of vegetation type within the remaining areas and does not give an accurate estimate of vegetation amount.

It is noted that habitat in the referred project area above the tunnel alignment has not been included in the below estimates as no surface impacts are anticipated.

For vegetation surveys to be undertaken in 2018, refer to Figure 6.

Table 9 Habitat hectare results from field assessments within the project area

Bioregion	EVC	Status	Area of habitat within project area (ha)	Habitat hectares within project area (Hha)
Gippsland Plain	Creekline Grassy Woodland (68)	Endangered	0.23	0.05
Gippsland Plain	Floodplain Riparian Woodland (56)	Endangered	5.52	1.55

Bioregion	EVC	Status	Area of habitat within project area (ha)	Habitat hectares within project area (Hha)
Gippsland Plain	Grassy Woodland (175)	Endangered	0.34	0.14
Gippsland Plain	Plains Grassy Woodland (55)	Endangered	16.11	8.22
Gippsland Plain	Riparian Woodland (641)	Endangered	17.46	7.81
Gippsland Plain	Swampy Riparian Woodland (83)	Endangered	10.19	4.26
Gippsland Plain	Valley Grassy Forest (47)	Vulnerable	0.07	0.01
Highlands Southern Fall	Floodplain Riparian Woodland (56)	Endangered	1.13	0.36
Highlands Southern Fall	Grassy Dry Forest (22)	Least Concern	1.32	0.27
Highlands Southern Fall	Valley Grassy Forest (47)	Vulnerable	2.76	1.14

Table 10 Modelled data of areas still to be assessed (VicMap, 2002)

Bioregion	EVC	Status	Total habitat within project area (ha)
Gippsland Plain	Floodplain Riparian Woodland (56)	Endangered	18.76
Gippsland Plain	Floodplain Wetland Aggregate (172)	Endangered	0.38
Gippsland Plain	Grassy Woodland (175)	Endangered	0.40
Gippsland Plain	Plains Grassy Woodland (55)	Endangered	7.30
Gippsland Plain	Swampy Riparian Woodland (83)	Endangered	1.56
Gippsland Plain	Valley Grassy Forest (47)	Vulnerable	0.10
Gippsland Plain	Valley Heathy Forest (127)	Endangered	3.81
Victorian	Plains Grassy Woodland	Endangered	1.69

Bioregion	EVC	Status	Total habitat within project area (ha)
Volcanic Plain	(55)		
Victorian Volcanic Plain	Stream Bank Shrubland (851)	Endangered	0.19

Areas containing amenity plantings (including planted native vegetation) have not been considered as part of this impact assessment. It is acknowledged that amenity plantings are of interest to various stakeholders however they have been excluded from this impact assessment as their removal does not hold direct legislative implications under the EPBC Act.

Scattered Indigenous Trees

A total of 98 scattered trees were identified within the project area (refer to Appendix E for locations).

4.2.2 Terrestrial fauna

While the project area is considerably urbanised, areas of high ecological value still remain in some sections, particularly near the Yarra River and its associated floodplain in the Banyule/Bulleen area. Because this land is a floodplain within a large metropolitan area, it is characterised by expansive, well-treed, multi-use recreational parks (including golf courses), which retain important patches of high value habitat for terrestrial fauna.

The northern parts of the project area generally pass through areas that have been previously disturbed. The woodland and forest areas that remain or that have regenerated or been re-planted offer low to moderate value habitat for threatened and migratory fauna species. While some species may use these habitats occasionally (e.g., Swift Parrot), these habitats are more likely to be used and visited by common and adaptable fauna that occur across much of the Melbourne area.

Further south, in the suburb of Yallambie, the corridor runs along the western fringe of the Simpson Barracks, which contains a relatively large area of remnant woodland, particularly for this part of otherwise urbanised Melbourne. This habitat is of moderately high value and the large eucalypts may attract threatened fauna species such as the Swift Parrot and Grey-headed Flying-fox occasionally.

The corridor then courses along Banyule Creek which is relatively degraded (weedy with non-native trees and shrubs) and generally of low to moderate value to fauna for most of the length. Banyule Creek flows into or alongside Banyule Swamp within a large area of recreational parks associated with the Yarra River floodplain in Heidelberg and Bulleen where there are numerous records of threatened species. Surface impacts though this entire area are being avoided via the construction of tunnels. The corridor then continues along the eastern side of more high value Yarra River floodplain, including the Bolin Bolin Billabong.

Where the corridor meets the Eastern Freeway at Bulleen Road, the area has been considerably disturbed historically, mostly for the construction of the Eastern Freeway. Golf courses adjacent to the Eastern Freeway (north side, west of Bulleen Road) provide some limited habitats for native fauna, but are mostly dominated by common and aggressive bird species such as Noisy Miner, Red Wattlebird and Rainbow Lorikeet. Threatened species may use those habitats occasionally. Fauna habitats along Koonung Creek (mainly east of Bulleen

Road) are mostly degraded and disturbed, and are likely to be used mostly by common and adaptable fauna.

West of Bulleen Road, the Eastern Freeway crosses the Yarra River and Merri Creek (separate locations). The fauna habitats at both locations are degraded and disturbed. Where it crosses the Yarra River, the project area abuts (north side) the Flying-fox Management Area (DSE 2005) associated with the Grey-headed Flying-fox camp/colony at Yarra Bend Park. The project area has been designed to avoid the Flying-fox Management Area which is a no-go zone. Avoiding this management area greatly reduces the chance of the project impacting significantly on the Grey-headed Flying-fox.

Access was not granted for site visits to Freeway Golf Course, but it is anticipated that this will have low habitat values for threatened and migratory fauna species.

4.2.3 Aquatic ecology

The highest aquatic ecology values along the corridor are contained with the Yarra River, and two associated floodplain wetlands. The Yarra River has known populations of EPBC Act-listed native fish: Australian Grayling, Macquarie Perch, Murray Cod (translocated population). The distribution of these fish throughout the wider stream network within the Yarra catchment is less well known, but there are various records of these listed fish also in the lower reaches of major tributaries, including the confluence with Merri Creek that falls within the project area. The river also provides habitat for a range of other native fish. At this location, the condition of the Yarra is somewhat impacted by urban stormwater and other threats to water quality. Thus, although the river at this location has moderately good instream habitat and some good riparian vegetation condition, the most significant ecological value is not so much based on the ecosystem resident per se, but more as a major aquatic corridor connecting the aquatic habitats in the wider stream network. Indeed, this location is immediately upstream of Dights Falls, which is the boundary between the tidally influenced estuary, and the freshwater river. The significance of this site as a transition site, and potential barrier to fish migration has resulted in high fish survey effort, and disproportionate density of fish records.

Merri Creek and Plenty River within the project area are urban waterways, subject to a range of impacts that have degraded the ecological condition. Both of these tributaries of the Yarra River extend from relatively good ecological condition in the less developed headwaters and upper reach catchments to the north, but have significant industrial and urban impacts in the mid and lower reaches. These waterways provide habitat suitable for native and exotic aquatic fauna, but the degree of stormwater inputs and modification to the catchment have resulted in low aquatic ecological values, despite some naturalised channel and riparian zone. There are records of EPBC-listed fish within the lower reaches of the Plenty River, and there is ample habitat for resident populations of native fish. It is possible that EPBC Act-listed fish could inhabit Merri Creek however there are no records of these beyond the vicinity of the confluence with the Yarra River.

Other waterways within the project area are unlikely to contain significant aquatic ecosystem values. Koonung Creek is heavily impacted, with poor water quality, poor bed and bank condition, significant pollution and several potential barriers to fish passage, and although it may possibly allow fish passage during periods of moderate flow, it has poor habitat for supporting a good aquatic ecosystem. Banyule Creek functions as an urban drain. Several reaches have been naturalised by waterway managers and may contain some good habitat conditions, but these are unlikely to maintain good quality aquatic ecosystems or to support populations of threatened species. The most upstream reaches appear to be ephemeral waterways, which

limits the ability of such waterways to maintain fish populations. Several constructed drainage structures are likely to provide barriers to fish passage, limiting colonisation by fish.

Banyule Swamp is a non-permanent wetland and, with the associated lake, provides a regionally significant and relatively well protected floodplain wetland. The aquatic ecology values of this site are likely to be limited to opportunistic species that are able to colonise during rare overbank flows and high flow events, due to the presence of barriers to fish passage. The wetland is likely to support a range of fauna other than aquatic species that are dependent on the aquatic ecosystem condition, e.g. piscivorous birds, amphibians. It appears that there is no direct connectivity with Banyule Creek except during high flow events, and the potential threats posed by urban stormwater from the creek may not impact Banyule Swamp to a great extent.

Bolin Bolin Billabong is a regionally significant floodplain wetland, with a largely intact riparian vegetation, but considerable weed infestation. The greatest threat to the ecological values of the billabong appears to be the lack of hydrological connectivity with the Yarra River, resulting from increasingly rare overbank flows. Hence the aquatic habitat within the billabong may not contain the potential fish species for this type of wetland. The billabong is mostly dry, but has high amounts of potential aquatic habitat structural diversity (i.e. woody debris and leaf litter), and little bed or bank disturbance suggesting it has good potential to contain high ecological values during periods of inundation.

The Banyule Swamp and Bolin Bolin Billabong are the only notable wetlands near the project area. There are several other smaller wetlands that are primarily functional stormwater drains or retarding basins that do not contain significant aquatic ecological values, despite providing water for terrestrial fauna. The hydrological contribution of groundwater to wetlands in the area is not known, and therefore these sites may be susceptible to changes in groundwater levels.

4.3 Targeted surveys

To support the desktop studies and broad field surveys, targeted surveys were undertaken to verify the presence and location of nationally threatened species which had a high likelihood of occurring (at the desktop phase) within the project area. For full details of targeted surveys refer to Appendix D.

4.3.1 Flora and vegetation

Through the desktop review and site investigations, the following EPBC Act-listed flora species were determined to have high potential to occur or are known to occur in the project area:

- Clover Glycine *Glycine latrobeana*
- Matted Flax-lily *Dianella amoena*
- River Swamp Wallaby-grass *Amphibromus fluitans.*

Targeted surveys were undertaken to determine the potential for the project to impact Matted Flax-lily and Clover Glycine, while it was deemed unnecessary to undertake targeted surveys for River Swamp Wallaby-grass given the absence of suitable habitat within the project area. The following sections provide a description of each species and the results of the targeted surveys.

