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Pettavel Basin Augmentation Project

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Ecological Limitations

The site assessment was undertaken in May 2023. This is considered to be an acceptable time of year to complete a Vegetation Quality Assessment. However, due to seasonal activity, many flora and fauna species are not detectable and additional surveys may be recommended to detect threatened species.

Use of Databases

The Victorian Biodiversity Atlas (VBA) database and other databases can be used to search a defined geographical area to produce species lists of flora and fauna that have been previously recorded within the search area. The database lists are only as accurate as the quality and quantity of data that have been recorded and documented from the area. The use of the database in a desktop assessment has the following limitations:

- Location details for many records (typically older records) have a relatively low degree of accuracy (≤ 1km). Thus, the database search may not pick up some records of species that were made within the site historically.
- These datasets are not exhaustive given many locations locally and across Victoria have low or in some instances no documented survey effort for one or more groups of flora and fauna. During field surveys, it is not uncommon to find species at locations for which there are few or no previous nearby database records.
- Professional experience and judgement are used through the assessment process to assess the potential for previously unrecorded threatened flora and fauna to be present within and adjoining the study site. Threatened flora and fauna records that are dated ≤1980 have been removed from our data analysis as they are not considered to provide an accurate representation of the species likely to occur within the site at present (unless stated otherwise in this report).

Contents

Acronyms **1**

Executive Summary **2**

1 Introduction **4**

1.1 Background 4

1.2 Scope of works 4

1.3 Study site and study area 5

1.4 Definition of key terms 5

2 Methods **6**

2.1 Database and literature review 6

2.2 Site assessment 6

2.3 Likelihood of occurrence 7

3 Results **8**

3.1 Site description and history 8

3.2 Native vegetation assessment 8

3.3 Vegetation and habitat descriptions 9

3.3.1. Impacts to native vegetation 15

3.4 Species and communities 15

3.4.1. Listed under the EPBC Act 16

Flora **16**

Fauna **17**

Communities **18**

3.4.2. Listed under the FFG Act 18

Flora **18**

Fauna **19**

Communities **20**

Other protected flora **21**

4 Legislation and policy **22**

4.1 Commonwealth legislation 22

4.1.1. Background 22

4.2 State (Victorian) legislation 23

4.2.1. Environment Effects Act 1978 23

4.2.2. Flora and Fauna Guarantee Act 1988 24

4.2.3. Fisheries Act 1995 25

4.2.4. Catchment and Land Protection Act 1994 25

4.2.5. Wildlife Act 1975 and Wildlife Regulations 2013 26

4.2.6. Water Act 1989 26

4.2.7. Planning and Environment Act 1987 26

Overlays **27**

Clause 52.17 and the Guidelines **27**

4.2.7.1. Avoid and Minimise Statement 29

5 Recommendations **31**

5.1 Recommended mitigation measures 31

5.2 Further requirements 31

References **32**

Appendices

Appendix A – Flora **34**
A1: Flora species recorded within the study site 34
A2: Threatened flora likelihood of occurrence and impact 36
A3: Vegetation Quality Assessment 44
Appendix B - Fauna **45**
B1: Fauna species recorded within the study site 45
B2: Threatened fauna likelihood of occurrence and impact 47
Appendix C - Communities **60**
C1: EPBC Act-listed communities listed on the PMST database 60
Appendix D – Native Vegetation Removal Report **61**
Appendix E - Figures **71**
Appendix F – Offset Availability Report **77**
Appendix G – Targeted survey report **81**

Tables

Table 1: Summary of results 2
Table 2: Summary of key legislation and policy 2
Table 3: Key terms 5
Table 4: Likelihood of occurrence categories 7
Table 5: Native vegetation 9
Table 6: Ecological Vegetation Classes (EVCs) 9
Table 7: Description of native vegetation (EVCs and scattered trees) 10
Table 8: Description of other vegetation and habitats 13
Table 9: Species and communities with suitable habitat within the study site 15
Table 10: Description of flora species listed under the EPBC Act 16
Table 11: Description of fauna species listed under the EPBC Act with potential to occur within the study site 17
Table 12: Description of flora species listed under the FFG Act 19
Table 13: Description of fauna species listed under the FFG Act 19
Table 14: Description of communities listed under the FFG Act 20
Table 15: FFG Act protected flora recorded within the study site 21
Table 16: Potential impacts to matters listed under the EPBC Act 22
Table 17: EE Act referral criteria that relate to ecological matters 23
Table 18: Noxious weeds, WONS and pest fauna identified within the study site 25
Table 19: Native vegetation impact and offset requirements 27
Table 20: Application requirements under ***Guidelines for the removal, destruction or lopping of native vegetation*** 28

Acronyms

Acronyms	Description
BCS	Bioregional Conservation Status
CaLP Act	***Catchment and Land Protection Act 1994***
CEMP	Construction Environmental Management Plan
CMA	Catchment Management Authority
DAWE	Commonwealth Department of Agriculture, Water and the Environment (now DCCEEW)
DCCEEW	Commonwealth Department of Climate Change, Energy, the Environment and Water
DBH	Diameter at Breast Height (taken 1.3 m from the ground)
DEECA	Department of Energy, Environment and Climate Action
DELWP	Former Department of Environment, Land, Water and Planning (now DEECA)
DEPI	Former Department of Environment and Primary Industries (now DEECA)
DTP	Department of Transport and Planning
EPBC Act	***Environment Protection and Biodiversity Conservation Act 1999***
EVC	Ecological Vegetation Class
FFG Act	***Flora and Fauna Guarantee Act 1988*** and ***Flora and Fauna Guarantee Amendment Act 2019***
GIS	Geographic Information System
Guidelines	***Guidelines for the removal, destruction or lopping of native vegetation*** (DELWP 2017)
ha	Hectares
HIM	Habitat Importance Maps (DELWP 2017)
km	Kilometres
LGA	Local Government Authority
m	Metres
MNES	Matters of National Environmental Significance
NVIM	Native Vegetation Information Management tool
PMST	Protected Matters Search Tool (DCCEEW)
sp.	Species (one species)
spp.	Species (more than one species)
subsp.	Subspecies
VBA	Victorian Biodiversity Atlas (DEECA)
WONS	Weed of National Significance

Executive Summary

Introduction

SMEC Australia Pty Ltd (SMEC) was commissioned by CMP Consulting Group Pty Ltd (CMP) to undertake a Detailed Flora and Fauna Assessment for the proposed water storage basin construction associated with the Pettavel Basin Augmentation Project, Victoria. The assessment was undertaken in May 2023 to identify ecological values within and adjoining the study site and inform CMP Consulting Group Pty Ltd of possible impacts associated with the Project.

Results

The results of the assessment are summarised in Table 1. A summary of key legislation and policy is provided in Table 2.

Table 1: Summary of results

Value	Summary of results
Native vegetation	A total of 2.590 ha of native vegetation was identified within the study site, all of which is an Ecological Vegetation Class (EVC) with a bioregional conservation status (BCS) of Endangered. All of the native vegetation is proposed to be impacted by the Project. No native vegetation is present within the laydown area.
Nearby reserves and wildlife corridors	***Local parks and reserves:*** Mount Moriac Recreation Reserve (5 km west) and Mount Duneed Recreation Reserve (6km east). Waurn Ponds Creek (3 km north) and Armstrong Creek (5 km east)
EPBC Act species and communities	Flora: No further consideration necessary. Fauna: Growling Grass Frog (Vulnerable) was recorded within the study site (borrow pit wetland) during targeted surveys. Suitable habitat for Latham's Snipe (Vulnerable/Migratory/Marine) occurs within the wetland vegetation of the study site, although the species has not been detected during targeted surveys. The following species may occasionally use resources within the study site but are unlikely to be impacted by the Project: Blue-winged ***Parrot (***Neophema chrysostoma), Gang-gang ***Cockatoo (***Callocephalon fimbriatum) and ***White-throated Needletail (***Hirundapus caudacutus). Communities: None.
FFG Act species and communities	Flora: An FFG Act Permit to Take Protected Flora will be required for removal of the FFG Protected flora listed in Table 13 and flora associated with the threatened ecological community from Table 14. Fauna: Growling Grass Frog (Vulnerable) and Little Eagle (Vulnerable) were recorded during targeted surveys of the study site. Suitable habitat was identified for a range of other threatened fauna (primarily highly mobile avifauna) that may utilise the wetland within the site opportunistically however these species are not likely to be dependent on the habitat within the study site and are unlikely to be impacted by the Project. Communities: Western (Basalt) Plains Grassland Community.

Table 2: Summary of key legislation and policy

Legislation	Potential impact	Recommendation
***Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act)**	Suitable habitat was identified within the study site for EPBC Act listed species. Details on the potential impacts to MNES are provided in Table 16. No suitable habitat for EPBC Act listed species or communities is present within the laydown area.	A significant impact assessment (SIA) has been undertaken for Growling Grass Frog to determine the potential impact of the project on the species. Following the SIA process, it is recommended the Project is referred under the EPBC Act.
Environment Effects Act 1978	Native vegetation was identified within the study site, the removal of which is a potential referral trigger under the EE Act. An EE Act self-assessment was completed and it is	A referral under the EE Act is unlikely to be necessary based on the grounds of impacts to ecological matters. Growling Grass Frog was recorded within the study site however the wetland habitat within the site is not considered a

Legislation	Potential impact	Recommendation
	considered unlikely that the Project will have a significant effect on ecological matters.	significant proportion of known remaining habitat due to its small size and its isolated location. **Barwon Water must ensure that *all* EE Act referral criteria are addressed (social, economic, emissions, etc) to confirm whether a referral is required.**
***Flora and Fauna Guarantee Act 1988* (FFG Act)**	A number of Protected flora species listed under the FFG Act were recorded within the study site (see Section 3.4.2, Table 15) and will be impacted by the proposed works. One threatened ecological community is proposed to be impacted by the Project (See Table 14). Flora species associated with the community also require a permit for removal. One threatened flora species, Giant Honey-myrtle, occurs within the study site, with two naturally recruited individuals proposed to be removed as part of the Project. No other threatened flora species listed under the FFG Act are considered likely to occur within the study site or laydown area.	Removal of FFG Act protected flora species listed in Table 15 (Section 3.4.2) and flora associated with the threatened ecological community will require a 'permit to take protected flora' issued by DEECA.
Wildlife Act 1975	A range of common (and threatened) fauna species were identified within the study site.	A permit is required under the ***Wildlife Act 1975*** to carry out field investigations for the purpose of conserving, monitoring, improving or maintaining wildlife habitat within Victoria. This also includes the capture and relocation of wildlife from a particular locality which requires a specific ***Wildlife Act 1975*** permit (authorised by DEECA) for the capture, handling and relocation of wildlife.
Water Act 1989	There are no watercourses or designated waterways that may be impacted by the proposed works.	Corangamite CMA is the responsible authority for the control, management and authorisation of works and activities in or over Designated Waterways in the study site. Approval from Corangamite CMA will not be required for construction activities as they do not adjoin watercourses within the study site.
Planning and Environment Act 1987	***Clause 52.16, Clause 52.17, the Guidelines*** ***Offset requirements to remove native vegetation:*** 0.956 general habitat units and 0 large trees (Table 19, Section 4.2.7).	Planning approval from City of Greater Geelong is required to remove, destroy or lop native vegetation under Clause 52.17. Should an approval to remove native vegetation be granted an offset that meets the requirements for its removal must be secured before the native vegetation can be removed.
	Zones and Overlays No overlays pertaining to biodiversity are present within the study site or laydown area.	No further consideration is necessary regarding environmental overlays.

1 Introduction

1.1 Background

SMEC was commissioned by CMP (on behalf of Barwon Water) to undertake a Detailed Flora and Fauna Assessment for the proposed water storage basin construction associated with the Pettavel Basin Augmentation Project (the Project), Victoria. The proposed works are situated on a 25 ha parcel of land on the corner of Draytons Road and Reservoir Road, Waurn Ponds ('the study site'), that has been used as a Barwon Water storage site for over 70 years . A second site on the eastern side of Drayton's Road was also inspected, and will be used during construction for site office, laydown areas and storage of spoil and construction materials ('the laydown area') (Figure 1).

The study site currently has two potable water storage basins at the Pettavel Basin site with a combined volume of 100 ML. This site supplies a population of approximately 130,000 in Armstrong Creek, Bellarine and Surf Coast urban growth areas and is forecast to grow to approximately 170,000 by 2041. Due to the rapid development in these areas, the existing 100 ML Pettavel Basin (combined volume) will no longer be capable of meeting the target peak day contingency storage by 2023-2024.

Barwon Water is planning to increase the water storage capacity at the Pettavel Basin site with the addition of a new 100 ML (Basin No.3) basin next to the existing Basin No. 2 at the site. The net capacity of 200 ML storage will provide 0.8 days contingency supply. The purpose of the Project is to increase the reliability and security of water supply for this region through the provision of an additional basin.

The Project will require the removal of native vegetation and fauna habitat within part of the study site. The purpose of this Detailed Flora and Fauna Assessment is to identify potential Project constraints related to ecological values and relevant environmental planning approvals that may be triggered by the Project components. This report outlines the findings of the desktop and site assessment and provides information regarding potential impacts to ecological values and likely permits, further site visits and documentation required to comply with State and Commonwealth legislation.

1.2 Scope of works

The scope of works includes the following:

- Database and literature review;
- Site assessment of the study site;
- Reporting:
  - **Biodiversity values:** Description of biodiversity values identified within the study site, including species, native vegetation and habitats recorded during the site assessment.
  - **Impact assessment:** Determining the potential impacts of the Project on biodiversity values. This includes an assessment of the likelihood that Commonwealth and Victorian listed species and communities are present.
  - **Management measures and opportunities:** Identifying priority or risk areas that should be avoided if there are opportunities to modify the design. Provide recommendations for design or mitigation measures to avoid or reduce impacts.
  - **Legislation and policy:** Providing advice on the implications and next steps under the below legislation and policy, including whether a referral/permit/equivalent is likely to be required:
    - ***Environment Effects Act 1978*** (EE Act)
    - ***Environment Protection and Biodiversity Conservation Act 1999*** (EPBC Act)
    - Melbourne Strategic Assessment

- ***Planning and Environment Act 1987***
- ***Flora and Fauna Guarantee Act 1988***
- ***Wildlife Act 1975***
- ***Catchment and Land Protection Act 1994***
- ***Water Act 1989***

– **Further requirements:** Providing a list of any further assessment or reporting that will be required.

1.3 Study site and study area

This report refers to two separate definitions describing the area assessed for the Project; ***study site*** and ***study area***.

Study site / laydown area

The study site refers to the 25 hectare site that was surveyed on-ground by SMEC ecologists on 13 May 2023. The laydown area refers to the 7.2 ha site that was surveyed on 8 March 2024 (Figure 1).

The following information describes these sites and immediate surrounds:

- ***Traditional owners:*** The study site and laydown area are located on the land of the Wadawurrung people.
- ***Nearest town:*** Waurn Ponds.
- ***Local bioregion:*** Victorian Volcanic Plain
- ***Local Government Area (LGA):*** City of Greater Geelong.
- ***Catchment Management Authority (CMA):*** Corangamite.
- ***Local parks and reserves:*** Mount Moriac Recreation Reserve (5 km west) and Mount Duneed Recreation Reserve (6 km east).
- ***Local waterways and wildlife corridors:*** Waurn Ponds Creek (3 km north) and Armstrong Creek (5 km east).

Study area

The study area refers to a 10 km buffer area and was assessed by desktop only. The study area provides ecological context and further insight as to what ecological values may occur within the study site and laydown area. This includes, but is not limited to, modelled vegetation and condition, threatened flora and fauna and ecological communities.

1.4 Definition of key terms

A definition of terms commonly used throughout this report is provided in Table 3.

Table 3: Key terms

Term	Definition
Ecological Vegetation Class (EVC)	A native vegetation type classified on the basis of a combination of its floristics, lifeforms, and ecological characteristics.
Native vegetation	Native vegetation is defined under the Victoria Planning Provisions (VPP) as '***plants that are indigenous to Victoria, including trees, shrubs, herbs and grasses***'.
Patch of native vegetation	An area of vegetation where at least 25 per cent of the total perennial understorey plant cover is native, or

Term	Definition
	Any area with three or more native canopy trees where the drip line of each tree touches, forming a continuous canopy, or Any mapped wetland included in the Current wetlands map, available in DEECA systems and tools.
Scattered tree	A native canopy tree that does not form part of a patch.

2 Methods

2.1 Database and literature review

The following resources were reviewed:

- Australian Government EPBC Act Protected Matters Search Tool (PMST);
- Victorian Biodiversity Atlas database (DEECA) and Birdlife Australia database records;
- NatureKit Map (DEECA);
- Ecological Vegetation Class (EVC) mapping of native vegetation;
- Victorian Planning Schemes online tool (VicPlan) for local government areas relevant to the study site and laydown area and environment planning overlays and relevant schedules to overlays (DTP 2023a, 2023b);
- Relevant state or Commonwealth legislation and policies; and
- Aerial imagery of the study site and laydown area.

2.2 Site assessment

A site assessment was undertaken by two SMEC ecologists on 13 May 2024. The full extent of the study site was assessed (Figure 1). An assessment of the laydown area was undertaken on 8 March 2024. The following was undertaken during the site assessment:

- Native vegetation was assessed and mapped in accordance with current DEECA methodology described in ***Vegetation Quality Assessment Manual – Guidelines for applying the habitat hectares scoring method*** (DSE 2013), and ***Guidelines for the removal, destruction or lopping of native vegetation*** (DELWP 2017, the Guidelines). This included mapping of:
  - Remnant patches of native vegetation (including canopy drip line and on-ground extent of understorey collected by a surveyor to an accuracy of ±5 m).
  - Large trees within patches.
  - Large and small scattered trees.
- Habitat for State and Commonwealth listed threatened species and communities was assessed and mapped. This included:
  - The location and number of any individuals recorded in the study site, including FFG Act-listed Protected flora.
  - The location of other important fauna habitats or wildlife corridors (including opportunistic observation of hollow-bearing trees, burrows, etc.).
- Mapping other vegetation types, including planted vegetation and non-native vegetation.

2.3 Likelihood of occurrence

An assessment of the likelihood of occurrence was undertaken for listed threatened and listed migratory or marine species previously recorded within 10 km, identified from available database searches. Four categories for the likelihood of occurrence of listed species are used in this report: **Likely**, **Possible**, **Unlikely** and **No occurrence** (Table 4).

- Species detected during site assessments or targeted surveys or confirmed as present using recent relevant database records, or previously completed targeted survey results have been assigned an additional category of **Present**.

Factors considered in determining the likelihood of occurrence include:

- **Recent records in local area:** Previous contemporary records gathered from database searches and/or verified anecdotal information. Database records older than 1980 were dismissed unless otherwise noted.
- **Species range:** Known natural or naturalised species distributions.
- **Habitat suitability:** Habitat(s) present and suitability for supporting the species, which are assessed as one of the following four categories:
  - ***Suitable*** = all or majority of habitat requirements present.
  - ***Partially suitable*** = some habitat requirements present.
  - ***Marginal or None*** = few or no habitat requirements present.
- The following factors and habitat requirements are considered when allocating a habitat suitability category:
  - Site assessment results, professional judgement and specific site knowledge.
  - Home range size, habitat dependence and likely habitat usage (e.g. resident or migratory, foraging, roosting, breeding or dispersal).
  - Geological/ soil preferences.
  - Presence of absence of specific habitat requirements (e.g. hollows, aquatic or semi-aquatic areas, vegetation etc).
  - Topographical preferences (e.g. aspect, ridgelines, midslopes, valleys, wetlands).
  - Site conditions (e.g. degree of disturbance, degradation, modification).

Unless otherwise specified, assessed likelihood of occurrence categories relate specifically to the identified areas surveyed by SMEC. Species which may utilise the habitat(s) on an occasional basis, as a transient flyover or in areas adjacent to the sites are noted as such. Marine species restricted to marine environments only (such as whales, dolphins, sharks, marine turtles and pelagic seabirds) were excluded from the likelihood of occurrence assessment as there is no marine habitat within the study site.

Table 4: Likelihood of occurrence categories

Within species range	Recent records in local area	Habitat suitability	Likelihood of occurrence
YES	YES	Suitable	Likely
		Partially suitable	Possible
		Marginal or None	Unlikely
	NO	Suitable or Partially suitable	Possible
		Marginal or None	Unlikely
NO			No occurrence

3 Results

3.1 Site description and history

The study site is situated on a 25 ha parcel of land that has been historically used as a water storage facility. Initially an earthen reservoir, the site has undergone extensive modification and disturbance (Figure 1). Bordering the northern extent of the site is a plantation of Radiata Pine (***Pinus radiata)*** that was likely planted shortly after the site's establishment as a reservoir. Some time prior to 1980 the earthen reservoir was drained, and the site transitioned to a modern water storage facility with the construction of two closed water storage basins (Basin No. 1 and Basin No. 2). The walls of the two basins were constructed using soil that was excavated from an area in the north of the site. This excavated area is known as a 'borrow pit'. With little disturbance in 20 years, the borrow pit has developed into a wetland system fringed with native vegetation. The borrow pit wetland supports a diversity of native flora and fauna species, including a breeding population of the EPBC Act-listed Growling Grass Frog (***Litoria raniformis***). Habitat surrounding the wetland is primarily mown pasture or introduced grasses with limited habitat value for native flora or fauna. These modified areas will be utilised to construct a new Growling Grass Frog wetland and overflow basin for the newly constructed Basin No. 3.

The laydown area is situated on a 7.2 ha parcel of land to the east of Drayton's Road (Figure 1). Construction of the proposed Growling Grass Frog wetland and overflow detention storage leaves little space for various site ancillary areas during the construction of Basin No.3. The laydown area which is unsuitable for water infrastructure is suitable for these construction site areas, which include:

- Contractor facilities, including site building and toilets;
- Laydown / storage of construction materials and plant;
- Stockpiling of earthworks between construction phases (e.g. top soil and spoil); and
- Drying area (if deemed required) – Including bunded area, spread of saturated material and run-off capture.

It is unlikely that construction will require the full area of the land parcel for the above purposes. However, the required stockpiling and drying areas are currently unknown, and it is useful to have large spread area for drying purposes. All nominated areas of impact incorporate construction and ancillary laydown areas (Figure 1).

3.2 Native vegetation assessment

A total of 2.590 ha of native vegetation was identified within the study site, all of which is an Ecological Vegetation Class (EVC) with a bioregional conservation status (BCS) of Endangered. All of the native vegetation is proposed to be impacted by the Project. No native vegetation is present within the laydown area. Native vegetation mapping is provided in Figure 2A. Details on impacts to native vegetation is provided below in Section 3.2.1 and Figure 2B.

A summary of native vegetation identified within the study site (including patches and scattered trees) and laydown area are provided in Table 5 below. Patches of native vegetation were classified into Ecological Vegetation Classes (EVCs) listed in Table 5 with a description provided in Table 6.

The results of the Vegetation Quality Assessment are provided at Appendix A3.

Table 5: Native vegetation

Native vegetation		Extent / no. within study site	Extent / no. to be removed
Patches of native vegetation	Extent – all EVCs (ha)	2.590 ha	2.590 ha
	Extent – Endangered EVC (ha)	2.590 ha	2.590 ha
	Large trees in patches	0	0
Scattered trees	Extent (ha)	0 ha	0 ha
	Small scattered trees	0	0
	Large scattered trees	0	0
Total	Native vegetation	2.590 ha	2.590 ha
	Large trees	0	0

Table 6: Ecological Vegetation Classes (EVCs)

Bioregion	EVC	Extent within study site	Extent to be removed
Victorian Volcanic Plain	Non-Eucalypt Grassy Woodland (Endangered)	1.786 ha	1.786 ha
Victorian Volcanic Plain	***Heavier-Soils*** Plains Grassland (Endangered)	0.143 ha	0.143 ha
DEECA Mapped Wetland	Pettavel Basin 54686 – Plains Sedgy Wetland/Tall Marsh mosaic (Endangered)	0.661 ha	0.661 ha
Total		**2.590 ha**	**2.590 ha**

3.3 Vegetation and habitat descriptions

A description of native vegetation (EVCs) recorded in the study site is provided in Table 7. A description of other vegetation and habitats recorded in the study site and laydown area are provided in Table 8. Vegetation and fauna habitats are shown in Figure 2A.

Table 7: Description of native vegetation (EVCs and scattered trees)

EVC Name and Description	Photograph (photographs taken on 1 June 2023)
Non-Eucalypt Grassy Woodland - EVC 175_61 - Habitat Zones: A1-4 Endangered, Victorian Volcanic Plain Bioregion ***EVC description (DEECA)*** A variable open eucalypt woodland to 15 m tall or occasionally Sheoak woodland to 10 m tall over a diverse ground layer of grasses and herbs. The shrub component is usually sparse. It occurs on sites with moderate fertility on gentle slopes or undulating hills on a range of geologies. ***Vegetation condition*** Non-Eucalypt Grassy Woodland within the study site was present in a highly modified state, all of which is assumed to have regenerated following disturbance within the last 25 years. Large trees were absent within all habitat zones due to historical and current land use. Native shrubs to 4 m high were the dominant lifeform and largely comprised Golden Wattle (***Acacia pycnantha***) and to a lesser extent Silver Wattle (***Acacia dealbata***), Hedge Wattle (***Acacia paradoxa***) and Black Wattle (***Acacia mearnsii***) surrounding the borrow pit (HZA1). Additional shrubs include Drooping Sheoak (***Allocasuarina verticillata***) to 5 m high (HZA2-4). These were present under the canopy of planted Radiata Pines that surrounds the northern extent of the study site. The understorey was variable between patches, with the lowest quality patches (HZA1-3) being species poor, consisting primarily of wallaby-grasses (***Rytidosperma*** spp.) and spear-grasses (***Austrostipa*** spp.) at a low to moderate cover (10-30%). Organic litter and bare ground comprised over 40% of the observed ground cover in areas surrounding the borrow pit. The understorey component of patch HZA4 had a diverse species composition, including Common Raspwort (***Gonocarpus tetragynus***), Chocolate Lily (***Arthropodium*** sp.), Spreading Flax-lily (***Dianella revoluta***), spear-grasses, Yellow Rush Lily (***Tricoryne elatior***), Honey-pots (***Acrotriche serrulata***), Common Tussock-grass (***Poa labillardierei***) and wallaby-grasses at up to 60% cover. Weed cover was low, ranging from 10-30% cover on average, however, weed cover increased significantly at the border of patches. Weedy species included Ribwort (***Plantago lanceolata***), Paspalum (***Paspalum dilatatum***), Cocksfoot (***Dactylis glomerata***), Toowoomba Canary-grass (***Phalaris aquatica***) and Kikuyu (***Cenchrus clandestinus***). Small incursions of African Boxthorn (***Lycium ferrocissimum***) and recruiting Radiata Pine occurred throughout patches that were within the Radiata Pine plantation. ***Fauna habitat*** Patches of Non-Eucalypt Grassy Woodland provided fauna habitat for adaptable species that may use trees and shrubs for opportunistic foraging and movement throughout the broader landscape. The high cover of organic litter and woody debris provide habitat for small reptiles and invertebrate species to forage and shelter. Scats of the invasive European Rabbit (***Oryctolagus cuniculus***) were observed across the site and the species is likely indiscriminately feeding on native and introduced species alike. Common bird species such as Superb Fairywren (***Malurus cyaneus)*** and Brown Thornbill (***Acanthiza pusilla***) likely utilise dense shrubs such as Hedge Wattle as breeding habitat but it is unlikely this habitat zone is utilised by any threatened species for breeding.	 

EVC Name and Description	Photograph (photographs taken on 1 June 2023)
Heavier-soils* Plains Grassland - EVC 132_61 – Habitat Zones: B1-7** Endangered, Victorian Volcanic Plain Bioregion ***EVC description (DEECA) Treeless vegetation mostly less than 1 m tall dominated by largely graminoid and herb life forms. Occupies fertile cracking basalt soils prone to seasonal waterlogging in areas receiving at least 500 mm annual rainfall. ***Vegetation condition*** Patches of Plains Grassland within the study site were characterised by a species poor cover of native graminoids with scattered native herbs. The species composition varied greatly depending on localised changes in topography. In free draining areas graminoids such as Rough Spear-grass (***Austrostipa scabra***), Kangaroo Grass (***Themeda triandra***) and Weeping Grass (***Microlaena stipoides***) were commonly recorded with covers ranging from 30-70%. Native herbs included Grassland Wood-sorrel (***Oxalis perennans***), Yellow Rush-lily, Small St John's Wort (***Hypericum gramineum)*** and Soft Crane's-bill (***Geranium potentilloides***) to a maximum of 5% cover. Organic litter cover was high, but was often dominated by non-native leaf litter (primarily pine needles). In areas shaded by the Radiata Pines, patches of Plains Grassland were often dominated by bryophytes (up to 70% cover). All patches of Habitat Zone B, regardless of species composition, are considered to be synonymous with the FFG Act-listed ***Western (Basalt) Plains Grasslands Community***. Localised depressions and poorly draining areas supported graminoid species that favoured periodic waterlogging such as Mat Grass (***Hemarthria uncinata***), Common Blown-grass (***Lachnagrostis filiformis***) and Brown-back Wallaby-grass (***Rytidosperma duttonianum***) and whilst no patches contained standing water some patches supported semi-aquatic forbs such as Water-milfoil (***Myriophyllum crispatum***) and Water Ribbons (***Cycnogeton procerum***). Weed cover was variable (20-50%) with Paspalum and Panic Veldt-grass (***Ehrharta erecta)*** commonly recorded in shaded zones whilst Cocksfoot and Rough Sow-thistle (***Sonchus asper***) were common in patches located in exposed areas. A Weed of National Significance, Serrated Tussock (***Nassella trichotoma***) and a ***Catchment and Land Protection*** (CaLP) Act-listed Spear Thistle (***Cirsium vulgare***) were recorded within two patches at a low cover (<10%). ***Fauna habitat*** Exposed rock is present in patches of Plains Grassland in the north east of the site which might be utilised by a range of reptile species as shelter and foraging habitat however the small size and lack of connectivity likely restrict the usage to common adaptable species. Regular mowing (and to a lesser extent Rabbit activity) was observed to be significantly reducing biomass and most patches lacked any significant tussocks that would otherwise support habitat for common reptiles and small mammals. It is likely that patches of Plains Grassland within the study site are utilised by a range of common opportunistic bird species as a foraging resource however these patches are unlikely to represent a significant resource for any native species.	 

EVC Name and Description	Photograph (photographs taken on 1 June 2023)
DEECA Mapped Wetland/Tall Marsh- Plains Sedgy Wetland – Habitat Zones C1 & 2 Endangered (Plains Sedgy Wetland) Victorian Volcanic Plain Bioregion ***EVC description*** Wetland vegetation that has developed within the borrow pit of the site is a combination of large and small emergent graminoids and small aquatic herbs best described as a mosaic of Spike Sedge Wetland and Tall Marsh in a highly modified state owing to its anthropogenic origins. Modelled condition scores are used in place of VQA values because of the difficulty in assigning a representative score due to the hybrid nature of the anthropogenic wetland. ***Vegetation condition*** Wetland vegetation within the borrow pit can be broadly described as a mosaic of Tall Marsh and Plains Sedgy Wetland with patches of Tall Marsh characterised by tall (> 1 m high) emergent graminoids including Narrow-leaf Cumbungi (***Typha domingensis***), Tall Spike-rush (***Eleocharis sphacelata***) and River Club-sedge (***Schoenoplectus tabernaemontani***) often forming dense monoculture patches at the transitional zone between shallow and deeper water. In shallow regions, small aquatic graminoids and aquatic herbs were dominant with the dominant species being Small Spike-sedge (***Eleocharis acuta***). Aquatic herbs such as Water Milfoil, Water Ribbons, Creeping Brookweed (***Samolus repens***), Poison Lobelia (***Lobelia pratioides***) and Lesser Joyweed (***Alternanthera denticulata***) were common, extending to the margins. A significant portion of the wetland (40%) comprises open water and at the time of assessment, lacked any aquatic vegetation. Weed cover was low with no aquatic weed species recorded. Despite the margins of the wetland often being comprised of bare ground only scattered annual weed species such as Hillmans Panic (***Panicum hillmanii***) and Rough Sow-thistle were present. ***Fauna habitat*** Open water within the wetland is likely utilised by a range of common waterbirds as a foraging resource. Hoary-headed Grebe (***Poliocephalus poliocephalus***) and Eurasian Coot (***Fulica atra***) were both observed within open water at the wetland site during the assessment. Ducks (including the FFG listed Blue-billed Duck) likely frequent the wetland and the sheltered nature of the site (owing to the surrounding pine plantation) and permanent water source (as evidenced by historic aerial imagery) likely make conditions suitable year-round. Dense beds of Tall Spike-rush and River Club-rush provide foraging and breeding habitat for a range of common native waterfowl whilst shallow water and low density aquatic graminoids and herbs provide breeding habitat for invertebrates and amphibians such as Common Froglet (***Crinia signifera***) and subsequently ideal foraging habitat for wading bird species such as White-faced Heron (***Egretta novaehollandiae***) and Nankeen Night Heron (***Nycticorax caledonicus***). A population of Short-finned Eel (***Anguilla australis)*** is known to be present within the wetland although the species would not be breeding .The aquatic habitat provided by the wetland is also known to support a small population of the threatened Growling Grass Frog which likely uses the site for both foraging and breeding.	 
Scattered trees No scattered trees were recorded within the study site	

Table 8: Description of other vegetation and habitats

Habitat Type and Description	Photograph (photographs taken on 1 June 2023)
Laydown Area Vegetation within the area of paddock assessed was dominated by the introduced weed Chilean Needle-grass (***Nassella neesiana***), which is a listed Weed Of National Significance. One native species was recorded; Clustered Wallaby-grass (***Rytidosperma racemosum***), which comprised <1% cover abundance. Other species recorded included weed species only, including exotic pasture grasses such as Cocksfoot and Toowoomba Canary-grass. The site did not contain any apparent surface or embedded rocks which indicates the site may have been modified historically. Planted Australian native trees and shrubs were present in a windrow on the western side of the paddock, however none of these were indigenous to the local area and were planted for amenity purposes. ***Fauna habitat*** The modified pasture provides marginal habitat for fauna and is likely to be utilised by locally common ground dwelling mammals and reptiles as refuge and foraging habitat. Aerial predation, foraging or displays by raptors and Eurasian Skylark are likely, including ground foraging opportunities by locally common bird species such as Australian Magpie, Little Raven, Australian White Ibis, Long-billed Corella, Magpie Lark, Straw-necked Ibis, Superb Fairy-wren and Willie Wagtail. The long-term modification of pasture and ongoing agricultural activities (i.e. harvesting hay) on this site are likely to limit the use and persistence of threatened species. In addition, a lack of previous records, the type, extent and connectivity of suitable habitat to adjoining properties within the local area indicate the site is unlikely to support threatened species.	
Planted *Vegetation* Rows of mature Radiata Pine and Monterey Cypress (***Hesperocyparis macrocarpa***) to 15 m high fringe the northern extent of the study site and represent a vegetative barrier that likely provides some protection from strong winds. Whilst small patches of native vegetation are interspersed within the plantation the understorey is generally comprised of either weedy annual grasses such as Panic Veldt-grass or non-vegetated areas covered in pine needles. ***Fauna habitat*** The mature pines are likely opportunistically utilised by a range of native fauna species as both breeding habitat and as a protective movement corridor between foraging and breeding habitat. Little Raven (***Corvus mellori***), Australian Magpie (***Gymnorhina tibicen***) and Grey Fantail (***Rhipidura albiscapa***) were all observed utilising the planted pines during the site assessment. A number of medium sized stick nests (approx. 50 cm diameter) were observed in the canopy of the pines and are likely Raven or Magpie nests however could belong to a species of Raptor. Drainage lines throughout and on the perimeter of the pine plantation colonised by the introduced Drain Flat-sedge (***Cyperus eragrostis***) likely provide refuge and potential breeding habitat for common amphibians. One species of frog, Southern Brown Tree Frog (***Litoria ewingii***), was identified calling within one of these ephemeral drainage lines.	
Non-native Vegetation Of the total vegetation within the study site, by area approximately 50% of the study site is comprised of a modified pasture of perennial introduced grasses that have been maintained as a lawn. These areas were almost completely devoid of native vegetation and were dominated by Kikuyu, Paspalum and Ribwort	

Habitat Type and Description	Photograph (photographs taken on 1 June 2023)
Plantain with scattered occurrences of Galenia (***Aizoon pubescens***). A large patch of Stinkwort (***Dittrichia graveolens)*** was observed recruiting within a disturbed area in the south-west of the site. Scattered woody weeds such as African Boxthorn and Sweet Pittosporum also occurred throughout the plantation, particularly within the north-west of the site. ***Fauna habitat*** The modified pasture provides little in the way of habitat features however is nonetheless utilised by opportunistic native fauna (almost only avifauna) and pest animals (European Rabbit) as a foraging resource. Magpies, Magpie-larks (***Grallina cyanoleuca***) and a Flame Robin (***Petroica phoenicea***) were all observed foraging either terrestrially or aerially across the modified pasture presumably on small invertebrates. Small birds such as wrens and thornbills are known to utilise dense scrub and may on occasion utilise African Boxthorn as nesting habitat.	

3.3.1. Impacts to native vegetation

Direct removal: The direct removal of native vegetation at the study site is required to construct the proposed Basin No.3, associated infrastructure and access tracks, drainage and inlet pipework for future site operation. This includes removal of the borrow pit wetland and surrounding native vegetation, which equates to 0.661 ha of wetland vegetation, 0.009 ha of Plains Grassland (EVC 132) and 1.630 ha of Grassy Woodland (EVC 175) (Figure 2B).

Assumed lost (retain where possible): The remaining native vegetation at the study site is located amongst and beneath the planted Radiata Pines that border the west, north and north-east of the study site (Figure 2B). The planted Radiata Pines are required to be removed to enable ongoing functionality of the new basins, to ensure that pine needles do not damage the proposed infrastructure once completed, and to allow access to the site during construction. As a result, some native vegetation persisting beneath the pines may be removed and will be included in the vegetation removal as ***assumed loss***. However, every effort will be made on site during construction to retain this vegetation where possible, including implementing No-Go Zone fencing and signage, micro-siting, and direction from on-ground ecologists that are present during construction.

The removal of the Radiata Pines also allows opportunity for these non-native species to be replaced with native flora species, which will result in an overall improvement on the biodiversity of the site in the long-term.

Impacts to wetlands: The existing borrow pit wetland is required to be removed due to location of the new basin and associated overflows. Alternative options to the proposed layout have been explored, with the chosen location and design representing the safest, most functional and most efficient location.

To provide supplementary habitat for common and threatened fauna species that utilise the existing borrow pit wetland, a new Growling Grass Frog wetland will be created in the south-west of the study site (Figure 2B). Installation of the new wetland will ensure that the site maintains its current ecological function in the landscape, that is, providing habitat for common and threatened native wetland dependant fauna species known to utilise the site.

Location of laydown areas: All laydown and site sheds will be located off site in an area also owned by Barwon Water, this is located to the west of Draytons Road (Figure 1).

3.4 Species and communities

Threatened species that have previously been recorded within the study area are listed in Appendix A2 and Appendix B2 and shown in Figure 3 and Figure 4. Of these species, suitable habitat was identified for those listed in Table 9.

Threatened communities that have previously been recorded within 10 km are listed in Appendix C1. Of these communities, those identified are listed in Table 9.

Table 9: Species and communities with suitable habitat within the study site

Legislation	Results
General	Identified within the study site during the site assessment: • ***Flora***: 97 flora species, including 45 native and 52 introduced species (Appendix A1). • ***Fauna***: 38 fauna species, including 33 native species and five introduced species (Appendix B1). • ***Communities***: None considered present.
EPBC Act	**Flora:** No further consideration necessary. **Fauna:** Growling Grass Frog (Vulnerable) was recorded within the study site (borrow pit wetland) during targeted surveys. Suitable habitat for Latham's Snipe (Vulnerable/Migratory/Marine) occurs within the wetland vegetation of the study site, although the species has not been detected during targeted surveys.

Legislation	Results
	The following species may occasionally use resources within the study site but are unlikely to be impacted by the Project: Blue-winged Parrot (***Neophema chrysostoma***), Gang-gang Cockatoo (***Callocephalon fimbriatum***) and White-throated Needletail ***(Hirundapus caudacutus***). **Communities:** None.
FFG Act	**Flora:** An FFG Act Permit to Take Protected Flora will be required for removal of the FFG Protected flora listed in Table 13 and flora associated with the threatened ecological community from Table 14. **Fauna:** Growling Grass Frog (Vulnerable) and Little Eagle (Vulnerable) were recorded during targeted surveys of the study site. Suitable habitat was identified for a range of other threatened fauna (primarily highly mobile avifauna) that may utilise the wetland within the site opportunistically however these species are not likely to be dependent on the habitat within the study site and are unlikely to be impacted by the Project. **Communities:** Western (Basalt) Plains Grassland Community.

3.4.1. Listed under the EPBC Act

Flora

The database review did not identify any previously recorded EPBC Act-listed flora species within 10 km of the study site or laydown area (VBA, DEECA 2023a), however 15 species have potential to occur based on species modelled habitat (PMST, DCCEEW 2023a). These species are listed in Appendix A2 and shown in Figure 3.

Of these species, suitable habitat was identified within the study site for the one threatened species listed in Table 10. However, no additional flora species are considered likely to occur or require further assessment as there is no suitable habitat within the study site or laydown area for remaining EPBC Act-listed species.

Table 10: Description of flora species listed under the EPBC Act

Species	Description
Suitable habitat present:	
Adamson's Blown-grass ***Lachnagrostis adamsonii***	***Conservation status:*** Endangered under the EPBC Act; Endangered under the FFG Act. ***Description:*** Adamson's Blown-grass is a tufted grass that occurs in saline depressions, slow-moving creeks, swamps or damp depressions that are seasonally inundated or waterlogged, typically within the Victorian Volcanic Plain bioregion (DCCEEW 2023f). ***Suitable habitat:*** Suitable, albeit marginal, habitat for this species was identified within the study site in shallow depressions and waterlogged areas of Plains Grassland (Figure 2A). However, samples were taken where any blown-grass species were encountered, and they were identified to species level to be Common Blown-grass (***L. filiformis***) which is not threatened. ***Recommendation:*** This species was not detected during the site assessment and is unlikely to be present within the study site. No further consideration required.
Basalt Peppercress ***Lepidium hyssopifolium***	***Conservation status:*** Endangered under the EPBC Act; not listed under the FFG Act. ***Description:*** Basalt Peppercress is a small perennial herb endemic to south-eastern Australia. Its former range has been reduced due to widespread degradation and loss of grassland and grassy woodland habitats in south-eastern Australia. It is currently only known from 35 populations containing approximately 1,700 plants within Victoria (DSE 2010). Basalt Peppercress requires disturbance for seed germination and seedling recruitment, and it is known to occur in grassy eucalypt and/or ***Allocasuarina*** woodlands (DSE 2010). Almost all of the remaining populations occur in heavily modified, non-natural environments amongst exotic pasture grasses and weed species (Vicflora 2023). ***Suitable habitat*:** Although there are no previous records for this species from within the study area (DCCEEW 2023a), suitable habitat for this species was identified within the study site throughout open weedy areas and within patches of Non-Eucalypt Grassy Woodland and Plains Grassland (Figure 2A). A similar peppercress species was recorded within these areas, however it was determined to be the weedy Common Peppercress (***L. africanum***). ***Recommendation:*** This species was not detected during the site assessment and is unlikely to be present within the study site. No further consideration required.

Fauna

The database review identified six EPBC Act-listed fauna species that have previously been recorded within 10 km of the study site and laydown area (VBA, DEECA 2023a), and an additional four species with potential to occur (PMST, DCCEEW 2023a). These species are listed in Appendix B2 and shown in Figure 4.

Of these species, suitable habitat was identified within the study site for the species listed in Table 11. There is no suitable habitat within the study site and/or laydown area for the remaining species.

Table 11: Description of fauna species listed under the EPBC Act with potential to occur within the study site

Species	Description
Suitable habitat present:	
Growling Grass Frog ***Litoria raniformis***	***Conservation status:*** Vulnerable under the EPBC Act; vulnerable under the FFG Act. ***Description:*** Growling Grass Frog can occur in still or slow-flowing waterbodies with a high cover of emergent and submerged vegetation. They can inhabit artificial waterbodies, such as farm dams, irrigation channels, and disused quarries. High-quality habitat includes abundant aquatic vegetation and minimal tree canopy cover, with open areas for basking. Grass and shrub cover on the banks are also important for the emerging froglets to gain protection from predators and to acquire insect prey as a food source (SWIFFT 2022). An extant population of Growling Grass Frog is present within the borrow pit wetland, and is confirmed to be utilising the site as foraging, refuge and breeding habitat as a result of targeted species surveys (Appendix G). It is likely this species will be impacted by the proposed works due to the removal of this habitat and a significant impact assessment has been prepared (Appendix G). **Recommendation:** Options to salvage and translocate individuals from this extant population are limited due to a lack of available habitat within 100 m of the study site and an associated risk of spreading chytrid fungus (***Batrachochytrium dendrobatidis***). The site provides an opportunity to create a supplementary Growling Grass Frog wetland for the species, and Barwon Water will investigate opportunities to build similar quality habitat to relocate this extant population. The details of this habitat creation will be developed in a separate management plan to provide guidance on wetland specifications and relocation procedures of Growling Grass Frog during construction. Opportunities to utilise guidelines provided in the ***Growling Grass Frog Habitat Design Standards*** (DELWP 2017b) will be applied by Barwon Water.
Latham's Snipe ***Gallinago hardwickii***	***Conservation status:*** Vulnerable and Migratory/Marine EPBC Act; not listed under the FFG Act. ***Description:*** Latham's Snipe is a medium-sized migratory shorebird that breeds in Japan and south-east Siberia. A large proportion of the population spends its non-breeding season in eastern and south-eastern Australia. It is a shy and secretive bird that is widely dispersed in low numbers across wetland and grassland areas. The species prefers open freshwater or brackish wetlands with cover close by, particularly dense ground vegetation and wet tussock grassland. During the day, they prefer to roost in grass and weeds near the water. Important habitat for Latham's Snipe is considered to occur when the site supports 18 or more individuals of the species (DCCEEW 2023). Whilst there are no previous records for this species from within 10km of the study site the species is known to forage across the region. Suitable habitat for this species was present in the wetland that has developed within the borrow pit particularly within the shallow margins dominated by low growing low density graminoids such as Common Spike-rush. Whilst it is unlikely that the habitat within the study site is a significant resource for the species it is possible that a number of individuals may opportunistically utilise the habitat when conditions permit. **Recommendation:** Targeted surveys have been completed between October and January, and the species has not been detected (Appendix G). Based on the unlikely use of potential habitat within the study site, no further consideration is necessary.
Suitable habitat present, however, species unlikely to be impacted by project and no further consideration is necessary:	
Blue-winged Parrot ***Neophema chrysostoma***	***Conservation status:*** Vulnerable under the EPBC Act; not listed under the FFG Act. ***Description:*** Blue-winged Parrot are a partial migrant with variable numbers of birds migrating across Bass Strait in winter to breed on mainland Australia south of the Great Dividing Range in southern Victoria from Port Albert to Gippsland west to Nelson. Blue-winged Parrots inhabit a

Species	Description
	range of habitats including inland, coastal, and sub coastal areas, through to semi-arid zones. The species favours grassy woodlands and grasslands and are often found near wetlands both near semi-arid zones and the coast. They can also occur in altered environments such as golf courses, airfields, and paddocks. Small parties of pairs forage near or on the ground for seeds from a variety of introduced and native grasses, shrubs and herbs (DCCEEW 2023h). There are 65 previous records for this species from within 10km of the study site, most recently in 2021 (Figure 4, DEECA 2023a, 2023b). Suitable habitat for this species was recorded in patches of Non-Eucalypt Grassy Woodland, Plains Grassland and open areas that contain introduced grasses (Figure 2A). However, given the regular disturbance (mowing) and lack of hollow bearing trees it is considered unlikely that the species regularly visits or is reliant on the habitat. Suitable foraging habitat is located adjacent the study site in large agricultural paddocks. **Recommendation:** The species may occasionally use resources within the study site. However, for the following reasons, the Project is considered unlikely to impact this species: • They are highly mobile and will move away if disturbed during construction; • The study site is subject to regular disturbance from maintenance practices which would deter the species from foraging within the study site on a regular basis; • Suitable foraging habitat in the form of rural paddocks are located adjacent to the study site, where the species is more likely to be found. No further consideration is necessary.
Gang-gang Cockatoo ***Callocephalon fimbratum***	***Conservation status:*** Endangered under the EPBC Act; endangered under the FFG Act. ***Description:*** Gang-gang Cockatoo uses woodland habitats for foraging, breeding and movement. Large hollows are used for nesting. They are seasonal altitudinal migrants meaning they migrate from high altitude forests to forests at lower altitudes during autumn and winter. There are 184 previous records for the species from within 10 km of the study site (DEECA 2023a). However, records are aggregated within areas that support typically intact remnant native vegetation rather than the highly modified vegetation within the site. The species is likely to use Non-Eucalypt Grassy Woodland vegetation particularly ***Allocasuarina*** and ***Acacia*** species within the study site for occasional foraging, particularly when travelling to more suitable areas of intact vegetation. ***Recommendation:*** The species may use resources within the study site on occasion as they travel between areas of higher quality habitat, however the trees within the study site are unlikely to represent a significant foraging resource for the species.
White-throated Needletail ***Hirundapus caudacutus***	***Conservation status:*** Vulnerable and Migratory/Marine under the EPBC Act; vulnerable under the FFG Act. ***Description:*** White-throated Needletail is a highly and almost exclusive aerial species occurring over a variety of habitat types. They are non-breeding migrants to Australia, arriving from their breeding ground in the northern hemisphere in October each year and leaving between May and August. ***Recommendation:*** Due to the highly aerial nature of the species, it is unlikely to use terrestrial habitat within the study site or laydown area. Therefore, it is unlikely to be impacted by the Project and no further consideration is necessary.

Communities

The database review identified four EPBC Act-listed communities with potential to occur within 10 km of the study site and laydown area (PMST, DCCEEW 2023a). These communities are listed in Appendix C1. None of these communities were identified within the study site or laydown area.

3.4.2. Listed under the FFG Act

Flora

The database review identified 35 FFG Act-listed flora species that have previously been recorded within 10 km of the study site and laydown area (VBA, DEECA 2023a). These species are listed in Appendix A2 and shown in Figure 3.

Of these species, suitable habitat was identified within the study site for the species listed in Table 12 below (species listed under both the FFG Act and the EPBC Act were described in Section 3.4.1). There is no suitable habitat within the study site or laydown area for the remaining species.

Table 12: Description of flora species listed under the FFG Act

Species	Description
Austral Crane's-bill ***Geranium solanderi*** var. ***solanderi***	***Conservation status:*** Endangered under the FFG Act. ***Description:*** Austral Crane's-bill is an uncommon species occurring in damp to dryish, usually sheltered sites in grassy woodlands, often along drainage lines or in seepage areas. It is characterised by long, spreading indumentum (surface coverings) on most of its stems (Vicflora 2023). There are two previous records for this species from within 10 km of the study site, occurring 7 km east of the study site from 2002 (DEECA 2023a, 2023b). ***Suitable habitat:*** Suitable habitat for this species was recorded within patches of Non-eucalypt Grassy Woodland and Plains Grassland (Figure 2A). Two Geranium species were detected during the site assessment however were identified to be the non-threatened Soft Crane's-bill (***Geranium potentilloides var. potentilloides***) and Grassland Crane's Bill (***Geranium retrorsum***). No other Geraniums were detected during the site assessment, and it is therefore considered unlikely that Austral Crane's-bill occurs within the study site. ***Recommendation:*** This species was not detected during the site assessment and given the highly disturbed nature of the site is unlikely to be present within the study site. No further consideration required.
Salt Blown-grass ***Lachnagrostis robusta***	***Conservation status:*** Endangered under the FFG Act. ***Description:*** Salt Blown-grass occurs in grassland, grassy woodland and seasonally swampy sites (Vicflora 2023). There is one previous record for this species from within 10 km of the study site, occurring 5 km west of the study site (DEECA 2023a, 2023b). ***Suitable habitat:*** Suitable habitat for this species was recorded within patches of Plains Grassland (EVC 132_61) and the wetland system within the borrow pit (Figure 2A). However, samples were taken where any blown-grass species were encountered, and they were identified to species level to be Common Blown-grass which is not threatened. ***Recommendation:*** This species was not detected during the site assessment and is unlikely to be present within the study site. No further consideration required.
Giant Honey-myrtle ***Melaleuca armillaris*** subsp. ***armillaris***	***Conservation status:*** Endangered under the FFG Act. ***Description:*** Giant Honey-myrtle is a distinctive shrub that is mainly confined to near coastal sandy heaths, scrubs, slightly raised above saltmarsh, riparian scrubs, rocky coastlines and foothill outcrops eastwards from about Marlo (Vicflora 2023). Occurrences to the west are naturalized. It is commonly planted in coastal areas. Recruiting Giant Honey-myrtle were recorded surrounding the borrow pit. The species is not indigenous to the area and is considered an environmental weed within the Geelong region. ***Recommendation:*** Whilst not indigenous to the local area the species is listed under the FFG Act and is therefore a Protected flora species. A permit to take protected flora will be required to remove this species within the study site.

Fauna

The database review identified 34 FFG Act-listed fauna species that have previously been recorded within 10km of the study site and laydown area (VBA, DEECA 2023a). These species are listed in Appendix A2 and shown in Figure 4.

Of these species, potentially suitable breeding habitat was identified within the study site for Little Eagle, but no observations of breeding were noted during the assessments (see Table 13 below). Whilst a range of other threatened avifauna (see Appendix B2 and below) may utilise the study site for opportunistic foraging, no suitable breeding habitat occurs within the study site or laydown area for these species and therefore no significant impacts are considered likely.

Table 13: Description of fauna species listed under the FFG Act

Species	Description
Suitable habitat present:	
Little Eagle	***Conservation status:*** vulnerable under the FFG Act.