Clover Glycine

Clover Glycine is a small perennial herb with leaves that look similar to common pasture clover (Tas DPI, 2003; Vic DSE, 2005). Low growing, it first spreads horizontally then becomes erect

(ascending) or continues horizontally with the ends growing upwards (decumbent). The leaves are round and grouped into three leaflets (trifoliate), similar to clover; the leaflets can be up to 20 mm long and 12 mm wide (Walsh & Entwisle, 1996; Vic DSE, 2005). A distinguishing feature is the stipules (pair of outgrowths occurring at base of leaf stalk) that are egg or kidney shaped and wrap around the stem (Tas DPI, 2003). The flowers are purple to pink, pea like, and up to 6 mm long (Tas DPI, 2003; Vic DSE, 2005). The fruit are small pods which contain three to five ovoid seeds approximately 3 mm long. The pods are between 15 to 25 mm long and covered with short hairs (Tas DPI, 2003; Walsh & Entwisle, 1996).

Results

Clover Glycine was not recorded in the project area despite a high likelihood of presence determined in the desktop assessment (there are 18 VBA records for Clover Glycine in the surrounding five kilometres). Much of the project area, including remnant patches, consisted of a modified understorey with varying levels of weediness. Generally, the most common weeds were grassy weeds (e.g. *Ehrharta* spp., *Bromus* spp., *Avena* spp.) which compete in the ground layer, generally making the environment unsuitable for Clover Glycine due to the high biomass (Carter & Sutter, 2010). Nonetheless, targeted surveys were completed during the tail-end of the flowing season to confirm the species' absence. Better quality remnant patches of Plains Grassy Woodland and Riparian Woodland such as Simpson Barracks, Banyule Reserve and some elevated flats along Koonung Creek were considered to have a higher potential to support the species because of their archetypal indigenous grassland structure (e.g. Kangaroo Grass *Themeda triandra*, Wallaby Grass *Rytidosperma* spp., Spear Grass *Austrostipa* spp. and Plume grasses *Dichelachne* spp.). However, Clover Glycine was not observed despite extensive searching in these areas. In addition to weed cover, pressure from rabbit and kangaroo grazing is likely to be a barrier to the species' persistence in the project area (Carter & Sutter, 2010) as well as the wider landscape. It is concluded that Clover Glycine has a low likelihood of occurring within the project area, and therefore specific mitigation for this species is not required. However, general construction monitoring measures and worker awareness training will be implemented to avoid potential impacts to listed flora such as Clover Glycine.

Matted Flax-lily

The Matted Flax-lily is a small, perennial, tufted lily endemic to south-east Australia, occurring in grassland and grassy woodland habitats. Much of this habitat has been cleared, and remaining populations of Matted Flax-lily are mostly small and highly fragmented. Current threats include ongoing clearing of habitat and weed invasion.

Habitat

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

Matted Flax-lily is typically found in association with native grasses such as Common Wheat Grass (*Anthosachne scabra*), Common Tussock-grass (*Poa labillardierei*), Kangaroo Grass (*Themeda triandra*), Grey Tussock-grass (*Poa sieberiana*), Slender Wallaby Grass (*Rytidosperma racemosa* var. *racemosa*), and Weeping Grass (*Microlaena stipoides* var. *stipoides*). In grassy woodland habitat, associated tree species include Blackwood (*Acacia melanoxylon*) and a variety of *Eucalyptus* species including River Red Gum (*Eucalyptus camaldulensis*), Long-leaved Box (*E. goniocalyx*), Red Stringy Bark (*E. macrorhyncha* subsp. *macrorhyncha*), Yellow Box (*E. melliodora*), Swamp Gum (*E. ovata*), Snow Gum (*E. pauciflora* subsp. *pauciflora*), and Red Box (*E. polyanthemos* subsp. *vestita*). Matted Flax-lily is also found

in association with various introduced grasses and herbs (Carr & Horsfall, 1995; Gray & Knight, 2001; Carter, 2010).

Flowers are buzz-pollinated by the native Blue-banded Bee (*Amegilla cingulata*). Fruits are readily formed but recruitment is often considered low or absent due to habitat disturbance and weed competition, and generally no seedlings are produced. Instead the species typically reproduces vegetatively through the production of rhizomes and ramets. The species can also be propagated by division (Carter, 2010).

Distribution

Matted Flax-lily is currently known to occur in Victoria and Tasmania. Approximately 2,500 plants are estimated to remain in the wild in Victoria, found across approximately 120 sites (Carter 2010). Further sites have been discovered across the species' range since 2010; however, an up-to-date population estimate for the species is not known. Multiple populations are known from the northern suburbs of Melbourne, typically within remnant vegetation along roadsides and within rail corridors, conservation reserves, and in translocation sites (Carter, 2010).

Previous studies

The population of Matted Flax-lily at Simpson Barracks is well documented, with the site listed as supporting a 'significant population' on the National Recovery Plan for the species, where it was recorded as possessing a population of 10 plants (Carter 2010). A number of previous investigations into the populations of Matted Flax-lily present at Simpson Barracks have been undertaken, as summarised below:

- HLA-Envirosciences, May 2007, Biodiversity Assessments and Strategies for Simpson Barracks.

  This report referred to a Kinhill report prepared in 2000 which identified two populations of Matted Flax-lily at the site. One population comprised approximately 50 individuals or clumps on the western section of the site, and the other comprised approximately 20 individuals or clumps in the eastern section of the barracks.

  To build upon this information, HLA-Envirosciences conducted field surveys in 2006. They recorded two individuals or clumps in the western section of the site, and 39 individuals or clumps in the eastern section. HLA-Envirosciences indicated that the population had declined by 90% in the western section of the site. It was acknowledged that this difference in number could be due to seasonality, with the Kinhill surveys having occurred in November/ January, and the 2006 survey occurring in September outside of the species' flowering season. Surveys of Matted Flax-lily should be conducted between November and February when flowers are present to increase plant visibility and thus detectability.

  Also, HLA-Envirosciences suggested that the Matted Flax-lily had been out-competed by highly invasive perennial weeds that were observed dominating the ground layer.

  Given that the National Recovery Plan listed a population size of 10 plants at the site, it is assumed that the Kinhill and HLA-Envirosciences reports were unavailable (or confidential and unable to be released) when the National Recovery Plan was being developed in 2010.

- GHD, May 2015, Simpson Barracks Watsonia Offset Plan.

The report was prepared for the purpose of offsetting an area of native vegetation lost through infrastructure works (not including any Matted Flax-lily).

The report identified that Matted Flax-lily was present at the site and that a monitoring program was underway.

Results

During targeted surveys conducted between October and December 2017, AECOM and GHD ecologists recorded 88 individual Matted Flax-lily plants/patches and one large patch (15 x 2m) in the project area. Of these, 84 individuals were within Simpson Barracks (including within the publically accessible section of Commonwealth Land). Within the M80 Interchange the species was observed as four plants/patches. Along the Hurstbridge Rail Line, one large patch was observed (2 x 15m). An additional 112 plants/patches were observed outside the referred project area on the eastern side of Simpson Barracks. Figure 5 shows the locations of Matted Flax-lily recorded during the most recent targeted assessment.

Most Matted Flax-lily plants/patches observed during targeted surveys were in a healthy condition (see Plate 1 to Plate 3). Plants showed evidence of recent flowering and leaf growth. Matted Flax-lily occurred in a number of different habitats including at the base of River Red Gums, on rocky escarpments or in shallow depressions. They often co-existed with other *Dianella* species within the project area, in particular *D. revoluta* s.l. (Black-anther Flax-lily) and *D. longifolia* var. *grandis* (Arching Flax-lily) (Plate 1).

Plate 1 Matted Flax-lily amongst Black-anther Flax-lily (*D. revolute* s.l.) below River Red Gum

Plate 2 Matted Flax-lily at Simpson Barracks

Plate 3 Matted Flax-lily within a shallow depression in Simpson Barracks

River Swamp Wallaby-grass

River Swamp Wallaby-grass is an aquatic perennial with 1 m long decumbent culms (aerial stems growing horizontally with tips turned up at the end) and often only the inflorescence is above water. The individual florets have a slender curved bristle and are massed into 5–12 flowered spikelets. The plant grows to 120 cm high overall. The leaf blade is 2–4.5 mm wide, rough to touch and deeply ribbed. The structure that breaks away from the flower-stalk (and contains the seed) is two-toothed, with a straight bristle arising about half way up its back (Jacobs & Lapinpuro, 1986; Walsh & Entwisle, Flora of Victoria Volume 2: Ferns and Allied Plants, Conifers and Monoctyledons, 1996). The species is stoloniforous (horizontal roots), and sometimes rhizomatic (PlantNet, 2012). River Swamp Wallaby-grass flowers from November to March and is difficult to positively identify outside this period.

Habitat

River Swamp Wallaby-grass occurs in both natural and man-made low flow water-bodies, including swamps, lagoons, billabongs and dams. Within the project area, optimal habitat for this species occurs in wetlands associated with the floodplain of the Yarra River.

Results

No River Swamp Wallaby-grass was observed during field assessments. Targeted assessments have not been completed for this species. Desktop surveys found a high likelihood of presence, with nine recent records within the five kilometre buffer of the project area with the most recent record from 2011. While there are some suitable areas of habitat such as Banyule Swamp and Bolin Bolin Billabong, these areas are outside the project area or are within no-go zones (refer to section 2.1 for comprehensive list). As such, there is a low likelihood that River Swamp Wallaby-grass is located within the project area. There may be some disturbance of groundwater due to tunnelling activities in under the Yarra River and Banyule Wetlands, which could cause dewatering and reduce water available to wetlands reliant on groundwater to some degree. While it is not anticipated that dewatering would impact the River Swamp Wallaby-grass, further groundwater investigations will occur through the EES process in 2018.

Seasonal Herbaceous Wetlands of the Temperate Lowland Plains

Seasonal Herbaceous Wetlands occur on the lowland plains of Victoria. The ecological community is limited to plains and lower slopes or stony rises at elevations below 500 metres above sea level. The soils on which the Seasonal Herbaceous Wetlands occur are generally fertile but poorly draining clays of various geologies (TSSC, 2012).

The community occurs on seasonally-filled drainage lines or depressions, sometimes poorly defined, that are variously categorised as isolated, closed or endorheic systems. Their inundation is typically seasonal. Inundation is not dependent on connections to riverine systems but is fed by local rainfall. There may be some groundwater influence that contributes to retention of the water in wetlands and persistence of wetland flora when climatic conditions are dry (TSSC, 2012).

The vegetation of is generally treeless and dominated by a herbaceous ground layer, often with a considerable graminoid component. The herbaceous species present are characteristic of wetter sites and most of them are typically absent or uncommon in any adjoining dryland grasslands and woodlands. The type of wetland vegetation present is variable, but is often strongly represented by native species that are rooted in the soil and are emergent (i.e. shoots rising well above the water level) or have leaves floating on the water surface. The dominant plants present are subject to seasonal and site conditions, and the diversity of the flora may range from relatively species-poor to species-rich composition (TSSC, 2012).