Species	Description
Hieraaetus morphnoides	***Description:*** Little Eagles are small, powerful and stocky (45-55 cm) birds of prey with a wingspan of more than 1 m. They have a long tail that is square-cut at the tip when it is closed. Legs are heavily feathered, and the feet and talons are powerful. In Victoria, the species is widespread, where they have been most commonly recorded from wooded farmlands and dry woodlands (Emison et al. 1987). They have also been reported from many other habitats but usually not in large areas of wet forest (e.g. Great Divide east of Melbourne), the mallee 'deserts' (Big Desert and Sunset Country-Wyperfeld) or treeless farmland. Little Eagle has been recorded utilising the airspace above the study site on numerous occasions both in the morning and in the evening indicating that the species likely utilises habitat within the study site for roosting. It is also possible that the species may utilise the Radiata Pine as nesting habitat however no active nests or nesting behaviour have been observed. ***Recommendation:*** The removal of Radiata Pines must occur outside of the breeding season of Little Eagle (August-December). The removal of pines associated with constructing Basin No.3 should be staged to allow raptors an opportunity to find alternative habitat. Adhere to the management recommendations outlined in the Project's Raptor Management Plan (SMEC 2024a).
Suitable habitat present, however, species unlikely to be impacted by project and no further consideration is necessary:	
Hardhead ***Aythya australis*** **Blue-billed Duck** ***Oxyura australis*** **Freckled Duck** ***Stictonetta naevosa*** **Musk Duck** ***Biziura lobata***	***Conservation status:*** See Appendix B2. ***Description:*** Medium sized highly mobile wetland birds that will forage in a variety of wetland habitats including artificial wetlands and inundated paddocks. These species prefer large, deep open freshwater lakes and dams with dense vegetated margins for breeding. They are rarely seen on land and tend to roost on low branches and stumps near the water. Whilst suitable foraging habitat is present within the borrow pit wetland and these species are likely to utilise this habitat on occasion it is not likely to be considered a significant resource for any of the species. The study site does not support breeding habitat for these species. ***Recommendation:*** Species are unlikely to be significantly impacted by the Project. If possible, options to construct a replacement wetland onsite should be considered.

Communities

Suitable habitat was identified within the study site for the communities listed in Table 14. No FFG Act-listed communities are present within the laydown area.

Table 14: Description of communities listed under the FFG Act

Species	Description
Western (Basalt) Plains Grassland Community	***Description:*** The FFG Act-listed ***Western (Basalt) Plains Grassland Community*** is an open grassland community found mainly on undisturbed, poorly-drained heavy clay soils on the basalt plains of western Victoria. These soils are usually waterlogged in winter and very hard, dry and cracking in summer. The vegetation is characteristically dominated by perennial native grasses, with very few eucalypts and shrubs. The community has scattered remnants typically associated with the Plains Grassland EVC (EVC 132) between Plenty River in the east, Hamilton in the west, Beaufort in the north and Colac in the south. Tussock grasses such as wallaby-grasses and spear grasses tend to predominate, particularly in moist sites. Perennial herbs are often scattered throughout patches of the community whilst trees and shrubs are confined to drainage lines and the margins of ephemeral wetlands that frequently occur in depressions. Given FFG Act-listed communities do not have condition thresholds, all patches of Plains Grassland recorded within the Victorian Volcanic Plain are considered the ***Western (Basalt) Plains Grassland Community***. Therefore, all patches of Plains Grassland recorded within the study site are synonymous with this community. ***Recommendation:*** This community is considered present. A total of 0.143 ha of the community was present within the study site is proposed to be removed as part of the Project. Therefore, an FFG Act-permit will be required for flora species associated with the community.

Other protected flora

An FFG Act permit is required for removal of flora that is listed as 'protected' under the FFG Act where it occurs on Public Land. In addition to the Western (Basalt) Plains Grasslands Community the protected flora species listed in Table 15 were recorded within the study site. No FFG Act protected flora are present within the laydown area.

Table 15: FFG Act protected flora recorded within the study site

Scientific name	Common name	Estimated number within study site	Estimated number to be impacted by the Project
Acacia pycnantha	Golden Wattle	4700	4700
Acacia mearnsii	Black Wattle	40	40
Laphangium luteoalbum	Jersey Cudweed	12	12
Microtis parviflora	Slender Onion-orchid	5	5
Melaleuca armillaris subsp. ***armillaris***	Giant Honey-myrtle	9	2
Senecio glomeratus su***bsp. glomeratus***	Annual Fireweed	1	1

4 Legislation and policy

4.1 Commonwealth legislation

4.1.1. Background

The ***Environment Protection and Biodiversity Conservation Act 1999*** (the EPBC Act) is the Australian Government's primary piece of environmental legislation to protect and manage nationally and internationally important species, communities and heritage places, known as Matters of National Environmental Significance (MNES). If a MNES could be impacted by a proposed action, an assessment of the potential impacts against the relevant EPBC Act significant impact criteria must be completed. If there is potential for a significant impact to occur the proposed action must be referred to the federal Environment Minister for assessment under the EPBC Act.

Potential impacts to matters listed under the EPBC Act are listed in Table 16. Please note that this table includes only MNES that pertain to ecology. CMP Consulting Group Pty Ltd must ensure that additional MNES are adequately addressed (world heritage properties, national heritage places, nuclear actions, water resources).

Potential impact

Suitable habitat was identified within the study site for EPBC Act listed species. Details on the potential impacts to MNES are provided in Table 16. No suitable habitat for EPBC Act listed species or communities is present within the laydown area.

Table 16: Potential impacts to matters listed under the EPBC Act

Species	Potential impact	Recommendation
Ramsar sites	No Ramsar sites occur within 10 km or are hydraulically connected to the study site.	Significant impact unlikely. No further action necessary.
Species and communities	Growling Grass Frog was detected within the study site following targeted surveys for the species. Targeted Latham's Snipe surveys were completed and the species was not detected. Fauna species including Blue-winged Parrot, Gang-gang Cockatoo and White-throated Needletail may occasionally use resources within the study site, however a significant impact to these species is considered unlikely.	A significant impact assessment (SIA) will be undertaken for Growling Grass Frog to determine the potential impact of the project on the species.
Migratory species	Some species (e.g., White-throated Needletail) may fly over the study site. However, such migratory species are unlikely to be impacted and no further consideration is required. See Section 3.4.1 for more information.	Significant impact to migratory species are considered unlikely. No further action necessary.
Commonwealth marine areas	None within 10 km of the study site.	N/A
The great barrier reef marine park	Not within 10 km of the study site.	N/A

Recommendations

A significant impact assessment (SIA) has been undertaken for Growling Grass Frog to determine the potential for significant impact on the species. Following the SIA process, it is recommended the Project is referred under the EPBC Act.

4.2 State (Victorian) legislation

4.2.1. Environment Effects Act 1978

The ***Environment Effects Act 1978*** (EE Act) provides for an assessment of proposed Projects that are capable of having a significant effect on the environment. The Ministerial Guidelines for Environment Effects Statements (DTP 2023c) outlines the referral criteria to determine whether a project could have a significant effect on the environment should be referred to the Minister. Projects that trigger the referral criteria must be referred to the Minister administering the EE Act to decide if an Environmental Effects Statement (EES) should be prepared. EE Act referral criteria that relate to ecological matters are listed in Table 17.

Potential impact

Native vegetation was identified within the study site, the removal of which is a potential referral trigger under the EE Act. An EE Act self-assessment was completed and it is considered unlikely that the Project will have a significant effect on ecological matters. The relevant referral criteria and a response to each are provided in Table 17.

Table 17: EE Act referral criteria that relate to ecological matters

Referral criteria	Response
Individual types of potential effects on the environment that might be of regional or State significance, and therefore warrant referral of a project:	
potential clearing of 10 ha or more of native vegetation from an area that: • is of an Ecological Vegetation Class identified as endangered by the Department of Sustainability and Environment (in accordance with Appendix 2 of Victoria's Native Vegetation Management Framework); or • is, or is likely to be, of very high conservation significance (as defined in accordance with Appendix 3 of Victoria's Native Vegetation Management Framework); and • is not authorised under an approved Forest Management Plan or Fire Protection Plan	**Criteria not met.** A total of 2.590 ha of native vegetation was identified within the study site, all of which is an Ecological Vegetation Class (EVC) with a bioregional conservation status (BCS) of Endangered. All of the native vegetation is proposed to be impacted by the Project. No native vegetation is present within the laydown area. The Project will not remove 10 ha or more of native vegetation and therefore does not trigger this referral criteria.
potential long-term loss of a significant proportion (e.g. 1 to 5 percent depending on the conservation status of the species) of known remaining habitat or population of a threatened species within Victoria	**Criteria not met.** Growling Grass Frog was recorded within the study site however the wetland habitat within the site is not considered a significant proportion of known remaining habitat due to its small size and its isolated location.
potential long-term change to the ecological character of a wetland listed under the Ramsar Convention or in 'A Directory of Important Wetlands in Australia' (DIWA)	**Criteria not met.** Ramsar or DIWA wetlands are unlikely to be impacted by the Project.
potential extensive or major effects on the health or biodiversity of aquatic, estuarine or marine ecosystems, over the long term	**Criteria not met.** Whilst impacts are likely to occur to the wetland system within the study site the artificial nature of the wetland and small size would discount this as a major impact in respect to the broader landscape.
A combination of two or more of the following types of potential effects on the environment that might be of regional or State significance, and therefore warrant referral of a project	
potential clearing of 10 ha or more of native vegetation, unless authorised under an approved Forest Management Plan or Fire Protection Plan	**Criteria not met.** A total of 2.590 ha of native vegetation was identified within the study site, all of which is an Ecological Vegetation Class (EVC) with a bioregional conservation status (BCS) of Endangered. All of the

Referral criteria	Response
	native vegetation is proposed to be impacted by the Project. No native vegetation is present within the laydown area. The Project will not remove 10 ha or more of native vegetation and therefore does not trigger this referral criteria.
matters listed under the Flora and Fauna Guarantee Act 1988: • potential loss of a significant area of a listed ecological community; or • potential loss of a genetically important population of an endangered or threatened species (listed or nominated for listing), including as a result of loss or fragmentation of habitats; or • potential loss of critical habitat; or • potential significant effects on habitat values of a wetland supporting migratory bird species	**Criteria not met.** Whilst growling Grass Frog was detected within the study site the population is not considered to be genetically important nor the habitat within the study site critical to the survival of the species in the broader landscape. Little Eagle is unlikely to be impacted by the Project provided recommendations listed in Section 5 are implemented. A small area (0.134 ha) of the FFG Act-listed Western (Basalt) Plains Grasslands Community is proposed to be removed. This vegetation loss is not considered to be a significant area of the listed community.
potential extensive or major effects on landscape values of regional importance, especially where recognised by a planning scheme overlay or within or adjoining land reserved under the ***National Parks Act 1975***	**Criteria not met.** No significant landscape features or values have been identified within the study site.

Recommendations

A referral under the EE Act is unlikely to be necessary based on the grounds of impacts to ecological matters. Growling Grass Frog was recorded within the study site however the wetland habitat within the site is not considered a significant proportion of known remaining habitat due to its small size and its isolated location.

There are numerous additional referral triggers that are beyond the scope of an ecology assessment (social, economic, emissions, etc). Barwon Water must ensure that ALL referral criteria are addressed to confirm whether a referral under the EE Act is required.

4.2.2. Flora and Fauna Guarantee Act 1988

The ***Flora and Fauna Guarantee Act 1988*** (FFG Act) and ***Flora and Fauna Guarantee Amendment Act 2019*** are the key pieces of Victorian legislation for the conservation of threatened species and communities and for the management of potentially threatening processes.

In performing any of their functions that may reasonably be expected to impact on biodiversity in Victoria, a Minister and public authority must give proper consideration to the objectives of the FFG Act.

A 'permit to take protected flora' is required for impacts to protected flora on Crown land and listed fish on both private and Crown land. A permit is not required under the FFG Act for impacts to terrestrial fauna.

Potential impact

A number of Protected flora species listed under the FFG Act were recorded within the study site (see Section 3.4.2, Table 15) and will be impacted by the proposed works. One threatened ecological community is proposed to be impacted by the Project (See Table 14). Flora species associated with the community also require a permit for removal. One threatened flora species, Giant Honey-myrtle, occurs within the study site, with two naturally recruited individuals proposed to be removed as part of the Project. No other threatened flora species listed under the FFG Act are considered likely to occur within the study site or laydown area.

Recommendations

Removal of FFG Act protected flora species listed in Table 15 (Section 3.4.2) and flora associated with the threatened ecological community will require a 'permit to take protected flora' issued by DEECA.

4.2.3. Fisheries Act 1995

The ***Fisheries Act 1995*** provides a legislative framework for the regulation, management and conservation of fisheries including aquatic habitats within the state of Victoria and is administered by the Victorian Fisheries Authority (VFA).

A general permit (under Section 49 of the ***Fisheries Act*** 1995) is required to take or possess fish for research, education, fish management, aquaculture, compliance or scientific purposes. Translocation approval is also required from the VFA when proposed movement of fish is greater than 500 m.

Potential impact

A population of Short-finned Eel (***Anguilla australis***) is likely to be present within the aquatic habitat of the borrow pit wetland. This population (if present) will require further consideration and planning for capture and relocation during dewatering works, and prior to the construction phase of the Project. The translocation is likely to be in excess of 500 m from the existing wetland.

Recommendations

Given the relocation distance, a translocation permit and associated general permit (both issued by the VFA) will be required to capture and relocated Short-finned Eel. Any CEMP prepared for the Project must detail controls and risks associated with the relocation of this species.

4.2.4. Catchment and Land Protection Act 1994

The key piece of legislation governing the management and classification of noxious weeds and pest animals throughout Victoria is the ***Catchment and Land Protection Act 1984*** (CaLP Act). The Act aims to Project primary production, Crown land, the environment and community health from the effects of noxious weeds and pest animals (Agriculture Victoria 2023). The CaLP Act requires landowners to manage noxious weeds and pest animals on their land. This includes the prevention of spread, direct management or in some instance's eradication of regionally prohibited or controlled weeds and pest animal species on their land (Agriculture Victoria 2023).

Potential impact

Noxious weeds listed under the ***Catchment and Land Protection Act 1994*** (CaLP Act) and/or as a Weed of National Significance (WONS), and pest fauna that were identified within the study site are listed in Table 18.

Table 18: Noxious weeds, WONS and pest fauna identified within the study site

Group	Scientific name	Common name	Listing[1]
Pest flora	***Dittrichia graveolens***	Stinkwort	CaLP (C)
	Lycium ferocissimum	African Box-thorn	CaLP (C), WONS
	Cirsium vulgare	Spear Thistle	CaLP (R)
	Oxalis pes-caprae	Soursob	CaLP (R)
	Nassella trichotoma	Serrated Tussock	CaLP (C), WONS
	Nassella neesiana	Chilean Needle-grass	CaLP (C), WONS
	Rubus fruticosus aggregate	Blackberry	CaLP (C), WONS
Pest fauna	***Oryctolagus cuniculus***	European Rabbit	CaLP (E)

[1] C = Listed as Regionally Controlled under the CaLP Act, R = Listed as Restricted under the CaLP Act

Group	Scientific name	Common name	Listing[1]
	Vulpes vulpes	Red Fox	CaLP (E)

Recommendations

It is recommended that a Construction Environmental Management Plan (CEMP) is developed by the contractor to ensure appropriate risk management measures are implemented during works to comply with the broader objectives of the CaLP Act.

4.2.5. Wildlife Act 1975 and Wildlife Regulations 2013

The ***Wildlife Act 1975*** and Wildlife Regulations 2013 are both Victorian legislation that prevent harm to wildlife. Authorisation is required under the ***Wildlife Act 1975*** to carry out field investigations for the purpose of conserving, monitoring, improvement or maintaining wildlife habitat within Victoria.

Potential impact

A range of common (and threatened) fauna species were identified within the study site.

Recommendations

A permit is required under the ***Wildlife Act 1975*** to carry out field investigations for the purpose of conserving, monitoring, improving or maintaining wildlife habitat within Victoria. This also includes the capture and relocation of wildlife from a particular locality which requires a specific ***Wildlife Act 1975*** permit (authorised by DEECA) for the capture, handling and relocation of wildlife.

Any works requiring the removal of wildlife within or adjoining the study site must be undertaken by suitably qualified and licenced personnel.

4.2.6. Water Act 1989

The ***Water Act 1989*** regulates the management and use of all water under the control of the Crown in Victoria. The Act provides Water Authorities with a range of enforcement powers and imposes obligations on persons and organisations not to interfere with assets of Water Authorities, waterways and water.

Works and activities in, under, on or over the bed and banks of Designated Waterways in Victoria require a Works on Waterways Permit from the relevant Catchment Management Authority. Designated Waterways are declared under the ***Water Act 1989***.

Potential impact

There are no watercourses or designated waterways that may be impacted by the proposed works.

Recommendations

Corangamite CMA is the responsible authority for the control, management and authorisation of works and activities in or over Designated Waterways in the study site.

Approval from Corangamite CMA will not be required for construction activities as they do not adjoin watercourses within the study site.

4.2.7. Planning and Environment Act 1987

The ***Planning and Environment Act 1987*** (P&E Act) governs the planning framework for the use and development of land in Victoria. The P&E Act provides procedures for the preparation and amendment of the Victoria Planning Provisions and the planning schemes. The removal of native vegetation is regulated via specific Clauses in the local planning schemes, which are administered by the relevant Local Government Area (LGA).

The following clauses require consideration when removing vegetation at this location:

- Clause 52.17 (Native vegetation)

Overlays

The local planning schemes regulate the type of use and development that can be implemented in a given area via zones and overlays. Zones specify how the land can be developed or built on and what is prohibited. Overlays set further restrictions on the land in terms of design, vegetation, heritage, flood levels or water catchment.

Potential impact

No overlays pertaining to biodiversity are present within the study site or laydown area.

Recommendations

No further consideration is necessary regarding environmental overlays.

Clause 52.17 and the Guidelines

Clause 52.17 of the local planning schemes specifies the requirement to obtain a planning permit to remove, destroy or lop native vegetation. The ***Guidelines for the removal, destruction or lopping of native vegetation*** (the Guidelines) is an incorporated document that sets out how to assess and compensate for the removal of native vegetation, with native vegetation impact and offset requirements specified in a ***Native vegetation removal report*** (NVR report) provided by DEECA.

Potential impact

The native vegetation impact and offset requirements are specified in the NVR report (Appendix E) and summarised in Table 19.

Table 19: Native vegetation impact and offset requirements

Native vegetation within the study site	Assessment pathway	Detailed Assessment Pathway
	Native vegetation removal extent (ha) total	2.599 ha
	Extent of past removal	0.008 ha
	Extent of proposed removal	2.590 ha
	Large trees (no.)	0
	Location category	2
Offset requirements to remove the native vegetation	Offset type	General
	Offset amount	0.956
	Vicinity	Corangamite Catchment Management Authority (CMA) or City of Greater Geelong Council
	Min. strategic biodiversity value score	0.145
	Large trees (no.)	0
Offset availability	A review of DEECA's online Native Vegetation Credit Register traded credits information (current to 28 February 2024) confirmed that credit sites that meet the above requirements are currently available (Offset Availability Report provided in Appendix F).	

Recommendations

Planning approval from City of Greater Geelong is required to remove, destroy or lop native vegetation under Clause 52.17. Should an approval to remove native vegetation be granted an offset that meets the requirements for its removal must be secured before the native vegetation can be removed.

The Guidelines further specify that an application to remove native vegetation must demonstrate that the three-step approach[2] of avoid, minimise and offset has been applied. An avoid and minimise statement must be prepared to support any application to remove native vegetation.

A response to each of the application requirements under the Guidelines is provided in Table 20.

Table 20: Application requirements under ***Guidelines for the removal, destruction or lopping of native vegetation***

No.	Application requirement	Response
1.	Information about the native vegetation to be removed. ***A NVR report from DEECA systems and tools contains information required to address this application requirement.***	An NVR report is supplied at Appendix D and summarised in Table 19, above. Additional information about native vegetation proposed to be removed is provided in Sections 3.1 and 3.2
2.	Topographic and land information relating to the native vegetation to be removed.	The land has a gentle slope from north to south with no obvious high or low points apart from the undulating terrain where the edge of basins have been constructed. Elevation ranges from around 120 m above sea level in the northern portion of the project area to 110 m in the southern portion
3.	Recent, dated photographs of the native vegetation to be removed.	Photographs of the native vegetation to be removed are provided in Section 3.3.
4.	Details of any other native vegetation approved to be removed, or that was removed without the required approvals, on the same property or on contiguous land in the same ownership as the applicant, in the five year period before the application for a permit is lodged.	One patch of Plains Grassland (0.008 ha in size) has been captured as ***past removal*** on this application, as it is located in the same property under the same ownership of this applicant and pertains to the upgrades required for the Pettavel Basins No. 1 and No. 2.
5.	An avoid and minimise statement.	An Avoid and minimise statement is provided below in Section 4.2.7.1.
6.	A copy of any Property Vegetation Plan contained within an agreement made pursuant to section 69 of the ***Conservation, Forests and Lands Act 1987*** that applies to the native vegetation to be removed.	N/A
7.	Where the removal of native vegetation is to create defendable space, a written statement explaining why the removal of native vegetation is necessary.	N/A
8.	If the application is under Clause 52.16, a statement that explains how the proposal responds to the Native Vegetation Precinct Plan considerations at decision guideline 8.	N/A
9.	An offset statement providing evidence that an offset that meets the offset requirements for the native vegetation to be removed has been identified and can be secured in accordance with the Guidelines.	A review of DEECA's online Native Vegetation Credit Register traded credits information (current to 28 February 2024) confirmed that credit sites that meet the above requirements are currently available (Offset Availability Report provided in Appendix F).
Additional application requirements for applications in the Detailed Assessment Pathway:		
10.	A site assessment report of the native vegetation to be removed, including:	
	A habitat hectare assessment of any patches of native vegetation, including the condition, extent, Ecological Vegetation Class and bioregional conservation status.	A habitat hectare assessment is provided in Appendix A3 and was completed by Arthur Nemet, a Vegetation Quality Assessment DEECA accredited assessor[3]

[2] The ***Guidelines for the removal, destruction or lopping of native vegetation*** describe the three-step approach:

1. **Avoid** the removal, destruction or lopping of native vegetation;
2. **Minimise** impacts from the removal, destruction or lopping of native vegetation that cannot be avoided; and
3. Provide an **offset** to compensate for the biodiversity impact from the removal, destruction or lopping of native vegetation.

[3] Vegetation Quality Assessment list of accredited assessors - updated 29 December 2023:https://www.environment.vic.gov.au/__data/assets/pdf_file/0035/546974/deeca-vegetation-quality-accredited-assessor-list-29Dec2023.pdf

No.	Application requirement	Response
	The location, number, circumference and species of any large trees within patches.	N/A no large trees associated with the Project.
	The location, number, circumference and species of any scattered trees, and whether each tree is small or large.	N/A no scattered trees associated with the Project.
11.	Information about impacts on rare or threatened species habitat. ***A NVR report from DEECA systems and tools contains information required to address this application requirement.***	An NVR report is supplied at Appendix D and summarised in Table 19 above. Species offsets are not required. Additional information about threatened species is provided in Section 3.3.1.

4.2.7.1. Avoid and Minimise Statement

Background: The study site is situated on a 25 ha parcel of land located at the corner of Draytons Road and Reservoir Road, Waurn Ponds, Victoria. This site has historically been used as a Barwon Water storage facility for over 70 years.

Barwon Water currently has two potable water storage basins at the Pettavel Basin site with a combined volume of 100 ML. This site supplies a population of approximately 130,000 in Armstrong Creek, Bellarine and Surf Coast urban growth areas and is forecast to grow to approximately 170,000 by 2041. Due to the rapid development in these areas, the existing 100 ML Pettavel Basin (combined volume) will no longer be capable of meeting the target peak day contingency storage by 2023-2024.

Barwon Water is planning to increase the water storage capacity at the Pettavel Basin site with the addition of a new 100 ML (Basin No.3) basin next to the existing Basin No. 2 at the site. The net capacity of 200 ML storage will provide 0.8 days contingency supply. The purpose of the Project is to increase the reliability and security of water supply for this region through the provision of an additional basin.

The location of the proposed Basin No. 3 has been refined to be located in the most appropriate site to enable functionality of the basins, utilise existing structures where possible (i.e., sharing embankments with Basin No. 2), and to enable the most efficient functionality of the new basin.

Description of works: The new earthen basin will include the following functional requirements:

- Geomembrane liner and cover material to protect the potable water from contamination;
- Geosynthetic underlay to facilitate drainage and protect the liner;
- Extension of existing Basin No.2 access track along the crest of the new embankment;
- New access track around all three basins to accommodate site operation and maintenance requirements, such as new above-ground control valves installed on the inlet pipework; and
- An overflow weir structure and discharge at the north-west corner of the basin.

Impact: The Project will require the removal of native vegetation and fauna habitat to allow the installation of the new basin and associated access tracks, overflow weirs and infrastructure to accommodate site operation and ongoing maintenance requirements (Figure 2B). The planted Radiata Pines that border the west, north and north-east of the site are also required to be removed as the pine needles they drop will damage and impede the new basin functionality. Impacts to native vegetation include the following:

- **Direct removal:** Direct removal is associated with the vegetation and habitat that is required to be completely removed in order to facilitate the installation of Basin No. 3 and associated infrastructure and includes:
  - 0.661 ha of wetland habitat and vegetation (endangered)
  - 0.009 ha of Plains Grassland (EVC 132 – endangered)
  - 1.630 ha of Grassy Woodland (EVC 175 – endangered)

- **Assumed loss (to be retained where possible):** Assumed loss of native vegetation that has been accounted for in the offsets and vegetation removal amounts pertains to the native vegetation patches that occur beneath the planted rows of Radiata Pines (Figure 2B). As the Radiata Pines are required to be removed for the Project, it is possible this will impact the patches of native vegetation persisting beneath them. However, every effort will be made to retain this vegetation during construction, and it is likely that the removal of the Radiata Pines will have an overall benefit on the native vegetation that is able to be retained here (i.e., increases sunlight, resources and space for growth).

  Vegetation that has been assumed lost as part of the Project includes:

  - 0.134 ha of Plains Grassland (EVC 132 – endangered)
  - 0.157 of Grassy Woodland (EVC 175 – endangered).

Avoidance and minimisation: A 100 ML storage is required at the Barwon Water Pettavel site to service future potable water demand in the region. Alternative options to the proposed layout have been explored, and the following outlines key rationale for the chosen option.

- The chosen layout:
  - Protects potable water quality. The layout allows a regular basin geometry, with the inlet and outlet at opposite ends. This allows for a consistent 'contact time' in regard to management of pathogen disinfection.
  - Allows Basin No.3 to share an embankment with Basin No.2, and align the inlet and outlet pipework for each basin. This allows for a more cost-effective design.
  - Is more conducive to the geomembrane liner and cover basin design. The regular geometry of the layout offers more effective and safer design, installation, operation and maintenance of the asset.
  - Has the most efficient cut and fill earthworks balance compared with all other alternatives, and more certainty in regard to useable onsite material for the embankment.
  - Allows the new wetland to be constructed adjacent to and work in conjunction with the site hydrology.
- The only remaining area within the Pettavel site is located toward the western boundary and south-west corner. Alternative options in this area:
  - Still encroach on the existing borrow pit and wetland, and would still impact native vegetation at the site.
  - Require irregular geometry to service the 100ML volume and create risk of stagnated water and inefficient mixing to maintain water quality.

A Growling Grass Frog Management Plan and Construction Environment Management Plan (CEMP) will be developed prior to commencement of construction detailing mitigation measures to alleviate any potential impacts to aquatic fauna and raptor species.