Synonymous EVCs

Table 11 presents Victorian Ecological Vegetation Classes (EVCs) most likely to correspond to the Seasonal Herbaceous Wetland community.

Table 11 Victorian EVCs most likely to correspond to Seasonal Herbaceous Wetlands

EVC number and name	Notes
125 Plains Grassy Wetland + complexes	Complexes may include EVCs 755, 767, 959, 960
306 Aquatic Grassy Wetland	
647 Plains Sedgy Wetland	

EVC number and name	Notes
678 Ephemeral Drainage-line Grassy Wetland	In gilgai systems along poorly defined drainage lines within natural temperate grassland
778 Gilgai Wetland	
920 Sweet Grass Wetland	
956 Herb-rich Gilgai Wetland	

Results

Two areas were surveyed for Seasonal Herbaceous Wetlands; Banyule Flats and the Warringal Parklands and Bolin Bolin Billabong.

Within the Banyule Flats and Warringal Parklands area exists an important remnant of relatively intact geomorphology, including the Banyule Swamp in the north-west and the Banyule Billabong, a large section of old river course, in the south-west; and various other apparently natural depressions. The Warringal Parklands has been significantly modified with the filling and levelling of the floodplain for sporting ovals, with the Warringal Swamp being retained. As wetlands in this area are primarily influenced by riverine processes and overbank flooding, they cannot support Seasonal Herbaceous Wetlands (TSSC, 2012).

Bolin Bolin Billabong is a regionally significant floodplain wetland, with largely intact riparian vegetation, but with considerable weed infestation. The greatest threat to the ecological values of the billabong appears to be the lack of hydrological connectivity with the Yarra River, resulting from increasingly rare overbank flows. Habitat hectare assessments revealed that the vegetation is primarily Floodplain Riparian Woodland of the Gippsland Plain that does not meet the Seasonal Herbaceous Wetlands criteria set out by TSSC (2012).

4.3.2 Terrestrial fauna

Through the desktop review and site investigations, the following EPBC Act-listed terrestrial fauna species were determined to have high potential to occur or are known to occur in the project area:

- Grey-headed Flying-fox *Pteropus poliocephalus*
- Swift Parrot *Lathamus discolor*
- Growling Grass Frog *Litoria raniformis*
- Latham's Snipe *Gallinago hardwickii.*

Habitat assessments were undertaken to determine the likely presence of these species and subsequently targeted surveys were completed where required. Targeted surveys were undertaken to determine the potential for the project to impact on these species. The following sections provide a description of each species and the results of the habitat assessments and targeted surveys.

Latham's Snipe is a Migratory species and is discussed in section 4.3.4.

Grey-headed Flying-fox

The Grey-headed Flying-fox uses a wide range of habitats in Victoria, from lowland rainforest and coastal Stringybark forests to agricultural land and suburban gardens. It occurs across the Melbourne area, foraging in densely vegetated flowering and fruiting trees.

According to the DELWP website[7], Grey-headed flying foxes have been coming to Melbourne for more than 100 years. Numbers have been increasing due to a loss of habitat in New South Wales and Queensland and the creation of a reliable food supply here. In 1986, a colony of Grey-headed flying foxes took up permanent residence in the Royal Botanic Gardens, Melbourne. Up to 6,000 individuals roosted in the gardens year-round, increasing to 20,000 during the breeding season. By 2002, the colony was out-growing its available habitat and was killing trees and damaging heritage-listed vegetation in the Botanic Gardens. Consequently, in 2003, a large-scale dispersal program successfully relocated the colony to Yarra Bend Park, Kew, in the vicinity of Bellbird Park. Over summer, the Yarra Bend colony can increase to more than 30,000 individuals, including young, but during winter, the population falls to around 6,000 individuals. The camp at Yarra Bend Park is identified in DoEE's interactive *National Flying-fox Monitoring Viewer* as a Nationally Important Flying-fox Camp.

The Management Plan for the Yarra Bend Flying-Fox colony (DSE, 2005) shows the Flying Fox Management Area to extend upstream from about Bellbird Park to the Eastern Freeway. This project proposes construction along the Eastern Freeway where it crosses the Yarra River near the Flying-fox camp. Given that some impacts on a nationally important camp have the potential to be considered a significant impact (DoEE, 2015), the project area has been designed to avoid the Flying-fox Management Area, designating the areas as a no-go zone. The project area abuts (north side) the Flying-fox Management Area. Avoiding activities within this management area greatly reduces the chance of the project impacting significantly on the Grey-headed Flying-fox.

Results

The northern limit of the flying-fox camp was visited on 16 November 2017 to ascertain current habitat use by roosting flying-foxes. Roosting flying-foxes were observed approximately 70 m from the Eastern Freeway (but note that, given the river's meanders, this location is approximately 400 m from the nearest freeway bridge across the river). No estimate of population size was made during the visit, but flying-foxes were observed to be roosting (and squabbling) at high densities across a large area. Numerous individuals were seen carrying dependent young. The camp was assessed as being large.

Aside from flying-foxes observed within the camp, the Grey-headed Flying-fox was observed in small numbers flying overhead during nocturnal field assessments at several locations across the alignment. The Grey-headed Flying-fox has previously been recorded more than 400 times within 5 kilometres of the alignment. The most recent VBA record dates from 2013, but the species is known to be present across the area at the time of assessment. Whilst individuals are expected to utilise the foraging resources within the project area, habitat of a similar quality and extent is present in the surrounding area. It is not expected that the Grey-headed Flying-fox will significantly utilise or rely on the habitats and resources within the project area.

[7] https://www.wildlife.vic.gov.au/our-wildlife/flying-foxes/victorias-flying-fox-colonies

Swift Parrot

The Swift Parrot is listed as Critically Endangered under the EPBC Act. It breeds in Tasmania only and forages on the mainland during the winter months. Typically, small numbers of birds fly through the Melbourne area on their northerly and southerly migrations, mostly en route to or from central or western Victoria. Birds are reported sporadically in small numbers across Melbourne (mainly in the northern and north-western suburbs) in most years, where suitable eucalypts occur and flower at appropriate times of the year.

Results

Records for Swift Parrot have been identified using two different databases. The VBA search identified a total of 57 Swift Parrot records within 5 kilometres of the project area, the most recent of which dates from 2009. From eBird, it was found that small numbers of Swift Parrots were observed in a few locations around Greensborough and Plenty (http://ebird.org/content/ebird), north-east of the northern part of the alignment in 2017.

Through desktop and field investigations, it was determined that the Swift Parrot has at least some potential to visit almost any flowering trees along the alignment occasionally, but is unlikely to use habitat along the project area to any great degree. This includes the western margin of Simpson Barracks, which largely consists of non-favoured Eucalypt species (mainly River Red-gum, *Eucalyptus camaldulensis*). During the site visit, it was found that the western margin was dominated by aggressive nectar feeders such as Noisy Miners, Red Wattlebirds and Rainbow Lorikeets which are reported to disturb or out-compete Swift Parrots. Swift Parrots may visit trees in the alignment occasionally, but the site is unlikely to comprise priority habitat. Superior habitat (dominated more by Yellow Box, *Eucalyptus melliodora*, and where a historic VBA record of Swift Parrot occurs) is present in the patch of woodland on the eastern side of the Simpson Barracks, which is not being impacted.

While Swift Parrots may forage in trees in the project area occasionally and opportunistically, there is no evidence to suggest that they rely on those trees, or use them regularly or frequently to the point that the birds would be displaced by removal of those trees.

Growling Grass Frog

The Growing Grass Frog is a member of the 'Bell Frog' species complex (Anura: Hylidae) and is distributed across a large portion of south-east Australia. In Victoria it was previously widespread and was absent only from the driest and highest parts of the state. The species has now disappeared from most of its former range. The species is found mostly amongst emergent vegetation including rushes, reeds and sedges, or in or at the edge of slow-flowing water bodies such as lagoons, swamps, lakes, ponds and farm dams. Growling Grass Frog may utilise permanent or semi-permanent waterbodies. Typical habitats include lowland grasslands, woodlands and open forests, open vegetated wetlands, flooded paddocks and drains. Persistence of the species now appears to depend on access to a matrix of connected wetlands/waterbodies/waterways, rather than one wetland alone (Heard, 2013).

Results

No Growling Grass Frogs were identified during targeted surveys. Some individuals may still use some of the waterways/waterbodies as movement corridors to enable dispersal across the landscape. The proposed works are not expected to significantly change the species' ability to do this and individuals if present are still expected to be able to disperse across the landscape. It is not expected that the Growling Grass Frog will significantly utilise or rely on the habitats/resources within the project area.

4.3.3 Aquatic ecology

Through the desktop review and initial site investigations, the following EPBC Act listed terrestrial fauna species have potential to occur or are known to occur in the project area:

- Eastern Dwarf Galaxias *Galaxiella pusilla*
- Macquarie Perch *Macquaria australasica*
- Australian Grayling *Prototroctes maraena*
- Murray Cod *Maccullochella peelii.*

Eastern Dwarf Galaxias

The Dwarf Galaxias is a tiny freshwater fish endemic to south-eastern Australia growing to a maximum of 40 mm for females and 34 mm for males. The species is classified threatened under both a Commonwealth and State level. It is listed as a Vulnerable species under the EPBC Act and a threatened taxon under Schedule 2 of the FFG Act. The species is also considered Vulnerable on the DSE Advisory List (DSE, 2013).

Results

This species is not known from the Yarra River catchment, apart from a population in wetlands near La Trobe University which is thought to be translocated. The relatively close vicinity of this site to the upstream reaches of Banyule Creek within Simpson Barracks, the absence of urbanised development in this reach and the lack of aquatic survey data from this site warrants consideration that the Eastern Dwarf Galaxias could be present. Other sites with potentially suitable habitat (e.g. Banyule swamp) have received sufficient historical fish surveys to indicate that this species is not present.

Targeted surveys at Banyule Creek found no Dwarf Galaxias. Other surveys at Koonung Creek (targeting other species) also found no Dwarf Galaxias. These results confirm that Dwarf Galaxias is unlikely to be present in waterways potentially impacted by the project.

Macquarie Perch

The Macquarie Perch is considered endangered under the EPBC Act. Macquarie Perch is a medium sized freshwater fish Native to Australia. They commonly grow to less than 350 mm in length and 1 kg in weight but have been recorded up to 465 mm in length and 3.5 kg. Macquarie Perch have a deep laterally compressed body. Body colour is generally black grey or bluish grey, with a white to silver belly. Some Individuals mottled particularly in the juvenile phase. They have large eyes with a silver iris, deep mucous cavities on the snout. The mouth is large and the jaws equal in length. The tail is rounded and the species has a single dorsal fin with long spines in the first portion (Lintermans, 2008).