There are no further opportunities to reduce vegetation removal without compromising the scope of the Project.

5 Recommendations

5.1 Recommended mitigation measures

The following measures are recommended to mitigate impacts to biodiversity values:

- Implement findings of the significant impact assessment for Growling Grass Frog (Appendix G), and refer the Project under the EPBC Act;
- Implement the Growling Grass Frog Management Plan (SMEC 2024b), which outlines the details of habitat creation, capture and relocation methods and associated bio-security procedures during construction;
- Retain mature pine trees where possible to allow for future nesting and refuge opportunities for locally common and threatened fauna on site;
- Retain native vegetation underneath mature pine trees that do not require removal to facilitate construction or future operations of the Project site;
- Adhere to the management recommendations outlined in the Project's Raptor Management Plan (SMEC 2024a).
- Following consultation with the Victorian Fisheries Authority undertake dewatering and fauna capture and relocation of Short-finned Eel from the borrow-pit wetland.

5.2 Further requirements

A summary of further assessment and reporting required is provided below:

- Develop a Construction Environmental Management Plan (CEMP) or similar, that addresses at a minimum:
  - Controls and mitigation measures associated with the removal of native vegetation and fauna habitat;
  - Controls and mitigation measures associated with management of raptors species on site, the capture and translocation of aquatic fauna and bio-security procedures;
  - Fauna management procedures for the staging and timing of habitat removals, and requirements for the capture and relocation of common fauna species;
  - Weed control and the obligations of contractors under the CaLP Act; and
  - Sediment and erosion control and rehabilitation measures.
- Assess the Project against the additional ***Environment Effects Act 1978*** referral criteria that are beyond the scope of an ecology assessment (social, economic, emissions, etc) to confirm whether a referral under the Act is required;
- Prepare and submit a planning permit application to the City of Greater Geelong to acquire a permit under Clause 52.17 (native vegetation) and obtain the required offsets prior to the removal of native vegetation;
- Obtain an FFG Act Permit to Take Protected Flora from DEECA prior to the removal of protected flora species; and
- Obtain translocation approval and a Section 49 permit from the Victorian Fisheries Authority prior to dewatering of the wetland and capture and relocation of Short-finned Eel.

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Appendix A – Flora

KEY

Introduced species:

CaLP	***Catchment and Land Protection Act 1994***
CaLP (P)	Listed as prohibited under the CaLP Act
CaLP (C)	Listed as controlled under the CaLP Act
CaLP (R)	Listed as restricted under the CaLP Act
WONS	Weed of National Significance
*	Introduced species
#	Native but may be alien species

Threatened species:

EPBC	Commonwealth ***Environment Protection and Biodiversity Conservation Act 1999***
FFG	***Flora and Fauna Guarantee Act 1988***
CR	Critically Endangered under the EPBC Act
EN	Endangered under the EPBC Act
VU	Vulnerable under the EPBC Act
cr	Critically Endangered under the FFG Act
en	Endangered under the FFG Act
vu	Vulnerable under the FFG Act

A1: Flora species recorded within the study site

Scientific Name	Common Name	Status
Native		
Acacia dealbata	Silver Wattle	
Acacia mearnsii	Black Wattle	
Acacia melanoxylon	Blackwood	
Acacia paradoxa	Hedge Wattle	
Acaena novae-zelandiae	Bidgee-widgee	
Acrotriche serrulata	Honey-pots	
Allocasuarina verticillata	Drooping Sheoak	
Alternanthera denticulata	Lesser Joyweed	
Austrostipa bigeniculata	Kneed Spear-grass	
Austrostipa scabra	Rough Spear-grass	
Austrostipa spp.	Spear Grass	
Bromus spp.	Brome	
Cassinia sifton	Drooping Cassinia	#
Cycnogeton spp.	Water Ribbons	
Dianella revoluta	Black-anther Flax-lily	
Eleocharis acuta	Common Spike-sedge	
Eleocharis sphacelata	Tall Spike-rush	
Eleocharis spp.	Spike Sedge	
Eragrostis brownii	Common Love-grass	
Geranium potentilloides var. ***potentilloides***	Soft Crane's Bill	
Geranium retrorsum	Grassland Crane's Bill	
Gonocarpus tetragynus	Common Raspwort	
Hemarthria uncinata var. ***uncinata***	Mat Grass	
Hydrocotyle laxiflora	Stinking Pennywort	
Hypericum gramineum	Small St John's Wort	
Juncus amabilis	Hollow Rush	

Scientific Name	Common Name	Status
Juncus flavidus	Gold Rush	
Lachnagrostis filiformis	Common Blown-grass	
Lobelia pratioides	Poison Lobelia	
Lomandra filiformis	Wattle Mat-rush	
Melaleuca armillaris subsp. ***armillaris***	Giant Honey-myrtle	en, #
Microlaena stipoides var. ***stipoides***	Weeping Grass	
Myoporum petiolatum	Sticky Boobialla	
Myriophyllum crispatum	Water Milfoil	
Oxalis perennans	Grassland Wood-sorrel	
Poa labillardierei var. ***labillardierei***	Common Tussock-grass	
Rytidosperma duttonianum	Brown-back Wallaby-grass	
Rytidosperma racemosum	Clustered Wallaby-grass	
Rytidosperma spp.	Wallaby Grass	
Samolus repens	Creeping Brookweed	
Schoenoplectus tabernaemontani	River Club-sedge	
Senecio glomeratus	Annual Fireweed	
Solanum aviculare	Kangaroo Apple	
Themeda triandra	Kangaroo Grass	
Tricoryne elatior	Yellow Rush-lily	
Typha domingensis	Narrow-leaf Cumbungi	
Introduced		
Acetosella vulgaris	Sheep Sorrel	
Agrostis capillaris	Brown-top Bent	
Aizoon pubescens	Galenia	
Anthoxanthum odoratum	Sweet Vernal-grass	
Arctotheca calendula	Cape Weed	
Avena spp.	Oat	
Brassica spp.	Turnip	
Briza maxima	Large Quaking-grass	
Cenchrus clandestinus	Kikuyu	
Centaurium spp.	Centaury	
Cerastium glomeratum	Common Mouse-ear Chickweed	
Cirsium vulgare	Spear Thistle	CaLP (C)
Cynodon dactylon var. ***dactylon***	Couch	
Cyperus eragrostis	Drain Flat-sedge	
Dactylis glomerata	Cocksfoot	
Dittrichia graveolens	Stinkwort	CaLP (C)
Echium plantagineum	Paterson's Curse	
Ehrharta erecta	Panic Veldt-grass	
Erigeron bonariensis	Flaxleaf Fleabane	
Fumaria spp.	Fumitory	
Holcus lanatus	Yorkshire Fog	

Scientific Name	Common Name	Status
Hordeum spp.	Barley Grass	
Hypochaeris radicata	Flatweed	
Lactuca serriola	Prickly Lettuce	
Lolium perenne	Perennial Rye-grass	
Lycium ferocissimum	African Box-thorn	WoNS, CaLP (C)
Lysimachia arvensis	Pimpernel	
Malva parviflora	Small-flower Mallow	
Medicago polymorpha	Burr Medic	
Modiola caroliniana	Red-flower Mallow	
Nassella trichotoma	Serrated Tussock	WoNS, CaLP (C)
Nassella neesiana	Chilean Needle-grass	WoNS, CaLP (C)
Oxalis pes-caprae	Soursob	CaLP (R)
Oxalis purpurea	Large-flower Wood-sorrel	
Panicum hillmanii	Hillman's Panic	
Paspalum dilatatum	Paspalum	
Phalaris aquatica	Toowoomba Canary-grass	
Pinus radiata	Radiata Pine	
Plantago coronopus	Buck's-horn Plantain	
Plantago lanceolata	Ribwort	
Romulea rosea	Onion Grass	
Rubus polyanthemos	Blackberry	WoNS, CaLP (C)
Rumex conglomeratus	Clustered Dock	
Solanum nigrum	Black Nightshade	
Sonchus asper	Rough Sow-thistle	
Sonchus oleraceus	Common Sow-thistle	
Sporobolus africanus	Rat-tail Grass	
Symphyotrichum subulatum	Aster-weed	
Trifolium spp.	Clover	
Vicia sativa	Common Vetch	
Vulpia spp.	Fescue	
Yucca gloriosa var***. recurvifolia***	Palm Lily	

A2: Threatened flora likelihood of occurrence and impact

KEY

EPBC	Commonwealth ***Environment Protection and Biodiversity Conservation Act 1999***
FFG	***Flora and Fauna Guarantee Act 1988***
CR	Critically Endangered under the EPBC Act
EN	Endangered under the EPBC Act
VU	Vulnerable under the EPBC Act
cr	Critically Endangered under the FFG Act
en	Endangered under the FFG Act
vu	Vulnerable under the FFG Act

Likelihood of Occurrence (LoO) is determined following methodology provided in Section 2.3.

Likelihood of Impact (LoI) is determined based on the LoO of a species and the potential impacts associated with the Project.

Scientific Name	Common Name	EPBC	FFG	Count of Sightings	Last Record	Source	Habitat Description	Likelihood of Occurrence	Likelihood of Impact
Species considered present within the study site, and further consideration recommended:									
Melaleuca armillaris subsp. ***armillaris***	Giant Honey-myrtle	-	en	22	2018	VBA	**Refer to Section 3.4.2**	Present but not indigenous to study site context.	Two individuals to be removed
Species with suitable habitat recorded within the study site, but considered unlikely to occur and no further consideration required:									
Geranium solanderi var. ***solanderi***	Austral Crane's-bill	-	en	1	2002	VBA	**Refer to Section 3.4.2**	Unlikely, potential habitat recorded, but species is considered unlikely to occur as all ***Geranium*** species were identified to species level and confirmed to be non-threatened species.	Unlikely
Lachnagrostis adamsonii	Adamson's Blown-grass	EN	en	2	2002	VBA, PMST	**Refer to Section 3.4.1**	Unlikely, potential habitat recorded, but species is considered unlikely to occur as all	Unlikely

Scientific Name	Common Name	EPBC	FFG	Count of Sightings	Last Record	Source	Habitat Description	Likelihood of Occurrence	Likelihood of Impact
								Lachnagrostis species recorded within the study site were identified to species level.	
Lachnagrostis robusta	Salt Blown-grass	-	en	5	2008	VBA	**Refer to Section 3.4.2**	Unlikely, potential habitat recorded, but species is considered unlikely to occur as all ***Lachnagrostis*** species recorded within the study site were identified to species level.	Unlikely
Species that are unlikely to occur within the study site and no further assessment is required:									
Acacia cupularis	Cup Wattle	-	cr	2	2004	VBA	Grows in sand or sometimes in dunes or in loam or sandy clay in mallee communities. Mostly coastal or near coastal in its range, in Vic., known only from Wyperfeld, Little Desert.	Unlikely, conspicuous species that was not detected during the site assessment.	Unlikely
Acacia uncifolia	Coast Wirilda	-	en	58	2020	VBA	Occurs from Geelong to Wilsons Promontory, on coastal dunes or near saltmarsh, chiefly on calcareous sand and sandy loam soils.	Unlikely, conspicuous species that was not detected during the site assessment.	Unlikely
Adriana quadripartita	Coast Bitter-bush	-	en	25	2018	VBA	Apart from disjunct inland occurrences at Mt Arapiles and near Ouyen, apparently confined to coastal and near-coastal areas west from Wilsons Promontory.	Unlikely, conspicuous species that was not detected during the site assessment.	Unlikely
Althenia marina	Sea Water-mat	-	cr	9	2005	VBA	Occurs in marine intertidal (mid-eulittoral) areas of western Port Phillip Bay on muddy substrates.	Unlikely, no suitable habitat.	Unlikely
Atriplex paludosa	Marsh Saltbush	-	en	32	2010	VBA	Locally common on fringes of coastal and near coastal	Unlikely, conspicuous species that was	Unlikely

Scientific Name	Common Name	EPBC	FFG	Count of Sightings	Last Record	Source	Habitat Description	Likelihood of Occurrence	Likelihood of Impact
subsp. ***paludosa***							saltmarshes west from Wilsons Promontory.	not detected during the site assessment.	
Amphibromus fluitans	River Swamp Wallaby-grass, Floating Swamp Wallaby-grass	VU	-	-	N/A - PMST only	PMST	Apparently confined to permanent swamps principally along the Murray River Between Wodonga and Echuca, uncommon to rare in the south probably due to alteration of habitat.	Unlikely, no previous records within 10 km of the study site.	Unlikely
Avicennia marina subsp. ***australasica***	Grey Mangrove	-	en	18	2011	VBA	Locally common on tidal mudflats from the western half of Port Phillip bay to Corner Inlet.	Unlikely, conspicuous species that was not detected during the site assessment.	Unlikely
Colobanthus apetalus var. ***apetalus***	Coast Colobanth	-	en	1	1978	VBA	Mostly scattered along the coast, usually on sheltered dune slopes and in dune swales, but rarely common.	Unlikely, conspicuous species that was not detected during the site assessment.	Unlikely
Corybas despectans	Coast Helmet-orchid	-	en	3	2022	VBA	Known from the Portland area in the far west, and an isolated occurrence at Cape Schanck on the Mornington Peninsula. Colony-forming, occurs in sandy soils, often in the shelter of bracken swards.	Unlikely, no suitable habitat.	Unlikely
Corymbia maculata	Spotted Gum	-	vu	3	2016	VBA	Occurring naturally north-west of Orbost.	Unlikely, conspicuous species that was not detected during the site assessment.	Unlikely
Dianella amoena	Matted Flax-lily	EN	cr	-	N/A - PMST only	PMST	Largely confined to drier grassy woodland and grassland communities south of the Dividing Range and now much depleted through its range.	Unlikely, conspicuous species that was not detected during the site assessment.	Unlikely

Scientific Name	Common Name	EPBC	FFG	Count of Sightings	Last Record	Source	Habitat Description	Likelihood of Occurrence	Likelihood of Impact
Dodonaea procumbens	Trailing Hop-bush	VU	-	-	N/A - PMST only	PMST	This species grows in low-lying, often winter-wet areas in woodland, low open forests, healthland and grasslands, on sands and clays. Victorian populations have been recorded in various plant communities including grassy woodland dominated by River Red Gum in western Victoria, heathy dry forest in central Victoria, damp heath in far-western Victoria, and sedge wetland, healthy woodland and damp heathland in eastern Victoria.	Unlikely, conspicuous species that was not detected during the site assessment.	Unlikely
Eucalyptus diversifolia subsp. ***megacarpa***	Coast Gum	-	vu	1	1992	VBA	Victorian occurrences apparently restricted to the Cape Nelson and the Aireys Inlet areas. In Victoria confined to dunes and limestone soils, and is common at Cape Nelson.	Unlikely, conspicuous species that was not detected during the site assessment.	Unlikely
Eucalyptus leucoxylon subsp. ***bellarinensis***	Bellarine Yellow-gum	-	cr	100	2020	VBA	Victorian endemic, occurring along the Bellarine Peninsula only.	Unlikely, conspicuous species that was not detected during the site assessment.	Unlikely
Eucalyptus leucoxylon subsp. ***connata***	Melbourne Yellow-gum	-	en	2	2002	VBA	North-eastern Metropolitan Melbourne distribution.	Unlikely, conspicuous species that was not detected during the site assessment.	Unlikely
Glycine latrobeana	Clover Glycine, Purple Clover	VU	vu	-	N/A - PMST only	PMST	Widespread but of sporadic occurrence and rarely encountered. Grows mainly in grasslands and grassy woodlands.	Unlikely, no previous records within 10 km of the study site.	Unlikely
Heterozostera nigricaulis	Australian Grass-wrack	-	en	23	2010	VBA	Forms large meadows in shallow coastal waters to a depth of c. 15 m.	Unlikely, no suitable habitat.	Unlikely

Scientific Name	Common Name	EPBC	FFG	Count of Sightings	Last Record	Source	Habitat Description	Likelihood of Occurrence	Likelihood of Impact
Heterozostera tasmanica	Eelgrass	-	en	13	2007	VBA	Locally common in shallow coastal waters to a depth of c. 8 cm, in sandy soil.	Unlikely, no suitable habitat.	Unlikely
Lachnagrostis semibarbata var. ***filifolia***	Purple Blown-grass	-	en	1	2002	VBA	Virtually co-extensive with the nominate variety, but known further east near the Gippsland Lakes east of Sale.	Unlikely, no suitable habitat.	Unlikely
Lawrencia spicata	Salt Lawrencia	-	en	18	2017	VBA	An occasional component of saltmarsh communities along the coast, rare in saline depressions and around salt lakes of south-western Victoria.	Unlikely, no suitable habitat.	Unlikely
Lepidium aschersonii	Spiny Peppercress	VU	en	-	N/A - PMST only	PMST	Mostly on heavy clay soil near salt lakes on volcanic plain, but with outlying records from near Lake Omeo.	Unlikely, no suitable habitat.	Unlikely
Lepidium hyssopifolium	Basalt Pepper-cress, Peppercress, Rubble Pepper-cress, Pepperweed	EN		-	N/A - PMST only	PMST	Collected from scattered sites on the volcanic plain, but now much reduced from its former range and recorded recently only from e.g., Moorabool, Winchelsea, Bacchus Marsh, Woodend, Trentham. Most recent collections are from disturbed, rather weedy sites. One collection from near Port Fairy is noteworthy for its occurrence in a slightly saline estuary amongst saltmarsh and fringing sedgeland.	Unlikely, not detected during the site assessment.	Unlikely
Leucochrysum albicans subsp. ***tricolor***	Hoary Sunray, Grassland Paper-daisy	EN	en	-	N/A - PMST only	PMST	Very rare in Victoria, the only recent collections from volcanic grassland remnants in the Wickliffe, Willaura, Streatham, Inverleigh and Creswick districts. All other Victorian collections were made last century from e.g.	Unlikely, no previous records within 10 km of the study site.	Unlikely

Scientific Name	Common Name	EPBC	FFG	Count of Sightings	Last Record	Source	Habitat Description	Likelihood of Occurrence	Likelihood of Impact
							Mt Cole, the Grampians and the Port Fairy district.		
Limonium australe var. ***australe***	Yellow Sea-lavender	-	en	11	2007	VBA	In Victoria apparently confined to mangrove and saltmarsh communities near Point Lonsdale, Western Port, Shallow Inlet and Corner Inlet.	Unlikely, no suitable habitat.	Unlikely
Malva preissiana s.s. (white-flowered coastal form)	Coast Hollyhock	-	en	2	1992	VBA	Locally common in north-western Victoria under favourable conditions, mostly confined to heavy soils prone to inundation; occasional on sand, mainly along the coast, with isolated eastern occurrences beside the Snowy River near the New South Wales border and near Orbost.	Unlikely, conspicuous species not detected during site assessment.	Unlikely
Oxalis rubens	Dune Wood-sorrel	-	en	1	2007	VBA	Largely confined to near-coastal sites, often growing on sand-dunes.	Unlikely, no suitable habitat.	Unlikely
Pimelea spinescens subsp. spinescens	Plains Rice-flower, Spiny Rice-flower, Prickly Pimelea	CR	cr	-	N/A - PMST only	PMST	Grows in grassland or open shrubland on basalt-derived soils west of Melbourne.	Unlikely, not detected during the site assessment.	Unlikely
Poa poiformis var. ***ramifer***	Dune Poa	-	en	7	2020	VBA	Largely co-extensive with var. ***poiformis***, but apparently uncommon. Known from near the tip of Bellarine Peninsula where it occurs further inland.	Unlikely, no suitable habitat.	Unlikely
Prasophyllum spicatum	Dense Leek-orchid	VU	cr	-	N/A - PMST only	PMST	Scattered over coastal and hinterland areas of Victoria but of disjunct occurrence. Found in grasslands, heathlands and heathy	Unlikely, no previous records within 10 km of the study site.	Unlikely

Scientific Name	Common Name	EPBC	FFG	Count of Sightings	Last Record	Source	Habitat Description	Likelihood of Occurrence	Likelihood of Impact
							woodlands on well-drained sand and clay loams.		
Prostanthera nivea var. ***nivea***	Snowy Mint-bush	-	vu	6	2014	VBA	Largely confined to shrubland and open woodland associated with granite outcrops.	Unlikely, conspicuous species not detected during site assessment.	Unlikely
Pterostylis chlorogramma	Green-striped Greenhood	VU	en	-	N/A - PMST only	PMST	Apparently localized in Victoria, but exact range uncertain due to confusion with closely allied species. Grows in moist areas of heathy and shrubby forest, on well-drained soils.	Unlikely	Unlikely
Pterostylis cucullata subsp. ***cucullata***	Leafy Greenhood	VU	en	3	1999	VBA, PMST	Scattered in near coastal scrub, often on sand dunes.	Unlikely	Unlikely
Rhagodia parabolica	Fragrant Saltbush	-	vu	1	2007	VBA	Confined to a few steep rocky slopes and broad ridges between Sunbury and Geelong.	Unlikely, conspicuous species not detected during site assessment.	Unlikely
Roepera billardierei	Coast Twin-leaf	-	en	26	2020	VBA	Found in coastal areas west from Wilsons Promontory where found on dunes and limestone cliffs in scrubby vegetation.	Unlikely, conspicuous species not detected during site assessment.	Unlikely
Salsola tragus subsp. ***pontica***	Coast Saltwort	-	en	2	1990	VBA	Widespread in semi-arid often slightly saline areas, in the north and north-west, occasionally coastal.	Unlikely, conspicuous species not detected during site assessment.	Unlikely
Senecio macrocarpus	Large-fruit Fireweed, Large-fruit Groundsel	VU	cr	-	N/A - PMST only	PMST	Largely confined to ***Themeda*** grasslands on loamy clay soils derived from basalt near Melbourne, west to Skipton area. Also known	Unlikely, conspicuous species not detected during site assessment.	Unlikely

Scientific Name	Common Name	EPBC	FFG	Count of Sightings	Last Record	Source	Habitat Description	Likelihood of Occurrence	Likelihood of Impact
							from auriferous ground near Stawell.		
Senecio psilocarpus	Swamp Fireweed, Smooth-fruited Groundsel	VU	-	-	N/A - PMST only	PMST	Rare in Victoria, restricted to a few herb-rich winter-wet swamps south and west from c. Ballarat, growing on volcanic clays or peat soils.	Unlikely, conspicuous species not detected during site assessment.	Unlikely
Thelymitra epipactoides	Metallic Sun-orchid	EN	en	-	N/A - PMST only	PMST	Usually found in coastal and hinterland areas west from Bairnsdale, but extending well inland in the far-western part of the state. Grows primarily in mesic coastal heathlands, grasslands and woodlands, but is also found in drier inland heathlands, open forests and woodlands. Substrates may be moist or dry sandy loams.	Unlikely, no previous records within 10 km of the study site.	Unlikely
Thelymitra matthewsii	Spiral Sun-orchid	VU	en	-	N/A - PMST only	PMST	Scattered sporadically across southern Vic and extending as far inland as the northern Grampians. Favours open forests and woodlands, where it is found in well-drained sand and clay loams. Grows best in areas where there has been soil disturbance, for example around old quarries and gravel pits, and on road verges, disused tracks or animal trails.	Unlikely, no previous records within 10 km of the study site.	Unlikely
Triglochin minutissima	Tiny Arrowgrass	-	en	6	2007	VBA	Scattered on damp saline soils near salt-lakes and forming part of herbfield in coastal saltmarshes.	Unlikely, no suitable habitat.	Unlikely
Triglochin mucronata	Prickly Arrowgrass	-	en	12	2007	VBA	Occurs in herbfields on damp saline soils of salt-flats and coastal saltmarshes.	Unlikely, no suitable habitat.	Unlikely

Scientific Name	Common Name	EPBC	FFG	Count of Sightings	Last Record	Source	Habitat Description	Likelihood of Occurrence	Likelihood of Impact
Xerochrysum palustre	Swamp Everlasting, Swamp Paper Daisy	VU	cr	-	N/A - PMST only	PMST	Occurs in lowland swamps, usually on black cracking clay soils, scattered from near the South Australian border north-west of Portland to Bairnsdale district, but rare due to habitat depletion.	Unlikely, no previous records within 10 km of the study site.	Unlikely

A3: Vegetation Quality Assessment

Habitat Zone			HZA1-4	HZB1-8
EVC number			VVP_0175_61	VVP_0132_61
Bioregion			Victorian Volcanic Plain	Victorian Volcanic Plain
EVC name			Non-eucalypt Grassy Woodland	Heavier Soils Plains Grassland
Conservation rating within bioregion			Endangered	Endangered
Patch score		***Max.***		
Site Condition	***Large old trees***	***10***	0	Na
	Canopy cover	***5***	5	Na
	Understorey	***25***	10	10
	Lack of weeds	***15***	7	6
	Recruitment	***10***	10	3
	Organic litter	***5***	5	2
	Logs	***5***	0	Na
	Subtotal		**37**	**21**
	Score standardiser		1	1.36
	Total (Subtotal x standardiser)	***75***	**37**	**28.56**
Landscape Value	***Patch size***	***10***	1	1
	Neighbourhood	***10***	0	0
	Distance to core	***5***	0	0
Habitat score		***100***	**38**	**29.56**
Habitat score out of 1 (i.e. ÷100)		***1***	**0.38**	**0.296**

Appendix B - Fauna

KEY

Introduced species:

CaLP	***Catchment and Land Protection Act 1994***
CaLP	Listed as an established pest animal under the CaLP Act
*	Introduced species

Threatened species:

EPBC	Commonwealth ***Environment Protection and Biodiversity Conservation Act 1999***
FFG	***Flora and Fauna Guarantee Act 1988***
CR	Critically Endangered under the EPBC Act
EN	Endangered under the EPBC Act
VU	Vulnerable under the EPBC Act
Mi	Migratory under the EPBC Act
Ma	Marine under the EPBC Act
cr	Critically Endangered under the FFG Act
en	Endangered under the FFG Act
vu	Vulnerable under the FFG Act List

B1: Fauna species recorded within the study site

Common name	Scientific name	Status
Birds		
Australian Magpie	***Gymnorhina tibicen***	
Australian White Ibis	***Threskiornis molucca***	
Australasian Swamphen	***Porphyrio melanotus***	
Brown Thornbill	***Acanthiza pusilla***	
Buff-rumped Thornbill	***Acanthiza reguloides***	
Common Blackbird	***Terdus merula***	*
Common Myna	***Acridotheres tristis***	*
Crested Pigeon	***Ocyphaps lophotes***	
Crimson Rosella	***Platycercus elegans***	
Eastern Rosella	***Platycercus eximius***	
Eurasian Coot	***Fulica atra***	
Eurasian Skylark	***Alauda arvensis***	
European Starling	***Sturnus vulgaris***	
Flame Robin	***Petroica phoenicea***	
Galah	***Eolophus roseicapilla***	
Grey Fantail	***Rhipidura albiscapa***	
Grey Shrike-thrush	***Colluricincla harmonica***	
House Sparrow	***Passer domesticus***	*
Little Eagle	***Hieraaetus morphnoides***	vu
Little Raven	***Corvus mellori***	
Long-billed Corella	***Cacatua tenuirostris***	
Magpie Lark	***Grallina cyanoleuca***	
New Holland Honeyeater	***Phylidonyris novaehollandiae***	
Pied Butcherbird	***Cracticus nigrogularis***	
Rainbow Lorikeet	***Trichoglossus moluccanus***	

Common name	Scientific name	Status
Red Wattlebird	***Anthochaera carunculata***	
Red-rumped Parrot	***Psephotus haematonotus***	
Spotted Pardalote	***Pardalotus punctatus***	
Straw-necked Ibis	***Threskiornis spinicollis***	
Striated Pardalote	***Pardalotus striatus***	
Superb Fairy-wren	***Malurus cyaneus***	
Willie Wagtail	***Rhipidura leucophrys***	
Yellow Thornbill	***Acanthiza nana***	
Amphibians		
Eastern Brown Tree Frog	***Litoria ewingii***	
Growling Grass Frog	***Litoria raniformis***	VU, vu
Invertebrates		
Brown-tail Moth	***Euproctis chrysorrhoea***	
Mammals		
European Rabbit	***Oryctolagus cuniculus***	CaLP (E)*
Red Fox	***Vulpes vulpes***	CaLP (E)*

B2: Threatened fauna likelihood of occurrence and impact

KEY

EPBC	Commonwealth ***Environment Protection and Biodiversity Conservation Act 1999***
FFG	***Flora and Fauna Guarantee Act 1988***
CR	Critically Endangered under the EPBC Act
EN	Endangered under the EPBC Act
VU	Vulnerable under the EPBC Act
cr	Critically Endangered under the FFG Act
en	Endangered under the FFG Act
vu	Vulnerable under the FFG Act

Likelihood of Occurrence (LoO) is determined following methodology provided in Section 2.3.