Results

An important translocated population of Macquarie Perch is known in the Yarra River (DoEE, 2017). There are numerous recent historical records of Macquarie Perch from the lower Yarra River, including sites near the confluence with Merri Creek. Based on the frequency and currency of these records, it is assumed that this species is present in the Yarra River and Merri Creeks within the project area.

The presence of Macquarie Perch is known from tributaries of the lower Yarra River including Plenty River, and so it is possible this species could be present in tributaries in the project area.

Preliminary targeted surveys of Koonung Creek and Plenty River undertaken in October and November 2017 found no Macquarie Perch.

Based on the desktop and preliminary targeted survey results, there is no evidence that Macquarie Perch are present in the Plenty River within the project area, although the species is known from other sites with the Plenty River. The Plenty River within the project area does contain suitable habitat for Macquarie Perch, and sites upstream are likely to also be able to support this species, and potentially provide breeding habitat.

Based on the desktop and preliminary targeted survey results, there is currently no evidence that Macquarie Perch are present in Koonung Creek. Some aquatic habitat present in Koonung Creek, at various locations between Bulleen Road and Springvale Road may be suitable for Macquarie Perch. These deeper pools are distributed at various locations along the creek reserve, however there are some potential barriers to migration, and the general ecological condition of the waterway is considered poor. Although Koonung Creek may contain habitat that could support Macquarie Perch, it is considered marginal quality, and low likelihood to support breeding or maintain high quality habitat.

Subsequent targeted surveys in Koonung Creek and Plenty River are planned for autumn 2018 to confirm whether Macquarie Perch are potentially migrating upstream from the Yarra River during this period.

Australian Grayling

The Australian Grayling is a streamline medium-sized dark brown to olive-green fish usually growing to 17-19 cm, reaching a maximum of 30 cm. With greenish bronze sides, occasionally with a steel blue sheen, silvery gill cover, silvery white to yellowish on the lower part of the head and body, and clear to greyish or straw coloured fins, males are differentiated from females and juveniles by a bright orange stripe positioned between the middle and lower dark stripes (Allen, 1989; McDowall, 1996).

Results

An important population of Australian Grayling is known in the Yarra River (Backhouse, Jackson, & O'Conner, 2008). There are numerous recent historical records of Australian Grayling from the lower Yarra River, including sites near the confluence with Merri Creek. The removal of a barrier to fish passage downstream of the project area (i.e. Dights Falls fishway) has improved upstream fish passage for this migratory species. Based on the frequency and currency of records in the Yarra River, and known life history attributes for breeding, it is assumed that this species migrates within the Yarra River area each year.

The presence of Australian Grayling is not known from tributaries of the lower Yarra River. It is possible that the removal of barrier at Dights Falls has enabled this species to expand its distribution into tributaries in the project area. This species is considered able to recolonise rivers from which it has been excluded. Preliminary targeted surveys of Koonung Creek and Plenty River undertaken in October and November 2017 found no Australian Grayling.

Based on the desktop and preliminary targeted survey results, there is no evidence that Australian Grayling are present in the Plenty River within the project area. The Plenty River within the project area does contain suitable habitat for migration of grayling and sites upstream are likely to also be able to support this species, and potentially provide breeding habitat.

Based on the absence of historical records, the degraded conditions of aquatic habitat present and presence of potential barriers to migration, it is considered unlikely that Australian Grayling are present in Koonung Creek.

Based on the lack of Australian Grayling detected during October surveys during which upstream migration of juveniles might be expected, subsequent targeted surveys for Australian Grayling in Koonung Creek are not considered necessary. However, further targeted surveys for Australian Grayling in the Plenty River are recommended, as this waterway could feasibly provide opportunities for this species to migrate through the project area.

Murray Cod

As the Murray Cod population in the Yarra River catchment is outside the natural distribution of this species, it is not protected under EPBC Act; therefore, the project would not constitute a significant impact on this species (DoE, 2016).

4.3.4 Migratory species

Through the desktop review and site investigations, one EPBC Act-listed Migratory terrestrial fauna was determined to have high potential to occur, or is known to occur, in the project area:

- Latham's Snipe *Gallinago hardwickii.*

Latham's Snipe

Latham's Snipe is listed as Migratory under the EPBC Act. It is also listed as Near Threatened on the Advisory List of Threatened Vertebrate Fauna in Victoria (DSE, 2013). Latham's Snipe is a summer migrant/visitor to south-eastern Australia, returning each year to Japan and eastern Russia to breed during the northern summer. This species is present in southern Australia only during the warmer months (August to March).

Latham's Snipe is a highly mobile species that forages in wet and flooded grasslands that are subjected to little disturbance. Preference of habitat does not appear to be determined by the diversity of native or introduced plants, but more related to the availability of suitably damp/wet habitat, food resources and level of disturbance (particularly people on foot, and presence of dogs). The species is omnivorous and feeds predominately on seeds, plant material, and invertebrates.

Results

According to the VBA records and preliminary field assessments, the most suitable habitat for this species is associated with the Yarra River and its associated floodplain, primarily in the Banyule/Bulleen area. These areas are currently proposed to be tunnelled, so will not be impacted. Consequently, no targeted survey for this species was conducted.

Very few VBA records of Latham's Snipe occur in habitats along the proposed corridor – a handful of pre-1991 records are from the Bolin Bolin Wetland area in Bulleen, and another record from 1970 appears to be within the project area but is reported as "roughly two kilometres SW of Ivanhoe", so may contain locational error and may not actually be with the project area.

Other locations within the project area where this species may occur are typically degraded, disturbed (particularly by people walking dogs) and within urbanised areas. That, in association with the relatively few VBA records, suggests that those areas are very unlikely to support large enough numbers of birds (18 or more) to be considered important habitat. For Latham's Snipe,

if the habitat regularly supports 18 or more individuals, then it should be considered important habitat. There is no indication that any site along the alignment supports or attracts an ecologically significant proportion of the Latham's Snipe population.

5. Wetlands of importance

5.1 Wetlands of international significance (Ramsar)

The PMST report (refer to Appendix C) identified no Ramsar sites within five kilometres of the project area. The nearest Ramsar site is the Edithvale-Seaford Wetlands, which are approximately 25 kilometres south from the proposed project area.

The waterways within the project area do not flow into the Edithvale-Seaford Wetlands or any other wetlands of international significance.

5.2 Wetlands of national importance

There are no EPBC Act-listed wetlands of national importance identified in the PMST report, and none would be affected by the project.

6. Assessment of potential impacts

This section assesses the potential impacts of the Project on matters of NES and whether they would be considered significant under the Significant Impact Guidelines.

6.1 Matters of NES present or possibly occurring in the project area

The following matters of NES were identified as being present or likely to occur within the project area:

- One endangered flora species; Matted Flax-lily
- One vulnerable flora species; Clover Glycine
- One critically endangered fauna species; Swift Parrot
- Two vulnerable fauna species; Grey-headed Flying-fox, Growling Grass frog
- One endangered aquatic fauna species; Macquarie Perch
- One vulnerable aquatic fauna species; Australian Grayling
- One Migratory fauna species: Latham's Snipe

6.2 Flora and vegetation

Individual assessments for the potential for the project to result in impacts on matters of NES in relation to Matted Flax-lily and Clover Glycine are provided below.

Table 12 Assessment of project against significant impact criteria for Clover Glycine

Criterion	Response
Lead to a long-term decrease in the size of an important population of a species	**Unlikely.** Populations important to the survival of Clover Glycine have not been identified; however significant populations based on size, geographic spread and land tenure have been identified in the National Recovery Plan (Carter and Sutter 2010). None of these populations occur within the project area. Targeted surveys during the tail-end of the flowering season identified no plants within the project area; however, 18 sites have been documented on the VBA within a 5-km radius of the project area. Consequently, there remains a possibility, albeit low, that the species may occur within the project area. Given the available evidence it is unlikely that the project would lead to a long-term decrease in the size of an important population of the species.

Criterion	Response
Reduce the area of occupancy of an important population	**Unlikely.** While the project has the potential to impact habitat suitable for Clover Glycine, the species has not been recorded within the project area during targeted surveys for the species. As outlined above, it is unlikely that an important population occurs within the project area. While it is possible that the area of occupancy of the species may be reduced through clearance of the habitat that supports the species, it is unlikely to reduce the area of occupancy for an important population.
Fragment an existing important population into two or more populations	**Unlikely.** As outlined above, an important population is unlikely to be present within the project area, and consequently, fragmentation of an important population is regarded as unlikely.
Adversely affect habitat critical to the survival of a species	**Unlikely.** No habitats within the project area are identified on the Register of Critical Habitat (however, it should be noted that the Register of Critical Habitat currently does not include any listing for Clover Glycine). In addition, information regarding habitat critical to the survival of the species is not available in the National Recovery Plan for the species (Carter and Sutter 2010). Given the above, and that the species has not been recorded within the project area during targeted surveys, it is unlikely that habitat critical to the survival of the species will be adversely affected.
Disrupt the breeding cycle of an important population	**Unlikely.** As outlined above, an important population is unlikely to be present within the project area, and consequently, the breeding cycle of an important population is unlikely to be disrupted.
Modify, destroy, remove or isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline	**Unlikely.** The availability or quality of habitat would be impacted by the project, however it is unlikely that the species would decline as a result, as the species has not been recorded following targeted surveys in suitable habitat during the flowering time for this species.
Result in invasive species that are harmful to a vulnerable species becoming established in the vulnerable species' habitat	**Unlikely.** Construction methods would be implemented through the CEMP such that it is unlikely that invasive species would be introduced.
Introduce disease that may cause the species to decline	**Unlikely.** Construction methods would be implemented through the CEMP such that it is unlikely that invasive species would be introduced. This could be undertaken through vehicle hygiene methods.

Criterion	Response
Interfere substantially with the recovery of the species	**Unlikely.** Threats to the survival of Clover Glycine as identified in *the National Recovery Plan* include weed invasion/competition, inappropriate fire regimes, grazing and human disturbance (Carter and Sutter 2010). Given that the species has not been recorded following targeted surveys in suitable habitat during the flowering time for this species, the project is unlikely to interfere substantially with the recovery of the species.

Table 13 Assessment of project against significant impact criteria for Matted Flax-lily

Criterion	Response
Lead to a long-term decrease in the size of a population	**Likely.** Works would require removal of up to 88 Matted Flax-lily plants/patches and one large patch (15 x 2m) from three sites across the project area (84 plants/patches at Simpson Barracks, four at the M80 Interchange and a patch (15 x 2m) at the Hurstbridge Rail Line). It should be noted that this is the total number recorded within the project area and the actual impact on plants in significant sites (e.g. Simpson Barracks) may be reduced.
Reduce the area of occupancy of the species	**Likely.** The project is likely to result in the loss of Matted Flax-lily at three discrete sites, totalling up to 88 discrete patches/individuals separated by at least 1 m and an additional large patch (15 x 2m). While the population at three sites is proposed to be impacted, at least 67 sites have been documented on the VBA within a 5-km radius of the project area. While the project would impact the area of occupancy of the species, it would not impact upon the total range of the species. It is likely that the area of occupancy of the species would be reduced through clearance of the habitat that supports the species.
Fragment an existing population into two or more populations	**Unlikely.** While plants are expected to be removed, it is unlikely that works could cause fragmentation of existing populations at any of the three identified sites. For example, while impacts in terms of total numbers at Simpson Barracks are expected to be significant, it would not fragment this population, as plants to be removed would be from the edge of the population.