Likelihood of Impact (LoI) is determined based on the LoO of a species and the potential impacts associated with the Project.

Common Name	*Scientific Name*	EPBC	FFG	MiMa	No. Records	Last Record	Source	Habitat description	Likelihood of Occurrence	Likelihood of Impact
Species with potential to be impacted by the Project:										
Growling Grass Frog	***Litoria raniformis***	VU	vu	-	5	2019	VBA, PMST	**Refer to Section 3.4.1**	Present, species detected within borrow pit wetland during targeted surveys.	Likely
Little Eagle	***Hieraaetus morphnoides***		vu	-	54	2019	VBA	**Refer to Section 3.4.2**	Present, may utilise woodland habitat and planted pines for foraging and roosting.	Possible
Suitable habitat present, however, species unlikely to be impacted by project and no further consideration is necessary:										
Blue-billed Duck	***Oxyura australis***		vu	-	5	2019	VBA	**Refer to Section 3.4.2** Prefers large, deep open freshwater lakes and dams with dense vegetated margins for breeding.	Possible, utilised wetland for foraging, but unlikely to be impacted by the Project.	Unlikely

Common Name	*Scientific Name*	EPBC	FFG	MiMa	No. Records	Last Record	Source	Habitat description	Likelihood of Occurrence	Likelihood of Impact
Blue-winged Parrot	***Neophema chrysostoma***	VU	vu	--	5	2019	VBA, PMST	**Refer to Section 3.4.1**	Possible, but unlikely to be impacted by the Project.	Unlikely
Freckled Duck	***Stictonetta naevosa***		en	-	10	2019	VBA	**Refer to Section 3.4.2** Prefers large, deep open freshwater lakes and dams with dense vegetated margins for breeding.	Possible, utilises wetland for foraging, but unlikely to be impacted by the Project.	Unlikely
Gang-gang Cockatoo	***Callocephalon fimbriatum***	EN	en	-	313	2021	VBA, PMST	**Refer to Section 3.4.1**	Possible, may utilise woodland habitat for foraging.	Unlikely
Hardhead	***Aythya australis***		vu	-	81	2019	VBA	**Refer to Section 3.4.2** Prefers large, deep open freshwater lakes and dams with dense vegetated margins for breeding.	Possible, utilises wetland for foraging, but unlikely to be impacted by the Project.	Unlikely
Latham's Snipe, Japanese Snipe	***Gallinago hardwickii***	VU	-	Mi/Ma	90	2020	VBA, PMST	**Refer to Section 3.4.1**	Possible, utilises wetland for foraging not detected during targeted surveys.	Unlikely
Musk Duck	***Biziura lobata***		vu	-	10	2019	VBA	**Refer to Section 3.4.2** Prefers large, deep open freshwater lakes and dams with dense vegetated margins for breeding.	Possible, utilises wetland for foraging, but unlikely to be impacted by the Project.	Unlikely
White-throated Needletail	***Hirundapus caudacutus***	VU	vu	Mi/Ma	23	2019	VBA, PMST	**Refer to Section 3.4.1**	Possible, aerial flyover only.	Unlikely

Common Name	*Scientific Name*	EPBC	FFG	MiMa	No. Records	Last Record	Source	Habitat description	Likelihood of Occurrence	Likelihood of Impact
Species unlikely to occur or be impacted by the Project:										
Australasian Bittern	***Botaurus poiciloptilus***	EN	cr	-	-	N/A - PMST Only	PMST	Frequents wetlands with dense reedbeds, and other vegetation in water such as cumbungi, lignum, rushes and sedges.	Unlikely	Unlikely
Australasian Shoveler	***Spatula rhynchotis***		vu	-	3	2017	VBA	Prefers large, deep open freshwater lakes and dams with dense vegetated margins for breeding.	Unlikely	Unlikely
Australian Fairy Tern	***Sternula nereis nereis***	VU	cr	-	-	N/A - PMST Only	PMST	The Fairy Tern is found on coastal beaches, inshore and offshore islands, sheltered inlets, sewage farms, harbours, estuaries and lagoons. They nest above the high-tide mark on sandy beaches, spits or ridges, laying their one or two speckled eggs in a shallow scrape in the sand, sometimes lined with small shells or seaweed	Unlikely	Unlikely
Australian Grayling	***Prototroctes maraena***	VU	en	-	17	1998	VBA, PMST	Occurs within streams and rivers in both fresh and brackish water environments. Larvae and early juvenile stages occur out at sea, before juveniles return to freshwater environments.	Unlikely	Unlikely
Australian Painted Snipe	***Rostratula australis***	EN	cr	Ma	-	N/A - PMST Only	PMST	Inhabits many different types of shallow, brackish or freshwater terrestrial wetlands. Suitable wetlands usually support a mosaic of low, patchy vegetation, as well as lignum and canegrass.	Unlikely	Unlikely
Barking Owl	***Ninox connivens***		cr	-	2	2000	VBA	Occurs in open woodlands and open forests, including Box Ironbark and riparian	Unlikely	Unlikely

Common Name	*Scientific Name*	EPBC	FFG	MiMa	No. Records	Last Record	Source	Habitat description	Likelihood of Occurrence	Likelihood of Impact
								River Red Gum habitats, as well as some foothill habitats on granitic slopes.		
Black Falcon	***Falco subniger***		cr	-	11	2015	VBA	Found along tree-lined watercourses and in isolated woodlands, mainly in arid and semi-arid areas. It roosts in trees at night and often on power poles by day.	Unlikely	Unlikely
Black-faced Monarch	***Monarcha melanopsis***	-	-	Mi/Ma	-	N/A - PMST Only	PMST	The Black-faced Monarch is found in rainforests, eucalypt woodlands, coastal scrub and damp gullies. It may be found in more open woodland when migrating.	Unlikely, no suitable habitat or previous records within 10 km of the study site.	Unlikely
Brolga	***Antigone rubicunda***		en	-	3	2020	VBA	Inhabits large open wetlands, grassy plains, coastal mudflats and irrigated croplands and, less frequently, mangrove-studded creeks and estuaries.	Unlikely	Unlikely
Brown Treecreeper	***Climacteris picumnus***	VU		-	3	2004	VBA	Brown treecreepers (south-eastern) occupy dry open eucalypt forests and woodlands. The subspecies mainly inhabits woodlands dominated by stringybarks or other rough-barked eucalypts, usually with an open grassy understorey, sometimes with one or more shrub species. They also occur in mallee, forests and woodlands subject to periodic inundation, e.g., river red gum (Eucalyptus camaldulensis) woodlands with an open understorey of acacias, saltbush, lignum, cumbungi and grasses in the upper Murray River.	Unlikely	Unlikely

Common Name	*Scientific Name*	EPBC	FFG	MiMa	No. Records	Last Record	Source	Habitat description	Likelihood of Occurrence	Likelihood of Impact
Brown Treecreeper (south-eastern)	***Climacteris picumnus victoriae***	VU	-	-	-	N/A - PMST Only	PMST	The subspecies mainly inhabits woodlands dominated by stringybarks or other rough-barked eucalypts, usually with an open grassy understorey, sometimes with one or more shrub species. They also occur in mallee, forests and woodlands subject to periodic inundation, e.g., river red gum (Eucalyptus camaldulensis) woodlands with an open understorey of acacias, saltbush, lignum, cumbungi and grasses in the upper Murray River	Unlikely, no suitable habitat or previous records within 10 km of the study site.	Unlikely
Caspian Tern	***Hydroprogne caspia***		vu	Mi/Ma	14	1999	VBA	Prefers coastal habitats. May be found inland in larger wetlands and major river systems with clear water.	Unlikely	Unlikely
Common Greenshank, Greenshank	***Tringa nebularia***	EN	en	Mi/Ma	-	N/A - PMST Only	PMST	Occur both on the coast and inland, in estuaries and mudflats, mangrove swamps and lagoons, and in billabongs, swamps, sewage farms and flooded crops.	Unlikely, no suitable habitat or previous records within 10 km of the study site.	Unlikely
Common Sandpiper	***Actitis hypoleucos***	-	vu	Mi/Ma	-	N/A - PMST Only	PMST	Found on intertidal mudflats of estuaries, lagoons, mangroves, as well as beaches, rocky shores and around lakes, dams and floodwaters.	Unlikely, no suitable habitat or previous records within 10 km of the study site.	Unlikely
Curlew Sandpiper	***Calidris ferruginea***	CR	cr	Mi/Ma	-	N/A - PMST Only	PMST	Found on intertidal mudflats of estuaries, lagoons, mangroves, as well as beaches, rocky shores and around lakes, dams and floodwaters.	Unlikely, no suitable habitat or previous records within 10 km of the study site.	Unlikely

Common Name	*Scientific Name*	EPBC	FFG	MiMa	No. Records	Last Record	Source	Habitat description	Likelihood of Occurrence	Likelihood of Impact
Diamond Firetail	***Stagonopleura guttata***	VU	vu	-	2	2018	VBA, PMST	Found in open grassy woodland, heath and farmland or grassland with scattered trees.	Unlikely	Unlikely
Eastern Curlew, Far Eastern Curlew	***Numenius madagascariensis***	CR	cr	Mi/Ma	-	N/A - PMST Only	PMST	Found on intertidal mudflats and sandflats, often with beds of seagrass, on sheltered coasts, especially estuaries, mangrove swamps, bays, harbours and lagoons.	Unlikely, no suitable habitat or previous records within 10 km of the study site.	Unlikely
Fork-tailed Swift	***Apus pacificus***	-	-	Mi/Ma	2	1989	VBA, PMST	They spend most of their time in the air and roost on cliffs or walls.	Unlikely	Unlikely
Golden Sun Moth	***Synemon plana***	VU	vu	-	-	N/A - PMST Only	PMST	Occurs in grassland dominated by wallaby grasses (Rytidosperma spp.) or Chilean Needle Grass (Nassella neesiana).	Unlikely, no suitable habitat or previous records within 10 km of the study site.	Unlikely
Greater Sand Plover, Large Sand Plover	***Charadrius leschenaultii***	VU	vu	Mi/Ma	-	N/A - PMST Only	PMST	Occurring mainly on sheltered sandy, shelly or muddy beaches or estuaries with large intertidal mudflats or sandbanks.	Unlikely, no suitable habitat or previous records within 10 km of the study site.	Unlikely
Grey Falcon	***Falco hypoleucos***	VU	vu	-	-	N/A - PMST Only	PMST	Usually restricted to shrubland, grassland and wooded watercourses of arid and semi-arid regions, although it is occasionally found in open woodlands near the coast.	Unlikely, no suitable habitat or previous records within 10 km of the study site.	Unlikely
Grey Goshawk	***Accipiter novaehollandiae***		en	-	33	2021	VBA	Found in most forest types, especially tall closed forests, including rainforests.	Unlikely, no suitable habitat.	Unlikely

Common Name	*Scientific Name*	EPBC	FFG	MiMa	No. Records	Last Record	Source	Habitat description	Likelihood of Occurrence	Likelihood of Impact
Grey-headed Flying-fox	***Pteropus poliocephalus***	VU	vu	-	10	2021	VBA, PMST	Widely distributed across eastern Australia feeding on nectar from a variety of eucalypt species and fruits in rainforest habitats and farmland.	Unlikely, no suitable habitat.	Unlikely
Hairy Burrowing Crayfish	***Engaeus sericatus***		vu	-	3	2008	VBA	Occur within the banks of freshwater streams.	Unlikely, no suitable habitat.	Unlikely
Large River Damselfly	***Caliagrion billinghursti***		vu	-	1	1992	VBA	Has a restricted distribution being recorded from only four Victorian localities (all near Alexandra).The last Victorian records of the Riverdamsel were from 196 (Endersby 21)	Unlikely, no suitable habitat.	
Little Egret	***Egretta garzetta***		en	-	6	2019	VBA	Frequents tidal mudflats, saltwater and freshwater wetlands, and mangroves.	Unlikely, no suitable habitat.	Unlikely
Long-nosed Potoroo (southern mainland)	***Potorous tridactylus trisulcatus***	VU	vu	-	-	N/A - PMST Only	PMST	Occurs in a range of vegetation types characterized by dense understoreys, including shrublands, coastal scrub, heathlands, forest and woodlands, and rainforests. It is often most likely to occur near creeks or gullies. Optimal habitat often includes a mosaic of different vegetation types, with denser vegetation used for shelter and more open areas for foraging.	Unlikely, no suitable habitat or previous records within 10 km of the study site.	Unlikely
Magpie Goose	***Anseranas semipalmata***		vu	-	1	2017	VBA	Frequents floodplains and wet grasslands. Some individuals may be seen at quite long distances inland.	Unlikely, no suitable habitat.	Unlikely
New Holland Mouse	***Pseudomys novaehollandiae***	VU	en	-	1	1985	VBA, PMST	Occurs in heathland, heathy woodland and vegetated coastal dunes on sandstone country.	Unlikely, no suitable habitat.	Unlikely

Common Name	*Scientific Name*	EPBC	FFG	MiMa	No. Records	Last Record	Source	Habitat description	Likelihood of Occurrence	Likelihood of Impact
Orange-bellied Parrot	***Neophema chrysogaster***	CR	cr	Ma	-	N/A - PMST Only	PMST	Migrate to mainland Australia in winter. Found exclusively in Coastal and sub-coastal areas in association with saltmarshes, littoral heathlands, low scrublands in addition to grassy areas.	Unlikely, no suitable habitat or previous records within 10 km of the study site.	Unlikely
Osprey	***Pandion haliaetus***	-	-	Mi	-	N/A - PMST Only	PMST	Osprey have a large home-range. The speces is a fish-eating bird of prey and utilises a wide variety of habitat. Breeding is typically near water where food resources are available.	Unlikely, no suitable habitat or previous records within 10 km of the study site.	Unlikely
Painted Honeyeater	***Grantiella picta***	VU	vu	-	-	N/A - PMST Only	PMST	Occurs in box-gum woodland and box-ironbark forests with high presence of mistletoe for foraging.	Unlikely, no suitable habitat or previous records within 10 km of the study site.	Unlikely
Pectoral Sandpiper	***Calidris melanotos***	-	-	Mi/Ma	-	N/A - PMST Only	PMST	Pectoral Sandpiper prefers shallow fresh to saline wetlands. The species is found at coastal lagoons, estuaries, bays, swamps, lakes, inundated grasslands, saltmarshes, river pools, creeks, floodplains and artificial wetlands.	Unlikely, no suitable habitat or previous records within 10 km of the study site.	Unlikely
Plains-wanderer	***Pedionomus torquatus***	CR	cr	-	-	N/A - PMST Only	PMST	Inhabits open, sparse swards and grasslands. Now mostly restricted to the Victorian Northern Plains. Does not persist in areas of improved pasture or if grass cover becomes too thick.	Unlikely, no suitable habitat or previous records within 10 km of the study site..	Unlikely
Platypus	***Ornithorhynchus anatinus***		vu	-	12	2019	VBA	Platypus is endemic to Australia and is dependent on rivers, streams and bodies of freshwater. They feed in both slow-moving	Unlikely, no suitable habitat.	Unlikely

Common Name	*Scientific Name*	EPBC	FFG	MiMa	No. Records	Last Record	Source	Habitat description	Likelihood of Occurrence	Likelihood of Impact
								and rapid (riffle) parts of streams, but show preference to coarser bottom substrates, particularly cobbles and gravel. When not foraging, the Platypus spends most of the time in its burrow in the bank of the river, creek or a pond.		
Plumed Egret	***Ardea intermedia plumifera***		cr	-	3	2001	VBA	Can be found at wetlands throughout the northern third of the continent as well as the eastern third. Mostly a denizen of the shallows in terrestrial wetlands, it prefers freshwater swamps, billabongs, floodplains and wet grasslands with dense aquatic vegetation, and is only occasionally seen in estuarine or intertidal habitats.	Unlikely, no suitable habitat.	Unlikely
Powerful Owl	***Ninox strenua***		vu	-	1	2007	VBA	Found in open forests and woodlands, as well as along sheltered gullies in wet forests with dense understoreys, especially along watercourses. Needs old growth trees to nest.	Unlikely, no suitable habitat.	Unlikely
Red Knot, Knot	***Calidris canutus***	VU	en	Mi/Ma	-	N/A - PMST Only	PMST	Gather in large flocks on the coast in sandy estuaries with tidal mudflats.	Unlikely, no suitable habitat or previous records within 10 km of the study site.	
Regent Honeyeater	***Anthochaera phrygia***	CR	cr	-	-	N/A - PMST Only	PMST	Occurs in dry open forest or woodlands comprising ironbarks, Yellow Box, White and Yellow Gum.	Unlikely, no suitable habitat or previous records within 10 km of the study site.	Unlikely

Common Name	*Scientific Name*	EPBC	FFG	MiMa	No. Records	Last Record	Source	Habitat description	Likelihood of Occurrence	Likelihood of Impact
Rufous Bristlebird (Otway)	***Dasyornis broadbenti caryochrous***		vu	-	2	2000	VBA	Usually inhabit dense shrubland, including heathland, usually where a high diversity of plant species grow; some occur in forests where there is a dense understorey of shrubs or bracken.	Unlikely, no suitable habitat.	Unlikely
Rufous Fantail	***Rhipidura rufifrons***	-	-	Mi/Ma	6	2019	VBA, PMST	The Rufous Fantail is found in rainforest, dense wet forests, swamp woodlands and mangroves, preferring deep shade, and is often seen close to the ground. During migration, it may be found in more open habitats or urban areas.	Unlikely, no suitable habitat.	Unlikely
Satin Flycatcher	***Myiagra cyanoleuca***	-	-	Mi/Ma	4	2015	VBA, PMST	The Satin Flycatcher is found in tall forests, preferring wetter habitats such as heavily forested gullies, but not rainforests.	Unlikely, no suitable habitat.	Unlikely
Sharp-tailed Sandpiper	***Calidris acuminata***	VU	-	Mi/Ma	1	2016	VBA, PMST	Sharp-tailed Sandpiper prefers the grassy edges of shallow inland freshwater wetlands. It is also found around sewage farms, flooded fields, mudflats, mangroves, rocky shores and beaches. Its breeding habitat in Siberia is the peat-hummock and lichen tundra of the high Arctic.	Unlikely, no suitable habitat.	Unlikely
South-eastern Hooded Robin, Hooded Robin (south-eastern)	***Melanodryas cucullata cucullata***	EN	vu	-	-	N/A - PMST Only	PMST	Prefer dry eucalypt and acacia woodlands and shrublands with an open understorey, some grassy areas and a complex ground layer. They avoid woodlands with tall trees or dense tree cover but sometimes occur in tall, dense heaths with scattered open areas. While	Unlikely, no suitable habitat or previous records within 10 km of the study site.	Unlikely

Common Name	*Scientific Name*	EPBC	FFG	MiMa	No. Records	Last Record	Source	Habitat description	Likelihood of Occurrence	Likelihood of Impact
								they can occur in patches as small as 2.9 ha		
Southern Brown Bandicoot	***Isoodon obesulus obesulus***	EN	en	-	2	1981	VBA, PMST	Occurs in scrubby habitats with dense, low ground and shrub cover.	Unlikely, no suitable habitat.	Unlikely
Southern Whiteface	***Aphelocephala leucopsis***	VU	-	-	-	N/A - PMST Only	PMST	Southern whitefaces live in a wide range of open woodlands and shrublands where there is an understorey of grasses or shrubs, or both. These areas are usually in habitats dominated by acacias or eucalypts on ranges, foothills and lowlands, and plains.	Unlikely, no suitable habitat.	Unlikely
Spot-tailed Quoll, Spotted-tail Quoll, Tiger Quoll (southeastern mainland population)	***Dasyurus maculatus maculatus (SE mainland population)***	EN		0	-	N/A - PMST Only	PMST	The Spotted-tailed Quoll is a mainly forest dependent species but occurs in a variety of habitats including closed forests (including temperate and sub-tropical rainforest), tall eucalypt forests, open woodlands, open forests, drier rainshadow woodlands and coastal heathlands	Unlikely, no suitable habitat or previous records within 10 km of the study site.	Unlikely
Striped Legless Lizard, Striped Snake-lizard	***Delma impar***	VU	en	-	-	N/A - PMST Only	PMST	Occurs in tussock grasslands with cracking clay soils and imbedded rock.	Unlikely, no suitable habitat or previous records within 10 km of the study site.	Unlikely
Swamp Antechinus (mainland)	***Antechinus minimus maritimus***	VU	vu	-	-	N/A - PMST Only	PMST	Habitat includes damp areas with dense vegetation cover such as wet heathlands, sedgelands, damp gullies, swamps and tussock grasslands.	Unlikely, no suitable habitat or previous records within 10 km of the study site.	Unlikely

Common Name	*Scientific Name*	EPBC	FFG	MiMa	No. Records	Last Record	Source	Habitat description	Likelihood of Occurrence	Likelihood of Impact
Swamp Skink, Eastern Mourning Skink	***Lissolepis coventryi***	EN	en	-	-	N/A - PMST Only	PMST	Occurs in densely vegetated habitats near creeks and wetlands including swamp scrub and coastal scrub.	Unlikely, no suitable habitat.	Unlikely
Swift Parrot	***Lathamus discolor***	CR	cr	Ma	25	2021	VBA, PMST	Migrates to mainland Australia in winter. Forages in dry sclerophyll forests and woodlands, suburban parks and gardens and flowering fruit trees.	Unlikely, no suitable habitat.	Unlikely
Victorian Grassland Earless Dragon	***Tympanocryptis pinguicolla***	CR	cr	-	-	N/A - PMST Only	PMST	Thought to be extinct from Victoria. Occurs in open, short grasslands dominated by native grass species with scattered rocks.	Unlikely, no suitable habitat or previous records within 10 km of the study site.	Unlikely
Western Burrowing Crayfish	***Engaeus merosetosus***		en	-	5	2014	VBA	Occur underground in burrows in riverbanks and ephemeral streams.	Unlikely, no suitable habitat.	Unlikely
White-bellied Sea-Eagle	***Haliaeetus leucogaster***		en	Ma	2	2017	VBA	Commonly found in coastal and near coastal areas of Australia. Normally seen perched high in a tree or soaring over waterways and adjacent land.	Unlikely, no suitable habitat.	Unlikely
White-faced Storm-Petrel	***Pelagodroma marina***		en	-	1	2020	VBA	Breeds on remote islands in the south Atlantic, Australia and New Zealand. It spends the rest of the year at sea.	Unlikely, no suitable habitat.	Unlikely
Yarra Pygmy Perch	***Nannoperca obscura***	EN	vu	-	28	2022	VBA, PMST	Typically occurs in lakes, ponds and slow-flowing rivers and is usually associated with large amounts of aquatic vegetation.	Unlikely, no suitable habitat.	Unlikely
Yellow Wagtail	***Motacilla flava***	-	-	Mi/Ma	-	N/A - PMST Only	PMST	Habitat requirements for the Yellow Wagtail are highly variable, but typically include open grassy flats near water. Habitats include open areas with low	Unlikely, no suitable habitat.	Unlikely

Common Name	*Scientific Name*	EPBC	FFG	MiMa	No. Records	Last Record	Source	Habitat description	Likelihood of Occurrence	Likelihood of Impact
								vegetation such as grasslands, airstrips, pastures, sports fields; damp open areas such as muddy or grassy edges of wetlands, rivers, irrigated farmland, dams, waterholes; sewage farms, sometimes utilise tidal mudflats and edges of mangroves.		
Yellow-bellied Glider (south-eastern)	***Petaurus australis australis***	VU	vu	-	-	N/A - PMST Only	PMST	The yellow-bellied glider (south-eastern) occurs in eucalypt-dominated woodlands and forests, including both wet and dry sclerophyll forests	Unlikely, no suitable habitat.	Unlikely

Appendix C - Communities

C1: EPBC Act-listed communities listed on the PMST database

EPBC Act-listed community	Conservation status	Corresponding Ecological Vegetation Class in study site	Present in study site
Natural Temperate Grassland of the Victorian Volcanic Plain	Critically Endangered	Heavier-soils Plains Grassland - EVC 132_61	Not present – patches do not meet minimum size requirement
Natural Damp Grassland of the Victorian Coastal Plains	Critically Endangered	Heavier-soils Plains Grassland - EVC 132_61	Not present – Site is not located within the South East Coastal Plain IBRA bioregion.
Grassy Eucalypt Woodland of the Victorian Volcanic Plain	Critically Endangered	None	Not present
White Box-Yellow Box-Blakely's Red Gum Grassy Woodland and Derived Native Grassland	Critically Endangered	None	Not present

Appendix D – Native Vegetation Removal Report

Native vegetation removal report

This report provides information to support an application to remove, destroy or lop native vegetation in accordance with the *Guidelines for the removal, destruction or lopping of native vegetation*. The report **is not an assessment by DELWP** of the proposed native vegetation removal. Native vegetation information and offset requirements have been determined using spatial data provided by the applicant or their consultant.