Criterion	Response
Adversely affect habitat critical to the survival of a species	**Possible.** No habitats within the project area are identified on the Register of Critical Habitat (however, it should be noted that the Register of Critical Habitat currently does not include any listing for the Matted Flax-lily). In addition, information regarding habitat critical to the survival of the species is not available in the National Recovery Plan for the species (Carter, 2010). While Simpson Barracks is listed as a significant population in the Recovery Plan (the 16th largest population listed in the Plan), the surveys associated with the NEL project have recorded 196 plants/patches at Simpson Barracks, with considerable areas of the site (outside of the referred project area) containing suitable grassy woodland habitat that are yet to be surveyed. Consequently, the total population size at the site could be over 300 individuals/patches. Habitat critical to the survival of the species has not been formally recognised.
Disrupt the breeding cycle of a population	**Unlikely.** Matted Flax-lily appears to rarely establish new seedlings in the wild (apart from colonising disturbed embankments, etc), with most populations appearing to increase in size via clonal growth. While individuals would be impacted, works are unlikely to disrupt the breeding cycle of a population.
Modify, destroy, remove or isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline	**Unlikely.** The availability or quality of habitat would be impacted by the project, however it is unlikely that the species would decline as a result, owing to the historical success of translocation as an impact mitigation measure for the species.
Result in invasive species that are harmful to a critically endangered or endangered species becoming established in the endangered or critically endangered species' habitat	**Unlikely.** Construction methods would be implemented through the CEMP such that it is unlikely that invasive species would be introduced.
Introduce disease that may cause the species to decline	**Unlikely.** Construction methods would be implemented through the CEMP such that it is unlikely that invasive species would be introduced. This could be undertaken through vehicle hygiene methods.
Interfere substantially with the recovery of the species	**Likely.** Threats to the survival of the Matted Flax-lily as identified in *the National Recovery Plan for the Matted Flax-lily Dianella amoena* include weed invasion/competition, habitat destruction and disturbance, and population fragmentation (Carter, 2010). The project has potential to reduce the amount of suitable habitat available for the species. Vegetation clearance would result in the loss of up to 88 plants/patches and one large patch (15 x 2m), which in the absence of mitigation measures, is likely to interfere with species recovery.

6.3 Terrestrial fauna

Individual assessments for the potential for the project to result in impacts on matters of NES in relation to the Swift Parrot, Grey-headed Flying-fox and Growling Grass Frog are provided below.

Table 14 Assessment of project against significant impact criteria for the Swift Parrot

Criterion	Response
Lead to a long-term decrease in the size of a population	**Unlikely.** The project is unlikely to lead to a long-term decrease in the size of the Swift Parrot population. While Swift Parrots may forage in trees along the alignment occasionally and opportunistically, there is no evidence to suggest that they rely on those trees, or use them regularly or frequently to the point that the birds would be displaced by removal of those trees.
Reduce the area of occupancy of the species	**Unlikely.** The project will not reduce the area of occupancy of the Swift Parrot. Each year, small numbers of Swift Parrots are reported sporadically across a wide area of the Melbourne metropolitan area, as the birds migrate north and south. Removal of potentially suitable trees from the alignment will not stop Swift Parrots from foraging in trees across the Melbourne area, and the parrots will continue to select trees that are suitable at the time of migration. No trees or patches of trees along the alignment appear to be regularly visited by this species, and all tree species within the area are well represented outside the alignment also.
Fragment an existing population into two or more populations	**Unlikely.** The project will not fragment the existing Swift Parrot population into two or more populations. Rationale as for criterion above (Reducing area of occupancy).
Adversely affect habitat critical to the survival of a species	**Unlikely.** The project is unlikely to adversely affect habitat critical to the survival of the Swift Parrot. No habitats within the project area are identified on the Register of Critical Habitat (note that the Register of Critical Habitat currently does not include any listing for the Swift Parrot). In terms of priority Swift Parrot habitats in Victoria, as identified by the Swift Parrot Recovery Plan (Saunders and Tzaros 2011), there is no evidence of priority habitat along the alignment. Swift Parrots may visit trees in and around the project area occasionally and opportunistically, but the alignment does not appear to offer Swift Parrots a particular foraging resource that is not also present and widely available in the suburbs surrounding the sites.
Disrupt the breeding cycle of a population	**Unlikely.** The project will not disrupt the breeding cycle of the Swift Parrot population. The species breeds entirely in Tasmania, and only uses trees in Victoria for foraging during the non-breeding season.

Criterion	Response
Modify, destroy, remove, isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline	**Unlikely.** The project is unlikely to modify, destroy, remove, isolate or decrease the availability or quality of habitat to the extent that the Swift Parrot is likely to decline. Swift Parrots may visit trees in and around the alignment to forage, but their use of those trees appears to be very occasional and opportunistic. Given the relatively wide range of eucalypt species that Swift Parrots are known to visit in Victoria, and the relative commonness of those trees in areas surrounding the alignment, impacts on trees in the project area is not expected to result in any change to the numbers of Swift Parrot.
Result in invasive species that are harmful to a critically endangered species becoming established in the critically endangered species' habitat	**Unlikely.** The project is unlikely to result in invasive species that are harmful to the Swift Parrot becoming established in the Swift Parrot's habitat. Known species that are potentially harmful or detrimental to the Swift Parrot (e.g., aggressive bird species such as the Noisy Miner and Rainbow lorikeet, which may harass or out-compete foraging Swift Parrots) are present along the alignment already.
Introduce disease that may cause the species to decline	**Unlikely.** The project is unlikely to introduce disease that may cause the Swift Parrot to decline.
Interfere substantially with the recovery of the species	**Unlikely.** The project is unlikely to impact on the Swift Parrot, so is unlikely to interfere with the recovery of the species. Threats to the species recovery as identified in the *National Recovery Plan for the Swift Parrot Lathamus discolour* include habitat loss, alternation and fragmentation, climate change, collision mortality, disease, invasion/ competition from other species and predation from cats *Felis catus* (Saunders & Tzaros, 2011). Habitat within the project area is only likely to be utilised by the species for foraging occasionally and opportunistically. There is no evidence to suggest that they rely on those trees, or use them regularly or frequently. The project would increase traffic volumes in some areas, however theses are already areas of high traffic. Traffic would not be introduced into regional areas or areas of low traffic volumes. It is therefore unlikely that the project would increase collision mortality. The project is therefore unlikely to interfere with the recovery of the species.

Table 15 Assessment of project against significant impact criteria for Grey-headed Flying-fox

Criterion	Response
Lead to a long-term decrease in the size of an important population of a species	**Unlikely.** The Grey-headed Flying-fox is considered to occur in one continuous population across south-east Australia, which must be considered an important population. A Nationally Important Flying-fox Camp is present at Yarra Bend, Fairfield. Works along the Eastern Freeway in the vicinity of the camp are expected to be restricted to the existing road and avoid the camp and flying-fox management area. This section of the Eastern Freeway is already very noisy and well-lit and construction is not expected to result in markedly increased noise or light levels that would disturb the camp. The project is not expected to decrease the size of this colony.
Reduce the area of occupancy of an important population	**Unlikely.** The Grey-headed Flying-fox is considered to occur in one continuous population across south-east Australia. This species forages widely across a broad area and its area of occupancy is unlikely to change with changes to the vegetation present along the proposed alignment. Works along the Eastern Freeway in the vicinity of the Nationally Important Flying-fox Camp are expected to be restricted to the existing road and the camp itself is not expected to be impacted. A decrease in the area of occupancy of this important population is not expected.
Fragment an existing important population into two or more populations	**Unlikely.** The Grey-headed Flying-fox is considered to occur in one continuous population across south-east Australia. The proposed project is not expected to result in the fragmentation of the population. The alignment for the most part follows existing roads and this species is fully capable of crossing large roads including the existing Eastern Freeway.
Adversely affect habitat critical to the survival of a species	**Unlikely.** Habitat critical to the survival of this species is present within the Yarra Bend flying-fox Camp. However this area is a no-go zone for the project, and the vegetation will not be impacted. No habitats within the project area are identified on the Register of Critical Habitat (note that the Register of Critical Habitat currently does not include any listing for the Grey-headed Flying-fox).

Criterion	Response
Disrupt the breeding cycle of an important population	**Unlikely.** The Grey-headed Flying-fox is considered to occur in one continuous population across south-east Australia. This species has a large breeding colony at Yarra Bend, Fairfield. Proposed works along the Eastern Freeway in the vicinity of the camp will be restricted to the existing road reserve, and the camp itself and the Flying-fox Management Area (DSE 2005) is not expected to be impacted. A disruption to the breeding cycle at the camp is not expected.
Modify, destroy, remove or isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline	**Unlikely.** This species forages widely across the Melbourne suburbs. The project is expected to result in the loss of small amounts of foraging resources (flowering/fruiting trees and shrubs). However, vegetation of similar quality is present in the surrounding area and the decrease in available foraging resources is expected to have a negligible impact on the species and not result in the species' decline.
Result in invasive species that are harmful to a vulnerable species becoming established in the vulnerable species' habitat	**Unlikely.** The project is not expected to result in the introduction of invasive species that would be harmful to the Grey-headed Flying-fox. A CEMP would be implemented to minimise likelihood of the introduction and establishment of invasive species.
Introduce disease that may cause the species to decline	**Unlikely.** The project is not expected to result in the introduction of disease that causing decline in this species.
Interfere substantially with the recovery of the species	**Unlikely.** The Draft National Recovery Plan for the Grey-headed Flying-fox (*Pteropus poliocephalus*) was released in 2017. Loss of foraging habitat has been identified as the primary threat to the species. Small areas of foraging habitat are expected to be impacted as a result of the project. However, similar quality habitat is abundant in the surrounding areas and the proposed vegetation losses are not expected to interfere with the recovery of the species (DoEE, 2017). Other threats identified include camp disturbance, mortality in commercial fruit crops, heat stress, electrocution on power lines, climate change and disease. These threats are unlikely to be exacerbated by the project. According to historical reports of colony size, the Grey-headed Flying-fox population in Melbourne appears to be growing rather than declining (DSE 2005). Avoiding impacts on the roosting/breeding camp will ensure that the project will not interfere with the species' recovery.

Table 16 Assessment of project against significant impact criteria for Growling Grass Frog

Criterion	Response
Lead to a long-term decrease in the size of an important population of a species	**Unlikely**. No individuals were detected during targeted surveys. Important populations are not expected to occur within the project area.
Reduce the area of occupancy of an important population	**Unlikely**. No individuals were detected during targeted surveys. Important populations are not expected to occur within the project area.
Fragment an existing important population into two or more populations	**Unlikely**. No individuals were detected during targeted surveys. No populations were observed. An important population is not expected to be fragmented.
Adversely affect habitat critical to the survival of a species	**Unlikely**. No habitat that is expected to be critical to the survival of the species was observed during habitat assessments. No populations or individuals of the species were detected within the project area. No habitats within the project area are identified on the Register of Critical Habitat (note that the Register of Critical Habitat currently does not include any listing for the Growling Grass Frog).
Disrupt the breeding cycle of an important population	**Unlikely**. No individuals were detected during targeted surveys. Important populations are not expected to occur within the project area.
Modify, destroy, remove or isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline	**Unlikely.** Potentially suitable habitat within the project area is minimal. No populations or individuals were detected during targeted surveys. The project is not expected to result in species' decline.
Result in invasive species that are harmful to a vulnerable species becoming established in the vulnerable species' habitat	**Unlikely.** Most of the waterways in the project area already support invasive fish species. The project is not expected to result in the spread or increase in invasive fish species within the project area. The project is unlikely to result in other invasive species that are harmful to the Growling Grass Frog becoming established in the frog's habitat. Known terrestrial species that are potentially harmful or detrimental to the frog (e.g., Red Fox) are present along the alignment already.
Introduce disease that may cause the species to decline	**Unlikely.** No individuals or populations were detected within the project area. Regardless, appropriate mitigation will be employed to minimise the risk of project works introducing or spreading Chytrid Fungus within the project area.
Interfere substantially with the recovery of the species	**Unlikely**. The project is not expected to interfere with the recovery of the species. There is a low likelihood that the species is present in small numbers within

Criterion	Response
	the project area and proposed impacts would not hinder movement/dispersal of the species across the landscape, if present. As identified in the *National Recovery Plan for the Southern Bell Frog Litoria raniformis,* primary threats facing the species include loss and degradation of habitat, barriers to movement, disease, predation, biocides and ultra-violet B radiation. It is not anticipated that the project will exacerbate these threats and substantially interfere with the recovery of the species.

6.4 Aquatic ecology

Individual assessments for the potential for the project to result in impacts on matters of NES in relation to the Macquarie Perch and Australian Grayling are provided below.

Table 17 Assessment of project against significant impact criteria for Macquarie Perch

Criterion	Response
Lead to a long-term decrease in the size of a population	**Unlikely.** It is unlikely that the important population in the Yarra River will be impacted by the project as the project area is close to the most downstream extent of the population distribution. There is potential that the project may result in some drawdown of groundwater, which could impact the Yarra River, however this is not anticipated to lead to a long-term decrease in the size of the Macquarie Perch population.
Reduce the area of occupancy of an important population	**Unlikely.** The project is not expected to impact the area available for this species. There is potential that the project may result in some drawdown of groundwater, which could impact the Yarra River, however this is not anticipated to reduce the area of occupancy for the Macquarie Perch.
Fragment an existing important population into two or more populations	**Unlikely.** The project area is close to the most downstream extent of the isolated population in the Yarra River. Any impacts are not expected to fragment this population.
Adversely affect habitat critical to the survival of a species	**Unlikely.** It is unlikely that the species relies on waterways in this location. There is potential that the project may result in some drawdown of groundwater, which could impact the Yarra River, however this is not anticipated to adversely affect the habitat of the Macquarie Perch.

Criterion	Response
Disrupt the breeding cycle of an important population	**Unlikely.** The spawning of this species is unlikely to occur in this location, and the project is not expected to affect cues for spawning. The potential for groundwater levels to decrease is unlikely to disrupt the breeding cycle of the population of Macquarie Perch.
Modify, destroy, remove or isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline	**Unlikely.** It is unlikely that the project will impact availability or quality of habitat that would impact the Yarra population of this species.
Result in invasive species that are harmful to a vulnerable species becoming established in the vulnerable species' habitat	**Unlikely.** The project is unlikely to result in invasive species.
Introduce disease that may cause the species to decline	**Unlikely.** It is unlikely that the project will result in new disease introduction.
Interfere substantially with the recovery of the species	**Unlikely.** It is unlikely that recovery of the species is reliant on aquatic habitat in this location.

Table 18 Assessment of project against significant impact criteria for Australian Grayling

Criterion	Response
Lead to a long-term decrease in the size of an important population of a species	**Unlikely.** It is unlikely that the important population in the Yarra River will be impacted as the project is not likely to impact conditions in the Yarra River that will affect migration. There is potential that the project may result in some drawdown of groundwater, which could impact the Yarra River, however this is not anticipated to lead to a long-term decrease in the size of the Australian Grayling population.
Reduce the area of occupancy of an important population	**Unlikely.** The project is not expected to impact the area available for this species. There is potential that the project may result in some drawdown of groundwater, which could impact the Yarra River, however this is not anticipated to reduce the area of occupancy for the Australian Grayling.

Criterion	Response
Fragment an existing important population into two or more populations	**Unlikely.** The Yarra River population is likely to remain connected to adjacent populations during marine phase of the lifecycle. As no impacts to upstream or downstream migration are expected, any impacts are not expected to fragment this population. While there is potential that changes in the groundwater level may impact the Yarra River, this is not anticipated to fragment the population.
Adversely affect habitat critical to the survival of a species	**Unlikely.** It is unlikely that the project will affect fish passage, which is the primary habitat attribute the species relies on waterways in this location. There is potential that changes in the groundwater level during construction may impact the Yarra River, however this is not anticipated to affect habitat critical to the survival of the species.
Disrupt the breeding cycle of an important population	**Unlikely.** It is unlikely that the project will affect fish passage, which is critical for breeding in this diadromous species. The spawning of this species is unlikely to occur in this location, and the project is not expected to affect cues for spawning.
Modify, destroy, remove or isolate or decrease the availability or quality of habitat to the extent that the species is likely to decline	**Unlikely.** It is unlikely that the project will impact availability or quality of habitat that would impact the Yarra population of this species. The potential for groundwater changes is not anticipated to impact eh availability of habitat.
Result in invasive species that are harmful to a vulnerable species becoming established in the vulnerable species' habitat	**Unlikely.** The project is unlikely to result in invasive species.
Introduce disease that may cause the species to decline	**Unlikely.** It is unlikely that the project will result in new disease introduction.
Interfere substantially with the recovery of the species	**Unlikely.** It is unlikely that the project will introduce or increase threatening processes listed for this species in this location.

6.5 Migratory species

Assessment of the potential for the project to result in impacts on matters of NES in relation to the Latham's Snipe is provided below.

Table 19 Assessment of project against significant impact criteria for Latham's Snipe

Criterion	Response
Substantially modify (including by fragmenting, altering fire regimes, altering nutrient cycles or altering hydrological cycles), destroy or isolate an area of important habitat for a migratory species	**Unlikely.** The history of VBA records and the general degradation and disturbance of the potential snipe sites within the project area suggest that the impacted sites are unlikely to constitute *important habitat* for this species. The most suitable habitat for Latham's snipe occurs in the vicinity of the Yarra River and associated floodplain in the Banyule/Bulleen area. This area is being tunnelled, so would not be impacted.
Result in an invasive species that is harmful to the migratory species becoming established in an area of important habitat for the migratory species	**Unlikely.** The project is unlikely to result in the introduction of a novel invasive species. Known terrestrial species that are potentially harmful or detrimental to Latham's Snipe (e.g., Cat, Red Fox) are present along the alignment already. Impacted areas are unlikely to constitute *important habitat* for this species
Seriously disrupt the lifecycle (breeding, feeding, migration or resting behaviour) of an ecologically significant proportion of the population of a migratory species.	**Unlikely.** Very few VBA records of Latham's Snipe occur in habitats along the proposed corridor – a handful of pre-1991 records are from the Bolin Bolin Wetland area in Bulleen, and another record from 1970 appears to be within the project area but is reported as "roughly 2 km SW of Ivanhoe", so may contain locational error and may not actually be with the project area. There is no indication that any site along the alignment supports or attracts an ecologically significant proportion of the Latham's Snipe population. Latham's Snipe does not breed in Australia, so the project will not disrupt the breeding cycle.

6.6 Indirect impacts

Where specific threats exist to certain species that may be introduced or increased with the project, they have been addressed in the table above. The project may also result in other activities that have the potential to result in indirect impacts on species as discussed here.

There may be increases in noise and light associated with construction activities, operation of the portals and changes in traffic volumes during operation. Some fauna species can experience behavioural changes due to increases in noise and light, however as this area is highly urbanised and the project would be located in proximity to existing major transport corridors, there are not anticipated to be significant impacts to species due to noise or lighting changes.

Tunnelling and construction activities would cause vibration, which has the potential to impact some fauna species. Given no matters of NES have been identified above the tunnel alignment, this is not expected to cause a significant impact to threatened fauna species.

The project is anticipated to increase traffic volumes in some areas, however this would not cause greater mortality to fauna associated with collisions with vehicles as works are mainly located within or abutting highly disturbed major transport corridors, and sections of the project would be located in tunnels and trenches where collisions would be less likely to occur.

During construction and operation there may be changes to air quality associated with construction works, tunnel portals and changes in traffic volumes, however these would be managed according to relevant standards and is not anticipated to significantly impact EPBC Act-listed species.

The proposed elevated structures will cause shading which has the potential to impact threatened flora species such as the Matted Flax-lily. To address this impact the project area has been set wider than the design which should account for the impacts of shading. Additionally, shade studies will be undertaken through the EES process and Matted Flax-lily potentially impacted would be offset and translocated.

7. Mitigation

Where the project has the potential to impacts matters of NES, specific mitigation measures have been recommended. General project wide mitigation measures have also been determined to minimise potential impacts on the environment.

7.1 Matted Flax-lily

As the action is considered likely to cause significant impact to the Matted Flax-lily, translocation of plants and offsetting are proposed as mitigation measures. A draft translocation strategy has been developed (refer to Attachment F – Draft translocation plan), which will continue to be refined in close consultation with DoEE and DELWP and be approved prior to the commencement of works. The methodology for developing the translocation strategy and offset requirements is discussed in the following sections.

DoEE (2016) state 'The rhizomatous nature of Matted Flax-lilies allows plants to be translocated. Translocation has occurred at a number of sites'. Translocation plans/strategies are factored into the approval decisions under Section 133 of the EPBC Act to address any residual impacts to matters of NES (DSEWPaC, 2013). Given that translocation measures are recognised to reduce residual impacts, this can lead to a reduction in required offsets. All offsets for residual impacts to this matter of NES will be assessed under the EPBC Act offsets policy (DSEWPaC, 2012).