Date of issue: **28/02/2024**
Time of issue: **11:52 am**

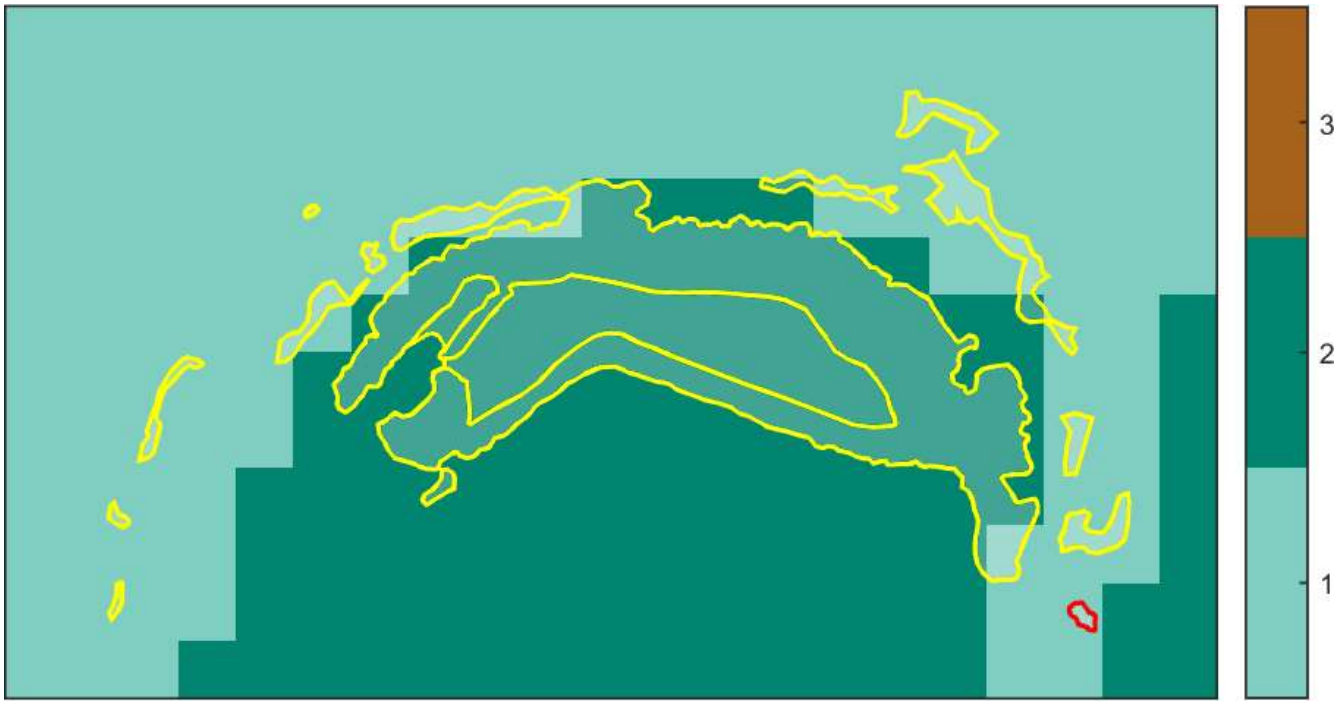
Report ID: SME_2024_007

Project ID	Pettavel_NVR_V2

Assessment pathway

Assessment pathway	**Detailed Assessment Pathway**
Extent including past and proposed	2.599 ha
Extent of past removal	0.008 ha
Extent of proposed removal	2.590 ha
No. Large trees proposed to be removed	0
Location category of proposed removal	Location 2 The native vegetation is in an area mapped as an endangered Ecological Vegetation Class (as per the statewide EVC map). Removal of less than 0.5 hectares of native vegetation in this location will not have a significant impact on any habitat for a rare or threatened species.

1. Location map



Offset requirements if a permit is granted

Any approval granted will include a condition to obtain an offset that meets the following requirements:

General offset amount[1]	0.956 general habitat units
Vicinity	Corangamite Catchment Management Authority (CMA) or Greater Geelong City Council
Minimum strategic biodiversity value score[2]	0.145
Large trees	0 large trees

NB: values within tables in this document may not add to the totals shown above due to rounding

Appendix 1 includes information about the native vegetation to be removed

Appendix 2 includes information about the rare or threatened species mapped at the site.

Appendix 3 includes maps showing native vegetation to be removed and extracts of relevant species habitat importance maps

1 The general offset amount required is the sum of all general habitat units in Appendix 1.

2 Minimum strategic biodiversity score is 80 per cent of the weighted average score across habitat zones where a general offset is required

Next steps

Any proposal to remove native vegetation must meet the application requirements of the Detailed Assessment Pathway and it will be assessed under the Detailed Assessment Pathway.

If you wish to remove the mapped native vegetation you are required to apply for a permit from your local council. Council will refer your application to DELWP for assessment, as required. **This report is not a referral assessment by DELWP.**

This *Native vegetation removal report* must be submitted with your application for a permit to remove, destroy or lop native vegetation.

Refer to the *Guidelines for the removal, destruction or lopping of native* vegetation (the Guidelines) for a full list of application requirements This report provides information that meets the following application requirements:

- The assessment pathway and reason for the assessment pathway
- A description of the native vegetation to be removed (partly met)
- Maps showing the native vegetation and property (partly met)
- Information about the impacts on rare or threatened species.
- The offset requirements determined in accordance with section 5 of the Guidelines that apply if approval is granted to remove native vegetation.

Additional application requirements must be met including:

- Topographical and land information
- Recent dated photographs
- Details of past native vegetation removal
- An avoid and minimise statement
- A copy of any Property Vegetation Plan that applies
- A defendable space statement as applicable
- A statement about the Native Vegetation Precinct Plan as applicable
- A site assessment report including a habitat hectare assessment of any patches of native vegetation and details of trees
- An offset statement that explains that an offset has been identified and how it will be secured.

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Authorised by the Victorian Government, 8 Nicholson Street, East Melbourne.

For more information contact the DELWP Customer Service Centre 136 186

www.delwp.vic.gov.au

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This publication may be of assistance to you but the State of Victoria and its employees do not guarantee that the publication is without flaw of any kind or is wholly appropriate for your particular purposes and therefore disclaims all liability for any error, loss or other consequence which may arise from you relying on any information in this publication.

Obtaining this publication does not guarantee that an application will meet the requirements of Clauses 52.16 or 52.17 of the Victoria Planning Provisions and Victorian planning schemes or that a permit to remove native vegetation will be granted.

Notwithstanding anything else contained in this publication, you must ensure that you comply with all relevant laws, legislation, awards or orders and that you obtain and comply with all permits, approvals and the like that affect, are applicable or are necessary to undertake any action to remove, lop or destroy or otherwise deal with any native vegetation or that apply to matters within the scope of Clauses 52.16 or 52.17 of the Victoria Planning Provisions and Victorian planning schemes.

Appendix 1: Description of native vegetation to be removed

The species-general offset test was applied to your proposal. This test determines if the proposed removal of native vegetation has a proportional impact on any rare or threatened species habitats above the species offset threshold. The threshold is set at 0.005 per cent of the mapped habitat value for a species. When the proportional impact is above the species offset threshold a species offset is required. This test is done for all species mapped at the site. Multiple species offsets will be required if the species offset threshold is exceeded for multiple species.

Where a zone requires species offset(s), the species habitat units for each species in that zone is calculated by the following equation in accordance with the Guidelines:

Species habitat units = extent x condition x species landscape factor x 2, where the species landscape factor = 0.5 + (habitat importance score/2)

The species offset amount(s) required is the sum of all species habitat units per zone

Where a zone does not require a species offset, the general habitat units in that zone is calculated by the following equation in accordance with the Guidelines:

General habitat units = extent x condition x general landscape factor x 1.5, where the general landscape factor = 0.5 + (strategic biodiversity value score/2)

The general offset amount required is the sum of all general habitat units per zone.

Native vegetation to be removed

Information provided by or on behalf of the applicant in a GIS file							Information calculated by EnSym					
Zone	**Type**	**BioEVC**	**BioEVC conservation status**	**Large tree(s)**	**Partial removal**	**Condition score**	**Polygon Extent**	**Extent without overlap**	**SBV score**	**HI score**	**Habitat units**	**Offset type**
PB-B1	Patch	vvp_0132_61	Endangered	0	no	0.296	0.038	0.038	0.370		0.011	General
PB-A4	Patch	vvp_0175_61	Endangered	0	no	0.380	0.102	0.102	0.132		0.033	General
PB-A3	Patch	vvp_0175_61	Endangered	0	no	0.380	0.039	0.039	0.100		0.012	General
PB-B3	Patch	vvp_0132_61	Endangered	0	no	0.296	0.007	0.007	0.410		0.002	General
PB-B4	Patch	vvp_0132_61	Endangered	0	no	0.296	0.002	0.002	0.410		0.001	General
PB-B5	Patch	vvp_0132_61	Endangered	0	no	0.296	0.030	0.030	0.410		0.009	General
PB-B7	Patch	vvp_0132_61	Endangered	0	no	0.296	0.019	0.019	0.464		0.006	General

Information provided by or on behalf of the applicant in a GIS file							Information calculated by EnSym					
Zone	Type	BioEVC	BioEVC conservation status	Large tree(s)	Partial removal	Condition score	Polygon Extent	Extent without overlap	SBV score	HI score	Habitat units	Offset type
PB-A1	Patch	vvp_0175_61	Endangered	0	no	0.380	1.630	1.630	0.177		0.547	General
PB-C1	Patch	wetland	Endangered	0	no	0.545	0.620	0.620	0.156		0.293	General
PB-C2	Patch	wetland	Endangered	0	no	0.545	0.041	0.041	0.410		0.024	General
PB-B8	Patch	vvp_0132_61	Endangered	0	no	0.296	0.030	0.030	0.100		0.007	General
PB-B9	Patch	vvp_0132_61	Endangered	0	no	0.296	0.009	0.009	0.100		0.002	General
PB-B10	Patch	vvp_0132_61	Endangered	0	no	0.296	0.004	0.004	0.100		0.001	General
PB-B6	Patch	vvp_0132_61	Endangered	0	no	0.296	0.004	0.004	0.100		0.001	General
PB-A2	Patch	vvp_0175_61	Endangered	0	no	0.380	0.017	0.017	0.410		0.007	General

Appendix 2: Information about impacts to rare or threatened species' habitats on site

This table lists all rare or threatened species' habitats mapped at the site.

Species common name	Species scientific name	Species number	Conservation status	Group	Habitat impacted	% habitat value affected
Blue-billed Duck	*Oxyura australis*	10216	Endangered	Dispersed	Top ranking map ; special site	0.0017
Melbourne Yellow-gum	*Eucalyptus leucoxylon subsp. connata*	504484	Vulnerable	Dispersed	Habitat importance map	0.0006
Velvet Daisy-bush	*Olearia pannosa subsp. cardiophylla*	502317	Vulnerable	Dispersed	Habitat importance map	0.0003
Woodland Leek-orchid	*Prasophyllum sp. aff. validum A*	505904	Endangered	Dispersed	Habitat importance map	0.0003
Salt Blown-grass	*Lachnagrostis robusta*	504223	Rare	Dispersed	Habitat importance map	0.0002
Snowy Mint-bush	*Prostanthera nivea var. nivea*	502746	Rare	Dispersed	Habitat importance map	0.0002
Wavy Swamp Wallaby-grass	*Amphibromus sinuatus*	503625	Vulnerable	Dispersed	Habitat importance map	0.0002
Paper Flower	*Thomasia petalocalyx*	503392	Rare	Dispersed	Habitat importance map	0.0002
Leafy Twig-sedge	*Cladium procerum*	500786	Rare	Dispersed	Habitat importance map	0.0002
Purple Blown-grass	*Lachnagrostis punicea subsp. punicea*	504206	Rare	Dispersed	Habitat importance map	0.0002
Spiral Sun-orchid	*Thelymitra matthewsii*	503378	Vulnerable	Dispersed	Habitat importance map	0.0001
Yarra Gum	*Eucalyptus yarraensis*	501326	Rare	Dispersed	Habitat importance map	0.0001
Purple Diuris	*Diuris punctata*	501084	Vulnerable	Dispersed	Habitat importance map	0.0001
Pale Swamp Everlasting	*Coronidium gunnianum*	504655	Vulnerable	Dispersed	Habitat importance map	0.0001
Clover Glycine	*Glycine latrobeana*	501456	Vulnerable	Dispersed	Habitat importance map	0.0001
Grey Goshawk	*Accipiter novaehollandiae novaehollandiae*	10220	Vulnerable	Dispersed	Habitat importance map	0.0000
Black Falcon	*Falco subniger*	10238	Vulnerable	Dispersed	Habitat importance map	0.0000

Brackish Plains Buttercup	*Ranunculus diminutus*	504314	Rare	Dispersed	Habitat importance map	0.0000
Blue-billed Duck	*Oxyura australis*	10216	Endangered	Dispersed	Habitat importance map ; special site	0.0000
White-throated Needletail	*Hirundapus caudacutus*	10334	Vulnerable	Dispersed	Habitat importance map	0.0000
Tufted Grass-tree	*Xanthorrhoea caespitosa*	505088	Rare	Dispersed	Habitat importance map	0.0000

Habitat group

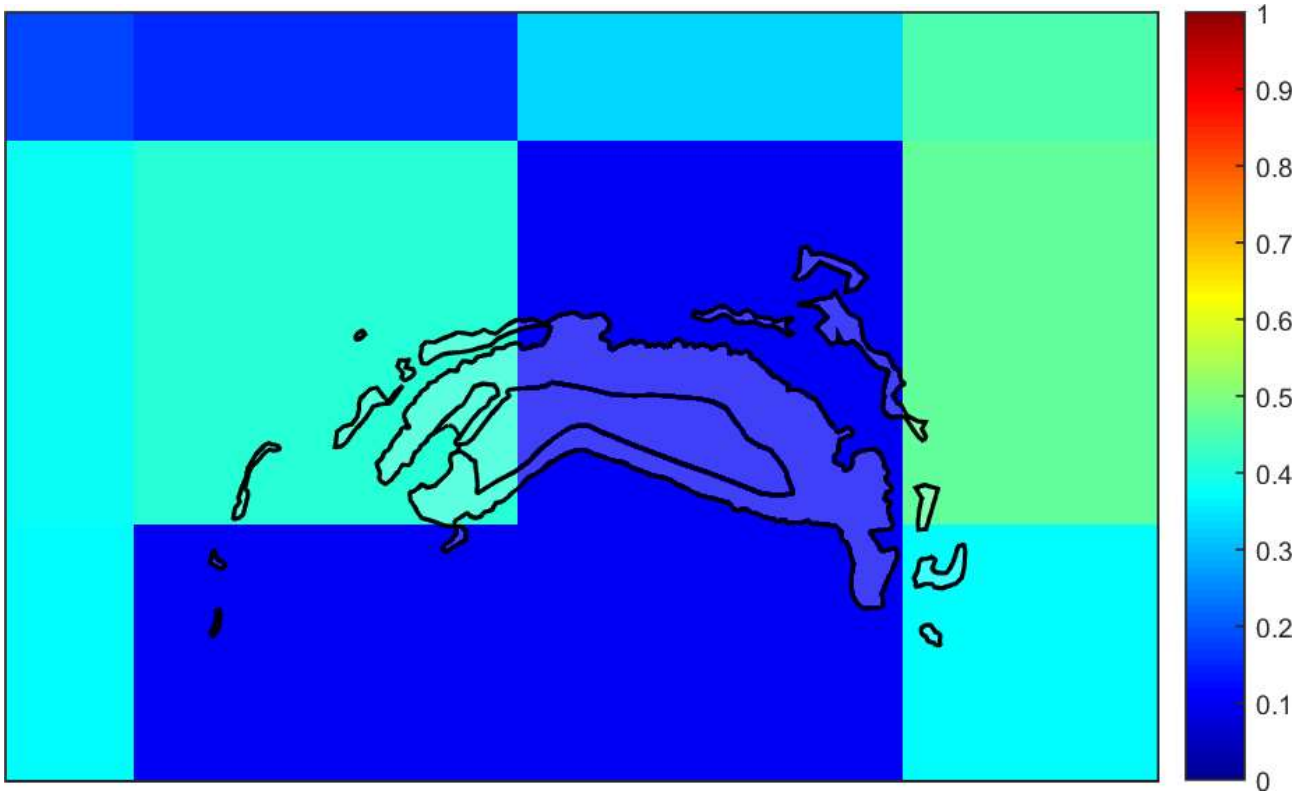
- Highly localised habitat means there is 2000 hectares or less mapped habitat for the species
- Dispersed habitat means there is more than 2000 hectares of mapped habitat for the species

Habitat impacted

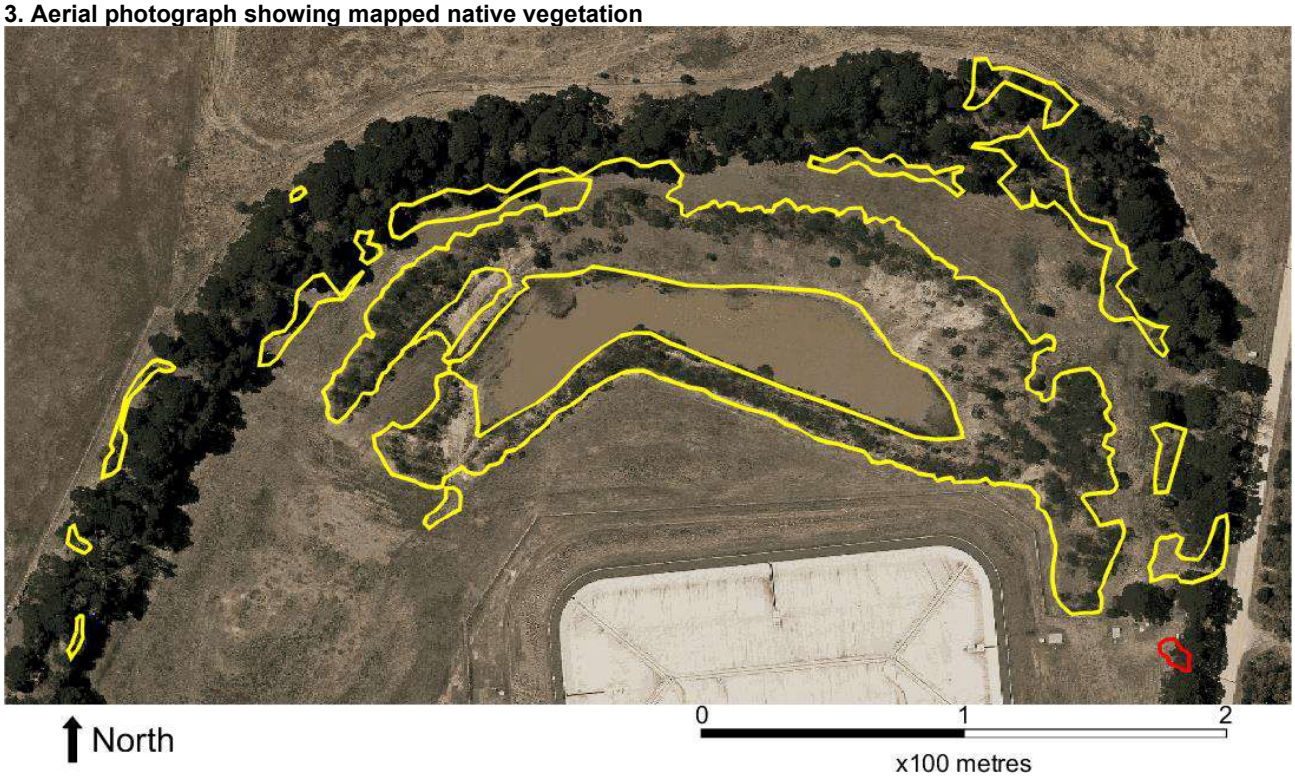
- Habitat importance maps are the maps defined in the Guidelines that include all the mapped habitat for a rare or threatened species
- Top ranking maps are the maps defined in the Guidelines that depict the important areas of a dispersed species habitat, developed from the highest habitat importance scores in dispersed species habitat maps and selected VBA records
- Selected VBA record is an area in Victoria that represents a large population, roosting or breeding site etc.

Appendix 3 – Images of mapped native vegetation

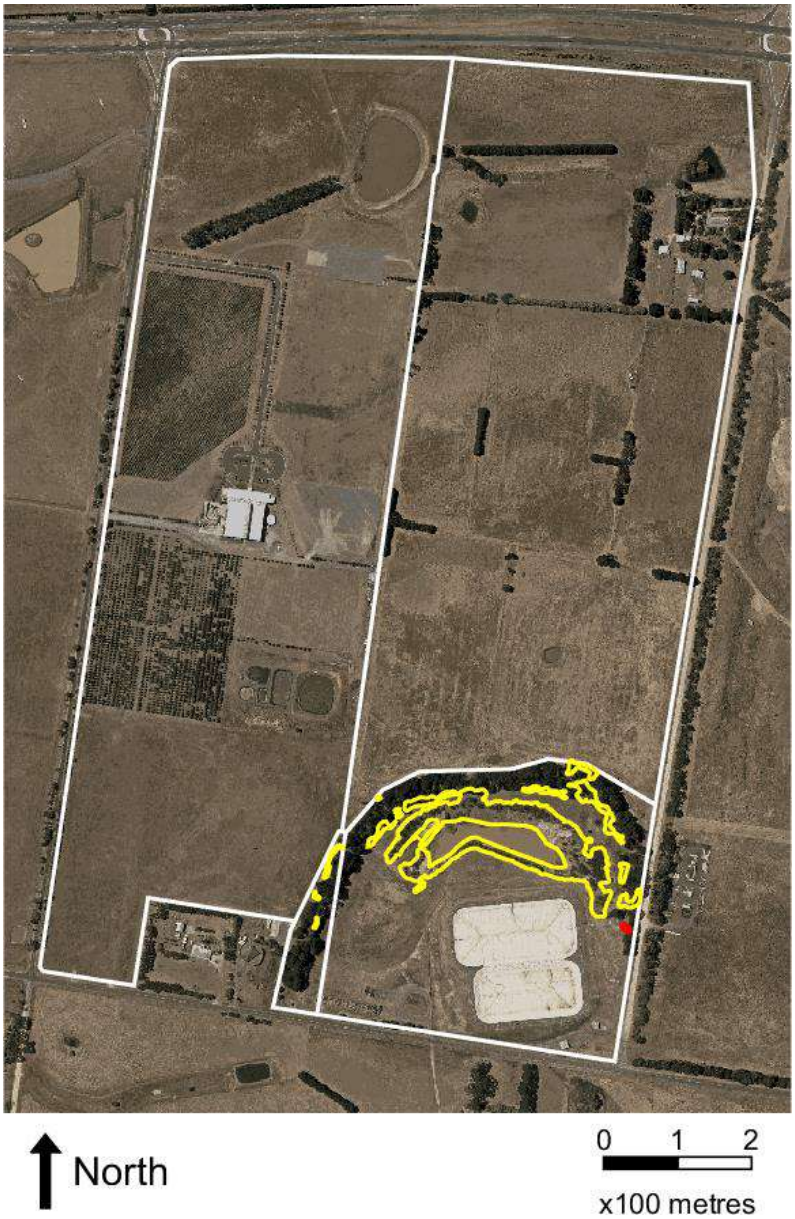
2. Strategic biodiversity values map



3. Aerial photograph showing mapped native vegetation



4. Map of the property in context



Yellow boundaries denote areas of proposed native vegetation removal.

Red boundaries denote areas of past removal.

Appendix E - Figures



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0 50 100 150 200
Meters

Scale:1:4,000 @ A3
GDA2020 MGA Zone 55

LEGEND

- Study Site
- Laydown Area
- Basin Footprint
- Minor road
- Rail line

Basin/Wetland Construction Footprint

- Proposed Basin No.3
- Overflow Detention Storage Basin
- Proposed Growling Grass Frog Wetland

KEY MAP



SOURCES:
1. Roads and Waterways © DDECA 2024
2. Basemap © Light Gray Base: Vicmap, Esri, TomTom, Garmin, FAO, NOAA, USGS
World Imagery: Source: Esri, Maxar, Earthstar Geographics, and the GIS User Community

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PROJECT:	Pettavel Augmentation Project
PROJECT NO:	30049187
FIGURE NO:	1
FIGURE TITLE:	Study Site Location
CREATED BY:	RS17486
DATE:	19/03/2024
VERSION:	3

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0 30 60 90 120
Meters

Scale:1:3,000 @ A3
GDA2020 MGA Zone 55

LEGEND

- Study site
- Laydown Area
- Planning Cadastre
- Contour 10m
- Rail line
- Minor road

Threatened Fauna

- Growling Grass Frog
- Little Eagle

Fauna Habitats

- Rabbit warren
- Stick nest (50cm)
- Stick nest (40cm) - inactive
- Straw nest (10cm)

Protected Flora Species

- Annual Fireweed
- Giant Honey-myrtle
- Golden Wattle
- Jersey Cudweed
- Slender Onion Orchid

Ecological Vegetation Classes

- Non-Eucalypt Grassy Woodland
- Plains Grassland
- DEECA Wetland

Noxious Weeds

- African Boxthorn
- Blackberry
- Patterson's Curse
- Serrated Tussock
- Spear Thistle
- Stinkwort
- Sweet Pittosporum

KEY MAP



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World Imagery: Source: Esri, Maxar, Earthstar Geographics, and the GIS User Community

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PROJECT:	Pettavel Augmentation Project
PROJECT NO:	30049187
FIGURE NO:	2A
FIGURE TITLE:	Ecological Values within the Study Site
CREATED BY:	RS17486
DATE:	19/03/2024
VERSION:	2

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0 25 50 75 100
Meters

Scale:1:2,000 @ A3
GDA2020 MGA Zone 55

LEGEND

- Study Site
- Laydown Area
- Planning Cadastre
- Swale Drain
- Associated Infrastructure
- Basin Footprint
- Contour 10m
- Minor Road

Protected Flora Species

- Annual Fireweed
- Giant Honey-myrtle
- Golden Wattle
- Jersey Cudweed
- Slender Onion Orchid

Native Vegetation Removal

- Assummed loss (retained where possible)
- Direct loss
- Past removal

Ecological Vegetation Classes

- Non-Eucalypt Grassy Woodland
- Plains Grassland
- DEECA Wetland

Basin/Wetland Construction Footprint

- Access Track
- Proposed Basin No.3
- Overflow Detention Storage Basin
- Proposed Growling Grass Frog Wetland