7.1.1 Application of Commonwealth outcomes-based policy

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

With this in mind, the environmental outcomes have been proposed that specifically relate to Matted Flax-lily, as well as management and monitoring measures to achieve these outcomes. The proposed outcome, management measures, and monitoring objectives for Matted Flax-lily, which are detailed in this document, are summarised in Table 20.

Table 20 Proposed outcomes for Matted Flax-lily

Outcome	Management measures	Monitoring
No net loss to the extent and distribution of Matted Flax-lily as a result of the project	Matted Flax-lily plants would be directly impacted by the project (with approximately 88 individuals and one large patch identified as potentially requiring translocation in the most recent surveys by the project team)	Not applicable

Outcome	Management measures	Monitoring
	Matted Flax-lily to be impacted would be translocated to a suitable recipient site in accordance with an approved Matted Flax-lily Translocation Plan	Condition of translocated plants would be monitored prior to, during and immediately post translocation in accordance with a Matted Flax-lily Translocation Plan
	Recipient sites would be monitored in accordance with a Matted Flax-lily Translocation Plan	Condition of translocated plants would be monitored for at least five years in accordance with a Matted Flax-lily Translocation Plan
	Remaining Matted Flax-lilies would be managed during construction, including fencing of 'no go' areas, appropriate sediment controls and training of project personnel. Fencing of 'no go' areas would occur prior to construction commencing	Condition of remnant plants would be monitored monthly throughout construction. Following construction a portion of the population would be monitored as a control population to compare condition against translocated individuals

7.1.2 Commonwealth and State offsets

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

7.1.3 Permits and approvals

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

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

7.1.4 Responsibilities

Responsibilities of each party involved in the Matted Flax-lily salvage and translocation is summarised in Table 21.

Table 21 Translocation program responsibilities

Activity	Responsibility	Monitoring and reporting
Plant Salvage and nursery management		
Pre-clearance Survey	NELA	NELA
Nursery selection	NELA	NELA

Activity	Responsibility	Monitoring and reporting
Plant salvage	Contractor	NELA
Nursery management until translocation completed	Contractor	NELA
Nursery management of “insurance” plants (after translocation)	Contractor until practical completion NELA from practical completion to year 5*	NELA
Recipient site management		
Site preparation	To be determined following selection of site(s)	NELA
Planting	To be determined following selection of site(s)	NELA
Management: Years 1 to 5	To be determined following selection of site(s)	NELA

** NELA will engage a suitably qualified contractor*

7.1.5 Translocation recipient site

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

7.2 Swift Parrot

Impacts on the Swift Parrot as a result of this project are expected to be immeasurably small. General project-wide mitigation measures (i.e., minimising the project footprint and the loss of trees and other vegetation) are expected to keep the risk of impacts minimal, and no additional species-specific mitigation measures are proposed.

7.3 Grey-headed Flying-fox

Impacts on the Grey-headed Flying-fox as a result of this project are expected to be minimal. Keeping the project area outside the Flying-fox Management Area in the vicinity of the

Nationally Important Camp is key to this. General project-wide mitigation measures (i.e., minimising the project footprint and the loss of trees and other vegetation) are expected to keep the risk of impacts low.

One additional species-specific mitigation measure is proposed:

- Avoid construction work at night in the vicinity of the Yarra River where it is crossed by the Eastern Freeway (for 300 metres east and 800 metres west of the Yarra River crossing; 1100 metres total).

7.4 Growling Grass Frog

Impacts on the Growling Grass Frog as a result of this project are expected to be immeasurably small – the species was not detected within the project area and may not be present. General project-wide mitigation measures (i.e., minimising the project footprint and the loss of wetland vegetation) are expected to keep the risk of impacts minimal.

Additional species-specific mitigation measures proposed are:

- Implement all mitigation measures proposed for Australian Grayling and Macquarie Perch along waterways (section 7.5).
- Implement strict hygiene procedures to avoid introducing or spreading the Amphibian Chytrid Fungus (Batrachochytrium dendrobatidis). As far as possible, protocols will follow the guidelines proposed in (Murray, 2011). Measures will include cleaning and drying (for >3 hrs) equipment/vehicles (e.g., excavators) operating in a waterway/waterbody before they move on to other waterbodies, not transporting mud or wetland flora or fauna from one waterway/waterbody to another (including on tyres, footwear).
- Avoid all handling of all frogs.

7.5 Macquarie Perch and Australian Grayling

The project is likely to impact waterways that are known or likely to contain Macquarie Perch and Australian Grayling. To avoid and minimise impact to this species, the following mitigation measures will be implemented.

- Minimise the potential for habitat degradation through processes such as sedimentation and destruction and/or removal of woody or rock habitats.
- Avoid the construction of structures that impede fish movement. Coffer dams or similar, if used during construction, should maintain adequate hydraulic connectivity to allow fish passage. Excessive turbulence can also act as a barrier to fish passage.
- Avoid and prevent chemical water pollution into waterways. This includes preventing spills and runoff in construction from entering the stormwater drainage system. This also includes managing stormwater from the constructed pavement surface to reduce the input of contaminated road runoff from entering the waterways. These may require engineered water treatment.
- Adoption of suitable hygiene protocols to protect populations of threatened native fish from outbreaks of disease. These include viral and parasitic pathogens that can be introduced by contaminated equipment.

- Ensure changes to waterway alignment or geomorphology do not result in degradation to habitat quality. The reinstatement or construction of artificial habitat may be suitable if good quality habitat for threatened native fish is impacted.
- Minimise works in waterways known or likely to contain threatened native fish during critical fish breeding or migration periods. For Australian Grayling and Macquarie Perch, this is particularly the upstream migration period, typically during spring. Given the relatively short lifespan and breeding period of Australian Grayling, impacts over consecutive years should be prevented to avoid potential for catastrophic breeding failure.

These mitigation actions are consistent with the National Recovery plans for Macquarie Perch (DoE 2016) and Australian Grayling (Backhouse, Jackson, & O'Conner, 2008).

7.6 Latham's Snipe

Impacts on Latham's Snipe as a result of this project are expected to be immeasurably small. General project-wide mitigation measures (i.e., minimising the project footprint and the loss of trees and other vegetation) are expected to keep the risk of impacts minimal, and no additional species-specific mitigation measures are proposed.

7.7 Project-wide mitigation measures

Works would be undertaken within the context of the Victorian planning approvals regime, which would typically require the development and implementation of an Environmental Management Framework (EMF). The EMF for this project would include environmental management measures such as:

- Minimising the project footprint to minimise adverse impacts on biodiversity such as minimising the removal of native vegetation and offsetting any adverse impact on native vegetation that does occur, in accordance with the 'no net loss' objective of Guidelines for the removal, destruction or lopping of native vegetation (DELWP, 2017)
- Implementation of appropriate sediment and erosion control measures in accordance with the State Environment Protection Policy (Waters of Victoria) (SEPP WoV) (Vic. Gov. 2004) and EPA Victoria's Best Practise Environmental Management Guidelines for Major Construction Sites (1996) (EPA Publication 480)
- Implementation of standard construction techniques to prevent the spread of weeds or introduction of new weeds in compliance with the Victorian Catchment and Land Protection Act 1994 and best practice guidelines such as EPA Victoria's Best Practice Environmental Management Guidelines for Major Construction Sites (1996) (EPA Victoria Publication 480) and A Guide For Machinery Hygiene For Civil Construction (Civil Contractors Federation 2011)
- Prevention of pollution of air, water, soil and groundwater under the requirements set by the Victorian Environment Protection Act 1970, including State Environment Protection Policy (Air Quality Management) (Vic. Gov. 2001a), State Environment Protection Policy (Waters of Victoria) (SEPP WoV) (Vic. Gov. 2004), State Environment Protection Policy (Prevention and Management of Contamination of Land) (Vic. Gov. 2013) and State Environment Protection Policy (Groundwaters of Victoria) (Vic. Gov. 2002)
- Management of acid sulfate soils in accordance with the Victorian Best Practice Guidelines for Assessing and Managing Coastal Acid Sulfate Soils (DSE 2010) and EPA Victoria's Industrial Waste Resource Guidelines (2009)

- Maintenance of waterway flow regimes and existing levels of flood protection in accordance with requirements under the Water Act 1989
- Control of construction noise levels in compliance with EPA Victoria's Best Practice Environmental Management Guidelines for Major Construction Sites (1996) (EPA Victoria Publication 480) and the information contained in State Environment Protection Policy (Control of Noise from Commerce, Industry and Trade) No. N–1 (Vic. Gov. 2001b)
- Management of Aboriginal cultural heritage and historic heritage assets as required by the Aboriginal Heritage Act 2006 and Heritage Act 2017.

8. Conclusions

The project is unlikely to impact any Wetlands of international significance due to geographic separation from the project area.

Based on the desktop review, field assessments and targeted surveys, it is concluded that the project would have a significant impact on one matter of NES – the Matted Flax-lily. A summary of key reasons for this conclusion are as follows.

Table 22 Summary of impacts on ecological matters of NES

Species	Potential impact
Clover Glycine	While suitable habitat is present, targeted surveys have failed to locate the species within the project area. Species unlikely to occur within the project area.
Matted Flax-lily	The Ecological Assessment prepared for the project concluded that the Project would likely have a significant impact on Matted Flax-lily based on its potential to lead to a long-term decrease in the size of a population, reduce the area of occupancy of the species and adversely affect habitat critical to the survival of a species. Therefore, the project is being referred to the Commonwealth Minister for the Environment for consideration under the EPBC Act.
River Swamp Wallaby-grass	Suitable habitat for this species is only present within no-go zones and as such would not be impacted by the project.
Seasonal Herbaceous Wetlands of the Temperate Lowland Plains	Field assessments determined that the community is not present within the project area. No impact to this community is anticipated due to the project.
Swift Parrot	The Swift Parrot has the potential to visit almost any flowering trees along the alignment occasionally and in small numbers, but is unlikely to use habitat along the alignment to any great degree. The project is not expected to impact significantly on this species.
Grey-headed Flying-fox	The Grey-headed Flying-fox is known within the project area. It is expected to utilise resources across the project area for foraging and a camp is present at Yarra Bend in the vicinity of the Eastern Freeway. Whilst individuals utilise foraging resources (trees and shrubs) within the project area, habitat of a similar quality and extent is present in the surrounding area. It is not expected that the Grey-headed Flying-fox will significantly utilise or rely on the habitats/resources within the project area. The project area does not enter the Flying-fox Management Area associated with the camp, and the camp is not expected to be impacted. Works along the Eastern Freeway in the vicinity of the camp are expected to be restricted to the existing road reserve. This section of the Eastern Freeway is already very noisy and well-lit and construction is not expected to result in drastically increased noise or light levels that would disturb the camp.