KEY MAP

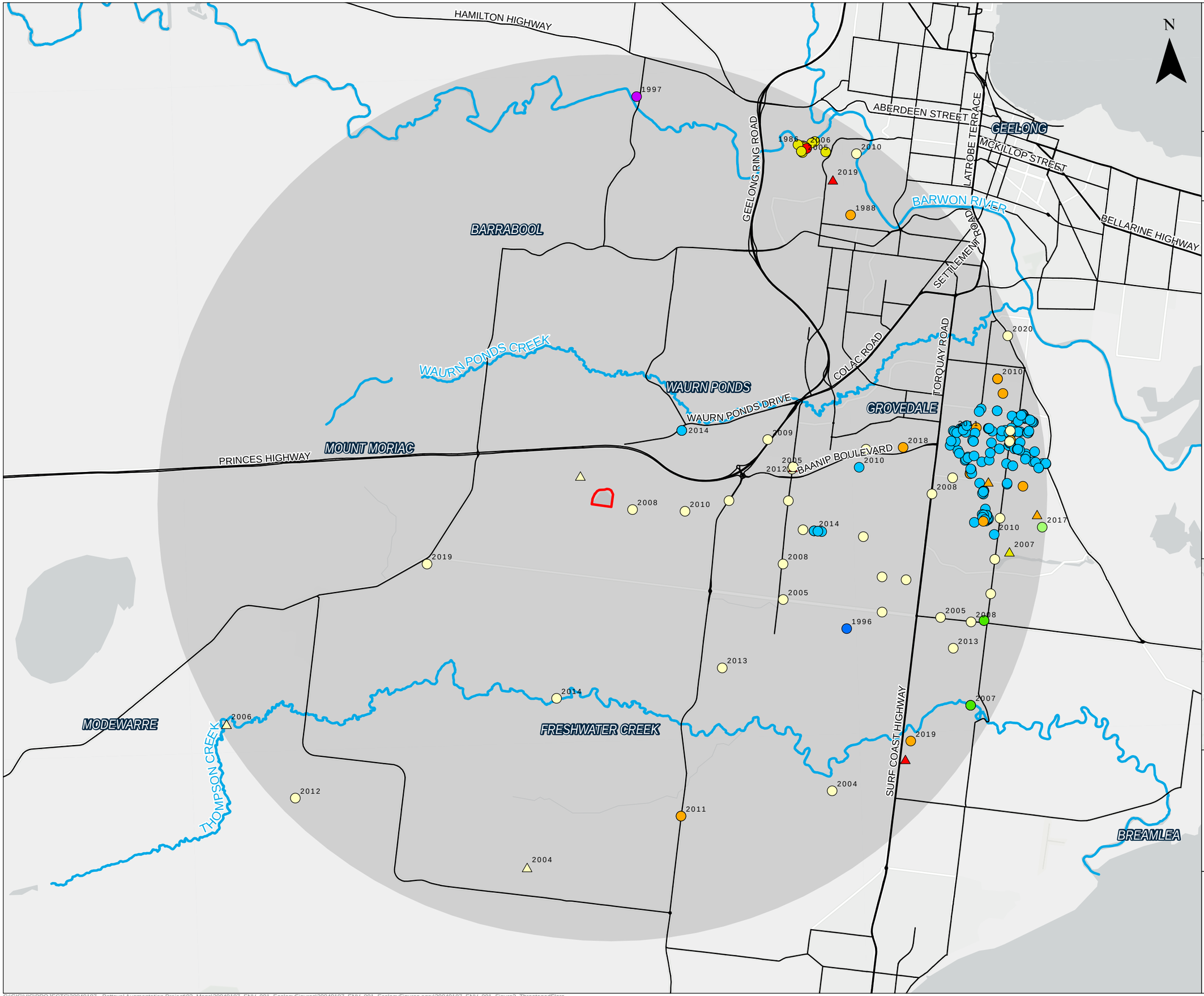


SOURCES:
1. Roads and Waterways © DEECA 2024
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World Imagery: Source: Esri, Maxar, Earthstar Geographics, and the GIS User Community

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PROJECT:	Pettavel Augmentation Project
PROJECT NO:	30049187
FIGURE NO:	2B
FIGURE TITLE:	Impacted Ecological Values within the Study Site
CREATED BY:	RS17486
DATE:	19/03/2024
VERSION:	2

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ABN 47 065 475 149

0 1000 2000 3000 4000
Meters

Scale:1:80,000 @ A3
GDA2020 MGA Zone 55

LEGEND

- Study site
- Study area
- Major road
- River

Threatened Flora Species

- Austral Tobacco
- Bellarine Yellow-gum
- Fragrant Saltbush
- Giant Honey-myrtle
- Large-fruit Yellow-gum
- Leafy Twig-sedge
- Melbourne Yellow-gum
- Pale Swamp Everlasting
- Rye Beetle-grass
- Salt Blown-grass
- Spotted Gum
- Sticky Wattle
- Studley Park Gum
- Yarra Gum

KEY MAP



SOURCES:
1. Roads and Waterways © DELWP 2023
2. Basemap © Light Gray Base: Vicmap, Esri, HERE, Garmin, FAO, NOAA, USGS
Light Gray Base: Vicmap, Esri, HERE, Garmin, Foursquare, METI/NASA, USGS

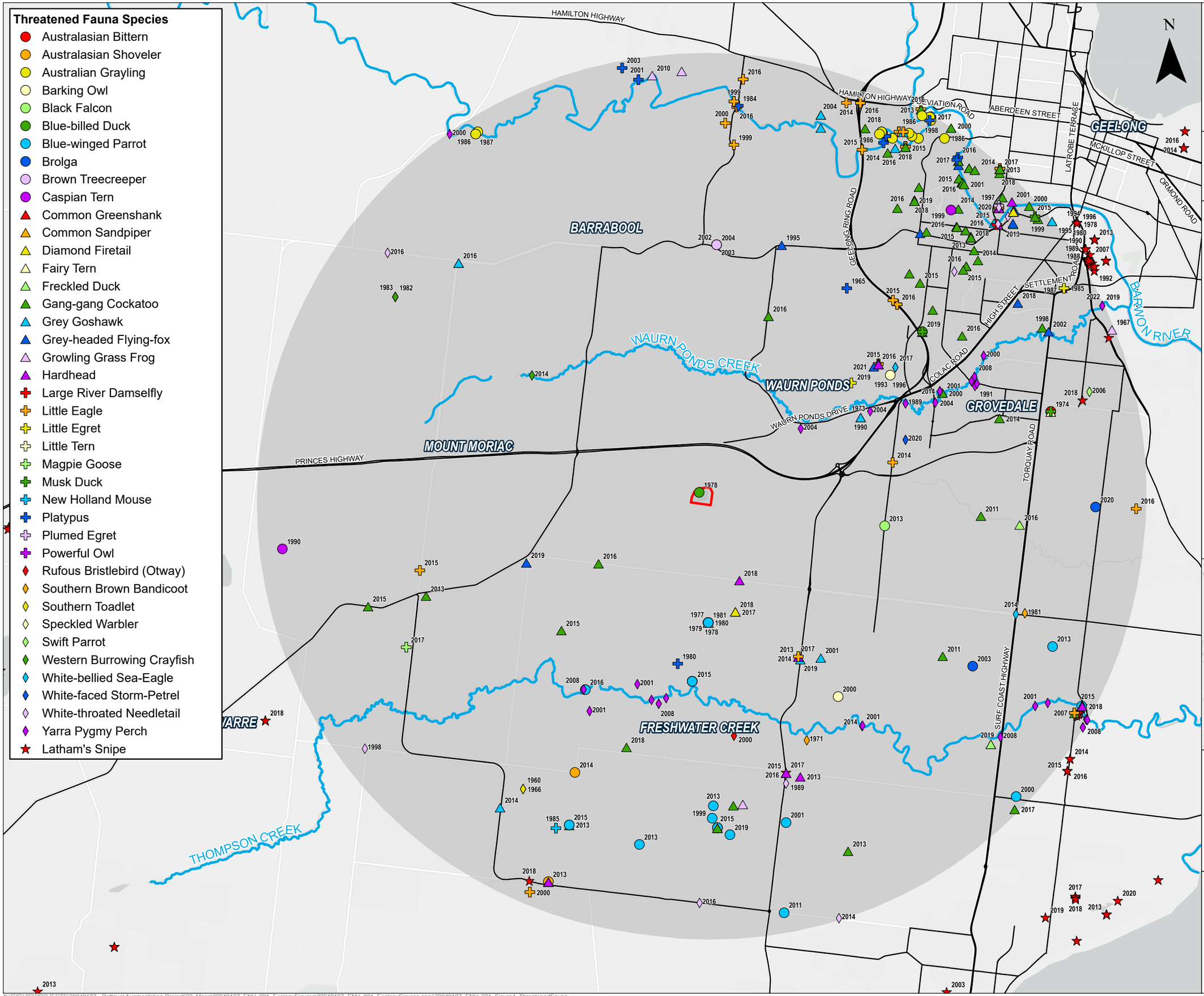
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PROJECT:	Pettavel Augmentation Project
PROJECT NO:	30049187
FIGURE NO:	3
FIGURE TITLE:	Threatened Flora Species within 10km of the Study Site
CREATED BY:	JO15865
DATE:	20/07/2023
VERSION:	1

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Threatened Fauna Species

- Australasian Bittern
- Australasian Shoveler
- Australian Grayling
- Barking Owl
- Black Falcon
- Blue-billed Duck
- Blue-winged Parrot
- Brolga
- Brown Treecreeper
- Caspian Tern
- Common Greenshank
- Common Sandpiper
- Diamond Firetail
- Fairy Tern
- Freckled Duck
- Gang-gang Cockatoo
- Grey Goshawk
- Grey-headed Flying-fox
- Growling Grass Frog
- Hardhead
- Large River Damselfly
- Little Eagle
- Little Egret
- Little Tern
- Magpie Goose
- Musk Duck
- New Holland Mouse
- Platypus
- Plumed Egret
- Powerful Owl
- Rufous Bristlebird (Otway)
- Southern Brown Bandicoot
- Southern Toadlet
- Speckled Warbler
- Swift Parrot
- Western Burrowing Crayfish
- White-bellied Sea-Eagle
- White-faced Storm-Petrel
- White-throated Needletail
- Yarra Pygmy Perch
- Latham's Snipe



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ABN 47 065 475 149

0 1000 2000 3000 4000
Meters

Scale:1:80,000 @ A3
GDA2020 MGA Zone 55

LEGEND

- Study site
- Study area
- Major road
- River

KEY MAP



SOURCES:
1. Roads and Waterways © DEECA 2024
2. Basemap © Light Gray Base: Vicmap, Esri, TomTom, Garmin, FAO, NOAA, USGS
Light Gray Base: Vicmap, Esri, TomTom, Garmin, Foursquare, METI/NASA, USGS

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PROJECT:	Pettavel Augmentation Project
PROJECT NO:	30049187
FIGURE NO:	4
FIGURE TITLE:	Threatened Fauna Species within 10km of the Study Site
CREATED BY:	RS17486
DATE:	20/03/2024
VERSION:	2

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Appendix F – Offset Availability Report

Report of available native vegetation credits

This report lists native vegetation credits available to purchase through the Native Vegetation Credit Register.

This report is **not evidence** that an offset has been secured. An offset is only secured when the units have been purchased and allocated to a permit or other approval and an allocated credit extract is provided by the Native Vegetation Credit Register.

Date and time: 28/02/2024 01:48 **Report ID: 23043**

What was searched for?

General offset

General habitat units	Strategic biodiversity value	Large trees	Vicinity (Catchment Management Authority or Municipal district)	
0.956	0.145	0	CMA	Corangamite
			or LGA	Greater Geelong City

Details of available native vegetation credits on 28 February 2024 01:48

These sites meet your requirements for general offsets.

Credit Site ID	GHU	LT	CMA	LGA	Land owner	Trader	Fixed price	Broker(s)
BBA-2252	107.459	0	Corangamite	Colac Otway Shire	No	Yes	No	Bio Offsets
BBA-2252	56.708	0	Corangamite	Colac Otway Shire	No	Yes	Yes	Bio Offsets
BBA-3017_02	1.984	0	Melbourne Water	Greater Geelong City	No	Yes	No	VegLink
VC_CFL-3080_01	5.287	100	Corangamite	Golden Plains Shire	Yes	Yes	No	Bio Offsets
VC_CFL-3697_01	18.297	0	Corangamite	Golden Plains Shire	Yes	Yes	No	Bio Offsets
VC_CFL-3699_01	1.834	45	Corangamite	Colac Otway Shire	Yes	Yes	No	Contact NVOR
VC_CFL-3699_01	2.457	0	Corangamite	Colac Otway Shire	No	Yes	No	Bio Offsets
VC_CFL-3718_01	8.696	911	Corangamite	Corangamite Shire	Yes	Yes	No	Bio Offsets
VC_CFL-3739_01	5.630	276	Corangamite	Colac Otway Shire	Yes	Yes	No	Bio Offsets
VC_CFL-3786_01	1.728	600	Corangamite	Corangamite Shire	Yes	Yes	No	VegLink
VC_CFL-3786_01	1.044	0	Corangamite	Corangamite Shire	Yes	Yes	Yes	VegLink

VC_CFL-3787_01	9.579	895	Corangamite	Colac Otway Shire	Yes	Yes	No	VegLink
VC_CFL-3798_01	2.368	232	Corangamite	Colac Otway Shire	Yes	Yes	No	VegLink

These sites meet your requirements using alternative arrangements for general offsets.

Credit Site ID	GHU	LT	CMA	LGA	Land owner	Trader	Fixed price	Broker(s)

There are no sites listed in the Native Vegetation Credit Register that meet your offset requirements when applying the alternative arrangements as listed in section 11.2 of the Guidelines for the removal, destruction or lopping of native vegetation.

These potential sites are not yet available, land owners may finalise them once a buyer is confirmed.

Credit Site ID	GHU	LT	CMA	LGA	Land owner	Trader	Fixed price	Broker(s)

There are no potential sites listed in the Native Vegetation Credit Register that meet your offset requirements.

LT - Large Trees *CMA - Catchment Management Authority* *LGA - Municipal District or Local Government Authority*

Next steps

If applying for approval to remove native vegetation
Attach this report to an application to remove native vegetation as evidence that your offset requirement is currently available.

If you have approval to remove native vegetation
Below are the contact details for all brokers. Contact the broker(s) listed for the credit site(s) that meet your offset requirements. These are shown in the above tables. If more than one broker or site is listed, you should get more than one quote before deciding which offset to secure.

Broker contact details

Broker Abbreviation	Broker Name	Phone	Email	Website
Abezco	Abzeco Pty. Ltd.	(03) 9431 5444	offsets@abzeco.com.au	www.abzeco.com.au
Baw Baw SC	Baw Baw Shire Council	(03) 5624 2411	bawbaw@bawbawshire.vic.gov.au	www.bawbawshire.vic.gov.au
Bio Offsets	Biodiversity Offsets Victoria	0452 161 013	info@offsetsvictoria.com.au	www.offsetsvictoria.com.au
Contact NVOR	Native Vegetation Offset Register	136 186	nativevegetation.offsetregister@delwp.vic.gov.au	www.environment.vic.gov.au/native-vegetation
Ecocentric	Ecocentric Environmental Consulting	0410 564 139	ecocentric@me.com	Not avaliable
Ethos	Ethos NRM Pty Ltd	(03) 5153 0037	offsets@ethosnrm.com.au	www.ethosnrm.com.au
Nillumbik SC	Nillumbik Shire Council	(03) 9433 3316	offsets@nillumbik.vic.gov.au	www.nillumbik.vic.gov.au
TFN	Trust for Nature	8631 5888	offsets@tfn.org.au	www.trustfornature.org.au
VegLink	Vegetation Link Pty Ltd	(03) 8578 4250 or 1300 834 546	offsets@vegetationlink.com.au	www.vegetationlink.com.au
Yarra Ranges SC	Yarra Ranges Shire Council	1300 368 333	biodiversityoffsets@yarraranges.vic.gov.au	www.yarraranges.vic.gov.au

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For more information contact the DEECA Customer Service Centre 136 186 or the Native Vegetation Credit Register at nativevegetation.offsetregister@delwp.vic.gov.au

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Notwithstanding anything else contained in this publication, you must ensure that you comply with all relevant laws, legislation, awards or orders and that you obtain and comply with all permits, approvals and the like that affect, are applicable or are necessary to undertake any action to remove, lop or destroy or otherwise deal with any native vegetation or that apply to matters within the scope of Clauses 52.16 or 52.17 of the Victoria Planning Provisions and Victorian planning schemes

Appendix G – Targeted survey report

Technical Memorandum

Project title	Pettavel Basin Augmentation Project - Targeted surveys for Growling Grass Frog and Latham's Snipe		
Prepared for	CMP Consulting Group Pty Ltd	Date of Issue	20 March 2024
Authors	Andrew Taylor, Clio Gates Foale	Project No.	30049187
Reviewed by	Dan Weller	Approved by	Andrew Taylor

1. Introduction

SMEC Australia Pty Ltd (SMEC) was commissioned by CMP Consulting Group Pty Ltd (CMP) to undertake targeted surveys for Growling Grass Frog (*Litoria raniformis*) and Latham's Snipe (*Gallinago hardwickii*) for the Pettavel Basin Augmentation Project, Victoria (the Project). The species is listed as Vulnerable under the federal *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act).

The Project aims to increase the water storage capacity of the existing Pettavel water storage facility, that has been used as a water storage facility by Barwon Water for over 70 years. The construction of a new 100 ML basin is required to meet future demand of the growing populations of Armstrong Creek, Leopold the Bellarine and Surf Coast. The proposed works are situated on a 25 ha parcel of land on the corner of Draytons Road and Reservoir Road, Waurn Ponds, Victoria (Figure 1).

A Detailed Flora and Fauna Assessment completed for the Project (SMEC 2024) identified potential habitat for Growling Grass Frog and Latham's Snipe within the borrow pit wetland and recommended targeted surveys for both species to confirm their presence or absence. This report details the outcome of those surveys.

2. Growling Grass Frog

2.1 Species description

Conservation Status

EPBC Act: Vulnerable
FFG Act: Vulnerable

Description

Growling Grass Frog is also commonly known as the Southern Bell Frog, Green and Golden Frog and Warty Swamp Frog. The species is a large diurnal frog that can be distinguished by its bright to olive-green colour, warty back (with brown blotches in the adult), dorso-lateral fold, and distinct tympanum (ear) (DCCEEW 2024).



Image 1: Growling Grass Frog (Source: Dan Weller, SMEC, 2021).

Growling Grass Frog generally breed between November to March, following local flooding and a rise in water levels. This rise in water levels triggers breeding males to begin calling for females (DCCEEW 2024). Eggs are laid within days of breeding and tadpoles hatch between 2–4 days later (DCCEEW 2024). The metamorphis stage of the tadpoles generally takes approximately three months, however, may take up to 12 months in exceptional circumstances (DCCEEW 2024). In Victoria, most tadpoles have emerged as frogs by the end of May (SWIFFT 2024).

Growling Grass Frog can be highly mobile species, capable of moving up to 1 km over a 24-hour period (DCCEEW 2024). When restricted to small, permanent waterbodies, dispersal is low where they tend to move shorter distances indicating high site fidelity. Conversely, when occupying ephemeral waterbodies, Growling Grass Frog are likely to disperse more and travel further distances to reach other suitable wetland habitat(s) (SWIFT 2023).

Growling Grass Frog are carnivorous where their diet ranges from invertebrates, small fish, small reptiles and other amphibians, even Growling Grass Frog young in rare circumstances (DCCEEW 2024).

Distribution

Growling Grass Frog is distributed across south-eastern Australia, being found in New South Wales (Riverina area), Victoria, Tasmania, and south-eastern South Australia. In Victoria, the species has isolated populations in the greater Melbourne area and across areas in south-western Victoria (SWIFFT 2024). Growling Grass Frog has experienced a significant range reduction in recent decades where this species is now considered locally extinct in most areas of Victoria (DCCEEW 2024).

Habitat

Growling Grass Frog occur in still or slow-moving waterbodies with emergent and fringing vegetation and mats of floating or submerged plants (SWIFFT 2024). They can inhabit artificial waterbodies, such as farm dams, irrigation channels and disused quarries. High quality habitat includes abundant aquatic vegetation and minimal tree canopy cover, with open areas for basking (SWIFFT 2024). Grass and shrub cover on the banks are also important for the emerging froglets to gain protection from predators and to acquire insect prey as a food source (SWIFFT 2024).

Key threats

The principal threats to Growling Grass Frog include habitat loss and Chytridiomycosis disease through the following impacts (SWIFFT 2024):

- Draining, filling or barriers to movement of waterbodies;
- Reduced water quality and increased salinity, phosphate and nitrate concentrations;
- Loss of terrestrial habitat through heavy stock grazing;
- Introduced fish; and
- Climate change.

2.2 Methods

2.2.1 Permits

Fauna monitoring was undertaken in accordance with a Research Permit approved by the Victorian Department of Energy, Environment, and Climate Action (DEECA) under the *Wildlife Act 1975* (Permit 10009728) (formerly the Department of the Environment, Land, Water and Planning [DELWP]). All animal handling was in accordance with SMECs Standard Operating Procedure (SMEC 2021), and Wildlife and Small Institutions Animal Ethics Committee (WSIAEC) approval 23.20.

2.2.2 Nomenclature

Unless otherwise noted, common and scientific names for fauna species follow the VBA database (current version) (DEECA 2023).

2.2.3 Online data

Database searches for the Victorian Biodiversity Atlas (VBA) encompassed a 10 km buffer radius around the study site (DEECA 2023). Records prior to 1980 are removed from the datasets based on age and relevance.

2.2.4 Targeted survey

Nocturnal surveys

Targeted surveys were undertaken over two separate days in November and December 2023 (Table 1) in areas identified as potential habitat within the study site (Figure 2). Surveys were undertaken in accordance with the '*Significant impact guidelines for the vulnerable Growling Grass Frog*' (DEWHA 2009), as follows:

- Sampling methods included nocturnal surveys, with two survey nights completed (non-consecutive nights to increase detectability over breeding season).
- Surveys were undertaken when night-time air temperatures are greater than 12°C with moderate to no wind, and during the breeding season when males are calling (October to December).

- Surveys utilised a combination of call playback and active searching. Call playback was used to elicit a response from breeding males (approx. 10 minutes), followed by a period of active listening (approx. 5 minutes) Areas of suitable habitat were then searched using a spotlight for approximately 20 minutes, including areas of dense vegetation and other possible refuges (e.g., rocks and logs).

Tadpole surveys

Breeding activity of Growling Grass Frog was investigated within the wetland using two separate survey methods, bait traps and dip netting. Ten bait traps were deployed around the margins of the wetland over one night, each trap was set with a glow stick as an attractant. The traps were set in shallow water with only the entrances at each end submerged. The top of each trap was retained above the water level. The traps were check the following morning and species identified. Deployment and retrieval of bait traps was coupled with dip-netting along the margins and within aquatic vegetation within the wetland over approximately four hours. Dip-netting was undertaken at different depths (bottom, mid-water and surface) using a swooping movement.

2.2.5 Habitat assessment

A diurnal habitat assessment was completed on 10 November 2023. Habitat quality was assessed using components of Heard (et al. 2010) for hydroperiods and aquatic vegetation cover. The following was recorded:

- Size: Physical dimensions of the water body (approximate width and length).
- Water Quality: Temperate (ºC), pH (0-14) and water turbidity (NTU).
- Hydroperiod: This is defined as the likelihood a selected wetland will remain inundated over the course of a single breeding season, on a scale from 0 to 3, where:
  - 0 = fills only in years with above average rainfall ('intermittent')
  - 1 = fills and dries out annually with average rainfall ('ephemeral')
  - 2 = dries out only during years of below average rainfall ('semi-permanent')
  - 3 = never dries out, regardless of rainfall ('permanent')
- Terrestrial vegetation and refuge: Cover of terrestrial vegetation, rocks and logs.
- Aquatic vegetation cover: Defined as the mean percentage of the water surface area covered by foliage associated with emergent, submergent and floating aquatic plants. The mean percentage of cover (%) ranges between 0-100%, and is calculated as follows:
  - Mean percentage of cover (%) = sum(%emergent + %submergent + %floating)/3.
  - For the purposes of this assessment, averages are rounded to the nearest unit value (i.e. 8% would be rounded to 10%).
- Connectivity: Level of connectivity is defined as follows:
  - Good connectivity - Wetlands or other suitable habitat present within 1 km, no dispersal barriers and minimal overland travel required (e.g., connectivity via a waterway within 100 m).
  - Moderate connectivity - Wetlands or other suitable habitat present within 1 km, however some dispersal barriers and/or overland travel required (e.g., connectivity via a waterway >100 m).
  - Poor connectivity - Wetlands or other suitable habitat >1 km away, dispersal barriers present and/or significant overland travel required (>1 km).
- Habitat quality: The borrow pit wetland was allocated habitat quality rating based on the attributes described above and known to support the species ecology (particularly breeding). A generalised description of habitat quality ratings is provided below, noting that a 'best-fit' rating is applied where a site supports attributes across multiple rating categories:
  - High quality habitat:
    - Contain many habitat attributes required for breeding, foraging and refuge (overwintering).
    - Habitat with low turbidity water (≤50 NTU).
    - Wetlands that are permanent and/or have high levels (>30-40%) of aquatic vegetation cover.

- Habitat with good connectivity.

- Medium quality habitat:
  - Contain some habitat attributes required for breeding, foraging and refuge (overwintering).
  - Habitat with moderate turbidity water (≤100 NTU).
  - Wetlands that are permanent or semi-permanent and/or have medium levels (>10-30%) of aquatic vegetation cover.
  - Habitat with moderate connectivity.
- Low quality habitat:
  - Contain few habitat attributes required for breeding, foraging and refuge (overwintering).
  - Habitat with high turbidity water (≥100 NTU).
  - Wetlands that are permanent, semi-permanent or ephemeral and/or have low levels of (<10%) aquatic vegetation cover.
  - Habitat with poor connectivity.

2.3 Results

2.3.1 Previous records

There are four previous records for Growling Grass Frog from within 10 km of the study site, most recently from 2019 (Figure 3). These records are typically associated with the Barwon River between 2001-2010, with no apparent records within 1 km of the study site.

2.3.2 Targeted survey

Nocturnal surveys

Growling Grass Frog was detected within the borrow pit wetland on two separate occasions (Table 1). The survey outcomes and weather conditions during each nocturnal survey are summarised below, with full details provided in Appendix 1.

A total of five other, non-threatened amphibian species were detected calling in low abundances during each survey:

- 25 x Common Froglet (*Crinia signifera*);
- 3 x Southern Brown Tree Frog (*Litoria ewingii*);
- 10 x Southern Bullfrog (*Limnodynastes dumerilii*);
- 8 x Spotted Marsh Frog (*Limnodynastes tasmaniensis*); and
- 2 x Striped Marsh Frog (*Limnodynastes peronii*).

One introduced fish species, Mosquito Fish (*Gambusia holbrooki*), was also detected within the borrow pit wetland. Mosquito Fish is listed as a key threat to the species due to predation of frog eggs and tadpoles (DCCEEW 2023).

Table 1: Growling Grass Frog survey dates and weather conditions

Date	Min. temp. (°C)	Max. temp. (°C)	Survey temp (°C)	Max. cloud cover (%)	Wind (km/h)	Rain	Detected?
10/11/2023	10.9	31.8	23	50	0-5	No rain	6 x Growling Grass Frog heard calling
5/12/2023	13.6	27.6	19	15	0-5	No rain	10 x Growling Grass Frog heard calling

Tadpole surveys

Growling Grass Frog tadpoles were detected within the borrow pit wetland (Table 1). This outcome confirms that the population of Growling Grass Frog present on the site is currently breeding. A total of five Growling Grass Frog tadpoles were collected and identified to species level using dip-netting methods between 18-19 January 2024.