Species	Potential impact
Growling Grass Frog	No Growling Grass Frogs were detected during targeted surveys. However, some individuals may still use some of the waterways/waterbodies as movement corridors or “stepping stones” to enable dispersal across the landscape. The proposed works are not expected to significantly change the species’ ability to do this and individuals, if present, are still expected to be able to disperse across the landscape. It is not expected that the Growling Grass Frog will significantly utilise or rely on the habitats/resources within the project area. A significant impact to this species is considered unlikely.
Latham’s Snipe	Latham’s Snipe may visit wet grassy locations (including waterways) in small numbers at any time, but is unlikely to use habitat along the alignment to any great degree. The most suitable habitats where Latham’s Snipe would be expected to occur are in the vicinity of the Yarra River in the Banyule/Bulleen area, which is being tunnelled. The project is not expected to impact significantly on this species.
Eastern Dwarf Galaxias	Species not expected to occur within the project area.
Murray Cod	The population known from the Yarra River system is outside the natural distribution of this species, and is therefore not protected species under EPBC Act.
Macquarie Perch	Macquarie Perch is known from the Yarra River and Plenty River, near the project site, The mitigation measures required to avoid impact to this species are consistent with standard practice for works in and around waterways. The works are expected to avoid activities that would affect the population in a significant way. The project is unlikely to impact this species.
Australian Grayling	The population of Australian Grayling in the Yarra River is listed as an important population, and the annual migration route for this species between marine and freshwater includes waterway potentially impacted by the project. The mitigation measures required to avoid impact to this species are consistent with standard practice for works in and around waterways. The works are expected to avoid activities that would affect the population in a significant way. The project is unlikely to impact this species.

Due to the potential impacts on Matted Flax-lily, it is concluded that the proposed action would be considered a ‘controlled action’.

9. References

(n.d.). State of Victoria Department of Sustainability and Environment.

Allen, G. R. (1989). *Freshwater Fisheries of Australia.* Brookvale, NSW: T.F.H Publications.

Backhouse, G., Jackson, J., & O'Conner, J. (2008). *National Recovery Plan for the Australian Grayling Prototroctes maraena.* East Melbourne: Department of Sustainability and Environment.

Barker, J., Grigg, G. C., & Tyler, M. J. (1995). *A field guide to Australian Frogs.* Surrey Beatty.

Carr, G. W., & Horsfall, P. H. (1995). Studies in Phormiaceae (Liliaceae) 1: New Species and Combinations in Dianella Lam. ex Juss. *Muelleria, 8*(3), 365-378.

Carter, O. (2010). *National Recovery Plan for the Matted Flax-lily Dianella amoena.* East Melbourne: Department of Sustainability and Environment.

Carter, O., & Sutter, G. (2010). National Recovery Plan for the Clover Glycine. Melbourne: Victorian Government Department of Sustainability and Environment.

DELWP. (2017). *Guidelines for the removal, destruction or lopping of native vegetation.* Melbourne: The State of Victoria Department of Environment, Land, Water and Planning.

Department of the Environment. (2017, Dec 11). *Galaxiella pusilla in Species Profile and Threats Database.* Retrieved from http://www.environment.gov.au/cgi-bin/sprat/public/publicspecies.pl?taxon_id=56790

DEPI. (2013). *Permitted clearing of native vegetation - Biodiversity assessment guidelines.* Melbourne: The State of Victoria Department of Environment and Primary Industries .

DEPI. (2014). *Advisory List of Rare or Threatened Plants In Victoria.* East Melbourne: The State of Victoria Department of Environment and Primary Industries.

DEWHA. (2008). Significant Impact Guidelines for the vulnerable growling grass frog (Litoria raniformis). Canberra: Department of the Environment, Water, Heritage and theArts.

DoE. (2013). Matters of National Environmental Significance - Significant impact guidelines 1.1. Canberra: Commonwealth of Australia.

DoE. (2016). *EPBC Act referral Guidelines for the vulnerable Murray cod (Maccullochella peeli).* Commonwealth of Australia. Retrieved 2017

DoEE. (2015). Referral guideline for management actions in Grey-headed and Spectacled flying-fox camps, Department of the Environment, Canberra. Retrieved from http://www.environment.gov.au/biodiversity/threatened/publications/referral-guideline-management-

DoEE. (2016). *Dianella amoena — Matted Flax-lily*. Retrieved 2017, from http://www.environment.gov.au/cgi-bin/sprat/public/publicspecies.pl?taxon_id=64886

DoEE. (2017). Draft Recovery Plan for the Grey-headed Flying-fox Pteropus poliocephalus. Canberra: Commonwealth of Australia.

DoEE. (2017). *Macquaria australasica — Macquarie Perch*. Retrieved 2017, from http://www.environment.gov.au/cgi-bin/sprat/public/publicspecies.pl?taxon_id=66632

DSE. (2005). Melbourne: Flying-Fox Campsite Management Plan - Yarra Bend Park. Department of Sustainability and Environment. Retrieved from https://www.wildlife.vic.gov.au/__data/assets/pdf_file/0031/27679/Flying_Fox_Management_Plan.pdf

DSE. (2005). *Flying-fox Campsite Management Plan Yarra Bend Park.* State of Victoria.

DSE. (2007). *Advisory List of Threatened Vertebrate Fauna in Victoria.* East Melbourne: Department of Sustainability and Environment.

DSE. (2010). *Biodiversity Precinct Structure Planning Kit.* Melbourne: Department of Sustainability and Environment.

DSE. (2013). East Melbourne: Advisory List of Threatened Vertebrate Fauna in Victoria. Department of Sustainability and Environment.

DSEWPaC. (2012). *Environment Protection and Biodiversity Act 1999 Environmental Offsets Policy*. Retrieved 2017, from http://www.environment.gov.au/system/files/resources/12630bb4-2c10-4c8e-815f-2d7862bf87e7/files/offsets-policy_2.pdf

DSEWPaC. (2013). *Environment Protection and Biodiversity Conservation Act 1999 (Cth) Policy Statement: Translocation of Listed Threatened Species – Assessment under Chapter 4 of the EPBC Act*. Retrieved 2017, from https://www.environment.gov.au/resource/epbc-act-policy-statement-translocation-listed-threatened-species-assessment-under-chapter

Eby, P., & Lunney, D. (2002). Managing the Grey-headed Flying-fox as a threatened species in NSW. In *Proceedings of the Royal Zoological Society of New South Wales.* Mosman, Sydney: Royal Zoological Society of New South Wales.

Gray, M., & Knight, J. (Eds.). (2001). *Flora of Melbourne: A Guide to the Indigenous Plants of the Greater Melbourne Area.* Flemington, Victoria: Hyland House.

Hall, L. (2002). Management of flying fox camps: what have we learnt in the last twenty five years. In P. Eby, & D. Lunney (Eds.), *Managing the Grey-headed Flying-fox as a Threatened Species in NSW* (pp. 215-224). Mosman: Royal Zoological Society of NSW.

Heard, e. a. (2013). A Bayesian model of metapopulation viability, with application to an endangered amphibian. . *Diversity and Distributions, 19*, 555-566.

Jacobs, S., & Lapinpuro, L. (1986). The Australian Species of Amphibromus (Poaceae). *Telopea*(6), 715-729.

Lintermans, M. (2008). The Status of Macquarie perch Macquaria australasica in the Mongarlowe River in 2007 and 2008. Canberra: Consultants report to the Friends of the Mongarlowe River Inc.
McDowall, R. (1996). *Freshwater Fishes of South-eastern Australia.* Sydney: Reed Pty Ltd.
Murray, K. L. (2011). *Hygiene protocols for the control of diseases in Australian frogs. A report for the Australian Government Department of Sustainability, Environment, Water, Population and Communities.* Retrieved from .
NSW DECCW. (2009). *Draft National Recovery Plan for the Grey-headed Flying-fox Pteropus poliocephalus*. Retrieved from http://www.environment.nsw.gov.au/resources/threatenedspecies/08214dnrpflyingfox.pdf
Pallin, N. (2000). Ku-ring-gai Flying-fox Reserve: habitat restoration project, 15 years on. *Ecological Management and Restoration*(1), 10-20.
PlantNet. (2012). *The Plant Information Network System*. Retrieved Oct 30, 2017, from http://plantnet.rbgsyd.nsw.gov.au
Practical Ecology . (2017). *Warringal Parklands and Banyule Flats Ecological and Conservation Values Assessment* . City of Banyule.
Saunders, D., & Tzaros, C. (2011). *National Recovery Plan for the Swift Parrot Lathamus discolor.* Carlton, Victoria: Birds Australia.
Tas DPI. (2003). *The Nut State Reserve Management Plan 2003*. Retrieved October 25, 2017, from http://www.parks.tas.gov.au/publications/tech/the_nut/the_nut.pdf
Tidemann, C. (1998). Grey-headed Flying-fox, Pteropus poliocephalus. In S. Van Dyck, & R. Strahan (Eds.), *The mammals of Australia* (p. 182). Frenchs Forest: New Holland Publishers Pty Ltd.
Tidemann, C., Eby, P., & Vardon, M. (1999). Grey-headed Flying-fox. In *The Action Plan for Australian Bats* (pp. 31-35). Department of Environment and Energy.
TSSC. (2012). *Approved Conservation Advice for the Seasonal Herbaceous Wetlands (Freshwater) of the Temperate Lowland Plains.* Canberra: Department of Sustainability, Environment, Water, Population and Communities.
van der Ree, R., McDonnell, M., Temby, I., Nelson, J., & Whittingham, E. (2006). The establishment and dynamics of a recently established urban camp of Pteropus ploiocephalus outside their geographic ran. *Journal of Zoology London*(268), 177-185.
Vic DSE. (2005). *Clover Glycine Gylcine latrobeana; a Nationally Threatened species of the Grassland and Grassy Woodland Communities*. Retrieved Oct 30, 2017, from https://victorianvolcanicplainscmn.files.wordpress.com/2014/03/glycine_latrobeana.pdf
VicMap. (2002). Native Vegetation - Modelled 2005 Ecological Vegetation Classes (with Bioregional Conservation Status). Melbourne. Retrieved from Bioregional Assessment Source Dataset.
Walsh, N. G., & Entwisle, T. J. (1996). *Flora of Victoria Volume 2: Ferns and Allied Plants, Conifers and Monoctyledons.* Chatswood, NSW: Inkata Press.
Walsh, N. G., & Entwisle, T. J. (1996). *Flora of Victoria Volume 3: Dicotyledons Winteraceae to Myrtaceae.* Chatswood, NSW: Inkata Press.