2.3.3 Habitat assessment

The following describes the habitat recorded at the site and its suitability for Growling Grass Frog:

- Size: Artificial wetland (160 x 30 m) and 1.2 m depth (containing a soft mud layer of approximately 60 cm).
- Water Quality:
  - Temperature: 20.7ºC
  - PH: 8.5 (alkaline)
  - NTU: 50.7 (low to moderate)
- Hydroperiod (0-3): The borrow pit wetland is a permanent wetland (score of 3), with expansion and reduction of shallow marsh areas during extended rainfall and/or extended high temperatures during summer.
- Terrestrial vegetation and refuge: Low levels of refuge/overwintering by means of rockery, logs, cracking soils. Tussock grasses (native or non-native) are predominantly absent surrounding the margins of the wetland. There is partial shading by acacia along edge of the wetland. However, areas to the north within the planted pine trees provide some of the habitat characteristics suitable for overwintering habitat (tussock grasses and wood piles), which were typically supporting European Rabbit (*Oryctolagus cuniculus*) warrens during the assessment. Open areas supporting modified grassland are routinely slashed and these provide foraging opportunities for the species.
- Aquatic vegetation cover: High cover of emergent vegetation but low levels of submerged and floating vegetation present, with a medium overall average cover of aquatic vegetation. The borrow pit wetland was estimated to provide a total mean aquatic vegetation of 36% cover, comprising 51% emergent, 50% submergent and 7% floating vegetation.
- Flora species composition: Vegetation within the borrow pit wetland can be broadly described as a mosaic of Tall Marsh and Plains Sedgy Wetland Ecological Vegetation Classes (EVCs), with patches of Tall Marsh characterised by tall (> 1 m high) emergent graminoids including Narrow-leaf Cumbungi (*Typha domingensis*), Tall Spike-rush (*Eleocharis sphacelata*) and River Club-sedge (*Schoenoplectus tabernaemontani*) often forming dense monoculture patches at the transitional zone between shallow and deeper water. In shallow regions, small aquatic graminoids and aquatic herbs were dominant with the dominant species being Small Spike-sedge (*Eleocharis acuta*). A significant portion of the wetland (40%) comprises open water contained submerged vegetation in high cover (90%) supporting Blunt Pond Weed (*Potamogeton ochreatus)*. Aquatic herbs such as Water-milfoil (*Myriophyllum crispatum*), Water Ribbons (*Cycnogetum procerum*), Creeping Brookweed (*Samolus repens*), Poison Lobelia (*Lobelia pratioides*) and Lesser Joyweed (*Alternanthera denticulata*) were also common, and extending to the margins. Weed cover was low with no aquatic weed species recorded. Despite the margins of the wetland often being comprised of bare ground only scattered annual weed species such as Hillmans Panic (*Panicum hillmanii*) and Rough Sow-thistle (*Sonchus asper*) were present.
- Connectivity: The borrow pit wetland has poor connectivity to other wetlands or suitable habitat. Based on available information, the nearest cluster of waterbodies is located approximately 220 m north-west of the study site (Figure 1), comprising a series of small to medium waterbodies used for irrigation of Mount Duneed Estate. With no evident habitat stepping stones or wildlife corridors to provide connectivity, dispersal is likely to be limited to overland movement during suitable conditions. Research into Growling Grass Frog dispersal capabilities suggests that populations separated by more than about 1 km have relatively little interaction with each other (Heard 2012).

  Opportunities to disperse within the local area are further limited by the presence of the following:

  - Agriculture: Areas to the north and west of the study site are subject to farming practices which include cropping and/or slashing on private property, which is likely to limit species dispersal due to noise and/or direct mortality from machinery. However, the level of risk for mortality is subject to the timing of farming practices and dispersal by the species.
  - Roads: The site is surrounded by public roads, including Daytons Road, Reservoir Road and Pettavel Road which may limit the success of dispersal from the study site. The Princess Highway is located approximately 1 km north of the study site, this is a four-lane road which is considered to be a barrier to dispersal. There are no underpass structures or culverts present within or adjoining the study site which can reduce potential road strikes if or when dispersing.

  - Railways: The Geelong-Warrnambool Railway is located approximately 650 m south of the study site and is considered to be a barrier to dispersal.
  - Active quarries: There is an active quarry operated by Boral approximately 250m east of the study site, this comprises a series of large waterbodies with varying levels of aquatic vegetation. The embankments are typically steep and consist of open bare ground which is likely to limit dispersal opportunities when coupled with the noise of machinery during operation of the quarry.

  However, new habitat will be constructed within the study site to maintain this extant population, with details outlined within a Growling Grass Frog Management Plan (SMEC 2024).

- Habitat quality: Overall, the borrow pit wetland is deemed to have high quality habitat as it is a permanent waterbody with a high level of aquatic vegetation (36%) and low to moderate water quality, however it has poor connectivity.

3. Latham's Snipe

3.1 Species description

Conservation status

EPBC Act: Vulnerable (in effect from 5 January 2024), Migratory/Marine
FFG Act: N/A

Description

Latham's Snipe (*Gallonage hardwickii*) is a medium-sized migratory shorebird and the largest snipe species in Australia (ABG 2017; SPRAT 2020a). Latham's Snipe migrate to Australia during the species non-breeding season. They arrive in Australia between late July to November and return to their breeding grounds in Japan and far eastern Russia typically from March to May (Higgins and Davies 1996). In Australia, Latham's Snipe inhabit both permanent and ephemeral wetlands ranging up to 2000 m above sea-level (Chapman 1969; Naarding 1982). These wetlands range from open freshwater wetlands with low, dense vegetation to saline or brackish water in modified or artificial habitats including those occurring near human activity (Naarding 1983; Frith et al. 1977).

3.2 Methods

3.2.1 Permits

Fauna monitoring was undertaken in accordance with a Research Permit approved by the Victorian Department of Energy, Environment, and Climate Action (DEECA) under the *Wildlife Act 1975* (Permit 10009728) (formerly the Department of the Environment, Land, Water and Planning [DELWP]). All animal handling was in accordance with SMECs Standard Operating Procedure (SMEC 2021), and Wildlife and Small Institutions Animal Ethics Committee (WSIAEC) approval 23.20.

3.2.2 Nomenclature

Unless otherwise noted, common and scientific names for fauna species follow the VBA database (current version) (DEECA 2023).

3.2.3 Online data

Database searches for the Victorian Biodiversity Atlas (VBA) encompassed a 10 km buffer radius around the study site (DEECA 2023). Records prior to 1960 are removed from the datasets based on age and relevance.

3.2.4 Targeted survey

Targeted surveys were undertaken over four separate days in spring and summer 2023-2024 (Table 2) in areas identified as potential habitat within the study site (Figure 2). Surveys were undertaken in accordance with the '*EPBC Act Policy Statement 3.21 - Industry guidelines for avoiding, assessing and mitigating impacts on EPBC Act listed migratory shorebird species'* (DoEE 2017). Multiple survey techniques were employed to maximise detection of Latham's Snipe potentially utilising habitat within and immediately adjacent to the study site, and to assess the relative importance of habitat for the species within the study site. The survey techniques included:

- Flushing transects – This involves several observers walking parallel at 3-5 meter (m) spacing, across an area of suitable habitat. This technique is employed to target Latham's snipe as the species typically utilises fringing or dense marsh vegetation for cover and can be difficult to detect by point count surveys;
- Identify, assess and map any suitable Latham's Snipe habitat within and immediately adjacent the study site;
- Count the number of any Latham's Snipe observed and map areas of use at time of observation; and
- Data was collected using the ArcGIS Collector mobile application with data captured to ± 5 metres.

3.2.5 Habitat assessment

Habitat assessments were undertaken to characterise the habitat values for migratory birds within the study site at all areas that are surveyed. Habitat attributes recorded during the habitat assessments included:

- A description of wetland features (i.e. wetted width, shape, depth, vegetation);
- Survey climate conditions;
- Presence of habitat features necessary for shorebirds e.g. muddy margins, fringing vegetation, riparian vegetation;
- Habitat suitability for Latham's snipe;
- Presence of all waterbirds and shorebirds; and
- Any other significant habitat features or values present.

3.3 Results

3.3.1 Targeted survey

Latham's Snipe was not detected during targeted surveys undertaken within the study site. Waterbirds identified utilising the wetland included: White-faced Heron (*Egretta novaehollandiae*), White-necked Heron (*Ardea pacifica*), Dusky Moorhen (*Gallinula tenebrosa*), Pacific Black Duck (*Anas superciliosa*), Hoary-headed Grebe (*Poliocephalus poliocephalus*), Straw-necked Ibis (*Threskiornis spinicollis*) and Yellow-billed Spoonbill (*Platalea flavipes*). No shorebirds were recorded within the borrow pit wetland. A summary of survey outcomes is provided in Table 2.

Table 2: Latham's Snipe survey dates and weather conditions.

Date	Min. temp. (°C)	Max. temp. (°C)	Survey temp (°C)	Max. cloud cover (%)	Wind (km/h)	Rain	Detected?
26/10/2023	6.4	15.8	10.3	35	15	6.6 mm	Not detected
10/11/2023	10.9	31.8	23	50	0-5	No rain	Not detected
05/12/2023	13.6	27.6	19	15	0-5	No rain	Not detected
19/01/2024	13.9	19.9	17	20	13	0.6 mm	Not detected

3.3.2 Habitat assessment

A detailed habitat description is provided in Sections 2.3.3 and Appendix 2. Habitat suitable for Latham's Snipe included shallow margins of the borrow pit wetland supporting adequate cover and refuge habitat in the form of emergent vegetation. Available habitat included shallow regions supporting small aquatic graminoids and aquatic herbs dominated by Small Spike-sedge. Suitable buffering habitat in the form of regenerating acacias provides a barrier to surrounding open areas of modified grassland maintained by Barwon Water.

4. Legislation

4.1 Environment Protection and Biodiversity Conservation Act 1999

The *Environment Protection and Biodiversity Conservation Act 1999* (the EPBC Act) is the Australian Government's primary piece of environmental legislation to protect and manage nationally and internationally important species, communities and heritage places, known as Matters of National Environmental Significance (MNES). If a MNES could be impacted by a proposed action, an assessment of the potential impacts against the relevant EPBC Act significant impact criteria must be completed. If there is potential for a significant impact to occur the proposed action must be referred to the federal Environment Minister for assessment under the EPBC Act.

Recommendations

- Growling Grass Frog: A breeding population of Growling Grass Frog was detected within the borrow pit wetland, which will be removed as part of the Project. A significant impact assessment was completed (Appendix 1) and a significant impact to Growling Grass Frog is considered to be Possible. As such, a referral under the EPBC Act is recommended.

  As part of the Project, a new wetland will be constructed prior to excavation of the borrow pit wetland in accordance with a Growling Grass Frog Management Plan (SMEC 2024). The new wetland will support the species habitat requirements for breeding, refuge and foraging habitat in accordance with industry standards for the species. Growling Grass Frog will be captured prior to and during excavation of the borrow pit wetland and relocated to the new wetland. The management plan includes measures to:

  - Create a new wetland that specifically accommodates the habitat requirements of Growling Grass Frog.
  - Relocate Growling Grass Frogs from the borrow pit wetland to the new wetland.
  - Control the spread of Chytrid fungus.
- Latham's Snipe: Latham's Snipe was not detected within the site. A significant impact to this species is unlikely.

4.2 Flora and Fauna Guarantee Act 1988

The *Flora and Fauna Guarantee Act 1988* (FFG Act) and *Flora and Fauna Guarantee Amendment Act 2019* is the key piece of Victorian legislation for the conservation of threatened species and communities and for the management of potentially threatening processes. In performing any of their functions that may reasonably be expected to impact on biodiversity in Victoria, a Minister and public authority must give proper consideration to the objectives of the FFG Act.

A permit is required for impacts to listed fish on both private and Crown land.

Recommendations

A permit is not required under the FFG Act for impacts to terrestrial fauna, including Growling Grass Frog and Latham's Snipe.

4.3 Wildlife Act 1975 and Wildlife Regulations 2013

The *Wildlife Act 1975* and Wildlife Regulations 2013 are both Victorian legislation that prevent harm to wildlife. Authorisation is required under the *Wildlife Act 1975* to carry out field investigations for the purpose of conserving, monitoring, improvement or maintaining wildlife habitat within Victoria.

A permit is required under the *Wildlife Act 1975* to carry out field investigations for the purpose of conserving, monitoring, improving or maintaining wildlife habitat within Victoria. This includes specific authorisation from DEECA for the capture, handling and relocation of wildlife.

Recommendations

A permit is required for the capture and relocation of Growling Grass Frog (and any other fauna species) during vegetation removal and construction. Any works requiring the removal of wildlife must be undertaken by suitably qualified and licenced personnel.

5. Summary

The following summarises the results of the assessment and further requirements:

- Growling Grass Frog: A breeding population of Growling Grass Frog was detected within the borrow pit wetland, which will be removed as part of the Project. As part of the Project, a new wetland will be constructed prior to excavation of the borrow pit wetland in accordance with a Growling Grass Frog Management Plan (SMEC 2024). The new wetland will support the species habitat requirements for breeding, refuge and foraging habitat in accordance with industry standards for the species. Growling Grass Frog will be captured prior to and during excavation of the borrow pit wetland and relocated to the new wetland. The management plan includes measures to:
  - Create a new wetland that specifically accommodates the habitat requirements of Growling Grass Frog.
  - Relocate Growling Grass Frogs from the borrow pit wetland to the new wetland.
  - Control the spread of Chytrid fungus.
- Latham's Snipe: Latham's Snipe was not detected within the site and no further action is required.
- EPBC Act: A significant impact assessment was completed (Appendix 1), and a significant impact to Growling Grass Frog is considered to be Possible. As such, a referral under the EPBC Act is recommended.
- FFG Act: A permit is not required under the FFG Act for impacts to terrestrial fauna, including Growling Grass Frog.
- Wildlife Act: A permit is required for the salvage and translocation of Growling Grass Frog (and any other fauna species) during vegetation removal and construction. Any works requiring the removal of wildlife must be undertaken by suitably qualified and licenced personnel.

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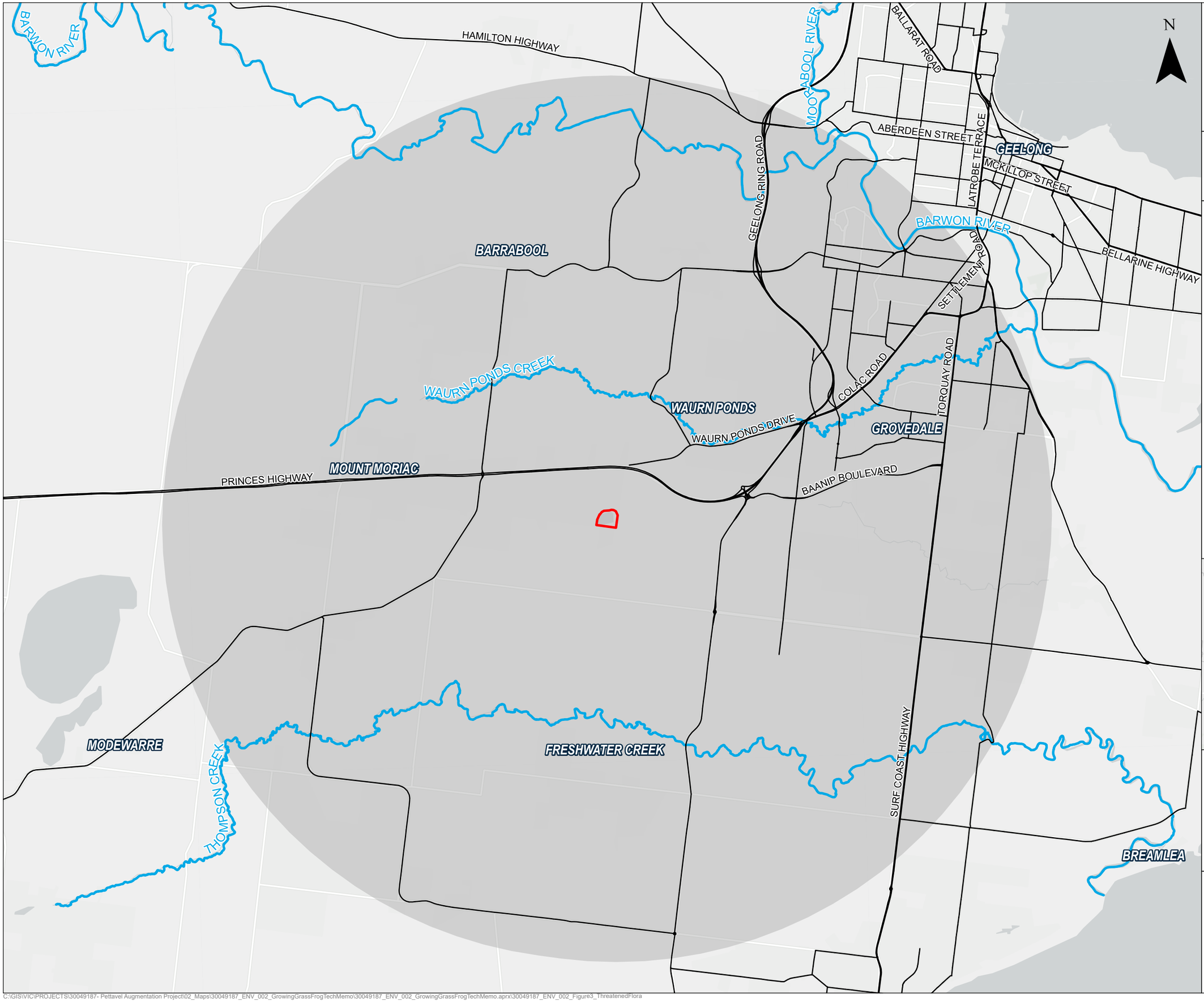
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Figures



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ABN 47 065 475 149

0 1000 2000 3000 4000
Meters

Scale:1:80,000 @ A3
GDA2020 MGA Zone 55

LEGEND

- Study site
- Study area
- Major road
- River

KEY MAP



SOURCES:
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2. Basemap © Light Gray Base: Vicmap, Esri, TomTom, Garmin, FAO, NOAA, USGS
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PROJECT:	Pettavel Augmentation Project
PROJECT NO:	30049187
FIGURE NO:	1
FIGURE TITLE:	Study Site Location
CREATED BY:	RS17486
DATE:	5/02/2024
VERSION:	1

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LEGEND

- Study site
- Waterbodies
- Stream
- Minor road

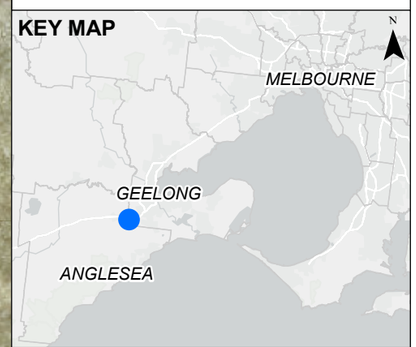
Growling Grass Frog Habitat

- Borrow pit wetland
- Terrestrial foraging habitat

Basin/Wetland Construction Footprint

- Proposed Basin No.3
- Overflow Detention Storage Basin
- Proposed Growling Grass Frog Wetland

KEY MAP



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PROJECT:	Pettavel Augmentation Project
PROJECT NO:	30049187
FIGURE NO:	2A
FIGURE TITLE:	Targeted Survey Locations
CREATED BY:	RS17486
DATE:	7/03/2024
VERSION:	2

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Meters

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LEGEND

- Study site
- Mt Duneed Estate
- Waterbodies
- Stream
- Major road
- Minor road
- Rail line

KEY MAP

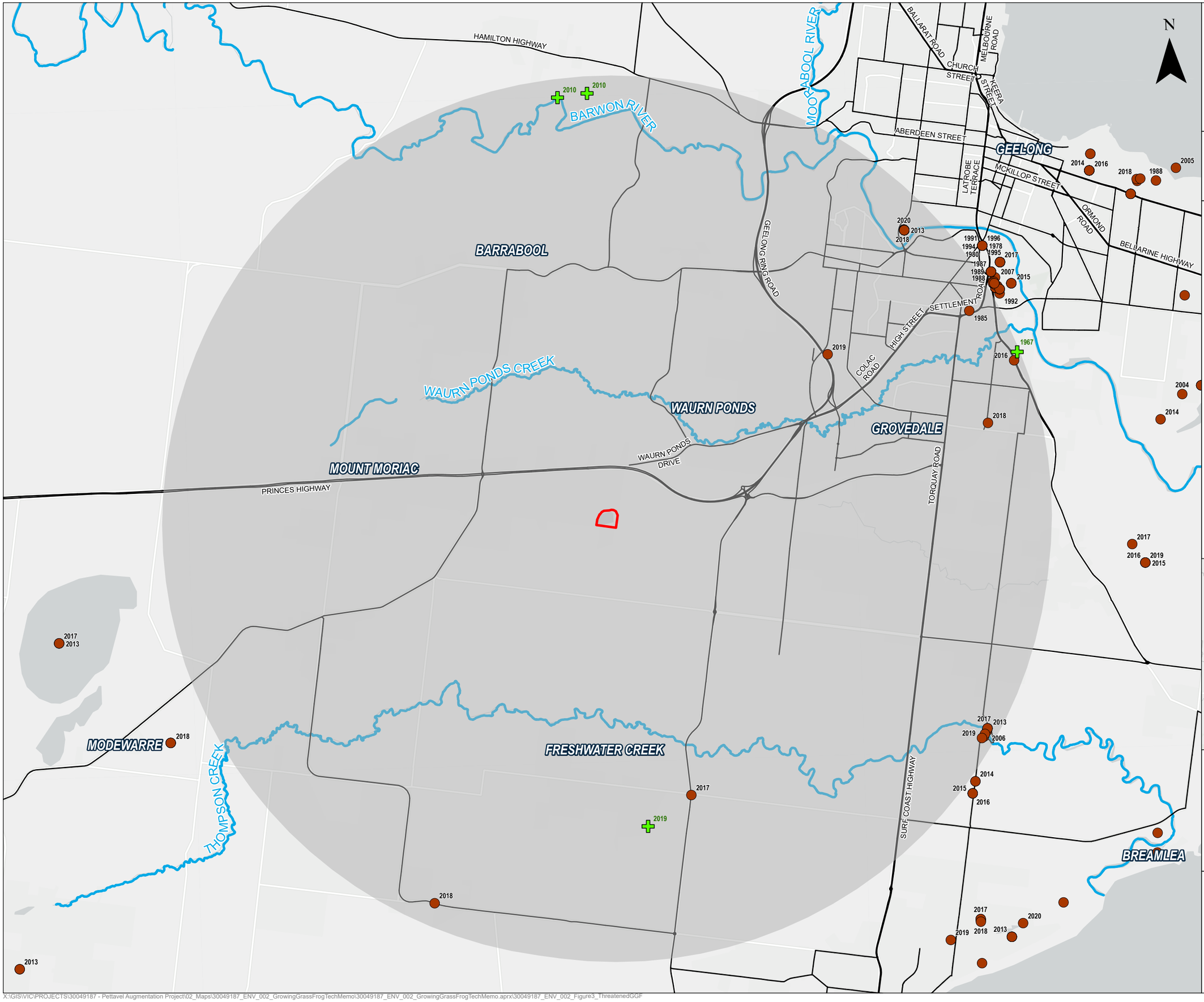


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PROJECT:	Pettavel Augmentation Project
PROJECT NO:	30049187
FIGURE NO:	2B
FIGURE TITLE:	Landscape Conditions Plan
CREATED BY:	RS17486
DATE:	7/03/2024
VERSION:	2

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Meters

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GDA2020 MGA Zone 55

LEGEND

- Study site
- Study area
- Major road
- River

Threatened Fauna Species

- Growling Grass Frog
- Latham's Snipe

KEY MAP



SOURCES:
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PROJECT:	Pettavel Augmentation Project
PROJECT NO:	30049187
FIGURE NO:	3
FIGURE TITLE:	Threatened Fauna Species within 10km of the Study Site
CREATED BY:	RS17486
DATE:	20/03/2024
VERSION:	2

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Appendix 1 – Significant impact assessment

Significant Impact Criteria	Description of potential impact	Likelihood of Significant Impact
Permanent removal or degradation of terrestrial habitat (for example between ponds, drainage lines or other temporary/permanent habitat) within 200 metres of a water body in temperate regions, or 350 metres of a water body in semi-arid regions, that results in the loss of dispersal or overwintering opportunities for an important population.	A breeding population of Growling Grass Frog was detected within the borrow pit wetland, which will be removed as part of the Project. Excavation of land surrounding the wetland may be considered an impact to terrestrial habitat. However, the impacts are restricted to within the study site, the impacts are not linear and are unlikely to form a dispersal barrier or limit dispersal opportunities for land surrounding the site.	Unlikely
Alteration of aquatic vegetation diversity or structure that leads to a decrease in habitat quality.	A breeding population of Growling Grass Frog was detected within the borrow pit wetland, which will be removed as part of the Project. A new wetland will be constructed prior to excavation of the borrow pit wetland in accordance with a Growling Grass Frog Management Plan (SMEC 2024). The new wetland will support the species habitat requirements for breeding, refuge and foraging habitat in accordance with industry standards for the species. Growling Grass Frog will be captured prior to and during excavation of the borrow pit wetland and relocated to the new wetland. The management plan includes measures to: • Create a new wetland that specifically accommodates the habitat requirements of Growling Grass Frog. • Relocate Growling Grass Frogs from the borrow pit wetland to the new wetland. • Control the spread of Chytrid fungus. As such, there will not be a net reduction in habitat quality on the site. However, when considering only the impacts to the borrow pit wetland, the Project will result in a decrease in habitat quality.	Possible
Alteration to wetland hydrology, diversity and structure (for example any changes to timing, duration or frequency of flood events) that leads to a decrease in habitat quality.	As above.	Possible
Introduction of predatory fish and/or disease agents.	The introduction of predatory fish or disease agents to the existing aquatic habitat is unlikely as the borrow pit wetland will be removed. A new wetland will be constructed on site prior to excavation of the borrow pit wetland. This will ensure there is alternative suitable habitat on site prior to the removal of the borrow pit wetland. The introduction of predatory fish or disease agents to the new habitat during construction activities is considered possible, however biosecurity protocols will be implemented in accordance with a species management plan to minimise the risk of transfer or introduction of pathogens or pest species.	Unlikely
Net reduction in the number and/or diversity of water bodies available to an important population.	An 'important population' of Growling Grass Frog is defined as (DEWHA 2009): *Any viable population of Growling Grass Frog is considered to be an important population… …A viable population is one which is not isolated from other populations or water bodies, such that it has the opportunity to interact with other nearby populations or has the ability to establish new populations when water bodies fill and become available.* Based on available information, the Growling Grass Frog population at the study site is considered to be an important population.	Unlikely

Significant Impact Criteria	Description of potential impact	Likelihood of Significant Impact
	Targeted surveys, including tadpole surveys, have confirmed that the Growling Grass Frog population is currently breeding. Further assessment would be necessary to determine breeding success (i.e. emergence of metamorphs). While the currently occupied wetland is proposed to be removed, a new wetland will be constructed prior to excavation of the borrow pit wetland in accordance with a Growling Grass Frog Management Plan (SMEC 2024). The new wetland will support the species habitat requirements for breeding, refuge and foraging habitat in accordance with industry standards for the species. Growling Grass Frog will be captured prior to and during excavation of the borrow pit wetland and relocated to the new wetland. The management plan includes measures to: • Create a new wetland that specifically accommodates the habitat requirements of Growling Grass Frog. • Relocate Growling Grass Frogs from the borrow pit wetland to the new wetland. • Control the spread of Chytrid fungus. As such, the Project will not result in a net reduction in the number and/or diversity of water bodies available to an important population.	
Removal or alteration of available terrestrial or aquatic habitat corridors (including alteration of connectivity during flood events).	The Project will not result in the removal or alteration of available terrestrial or aquatic habitat corridors (including alteration of connectivity during flood events).	Unlikely
Construction of physical barriers to movement between water bodies, such as roads or buildings.	As above.	Unlikely

Appendix 2 – Habitat photos

The following photos depict the borrow pit wetland and adjoining vegetation types.



Plate 1: Modified mown grass to the south of the borrow pit wetland.



Plate 2: Modified mown grass to the north of the borrow pit wetland.



Plate 3: Acacias adjoining wetland, indicating a lack of terrestrial fringing and refuge habitat along the margins.



Plate 4: Emergent vegetation within the eastern section of the wetland adjoined by acacias and open ground.



Plate 5: Emergent vegetation within the wetland, the predominant aquatic vegetation type.



Plate 6: Emergent vegetation and shallow marsh areas subject to and periodic inundation and ephemeral conditions.

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